Network Rail

170248 Headbolt Lane New Station GRIP 4

Environmental Statement Volume III: Technical Appendices

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 276736

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Introduction

Background

Merseytravel is looking to extend the current Merseyrail network east of Kirkby station to a new station at Headbolt Lane. It is proposed that Headbolt Lane will become the new interchange between Merseyrail and Northern services.

Headbolt Lane will be a new three platform station and car park and is located approximately 900 m north-east of Kirkby station using the existing railway alignment. To serve the new station, the railway line east of Kirkby will be upgraded from a single track to a twin track.

Purpose of this Report

Due to project timescales it has been agreed with Knowsley Council as the Local Planning Authority (LPA) that a combined Screening and Scoping Report will be submitted to support the planning application for the development of the new Headbolt Lane Station and associated works.

The purpose of this report is to provide information that will enable Knowsley Council to screen the new Headbolt Lane Station and associated works to determine whether it constitutes an Environmental Impact Assessment (EIA) development. Should Knowsley Council determine that an EIA is required, this report sets out the proposed scope and methodology that an EIA would follow.

Structure of this Report

This report is structured in two parts comprising the following sections:

- Part 1 EIA Screening
  - Location and description of the proposed scheme;
  - Potentially significant impacts; and
  - Characteristics of impacts.
- Part 2 EIA Scoping
  - Environmental topics scoped in and assessment methodology;
  - Environmental topics scoped out and reasoning; and
  - Proposed structure of the Environmental Statement (ES).

Part 1 – EIA Screening

1 EIA Screening

Ove Arup & Partners Ltd ('Arup') has been commissioned by Network Rail ('the Applicant') to prepare a report to support a request for an EIA Screening Opinion ('EIA Screening Report'), in respect of the proposed Headbolt Lane Station, car park and railway line upgrade (hereafter referred to as the 'Proposed Scheme).

This is a formal request for a screening opinion from the LPA under Part 2 of the Town and Country (EIA) Regulations 2017 ('the EIA Regulations') in terms of the requirement for an EIA, prior to submission of a planning application for the Proposed Scheme.

A planning application will be submitted for the proposed railway station and car park under the Town and Country Planning Act 1990. Depending on the outcome of the LPA Screening Opinion, the proposed upgrade to the railway line may be included in the planning application or could be done under Network Rail's Permitted Development Rights.

1.1 EIA Directive

Directive 2014/52/EU[1], amending Directive 2011/92/EU 'on the assessment of the effects of certain public and private projects on the environment' (the 'Environmental Impact Assessment (EIA) Directive') requires that EIA is undertaken for those plans or projects listed under either Annex I (where mandatory EIA is required) or Annex II, where a project listed, because of its size, nature or location, is likely to have significant effects on the environment.

1.2 EIA Regulations

The process of EIA in the context of town and country planning in England is governed by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the '2017 Regulations'). These regulations apply to development which is given planning permission under the Town and Country Planning Act 1990.

These regulations apply the amended EU directive (2014/52/EU)"*on the assessment of the effects of certain public and private projects on the environment*" to the planning system in England.

The EIA Regulations divide developments into two categories:

- Schedule 1 includes larger scale projects and EIA is compulsory; and
- Schedule 2 includes smaller projects that may require EIA depending on the sensitivity of the area and the potential to give rise to significant environmental effects.

[1] Whilst the UK has left the EU, this legislation still applies until the UK Government undertake a review and create UK specific legislation.

The Proposed Scheme does not fall under Schedule 1 of the EIA Regulations. However, the scheme should be considered against the following Schedule 2 development thresholds:

- Part 10(b)(i) 'Urban development projects' where the overall area of the development exceeds 1 hectares (ha); and
- Part 10(b)(iii) the overall area of the development exceeds 5 hectares.

The Proposed Scheme is over the threshold for both overall area (approximately 8.1 ha) and for urban development projects (approximately 4.4 ha for the station and car park).

As the Proposed Scheme falls within the list of development types in Schedule 2 and is over the screening thresholds based on area, the EIA Regulations requires an assessment of whether the Proposed Scheme is likely to have significant effects on the environment. However, guidance stresses that it should not be presumed that developments above the indicative thresholds should always be subject to EIA and that each development should be considered on its own merits[2].

The purpose of this report is to identify whether the Proposed Scheme is likely to result in significant effects on the environment by virtue of its scale, nature or location. Therefore, this report provides the relevant information for the consenting authority to come to a decision.

[2] Ministry of Housing, Communities & Local Government (2019) Environment Impact Assessment Guidance

2 Location and Description of the Proposed Scheme

This section describes the Proposed Scheme's location, the surrounding land use and summarises the environmental sensitivity of the surrounding area and describes the Scheme.

2.1 Location

2.1.1 Proposed Station and Car Park Site

The Proposed Scheme site (the 'Site') is situated in an area of green space adjacent to the A506 to the west and Headbolt Lane to the north (Grid Ref: SJ 41308 99815). The Site lies approximately 900 m north east of the centre of Kirkby (shown in Figure 1).

2.1.2 Rail Corridor Upgrades

The railway upgrade element of the Proposed Scheme is on the existing Liverpool-Wigan rail corridor between the existing Merseyrail Kirkby station to the proposed Headbolt Lane station. The alignment of the rail corridor is roughly south-west to north-east. For the majority of its length the existing rail corridor is bounded by residential properties to the north and south (shown in Figure 1).



Figure 1 Site location plan showing the existing Kirkby Station, rail corridor works and the proposed station and car park site

2.2 Existing Environmental Sensitives

The following environmental information is presented in Figure 2 where applicable.

2.2.1 Air Quality

Notable air quality receptors in the area include residential receptors. There are large housing estates to the north of Headbolt Lane, adjacent to the Site and to the south, adjacent to the existing railway line. There are also residential receptors located directly adjacent to the existing Kirkby Station and to the south and north of the railway line between the existing Kirkby Station and the proposed station at Headbolt Lane.

2.2.2 Traffic and Transport

The proposed station and car park site is bound to the north by Headbolt Lane. Headbolt Lane links to the A506 which is located adjacent to the west of the site.

There is a railway line, operated by Northern Rail, located to the south of the Site running in a south west to north east alignment.

2.2.3 Cultural Heritage

There are 18 designated heritage assets within 1 km of the Proposed Scheme, the closest of which are:

- Carter Arms Public House Waverley House (Kirkby Conservative Club) and 1 and 3 Mill Lane (Grade II Listed Buildings) are located adjacent to the existing Kirkby railway station; and
- Six Listed Buildings associated with St Chad's Church and grounds and St Chads Park, notably Church of St Chad (Grade II* Listed Building) located approximately 750 m to the south west of the proposed station and car park site.

2.2.4 Landscape and Visual

The Site lies within National Character Area (NCA) 58, Merseyside Conurbation. This NCA is a predominantly urban and suburban landscape, based around the settlements of Liverpool, Birkenhead, Bootle, Kirkby, Maghull, Huyton, Bebington and Wallasey. The NCA sits on a low-lying but gently rolling platform punctuated by low sandstone ridges and bisected by the lower estuary of the River Mersey.

The Proposed Scheme is not located within 5 km of any Area of Outstanding Natural Beauty (AONB), National Park or Green Belt.

2.2.5 Ecology

There are no statutory designated ecological sites within 2 km of the site. The nearest designated sites, Sefton Coast (SAC/ SSSI) and Ribble and Alt Estuaries (SPA/ Ramsar) are both situated approximately 10.4 km to the west. There are two non-statutory designated sites within 2 km, Kirkby Brook/Mill Brook Local Wildlife Site (LWS) which is located adjacent to Simonswood Brook situated below the existing elevated railway line and runs through the proposed station and car park site and Northwood Forest Hills LWS which is located approximately 640 m to the east.

The habitats recorded on site are relatively common and widespread and support commonly occurring botanical species comprising semi-improved neutral grassland, tall ruderal, scrub, amenity grassland, bare ground and running water.

The Preliminary Ecological Appraisal (PEA) produced by NLG Ecology in 2020 (Appendix A) confirmed the presence or potential for habitats to support the following species: nesting birds, bats, reptiles, riparian mammals, hedgehog and common amphibian species on site and also confirmed the presence of a small and localised stand of Japanese knotweed *Reynoutria japonica*, on site.

2.2.6 Noise and Vibration

Notable noise receptors in the area include residential receptors. There are large housing estates to the north of Headbolt Lane, adjacent to the Proposed Scheme and to the south, adjacent to the existing railway line.

2.2.7 Water Resources

Kirkby Brook runs through the site and is designated as an Environment Agency main river.

Simonswood Brook is a designated Water Framework Directive (WFD) waterbody (GB112069060630), has a classification of Moderate (Ecological score of Moderate and Chemical score of Fail) and flows under the existing railway bridge over the A502. Kirkby Brook feeds directly into Simonswood Brook.

There are areas of Flood Risk Zones 2 (between a 1 in 100 and 1 in 1,000 annual probability of river flooding) and 3 (1 in 100 or greater annual probability of river flooding) within the proposed station and car park site and are found in land immediately adjacent to Kirkby Brook. The rail corridor is situated within Flood Zone 1.

2.2.8 Population and Human Health

There are large housing estates to the north of Headbolt Lane and to the south, adjacent to the existing railway line. Headbolt Lane lies approximately 900 m north east of the centre of Kirkby. The rail corridor between Kirkby Station and the proposed new station is bordered by residential areas to the south and north.

The proposed station and car park site is an area of Urban Greenspace / Education Land, called Mercers Dell, as allocated by Knowsley Council's Local Plan. A designated Public Right of Way (PRoW) is located within the north-eastern corner of the area running southwards from Headbolt Lane, via a non-designated footpath, before heading south-east along the banks of Kirby Brook. The non-designated footpath bisects Mercers Dell connecting Headbolt Lane in the north east to the A506 County Road in the southwest. A series of existing bridges along the non-designated footpath provide crossings over Kirkby Brook.

2.2.9 Waste and Natural Resources

There are no authorised landfill sites or other waste facilities within 1 km of the Proposed Scheme. The nearest authorised landfill site is Marl Road/ Ward Road Inert Landfill located approximately 1.5 km to the south east of Headbolt Lane.

2.2.10 Ground Conditions

There are two historic landfills within 1 km of the Proposed Scheme; Bank Lane site, located adjacent to the A506 (Bank Lane) approximately 600 m to the north and Stopgate Lane site located at Simonswood Industrial Estate approximately 1 km to the east of the proposed station and car park site.

A Ground Investigation Report (GIR) produced by Arup in 2020 (Appendix B) outlined that the earliest historic mapping reviewed, dating from 1850, showed that the Site was occupied by agricultural land with a sandstone quarry identified within the centre of the Site, however historic mapping dating from 1902 showed that the quarry was no longer present and is assumed to have been infilled.

Based on the British Geological Survey (BGS) 1:50,000 scale solid geological map, the bedrock present beneath the Proposed Scheme comprises the Wilmslow Sandstone of the Sherwood Sandstone Group. The Proposed Scheme does not lie within a Coal Authority Coal Mining Reporting Area.

The Environment Agency classifies the land beneath the Proposed Scheme as a Principal Bedrock Aquifer, an aquifer which can provide a high level of water storage and may provide water supply and/or base river flow on a strategic scale. The site is located within a groundwater Source Protection Zone (SPZ) 3, with several abstractions located to the north and south. The nearest groundwater abstractions are located approximately 2 km to the north of the rail alignment of the Proposed Scheme.

2.3 Environmental Sensitivity of the Site and Surrounding Area

For the purposes of defining whether the development falls within Schedule 2, the EIA Regulations define sensitive areas as including:

a) Site of Special Scientific Interest (SSSI);

b) a National Park;

c) the Broads;

d) properties appearing on the World Heritage List;

e) Scheduled monuments;

f) Areas of Outstanding Natural Beauty (AONB); and

g) European sites for conservation.

The Proposed Scheme is not within 2 km of a National Park, the Broads or an AONB, nor is it near any properties appearing on the World Heritage List or Scheduled Monuments.

There are no internationally or European designated sites for conservation or statutory designated nature conservation sites within 2 km of the Proposed Scheme.

Further details regarding the sensitivity of the location are provided in Section 2.2 above.

2.4 Description of the Proposed Scheme

The Proposed Scheme comprises of the following features:

- railway line upgrade to a twin track and associated infrastructure (third line electrification, signalling etc);
- supply bulk point and substation to accommodate electrification of rail corridor upgrades and for the new station;
- a new station located on land at Headbolt Lane;
- a new car park and associated structures (signage, waiting shelters and car park lighting) and to service the new station;
- new vehicular and pedestrian access including two footbridges over Kirkby Brook and a road bridge to access each section of the car park;
- associated landscaping; and
- decommissioning works to the existing Kirkby Station.

Further scheme details are provided in below.

2.4.1 Existing Kirkby Station works

The existing Northern Rail platform at Kirkby will be decommissioned, made safe from public access and partially removed. The Kirkby station will remain as per the existing arrangement, and the walkway that currently connects to the Northern Rail platform will be removed. The eastern end of the Merseyrail platform will be fenced off to stop public accessing the operational railway.

2.4.2 Rail Corridor Works

The existing rail corridor comprises a single line. The Merseyrail network will be extended east from the existing terminating station at Kirkby by removing the existing buffer stops and connecting these with new trackwork. A new railway switch will split the tracks from a single alignment into a new twin-track arrangement. As part of these works the existing earthwork will be widened and strengthening and / or renewal works will be required to the existing Underbridges 55 and 56. The existing Northern Rail network will be shortened as a result. To facilitate the new twin-track arrangement, vegetation removal will be required along the existing railway corridor.

The existing 3rd rail from Merseyrail will be extended to Headbolt Lane. To facilitate this 3rd rail extension, a new sub-station is required that will be located at Headbolt Lane in the vicinity of the proposed station and car park development. The total distance of the major rail corridor works will be approximately 1.25 km.

2.4.3 Proposed Station

A proposed station interchange will be provided at Headbolt Lane. This proposed station will comprise three platforms, with two platform faces serving Merseyrail and a single platform face serving Northern Rail. Buffer stops will be provided to Merseyrail and Northern Rail to indicate the two Train Operating Companies. The platforms will be connected by a cross station access arrangement, replicating the operational functionality at the existing Kirkby station.

A single station building will be provided, with mess facilities for station staff and train crew. The station building will be staffed and will have facilities for customers to purchase tickets. Ticket vending machines will be available for customers who approach the station on foot from the housing estates to the south and the east. The proposed station building will have a height of 8 m (Figures 3 and 4) and total area of approximately 190 m^2 (see Figure 5).

2.4.4 Proposed Station Car Park

The approximate area for the station and car park is 4.4 hectares (ha) (see Figure 6) and comprises approximately 300 spaces with passive provision for another 200 to allow future expansion to 500 if required. Thirty of the spaces will be disabled access bays, comprising 15 blue badge spaces and 15 enlarged bays. Three staff spaces and two Network Rail maintenance bays are to be provided, along with a parking area for five motorcycles. Provision of electric charging points will inline with Knowsley Council policy. A short stay pick-up / drop-off area is also proposed outside the station building, with space for four vehicles. Parking facilities for 100 cycles will be provided with passive provision for a further 200 spaces.

2.4.5 Access

The creation of a new junction to provide access from Headbolt Lane to the Proposed Scheme will be required.

Public transport interchange facilities will be provided at the proposed station comprising bus stops and a taxi rank. To enable highway access to Headbolt Lane a new bridge is required over the existing brook.

Pedestrian footways are to be provided within the site on key desire lines. A series of zebra crossings are included within the design to facilitate safe and convenient pedestrian movements through the site.

Two footbridges will be provided over Kirkby Brook to allow improved connectivity to the proposed station building from the car park and for customers walking through the site.

2.4.6 Drainage

The proposed surface water drainage strategy for the Proposed Scheme is to comprise of the following key elements:

- surface SuDS, such as permeable paving and bioretention systems will be incorporated into the drainage designs where appropriate;
- attenuation systems to be incorporated into the car park areas; and
- an unrestricted discharge from the network will be provided to the adjacent watercourse (Kirkby Brook).

2.4.7 Landscaping

Design is ongoing and details of landscaping, planting and screening is not known at this stage, however landscaping will be incorporated into the design of the proposed station and car park as part of the planning application.

2.4.8 Lighting and Security

Details of lighting and security are ongoing, however any new lighting within exterior car parks is covered under the guidance of British Standards BS EN 12464 and BS 5489: 2013 and will be designed in adherence to these standards offering consistent and safe lighting. Design of the lighting and security is anticipated to be subject to a risk assessment based on the anticipated vehicle, pedestrian, crime and type of use to determine the appropriate lighting and security used for the site.

2.4.9 Construction

Construction Programme and Hours

It is anticipated that the construction of the Proposed Scheme will commence in Q4 2021 and take approximately 1.5 years to complete.

Construction activities would include the following phases:

- preliminary works and site establishment;

- earthworks;
- civil engineering work;
- rail systems works within the railway corridor; and
- buildings and substation construction.

It is anticipated that normal construction working hours would be followed (Monday to Friday 08:00 to 18:00 and Saturday 08:00 to 13:00 with no working on Sundays or bank holidays). Should construction works need to be conducted outside these normal construction working hours they would be agreed in advance with Knowsley Council and would comply with any restrictions imposed by the planning consent, and in particular regarding control of noise and traffic.

Construction Methods and Equipment

Due to underground rock being shallow at the site it is not anticipated that piling will be required for any proposed structures.

At this stage, the exact plant to be use on site is not currently known. It is, however, likely to comprise:

- HGV for transportation of construction material and plant to site;
- HGV for removal of construction material off site;
- Heavy plant machinery (excavators, dump trucks, vibratory rollers); and
- Rail plant (for works within railway corridor).

Storage areas for flammable/ toxic/ corrosive materials will be located in a separate locked fenced off area. Material data sheets will be available for all these materials and the Control of Substances Hazardous to Health (COSHH) assessments kept within the relevant Risk Assessment for the task being undertaken.

Construction Traffic and Access

Access to the site during construction will be via Headbolt Lane. Access details will be provided and consulted upon with the Knowsley Council's highways department and other highways consultees to ensure that the design accords with Knowsley Council design guide and the impact of additional vehicular traffic can be mitigated effectively.

Construction Waste and Materials

The design of the Proposed Scheme will seek to 'design out waste' through following the waste principles outlined in the waste hierarchy.

3 Aspects of the Environment with the Potential to be Significantly Affected by the Development

This section presents a description of the aspects of the environment with the potential to be significantly affected by the Proposed Scheme and describes those environmental aspects which are not likely to be significant.

3.1 Air Quality

3.1.1 Baseline

The nearest Air Quality Management Area (AQMA) is Liverpool City AQMA and is located approximately 1.5 km to the south west.

Existing or baseline ambient air quality refers to the concentration of relevant substances that are already present in the environment. These exist from various sources, such as industrial processes, commercial and domestic activities, road traffic and natural sources.

Baseline, or existing, background air quality at the Site and surrounding area will be determined using data from nearby representative automatic monitoring stations, supplemented with available Local Authority diffusion tube sampling and Defra background air quality maps, where appropriate.

3.1.2 Construction Impacts

The construction of the Proposed Scheme may impact on air quality in the local area due to potential fugitive emissions of dust from demolition and construction works, and emissions from plant equipment.

Emissions from construction traffic may cause a potential issue. The number of HGV movements is not currently known. When this information is available the data will be screened into a standalone Air Quality Assessment to support the planning application to assess the impacts and outline if further work or assessment will be required.

Construction methods will use best practice measures with reference to the Institute of Air Quality Management's Guidance on the assessment of dust from demolition and construction, which is widely applied throughout the UK, plus any relevant local authority guidance to minimise the potential for air emissions, including measures for dust management, measures to minimise track out of material onto highways, materials management to prevent dust blow and measures to minimise plant emissions, such as avoidance of engine idling. These measures will be implemented through a CEMP that will be developed and implemented by the construction contractor. With the appropriate good practice mitigation measures in place there are likely to be no significant effects from dust emissions during construction.

3.1.3 Operational Impacts

Once operational, the Proposed Scheme is expected to be a source of localised emissions through train movements and vehicle movements through commuters using the station. Traffic movements are expected to increase significantly above what is already experienced in the area and therefore may lead to the Proposed Scheme having significant effects within the area where air quality is concerned.

There is potential for a beneficial effect on air quality during operation as the Proposed Scheme will introduce electrification and reduce diesel operated trains.

There will be an Air Quality Assessment submitted as part of the planning application documents which will assess the impact of changes in air quality in the area. Following the assessment of operational air quality impacts, the need, nature and extent of any mitigation measures will be considered and fed into the design process to reduce exposure of future users and neighbours to air pollutants.

3.2 Traffic and Transport

The nearest accessible road to the Proposed Scheme is Headbolt Lane which will be used for the construction and operation of the Proposed Scheme. Construction traffic is anticipated to travel to site either via the M57, M58 or the A580 and then travel on the A5208 and the A506 to reach Headbolt Lane and site access.

3.2.1 Construction Impacts

Details of the amount of construction traffic on the local road network is not known at this early stage in scheme design. It is likely that construction will require the use of an excavator and dump trucks for site clearance and enabling works and then the use of HGVs and heavy plant machinery for the construction of the station, associated structures and works on the railway. It is proposed that the site is accessed from the existing Headbolt Lane.

To limit potential short-term effects, a Construction Traffic Management Plan will be prepared by the contractor detailing how traffic will be managed. This will include mitigation measures necessary to minimise the effects on the local road network. It is expected that this will include confirmed details of construction vehicle numbers (including deliveries and staff), construction delivery and staff parking and management, official construction traffic access routeing and how this will be controlled, and additional measures as necessary.

Given the short term and temporary nature of any impacts during construction and with the implementation of a CEMP which will include standard mitigation measures, there is not expected to be a significant effect on the surrounding highway network from the construction traffic associated with the Proposed Scheme.

3.2.2 Operational Impacts

During operation it is expected that vehicle movements associated with the Proposed Scheme will come from the following sources:

- commuters using the station through park and ride;
- vehicles dropping commuters through pick up drop off facilities;
- staff members; and
- maintenance services and deliveries.

The preliminary Transport Assessment (TA) has identified that the morning peak hour occurs between 08:00 and 09:00, with 257 and 44 passengers arriving and departing the proposed station respectively, and the evening peak occurs between 17:00 and 18:00, with 72 and 273 arrivals and departures. The TA also quantified this in terms of vehicle trips, which are anticipated to generate 132 two-way vehicle trips in the weekday morning peak, and 171 two-way trips in the weekday evening peak. 48% of these vehicles are predicted to use the A506 to travel to and from the Proposed Scheme.

Trip generation has been calculated in the TA and can be seen below in Table 1.

Table 1 Trip generation by mode during weekday AM peak and weekday PM peak.

Mode	Weekday AM Peak (08:00-09:00)			Weekday PM Peak (17:00-18:00)		
	Arrivals	Departures	Two-way	Arrivals	Departures	Two-way
Walk	129	22	151	36	137	173
Park & Ride	53	9	62	15	57	72
Bus	40	7	47	11	42	53
Pick-up	0	5	5	0	30	30
Drop-off	28	0	28	8	0	8
Bicycle	4	1	5	1	5	6
Taxi	2	0	2	1	3	4
Motorcycle	1	0	1	0	1	1
Total	**257**	**44**	**301**	**72**	**274**	**346**

The data shows that although there will be a number of vehicles visiting the site to either pick up, drop off or park and ride, the majority of trips will be made by walking. The Transport Assessment will be produced and submitted to support the planning application and will outline measures to measure operational traffic and to provide mitigation measures if appropriate.

3.3 Noise and Vibration

3.3.1 Baseline

There are no Noise Action Planning Important Areas (NIA) identified within 250 m of the Proposed Scheme. The nearest NIA (ID; 7003) is located on Hall Lane at the junction of the A506 and A5208 approximately 800 m to the south. The A506 is likely to be the route taken by construction traffic to the Proposed Scheme.

The Site is situated in an urban environment were the ambient noise climate at the site is currently influenced by traffic noise from the A506 and by noise from the Northern Rail railway line. Impacts are likely to be confined to sensitive receptors, primarily residential areas, located close to the boundary of the Proposed Scheme.

3.3.2 Construction Impacts

There are large housing estates to the north of Headbolt Lane, adjacent to the north of the Proposed Scheme. Headbolt Lane will be used by HGVs and other vehicles throughout construction. As a result, short term adverse noise impacts are likely to be experienced by these residential receptors. Construction works on the railway line will also lead to short term adverse noise impacts experienced by residential receptors that are adjacent to the railway line to the south.

A Noise and Vibration Assessment will be submitted as part of the planning application to assess the potential impacts of construction noise in the area, which will outline mitigation measures to inform the CEMP. The CEMP, using findings of the Noise Assessment will outline any measures to minimise noise impacts during construction, including control of vehicular movements, reducing the number of journeys where possible and good practice in construction methods such as no night-time working. Therefore, with the implementation of the CEMP significant effects are not anticipated as a result of the Proposed Scheme.

3.3.3 Operational Impacts

During operation the higher volumes of traffic along Headbolt Lane associated with vehicles accessing the car park, as well as vehicles using the car park, has potential to increase noise at nearby residential receptors. The new platform is close to residential properties to the south of the railway line and there is potential for noise disturbance (for example, from The Public Announcement (PA) system). Mitigation measures such as reducing announcements outside of peak operating hours, or lowered volumes of announcements outside of peak hours has the potential to decrease any adverse operational noise impacts experienced by these nearby residential receptors. There will be a Noise Assessment submitted as part of the planning application documents which will assess the impact of operational noise in the area and will recommend mitigation measures where appropriate.

3.4 Water Resources, Drainage and Flood Risk

3.4.1 Baseline

Kirkby Brook is identified as an Environment Agency main river. There are areas of Flood Risk Zones 2 (between a 1 in 100 and 1 in 1,000 annual probability of river flooding) and 3 (1 in 100 or greater annual probability of river flooding) within the proposed station and car park site and are found in land immediately adjacent to Kirkby Brook. The rail corridor is situated within Flood Risk Zone 1. The whole of the Proposed Scheme is located within a groundwater SPZ.

The area in which the Proposed Scheme is located does not currently flood, the Flood Risk Assessment (FRA) produced by Arup in 2020 indicated that the only instance of historic flooding was a surface water flood event on the A506 adjacent to Headbolt Lane.

As Kirkby Brook feeds into a WFD Watercourse (Simonsbrook) a WFD Assessment will be submitted to support the planning application which will assess the potential for impacts on Simonsbrook and will outline mitigation measures for both construction and operational activities.

3.4.2 Construction Impacts

During construction of the Proposed Scheme activities such as site clearance and preparation will be required as part of enabling works and as a result soil disturbance may occur. Areas of exposed soil are highly susceptible to erosion during rainfall events, partly due to loosening of soil and potentially due to increased runoff rates. Surface runoff from such areas can be heavily laden with sediment, which risks being transported to surface watercourses such as Kirkby Brook that runs through the Proposed Scheme, and Simonswood Brook (WFD designated) that is located approximately 330 m to the west of the Proposed Scheme and which Kirkby Brook flows into. In addition, contamination of surface waters, groundwater and soil could result from accidental spillage of fuels, oils, waste and chemicals, which can impact on water quality and aquatic fauna and flora. However, mitigation against such pollution and contamination events will be covered in and implemented as part of the CEMP including careful soil management and silt/spillage prevention and containment measures.

The CEMP will also include emergency flood prevention and flood event response management plans to ensure there is no significant effect of flooding from and to the Proposed Scheme.

3.4.3 Operational Impacts

The Proposed Scheme, once operational has the potential to increase the amount of impermeable areas in the area, particularly as a result of the proposed car park, however the car park is located within Flood Zone 1 and with no historical flood events recorded on site it is expected the introduction of impermeable areas will not raise the risk of surface or ground water flooding. Further to this, the FRA outlined that normal greenfield run off rates are still anticipated and therefore there is expected to be no increased risk of run off to both Kirkby Brook and to groundwater.

New impermeable areas around the station and car park will be positively drained, with run-off water stored via attenuation tanks and discharged to the Kirkby Brook at an appropriate discharge rate. It is expected that with detailed drainage design and mitigation measures applied as part of the design of the Proposed Scheme, that there will not be a significant impact on the local water environment as a result of the Proposed Scheme.

3.5 Ecology and Biodiversity

3.5.1 Baseline

There are no statutory or non-statutory designated ecological sites within 2 km of the Proposed Scheme. Two non-statutory designated sites were identified within 2 km: Kirkby Brook/Mill Brook LWS and Northwood Forest Hills LWS. The surrounding land is predominantly urban in nature. Areas of dense scrub are located adjacent to the existing railway line and the proposed station car park Proposed Scheme is solely located on an area of amenity grassland. Other habitats recorded within the site include semi-improved neutral grassland tall ruderal and running water.

3.5.2 Construction Impacts

There are no statutory designated sites within 2 km of the Proposed Scheme, therefore no likely impacts are anticipated during construction.

Two non-statutory designated sites are located within 2 km of the Proposed Scheme. During construction there are potentially pollution pathways from the use of fuels for heavy plant and machinery that may run off to Kirkby Brook LWS and have the potential to affect water quality and aquatic flora and fauna in the short to medium term. However, pollution prevention measures that will be implemented as part of the CEMP will ensure the risk of contamination is managed and no significant effects on habitats and species associated with Kirkby Brook LWS are anticipated. No pollution pathways e.g. watercourses, were identified between the Proposed Scheme and Northwood Forest Hills LWS. Consequently, no likely impacts are anticipated on this site.

During construction of the Proposed Scheme activities such as site clearance and preparation will be required as part of enabling works and as a result habitat removal and fragmentation may occur, along with the disturbance of and habitat loss for species that may be present.

Any trees should be retained and incorporated into the landscaping design if possible; any necessary vegetation removal should be undertaken in accordance with the advice given for nesting birds, common amphibian species and small mammals. It is generally recommended that the amount of vegetation removal is restricted to the minimum required to facilitate the proposals and that any bounding vegetation or habitats remain protected and unaffected by the construction of the Proposed Scheme.

The PEA identified ecological considerations and mitigation measures required for pre commencement and during construction of the Proposed Scheme regarding species in the area, these are outlined below.

Nesting Birds

The PEA advises that all vegetation removal works are undertaken outside the main nesting bird season (March to August inclusive) and maintained occasionally to deter any uptake prior to the commencement of works. If this

timing is not possible and suitable nesting habitat needs to be removed during the main nesting bird season, checks of the affected areas will need to be undertaken by an ecologist no more than 48 hours prior to removal/ management. If any active nests are identified, a buffer of at least 5m in all directions would be required, to protect the nest from disturbance until any chicks have fledged.

Bats

If trees holding a moderate bat roosting potential are to be impacted, roost locations should be assessed via aerial inspection and/or with an endoscope by a suitably qualified ecologist to confirm the assessment of bat roost potential and to check for bat occupation. If bat roost potential is confirmed to be moderate or higher, further surveys in the form of bat emergence/re-entry surveys[3] would be required to determine if the roosting features are being utilised by bats, in-line with best practice guidelines. Should bats be confirmed to be present at this stage, a Natural England mitigation licence would be required for any trees with confirmed bat roosts, to be removed to facilitate the works.

Trees holding a low bat roosting potential can be removed adhering to the ecological precautionary working method statement in regards to roosting bats, which is outlined in the PEA submitted with this report.

Reptiles

The site is considered suitable for common reptile species. It is recommended that during vegetation removal works, should a suspected reptile be observed on site that works cease and that a 10 m exclusion zone be demarcated around the reptile and that the reptile be left to disperse on its own accord. A competent ecologist should also be notified immediately. The ecologist will then attend site, assess the situation and establish any required mitigation measures.

Common Amphibian Species

To avoid any potential impacts on common amphibian species vegetation removal works should be completed ideally to avoid nesting bird season but also to avoid amphibian hibernation season (November to February).

The PEA will be submitted to support the planning application and outlines the mitigation measures required to ensure no significant effects occur. If these measures are followed there is not anticipated to be any significant effect on ecology and biodiversity.

3.5.3 Operational Impacts

During operation there is predicted to be noise, vibration, dust and emissions produced from daily operations, however these are not anticipated to exceed what

[3] bat emergence/re-entry surveys have the following requirements: trees with moderate bat roost suitability require two surveys; one dusk emergence and one dawn re-entry survey. Trees with high bat roost suitability require three surveys; one dusk emergence, one dawn re-entry and one dusk or dawn.

is already experienced in the area due to the urban surroundings and therefore there is likely to be no impact from disturbance on the local biodiversity.

3.6 Landscape and Visual

3.6.1 Baseline

The Proposed Scheme lies within an area of amenity grassland surrounding by housing estates and commercial properties.

3.6.2 Construction Impacts

Although the surrounding area is urban in nature, the nearest residential receptors lies directly adjacent to the Proposed Scheme, both to the north and the south. During construction these receptors are likely to experience visual impacts due to the movement of HGV's and other construction traffic travelling to and from site and through the construction of the new station in an area that was previously greenfield. However, it is expected that the CEMP will aim to reduce vehicular movements where possible by limiting material brought on and away from site, which will reduce the visual impact experienced by these receptors during construction. Any adverse effects will be temporary and short-medium term therefore not significant.

3.6.3 Operational Impacts

The Proposed Scheme will consist of a new station building up to 8 m high, three operational platforms and a walkway between platforms, which, due to little existing natural visual screens raises the potential for significant visual effects to be experienced by the visual receptors. Screening in the form of tree and hedgerow planting will be implemented as part of the landscape design to mitigate any adverse visual effects from nearby receptors. The design of the Proposed Scheme will aim to design out any potential significant effects. A Landscape Visual Impact Assessment will be submitted with the planning application to assess the impact of the Proposed Scheme on visual receptors in the area and will proposed mitigation measures to reduce any potential significant affects.

3.7 Cultural Heritage

3.7.1 Baseline

There are eight designated heritage assets within 1 km of the Proposed Scheme. Merseyside HER indicate that there have been three archaeological finds in the area with these finds being dated between 1700 and 1800.

3.7.2 Construction Impacts

During construction, there is anticipated to be additional traffic along the A506 including HGV's, however there are only a few listed buildings adjacent to the

A506 and the traffic movements associated with the construction of the Proposed Scheme are not anticipated to increase baseline noise and disturbance to the assets above what is already experienced from traffic using the A506 and may be avoided completely dependent on the route construction traffic travels on. None of the listed buildings within 1 km are expected to experience adverse setting impacts as the surrounding land is predominantly urban in nature and any construction is expected to be shielded by surrounding buildings.

A Heritage Desk Based Assessment (DBA) will be undertaken to assess all heritage assets in the area, including the potential for unknown archaeological assets, although the archaeological potential in the area is predicted to be low.

Following the implementation of mitigation measures it is not anticipated any significant effects on archaeology or historic assets will arise as a result of the Proposed Scheme.

3.7.3 Operational Impacts

The DBA will assess the potential for setting effects and will inform the design of planting that will be implemented as part of the landscape design to mitigate any adverse effects, sufficient areas for the inclusion of which will need to be confirmed and refined at later design stages. With the implementation of appropriate mitigation (if required) there is not considered to be potential for significant effects on the setting of designated heritage assets during operation of the Proposed Scheme.

3.8 Population and Human Health

3.8.1 Baseline

Health profiles produced by Public Health England (PHE) provide baseline data on the health of people within the local area, compared with average values for all areas of England.

The health of people in Knowsley is worse than the England average. Knowsley is one of the 20% most deprived districts/unitary authorities in England and about 25% (7,460) children live in low-income families. Table 2 below shows the average life expectancy for people living within Knowsley compared with the region and national average. In Knowsley, life expectancy for both male's and female's is significantly worse than both the North-West region and England.

Table 1: Average life expectancy for Knowsley, the North West and England

Location	Population	Female average (years)	Male average (years)
England*	55,977,178	83.4	79.8
North-West*	7,292,093	82.1	78.4
Knowsley*	156, 571	80.5	76.8

* Office for National Statistics (ONS) mid-2018 population estimates

Various factors contribute to mortality and indices are reported for eight factors, which can be used to determine health inequalities of a local area when compared to the national average and neighbouring authorities.

The health outcomes for people, when compared against the England average, show that Knowsley is worse than the national average for child and adult obesity, the rates of violent crime, under 75 mortality rate from cardiovascular diseases, under 75 mortality rate from cancer and the percentage of the population employment aged between 16 years old and 64 years old are worse than the England average. Knowsley, however, was better than the national average for statutory homelessness.

3.8.2 Construction Impacts

The Proposed Scheme would generate a small number of jobs during construction; however, this would be short term and temporary.

During construction there will be a permanent loss of Urban Greenspace / Education Land, associated with Mercers Dell, however, this is not likely to be significant as there are multiple other areas allocated as Urban Greenspace / Education Land within the local area such as Mill Dam and Tower Hill both of which are within a 10-minute walk of the Proposed Scheme and are larger in size, offering more opportunities to the local population for recreation.

It is anticipated that during construction users of the non-designated footpath will be diverted along the existing segregated walkway on the northern side of Headbolt Lane. This diversion route already connects Headbolt Lane to the A506 County Road and therefore access would be maintained. The potential increase in journey time is likely to be negligible and non-significant. It is anticipated that access to the designated PRoW will be maintained during construction along its existing alignment and it would remain in-situ until completion of the works, at which point the new connection to the partially re-aligned footpath will be instated. As such a severance of access will not occur whereby the potential impact to the PRoW will be minor and non-significant due to associated disturbance and loss of amenity during construction.

Possible effects on human health that may result from the Proposed Scheme include disturbance from noise and construction dust and stress during construction. However well-established methods of best practice, impact avoidance and mitigation measures in order to protect human health during construction are expected to be utilised and have been explored further in sections 3.1 and 3.3 above. Following the implementation of these measures there is expected to be no significant effect on population and human health during construction.

3.8.3 Operational Impacts

The operation of the proposed Scheme is unlikely to generate a significant number of jobs as staff are expected to be moved to the new station from the existing Kirkby Station once decommissioned.

During operation, the non-designated footpath is expected to be partially re-aligned to the north of its current location for the section between the proposed car park and Headbolt Lane. Access to the A506 County Road will remain unchanged whereby any impacts are likely to be negligible and non-significant. It is assumed that the designated PRoW which connects to the non-designated path will be reconnected accordingly to maintain access for users wishing to utilise the provision along Kirkby Brook whereby any impacts are likely to be negligible and non-significant.

The proposed Scheme is considered to have a beneficial effect on the local population, by providing new transport infrastructure which will enable greater connectivity for the local population. In turn, this could enable an increase in access to a wider variety of services, employment and community facilities for the local population which would have a beneficial impact upon population and human health receptors although this is unlikely to be significant.

3.9 Waste and Natural Resources

3.9.1 Baseline

There are no authorised landfill sites or other waste facilities within 1 km of the Proposed Scheme.

3.9.2 Construction Impacts

Any waste materials produced as a result of site clearance works will be re-used where possible in uses such as back fill or landscape planting, or if this is not possible, material will be disposed at a local licenced landfill facility in accordance with applicable waste management legislation. All construction materials which can be recycled will be separated, processed and removed from site for recycling on a regular basis to avoid a build-up of material no longer required and to reduce the risk of runoff into Kirkby Brook.

A Site Waste Management Plan (SWMP) will be prepared by the contractor prior to the work commencing to help manage site wastes more effectively, reducing potential harm to the environment and human health.

3.9.3 Operational Impacts

During operation of the Proposed Scheme sources of waste are predicted to arise from maintenance operations and waste from commuters/staff. However it is predicted that the waste hierarchy will be followed and measures such as segregated recycling bins/skips will be used in both public and staff areas. Both Northern Rail and Merseyrail are expected to have operational management measures in place to appropriately deal with operational waste arising from the proposed Scheme.

Although there have been no impacts identified, general best practice in terms of design will be employed and the circular economy principles will also be implemented, which may lead to reductions in operational waste. Operational

waste produced by the Proposed Scheme is not expected to cause any significant effects.

3.10 Ground Conditions

3.10.1 Baseline

The two historic landfills within 1 km of the Proposed Scheme are not likely to be a cause for concern due to the distance from the Proposed Scheme. The Proposed Scheme located within a groundwater SPZ and overlies a Principal Bedrock Aquifer.

3.10.2 Construction Impacts

During the enabling works it is likely that excavators and dump trucks will be used to move and process material. The use of this plant is likely to require the storage of fuel, which if an accident occurs, could be spilled and effect the underlying Principal Bedrock aquifer, resulting in a short-term impact.

During construction there is risk for contaminated surface material and surface runoff. Exposed soils or stockpiles generate dust, and precipitation could result in run-off into nearby watercourses including Kirkby Brook, affecting water quality, which would have a short-term moderate impact.

A CEMP will be prepared and implemented which would include pollution prevention control measures and measures to deal with any land contamination encountered during demolition and construction activities. These measures would include the following:

- should any potentially contaminated ground be encountered during construction works, the contractor will be required to investigate the area and then assess whether there is a need for containment or disposal of the material. The contractor will also be required to assess whether any additional health and safety measures are required. Any such investigations will be required to be undertaken in consultation with the Environment Agency. To further minimise the risks of contaminants being mobilised and contaminating other soils/ water during the development of the Proposed Scheme, workers will be briefed as to the possibility of the presence of such materials;
- in the event that contamination is identified during site works, appropriate remediation measures will be undertaken to protect workers, future site users, water resources, structures and services;
- the contractor will be required to place arisings and temporary stockpiles away from watercourses and drainage systems and surface water will be directed away from stockpiles to prevent erosion;
- the risk to surface water and groundwater from run-off from any contaminated stockpiles during construction works will be further reduced by implementing suitable measures including sealing stockpiles to prevent rainwater infiltration. Alternatively, bunding and/ or temporary drainage systems will be put in

place, designed in line with current good practice, following appropriate guidelines and obtaining all relevant licences including discharge consents;

- any fuels or chemicals used during the construction phase will be stored in bunded areas, with an impermeable base, in accordance with Environment Agency guidelines, thereby limiting the potential for migration of contaminants into groundwater following leaks/ spillages; and
- the contractor will implement a dust suppression/ management system, in order to control the potential risk from airborne contamination migrating off site to adjacent sites. Site specific method statements will be produced for different locations and activities. Best practice and widely accepted environmental management practices implemented by the contractor will effectively mitigate any associated risks. As such, there is not considered to be potential for significant effects on ground conditions or human health to occur.

Foundations and services will be designed and constructed to prevent the creation of pathways for the migration of contaminants and will be constructed of materials that are suitable for the ground conditions and designated use.

Site specific method statements will be produced for different locations and activities. Standard environmental management practises implemented by the contractor will effectively mitigate any associated risks. As such, there is not considered to be potential for significant effects in relation to ground conditions or human health to occur.

3.10.3 Operational Impacts

The Proposed Scheme is not anticipated to generate significant amounts of contaminated materials or waste during its operation. Operational activities including maintenance and cleaning should aim to use industry standard best practices to ensure there is no contamination risk to groundwater or surface water. Operational use of the rail corridor also has the potential for contamination to occur however it is expected that industry standard measures will be used to mitigate this. No significant effects are therefore likely arising from operation.

3.11 Major Accidents and Disasters

3.11.1 Baseline

Existing sources of risk assessment are typically taken as informing the baseline of any major accident and disaster assessment. The National Risk Register (NRR) of Civil Emergencies and the Health and Safety (HSE) Control of Major Accident Hazards (COMAH) site registers have been used to inform the baseline.

According to the HSE COMAH site register the nearest registered sites are located at W H Bowker Ltd, Knowsley Industrial Park Charleywood Road and Syntor Fine Chemicals Limited, Acornfield Road, Knowlsey Industrial Park which are located approximately 2.5 km to the south east and 2.5km to the east of the Proposed Scheme respectively.

The NRR is based on information from the National Risk Assessment, which is a classified assessment of risks that could happen in the UK. The risk register classifies risks into categories such as natural hazards, accidents, diseases, societal risks and malicious attacks (e.g. conducted by terrorists).

The NRR states that for risks that are most relevant to a local area, a review of the relevant Community Risk Register (CRR) should be undertaken. Within the Merseyside CRR the top risks have been identified as:

- Pandemic flu
- Severe Weather
- Surface Water Flooding
- Loss of Critical National Infrastructure
- Cyber Attack

The Proposed Scheme is not likely to fall under any category of risk identified by the CRR.

3.11.2 Construction Impacts

The construction of the Proposed Scheme must comply with legal requirements, codes and standards, such as:

- Health and Safety at Work Act, 1974;
- The Management of Health and Safety at Work Regulations (1999);
- CDM 2015 Regulations; and
- The Workplace (Health, Safety and Welfare) Regulations 1992.

The construction of the proposed Scheme will be carried out under the Construction (Design and Management) Regulations 2015. The risks of accidents will be minimised through adherence to the contractor's Health and Safety procedures. It is therefore not considered likely that significant environmental impacts during construction would arise as a result of major accidents and disasters.

3.11.3 Operational Impacts

The operation of the Proposed Scheme must also comply with the requirements codes and standards outline above in 3.11.2. The risks of accidents will be minimised through adherence to the Applicant's Health and Safety operational procedures. It is therefore not considered likely that significant environmental impacts during operation would arise as a result of major accidents and disasters.

3.12 Climate Change

Per capita emissions average 4.5 tonnes per annum across the Liverpool City Region area; lower than the England or North West average, although there is considerable variation between the six local authority areas. Knowsley has the second lowest emissions per capita of the six local authorities in LCR with approximately 750 kilotonnes of Carbon Dioxide emissions.

3.12.1 Construction Impacts

The construction of the Proposed Scheme would result in a number of HGVs which has the potential to increase the contribution of Greenhouse Gas (GHG) emissions from vehicles. However, it is anticipated that any additional emissions from construction activities will be short-lived and will be managed to reduce unnecessary vehicle movements and plant movement and will therefore not generate significant GHG emissions.

3.12.2 Operational Impacts

Once operational, the Proposed Scheme has the potential to increase the contribution of localised GHG emissions from vehicles and train movements as operational traffic movements associated with the Proposed Scheme are predicted to be significantly higher than that already experienced in the area. Increased parking provision as part of the Proposed Scheme will also encourage greater use of the proposed station and therefore also has the potential to contribute to GHG emissions through increased use of the local road network during operation. However reductions in the usage of the local road network around the existing Kirkby Station are anticipated as travellers use the proposed station at Heabolt Lane instead of Kirkby Station.

3.13 Cumulative

3.13.1 Construction and Operational Impacts

A search of Knowsley planning portal has been undertaken to identify any other developments within the surrounding area which have the potential for cumulative impacts with the Proposed Scheme. There are no other known planned or permitted developments within the surrounding area that are considered to have the potential to generate a significant cumulative impact during construction or operation with the Proposed Scheme.

4 Characteristics of the Potential Impacts

4.1 Extent of Impact (Geographical Area and Size of Affected Population)

The total footprint of the Proposed Scheme extends to approximately 8.1 ha. This comprises the proposed station and car park at approximately 4.4 ha and the rail works at approximately 3.7 ha.

4.2 Transfrontier Nature of Impact

Due to the scale and location of the Proposed Scheme, there is no potential for transboundary environmental effects to occur.

4.3 Magnitude and Complexity of Impact

Impacts are not anticipated to be complex in nature, whilst combined effects are not considered to be significant.

4.4 Probability of Impact

Given the characteristics and scale of the construction works for the Proposed Scheme, significant environmental effects are not anticipated. The CEMP will provide guidance on appropriate methods of working and will outline suitable impact avoidance measures and mitigation strategies.

4.5 Duration, Frequency and Reversibility of Impact

Any impacts occurring as a result of the construction of the Proposed Scheme would be short term, temporary and reversible. The design of the Proposed Scheme will incorporate measures aimed at avoiding and minimising environmental impacts, whilst construction activities will be undertaken in a manner that aims to management and minimise environmental impacts and nuisance. It is estimated that the construction timescales will be approximately 1.5 years.

5 Screening Summary

The Applicant seeks the Screening Opinion of Knowsley Council to confirm whether the Proposed Scheme of Headbolt Lane Station and associated works would constitute EIA Development. The Scheme has been identified as a 'Schedule 2' Development under Part 3(a) of the Town and Country Planning (EIA) Regulations 2017, exceeding the screening threshold of 0.5 ha in development area.

This EIA Screening Report considers the likely environmental effects of the Proposed Scheme. Potential environmental impacts across a range of environmental topics have been considered, taking into account the possible effects upon identified sensitive receptors.

Standalone assessments will be produced and submitted as part of the planning application which will assess the potential for impacts and propose mitigation to reduce any significant effects as far as possible.

Knowsley Council, as local planning authority, is invited to review the details as presented herein and provide an EIA screening opinion in accordance with the EIA Regulations.

Part 2 – EIA Scoping Report

6 Scoping

6.1 Introduction

Should the LPA determine that an EIA will be required for the Proposed Scheme, scoping forms the next key stage of the EIA process. It provides a framework for identifying the likely significant environmental impacts arising from the Proposed Scheme and distinguishes the priority issues to be addressed at the assessment stage. By doing so, the scoping phase assists in focussing attention on key environmental impacts for inclusion within the assessment. A Scoping Report also identifies those matters which do not need to be assessed in detail. In addition, scoping provides key stakeholders with an early opportunity to comment on the proposed structure, methodology and content of the EIA.

This section of the report outlines:

- proposed scope of the EIA;
- environmental topics that are being taken forward for assessment (scoped in) including potential impacts and assessment methodologies;
- environmental topics that are being discounted for assessment (scoped out) including reasoning for decision; and
- structure of the Environmental Statement (ES).

6.2 Objectives for Scoping

The objectives of the EIA scoping process are to:

- identify the nature of the Proposed Scheme, including (where known) its purpose, physical characteristics, land use requirements and alternatives;
- identify and describe the key environmental issues that the EIA must consider;
- identify any environmental issues that may not be relevant to the EIA (i.e. that may be scoped out of the full EIA, to ensure the EIA remains focussed on potentially significant effects);
- define the extent to which environmental issues need to be investigated, and the methodology for assessment; and
- facilitate preliminary consultation with stakeholders.

In accordance with Regulation 15(1) of the Town and Country (EIA) Regulations 2017, this Scoping Report, together with a request for a formal written Scoping Opinion, has been submitted to Knowsley Council. The EIA Regulations state that a request for a Scoping Opinion shall be accompanied by:

"2(a) (i) a plan sufficient to identify the land;

(ii) a brief description of the nature and purpose of the development, including its location and technical capacity;

(iii) an explanation of the likely significant effects of the development on the environment; and

(iv) such other information or representations as the person making the request may wish to provide or make;"

These information requirements are met by this EIA Scoping Report, which describes the Proposed Scheme (within Section 2 of the Screening Report above), its environmental context and potential environmental effects and how the EIA reported in the ES will assess and report the potential environmental effects of the Proposed Scheme.

7 Potentially Significant EIA Issues

Based on a preliminary assessment of the site and the Proposed Scheme, the following sections identify the potential environmental impacts associated with the Proposed Scheme for inclusion in the EIA. For each topic the baseline conditions have been outlined in Section 3 of the Screening Report above. Topics that have been identified as having the potential for significant effects and that are being scoped in are outline further below. The proposed methodology and assessment criteria, which will be used to assess the potential significance of the identified impacts are described, and potential mitigation measures for implementation following assessment are outlined below.

7.1 Air Quality

7.1.1 Potential Impacts

To inform early design works, an initial appraisal has been undertaken and has considered the impacts of:

- emissions from the Proposed Scheme primarily arising from internal plant operations and idling of trains;
- emissions from road traffic attributed to the construction (including emissions from bus replacement provisions during construction) and operation of the Proposed Scheme;
- emissions generated by construction plant on site; and
- dust generation during construction works.

7.1.2 Assessment Methodology

The assessment of construction effects will involve a review of the proposed construction works and construction traffic data during the various phases of the development to identify any potentially adverse effects at nearby sensitive receptors. Potential impacts and nuisance from site clearance, construction dust and mobile plant exhaust emissions generated during the construction phase of the Proposed Scheme. When construction traffic data is available this information will be screened in the EIA to identify whether a detailed modelling assessment is required. Where necessary, mitigation measures will be recommended for the control of dust and site plant emissions during demolition or construction works to minimise or remove the potential impacts which will then be reflected in the CEMP.

The approach to the assessment of effects during the operation of the Proposed Scheme will consider the changes in traffic flows on local roads and will examine the associated effects on any of the nearby sensitive receptors and will include screening the traffic data against the screening criteria to identify if a detailed assessment is required/this is screened in. The extent of the assessment of the traffic related air quality effects will be determined by the extent of the Transport

Assessment as agreed with the relevant bodies. It is anticipated that this will cover the local road network and any roads predicted to experience changes (as a result of the Proposed Scheme) that meet the criteria detailed in the Design Manual for Roads and Bridges (DMRB).

The assessment of operational effects will be undertaken for the key pollutants of concern in the area using an appropriate air dispersion model. It will establish whether there are other process related pollutants to be included in the detailed assessment. The model will be set up for the baseline year which will be confirmed when traffic data are collated and verified with reference to local air quality monitoring data. The modelling assessment will compare the 'Do-Minimum' (i.e. without the Proposed Scheme) with the 'Do-Something' situation. The model will be used to derive the appropriate parameters for comparison with relevant air quality objectives and limit values in the baseline year and for the proposed year of opening of the Proposed Scheme.

The significance of effects will be assessed using the approach outlined in National Society for Clean Air (now known as UK Environment Protection) guidance.

The air quality assessment will be in accordance with all relevant guidance from the Defra and Local Air Quality Management (LAQM) Technical Guidance (TG16), IAQM construction dust guidance, and IAQM/ EPUK land use and planning guidance.

7.2 Traffic and Transport

7.2.1 Potential Impacts

Transport related effects could arise from an increased travel demand which would be identified through the TA process. The following traffic and transport effects identified for inclusion within the assessment include:

- Net change in vehicular traffic patterns;
- AM and PM peak hour vehicle movements;
- Local footway provision; and
- Local cycle facility provision.

7.2.2 Assessment Methodology

The Transport chapter of the ES will comprise an assessment of the effects of the Proposed Scheme on the existing transport infrastructure, including both construction and operation traffic. It will also take into consideration the cumulative effect of the traffic levels during the operational phase of the Proposed Scheme and screen against any committed developments in the area and the operational traffic arising from such developments. The assessment will address the impact of truck and private car movements, and pedestrian and cycle movements. A standalone TA and Traffic Plan will also be produced to support the ES.

The scope of the TA will be agreed with the Transportation Officers at Knowsley Council, though it is proposed to comprise:

- establishment of baseline conditions for all modes of transport including movement flows for road traffic based on available data and recent surveys;
- an outline of the context of the Proposed Scheme including consideration of accessibility by all main transport modes;
- a review of highway safety issues including examination of personal injury accident data;
- establishment of construction traffic flows;
- assessment of the transport implications of the Proposed Development in combination with consented development and highway schemes;
- an assessment of the travel demands expected to arise from the Proposed Scheme;
- consideration of the sweep required by abnormal loads during the construction phase;
- a forecast of the likely distribution of trips across the catchment area;
- projections of the modal splits anticipated;
- consideration of bus and rail provision, capacity and access issues;
- a review of walking and cycling issues including those related to the highways surrounding the Proposed Scheme;
- a description of the parking and servicing proposals;
- a framework of measures to be included in development travel plans; and
- a summary of the significant residual and cumulative effects and consideration of mitigation measures where appropriate to reduce adverse effects of changes in trip generation and distribution.

7.3 Noise and Vibration

7.3.1 Potential Impacts

The following potential impacts are likely to be associated with the Proposed Scheme:

- construction noise and vibration impacts (including construction traffic on public roads);
- operational noise impacts from the new station operations (messing facilities, deliveries, PA system); and
- operational noise impacts from road traffic (staff, commuter and services movements) on public roads.

7.3.2 Assessment Methodology

The noise and vibration assessment will examine the potential noise and vibration impacts arising from construction and operation of the Proposed Scheme. A baseline noise survey will be undertaken to detail the prevailing acoustic environment including ambient noise sources such as the rail and road traffic noise. Baseline measurements will be recorded at secure locations identified around the Proposed Scheme for comparison and assessment against current guidelines for constructional noise and vibration

The proposed scope of the noise and vibration assessment comprises:

- the identification of nearest noise and vibration sensitive receptors;
- liaison with Knowsley Council Environmental Health Officer(s) to agree scope and methodology of the noise assessment, including baseline noise monitoring locations, if additional monitoring is required, and measurement protocol;
- establishment of baseline noise levels in the surrounding area; and
- assessment of the impact of predicted noise levels at the nearest noise sensitive receptors from the construction and operation of the Proposed Scheme which will include construction noise and vibration (including construction traffic on public roads) and operational noise and vibration (including delivery vehicles on public roads).

A site preparation and construction phase impact assessment will be undertaken based on construction activity and traffic movement information. From the results of the construction noise impact assessment, construction noise control measures will be developed in accordance with BS5228 Part 1: Noise. Significance criteria for construction noise will be selected by reference to existing ambient noise levels and the 'ABC' method which is described in Annex E of BS5228.

Due to the nature of the Proposed Scheme consideration will be given to construction traffic on the wider road network.

7.4 Ecology and Biodiversity

7.4.1 Potential Impacts

Potential impacts on ecology arising from the Proposed Scheme are, but aren't limited to:

- Construction activities have the potential to result in habitat severance or fragmentation (e.g. through physical damage or loss);
- construction activities have the potential to result in entrapment, killing or injury of species present in the area;
- potential opportunity to deliver net benefit for ecology through habitat creation and improvement; and

- Potential for loss of habitats/increased levels of external lighting and disturbance through operational activities.

7.4.2 Assessment Methodology

A qualitative ecological assessment will be undertaken in accordance with the EIA guidance produced by the Institute of Ecology and Environmental Management (IEEM). Where possible, context will be given to the significance of impacts by reference to UK and local biodiversity targets. The assessment will inform the need for any mitigation, whilst highlighting opportunities to incorporate ecological enhancements within and outside of the scheme.

The assessment will apply qualitative scheme specific criteria taking into consideration the following:

- size, value and sensitivity of the ecological resource;
- severity and direction of potential impacts (positive or negative);
- ability of the ecological resource to recover from temporary effects;
- potential for effective mitigation;
- consideration of duration – short, medium or long-term; and
- consideration of whether effects will be reversible.

7.5 Landscape and Visual

7.5.1 Potential Impacts

Potential landscape and visual impacts that may arise from the Proposed Scheme are:

- Changes in visual amenity throughout construction through the presence of construction compounds, plant and vehicles, clearance (including vegetation clearance) and earthworks and construction of internal road infrastructure;
- Changes in visual amenity from constructed components of the Proposed Scheme such as the new station building, substation and other associated components.

7.5.2 Assessment Methodology

Data will be gathered for the Proposed Scheme and surrounding area through site survey and desk-based baseline data gathering. The visual envelope for the Proposed Scheme is defined as the area over which the physical components or changes caused by its introduction could affect peoples' views of the landscape within the wider area surrounding the Proposed Scheme.

Baseline conditions will be established through the following:

- a factual description of the existing landscape (topography, land use, patterns, scale, settlement, transport routes etc);

- identifying sensitive elements or groups of elements in the landscape (landscape resource);
- preparing a landscape character assessment to classify the landscape into distinct character areas which display common features and characteristics. Any special values that apply to the landscape will be noted. These are generally identified by statutory and non-statutory designations and are influenced by prepared documentation relating to landscape character. Cultural associations may also be noted where they influence the sensitivity of the landscape resource rather than that of the cultural resource. Each landscape character area is evaluated in terms of sensitivity to change, i.e. the capacity of the landscape to accept change of the type and scale proposed; and
- reviewing the condition of the landscape, including reference to the maintenance and condition of individual elements (buildings, hedgerows, woodlands etc) and an assessment of the potential for landscape enhancement.

The visual assessment will examine the main views of the Proposed Scheme from the neighbouring environment, and a desk study and field survey will identify and describe potential visual receptors (residential areas, recreation sites, pedestrian routes). A 'Zone of Theoretical Visibility Map' will be produced to establish the extent to which the Proposed Scheme may have an effect over the wider landscape, and this will be used as a basis for both the landscape and visual assessments.

The LPA will be consulted on the scope of view locations to be assessed, and this will form part of the assessment process.

The methodology for landscape and visual impact assessment generally follows the Guidelines for Landscape and Visual Impact Assessment.

The potential effects arising from the Proposed Scheme will be identified, evaluated and assessed as to whether they are considered to be significant. The magnitude i.e. the likely nature and scale of changes to individual landscape elements and characteristics will be described together with consequential effects on landscape character. For visual effects, potential visual receptors will be identified, and their sensitivity judged. This will depend on a number of factors including location of viewpoint, importance of view and the expectations of the receptor (i.e. residents, users of recreational facilities, motorists passing through). The type of view will also be taken into account, for example whether it is a wide panorama, glimpsed or partial view. The immediate effect of the proposals on the surrounding area will be assessed as well as any residual effects after any proposed mitigation has matured.

Determination of the significance of an effect requires the application of professional judgement to weigh the findings of sensitivity of the receptor and the magnitude of an effect. Significant effects may be judged to be adverse or, where the effect results in an enhancement of the existing situation, beneficial. As part of the assessment, mitigation measures and design recommendations will be identified to address any significant adverse effects, together with an assessment of the likely effectiveness of such mitigation.

Figures illustrating the assessment will be provided, including a Zone of Theoretical Visibility Map.

8 Topics Proposed to be Scoped Out

8.1 Cultural Heritage

Traffic movements associated with the construction of the Proposed Scheme are not anticipated to increase disturbance to designated heritage assets above what is already experienced from traffic movements in the area. None of the designated heritage assets within 1 km are expected to experience adverse setting impacts as the surrounding land is predominantly urban in nature and any construction is expected to be shielded by surrounding buildings.

A Heritage Desk Based Assessment (DBA) is required by the LPA and will therefore be undertaken to assess all heritage assets in the area, including the potential for unknown archaeological assets and submitted to support the planning application. The DBA will also assess the potential for setting effects and if required, will outline mitigation measures to be implemented. If these measures are followed then it is anticipated that there will be no significant effects on cultural heritage as a result of the Proposed Scheme.

With the implementation of appropriate mitigation (if required) there is not considered to be potential for significant effects on local Cultural Heritage and therefore it is proposed that Cultural Heritage is scoped out of the EIA.

8.2 Water Resources and Flood Risk

A FRA was prepared by Arup in 2020 to understand the flood risk aspects associated with the development of the Proposed Scheme

Any risks regarding water resources and flood risk at the site during construction are anticipated to be managed through standard mitigation measures and methods of best practice and will adhere to water management during construction guidelines from both Knowsley Council and Network Rail. Through the implementation of these measures there is anticipated to be no significant effect arising from the development of the Proposed Scheme where water resources and flood risk are concerned.

Historic records and flood modelling data indicates that the site is at very low risk of flooding from all sources, with the only historic record of flooding was a surface water flood event on the A506 adjacent to Headbolt Lane.

The FRA recommended that measures to manage any residual flood risk are incorporated into the final design. These include:

- site master planning, including strategies to manage flow paths during exceedance events and protect ‘non water compatible’ assets from flooding.
- a complete surface Water drainage strategy in line with Knowsley Council technical drainage guidance.

The residual flood risk from all sources, if these measures are put in place is considered to be very low. Fluvial risk to the development is negligible, and any potential increases in flood risk off site will be mitigated through effective surface water management.

Potential future blockages beneath the bridge structures over Kirkby Brook are to be mitigated by providing clear spans over the watercourse and applying adequate space from the underside of the structures to above the maximum flood levels to account for debris. The likelihood of large items of debris occurring is however extremely low, given the throttling effect of the upstream culvert under the existing railway.

The FRA also outlined that should the drainage infrastructure of the Proposed Scheme fail, exceedance routes would channel flows away from buildings and critical infrastructure and into the adjacent Kirkby Brook.

As there are no significant effects on Water Resources and Flood Risk arising from the Proposed Scheme it is therefore proposed that Water Resources and Flood Risk is scoped out of the EIA.

8.3 Population and Human Health

Possible effects on human health that may result from the Proposed Scheme include noise disturbance and stress during construction. Impact avoidance and mitigation measures to protect the population and their human health are those presented in the air quality, noise and traffic and transport technical chapters of the ES.

No additional impact avoidance or mitigation measures are considered necessary to ensure that effects on human health and the local population are not significant. Significant adverse effects on population and human health receptors are not envisaged at a local population scale as a result of the Proposed Scheme.

The Proposed Scheme is considered to have a beneficial effect on the local population, by providing new transport infrastructure which will enable greater connectivity for the local population. In turn, this could enable an increase in access to a wider variety of services, employment and community facilities for the local population which would have a beneficial impact upon population and human health receptors although this is unlikely to be significant.

As there are no significant effects on Population and Human Health arising from the Proposed Scheme it is therefore proposed that Population and Human Health is scoped out of the EIA.

8.4 Waste and Resources

The Proposed Scheme is located in an area of amenity grassland. As such, the existing site does not currently generate any waste. There is potential for the Proposed Scheme to generate hazardous and non-hazardous waste during the construction phase, however, with the implementation of a Site Waste

Management Plan (SWMP) there is not considered to be potential for significant environmental effects resulting from waste and materials.

Contamination present in the area has been addressed within a standalone Ground Investigation Report. The Proposed Scheme would be designed to be follow principles of the waste hierarchy and would use best practices for storage and disposal of waste. As such, there is not considered to be potential for significant environmental effects resulting from waste and materials during operation. It is therefore proposed that waste and materials is scoped out of the EIA.

8.5 Ground Conditions

A GIR was produced by Arup in January 2021. Limited groundwater was encountered during the ground investigation and no significant contamination which could be considered to pose a risk to groundwater was recorded within the made ground soils beneath the site. The GIR reported that the existing ground conditions within the rail corridor were typical of rail corridors; a layer of ballast underlain by granular track bed material. The ballast was report as being either 'dirty or very dirty ballast' which raises the potential for contamination to occur from works in situ to the rail corridor or in the removal of old material off site. However exploratory bore holes also found no ground water, leading to the conclusion that the main groundwater body lies at a considerable depth below ground level meaning that the risk from contamination associated with the rail corridor works are low.

The proposed station and car park development will predominantly comprise buildings and hardstanding which will minimise infiltration particularly compared to the current situation.

It is understood that new buildings and structures will be constructed using shallow foundations and currently no piled foundations are proposed. Consequently, the risks to controlled waters from the proposed development are considered to be very low and not significant.

Grossly contaminated materials are not expected to be encountered at the site. However, on any brownfield site there is the possibility that unforeseen contaminated material may be encountered during excavation works. Care should be taken during ground works and excavations should be supervised to ensure any previously unforeseen contamination is appropriately managed through a CEMP.

It is therefore proposed that Ground Conditions is scoped out of the EIA.

8.6 Major Accidents and Disasters

Following a high-level screening exercise, it has been determined that the Proposed Scheme does not meet any of the following criteria:

- the Proposed Scheme is not considered to be a source of a hazard itself that could result in a major accident;
- the Proposed Scheme does not interact with external sources of hazard. For instance, the nearest COMAH sites are located approximately 3.5km south

east and 3.5km east of the Proposed Scheme. It is not considered that the presence of the Proposed Scheme increases the risk of a hazard occurring at this external hazardous site, such as impeding emergency response; and

- if an external disaster occurred, it is not considered that the presence of the Proposed Scheme would increase risk of serious damage to any nearby sensitive receptors.

Further to this, the following key risks will be considered within the technical chapters of the ES:

- the volume and type of traffic using the Proposed Scheme is likely to alter the traffic flows of the surrounding area, the traffic assessment will consider the overall impact of the Proposed Scheme on road safety;
- the FRA and drainage design will consider the potential for changes in weather patterns resulting from climate change to increase flooding on or off site: and
- accidental spillage of contaminants such as hydrocarbons and their subsequent release into the drainage system will be controlled via implementation of a CEMP and the drainage strategy.

Although there is always the potential for a wide range of major accidents and disasters to occur, the probability, likelihood and frequency is very low in the instance of the Proposed Scheme and the environmental effects that could arise as a result of a major accident or disaster are considered to be already considered within the ES, or managed under established legislative requirements or the design process. It is therefore proposed that major accidents and natural disasters is scoped out of the EIA.

8.7 Climate Change

The construction of the Proposed Scheme would result in a number of HGVs and other goods vehicles visiting the Site, which has the potential to increase the contribution of GHG emissions from vehicles. However, it is anticipated that any additional emissions from construction activities will only occur throughout limited daily working hours and only for the course of 1.5 years. Further to this it is expected than any localised impacts of GHG emissions arising from the construction and operation of the Proposed Scheme will be considered in the Traffic and Transport and Air Quality chapters of the ES.

Through operation, the Proposed Scheme will encourage greater use of public transport by making public transport accessible to more people in the Knowsley area which will aim to reduce the numbers of daily trips undertaken by commuters via cars in the Liverpool City Region and further afield, this has the potential for beneficial contribution to reducing contributions to climate change on a larger scale.

It is therefore proposed that Climate Change is scoped out of the EIA.

9 Environmental Impact Assessment Scope and Process

9.1 Proposed Scope of the EIA

Based on an evaluation of the baseline environmental information that exists for the site and surrounding area and the potential environmental effects of the Proposed Scheme, it is proposed that the EIA will include the following technical disciplines:

- Air Quality;
- Traffic and Transport;
- Noise and Vibration;
- Ecology and Biodiversity;
- Landscape and Visual; and
- Cumulative.

As outlined in Section 8, a number of assessments are not considered relevant to the EIA for the Proposed Scheme as no significant environmental effects are anticipated to occur. The term 'significant' is an important distinction because a development may cause minor impacts to occur which do not have significant environmental effects. As such, the following topics are proposed to be scoped out of the EIA:

- Water Resources and Flood Risk;
- Population and Human Health;
- Waste and Resources;
- Ground Conditions;
- Cultural Heritage;
- Major Accidents and Disasters; and
- Climate Change.

9.2 EIA Method and Reporting

The ES will set out the process followed during the preparing of the EIA including the methods used for the collection of data and for the identification and assessment of impacts. Any assumptions made will be clearly identified. The EIA is based on a number of related activities, as follows:

- establishing baseline conditions;
- consultation with statutory and non-statutory consultees;

- consideration of local, regional and national planning policies, guidelines and legislation relevant to EIA;
- consideration of technical standards for the development of significant criteria;
- review of secondary information, previous environmental studies and publicly available information and databases;
- physical surveys and monitoring;
- desk-top studies;
- computer modelling;
- reference to current legislation and guidance; and
- expert opinion.

Impacts will be considered on the basis of their magnitude, duration and reversibility. Cumulative and combined effects will also be considered where appropriate. Significance will be evaluated on the basis of the scale of impact and the importance or sensitivity of the receptors, in accordance with standard assessment methodologies (major, moderate, minor and negligible).

Where likely significant environmental effects are identified in the assessment process, measures to mitigate these effects will be put forward in the form of recommendations to be undertaken as part of the project development.

9.2.1 Alternatives

In accordance with Schedule 4(2) of the Town and Country Planning EIA Regulations, the ES will provide a description of the reasonable alternatives studied by the Applicant and an indication of the main reasons for selecting the Proposed Scheme, including a comparison of the environmental effects.

9.2.2 Consultation

Consultation is an important part of the EIA process and this scoping report represents an early stage in the formal consultation process. Consultation with relevant stakeholders will continue throughout the planning process, and following submission of the application, where appropriate. Consultation will be undertaken with statutory and non-statutory stakeholders throughout the process in a variety of methods including meetings, telephone calls and email. In the lead up to the submission of the planning application and throughout the design process, a programme of consultation will continue to be undertaken with statutory and non-statutory consultees.

Comments on the proposed approach are invited from all relevant consultees. Once received, the environmental specialists appointed will undertake assessments to identify and understand any likely significant environmental effects. Where identified, such effects will be designed out of the Proposed Scheme or reduced through mitigation. The results of this process will be set out in a full ES, which will accompany the planning application.

9.3 Proposed Structure of the Environmental Statement

The ES will comprise the following set of documents:

- Volume I: Main Report: This will contain the full ES text of the EIA with the proposed chapter headings as follows:
    - Chapter 1: Introduction
    - Chapter 2: EIA Assessment Method
    - Chapter 3: The Proposed Scheme;
    - Chapter 4: Traffic and Transport;
    - Chapter 5: Air Quality;
    - Chapter 6: Noise and Vibration
    - Chapter 7: Ecology and Biodiversity;
    - Chapter 8: Landscape and Visual;
    - Chapter 9: Cumulative and Combined Effects; and
    - Chapter 10: Summary of Significant Effects, Mitigation and Monitoring.
- Volume II: Figures: This will provide supporting figures of the environmental studies conducted during the EIA.
- Volume III: Technical Appendices: These will provide supplementary details of the environmental studies conducted during the EIA including relevant data tables, figures and photographs.
- Volume IV: Non-technical Summary (NTS): This document will provide a summary of the key issues and findings of the EIA in non-technical language.

9.4 Structure of Technical Chapters

Each environmental topic 'scoped in' to EIA (see Section 8) will be addressed in a separate technical chapter of the ES. Chapters 4 – 9 will be structured based on the following sub-headings:

9.4.1 Introduction

The introduction will provide a brief summary of what is considered, and the format of, in the chapter and will state the author and/or relevant technical contributor.

9.4.2 Assessment Method and Significance Criteria

The assessment method will provide an explanation of methods used in undertaking the technical assessment and the prediction of effects. Reference will be made to any published standards (e.g. British Standards, Building Research Establishment), guidelines (e.g. Design Manual for Roads and Bridges (DMRB) and Institute of Environmental Management and Assessment (IEMA) guidelines) and relevant significance criteria.

The significance of effects before and after mitigation will be evaluated with reference to definitive standards, accepted criteria and legislation where available. Where it is not possible to quantify impacts, qualitative assessments will be carried out, based on available knowledge and professional judgement. Where uncertainty exists, this will be noted in the relevant technical assessment chapter.

Specific criteria for each technical assessment will be developed, giving due regards to the following:

- Extent and magnitude of the impact;
- Impact duration (short, medium or long term);
- Impact nature;
- Whether the impact occurs in isolation, is cumulative or interactive;
- Performance against environmental quality standards where relevant;
- Sensitivity of the receptor; and
- Compatibility with environmental policies and standards.

For issues where definitive quality standards do not exist, significance will be based on:

- Local, district, regional or national scale or value of the resource effected;
- Number of receptors affected;
- Sensitivity of these receptors; and
- Duration of the impact.

In order to provide a consistent approach to expressing the outcomes of the various studies undertaken as part of the EIA, and thereby enable comparison between effects upon different environmental components, the following terminology will be used throughout the ES to define effects:

- Adverse – detrimental or negative effects to an environmental resource or receptor; or
- Beneficial – advantageous or positive effect to and environmental resource or receptor; and
- Negligible – imperceptible effect to an environmental resource or receptor; or
- Minor – slight, very short or localised effect of no significant consequence;

- Moderate – more than a slight, very short or localised effect (by extent, duration or magnitude) which may be considered significant; or
- Major – considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.

As indicated above, for the purpose of this EIA, moderate and major effects will be deemed 'significant'. Where possible mitigation measures will be identified to reduce the residual effects to 'not significant'.

Each of the technical chapters will provide the criteria, including sources and justifications, for quantifying the different levels of residual effect. Where possible, this has been based upon quantitative and accepted criteria, together with the use of value judgement and expert interpretation to establish the scale of an effect.

9.4.3 Baseline Conditions

In order to assess the potential impacts and effects of the Proposed Scheme, it is necessary to determine the environmental conditions that currently exist on site and in the surrounding area, for comparison. These are known as the existing baseline conditions. Baseline conditions are determined using the results of site surveys and investigations or desk-based data searches, or a combination of these, as appropriate.

In order to compare future operation against the baseline that is likely to occur at the time of full operation, for most technical disciplines it will be necessary to establish future baseline conditions taking account of any planned or likely changes.

9.4.4 Development Design and Impact Avoidance

Measures that have been integrated into the Proposed Scheme in order to avoid or reduce adverse environmental effects will be described. Such measures may include refinement of the design and layout of the Proposed Scheme to avoid such impacts on sensitive receptors, implementation of Construction and Operational Environmental Management Plans, the adherence of relevant legislation, guidance and best practice. The assessment of impacts and effects in the next section takes account of these measures already in place.

9.4.5 Assessment of Potential Impacts and Effects

This section will identify the likely impacts resulting from the Proposed Scheme. The magnitude of impacts are defined with reference to the relevant baseline conditions (existing or future, as appropriate), and effects are determined in accordance with the identified methodology. This section will summarise the mitigation measures proposed to avoid, reduced or otherwise offset or compensate for any significant adverse environmental effects to enhance the beneficial effects of the Proposed Scheme. The potential method by which the proposed measures will be implemented will be specified.

9.4.6 Mitigation and Enhancement Measures

The Mitigation and Enhancement Measures section will describe the measures that will be implemented by the Applicant to reduce any significant adverse effects identified by the assessment and enhance beneficial effects during construction and operation of the Proposed Scheme.

9.4.7 Residual Effects and Conclusions

Effects of the Proposed Scheme remaining following the implementation of available mitigation measures are known as ‘residual effects’. These will be discussed for each of the potential effects, and their significance level identified.

10 Summary

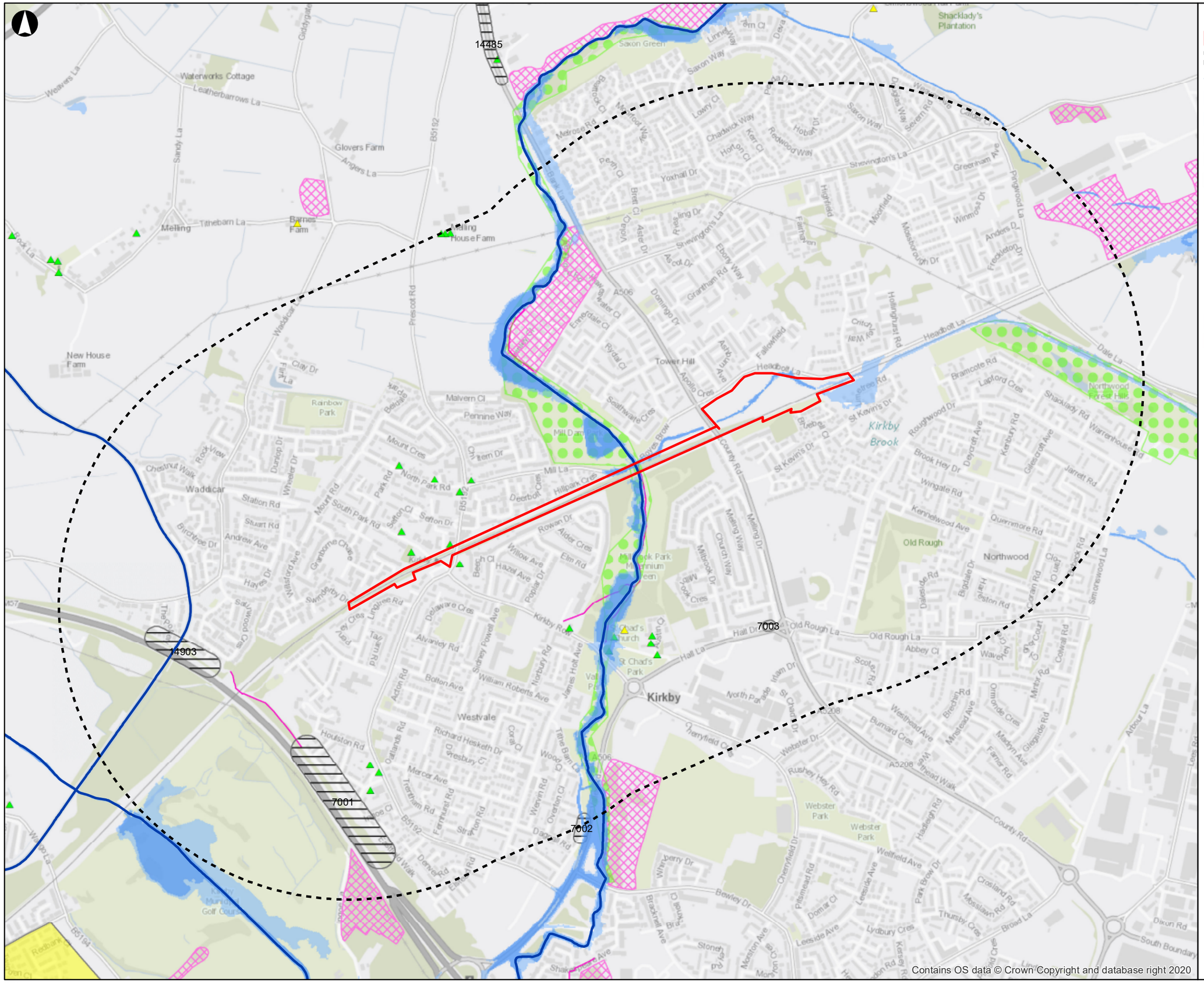
This EIA Scoping Report had identified the potential for significant effects to arise from the construction and operation of the Proposed Scheme. The following technical specialist assessments are proposed:

- Traffic and Transport;
- Air Quality;
- Noise and Vibration;
- Ecology and Biodiversity; and
- Landscape and Visual Impact.

The detailed assessments for each of these topics will be undertaken in accordance with standard guidance and best practice reported in the ES. Where significant effects are identified, mitigation measures will be described where possible to reduce the residual effects. This EIA Scoping Report is submitted to Knowsley Council with a formal request for a Scoping Opinion in accordance with Part 4 of the Town and Country Planning (EIA) Regulations 2017.

Figure 2
Environmental Constraints Plan

A3



Legend

- Indicative Red Line Boundary
- 1km Study Area
- WFD Watercourse
- Flood Zone 2
- Flood Zone 3
- Air Quality Management Area
- Noise Action Planning Important Area
- Local Nature Reserve
- Local Wildlife Site
- Public Right of Way
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- Scheduled Monument
- Historic Landfill
- Authorised Landfill Site

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Issue	Date	By	Chkd	Appd
P1	29-01-21	SM	EB	EC

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Client
Network Rail

Job Title
170248 Headbolt Lane New Station GRIP 4

Figure 2
Environmental Constraints Plan

Scale at A3
1:12,325

Job No	Drawing Status
276736-00	**Issue**

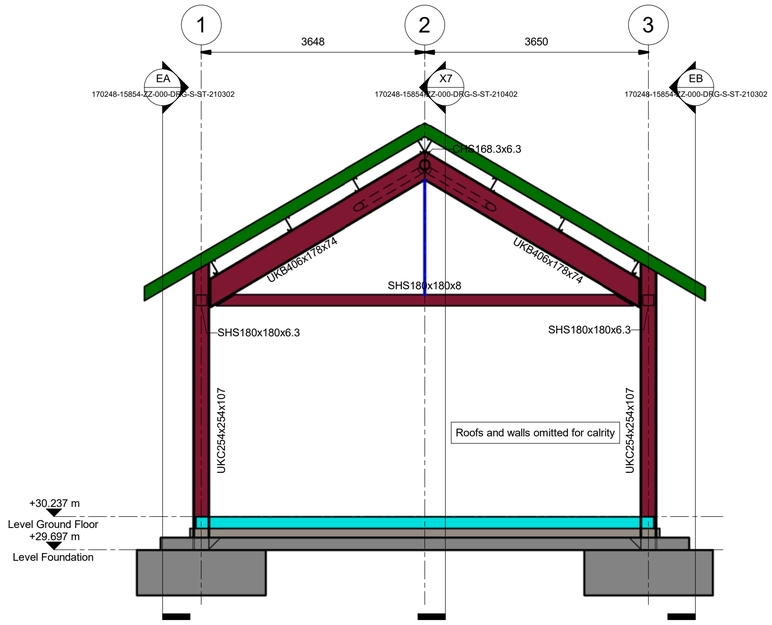
Drawing No	Issue
2	**P1**

MXD Location

© Arup

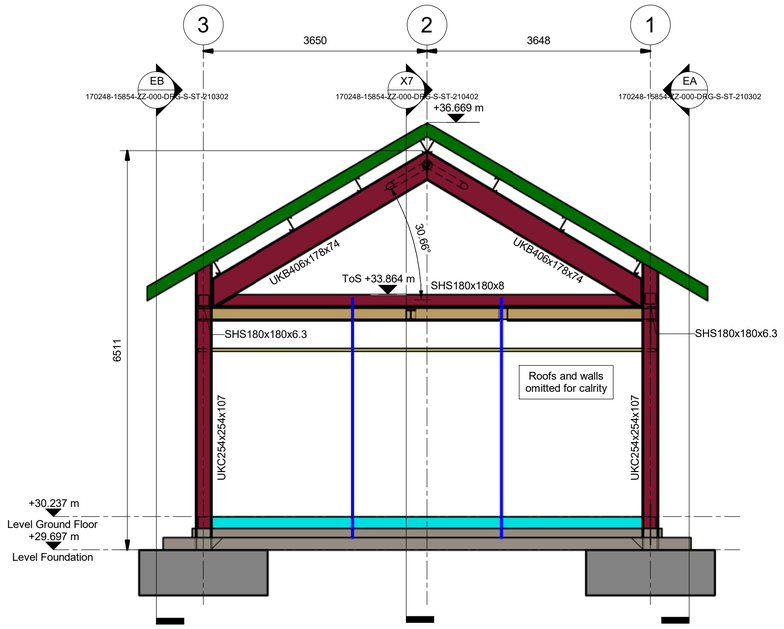
Figure 3
Structural Elevations 1

Drawing Number
170248-15854-ZZ-000-DRG-S-ST-210301



Elevation on Grid Line 1

Scale 1 : 50



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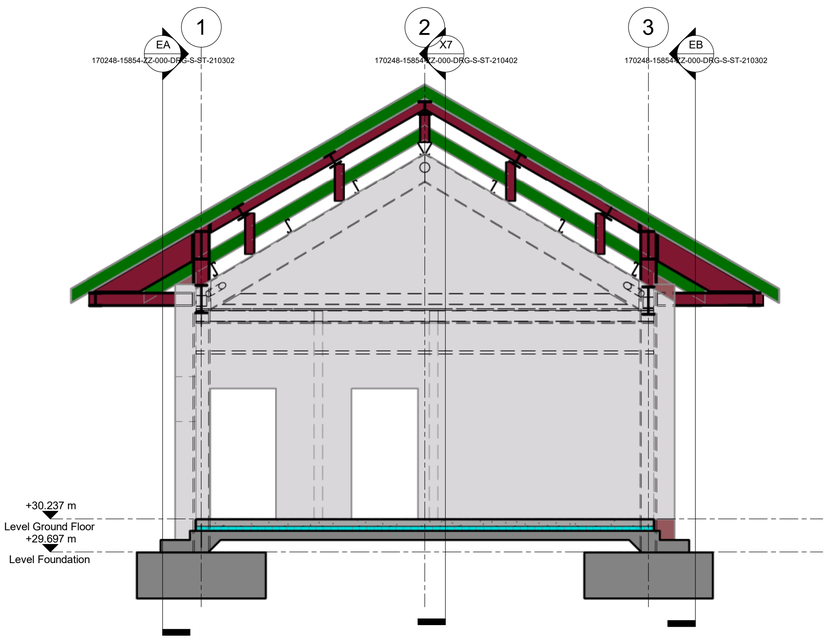

Internal Elevation on Grid Line E

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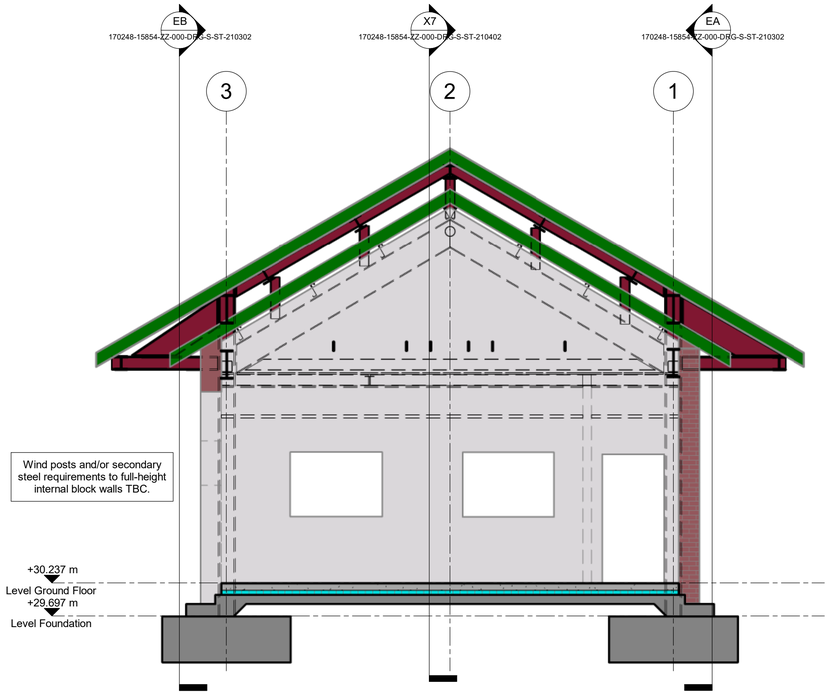


Internal Elevation on Grid Line D

Scale 1 : 50

Legend/Notes

1. All dimensions are in millimeters unless stated otherwise. All levels are given in metres and are structural levels relative to Ordnance Survey Datum unless noted otherwise.
2. Do not scale from these drawings, if in doubt ask.
3. This drawing is to be read in conjunction with the 'General Notes' Drawing 170248-15854-ZZ-000-DRG-S-ST-210101.
4. For survey grid information refer to P-Way Drawings.
5. Windpost locations to external envelope TBC. Allow for Ancon WP3 115x65x8 or similar to all locations shown.
6. Windposts and/or secondary steel requirements to internal blockwork walls TBC at next GRIP stage. Lintel requirements for all masonry openings TBC at next GRIP stage. Contractor to make appropriate allowance for such items include head restraints to full height walls.

Indicative windpost locations

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P02	13/01/21	Second Revision	EA	DA	CDR
P01	01/12/20	First Issue	EA	DA	CDR

Status: Suitable for Coordination
Suitability: S1

Network Rail

Authorised		Signed	Date

Contractor(s): Ove Arup & Partners

Location/Level: No Specific Location

Type: CAD Drawing	Sub-type:
Role: Structural	Discipline: Structures
Volume/System: No Specific Volume or System	
Phasing: Proposed	Grip Stage: 4

Project: Headbolt Lane

Contract no.: 170248

Contract Title: Headbolt Lane

Drawing Title: Structural Elevations Sheet 1

Designed	D.Almond	Signed	Date 01/12/20
Drawn	E.Allcock	Signed	Date 01/12/20
Checked	D.Almond	Signed	Date 01/12/20
Approved		Signed	Date 01/12/20

Scale(s): As indicated
ELR & Mileage: WLK2 28.1232 to 29.0913

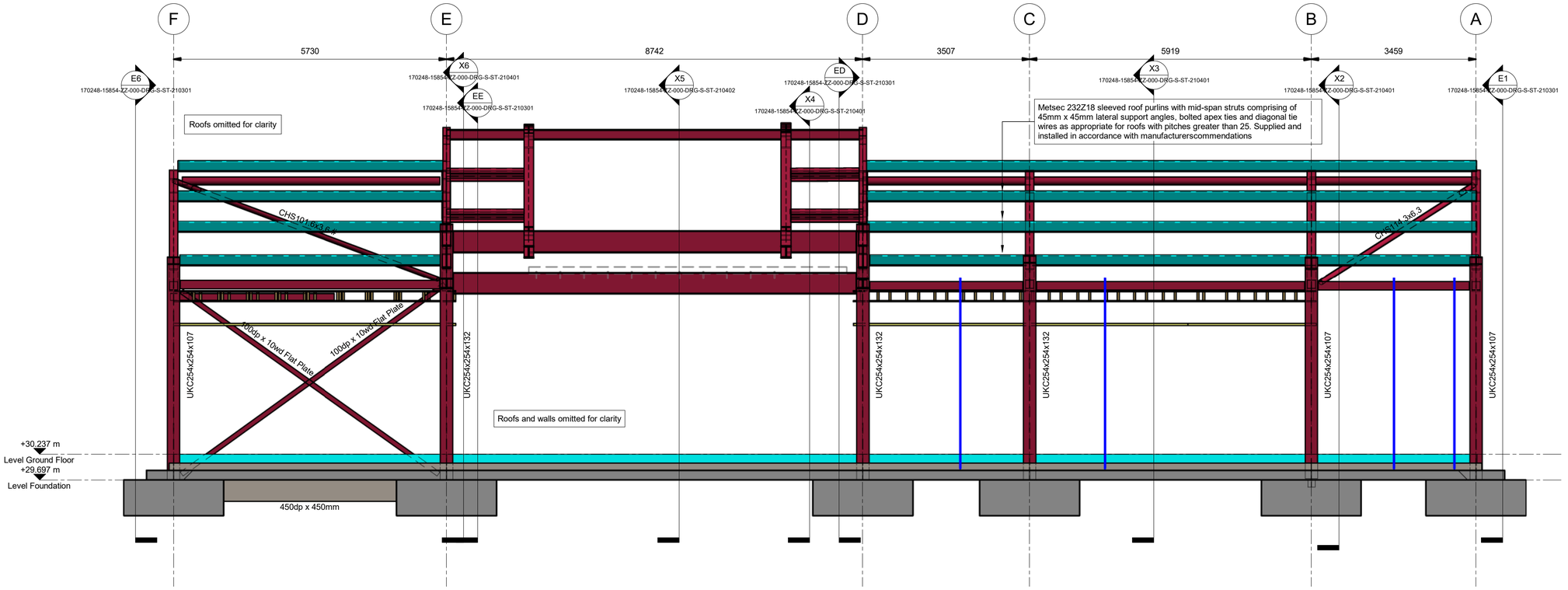
Alternative Reference: 170248-ARU-DRG-EST-000004
Sheet: 1 of 2

Drawing Number: 170248-15854-ZZ-000-DRG-S-ST-210301
Revision: P02

Sheet Size A1 594 x 841

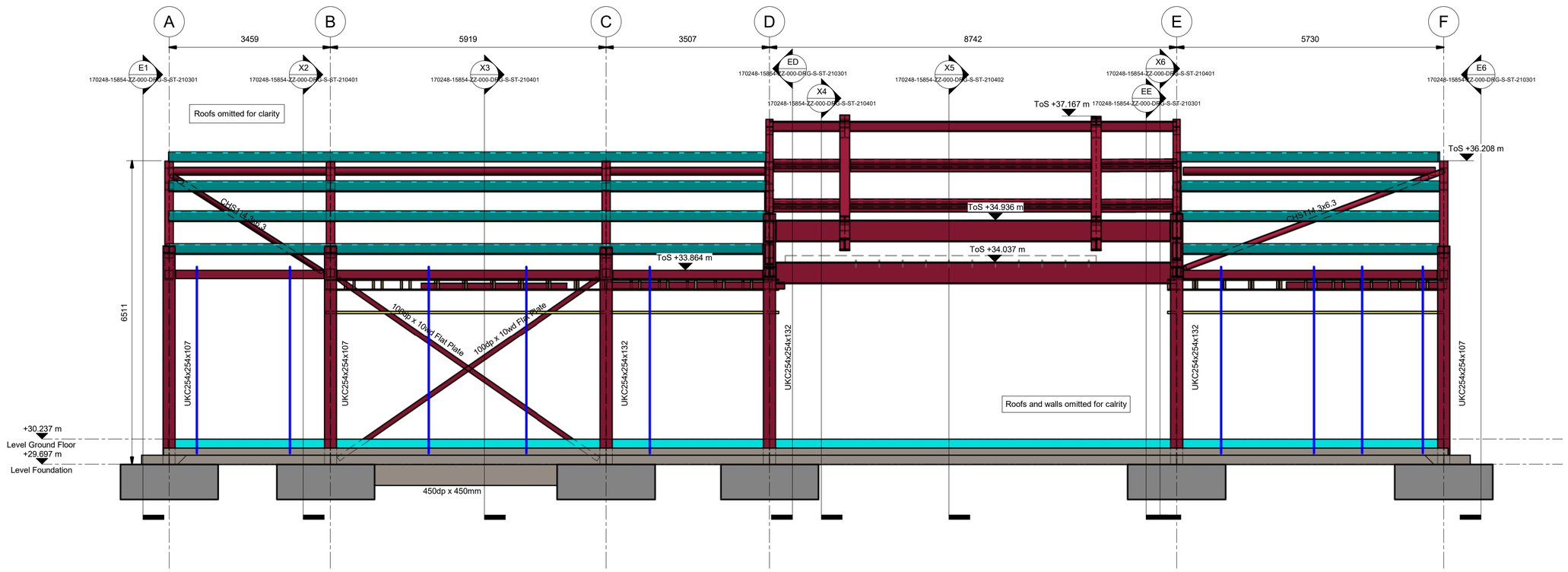
Figure 4
Structural Elevations 2

Drawing Number
170248-15854-ZZ-000-DRG-S-ST-210302



Elevation on Grid Line A

Scale 1 : 50



Elevation on Grid Line B

Scale 1 : 50

Legend/Notes

1. All dimensions are in millimeters unless stated otherwise. All levels are given in metres and are structural levels relative to Ordnance Survey Datum unless noted otherwise.
2. Do not scale from these drawings, if in doubt ask.
3. This drawing is to be read in conjunction with the 'General Notes' Drawing 170248-15854-ZZ-000-DRG-S-ST-210101.
4. For survey grid information refer to P-Way Drawings.
5. Windpost locations to external envelope TBC. Allow for Ancon WP3 115x65x8 or similar to all locations shown.
6. Windposts and/or secondary steel requirements to internal blockwork walls TBC at next GRIP stage. Contractor to make appropriate allowance for such items include head restraints to full height walls.

Indicative windpost locations

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P02	13/01/21	Second Revision	EA	DA	CDR
P01	01/12/20	First Issue	EA	DA	CDR

Status: Suitable for Coordination
Suitability: S1

Network Rail

Authorised | Signed | Date

Contractor(s): Ove Arup & Partners

Location/Level: No Specific Location

Type: CAD Drawing | Sub-type:

Role: Structural | Discipline: Structures

Volume/System: No Specific Volume or System

Phasing: Proposed | Grip Stage: 4

Project: Headbolt Lane

Contract no.: 170248

Contract Title: Headbolt Lane

Drawing Title: Structural Elevations Sheet 2

Designed	D.Almond	Signed	Date 01/12/20
Drawn	E.Allcock	Signed	Date 01/12/20
Checked	D.Almond	Signed	Date 01/12/20
Approved		Signed	Date 01/12/20

Scale(s): As indicated
ELR & Mileage: WLK2 28.1232 to 29.0913

Alternative Reference: 170248-ARU-DRG-EST-000005
Sheet: 2 of 2

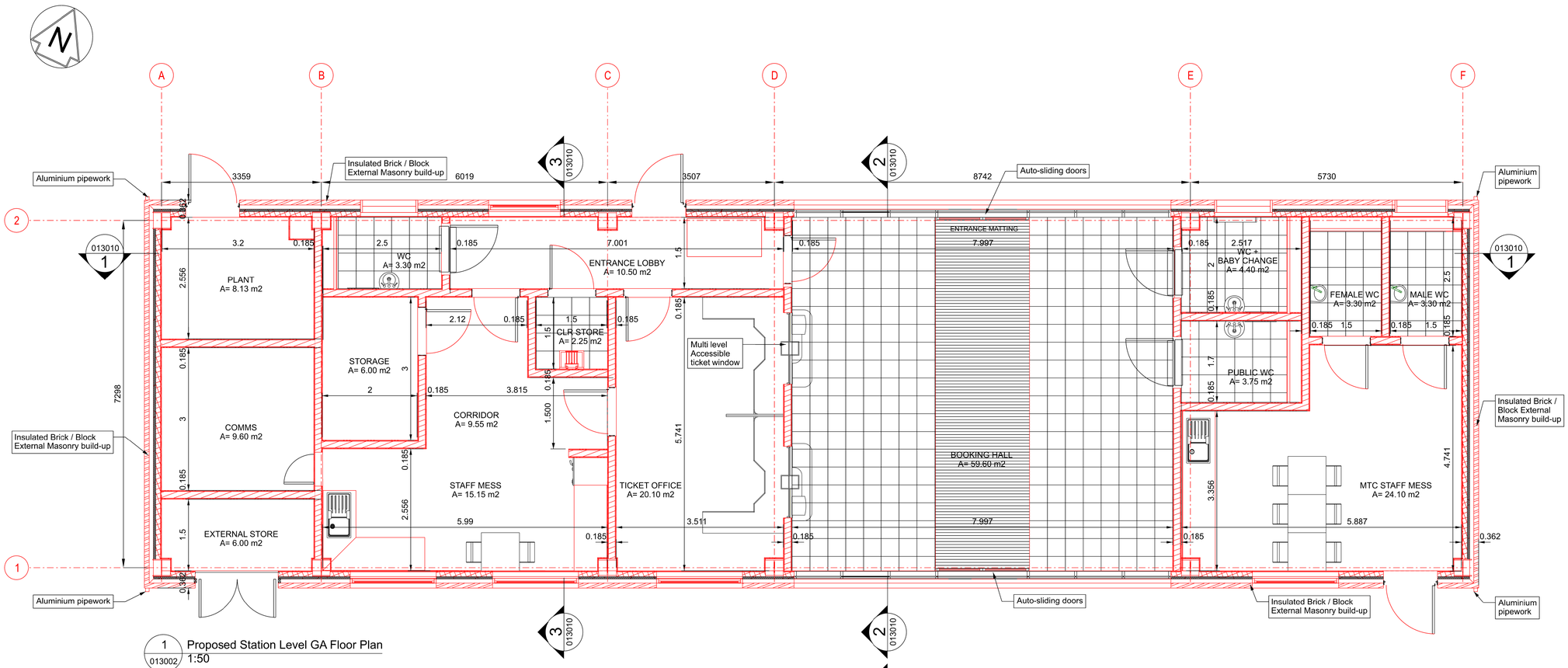
Drawing Number: 170248-15854-ZZ-000-DRG-S-ST-210302
Revision: P02

Sheet Size A1 594 x 841

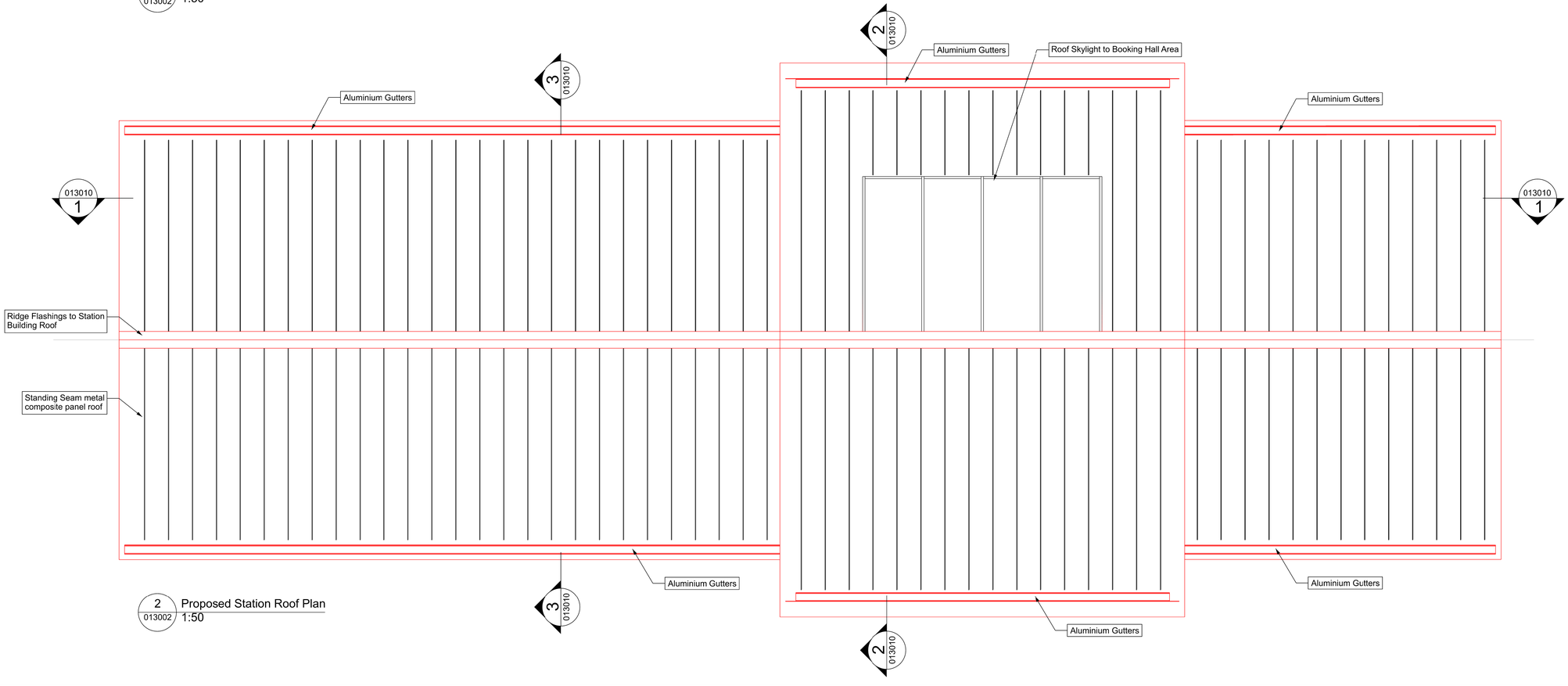
Figure 5

Proposed Station Level GA Floor Plan and Roof Plan

Drawing Number
170248-15854-ZZ-ZZZ-DRG-A-AR-013002 P03



1 / 013002 Proposed Station Level GA Floor Plan
1:50



2 / 013002 Proposed Station Roof Plan
1:50

Legend/Notes

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01	23/11/20	First Revision	GF	GS	---
P02	11/12/20	Second Revision	GF	GS	---
P03	13/01/21	Issue for IDC	GF	GS	---

Status: Suitable for Co-ordination
Suitability: S1

NetworkRail

Authorised	---	Signed ---	Date

Contractor(s): Ove Arup & Partners Scotland Ltd

Location\Level: No Specific Location

Type: CAD Drawing	Sub-type: Plan	
Role: Architect	Discipline: Architecture	
Volume\System: No Specific Volume or System		
Phasing: Proposed	Grip Stage: 4	

Project: Headbolt Lane

Contract No.: 170248

Contract Title: Headbolt Lane

Drawing Title: Proposed Station Level GA Floor and Roof Plan

Designed	---	Signed ---	Date 29/10/20
Drawn	G.FERREIRA	Signed GF	Date 13/01/21
Checked	G.SEED	Signed GS	Date 13/01/21
Approved	--	Signed ---	Date

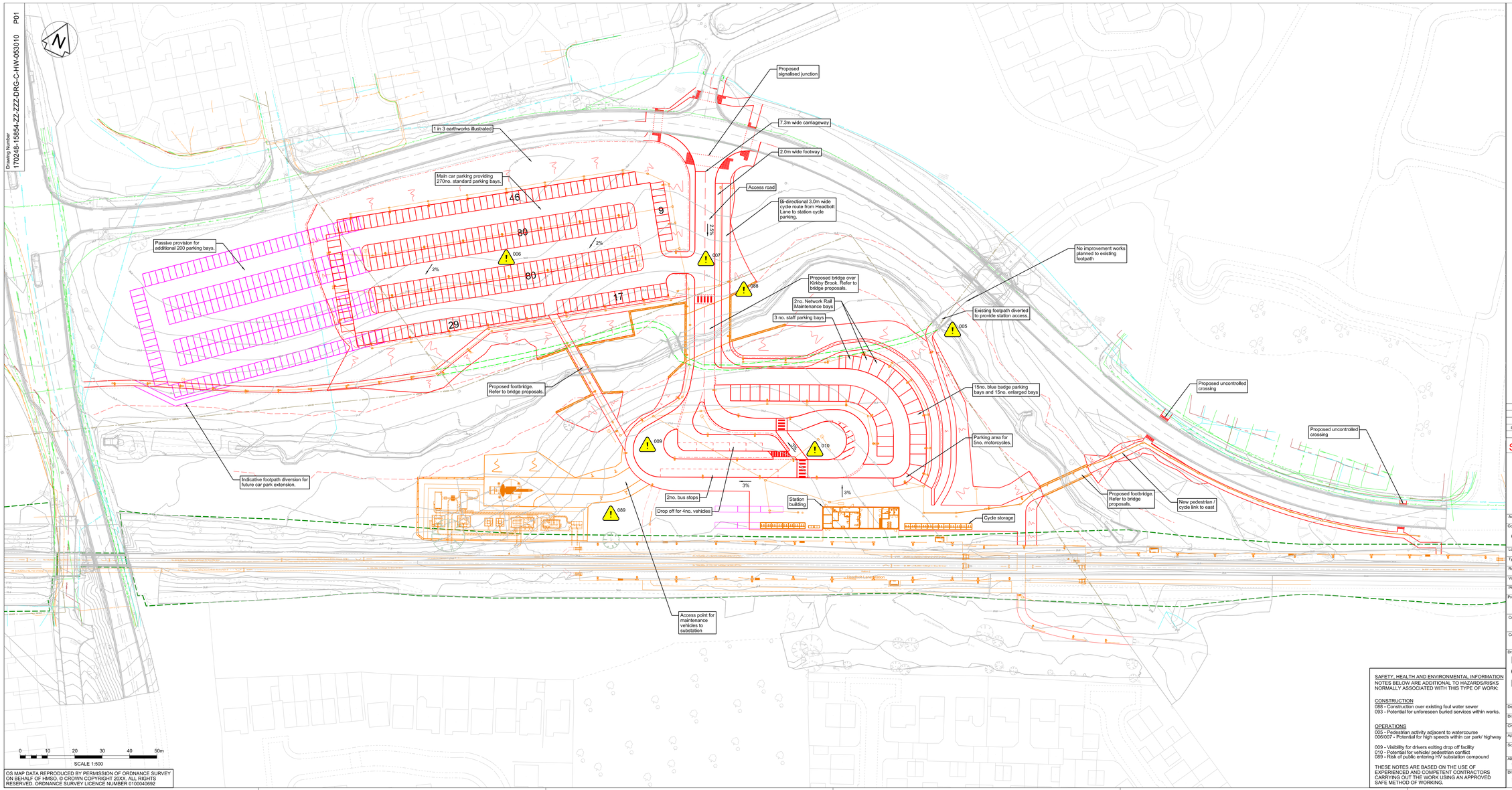
Scale(s): 1:50
ELR & Mileage: WKL2 28.1232 to 29.0913

Alternative Reference: 170248-ARU-DRG-EAR-000001
Sheet: 1 of 1

Drawing Number: 170248-15854-ZZ-ZZZ-DRG-A-AR-013002
Revision: P03

Sheet Size A1 594 x 841

Figure 6
Car Park and Access Proposed Layout



0 10 20 30 40 50m

SCALE 1:500

OS MAP DATA REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN COPYRIGHT 20XX. ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENCE NUMBER 0100040692

Drawing Number
170248-15854-ZZ-ZZZ-DRG-C-HW-053010 P01

Legend/Notes

1. Do not scale from this drawing.
2. All dimensions are in millimetres unless shown otherwise.
3. For drainage details refer to drawing 170248-15854-ZZ-ZZZ-DRG-C-DR-003001.
4. For further car park details refer to Form 001 document reference 170248-ARU-REP-ECV-000005.
5. For platform details refer to Form 001 document reference 170248-ARU-REP-ECV-000004.
6. For lineside infrastructure details refer to Form 001 document 170248-ARU-REP-ECV-000006.
7. Proposed incoming utilities routes, sizing etc. to be confirmed following MEP IDC.

Key:

- Proposed Highway and Car Park
- Proposed Fencing / Guardrailing
- Passive Provision for Future Car Park Extension
- Other Proposed Works
- Network Rail Boundary

Key (Utilities):

- Existing BT Network
- Existing Surface Water Sewer
- Existing Foul Sewer
- Existing Potable Water
- Existing LV Electric
- Existing HV Electric
- Existing Virgin Media
- Existing Low Pressure Gas

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01	20/01/21	First Revision	GC	RS	---

Status: Suitable for Co-ordination
Suitability: S1

NetworkRail

Authorised	---	Signed	Date

Contractor(s): Ove Arup & Partners

Location/Level	No Specific Location		
Type	CAD Drawing	Sub-type	General Arrangement
Role	Civil Engineer	Discipline	Highways
Volume/System	No Specific Volume or System		
Phasing	Proposed	Grip Stage	4

Project: Headbolt Lane

Contract No.: 170248

Contract Title: Headbolt Lane

Drawing Title: Headbolt Lane New Station Car Park and Access Proposed Layout

Designed		Signed ---	Date
Drawn	G.COURTNEY	Signed GC	Date 20/01/21
Checked	R.SCRIVENER	Signed RS	Date 20/01/21
Approved	---	Signed ---	Date
Scale(s)	1:1000	ELR & Mileage	WKL2 28.1232 to 29.0913

Alternative Reference: 170248-ARU-DRG-ECV-000008
Sheet: 1 of 1
Drawing Number: 170248-15854-ZZ-ZZZ-DRG-C-HW-053010
Revision: P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
NOTES BELOW ARE ADDITIONAL TO HAZARDS/RISKS NORMALLY ASSOCIATED WITH THIS TYPE OF WORK

CONSTRUCTION
088 - Construction over existing foul water sewer
093 - Potential for unforeseen buried services within works.

OPERATIONS
005 - Pedestrian activity adjacent to watercourse
006/007 - Potential for high speeds within car park/ highway

009 - Visibility for drivers exiting drop off facility
010 - Potential for vehicle/ pedestrian conflict
089 - Risk of public entering HV substation compound

THESE NOTES ARE BASED ON THE USE OF EXPERIENCED AND COMPETENT CONTRACTORS CARRYING OUT THE WORK USING AN APPROVED SAFE METHOD OF WORKING.

Appendix A
Preliminary Ecological Appraisal, NGL, 2020

Headbolt Lane, Kirkby

Preliminary Ecological Appraisal Report

nlg ecology ltd

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July 2020

Project No/Title:

Title: **Headbolt Lane/ Buckingham**
Preliminary Ecological Appraisal Report

Client: **Buckingham**

Date: July 2020

Status	Date	Prepared by	Reviewed by	Approved by
V1	27/07/2020	Rowena Tylden-Pattenson Assistant Ecologist	Neil Lee-Gallon Principal Ecologist	Neil Lee-Gallon Principal Ecologist

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Data supplied by the client or from other sources have been used - it has been assumed that the information is correct. No responsibility can be accepted by NLG for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work. This work has been undertaken in accordance with the quality management system of NLG Ecology Ltd. No part of this report may be copied or duplicated without the express permission of NLG Ecology Ltd and the party for whom it was prepared.

SUMMARY

NLG Ecology Ltd (NLG) was commissioned by Buckingham Group to undertake a Preliminary Ecological Appraisal of a site subject to works pertaining to the construction of a new station proposal and located at Headbolt Lane. The survey area is centred at OS Grid Reference SJ 41325 99798, with its nearest postcode being L33 1WD; the site location, along with any recorded habitats and features of ecological interest are shown on Figure 1, Appendix 1 and in Photographs 1 to 21 in Appendix 3.

The appraisal was required to inform proposals to construct a new station at Headbolt Lane, and associated engineering works at Kirkby Station and the adjacent track. In general, and facilitated by the Preliminary Ecological Appraisal report, for all rail projects that may affect any plants and/or animals, biodiversity risks and opportunities must be identified and managed in accordance with the 'Biodiversity Mitigation Hierarchy'. This comprises sequential steps to avoid, minimise, rehabilitate/restore and offset any negative impacts on biodiversity, aiming ultimately to achieve a net gain in biodiversity.

The Preliminary Ecological Appraisal of the site has comprised of an open-source and record searchto 2km radius, an Extended Phase 1 Habitat Survey in accordance with Joint Nature Conservation Committee (JNCC) guidelines (2010) and an evaluation of the key ecological constraints to the project. The data collected have been used to form a baseline for the site and to inform any necessary recommendations for further surveys, mitigation and enhancement measures. In addition, Defra's Biodiversity Metric v2.0 Toolkit has been used to assess the baseline biodiversity of the survey area, the comparative ecological value of the various features recorded and the level of habitat loss to the project.

The appraisal, including the Extended Phase 1 Habitat Survey completed on 13th and 14th July 2020, has been undertaken by Rowena Tylden-Pattenson (Assistant Ecologist at NLG, Graduate CIEEM member).

The site baseline habitat size is 10.18ha, including buffer zones around the proposed site boundaries, including compound areas, with baseline habitat units calculated as 53.99. The post-works habitat units (post-habitat creation) have been calculated as 15.14, with losses of 38.86 biodiversity units (approximate overall losses of 71.98%) due to the works. To achieve a biodiversity net-gain of 10%, off-site mitigation is considered necessary, with the creation of approximately 44.25 biodiversity units.

Recommendations are made with respect to bats, amphibians, nesting birds, rabbit, fox, badger, riparian mammals, reptiles, invasive species, and small mammals. All recommendations are located in Section 4.4. Post-works suggestions for habitat creation are outlined in Section 4.5.

The data contained within this report are considered to be valid for a period of 18 months from the date of the last survey on site (i.e. until 14/01/2022).

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1 INTRODUCTION

1.1 Background

1.1.1 NLG Ecology Ltd (NLG) was commissioned by Buckingham Group to undertake a Preliminary Ecological Appraisal of a site subject to works pertaining to the construction of a new station proposal and located at Headbolt Lane. The survey area is centred at OS Grid Reference SJ 41325 99798, with its nearest postcode being L33 1WD; the site location, along with any recorded habitats and features of ecological interest are shown on Figure 1, Appendix 1 and in Photographs 1 to 21 in Appendix 3.

1.1.2 The appraisal was required to inform proposals to construct a new station at Headbolt Lane, and associated engineering works at Kirkby Station and the adjacent track. In general, and facilitated by the Preliminary Ecological Appraisal report, for all rail projects that may affect any plants and/or animals, biodiversity risks and opportunities must be identified and managed in accordance with the 'Biodiversity Mitigation Hierarchy'. This comprises sequential steps to avoid, minimise, rehabilitate/restore and offset any negative impacts on biodiversity, aiming ultimately to achieve a net gain in biodiversity.

1.1.3 The Preliminary Ecological Appraisal has mainly comprised of an open-source desk study to 2km radius, an Extended Phase 1 Habitat Survey and an evaluation of the key ecological constraints to the project. In order to identify ecological opportunities and constraints in respect of the proposals, this report collates the data gathered and seeks to fulfil the following objectives:

- To establish an ecological baseline for the site;
- To assess the potential for, or to confirm actual presence of, protected and notable species;
- To make recommendations for further appraisal and ecological survey where required; and
- To make recommendations for habitat retention and enhancement, so as to ensure opportunities for biodiversity gain are considered in line with the Network Rail Biodiversity Calculator where applicable, along with national and local planning policy and strategies for nature conservation (e.g. the UK Post-2010 Biodiversity Framework, the NERC Act 2006 (Section 41) and the National Planning Policy Framework 2018).

1.1.4 The appraisal, including the Extended Phase 1 Habitat Survey completed on 13th and 14th July 2020, has been undertaken by Rowena Tylden-Pattenson (Assistant Ecologist at NLG, Graduate CIEEM member).

1.2 Relevant Legislation

1.2.1 Legislation that is applicable to the site is listed below, which covers the UK and Wales only. For a more definitive statement of law it is recommend that the full legislative acts are sighted.

- ***The Conservation of Habitats and Species Regulations 2017*** (the 'Habitats Regulations'): These Regulations consolidate and update the Conservation (Natural Habitats, &c.) Regulations 1994 ("the 1994 Regulations"). The Habitats Regulations, which are made under section 2(2) of the European Communities Act 1972, are the principal means by which Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the "Habitats Directive") is transposed for England and Wales and territorial seas.

- ***The Wildlife and Countryside Act 1981 (as amended)*** gives general protection measures for wildlife and special measures for species included on Schedules of the Act. Schedule 1 lists birds that are afforded special protection, Schedules 4-6 protects various wild animal species from injury, killing or disturbance, and Schedule 8 confers protection to certain plant species. The statutory designation of Sites of Special Scientific Interest (SSSI) is the main site protection measure in the UK established under the WCA

- ***The Countryside and Rights of Way Act (CROW Act) 2000*** amended the Wildlife and Countryside Act 1981 to also make it an offence to intentionally or recklessly damage, destroy or obstruct a place that a species, listed on Schedules of the Wildlife and Countryside Act, uses for shelter or protection. The repealed Section 74 of the CROW Act listed habitats and species important to biological diversity in England, in accordance with the 1992 UN Convention on Biodiversity (Habitats and Species Action Plans under The UK Biodiversity Action Plan is the means by which the government complied with it's duty under Section 74).

- ***Section 41 of the Natural Environment and Rural Communities Act (2006)*** replaces Section 74 of the Countryside and Rights of Way Act, 2000 and refers to the list of organisms and habitats of principal importance published under the repealed Section 74 of the CROW Act 2000. The Secretary of State must take such steps to further the conservation of the living organisms and types of habitat included in the list and promote the taking by others of such steps.

- ***Hedgerow Regulations (1997)*** restrict the removal or part removal of hedgerows which are over 20m in length. Removal includes digging, replanting elsewhere or destroying a hedgerow.

- **The National Planning Policy Framework (NPPF) (Department of Housing Communities and Local Government, 2019)**: sets out the UK Government's planning policies for England and provides guidance on how these policies are expected to be applied. The NPPF includes a chapter on biodiversity, Chapter 15 – Conserving and Enhancing the Natural Environment. In addition to being concerned with the protection of statutorily designated sites, the Chapter outlines ways in which the planning system is required to contribute to and enhance the natural and local environment and sets out guidance for local authorities in respect of the consideration of biodiversity and green infrastructure. The NPPF is a material planning consideration.

- **The 'UK Post-2010 Biodiversity Framework**': succeeded the UK Biodiversity Action Plan (UKBAP) in July 2012. The post-2010 framework is underpinned by the biodiversity and environment strategies of the four countries of the UK and sets out their common purpose and shared priorities. The UKBAP list of priority species remains as a reference source and has been used to help draw up statutory lists of priorities.

- **Biodiversity 2020**: is a strategy for England's wildlife and ecosystem services'. Published in 2011, it is the most recent biodiversity strategy for England, and has as its mission to halt overall biodiversity loss, support healthy well-functioning ecosystems, and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.

- ***Bats***. Receive full protection under the Wildlife and Countryside Act 1981 (as amended). They are also protected under the Conservation of Habitats and Species Regulations 2017. The legislation makes it an offence to intentionally kill, injure or take a wild bat uses for shelter or protection whether present or not, and to intentionally disturb any wild bat while it is occupying a structure or place that it uses for shelter or protection.

- ***The Protection of Badgers Act (1992)*** relates to protecting badgers from activities that result in disturbing or interfering with a badger's sett.

- ***Nesting Birds.*** Under the Wildlife and Countryside Act 1982 (as amended) all wild birds, their nests and eggs are protected by law and it is an offence to internationally kill, injure and wild bird, to intentionally take, damage or destroy the nest of any wild bird while it is in use or being built, and to intentionally take or destroy the egg of any wild bird.

- ***Great Crested Newt*** is a European Protected Species (EPS), receiving full protection under the 1981 Wildlife and Countryside Act (as amended), the 2017 Conservation and Species Regulations and the Countryside and Rights of Way Act (CROW) 2000.

- ***Reptiles.*** All UK reptile species are protected under the Wildlife and Countryside Act 1981 (as amended), making it illegal to intentionally kill or injure a common reptile. Rare reptiles (smooth snake and sand lizard) are also protected under the Conservation of Habitats and Species Regulations 2010. This makes it an offence to deliberately injure, kill, capture or disturb a rare reptile, or to damage or obstruct any place used by the species for shelter or protection.

- ***Hedgehogs*** are protected in England under Schedule 6 of the Wildlife and Countryside Act (1981) and are also listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006). This lists English species that were formerly identified as requiring action under the UK Biodiversity Action Plans and which continue to be regarded as conservation priorities under many Local Biodiversity Action Plans (LBAP) and the current UK Post-2010 Biodiversity Framework.

- ***Otter*** are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981 (as amended). This makes it an offence to: intentionally or recklessly disturb an individual while it is occupying a structure or place which it uses for shelter or protection (S9:4b) and to intentionally or recklessly obstruct access to any structure or place used for shelter or protection by an individual (S9:4c). It is also an offence to deliberately capture, injure or kill an otter or to impair their ability to survive or reproduce.

- ***Rabbit (and fox).*** The Wild Mammals Protection Act (1996) makes it an offence to crush or asphyxiate any wild mammal. This may apply during site clearance works, particularly where burrowing mammals such as rabbit and fox are present, as such animals could be crushed or asphyxiated in their burrows by heavy machinery.

- ***Water Vole*** are protected under Schedule 5 of the Wildlife and Countryside Act (1981 as amended), which makes it an offence to: intentionally capture, kill or injure water voles, damage, destroy or block access to their places of shelter or protection (on purpose or by not taking enough care) or to disturb them in a place of shelter or protection (on purpose or by not taking enough care).

2 METHODOLOGY

2.1 Project and Survey Scope

2.1.1 A brief description of the works, as proposed within the document "Multidisciplinary Survey Requirements for AiP" (Iss. 1.0, 06/03/2020), is as follows:

- Construction of a substation for Kirkby station;
- Northern platform and walkway of Kirkby station to be demolished or modified;
- Second track to be built from Kirkby station to proposed Headbolt Lane station;
- Construction of supply bulk point, substation for Headbolt Lane, two platform station, walkway and associated non-rail transport infrastructure at proposed Headbolt Lane site; and
- Repositioning of Knowsley Freight Terminal

2.1.2 The aim of the Preliminary Ecological Appraisal, including the desk study, is to inform the scheme in recording the ecological baseline for the site and/or identifying key features. Where possible, the ecological value of the features present on site is assessed in accordance with guidelines issued by the Chartered Institute of Ecology and Environmental Management (CIEEM 2016), although the values are usually provisional upon data obtained from further survey effort where required.

2.2 Desk Study

2.2.1 A desk study provides background information on the ecological context of a site and complements data collected in the field. The search area extended up to 2km and incorporated the following resources:

- Defra's Multi-Agency Geographic Information for the Countryside (MAGIC) www.magic.gov.uk was searched for European and National Statutory designated sites, including Special Protected Areas (SPAs), Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNRs). The site was also searched for records of nearby granted European Protected Species (EPS) mitigation licences;
- MAGIC also provided a basis for highlighting the location of nearby UK BAP (Biodiversity Action Plan – now covered by the UK Post-2010 Biodiversity Framework) priority habitats;
- The National Biodiversity Network (NBN) Atlas (https://records.nbnatlas.org) was consulted with reference to relevant and notable species records on, or within 1km of, the site; and
- Aerial imagery from Google Maps (www.google.co.uk/maps), and Ordnance Survey mapping from Bing (https://www.bing.com/maps/), was reviewed to help determine terrestrial and hydrological connectivity with the wider landscape. This particularly related to the presence of ponds within 250m of the proposal site. Where potential water bodies are identified, further ground investigation of their presence and suitability for great crested newt (*Triturus cristatus*) is recommended.

2.3 Extended Phase 1 Habitat Survey

2.3.1 The Phase 1 Habitat Survey broadly followed the standard methodology as detailed in the JNCC (2010) *Handbook for Phase 1 Habitat Survey - A technique for environmental audit*, and further developed in Guidance for Baseline Ecological Assessment (Institute of Environmental Assessment, 1995). This involved mapping and describing the broad habitats and compiling a general plant species list to reflect the floristic assemblage of each habitat type. All botanical names follow the nomenclature of Stace (2010).

2.3.2 Target notes (TN) were used to illustrate key features of interest (i.e. over mature trees / dead standing wood) or to draw attention to areas considered too small to map or for the purpose of highlighting the location of an invasive plant species.

2.3.3 The survey was 'extended' in accordance with the Institute of Environmental Assessment, (1995) to assess faunal potential through, and adjacent to, the survey area. The level of scoping does not necessarily constitute full survey effort, although reasonable effort is made to provide informed conclusions for the potential requirement of further survey.

2.4 Biodiversity Calculations – DEFRA 2.0

2.4.1 Biodiversity calculations were undertaken via the "Biodiversity Metric 2.0 Calculation Tool Beta Test - December 2019 Update" tool.

1.1.1 Habitat areas were calculated from the Phase 1 Habitat Plan (Figure 1), using polygon size, per habitat parcel calculated, with MapInfo Pro V17, utilising habitat notes gathered from site survey data and satellite imagery.

2.4.2 Condition assessments were undertaken utilising the Biodiversity metric 2.0 Technical supplement – JP029 (BETA).

2.5 Constraints

2.5.1 Some areas of dense scrub were impenetrable and therefore could not be fully surveyed for evidence of badgers.

2.5.2 Whilst desk study records can help to inform and complement survey effort, they should not be treated as a comprehensive list of species present within the search area. Many species are under-recorded and a lack of records can reflect a lack of survey effort in certain areas rather than confirming absence of a species.

3 FINDINGS

3.1 Desk Study

Designations and Notable Habitats

3.1.1 Headbolt Lane is located north of Kirkby, Knowsley, Merseyside. The surrounding habitats are suburban, with rural agricultural lands in close proximity. Simonswood Dell runs underneath the railway track to the west of the proposed station location.

3.1.2 Habitats recorded by MAGIC as within 2km of the site include deciduous woodland, which is considered to be of 'priority' conservation status in accordance with the UK Post-2010 Biodiversity Framework.

3.1.3 Connectivity from the proposed development is moderate, with linear features present in the form of a small brook connecting to Simonswood Dell, the railway track and open grassland connecting to the wider rural landscape.

Protected, Notable and Invasive Species Records

3.1.4 No EPS mitigation licence records were returned within 1km. Three EPS mitigation licence records for common pipistrelle (*Pipistrellus pipistrellus*) were returned within 2km of the site: EPSM2013-5715 1.56km away; 2017-30556-EPS-MIT 1.58km away and 2015-7259-EPS-MIT 1.67km away.

3.1.5 The NBN Atlas was used to search for records of protected or notable species within 2km from the past 10 years. These records are summarised as follows:

- Mammals: Four hedgehog (*Erinaceus europaeus*), four brown hare (*Lepus europaeus*), four water vole (*Arvicola amphibious*), four common pipistrelle (*Pipistrellus pipistrellus*) nine red squirrel (*Sciurus vulgaris*) and two red fox (*Vulpes vulpes*).

- Birds (Schedule 1 birds within the Wildlife and Countryside Act 1981, as amended): seven fieldfare (*Turdus pilaris*), one peregrine (*Falco peregrinus*) and 15 redwing (*Turdus iliacus*). 116 bird species were recorded within 2km of the site.

- Plants: Two bluebell (*Hyacinthoides non-scripta*).

- Key invasive plant species: ten records of Himalayan balsam (*Impatiens glandulifera*), and three records of Japanese knotweed (*Fallopia japonica*).

3.1.6 During the search, no reptile or amphibian records were returned.

3.2 Extended Phase 1 Habitat Survey

3.2.1 The habitat survey findings are illustrated on Figure 1 (Appendix 1) and are described further below, with target notes (TN) tabulated in Appendix 2 and cross referenced within the text below. Photographic plates are presented in Appendix 3. The survey area is approximately 42,923m^2 in size and was accessed from Headbolt Lane, Kirkby Station, and Millbrook Bridge access gate. The boundary of the planning application site at Headbolt Lane is approximately 57,029m^2, and the length of track and adjacent cess to also be affected is approximately 34,558m^2.

Habitats

Grassland communities

Tall ruderal

3.2.2 Tall ruderal grassland (TN3, photograph 3) with ragwort (*Jacobaea vulgaris*), red campion (*Silene dioica*), immature silver birch (*Betula pendula*), immature oak (*Quercus sp*), nettle (*Urtica dioica*), Himalayan balsam (*Impatiens glandulifera)*, rosebay willowherb (*Chamaenerion angustifolium*), cow parsley (*Anthriscus sylvestris*), hogweed (*Heracleum spondylium*) and rapeseed (*Brassica napus*).

Semi-improved neutral grassland

3.2.3 Semi-improved neutral grassland (TN4, photographs 5 and 6), with lesser stitchwort (*Stellaria graminea*), great willowherb (*Epilobium hirsutum*), ragwort, sorrel (*Rumex acetosa*), thistle (*Cirsium arvense*), nettle, yarrow (*Achillea millefolium*), sweet vernal grass (*Anthoxanthum odoratum*), cocksfoot (*Dactylis glomerata*), ribwort plantain (*Plantago lanceolata*), dandelion (*Taraxacum* sp.), hogweed (*Heracleum spondylium*), creeping buttercup (*Ranunculus repens*), cleavers (*Galium aparine*), bindweed (*Convolvulus arvensis*), dock (*Rumex* sp.), rosebay willowherb, white dead-nettle (*Lamium album*), hawkbit (*Leontodon* sp.), borage (*Borago officinalis*) and garlic mustard (*Alliaria petiolata*), with two ash (*Fraxinus excelsior*) trees.

3.2.4 Small cluster of immature trees (TN5, photograph 6) within semi-improved neutral grassland, including sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*) and elm (*Ulmus procera*), with an understorey of Yorkshire fog (*Holcus lanatus*), meadow cranesbill (*Geranium pratense*), nettle, ragwort, ribwort plantain, mallow (*Malva sylvestris*), herb Robert (*Geranium robertianum*) and hawkbit.

3.2.5 Unmown areas of semi-improved neutral grassland (TN7, photograph 6), with hawkbit, sweet vernal grass, sorrel, white clover, Yorkshire fog, thistle, dock, ribwort plantain, creeping buttercup, ragwort, weld (*Reseda luteola*), yarrow, bird's foot trefoil (*Lotus corniculatus*) and selfheal (*Prunella vulgaris*).

3.2.6 Semi-improved neutral grassland sloping down to embankment (TN11, photograph 9). Species include garlic mustard, thistle, feverfew (*Tanacetum parthenium*), rosebay willowherb, dock, sweet vernal grass, chickweed (*Stellaria media*), horsetail (*Equisetum* sp.), poppy (*Papaver somniferum*), great willowherb, bramble (*Rubus fruticosus*), ribwort plantain, hawkbit, common vetch (*Vicia sativa*), bindweed, red fescue (*Festuca rubra*), pineappleweed (*Matricaria discoidea*) and creeping buttercup.

Mown grassland

3.2.7 Mown amenity grassland (TN1, photograph 1) with Lombardy poplars (*Populus nigra 'Italica'*), one with a broken knot hole (photograph 2) with low bat roosting potential.

3.2.8 Mown amenity grassland (TN6, photograph 6) with white clover (*Trifolium repens*), ragwort, ribwort plantain, dandelion, Yorkshire fog, creeping buttercup, black medick (*Medicago lupulina*) and shining cranesbill (*Geranium lucidum*).

3.2.9 Mown amenity grassland (TN12, photograph 9), with infrequent thistle, ribwort plantain, Yorkshire fog, garlic mustard, feverfew, horsetail, white clover, greater plantain (*Plantago major*) and areas of bare ground.

Dense scrub

3.2.10 Dense scrub dominated by bramble (TN9), with Himalayan balsam, nettle and sweet vernal grasses at edges. A flytipped shed underneath an English elm may provide cover for reptiles or amphibians.

3.2.11 Very dense scrub along the railway boundary (TN10, photograph 8). Species include hawthorn (*Crataegus monogyna*), cherry (*Prunus* sp.), elder (*Sambucus nigra*), ash, field rose (*Rosa arvensis*) and oak, with an understory of bird's foot trefoil, bindweed, bramble, nettle, creeping buttercup, cocksfoot, rosebay willowherb, raspberry (*Rubus idaeus*), hogweed, ragwort, and dock.

3.2.12 Railway embankment scrub vegetation east of Kirkby station (TN15, photographs 11 and 12), with species including oak, goat willow (*Salix caprea*), sycamore, silver birch, elder, common lime (*Tilia x europaea*), Lombardy poplar, field maple (*Acer campestre*), cherry, privet (*Ligustrum vulgare*), field rose, hawthorn, gooseberry (*Ribes uva-crispa*), cotoneaster (*Cotoneaster horizontalis*) and Leyland cypress (*Cupressus × leylandii*). Behind the northern platform, trees include laburnum (*Laburnum anagyroides*), sycamore, elder and laurel (*Laurus nobilis*). Ground flora includes horsetail, bramble, ragwort, cocksfoot, red fescue, rosebay willowherb, bindweed, nettle, cleavers, old man's beard (*Clematis vitalba*), bracken (*Pteridium aquilinum*), thistle, hawkbit, ivy (*Hedera helix*), yellow flag iris (*Iris pseudacorus*), goldenrod (*Solidago virgaurea*), raspberry, yarrow, variegated yellow archangel (*lamiastrum galeobdolon* subsp.*argentatum*), foxglove (*Digitalis purpurea*), common vetch, buddleija (*Buddleja davidii*), groundsel (*Senecio vulgaris*) and herb Robert.

3.2.13 Railway embankment scrub vegetation opposite the Merseyrail Kirkby station platform (TN14), includes bramble, hawthorn, cleavers, rosebay willowherb, buddeja, elder, ragwort, bracken, nettle, raspberry, dogwood (*Cornus sanguinea*) and ash. The platform is a mixture of planted and seeded species, including hart's tongue fern (*Asplenium scolopendrium*), ribwort plantain, nettle, ivy, sycamore, hawthorn, dogwood, laurel, field rose, horsetail, St John's wort (*Hypericum perforatum*), dandelion and cotoneaster.

3.2.14 Along the railway embankment from Millbrook Bridge (TN16), species include ash, sycamore, hawthorn, oak, osier (*Salix viminalis*), ivy, cherry species, elder, field rose, Himalayan balsam, ragwort, rosebay willowherb, bracken, bramble, horsetail, nettle, greater willowherb and common toadflax (*Linaria vulgaris*), the last found above County Road Bridge WKL2 55.

3.2.15 Railway embankment species adjacent to Headbolt Lane (TN17) include goat willow, bracken, tormentil (*Potentilla erecta*), yarrow, hawkbit, bindweed, sage (*Salvia officinalis*), common vetch, cherry species, apple species (*Malus* sp.), and wood forget-me-not (*Myosotis sylvatica*). A large mammal run was observed partway down the track on the southern embankment (photograph 13).

Bare ground

3.2.16 An area of bare ground (TN13, photograph 10), with buddleja, bramble, dock, rosebay willowherb, hop (*Humulus lupulus*) and Japanese knotweed (*Fallopia japonica*) present at security fence alongside track. Trees include field rose, sycamore, silver birch, hawthorn and cherry.

Running water

3.2.17 Very slow flowing stream (TN2, photograph 3) emerging from two culverts under the rail track, with a depth of 50cm and a width of 1.5m. Some glossy film was observed on the water's surface, and large pieces of litter were observed on the bed. Bankside vegetation included rosebay willowherb, Himalayan balsam, thistle, nettle, horsetail, cleavers, bindweed, Yorkshire fog, bramble, cow parsley and common reed (*Phragmites australis*), with immature oak.

3.2.18 A generally slow-flowing stream (TN8, photograph 7), at a width of 1m or more, and a depth of 30cm. Some shallower sections have a faster current. The bed is silty, and banks varying between a height of 20cm to 1m, and heavily vegetated. Some undercutting of river banks from current present at points, but no mammal or crayfish holes visible. Bankside vegetation includes Himalayan balsam, rosebay willowherb, ragwort, thistle, nettle, common reed, yarrow, sorrel, cocksfoot and creeping buttercup, with areas of bare ground.

Invasive plant communities

3.2.19 Himalayan balsam was identified along the banks of the stream running through Headbolt Lane (TN2, TN8). Japanese knotweed was identified near Kirkby station (TN13, photograph 10), in an area of bare ground proposed to be developed for a new substation.

Faunal Species

3.2.20 The survey has identified potential or confirmed presence for the following protected species.

Breeding Birds

3.2.21 Opportunities for nesting birds are prevalent throughout the vegetation within the survey area, including railway embankments and bridges, where trees, scrub and tall ruderal vegetation are present. The dense bramble scrub within the proposed development is of notable value for nesting long tailed tit (*Aegithalos caudatus*), blackbird (*Turdus merula*) and dunnock (*Prunella modularis*).

3.2.22 Old bird nests (photograph 17) from prior to the 2020 nesting season were observed underneath the steel crossbeams of a metal footbridge adjacent to Glovers Brow Bridge (SJ 40249 99256).

Badger, rabbit or fox

3.2.23 A cluster of shallow mammal holes were identified along the railway embankment at SJ 41369 99759 (photograph 14). Two mammal pathways, likely used by foxes or domestic cat, was identified the opposite side of the railway track at SJ 41275 99709 (photograph 13) and at SJ 40753 99478 through thick scrub vegetation. As the vegetation along the railway embankment and in some area of the proposed development at Headbolt Lane is dense, it is possible that other evidence of badger, rabbit or fox including mammal holes may have been missed. Therefore as a precaution, recommendations for badger, rabbit and fox are included within the Conclusion and Recommendations section, below.

Amphibians

3.2.24 No ponds have been recorded within 250m of the proposed development. Suitable terrestrial habitat for great created newt was recorded throughout the survey area; in particular, along the railway embankments and within areas of dense tall ruderal vegetation and scrub within the Headbolt Lane survey area. A flytipped shed (TN9) may provide cover for amphibians near the railway embankment.

Reptiles

3.2.25 The scrub habitats near the brook hold potential for reptiles (TN3, photograph 4). The slope from the road has a south-westerly facing aspect, with optimal foraging potential due to the density and structure of the scrub. Basking opportunity is present in the more open adjacent habitats of shorter vegetation.

3.2.26 A flytipped shed (TN9) may provide cover for reptiles near the railway embankment.

Bats

Proposed Headbolt Lane station site and railway embankments

3.2.27 The area within the proposed Headbolt Lane station site offers suitable and ecologically well-connected habitat for foraging and commuting bat species.

3.2.28 A Preliminary Ground Level Roost Assessment was carried out for the trees within the survey area, in accordance with best practice guidance (Collins, 2016). This included any trees along the railway embankments where track works are proposed.

3.2.29 A mature Lombardy poplar is present adjacent to Headbolt Lane at SJ 41536 99849. The tree has a knot hole approximately 2.5m high, facing east (photograph 2). The extent of the knot hole could not be fully observed during the preliminary ground-level roost appraisal. Due to the potential of the features to support roosting bats and the suitable surrounding habitat, the tree has been assessed to hold a **moderate** bat roosting potential.

3.2.30 All other trees within the Headbolt Lane station site were assessed as offering **negligible** potential for roosting bats based on their age and/or a lack of suitable roosting features.

3.2.31 Along the railway embankments, multiple trees have ivy growth along the length of the trunks. The ivy conceals a number of trunks from being directly observed and due to the maturity of some trees along the embankments it is considered likely to conceal potential bat roosting features. Due to the maturity of some trees along the railway embankments and highly suitable foraging habitat for foraging bat species, all mature trees have collectively been assessed to hold a **low** bat roosting potential.

County Road Bridge A502 UB WKL2 55

3.2.32 County Road Bridge is a reinforced steel and stone structure (photograph 18), with no signs of weathering or colonisation by plant species. There are no gaps or cracks present that could provide potential spaces for roosting bats. No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.

3.2.33 Therefore County Road Bridge was assessed as having **negligible** potential for roosting bats due to a lack of evidence of bat use and the absence of any suitable roosting features.

Millbrook Bridge UB WKL2 56

3.2.34 Millbrook Bridge is a stone structure with some vegetation growth present on the elevations and underside.

3.2.35 Gaps are present above the arch ring (photograph 19), on the north-west elevation, under the river arch on the western side (photograph 21) and under the arch of the bridge deck (photograph 20); the depth of these gaps are unknown, and therefore may provide suitable roosting opportunities for bats. It is possible that the presence of ivy growing across the wing walls and above the arch rings may have obscured potential bat roosting features; however, the presence of this vegetation is likely to lessen the likelihood of bats roosting in this particular locations due to the decrease in available space and the overly cluttered nature of the vegetation which is thought to obstruct a direct flight path. No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.

3.2.36 Millbrook Bridge was assessed as having **low** potential for roosting bats due to a lack of evidence of bat use, and the presence of only minor superficial roosting features.

Glovers Brow Bridge OB WKL2 57

3.2.37 Glovers Brow Bridge is a solid concrete and sandstone construction, with a section of metal plating underneath the arch. Gaps are present between the concrete arch and metal plating (photograph 16) that may provide suitable roosting opportunities for bats, although cobwebs present suggest that these spaces have not been used recently. Some small pockmarks and cracks were present in the eastern sandstone elevation (photograph 15). No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.

3.2.38 Glovers Brow Bridge was assessed as having **low** potential for roosting bats due to a lack of evidence of bat use, and the presence of only minor superficial roosting features.

Riparian mammals

3.2.39 The brook running through the proposed site for Headbolt Lane Station appears sub-optimal for otter as the watercourse appears too shallow and narrow.

3.2.40 No evidence of water vole was recorded during the survey; however the banks of the brook were densely vegetated, preventing the completion of a thorough inspection. Therefore, it is possible burrows may have been missed.

Other

3.2.41 The scrub habitats on site offer refuge opportunities to small mammals, such as hedgehogs.

3.3 Biodiversity Value of Habitats within Development Site

3.3.1 Land within the proposed development site supports semi natural habitats comprising a mosaic of semi-improved neutral grassland, tall ruderal, dense scrub, running water, mown grassland and bare ground amounting to approximately 101,800m² in area. The habitats within the footprint of the development range from poor to moderate condition and of low to high habitat distinctiveness with low ecological connectivity to the wider area and of medium strategic significance in Knowsley.

3.3.2 Approximately 39,400m² of habitat within the development footprint will be retained post-construction works. Approximately 62,400m² of habitat within the development footprint will be lost on a permanent basis. To compensate for the temporary and permanent habitat loss opportunities for habitat creation are to be undertaken on completion of the works.

3.3.3 When assessed through the DEFRA Biodiversity Metric habitat loss to the development equates to a total loss of 38.86 biodiversity Units.

3.3.4 Table 1 below details the habitat types and areas that will be impacted by the proposed development.

Table 1: Habitats within proposed development

Habitat type	**Description, species and TN Habitat Condition & Distinctiveness**	**Estimated Area of habitat / distance of linear feature**	
		Hectares (ha) / Metres (m)	**% of development area**
Tall ruderal	Tall ruderal with ragwort, rosebay willowherb, Himalayan balsam and immature trees. The habitat is considered to be in poor condition and of high distinctiveness.	0.24ha 2400m^2	2.79
Dense scrub	Areas of dense or very dense scrub characterized by bramble, with Himalayan balsam, nettle, thistle, woody species and un-grazed tall herb edges. The habitat is considered to be in poor condition and of medium distinctiveness.	3.41ha 34100m^2	39.64
Urban amenity grassland	Areas of mown grassland, with stress-tolerant species. The habitat is considered to be in moderate condition and of low distinctiveness.	2.21ha 22100m^2	25.69
Lowland mixed deciduous woodland	A small area of deciduous trees, all of similar ages, with a developed ground flora. The habitat is considered to be in moderate condition and of high distinctiveness.	0.02ha 200m^2	0.23
Semi-improved neutral grassland	Mixed grassland species, including wildflowers but excluding sedges, with some immature trees and undesirable species such as ragwort, hogweed and bramble. The habitat is considered to be in moderate condition and of medium distinctiveness.	2.72ha 27200m^2	31.62
Planted shrub	Not included in biodiversity metric due to small size.	0.0004ha 4m^2	0.00
Bare ground	Not included in biodiversity metric due to small size.	0.0014ha 14m^2	0.02

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Habitats

4.1.1 The habitats recorded on site within the footprint of the development proposal are relatively common and widespread and support commonly occurring botanical species. However within the context of the urban environment they are of relatively high ecological value in the local context. When assessed under the criteria of the DEFRA Biodiversity Metric 2.0 the mosaic of semi-improved neutral grassland, tall ruderal, scrub, mown grassland, bare ground and running water habitats that will be lost to the development range from poor to moderate condition and from low to high habitat distinctiveness. These habitats will provide valuable places of refuge, shelter and foraging opportunities for common amphibian and reptile species, small mammals and birds. Any trees should be retained and incorporated into the landscaping design if possible; any necessary de-vegetation should be undertaken in accordance with the advice given for nesting birds, common amphibian species and small mammals. It is generally recommended that the amount of de-vegetation is restricted to the minimum required to facilitate the proposals and that any bounding vegetation or habitats remain protected and unaffected by the works.

4.2 Invasive Species

4.2.1 The survey has confirmed the presence of a small and localised stand of Japanese knotweed on site. To prevent further spread the works will be carried out in accordance with a site specific Japanese knotweed management plan to include strict biosecurity measures to prevent the spread of this highly invasive plant along the railway embankments and other locations.

4.2.2 Site operatives should be made aware of the presence of Himalayan Balsam within the proposed working area; an identification guide has been included in Appendix 4. Control measures will be required prior to the works to prevent the spread of this species. Control of this species entails manual hand pulling or strimming (below the first node) of any Himalayan balsam plants within any work areas. This management should be undertaken outside the seeding period (July to October, inclusive), accompanied by the burying or composting (in a designated, contained area) of plant fragments; arisings must not be removed from site. Biosecurity measures would be integral to the plan, including cleaning of plant, tools and footwear used within any contaminated areas.

4.3 Water Pollution Control Measures

4.3.1 All works will be conducted in line with Network Rail Environment Contract Requirements (NR/SP/ENV/015) and all industry standard best practice. This will avoid the risk of polluting the watercourse through chemical contamination or substrate run off.

- Any chemicals (if required) will be stored in designated places and bunded to prevent leakages.
- Spill kits will be on site to deal with any leakage of fuel, wet concrete or chemicals.
- Vehicles will be inspected regularly to identify leaks, fuelling will be carried out off site.
- On completion of the works, the working area will be reinstated on a like-for-like basis.

4.4 Protected Species

4.4.1 The survey has confirmed the potential or actual presence of nesting birds, bats, small mammals, reptiles, riparian mammals and amphibian species on site. The following is therefore recommended in respect of these species:

Nesting Birds

4.4.2 Nesting opportunities for a range of common bird species exist across the site, including within the proposed development area in grassland, tall ruderal, scrub, under bridges and within trees.

4.4.3 It is recommended that all devegetation works are undertaken outside the main nesting bird season (March to August inclusive), and maintained occasionally to deter any uptake prior to the commencement of works. If this timing is not possible and dense scrub or mature trees need to be removed during the main nesting bird season, checks of the affected areas will need to be undertaken by an ecologist no more than 48 hours prior to removal/ management. If any active nests are identified, a buffer of at least 5m in all directions would be required, to protect the nest from disturbance until any chicks have fledged.

Bats

4.4.4 Trees on site were assessed to hold bat roosting potential. If trees holding a **moderate** bat roosting potential are to be impacted, roost locations should be assessed via aerial inspection and/or with an endoscope by a suitably qualified ecologist to confirm the assessment of bat roosting potential and to check for bat occupation. If bat roosting potential is confirmed to be moderate or higher, further survey effort if the form of bat emergence surveys (at least one dusk and one dawn emergence survey) would be required to determine if the roosting features are being utilised by bats, in-line with best practice guidelines (Collins, 2016) . Should bats be confirmed to be present at this stage, a Natural England mitigation licence would be required for any trees with confirmed bat roosts, to be removed to facilitate the works.

4.4.5 Trees holding a **low** bat roosting potential can be de-vegetated adhering to the ecological precautionary working method statement in regards roosting bats, located below;

Preliminary Working Methods Statement for Trees with Low Bat Roosting Potential

- The soft felling will be carried out under the supervision of a bat licensed ecologist;
- Ideally carry out work on trees in autumn and spring (i.e. September to October and March to April), as this is when bats are least likely to be present;
- When preparing to cut a tree, look for evidence of bat occupancy – behind ivy stems; obvious holes, cavities and splits; dark staining on a tree below a hole; staining around a hole; maze of tiny scratch marks around the hole; noise coming from a hole; droppings within a hole;
- Bats may be behind partially detached ivy with stems in excess of 50mm, such features much be searched for evidence of bat occupancy before removal;
- Bats may be anywhere inside a hole, try to cut as far above a hole as possible. If in doubt if it is a roost, do not cut and seek ecological advice from the on-site ecologist;

- Bats may be inside cracks held open by the weight of a branch, which will close when the branch is taken off. Search such splits for bats before removing large limbs;

- Where possible, ring bark and leave up to 15m standing dead wood (trunk), with due regard to Health and Safety issues;

- If bats are found: if the roost(s) is still intact and bats are not injured, works will temporarily cease until the ecologist has assessed the situation and establish the most appropriate way forward. If necessary, Natural England will be consulted and a mitigation licence will be applied for. If the bat(s) is injured, the bat will be taken into care by a local bat group/bat carer – works should only recommence once the ecologist has said that it is safe and legal to do so;

- If the timber is felled, the roost is not exposed and the bats are not injured, the ecologist will temporarily seal and isolate the roost and contact Natural England if necessary before re-locating the roost to a nearby suitable location and allowing the bats to disperse of their own accord when ready to do so;

- If the roost has been exposed, and a bat(s) has been injured, the bat(s) will be placed into a secure box or bag by the ecologist, who will then contact the local bat group/carer for advice and assistance. Bats must not be handled without gloves or by non-licensed personnel; and

- In all cases where bats are found to occupy a tree, the ecologist will keep a log of all decisions made and any mitigation undertaken on site.

Badgers, foxes and rabbits

4.4.6 Whilst no evidence of badger, rabbit or fox was recorded during the survey, small areas were not accessible during the survey due to the presence of dense scrub vegetation; it is therefore possible that mammal holes and/or evidence are present within.

4.4.7 As a precaution, if any holes suspected to be badger sett entrances are unexpectedly discovered during any future works, work in that area must cease and an ecologist must be contacted for advice on how to proceed, a site visit may be required to assess the hole(s). Badger sett entrances are typically in the shape of a capital 'D' with the flat side down, measuring on average 25-35cm in width and maintaining a wide tunnel within. Fresh spoil is often present outside regularly used entrances.

4.4.8 With regards to rabbit and fox, these species are protected under the Wild Mammals Protection Act (1996) from asphyxiation and crushing. It is recommended that if any mammal holes are identified then these holes should be avoided – this includes trampling, obstruction, machinery and temporary storage of materials. If avoidance is not possible, an ecologist should be contacted so that the species to which the hole belongs to can be identified. This information will then be used to provide further advice (a site visit may be required to assess the hole(s)).

Reptiles

4.4.9 The site is considered suitable for commonly occurring reptile species. It is recommended that during de-vegetation works, should a suspected reptile be observed on site that works cease and that a 10m exclusion zone be demarcated around the reptile and that the reptile be left to disperse on its own accord. A competent ecologist should also be notified immediately. The ecologist will then attend site, assess the situation and establish any required mitigation measures.

Riparian mammals

4.4.10 The small watercourse on the site has been considered to offer negligible potential for riparian mammals. However, there may be more suitable habitat within the wider surrounding area. Therefore, as a precaution, if an otter or water vole is sighted at any point, works should cease in that area until the animal(s) has dispersed of its own accord. In addition, as a precaution throughout the proposed works, the watercourse should remain open to wildlife passage; i.e. in-channel scaffolding or machinery, if required, should not fully block access for wildlife to pass through. No overnight lighting should be used.

Common Amphibian Species

4.4.11 It is highly likely that common frog and common toad will be present on site and utilising the semi natural habitats for shelter and foraging. To avoid any impacts upon common amphibian species devegetation works should be completed ideally to avoid nesting bird season but also to avoid amphibian hibernation season (November to February).

Other

4.4.12 The scrub habitats present on site offer refuge opportunities to small mammals such as hedgehog.

4.4.13 Any dense scrub on site, if removal is required, should be carefully cut back in stages by hand in accordance with previous recommendations, taking care to look for hedgehogs in particular. If any hedgehogs are found, these should be safely relocated to a nearby, suitably dense/ well-vegetated area or brash pile that will remain undisturbed by the works.

4.4.14 If there is any doubt over translocating the hedgehog to a different part of the site, or if the hedgehog appears to be harmed or underweight, an ecologist will take the hedgehog into care and will contact a local wildlife hospital for advice.

4.4.15 As part of the site's landscaping, enhancement opportunities for wildlife could be considered, including: the installation of bird boxes on nearby mature trees; the planting of pollen rich species of benefit to insects; the planting of a small number of fruit trees; and the addition of shrubs to provide a variable vegetative structure.

4.4.16 Provision of artificial or natural hedgehog boxes could also be considered for quiet undisturbed areas on site with ground covering vegetation, preferably against a wall or fence. For example, three or four logs may be arranged to leave an appropriately sized hole for a hedgehog to nest in, and covered with masses of twigs and leaves. Retaining wood piles attracts invertebrates and fungi, providing a good local food source for hedgehogs and other species, and possible nesting sites (materials from site works could be used for this purpose).

4.5 Suggested Ecological Enhancement

4.5.1 In line with Defra's 'Biodiversity Metric v2.0 Toolkit' and Network Rail's commitment to the 'Mitigation Hierarchy', which comprises sequential steps to avoid, minimise, rehabilitate/restore and offset any negative impacts on biodiversity, calculations of the project's baseline biodiversity units before the works have been made – see relevant pages in the separate document, titled 'Biodiversity Metric 2.0 Calculation Tool Headbolt Lane July 2020'. Calculations were made using the 'Beta Test - December 2019 Update' version of the Biodiversity Metric 2.0 Calculation Tool.

4.5.2 The site baseline habitat size is 10.18ha, including buffer zones around the proposed site boundaries.

4.5.3 The post-works habitat units have been calculated as 53.99, with **losses** of 38.86 biodiversity units (approximate overall **losses** of 71.98%) due to the works. To achieve a biodiversity net-**gain** of 10%, **off-site mitigation is considered necessary**, with the creation of 44.25 biodiversity units.

4.5.4 Should any changes to the proposed works be required, the habitat calculations should be updated to reflect the updated habitat losses on site, once specific habitat and biodiversity losses can fully ascertained.

4.5.5 It should be noted that calculations that support this report have been carried out with the December 2019 BETA biodiversity calculator, the most recent release at the time of this report. All further updated calculation should take place with this version to ensure comparability to the calculations above. Future versions of the calculator may yield differing results.

4.5.6 The railway embankments offer value to wildlife, as they act as a habitat corridor for wildlife foraging and commuting in the wider landscape. Therefore, it is suggested that de-vegetation within the proposed working area is kept to a minimum and that any vegetation removed is reinstated, and enhanced, where possible.

4.5.7 Dependent upon an on-site habitat management plant that would ensure the quality and diversity of habitats generated post-works, off-site mitigation is anticipated required for the site to achieve a net-gain in biodiversity.

4.5.8 It is recommended that any wood or brash arising from the proposed de-vegetation should be used to create habitat piles in nearby suitable undisturbed locations along the railway embankments/rail corridor or within the compound area where appropriate. This may provide suitable habitat for sheltering and hibernating hedgehogs and provide refuge to other small mammals. The habitat piles should be created by lining up logs or brash horizontally (each layer in alternating directions) in layered, compact piles. Soil and any stones can also be added. Large diameter pieces of wood are the most valuable. The location of the habitat piles should be where feasible but also in areas which are unlikely to be disturbed and remain ecologically well-connected to other habitats.

4.5.9 To best achieve a net gain in biodiversity, the following interventions should be implemented on site:

- Any vegetation cleared will be allowed to naturally re-colonise; opening up small areas of vegetation will increase opportunities for successional plants to take hold; and
- Any areas of scrub and tall ruderal cleared will be allowed to naturally re-colonise. Removal of small areas will diversify the structure of the scrub with open areas, providing disturbance features and an opportunity for other successional plants to grow.
- A landscape plan should be developed to include habitat creation post development of the area subject to temporary construction impacts

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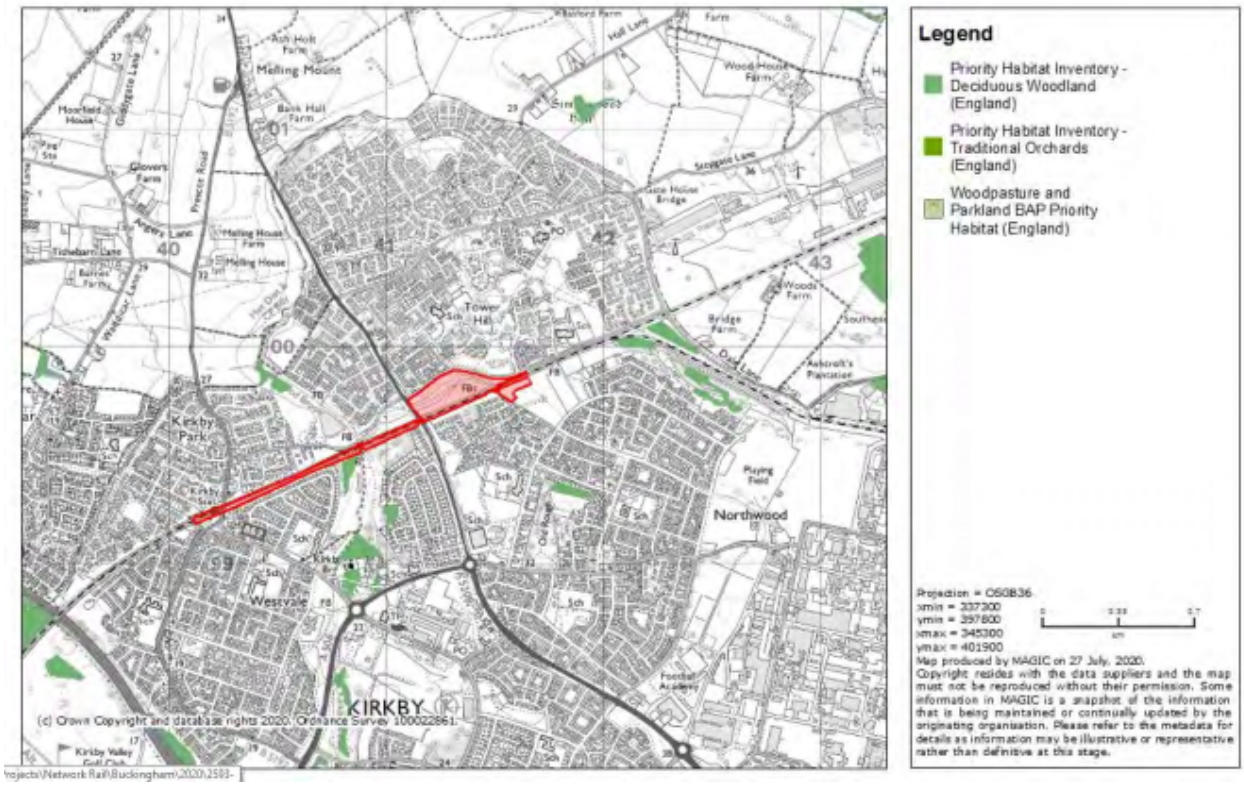
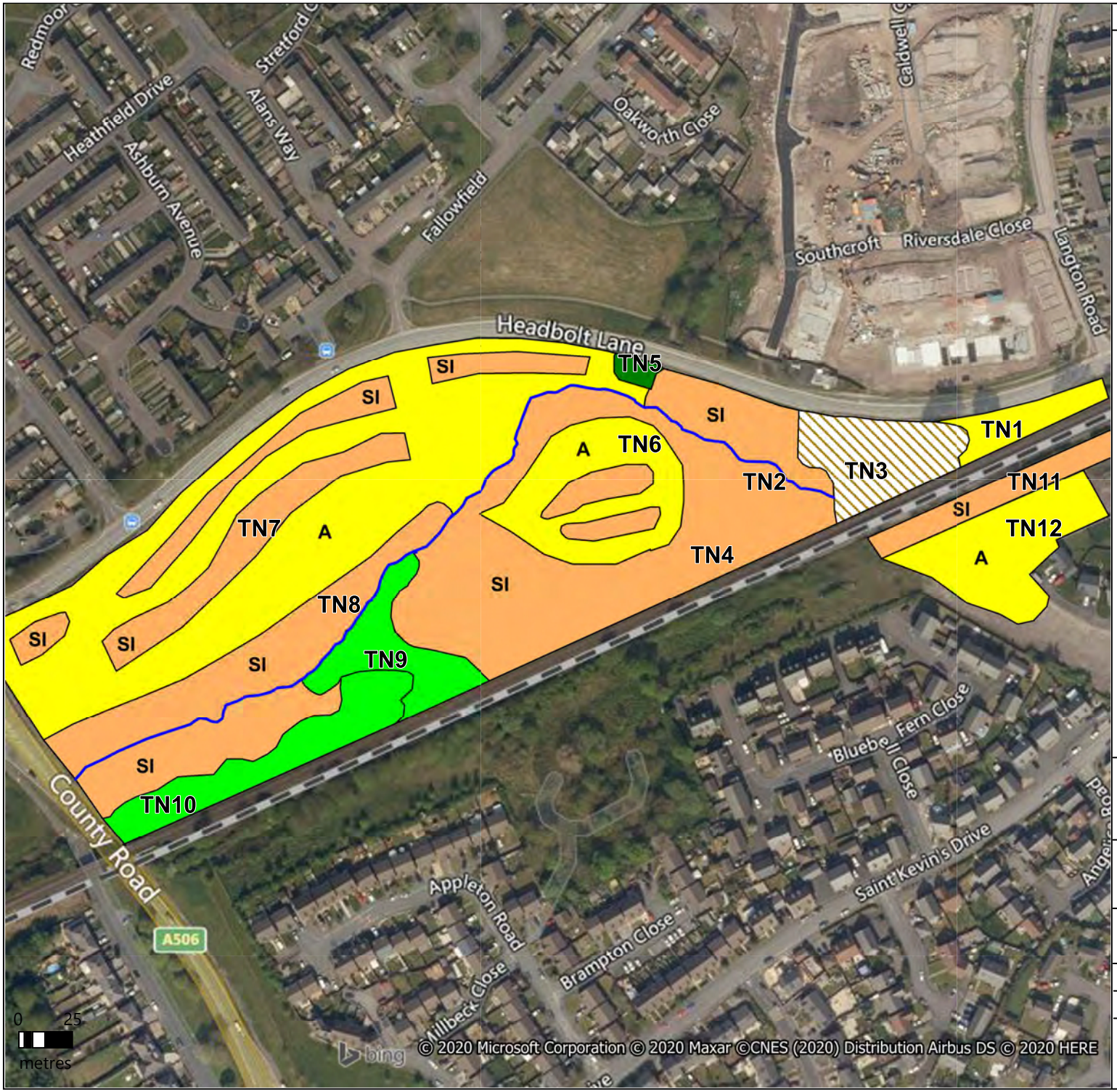
APPENDIX 1: FIGURES

Figure 1: Location of proposed Headbolt Lane station and engineering works, showing extent of survey area (red highlight) and local BAP deciduous woodland habitats (green polygons). Map screenshot from MAGIC maps (accessed on 27/07/2020).





Key

- Cluster of trees
- Dense scrub
- Semi improved neutral grassland
- Tall ruderal
- Stream
- Amenity grassland

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Headbolt Lane
Phase 1 Habitat Plan

Figure 1

Rev	Date	Drawn	Checked	Approved
00	22/07/2020	LK	RT	NLG

N

Scale at A4
1:2500

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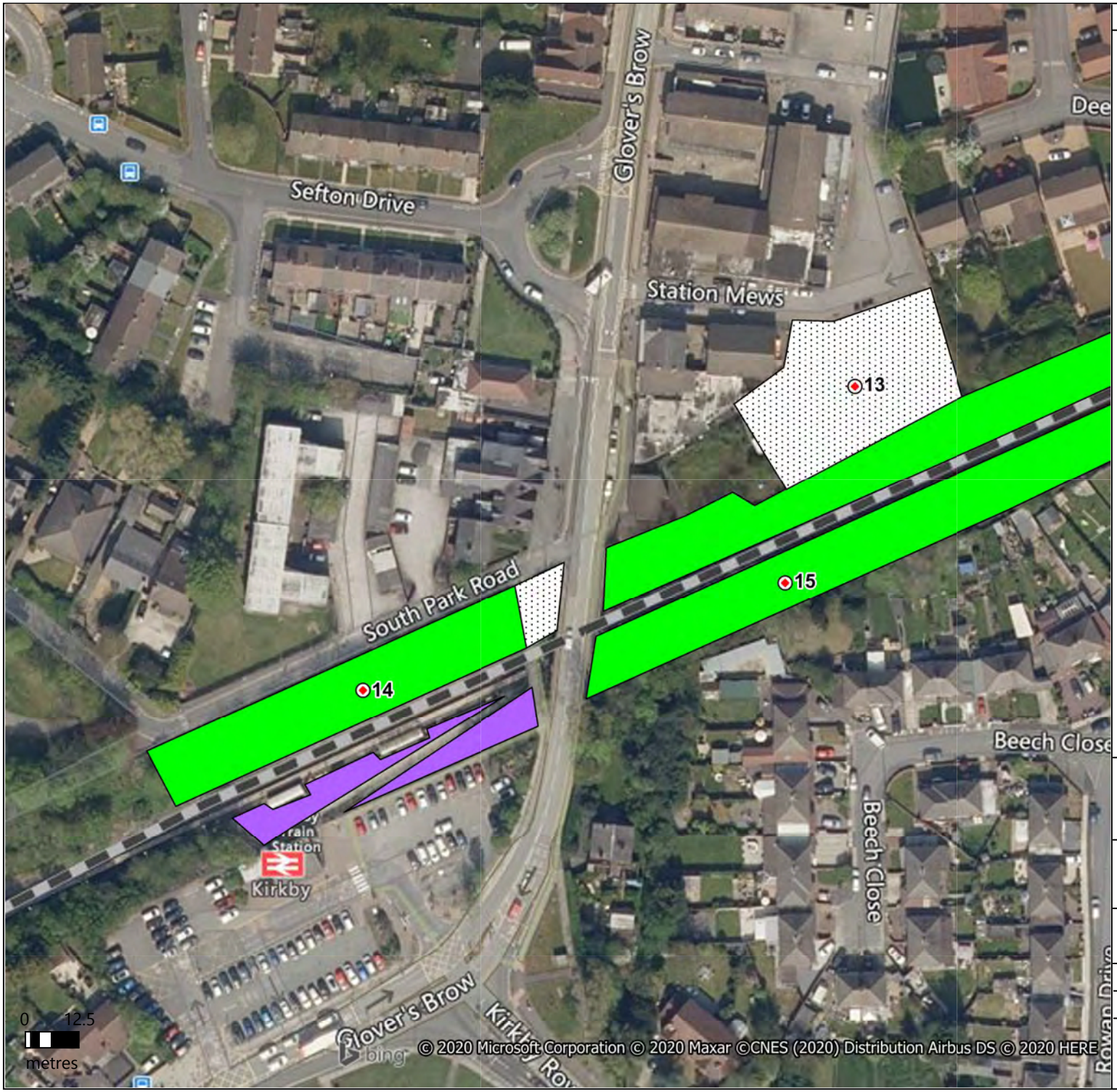

Key

- Dense scrub
- Planted shrub
- Bare ground
- Target note

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Headbolt Lane
Phase 1 Habitat Plan

Figure 1.1

Rev	Date	Drawn	Checked	Approved
00	26/07/2020	LK	RT	NLG

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Scale at A4
1:1250

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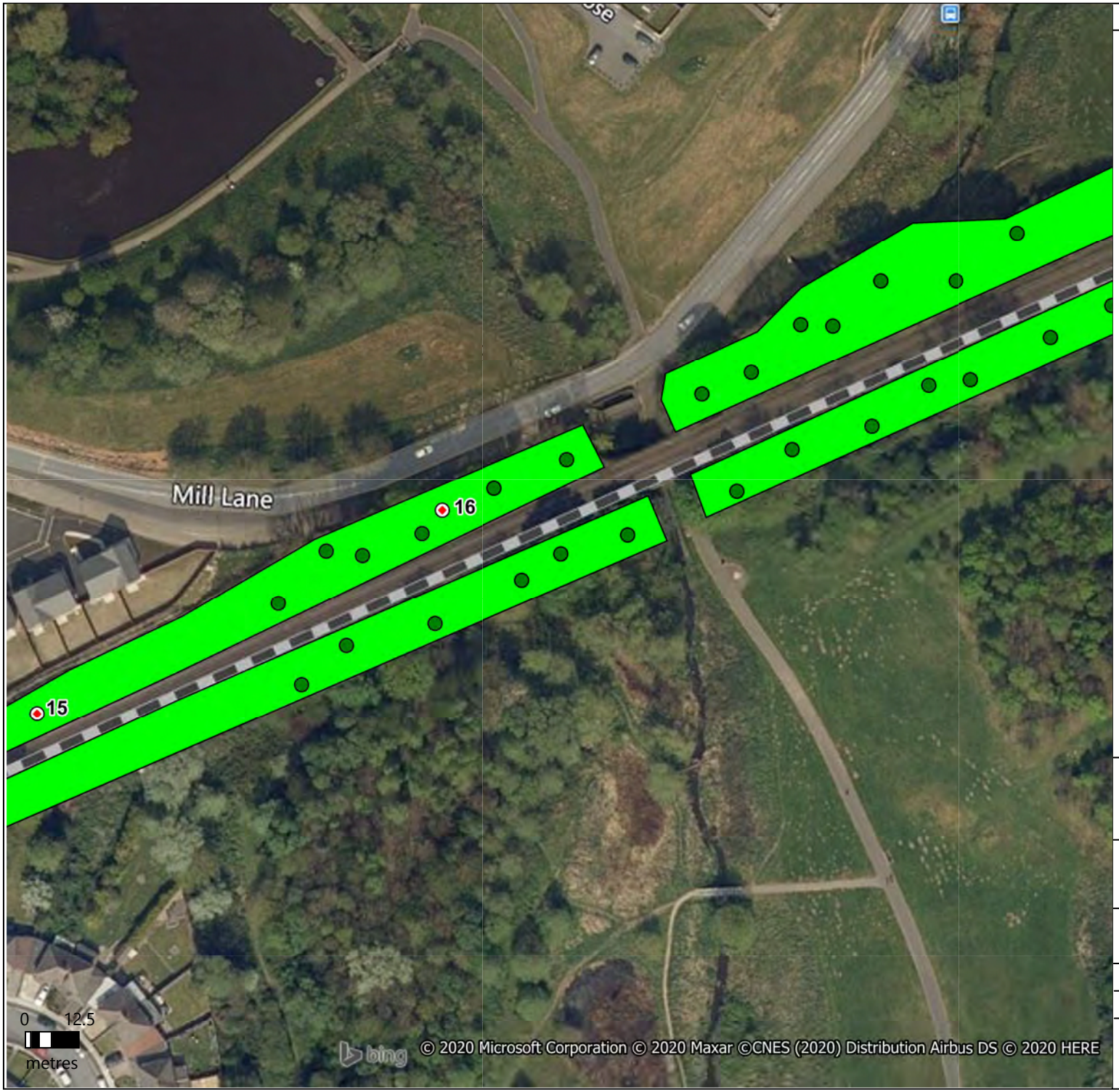

Key

- Tree
- Dense scrub
- Target note

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Headbolt Lane
Phase 1 Habitat Plan

Figure 1.2

Rev	Date	Drawn	Checked	Approved
00	26/07/2020	LK	RT	NLG

N

Scale at A4
1:1250

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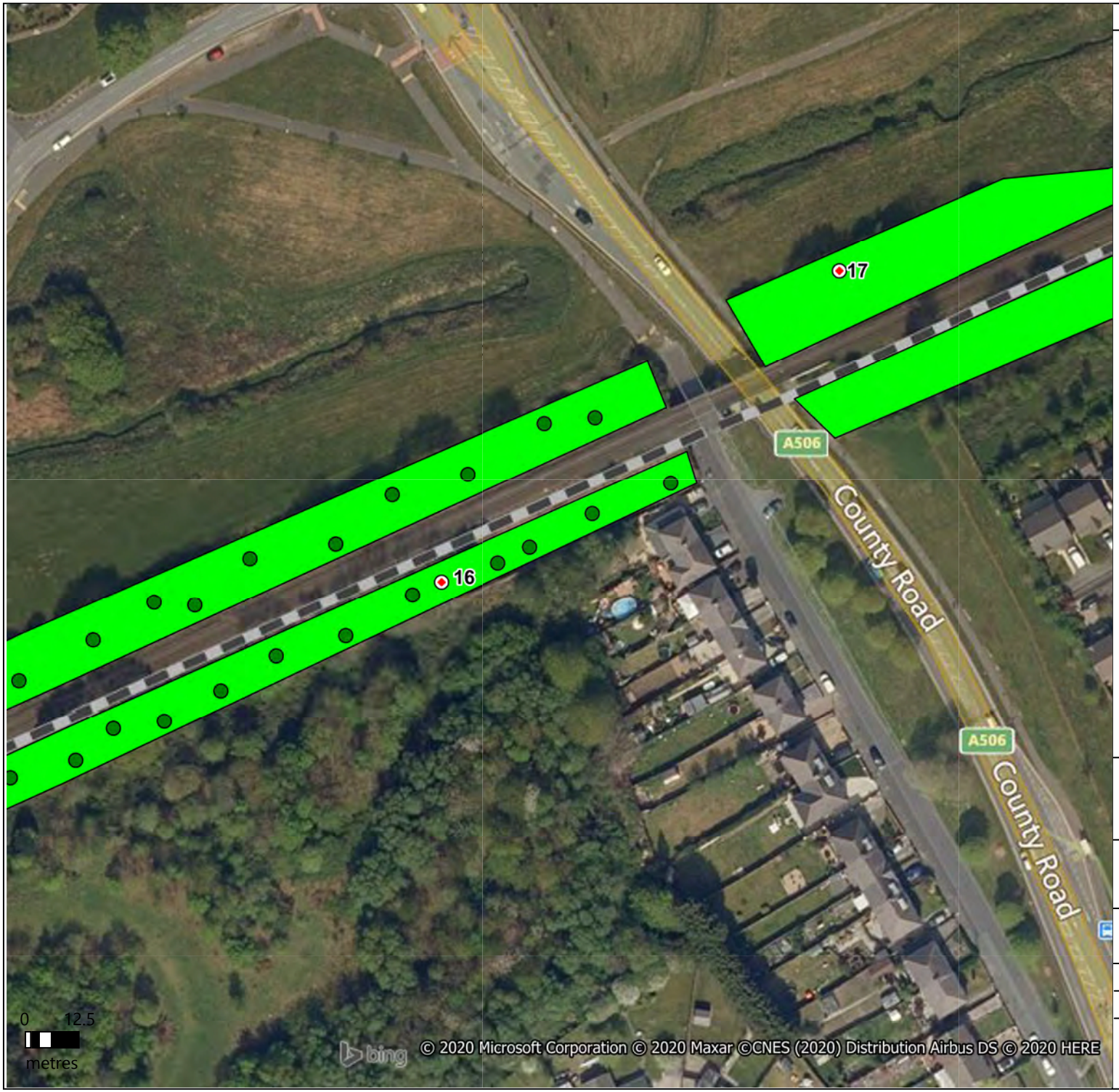

Key

- Tree
- Dense scrub
- Target note

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Headbolt Lane
Phase 1 Habitat Plan

Figure 1.3

Rev	Date	Drawn	Checked	Approved
00	26/07/2020	LK	RT	NLG

N

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1:1250

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Key

- Dense scrub
- Semi improved neutral grassland

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Headbolt Lane
Phase 1 Habitat Plan

Figure 1.4

Rev	Date	Drawn	Checked	Approved
00	26/07/2020	LK	RT	NLG

N

Scale at A4
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APPENDIX 2: TARGET NOTES

Target note (TN)	Description
1	Mown amenity grassland with Lombardy poplars (*Populus nigra 'Italica'*), one with a broken knot hole with low bat roosting potential.
2	Very slow flowing stream emerging from two culverts under the rail track, with a depth of 50cm and a width of 1.5m. Some glossy film was observed on the water's surface, and large pieces of litter were observed on the bed. Bankside vegetation included rosebay willowherb (*Chamaenerion angustifolium*), Himalayan balsam (*Impatiens glandulifera*), thistle (*Cirsium arvense*), nettle (*Urtica dioica*), horsetail (*Equisetum* sp.), cleavers (*Galium aparine*), bindweed (*Convolvulus arvensis*), Yorkshire fog (*Holcus lanatus*), bramble (*Rubus fruticosus*), cow parsley (Anthriscus sylvestris) and common reed (*Phragmites australis*), with immature oak (*Quercus robur*).
3	Tall ruderal grassland with with ragwort (*Jacobaea vulgaris*), red campion (*Silene dioica*), immature silver birch (*Betula pendula*), immature oak, nettle, Himalayan balsam, rosebay willowherb, cow parsley, hogweed (*Heracleum spondylium*) and rapeseed (*Brassica napus*).
4	Semi-improved neutral grassland, with lesser stitchwort (*Stellaria graminea*), great willowherb (*Epilobium hirsutum*), ragwort, sorrel (*Rumex acetosa*), thistle, nettle, yarrow (*Achillea millefolium*), sweet vernal grass (*Anthoxanthum odoratum*), cocksfoot (*Dactylis glomerata*), ribwort plantain (*Plantago lanceolata*), dandelion (*Taraxacum* sp.), hogweed (*Heracleum spondylium*), creeping buttercup (Ranunculus repens), cleavers, dock (*Rumex* sp.), rosebay willowherb, white dead-nettle (*Lamium album*), hawkbit (*Leontodon* sp.), bindweed, borage (*Borago officinalis*) and garlic mustard (*Alliaria petiolata*), with two ash (*Fraxinus excelsior*) trees.
5	Small cluster of immature trees within semi-improved neutral grassland, including sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*) and elm (*Ulmus procera*), with an understorey of Yorkshire fog, meadow cranesbill (*Geranium pratense*), nettle, ragwort, ribwort plantain, mallow (*Malva sylvestris*), herb Robert (*Geranium robertianum*) and hawkbit.
6	Mown amenity grassland with white clover (*Trifolium repens*), ragwort, ribwort plantain, dandelion, Yorkshire fog, creeping buttercup, black medick (*Medicago lupulina*) and shining cranesbill (*Geranium lucidum*).
7	Unmown areas of semi-improved neutral grassland, with hawkbit, sweet vernal grass, sorrel, white clover, Yorkshire fog, thistle, dock, ribwort plantain, creeping buttercup, ragwort, weld (*Reseda luteola*), yarrow, bird's foot trefoil (*Lotus corniculatus*) and selfheal (*Prunella vulgaris*).
8	A generally slow-flowing stream, at a width of 1m or more, and a depth of 30cm. Some shallower sections have a faster current. The bed is silty, and banks varying between a height of 20cm to 1m, and heavily vegetated. Some undercutting of river banks from current present at points, but no mammal or crayfish holes visible. Bankside vegetation includes Himalayan balsam, rosebay willowherb, ragwort, thistle, nettle, common reed, yarrow, sorrel, cocksfoot (*Dactylis glomerata*) and creeping buttercup, with areas of bare ground.
9	Dense scrub dominated by bramble, with Himalayan balsam, nettle and sweet vernal grasses at edges. A flytipped shed underneath an English elm may provide cover for reptiles or amphibians.
10	Very dense scrub along the railway boundary. Species include hawthorn (*Crataegus monogyna*), cherry (*Prunus* sp.), elder (*Sambucus nigra*), ash, field rose (*Rosa arvensis*) and oak, with an understory of bird's foot trefoil, bindweed, bramble, nettle, creeping buttercup, cocksfoot, rosebay willowherb, raspberry (*Rubus idaeus*), hogweed, ragwort, and dock.
11	Semi-improved neutral grassland sloping down to embankment. Species include garlic mustard, thistle, feverfew (*Tanacetum parthenium*), rosebay willowherb, dock, sweet vernal grass, chickweed (*Stellaria media*), horsetail, poppy (*Papaver somniferum*), great willowherb, bramble, ribwort plantain, hawkbit, common vetch (*Vicia sativa*), bindweed, red fescue (*Festuca rubra*), pineappleweed (*Matricaria discoidea*) and creeping buttercup.
12	Mown amenity grassland, with infrequent thistle, ribwort plantain, Yorkshire fog, garlic mustard, feverfew, horsetail, white clover, greater plantain (*Plantago major*) and areas of bare ground.
13	An area of bare ground, with buddleja (*Buddleja davidii*), bramble, dock, rosebay willowherb, hop (*Humulus lupulus*) and Japanese knotweed (*Fallopia japonica*) present at security fence alongside track. Trees include field rose, sycamore, silver birch, hawthorn and cherry.
14	Railway embankment scrub vegetation opposite the Merseyrail Kirkby station platform, includes bramble, hawthorn, cleavers, rosebay willowherb, buddeja, elder, ragwort, bracken, nettle, raspberry, dogwood (*Cornus sanguinea*) and ash. The platform is a mixture of planted and seeded species, including hart's tongue fern (*Asplenium scolopendrium*), ribwort plantain, nettle, ivy, sycamore, hawthorn, dogwood,

	laurel, field rose, horsetail, St John's wort (*Hypericum perforatum*), dandelion and cotoneaster.
15	Railway embankment scrub vegetation east of Kirkby station, with species including oak, goat willow (Salix caprea), sycamore, silver birch, elder, common lime (*Tilia x europaea*), Lombardy poplar, field maple (*Acer campestre*), cherry, privet (*Ligustrum vulgare*), field rose, hawthorn, gooseberry (*Ribes uva-crispa*), cotoneaster (*Cotoneaster horizontalis*) and Leyland cypress (*Cupressus × leylandii*). Behind the northern platform, trees include laburnum (*Laburnum anagyroides*), sycamore, elder and laurel (*Laurus nobilis*). Ground flora includes horsetail, bramble, ragwort, cocksfoot, red fescue, rosebay willowherb, bindweed, nettle, cleavers, old man's beard (*Clematis vitalba*), bracken (*Pteridium aquilinum*), thistle, hawkbit, ivy (*Hedera helix*), yellow flag iris (*Iris pseudacorus*), goldenrod (*Solidago virgaurea*), raspberry, yarrow, variegated yellow archangel (*lamiastrum galeobdolon* subsp.*argentatum*), foxglove (*Digitalis purpurea*), common vetch, buddleija, groundsel (*Senecio vulgaris*) and herb Robert.
16	Along the railway embankment from Millbrook Bridge, species include ash, sycamore, hawthorn, oak, osier (*Salix viminalis*), ivy, cherry species, elder, field roase, Himalayan balsam, ragwort, rosebay willowherb, bracken, bramble, horsetail, nettle, greater willowherb and common toadflax (*Linaria vulgaris*), the last found above County Road Bridge WKL2 55.
17	Railway embankment species adjacent to Headbolt Lane include goat willow, bracken, tormentil (*Potentilla erecta*), yarrow, hawkbit, bindweed, sage (*Salvia officinalis*), common vetch, cherry species, apple species (*Malus* sp.), and wood forget-me-not (*Myosotis sylvatica*). A large mammal run was observed partway down the track on the southern embankment.

APPENDIX 3: PHOTOGRAPHIC PLATES

Photograph 1. Mature Lombardy poplar trees (TN1); tree with knot hole seen to left hand side.	Photograph 2. Knot hole in Lombardy poplar with medium bat roosting potential (TN1).
	
Photograph 3. Slow-flowing culverted stream (TN2) running through the proposed Headbolt Lane station site.	Photograph 4. Tall ruderal (TN3) with potential for reptiles.
	

Photograph 5. Semi-improved neutral grassland (TN4) looking west.	Photograph 6. Mosaic of semi-neutral grassland (left side, TN4), small cluster of immature trees (background left side, TN5), mown amenity grassland (foreground, TN6) and unmown grassland (right side, TN7).
	
Photograph 7. Undercutting of stream banks (TN8).	Photograph 8. Thick bramble scrub outside of railway embankment (TN10).
	

Photograph 9. Scrub and semi-improved neutral grassland sloping down to culvert under railway embankment (TN11). Mown grassland (TN12) present to far right.	Photograph 10. Japanese knotweed present on bare ground for proposed substation (TN13).
	
Photograph 11.Northern platform of Kirkby (TN15), with bankside vegetation opposite including Japanese knotweed at base of bare ground for substation (TN13).	Photograph 12. Embankment vegetation (TN15).
	

Photograph 13. Mammal path (TN17) at SJ 41275 99709.	Photograph 14. Shallow mammal holes (TN17) at SJ 41369 99759.
	
Photograph 15. Glovers Brow Bridge (eastern elevation) with crack to left and pockmark to right highlighted (red circles).	Photograph 16. Metal plate underneath Glovers Brow Bridge with low bat potential.
	

Photograph 17. Old bird nest present underneath Glovers Brow footbridge.	Photograph 18. County Road Bridge with no bat potential.
	
Photograph 19. Millbrook Bridge with gap present above arch ring.	Photograph 20. Gap in arch of Millbrook Bridge near northern elevation, above footpath.
	

Photograph 21. Cracks and pockmarks in Millbrook Bridge over stream.	
	

APPENDIX 4: HIMALAYAN BALSAM IDENTIFICATION GUIDE

This plant is listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). It is an offence to plant or otherwise cause spread in the wild.

	Seedling in moss Seedlings begin to appear in March (depending on weather and climate) The first 'leaves' are nearly-round, pale green and un-toothed with a nick at the end
	Real, toothed leaves begin to come through and may have reddish mid-ribs

	Immature plant Leaves are slender with finely serrated edges. They are opposite or in whorls along the stem and may have a reddish mid-rib
	Flowers begin to show in June/July and range in colour from pink to white. Stems are round, hollow and range in colour from red (early in year) to pink (summer). Stems can be up to 10cm thick, although usually 3cm. Adult plants can grow up to 2m tall.

	Flowers are trumpet shaped with wide petals and sweetly scented. Flowers are present from June to October.
	Seed pods can form from July to October. Seed pods are droplet shaped and 'explode' when touched. Seeds themselves range from white (unripe) to brown (ripe)
	Winter 'hay' like remains It may be difficult to identify in winter although you can look for 'hay' like remains from last year's growth Old stems are hollow and light. Often areas of high infestation are left bare following annual die-off.

Images used in this identification sheet were adapted from http://dinns.sketchfiles.co.uk/en/invasive-species/on-the-dee/himalayan-balsam.aspx http://wildflowerfinder.org.uk/Flowers/B/Balsam(Himalayan)/Balsam(Himalayan).htm and nonnativespecies.org/

Rabbits: management options for preventing damage

The European rabbit *Oryctolagus cuniculus* has once again established itself as the major vertebrate pest of British agriculture, causing economic losses estimated to be in excess of £100 million annually. The total winter population is estimated to be at 35% to 40% of the pre-myxomatosis level (circa 1952) and is increasing by about 2% annually. This is due primarily to the reduced effect of myxomatosis, resulting from increased levels of genetic resistance. Given the problems associated with rabbits, this increase in numbers is likely to be accompanied by a corresponding rise in the amount of serious crop damage reported. It is essential, therefore, that effective control strategies are available to ensure that crops vulnerable to rabbit damage are adequately protected. This will serve to benefit landowners and occupiers who have a statutory responsibility to manage rabbit infestations on their land and to prevent them causing damage to neighbouring properties.

Damage

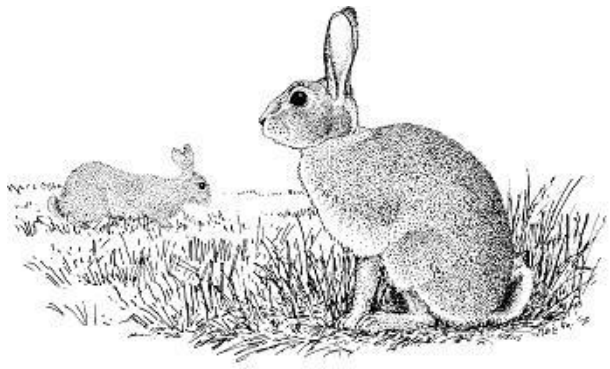
Cereals

It is estimated that farmers are losing about £50 million per annum as a consequence of rabbit damage to cereals. Winter wheat, barley and oats appear to be most vulnerable. Rye and triticale suffer smaller losses and spring barley appears to be the least susceptible to rabbit damage. In terms of annual yield, a loss of 1% per rabbit per hectare (2.5 acres) has been recorded for winter wheat and 0.33% per rabbit per hectare for spring barley.

The effects of grazing on winter cereals are most obvious during the winter, when plant growth is slow, and become less apparent when crops grow more rapidly in the spring.

In fact, by harvest, plants grazed by as many as 20 rabbits per hectare can be the same height as plants that have never been grazed. Yields, however, can be reduced by about 20%.

This clearly illustrates not only the scale of the problem but also the difficulties in accurately assessing the impact of grazing.



Rabbits

Grassland

The effect of rabbit grazing on pasture is less obvious than on cereals. Grazing of newly sown grassland may result in poor establishment or complete failure of the sward. Over-winter grazing of established grassland reduces early grass that is needed in the spring. Yields of crops cut later for silage or hay may also be substantially reduced.

Continuous grazing soon reduces the vigour of species such as Italian ryegrass or meadow fescue.

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Permanent grass on good soils is better able to withstand close defoliation, but grazing by large numbers of rabbits can weaken or kill even persistent leafy ryegrass. Scratching and burrowing can degrade pasture still further by encouraging the establishment of weeds such as nettles, thistles and ragwort. In terms of annual yield, recent studies have indicated the loss to be almost 1% per rabbit per hectare.

Other crops

Rabbit damage has been recorded to a wide range of crops in Britain. Besides cereals and grassland, some of the most important include roots, brassicas and market garden crops, which can all suffer severe damage, both to the growing plants and the marketable end product.

Trees

Rabbits can damage or kill planted nursery stock and young trees of many species. Damage to the bark of large trees can also be serious and semi-mature hedgerows may also be vulnerable. In extreme circumstances, rabbits may prevent natural regeneration in woodlands. Damage ranges from the eating of young seedlings to the destruction of leading shoots, the browsing of branches and removal of bark. The burrowing activities of rabbits can also undermine root systems.

Damage to archaeological sites, monuments and landscapes

Animal burrowing on archaeological sites results in the disturbance and sometimes destruction of artefacts, ecofacts and buried land surfaces. It also leads to the destabilisation of monuments, which in turn can lead to an altering of a monuments profile. Damage by burrowing should be prevented or avoided because our archaeological resource is finite and contains irreplaceable information that is important to the study of the human past.

Management

Rabbit populations can withstand high mortality from natural causes, therefore control efforts must add to, and not merely replace, these causes if direct control is to be effective.

Because of the size of the effort required, and the rabbit's inherent capacity for population increase, complete eradication is impractical.

Instead the aim should be to reduce rabbit numbers to levels at which the damage they cause is economically acceptable. Where access can be gained to burrows, gassing - accompanied by careful habitat management to reduce rabbit harbourage, if necessary - is the most effective method of control. In some situations, other techniques may be appropriate.

The most effective time for control is from November to March, although earlier action may be needed on autumn cereals showing signs of heavy grazing. There are four main reasons for this recommendation:

- Mortality from natural causes will have reduced rabbit numbers to their lowest level by the winter. Up to 90% of young rabbits born during the summer will have died by this time without human intervention.
- Action at this time will reduce the adult breeding population before the next breeding season begins. Each doe killed during this period can mean at least 20 fewer young rabbits born next summer.
- Reduction of numbers during this period will reduce damage to vulnerable autumn sown crops.
- Vegetation is dying back, making access to burrows easier.

More effective results will be achieved if adjoining land is treated at the same time in a co-operative exercise. Rabbits do not respect boundaries, and joint action will remove animals that use burrows on one holding and feed on another. Control over a substantial block of land will also reduce the rate of re-infestation.

The quality and amount of harbourage are major factors that can determine the number of rabbits in a particular area. Habitat management should therefore play an integral part of any successful rabbit control programme. Scrub and ground cover may need to be thinned sufficiently to give access to all burrows; this is essential where gassing is planned. Also, where practicable,

burrow systems should be destroyed following control operations.

Appropriate measures should be taken to minimise damage to other wildlife and habitats. For example, scrub clearance should be avoided during the bird-nesting season.

Legal considerations

Under the Wild Mammals (Protection) Act 1996 it is an offence to intentionally inflict unnecessary suffering, as specified by the Act, on any wild mammal. This legislation may need to be considered where the destruction of occupied warrens and burrow systems is being contemplated.

Under the Animal Welfare Act 2006 a rabbit becomes a Protected Animal once it is caught in a trap or snare, making it an offence to cause unnecessary suffering. Traps and snares should therefore be inspected at least once and preferably twice a day and, wherever possible, be placed where the trapped animal will not be exposed to extremes of weather.

Under Section 12 of the Pests Act 1954, it is an offence to knowingly spread myxomatosis to uninfected rabbits. The Specified Animal Pathogens Order 1998 (S.I. 1998/463) prohibits the introduction into an animal of the live virus causing viral haemorrhagic disease (VHD) of rabbits, except where such introduction is undertaken under the authority of a licence. These prohibitions mean that the deliberate spreading of myxomatosis or VHD cannot be used as a legal method of controlling rabbits.

An Order has been made under Section 1 of the Pests Act 1954 by which England and Wales (except for the City of London, the Isles of Scilly and Skokholm Island) have been designated a Rabbit Clearance Area. In this area, every occupier of land is responsible for the killing or taking of wild rabbits on his land. Where it is not reasonably practical to destroy the rabbits, occupiers must take the necessary steps to prevent them causing damage.

Under section 98 of the Agricultural Act 1947, Defra has the power to serve a Notice under the Agriculture Act 1947, requiring rabbit control to be carried out; if this is not done, they may arrange for the necessary work to be undertaken at the expense of the occupier, who could also be liable to a fine.

To help manage infestations, the Ground Game Act 1880 gives every occupier of land a limited right to kill and take rabbits and hares concurrently with the right of any other person entitled to do so on the same land. An occupier may use any legal method to kill rabbits and should ensure that they comply with other legislative controls on the methods of killing and taking animals, the most relevant of which are discussed further below.

The occupier may, in writing, authorise other persons to assist him, however only he and one other person authorised by him are entitled to kill using a firearm. The Ground Game Act 1880 exempts an occupier, and persons authorised by him, from the need to hold a game licence when killing or taking rabbits on the occupier□s land.

Monuments that are being damaged by burrowing animals may be Scheduled. Any proposals to control rabbits on Scheduled Monuments should be discussed with English Heritage before work starts, to determine whether Scheduled Monument Consent is required.

Control methods: gassing

Gassing is the most effective method of reducing rabbit numbers where burrows are accessible. When correctly used, under the right conditions, gassing can reduce the rabbit population by up to 80%. However, effectiveness decreases in porous soils, when soil moisture is low and also when air temperatures fall below 5 ^{o}C. For best results, it is essential to drive rabbits to ground before gassing and to find and treat every entrance to the warren system.

On monuments and archaeological sites the soil used for closing up burrow holes should be brought in from off-site as any further digging on site will further damage the monument and add to its disfigurement. On Scheduled Monuments this should have already been agreed with

English Heritage as part of the Scheduled Monument Consent.

Selective scrub clearance may be necessary to gain access to burrows. Before embarking on a gassing programme, particular attention should be paid to the possible presence of badger setts, as it is illegal to gas badgers. Care should also be taken to avoid gassing fox earths, as no fumigant is approved for use against foxes. Burrows in or around badger setts and fox earths must not therefore be treated. The impact on other wildlife living in burrows, for example adders, may also need to be considered.

Since the withdrawal of Cymag as a vertebrate control agent, the only commercially available fumigants are formulations that generate phosphine gas on contact with moisture. These are available either in tablet or pellet form.

All fumigants must be approved under the Control of Pesticides Regulations 1986 and must be used according to label instructions.

Gassing should only be undertaken by persons trained in the use of aluminium phosphide, and familiar with the precautionary measures to be observed. Fumigants can be lethal to humans and it is essential that users follow the instructions on safety aspects.

Users should be aware of the need to comply with the Control of Substances Hazardous to Health Regulations 2002 (S.I. 2002/2677), in respect both of its general provisions and those which relate specifically to fumigations. Further guidance is provided in the Health and Safety Executive Agriculture Information Sheet No. 22 Gassing of rabbits and vertebrate pests (see Further information).

Use of phosphine

The only available phosphine generating formulations are Phostoxin and Talunex. Both are extremely toxic to rabbits with inhalation resulting in rapid death.

Phostoxin is formulated as a spherical 3 gram tablet and can be introduced into the burrow system either by hand (protected by suitable gloves) or via an applicator. One tablet should be inserted into each hole. This should then be sealed with a piece of turf, grass side downwards. Care must be taken not to drop soil onto the tablet.

Talunex consists of 0.6 gram pellets that are injected into the burrow system using a Topex applicator, specifically designed for use with this product. The system has the advantage of minimising operator exposure to the formulation. Treatment of infested areas should be the same as with Phostoxin, with the exception that 4 or 5 pellets should be introduced into each hole.

Follow-up action

The effectiveness of all gassing treatments should be monitored by inspecting treated areas for signs of fresh activity 48 hours after the initial treatment. In many situations, a follow-up treatment of re-opened holes will be necessary. Ideally, the procedure should be repeated until no re-opened burrows are found.

Control methods: fencing

Fencing is a particularly useful management tool where the nature of the rabbit harbourage makes other techniques impractical, or when complete exclusion is the aim. In many situations, fencing can be more cost-effective than control methods that have to be undertaken year after year. Traditionally, permanent wire-netting fences have been used to deny rabbits access to vulnerable areas but more recently, temporary electric fences, either netting or multi-strand wire systems, have become popular methods of crop protection.

When correctly erected and maintained, wire-netting and electric fences can reduce rabbit numbers on protected fields by 85% to 90%, and both have a useful life of about ten years. Electric fencing is cheaper to purchase and erect than wire-netting, but its maintenance costs are higher.

Wire-netting

Netting fences should be constructed of 18 gauge, 31 mm (1 1/4 in) hexagonal mesh. They should be a minimum of 750 mm (2 ft 6 in) high with a further 150 mm (6 in) lapped on the surface of the ground towards the rabbit

harbourage. Turfs of grass should be placed on the lapped netting at 1 m (about 1 yard) intervals to hold it firmly in place (vegetation should later grow through the mesh to complete this job). The netting should be attached to two 2.65 mm (1/8 in) high tensile spring steel straining wires (one at the bottom of the fence and one at the top) with galvanised fence rings. The straining wires should be supported by wooden stakes 1.8 m (5 ft 11 in) x 80 mm (3 in). The stakes can be placed up to 15 m (48 ft 9 in) apart although ground undulations may dictate closer spacing. End posts 2 m (6 ft 6 in) x 100 mm (4 in) braced by struts 2 m (6 ft 6 in) x 80 mm (3 in) should be placed at the ends of the fence and at bends.

Local site conditions or other considerations may demand a variation to these specifications. For example, particular attention should be paid to the presence of potential weak spots such as uneven ground, dry stone-walls and watercourses. In areas such as young farm woodlands, where it is especially important to prevent invasion by rabbits, the fence specification can be improved by projecting the top 150 mm (6 in) of the fence outwards at 45° towards the harbourage. It is recommended that any proposed changes to the specification are first discussed with one of Natural England's Wildlife Management Advisers (see *Further information*).

Ideally, wire-netting fences should be erected to surround fully the area to be protected. If this is not practical, a strip fence, which extends at least 150 m beyond either end of the problem area, may be used.

The number of gates in a fence should be kept to a minimum because they make maintenance more difficult. They should be hung on supports independent of fence straining posts, as the latter will inevitably move and so affect the hang of the gates. A wooden sill must be dug into the ground to prevent burrowing underneath, and gates should shut against a post. Badger gates should be installed in the netting if the fence crosses any badger tracks or paths.

An advisory leaflet, describing the design and installation of badger gates in rabbit-proof fencing (TIN026) is available (see under *Further information*).

Regular monthly inspections and maintenance of fences are essential to block burrows dug under the fences and to repair damage caused by farm machinery, fallen tree branches and vegetation. This safeguards the long-term effectiveness of the fence.

Electric fences

There are two types of electric fence in common use: netting and strained-wire. Both have been shown to be as effective as wire-netting fences.

Electric-netting fences are available in a number of commercial designs. Basically, they all consist of a heavy-duty polythene twine mesh in which the horizontal strands are interwoven with electrically conductive stainless steel wire. To prevent shorting, the steel wires are omitted from the bottom strand. They are between 0.5 to 0.75 m (1 ft 8 in to 2 ft 5 in) high and are supplied in 25 m (82 ft) or 50 m (164 ft) rolls in which the fence posts are already fitted. This type of fence is very quick and easy to erect and take down.

The electric strained-wire system consists of seven parallel electrified conducting wires (7-strand, 16 gauge medium tensile mild steel) at heights of 5, 10, 15, 20, 25, 30, and 40 cm (2, 4, 6, 8, 10, 12 and 16 in) above the ground. The lowest wire is earthed and the remaining six are live (a small length of wire should be wound around each of the top six wires to electrically connect them). Adjustable plastic insulators supported on metal stakes hold the wires. The stakes can be placed up to 7 m apart (about 8 yards), although ground undulations may dictate closer spacing. Where the fence line bends, anchor posts replace the normal metal stakes. The whole system is tensioned at a reel post placed at the end of the fence.

Both electric fence types must be powered by an energiser capable of producing an output of at least 1 joule when measured into a 500 ohm resistance. Most mains-operated energisers, and the more powerful battery-powered units, have this capability. Batteries should be

changed regularly (a fully charged 70 Ah battery will need to be changed every 2 to 3 weeks). A wide range of energisers is available and users are advised to discuss specific requirements with their supplier. To effectively deter rabbits, it is important to maintain a minimum of 2.5 kV throughout the fenceline. A good earthing system is essential to achieve this.

Ideally, as for wire-netting fences, electric fences should be erected to surround fully the area to be protected. If this is not practical a strip fence, which extends at least 150 m beyond either end of the problem area, may be used. Prior to erection, a 450 mm to 600 mm (1 ft 6 in to 2 ft) wide strip should be mown along the fence line or the vegetation killed off using an approved herbicide. This ensures that the conducting wires are kept clear of vegetation that would otherwise short-circuit the system thereby draining power and reducing effectiveness. Initially, fences should be inspected every few days but this can later be extended to 2 to 3 week intervals.

A more detailed advisory leaflet on the use of fencing (TIN023) is available (see *Further information*).

Lethal control methods

Shooting

Shooting is a popular method of rabbit control and is most effective when conducted at night, using a spotlight.

The Ground Game Act 1880 gives an occupier the right to shoot rabbits on his land during the day and to authorise in writing one other person to do so. The person must be a member of the occupier's household or staff or be employed for reward. Under the Pests Act 1954, an occupier may apply to Natural England for authority to use a reasonable number of extra guns, if the owner of the shooting rights will neither permit the occupier to bring on extra guns, nor undertake to destroy the rabbits himself, and it is necessary to use more guns than the occupier has the right to authorise.

Under the Ground Game Act 1880 as amended by the Wildlife and Countryside Act 1981, the following are allowed to shoot at night:

- An owner-occupier with shooting rights.
- A landlord who has reserved his shooting rights.
- A shooting tenant not in occupation who has derived his shooting rights from the owner.
- An occupier or one other person authorised by him provided he has written authority from another person with shooting rights.

The Firearms Act 1968 requires any person possessing, purchasing or acquiring a shotgun to obtain a shotgun certificate from the police. A firearms certificate is required for rifle use.

Single shooting operations are not particularly effective and reduce rabbit numbers by only about 30%. The technique should only be used therefore as an adjunct to more effective control methods or to remove problem individuals that cannot be disposed of by other means. Shooting also tends to target adult males and therefore has a relatively limited effect on the breeding potential of the population the following spring unless considerable time and effort are expended.

Baited cage trapping

This technique involves the live capture of wild rabbits in galvanised wire-mesh cages baited with carrot. The technique can be used throughout the year, but is most effective at catching adult rabbits during the winter. Additional benefits are that the technique does not require access to burrows and non-target species can be released unharmed.

The traps should be set in short open vegetation and checked twice a day, early morning and late afternoon. Captured rabbits must be dispatched humanely. Cage trapping has been shown to reduce numbers by about 65% and is most appropriate for protecting high value crops where manpower is available for frequent checking of traps. A detailed advisory leaflet on the use of cage trapping is available from Natural England (see under *Further information*).

Drop box trapping

Drop boxes are designed to be used in conjunction with wire-mesh netting. A tunnel is either inserted into the fence line at right angles or placed parallel to the netting on the harbourage side of the barrier. Rabbits are caught when they enter the tunnel and fall through a hinged flap into a box that has been buried in the ground. The lid returns to place by means of a counter balance weight fixed to it.

Drop box traps should be visited at least once a day, when set, preferably early in the mornings. Captured rabbits must be despatched humanely. Traps should not be installed where they may be at risk from flooding. Permanently sited traps can be an effective method of capturing rabbits where fences are newly erected and where rabbits are passing through holes in established fences.

Spring trapping

Under the Pests Act 1954 only approved spring traps, designed to catch and kill rabbits humanely, may be used. Those currently approved by the Spring Traps Approval Order 1995 are the Imbra Trap Mark I and Mark II, Juby Trap, Fenn Rabbit Trap Mark I, Fenn Vermin Trap Mark VI (Dual Purpose), Springer No. 6 (Multi Purpose), Victor Conibear 120-2, BMI Magnum 116, and clones of any of these listed spring traps.

Spring traps generally consist of a pair of clamps that are triggered to catch rabbits that step onto a plate mechanism. The traps should be set firmly in position with the treadle plate flush with the floor. The plate should be concealed by covering lightly with soil. To minimise the risk to non-target species, stock and pets should be excluded from the trapping area and the traps must be set only within the overhang of natural or artificial tunnels.

The Protection of Animals Act 1911 requires that all spring traps set for the purpose of catching rabbits (or hares) should be inspected at reasonable intervals and at least once every day between sunrise and sunset.

Snaring

Snares are intended for use to tether animals for subsequent humane despatch. They are made from stranded brass wires that run freely through a small eye made in one end of the wire. The looped end of the wire (100 mm (4 in) diameter), into which the animal places its head, is positioned about 90 mm (3 in), above the ground using a short, notched stick (the 'pricker' or 'feeler'). The free end of the wire is securely tethered by a strong rot-proof cord to a peg, which is driven firmly into the ground. This prevents captured animals from escaping. Snares with a 'stop' or knot about 140 mm (5 in) from the eye can be used. The 'stop' prevents the loop from closing fully, thus ensuring the snare tethers rather than kills the rabbit. Snares should be set on well-used rabbit runs, in short vegetation, close to the harbourage from which rabbits are gaining access to crops. Where rabbits are numerous, the use of well-placed snares can catch animals quickly and efficiently, but results are poor during dry weather and frost.

The Wildlife and Countryside Act 1981 prohibits the use of self-locking snares and requires free-running snares to be inspected daily. All reasonable precautions should be taken to avoid catching non-target animals. Under the Wildlife and Countryside Act 1981 it is illegal to set a snare to catch certain animals, such as badgers and otters. Under the Deer Act 1991 it is an offence to use snares to kill or take deer. It is recommended that they are inspected at dawn and dusk, and that they are not set where livestock are present or if there is a risk to domestic pets.

Ferreting

This involves the introduction of ferrets into the burrow system. The ferrets drive rabbits into nets, which are placed over the burrow entrances or to waiting guns that shoot them as they bolt from tunnel entrances. Ferreting is most successful outside of the breeding season and, having the advantage of capturing more females than males, may serve as a valuable technique for dealing with intransigent populations. However, the method is time consuming and, when used in isolation, is

unlikely to produce effective control of rabbit infestations.

Damage reduction methods

Tree-guards

Individual tree guards and shelters can be used to protect young trees and shrubs from rabbit browsing and bark stripping where it is impractical or uneconomic to enclose them with fencing. There are many types available including plastic net guards, split plastic tubes, spiral plastic sleeves and welded mesh cylinders. Spiral plastic sleeves are perhaps the least successful because they tend to be displaced by wind or animals. The effectiveness of split plastic sleeves and net guards is greater because they are more robust. To effectively reduce rabbit damage tree guards should be at least 60 cm (2 ft) high.

Repellents

The use of repellents can be expensive, and does not always provide long-term protection from attack by rabbits. Any benefit they can provide is often offset when, as is often the case, repeated applications are necessary. Their use should therefore be restricted to small plantations or to areas that cannot be protected in any other way. Only repellents approved under the Control of Pesticides Regulations 1986 may be used. Users must comply fully with the label instructions.

Further information

In England further advice on dealing with rabbit problems, as well as problems caused by other mammals and birds can be obtained by contacting Wildlife Management and Licensing at: Natural England, Wildlife Licensing Unit, First Floor, Temple Quay House, 2 The Square, Bristol, BS1 6EB
Tel: 0845 601 4523 (local rate). Email: **wildlife@naturalengland.org.uk**

A range of leaflets on wildlife topics is available online **www.naturalengland.org.uk.** In particular see:

- TIN023: *Rabbits: use of fencing to prevent agricultural damage*
- TIN024: *Rabbits: use of cage-trapping to prevent agricultural damage*
- TIN026 : *Badger gates in rabbit-proof fencing*

The Forestry Commission produces a number of publications and these can be obtained from Publication Section, Forest Research Station, Alice Holt Lodge, Wrecclesham, Farnham, Surrey GU10 4LH. Tel: 01420 23337.

The Health and Safety Executive Agriculture Information Sheet No. 22 Gassing of rabbits and vertebrate pests is available via their Infoline (Tel: 08701 545500) or online at **www.hse.gov.uk/pubns/ais22.pdf**

This leaflet was produced by Natural England and the Central Science Laboratory, now known as the Food and Environmental Research Agency (FERA).

Appendix B
Ground Investigation Report, Arup, 2020

Buckingham Group Construction Ltd

170248 Headbolt Lane New Station GRIP 4

Ground Investigation Report

170248-ARU-REP-EGE-000001

P01 | 26 January 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 276736-06

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ARUP

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Pre-Planning Application Drawings

Appendix B

Dunelm, 2020. Mining Risk Assessment

Appendix C

CCG Ground Investigation Locations

Appendix D

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1 Introduction

1.1 Context

Headbolt Lane is an infrastructure project that will extend the Merseyrail network from the existing terminating station at Kirkby to a new station to be constructed at Headbolt Lane.

The project extents (based on the GRIP 3 Option Selection Report) are 29m 57ch to 28m 44ch (29m 1254y to 28.0968y). The engineers line reference (ELR) changes from WJK to WKL2 at the existing head shunt to the east of Kirkby station (~29m 0902y).

The existing rail corridor comprises a single line. The Merseyrail network will be extended east from the existing terminating station at Kirkby, a new turnout will provide access to a new twin-track arrangement with provision for new 3rd rail DC electrification and bi-directional signalling. As part of these works the existing earthwork will be widened and strengthening and / or renewal works will be required to the existing Underbridges 55 and 56 (UB55 and UB56). The existing Northern Rail network will be shortened as a result.

The existing Northern Rail station at Kirkby will be decommissioned and a new station interchange provided at Headbolt Lane. This new station will comprise three platforms, with two platform faces serving Merseyrail and a single platform face serving Northern Rail. Buffer stops will be provided to Merseyrail and Northern Rail to delineate between the two Train Operating Companies. The platforms will be connected by a station access arrangement replicating the operational functionality at the existing Kirkby station.

A new 300 space car park, with passive provision to increase to 500 should demand require, with public transport interchange facilities will be provided at Headbolt Lane.

The scheme has been developed to GRIP stage 3 by Network Rail. Buckingham Group Construction Ltd (BGCL) has been appointed to develop the design to GRIP stage 4, and have appointed Ove Arup and Partners Ltd (Arup) to undertake design services.

Drawings to summarise the anticipated scope of works required for the scheme, prepared to support a recent pre-planning application are presented in Appendix A. It should be noted that GRIP stage 4 design is currently ongoing and as such these may be subject to change as the scheme design develops.

Arup has been commissioned by BGCL to prepare a Ground Investigation Report (GIR) and a Geo-environmental Report to support the GRIP stage 4 design and planning application for the scheme. This report covers both these aspects.

1.2 Objectives

A number of ground related uncertainties were identified in an earlier desk study completed by others [1],[2] and an intrusive ground investigation was recommended.

A ground investigation was designed by Arup to inform GRIP stage 4 design activities and preparation of approval in principle (F001) documents for the scheme.

The purpose of this report is to summarise the findings of this intrusive ground investigation and evaluate the potential impact on the future development by:

- Establishing the general ground profile and ground condition across the site;
- Providing an overview on the groundwater levels below the site;
- Characterising the existing geoenvironmental conditions and providing sufficient information to accompany the planning application to enable conditional planning approval;
- Summarising the existing earthworks within the rail corridor.

The report includes preliminary guidance on the ground-related risks which should be considered within subsequent design and construction phases. Key ground-related risks have also been recorded in the Designers Risk Assessment for the project, with relevant entries presented in Appendix G.

This Ground Investigation Report (GIR) has been prepared in accordance with BS EN 1997 (Eurocode 7 [3]) and NR/L3/CIV/071 [4]. Additionally, it contains the results of geoenvironmental investigations and contamination risk assessment.

The factual data from the ground investigation is provided in the Ground Investigation Factual Report [5].

1.3 Geotechnical category

The scheme has currently been identified to be Geotechnical Category 2 in accordance with BS EN 1997-1:2004, which comprise conventional types of structures, foundations and earthworks design with no exceptional risk or difficult ground or loading conditions.

It is anticipated that a number of design elements within the scheme (primarily bases for ancillary lineside civils structures) will be classed as Category 1 and where appropriate standard Network Rail design details will be used for design.

The Geotechnical Category of the various design elements will be identified in the relevant Form 001.

1.4 Use of report and limitations

This report was prepared by Arup on behalf of BGCL. It takes into account our Client's particular instructions and requirements. This report is not intended for,

and should not be relied on by, any third party and no responsibility is undertaken to any third party in relation to it.

All reasonable skill, care and diligence have been exercised within the timescale available and in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in preparing the report, it is possible that other ground contamination or ground conditions, as yet undetected, may exist and consequently reliance on this report must be limited accordingly.

2 The Site

2.1 Existing land use

The site location is shown in Figure 1. The majority of the site is currently occupied by the existing Liverpool-Wigan rail corridor between the existing Merseyrail Kirkby station to the proposed Headbolt Lane station site. The alignment of the rail corridor is roughly south-west to north-east. For the majority of its length the existing rail corridor is bounded by residential properties to the north and south. A number of overline and underline structures are present along the length of the project, these are discussed further in sections 2.9 and 2.10.

Figure 1: Site Location



Existing rail levels range from ~23.4 mOD in the vicinity of Kirkby station rising to ~29.7 mOD in the vicinity of the proposed Headbolt Lane Station site.

On the approach to Kirkby Station the existing rail alignment is situated in cutting, transitioning to embankment to the east of Kirkby Station. The rail alignment remains on embankment for the majority of the remainder of the site. Within the vicinity of the proposed Headbolt Lane Station the rail alignment transitions briefly to at-grade, before entering a section of low-height embankment and cutting to the east. The earthworks within the project extents are discussed further in section 2.8.

The proposed station and car park area is in an area of undulating grassland bounded to the south by the Liverpool-Wigan railway line, to the north and east by Headbolt Lane, and to the west by the A506, Back Lane. The ground levels within the proposed car park area slope from the north and south forming a valley centred on Kirkby Brook.

Kirkby Brook bisects the proposed car park area, entering the east of the site from the south via a culvert beneath the railway. The brook flows north west to the centre of the site before diverting to the south west exiting the site in the west beneath the A506.

2.2 Existing desk-based reports

A series of desk-based assessments have been produced by Mott MacDonald which include detailed description of the site and the site history. The assessments cover the site as a whole and are listed below:

- Geoenvironmental Desk Study – Headbolt Lane Station, dated August 2018, 139606-MMD-REP-EGE-000003 (Rev A) [1]
- Existing Track Geoenvironmental Desk Study – Skelmersdale Rail Link, dated March 2020, 139606-MMD-REP-EGE-000001 (Rev A) [2]

Further to the above, reports have been produced for the housing estate to the south of the site on St Kevins Drive and are referenced in the wider context to understand the ground conditions in the local areas. The reports that have been reviewed are listed below:

- ALM Consult, Geoenvironmental Appraisal of land to the west of Bramcote Walk, Kirkby – Interpretive Report, dated April 2016 [6]
- ESG, Knowsley Northern Primary Support Centre, Kirkby – Factual Report on Ground Investigation, dated September 2015 [7]

2.3 Historical land use

A detailed review of on-site and off-site history, based on publicly available sources and historical mapping, is presented in the following reports:

- Existing Track Geo-environmental Desk Study, Skelmersdale Rail Link, Mott MacDonald, 139606-MMD-REP-EGE-000001, March 2020 (NB the site is within study area 1 of this report) [2]
- Geo-environmental Desk Study, Headbolt Lane Station, Mott MacDonald, 139606-MMD-REP-EGE-000003, August 2018 [1]

A brief summary of the on-site history is described below.

The existing railway line is shown in its present day alignment on the earliest mapping reviewed which dates from 1850. The line was initially constructed as a two track railway as part of the Liverpool to Bury line which opened in 1848. Historical mapping indicates the line reduced from a two to a one track railway between 1962 and 1972.

Overbridge 57, Underbridge 56 and the existing western span of Underbridge 55 were constructed when the original railway line was established.

Record drawings indicate that the western span of Underbridge 55 (over County Road), was constructed in 1847. The original superstructure was replaced with the existing deck in 1930. In 1970 the remaining two spans of Underbridge 55 (over

A506), intermediate pier and eastern abutment were built as part of works associated with the construction of the present day A506. Significant strengthening works were undertaken on the intermediate pier in 1990 due to deterioration, thought to be the result of Alkali-Silica Reaction (ASR).

The earliest mapping reviewed, dating from 1850, shows the proposed car park and station site to be occupied by agricultural land with a sandstone quarry identified as Mercer's Delf located within the centre of the site, to the north of Kirkby Brook which is shown flowing through the centre of the site from east to west. A small building identified as Tanpit House is shown be located in the centre north of the site off Headbolt Lane.

Mapping dating from 1902 shows the quarry to be no longer present and further development of buildings on the northern boundary of the site adjacent to Headbolt Lane. As the quarry is no longer evident it is assumed to have been infilled.

Mapping from 1972 shows the western portion of Kirkby Brook to have been realigned to its present day alignment; presumably as part of works for construction of the A506, and Headbolt Lane which bounds the site in its present day alignment. The footpath which currently crosses the site from east to west is also shown.

Mapping dating from 1990 no longer shows Tanpit House to be present. The crest of the hill on the northern boundary with Headbolt Lane appears to have moved southwards, suggesting a change of ground levels.

2.4 Published geology

Based on the British Geological Survey (BGS) 1:50,000 scale solid geological map [8], the bedrock present beneath the site comprises the Wilmslow Sandstone of the Sherwood Sandstone Group. Immediately to the west of Kirkby Station is a northwest-southeast trending fault with the Chester Formation of the Sherwood Sandstone Group present to the west of the fault line. The Chester Formation is also indicated to subcrop approximately 400m to the south of the proposed Headbolt Lane Station and car park.

Along the rail alignment between Kirkby Station and Underbridge 56 superficial deposits are generally absent in the west with the eastern half of this section underlain by Glacial Till. Alluvium is present in the vicinity of Underbridge 56 associated with Kirkby Brook.

Between Underbridge 56 and the proposed station and car park area superficial deposits are absent, however wind blown sands of the Shirdley Hill Sand Formation are indicated to be present at the eastern site boundary. It is anticipated that the extent of the Shirdley Hill Sand Formation deposits may extend to the west towards Kirkby Brook and may contain some layers of peat.

No made ground is indicated to be present on the site from geological mapping however, given the site's history and current land use, made ground is anticipated to be present along the entire rail alignment associated with the railway

development. Made ground is also anticipated to be present within the following areas of the proposed station and car park site:

- Area of former Tanpit House in the north of the site;
- Area of sandstone quarry (Mercer's Delf);
- Area of railway line and embankment in the west of the site associated with Headbolt Lane; and
- Area of backfilled former stream channel adjacent to the railway line where it crosses the A506.

2.5 Historical ground investigation

Limited historical BGS borehole data [8] is available for the site. There are no records within the site boundary. A BGS borehole record (SD40SW12) is available 270m north of the proposed car park site drilled at land to the east of Ravenscroft Community Primary School. The ground conditions encountered comprised topsoil to 0.46m bgl over sand to 1.86m bgl over clay to 1.83m bgl and weathered sandstone at 3.05m bgl.

A ground investigation comprising fourteen window sample boreholes and thirty four mechanically excavated trial pits was undertaken for the St Kevins Drive housing estate to the south of the proposed station and car park [6]. The reported ground conditions generally comprised made ground over glacial till over sandstone bedrock. The bedrock was encountered at depths ranging from 3.3-5.2m bgl and is at a level of 24.98-27.9mOD. No significant seepages of groundwater were encountered within the exploratory holes

A request for information (HBL-RFI-034) was submitted for any information held by Network Rail RAM teams (Civil Engineering, Earthworks & Track) within the project extents. No geotechnical information was reported to be held (including historical ground investigation, track bed investigation data and earthwork maintenance records).

2.6 Coal mining risk assessment

The site does not lie within a Coal Authority Coal Mining Reporting Area. A mining risk assessment report was completed by Dunelm Limited in July 2020 [9]. This covered the whole site including the existing rail corridor and proposed car park and station areas. The report states that the site is underlain by sandstone with no known mine workings present and no recorded mine entries within 20m of the site. The mining risk assessment report concludes that the site is not considered to be underlain by shallow workings that would pose a risk to the development of the site and no further action in relation to shallow mine workings is required. A copy of the assessment is presented in Appendix B.

2.7 Hydrogeology and hydrology

The closest surface water features to the site are Kirkby Brook which flows beneath the rail corridor in culvert and through the centre of the proposed car park and Simonswood Brook which flows beneath the rail corridor at Underbridge 56.

The site is not indicated to be at risk of flooding from rivers or sea. Localised flooding associated with Kirkby Brook is indicated to be a risk.

The Environment Agency classifies the Shirdley Hill Sand Formation and Alluvium as Secondary A Aquifers, an aquifer supporting water supplies at a local scale. The Glacial Till deposits are classified as unproductive strata.

The Wilmslow Sandstone Formation and Chester Formation are classified as Principal Aquifers, an aquifer which can provide a high level of water storage and may provide water supply and/or base river flow on a strategic scale.

The site is located within a groundwater Source Protection Zone (SPZ) 3, with several abstractions located to the north and south. The nearest groundwater abstractions are located approximately 2km to the north of the rail alignment.

2.8 Earthworks

Earthwork examination records held by Network Rail within the scheme extents have been reviewed. The earthwork examination database was accessed in July 2020, inspection dates range from January 2013 to March 2020. A high level summary of this information is presented in Table 1.

The earthwork examinations have been undertaken in accordance with the procedure described in NR/L3/CIV/065. It should be noted that for the purpose of identifying earthworks for examination the network is divided into 110 yard (100m) lengths and cuttings or embankments less than 3m high are not classified as earthwork assets and as such are not examined. The earthwork hazard category (EHC) and risk category are both assessed using data obtained from earthwork examination. The EHC is a measure of the statistical likelihood of failure (A is least likely and E most likely). The risk category is an evaluation of the risk posed to the operation of the railway from a variety of failure mechanisms.

Table 1: Summary of data from Earthworks examination records

ELR	Start Mileage	End Mileage	Earthwork Type	Side	EHC	Risk Category	Earthwork Geometry	Summary of Earthwork Characteristics	Movement Indicators
WKL2	28.0770	28.1430	No Earthwork	U		Low Risk	(from topo) 28.1430 at grade, 28.1210 embankment ~2m, <28.1210 embankment ~2m		
WKL2	28.0770	28.1430	No Earthwork	D		Low Risk	(from topo) 28.1430 at grade, 28.1210 embankment ~2m, <28.1210 cutting ~2m		
WKL2	28.1430	29.0440	Soil embankment	U	A	Low Risk	5 to 6m high 32 to 35 degrees	slope vegetated (mature trees and grass/brambles) uniform toe & crest slope to track separation 2 to 3m no earthwork drainage, slope face and toe dry occasional rabbit burrows	29.0108 to 29.0220 local slumping noted
WKL2	28.1430	29.0440	Soil embankment	D	A	Low Risk	3 to 6m high 32 degrees	slope vegetated (mature trees and grass/brambles) uniform toe & crest slope to track separation 2 to 3m no earthwork drainage, slope face and toe dry occasional rabbit burrows	28.1758 to 29.0016 translational failure noted. (NB frequent rabbit burrows present)
WKL2	29.0440	29.0550	No Earthwork	U		Low Risk	(from topo) 29.0440 cutting ~2m, 29.0550 cutting ~2m		
WKL2	29.0440	29.0550	No Earthwork	D		Low Risk	(from topo) 29.0440 at grade, 29.0550 cutting ~2m		
WKL2	29.0550	29.0770	Soil Cutting	U	A	Low Risk	4 to 5m high 30 degree slope	slope vegetated (mature trees and grass/brambles) uniform toe & crest	None noted

ELR	Start Mileage	End Mileage	Earthwork Type	Side	EHC	Risk Category	Earthwork Geometry	Summary of Earthwork Characteristics	Movement Indicators
								slope to track separation 3m no animal activity no cess drainage present, slope face dry	
WKL2	29.0550	29.0880	Soil Cutting	D	A to B	Low Risk	3 to 5m high 30 to 34 degree slope	slope vegetated (mature trees and grass/brambles) uniform toe and crest slope to track separation 3 to 4m no animal activity no cess drainage present, slope face dry	None noted
WKL2	29.0660	29.0770	Rock Cutting	D	B	Low Risk	4m high 90 degree slope	noted as sandstone outcrop midslope distant from track	None noted
WKL2	29.0770	29.0880	No Earthwork	U		Low Risk	(from topo) cutting/retaining wall behind Kirkby station platform		
	29.0880	29.0897	NO DATA	U & D					
WJK	29.0897	29.1210	Soil Cutting	D	B to C	Low to Average Risk	4 to 6m high 28 to 32 degree slope	slope vegetated (mature trees and grass/brambles) slope to track separation 2 to 4m dry slope face (typically) cess drainage present in parts (typically impaired/blocked or unknown condition)	29.0915 to 29.0999 surface issues on lower slope
WJK	29.0897	29.1320	Soil Cutting	U	A	Low Risk	3 to 5m 28 to 36 degrees	slope vegetated (mature trees and grass/brambles) slope to track separation 2 to 4m dry slope face cess drainage present in parts (typically impaired/blocked or unknown condition)	29.1010 to 29.1241 movement indicators noted slope washout, soil creep movement & local slumping at slope face
WJK	29.1210	29.1320	No Earthwork	D		Low Risk	assumed low height cutting		

Notes

Earthworks examination data is reported as Up side (U) and Dn side (D). However only a single line is present within the project extent. Based on topography it is assumed that Up = right cess (back to Liverpool) & Down = left cess.

EHC = Earthwork Hazard Category (where A is least likely, E most likely and N not applicable)

2.9 Services/ Utilities

The desk study reports undertaken previously for the project identified a number of active services/utility crossings within the rail corridor, based on a review of 5-mile plans provided by Network Rail. The services/utilities identified within the project extents are summarised in Table 2.

Table 2: Summary of services/utilities within the project extents

ELR	Miles	Yards	Service/ Utility
WKL2	28	1160	4ft 2" stone arch culvert
WKL2	28	1322	NW 18" stone pipe
WKL2	29	0195	3ft 10" stone arch culvert (Millstream)

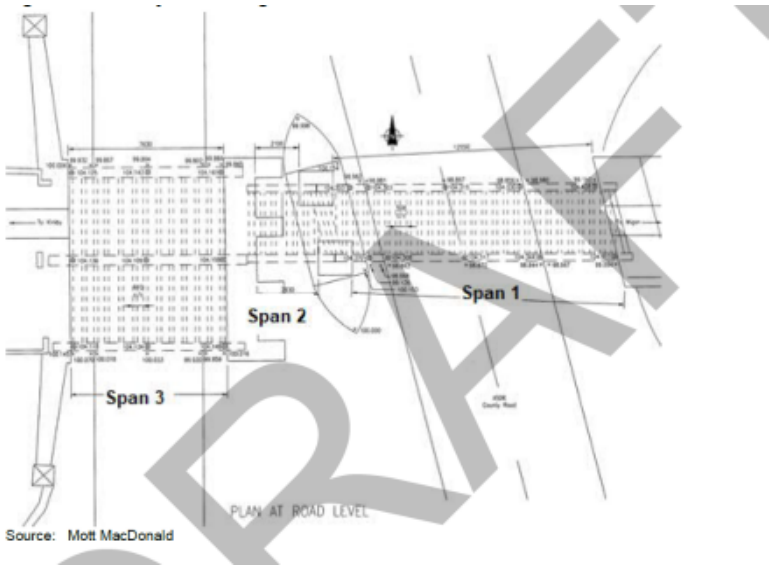
A buried services record search was undertaken by Centara in August 2020 for BGCL to inform the ground investigation works on the site.

2.10 Existing structures

2.10.1 Underbridge 55

Underbridge 55 (located at WKL2, 28m 1590yds) is a three span steel bridge that crosses over the A506 and County Road. Span 3 was constructed in 1847 and spans 1 and 2 added in 1970 to facilitate construction of the A506. The existing pier 2 formed the eastern abutment when the bridge was originally constructed and was modified during the 1970s.

Figure 2: Underbridge 55 layout

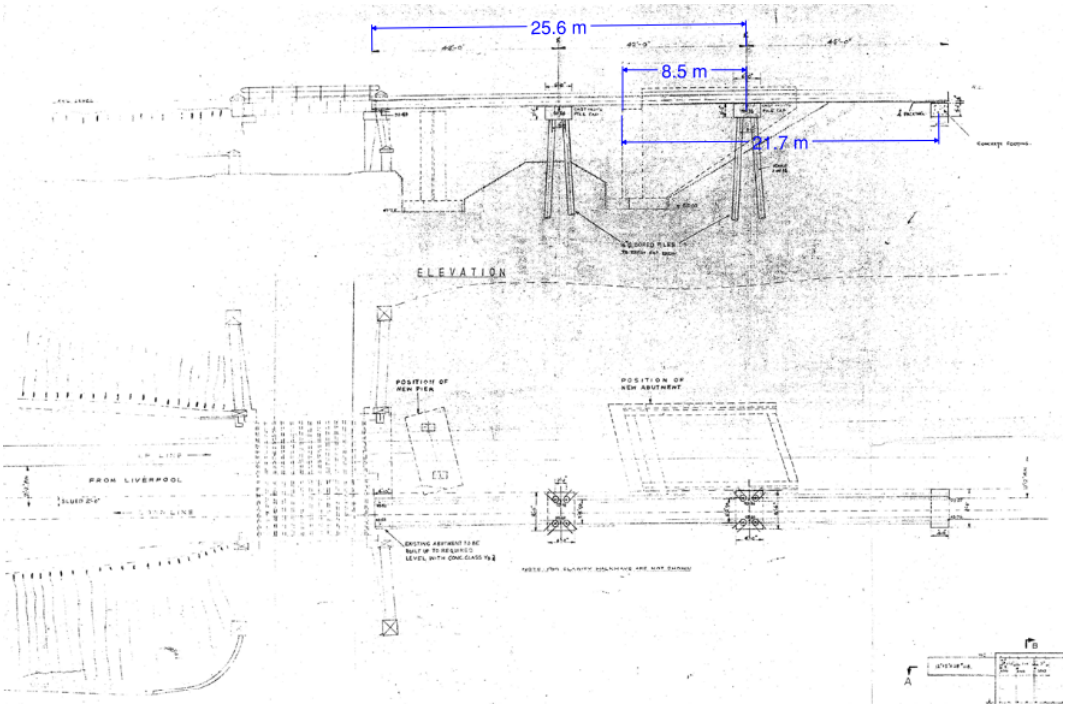


Based on review of published geology, rock is anticipated to be present at shallow depth in the vicinity of UB55. Record drawings held by Network Rail have been reviewed and indicate that all foundations for the existing structure comprise

shallow foundations, which are assumed to bear onto sandstone bedrock. The inferred level of the underside of existing foundations is as follows: pier 2 (21.6mOD), pier 1 (20.3mOD) and east abutment 20.7mOD). Existing road level of A506 is approximately 22mOD.

Record drawings held by Network Rail indicate that temporary works including two groups of four raked bored piles of 16" (~0.4m) diameter were installed as part of the 1970 modification works to UB55 to support a temporary track alignment during construction and are now redundant. The depth of the piles is not clear however it is assumed these extend into underlying rock and that some sub-structure elements remain in place.

Figure 3: Extract from Network Rail drawings showing temporary work (dimensions in m have been added based on scaling from original drawing)



2.10.2 Other structures

Underbridge 56 (located at WKL2, 29m 0145yds) is a two-span masonry arch bridge that crosses over a footpath and the Simonswood Brook.

Overbridge 57 (located at WKL2 29m 0895yds) is a road bridge which carries Glovers Brow over the railway corridor.

A retaining wall (reference WKL2 290820) is located at the back of the Northern platform of Kirkby station, between 29m 0820yrds and overbridge 57 (OB57). The latest Network Rail detailed examination (15th April 2010) notes the wall to be predominantly of stonework construction with a blockwork and brickwork section adjacent to OB57. Retained height vary from 2.1m to 0.5m, reducing in height away from OB57. The wall is noted to be secure but sections are identified to be in poor condition with vegetation clearance and repair works recommended to address defects recorded – which include missing mortar, blocks and bulging .

There are no level crossings within the project boundary.

2.11 Unexploded ordnance

A pre-desk study assessment for unexploded ordnance (UXO) was obtained from Zetica as part of the previous desk study work undertaken. This did not identify any UXO risks on or affecting the site and concluded that a detailed desk study was not necessary. As such the site is considered to be situated in an area with a low risk potential from UXO.

3 Ground investigation

3.1 Overview

A ground investigation scope was designed and specified by Arup and implemented by CC Geotechnical Ltd appointed by BGCL. The works were supervised by CC Geotechnical with occasional site visits from Arup.

The fieldwork was split into two categories as outlined below:

- Rail corridor investigation – to provide geotechnical and geoenvironmental data to input to lineside civil, earthwork widening, structures and track bed designs
- Off track investigation – to provide geotechnical and geoenvironmental data to input to off-track civil works primarily the new station and car park design

The factual findings of the investigations were reported in a factual report produced by CC Geotechnical [5].

The as-constructed ground investigation locations are shown in Appendix C.

In-situ testing was undertaken to gain further understanding of soil strength profile and inform classification and parameter selection for geotechnical design. Standard penetration tests (SPT) were undertaken at regular intervals in cable percussive and windowless sampler holes. Tests undertaken in rock were extended from the standard 50 blows to 100 blows. Pocket penetrometer testing was undertaken at regular intervals in suitable fine-grained soil materials in windowless sampler and automatic ballast sampler holes.

Two soakaway tests were undertaken in trial pits within the proposed car park area.

Selected boreholes were fitted with installations to permit gas and groundwater monitoring. Following completion of the fieldwork, four rounds of monitoring were undertaken between 30th September 2020 and 18th November 2020. Monitoring records are presented in the factual report [5] and assessed in subsequent sections of this report.

A programme of laboratory testing was undertaken to establish the geotechnical and geoenvironmental properties of the ground.

3.2 Rail corridor

As part of the ground investigation, selected intrusive locations were undertaken within the rail corridor. These are summarised below:

- 14 automatic ballast sampler holes (ABS1001 to ABS1013) to depths up to 2m below ground level (bgl) within the 4’ of existing tracks;
- 10 windowless sample holes (WS1201A-B, WS1202, WS1203, WS1205, WS1207, WS1208, WS1210A-D, WS1212, WS1215) to depths up to 6m bgl within the cess of existing tracks;

- 3 windowless sampler holes (WS1204, WS1206, WS1209, WS1211, WS1214) to depth up to 4.6m bgl at the toe/crest of existing embankment/cut slopes;
- 1 cable percussive borehole (BH1301) adjacent to existing UB55 to depths up to 2.8m bgl.

Exploratory holes with letters after hole reference (e.g. WS1201A) denote repeated attempts due to early refusal.

A groundwater sample was obtained from borehole BH1301. The sample was tested for a range of contaminants including metals, inorganics and hydrocarbons.

3.3 Off track

Further to the above, selected exploratory holes were undertaken to provide geotechnical and geoenvironmental data to input to the design of the proposed new station and car park with associated ancillary roadways and crossings. The intrusive locations undertaken in the off track areas at the site are summarised below:

- 10 mechanically excavated trial pits (TP1401 to TP1410) to depths up to 3.5m bgl;
- 4 cable percussive boreholes (BH1302 to BH1305) to depths up to 2.7 m bgl; and
- 2 mechanically excavated pits (SA1 and SA2) to conduct BRE infiltration/ soakaway testing to depths up to 2.2m bgl.

In addition, two surface water samples (SW1601 to SW1602) were obtained from the brook crossing the site. The samples were tested for a range of contaminants including metals, inorganics and hydrocarbons.

4 Ground summary and properties

The ground conditions described in the following sections is predominantly informed by the recent ground investigation, supplemented where appropriate by historical investigation data and desk study sources.

The site has been separated into two main areas, the rail corridor (i.e. within and in close proximity to the Network Rail boundary fence) and the proposed new station and car park. A high level summary of the ground conditions encountered is presented in the following sections, further review and refinement is likely to be required to inform design.

4.1 Rail corridor

4.1.1 Overview

Exploratory holes undertaken within the rail corridor encountered a range of ground conditions influenced by superficial and solid geology and presence of earthworks. As such a series of ground models have been developed, these are detailed in Table 3. It should be noted that the boundaries between the various ground models is indicative and based on a review of both exploratory hole records and topography.

Table 3: Summary of ground models within rail corridor

Project meterage [m]	Network mileage [mm.yyyy]	Earthwork type	Relevant exploratory holes
750 to 1500	29.1283 – 29.463	Cutting	ABS1001 to ABS1007 WS1201B to WS1201A
1500 to 2225	29.463 – 28.1430	Embankment	ABS1008 to ABS1011 WS1202 to WS1209
2225 to 2375	28.1430 – 28.1266	At grade	WS1210
2375 to 2525	28.1266 – 28.1102	Embankment	ABS1012 to ABS1013 WS1211 to WS1212
2525 - 2600	28.1102 – 28.1020	Cutting	ABS1015 WS1215

4.1.2 ~750 to 1500m: existing cutting

Table 4: Ground model 750 to 1500m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0 – 0.2	0.3 - 1	Ballast	

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made ground	0 – 0.8	0.1 – 0.3	Granular track bed material	Not encountered in ABS1001.
Drift Deposits (not encountered in ABS1005, WS1201A and WS1201B)				
Glacial Till deposits	0.85 – 1.2	0.1 – 1.25	Cohesive	Not encountered in ABS1005, ABS1007, WS1201A and WS1201B.
Solid Geology (only encountered between ABS1004 & ABS1007)				
Sandstone	0.25-1.5	0.1 to 0.5 (max proven thickness)	Weathered brown	Not encountered in ABS1001, ABS1002, ABS1003. ABS boreholes report end at shallow depths below ground level. Max thickness proven in WS1201B.

A marked change in ground conditions is evident from the holes in the vicinity of Kirkby Station. To the west of Kirkby Station (ABS1001 to ABS1003) the existing track bed is underlain by Glacial Till whilst rock was encountered at shallow depth in holes within and to the east of the station (including ABS1004 to ABS1006). This is thought to be due to the presence of a fault shown to the west of Kirkby station on published geological mapping.

4.1.3 ~1500 to 2225m: existing embankment

Table 5: Ground model 1500 to 2225m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0 – 0.2	0.2 – 0.6	Ballast	
Made ground	0.3 – 0.8	0.35 – 1.2	Granular track bed material	
Made ground	0.75 – 1.6	0.55 – 4.4	Cohesive embankment fill	
Made ground	0.9	4.6	Granular embankment fill	Only present in WS1208
Drift Deposits				
Glacial Till deposits	1.3 – 5.2	0.2 – 1.1	Cohesive	Not encountered in ABS1008. ABS1009, ABS1010,

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
				ABS1011, WS1208.
Glacial Till deposits	4 – 4.7	0.4 – 0.5	Granular	Not encountered in ABS1008, ABS1009, ABS1010, ABS1011, WS1208.
Solid Geology				
Sandstone	2.4 – 5.5	0.25 to 1.5 (max proven thickness)	Weathered brown	Not encountered in ABS1009, ABS1010, ABS1011, WS1207, WS1208. Max thickness proven in WS1202.

4.1.4 ~2225 to 2375m: existing at-grade

Table 6: Ground model 2225 to 2375m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0	0.4	Topsoil	
Solid Geology				
Sandstone	0.4	0.6 (max proven)	Weathered brown	Max proven thickness in WS1210.

4.1.5 ~2375 to 2525m: existing embankment

Table 7: Ground model 2375 to 2525m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0 – 0.2	0.3 – 0.85	Ballast	
Made ground	0.3 – 1.05	0.3- 1.15	Granular track bed material	
Made ground	1.2	1.5	Cohesive embankment fill	Encountered only in WS1212.
Solid Geology				

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Sandstone	2.7	1 (max proven thickness)	Weathered brown	Encountered only in WS1212, max thickness proven.

4.1.6 ~2525 to 2600m: existing cutting

Table 8: Ground model 2525 to 2600m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0 – 0.2	0.3 – 0.65	Ballast	
Made ground	0.3 – 0.85	0.1 – 1.2	Granular track bed material	
Drift Deposits				
Glacial Till deposits	0.95 – 1.5	1.25 - 3	Cohesive	
Solid Geology				
Sandstone	4.5	0.1 (max proven thickness)	Weathered brown	Not encountered in ABS1015. Max thickness proven in WS1215.

4.1.7 Made ground

4.1.7.1 Extent and description

Made ground was encountered in the following holes undertaken within the rail corridor and its proximity: ABS1001 to ABS1011, ABS1013, ABS1015 and WS1201 to WS1203, WS1205, WS1207, WS1208 and WS1212. This comprised a layer of ballast in all cases, typically underlain by granular track bed material and for the majority of the project extent embankment fill.

Ballast

Ballast was encountered in all holes undertaken on or adjacent to the existing tracks. This was typically described as dirty or very dirty ballast, although some holes within the existing 4' reported a thin (up to 150mm thick) layer of clean ballast to be present at ground level.

A layer of pitching stones (described as coarse granite cobbles and typically 150mm thick) were encountered underneath the ballast within the Kirby station area west of OB57. The pitching stones were encountered in ABS1002, ABS1003 and ABS1004 located between ~850 to ~1050. The exact limits of the pitching

stones is not known but they were not encountered in ABS1001 or ABS1005 located at ~ 750m and 1150m respectively.

Granular track bed material

All holes undertaken on or adjacent to existing track alignment (i.e. within the 4' and cess of the existing track alignment) encountered a layer of blanketing material below the ballast. The thickness of this layer ranged from 0.1m to 1.2m but was typically ~0.7m.

Generally, this comprised a layer of ashy fill, described as brown silty sandy gravel, where gravel is fine to coarse angular to sub-angular ash and granite, underlain by a layer of light brown silty gravelly sand, described as loose brown silty fine to medium grained sand. This material is thought to represent a combination of the blanketing material and granular embankment fill used to form the original track bed and seal the cohesive fill used to form the core of the existing embankment.

No visible or olfactory evidence of contamination was reported in any of the locations.

Embankment fill

In on-line holes undertaken where the rail corridor is located on embankment the granular blanketing material overlies embankment fill. In all locations (apart from WS1208) this was reported to be cohesive in nature, typically described as brown sandy gravelly silty clay. The thickness of this layer ranged from 0.55m to 4.4m (typically 2.7m) increasing with embankment height.

At WS1208 the embankment fill was reported to be predominantly granular, typically described as a medium dense brown silty gravelly fine to medium sand to 5m depth, with clay bands present (0.4m as maximum thickness).

A possible relict soil surface was encountered in a number of holes, including WS1207 (3.6 to 4.1m depth) and WS1208 (5 to 5.5m depth). This was reported as a soft brown slightly sandy slightly gravelly silty clay with sand lenses and silty organic sand.

4.1.7.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for ballast, blanketing material and for both cohesive and granular embankment fill are presented in

Table 9 to 12.

Table 9: Summary of classification tests in ballast material

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	4	22.44 – 29.76 [0.2 to 0.8]	**Gravel content**: 87 to 100 **Sand content**: 0 to 10 **Clay and silt content**: 0 to 3		Consistent with material descriptions on engineer logs (ABS1004, ABS1008, ABS1011, ABS13).

Table 10: Summary of classification tests in granular track bed material

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	8	23.58 – 29.53 [0.5 to 0.9]	**Gravel content**: 51 to 88 **Sand content**: 9 to 41 **Clay content and silt content**: 3 to 11		Consistent with material descriptions on engineer logs.

Table 11: Summary of classification tests in cohesive embankment fill

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	3	24.34 – 26.72 [1 to 2]	**Gravel content**: 3 to 18 **Sand content**: 20 to 44 **Silt content**: 36 to 57 **Clay content**: 18 to 20		Consistent with material descriptions on engineer logs.
Moisture Content (%)	7	24.09 – 27.35 [1.4 to 2.1]	12 to 20	16.1	
Liquid Limit (%)	6	24.09 – 27.35 [2.1 to 4]	27 to 39	30.8	
Plastic Limit (%)	6	24.09 – 27.35 [2.1 to 4]	13 to 19	15.2	
Plasticity Index (%)	6	24.09 – 27.35 [2.1 to 4]	13 to 20	15.7	

Table 12: Summary of classification tests in granular embankment fill

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	1	25.15 [3]	**Gravel content**: 4 **Sand content**: 82 **Clay and silt content**: 14		Consistent with material descriptions on engineer logs (WS1208).
Moisture Content (%)	2	23.35 – 25.15 [3 to 4.8]	9.6 to 12	10.8	

A summary of SPT N values obtained from made ground materials, specifically in cohesive and granular embankment fill, is presented in Table 13.

Table 13: Summary of SPT N values in made ground

Stratum	No. of SPT N results	Level (mOD)	SPT N range values	SPT N mean value
Cohesive embankment fill	9	22.66 to 28.05	4 to 10	6.7
Granular embankment fill	5	22.85 to 26.85	10 to 18	13.2

Within cohesive materials SPT 'N' values can be used to derive undrained shear strength (c_u). Based on cu = 5.5 x N (Stroud, 1989 for a typical plasticity index of about 20) [10] this indicates an undrained shear strength (c_u) of 22 to 55kPa.

Pocket penetrometer testing was undertaken on soil samples recovered from windowless sample holes. Within cohesive embankment fill materials reported undrained shear strength values ranged from 30 to 90kPa (from sixteen tests).

There is no clear correlation between measured or derived undrained shear strength with depth, but values are generally consistent with descriptions on engineer logs.

Table 14: Summary of SPT hand vane peak values in embankment fill

Stratum	No. of Hand Vane results	Level (mOD)	Hand Vane peak range values
Cohesive embankment fill	16	22.68 to 27.85	30 to 90

4.1.8 Superficial deposits

4.1.8.1 Extent and description

Glacial Till deposits

Glacial Till, comprising cohesive and granular deposits, was encountered in the majority of exploratory holes undertaken within the rail corridor cutting (from 750

to 1500m and from 2525 to 2600m), and in its proximity, at the crest and toe of embankment (from 1500 to 2225m).

Reported depths ranged from 0.6m to 4.7m with the base of the strata proven in all locations. A variation in composition with depth for both the cohesive and granular deposits has been identified. Material descriptions range from soft to stiff clay for the cohesive deposits, typically described as brown slightly sandy silty clay overlying the bedrock. The granular deposits range from loose to medium dense sand, typically described as brown silty sand.

4.1.8.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for Glacial Till deposits are presented in Table 15 respectively.

Table 15: Summary of classification tests in Glacial Till deposits

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	2	21.78 – 23.58 [0.8 to 4.5]	**Gravel content**: 51 **Sand content**: 41 **Clay and silt content**: 8		Consistent with granular material descriptions on engineer log ABS1006.
			Gravel content: 1 **Sand content**: 26 **Silt content**: 40 **Clay content:** 33		Consistent with cohesive material descriptions on engineer log WS1203.
Moisture Content (%)	14	21.52 – 29.22 [1.2 to 4.5]	13 to 32	22.5	Cohesive Glacial Till deposits
Liquid Limit (%)	7	21.52 – 29.22 [1.2 to 4.5]	27 to 41	32.6	Cohesive Glacial Till deposits
Plastic Limit (%)	7	21.52 – 29.22 [1.2 to 4.5]	13 to 20	15.7	Cohesive Glacial Till deposits
Plasticity Index (%)	7	21.52 – 29.22 [1.2 to 4.5]	14 to 21	16.9	Cohesive Glacial Till deposits

SPT testing was conducted in the glacial till at a range of depths, totalling 7 tests. SPT ‘N’ values in the cohesive layer were between 4 and 31, typically increasing with depth. Based on cu = 5.5 x N (Stroud, 1989 for a typical plasticity index of about 20) [10], this indicates an undrained shear strength (cu) of around 22 to 170kPa, indicative of a soft to stiff clay which broadly corresponds to the soil descriptions.

A summary of SPT N values obtained from Glacial Till deposits is presented in Table 16.

Table 16: Summary of SPT N values in Glacial Till deposits

Stratum	No. of SPT N results	Level (mOD)	SPT N range values	SPT N mean value
Cohesive Glacial Till deposits	4	20.98 to 23.84	4 to 31	17.5
Granular Glacial Till deposits	3	21.98 to 22.82	5 to 15	10

Table 17: Summary of Hand Vane peak values in Glacial Till deposits.

Stratum	No. of Hand Vane results	Level (mOD)	Hand Vane peak range values
Cohesive Glacial Till deposits	25	20.81 to 28.52	5 to 110

4.1.9 Bedrock deposits

4.1.9.1 Extent and description

The underlying bedrock was encountered in the all the logs undertaken within the rail corridor and its proximity, at the crest and toe of embankment, apart from ABS1001 to ABS1003, ABS1009 to ABS1015 and WS1207.

Locations which reported sandstone at shallow depth (< 1m) were ABS1005 WS1201 ABS1007 (~1150 to 1400) and WS1210 (~2300).

In most locations there is a layer of completely weathered sandstone which was typically recovered as a silty gravelly sand with gravel of sandstone. Depths to the top of the completely weathered sandstone ranged from 0.4m to 2.7m below ground level. The completely weathered sandstone was between 0.2m and 1.6m thick.

Where encountered, the sandstone beneath the completely weathered layer was described as a weathered reddish brown sandstone, recovered as a slightly silty slightly gravely sand. Depths to the top of sandstone ranged from 0.25m to 4.5m below ground level, typically within the range 0.7m to 2.4m. The base of sandstone was not proven with holes terminating 0.1m to 1.5m below rockhead level.

No visual or olfactory evidence of contamination was reported in any of the locations.

BH1301 was undertaken adjacent to UB55. This reported sandstone bedrock at 2.2m depth (~21.3mOD) with 0.6m penetration achieved. This suggests the original foundations (existing pier 2) are founded at rockhead, potentially within weathered material, and the more recent foundations (existing pier 2) are located ~1m below rockhead, potentially within more competent material.

4.1.9.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for sandstone within the rail corridor is presented in Table 18.

Table 18: Summary of classification tests in weathered sandstone

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	2	23.52 – 25.3 [0.9 to 1]	**Gravel content**: 0 to 58 **Sand content**: 31 to 95 **Clay + silt content**: 5 to 11		Consistent with material descriptions on engineer logs
Moisture Content (%)	1	28.76 [2.2]	13		ABS1013

SPT 'N' values in the Sandstone were 9 to 750 and a mean value of 219. Lower values were recorded in completely weathered sandstone material. Typical SPT 'N' values ranged from 60 to 375 which corresponds to a very weak to weak rock with a UCS of 0.6 to 3.75MPa

A summary of SPT N values obtained from sandstone is presented in Table 19.

Table 19: Summary of SPT N values in sandstone

Stratum	No. of SPT N results	Level (mOD)	SPT N range values	SPT N mean value
Sandstone	21	19.98 – 28.81	9 - 750	219

4.1.10 Summary of derived parameters

A summary of derived soil parameters for stratum encountered within the railway corridor is presented in Table 20. These values are a preliminary assessment only and should be reviewed before being used for design:

Table 20: Summary of parameters within the railway corridor

Geotechnical Parameter	Derived Value	Basis
Made Ground (granular track bed material)		
Bulk Unit Weight, γ [kN/m^3]	19 to 21	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	30 (minimum)	Based on soil description
Made Ground (cohesive embankment fill)		
Bulk Unit Weight, γ [kN/m^3]	17 to 19	Based on soil descriptions & typical values in BS8002

Geotechnical Parameter	Derived Value	Basis
Undrained shear strength, c_u, [kN/m2]	30 to 90	Based on soil descriptions and in-situ testing (SPT & hand shear vane)
Angle of shearing resistance, φ' [°]	28 to 32	Based on soil descriptions and correlation with PI
Made Ground (granular embankment fill)		
Bulk Unit Weight, γ [kN/m^3]	20	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	34 (minimum)	Based on soil descriptions & typical values in BS8002
Glacial Till		
Bulk Unit Weight, γ [kN/m^3]	17 to 19	Based on soil descriptions & typical values in BS8002
Undrained shear strength, c_u, [kN/m2]	20 to 100	Based on soil descriptions and in-situ testing (SPT & hand shear vane)
Angle of shearing resistance, φ' [°]	28 to 34	Based on soil descriptions, correlation with PI and in-situ testing (SPT)
Weathered Sandstone		
Bulk Unit Weight, γ [kN/m^3]	20 to 22	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	38 (minimum)	Based on soil descriptions and in-situ testing (SPT)
Intact Sandstone		
Bulk Unit Weight, γ [kN/m^3]	20 to 22	Based on soil descriptions & typical values in BS8002
Unconfined Compressive Strength [MN/m^2]	0.8 (minimum)	Based on soil descriptions and in-situ testing (SPT)

4.2 Station and car park

The sequence and type of geological strata identified in the ground investigation are summarised in Table 21. This summary is based on the exploratory holes in the recent ground investigation (TP1401 to TP1410 and BH1302 to BH1305).

Table 21: Stratigraphy summary station and car park

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground				
Topsoil	0	0.05 - 0.5		Not encountered in BH1303.
Made Ground	0.05 - 1.4	0.5 – 1.6 (proven) 3.1 (unproven)	Granular	Thickness unproven in TP1405.

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground	0 – 0.8	0.25 - 1	Cohesive	Encountered in BH1303 and in TP1408.
Solid Geology				
Sandstone	0.5 - 3.5+	2.4 (max proven)	Weathered brown	Boreholes terminated at shallow depths in bedrock. TP1405 excavated to 3.5m and did not encounter bedrock.

4.2.1 Made ground

4.2.1.1 Extent and description

Made ground was encountered in all off-line holes undertaken within the proximity of the proposed station and car park.

Outside the extent of the former quarry reported depths to underside of made ground ranged from 0.5m to 2m bgl, typically 0.5m to 1.5m bgl, with the base of the strata proven in all locations.

Historical mapping shows a quarry within the car park area (north of Kirkby Brook) and former provides an indication of its extent. BH1303 was undertaken close to the centre of the mapped extent and TP1404 some 5 m to the east. Made ground depths of 2 & 3.1 were encountered in BH1303 and TP1404 respectively. The base of made ground was not proven in TP1404 and whilst sandstone was reported for 0.7m below base of made ground in BH1303 it is possible that this may be a sandstone boulder within quarry infill rather than bedrock.

In the majority of locations, the made ground was reported as a predominantly coarse grained material typically described as dark brown silty gravelly fine to medium sand, (brick, ceramic and inclusions of plastic). In a limited number of locations (BH1303 & TP1408) it was reported as a predominantly fine grained material; typically described as sandy slightly gravelly silty clay, gravel is fine to medium subrounded mudstone and red brick, and sand is fine to coarse. The composition of made ground encountered within the former quarry (TP1404 & BH1303) was not significantly different from that reported elsewhere on the site.

No visual signs of contamination were reported in any of the locations, but a strong fuel smell was reported in BH1303 at a depth of 1.4 to 2m bgl.

No relict substructures where encountered within the made ground, including TP1409 & TP1410 which were located within the vicinity of buildings shown on historical mapping.

4.2.1.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for made ground is presented in Table 22.

Table 22: Summary of classification tests in made ground

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	5	24.09 – 30.01 [0.6 to 1.2]	**Gravel content**: 3 to 37 **Sand content**: 52 to 71 **Clay and silt content**: 8 to 26		Consistent with material descriptions on engineer logs
Moisture Content (%)	14	24.09 – 30.01	24 to 28	26	
Liquid Limit (%)	1	29.24	25		Cohesive made ground in TP1408
Plastic Limit (%)	1	29.24	13		Cohesive made ground in TP1408
Plasticity Index (%)	1	29.24	12		Cohesive made ground in TP1408

A single SPT test was undertaken in the granular made ground at BH1303 at 26.68mOD (1.2 mbgl), returning an SPT 'N' of 4.

Five tests were undertaken on bulk samples obtained from trial pits to establish dry density vs moisture content relationship using light compaction (2.5kg rammer). Sample depths ranged from 0.7 to 2.0m. Reported maximum dry densities ranged from 1.84 to 1.89 with optimum moisture content of 15 to 13% respectively, on average 95% maximum dry density achieved for a moisture content range of 10.7 to 17.7%. Moisture content testing indicates the soils to be wet of optimum, meaning that at natural moisture content achievable compaction will be less than 95% maximum dry density.

4.2.2 Bedrock deposits

4.2.2.1 Extent and description

The underlying bedrock was encountered in all the locations undertaken within the proximity of the proposed station and car park, apart from TP1405 located within the proximity of the former quarry and excavated to a depth of 3.5m.

Depths to top of sandstone ranged from 0.2m to 3.2m below ground level, typically within the range 0.8m to 3m. The base of sandstone was not proven with holes terminating 0.6m to 2.4m below rockhead level.

In most locations, it was typically described as weathered reddish brown sandstone, in BH1302, 1303, 1305 and TP1404 it was recovered as silty gravelly sand.

No visual or olfactory evidence of contamination was reported in any of the locations.

4.2.2.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for sandstone within car park and station is presented in Table 23.

Table 23: Summary of classification tests in sandstone

Laboratory Test	No. of tests	Sample Level range (mOD)	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	5	24.51 – 29.54	**Sand content**: 21 to 97 **Gravel content**: 12 to 60		
Moisture Content (%)	7	23.29 – 29.54	6 - 18	12.4	

SPT testing was conducted in the sandstone at depths of 0.2-1.3 below the rock surface and vary from 68 to 429. This corresponds to an extremely weak to very weak rock with a UCS of 0.7-4.3MPa.

Table 24: Summary of SPT N values in sandstone

Stratum	No. of SPT N results	Level range (mOD)	SPT N range values	SPT N mean value
Sandstone	10	24.42 – 28.11	68 - 429	160

Two soakaway tests were undertaken in SA1 and SA2 in accordance with the methodology outlined in BRE 365 to assess the infiltration rate within the weathered and competent sandstone strata. The logs and calculation sheets are presented in the CCG Factual Report [5]. The infiltrations rates obtained were $1.41x10^{-05}$ m/s (SA1) and $1.35x10^{-05}$ m/s (SA2).

4.2.3 Summary of derived parameters

A summary of derived soil parameters for stratum encountered within the proposed station and car park area is presented in Table 25. These values are a preliminary assessment only and should be reviewed before being used for design:

Table 25: Summary of parameters within the station and car park

Geotechnical Parameter	Derived Characteristic Value	Basis
Made Ground		
Bulk Unit Weight, γ [kN/m^3]	17 to 19	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	32 (minimum)	Based on soil descriptions and in-situ testing (SPT)
Weathered Sandstone		
Bulk Unit Weight, γ [kN/m3]	20 to 22	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	38 (minimum)	Based on soil descriptions and in-situ testing (SPT)
Intact Sandstone		
Bulk Unit Weight, γ [kN/m3]	20 to 22	Based on soil descriptions & typical values in BS8002
Unconfined Compressive Strength [MN/m2]	0.8 (minimum)	Based on soil descriptions and in-situ testing (SPT)

4.3 Groundwater

4.3.1 Groundwater encountered during fieldworks

Groundwater strikes was encountered during the fieldworks as summarised below in Table 26.

Table 26: Summary of groundwater strikes

Location	Strata	Groundwater strike depth (m bgl)	Comments
WS1207	Made ground (embankment – cohesive)	3.0	Described as a slight seepage
WS1214	Superficial deposits (granular)	2.3	Described as groundwater strike
WS1215	Made ground (granular)	0.8	Described as surface water

Groundwater were not encountered at any of the other intrusive locations during the field works.

4.3.2 Groundwater monitoring

Twelve window sample boreholes and five cable percussive boreholes were installed with a single 50mm combined gas and groundwater monitoring standpipe. The standpipes in the window sample boreholes have been monitored on four occasions between 30th September 2020 and 18th November 2020. The standpipes in the cable percussive boreholes have been monitored on three occasions between 7th October 2020 and 18th November 2020.

The installation details and the range of depths to groundwater recorded during monitoring undertaken to date are summarised in Table 27.

Table 27: Summary of groundwater monitoring

Location	Response zone (m bgl)	Response zone stratum	Groundwater depth during monitoring visits (m bgl)	Site area
WS1202	1 – 2.4	Superficial Deposits	1.43 to 1.8	Railway embankment crest
WS1203	1 - 4	Made Ground	Dry	Railway embankment crest
WS1204	0.5 – 2.3	Sandstone	Dry	Railway embankment toe
WS1205	1 - 5	Made Ground	Dry	Railway embankment crest
WS1206	0.5 – 3.1	Sandstone	2.37 to 2.52	Railway embankment toe
WS1207	3 – 6	Made Ground	Dry	Railway embankment crest
WS1208	1 – 4	Made Ground	Dry	Railway embankment crest
WS1209	0.5 – 1.7	Sandstone	0.34 to 1	Railway embankment toe
WS1211	0.5 – 2.2	Sandstone	1.44	Railway embankment toe
WS1212	2.7 – 3.7	Sandstone	Dry	Railway embankment toe
WS1214	0.5 – 4.6	Superficial Deposits	1.31 to 2.4	Railway embankment toe

Location	Response zone (m bgl)	Response zone stratum	Groundwater depth during monitoring visits (m bgl)	Site area
WS1215	0.5 – 1.4	Made Ground	0.27 to 0.6	Railway embankment crest
BH1301	1 – 2.8	Sandstone	1.62 to 2.07	Bridge 55
BH1302	0.5 – 1.8	Sandstone	1.35 to 1.65	Station
BH1303	1.4 – 2.7	Sandstone	Dry	Car park
BH1304	1.0 – 1.3	Sandstone	Dry	Central culvert crossing
BH1305	1.4 – 2	Sandstone	1.57	Eastern culvert crossing

5 Geoenvironmental screening assessment

5.1 Conceptual site model

5.1.1 Introduction

A conceptual model describes the scenario in which the risks to human health and the environment posed by contaminated land are assessed. It describes the ground and surface conditions, the proposed ground works and the final form of the development. In particular, the model identifies and describes the sources of the potential contamination, the behaviour of the contamination in environmental media such as soil and groundwater, surface water and air. It also identifies and characterises potential human health and environmental receptors, and plausible pathways.

The potential risks to human health and the environment have been considered in the context of a conceptual source-pathway-receptor model of the site, identifying:

- The principal pollutant hazards associated with the site (the sources);
- The principal receptors at risk from the identified hazards; and
- The existence, or absence, of plausible pathways which may exist between the identified hazards and receptor.

For risks to be present at the site, all three elements (source-pathway-receptor) of a plausible pollutant linkage must be present. Potential source-pathway-receptor linkages are described below based on the assumption that the site will be redeveloped for commercial use in the form of a new station building and car park with associated works along the existing rail corridor to provide the new twin-track arrangement.

5.1.2 Potential sources

The existing rail alignment has been present since the mid-1800s. The proposed station and car park area was historically agricultural land and later a quarry with associated out houses before its current use as public open space. The site has a history of earthworks in the form of level changes associated with land reprofiling and surface water and utility diversions. The historical activity on site will contribute to the potential sources of contamination that may be present. A summary of potential contaminants that could be associated with historical activity on site are provided in Table 28.

Table 28: Summary of potential contaminants

Potential source	Potentially contaminative materials	Comments
Made ground (demolition material/ infilled quarry/ railway)	Asbestos Heavy metals Petroleum hydrocarbons Polycyclic aromatic hydrocarbons (PAH) Ground gases (methane, carbon dioxide)	Made ground deriving from building demolition of historical buildings on site (Tanpit House) could contain asbestos. Potential contamination also associated with railway line, quarry and infilling The generation of ground gas will depend on the thickness and organic content of made ground.

5.1.3 Potential receptors

Receptors that may be present during construction and after completion of the development include:

- Construction workers, site workers/visitors and site neighbours during construction;
- Site workers/visitors post-construction;
- Groundwater within the Sherwood Sandstone (Principal Aquifer) and Shirdley Hill Sand Formation (Secondary A Aquifer); and
- Kirkby Brook.

5.1.4 Potential pathways

Potential pathways that may be present during redevelopment and operation include:

- Human health - ingestion of soils or dust;
- Human health - inhalation of dust, vapour or ground gas;
- Human health - dermal contact with soils;
- Controlled waters - migration of dissolved phase contamination within groundwater;
- Controlled waters (and human health by vapours) – transport of non-aqueous phase contaminants;
- Ground gas - ingress of ground gas into buildings.

5.1.5 Summary of potential pollutant linkages

A summary of the potential pollutant linkages identified based on the findings of the ground investigation in relation to the site is presented in Table 29. Overall a low risk from site contamination was identified at the site.

Table 29: Summary of potential pollutant linkages

Sources	Pathways	Receptors	Comments
Potentially impacted made ground soils	Dermal contact with soils Inhalation of dust or vapour Ingestion of dust, soil	Construction workers	No significant contamination identified in soils beneath the site which is considered to pose a risk to future site users. Standard good health and safety practices to be applied
Ground gases	Accumulation of gases in confined spaces producing asphyxiation and explosion risk	Future site users of Headbolt Station	No significant sources of ground gas expected on site. Ground gas monitoring undertaken to date indicates that the risk from ground gas to site end users is negligible
Leachable contaminants in the made ground	Vertical infiltration of leachate Lateral movement along service pipe/trenches	Groundwater	No significant contamination identified in soils beneath the site. Limited localised pockets of perched groundwater were recorded during the ground investigation. Hardstanding/ building slab will limit infiltration and leachate production.

5.2 Data screening

The laboratory analytical results and field data collected during the ground investigation have been screened against current published or internal guideline values in order to provide an initial assessment of the potential contamination status of the site. The data for soil, water and ground gas have been assessed separately, as presented in the sections below.

5.3 Soil screening assessment

5.3.1 Methodology

To simplify the assessment of ground contamination risks, the statutory guidance suggests that generic soil quality guideline values may be used for the initial screening of soil contamination testing results. Generic assessment criteria (GAC) and site-specific assessment criteria (SSAC) can be calculated using the software version of the Contaminated Land Exposure Assessment (CLEA) model. The model estimates human exposure (children and adults) to soil contaminants for those potentially living, working and/or playing on contaminated sites over long time periods (chronic exposure). The CLEA model does not consider short-term (acute) risks to humans, such as those which may arise during construction activities, or the risks posed by contaminated groundwater.

Soil guideline values (SGVs) generated using the CLEA software and accompanying toxicological reports have been issued by the Environment Agency

(EA) for eleven contaminants. Arup has produced GAC using risk assessment software (CLEA v1.06) in accordance with the CLEA assessment framework for the four standard CLEA end uses (residential with plant uptake, residential without plant uptake, allotments, and commercial) and for soil organic matter (SOM) values of 1%, 2.5% and 6%.

5.3.2 Soil assessment criteria – commercial end use

The soil results have been compared against screening criteria for a commercial end use. The key input parameters are summarised in Table 30. Full details on the input parameters and background research can be provided upon request. The GACs have been developed using a Soil Organic Matter (SOM) value of 6%, which has been selected based on the average SOM content of the soils sampled on site.ining

Table 30: Summary of key input parameters

Parameter	Unit	Value (commercial end use)
Age Range (critical receptor)	Years	16-65 (Female)
Exposure Frequency	days/yr	230
Exposure duration outdoor	hr/day	1
Soil to skin adherence factor	mg cm^{-2} day^{-1}	0.14
Maximum exposed skin fraction	m^2/m^2	0.08
Soil and dust ingestion rate	mg/day	50
Inhalation rate	m^3/day	13.4

5.3.3 Soil screening results

The results of the human health screening assessment are presented in Appendix E1. A total of 62 soil samples were screened for a variety of contaminants.

All contaminants have been reported below their respective screening criteria for a commercial end use and are considered unlikely to pose a significant risk to future site users.

There is a potential risk to construction workers who may come into direct contact with contaminated soils, particularly during earthworks. However, exposure periods are generally shorter than those experienced by long term site users and can usually be reduced to an acceptable level through adoption of adequate health and safety procedures.

Asbestos was not identified in any of the soil samples tested. However, asbestos may be present (as yet undetected) and it would be prudent to proceed assuming a potential risk during earthworks and construction works where soils are disturbed, as this may allow fibres to be released into ambient air. Appropriate mitigation measures should be applied to protect construction workers and site neighbours and should be designed and implemented by a competent contractor. Mitigation measures should include as a minimum dust suppression and appropriate PPE.

The results indicate that the existing soils within the site are likely to be chemically suitable for reuse as part of the development and that no specific remediation is likely to be required with respect to the protection of human health.

5.4 Controlled waters screening assessment

5.4.1 Controlled waters assessment criteria

Groundwater and surface water test results have been screened against criteria based on the lowest published value of freshwater Environmental Quality Standards (EQS) and UK drinking water standards (DWS) to identify potential contaminants of concern. Where no EQS values are available the results have been compared to EU drinking water standards (EUDWS) or World Health Organisation standards (WHO).

5.4.2 Controlled water screening results

Two surface water samples (SW01 and SW02) from Kirkby Brook upstream and downstream of the station and car park area and one sample of groundwater (BH1301) were obtained during the ground investigation. The contaminants which exceed the screening criteria are summarised in Table 31. This assessment is also presented as Appendix E2.

Table 31: Exceedances of water screening criteria

Determinand	Screening criteria	Exceedances
Manganese	30 µg/l	BH1301 (917 µg/l)
Selenium	10 µg/l	BH1301 (44 µg/l)
Anthracene	0.1 µg/l	BH1301 (0.34 µg/l)
Fluoranthene	0.0063 µg/l	BH1301 (3.69 µg/l) SW01 (0.09 µg/l) SW02 (0.14 µg/l)
Benzo(a)pyrene	0.00017 µg/l	BH1301 (3.37 µg/l) SW01 (0.06 µg/l) SW02 (0.1 µg/l)

In general, the groundwater and surface water testing indicates that the majority of contaminants tested are recorded below the screening criteria.

Elevated concentrations of manganese and selenium were recorded in the groundwater in BH1301. Manganese and selenium are known to be naturally present within groundwater in the Sherwood Sandstone in this region of the UK. Due to the lack of significant contamination identified in the made ground it is considered unlikely that the site is the source of elevated manganese and selenium groundwater concentrations.

Elevated concentrations of PAHs were recorded in the groundwater (anthracene, fluoranthene and benzo(a)pyrene)) and both surface water samples (fluoranthene and benzo(a)pyrene) and it is possible that the made ground may be a contributory

source, however no significant hydrocarbon contamination was recorded within the soils.

Due to the limited of groundwater encountered during the investigation and the lack of significant contamination identified in the made ground any risk posed from soil contamination is considered to be negligible.

5.5 Gas monitoring

Made ground can be a source of ground gases, however at the site significant organic material that could be considered a potential source of ground gases has not been identified. A plausible pollutant linkage between site users and any ground gases accumulating in the station buildings to asphyxiating or explosive concentrations was identified in the conceptual site model. Ground gas monitoring was undertaken upon completion of the recent ground investigation and a generic risk assessment has been undertaken following the guidance outlined in CIRIA C665 [12] the results of which are described below. V low risk

5.5.1 Methodology

The risk posed to buildings by hazardous ground gases has been assessed in accordance with CIRIA C665 [12] and British Standard guidance [13] and follows the source-pathway-receptor model.

5.5.2 Gas monitoring results

To date, a total of four rounds and three rounds of gas monitoring have been completed for twelve standpipes and five standpipes respectively installed within the site as part of the recent ground investigation. The cable percussive borehole installations have only been monitored three times as they were not drilled at the time of the first monitoring round. Atmospheric pressures during the monitoring to date have ranged from 989 to 1006 mb.

The results of the gas monitoring are summarised in Table 32.

Table 32: Summary of gas monitoring data

Monitoring well	No. visits	Methane		Carbon dioxide		Peak gas flow (l/hr)	Site area
		Range % v/v	No. >1%v/v	Range % v/v	No. >5%v/v		
Response zone in made ground							
WS1202	4	<0.1	0	<0.1 – 3.1	0	<0.1	Railway embankment crest
WS1203	4	<0.1	0	1.3 – 11.1	1	<0.1	Railway embankment crest
WS1205	4	<0.1	0	0.2 – 7.1	1	<0.1	Railway embankment crest

Monitoring	No.	Methane		Carbon dioxide		Peak gas flow	Site area
WS1207	4	<0.1	0	2.7 – 9.5	2	<0.1	Railway embankment crest
WS1208	4	<0.1	0	3.7 – 5.5	1	<0.1	Railway embankment crest
WS1214	4	<0.1	0	1.1 – 2.4	0	<0.1	Railway embankment toe
WS1215	4	<0.1	0	<0.1 – 0.4	0	<0.1	Railway embankment crest
BH1303	3	<0.1	0	8.5 – 13.2	3	<0.1	Car park
Response zone in sandstone							
WS1204	4	<0.1	0	1 – 2.2	0	<0.1	Railway embankment toe
WS1206	4	<0.1	0	2.1 – 2.8	0	<0.1	Railway embankment toe
WS1209	4	<0.1	0	0.4 – 1.8	0	<0.1	Railway embankment toe
WS1211	4	<0.1	0	0.6 – 1.0	0	<0.1	Railway embankment toe
WS1212	4	<0.1	0	0.4 – 4.6	0	<0.1	Railway embankment toe
BH1301	3	<0.1	0	1.5 – 1.6	0	<0.1	Bridge 55
BH1302	3	<0.1	0	0.9 – 2.3	0	<0.1	Station
BH1304	3	<0.1	0	1.9 – 2.3	0	<0.1	Central culvert crossing
BH1305	3	<0.1	0	1.7 – 2.3	0	<0.1	Eastern culvert crossing

No methane was recorded in any of the boreholes (<0.1%). Carbon dioxide levels within the made ground recorded elevated concentrations in some wells with a maximum concentration of 13.2% recorded in BH1301.

The gas flow rates recorded were negligible (<0.1 l/hr) in all boreholes suggesting that ground gases are not being generated in significant quantities.

Gas Screening Values (GSV) have been calculated for methane and carbon dioxide, in line with current CIRIA guidance. The GSVs indicate that the gassing regime within the site conforms to Characteristic Situation 1 and presents a very

low risk to the future development. For this situation gas protection measures are not required within new buildings.

5.6 Preliminary waste assessment

An indicative waste classification exercise was undertaken to provide information for the management of materials at the site. Made ground samples were tested for a range of inorganic and organic contaminants during the recent ground investigation and the online waste classification service HazWasteOnline was used to screen the results to identify those samples that may be classified as hazardous if offsite disposal is required. The online service classified material in line with current waste guidance, WM3. Once data is uploaded the service generates detailed reports containing the hazardous properties identified for each sample. These reports are presented in Appendix F.

5.6.1 Automatic Ballast Sampling assessment

Automatic Ballast Sampling (ABS) was carried out to investigate the construction and condition of existing track bed. The procedure for assessing the re-usability of the ballast is defined in NR/L3/ENV/044 [16].

15 ABS samples were analysed for the Network Rail ballast analytical suite which includes a limited metal suite, TPH, asbestos and other analytes that have been identified by risk assessment as potential contaminants – in this case PAH. HazWasteOnline was used to screen the results to identify those samples that may be classified as hazardous waste.

HazWasteOnline classification identified all of the ballast samples tested would be classified as non-hazardous waste.

5.6.2 Car park and station assessment

An indicative waste classification has not been undertaken for samples obtained from the proposed car park and station site as the earthworks strategy is still being developed and the volume of material which may require off-site disposal as waste is currently unknown. On the basis of initial earthworks assessments to inform pre-planning a net deficit of fill materials is anticipated and the volumes of material requiring off-site disposal are likely to be small. Once the earthworks strategy for the site has been developed it is recommended that the requirement for waste classification assessment on materials from the proposed car park and station site be revisited.

5.7 Concrete aggressivity

Contaminants such as sulphate and acidic conditions generally present a low risk to human health but can result in degradation of buried concrete. The chemical environment for concrete has been assessed following the guidance outlined in BRE Special Digest 1 [14].

The design sulphate (DS) and aggressive chemical environment for concrete (ACEC) classes were assessed assuming that the site was classified as non-pyritic brownfield with mobile groundwater. A summary of the assessment results is provided in Table 33.

Table 33: Summary of concrete aggressivity assessment

Strata	Characteristic pH	Characteristic sulphate (mg/l)	Design sulphate class	ACEC class
Made ground	6.3	20	DS-1	AC-1
Superficial Deposits	6.4	20	DS-1	AC-1
Bedrock	6.2	60	DS-1	AC-1

6 Geoenvironmental risk assessment

6.1 Introduction

The screening assessments for the receptors identified in the conceptual site model have identified residual risks at the proposed site. Based on the proposed redevelopment and the plausible pollutant linkages identified in the conceptual site model, these residual risks have been assessed. The risk classifications of Very Low, Low, Moderate or High risk have been based on the CIRIA guidance C552 [17]. A brief description of each is provided below:

- High Risk - There is a high probability that severe harm could arise or is occurring to a designated receptor from an identified hazard. Urgent investigation (if not undertaken already) is required and remedial works may be necessary;
- Moderate Risk - It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm
- were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk. Some remedial works may be required in the longer term;
- Low Risk - It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild;
- Very Low Risk - There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be significant.

In addition to the risk classifications within the CIRIA guidance, a Negligible risk rating has also been used within the assessment where no plausible pollutant linkage exists.

6.2 Human health

6.2.1 Construction phase

There is a potential risk to construction workers who may come into direct contact with contaminated soils, particularly during earthworks. However, exposure periods are generally shorter than those experienced by long term site users and can usually be reduced to an acceptable level through adoption of adequate health and safety procedures.

Asbestos was not identified in any of the soil samples tested. However, asbestos may be present (as yet undetected) and it would be prudent to proceed assuming it still poses a potential risk during earthworks and construction works where soils are disturbed, as this may allow fibres to be released into ambient air. Appropriate good practice measures should be applied to protect construction workers and site neighbours and should be designed and implemented by a competent contractor.

Mitigation measures should include as a minimum dust suppression and appropriate PPE.

If the mitigation procedures described above are implemented during construction it is assessed that the risk of harm to construction workers and neighbours will be **Very Low**.

6.2.2 Operational phase

The concentrations of all contaminants measured during the ground investigation in soil were below values that might be regarded as posing a risk to future users of the proposed station and car park.

The proposed site use means that there is little potential that site users will come into contact with the soils on site. The results indicate that the existing soils within the site are chemically suitable for reuse as part of the development. If soft landscaping areas are proposed then a validated clean topsoil and subsoil will be required, it is possible that some of this material could be site-won.

Consequently, the risks from dermal contact with made ground soils, ingestion of site made ground and inhalation of made ground soil or dust vapour to future site users is **Very Low** and that no specific remediation is likely to be required with respect to the protection of human health.

6.3 Controlled waters

Limited groundwater was encountered during the ground investigation. The lack of superficial deposits between the made ground deposits and sandstone within the proposed station and car park site may permit migration of leachable contaminants into the underlying principal aquifer. However, no significant contamination which could be considered to pose a risk to groundwater was recorded within the made ground soils beneath the site. The proposed station and car park development will predominantly comprise buildings and hardstanding which will minimise infiltration.

Consequently the risks to controlled waters from the proposed development are considered to be **Very Low**.

It is understood that new buildings and structures will be constructed using shallow foundations. If piled foundations into the sandstone are proposed for any new structures a pathway between the made ground and the principal aquifer may be established through piling operations. However, due to the limited presence of significant contamination and absence of a low permeability layer above the principal aquifer, the risk of piling operations creating a pollutant pathway is deemed to be low.

Infiltration drainage may be incorporated into the drainage scheme for the development. This will be confirmed as part of the next design stage where further assessment will be undertaken to confirm the design. The drainage system will incorporate control measures (e.g. petrol interceptor) to prevent migration of any pollutants into the sandstone bedrock which will be assessed as part of the design.

6.4 Ground gas

A potential pollutant linkage exists between ground gas generating soils and future users of the proposed station building, if gas can flow or permeate through building envelopes and accumulate within enclosed spaces. None of the soils encountered have potential to generate significant flows of hazardous gases. Gas monitoring undertaken at the site to date indicates that the gas regime would be classified as Characteristic Situation 1 and therefore ground gas protection measures in new buildings on the site will not be required. The risk from ground gases based on the monitoring results is therefore assessed to be **Very Low**.

6.5 Construction materials

The BRE assessment did not identify any elevated sulphate concentrations within made ground on site which could pose a potential risk to buried concrete. It is considered that all buried concrete at the development site should be designed in accordance with DS-1 and AC-1.

7 Outline remediation strategy

This section presents an outline remediation strategy for the proposed works. Detailed contractor's method statements will need to be prepared prior to commencing works on site. An options appraisal has not been undertaken as the mitigation measures are intrinsic to the development design or relate to site management, as described below.

7.1 Excavated materials management

The scheme includes significant earthworks cut and fill in the car park area. The most sustainable approach is to reuse materials onsite during the development and minimise offsite disposal. This includes materials resulting from the demolition of the existing buildings and excavated soils.

The risk assessments indicate excavated soils are chemically suitable for reuse where needed in the development. A Materials Management Plan (MMP) prepared in accordance with the CL:AIRE Definition of Waste Code of Practice (CL:AIRE DoWCoP) would enable excavated materials to be reused within the development and avoid the material being considered as waste.

The CL:AIRE DoWCoP requires a validation report is produced confirming the location, quantity and suitability of material reused. No visibly contaminated or odorous material should be reused.

If excavated material cannot be reused on site (for example geotechnically unsuitable or surplus to requirements) it may be possible to treat the soil to make it suitable for reuse, reuse the material on another project (with consideration of waste regulatory requirements) or as a least preferred option, offsite disposal to soil treatment facility or landfill.

7.2 Imported material

If any import of soils is proposed the material must be confirmed as geotechnically and chemically suitable. If the imported material is potentially a waste the regulatory mechanism for the material import must be clearly defined (e.g. CL:AIRE DoWCoP).

The testing regime for imported material must be defined. Typically imported materials from brownfield sites should be tested at a frequency of 1 sample in 50m^3. If the source desk study confirms a greenfield source, and no environmental incidents on the site of origin, then it is considered that the testing frequency for imported material can be reduced (e.g. 1 per 500m^3).

7.3 Unforeseen contamination

Grossly contaminated materials are not expected to be encountered at the site. However, on any brownfield site there is the possibility that unforeseen contaminated material may be encountered during excavation works. Care should

be taken during ground works and excavations should be supervised to ensure any previously unforeseen contamination is appropriately managed.

Any material which is identified as potentially contaminated (for example by visual appearance or odour) should be delineated and samples taken for chemical analysis by an Environmental Scientist. The samples should be compared to the soil assessment criteria to determine the suitability of this material for use within the development.

7.4 Buried structural concrete

It is recommended that buried concrete is specified to meet design sulphate class DS-1 and ACEC AC-1.

7.5 Liaison with regulatory authorities

A contaminated land planning condition may be applied to the planning consent, typically requiring investigation, risk assessment and remediation strategy to be approved prior to the commencement of development. This report has been produced in anticipation of such a condition. The planning consent may also include a condition requiring the works be implemented in accordance with the remediation strategy and a validation report be approved prior to occupation of the development.

The need for regulator consultation and decision should be considered in the programme and sufficient time allowed.

7.6 Remediation implementation

Detailed contractor's method statements should be prepared prior to commencing works on site in accordance with this Remediation Strategy and including the following content:

- Environmental protection measures (including water management and dust suppression)
- Health and safety management
- Stockpile management
- Material reuse proposals (if required, with reference to CL:AIRE DoWCoP)
- Confirm material reuse validation criteria and testing frequency (if required)
- Waste management proposals (off site soil disposal, if required)
- Imported soil proposals (if required)
- Proposals for addressing unforeseen contamination
- Buried concrete classification
- Potable water supply pipe requirements
- Validation plan (see below).

7.7 Validation and reporting

Evidence that the works have been undertaken in accordance with this Remediation Strategy and the method statements should be collected by the contractor during the works. A validation report should be prepared including the following, as a minimum:

- Photographic records and details of any below ground infrastructure removed
- Records of environmental protection measures implemented
- Results of validation testing compared to validation criteria
- Records of earthworks including photographs
- Details of any unexpected contamination encountered
- Material reuse records
- Offsite surplus soil disposal records
- Environmental regulator communications

This information should be compiled into a validation report by a suitably qualified environmental scientist at the end of the works.

8 Key development considerations

This section outlines the main areas of geotechnical design associated with the project and provides a description of the relevant geotechnical risk and recommended approach for the management of these. In is intended to assist with the development of specific solutions to address these risks in latter design stages and support the preparation of the Approval in Principle documents at GRIP stage 4.

8.1 Rail corridor

8.1.1 General ground and groundwater conditions

Made ground deposits present along the rail corridor typically comprise a layer of ballast, underlain by granular track bed material and for the majority of the project extent embankment fill.

The ballast encountered was described as dirty or very dirty ballast. The granular track bed material was on average 0.7m thick and comprised a layer of ashy fill (sandy gravel) over a gravelly sand layer. In most locations the embankment fill comprises cohesive material (sandy gravelly silty clay).

Glacial Till, comprising cohesive and granular deposits, was encountered in the majority of exploratory holes undertaken within the rail corridor cutting (from 750 to 1500m and from 2525 to 2600m), and in its proximity, at the crest and toe of embankment (from 1500 to 2225m). Reported depths ranged from 0.6m to 4.7m with the base of the strata proven in all locations.

Sandstone bedrock was encountered at depths ranging from 0.25m to 4.5m below ground level and typically described as weathered reddish brown sandstone. Sandstone was generally encountered at a depth greater than 2m, however in exploratory holes between 1150 to 1400 and 2300m it was reported at shallow depth (<1m).

Pitching stones were encountered at shallow depth underneath the ballast within the Kirby station area west of OB57 (~850 to ~1050). The exact limits of the pitching stones has not been defined but they were not encountered in holes undertaken at ~750m and 1150m.

Very limited perched groundwater was encountered with the exploratory holes undertaken during the ground investigation. Where encountered groundwater monitoring in the sandstone recorded water levels at approximately 1.4 – 2.5m depth. It is anticipated that the main groundwater body lies at a considerable depth below ground level.

8.1.2 Impact on existing earthworks

Some embankment widening to accommodate the proposed track alignment will be required. The extent will be assessed during design development in GRIP stage

4 and will be a function of the rail corridor width required to accommodate access routes, position of safety, cabling in addition to the tracks.

It is anticipated that cess retention will be required to facilitate embankment widening in some areas as widening by earthworks will not be practical for large sections of the site, due to vegetation cover on existing earthwork slopes and/or proximity of the Network Rail boundary to embankment toe.

Network Rail standard details for cess retention, utilising a king post retaining structure, are likely to be suitable for retained heights of up to 1m (subject to design). Retained heights greater than 1m may require anchoring (for example by soil nails) or the use of an alternative retaining structure (for example reinforced concrete stem wall) if widening by earthworks is not practical.

Where the proposed rail corridor is situated in areas of cutting it is anticipated that it will be possible to accommodate this within the existing cutting width without impacting on existing cut slopes. Some local regrading or low height retention may be required to accommodate lineside equipment, this will require further review during design development when lineside equipment locations are confirmed.

8.1.3 UB 55 (Bridge 55)

In order to accommodate the proposed track alignment works to UB55 are required. New foundations will need to be constructed to support the new eastern abutment and intermediate pier. Based on the ground conditions encountered the anticipated foundation solution is shallow pads bearing onto intact sandstone bedrock.

The interface between the new foundations and the existing substructure elements will require careful consideration (in particular for pier 2) to manage issues associated with differential settlement and to develop construction sequencing.

Further ground investigation will be required to inform detailed design. The ground investigation is required to investigate temporary works installed for the construction of UB55 adjacent to the east abutment and prove the depth of the underside of the existing foundation of the abutment. Further investigation is also recommended to provide rotary coring into the intact sandstone to understand rock strength for the bridge widening foundations.

8.1.4 Ancillary civils

Details of the specific locations of individual lineside infrastructure elements of the projects are to be confirmed. It is anticipated that these will include lineside equipment foundations (location cases, REB, etc) within the vicinity of Kirkby station. A limited number of signal structures will be required however the location of these is not currently known.

Based upon ground investigation information it is expected that the majority of locations will be suitable for application of standard detail foundations utilising shallow foundations bearing onto embankment fill or natural ground. However further assessment will be required during design development to confirm this.

For structures with significant lateral loading (for example signal structures) piled foundations may be more efficient particularly if located on areas of existing embankment or in areas where widening to accommodate the existing rail corridor is required to minimise loading on the widening solution.

8.1.5 Track bed and ballast re-use assessment

Automatic Ballast Sampling (ABS) was carried out to investigate the construction and condition of existing track bed. Waste classification identified all ballast samples tested (15No.) would be classified as non-hazardous waste. Which indicates that the ballast should be managed as non-hazardous ballast in accordance with the requirements of NR/L3/ENV/044 [16].

The suitability of existing track bed materials for use in the track bed for the proposed track alignment will be reviewed as part of the track design.

8.1.6 Geoenvironmental issues

The ground investigation did not identify any evidence of significant contamination within the soils in the rail corridor.

There is a potential risk to construction workers who may come into direct contact with contaminated soils, particularly during earthworks. However, these risks can be mitigated to an acceptable level through the adoption of adequate health and safety procedures and appropriate good practice measures including dust suppression and PPE.

The soil assessment indicates that soils are suitable for reuse within the site. A Materials Management Plan (MMP) prepared in accordance with the CL:AIRE Definition of Waste Code of Practice would enable excavated materials to be reused within the development and avoid the material being considered as waste.

It is considered that all buried concrete at the development site should be designed in accordance with DS-1 and AC-1.

8.2 Car park and station

8.2.1 General ground and groundwater conditions

Made ground was encountered in all off-line holes undertaken within the proximity of the proposed station and car park. Outside the extent of the former quarry reported depths to underside of made ground ranged from 0.5m to 2m bgl, typically 0.5m to 1.5m bgl, with the base of the strata proven in all locations.

Historical mapping shows a quarry within the car park area (north of Kirkby Brook). Ground investigation locations within the mapped extent of the former quarry reported made ground depths between 2m and 3.1m bgl, however the base of made ground was not proven in one location.

The underlying bedrock was encountered in all the locations undertaken within the proximity of the proposed station and car park. Depths to top of sandstone

ranged from 0.2m to 3.2m below ground level, typically within the range 0.8m to 3m. The base of sandstone was not proven with holes terminating 0.6m to 2.4m below rockhead level.

Limited perched groundwater was encountered with the exploratory holes undertaken across this area of the site during the ground investigation. Groundwater monitoring in the sandstone shows the water level to be similar to that seen during the fieldwork. It is anticipated that the main groundwater body lies at a considerable depth below ground level. There is a risk of encountering localised perched groundwater during construction activities.

Soakaway testing indicates the sandstone permeability (1.3 to 1.4 x10^{-05} m/s) is likely to be suitable to enable infiltration drainage to be incorporated into the drainage scheme, although further assessment is required to confirm this and size any soakaways. Given the site end usage, control measures (for example a petrol interceptor) will be required to prevent migration of any pollutants into the sandstone bedrock and should be assessed as part of design development.

8.2.2 General earthworks

In order to form the proposed car park levels earthworks will be required. An earthworks volume assessment has not yet been undertaken however it is anticipated that the volume of cut will be greater than the volume of fill and as such there will be an earthworks deficit requiring net import of earthwork fill. It is recommended that any imported earthworks fill is granular in nature.

Based on the ground investigation trial pits (undertaken using a 5T excavator to depths up to 2.5m below rockhead and 0.5m below intact rockhead) it is anticipated that excavations for proposed car park level (up to 2m below existing ground level) should be possible with conventional plant.

Site won made ground and sandstone materials are both considered geotechnically suitable for re-use as general earthworks fill. Based on grading the made ground is anticipated to be suitable as a class 2 materials (general cohesive fill) and sandstone a class material (general granular fill).

Given the nature of site won materials earthwork gradients of 1 in 3 (vertical to horizontal) are considered appropriate. Steeper gradients may be achievable with selected site-won soils or imported granular fill.

Changes in proposed ground levels are proposed to be accommodated through earthwork slopes. As such retaining walls are not currently anticipated to be required, should this change during design development gravity or reinforced concrete stem walls, founded on weathered sandstone or competent made ground are likely to be suitable.

8.2.3 Station building and platforms

Given the anticipated loading of the station building and the relatively shallow bedrock, shallow pad foundations are likely to be the preferred foundation option to support the main structural loads. These would be founded on competent underlying sandstone bedrock.

Due to the variable nature of the made ground it is not recommended that ground bearing floor slabs are founded directly on to this material. However, if the existing made ground is removed to confirm the top of the underlying competent bedrock and replaced with compacted and validated engineered granular fill, the use of a ground bearing slab should be suitable.

The proposed station platforms will be relatively lightly loaded and as such shallow foundations based upon Network Rail standard details are considered to be appropriate. Dependent upon local ground conditions it is anticipated that it will be possible to found the majority of these on weathered sandstone bedrock. In areas where this is not practical bearing onto competent made ground or embankment fill materials should be appropriate.

8.2.4 Brook crossings

The proposed scheme includes a road bridge and two footbridge crossings over Kirkby Brook. The span and structural form for these is subject to design development. It is anticipated that wingwall structures will be required to accommodate the approach earthworks to the road crossing.

Shallow foundations on sandstone bedrock are likely to be the preferred foundation solution for the bridges over the brook. Dependent upon loadings and settlement criteria shallow foundations on competent made ground may be possible for the footbridge crossings. The northern abutment of the road bridge is close to the former quarry extents from historical mapping and as such rockhead may be locally deeper requiring a greater foundation depth.

Shallow foundations, founded on sandstone bedrock, are also considered suitable for the wingwalls associated with the approach earthworks for the road crossing. The form of construction for the wingwalls requires review but reinforced concrete stem walls or reinforced earth structures are considered to be suitable at this stage.

8.2.5 Headbolt Substation

An earthworks platform is proposed to accommodate a substation between the existing railway embankment and Kirkby Brook. In addition to earthworks to form the platform and approach ramp it is anticipated that retaining walls or reinforced soil structures or slopes (~2 to 3m high) will be required to avoid the substation platform encroaching into the maintenance easement associated with Kirkby Brook.

The requirement for structures to form the compound requires review but reinforced concrete stem walls or reinforced soil structures founded on sandstone are considered suitable options for the compound walls. Reinforced soil slopes may also be an option. High quality granular fill will be required for backfill to structures and for reinforced soil structures/slopes and will need to be imported to site.

There is a level difference between the substation platform and track alignment (~2.5m). The horizontal separation between platform and track alignment reduces

towards Headbolt station. In areas where an earthwork slope is not suitable a retaining wall will be required to accommodate the level difference. If a wall is required a reinforced concrete stem wall founded within the earthwork platform or a sheet piled retaining wall are considered the most likely options.

8.2.6 Geoenvironmental issues

The soil assessment identified that the existing made ground is unlikely to pose a risk to human health if reused within the final development. Exposure of construction workers to potentially contaminated soils should be controlled to be as low as reasonably practicable (ALARP). No soil remediation is likely to be necessary to protect the health of future site users.

The soil assessment indicates that soils may be chemically suitable for reuse within the site. A Materials Management Plan (MMP) prepared in accordance with the CL:AIRE Definition of Waste Code of Practice would enable excavated materials to be reused within the development and avoid the material being considered as waste.

If soft landscaping areas are proposed then a validated clean topsoil and subsoil will be required, it is possible that some of this material could be site-won.

Risks to controlled waters are considered to be low and limited perched shallow groundwater was recorded within the made ground beneath the site.

The ground gas risk assessment suggests that the gassing regime within the site conforms to Characteristic Situation 1 and therefore gas protection measures in new station buildings will not be required.

It is considered that all buried concrete at the development site should be designed in accordance with DS-1 and AC-1.

8.3 Further ground investigation

The ground investigation undertaken to date is considered appropriate to inform development of approval in principle designs for the scheme. Further ground investigation will be required to inform detailed design and is summarised below.

- **UB55** - ground investigation is required to provide further information on depth and strength of sandstone rockhead. Additional investigation to provide information on form of construction and founding depth to existing abutment and pier foundations and relict temporary works is recommended to inform design and construction sequencing.
- **Highway brook crossing & associated wingwalls** – additional exploratory holes at proposed abutment and wingwall locations are recommended to inform substructure, approach earthworks and retaining wall design. These should confirm depth and strength of sandstone rockhead and the extent of former quarry
- **Car Park and Station** – additional exploratory holes are recommended to provide further information to inform design of platform foundation and

associated retaining structures, earthworks modelling and substructure design for footbridge brook crossings. Investigation at the highway junction to confirm existing road pavement build-up should also be undertaken

- **Headbolt Substation** – exploratory holes to confirm ground conditions beneath the proposed substation platform and the composition of the adjacent existing embankment should be undertaken to inform design of earthworks and retaining structures associated with the proposed substation platform.
- **Embankment widening** – additional holes at the toe and crest of the embankment are required to provide more detailed information on the embankment composition and underlying natural ground. This will be used to inform design of cess retention/embankment widening, earthworks stability assessment and track bed design.
- **Supplementary track bed investigation** – additional exploratory holes are recommended to inform detailed track bed design. This should include targeted investigation to delineate the extent of pitching stones and shallow rock in the Kirkby station area. A typical hole spacing along the rail corridor of c.50m is recommended (across all phases of investigation).
- **Ancillary Civils** – for most locations it is anticipated that holes scoped for embankment widening and track bed design will provide sufficient information on ground conditions for ancillary civils sub-structure elements. The requirement for targeted investigation locations is anticipated to be limited but will require review during design development.

8.4 Geotechnical Risks

An extract from the CDM Designers Risk Assessment detailing the geotechnical and geo-environmental risks identified and their associated mitigation measures is included in Appendix G.

9 References

[1] Mott MacDonald (2018) Geoenvironmental Desk Study, Headbolt Lane Station, 24 August 2018. 139606-MMD-REP-EGE-000003 A01

[2] Mott MacDonald (2020) Existing Track Geoenvironmental Desk Study, Skelmersdale Rail Link, 2 March 2020. 139606-MMD-REP-EGE-000001 A01.

[3] British Standards Institute (2014) Annex to Eurocode 7:Geotechnical design. Ref: NA+A1:2014 to BS EN 1997-12004+A1:2013

[4] Network Rail (2011) Level 3 Geotechnical Design, Issue 4. NR/L3/CIV/071

[5] CC Geotechnical Ltd (2020) Ground Investigation for Headbolt Lane, Kirkby, Factual Report, November 2020. CCG-C-20-11799.

[6] ALM Consult Ltd (2016) Geoenvironmental Appraisal of Land to the West of Bramcote Walk, Kirkby (Former Overdale Junior and Infant Schools) Interpretative Report.

[7] ESG (2015) Knowsley Northern Primary Support Centre, Kirkby, Factual Report on Ground Investigation.

[8] British Geological Survey Geology of Britain Viewer https://www.bgs.ac.uk/map-viewers/geology-of-britain-viewer/ [accessed December 2020]

[9] Dunelm Geotechnical & Environmental Ltd (2020) Mining Risk Assessment – Kirkby, Nr Liverpool, 22 July 2020.

[10] Stroud. M. A and Butler F. G Standard Penetration Tests and Engineering Properties of Glacial Materials, proc. symp Engineering Properties of Glacial Material, Midlands Geotechnical Society, Birmingham 117-28.

[11] Peck R. B., Hanson .W.B and Thornburn.T.H (1974) Foundation Engineering, Wiley, London

[12] CIRIA 143: The Standard Penetration Test (SPT): Methods and Use, London 1995

[13] CIRIA (2007) Assessing the risks posed by hazardous ground gases to buildings. Report C665

[14] British Standards Institute, 2019. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings, BS8485:2015+A1:2019

[15] BRE (2005) Special Digest 1: Concrete in Aggressive Ground. Third Edition. BRE press

[16] Network Rail (2018) Track Maintenance, Renewal or Alteration – Used Ballast and Excavation Waste Handling, NR/L3/ENV/044

[17] CIRIA (2001) Contaminated land risk assessment – a guide to good practice. Report C552

Appendix A

Pre-Planning Application Drawings

Pre Planning Application Proposed Works General Arrangement
170248-15854-ZZ-ZZZ-DRG-C-CV-023020 P01

Pre Planning Application Proposed Elevation
170248-15854-ZZ-ZZZ-DRG-C-CV-029001 P01

Pre Planning Application Cross Sections
170248-15854-ZZ-ZZZ-DRG-C-CV-029002 P01

Appendix B

Mining Risk Assessment

170248-BGC-RSA-EMD-000001 P01

Appendix C

Ground Investigation Plans

As Built Ground Investigation Sheet 1 or 3
Car Park and Station Area
170248-15854-ZZ-ZZZ-DRG-G-GE-093001 P01

As Built Ground Investigation Sheet 2 or 3
170248-15854-ZZ-ZZZ-DRG-G-GE-093002 P01

As Built Ground Investigation Sheet 3 of 3
170248-15854-ZZ-ZZZ-DRG-G-GE-093003 P01

Appendix D

Geotechnical cross sections and plots

170248-ARU-SKE-EGE-000004 P01

Appendix E

Geoenvironmental Screening Assessment

170248-ARU-SCH-EGE-000003 P01

E1 Human health screening assessment

E2 Controlled waters screening assessment

Appendix F

Waste Classification

170248-ARU-REP-EGE-000002 P01

Appendix G

Extract from CDM Designers Risk Assessment

170248-ARU-REG-EMF-000002 P01

Appendix 1B

Knowsley Metropolitan Borough Council's Scoping Opinion

Knowsley Council

Michael Gradwell
Network Rail
Square One
4 Travis Street
Manchester
M1 2NY

Please ask for: Mark Quinn
Telephone No: 0151 443 2223
Email: mark.quinn@knowsley.gov.uk
Our Reference: 21/00132/SO
Date: 30/03/2021

Dear Michael

TOWN AND COUNTRY PLANNING ACT 1990

TOWN AND COUNTRY PLANNING (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS 2017

PROPOSAL: EIA SCREENING /SCOPING OPINION REQUEST FOR PROPOSED RAILWAY STATION, CAR PARKING, SUB STATION, TRACK WIDENING AND ASSOCIATED WORKS

LOCATION: LAND OFF HEADBOLT LANE, AND KIRKBY – HEADBOLT LANE RAILWAY TRACK, KIRKBY.

Thank you for your letter and scoping report dated 18th February setting out the proposal for the above site.

From the information submitted I can confirm that an Environmental Impact Assessment would be required in support of your planning application.

The Council's formal screening opinion is attached.

Should you wish to discuss the matter further or require any additional information please do not hesitate to contact me on 0151 443 2223 email mark.quinn@knowsley.gov.uk. Any written correspondence should be sent to the address below.

Yours Sincerely

M Quinn

Mark Quinn
Principal Planner

POSITIVE ABOUT DISABLED PEOPLE
EQUALITY FRAMEWORK FOR LOCAL GOVERNMENT EXCELLENT

Knowsley Council

The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2017

APPLICATION NUMBER: 21/000132/SO

SITE ADDRESS: LAND OFF HEADBOLT LANE, AND KIRKBY – HEADBOLT LANE RAILWAY TRACK, KIRKBY.

DESCRIPTION OF DEVELOPMENT: **PROPOSED RAILWAY STATION, CAR PARKING, SUB STATION, TRACK WIDENING AND ASSOCIATED WORKS**

- **DOES THE DEVELOPMENT FALL WITHIN SCHEDULE 1?**
  NO

- **DOES THE DEVELOPMENT FALL WITHIN SCHEDULE 2?**
  YES

EIA SCREENING OPINION

The applicant has submitted a screening request (Arup, EIA Screening and Scoping Report, 170248 Headbolt Lane, New Station GRIP4 for Network Rail dated February 2021) which have been considered to form the basis of this screening opinion.

This is a screening opinion for the purpose of determining whether Environmental Impact Assessment (EIA) is required for this development under the terms of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017. The proposal falls under Schedule 2 10(b) of the EIA Regulations 2017, as an urban infrastructure project as well as Schedule 2(d) Construction of Railways.

Having reviewed the proposal and considered the project against the provisions of the EIA Regulations (including screening criteria presented in Schedule 3) and the relevant National Planning Practice Guidance, I accordingly consider that the proposals are likely to give rise to significant environmental effects from an EIA perspective, and that EIA is therefore required in this case.

Full details of the screening opinion can be found in Appendix 1 (attached)

Knowsley Council

EIA SCOPING REPORT

1. The Environmental Statement that supports any planning application should include the following sections as a minimum:

• A non-technical summary;

• Detailed scope of works;

• Reference to key plans and legislation. It is essential that all relevant guidance and policies be complied with as appropriate;

• Detailed baseline review (associated with all development issues); and

• Detailed integrated assessment of all environmental impacts.

2. This assessment needs to take into account the nature of impact (importance, magnitude and duration – quantified as appropriate), reversibility of impact, mitigation, monitoring measures (including reference to long-term management and maintenance measures/plans) and residual impacts.
3. The Scoping Opinion proposes to include the above, which require input from the relevant technical specialists.
4. It is important that the conclusions of the environmental impact assessment are transparent, and that all information used to draw conclusions is clearly presented and objective (including survey/assessment results) to enable third party verification.
5. The following topics are to be scoped out of the Environmental Statement:

   • Cultural Heritage

   • Water Resources and Flood Risk

   • Population and Human Health

   • Waste and Resources

   • Ground Conditions

   • Major Accidents and Disasters

   • Climate Change

6. It is agreed that waste can be scoped out and note that there is a commitment to produce a Site Waste Management Plan to manage any waste generated. This can be addressed at planning application stage.
7. Section 8.6 Major Accidents and Disasters states that certain issues will be considered within the technical chapters of the Environmental Statement. This includes the Flood Risk Assessment and drainage design will consider the potential for changes in weather patterns resulting from climate change to increase flooding on or off site.

Knowsley Council

8. However, both Water Resources and Flood Risk as well as Climate Change have been proposed to be scoped out of Environmental Statement. I advise that clarification is required as to where this information is intended to be included but would recommend it is included as an EIA chapter especially as some of the site falls within a Flood Risk Zone 3. (see further advice from Environment Agency below)
9. The Environment Agency and the Lead Local Flood Authority have reviewed the submitted EIA scoping report and **disagree** that flood risk should be scoped out of any potential EIA.
10. There are a number of watercourse crossings which, as part of this development will be installed, removed or replaced/modified in addition to a new open span bridge for the proposed access road over Kirkby Brook, main river. The impacts of the works have not been sufficiently addressed and there is no quantifiable evidence in the submission to relieve concerns on flood risk grounds.
11. From discussion with the consultants on behalf of the applicant, the design of the new proposed access road is yet to be confirmed and the option of a box culvert rather than an open span bridge has not yet been ruled out.
12. We consider that flood risk should be scoped in to ensure the impacts the works will have are sufficiently assessed. It would not be acceptable to assume that the proposed structures will have no effect on flood risk without a thorough assessment.
13. Sufficient evidence and quantifiable data should be presented to demonstrate that the proposed crossings are sufficient and will not increase flood risk elsewhere. It needs to be demonstrated that any structure over a main river has the capacity to take the Q100 CC freeboard flow and the proposals will not impact the Environment Agency's ability to maintain the main river for flood risk purposes.
14. The following topics are proposed to be scoped into the Environmental Statement:

- Air Quality;
- Traffic and Transportation;
- Noise and vibration;
- Ecology and Biodiversity;
- Landscape and visual impact;
- Cumulative and Combined Effects

15. Air Quality should also consider the impact of climate change and green houses gases as this is not specifically discussed within Section 7.1 Air Quality although it advised in Section 8.7 Climate Change.

16. I note that the potential impact on the Local Geological Site has not been assessed.

17. The proposed construction of two footbridges and an access road over the Kirkby Brook may have significant implications on this geological feature which need to be addressed. I advise (in the absence of any information) that this needs to be

included within the Scope of the Environmental Statement and could be reasonably included in the ecology chapter.

Cumulative Impacts

18. There is limited information on how intra-project impacts are to be assessed. It is important that an integrated approach is taken to the EIA methodology to ensure consideration of interactions and in-combination effects. In addition, it is necessary to ensure that the results of the assessment are used to inform development design.

Alternative Sites Assessment

19. The Environmental Statement is to include a description of the reasonable alternatives studied and the main reasons for selecting the proposed scheme. This is acceptable under the 2017 Regulations.

Ecological Information

20. A Preliminary Ecological Appraisal (PEA) has been submitted with the application (Preliminary Ecological Appraisal Report – Headbolt Lane Kirkby, nlg ecology ltd., Version 2, October 2020).

EIA Screening

21. Section 3.5 of the EIA Screening and Scoping report deals with Ecology & Biodiversity. The screening report highlights potential ecological impacts associated with the development during both construction and operation.

Construction Impacts

22. Potential pollution of the Kirkby Brook corridor is highlighted within the screening report, and it is confirmed that risks will be dealt with by means of a CEMP. This approach is accepted.

23. Potential fragmentation issues associated with loss of trees along the railway embankment are considered, and the report states that these will be minimised wherever possible.

24. A number of protected/priority species issues are identified within the screening section of the report which include:

• Nesting birds precautions to be implemented on site;
• RAMs to be implemented in respect of common amphibian species and reptiles;
• RAMs in respect of potential bat roosting in trees; and
• RAMs in respect of mammals.

25. The following additional potential impacts highlighted in the pre application advice have not been considered:

• Potential for bat roosting within the railway bridges that will be impacted by the construction works;

• Potential presence of great crested newts in the pond to the south of the site;
• Potential impacts on water voles as a result of construction works in close proximity to the brook; and
• Potential operational impacts associated with new external lighting.

EIA Scoping
Potential Impacts

26. Section 7.4 of the Scoping and Screening report considers Ecology and Biodiversity.

    The following potential impacts have been scoped into the EIA.
    • Construction activities have the potential to result in habitat severance or fragmentation (e.g. through physical damage or loss);
    • Construction activities have the potential to result in entrapment, killing or injury of species present in the area;
    • Potential opportunity to deliver net benefit for ecology through habitat creation and improvement; and
    • Potential for loss of habitats/increased levels of external lighting and disturbance through operational activities.

27. The following specific potential ecological issues should be within the scope of the EIA:

    • Additional dusk/dawn bat surveys to address potential bat roosting issues associated with the railway bridges that will be impacted by the construction works.
    • HSI assessment and potential presence absence survey in respect of great crested newts in the pond located to the south of the railway.
    • Additional water vole surveys to address potential impacts on this species as a result of construction works in close proximity to the brook.
    • RAMs to be implemented in respect of common amphibian species and reptiles;
    • RAMs in respect of potential bat roosting in trees;
    • RAMs in respect of mammals (badgers and hedgehog);
    • Nesting birds precautions to be implemented on site;

28. The above ecological issues can be addressed through further/updated ecological surveys and a CEMP for the site.

Assessment Methodology

29. Section 7.4.2 of the scoping report states that A qualitative ecological assessment will be undertaken in accordance with the EIA guidance produced by the Institute of Ecology and Environmental Management (IEEM). Where possible, context will be given to the significance of impacts by reference to UK and local biodiversity targets. The assessment will inform the need for any mitigation, whilst highlighting opportunities to incorporate ecological enhancements within and outside of the scheme.

30. The assessment will apply qualitative scheme specific criteria taking into consideration the following:

- size, value and sensitivity of the ecological resource;
- severity and direction of potential impacts (positive or negative);
- ability of the ecological resource to recover from temporary effects;
- potential for effective mitigation;
- consideration of duration – short, medium or long-term; and
- consideration of whether effects will be reversible.

31. The above assessment methodology is accepted. I advise that the following should also form part of the ES:

- The ES should provide information on a CEMP to be produced for the site in order to manage potential pollution risks (specifically in relation to watercourses and retained habitats), invasive species issues and protected species impacts.
- Ecological issues should be considered both in isolation, and in combination with other nearby developments.
- Mitigation measures should adopt the mitigation hierarchy (avoidance-mitigate-compensate).
- A landscape strategy showing retained habitats and proposed habitat creation and planting would be required with any future EIA application. This would provide certainty of habitat loss and facilitate assessment of impacts. The landscape strategy should include the creation of new Priority Habitat grassland to replace that being lost and replacement tree planting along the section of the railway to be widened.
- A habitat management plan is required and will provide a mechanism to secure necessary ecological compensation, mitigation and enhancements.
- Biodiversity enhancements should be incorporated into the scheme design in line with NPPF and local plan policy CS8, and also in anticipation of mandatory net gain due for inclusion as part of the pending Environment Bill. The Defra Biodiversity metric should be sued to assess net gain. This should form part of the ES.

Biodiversity

32. We are aware that a second riparian mammal survey is yet to be carried out and until then any impacts to water vole habitat cannot be ruled out. In addition dependent upon final river crossing designs the proposed net gain may require amendment and off-site mitigation may be necessary.

33. Water voles are still known to be present on the wider River Alt catchment within a relatively short distance of the site and although we don't generally undertake biological in channel surveys in house anymore we have old records of this species at the proposed development site. This species is identified under England's Biodiversity Strategy (EBS) and is listed under section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Section 40 of the NERC Act 2006 states

that local planning authorities must have regard to biodiversity conservation. One survey has been conducted so far- outside of the optimum survey season.

34. Rat presence here has been noted, but from experience this doesn't automatically mean that water voles are not also present here. In any event, this species has suffered from loss of ecological connectivity as a consequence of previous large scale culverting and built development encroachment. It is crucial to retain any remaining suitable habitats. This particular section is steep and difficult to access, which will benefit semi aquatic mammals that require protection from human and predator disturbance.

35. We will require a scheme (to be secured by planning condition) to be agreed to ensure that as much as possible natural bank within the Kirkby Brook corridor is protected via sensitive bridge crossing design and limiting built development encroachment into the channel. We would expect any scheme to include the following elements:

 open span bridge crossings / retention and positive management of existing aquatic and marginal habitats
 future management plan
 adequate water quality protective provisions

36. Further useful guidance is available in the SEPA document 'Engineering in the Water Environment: good practice guide River Crossings' available here: https://www.sepa.org.uk/media/151036/wat-sg-25.pdf.

Archaeology

37. A programme of pre-construction archaeological works would be secured by means of an appropriately worded planning condition.

38. The scoping report states that a Heritage Desk Based Assessment (DBA) will be undertaken to assess all heritage assets in the area, including the potential for unknown archaeological assets, although the archaeological potential in the area is predicted to be low. This prediction is incorrect.

39. There are two non-designated heritage assets recorded on the Merseyside Historic Environment Record within the proposed development: Former site of Tanpit House, Headbolt Lane, Kirkby (MME5218) and the Liverpool and Bury railway, built in the 1840s (MME18089).

40. Based on the archaeological information provided within the preapplication response the archaeological issues associated with the proposed development are not likely to be significant. Therefore, I advise that the archaeological issues associated with this site would not require EIA and could be addressed through a programme of pre-construction archaeological works, secured by means of an appropriately worded planning condition.

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Contaminated Land

41. Please find below our comments and observations following a review of the documents referenced below.

- Arup (February 2021) EIA Screening and Scoping Report, 170248 Headbolt Lane, New Station GRIP 4 for Network Rail

- Arup (26th January 2021) Ground Investigation Report, 170248 Headbolt Lane New Station GRIP 4 for Buckingham Group Construction Ltd Ref: 170248-ARU-EGE-000001

Comments and Observations

42. Section 2.2 *Existing desk-based reports* of the Ground Investigation Report details 2 Desk Studies associated with the site. It is advised that all available documents should be submitted with any planning application to ensure that all relevant information is reviewed as part of the planning process.

43. The intrusive works undertaken in 2020 was partitioned into two distinct areas:
    a. The railway corridor
    b. Off track (including the proposed station and car park)

44. The report concludes that neither investigation recorded significant contamination and that the site and proposed development poses a low risk to both human health and controlled waters. Unfortunately, as no Appendices have been attached to the report it is not possible to undertake a full review. It is advised that this information is required before an assessment of any potential risk associated with the site is undertaken and any conclusions made.

45. Section 7 *Outline Remediation Strategy* states that the scheme is to include significant earthworks such as a cut and fill in the car park area. It is proposed to reuse materials and excavated soils onsite. A Material Management Plan may be required should material be taken off site.

46. The information pertaining to ground gas includes the summary results of 4 rounds of ground gas monitoring from the wells installed in the window samples and 3 rounds of monitoring from the wells installed in the cable percussive boreholes. Whilst no methane was recorded elevated levels of carbon dioxide (up to 13.2%v/v) was recorded. ARUP classify the risk from ground gas to be very low with no gas protection measures required within any buildings. Until we have access to all information including the location of the exploratory holes, we are unable to accept this conclusion. Clarification is also required as to whether further round of gas monitoring is planned particularly for those wells installed in the boreholes.

47. Based on the information submitted to date it is considered that ground conditions could result in significant environmental effects and should therefore be **scoped into the EIA.**

Noise

48. A noise assessment will be required upfront to assess the impact of this development on the surrounding residential properties. There are concerns that the development will have a negative impact on the amenity of the nearby residents. Therefore, a noise impact assessment and details of any mitigation measures will be required prior to determination.

49. Any mitigations measures should be included in the report that are required to ensure that noise levels meet the appropriate standards (e.g. BS 4142,BS8233, World Health Organisation). Overall the assessment should follow the principles within the IOA and CIEH guidance "ProPG: Planning and Noise" (May 2017),

Lighting

50. A Light assessment and subsequent scheme will be required with the planning application to ensure any external lighting used in the development will not have a negative impact on the nearby residents.

Air Quality

51. An air quality assessment will be required upfront to demonstrate the development will not have a negative impact on air quality.

52. Any traffic assessment used within the report would need approving by KMBC Highways team.

HIGHWAYS

53. The planning application will need to include a Transport Assessment (TA), including a Travel Plan and a Minimum Accessibility Standard Assessment, all in accordance with the 'Ensuring a Choice of Travel' Supplementary Planning Document (SPD) available on the Knowsley Council website.

54. A review of the latest five years of traffic accident data will be required in the TA which KMBC Highways can supply for a fee (the use of Crashmap data as an alternative is unacceptable).

55. The TA will need to incorporate the following committed developments:

- Tower Hill – 15/00570/HYB – Phases 1 and 2 built and Phase 3 has approximately two thirds of dwellings left to build.

- St Kevin's Drive – 17/00201/FUL – approximately half to two thirds of all the dwellings left to build for Phases 1 to 4.
- Bank Lane – 13/00393/OUT & 14/00874/REM – almost fully built (approx. 200 dwellings).
- Kirkby Town Centre redevelopment – 17/00559/FUL – mostly built.
- East Maghull residential extension in Sefton - http://pa.sefton.gov.uk/online-applications/ using application number DC//2017/01532
- Academy Business Park, Lees Rd, Knowsley Industrial Park – 20/00146/REM & 19/00337/OUT
- Sonae, Moss Lane, Knowsley Industrial Park – 15/00417/OUT & 18/00776/HYB & 20/00124/FUL

56. The traffic impact of the following junctions needs to be assessed for the development opening year and 5 years later:

- Site access junction
- A506 Bank Lane / Headbolt Lane
- A506 Bank Lane / Shevington's Lane
- Headbolt Lane / Pingwood Lane
- Pingwood Lane / Stopgate Lane

57. It should be noted that should the trip generation/distribution show wider impacts then further junction assessments may be required.

58. The TA needs to provide full details of all new and diverted bus services that will stop at the development.

59. Convenient pedestrian and cycle links from the highway and surrounding residential areas to the development are required including good links to the south of the site and to connect to existing footpaths in the surrounding area. The removal of the existing footway subway to the north east of site is required with replacement at grade pedestrian crossing facilities.

60. A gradient no steeper than 1:20 would be required for all pedestrian and vehicle areas.

61. Swept path analysis of a full size bus (15m in length) and large car (over 5m in length) would need to be shown on a scale site layout plan to demonstrate that such vehicles can access, egress and turn around within the site without obstructing, or being obstructed by, other site parking. Two-way traffic needs to be maintained within the site.

62. The site parking provision needs to include disabled, motorcycle and cycle parking and electric vehicle charging points. Cycle parking needs to be secure, covered for staff and located adjacent to the building entrance(s). Motorcycle parking also needs to be secure. Taxi and pick-up/drop-off provision needs to be included and any servicing requirements.

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63. The TA needs to include a full justification of the proposed level of parking including any overspill car park and any proposals for increased future parking. The TA must demonstrate that there is adequate on-site parking provision and that there would be no overspill parking from the site onto the adjacent highway.

64. The car park aisle widths should be at least 6m with the minimum parking space dimensions as follows:

- 2.4m x 5m for a standard car parking space;
- 3.6m x 6m for a disabled parking space;
- 1.2m x 2.3m for a motorcycle parking space.

End of Scoping Report

Network Rail

170248 Headbolt Lane New Station GRIP 4

Appendix 2A: Outline Construction Environmental Management Plan

170248-ARU-REP-EEN-000017

Final | October 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 276736

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1 Outline Construction Environmental Management Plan

This document comprises the Outline Construction Environmental Management Plan (CEMP) which has been prepared on behalf of Network Rail ('the Applicant') to support a detailed planning application for the development of Headbolt Lane station, car park and associated railway line works submitted under the Town and Country Planning Act (TCPA).

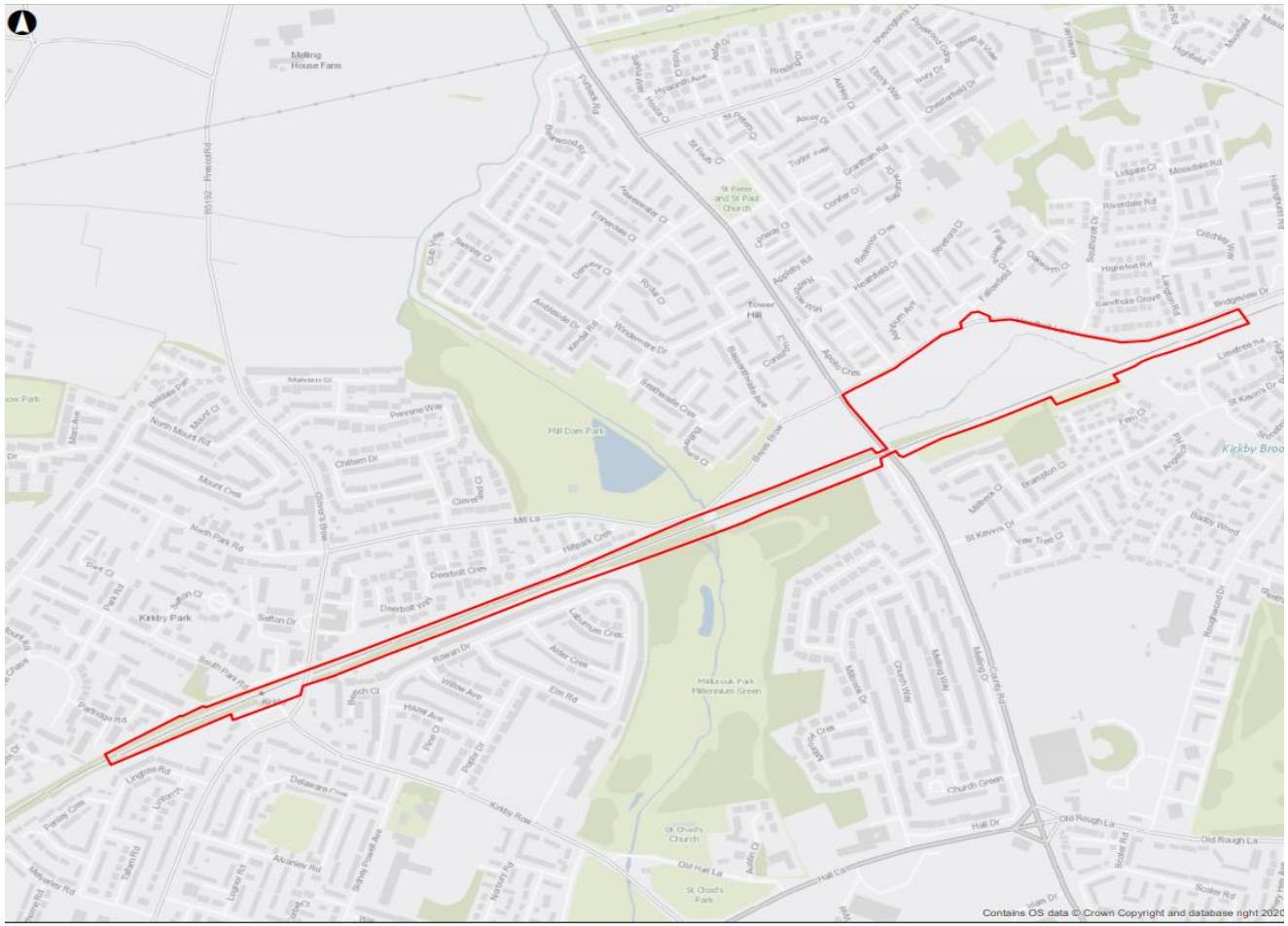
1.1 The Site

The extent of the proposed Scheme site is approximately 10 hectares (ha) and is shown in Figure 1. For the purposes of this ES, the site is divided into the two following areas:

- the station and car park (an area of 5.9 ha); and
- the railway corridor (an area of 4.1 ha).

A detailed description of the proposed Scheme site is contained in ES Volume I, Chapter 2: Scheme Description.

Figure 1: Site location plan



1.2 The Proposed Scheme

The proposed station and car park comprises the following elements:

- a new station located on land at Headbolt Lane;
- a new 300 space car park and associated structures (signage, waiting shelters and car park lighting) and to service the new station;
- bulk supply point and substation to accommodate electrification of rail corridor upgrades and for the new station;
- new vehicular and pedestrian access including two footbridges over Kirkby Brook and a road bridge to access each section of the car park; and
- associated landscaping.

Works to the railway corridor comprises the following:

- railway line upgrade to a twin track and associated infrastructure to extend the Merseyrail electrification to the proposed station (including the extension of the existing third line electrification network and a new substation); and
- decommissioning works to the existing Kirkby Station.

Construction of the proposed Scheme is due to commence immediately following grant of planning permission and the proposed Scheme is anticipated to be fully operational in Q1 2023.

A detailed description of the proposed Scheme is contained in Chapter 2: Scheme Description.

1.3 The Purpose and Structure of this CEMP

This document presents a framework for the CEMP, which is a document designed to highlight the key environmental constraints and receptors and the measures that will be implemented throughout the construction phase to protect those receptors and minimise environmental impacts. The detailed CEMP will be produced for the proposed Scheme following approval of detailed and reserved maters applications and the appointment of the contractor(s).

Potential environmental impacts during the construction phase of the proposed Scheme have been identified through the EIA process. These potential impacts are reported in the ES, which has been submitted along with the outline planning application for the proposed Scheme. In addition, a range of ‘standard’ or best practice mitigation and construction management measures were assumed as part of the assessment methodologies presented within a number of the technical chapters within the ES (Chapters 4-10) and it is assumed these will be implemented during construction of the proposed Scheme, including for some technical chapters this framework CEMP. This framework CEMP demonstrates how these commitments in the ES will be implemented during the construction phase. It also sets out the monitoring and auditing activities that should be

undertaken to demonstrate that such mitigation measures are carried out and that they are effective.

In addition to the environmental topics assessed in the EIA, this outline CEMP also includes mitigation from other planning documents e.g. the WFD Assessment (document ref. no.: 170248-ARU-REP-EEN-000022) and Heritage Desk Based Assessment (document ref. no.: 170248-ARU-REP-EEN-000021) where mitigation is included relevant to the construction phase.

This document provides a suggested structure for the CEMP, some preliminary information relevant to the CEMP, and indicates what additional information might be included under each sub-section within the final CEMP, which will be produced by the contractor(s) selected to deliver the proposed Scheme.

The detailed CEMP will be produced in line with this framework document following receipt of planning consent and would be agreed with the Local Authority in advance of starting the enabling works on the Site. The need for a detailed CEMP to be produced in this manner is likely to be a requirement of the planning conditions, should the outline planning application be granted permission.

This framework CEMP covers the principal construction activities envisaged at the time of outline planning application. The final scope will be determined through consultation with the Local Authority and other relevant regulatory authorities. The key elements of the CEMP will include:

- an overview of the proposed Scheme and associated construction programme;
- prior assessment of environmental impacts (through the EIA);
- reduction of potential adverse impacts though design and other mitigation measures;
- monitoring of effectiveness of mitigation measures;
- corrective action procedure; and
- links to other complementary plans and procedures.

In summary, the CEMP will identify how commitments made in the EIA will be translated into actions on the Site and includes a schedule from implementing the actions through allocation of key roles and responsibilities.

The contractor(s) will be responsible for working in accordance with the environmental controls documented in the CEMP. The overall responsibility for implementation of the CEMP will lie with the Applicant.

The CEMP will be designed with the objective of compliance with the relevant environmental legislation and the mitigation measures set out within the ES (both the embedded mitigation assumed within the assessments, and project specific mitigation required as a result of anticipated impacts. It should be read alongside any Construction Method Statements (which are to be produced by the appointed contactor(s)) and the ES submitted in support of the detailed planning application.

Finally, it is noted that the proposed Scheme is likely to be built out over a number of phases and through a number of separate construction projects. Therefore, a number of detailed CEMPs may be produced, with each relate to a particular phase of construction works and/or a construction contract. This Framework CEMP provides the basis for the detailed CEMP.

2 The Construction Phase

2.1 Overview of the Proposed Scheme

The proposed Scheme is summarised in Section 1.2 above and described in more detail in ES Chapter 2: Scheme Description of Volume I of the ES.

Any additional construction licences, permits or approvals that are required will be listed in the detailed CEMP, including any environmental information submitted in respect of them.

2.2 Construction Programme

It is anticipated that the construction of the proposed Scheme will commence in Q4 2021 and take approximately 18 months to complete.

Construction activities would include the following phases:

- preliminary works and site establishment;
- earthworks;
- civil engineering work;
- rail systems works within the railway corridor; and
- buildings and substation construction.

Construction will generally operate Monday-Friday between 08:00-18:00 and Saturday 08:00-13:00, with no working on Sundays or bank holidays, however, during rail blockades, which are required to facilitate construction of certain aspects of the proposed Scheme, there will be some night -time working and instances where construction working hours will operate on a 24 hours a day, for seven days basis. The instances where working will be out of the general operating hours can be seen below including the works proposed and equipment used, (however exact equipment will be confirmed in the detailed CEMP):

- January 2022- March 2022- de-vegetation works (weekday daytime and Sunday daytime working hours utilising chainsaws and Road Rail Vehicles (RRVs));
- March 2022-May 2022- installation of kingpost retention piles, which will consist of Sunday day time working hours (close to residential receptors) and midweek night-time working (for works away from residential receptors) these works will use RRVs and excavators with piling equipment;

- May 2022- June 2022- embankment widening works which will consist of Sunday day time working hours (close to residential receptors) and midweek night-time working (for works away from residential receptors) these works will use RRV and rollers and other compacting equipment;
- June 2022- works to Underbridge 56, (24 hour working over Bank Holiday weekend and will include use of cranes, RRVs and concrete pumps);
- July to August- Underbridge 55 works; (24 hour working and will include use of excavators, breakers, cranes, RRVs and compaction equipment); This will also include Permanent Way installation involving RRVs haulage trains and compaction equipment
- August to December- Permanent Way installation (Saturday/Sunday 2030-0530 only and will use RRVs); and haulage trains and compaction equipment
- January /February- connect up and commission the Proposed Scheme (3-week blockade working 24 hours a days and will use RRVs and compaction equipment).

A further breakdown of activities within these time frames, including a noise mitigation strategy and constraints can be seen in Chapter 6 Noise and Vibration Appendix 6F.

2.3 Site Context

2.3.1 Surrounding Area

The proposed station and car park is situated on an area of green space off Headbolt Lane (Grid Ref: SJ 41308 99815). The proposed station and car park is bound to the north and east by Headbolt Lane, to the south by the railway line and to the west by the A506. The proposed station and car park lies approximately 900 m north-east of the centre of Kirkby (shown in Figure 2.1). The area of the proposed station and car park is approximately 5.9 ha.

2.3.2 Nearby Sensitive Receptors

Key environmental constraints and nearby receptors are shown on Figure 2.

Notable receptors in the area include residential properties. There are large housing estates to the north of Headbolt Lane, adjacent to the proposed station and car park site and to the south, adjacent to the existing railway line. There are also residential properties located directly adjacent to the existing Kirkby Station and to the south and north of the railway line between the existing Kirkby Station and the proposed station at Headbolt Lane.

There are 18 designated heritage assets within 1 km of the proposed Scheme boundary, the closest of which are:

- six Listed Buildings associated with St Chad's Church and grounds and St Chads Park, notably Church of St Chad (Grade II* Listed Building) located approximately 750 m to the south-west of the proposed station and car park site; and
- Carter Arms Public House Waverley House (Kirkby Conservative Club) and 1 and 3 Mill Lane (Grade II Listed Buildings) are located adjacent to the existing Kirkby railway station.

Kirkby Brook/Mill Brook Local Wildlife Site (LWS) is a non-statutory ecological designated site which is located adjacent to Simonswood Brook situated below the existing elevated railway line and runs through the proposed station and car park site. One further non-statutory ecological designated site is located within a 2km of the proposed scheme is Northwood Forest Hills LWS which is located approximately 640 m to the east.

The habitats recorded on site are relatively common and widespread and support commonly occurring botanical species comprising semi-improved neutral grassland, tall ruderal, scrub, amenity grassland, bare ground and running water.

Kirkby Brook runs through the proposed station and car park site and is designated by the Environment Agency as a main river. Kirkby Brook feeds directly into Simonswood Brook which is located approximately 300 m to the west of the proposed station and car park.

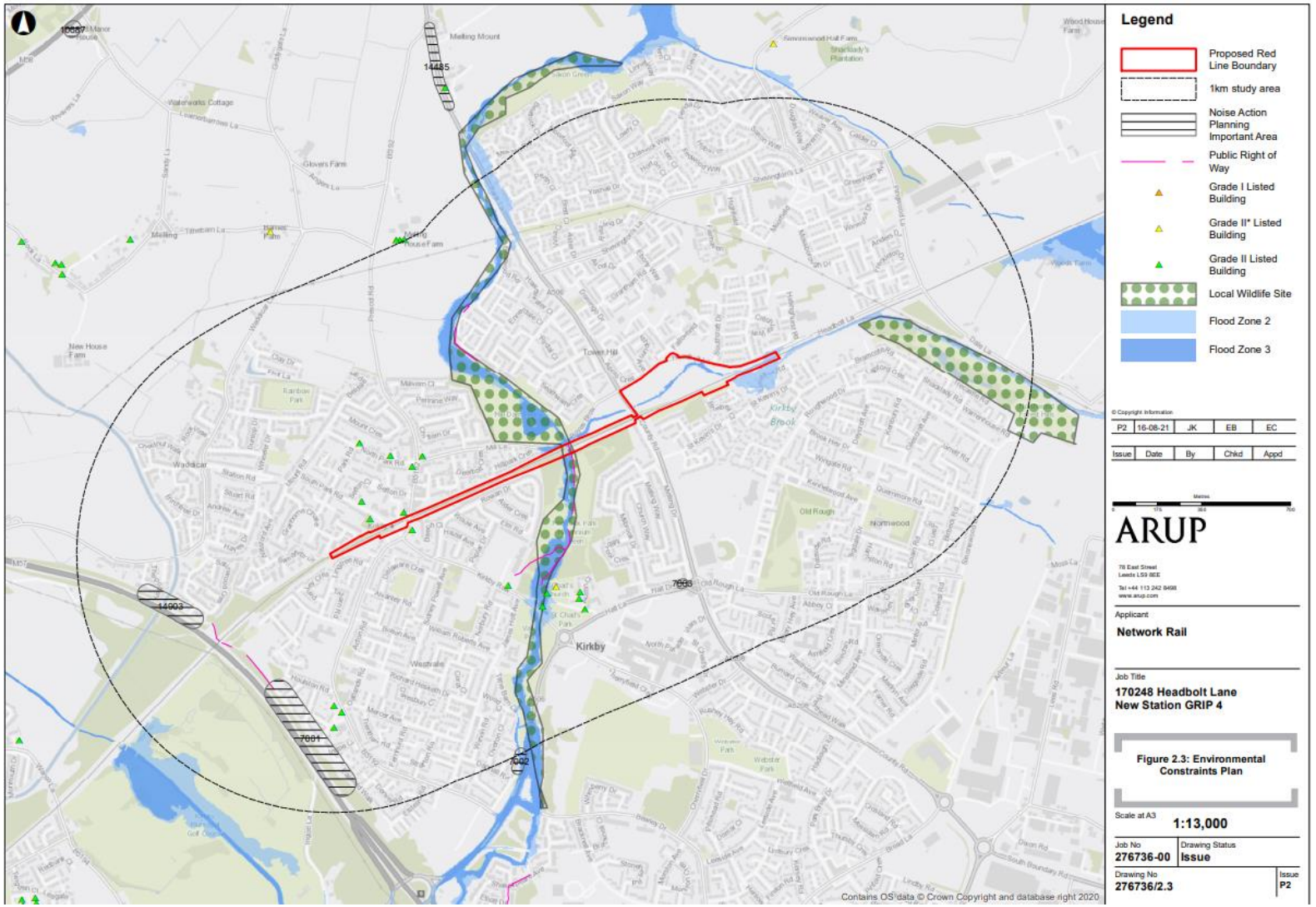
Simonswood Brook is a designated Water Framework Directive (WFD) waterbody (GB112069060630), has a classification of Moderate (Ecological score of Moderate and Chemical score of Fail) and flows under the existing railway bridge (Underbridge 56). There are areas of Flood Risk Zones 2 (between a 1 in 100 and 1 in 1,000 annual probability of river flooding) and 3 (1 in 100 or greater annual probability of river flooding) on the land immediately adjacent to Kirkby Brook within the proposed station and car park site. The rail corridor is situated entirely within Flood Zone 1 (land assessed as having a less than 1 in 1,000 annual probability of river flooding).

There are two historic landfills within 1 km of the proposed Scheme boundary; Bank Lane site, located adjacent to the A506 (Bank Lane) approximately 600 m to the north of the proposed railway corridor works and Stopgate Lane located at Simonswood Industrial Estate approximately 980 m to the east of the proposed station and car park site.

The Environment Agency classifies the land beneath the entire proposed Scheme as a Principal Bedrock Aquifer, an aquifer which can provide a high level of water storage and may provide water supply and/or base river flow on a strategic scale.

The entire proposed Scheme is located within a groundwater Source Protection Zone (SPZ) 3, with several abstractions located to the north and south. The nearest groundwater abstractions are located approximately 2 km to the north of the rail corridor.

Figure 2: Environmental constraints plan (to scale at A3)



2.4 Construction Traffic/ Site Access

Construction traffic will be advised to follow the M6, leaving at Junction 26 towards Liverpool on the M58. Construction traffic will then leave the M58 at Junction 1 onto Maghull Lane and travel south along the A506 until reaching Headbolt Lane. This route can also be used by construction traffic travelling easterly from Liverpool along the M58.

The intent for construction traffic using these routes is to minimise transport travelling through Kirkby town centre and Westvale to avoid disruption.

A Construction Traffic Management Plan (CTMP) will be prepared by the contractor and consulted upon with the Knowsley Council's highways department and other highways consultees to ensure that the access design accords with Knowsley Council's design guide and the impact of additional vehicular traffic can be mitigated effectively. The CTMP will also set out monitoring requirements as well as roles and responsibilities.

2.5 Lighting and Security

Construction temporary site lighting is proposed to enable safe working on the construction site in hours of darkness. Construction temporary lighting will be arranged so that glare is minimised outside the construction site.

2.6 Site Waste Management

In order to control the waste generated on the Site during preparation and the construction and remediation phase, the contractor will separate the main waste streams on the Site, prior to them being taken to a waste facility for disposal.

A Site Waste Management Plan (SWMP) will be developed, which will specify the waste streams to be estimated and monitored and goals set with regards to the waste produced. The production of the SWMP will be the responsibility of the contractor and subject to agreement with the Local Authority.

All waste to be removed from the Site will be undertaken by fully licensed waste carriers and taken to licensed waste facilities.

2.7 Environmental Management

The contractor will be required to have a certified ISO 14001 Environmental Management System (EMS). The detailed CEMP will be prepared in accordance with the EMS and other Compliance Obligations relevant to the project, such as Network Rail's NR/ENV/015 Environmental and Social Minimum Requirements, including Permits, Licenses and Consents.

The detailed CEMP will include an Environmental and Social Risk Assessment (ESRA) which will identify applicable environmental constraints, risks and opportunities, including topics which have not been assessed in the EIA but that

require best practice or precautionary working methods to ensure compliance with statutory requirements.

3 Management and Mitigation Plan

This section of the outline CEMP sets out the mitigation and management measures to be included as a minimum in the CEMP(s). It also illustrates how the monitoring strategy will be set out and the responsible party identified for each mitigation/ enhancement measures or monitoring requirement.

Table 3.1: Mitigation and management measures to be included in the CEMP

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
Traffic & Transport	Impact on the local highway network from construction traffic	The volume, type and frequency of construction CTMP	To be confirmed in detailed CEMP and CTMP	To be confirmed in detailed CEMP and CTMP
		Construction times and hours of operation with respect to construction vehicle movements to minimise travel during the AM and PM peak periods to be detailed in the CTMP	To be confirmed in detailed CEMP and CTMP	To be confirmed in detailed CEMP and CTMP
		Suitable construction vehicle routes to be detailed in the CTMP	To be confirmed in detailed CEMP and CTMP	To be confirmed in detailed CEMP and CTMP
Air Quality	Construction Dust	**General Measures** • Develop and implement a Stakeholder Management Plan that includes community engagement before works commences on-site; • Display the name and contact details of person(s) accountable for air quality and dust issues on the Site boundary. This may be the environment manager/engineer or the site manager and • Display the head or regional office contact information (if applicable). • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. **Site Management** • Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken; • Make the complaints log available to the local authority when asked; • Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book; and • Hold regular liaison meetings with other high-risk construction sites within 500 m of the Site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes. **Monitoring** • Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills along Riverside drive within 20 m of the Site boundary, with cleaning to be provided if necessary; • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked; • Increase the frequency of site inspections by the person accountable for air quality and dust issues on-site when activities with a high potential to		

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		produce dust are being carried out and during prolonged dry or windy conditions; and • Consider whether dust deposition, dust flux, or real-time PM10 continuous monitoring is required and agree with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on-site or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction. **Preparing and Maintaining the Site** • Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible; • Erect solid screens or barriers around dusty activities or the Site boundary that are at least as high as any stockpiles on-site; • Fully enclosed site or specific operations where there is a high potential for dust production and the Site is active for an extensive period; • Avoid site runoff of water or mud; • Keep site fencing, barriers and scaffolding clean using wet methods; • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on-site. If they are being re-used on-site cover as described below; and • Cover, seed or fence stockpiles to prevent wind whipping. **Operating Vehicle/Machinery and Sustainable Travel** • Ensure all vehicles switch off engines when stationary - no idling vehicles; • Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable;		

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• Impose and signpost a maximum-speed-limit of 15 miles per hour (mph) on surfaces and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate); • Produce a Construction Traffic Management Plan to manage the sustainable delivery of goods and materials, as well supporting sustainable travel (public transport, cycling, walking, and car-sharing) of construction staff. • **Operations** • Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems; • Ensure an adequate water supply on the Site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate; • Use enclosed chutes and conveyors and covered skips; • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and • Ensure equipment is readily available on site to clean and dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods. **Waste Management** • Avoid bonfires and burning of waste materials. **Measures Specific to Demolition**		

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground; • Avoid explosive blasting, using appropriate manual or mechanical alternatives; and • Bag and remove any biological debris or damp down such material before demolition. **Measures Specific to Earthworks** • Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable; • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and • Only remove the cover in small areas during work and not all at once. **Mitigations Specific to Construction** • Avoid scabbling (roughening of concrete surfaces) if possible • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. • For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust. **Measures Specific to Trackout**		

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the Site. This may require the sweeper being continuously in use; • Avoid dry sweeping of large areas; • Ensure vehicles entering and leaving sites (if applicable) are covered to prevent escape of materials during transport; • Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon reasonably practicable; • Record all inspections of haul routes and any subsequent action in a site log book; • Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned; • Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the Site where reasonably practicable); • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the Site exit, wherever site size and layout permits; and • Access gates to be located at least 10m from receptors where possible.		
Noise & Vibration	Construction site noise	Best practical means (BPM) mitigation will be implemented to control construction noise and vibration at source. Such measures as required by the Control of Pollution Act (CoPA) are summarised below: • Hours of working to be planned, taking into account the nature of land use in the areas concerned and duration of the work; • Working hours limited to Monday to Friday: 08:00 – 18:00; Saturday: 08:00 – 13:00; and on Sunday and bank holiday no noisy working (other than special works subject to prior agreement with KMBC).	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• Where practicable, quiet working methods should be employed, including the use of the most suitable plant, and suitably sized plant; • Haulage vehicles should not access the site outside of day time periods; • Equipment should be switched off when not required; • Internal haul routes should be well maintained and avoid steep gradients; • The drop height of materials should be minimised; • Plant and vehicles should be started up sequentially rather than simultaneously; • Broadband (i.e. White noise) reversing alarms should be used rather than tonal alarms; • The siting of plant should be considered to avoid noise being directed towards dwellings; and • Noise barriers in the form of temporary hoarding, stacks of materials such as bricks, timber or top soil, should be used to provide screening to nearby sensitive receptors. All work shall be carefully planned, sequenced and executed in order to minimise noise and vibration • Night-time deliveries will be avoided, materials will be delivered and stored at or near the site during daytime and components will be prefabricated off-site, where practicable • Vehicles shall be loaded/ unloaded with care in designated areas and engine idling is prohibited • Equipment will be modern, quiet and well-maintained and shall comply with relevant noise and other emissions standards • Plant and equipment with the potential to create noise and vibration will be located away from sensitive receptors and the use of barriers or other structures to absorb and/or deflect noise away from noise sensitive receptors		

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• All staff and operatives will be briefed on the requirement to minimize nuisance from site activities, via briefings, toolbox talks etc. • Layout of the site will be designed where possible to reduce the need for reversing and reversing alarms shall include one or more noise reducing feature i.e. non-tonal signals, self-adjusting output, flashing warning lights. Alarms shall be set to the minimum output for safety compliance • Modern silenced piling methods shall be used (with the use of driven impact piles avoided, where possible), and rigs shall be carefully operated • Vehicles and mechanical plant utilised on the work sites will be fitted with effective exhaust silencers and shall be examined on a daily basis and maintained in good working order and operated in a manner such that noise emissions are controlled • All compressors and generators should be 'sound reduced' models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools should be fitted with mufflers or suppressers of the type recommended by the manufacturers and should be kept in a good state of repair • Any plant, equipment, or item found to have defective noise control equipment shall not be operated until it is repaired • Fixed items of construction plant will be electrically powered from the mains supply in preference to being diesel or petrol driven • Screws and drills shall be used (rather than hammer and nails) for fixing hoardings, etc. • All materials, scaffolding, tools and waste shall be carefully handled, e.g. by lowering rather than dropping items • Small power tools and temporary power shall make use of Alternative Power Technology where possible: Such as Battery Power Sources, instead of small generators, Hybrid and Solar Powered equipment		

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• Site Vehicles shall be EV or Zero/ Low Emission Technology where possible to reduce noise, emissions, and other sources of nuisance • Noise screens will be used where possible;. • Machines will be turned on sequentially to reduce the impact of sudden noises; . • Equipment should be switched off when not required; • Internal haul routes should be well maintained and avoid steep gradients; • Plant will be turned off when not in use; and. •		
Ecology	Potential loss of, or disturbance to, habitats, protected species and breeding birds.	The following documents and standard best practice guidelines will be adhered to during the construction: • Construction Environmental Management Plan (CEMP); • Pollution Prevention Guidelines; • Embedded mitigation prescribed in Chapter 5: Air Quality; • Embedded mitigation prescribed in Chapter 6: Noise & Vibration; and • Embedded mitigation prescribed in the Light Obtrusion Assessment • Programming Site/vegetation clearance outside the bird nesting season (March – August) to avoid impacts on breeding birds.; • Inspection of UB56 Millbrook Bridge from a Mobile Elevating Work Platform (MEWP) by a licenced bat ecologist a minimum three months prior to construction activities.; • Provision of Site toolbox talks and training to all Site personnel prior to construction so that all personnel are aware of the key requirements of the CEMP.;	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• Presence of an ECoW on-site during implementation of key mitigation measures.; • Procedures for a call out service of the appointed ECoW during construction works.; • Preparation of specific Method Statements detailing best practice working methods to avoid adversely impacting ecological features on-site; and. • Application of Site-specific mitigation measures to reduce dust emitting activities. A Landscape and Ecology Management Plan (LEMP) (see document 170248-ARU-REP-EEN-000024) has been developed to ensure that proposed enhancement and creation of habitats are maintained post-construction.		
	Impacts of additional lighting and noise during construction on-site will	• All lighting will be directed on equipment only and directed away from suitable foraging habitat such as retained scrub and trees.; • The lights used for construction will be set at a low illumination levels (brightness) or as low as possible whilst maintaining a safe working environment;. • Upward lighting will be minimised to reduce light pollution;. • The height of the lighting columns will be limited to reduce light spillage;. • Noise screens will be used where possible;. • Machines will be turned on sequentially to reduce the impact of sudden noises; . • Plant will be turned off when not in use; and. • Ensure silencers are fitted to exhausts.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP
Landscape and Visual Impact Assessment	Impacts to retained vegetation and proposed planting	The following measures will be implemented to help mitigation visual impacts:	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• providing suitable protective fencing to existing trees and other vegetation that are to be retained in line with the recommendations in BS5837: Trees in relation to design, demolition and construction; • providing an Arboricultural Method Statement, based on the Arboricultural Impact Assessment and in line with BS5837: Trees in relation to design, demolition and construction; • site supervision by a qualified Arboricultural Clerk of Works (ArbCoW) during the construction phase to ensure that measures to protect retained vegetation are carried out in line with the recommendations in BS5837; and • site supervision by a qualified Lndscape Clerk of Works (LCoW) during the implementation of the landscape scheme, including the built up soil in areas to receive planting as well as at tree and shrub planting. It is advisable to ensure appropriate quality of plant material and plant handling. This will improve the successful establishment of the proposed landscape.		
Flood Risk	Flood Risk	The Contractor will consult with the EA and the Local Lead Flood Authority and other relevant risk management authorities on areas at risk of flooding and make appropriate use of the EA Floodline flood warning service for works within areas at risk of flooding. During construction, the contractor should adhere to industry standard practice working methods and mitigation measures set out in the relevant Construction Industry Research and Information Association (CIRIA) publications, the EA's Pollution Prevention Guidelines (PPG) (withdrawn in 2015) and their replacement series Guidance for Pollution Prevention (GPPs). These plans, methods and measures (specifically GPP1, GPP2, GPP5 GPP21, GPP22, GPP26 and PPG6) would reduce the likelihood of flooding during construction.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP
Ground Conditions	Inhalation of soil-derived dust (which	Dust generated from areas of contaminated soils during dry weather is a potential means for migration of contaminants to both site workers and adjacent site users.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
	may contain contaminants such as metals, asbestos fibres, PAH) by construction workers and adjacent site users.	Dust suppression measures are presented in the air quality section above. Use of appropriate site controls, abatement measures and monitoring will mitigate against potential risks.		
	Generation of airborne asbestos fibres from asbestos-containing soils and asbestos-containing materials (ACMs) presenting a risk via inhalation to construction workers and adjacent site users.	Although ACMs have not been identified in the GIR, there is still potential that it may be present in site soils. It is likely that the greatest potential risks will be during excavation and processing of the infill materials, when they are disturbed and may allow fibres to be released into ambient air. Therefore, works will need to be carried out by a suitably qualified experienced contractor and employ methods to control risks to on-site workers and adjacent site users.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP
	Exposure of construction workers to infill and groundwater (which may contain contaminants such as asbestos, metals, PAH) via dermal contact, ingestion, and inhalation of vapours.	Contractors working on the Site will require appropriate Health and Safety briefings on the types of contaminants known to exist on-site and the possibility of unexpected contamination. Procedures should be in place in the event that unexpected contamination is encountered. Contractors should be provided with personal protective equipment (PPE) appropriate for the contamination expected.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP
	Exposure of soils during removal of existing hardstanding and increased potential	Sequencing of the earthworks to minimise the amount of soil exposed at any one time.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
	for leaching and infiltration into groundwater			
WFD	General Good Practice Guidance	Pollution Prevention Guidelines (PPG) and Guidance for Pollution Prevention (GPP). The PPG/GPPs listed below are of particular relevance to the proposed scheme: PPG1: Understanding your environmental responsibilities - good environmental practices; PPG 3: Use and design of oil separators in surface water drainage systems; GPP 5: Works and maintenance in or near water; PPG 6: Working at construction and demolition sites; GPP 8: Safe storage and disposal of used oils; PPG 18: Managing fire water and major spillages; GPP 21: Pollution incident response planning; and GPP 22: Dealing with spills.	To be confirmed in detail in WFD Assessment	To be confirmed in detail in WFD Assessment
	Control of sediment runoff	Best practice will be adopted in line with GPP 5 [1]to minimise the risk of silt pollution to nearby watercourses during construction activities. This will involve the identification of potential sources and pathways to Kirkby Brook and Simondswood Brook in the WFD catchment Simonswood Brook, and the River Alt in the WFD catchment Alt US Bull Bridge, and the application of appropriate measures, where necessary, to avoid or control silt runoff. this may include: • seeding or covering exposed ground and sediment stockpiles;	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP

[1] NRW, NIEA, & SEPA (2018), *Guidance for Pollution Prevention: Works and maintenance in or near water: GPP 5.*

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• only removing vegetation from areas that need to be exposed in the near future; • minimising the amount of time soil stockpiles are exposed for; • all plant and wheel washing to be carried out in a designated area at least 10 m from any water body or surface drain; • runoff to be collected in lagoons or settlement tanks (or similar) to allow suspended solids to settle and be removed to appropriate levels before discharge to the nearby watercourse; • any runoff water containing silt or other pollutants to be treated appropriately before discharge back to the water environment.		
	Spillages	A pollution risk assessment will be carried out for the proposed site ahead of construction, considering both the storage and transportation of materials used. A pollution incident response plan (see GPP 21[2]) is to be compiled to identify the specific measures needed to reduce the likelihood of a spillage happening, and to minimise the impact of any spills that may occur.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP

[2] NRW, NIEA, & SEPA (2017), *Guidance for Pollution Prevention: Pollution Incident Response Plans: GPP 21*.

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
	Managing contamination risk	The site history and previous ground investigation data suggest that the made ground beneath the site may contain a range of contaminants including localised areas of asbestos and Polycyclic aromatic hydrocarbons (PAHs). Whilst it is not anticipated that the geo-environmental risks at the proposed scheme pose a risk to the water environment appropriate controls and good practice measures should implemented through the construction contractors CEMP. This should include further ground investigation to help inform a detailed risk assessment, remediation options appraisal and remediation strategy (if appropriate) and inspection of materials for any evidence of further contamination. Should any further evidence of contamination be identified this should be further assessed and tested as appropriate to enable any required additional controls/works to be determined. Such measures should mitigate potential environmental impacts associated with the potential mobilisation of contaminated soils at the site during construction.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP
	Minimising disturbance	Appropriate measures should be included within the work method statements to reduce potential environmental impacts of in-channel and marginal construction activities. This should include measures to: • minimise the footprint of any in-channel works as far as reasonable possible to reduce the degree of physical disturbance of the riverbed and banks; • reinstate any impacted marginal habitats where necessary; reduce associated noise, vibration, and any artificial lighting impacts where possible; and • control the timing of works so that any in-channel works are programmed to take place outside of sensitive times of year for juvenile fish and migratory fish.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP
	Biosecurity	Good biosecurity practices are vital for preventing the spread of invasive non-native species and pathogens such as waterborne fish diseases. Measures should be adopted so that the construction activities do not lead to the spread of invasive non-native species or pathogens.	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP

Topic	Potential Impact	Embedded Mitigation & Site Specific Mitigation	Monitoring Requirements	Responsibility
		• All site personnel and site visitors should be informed that Japanese knotweed is present within the vicinity of the proposed scheme and that they are jointly responsible for preventing its spread/impacts. They should be made aware of what this species looks like, so they can avoid it where possible and take appropriate actions. Biosecurity measures will be in place to prevent the spread of Japanese knotweed throughout the construction area. This will include clearing and disinfection of (but not limited to): all equipment; footwear; clothing; vehicle parts (wheels, tracks, buckets); pumps; pipework; any other equipment in contact with the watercourse of river banks.		
Heritage	Impacts to original structures forming part of the Liverpool and Bury railway line	Photographic building recording of Underbridge 55 and 56 prior to the start of work	To be confirmed in detailed CEMP	To be confirmed in detailed CEMP
	Impact to buried remains associated with Tanpit House and Mercer's Delf quarry and any other previously unrecorded archaeological remains located within the proposed station site	Archaeological evaluation carried out across the Headbolt Lane site to test the presence, nature, extent and significance of remains of Tanpit House and any other previously unrecorded archaeological remains, as well as inform any further mitigation required.	To be confirmed in detailed CEMP and WSI	To be confirmed in detailed CEMP and WSI

4 Monitoring

4.1 Checking and Corrective Action

4.1.1 Monitoring

To meet the requirement of the CEMP, environmental monitoring of the proposed Scheme and its impacts will be undertaken throughout the construction phase. In particular, the following requirements of the CEMP will be closely monitored:

- licences and approvals;
- air quality and dust monitoring;
- noise and vibration monitoring; and
- groundwater monitoring.

As part of the monitoring process the contractor will allocate a designated Environmental Site Officer (ESO), who will be present on the Site throughout the construction process and when new activities are commencing. The ESO will observe the Site activities and report any deviations from the CEMP in a log book, along with the action taken and general conditions at the time. The Applicant will be informed of any deviations from the CEMP as soon as possible following identification of such issues. The ESO would also act as day-to-day contact with Local Authority and other regulatory agencies such as the EA.

During construction, the ESO will conduct daily walkover surveys to ensure all requirements of the CEMP are being met. Action from these surveys will be documented on an Environmental Action Schedule, discussed with the Site Foreman for programming requirements and issued weekly for actioning.

The Environmental Manager/ Project Manager will arrange regular formal inspections to ensure the requirements of the CEMP are being met. After completion of the works, the ESO will conduct a final review.

4.1.2 Records

The Environmental Manager/ Project Manager will retain records of environmental monitoring and implementation of the CEMP. This will allow provision of evidence that the CEMP is being implemented effectively. Their records will include:

- Environmental Action Schedule;
- licenses and approvals;
- results of inspections by Environmental Manager/ Project Manager;
- other environmental surveys and investigations; and
- environmental equipment test records.

The CEMP will be updated as necessary, with a full review as required throughout the construction period.

Network Rail

170248 Headbolt Lane New Station GRIP 4

Appendix 2B: Existing Site Levels

170248-ARU-REP-EEN-000027

Final | October 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 276736

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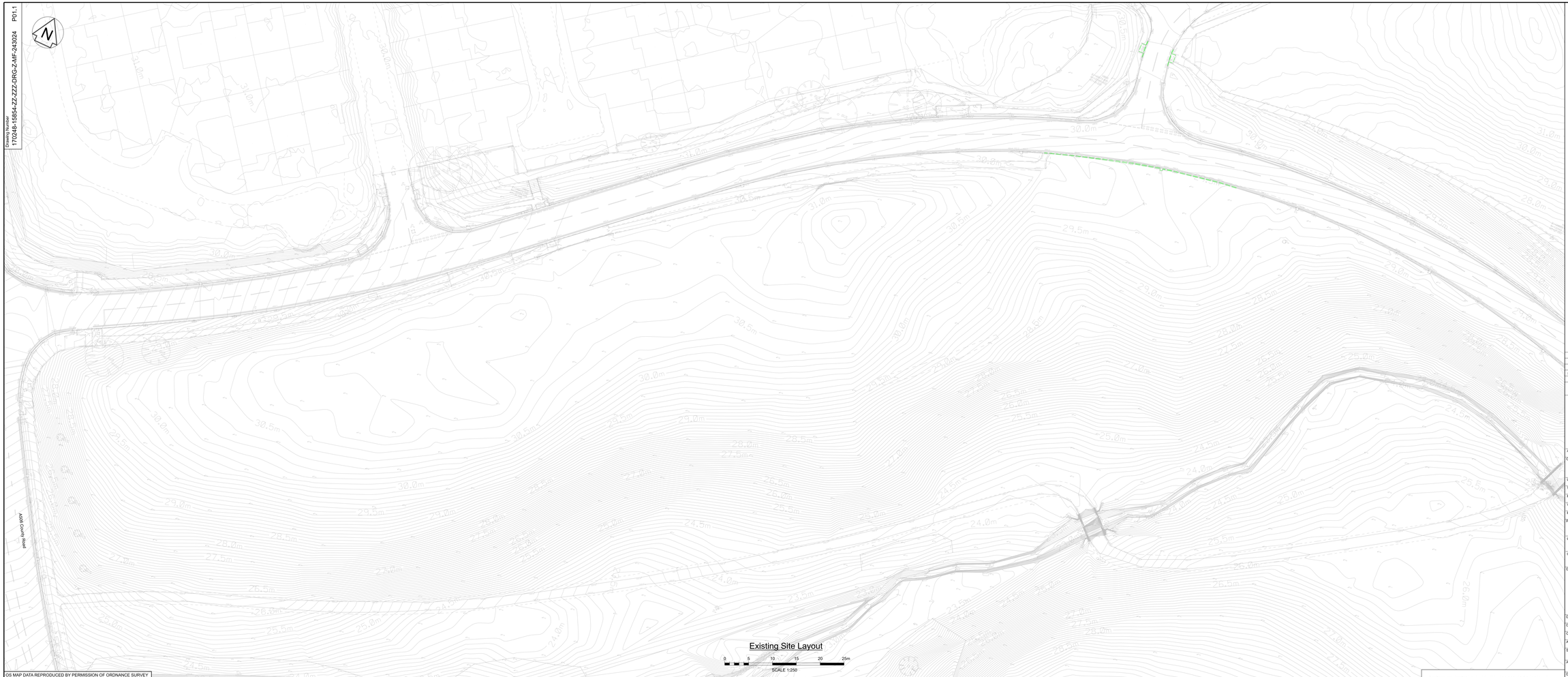

Drawing Number
170248-15854-ZZ-ZZZ-DRG-Z-MF-243024 P01.1

Legend/Notes

1. Do not scale from this drawing.
2. All dimensions are in millimetres unless shown otherwise.
3. All levels are in metres above ordnance datum.
4. Topographical information referenced from IncRail Topographical Survey (P-116-099-SUR-DM2-0001 A03)

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01.1	27/10/21	First Revision	---	---	---

Status: Issued for Planning
Suitability: S0

NetworkRail

Authorised: ---
Signed: ---
Date:

Contractor(s): Ove Arup & Partners

Location/Level: No Specific Location

Type: CAD Drawing
Sub-type:
Role: General (non-disciplinary)
Discipline: Multi-Functional
Volume/System: No Specific Volume or System
Phasing:
Stage:

Project: Headbolt Lane

Contract No.: 170248

Contract Title: Headbolt Lane

Drawing Title:
Planning Application Drawing
Existing Site Levels
Sheet 1 of 2

Designed		Signed ---	Date
Drawn	---	Signed ---	Date
Checked	---	Signed ---	Date
Approved	--	Signed ---	Date
Scale(s)		ELR & Mileage	
		to	
Alternative Reference			Sheet of
Drawing Number	170248-15854-ZZ-ZZZ-DRG-Z-MF-243024		Revision P01.1

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Continued on Drawing No. 170248-15854-ZZ-ZZZ-DRG-Z-MF-243025

Sheet Size A1+3 594 x 1471



Drawing Number
170248-15854-ZZ-ZZZ-DRG-Z-MF-243025 P01.1

Legend/Notes

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3. All levels are in metres above ordnance datum.
4. Topographical information referenced from InoRail Topographical Survey (P-115-099-SUR-DM2-0001 A03)

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01.1	27/10/21	First Revision	---	---	---

Status: Issued for Planning
Suitability: S0

NetworkRail

Authorised: --- Signed: --- Date:

Contractor(s): Ove Arup & Partners

Location/Level: No Specific Location

Type: CAD Drawing Sub-type:

Role: General (non-disciplinary) Discipline: Multi-Functional

Volume/System: No Specific Volume or System

Phasing: Stage:

Project: Headbolt Lane

Contract No.: 170248

Contract Title: Headbolt Lane

Drawing Title:
Planning Application Drawing
Existing Site Levels
Sheet 2 of 2

Designed		Signed: ---	Date:
Drawn	---	Signed: ---	Date:
Checked	---	Signed: ---	Date:
Approved	--	Signed: ---	Date:
Scale(s):		ELR & Mileage: to	
Alternative Reference:			Sheet: of
Drawing Number: 170248-15854-ZZ-ZZZ-DRG-Z-MF-243025			Revision: P01.1

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Sheet Size A1+3 594 x 1471

Network Rail

170248 Headbolt Lane New Station GRIP 4

Appendix 2C: Proposed Site Levels

170248-ARU-REP-EEN-000028

Final | October 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 276736

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Drawing Number
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Continued on Drawing No. 170248-15854-ZZ-ZZZ-DRG-Z-MF-243029

Legend/Notes

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2. All dimensions are in millimetres unless shown otherwise.
3. All levels are in metres above ordnance datum.
4. Topographical information referenced from InoRail Topographical Survey (P-116-099-SUR-DM2-0001 A03)

XX.XX E Existing Levels

XX.XX P Proposed Levels

Proposed Minor Contour (0.20m interval)

Proposed Major Contour (1.00m interval)

Existing Contour (0.20m interval)

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01.1	27/10/21	First Revision	---	---	---

Status: Issued for Planning

Suitability: S0

NetworkRail

Authorised: ---

Signed: ---

Date:

Contractor(s): Ove Arup & Partners

Location/Level: No Specific Location

Type: CAD Drawing

Sub-type:

Role: General (non-disciplinary)

Discipline: Multi-Functional

Volume/System: No Specific Volume or System

Phasing:

Stage:

Project: Headbolt Lane

Contract No.: 170248

Contract Title: Headbolt Lane

Drawing Title: Planning Application Drawing Proposed Site Levels Sheet 1 of 2

Designed		Signed: ---	Date
Drawn	---	Signed: ---	Date
Checked	---	Signed: ---	Date
Approved	---	Signed: ---	Date

Scale(s): 1:250

ELR & Mileage: to

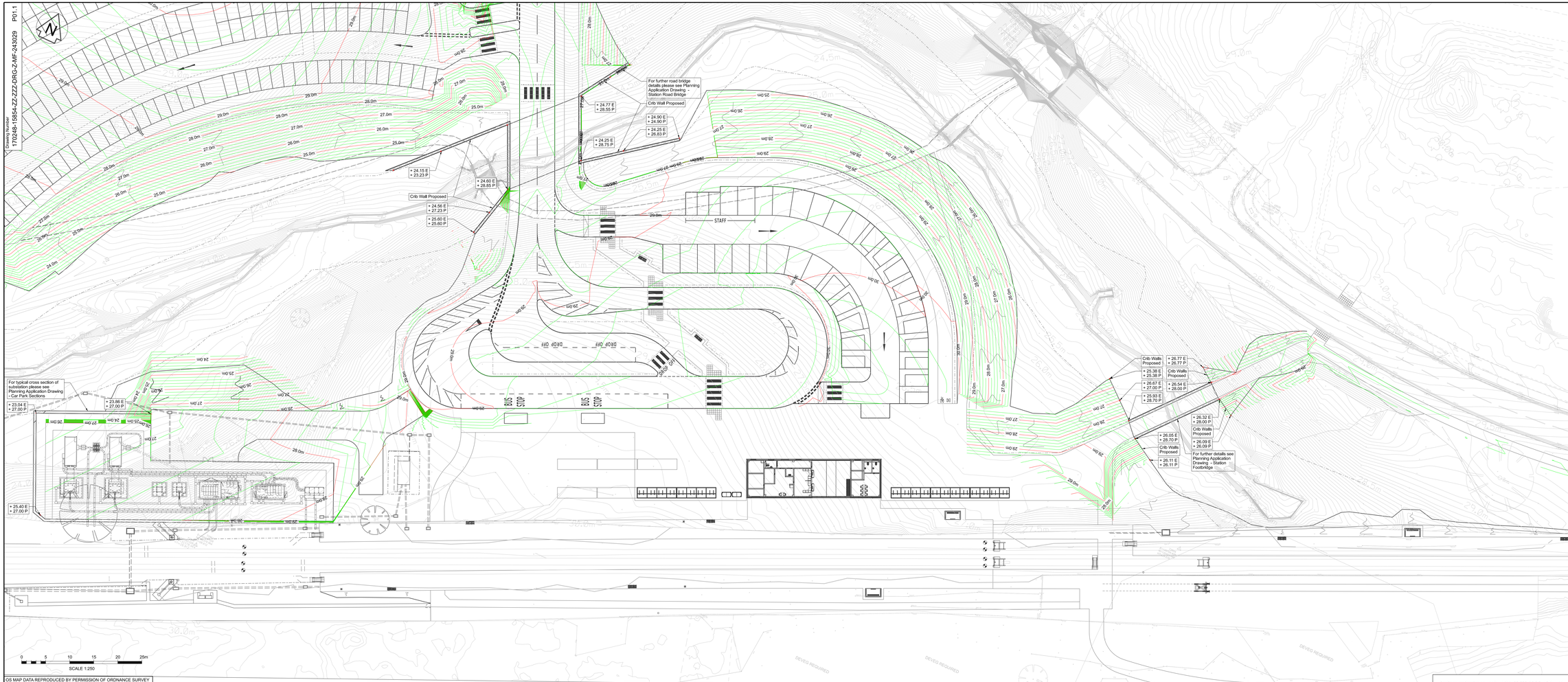
Alternative Reference:

Sheet of

Drawing Number: 170248-15854-ZZ-ZZZ-DRG-Z-MF-243028

Revision: P01.1

Sheet Size A1+3 594 x 1471



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Continued on Drawing No. 170248-15854-ZZ-ZZZ-DRG-Z-MF-243028

Legend/Notes

1. Do not scale from this drawing.
2. All dimensions are in millimetres unless shown otherwise.
3. All levels are in metres above ordnance datum.
4. Topographical information referenced from InoRail Topographical Survey (P-116-099-SUR-DM2-0001 A03)

Legend

XX.XX E Existing Levels

XX.XX P Proposed Levels

Proposed Minor Contour (0.20m interval)

Proposed Major Contour (1.00m interval)

Existing Contour (0.20m interval)

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01.1	27/10/21	First Revision	---	---	---

Status: Issued for Planning

Suitability: S0

NetworkRail

Authorised: --- Signed: --- Date:

Contractor(s): Ove Arup & Partners

Location/Level: No Specific Location

Type: CAD Drawing Sub-type:

Role: General (non-disciplinary) Discipline: Multi-Functional

Volume/System: No Specific Volume or System

Phase/s: Stage:

Project: Headbolt Lane

Contract No.: 170248

Contract Title: Headbolt Lane

Drawing Title:

Planning Application Drawing Proposed Site Levels Sheet 2 of 2

Designed		Signed: ---	Date: ---
Drawn	---	Signed: ---	Date: ---
Checked	---	Signed: ---	Date: ---
Approved	---	Signed: ---	Date: ---
Scale(s)		EUR & Mileage	
		to	
Alternative Reference			Sheet: of
Drawing Number: 170248-15854-ZZ-ZZZ-DRG-Z-MF-243029			Revision: P01.1

Sheet Size A1+3 594 x 1471

Network Rail

170248 Headbolt Lane New Station GRIP 4

Appendix 2D: Cut and Fill

170248-ARU-REP-EEN-000029

Final | October 2021

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Job number 276736

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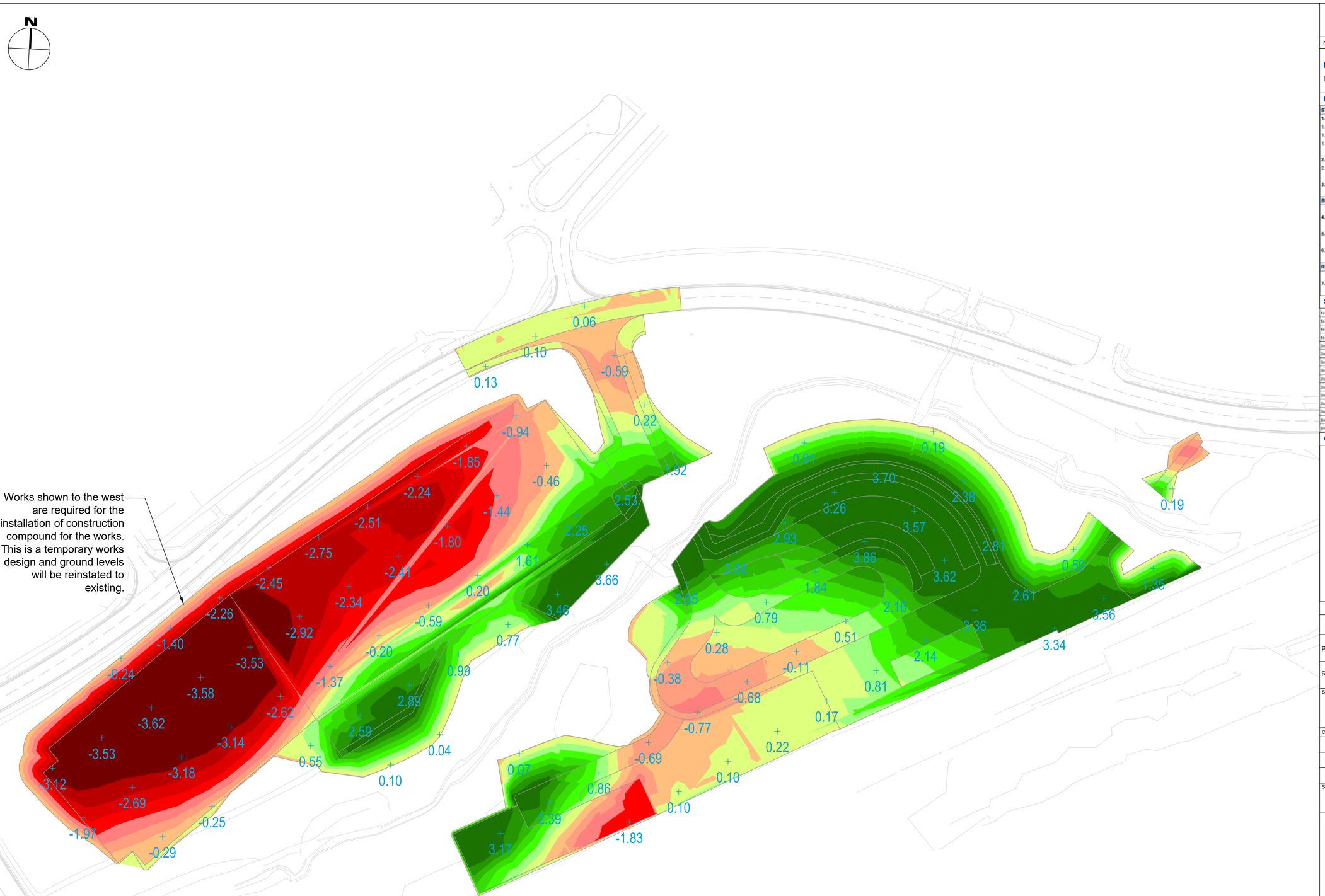
BGC-00-LD-DR-W-6601 | P01

Originator | Zone | Level | Type | Role | Number | Revision



Works shown to the west are required for the installation of construction compound for the works. This is a temporary works design and ground levels will be reinstated to existing.

For existing and proposed levels including extent of retaining walls see the following drawings:
Planning Application Drawing - Existing Site Levels Sheet 1 of 2
Planning Application Drawing - Existing Site Levels Sheet 2 of 2
Planning Application Drawing - Proposed Site Levels Sheet 1 of 2
Planning Application Drawing - Proposed Site Levels Sheet 2 of 2

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Scale 1:600 (0, 12, 24, 36, 48, 60)

Notes:

BULK EARTHWORKS ANALYSIS

In Summary: "F20002-BGC-00-XX-SH-W-6601-P01-S1"

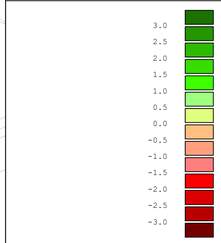
Earthworks Summary:

STRIP VOLUMES		
1.Strip		
1.1 SA Topsoil	6,580 m3	
1.2 Hard Material	126 m3	Not included in Topsoil Net
1.3 Soft Strip (Unacceptable)	398 m3	Not included in Topsoil Net
2. Resoil		
2.1 SA Topsoil	2,374 m3	
3. Topsoil Net (1.1 - 2.1)	**4,206 m3**	Surplus
BULK EARTHWORKS		
4. Bulk Earthworks Cut:	23,043 m3	Includes Any Arisings and Stockpiles
5. Bulk Earthworks Fill:	27,832 m3	
6. Bulk Earthworks Net (4 - 5)	**-4,788 m3**	Shortfall
REGULATING		
7. Regulating Fill:	**22 m3**	

Strip and Construction Depths:

Existing Strip Depth	Carriageway Plane Off	40mm
Existing Strip Depth	Footways	230mm
Existing Strip Depth	Grass	280mm
Existing Strip Depth	Vegetation	280mm
Design Construction Depth	Access Road	505mm
Design Construction Depth	Batters	300mm
Design Construction Depth	Building Slab	600mm
Design Construction Depth	Substation	730mm
Design Construction Depth	Car Park	505mm
Design Construction Depth	Footways	330mm
Design Construction Depth	Grass	300mm
Design Construction Depth	Carriageway Overlay	40mm
Design Construction Depth	Paving	280mm
Design Construction Depth	Future Car Park	505mm
Design Construction Depth	Cycle Path	230mm

Cut / Fill Depths Legend:



* **Level Difference Range: from -3.82m to 4.89m**

Issued for Planning

Rev						
P01	Isopachyte 6601-P01					
		19 Feb 21		19 Feb 21		19 Feb 21
Rev	Comment					
	Created By	Date	Checked By	Date	Approved By	Date

Scale at A1	Issuing Office	Project Number
1:600	STOWE	F20002

Client Approval

- A - Approved
- B - Approved With Comments
- C - Do Not Use

Status	Purpose of Issue
S1	For Coordination

BUCKINGHAM Group Contracting

Silverstone Road, Stowe, Buckingham MK18 5LJ
Telephone: 01280 823355 Fax: 01280 812830
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Project: Headbolt Lane

Title: Planning Application Drawing
Headbolt Lane Station Cut and Fill

Client: Network Rail

BGC-00-LD-DR-W-6601 | P01

Originator | Zone | Level | Type | Role | Number | Revision

File Path:C:\Users\liam.bromley\Arup\282997-00 HEADBOLT LANE STATION GS - Documents\03 Internal Data - Engineering\EOV - Civil Engineering\03 Drawing Renditions\2021-10-29 BGCL CAD Model and Heat Map DWG\F20002-BGC-00-LD-DR-W-6601-P01-S1 Isopachyte.dwg

Plot Date:29 October 2021 Plot Style: ---- Saved By: Liam.Bromley on 29 October 2021 | Plot Scale Check | 100mm | Sheet Size A1 841 x 594

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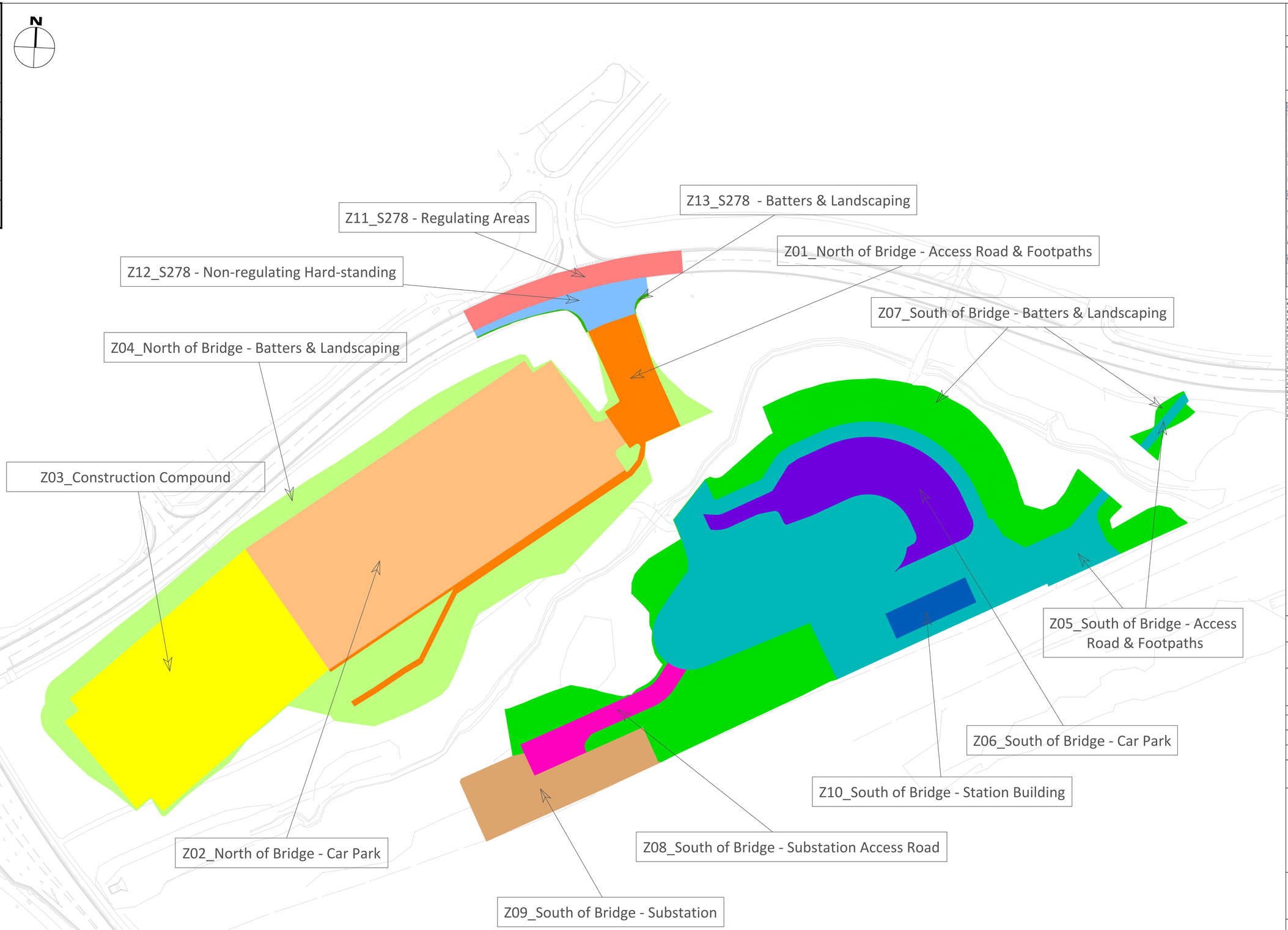
Originator | Zone | Level | Type | Role | Number | Revision



Scale 1:600 — 0 12 24 36 48 60

Notes:

BULK EARTHWORKS ANALYSIS

In Summary: "F20002-BGC-00-XX-SH-W-6601-P01-S1"

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Design Construction Depth	Grass	300mm
Design Construction Depth	Carriageway Overlay	40mm
Design Construction Depth	Paving	280mm
Design Construction Depth	Future Car Park	505mm
Design Construction Depth	Cycle Path	230mm

Issued for Planning

Rev						
P01	Zones 6601-P01					
		19 Feb 21		19 Feb 21		19 Feb 21
Rev	Comment					
	Created By	Date	Checked By	Date	Approved By	Date

Scale at A1	Issuing Office	Project Number
1:600	STOWE	F20002

Client Approval

- A - Approved
- B - Approved With Comments
- C - Do Not Use

Status	Purpose of Issue
S1	For Coordination

BUCKINGHAM Group Contracting
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Project: Headbolt Lane

Title: Planning Application Drawing - Headbolt Lane Zone Areas (relating to bulk earthworks analysis)

Client: Network Rail

BGC - 00 - ZL - DR - W - 6601 | P01
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File Path:C:\Users\liam.bromley\Arup\282987-00 HEADBOLT LANE STATION GS - Documents\03 Internal Data - Engineering\EOV - Civil Engineering\03 Drawing Renditions\2021-10-29 BGCL CAD Model and Heat Map DWG\F20002-BGC-00-ZL-DR-W-6601-P01-S1 Zones.dwg
Plot Date:29 October 2021 Plot Style: ---- Saved By: Liam.Bromley on 29 October 2021 | Plot Scale Check | 100mm | Sheet Size A1 841 x 594

Appendix 4A

Headbolt Lane Station Transport Assessment

Buckingham Group Contracting Limited

170248 Headbolt Lane New Station GRIP 4

Transport Assessment

170248-ARU-REP-EHW-000003

Final | 30 June 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 276726

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Appendix C

Accessibility Assessment Form

Appendix D

Car Park Layout

Appendix E

Traffic Flow Diagrams

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Junction Modelling Outputs

1 Introduction

Arup has been commissioned by Buckingham Group Contracting Limited (BGCL) on behalf of Network Rail to produce a Transport Assessment (TA) to assess the highway and transport impacts of the proposed new railway station at Headbolt Lane.

Headbolt Lane is an infrastructure project that will extend the Merseyrail network from the existing terminating station at Kirkby to a new station to be constructed at Headbolt Lane.

The existing rail corridor comprises a single line. The Merseyrail network will be extended east from the existing terminating station at Kirkby, and a new turnout will provide access to a new twin-track arrangement.

The existing Northern Rail platform at Kirkby station will be decommissioned and a new station interchange provided at Headbolt Lane. This new station will comprise three platforms, with two platform faces serving Merseyrail and a single platform face serving Northern Rail. Buffer stops will be provided to Merseyrail and Northern Rail to delineate between the two Train Operating Companies. The platforms will be connected by a station access arrangement replicating the operational functionality at the existing Kirkby station.

A new 300 space car park and public transport interchange facilities will be provided at Headbolt Lane. Parking facilities for 100 cycles will be provided with passive provision for a further 200 spaces.

The scheme has been developed to GRIP 3 by Network Rail. BGCL has been appointed to develop the design to GRIP 4, who in turn have appointed Arup to undertake design services.

1.1 Site location

Headbolt Lane lies within the in the Northwood area of Kirkby, Merseyside.

The site is located on green space bounded by the A506 to the west, Headbolt Lane to the north and east and the Kirkby Branch railway line to the south. Kirkby Brook crosses under the railway and into the site from the south-east, before running through the centre of the site and leaving the site downstream to the west.

The surrounding area is primarily low-density housing, with Kirkby town centre located approximately 800m to the south of the site.

The site location is shown in Figure 1.

Figure 1: Site location



1.2 Scope of this report

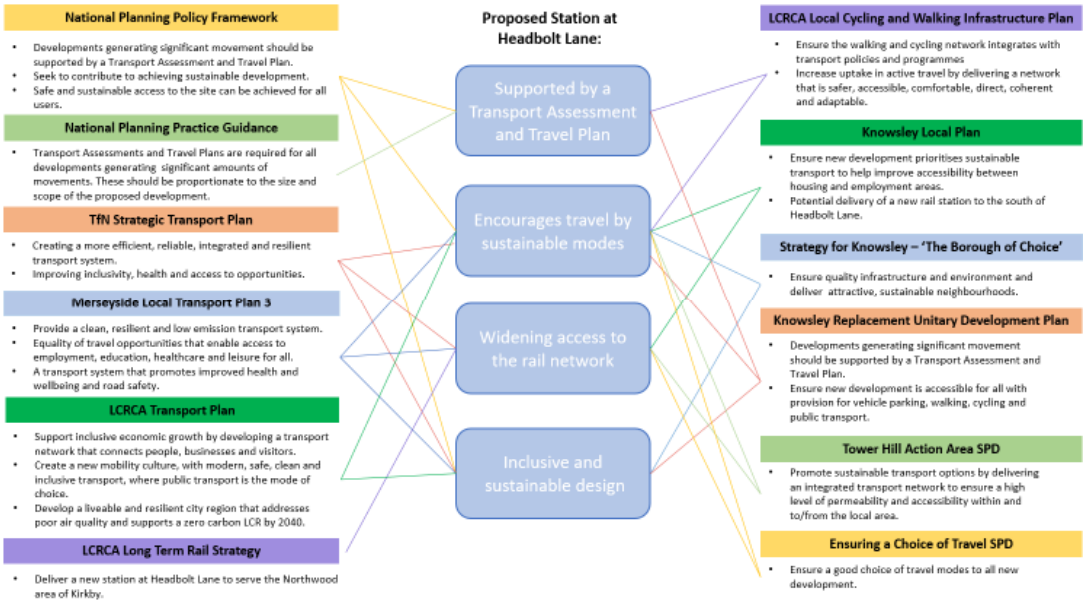
The scope of this assessment has been agreed with Knowsley Metropolitan Borough Council (KMBC) as the highway authority. A scoping meeting was held with Arup and KMBC on 5th February 2021, the minutes of which are provided in Appendix A. The purpose of this TA is to set out the existing conditions in the vicinity of the site and assess the accessibility of the proposed development by all available transport modes. An assessment of the transport impacts associated with the development has also been undertaken.

The structure of this report is as follows:

- **Section 2** discusses relevant national and local planning policy with regards to the site;
- **Section 3** sets out the existing transport at the site and surrounding area;
- **Section 4** presents the development proposals;
- **Section 5** sets out the methodology used to derive the trip generation and distribution of traffic associated with the development;
- **Section 6** presents an assessment of the highway impact of the proposed development; and
- **Section 7** draws a conclusion to the report.

2 Policy review

The proposed development has been designed with full regard to national and local transport and planning policies. A summary of the key relevant policies is provided below. A detailed analysis of these policies in relation to the proposed development is shown in Appendix C.



All relevant policy documents emphasise the need for sustainable development in accessible locations. The proposed development itself would provide a sustainable travel option for local residents and increased accessibility for all its users.

National and local policy identifies the need for all developments that generate a significant level of vehicle movements to provide a Transport Statement or Transport Assessment and Travel Plan. This Transport Assessment has been produced in support of the proposals and details the sustainable credentials of the site, as well as its anticipated highway impact. A Travel Plan has also been prepared for the development to encourage access by sustainable modes through a variety of measures.

Similarly, a key theme across all policy documents is ensuring development supports inclusive and sustainable access. Policy states that developments should seek to improve people's health, wellbeing and environment by reducing traffic emissions, improving road safety and creating safer places for cycling and walking.

The aim of the proposed development is to minimise long vehicle trips and encourage multi-modal trips by more sustainable modes, which fully supports these key policies. Access to the site by all modes has been considered and designed for. The provision of cycle infrastructure, cycle parking, and electric vehicle charging further enhances the sustainability of the development.

The policy review demonstrates that the proposed station development at Headbolt Lane aligns with both national and local policies.

3 Existing conditions

This section outlines the baseline conditions on and in the vicinity of the development site. This assessment been undertaken entirely as a desktop review due to COVID-19 restrictions. Infrastructure and conditions are explored relating to highways, walking, cycling and public transport.

A completed 'Accessibility Assessment Form' is provided in Appendix C.

3.1 Site information

The proposed development site is an area of green space with a pedestrian route traversing from east to west. Headbolt Lane runs in an east-west alignment along the northern boundary of the site, connecting with the A506 to the west and Pingwood Lane / Dale Lane to the east.

To the north of the development site is the residential area of Tower Hill. To the south is the rail line running east to west with the residential area of Northwood and Kirkby town centre beyond. Kirkby rail station and surrounding residential areas lie to the west, and agricultural land and the William Brothers Industrial Park lie to the east.

Figure 2 shows the key transport infrastructure serving the development site

Figure 2: Key transport infrastructure



3.2 Active travel

Figure 3 provides an overview of the key walking and cycling infrastructure serving the development site.

Figure 3: Active travel infrastructure serving the development site

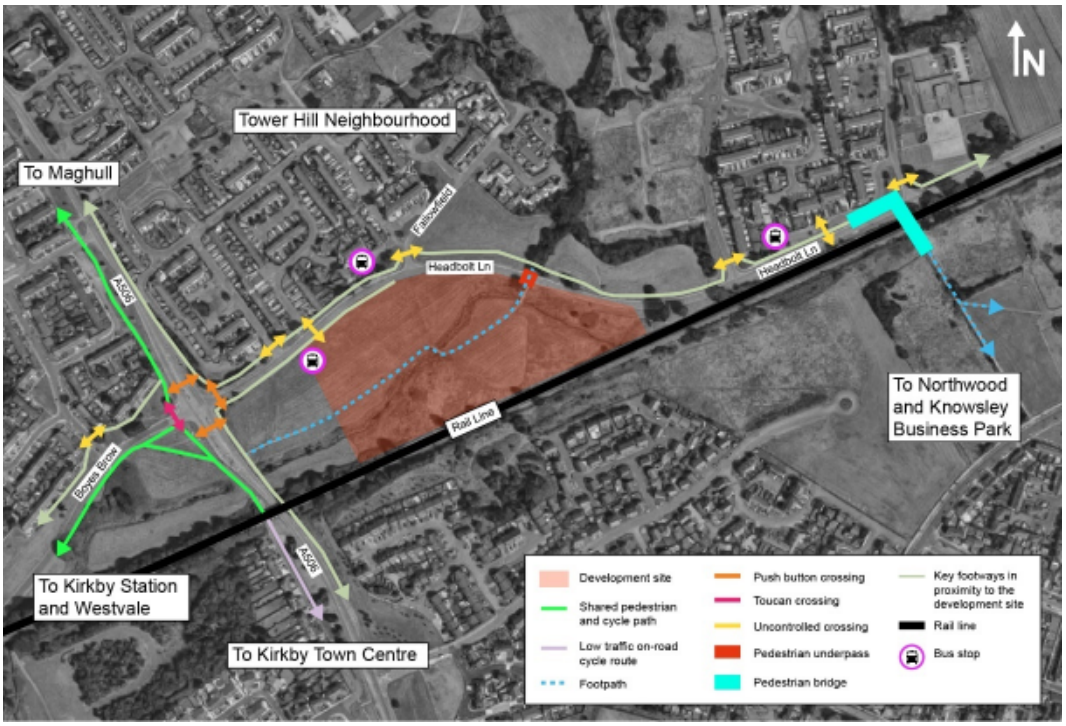
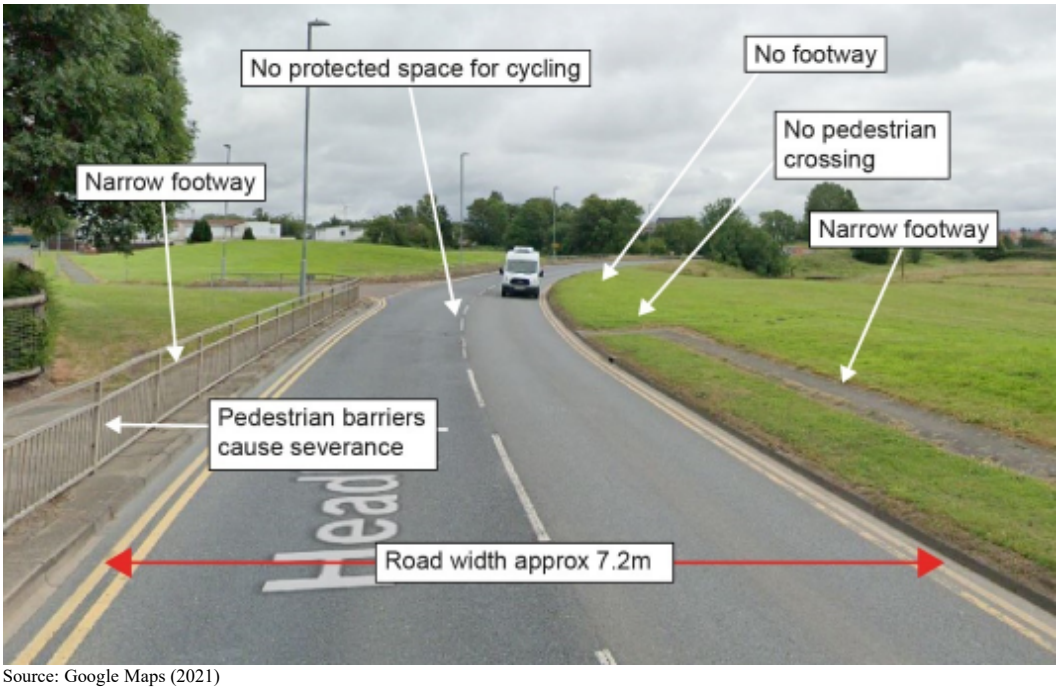


Figure 4 provides an overview of existing conditions on Headbolt Lane.

The footway on the northern side of Headbolt Lane is below the recommended 2m minimum width and guardrails separate the footways from the road, creating a degree of severance between the residential areas to the north and the proposed development site.

Figure 4: Analysis of existing conditions on Headbolt Lane

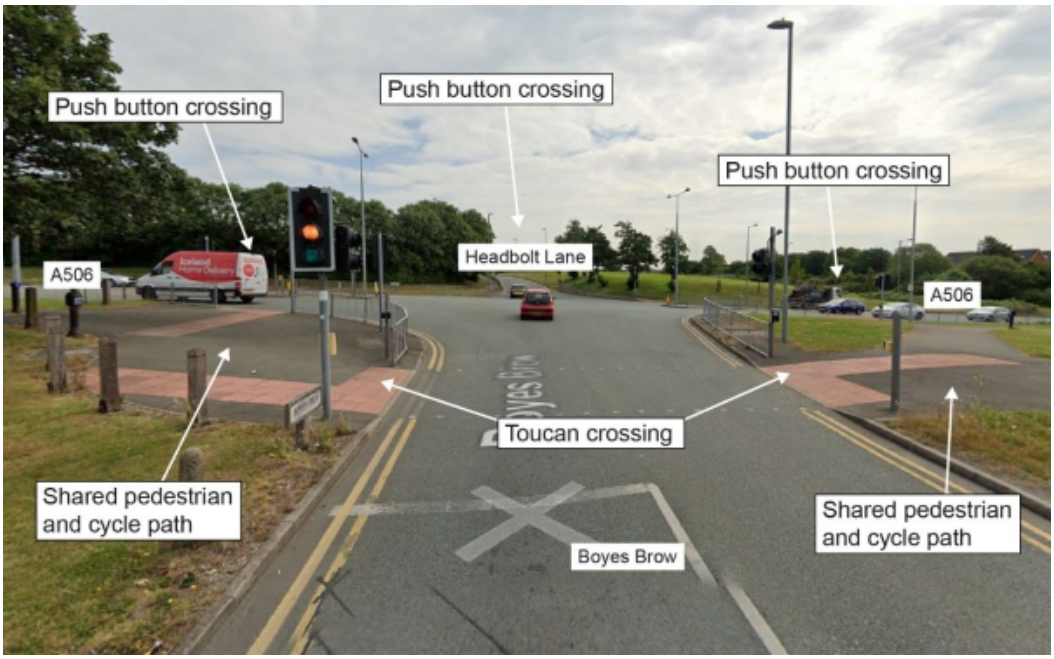


Source: Google Maps (2021)

There is a limited section of footway (approx. 220m) on the southern side of Headbolt Lane from the junction with the A506 to Fallowfield. At its eastern extent, the footway ends without providing access to the footways on the opposite side of the road.

There are three uncontrolled crossings with dropped kerbs and tactile paving along the length of the road and signalised pedestrian crossings on all arms of the A506 / Boyes Brow / Headbolt Lane junction, as shown in Figure 5.

Figure 5: Pedestrian and cycle crossings at A506 / Headbolt Lane / Boyes Brow junction



Source: Google Maps (2021)

The rail line to the south of the proposed development site causes a degree of severance for areas to the north and south. There is a pedestrian bridge approximately 300m to the east of the development site which provides access over Headbolt Lane and the rail line, as shown in Figure 6. It provides a link between the site and the Northwood area to the south, including Knowsley Business Park beyond.

Figure 6: Pedestrian bridge located to the east of the development site



Source: Google Maps (2021)

There is an existing footpath that runs in an east-west alignment across the development site from the A506 to the junction of Headbolt Lane and Southcroft Drive, as shown in Figure 7. The footway is relatively narrow with an uneven surface. At its western end the path uses an underpass below the highway, which although minimises conflict with vehicles, may be an unattractive route choice for some pedestrians. It is understood that KMBC plans to close the underpass and raise the footpath to the level of the road.

Figure 7: Footway crossing the development site, viewed looking east from the A506



Source: Google Maps (2021)

There is a shared use pedestrian and cycle path to the west of the development site along the A506 (see Figure 8), providing a link towards Kirkby town centre to the south and neighbourhoods to the north of the proposed development site. There is a toucan crossing on the western arm of the Headbolt Lane / A506 / Boyes Brow junction.

A shared footway / cycleway is also in place on Boyes Brow on approach to the A506. However, there are no cycle crossings on the northern or southern arms of the Headbolt Lane / A506 / Boyes Brow junction meaning there is no formal cycle connection across the A506.

Figure 8: Shared use pedestrian and cycle path located to the north of the A506 / Headbolt Lane / Boyes Brow junction



Source: Google Maps (2021)

The Tower Hill area to north of development site has a street network which encourages low traffic speeds, creating a more pleasant environment for pedestrians and cyclists.

3.3 Public transport

3.3.1 Bus

The number 20 bus is the only service which serves Headbolt Lane, connecting Tower Hill with Liverpool city centre via Kirkby. The service runs in an eastbound direction on Headbolt Lane before circling Tower Hill via Pingwood Drive and Shevington's Lane, returning to Liverpool via the A506.

Figure 9: Bus stop on northern side of Headbolt Lane



Source: Google Maps (2021)

There are three bus stops on the northern side of Headbolt Lane and a bus stop on the southern side of Headbolt Lane adjacent to the junction with Freckleton Drive. The stop on the southern side of Headbolt Lane is not currently operational.

The 14a, 14c, and 133 bus services operate along the A506. These services can be accessed from bus stops adjacent to Windemere Drive in a northerly direction and adjacent to St Kevin's Drive in a southerly direction. Both stops are approximately 400m walk from the proposed development site.

The number 21 service operates to the south of the proposed development site, connecting the Northwood area with Liverpool. Currently, accessing this service requires crossing the rail line over the pedestrian bridge approximately 300m to the east of the proposed development site.

Table 1 provides further details of the bus services serving the area around the development site.

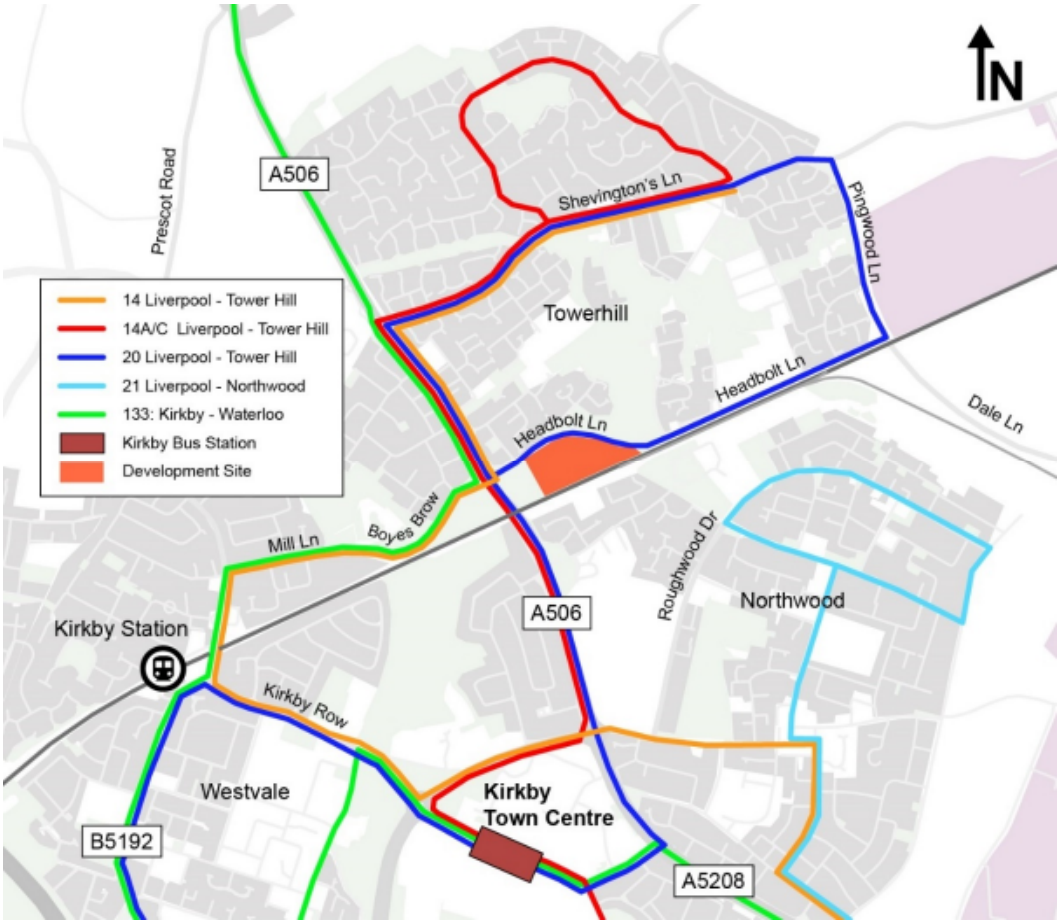
Table 1: Bus services operating in the vicinity of the site

Service	Route	Stop location	Service frequency*
14**	Liverpool – Tower Hill	Boyes Brow	0
14A / 14C	Liverpool – Tower Hill	A506	2
20	Liverpool – Tower Hill	Headbolt Lane (towards Tower Hill) A506 (towards Liverpool)	5
21	Liverpool – Northwood	Roughwood Drive	5
133	Waterloo – Kirkby	Boyes Brow	1

*Services per hour in one direction
**14 only runs to and from Tower Hill before 6am.

Bus routes operating in the local area are shown in Figure 10.

Figure 10: Bus routes in proximity to the proposed development site



3.3.2 Rail

Kirkby Rail Station lies 1.3km to the southwest of the development site. It is the current terminus of the Merseyrail Northern Line and the Kirkby Branch Line from Wigan. It serves as an interchange between Merseyrail services from Liverpool Central and Northern services from Manchester Victoria via Wigan Wallgate.

There are four services per hour from Kirkby to Liverpool Central and one service per hour to Wigan Wallgate. There are also infrequent services between Manchester Victoria with two services arriving at Kirkby and four services departing on weekdays between 06:00 and 10:00. Two services also arrive at Kirkby from Manchester Victoria and one service departs between 18:00 and 20:00. The proposed Headbolt Lane station will serve as the future terminus of these services.

3.4 Vehicle access

3.4.1 Local highway network

Headbolt Lane is a two-way single carriageway road, providing access to several residential areas within Tower Hill. The road is subject to a 30mph speed limit.

At its western end, Headbolt Lane connects with the A506 Bank Lane. This is the main vehicle route accessing M58 Junction 1 and Maghull to the north and Kirkby town centre, Knowsley Business Park, and the residential areas of Northwood and Southdene to the south. Boyes Brow forms the western arm of the junction of Headbolt Lane and the A506 Bank Lane.

At its eastern end, Headbolt Lane joins Pingwood Lane and Dale Lane via a priority-controlled T-junction. Dale Lane leads south providing access to Knowsley Business Park and on towards the A580 East Lancashire Road. Pingwood Lane provides access to Shevington's Lane and Stopgate Lane to the north.

Figure 11: Local highway network

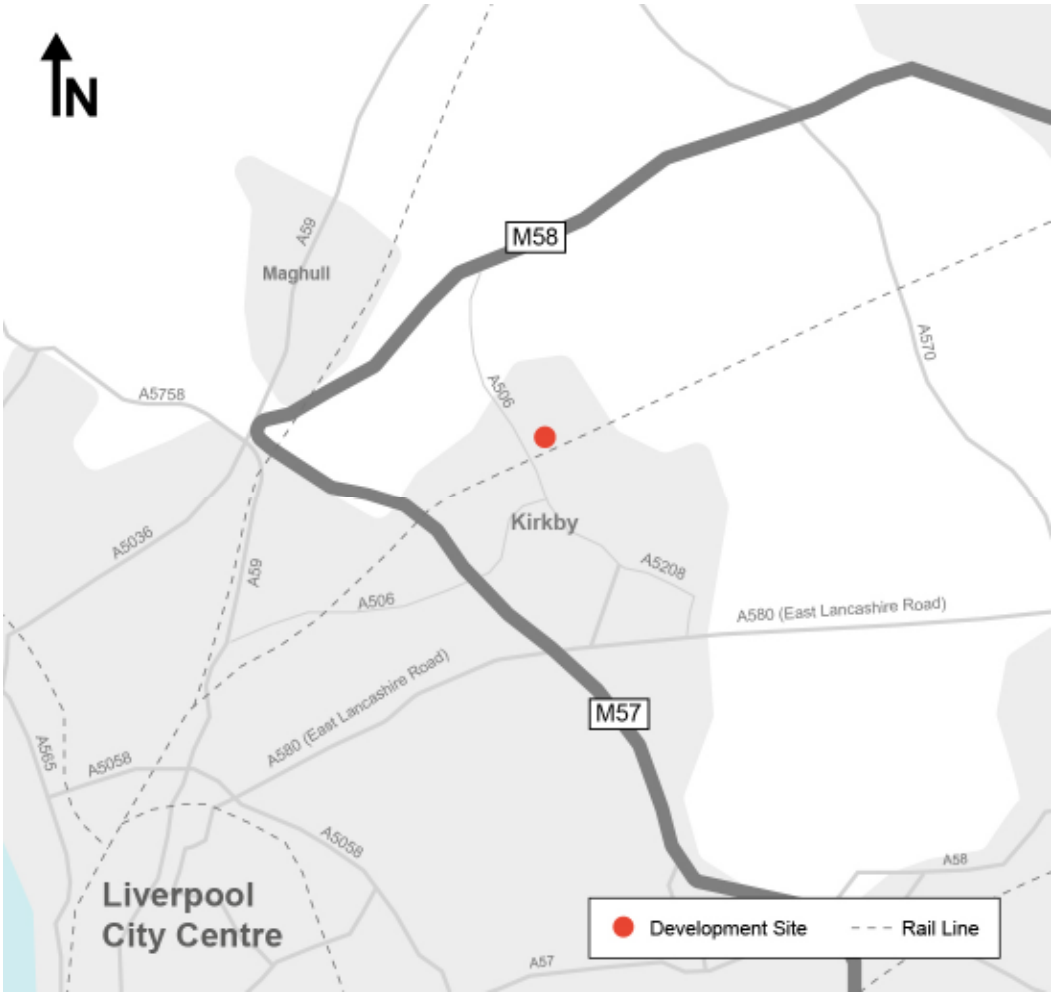


3.4.2 Wider network

The wider highway network includes the M57, M58, and M62 motorways as well as the A580 East Lancashire Road. These routes connect the proposed development site with Liverpool to the west and Manchester to the east.

As previously noted, the Strategic Road Network can be directly accessed directly from the northern end of A506 Bank Lane via M58 Junction 1.

Figure 12: Wider highway network



3.4.3 Parking / waiting restrictions

There are currently no parking or waiting opportunities on Headbolt Lane, with double yellow lines on both sides of the carriageway for the entire length.

There are limited on-street parking restrictions in the residential area of Tower Hill, directly north of the proposed development site. The only restrictions are no stopping outside the entrance to Eastcroft Park Primary School between 08:00-17:00. Similarly, in the Northwood area to the sout h of the rail line, parking restrictions are limited to areas outside schools as well as at junctions on Roughwood Drive. There are permitted parking zones in areas adjacent to Kirkby town centre to the southwest, restricting parking to those with permits.

3.4.4 Highway safety

Personal injury accident data for May 2016 to December 2020, has been provided by KMBC. The study area comprises the local highway network in the vicinity of

Headbolt Lane. An overview of the locations of all collisions within the study area is presented in Table 2 and Figure 13.

Table 2: Annual recorded collisions by severity

Severity	2016	2017	2018	2019	2020	Total
Fatal	1	0	1	0	0	2
Serious	0	2	1	1	0	4
Slight	2	4	4	1	9	20
Total	3	6	6	2	9	26

Figure 13: Road traffic collisions (May 2016 – December 2020)



Over the course of the study period, a total of 26 collisions have been recorded within the study area. Of these collisions, two were fatal, four resulted in serious injury, and the remainder resulted in slight injury.

Table 3 and Table 4 present more detailed information on the collisions recorded at specific locations within the study network.

Table 3: Recorded collisions by mode

Location	No. of recorded collisions	No. of each mode involved in recorded collisions				
		Pedestrian	Cycle	Motorcycle	Car	LGV / HGV
A506 / St Kevin's Drive	4	1	0	2	6	1
A506 / Headbolt Lane	2	0	1	0	3	0
Shevington's Lane / Pingwood Drive / Stopgate Lane	4	0	2	0	4	1
A506 / Shevington's Lane	1	0	0	0	2	0
Headbolt Lane / Stopgate Lane / Dale Lane	1	0	0	0	2	2
A506 County Road	1	1	0	0	1	0
Headbolt Lane	1	0	0	0	2	0
A506 Bank Lane	5	2	0	0	7	1
Shevington's Lane	3	1	0	0	3	1
Domingo Drive	1	1	0	0	1	0
Chamberlain Drive	1	1	0	0	2	0
Pingwood Lane	2	1	0	0	1	1
Total	**26**	**8**	**3**	**2**	**34**	**7**

Table 4: Recorded collisions by severity

Location	No. of recorded collisions	Severity		
		Slight	Serious	Fatal
A506 / St Kevin's Drive	4	3	0	1
A506 / Headbolt Lane	2	2	0	0
Shevington's Lane / Pingwood Drive / Stopgate Lane	4	4	0	0
A506 / Shevington's Lane	1	1	0	0
Headbolt Lane / Stopgate Lane / Dale Lane	1	1	0	0
A506 County Road	1	1	0	0
Headbolt Lane	1	1	0	0
A506 Bank Lane	5	5	0	0
Shevington's Lane	3	2	1	0
Domingo Drive	1	0	1	0
Chamberlain Drive	1	0	1	0
Pingwood Lane	2	0	1	1
Total	**26**	**20**	**4**	**2**

The data shows that two fatalities have been recorded within the study area in the last five years. These incidents occurred at the County Road / St Kevin's Drive junction and Pingwood Lane, and both involved a pedestrian being struck by a vehicle. At the time of both collisions, the weather was fine, although the road surface was wet. Both incidents occurred after dark, but the areas were well lit with street lighting. Although regrettable, there is no indication that either of these fatalities occurred a as a result of an issue with the highway layout or condition.

The area with the most recorded collisions is the A506 Bank Lane and County Road, which includes the junctions with Shevington's Lane, Headbolt Lane and St Kevin's Drive. This is a highly trafficked road, and as such, the number of accidents recorded on the A506 across five years is not out of the expected range for a road of this type, and is therefore not considered to be indicative of a highway safety issue.

A cluster of collisions is shown in the vicinity of the Shevington's Lane / Pingwood Drive / Stopgate Lane junction. All of these incidents resulted in slight injury. Contributing factors for these incidents are listed as including an inexperienced driver misunderstanding signage; failure of a driver to judge another vehicle's path; mud on the road; and possible inebriation. There is no indication that any of these collisions occurred as a result of an issue with the highway layout or condition.

Overall, whilst there are some clusters of road traffic collisions, there are no identified common contributing factors and the number of incidents does not fall outside what would be expected for a study area of this size over a five-year study period.

4 Proposed Development

The proposed development comprises a new rail station at Headbolt Lane, to facilitate the extension of the Merseyrail network beyond the existing terminating station at Kirkby. The proposed station comprises three platforms, with two platform faces serving Merseyrail and a single platform face serving Northern Rail.

The proposed station car park layout is shown in Drawing Ref. 170248-15854-ZZ-ZZZ-DRG-C-HW-053010 in Appendix D.

4.1 Rail services

A summary of the rail services that will be provided by the proposed station is shown in Table 5.

Table 5: Headbolt Lane station rail service summary

Line	Weekday / Saturday services	Sunday service frequency
Merseyrail	4 services per hour in each direction to / from Headbolt Lane and Liverpool Central	2 services per hour in each direction to / from Headbolt Lane and Liverpool Central
Northern	1 service per hour in each direction to / from Headbolt Lane and Wigan Wallgate	1 service per hour in each direction to / from Headbolt Lane and Wigan Wallgate

4.2 Car parking

A new 300 space car park is proposed to serve the new station at Headbolt Lane. A car parking accumulation exercise has been undertaken to support the development of the design and the allocation of car parking spaces. Further information is provided in Section 5.6.

30no. of the proposed parking spaces will be disabled access bays, comprising 15no. blue badge spaces and 15no. enlarged bays.12no. electric vehicle charging bays will be provided on site.

In addition to the 300 space car park, 3no. staff spaces and 2no. Network Rail maintenance bays are to be provided, along with a parking area for 5no. motorcycles.

A taxi and pick-up / drop-off area is also proposed outside the station building, with space for 4no. vehicles.

4.2.1 Waiting restrictions

During scoping discussions with KMBC, overspill parking associated with the proposed development was raised as a potential issue.

As identified in Section 3.4.3, waiting is not permitted at any time on the length of Headbolt Lane on both sides of the carriageway. There are, however, limited

restrictions to on-street parking across a number of local residential areas where overspill parking could potentially occur.

A parking accumulation exercise has been undertaken based on the anticipated vehicle trip generation of the proposed development, which is detailed in Section 5.6. This demonstrates that under the forecast parking demand, a daily peak car park occupancy of around 63% is expected. It is therefore considered that a reasonable level of spare parking capacity has been provided within the proposed station design to prevent the occurrence of overspill parking.

This represents a balanced approach between providing sufficient parking capacity, whilst not inducing additional traffic demand through overprovision of parking.

4.3 Vehicle access

Vehicular site access will be taken via a new access junction on Hea5.6dbolt Lane, as shown in Drawing Ref. 170248-15854-ZZ-ZZZ-DRG-C-HW-053010 in Appendix D. The proposed site access junction is a signalised crossroads in the location of the existing priority-controlled T-junction of Fallowfield / Headbolt Lane.

The proposed access road is a 7.3m wide two-way carriageway, running in a north-south alignment through the development site. It provides access to the car parking areas, bus interchange and pick-up / drop-off area.

4.4 Bus

Proposals for bus facilities and services at Headbolt Lane station have been developed through discussions with Merseytravel.

A key feature of the new station design is that it will provide a high-quality bus-rail interchange facility, consisting of two bus stops directly in front of the station building accessed via a turning loop. The bus stops will be designed to the latest standards, incorporating enclosed passenger waiting shelters and high kerbs to minimise the step off the bus and ease passenger access.

With the provision of these facilities the station will be capable of accommodating up to 10 buses per hour, divided by direction of travel and destination. Merseytravel will also work with the bus operators though the Bus Alliance in order to integrate the station within the overall bus network.

The installation of MOVA at the proposed site access junction will help to prioritise buses accessing and egressing the site, therefore minimising delay for bus services.

4.5 Walking and Cycling

The new station access junction includes signalised pedestrian crossings on all arms of the crossroads.

It is understood that KMBC plans to deliver a new cycleway on the southern side of Headbolt Lane. The proposed station access junction design has been developed to enable the future cycleway to tie into the junction.

A 3m wide bi-directional cycleway is proposed alongside the vehicle access road. This will provide a continuous off-road cycle route between Headbolt Lane and the station cycle parking. Parking facilities for 100 cycles will be provided adjacent to the station building, with passive provision for a further 200 spaces.

Pedestrian footways are to be provided within the site on key desire lines. A series of zebra crossings are included within the design to facilitate safe and convenient pedestrian movements through the site.

The existing footpath which crosses the site from east to west will be diverted and incorporated into the site access proposals. The existing western footbridge over Kirkby Brook shall be removed and the eastern footbridge retained. An additional footbridge is proposed over Kirkby Brook to the east of the station building. The eastern bridge provides a link to the eastern section of Headbolt Lane and allows pedestrians arriving from this area to easily cross Kirkby Brook in order to reach the station building. A new uncontrolled crossing with dropped kerbs and tactile paving to provide a connection across Headbolt Lane and to the residential area to the east is also proposed.

An at-grade crossing within the station will provide a connection to/from Platform 2, and a new footway from the residential estate to the south will form a secondary access to the station.

5 Trip generation, distribution and assignment

This section of the TA presents the methodology for the assessment of the traffic impact of the proposed development. The forecast trip generation for the proposed development and the distribution of the forecast vehicle trips onto the highway network are reported in this section.

5.1 Study network

As agreed with KMBC, the following key junctions form the study network:

1. Headbolt Lane Station proposed access junction;
2. A506 Bank Lane / Headbolt Lane / A506 County Road / Boyes Brow signalised junction;
3. Stopgate Lane / Pingwood Lane / Shevington's Lane priority junction;
4. Pingwood Lane / Dale Lane / Headbolt Lane priority junction;
5. A506 County Road / St Kevin's Drive signalised junction.

5.2 Traffic Survey Data

Under the current situation with COVID-19, it is not considered that traffic surveys undertaken at this time will be representative of typical traffic levels. Alternative sources of data have therefore been agreed with KMBC for use in the assessment. A summary of the data obtained for each junction is provided in Table 6.

Table 6: Summary of baseline data

Survey location	Date of survey
Headbolt Lane / Fallowfield	January 2014
A506 Bank Lane / Headbolt Lane / A506 County Road / Boyes Brow	Thursday 17th January 2019
Stopgate Lane / Pingwood Land / Shevington's Lane	January 2014
Pingwood Lane / Dale Lane / Headbolt Lane	January 2014
A506 County Road / St Kevin's Drive	Thursday 17th January 2019

From this data, the following peak periods for vehicle movements across the study network have been identified:

- AM Peak – 07:45-08:45
- PM Peak – 16:15-17:15

5.3 Assessment Years

TEMPRO software has been used to derive growth factors to be applied to the 2014 and 2019 traffic data (see Table 6) to represent traffic growth on the road

network up to 2021. This will form the base year assessment. An opening year assessment of 2023 and future year assessment of 2028 (five years post-opening) have been agreed with KMBC.

The growth factors for each assessment year are shown in Table 7.

Table 7: Growth factors

Assessment scenario	Growth period	Growth factors	
		AM Peak	PM Peak
2021 (Base)	2014-2021	1.0996	1.09895
	2019-2021	1.0315	1.03075
2023 (Opening)	2021-2023	1.02095	1.01955
2028 (Future)	2021-2028	1.06415	1.05925

Traffic flow diagrams showing the background traffic flows and factored 2023 and 2028 baseline traffic flows are provided in Appendix E.

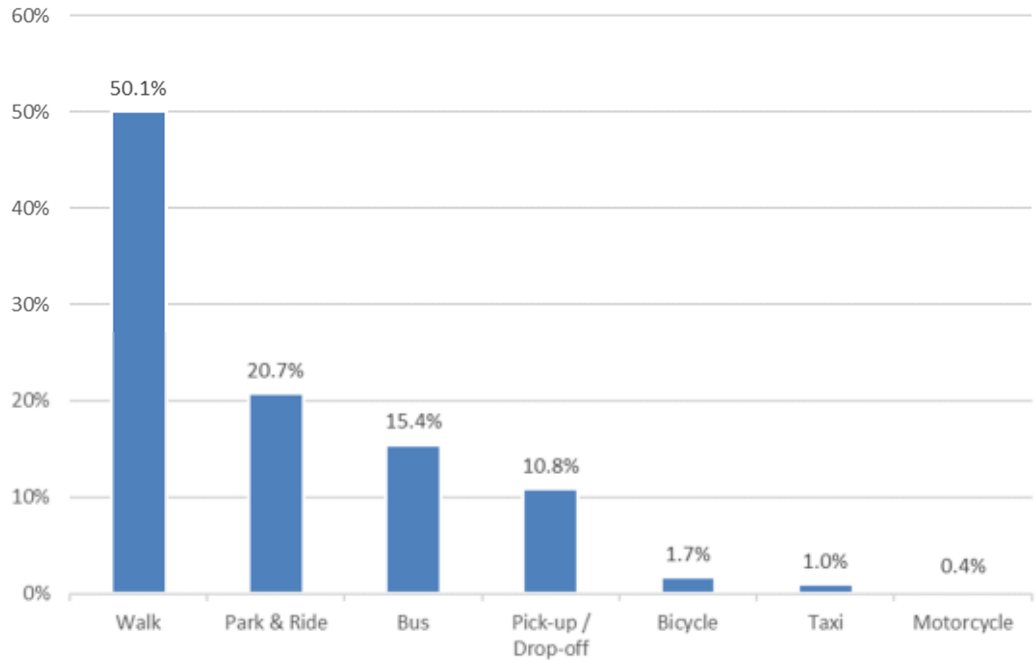
5.4 Mode Split

Mode split data to inform the trip generation assessment has been obtained from work undertaken as part of the Headbolt Lane Station Outline Business Case at GRIP 2. The access and egress mode split is based on:

1. The distribution of demand by distance from the station from the trip rate and catchment analysis;
2. Estimates of how this demand by distance band then splits by journey purpose; and
3. National Rail Traveller Survey analysis of access / egress mode choices by journey purpose and distance band from the comparator station selected for the trip rate analysis.

The resultant mode split is shown in Figure 14.

Figure 14: Passenger access / egress mode split



5.5 Trip generation

Forecast passenger demand data has been obtained from the Pedestrian Flow Analysis (Document Ref. 170248-ARU-REP-EMF-000001) for the proposed station at Headbolt Lane. The pedestrian flow analysis considers an annual passenger demand of c.803 & Ride / Drop-off,000 in 2024 and c.806,000 in 2030, based on GRIP 2 analysis outputs. Daily arrival and departure profiles have been derived from these outputs.

The daily trip profile for 2030 forms the basis of the trip generation assessment and is shown in Table 8. The 2030 scenario is considered to represent a ‘worst case’.

Table 8: Person trip generation

Time	Arrivals	Departures	Two-way
05:00-06:00	12	0	12
06:00-07:00	71	18	89
07:00-08:00	184	32	216
08:00-09:00	257	44	301
09:00-10:00	182	22	205
10:00-11:00	72	16	88
11:00-12:00	87	29	117
12:00-13:00	79	44	123
13:00-14:00	56	37	93
14:00-15:00	52	82	134
15:00-16:00	41	103	144
16:00-17:00	48	165	214
17:00-18:00	72	273	346
18:00-19:00	54	113	167
19:00-20:00	22	69	91
20:00-21:00	10	45	54
21:00-22:00	9	36	45
22:00-23:00	6	30	36
23:00-00:00	3	41	45
Total	**1,318**	**1,202**	**2,520**

As shown in Table 8, the morning peak hour occurs between 08:00 and 09:00, with 257 and 44 passengers arriving and departing the proposed station, respectively. The evening peak occurs between 17:00 and 18:00, with 72 and 273 arrivals and departures.

It should be noted that the development evening peak (17:00-18:00) falls slightly later than the network evening peak (16:15-17:15). To ensure a robust assessment, the vehicle movements forecast in the development evening peak have been used in the assessment of the network peak. This is considered to represent a worst case.

In order to predict the number of vehicle trips to and from the proposed development, the mode split presented in Figure 14 has been applied to the person trip generation in

Table 8. It has been assumed that no park and ride departures occur before midday. All park and ride trips occurring pre-midday have therefore been redistributed proportionately across the rest of the day.

The subsequent arrivals and departures by mode during the weekday AM and PM peak periods are shown in Table 9.

Table 9: Trip generation by mode

Mode	Weekday AM Peak (08:00-09:00)			Weekday PM Peak (17:00-18:00)		
	Arrivals	Departures	Two-way	Arrivals	Departures	Two-way
Walk	129	22	151	36	137	173
Park & Ride	53	9	62	15	57	72
Bus	40	7	47	11	42	53
Pick-up	0	5	5	0	30	30
Drop-off	28	0	28	8	0	8
Bicycle	4	1	5	1	5	6
Taxi	2	0	2	1	3	4
Motorcycle	1	0	1	0	1	1
Total	**257**	**44**	**301**	**72**	**274**	**346**

The vehicle trip generation (comprising all modes except walking and cycling) is shown in Table 10.

Table 10: Vehicle trip generation

Mode	Weekday AM Peak (08:00-09:00)			Weekday PM Peak (17:00-18:00)		
	Arrivals	Departures	Two-way	Arrivals	Departures	Two-way
Park & Ride	53	0	53	15	65	80
Bus	4	4	8	4	4	8
Pick-up*	5	5	10	30	30	60
Drop-off*	28	28	56	8	8	16
Taxi*	2	2	4	3	3	6
Motorcycle	1	0	1	0	1	1
Total	**93**	**39**	**132**	**60**	**111**	**171**

** All Pick-up, drop-off and taxi trips assumed to arrive and depart within the same hour*

The proposed station at Headbolt Lane is anticipated to generate 132 two-way vehicle trips in the weekday morning peak and 171 two-way trips in the weekday evening peak.

5.6 Car parking accumulation

Based on the daily vehicle trip generation associated with the Park & Ride facility, a car parking accumulation assessment has been undertaken to understand the potential parking demand of the proposed development. The results of the analysis are shown in Table 11.

Table 11: Car parking accumulation

Time	Arrivals	Departures	Accumulation
05:00-06:00	2	0	2
06:00-07:00	15	0	17
07:00-08:00	38	0	55
08:00-09:00	53	0	108
09:00-10:00	38	0	146
10:00-11:00	15	0	161
11:00-12:00	18	0	179
12:00-13:00	16	11	185
13:00-14:00	**12**	**9**	**188**
14:00-15:00	11	20	179
15:00-16:00	8	25	162
16:00-17:00	10	40	133
17:00-18:00	15	65	82
18:00-19:00	11	27	67
19:00-20:00	5	16	55
20:00-21:00	2	11	46
21:00-22:00	2	9	39
22:00-23:00	1	7	33
23:00-00:00	1	10	24

Table 11 shows that the maximum number of vehicles anticipated to park at the proposed development is 188, which occurs between 13:00-14:00. This is lower than the proposed car parking provision of 300 spaces, however, providing some additional parking capacity will lessen the risk of overspill parking occurring on surrounding residential streets should demand increase in future.

It is considered that the proposed parking provision of 300 spaces ensures a balanced and conservative approach to car parking at the site.

5.7 Trip distribution

The trip distribution has been derived based on assumptions from the Skelmersdale Rail Link Business Case 2015. Use of this distribution has been agreed with KMBC. The trip distribution is shown in Table 12.

Table 12: Trip distribution

Route	Trip distribution
A506 County Road (south)	48.3%
Shevington's Lane (west)	18.5%
Shevington's Lane (east)	9.0%
Windermere Drive (off A506 Bank Lane)	8.0%
Freckleton Drive (off Headbolt Lane)	7.2%
A506 Bank Lane (north)	4.4%
Dale Lane (south)	3.7%
Boyes Brow (west)	0.7%
Stopgate Lane (east)	0.2%

The trip distribution has been applied to the proposed development trips shown in Table 10. The resultant traffic flows are presented in Appendix E.

5.8 Committed development

The following committed developments have been identified for consideration within the assessment. It should be noted that some of these developments have now been completed, however, it has been agreed with KMBC to retain them within the assessment due to the use of traffic survey data collected in 2014 and 2019, prior to any of these developments being completed.

As the growth factors derived from TEMPRO (See Section 5.3) represent employment and housing growth, it is possible that some of the traffic associated with the below committed developments has already been accounted for within the background traffic flows. Notwithstanding, all committed developments have been considered and this assessment therefore represents a 'worst case'.

Traffic flow diagrams showing the committed development traffic flows are provided in Appendix E.

5.8.1 Land east of Maghull

The committed development site at land east of Maghull is bound by School Lane to the north, the M58 J1 to the east, Poverty Lane to the south and the Merseyrail Northern Line to the west. The site lies approximately 3km to the north west of the Headbolt Lane site and access between the sites can be taken via the A506 and Maghull Lane.

The wider site is allocated in the Sefton Local Plan for a minimum of 1,400 homes and a 20ha business park, with a new link road connecting Poverty Lane and School Lane.

A hybrid application (Planning Ref. DC/2020/01778) was submitted in September 2020 seeking full planning permission for the demolition of existing buildings and the construction of 841 dwellings, new vehicle accesses via Poverty lane and ancillary infrastructure, and outline planning permission for an older

persons housing scheme with ancillary infrastructure. The application is a re-submission of an application originally submitted in 2017 (Planning Ref. DC/2017/01532).

A Transport Assessment (Document Ref. WYG, A083347) was produced for the proposed development in August 2018. The proposed development in Kirkby town centre results in additional flows, as well as a reduction in flows in some locations, on the local highway network surrounding the proposed development. It has therefore been included within the assessment as a committed development.

5.8.2 Kirkby town centre redevelopment

A planning application (Planning Ref. 17/00559/FUL) was submitted in 2017 for 130,000 sq. ft mixed-use development comprising a 45,000 sq. ft supermarket, and 80,000 sq. ft of retail, with associated car parking and public realm improvements. A significant proportion of the proposed development has been completed.

The proposed development in Kirkby town centre results in additional flows on the local highway network surrounding the proposed development at Headbolt Lane. It has therefore been included within the assessment as a committed development.

5.8.3 Bank Lane residential development

The Bank Lane residential development (Planning Ref. 13/00393/OUT and 14/00874/REM) is located 650m to the northwest of Headbolt Lane and comprises 195 dwellings. The development is due for completion imminently.

The residential development at Bank Lane is anticipated to result in additional flows on the local highway network surrounding the proposed development at Headbolt Lane. It has therefore been included within the assessment as a committed development.

5.8.4 Tower Hill residential development

The Tower Hill residential development (Planning Ref. 15/00570/HYB) comprises a total of 359 dwellings. Vehicle access to 200 of the units is via 2no. junctions on Shevington's Lane. The remaining units are accessed via 1no. existing (at Langton Road) and 2no. new priority-controlled junctions on Headbolt Lane. Phases 1 and 2 have been completed, whilst approximately two thirds of Phase 3 dwellings are yet to be built.

The residential development at Tower Hill is anticipated to result in additional flows on the local highway network surrounding the proposed development at Headbolt Lane. It has therefore been considered within the assessment.

5.8.5 St Kevin's Drive residential development

The St Kevin's Drive residential development (Planning Ref. 17/00201/FUL) lies to the south of the Headbolt Lane development site, on the southern side of the

rail line. The development comprises 173 dwellings to be accessed via St Kevin's Drive. Approximately half to two thirds of the proposed units for Phases 1-4 are yet to be built.

The residential development at St Kevin's Drive is anticipated to result in additional flows on the local highway network surrounding the proposed development at Headbolt Lane. It has therefore been included within the assessment.

5.8.6 Academy Business Park

A mixed-use development is proposed at the Academy Business Park (Planning Ref. 19/00337/OUT), which lies on the western edge of Knowsley Industrial Park. The proposed development comprises a drive-through restaurant, kiosk / sandwich shop, self-storage unit, showroom units, and a mix of employment / business / trade counter units.

The proposed mixed-use development at Academy Business Park is not anticipated to result in additional flows on the assessment network surrounding the proposed development at Headbolt Lane. It has therefore been excluded from the assessment.

5.8.7 PLP Knowsley

The PLP Knowsley site was granted planning permission (Planning Ref. 20/00124/FUL) in May 2020 for 80,000sqm GIA of B8 warehouse. The Transport Assessment produced in support of the proposals (Document Ref. Hydrock, 11647-HYD-XX-XX-RP-TP-5001-P2) demonstrates that no additional traffic would be anticipated to enter the assessment network surrounding the proposed development at Headbolt Lane. The PLP Knowsley site has therefore been excluded from the assessment.

5.9 Future provision

A Network Rail requirement (CRD Ref. 170248-HBL-CRD-REQ-003) for the project is to demonstrate that the proposed station design can safely operate with 3 million passengers per annum for future provision.

As described in Section 5.5, the GRIP 2 demand analysis outputs indicate that an annual demand of c.803,000 and c.806,000 is forecast for the proposed station in 2024 and 2030, respectively. This is significantly lower than the design requirement to accommodate 3 million passengers per annum.

Notwithstanding, a trip generation assessment has been undertaken to understand the potential traffic impact that could be expected under the 'future provision' scenario with a 500-space car park.

The parking accumulation exercise in Section 5.6 identified that the peak accumulation is anticipated to occur between 13:00-14:00 with 188 vehicles parked at the site. A factor of 2.67 has been calculated to represent an uplift from 188 parked vehicles to 500 parked vehicles to test the 'future provision' scenario.

This has been applied to the arrival / departure profile shown in Table 11, the results of which are shown in Table 13.

Table 13: Car parking accumulation – 'future provision'

Time	Arrivals	Departures	Accumulation
05:00-06:00	7	0	7
06:00-07:00	39	0	46
07:00-08:00	102	0	147
08:00-09:00	142	0	289
09:00-10:00	101	0	389
10:00-11:00	40	0	429
11:00-12:00	48	0	477
12:00-13:00	44	28	493
13:00-14:00	**31**	**24**	**500**
14:00-15:00	29	53	476
15:00-16:00	23	66	433
16:00-17:00	27	105	354
17:00-18:00	40	174	220
18:00-19:00	30	72	178
19:00-20:00	12	44	146
20:00-21:00	5	28	123
21:00-22:00	5	23	105
22:00-23:00	3	19	89
23:00-00:00	2	26	65

This factor has also been applied to all other vehicle modes, excluding bus. The subsequent weekday morning and evening trip generation for the 'future provision' scenario is shown in Table 14.

Table 14: Vehicle trip generation – 'future provision'

Mode	Weekday AM Peak (08:00-09:00)			Weekday PM Peak (17:00-18:00)		
	Arrivals	Departures	Two-way	Arrivals	Departures	Two-way
Park & Ride	142	0	142	40	174	214
Bus	4	4	8	4	4	8
Pick-up	13	13	26	79	79	158
Drop-off	74	74	148	21	21	42
Taxi	7	7	14	9	9	18
Motorcycle	3	0	3	1	3	4
Total	**242**	**98**	**340**	**153**	**290**	**443**

Under the ‘future provision’ scenario, the proposed station at Headbolt Lane is anticipated to generate 340 two-way vehicle trips in the weekday morning peak and 443 two-way trips in the weekday evening peak.

For clarity, the planning application is for a 300 space car park, which provides sufficient capacity based on the forecast demand up to 2030. The ‘future provision’ scenario has been undertaken as a sensitivity test outside of the planning application to ensure the proposed station access junction could theoretically accommodate an increase in demand in future. However, this scenario is unlikely to occur. Should this additional level of demand materialise, a new planning application would be proposed.

6 Highway impact

As agreed with KMBC, traffic modelling has been undertaken for the following junctions:

1. Headbolt Lane Station Access junction;
2. A506 Bank Lane / Headbolt Lane / County Road / Boyes Brow signalised junction;
3. Stopgate Lane / Pingwood Lane / Shevington's Lane priority junction;
4. Pingwood Lane / Dale Lane / Headbolt Lane priority junction; and
5. A506 County Road / St Kevin's Drive.

Operational assessments of junctions within the study network have been undertaken using Junctions 9 and LinSig v3 modelling software, as appropriate. Where a junction is a roundabout or priority controlled, it has been assessed in 'Junctions 9' modelling software, which calculates the Ratio of Flow to Capacity (RFC) and average queues experienced by all vehicles on each arm of a junction. The RFC is a key indicator of the likely performance of a turning movement at a junction under a given set of traffic flows. It is generally accepted that a junction approach with an RFC value of less than 0.85 is operating within its practical capacity. A modelled RFC of greater than 1.0 indicates that an approach is operating in excess of theoretical capacity.

Where a junction is under traffic signal control 'LinSig' software has been used. LinSig is used to indicate the performance of a signalised junction under a given set of traffic flows. The software calculates the 'degree of saturation' (DoS), expressed as a percentage, for each approach to a junction. Approaches where the degree of saturation is forecast to exceed 90% are considered over-capacity. Alongside this the 'mean maximum queue' (MMQ), is calculated, to represent the average position of the furthest vehicle from the stop line in each cycle.

Junction modelling outputs are provided in Appendix F.

6.1 Assessment scenarios

A summary of each assessment scenario considered in the junction modelling exercise is provided in Table 15.

Table 15: Assessment scenarios

Assessment scenario	Description
2023 Base	Background traffic flows with growth applied to 2023
2023 Base + Committed Development	Background traffic flows with growth applied to 2023, plus committed development flows.
2023 Base + Committed Development + Proposed Development	As above, including the vehicle trips associated with the proposed station development.
2028 Base	Background traffic flows with growth applied to 2028
2028 Base + Committed Development	Background traffic flows with growth applied to 2028, plus committed development flows.
2028 Base + Committed Development + Proposed Development	As above, including the vehicle trips associated with the proposed station development with 300 parking spaces.
2028 'Future Provision'	As above, including the vehicle trips associated with the proposed station development with 500 parking spaces.

6.2 Headbolt Lane Station Access

The proposed site access junction expands on the existing Headbolt Lane / Fallowfield priority-controlled T-junction to deliver a new signalised crossroad junction. The proposed layout is illustrated in Appendix D.

The new junction comprises single lane approaches on all arms. Pedestrian crossings are proposed on all arms of the junction, with an all-red pedestrian phase every cycle. A cycle time of 90 seconds has been modelled for all scenarios.

Junction modelling results for the proposed access junction are shown in Table 16.

Table 16: Headbolt Lane station access junction – modelling results

Approach	Weekday AM Peak			Weekday PM Peak		
	DoS	MMQ (pcu)	Delay (pcu/Hr)	DoS	MMQ (pcu)	Delay (pcu/Hr)
2023 Base + Committed Development + Proposed Development						
Headbolt Lane (E)	38.7%	6	5.23	44.1%	7	6.27
Station Access	24.5%	1		42.8%	3	
Headbolt Lane (W)	46.5%	7		43.6%	7	
Fallowfield	17.9%	1		8.3%	0	
2028 Base + Committed Development + Proposed Development						
Headbolt Lane (E)	40.2%	7	5.47	45.9%	7	6.51
Station Access	24.5%	1		42.8%	3	
Headbolt Lane (W)	48.4%	8		44.9%	7	
Fallowfield	19.3%	1		8.9%	0	
2028 Base + Committed Development + Proposed Development (Future Provision)						
Headbolt Lane (E)	43.7%	7	9.40	53.7%	9	14.08
Station Access	61.5%	3		85.3%	10	
Headbolt Lane (W)	74.4%	13		79.5%	12	
Fallowfield	19.3%	1		8.9%	0	

The modelling results indicate that the proposed station access junction is anticipated to operate well within capacity in both 2023 and 2028, should the station come forward as proposed with a 300-space car park. The results also demonstrate that should an additional 200 parking spaces be provided in future, the proposed access junction could continue to operate within capacity.

6.2.1 Sensitivity Test

Through consultation with Merseytravel, a concern was raised regarding potential delay for buses egressing the site during busy periods. In order to address this concern, a sensitivity test of the proposed site access junction has been undertaken.

The site access junction has been modelled using LinSig software, which is an industry-standard tool. However, the software assesses junctions over an hour period, dividing the total hourly traffic flow evenly across the hour.

Given the nature of a rail station, the traffic demand at the proposed development is not expected to be uniform across an hourly period, with peaks occurring shortly after the arrival of a train at the station. The sensitivity test has been developed in order to model these characteristics more robustly.

To inform the sensitivity test, the forecast traffic flows at the site access junction have been uplifted to represent an approximate 15-minute peak period for traffic exiting the site. Passenger boarding and alighting data for Kirkby station, which

can be considered broadly comparable to the proposed station at Headbolt Lane, has been used to derive factors to uplift the proposed development traffic flows. Analysis of the Kirkby station data is shown in Table 17.

Note that 'arrivals' refers to passengers arriving at the station to catch a train, whilst 'departures' refers to passengers leaving the station after alighting a train.

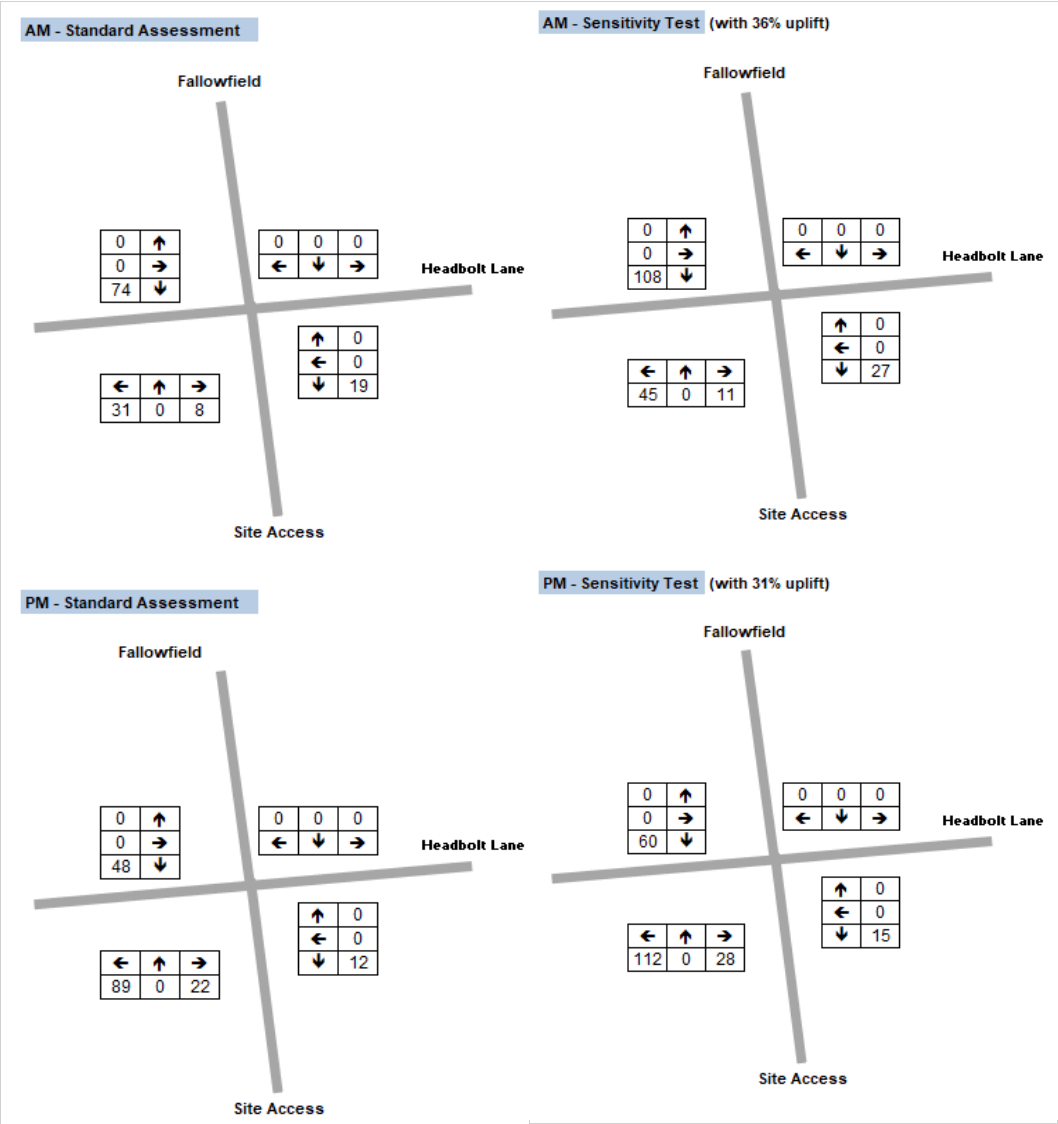
Table 17: Kirkby station boarding and alighting data

Time	Kirkby station survey data			Percentage split		
	Arr	Dep	Two-way	Arr	Dep	Two-way
Weekday AM Peak						
07:45-08:00	114	12	126	20%	16%	20%
08:00-08:15	213	21	234	37%	28%	**36%**
08:15-08:30	158	18	176	28%	24%	27%
08:30-08:45	84	25	109	15%	33%	17%
Weekday PM Peak						
16:15-16:30	44	75	119	40%	21%	25%
16:30-16:45	0	93	93	0%	26%	20%
16:45-17:00	21	89	110	19%	25%	23%
17:00-17:15	44	104	148	40%	29%	**31%**

The analysis shows that around 36% of the total AM peak hour journeys to /from Kirkby occur within a peak 15-minute period. Whilst in the PM peak, 31% of the total peak hour trips occur within the peak 15-minute period.

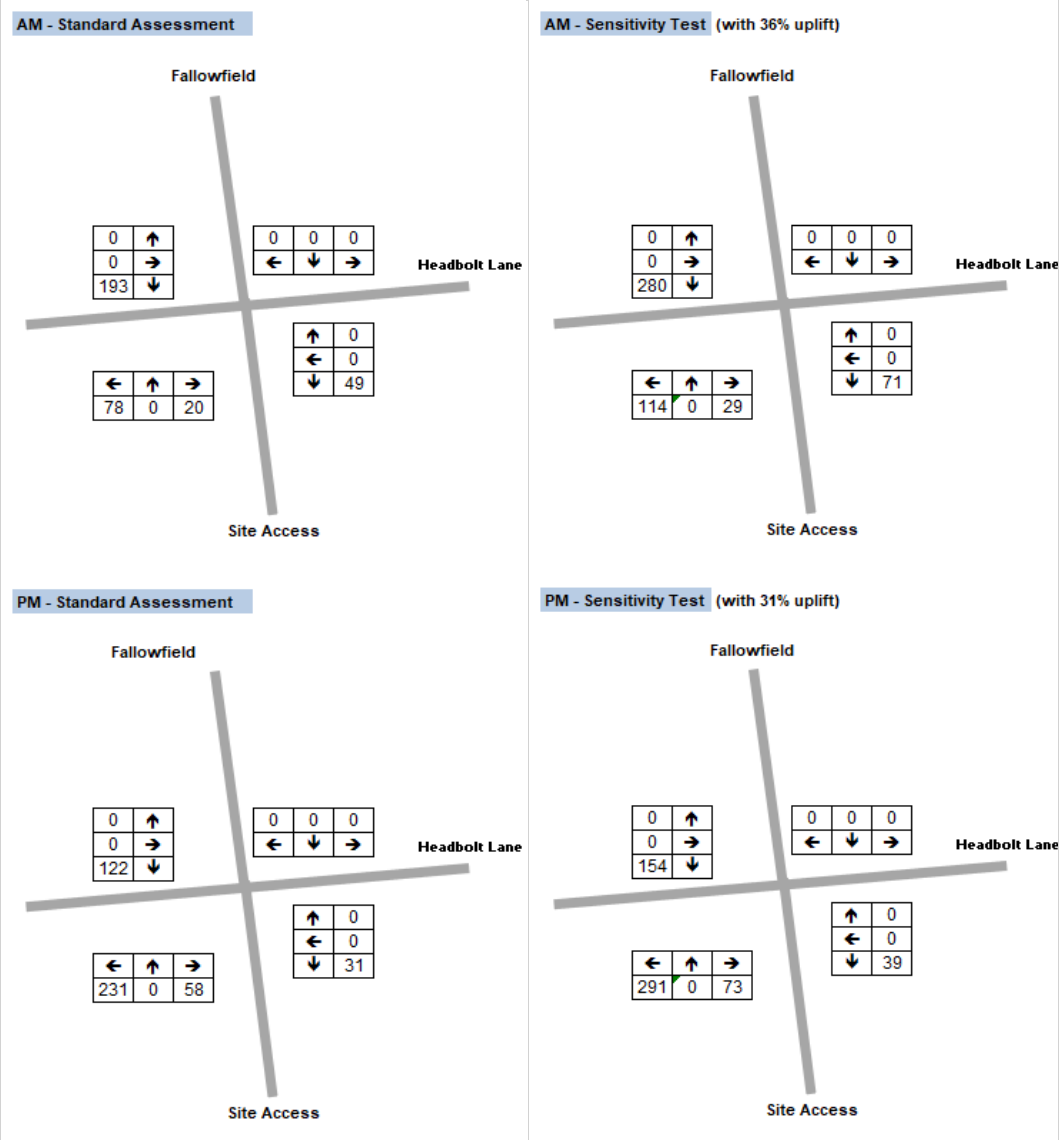
These percentages have been used to uplift the total hourly flows previously used in the standard assessment of the proposed station access junction in Section 6.2. This approach will ensure that the LinSig modelling considers the full impact of the identified peak AM and PM 15-minute periods. A comparison of the flows used in the standard assessment and the sensitivity test is provided in Figure 15.

Figure 15: Comparison of traffic flows used in standard assessment and sensitivity test



The same process has been undertaken for the 'Future Provision' scenario, providing an absolute 'worst case'. A comparison of the flows used in the 'Future Provision' standard assessment and sensitivity test is shown in Figure 16.

Figure 16: Comparison of traffic flows used in standard assessment and sensitivity test under 'Future Provision' scenario



Junction modelling results for the proposed access junction sensitivity test are shown in Table 18.

Table 18: Headbolt Lane station access junction – sensitivity test

Approach	Weekday AM Peak			Weekday PM Peak		
	DoS	MMQ (pcu)	Delay (pcu/Hr)	DoS	MMQ (pcu)	Delay (pcu/Hr)
2023 Base + Committed Development + Proposed Development						
Headbolt Lane (E)	39.6%	6	6.09	44.5%	7	6.97
Station Access	35.1%	2		54.0%	4	
Headbolt Lane (W)	54.8%	9		46.5%	7	
Fallowfield	17.9%	1		8.3%	0	
2028 Base + Committed Development + Proposed Development						
Headbolt Lane (E)	41.1%	7	6.34	47.4%	8	7.31
Station Access	35.1%	2		50.2%	4	
Headbolt Lane (W)	56.0%	9		49.9%	7	
Fallowfield	19.3%	1		8.9%	0	
2028 Base + Committed Development + Proposed Development ('Future Provision')						
Headbolt Lane (E)	46.2%	8	17.44	58.1%	9	31.03
Station Access	89.7%	7		96.1%	16	
Headbolt Lane (W)	92.4%	21		101.4%	25	
Fallowfield	19.3%	1		8.9%	0	

The sensitivity test modelling indicates that the proposed station access junction is anticipated to operate well within capacity in both 2023 and 2028, should the station come forward as proposed with a 300-space car park. Furthermore, the above assessments assume an all-red pedestrian phase every cycle, which is unlikely to occur in reality. The junction could therefore be expected to operate more efficiently than the results suggest.

In the 'Future Provision' scenario, the results show that the traffic associated with an additional 200 parking spaces at the site would cause the proposed access junction to exceed capacity. However, as previously mentioned this scenario is unlikely to occur. If this level of additional demand were to materialise, a review of the junction cycle time could be undertaken to improve the operation of the access junction.

The installation of MOVA at the proposed site access junction will also help to prioritise buses accessing and egressing the site, therefore minimising delay for bus services.

6.3 A506 / Headbolt Lane / Boyes Brow

This junction is a signalised crossroad located to the northwest of the development site at the western end of Headbolt Lane. The junction operates with a 90 second cycle. There are signalised pedestrian crossings on all four arms of the junction. In reality these crossings may not be called every cycle due to there being no

demand on some cycles. However, in order to assess a worst-case, the modelling assumes that an 'all-red' pedestrian stage is called every cycle.

A summary of the modelling results for this junction are shown in Table 19.

Table 19: A506 / Headbolt Lane / Boyes Brow – modelling results

Approach	Weekday AM Peak			Weekday PM Peak		
	DoS	MMQ (pcu)	Total Delay (pcu/Hr)	DoS	MMQ (pcu)	Total Delay (pcu/Hr)
2023 Base						
A506 County Road	40.3%	5	15.08	57.5%	8	29.29
A506 Bank Lane	57.4%	6		93.4%	10	
Boyes Brow	45.6%	4		70.7%	7	
Headbolt Lane	58.7%	6		93.1%	13	
2023 Base + Committed Development						
A506 County Road	49.0%	7	19.58	67.1%	12	96.53
A506 Bank Lane	70.3%	8		128.2%	21	
Boyes Brow	54.2%	5		106.1%	20	
Headbolt Lane	69.7%	7		127.6%	48	
2023 Base + Committed Development + Proposed Development						
A506 County Road	52.1%	7	21.75	70.8%	14	124.41
A506 Bank Lane	76.1%	9		142.8%	26	
Boyes Brow	51.3%	5		90.9%	10	
Headbolt Lane	74.6%	8		140.9%	77	
2028 Base						
A506 County Road	40.6%	5	16.00	59.6%	9	37.73
A506 Bank Lane	62.0%	6		103.9%	11	
Boyes Brow	47.1%	5		73.4%	8	
Headbolt Lane	61.4%	6		98.8%	16	
2028 Base + Committed Development						
A506 County Road	49.4%	7	20.76	68.9%	13	114.82
A506 Bank Lane	73.6%	9		140.8%	26	
Boyes Brow	59.7%	5		110.2%	25	
Headbolt Lane	77.8%	8		132.8%	55	
2028 Base + Committed Development + Proposed Development						
A506 County Road	53.8%	7	23.04	70.3%	14	152.14
A506 Bank Lane	81.2%	9		150.6%	30	
Boyes Brow	52.9%	5		101.7%	16	
Headbolt Lane	77.7%	8		156.5%	95	

2028 Base + Committed Development + Proposed Development ('Future Provision')						
A506 County Road	130.2%	36	169.06	100.7%	33	297.14
A506 Bank Lane	134.3%	57		175.0%	86	
Boyes Brow	82.2%	7		73.7%	8	
Headbolt Lane	141.2%	62		172.3%	145	

The results demonstrate that in the 2023 and 2028 assessment years with the addition of the committed development, the junction is expected to operate over capacity with degrees of saturation of over 100% on the A506 Bank Lane, Boyes Brow and Headbolt Lane arms in the PM Peak.

The addition of the proposed station traffic does demonstrate some increases in queueing and degree of saturation, but this is not considered significant in the context of the 'worst case' assessment presented. It is noted that the cumulative impact of the committed development traffic within the assessment results in the junction operating over 100% capacity.

It is also worth noting that the proposed station development is likely to attract car journeys that were already on the local highway network and would divert to the station car park upon opening, although this effect has not been modelled.

It is therefore considered that the traffic associated with the proposed development can be accommodated at the A506 / Headbolt Lane / Boyes Brow junction without significant impact on the future baseline situation.

6.4 Stopgate Lane / Pingwood Lane / Shevington's Lane

The Stopgate Lane / Pingwood Lane / Shevington's Lane junction is a priority-controlled T-junction located approximately 1.2km to the northeast of the development site. Junctions 9 modelling results for this junction are shown in Table 20.

Table 20: Stopgate Lane / Pingwood Lane / Shevington's Lane – Junctions 9 modelling results

Approach	Weekday AM Peak		Weekday PM Peak	
	RFC	Queue (PCU)	RFC	Queue (PCU)
2023 Base				
Shevington's Lane - Left turn out	0.16	0	0.02	0
Shevington's Lane - Right turn out	0.81	4	0.21	0
Stopgate Lane	0.03	0	0.06	0
2023 Base + Committed Development				
Shevington's Lane - Left turn out	0.16	0	0.02	0
Shevington's Lane - Right turn out	0.81	4	0.21	0
Stopgate Lane	0.03	0	0.06	0

2023 Base + Committed Development + Proposed Development				
Shevington's Lane - Left turn out	0.18	0	0.02	0
Shevington's Lane - Right turn out	0.84	5	0.22	0
Stopgate Lane	0.03	0	0.06	0
2028 Base				
Shevington's Lane - Left turn out	0.21	0	0.02	0
Shevington's Lane - Right turn out	0.86	5	0.22	0
Stopgate Lane	0.03	0	0.06	0
2028 Base + Committed Development				
Shevington's Lane - Left turn out	0.21	0	0.02	0
Shevington's Lane - Right turn out	0.86	5	0.22	0
Stopgate Lane	0.03	0	0.06	0
2028 Base + Committed Development + Proposed Development				
Shevington's Lane - Left turn out	0.24	0	0.02	0
Shevington's Lane - Right turn out	0.87	6	0.23	0
Stopgate Lane	0.03	0	0.06	0
2028 Base + Committed Development + Proposed Development (Future Provision)				
Shevington's Lane - Left turn out	0.34	0	0.02	0
Shevington's Lane - Right turn out	0.90	7	0.25	0
Stopgate Lane	0.03	0	0.06	0

The results demonstrate that in 2023, the junction is shown to operate within capacity under all assessment scenarios. In the 2028 assessment year, and with the addition of committed development traffic, the junction is expected to operate over capacity with an RFC of over 0.85 on the Shevington's Lane approach in the AM Peak. The addition of the proposed station traffic does demonstrate a minor increase in queueing and RFC, but this is considered to be negligible.

It is therefore concluded that the traffic associated with the proposed development can be accommodated at the Stopgate Lane / Pingwood Lane / Shevington's Lane junction without significant impact on the future baseline situation.

6.5 Pingwood Lane / Dale Lane / Headbolt Lane

This priority-controlled T-junction lies at the eastern end of Headbolt Lane, approximately 850m to the east of the development site. Junctions 9 modelling results for the Pingwood Lane / Dale Lane / Headbolt Lane junction are shown in Table 21.

Table 21: Pingwood Lane / Dale Lane / Headbolt Lane – Junctions 9 modelling results

Approach	Weekday AM Peak		Weekday PM Peak	
	RFC	Queue (PCU)	RFC	Queue (PCU)
2023 Base				
Headbolt Lane - Left turn out	0.15	0	0.26	0
Headbolt Lane - Right turn out	0.15	0	0.07	0
Pingwood Lane	0.47	1	0.27	0
2023 Base + Committed Development				
Headbolt Lane - Left turn out	0.15	0	0.26	0
Headbolt Lane - Right turn out	0.15	0	0.07	0
Pingwood Lane	0.47	1	0.27	0
2023 Base + Committed Development + Proposed Development				
Headbolt Lane - Left turn out	0.15	0	0.28	0
Headbolt Lane - Right turn out	0.15	0	0.08	0
Pingwood Lane	0.49	1	0.28	1
2028 Base				
Headbolt Lane - Left turn out	0.15	0	0.27	0
Headbolt Lane - Right turn out	0.16	0	0.07	0
Pingwood Lane	0.50	1	0.28	1
2028 Base + Committed Development				
Headbolt Lane - Left turn out	0.15	0	0.27	0
Headbolt Lane - Right turn out	0.16	0	0.07	0
Pingwood Lane	0.50	1	0.28	1
2028 Base + Committed Development + Proposed Development				
Headbolt Lane - Left turn out	0.16	0	0.29	0
Headbolt Lane - Right turn out	0.16	0	0.08	0
Pingwood Lane	0.52	1	0.29	1
2028 Base + Committed Development + Proposed Development (Future Provision)				
Headbolt Lane - Left turn out	0.17	0	0.32	1
Headbolt Lane - Right turn out	0.17	0	0.10	0
Pingwood Lane	0.55	2	0.31	1

The modelling results indicate that the Pingwood Lane / Dale Lane / Headbolt Lane junction is anticipated to operate with significant reserve capacity in all assessment scenarios. The addition of traffic associated with the proposed development is demonstrated to have a negligible impact on the overall operation of the junction.

6.6 A506 County Road / St Kevin's Drive

This is a three-arm signalised junction providing access to the St Kevin's Drive residential estate from the A506 County Road. LinSig modelling results for the junction are shown in Table 22.

Table 22: A506 County Road / St Kevin's Drive – LinSig modelling results

Approach	Weekday AM Peak			Weekday PM Peak		
	MMQ (pcu)	Total Delay (pcu/Hr)	MMQ (pcu)	Total Delay (pcu/Hr)	MMQ (pcu)	Total Delay (pcu/Hr)
2023 Base						
A506 County Road (N)	32.5%	4	8.19	28.3%	4	9.21
A506 County Road (S)	49.7%	8		76.1%	17	
St Kevin's Drive	50.7%	4		36.9%	2	
2023 Base + Committed Development						
A506 County Road (N)	55.1%	8	16.91	44.2%	7	64.67
A506 County Road (S)	79.0%	17		107.2%	79	
St Kevin's Drive	74.4%	8		63.2%	3	
2023 Base + Committed Development + Proposed Development						
A506 County Road (N)	54.7%	8	17.20	47.1%	8	79.73
A506 County Road (S)	81.9%	19		109.8%	94	
St Kevin's Drive	79.1%	8		63.2%	3	
2028 Base						
A506 County Road (N)	33.8%	5	8.65	29.4%	4	9.98
A506 County Road (S)	51.8%	9		79.1%	19	
St Kevin's Drive	52.7%	5		38.7%	2	
2028 Base + Committed Development						
A506 County Road (N)	54.9%	8	17.71	45.3%	7	82.11
A506 County Road (S)	79.3%	18		110.3%	96	
St Kevin's Drive	81.1%%	9		64.9%	4	
2028 Base + Committed Development + Proposed Development						
A506 County Road (N)	56.1%	9	19.04	48.3%	8	97.67
A506 County Road (S)	84.0%	20		112.9%	111	
St Kevin's Drive	81.1%	89		64.9%	4	
2028 Base + Committed Development + Proposed Development (Future Provision)						
A506 County Road (N)	56.3%	9	22.01	53.0%	9	122.35
A506 County Road (S)	89.6%	24		116.9%	135	
St Kevin's Drive	86.5%	10		64.9%	4	

The results demonstrate that in the 2023 and 2028 assessment years with the addition of committed development traffic, the junction is expected to operate over capacity with a degree of saturation of over 100% on the A506 County Road (S) approach in the PM Peak.

The addition of the proposed station traffic does demonstrate some increases in queueing and degree of saturation, but this is not considered significant in the context of the 'worst case' assessment presented. It is also worth noting that the proposed station development is likely to attract car journeys that were already on the local highway network and would divert to the station car park upon opening, although this effect has not been modelled.

It is therefore considered that the traffic associated with the proposed development can be accommodated at the A506 County Road / St Kevin's Drive junction without significant impact on the future baseline situation.

7 Conclusion

Arup has been commissioned by Buckingham Group Contracting Limited on behalf of Network Rail to produce a Transport Assessment to assess the highway and transport impacts of the proposed new railway station at Headbolt Lane.

The policy review has demonstrated that the proposed development aligns with planning policy and guidance at both a national and local level. A Travel Plan has been produced alongside the TA to help encourage walking, cycling and public transport use to / from the proposed station.

The site layout has been developed with the aim of enhancing the connectivity of the new station by walking and cycling, and proposals for bus facilities have been developed through consultation with Merseytravel.

The trip generation assessment has shown that the new station is anticipated to generate around 2,500 daily person trips. In terms of vehicle trips, the station is expected to generate 132 and 171 two-way vehicle movements during the weekday morning and evening peak hours, respectively.

A new signalised crossroad junction is proposed on Headbolt Lane to serve as the site access. The new junction comprises single lane approaches with signalised pedestrian crossings on all arms. Modelling of the junction has demonstrated that the proposed layout provides sufficient capacity to accommodate the forecast traffic demand up to 2028.

Junction modelling has also been undertaken for four existing junctions on the local highway network. The modelling results demonstrate that the traffic associated with the proposed development can be accommodated at these junctions without significant impact on the future baseline situation.

Overall, therefore, it is concluded that the impacts of proposed development traffic can be accommodated, and that the proposed development is acceptable in transport terms.

Appendix A

Scoping Meeting Minutes

Minutes

ARUP

Project title	Headbolt Lane Station	Job number	276736
Meeting name and number	Transport Scope	File reference	TRA-001
Location	MS Teams	Time and date	10:00-11:00 5 February 2021
Purpose of meeting	Discussion of scope of Transport Assessment		
Present	Maria Barry (KMBC) Rachel Cornfoot (Arup)	James Tate (Arup)	
Apologies	n/a		
Circulation	Those present		

Draft

Action

1. Study network

Agreed the following junctions should be included in the assessment and those with significant development impact to be modelled:

- Headbolt Lane Station proposed access junction;
- A506 Bank Lane / Headbolt Lane / A506 County Road / Boyes Brow signalised junction;
- Stopgate Lane / Pingwood Lane / Shevington's Lane priority junction;
- Pingwood Lane / Dale Lane / Headbolt Lane priority junction;
- A506 Bank Lane / Shevington's Lane signalised junction; and
- A506 County Road / St Kevin's Drive signalised junction.

Requests for signal timing data and junction layouts should be directed to KMBC (Michaela Gray). MB to provide contact details — MB

2. Traffic data

Traffic survey data from 2014 and 2019 is acceptable to use as new surveys cannot currently be undertaken.

Prepared by	Rachel Cornfoot
Date of circulation	n/a

Minutes

Project title	Job number	Date of Meeting
Headbolt Lane Station	276736	5 February 2021

Action

3. Assessment years

Agreed to assess opening year and +5 years after opening.

4. Committed development

Due to traffic survey data being from 2014/2019, the same committed developments as considered in the Motts TA should be included in the assessment, despite some now being built out. RC to email list of committed developments to MB. — RC

5. Trip generation

Agreed to assess 300 space and 500 space car park scenarios. RC outlined proposed methodology to derive trip generation:

- Derive hourly and daily passenger demand from Pedestrian Flow Analysis based on GRIP 2 analysis outputs.
- Apply mode split from draft Headbolt Lane Station OBC to understand number of vehicle trips.
- Undertake parking accumulation exercise for 300 space scenario.
- Sensitivity testing – factor up vehicle arrivals and departures from parking accumulation exercise for a max. 500 accumulation scenario.

MB broadly agreed with methodology but outlined importance of demonstrating that the forecast parking demand can be accommodated within the site.

6. Trip distribution

Trip distribution will be based on that from Motts TA, which was calculated using 2015 OBC and 2011 Census data.

7. Personal injury accident data — RC

RC outlined that the client holds accident data for Jan 2014-Dec 2018. MB advised that new data would be required to cover latest available five-year period. RC to request.

8. Car parking provision

300 spaces with passive provision for further 200 spaces is considered acceptable if robust justification is provided within the Transport Assessment (TA).

Some EV charging spaces should be provided from day one, with passive provision to meet potential future demand.

Draft

Minutes

Project title	Job number	Date of Meeting
Headbolt Lane Station	276736	5 February 2021

		Action
	Potential impacts of overspill parking require consideration.	
9.	**Cycle parking**	
	100 cycle parking spaces with passive provision for further 200 spaces is considered acceptable, depending on forecast cycle trips outlined in TA. Cycle parking should be high quality, secure and sheltered.	
10.	**Pedestrian / Cycle Access**	
	Provision of pedestrian access to south west should be explored.	
	Provision of pedestrian access onto to Headbolt Lane from west side of car park should be explored.	MB
	A segregated cycleway is proposed on Headbolt Lane (by KMBC). MB to provide update on this via email. HBL station proposals should tie into this scheme.	
11.	**Public Transport**	
	Discussions regarding rerouting of bus services to serve the site should be directed to Merseytravel (Steve Cook). MB to provide contact and can attend meeting if required.	MB
12.	**AOB**	
	KMBC require an accessibility questionnaire to be submitted with the Transport Assessment. This can be obtained from KMBC's 'Ensuring Choice of Travel SPD'.	
	A Travel Plan will be required to support the planning application.	

Draft

Appendix B

Policy Review

National Planning Policy Framework

The National Planning Policy Framework (NPPF) was originally published by the Department for Communities and Local Government (DCLG) in March 2012, with the most recent revision being published in February 2019.

The NPPF details the Government's planning policies for England and how these are to be applied. The document seeks to contribute to promoting sustainable transport, and states that 'transport issues should be considered from the earliest stages of plan-making and development proposals, so that:

- the potential impacts of development on transport networks can be addressed;
- opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;
- opportunities to promote walking, cycling and public transport use are identified and pursued;
- the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and
- patterns of movement, streets, parking and other transport considerations are integral to the design of schemes and contribute to making high quality places.'

Paragraph 109 states that 'development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe'.

In addition, paragraph 110 sets out development design guidelines. Where practical, developments should be designed to:

- 'give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitate access to high quality public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;
- address the needs of people with disabilities and reduced mobility in relation to all modes of transport;
- create places that are safe, secure and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards; and
- allow for the efficient delivery of goods, and access by service and emergency vehicles.'

The development site is located within a residential area and the proposed development seeks to enhance the connectivity of the area by public transport. A number of measures to promote sustainable travel to / from the station, such as cycle parking facilities and appropriate bus provision, have been incorporated into the proposals. A comprehensive Travel Plan has also been produced for the proposed development.

National Planning Practice Guidance

The National Planning Practice Guidance (NPPG) was last updated in October 2019 and contains guidance on Travel Plans and Transport Assessments, setting out that they are required for all developments which generate significant amounts of movements. The NPPG states that these should be:

- Proportionate to the size and scope of the proposed development to which they relate and build on existing information wherever possible;
- Established at the earliest practicable possible stage of a development proposal;
- Be tailored to particular local circumstances (other locally-determined factors and information beyond those which are set out in this guidance may need to be considered in these studies provided there is robust evidence for doing so locally); and
- Be brought forward through collaborative ongoing working between the local planning authority/transport authority, transport operators, rail network operators, Highways Agency where there may be implications for the strategic road network and other relevant bodies. Engaging communities and local businesses in Travel Plans, Transport Assessments and Statements can be beneficial in positively supporting higher levels of walking and cycling (which in turn can encourage greater social inclusion, community cohesion and healthier communities).

A Transport Assessment and accompanying Travel Plan have been developed in line with this guidance to appropriately assess the potential transport impacts of the proposals and promote a sustainable development.

TfN Strategic Transport Plan

The Strategic Transport Plan (STP) sets out Transport for the North's (TfN) investment priorities for transport across the North and identifies key areas for enhanced connectivity.

The objectives of the STP are to:

- Transform economic performance;
- Create a more efficient, reliable, integrated and resilient transport system;
- Improve inclusivity, health and access to opportunities; and
- Promote the built, historic and natural environment.

By providing a new rail station with facilities for bus interchange, the proposed development will contribute to TfN's aim of creating a creating a more efficient and integrated transport system. It will also improve access to a range of opportunities for residents. This enhanced connectivity and accessibility will support transformational economic growth in the North.

Merseyside Local Transport Plan 3

The Merseyside LTP3, adopted in April 2011, outlines the transport strategy for Merseyside. The LTP3 is a collaborative strategy created by the five Merseyside Local Authorities, which includes Knowsley Metropolitan Borough Council.

The plan sets out a vision for Merseyside's transport network:

'A city region committed to a low carbon future which has a transport network and mobility culture that positively contributes to a thriving economy and the health and wellbeing of its citizens and where sustainable travel is the option of choice.'

The above vision will be achieved by pursuing six goals:

1. Create conditions to enable sustainable economic growth by supporting the priorities of the Liverpool City Region, the Local Enterprise Partnership and the Local Strategic Partnerships.
2. Provide a clean, resilient and low emission transport system.
3. Ensure the transport system promotes health and wellbeing and road safety.
4. Ensure equal travel opportunities for all and promote a transport network that enables access to employment, education, healthcare, leisure and recreation for all.
5. Ensure the transport system supports economic success for the LCR through the efficient movement of people and goods.
6. Maintain assets to a high standard.

The proposed rail station at Headbolt Lane will provide a new, convenient and sustainable transport option for local people. It will increase the accessibility of a range of opportunities, which in turn which help to support economic growth in the LCR.

LCRCA Transport Plan

The Liverpool City Region Combined Authority (LCRCA) Transport Plan (2019) sets out a strategic framework and delivery plan for transport in the LCR. The strategic objectives of the plan include:

- supporting inclusive economic growth by developing a transport network that connects people, businesses and visitors;
- creating a new mobility culture with modern, safe, clean and inclusive transport, where public transport is the mode of choice, which in turn will help to enhance health and wellbeing;
- developing a liveable and reliant city region that addresses poor air quality and supports a zero carbon LCR by 2040;
- providing a safe, well maintained and resilient transport network.

The LCRCA Transport Plan emphasises the importance of connecting people, business and visitors whilst promoting sustainability, health and wellbeing. The proposed development itself would provide a sustainable travel option for local residents and increased accessibility for all its users, which will help to support the LCRCA's goal of making public transport the mode of choice.

LCRCA Long Term Rail Strategy

The LCRCA Long Term Rail Strategy, most recently updated in April 2018, has been developed to ensure the rail network meets the LCR's needs for the next 30 years and

beyond. It seeks to support the development of the network to increase connectivity, capacity and frequency to generate a clustering effect and in turn, increased productivity.

The Strategy notes areas of weaker connectivity within the LCR, including the Merseyrail line to Kirkby, which should be prioritised for growth.

It also identifies some existing constraints on the rail network, such as lack of connectivity between places where people live and employment areas. The Strategy goes on to identify how a new station at Headbolt Lane would open up the rail network to a population that does not currently have easy access to it. It is therefore considered that the proposed station at Headbolt Lane is an important component to achieving the aims of the LCRCA Long Term Rail Strategy.

LCRCA Local Cycling and Walking Infrastructure Plan

The Local Cycling and Walking Infrastructure Plan (LCWIP) is a 'strategic approach to developing a cohesive network of high standard active travel routes across the region' between 2019-29. The LCWIP has been developed in accordance with the Department for Transport's Cycling and Walking Investment Strategy.

A key objective of the LCWIP is to develop a walking and cycling network that increases active travel by providing safe, accessible, comfortable, direct and coherent routes.

The proposed station at Headbolt Lane has been developed with the aim of maximising the connectivity of the site for pedestrians and cyclists, for example, through the provision of new pedestrian crossing infrastructure on Headbolt Lane and high-quality cycle parking adjacent to the station building. It is therefore considered that the proposals align with the aims of the LCWIP.

Knowsley Local Plan: Core Strategy

The Knowsley Local Plan Core Strategy (2016) sets out a strategic framework for the development of Knowsley up to 2028 and beyond.

Strategic Objective 6 relates to sustainable transport. It states that new development should seek to prioritise sustainable transport to help improve accessibility between housing and employment areas, as well as shopping leisure, healthcare, education and other services.

The Core Strategy contains a number of policies pertaining to transport and the proposed development.

Policy SD1 states that a positive approach will be adopted when considering development proposals, in accordance with the NPPF's presumption in favour of sustainable development. Planning applications that accord with Local Plan policies will be approved without delay.

Policy CS7 states that planning powers will be used to support an integrated and sustainable transport system within the borough that:

- supports the development needs of the borough up to 2029;
- enables people to travel by walking, cycling and public transport;
- enhances road safety;

- strives to reduce carbon emissions; and
- supports local people's health and wellbeing.

New development will need to be:

- located and designed to maximise accessibility by sustainable modes, with developer contributions required where deficiencies are identified;
- designed to ensure large scale proposals are in the most accessible locations;
- supported by a Transport Assessment and Travel Plan;
- compliant with adopted parking standards; and
- supported by measured to reduce carbon emissions and improve air quality.

The Council will work with partners to deliver schemes which support the Merseyside LTP3 priorities including:

- improvements to the rail network such as electrification, improvements to stations and interchange facilities and provision of Park and Ride facilities;
- enhanced bus provision, including improved facilities and enhancement of key bus routes through Quality Bus Partnerships and Quality Bus Contracts; and
- provision of walking and cycling routes as part of the Green Infrastructure Network.

Policy CS8 seeks to maximise the benefits of green infrastructure for the borough. Planning powers will be used to manage and enhance green infrastructure in order to provide sustainable transport links between residential areas, employment areas, community services and leisure opportunities.

Policy CS12 identifies Tower Hill as a principal regeneration area. Redevelopment of the area will be supported through:

- public realm and green infrastructure enhancements with a focus on quality, accessibility and integration with new development;
- infrastructure improvements including enhanced public transport, walking and cycling provision to increase accessibility in Tower Hill and surrounding area; and
- flexibility to integrate the potential delivery of a new rail station / Park and Ride facility to the south of Headbolt Lane.

Policy CS19 sets out the expectations for design quality and accessibility in new development:

- complement and enhance existing green infrastructure where possible;
- create places that facilitate social interaction and active lifestyles, and integrate high quality public realm; and
- deliver safe and convenient routes for movement that prioritise walking, cycling and public transport and meet the needs of all users.

Strategy for Knowsley: 'The Borough of Choice'

The Strategy for Knowsley: The Borough of Choice, adopted in 2013, focuses on actions to deliver the short-terms priorities for the borough. By 2023, the Strategy wants Knowsley to have:

- attractive, sustainable neighbourhoods and vibrant, welcoming town centres;
- residents who are enabled to make positive lifestyle choices;
- high quality employment areas to support economic growth in the LCR; and
- narrowed the deprivation gap between areas in Knowsley and elsewhere.

The proposed development would provide sustainable travel options for the local community, whilst improving accessibility to a wider range of opportunities for residents. It is therefore considered to be in accordance with the Strategy for Knowsley: The Borough of Choice.

Knowsley Replacement Unitary Development Plan

The Knowsley Replacement Unitary Development Plan (UDP), adopted in June 2006, sets out KMBC's strategy for development in the borough. Following the adoption of the Knowsley Local Plan, 39 UDP policies remain active, a number of which pertain to transport and new development.

Policy T5 states that all major traffic generating developments should be well located for access by walking, cycling and public transport.

Policy T7 outlines how new development should seek to enhance the walking and cycling network in order to promote health and wellbeing for all.

Policy T8 states that any development proposals that generate a material increase in traffic on the highway network should be supported by a Transport Assessment, and any associated impacts mitigated as appropriate. Similarly, **Policy T9** states that all major traffic generating developments must be supported by a Travel Plan.

Policy T10 outlines how new development must provide suitable access for the less mobile in accordance with the Disability Discrimination Act 1995 and its successors.

By proving new rail connections, the proposed development would support a number of the policies outlined in the UDP. The proposals have been developed to ensure sustainable and inclusive access for users of the station.

Furthermore, a Transport Assessment and Travel Plan have been produced to support the planning application for the new station.

The proposed development is therefore considered to be in accordance with the above policies outlines in the UDP.

Ensuring a Choice of Travel SPD

The 'Ensuring a Choice of Travel' Supplementary Planning Document was published by KMBC in 2010. It sets out how new developments can satisfy the accessibility requirements of policies within the Knowsley Replacement Unitary Development Plan.

The main objective of the SPD is to ensure a good choice of travel modes to all new development. The proposed development includes provision for access by a range of sustainable travel modes, including rail, bus, walking and cycling.

The SPD states that parking areas should be designed to ensure pedestrians and cyclists are given priority over motor vehicles where possible. The internal layout of the proposed development has been designed as such. A 3m wide bi-directional cycleway is proposed alongside the vehicle access road and dedicated pedestrian footways and zebra crossings are provided throughout the car park.

In terms of cycle parking, the SPD states that a wide range of cycle storage options should be considered when designing facilities. A high level of cycle parking provision is proposed adjacent to the station building to ensure convenient access for cyclists.

Tower Hill Action Area SPD

The Tower Hill (Kirkby) Action Area Supplementary Planning Document was published by KMBC in April 2007. The purpose of the SPD is to guide future development proposals for the Tower Hill Action Area. The objectives of the SPD include:

- **Urban quality –** to provide a high quality, sustainable and accessible village centre that serves as the focus for the wider Tower Hill regeneration. This requires the delivery of comprehensive development, redevelopment and improvement.
- **Community cohesion –** to create attractive, safe, and well-designed neighbourhoods with good connectivity to each other and the village centre. This requires the delivery of high-quality, accessible public realm that provides facilities for the whole community**.**
- **Sustainable transport –** to promote sustainable transport by providing an integrated, well-connected network of roads, footways, cycleways, and public transport facilities that ensure permeability and accessibility within and to / from Tower Hill.

The SPD also notes the aspiration for a rail station to be provided on the Headbolt Lane site. It states the importance of providing a bus link within the proposed station site to enhance connectivity within Tower Hill.

Appendix C

Accessibility Assessment Form

Accessibility Assessment Form

Access on foot			Points	Score	Justification for Scoring
Location	Residential Development: Is the site within 800m of a district or local centre (see Accessibility Maps) **OR** Non-residential development: Is the density of existing local housing (i.e. within 800m) more than 30 houses per hectare (see Accessibility Maps)	Yes	2	2	Existing local housing generally at density of more than 30 houses per hectare, as per KMBC Accessibility Maps.
		No	0		
Internal layout	Does 'circulation' and access inside the sites reflect direct, safe and easy to use pedestrian routes for all, with priority given to pedestrians when they have to cross roads or cycle routes?	Yes	1	1	A series of footways and zebra crossings are proposed throughout the site to facilitate safe pedestrian movements.
		No	0		
External layout	Are there barriers between site and local facilities or housing, which restrict pedestrian access? Examples include no dropped kerbs at crossings or on desire lines; steep gradients; a lack of a formal crossing where there is heavy traffic; security concerns, e.g. lack of lighting	Yes	-1	1	There is a current lack of crossing provision on Headbolt Lane, and sections with no footway on the southern side of Headbolt Lane. The proposed development includes a new site access junction on Headbolt Lane with signalised pedestrian crossings on all arms of the junction. A new uncontrolled crossing with dropped kerbs and tactile paving is also proposed on Headbolt Lane to the east of the
		No	1		

					site, providing access to the residential area to the northeast The proposed southern access to the station will significantly improve north-south connectivity between the residential areas to the north and south and the station.
			Total Score	4	
			Minimum score required	4	

Comments or action needed to correct any shortfall

N/A

Access by Cycle			**Points**	**Score**	Justification for Scoring
Location	Residential Development: Is the site within 1500m of a district or local centre (see Accessibility Maps) **Or** Non-residential development: Is the density of existing local housing (e.g. within 1500m) more than 30 houses per hectare (see Accessibility Maps)	Yes	2	2	Existing local housing generally at density of more than 30 houses per hectare, as per KMBC Accessibility Maps.
		No	0		
Internal layout	Does 'circulation' and access inside the site reflect appropriate and direct cycle routes, with priority given to cyclists where they meet motor vehicles?	Yes	1	1	A 3m wide bi-directional cycleway is proposed alongside the vehicle access road, providing a continuous off-road cycle route through the site.
		No	0		
External	Is the development	Yes	1	1	It is understood

Access	within 400m of an existing or proposed designated cycle route and/ or proposes to create a link to a cycle route, or develop a route.	No	-1		that KMBC plans to deliver a new cycleway on the southern side of Headbolt Lane. The proposed station access junction design has been developed to enable the future cycleway to tie into the junction.
Other	Development includes cycle parking, shower facilities, and lockers for cyclists.	Yes	1	1	Parking facilities for 100 cycles will be provided adjacent to the station building, with passive provision for a further 200 spaces.
		No	0		
			Total Score	**5**	
			Minimum score required	**5**	
Comments or action needed to correct any shortfall N/A					

Access by Public Transport			**Points**	**Score**	Justification for Scoring
Location and access to public transport	Is the site within a 200m walk of a bus or tram stop, and/or within 400m of a rail station?	Yes	2	2	There are existing bus stops within 200m of the site on Headbolt Lane. The proposed development will provide a new rail connection for the local area. 2no. bus stops are to be provided on site.
		No	0		
	Are there barriers on direct pedestrian routes to bus or tram stops or rail stations e.g. a lack of dropped kerbs, footpaths less than 2m wide, a lack of formal crossings and / or bus stop infrastructure.	Yes	0	1	There is a current lack of crossing provision on Headbolt Lane, and sections with no footway on the southern side of Headbolt Lane
		No	1		

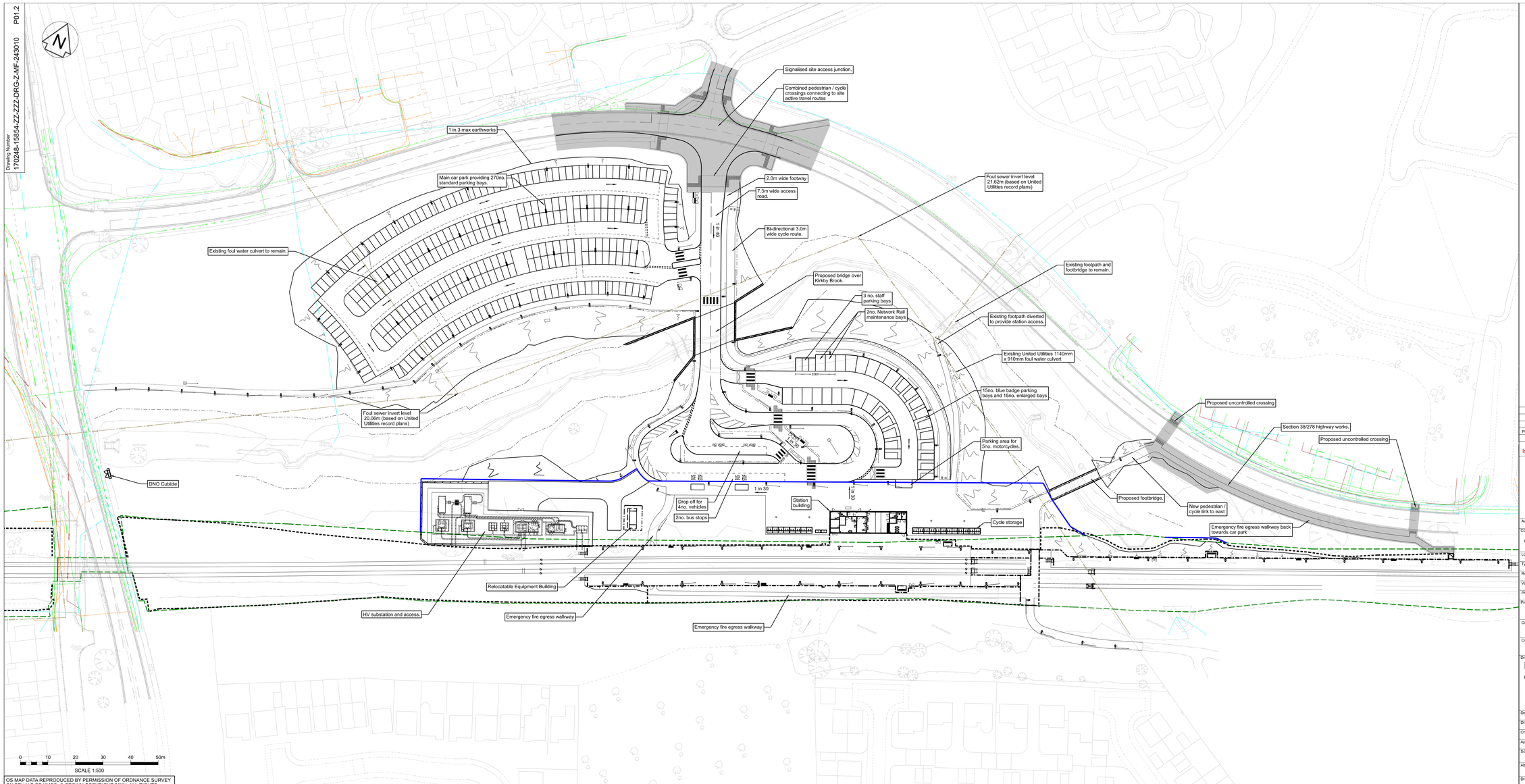
					However, the aforementioned pedestrian crossing proposals will improve access to existing bus stops on Headbolt Lane. The proposed bus stops on site are located adjacent to the station building and are therefore easily accessible.
Frequency	High (four or more bus or tram services or trains an hour)		2	2	As a rail station with a bus interchange facility, the proposed development will be highly accessible by public transport. It is envisaged that the station will be served by c.5-6 trains and c.10 buses per hour.
	Medium (two or three bus or tram services or trains an hour)		1		
	Low (less than two bus or tram services or trains an hour)		0		
Other	The proposal contributes to bus priority measures serving the site	Yes	1	1	2no.bus stops and a bus turning loop are provided on site. The station access junction has been designed to provide sufficient capacity to minimise delay to buses.
		No	0		
	The proposal contributes to bus stops, bus interchange, tram facilities or bus or rail stations in the vicinity and/or provides bus stops or bus interchange in the site	Yes	1	1	As a rail station with a bus interchange facility, the proposed development will be highly accessible by public transport
		No	0		
	The proposal contributes to an existing or new	Yes	1	0	
		No	0		

	supported bus service				
			Total Score	**7**	
			Minimum score required	**6**	
Comments or action needed to correct any shortfall N/A					

Parking			**Points**	**Score**	Justification for Scoring
Parking	The off-street parking provided is as advised in Section 4 for that development type	Yes	1	n/a	Section 4 does not provide parking standards for rail stations.
		No	0		
	The off-street parking provided is less than 75% of the amount advised in Section 4 for that development type (or shares parking provision with another development).	Yes	2	n/a	As above.
		No	0		
	For development in controlled parking zones:				
	Is the proposal for a car free development?	Yes	1	0	
		No	0		
	Does it support the control or removal of on-street parking spaces (inc provision of disabled spaces) or contributes to other identified measures in the local parking strategy (including car clubs)	Yes	1	0	
		No	0		
			Total Score	**n/a**	
			Minimum score required	**1**	
Comments or action needed to correct any shortfall. KMBC does not provide parking standards for rail stations. The suitability of the parking provision is detailed and justified in the Transport Assessment supporting the planning application. The TA includes details of trip forecasting and a parking accumulation exercise.					

Appendix D

Car Park Layout



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Drawing Number
170248-15854-ZZ-ZZZ-DRG-Z-MF-243010 P01.2

Legend/Notes

1. Do not scale from this drawing.
2. All dimensions are in millimetres unless shown otherwise.

Key:

- Existing Network Rail Boundary
- Proposed Network Rail boundary alterations
- Works subject to Section 278 Agreement
- Seating
- CCTV Column
- Lighting Column

Key (Utilities):

- Existing BT Network
- Existing Surface Water Sewer
- Existing Foul Sewer
- Existing Potable Water
- Existing LV Electric
- Existing HV Electric
- Existing Virgin Media
- Existing Low Pressure Gas

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01.2	18/07/21	First Revision	---	---	---

Status: Issued for Planning
Suitability: S0

NetworkRail

Authorised: ---
Signed: ---
Date:

Contractor(s): Ove Arup & Partners

Location/Level: No Specific Location
Type: CAD Drawing
Sub-type: Plan
Role: General (non-disciplinary)
Discipline: Multi-Functional
Volume/System: No Specific Volume or System
Phasing: Proposed
Grip Stage: 4

Project: Headbolt Lane
Contract No.: 170248
Contract Title: Headbolt Lane
Drawing Title: Planning Application Drawing Car Park and Access Layout

Designed		Signed ---	Date
Drawn	---	Signed ---	Date
Checked	---	Signed ---	Date
Approved	--	Signed ---	Date
Scale(s)		ELR & Mileage	WKL2 28.1232 to 29.0913
Alternative Reference		Sheet	of

Drawing Number: 170248-15854-ZZ-ZZZ-DRG-Z-MF-243010
Revision: P01.2

Appendix E

Traffic Flow Diagrams

2023 AM Base
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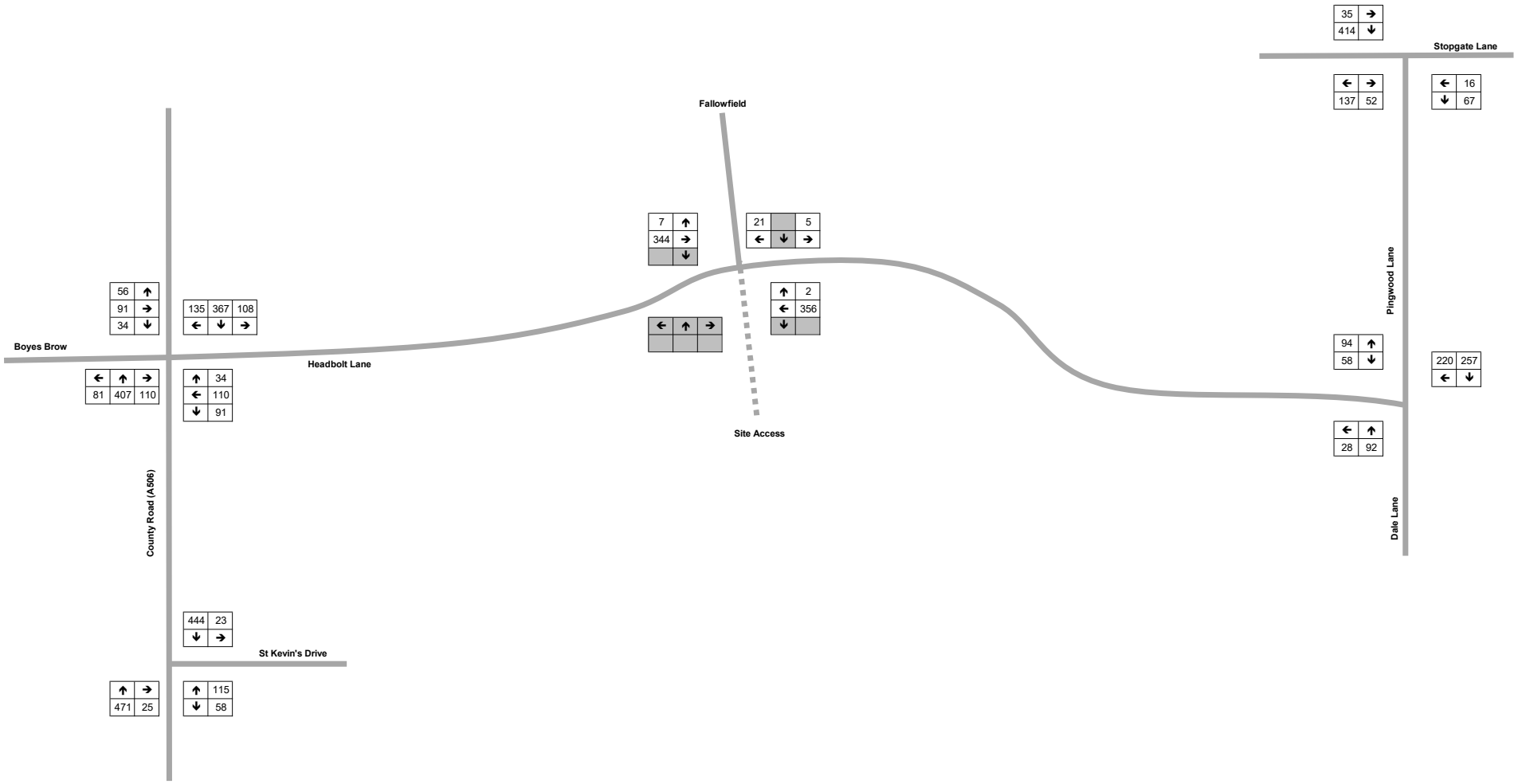
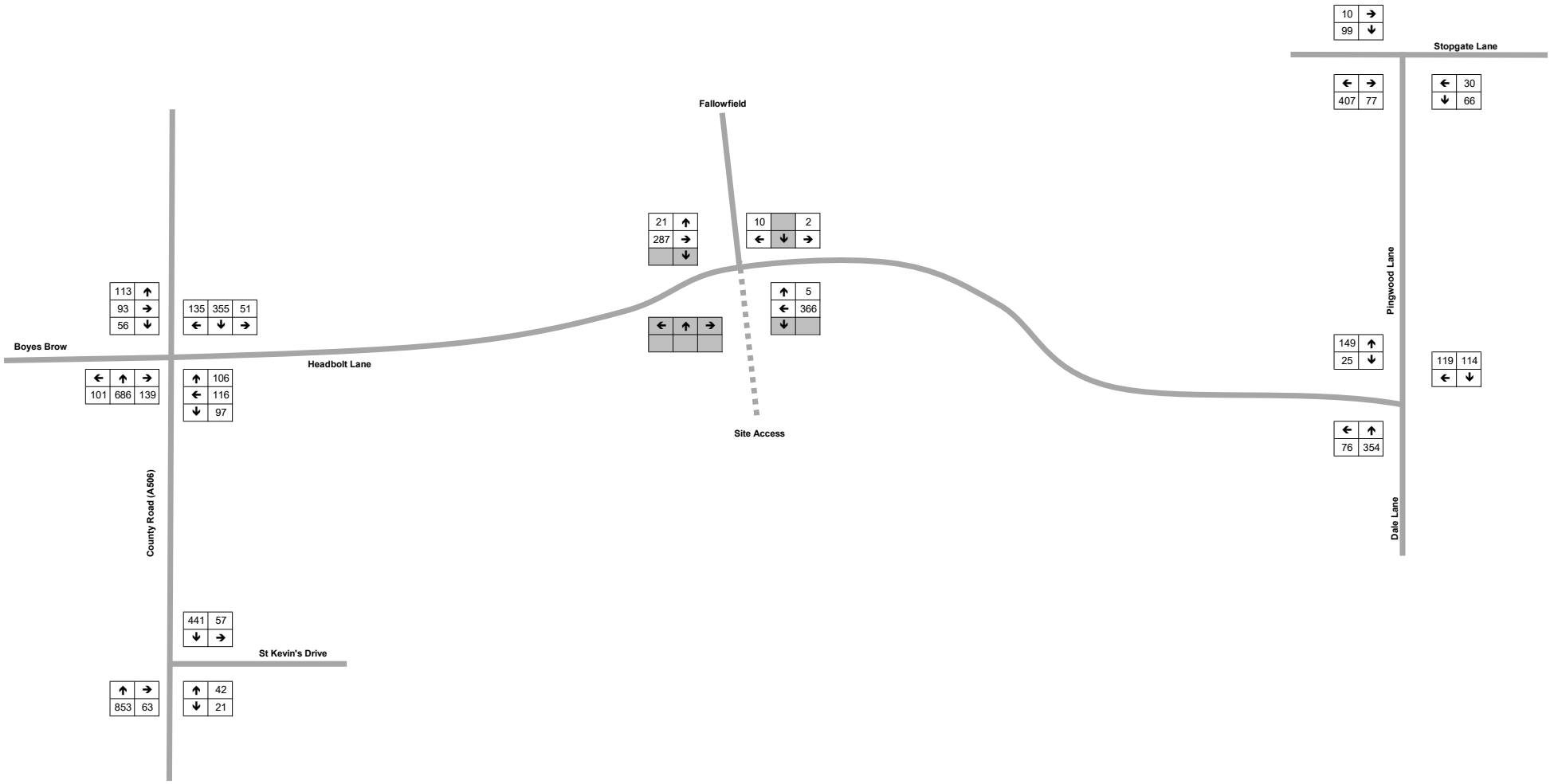


2023 PM Base
16:15-17:15



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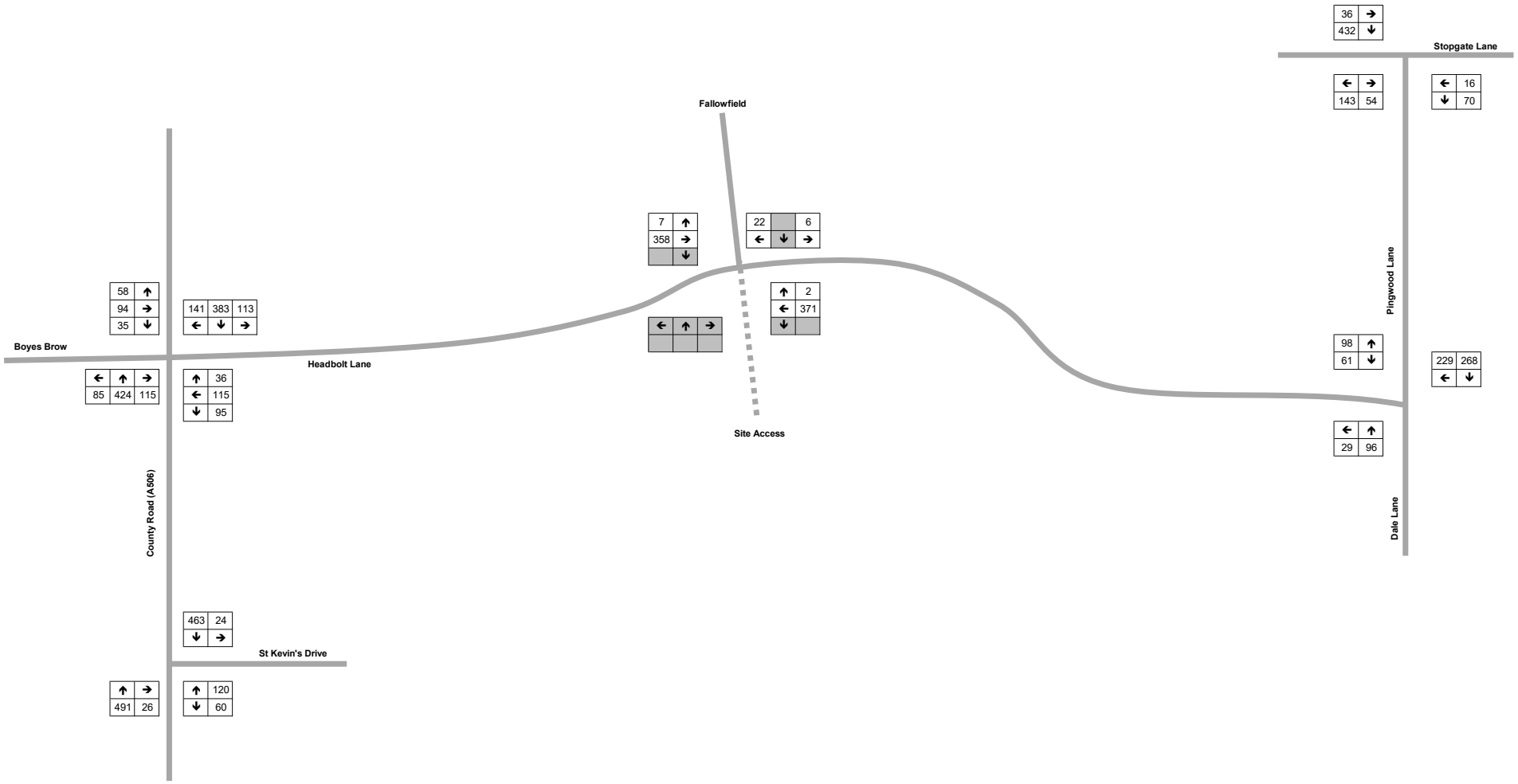

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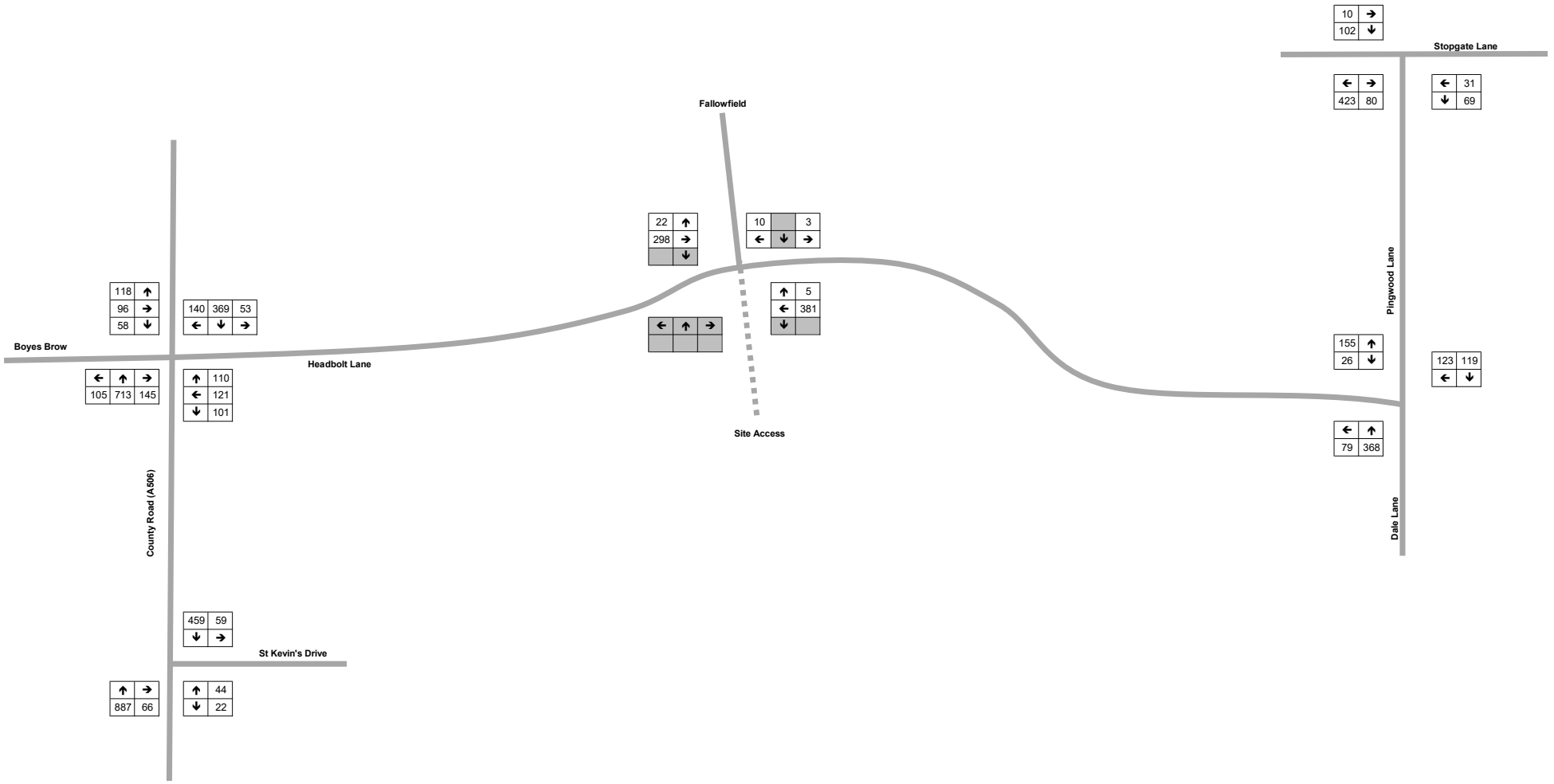

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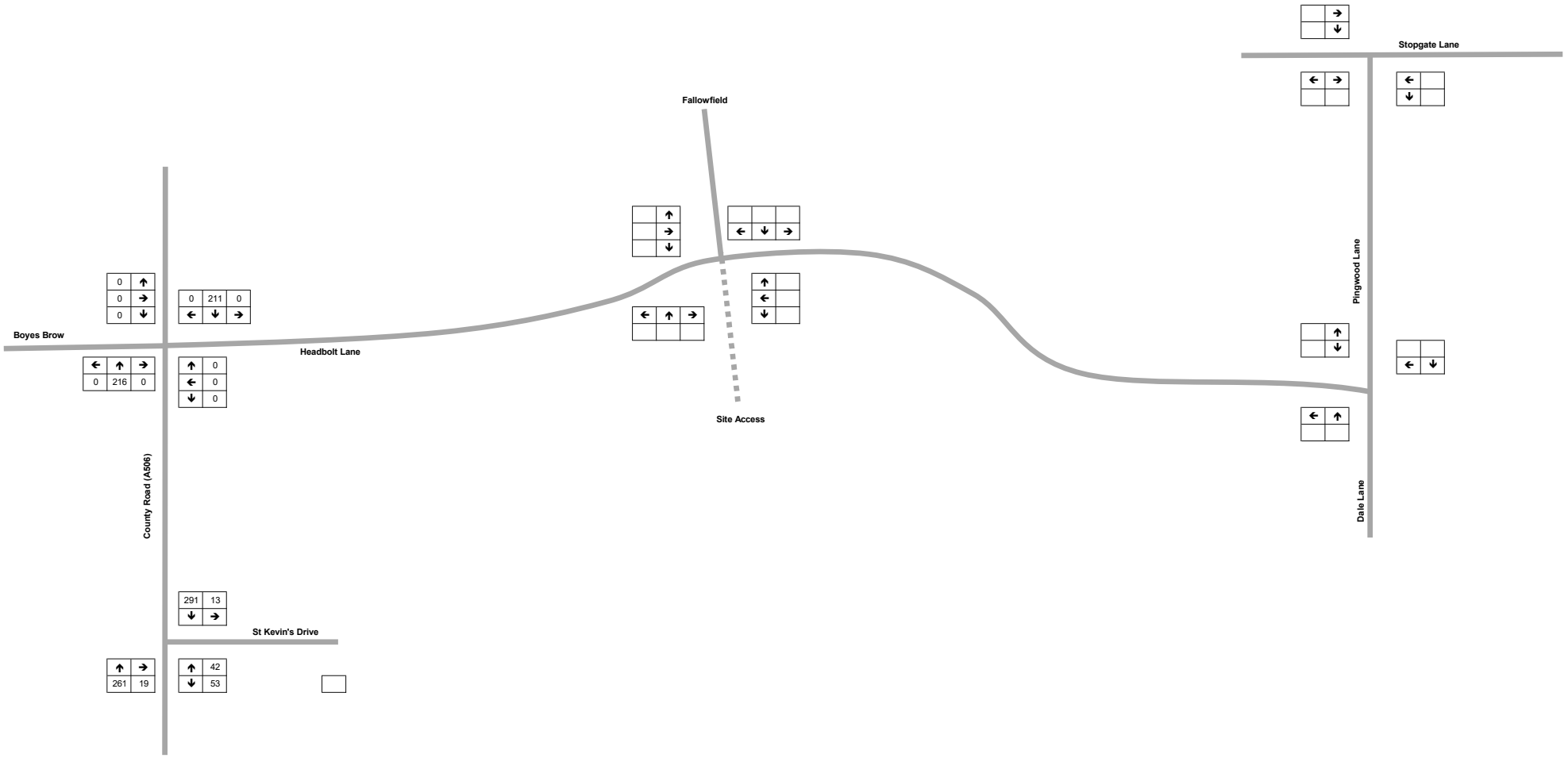
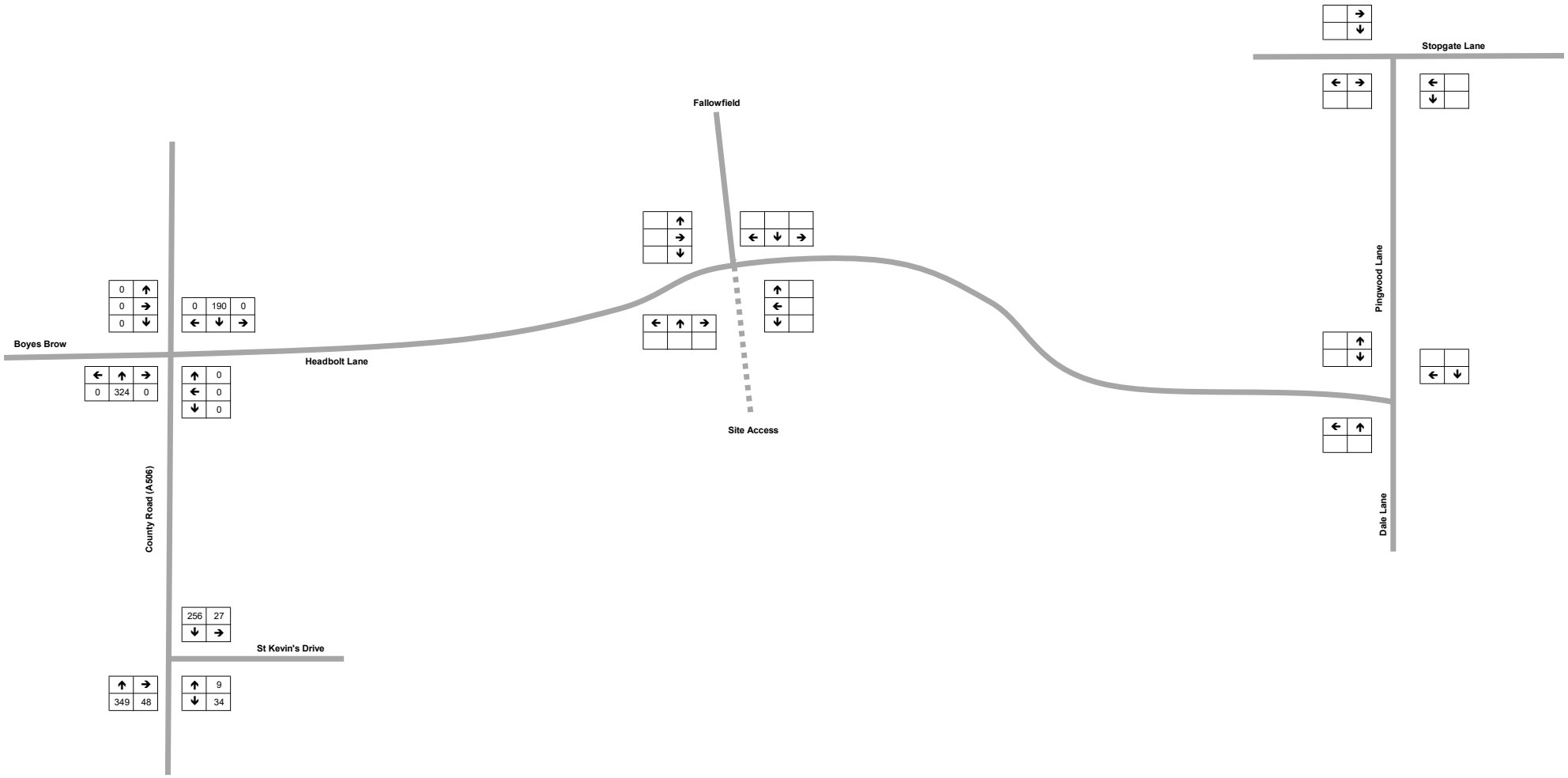
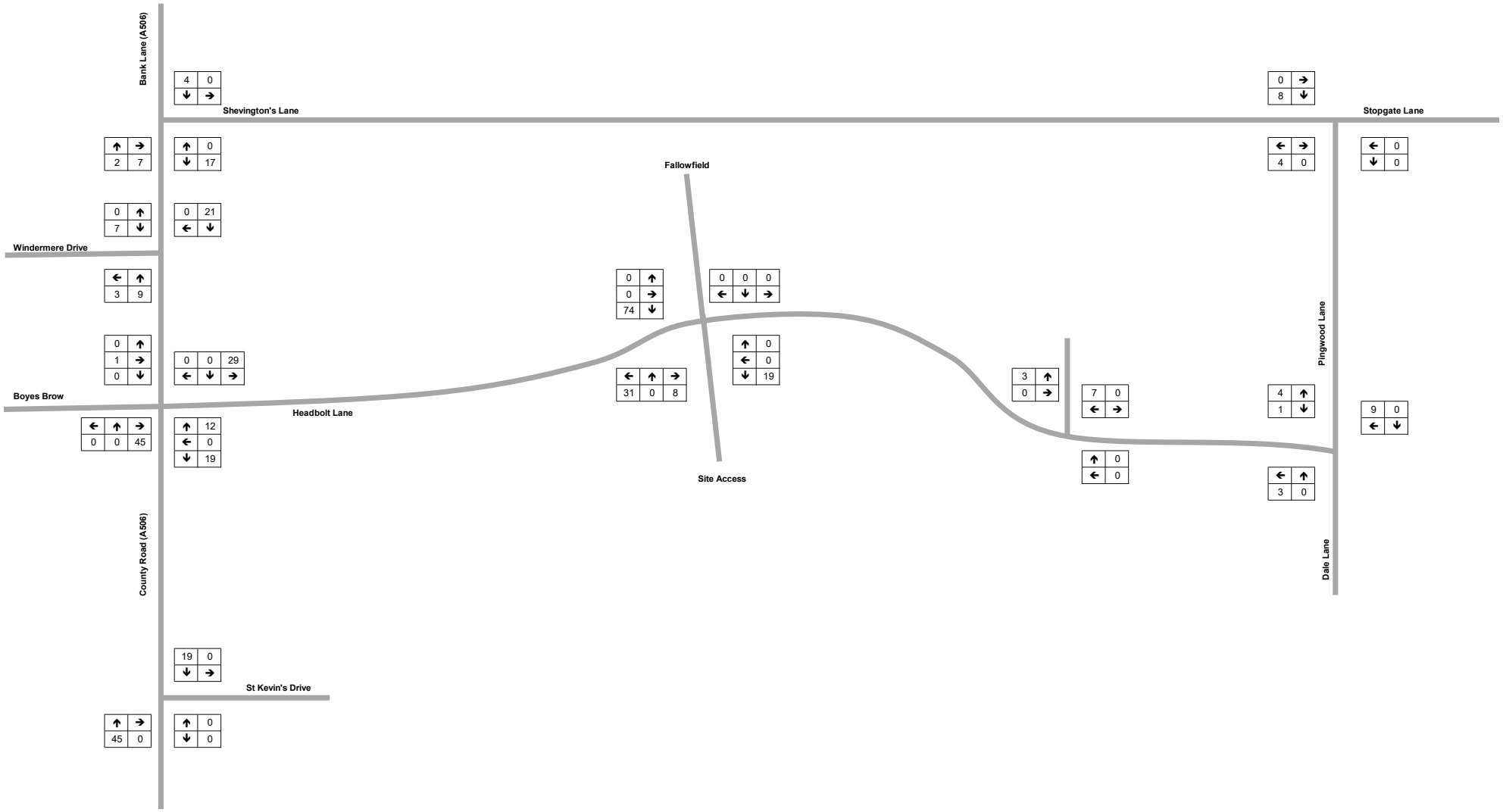


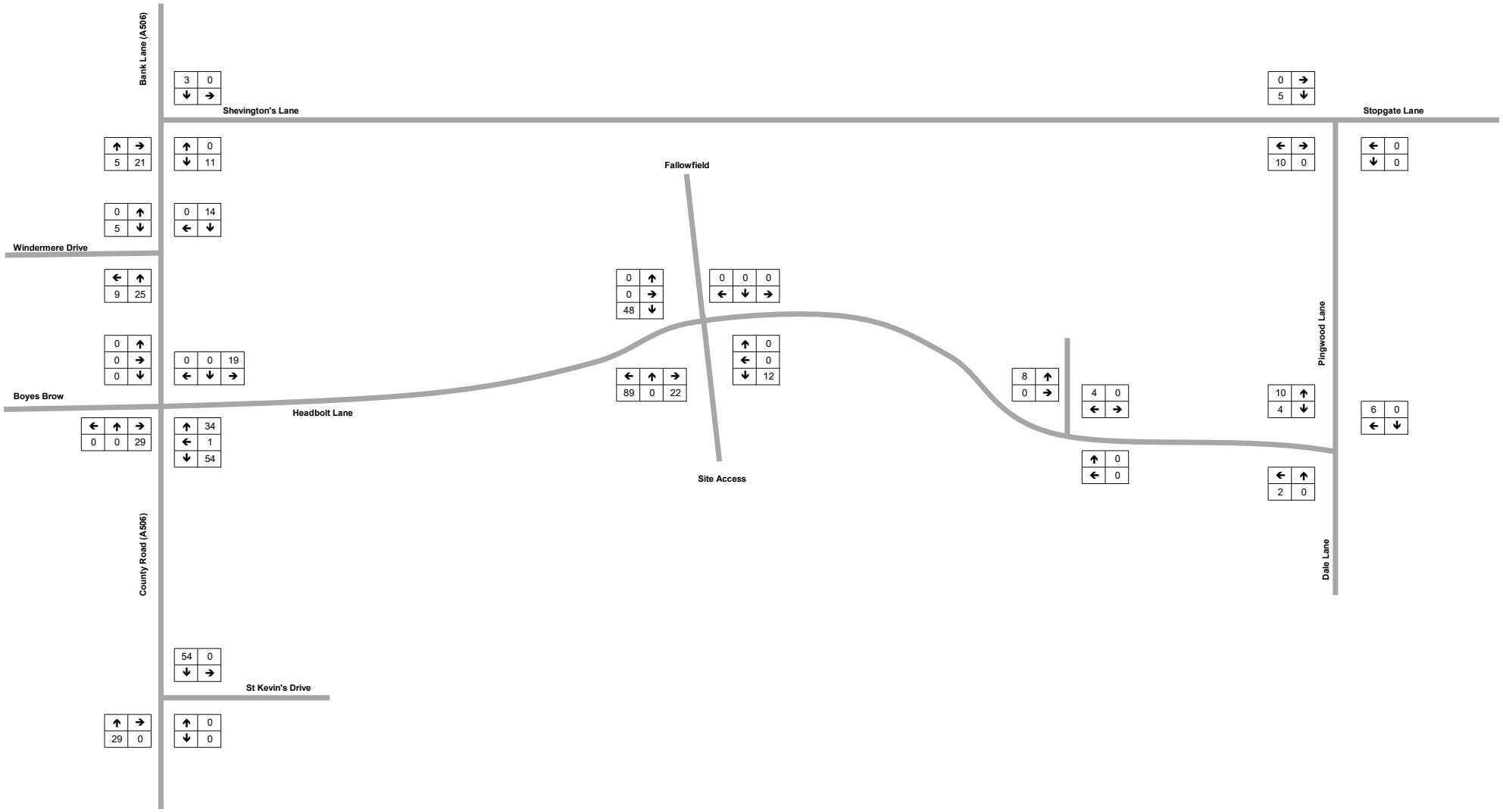
Committed Development PM



Proposed Development Trips AM (08:00-09:00)

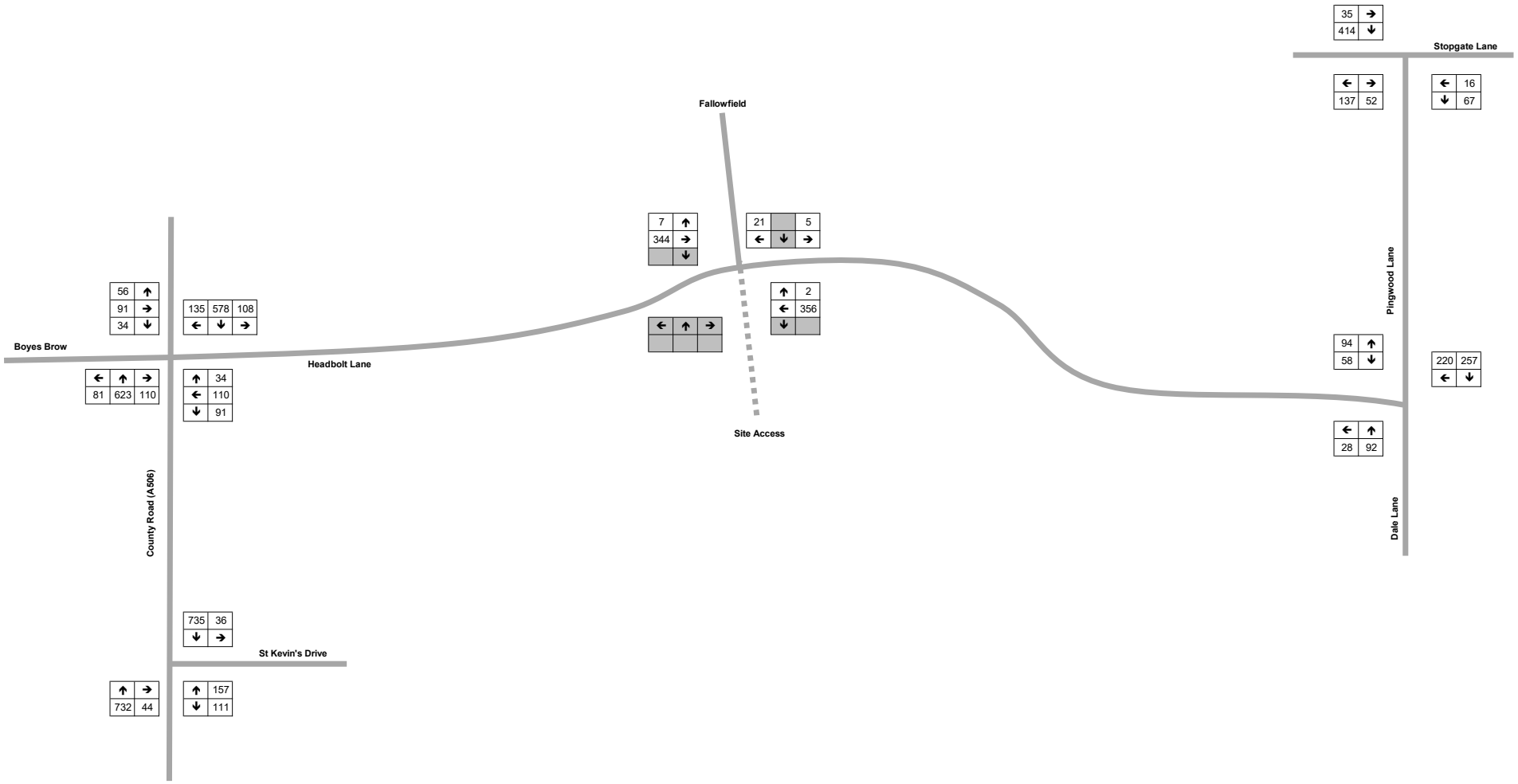


Proposed Development Trips PM (17:00-18:00)



2023 AM Base + Committed Development

07:45-08:45



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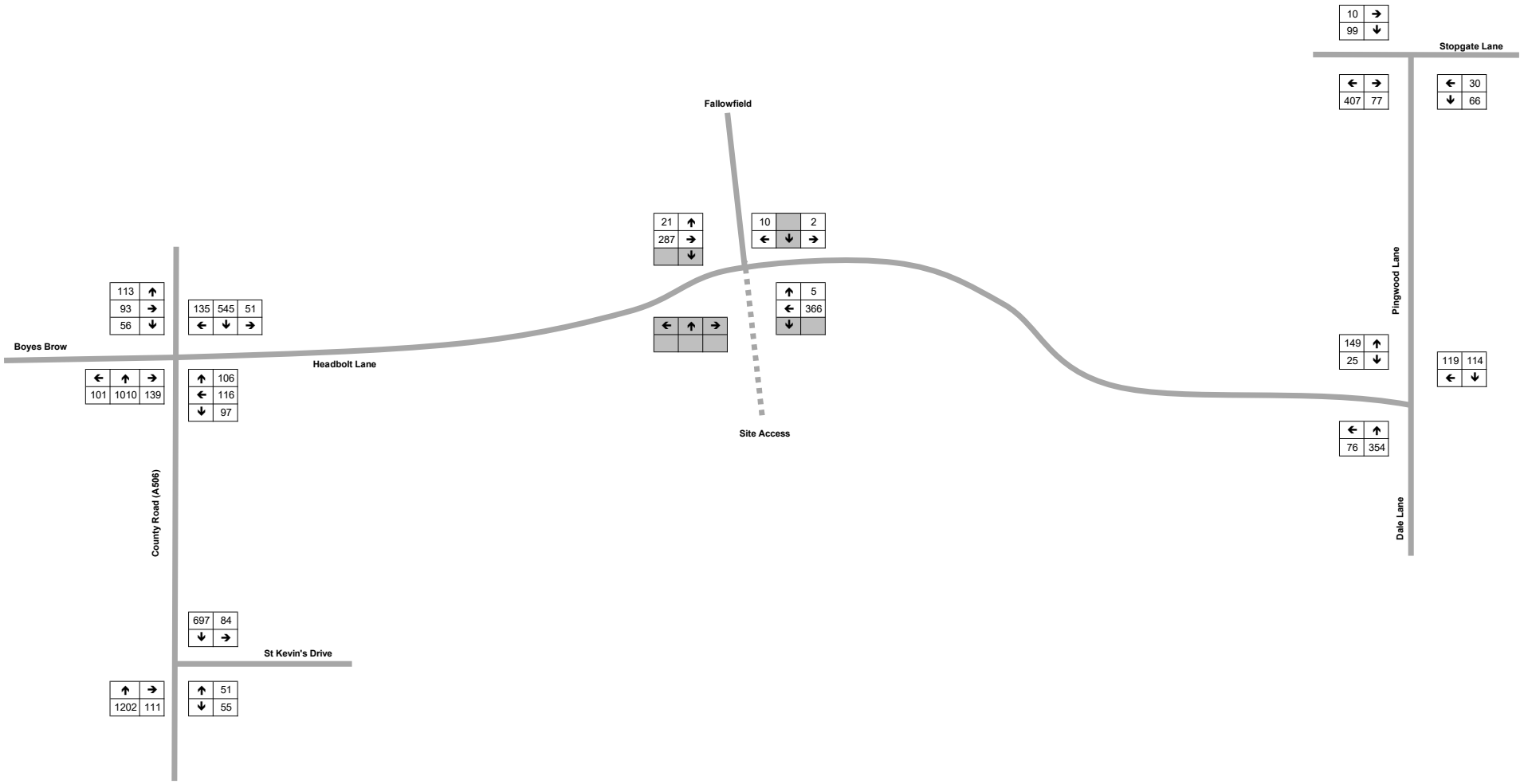
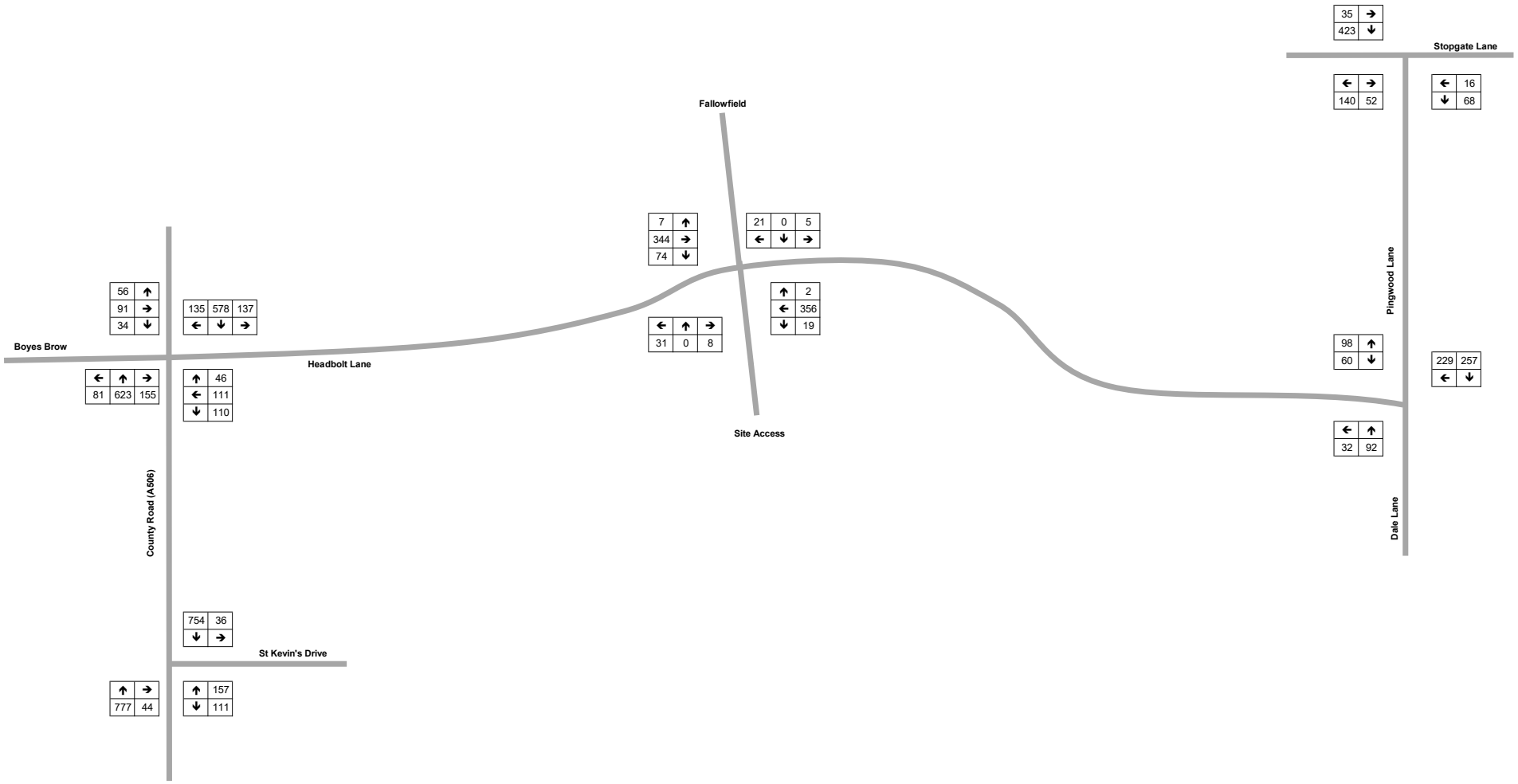


2023 AM Base + Committed Development + Proposed Development

07:45-08:45



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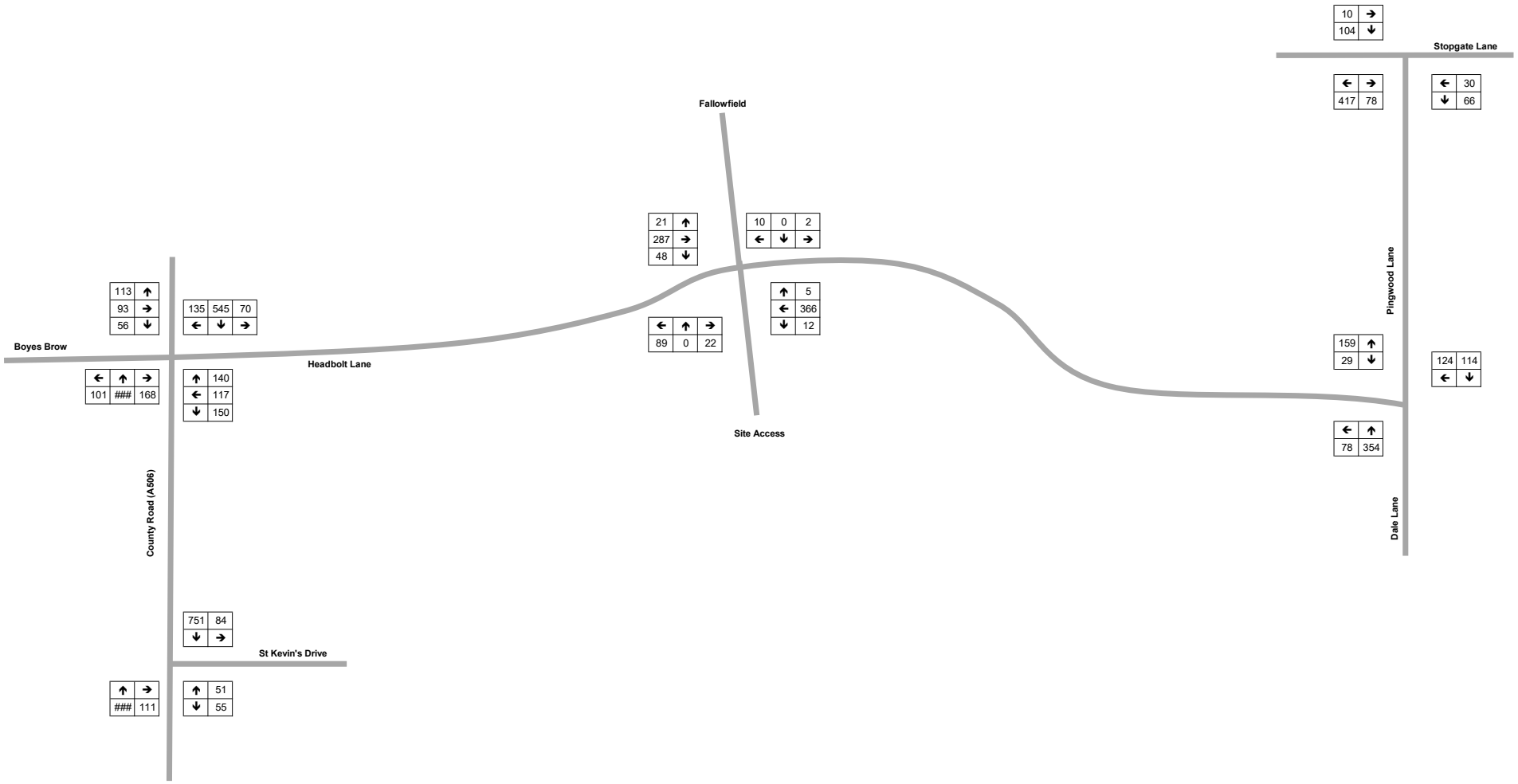
16:15-17:15



2028 AM Base + Committed Development

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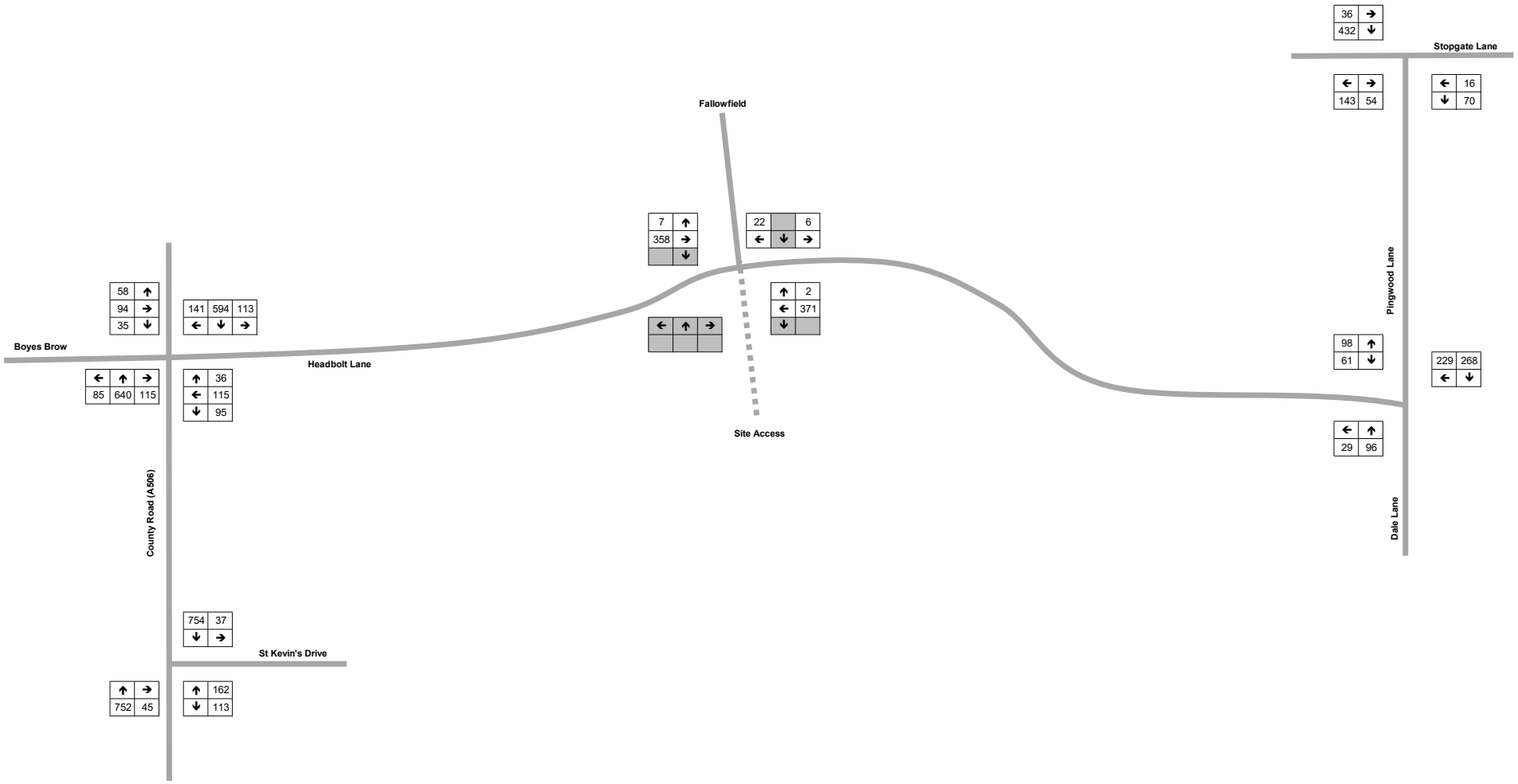
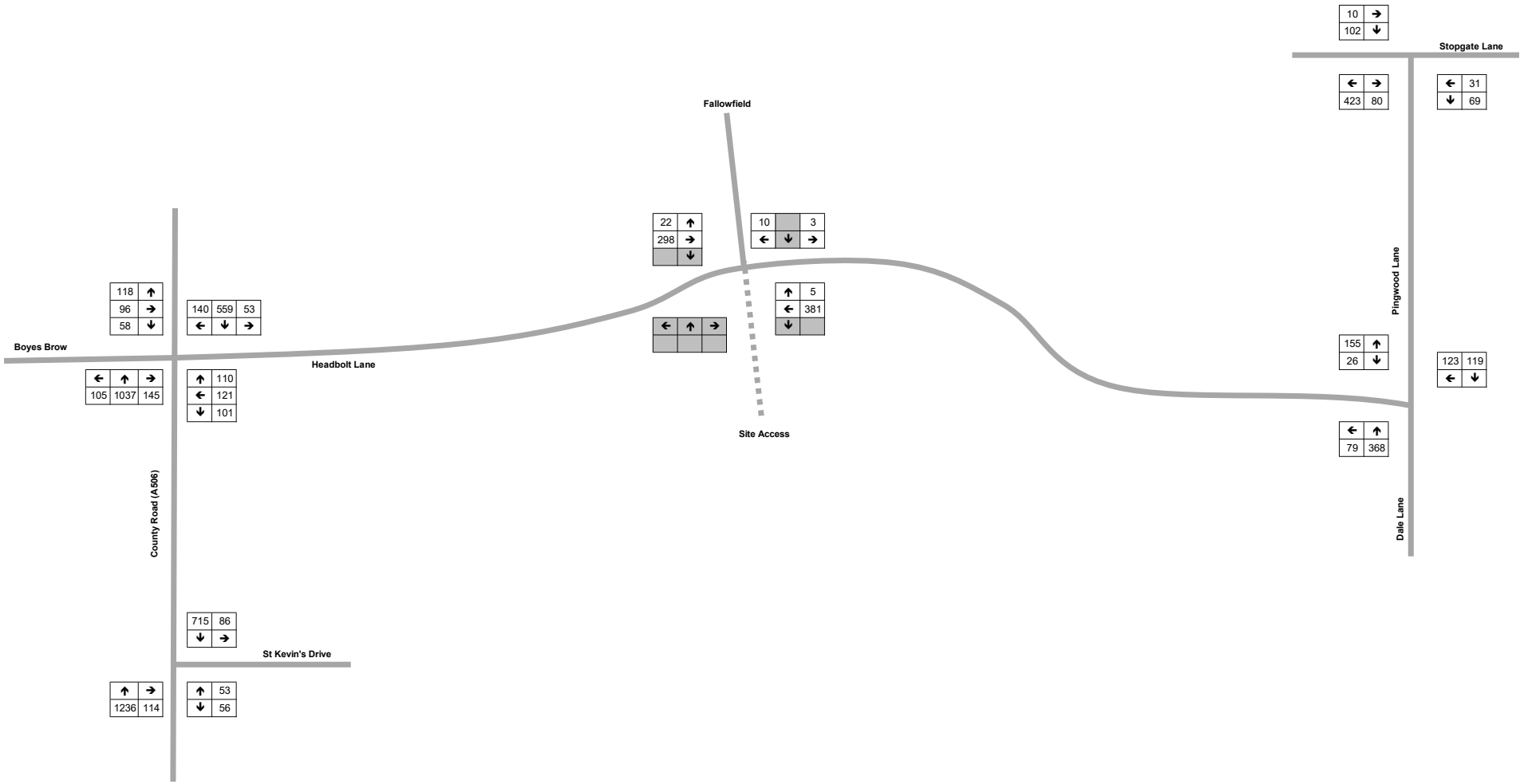


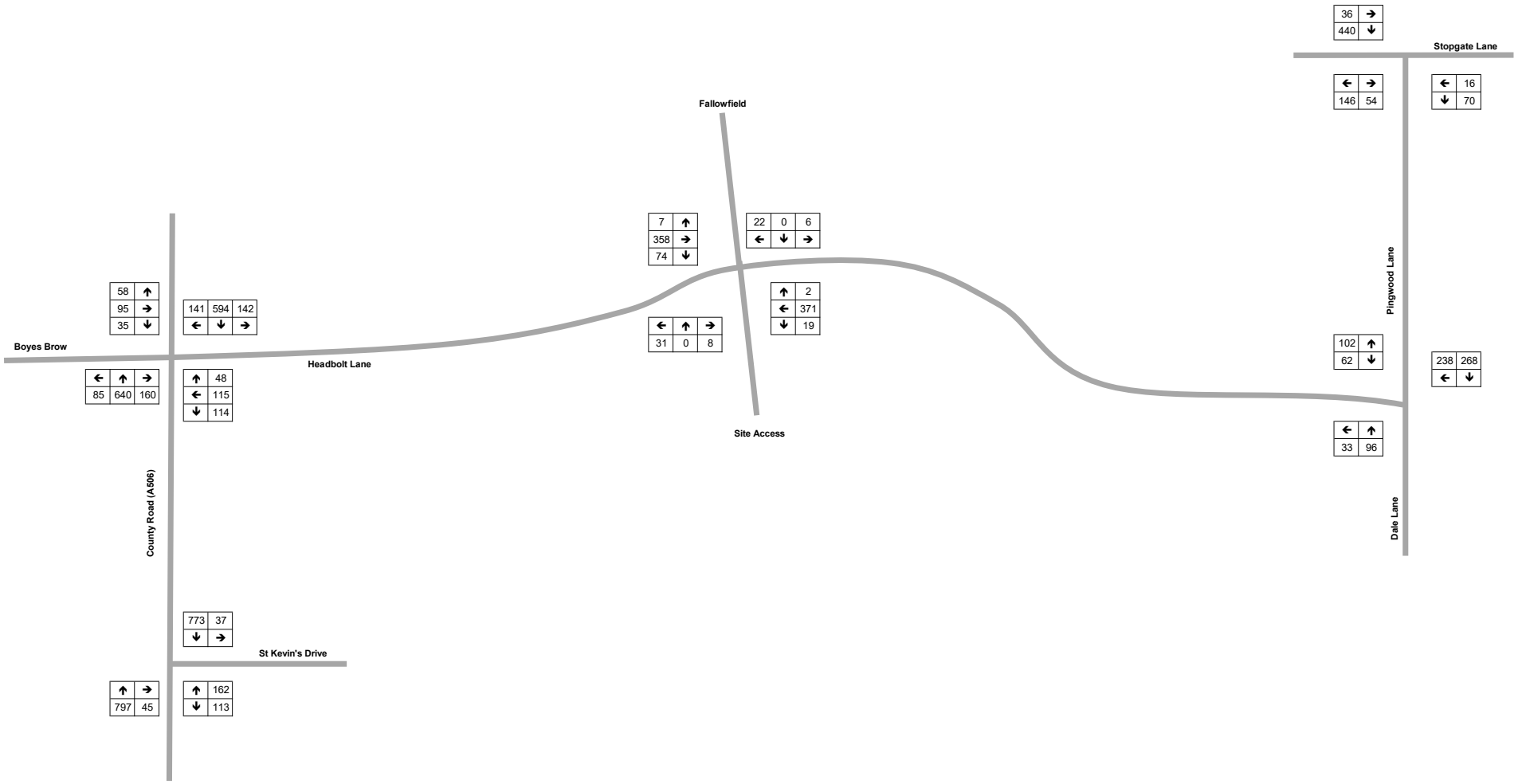
2028 PM Base + Committed Development

16:15-17:15



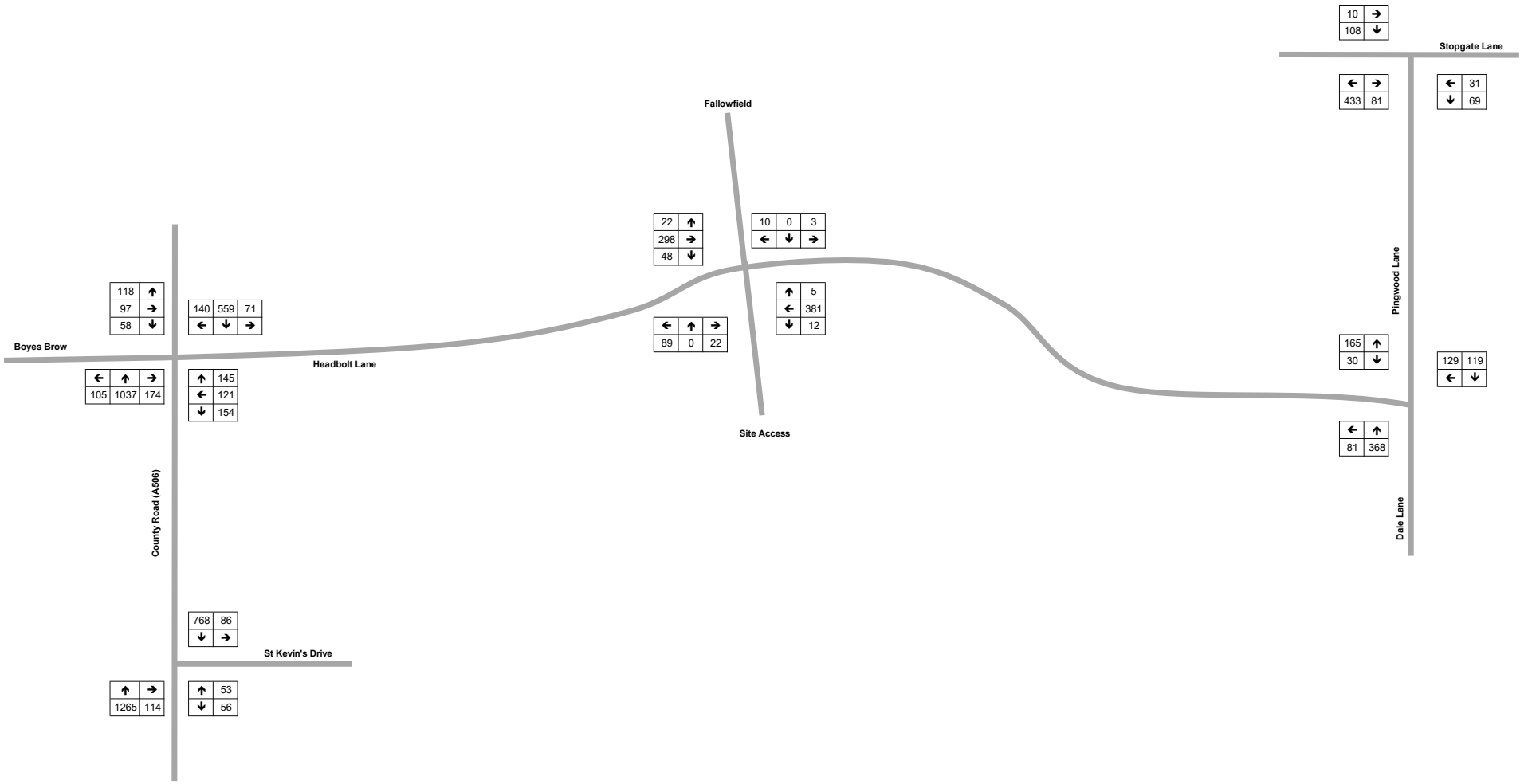
2028 AM Base + Committed Development + Proposed Development

07:45-08:45

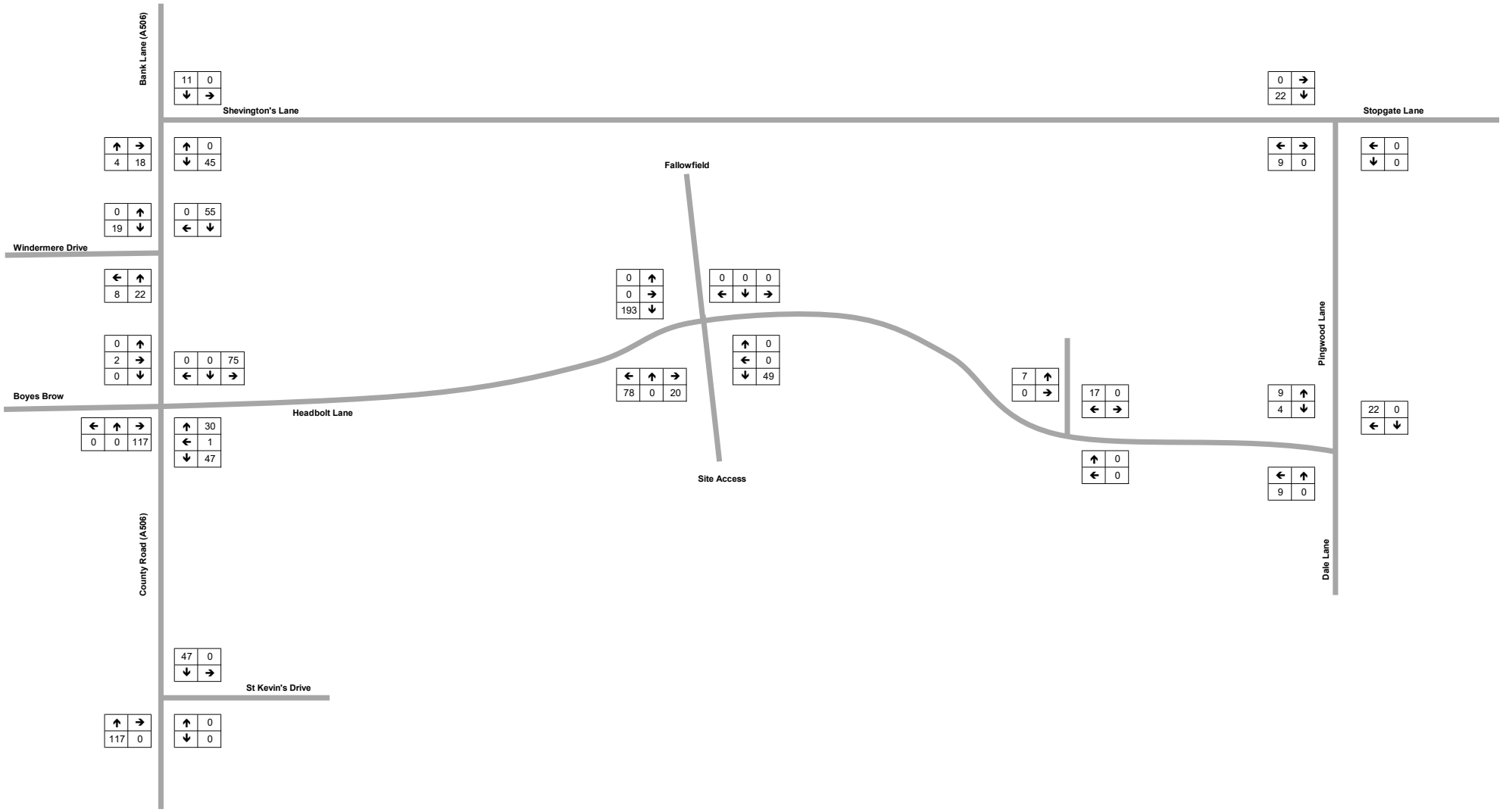


2028 PM Base + Committed Development + Proposed Development

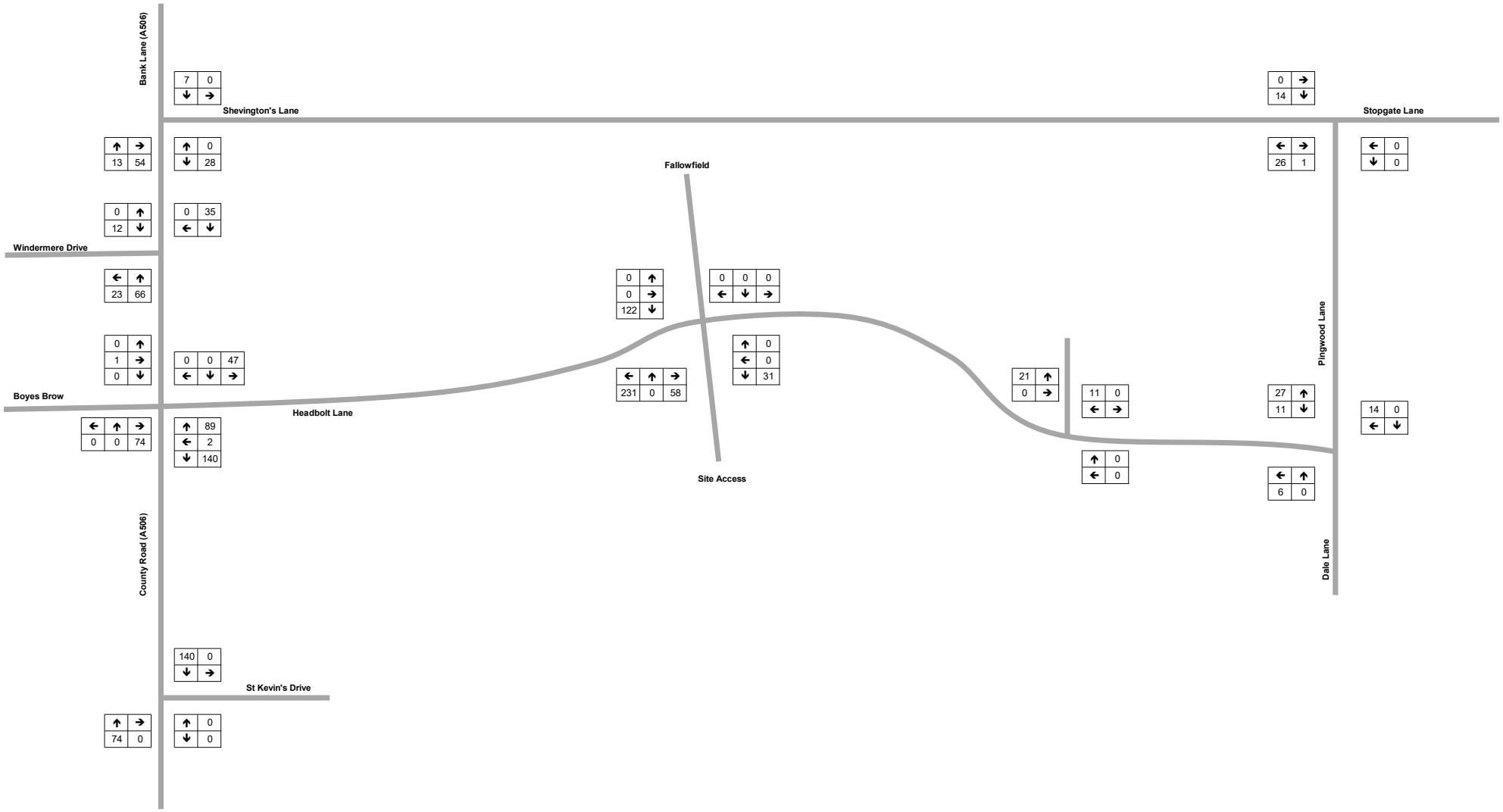
16:15-17:15



Proposed Development (Future Provision) Trips AM (08:00-09:00)

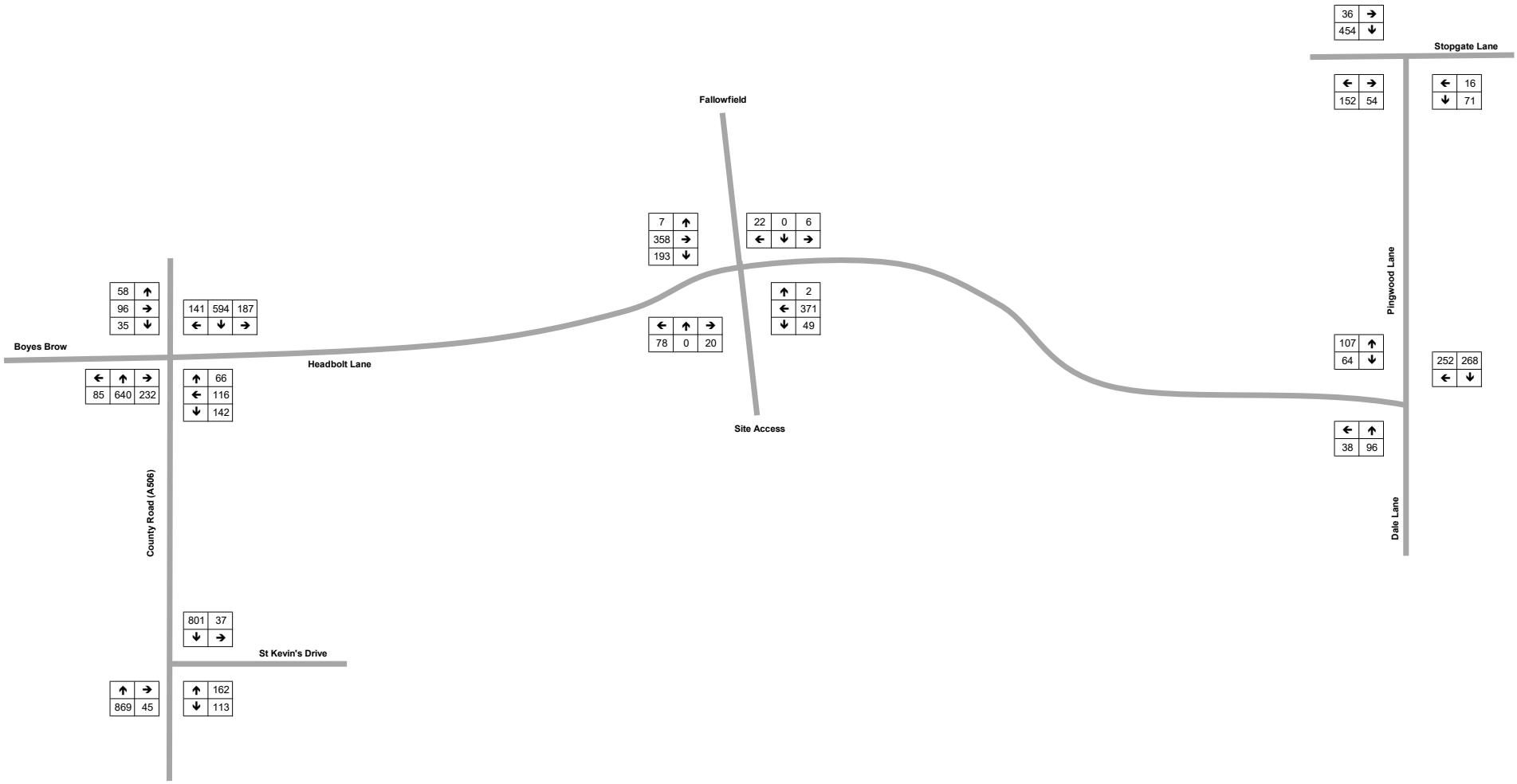


Proposed Development (Future Provision) Trips AM (17:00-18:00)



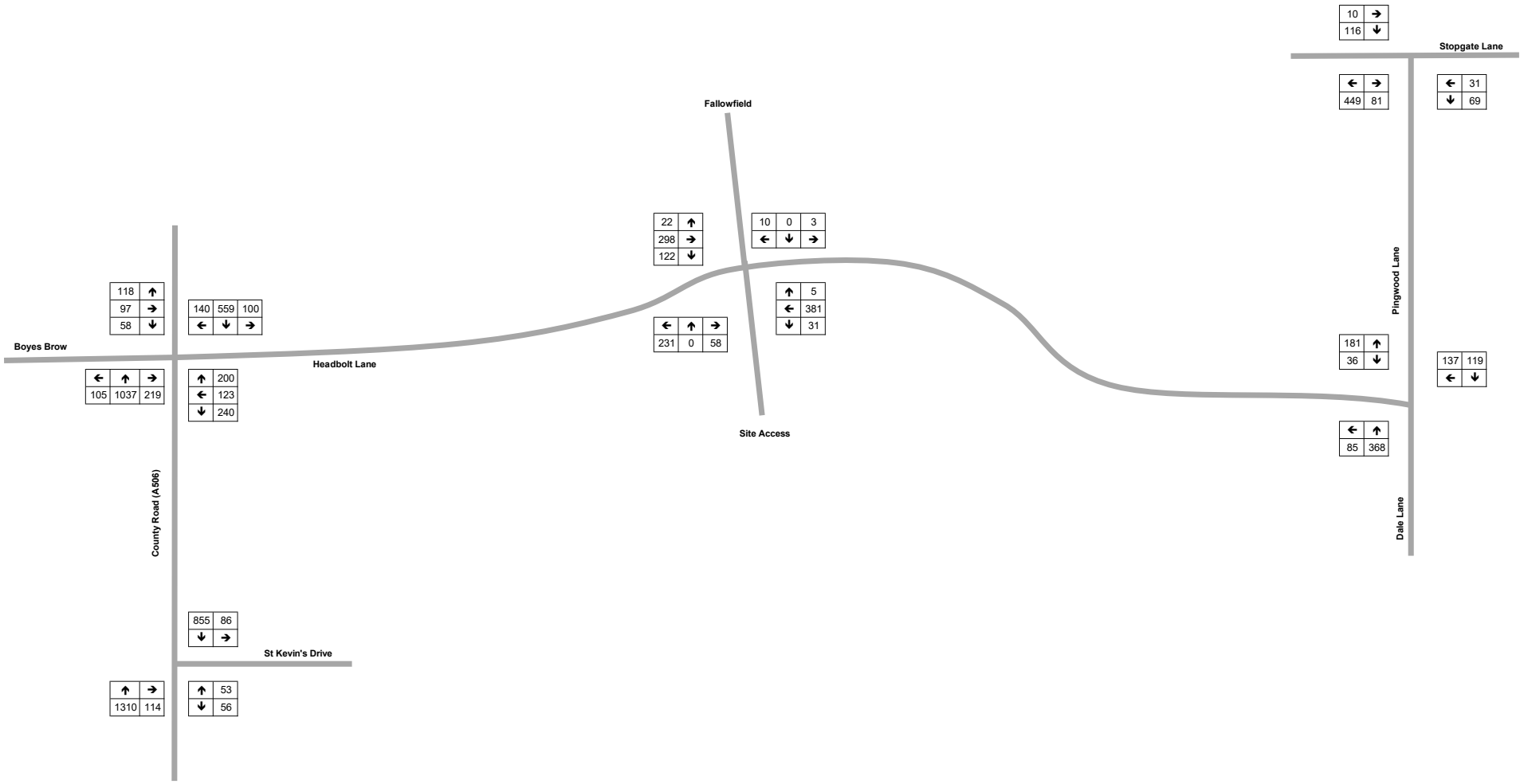
2028 AM Base + Committed Development + Proposed Development (Future Provision)

07:45-08:45



2028 PM Base + Committed Development + Proposed Development (Future Provision)

16:15-17:15



Appendix F

Junction Modelling Outputs

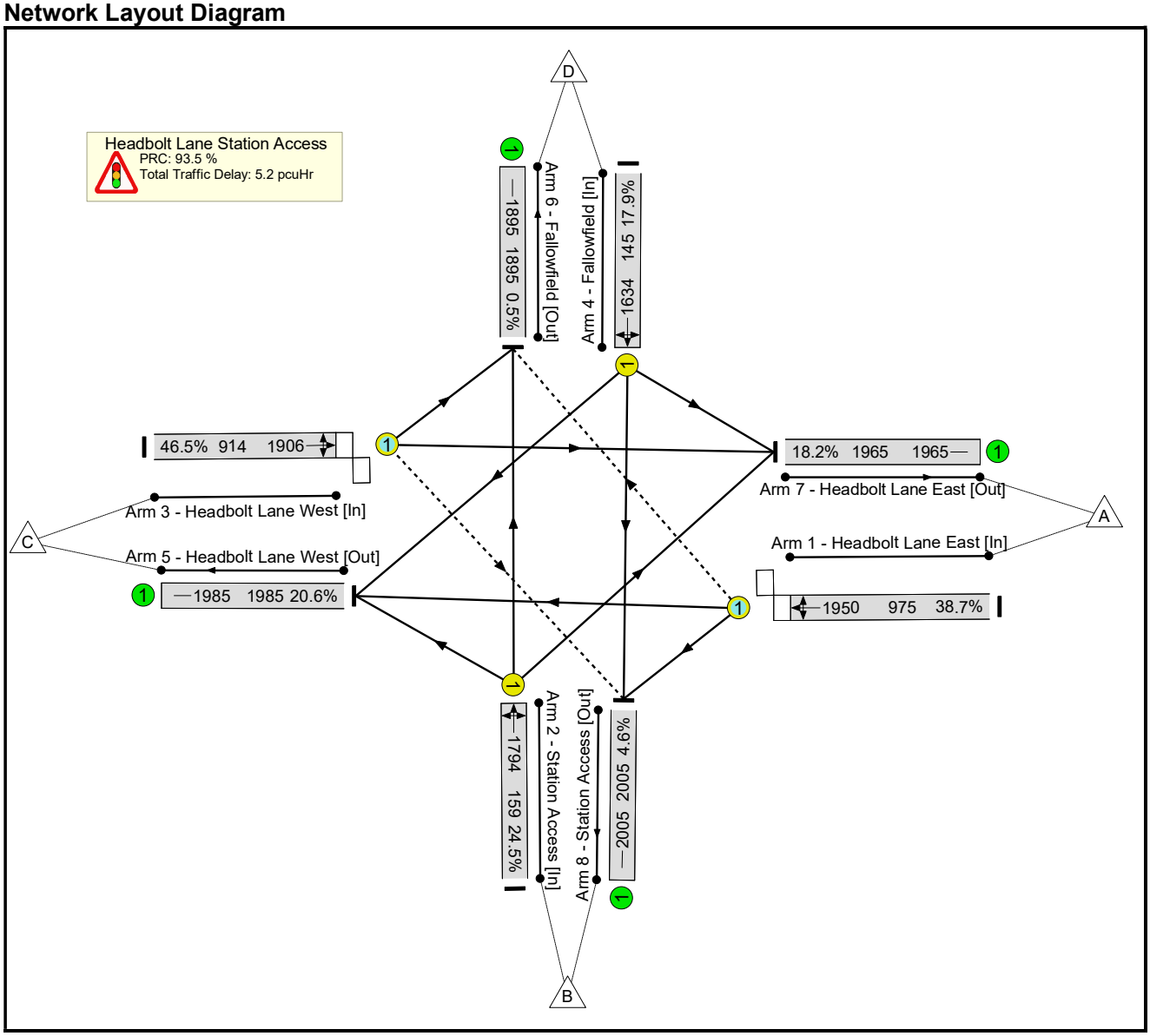
Basic Results Summary

User and Project Details

Project:	
Title:	
Location:	
File name:	Headbolt Lane - Station Access Junction.lsg3x
Author:	
Company:	
Address:	
Notes:	

Scenario 1: '2023 AM Base + Committed + Development' (FG13: '2023 AM Base + Committed + Development', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**46.5%**	**75**	**0**	**1**	**5.2**	-	-
Headbolt Lane Station Access	-	-	-		-	-	-	-	-	-	**46.5%**	**75**	**0**	**1**	**5.2**	-	-
1/1	Headbolt Lane East [In] Ahead Right Left	O	B		1	44	-	377	1950	975	38.7%	2	0	0	1.8	17.0	6.1
2/1	Station Access [In] Left Ahead Right	U	C		1	7	-	39	1794	159	24.5%	-	-	-	0.6	53.1	1.1
3/1	Headbolt Lane West [In] Left Ahead Right	O	A		1	44	-	425	1906	914	46.5%	73	0	1	2.2	18.8	7.2
4/1	Fallowfield [In] Right Left Ahead	U	D		1	7	-	26	1634	145	17.9%	-	-	-	0.4	53.1	0.7
5/1	Headbolt Lane West [Out]	U	-		-	-	-	408	1985	1985	20.6%	-	-	-	0.1	1.1	0.1
6/1	Fallowfield [Out]	U	-		-	-	-	9	1895	1895	0.5%	-	-	-	0.0	1.0	0.0
7/1	Headbolt Lane East [Out]	U	-		-	-	-	357	1965	1965	18.2%	-	-	-	0.1	1.1	0.1
8/1	Station Access [Out]	U	-		-	-	-	93	2005	2005	4.6%	-	-	-	0.0	0.9	0.0

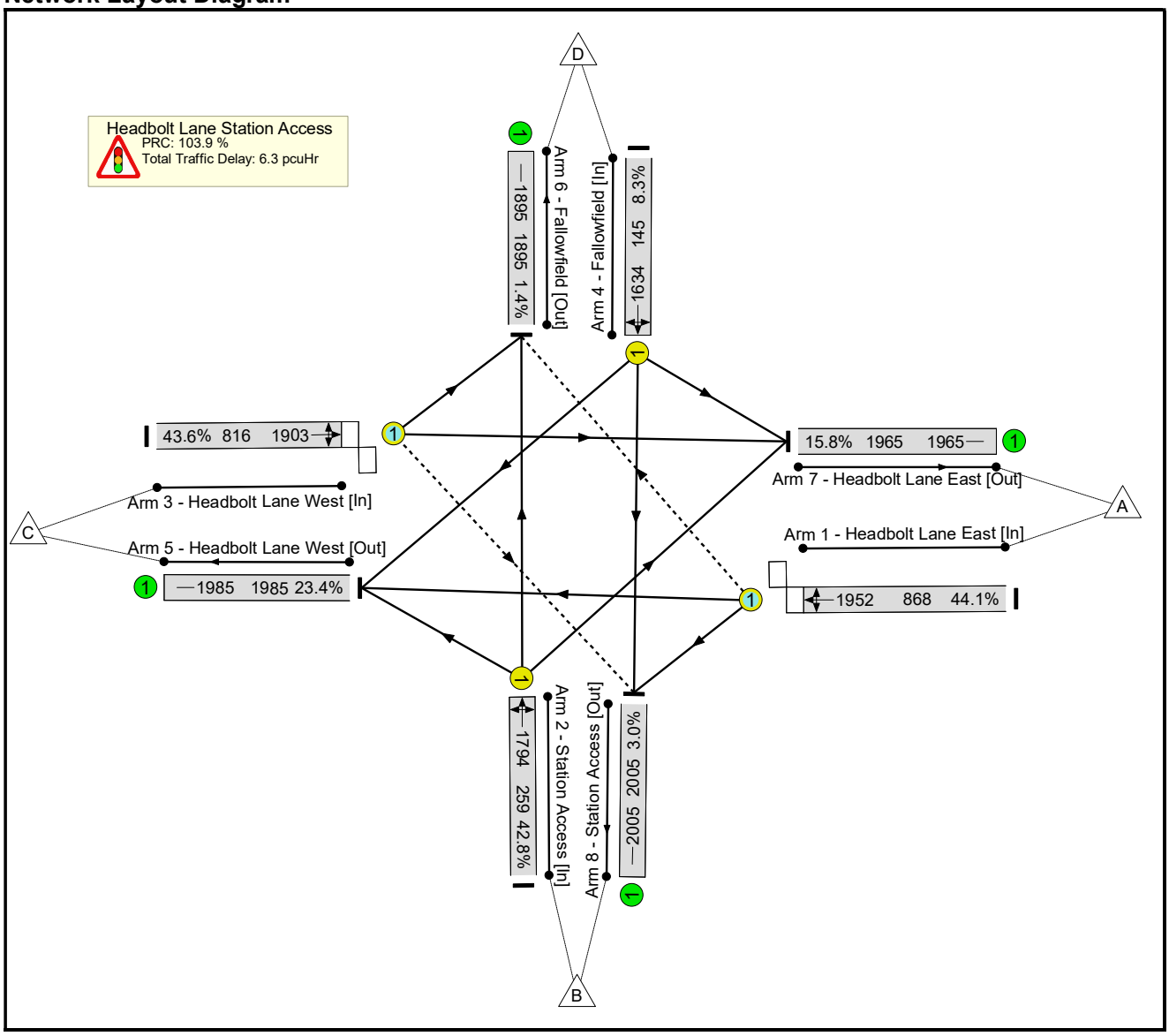
C1 PRC for Signalled Lanes (%): 93.5 Total Delay for Signalled Lanes (pcuHr): 4.96 Cycle Time (s): 90

PRC Over All Lanes (%): 93.5 Total Delay Over All Lanes(pcuHr): 5.23

Basic Results Summary

Scenario 2: '2023 PM Base + Committed + Development' (FG14: '2023 PM Base + Committed + Development', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**44.1%**	**52**	**0**	**1**	**6.3**	-	-
Headbolt Lane Station Access	-	-	-		-	-	-	-	-	-	**44.1%**	**52**	**0**	**1**	**6.3**	-	-
1/1	Headbolt Lane East [In] Ahead Right Left	O	B		1	39	-	383	1952	868	44.1%	5	0	0	2.2	21.0	7.0
2/1	Station Access [In] Left Ahead Right	U	C		1	12	-	111	1794	259	42.8%	-	-	-	1.5	47.2	2.9
3/1	Headbolt Lane West [In] Left Ahead Right	O	A		1	39	-	356	1903	816	43.6%	47	0	1	2.1	21.6	6.4
4/1	Fallowfield [In] Right Left Ahead	U	D		1	7	-	12	1634	145	8.3%	-	-	-	0.2	51.3	0.3
5/1	Headbolt Lane West [Out]	U	-		-	-	-	465	1985	1985	23.4%	-	-	-	0.2	1.2	0.2
6/1	Fallowfield [Out]	U	-		-	-	-	26	1895	1895	1.4%	-	-	-	0.0	1.0	0.0
7/1	Headbolt Lane East [Out]	U	-		-	-	-	311	1965	1965	15.8%	-	-	-	0.1	1.1	0.1
8/1	Station Access [Out]	U	-		-	-	-	60	2005	2005	3.0%	-	-	-	0.0	0.9	0.0

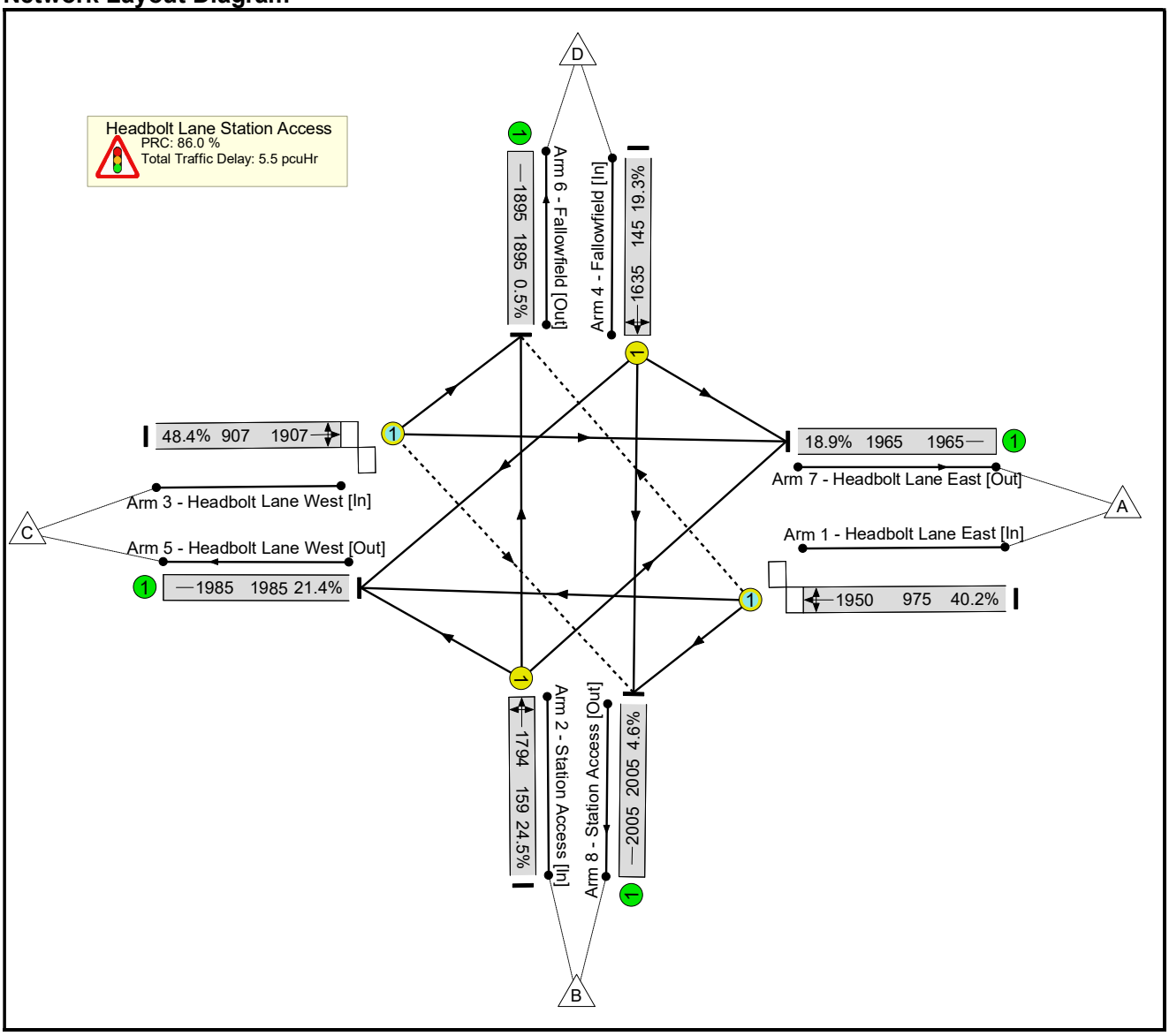
C1 PRC for Signalled Lanes (%): 103.9 Total Delay for Signalled Lanes (pcuHr): 6.00 Cycle Time (s): 90

PRC Over All Lanes (%): 103.9 Total Delay Over All Lanes(pcuHr): 6.27

Basic Results Summary

Scenario 3: '2028 AM Base + Committed + Development (300 Spaces)' (FG15: '2028 AM Base + Committed + Development', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**48.4%**	**75**	**0**	**1**	**5.5**	-	-
Headbolt Lane Station Access	-	-	-		-	-	-	-	-	-	**48.4%**	**75**	**0**	**1**	**5.5**	-	-
1/1	Headbolt Lane East [In] Ahead Right Left	O	B		1	44	-	392	1950	975	40.2%	2	0	0	1.9	17.2	6.4
2/1	Station Access [In] Left Ahead Right	U	C		1	7	-	39	1794	159	24.5%	-	-	-	0.6	53.1	1.1
3/1	Headbolt Lane West [In] Left Ahead Right	O	A		1	44	-	439	1907	907	48.4%	73	0	1	2.3	19.1	7.5
4/1	Fallowfield [In] Right Left Ahead	U	D		1	7	-	28	1635	145	19.3%	-	-	-	0.4	53.4	0.8
5/1	Headbolt Lane West [Out]	U	-		-	-	-	424	1985	1985	21.4%	-	-	-	0.1	1.2	0.1
6/1	Fallowfield [Out]	U	-		-	-	-	9	1895	1895	0.5%	-	-	-	0.0	1.0	0.0
7/1	Headbolt Lane East [Out]	U	-		-	-	-	372	1965	1965	18.9%	-	-	-	0.1	1.1	0.1
8/1	Station Access [Out]	U	-		-	-	-	93	2005	2005	4.6%	-	-	-	0.0	0.9	0.0

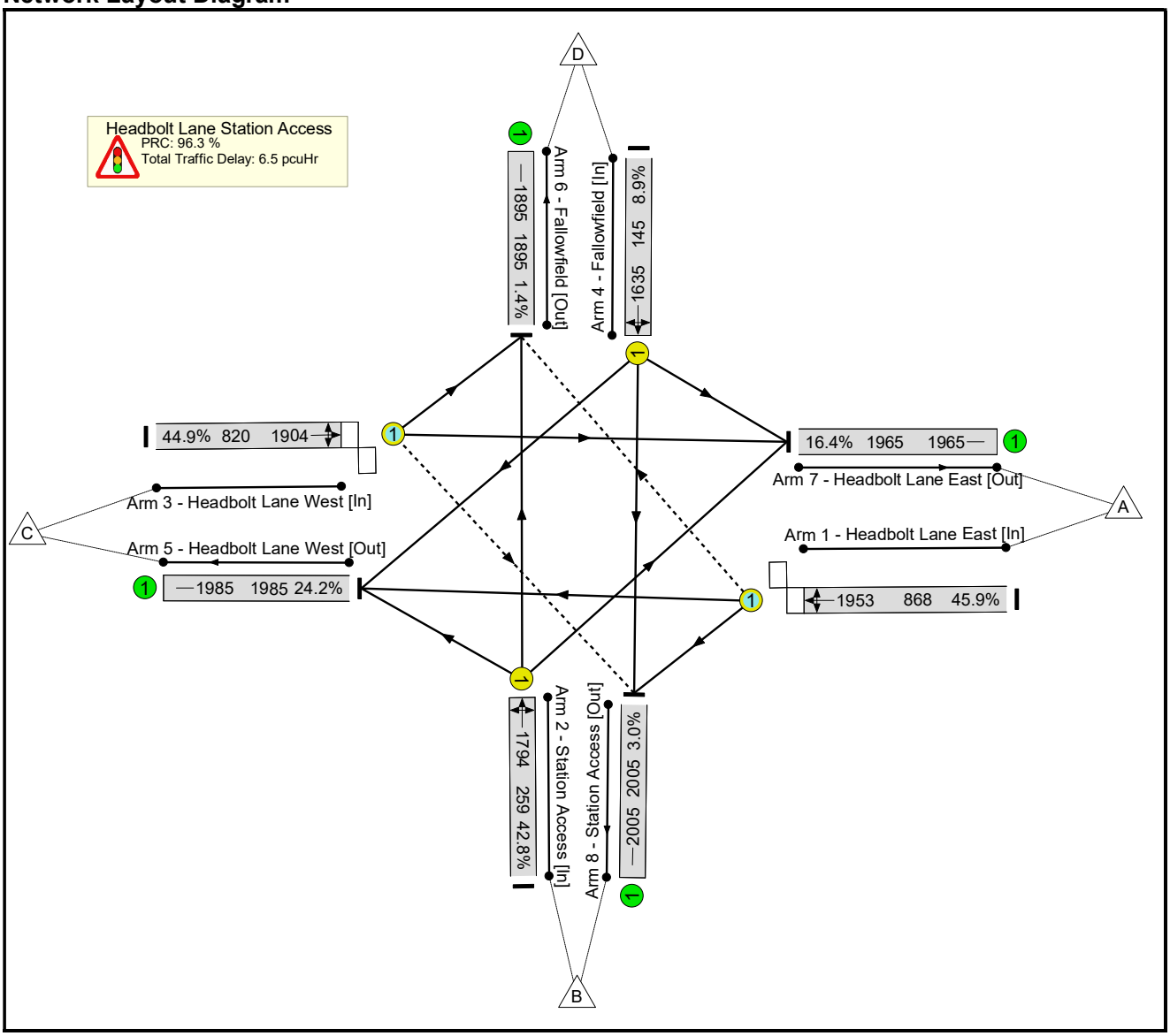
C1 PRC for Signalled Lanes (%): 86.0 Total Delay for Signalled Lanes (pcuHr): 5.19 Cycle Time (s): 90

PRC Over All Lanes (%): 86.0 Total Delay Over All Lanes(pcuHr): 5.47

Basic Results Summary

Scenario 4: '2028 PM Base + Committed + Development (300 Spaces)' (FG16: '2028 PM Base + Committed + Development', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**45.9%**	**52**	**0**	**1**	**6.5**	-	-
Headbolt Lane Station Access	-	-	-		-	-	-	-	-	-	**45.9%**	**52**	**0**	**1**	**6.5**	-	-
1/1	Headbolt Lane East [In] Ahead Right Left	O	B		1	39	-	398	1953	868	45.9%	5	0	0	2.4	21.3	7.3
2/1	Station Access [In] Left Ahead Right	U	C		1	12	-	111	1794	259	42.8%	-	-	-	1.5	47.2	2.9
3/1	Headbolt Lane West [In] Left Ahead Right	O	A		1	39	-	368	1904	820	44.9%	47	0	1	2.2	21.8	6.6
4/1	Fallowfield [In] Right Left Ahead	U	D		1	7	-	13	1635	145	8.9%	-	-	-	0.2	51.4	0.3
5/1	Headbolt Lane West [Out]	U	-		-	-	-	480	1985	1985	24.2%	-	-	-	0.2	1.2	0.2
6/1	Fallowfield [Out]	U	-		-	-	-	27	1895	1895	1.4%	-	-	-	0.0	1.0	0.0
7/1	Headbolt Lane East [Out]	U	-		-	-	-	323	1965	1965	16.4%	-	-	-	0.1	1.1	0.1
8/1	Station Access [Out]	U	-		-	-	-	60	2005	2005	3.0%	-	-	-	0.0	0.9	0.0

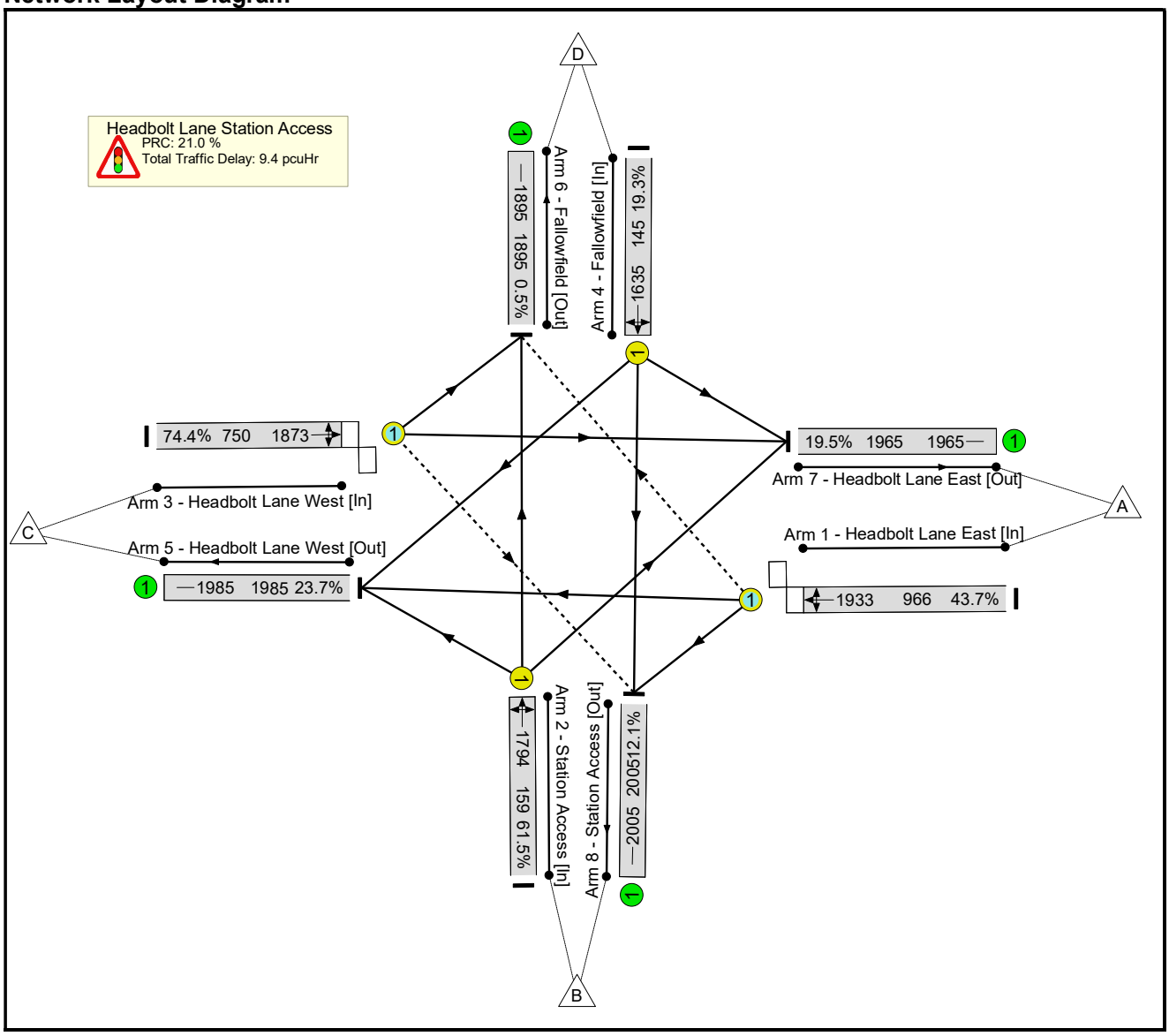
C1 PRC for Signalled Lanes (%): 96.3 Total Delay for Signalled Lanes (pcuHr): 6.23 Cycle Time (s): 90

PRC Over All Lanes (%): 96.3 Total Delay Over All Lanes(pcuHr): 6.51

Basic Results Summary

Scenario 5: '2028 AM Base + Committed + Development (500 Spaces)' (FG19: '2028 AM Base + Committed + Development (Future Provision)', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

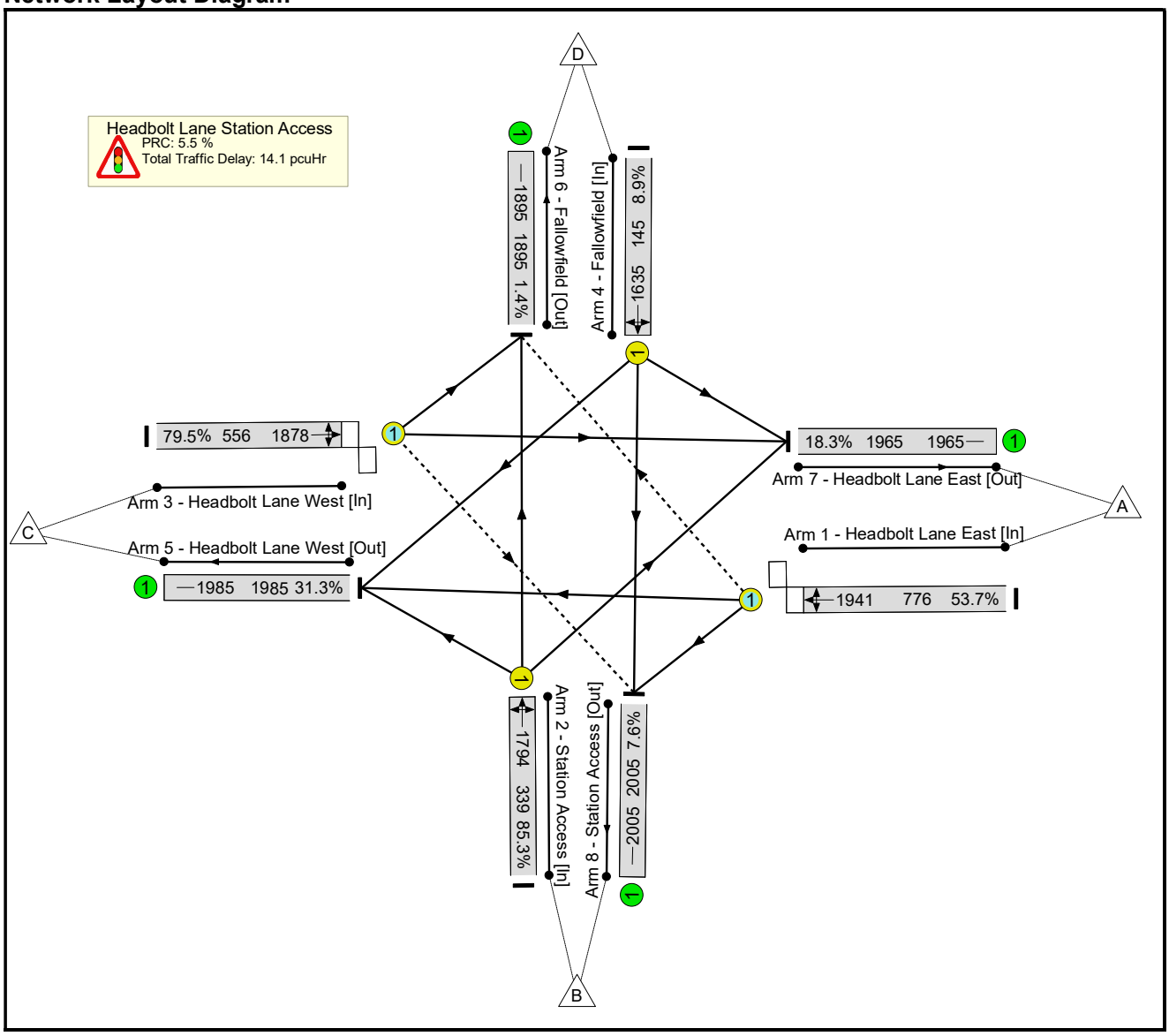
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**74.4%**	**193**	**0**	**2**	**9.4**	-	-
Headbolt Lane Station Access	-	-	-		-	-	-	-	-	-	**74.4%**	**193**	**0**	**2**	**9.4**	-	-
1/1	Headbolt Lane East [In] Ahead Right Left	O	B		1	44	-	422	1933	966	43.7%	2	0	0	2.1	17.7	7.1
2/1	Station Access [In] Left Ahead Right	U	C		1	7	-	98	1794	159	61.5%	-	-	-	1.9	68.1	3.1
3/1	Headbolt Lane West [In] Left Ahead Right	O	A		1	44	-	558	1873	750	74.4%	191	0	2	4.7	30.4	13.2
4/1	Fallowfield [In] Right Left Ahead	U	D		1	7	-	28	1635	145	19.3%	-	-	-	0.4	53.4	0.8
5/1	Headbolt Lane West [Out]	U	-		-	-	-	471	1985	1985	23.7%	-	-	-	0.2	1.2	0.2
6/1	Fallowfield [Out]	U	-		-	-	-	9	1895	1895	0.5%	-	-	-	0.0	1.0	0.0
7/1	Headbolt Lane East [Out]	U	-		-	-	-	384	1965	1965	19.5%	-	-	-	0.1	1.1	0.1
8/1	Station Access [Out]	U	-		-	-	-	242	2005	2005	12.1%	-	-	-	0.1	1.0	0.1

C1 PRC for Signalled Lanes (%): 21.0 Total Delay for Signalled Lanes (pcuHr): 9.06 Cycle Time (s): 90
PRC Over All Lanes (%): 21.0 Total Delay Over All Lanes(pcuHr): 9.40

Basic Results Summary

Scenario 6: '2028 PM Base + Committed + Development (500 Spaces)' (FG20: '2028 PM Base + Committed + Development (Future Provision)', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**85.3%**	**126**	**0**	**1**	**14.1**	-	-
Headbolt Lane Station Access	-	-	-		-	-	-	-	-	-	**85.3%**	**126**	**0**	**1**	**14.1**	-	-
1/1	Headbolt Lane East [In] Ahead Right Left	O	B		1	35	-	417	1941	776	53.7%	5	0	0	3.0	25.6	8.5
2/1	Station Access [In] Left Ahead Right	U	C		1	16	-	289	1794	339	85.3%	-	-	-	5.5	68.0	9.6
3/1	Headbolt Lane West [In] Left Ahead Right	O	A		1	35	-	442	1878	556	79.5%	121	0	1	5.1	41.3	11.9
4/1	Fallowfield [In] Right Left Ahead	U	D		1	7	-	13	1635	145	8.9%	-	-	-	0.2	51.4	0.3
5/1	Headbolt Lane West [Out]	U	-		-	-	-	622	1985	1985	31.3%	-	-	-	0.2	1.3	0.2
6/1	Fallowfield [Out]	U	-		-	-	-	27	1895	1895	1.4%	-	-	-	0.0	1.0	0.0
7/1	Headbolt Lane East [Out]	U	-		-	-	-	359	1965	1965	18.3%	-	-	-	0.1	1.1	0.1
8/1	Station Access [Out]	U	-		-	-	-	153	2005	2005	7.6%	-	-	-	0.0	1.0	0.0

C1 PRC for Signalled Lanes (%): 5.5 Total Delay for Signalled Lanes (pcuHr): 13.69 Cycle Time (s): 90

PRC Over All Lanes (%): 5.5 Total Delay Over All Lanes(pcuHr): 14.08

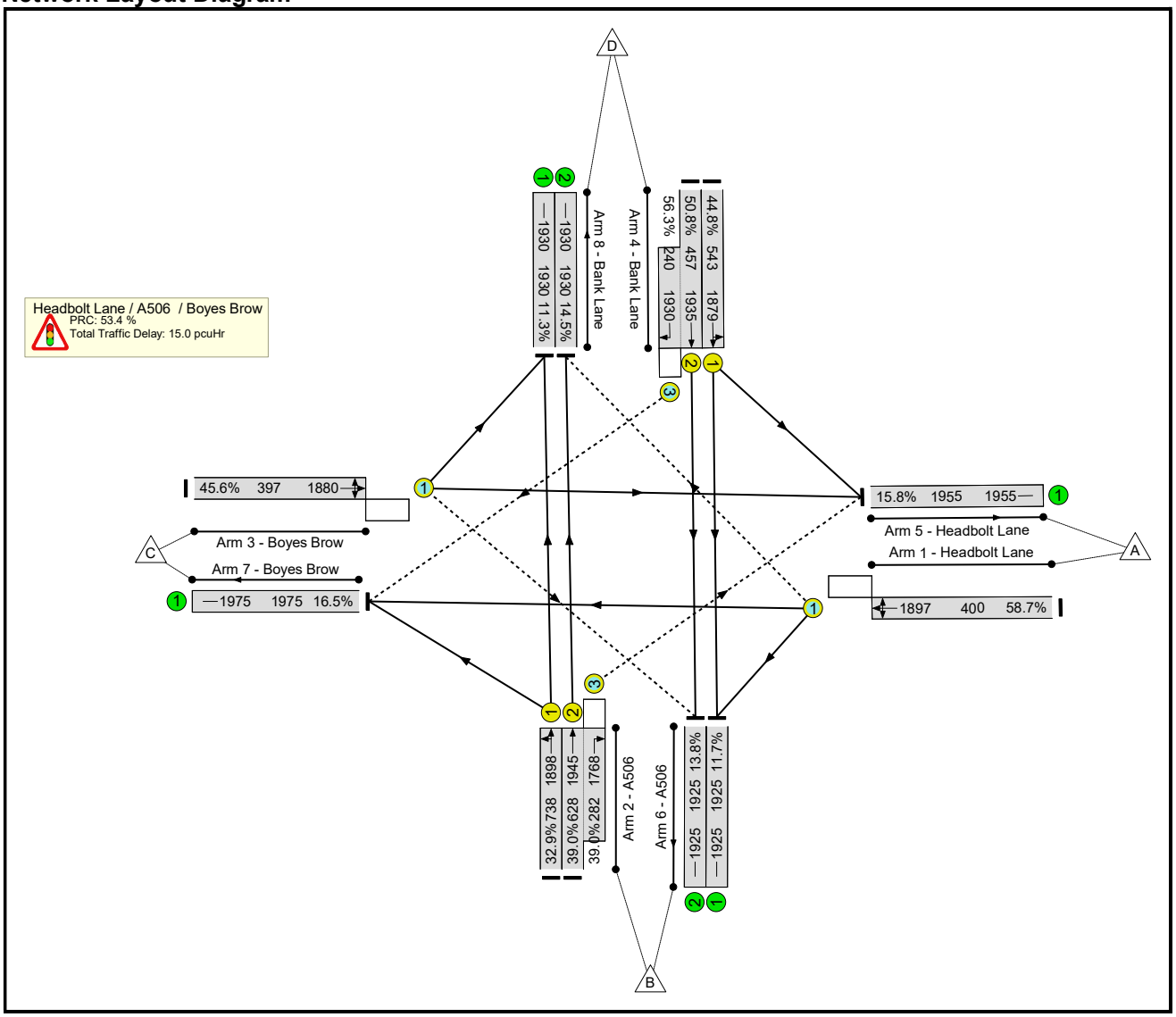
Basic Results Summary

User and Project Details

Project:	
Title:	
Location:	
File name:	Headbolt Lane_Boyes Brow_A506.lsg3x
Author:	
Company:	
Address:	
Notes:	

Scenario 1: '2023 AM Base' (FG1: '2023 AM Base', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**58.7%**	**301**	**9**	**3**	**15.0**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**58.7%**	**301**	**9**	**3**	**15.0**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	18	-	235	1897	400	58.7%	34	0	0	2.8	43.1	6.0
2/1	A506 Left Ahead	U	A		1	34	-	243	1898	738	32.9%	-	-	-	1.5	22.9	4.5
2/2+2/3	A506 Right Ahead	U+O	A	K	1	34	4	355	1945:1768	628+282	39.0 : 39.0%	99	9	2	2.4 (1.5+0.9)	24.8 (22.5:29.9)	4.5
3/1	Boyes Brow Ahead Right Left	O	D		1	18	-	181	1880	397	45.6%	34	0	0	2.0	40.4	4.3
4/1	Bank Lane Left Ahead	U	B		1	25	-	243	1879	543	44.8%	-	-	-	2.2	32.1	5.3
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	25	0	367	1935:1930	457+240	50.8 : 56.3%	135	0	0	3.5 (2.0+1.5)	34.3 (31.3:39.4)	5.2
5/1	Headbolt Lane	U	-		-	-	-	309	1955	1955	15.8%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	226	1925	1925	11.7%	-	-	-	0.1	1.1	0.1
6/2	A506	U	-		-	-	-	266	1925	1925	13.8%	-	-	-	0.1	1.1	0.1
7/1	Boyes Brow	U	-		-	-	-	326	1975	1975	16.5%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	218	1930	1930	11.3%	-	-	-	0.1	1.1	0.1
8/2	Bank Lane	U	-		-	-	-	279	1930	1930	14.5%	-	-	-	0.1	1.1	0.1

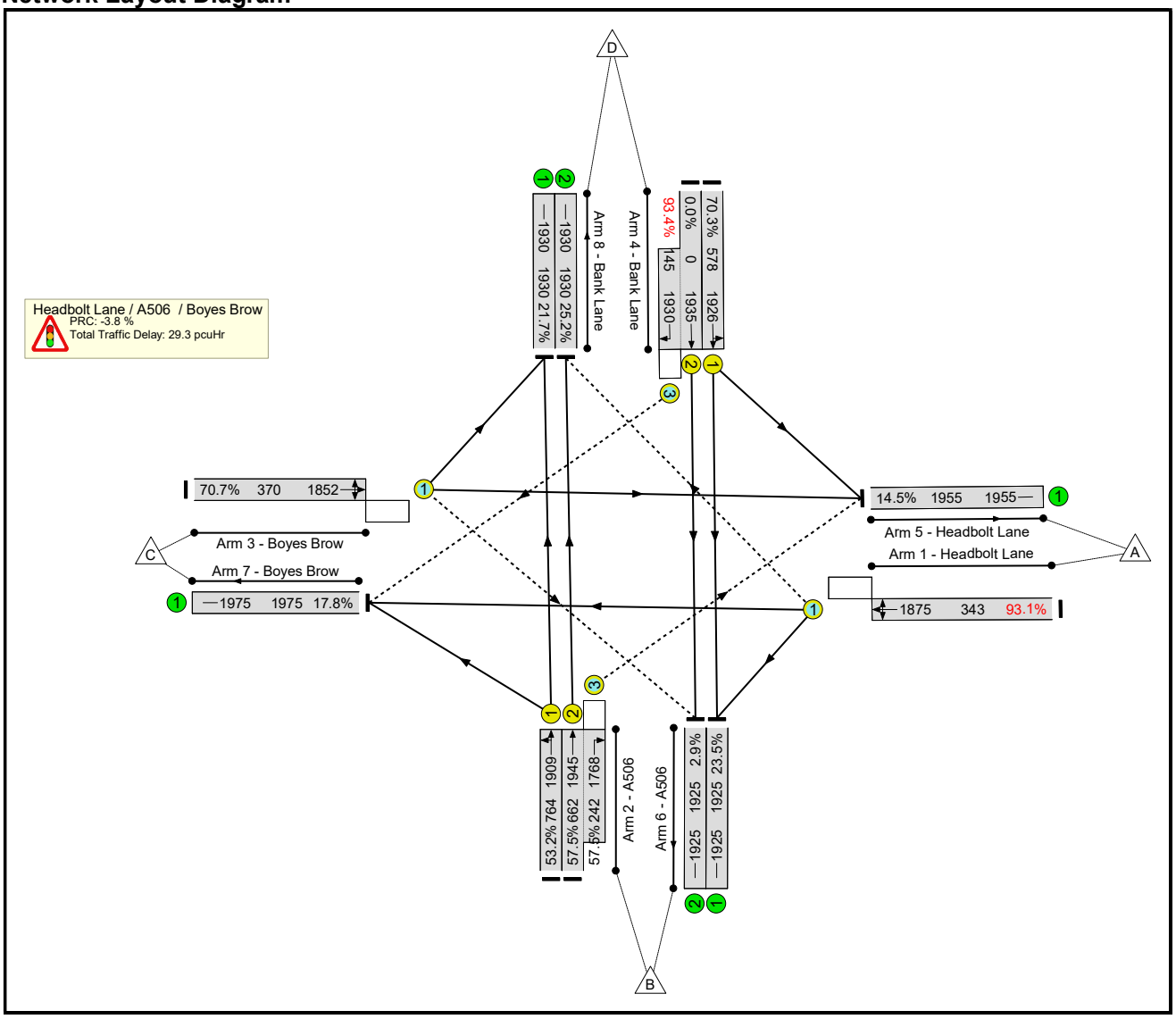
C1 PRC for Signalled Lanes (%): 53.4 Total Delay for Signalled Lanes (pcuHr): 14.50 Cycle Time (s): 90

PRC Over All Lanes (%): 53.4 Total Delay Over All Lanes(pcuHr): 14.99

Basic Results Summary

Scenario 2: '2023 PM Base' (FG2: '2023 PM Base', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**93.4%**	**382**	**25**	**29**	**29.3**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**93.4%**	**382**	**25**	**29**	**29.3**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	17	-	319	1875	343	93.1%	81	0	25	8.1	91.4	12.6
2/1	A506 Left Ahead	U	A		1	35	-	406	1909	764	53.2%	-	-	-	2.9	25.6	8.2
2/2+2/3	A506 Right Ahead	U+O	A	K	1	35	4	520	1945:1768	662+242	57.5 : 57.5%	111	25	3	4.1 (2.6+1.4)	28.1 (24.8:37.2)	7.8
3/1	Boyes Brow Ahead Right Left	O	D		1	17	-	262	1852	370	70.7%	55	0	1	3.7	51.3	7.2
4/1	Bank Lane Left Ahead	U	B		1	26	-	406	1926	578	70.3%	-	-	-	4.3	38.3	10.1
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	26	0	135	1935:1930	0+145	0.0 : 93.4%	135	0	0	5.5 (0.0+5.5)	147.2 (0.0:147.2)	7.2
5/1	Headbolt Lane	U	-		-	-	-	283	1955	1955	14.5%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	452	1925	1925	23.5%	-	-	-	0.2	1.2	0.2
6/2	A506	U	-		-	-	-	56	1925	1925	2.9%	-	-	-	0.0	1.0	0.0
7/1	Boyes Brow	U	-		-	-	-	352	1975	1975	17.8%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	418	1930	1930	21.7%	-	-	-	0.1	1.2	0.1
8/2	Bank Lane	U	-		-	-	-	487	1930	1930	25.2%	-	-	-	0.2	1.2	0.2

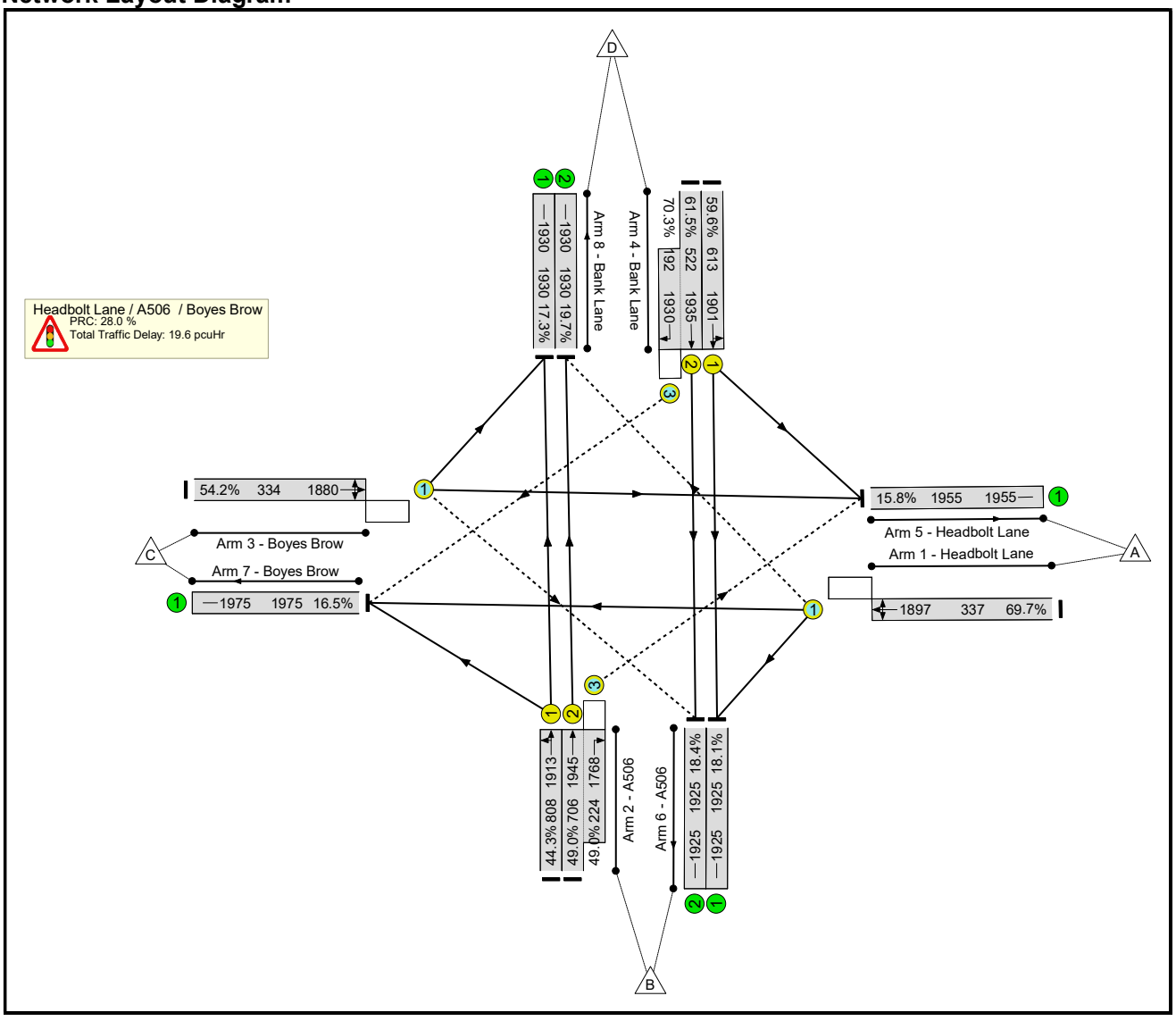
C1 PRC for Signalled Lanes (%): -3.8 Total Delay for Signalled Lanes (pcuHr): 28.62 Cycle Time (s): 90

PRC Over All Lanes (%): -3.8 Total Delay Over All Lanes(pcuHr): 29.29

Basic Results Summary

Scenario 3: '2023 AM Base + Com' (FG7: '2023 AM Base + Com', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

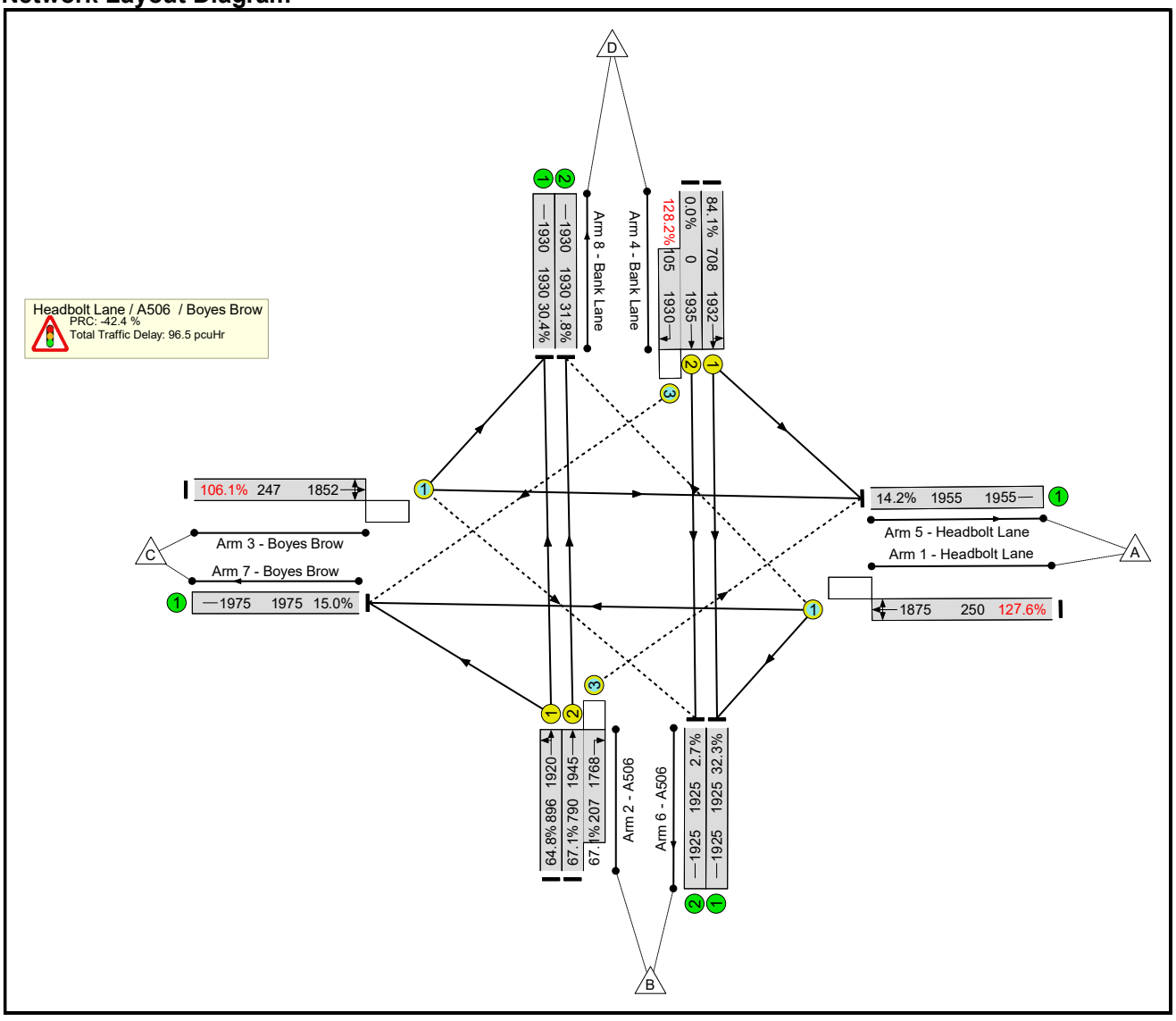
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**70.3%**	**301**	**9**	**3**	**19.6**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**70.3%**	**301**	**9**	**3**	**19.6**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	15	-	235	1897	337	69.7%	34	0	0	3.4	52.4	6.6
2/1	A506 Left Ahead	U	A		1	37	-	358	1913	808	44.3%	-	-	-	2.2	22.5	6.7
2/2+2/3	A506 Right Ahead	U+O	A	K	1	37	4	456	1945:1768	706+224	49.0 : 49.0%	99	9	2	3.1 (2.1+1.0)	24.8 (22.1:33.5)	6.5
3/1	Boyes Brow Ahead Right Left	O	D		1	15	-	181	1880	334	54.2%	34	0	0	2.3	46.5	4.7
4/1	Bank Lane Left Ahead	U	B		1	28	-	365	1901	613	59.6%	-	-	-	3.3	32.8	8.3
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	28	0	456	1935:1930	522+192	61.5 : 70.3%	135	0	0	4.5 (2.8+1.6)	35.3 (31.7:44.0)	7.4
5/1	Headbolt Lane	U	-		-	-	-	309	1955	1955	15.8%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	348	1925	1925	18.1%	-	-	-	0.1	1.1	0.1
6/2	A506	U	-		-	-	-	355	1925	1925	18.4%	-	-	-	0.1	1.1	0.1
7/1	Boyes Brow	U	-		-	-	-	326	1975	1975	16.5%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	333	1930	1930	17.3%	-	-	-	0.1	1.1	0.1
8/2	Bank Lane	U	-		-	-	-	380	1930	1930	19.7%	-	-	-	0.1	1.2	0.1

C1 PRC for Signalled Lanes (%): 28.0 Total Delay for Signalled Lanes (pcuHr): 18.94 Cycle Time (s): 90
PRC Over All Lanes (%): 28.0 Total Delay Over All Lanes(pcuHr): 19.58

Basic Results Summary

Scenario 4: '2023 PM Base + Com' (FG8: '2023 PM Base + Com', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**128.2%**	**125**	**73**	**182**	**96.5**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**128.2%**	**125**	**73**	**182**	**96.5**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	11	-	319	1875	250	127.6%	0	0	83	43.8	494.4	47.8
2/1	A506 Left Ahead	U	A		1	41	-	581	1920	896	64.8%	-	-	-	3.9	24.0	11.9
2/2+2/3	A506 Right Ahead	U+O	A	K	1	41	4	669	1945:1768	790+207	67.1 : 67.1%	63	73	3	5.0 (3.4+1.6)	26.8 (23.0:41.0)	11.0
3/1	Boyes Brow Ahead Right Left	O	D		1	11	-	262	1852	247	106.1%	9	0	44	16.4	225.0	19.8
4/1	Bank Lane Left Ahead	U	B		1	32	-	596	1932	708	84.1%	-	-	-	6.9	41.4	16.1
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	32	0	135	1935:1930	0+105	0.0 : 128.2%	53	0	52	19.8 (0.0+19.8)	527.0 (0.0:527.0)	21.0
5/1	Headbolt Lane	U	-		-	-	-	283	1955	1955	14.2%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	642	1925	1925	32.3%	-	-	-	0.2	1.4	0.2
6/2	A506	U	-		-	-	-	56	1925	1925	2.7%	-	-	-	0.0	1.0	0.0
7/1	Boyes Brow	U	-		-	-	-	352	1975	1975	15.0%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	593	1930	1930	30.4%	-	-	-	0.2	1.3	0.2
8/2	Bank Lane	U	-		-	-	-	636	1930	1930	31.8%	-	-	-	0.2	1.4	0.2

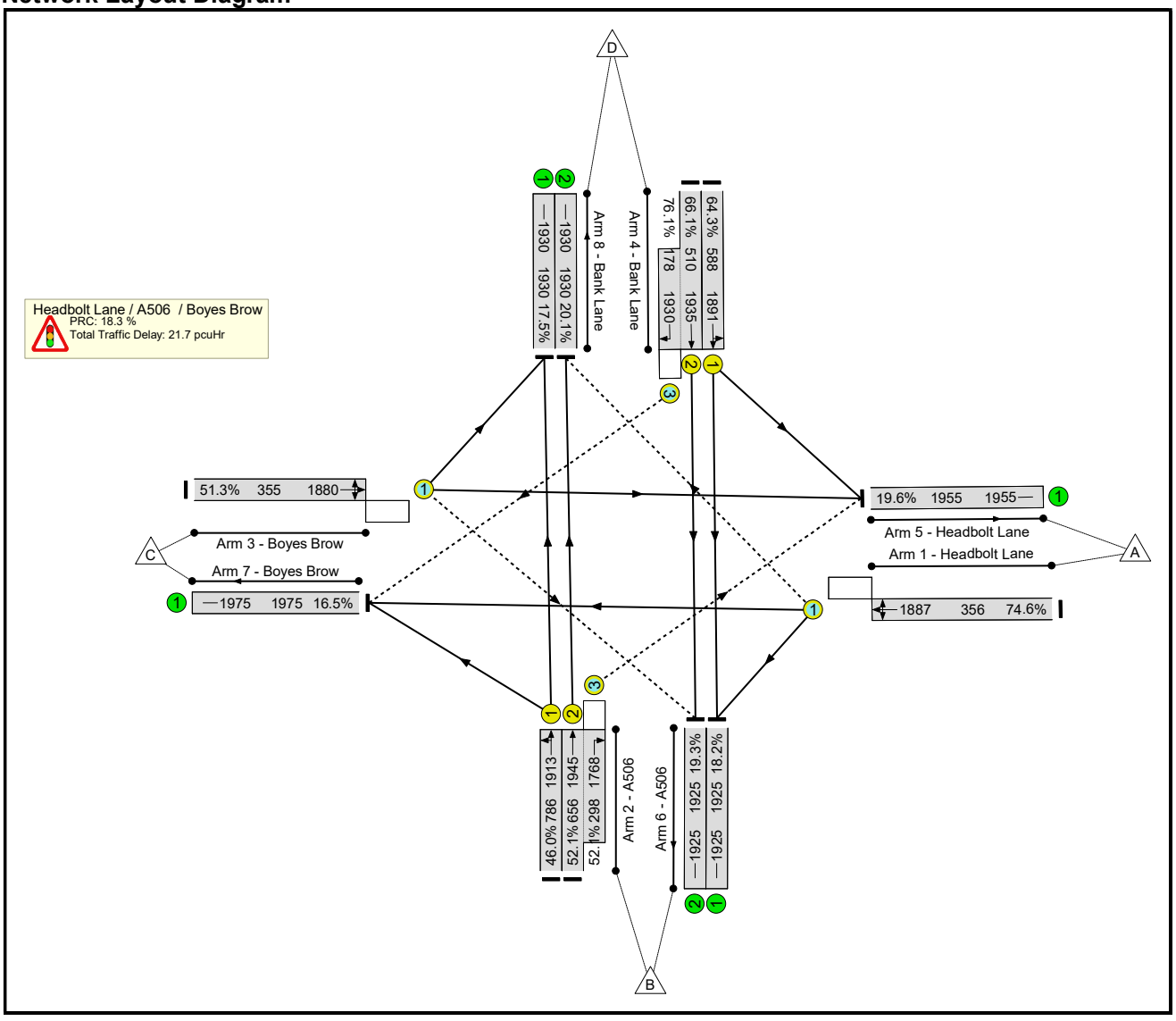
C1 PRC for Signalled Lanes (%): -42.4 Total Delay for Signalled Lanes (pcuHr): 95.66 Cycle Time (s): 90

PRC Over All Lanes (%): -42.4 Total Delay Over All Lanes(pcuHr): 96.53

Basic Results Summary

Scenario 5: '2023 AM Base + Com + Dev' (FG9: '2023 AM Base + Com + Dev', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

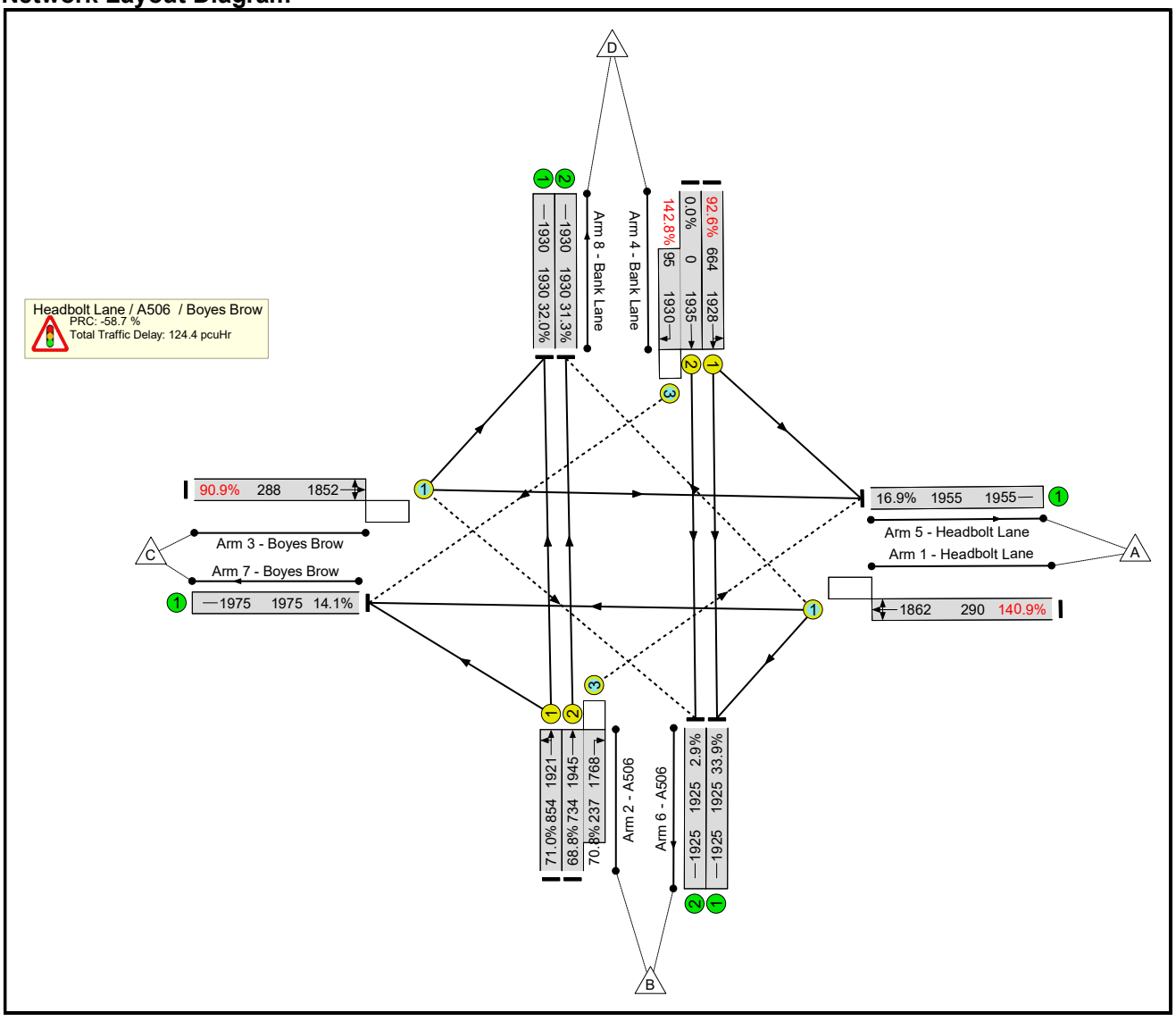
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**76.1%**	**302**	**64**	**4**	**21.7**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**76.1%**	**302**	**64**	**4**	**21.7**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	16	-	266	1887	356	74.6%	45	0	1	4.0	54.2	7.6
2/1	A506 Left Ahead	U	A		1	36	-	362	1913	786	46.0%	-	-	-	2.4	23.5	7.0
2/2+2/3	A506 Right Ahead	U+O	A	K	1	36	4	497	1945:1768	656+298	52.1 : 52.1%	88	64	3	3.8 (2.2+1.6)	27.4 (22.9:37.5)	6.6
3/1	Boyes Brow Ahead Right Left	O	D		1	16	-	182	1880	355	51.3%	34	0	0	2.3	44.5	4.6
4/1	Bank Lane Left Ahead	U	B		1	27	-	378	1891	588	64.3%	-	-	-	3.7	35.2	9.0
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	27	0	472	1935:1930	510+178	66.1 : 76.1%	135	0	0	5.0 (3.2+1.8)	37.9 (34.1:47.2)	8.1
5/1	Headbolt Lane	U	-		-	-	-	384	1955	1955	19.6%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	351	1925	1925	18.2%	-	-	-	0.1	1.1	0.1
6/2	A506	U	-		-	-	-	371	1925	1925	19.3%	-	-	-	0.1	1.2	0.1
7/1	Boyes Brow	U	-		-	-	-	326	1975	1975	16.5%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	337	1930	1930	17.5%	-	-	-	0.1	1.1	0.1
8/2	Bank Lane	U	-		-	-	-	388	1930	1930	20.1%	-	-	-	0.1	1.2	0.1

C1 PRC for Signalled Lanes (%): 18.3 Total Delay for Signalled Lanes (pcuHr): 21.06 Cycle Time (s): 90
PRC Over All Lanes (%): 18.3 Total Delay Over All Lanes(pcuHr): 21.75

Basic Results Summary

Scenario 6: '2023 PM Base + Com + Dev' (FG10: '2023 PM Base + Com + Dev', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

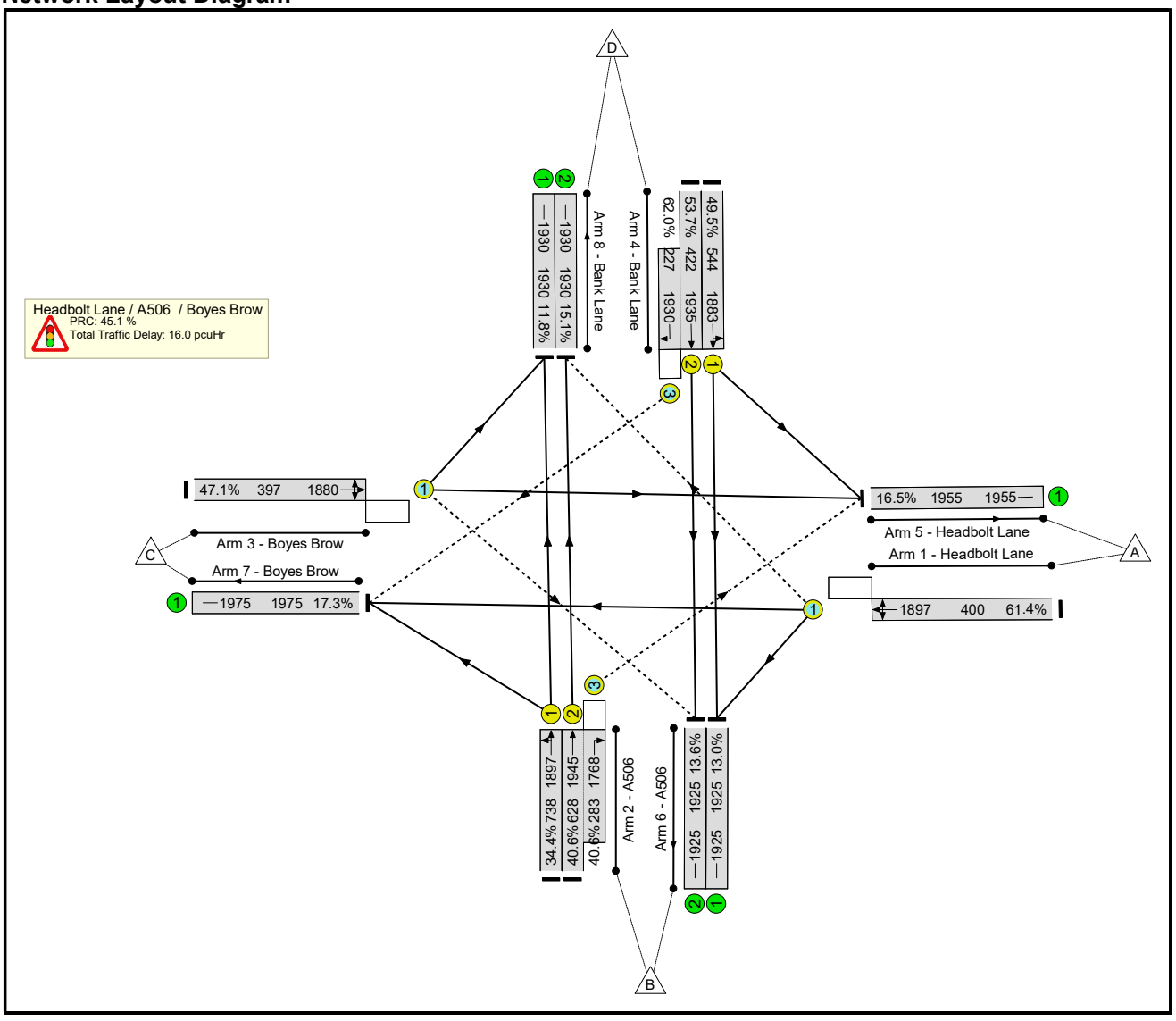
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**142.8%**	**102**	**138**	**178**	**124.4**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**142.8%**	**102**	**138**	**178**	**124.4**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	13	-	408	1862	290	140.9%	19	0	80	71.4	630.3	76.6
2/1	A506 Left Ahead	U	A		1	39	-	606	1921	854	71.0%	-	-	-	4.6	27.5	13.5
2/2+2/3	A506 Right Ahead	U+O	A	K	1	39	4	673	1945:1768	734+237	68.8 : 70.8%	26	138	5	5.6 (3.5+2.1)	29.8 (24.8:44.9)	10.9
3/1	Boyes Brow Ahead Right Left	O	D		1	13	-	262	1852	288	90.9%	15	0	41	6.7	91.8	10.3
4/1	Bank Lane Left Ahead	U	B		1	30	-	615	1928	664	92.6%	-	-	-	10.0	58.7	19.9
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	30	0	135	1935:1930	0+95	0.0 : 142.8%	42	0	52	25.2 (0.0+25.2)	671.0 (0.0:671.0)	26.2
5/1	Headbolt Lane	U	-		-	-	-	331	1955	1955	16.9%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	696	1925	1925	33.9%	-	-	-	0.3	1.4	0.3
6/2	A506	U	-		-	-	-	56	1925	1925	2.9%	-	-	-	0.0	1.0	0.0
7/1	Boyes Brow	U	-		-	-	-	353	1975	1975	14.1%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	618	1930	1930	32.0%	-	-	-	0.2	1.4	0.2
8/2	Bank Lane	U	-		-	-	-	645	1930	1930	31.3%	-	-	-	0.2	1.4	0.2

C1 PRC for Signalled Lanes (%): -58.7 Total Delay for Signalled Lanes (pcuHr): 123.49 Cycle Time (s): 90
PRC Over All Lanes (%): -58.7 Total Delay Over All Lanes(pcuHr): 124.41

Basic Results Summary

Scenario 7: '2028 AM Base' (FG11: '2028 AM Base', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

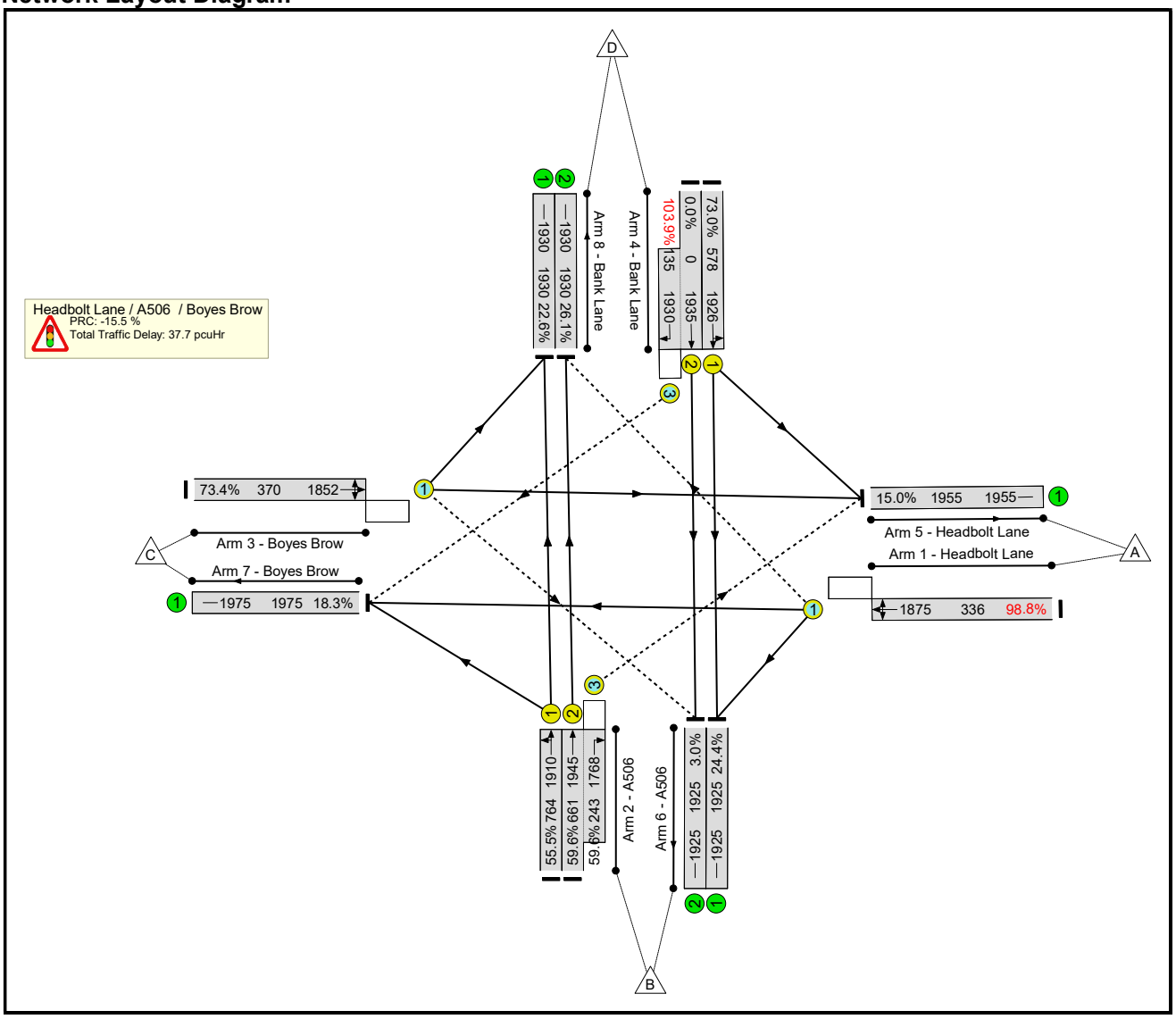
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**62.0%**	**315**	**9**	**3**	**16.0**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**62.0%**	**315**	**9**	**3**	**16.0**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	18	-	246	1897	400	61.4%	36	0	0	3.0	44.1	6.3
2/1	A506 Left Ahead	U	A		1	34	-	254	1897	738	34.4%	-	-	-	1.6	23.1	4.7
2/2+2/3	A506 Right Ahead	U+O	A	K	1	34	4	370	1945:1768	628+283	40.6 : 40.6%	103	9	3	2.6 (1.6+1.0)	25.3 (22.7:31.1)	4.8
3/1	Boyes Brow Ahead Right Left	O	D		1	18	-	187	1880	397	47.1%	35	0	0	2.1	40.8	4.5
4/1	Bank Lane Left Ahead	U	B		1	25	-	269	1883	544	49.5%	-	-	-	2.5	33.1	6.0
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	25	0	368	1935:1930	422+227	53.7 : 62.0%	141	0	0	3.7 (2.0+1.6)	35.8 (32.1:41.6)	5.2
5/1	Headbolt Lane	U	-		-	-	-	322	1955	1955	16.5%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	251	1925	1925	13.0%	-	-	-	0.1	1.1	0.1
6/2	A506	U	-		-	-	-	262	1925	1925	13.6%	-	-	-	0.1	1.1	0.1
7/1	Boyes Brow	U	-		-	-	-	341	1975	1975	17.3%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	227	1930	1930	11.8%	-	-	-	0.1	1.1	0.1
8/2	Bank Lane	U	-		-	-	-	291	1930	1930	15.1%	-	-	-	0.1	1.1	0.1

C1 PRC for Signalled Lanes (%): 45.1 Total Delay for Signalled Lanes (pcuHr): 15.49 Cycle Time (s): 90
PRC Over All Lanes (%): 45.1 Total Delay Over All Lanes(pcuHr): 16.00

Basic Results Summary

Scenario 8: '2028 PM Base' (FG12: '2028 PM Base', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**103.9%**	**339**	**44**	**65**	**37.7**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**103.9%**	**339**	**44**	**65**	**37.7**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	17	-	332	1875	336	98.8%	74	0	36	11.7	126.4	16.4
2/1	A506 Left Ahead	U	A		1	35	-	424	1910	764	55.5%	-	-	-	3.1	26.1	8.7
2/2+2/3	A506 Right Ahead	U+O	A	K	1	35	4	539	1945:1768	661+243	59.6 : 59.6%	98	44	3	4.3 (2.8+1.6)	28.8 (25.2:38.5)	8.1
3/1	Boyes Brow Ahead Right Left	O	D		1	17	-	272	1852	370	73.4%	45	0	13	4.0	53.1	7.7
4/1	Bank Lane Left Ahead	U	B		1	26	-	422	1926	578	73.0%	-	-	-	4.6	39.6	10.7
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	26	0	140	1935:1930	0+135	0.0 : 103.9%	122	0	13	9.3 (0.0+9.3)	240.0 (0.0:240.0)	11.0
5/1	Headbolt Lane	U	-		-	-	-	294	1955	1955	15.0%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	470	1925	1925	24.4%	-	-	-	0.2	1.2	0.2
6/2	A506	U	-		-	-	-	58	1925	1925	3.0%	-	-	-	0.0	1.0	0.0
7/1	Boyes Brow	U	-		-	-	-	366	1975	1975	18.3%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	437	1930	1930	22.6%	-	-	-	0.1	1.2	0.1
8/2	Bank Lane	U	-		-	-	-	504	1930	1930	26.1%	-	-	-	0.2	1.3	0.2

C1

PRC for Signalled Lanes (%): -15.5
PRC Over All Lanes (%): -15.5

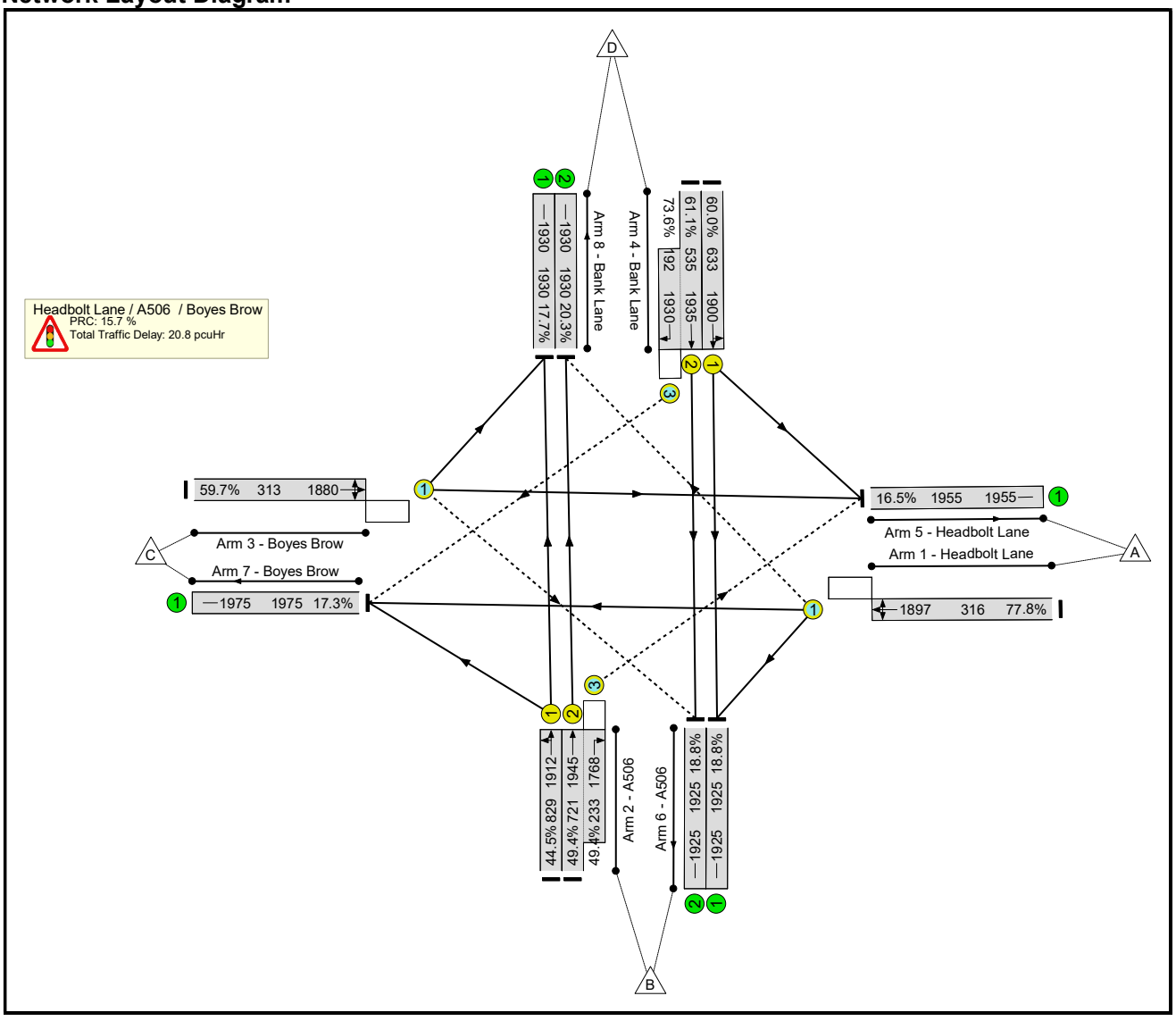
Total Delay for Signalled Lanes (pcuHr): 37.03
Total Delay Over All Lanes(pcuHr): 37.73

Cycle Time (s): 90

Basic Results Summary

Scenario 9: '2028 AM Base + Com' (FG13: '2028 AM Base + Com', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

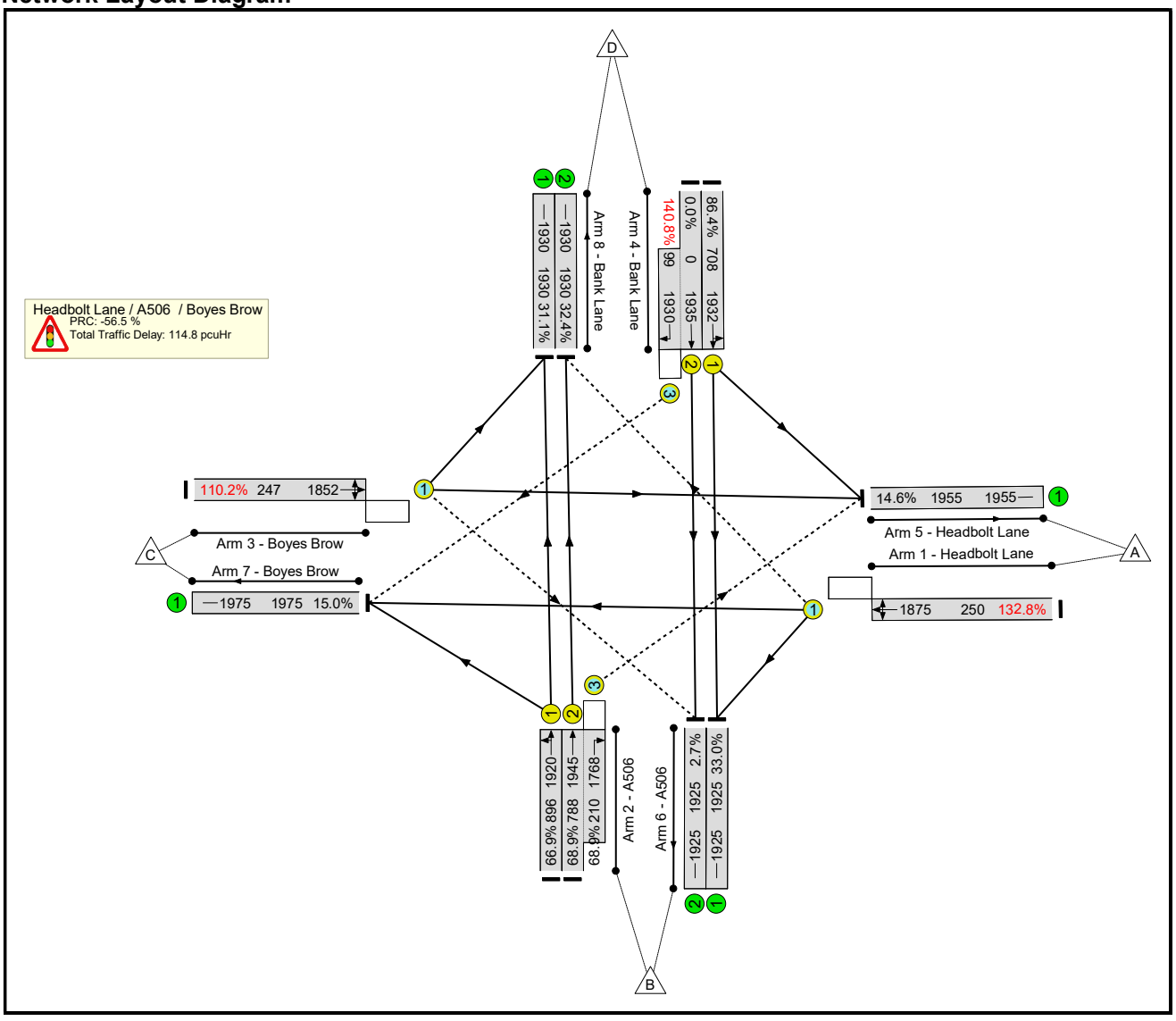
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**77.8%**	**315**	**9**	**3**	**20.8**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**77.8%**	**315**	**9**	**3**	**20.8**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	14	-	246	1897	316	77.8%	36	0	0	4.2	60.8	7.5
2/1	A506 Left Ahead	U	A		1	38	-	369	1912	829	44.5%	-	-	-	2.2	21.8	6.9
2/2+2/3	A506 Right Ahead	U+O	A	K	1	38	4	471	1945:1768	721+233	49.4 : 49.4%	103	9	3	3.2 (2.1+1.1)	24.2 (21.4:33.0)	6.6
3/1	Boyes Brow Ahead Right Left	O	D		1	14	-	187	1880	313	59.7%	35	0	0	2.6	50.1	5.0
4/1	Bank Lane Left Ahead	U	B		1	29	-	380	1900	633	60.0%	-	-	-	3.4	32.1	8.7
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	29	0	468	1935:1930	535+192	61.1 : 73.6%	141	0	0	4.5 (2.8+1.7)	35.0 (31.0:44.2)	7.4
5/1	Headbolt Lane	U	-		-	-	-	322	1955	1955	16.5%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	362	1925	1925	18.8%	-	-	-	0.1	1.2	0.1
6/2	A506	U	-		-	-	-	362	1925	1925	18.8%	-	-	-	0.1	1.2	0.1
7/1	Boyes Brow	U	-		-	-	-	341	1975	1975	17.3%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	342	1930	1930	17.7%	-	-	-	0.1	1.1	0.1
8/2	Bank Lane	U	-		-	-	-	392	1930	1930	20.3%	-	-	-	0.1	1.2	0.1

C1 PRC for Signalled Lanes (%): 15.7 Total Delay for Signalled Lanes (pcuHr): 20.09 Cycle Time (s): 90
PRC Over All Lanes (%): 15.7 Total Delay Over All Lanes(pcuHr): 20.76

Basic Results Summary

Scenario 10: '2028 PM Base + Com' (FG14: '2028 PM Base + Com', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

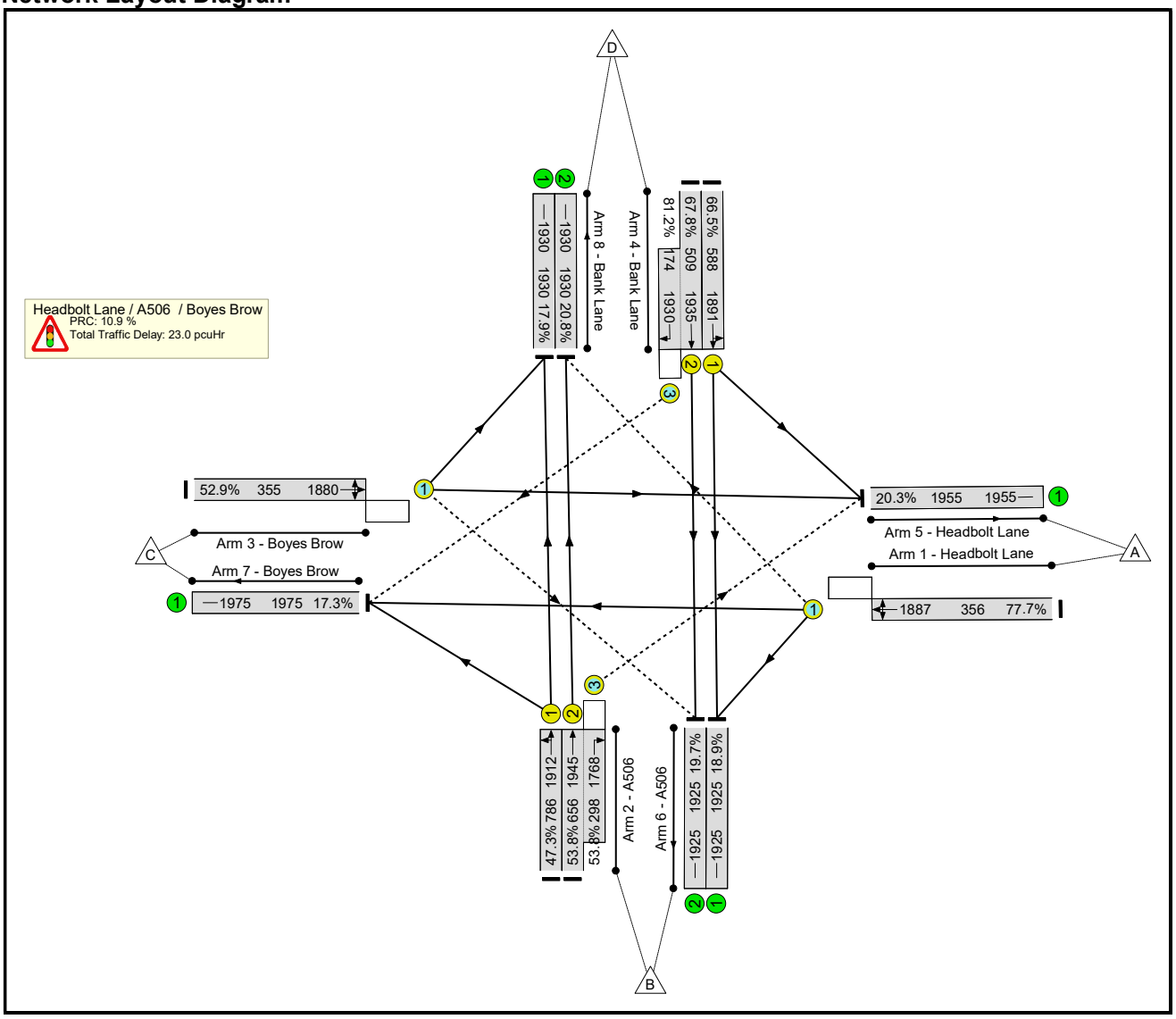
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**140.8%**	**105**	**89**	**186**	**114.8**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**140.8%**	**105**	**89**	**186**	**114.8**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	11	-	332	1875	250	132.8%	0	0	83	50.9	551.6	55.1
2/1	A506 Left Ahead	U	A		1	41	-	599	1920	896	66.9%	-	-	-	4.1	24.6	12.5
2/2+2/3	A506 Right Ahead	U+O	A	K	1	41	4	688	1945:1768	788+210	68.9 : 68.9%	53	89	3	5.2 (3.5+1.7)	27.5 (23.5:42.2)	11.7
3/1	Boyes Brow Ahead Right Left	O	D		1	11	-	272	1852	247	110.2%	9	0	44	20.9	276.9	24.5
4/1	Bank Lane Left Ahead	U	B		1	32	-	612	1932	708	86.4%	-	-	-	7.5	44.0	17.1
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	32	0	140	1935:1930	0+99	0.0 : 140.8%	43	0	56	25.3 (0.0+25.3)	650.8 (0.0:650.8)	26.4
5/1	Headbolt Lane	U	-		-	-	-	294	1955	1955	14.6%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	660	1925	1925	33.0%	-	-	-	0.2	1.4	0.2
6/2	A506	U	-		-	-	-	58	1925	1925	2.7%	-	-	-	0.0	1.0	0.0
7/1	Boyes Brow	U	-		-	-	-	366	1975	1975	15.0%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	612	1930	1930	31.1%	-	-	-	0.2	1.4	0.2
8/2	Bank Lane	U	-		-	-	-	653	1930	1930	32.4%	-	-	-	0.2	1.4	0.2

C1 PRC for Signalled Lanes (%): -56.5 Total Delay for Signalled Lanes (pcuHr): 113.93 Cycle Time (s): 90
PRC Over All Lanes (%): -56.5 Total Delay Over All Lanes(pcuHr): 114.82

Basic Results Summary

Scenario 11: '2028 AM Base + Com + Dev' (FG15: '2028 AM Base + Com + Dev', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

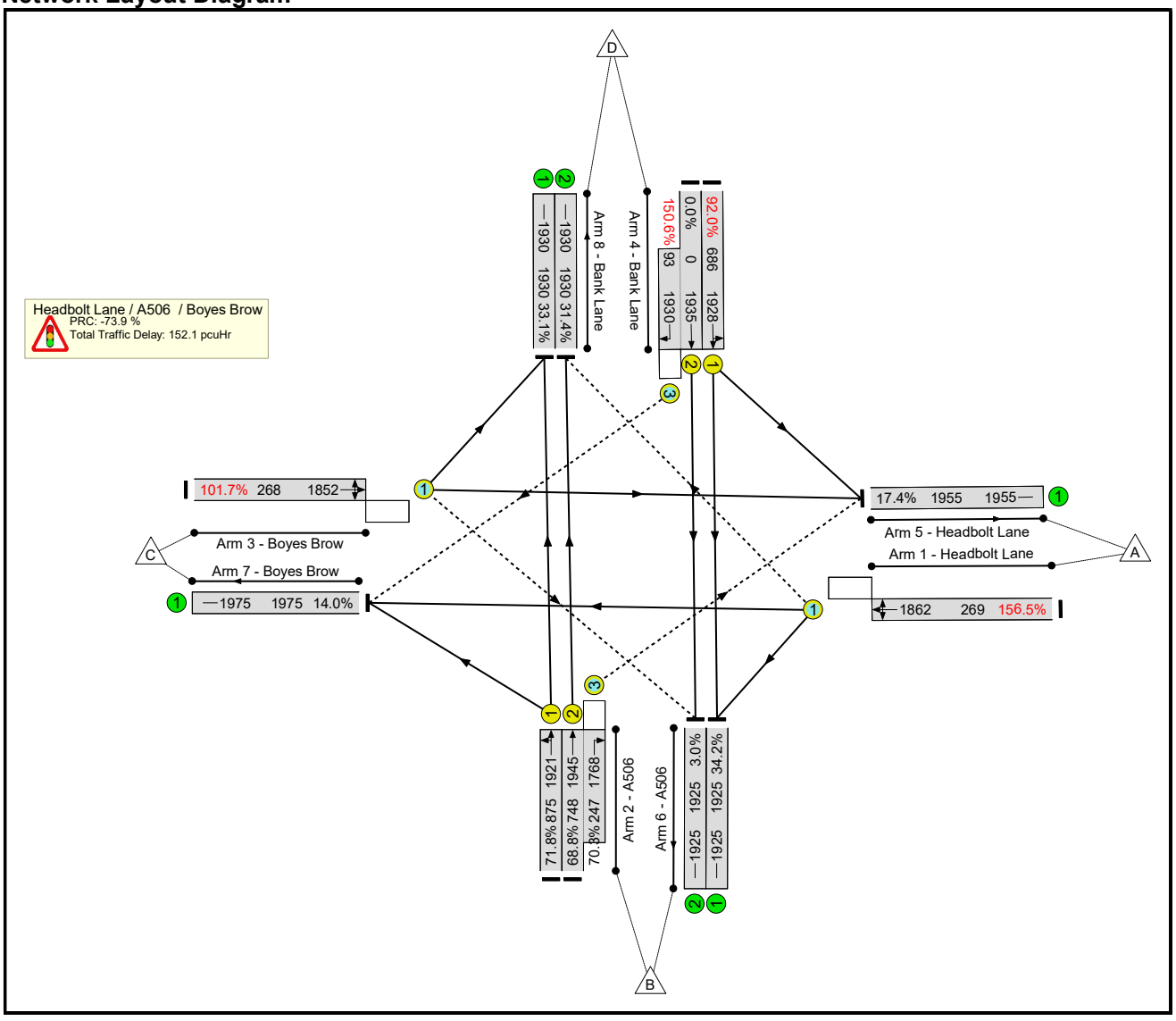
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**81.2%**	**305**	**74**	**4**	**23.0**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**81.2%**	**305**	**74**	**4**	**23.0**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	16	-	277	1887	356	77.7%	47	0	1	4.4	56.9	8.2
2/1	A506 Left Ahead	U	A		1	36	-	372	1912	786	47.3%	-	-	-	2.5	23.7	7.2
2/2+2/3	A506 Right Ahead	U+O	A	K	1	36	4	513	1945:1768	656+298	53.8 : 53.8%	82	74	4	4.0 (2.3+1.7)	27.8 (23.1:38.2)	6.9
3/1	Boyes Brow Ahead Right Left	O	D		1	16	-	188	1880	355	52.9%	35	0	0	2.4	45.1	4.8
4/1	Bank Lane Left Ahead	U	B		1	27	-	391	1891	588	66.5%	-	-	-	3.9	36.0	9.5
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	27	0	486	1935:1930	509+174	67.8 : 81.2%	141	0	0	5.3 (3.4+1.9)	39.0 (35.0:48.8)	8.6
5/1	Headbolt Lane	U	-		-	-	-	397	1955	1955	20.3%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	363	1925	1925	18.9%	-	-	-	0.1	1.2	0.1
6/2	A506	U	-		-	-	-	380	1925	1925	19.7%	-	-	-	0.1	1.2	0.1
7/1	Boyes Brow	U	-		-	-	-	341	1975	1975	17.3%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	345	1930	1930	17.9%	-	-	-	0.1	1.1	0.1
8/2	Bank Lane	U	-		-	-	-	401	1930	1930	20.8%	-	-	-	0.1	1.2	0.1

C1 PRC for Signalled Lanes (%): 10.9 Total Delay for Signalled Lanes (pcuHr): 22.33 Cycle Time (s): 90
PRC Over All Lanes (%): 10.9 Total Delay Over All Lanes(pcuHr): 23.04

Basic Results Summary

Scenario 12: '2028 PM Base + Com + Dev' (FG16: '2028 PM Base + Com + Dev', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

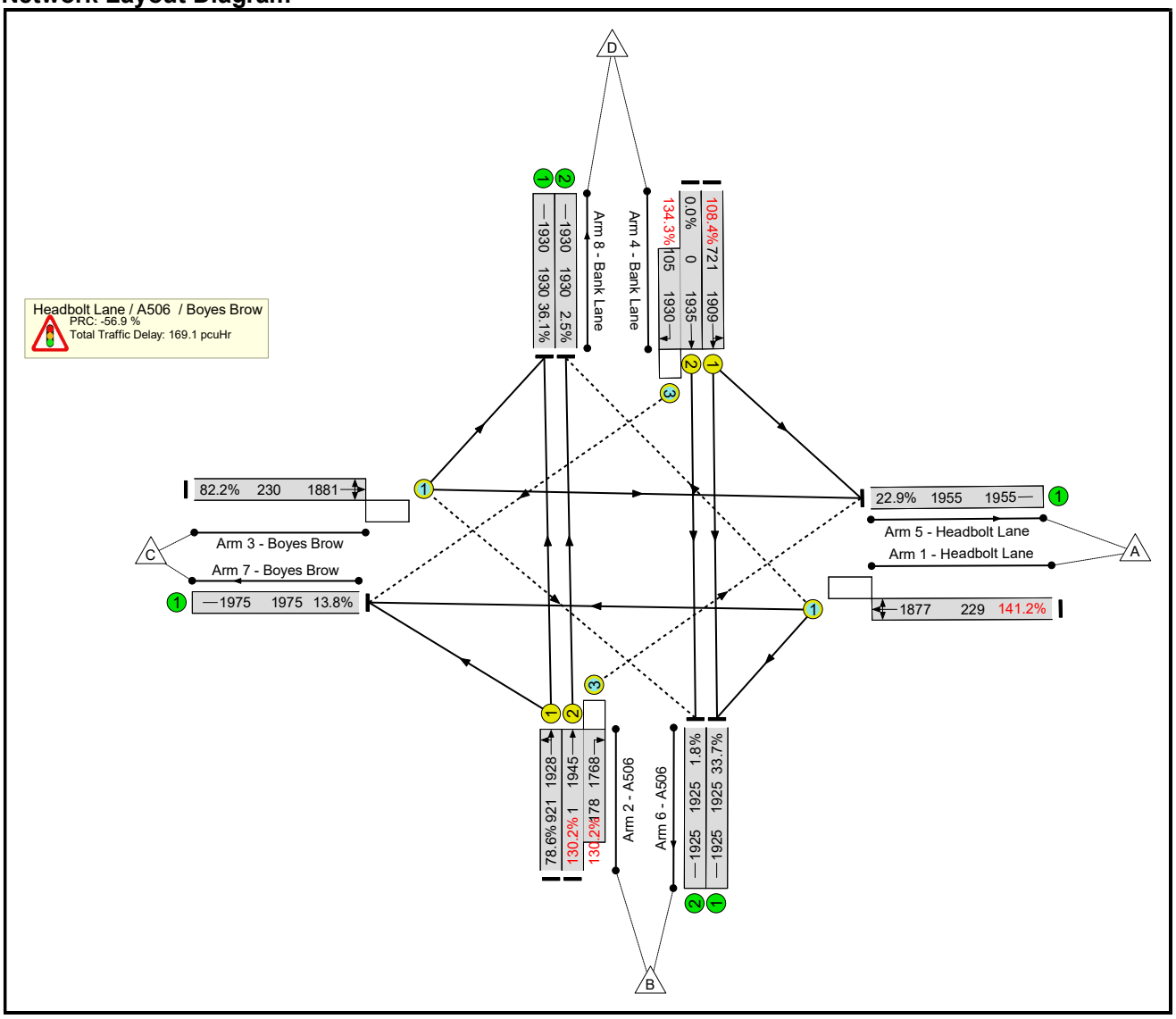
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**156.5%**	**80**	**138**	**198**	**152.1**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**156.5%**	**80**	**138**	**198**	**152.1**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	12	-	421	1862	269	156.5%	0	0	92	89.9	768.3	95.2
2/1	A506 Left Ahead	U	A		1	40	-	628	1921	875	71.8%	-	-	-	4.7	27.0	13.8
2/2+2/3	A506 Right Ahead	U+O	A	K	1	40	4	688	1945:1768	748+247	68.8 : 70.3%	30	138	7	5.6 (3.4+2.2)	29.2 (24.0:44.6)	11.0
3/1	Boyes Brow Ahead Right Left	O	D		1	12	-	272	1852	268	101.7%	14	0	43	12.7	167.6	16.4
4/1	Bank Lane Left Ahead	U	B		1	31	-	631	1928	686	92.0%	-	-	-	9.8	55.8	20.0
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	31	0	140	1935:1930	0+93	0.0 : 150.6%	37	0	56	28.6 (0.0+28.6)	736.0 (0.0:736.0)	29.6
5/1	Headbolt Lane	U	-		-	-	-	342	1955	1955	17.4%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	714	1925	1925	34.2%	-	-	-	0.3	1.4	0.3
6/2	A506	U	-		-	-	-	58	1925	1925	3.0%	-	-	-	0.0	1.0	0.0
7/1	Boyes Brow	U	-		-	-	-	367	1975	1975	14.0%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	641	1930	1930	33.1%	-	-	-	0.2	1.4	0.2
8/2	Bank Lane	U	-		-	-	-	658	1930	1930	31.4%	-	-	-	0.2	1.4	0.2

C1 PRC for Signalled Lanes (%): -73.9 Total Delay for Signalled Lanes (pcuHr): 151.20 Cycle Time (s): 90
PRC Over All Lanes (%): -73.9 Total Delay Over All Lanes(pcuHr): 152.14

Basic Results Summary

Scenario 13: '2028 AM Base + Com + Dev (Future Provision)' (FG19: '2028 AM Base + Com + Dev (Future Provision)', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

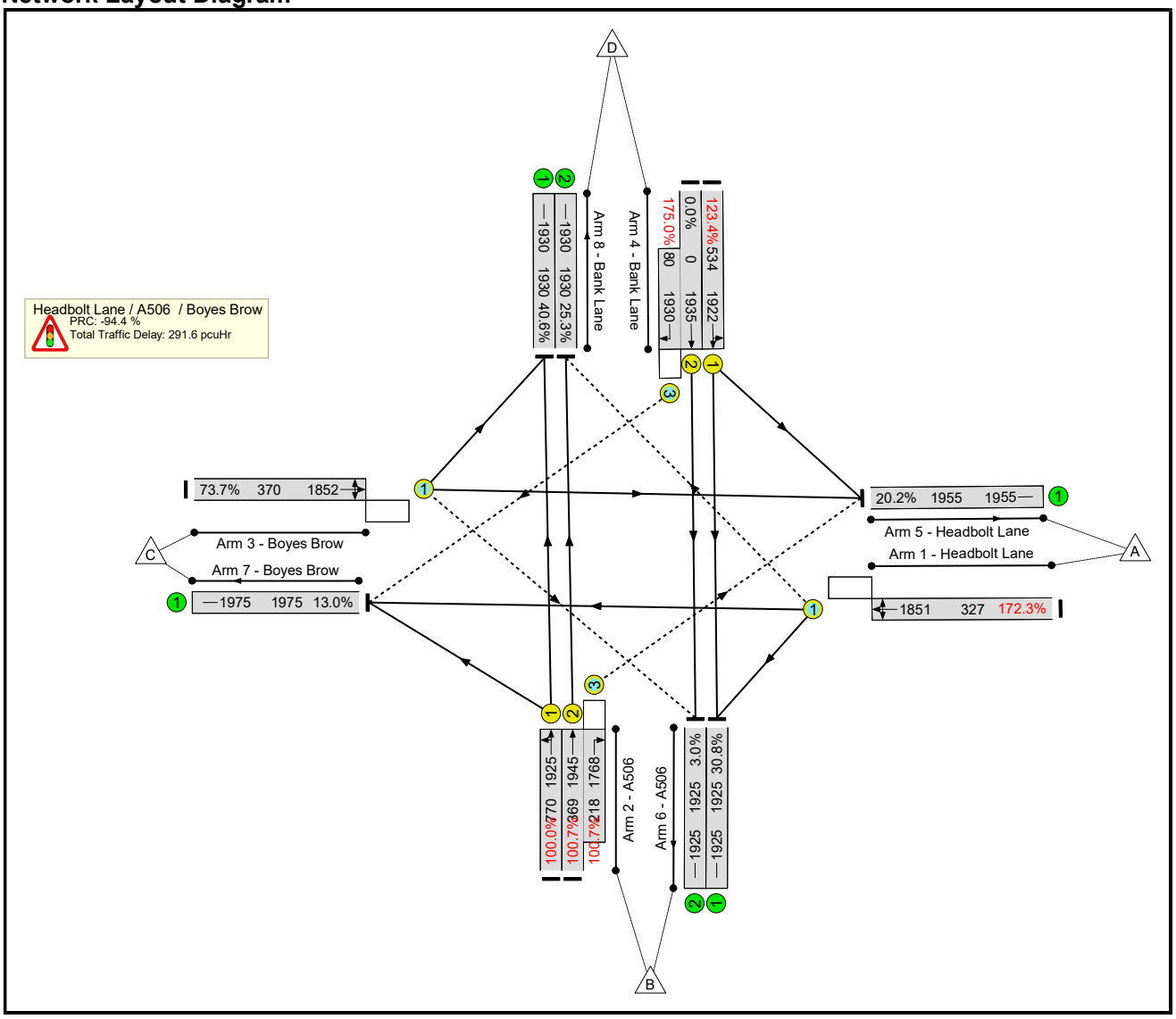
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**141.2%**	**133**	**138**	**95**	**169.1**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**141.2%**	**133**	**138**	**95**	**169.1**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	10	-	324	1877	229	141.2%	29	0	18	57.4	637.4	61.5
2/1	A506 Left Ahead	U	A		1	42	-	724	1928	921	78.6%	-	-	-	5.8	28.6	16.9
2/2+2/3	A506 Right Ahead	U+O	A	K	1	42	4	233	1945:1768	1+178	130.2 : 130.2%	0	138	41	33.6 (0.1+33.4)	518.4 (460.8:518.7)	36.2
3/1	Boyes Brow Ahead Right Left	O	D		1	10	-	189	1881	230	82.2%	0	0	35	4.2	79.6	6.7
4/1	Bank Lane Left Ahead	U	B		1	33	-	782	1909	721	108.4%	-	-	-	44.5	204.8	56.9
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	33	0	141	1935:1930	0+105	0.0 : 134.3%	104	0	1	22.9 (0.0+22.9)	585.5 (0.0:585.5)	24.2
5/1	Headbolt Lane	U	-		-	-	-	516	1955	1955	22.9%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	736	1925	1925	33.7%	-	-	-	0.3	1.4	0.3
6/2	A506	U	-		-	-	-	35	1925	1925	1.8%	-	-	-	0.0	1.0	0.0
7/1	Boyes Brow	U	-		-	-	-	342	1975	1975	13.8%	-	-	-	0.1	1.1	0.1
8/1	Bank Lane	U	-		-	-	-	697	1930	1930	36.1%	-	-	-	0.3	1.5	0.3
8/2	Bank Lane	U	-		-	-	-	67	1930	1930	2.5%	-	-	-	0.0	1.0	0.0

C1 PRC for Signalled Lanes (%): -56.9 Total Delay for Signalled Lanes (pcuHr): 168.28 Cycle Time (s): 90
PRC Over All Lanes (%): -56.9 Total Delay Over All Lanes(pcuHr): 169.06

Basic Results Summary

Scenario 14: '2028 PM Base + Com + Dev (Future Provision)' (FG20: '2028 PM Base + Com + Dev (Future Provision)', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**175.0%**	**129**	**177**	**166**	**291.6**	-	-
Headbolt Lane / A506 / Boyes Brow	-	-	-		-	-	-	-	-	-	**175.0%**	**129**	**177**	**166**	**291.6**	-	-
1/1	Headbolt Lane Left Ahead Right	O	C		1	17	-	563	1851	327	172.3%	74	0	42	137.3	878.0	144.7
2/1	A506 Left Ahead	U	A		1	35	-	770	1925	770	100.0%	-	-	-	19.6	91.9	33.1
2/2+2/3	A506 Right Ahead	U+O	A	K	1	35	6	591	1945:1768	369+218	100.7 : 100.7%	0	177	41	17.7 (10.4+7.4)	108.0 (100.4:120.9)	20.0
3/1	Boyes Brow Ahead Right Left	O	D		1	17	-	273	1852	370	73.7%	55	0	3	4.0	52.9	7.7
4/1	Bank Lane Left Ahead	U	B		1	24	-	659	1922	534	123.4%	-	-	-	76.4	417.5	84.7
4/2+4/3	Bank Lane Ahead Right	U+O	B	L	1	24	0	140	1935:1930	0+80	0.0 : 175.0%	0	0	80	35.5 (0.0+35.5)	913.8 (0.0:913.8)	36.1
5/1	Headbolt Lane	U	-		-	-	-	416	1955	1955	20.2%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	800	1925	1925	30.8%	-	-	-	0.2	1.4	0.2
6/2	A506	U	-		-	-	-	58	1925	1925	3.0%	-	-	-	0.0	1.0	0.0
7/1	Boyes Brow	U	-		-	-	-	368	1975	1975	13.0%	-	-	-	0.1	1.0	0.1
8/1	Bank Lane	U	-		-	-	-	783	1930	1930	40.6%	-	-	-	0.3	1.6	0.3
8/2	Bank Lane	U	-		-	-	-	571	1930	1930	25.3%	-	-	-	0.2	1.2	0.2

C1 PRC for Signalled Lanes (%): -94.4 Total Delay for Signalled Lanes (pcuHr): 290.66 Cycle Time (s): 90
PRC Over All Lanes (%): -94.4 Total Delay Over All Lanes(pcuHr): 291.61

Junctions 9

PICADY 9 - Priority Intersection Module

Version: 9.5.1.7462
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Filename: Shevington_Stopgate_Pingwood.j9
Path: C:\Users\rachel.cornfoot\Arup\HBL New Station - Project Files\01 Engineering\04 Internal Project Data\Transport Planning\Junction Models
Report generation date: 14/05/2021 15:40:24

»2021 Base, AM
»2021 Base, PM
»2023 Base, AM
»2023 Base, PM
»2028 Base, AM
»2028 Base, PM
»2023 Base + Com, AM
»2023 Base + Com, PM
»2028 Base + Com, AM
»2028 Base + Com, PM
»2023 Base + Com + Dev, AM
»2023 Base + Com + Dev, PM
»2028 Base + Com + Dev, AM
»2028 Base + Com + Dev, PM
»2028 Base + Com + Dev (500 Spaces), AM
»2028 Base + Com + Dev (500 Spaces), PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2021 Base									
Stream B-C	D1	0.2	16.66	0.15	C	D2	0.0	7.49	0.02	A
Stream B-A		3.7	31.41	0.80	D		0.3	8.76	0.21	A
Stream C-AB		0.0	5.74	0.03	A		0.1	6.75	0.06	A
	2023 Base									
Stream B-C	D3	0.2	17.80	0.16	C	D4	0.0	7.52	0.02	A
Stream B-A		4.0	33.04	0.81	D		0.3	8.83	0.21	A
Stream C-AB		0.0	5.76	0.03	A		0.1	6.78	0.06	A
	2028 Base									
Stream B-C	D5	0.3	24.58	0.21	C	D6	0.0	7.58	0.02	A
Stream B-A		5.2	41.91	0.86	E		0.3	8.98	0.22	A
Stream C-AB		0.0	5.78	0.03	A		0.1	6.85	0.06	A
	2023 Base + Com									
Stream B-C	D7	0.2	17.80	0.16	C	D8	0.0	7.52	0.02	A
Stream B-A		4.0	33.04	0.81	D		0.3	8.83	0.21	A
Stream C-AB		0.0	5.76	0.03	A		0.1	6.78	0.06	A
	2028 Base + Com									
Stream B-C	D9	0.3	24.58	0.21	C	D10	0.0	7.58	0.02	A
Stream B-A		5.2	41.91	0.86	E		0.3	8.98	0.22	A
Stream C-AB		0.0	5.78	0.03	A		0.1	6.85	0.06	A
	2023 Base + Com + Dev									
Stream B-C	D11	0.2	20.81	0.18	C	D12	0.0	7.57	0.02	A
Stream B-A		4.6	37.56	0.84	E		0.3	8.97	0.22	A
Stream C-AB		0.0	5.76	0.03	A		0.1	6.82	0.06	A
	2028 Base + Com + Dev									
Stream B-C	D13	0.3	29.15	0.24	D	D14	0.0	7.63	0.02	A
Stream B-A		5.8	46.04	0.87	E		0.3	9.15	0.23	A
Stream C-AB		0.0	5.78	0.03	A		0.1	6.89	0.06	A
	2028 Base + Com + Dev (500 Spaces)									
Stream B-C	D15	0.5	45.74	0.34	E	D16	0.0	7.71	0.02	A
Stream B-A		7.1	55.16	0.90	F		0.3	9.39	0.25	A
Stream C-AB		0.0	5.80	0.03	A		0.1	6.95	0.06	A

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

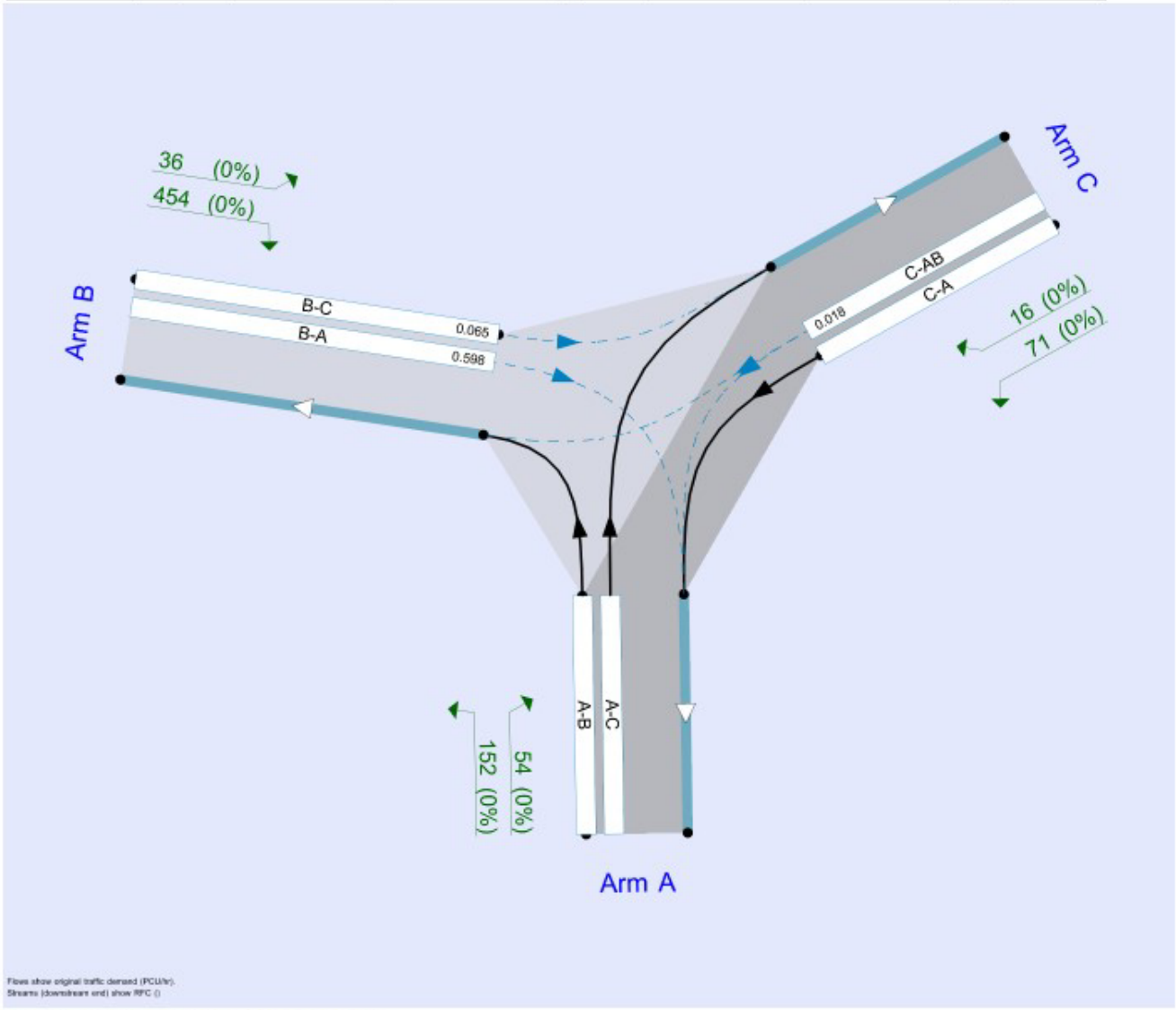
File summary

File Description

Title	
Location	
Site number	
Date	18/03/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	GLOBAL\Rachel.Cornfoot
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Base	AM	ONE HOUR	07:30	09:00	15
D2	2021 Base	PM	ONE HOUR	16:00	17:30	15
D3	2023 Base	AM	ONE HOUR	07:30	09:00	15
D4	2023 Base	PM	ONE HOUR	16:00	17:30	15
D5	2028 Base	AM	ONE HOUR	07:30	09:00	15
D6	2028 Base	PM	ONE HOUR	16:00	17:30	15
D7	2023 Base + Com	AM	ONE HOUR	07:30	09:00	15
D8	2023 Base + Com	PM	ONE HOUR	16:00	17:30	15
D9	2028 Base + Com	AM	ONE HOUR	07:30	09:00	15
D10	2028 Base + Com	PM	ONE HOUR	16:00	17:30	15
D11	2023 Base + Com + Dev	AM	ONE HOUR	07:30	09:00	15
D12	2023 Base + Com + Dev	PM	ONE HOUR	16:00	17:30	15
D13	2028 Base + Com + Dev	AM	ONE HOUR	07:30	09:00	15
D14	2028 Base + Com + Dev	PM	ONE HOUR	16:00	17:30	15
D15	2028 Base + Com + Dev (500 Spaces)	AM	ONE HOUR	07:30	09:00	15
D16	2028 Base + Com + Dev (500 Spaces)	PM	ONE HOUR	16:00	17:30	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2021 Base, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		18.99	C

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	Pingwood Lane	Pingwood Lane	Major
B	Shevington's Lane	Shevington's Lane	Minor
C	Stopgate Lane	Stopgate Lane	Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	7.70		✓	2.90	120.0	✓	1.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B	One lane plus flare	10.00	5.80	4.60	4.55	4.20	✓	2.00	60	58

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	611	0.103	0.260	0.164	0.372
B-C	570	0.081	0.204	-	-
C-B	692	0.248	0.248	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Base	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	185	100.000
B		✓	440	100.000
C		✓	81	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	134	51
	B	406	0	34
	C	66	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.15	16.66	0.2	C
B-A	0.80	31.41	3.7	D
C-AB	0.03	5.74	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	446	0.057	25	0.1	8.544	A
B-A	306	578	0.529	301	1.1	12.826	B
C-AB	11	659	0.017	11	0.0	5.559	A
C-A	50			50			
A-B	101			101			
A-C	38			38			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	31	389	0.079	30	0.1	10.036	B
B-A	365	571	0.639	363	1.7	17.032	C
C-AB	14	652	0.021	13	0.0	5.634	A
C-A	59			59			
A-B	120			120			
A-C	46			46			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	37	265	0.141	37	0.2	15.743	C
B-A	447	559	0.800	440	3.5	28.663	D
C-AB	17	644	0.026	17	0.0	5.739	A
C-A	73			73			
A-B	148			148			
A-C	56			56			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	37	253	0.148	37	0.2	16.663	C
B-A	447	559	0.800	446	3.7	31.406	D
C-AB	17	644	0.026	17	0.0	5.739	A
C-A	73			73			
A-B	148			148			
A-C	56			56			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	31	375	0.081	31	0.1	10.457	B
B-A	365	567	0.643	372	1.9	19.062	C
C-AB	14	652	0.021	14	0.0	5.636	A
C-A	59			59			
A-B	120			120			
A-C	46			46			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	440	0.058	26	0.1	8.700	A
B-A	306	574	0.533	309	1.2	13.714	B
C-AB	11	659	0.017	11	0.0	5.562	A
C-A	50			50			
A-B	101			101			
A-C	38			38			

2021 Base, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		1.67	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2021 Base	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	475	100.000
B		✓	107	100.000
C		✓	95	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	399	76
	B	97	0	10
	C	65	30	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.02	7.49	0.0	A
B-A	0.21	8.76	0.3	A
C-AB	0.06	6.75	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	518	0.015	7	0.0	7.052	A
B-A	73	547	0.134	72	0.2	7.582	A
C-AB	23	605	0.037	22	0.0	6.173	A
C-A	49			49			
A-B	300			300			
A-C	57			57			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	507	0.018	9	0.0	7.229	A
B-A	87	535	0.163	87	0.2	8.042	A
C-AB	27	589	0.046	27	0.0	6.405	A
C-A	58			58			
A-B	359			359			
A-C	68			68			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	491	0.022	11	0.0	7.492	A
B-A	107	518	0.206	107	0.3	8.747	A
C-AB	33	567	0.059	33	0.1	6.747	A
C-A	71			71			
A-B	439			439			
A-C	84			84			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	491	0.022	11	0.0	7.493	A
B-A	107	518	0.206	107	0.3	8.757	A
C-AB	33	567	0.059	33	0.1	6.747	A
C-A	71			71			
A-B	439			439			
A-C	84			84			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	507	0.018	9	0.0	7.234	A
B-A	87	535	0.163	87	0.2	8.058	A
C-AB	27	589	0.046	27	0.0	6.409	A
C-A	58			58			
A-B	359			359			
A-C	68			68			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	518	0.015	8	0.0	7.058	A
B-A	73	547	0.134	73	0.2	7.606	A
C-AB	23	605	0.037	23	0.0	6.177	A
C-A	49			49			
A-B	300			300			
A-C	57			57			

2023 Base, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		19.97	C

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2023 Base	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	189	100.000
B		✓	449	100.000
C		✓	83	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	137	52
	B	414	0	35
	C	67	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.16	17.80	0.2	C
B-A	0.81	33.04	4.0	D
C-AB	0.03	5.76	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	442	0.060	26	0.1	8.652	A
B-A	312	577	0.540	307	1.1	13.133	B
C-AB	12	658	0.018	12	0.0	5.572	A
C-A	50			50			
A-B	103			103			
A-C	39			39			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	31	381	0.083	31	0.1	10.298	B
B-A	372	570	0.653	370	1.8	17.689	C
C-AB	14	652	0.022	14	0.0	5.649	A
C-A	60			60			
A-B	123			123			
A-C	47			47			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	39	254	0.152	38	0.2	16.656	C
B-A	456	561	0.812	448	3.7	29.902	D
C-AB	18	643	0.027	18	0.0	5.758	A
C-A	74			74			
A-B	151			151			
A-C	57			57			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	39	241	0.160	38	0.2	17.799	C
B-A	456	561	0.812	455	4.0	33.044	D
C-AB	18	643	0.027	18	0.0	5.758	A
C-A	74			74			
A-B	151			151			
A-C	57			57			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	31	366	0.086	32	0.1	10.799	B
B-A	372	566	0.657	380	2.0	20.030	C
C-AB	14	652	0.022	14	0.0	5.651	A
C-A	60			60			
A-B	123			123			
A-C	47			47			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	436	0.060	26	0.1	8.792	A
B-A	312	577	0.540	315	1.2	13.903	B
C-AB	12	658	0.018	12	0.0	5.574	A
C-A	50			50			
A-B	103			103			
A-C	39			39			

2023 Base, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		1.67	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2023 Base	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	484	100.000
B		✓	109	100.000
C		✓	96	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	407	77
	B	99	0	10
	C	66	30	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.02	7.52	0.0	A
B-A	0.21	8.83	0.3	A
C-AB	0.06	6.78	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	517	0.015	7	0.0	7.070	A
B-A	75	546	0.137	74	0.2	7.618	A
C-AB	23	604	0.038	23	0.0	6.191	A
C-A	50			50			
A-B	306			306			
A-C	58			58			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	505	0.018	9	0.0	7.251	A
B-A	89	534	0.167	89	0.2	8.094	A
C-AB	27	587	0.046	27	0.0	6.427	A
C-A	59			59			
A-B	366			366			
A-C	69			69			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	490	0.022	11	0.0	7.520	A
B-A	109	517	0.211	109	0.3	8.819	A
C-AB	33	564	0.059	33	0.1	6.777	A
C-A	72			72			
A-B	448			448			
A-C	85			85			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	490	0.022	11	0.0	7.521	A
B-A	109	517	0.211	109	0.3	8.830	A
C-AB	33	564	0.059	33	0.1	6.777	A
C-A	72			72			
A-B	448			448			
A-C	85			85			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	505	0.018	9	0.0	7.253	A
B-A	89	534	0.167	89	0.2	8.108	A
C-AB	27	587	0.046	27	0.0	6.428	A
C-A	59			59			
A-B	366			366			
A-C	69			69			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	516	0.015	8	0.0	7.073	A
B-A	75	546	0.137	75	0.2	7.643	A
C-AB	23	604	0.038	23	0.0	6.197	A
C-A	50			50			
A-B	306			306			
A-C	58			58			

2028 Base, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		25.41	D

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2028 Base	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	197	100.000
B		✓	468	100.000
C		✓	86	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	143	54
	B	432	0	36
	C	70	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.21	24.58	0.3	C
B-A	0.86	41.91	5.2	E
C-AB	0.03	5.78	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	429	0.063	27	0.1	8.941	A
B-A	325	572	0.569	320	1.3	14.044	B
C-AB	12	657	0.018	12	0.0	5.584	A
C-A	53			53			
A-B	108			108			
A-C	41			41			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	32	358	0.090	32	0.1	11.054	B
B-A	388	565	0.687	385	2.1	19.661	C
C-AB	14	650	0.022	14	0.0	5.664	A
C-A	63			63			
A-B	129			129			
A-C	49			49			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	40	207	0.192	39	0.2	21.477	C
B-A	476	555	0.856	465	4.7	36.062	E
C-AB	18	641	0.028	18	0.0	5.777	A
C-A	77			77			
A-B	157			157			
A-C	59			59			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	40	186	0.213	40	0.3	24.585	C
B-A	476	555	0.856	474	5.2	41.911	E
C-AB	18	641	0.028	18	0.0	5.777	A
C-A	77			77			
A-B	157			157			
A-C	59			59			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	32	338	0.096	33	0.1	11.808	B
B-A	388	565	0.687	400	2.3	23.058	C
C-AB	14	650	0.022	14	0.0	5.665	A
C-A	63			63			
A-B	129			129			
A-C	49			49			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	422	0.064	27	0.1	9.130	A
B-A	325	572	0.569	329	1.4	15.066	C
C-AB	12	657	0.018	12	0.0	5.585	A
C-A	53			53			
A-B	108			108			
A-C	41			41			

2028 Base, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		1.69	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2028 Base	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	503	100.000
B		✓	112	100.000
C		✓	100	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	423	80
	B	102	0	10
	C	69	31	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.02	7.58	0.0	A
B-A	0.22	8.98	0.3	A
C-AB	0.06	6.85	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	514	0.015	7	0.0	7.103	A
B-A	77	544	0.141	76	0.2	7.689	A
C-AB	23	600	0.039	23	0.0	6.236	A
C-A	52			52			
A-B	318			318			
A-C	60			60			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	503	0.018	9	0.0	7.292	A
B-A	92	531	0.173	92	0.2	8.189	A
C-AB	28	583	0.048	28	0.1	6.484	A
C-A	62			62			
A-B	380			380			
A-C	72			72			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	486	0.023	11	0.0	7.575	A
B-A	112	513	0.219	112	0.3	8.964	A
C-AB	34	560	0.062	34	0.1	6.854	A
C-A	76			76			
A-B	466			466			
A-C	88			88			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	486	0.023	11	0.0	7.576	A
B-A	112	513	0.219	112	0.3	8.977	A
C-AB	34	560	0.062	34	0.1	6.854	A
C-A	76			76			
A-B	466			466			
A-C	88			88			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	502	0.018	9	0.0	7.297	A
B-A	92	531	0.173	92	0.2	8.207	A
C-AB	28	583	0.048	28	0.1	6.488	A
C-A	62			62			
A-B	380			380			
A-C	72			72			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	514	0.015	8	0.0	7.109	A
B-A	77	544	0.141	77	0.2	7.719	A
C-AB	23	600	0.039	23	0.0	6.239	A
C-A	52			52			
A-B	318			318			
A-C	60			60			

2023 Base + Com, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		19.97	C

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2023 Base + Com	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	189	100.000
B		✓	449	100.000
C		✓	83	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	137	52
	B	414	0	35
	C	67	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.16	17.80	0.2	C
B-A	0.81	33.04	4.0	D
C-AB	0.03	5.76	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	442	0.060	26	0.1	8.652	A
B-A	312	577	0.540	307	1.1	13.133	B
C-AB	12	658	0.018	12	0.0	5.572	A
C-A	50			50			
A-B	103			103			
A-C	39			39			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	31	381	0.083	31	0.1	10.298	B
B-A	372	570	0.653	370	1.8	17.689	C
C-AB	14	652	0.022	14	0.0	5.649	A
C-A	60			60			
A-B	123			123			
A-C	47			47			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	39	254	0.152	38	0.2	16.656	C
B-A	456	561	0.812	448	3.7	29.902	D
C-AB	18	643	0.027	18	0.0	5.758	A
C-A	74			74			
A-B	151			151			
A-C	57			57			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	39	241	0.160	38	0.2	17.799	C
B-A	456	561	0.812	455	4.0	33.044	D
C-AB	18	643	0.027	18	0.0	5.758	A
C-A	74			74			
A-B	151			151			
A-C	57			57			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	31	366	0.086	32	0.1	10.799	B
B-A	372	566	0.657	380	2.0	20.030	C
C-AB	14	652	0.022	14	0.0	5.651	A
C-A	60			60			
A-B	123			123			
A-C	47			47			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	436	0.060	26	0.1	8.792	A
B-A	312	577	0.540	315	1.2	13.903	B
C-AB	12	658	0.018	12	0.0	5.574	A
C-A	50			50			
A-B	103			103			
A-C	39			39			

2023 Base + Com, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		1.67	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2023 Base + Com	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	484	100.000
B		✓	109	100.000
C		✓	96	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	407	77
	B	99	0	10
	C	66	30	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.02	7.52	0.0	A
B-A	0.21	8.83	0.3	A
C-AB	0.06	6.78	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	517	0.015	7	0.0	7.070	A
B-A	75	546	0.137	74	0.2	7.618	A
C-AB	23	604	0.038	23	0.0	6.191	A
C-A	50			50			
A-B	306			306			
A-C	58			58			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	505	0.018	9	0.0	7.251	A
B-A	89	534	0.167	89	0.2	8.094	A
C-AB	27	587	0.046	27	0.0	6.427	A
C-A	59			59			
A-B	366			366			
A-C	69			69			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	490	0.022	11	0.0	7.520	A
B-A	109	517	0.211	109	0.3	8.819	A
C-AB	33	564	0.059	33	0.1	6.777	A
C-A	72			72			
A-B	448			448			
A-C	85			85			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	490	0.022	11	0.0	7.521	A
B-A	109	517	0.211	109	0.3	8.830	A
C-AB	33	564	0.059	33	0.1	6.777	A
C-A	72			72			
A-B	448			448			
A-C	85			85			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	505	0.018	9	0.0	7.253	A
B-A	89	534	0.167	89	0.2	8.108	A
C-AB	27	587	0.046	27	0.0	6.428	A
C-A	59			59			
A-B	366			366			
A-C	69			69			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	516	0.015	8	0.0	7.073	A
B-A	75	546	0.137	75	0.2	7.643	A
C-AB	23	604	0.038	23	0.0	6.197	A
C-A	50			50			
A-B	306			306			
A-C	58			58			

2028 Base + Com, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		25.41	D

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2028 Base + Com	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	197	100.000
B		✓	468	100.000
C		✓	86	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	143	54
	B	432	0	36
	C	70	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.21	24.58	0.3	C
B-A	0.86	41.91	5.2	E
C-AB	0.03	5.78	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	429	0.063	27	0.1	8.941	A
B-A	325	572	0.569	320	1.3	14.044	B
C-AB	12	657	0.018	12	0.0	5.584	A
C-A	53			53			
A-B	108			108			
A-C	41			41			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	32	358	0.090	32	0.1	11.054	B
B-A	388	565	0.687	385	2.1	19.661	C
C-AB	14	650	0.022	14	0.0	5.664	A
C-A	63			63			
A-B	129			129			
A-C	49			49			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	40	207	0.192	39	0.2	21.477	C
B-A	476	555	0.856	465	4.7	36.062	E
C-AB	18	641	0.028	18	0.0	5.777	A
C-A	77			77			
A-B	157			157			
A-C	59			59			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	40	186	0.213	40	0.3	24.585	C
B-A	476	555	0.856	474	5.2	41.911	E
C-AB	18	641	0.028	18	0.0	5.777	A
C-A	77			77			
A-B	157			157			
A-C	59			59			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	32	338	0.096	33	0.1	11.808	B
B-A	388	565	0.687	400	2.3	23.058	C
C-AB	14	650	0.022	14	0.0	5.665	A
C-A	63			63			
A-B	129			129			
A-C	49			49			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	422	0.064	27	0.1	9.130	A
B-A	325	572	0.569	329	1.4	15.066	C
C-AB	12	657	0.018	12	0.0	5.585	A
C-A	53			53			
A-B	108			108			
A-C	41			41			

2028 Base + Com, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		1.69	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2028 Base + Com	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	503	100.000
B		✓	112	100.000
C		✓	100	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	423	80
	B	102	0	10
	C	69	31	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.02	7.58	0.0	A
B-A	0.22	8.98	0.3	A
C-AB	0.06	6.85	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	514	0.015	7	0.0	7.103	A
B-A	77	544	0.141	76	0.2	7.689	A
C-AB	23	600	0.039	23	0.0	6.236	A
C-A	52			52			
A-B	318			318			
A-C	60			60			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	503	0.018	9	0.0	7.292	A
B-A	92	531	0.173	92	0.2	8.189	A
C-AB	28	583	0.048	28	0.1	6.484	A
C-A	62			62			
A-B	380			380			
A-C	72			72			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	486	0.023	11	0.0	7.575	A
B-A	112	513	0.219	112	0.3	8.964	A
C-AB	34	560	0.062	34	0.1	6.854	A
C-A	76			76			
A-B	466			466			
A-C	88			88			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	486	0.023	11	0.0	7.576	A
B-A	112	513	0.219	112	0.3	8.977	A
C-AB	34	560	0.062	34	0.1	6.854	A
C-A	76			76			
A-B	466			466			
A-C	88			88			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	502	0.018	9	0.0	7.297	A
B-A	92	531	0.173	92	0.2	8.207	A
C-AB	28	583	0.048	28	0.1	6.488	A
C-A	62			62			
A-B	380			380			
A-C	72			72			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	514	0.015	8	0.0	7.109	A
B-A	77	544	0.141	77	0.2	7.719	A
C-AB	23	600	0.039	23	0.0	6.239	A
C-A	52			52			
A-B	318			318			
A-C	60			60			

2023 Base + Com + Dev, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		22.76	C

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D11	2023 Base + Com + Dev	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	192	100.000
B		✓	458	100.000
C		✓	84	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	140	52
	B	423	0	35
	C	68	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.18	20.81	0.2	C
B-A	0.84	37.56	4.6	E
C-AB	0.03	5.76	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	435	0.061	26	0.1	8.799	A
B-A	318	573	0.556	314	1.2	13.657	B
C-AB	12	658	0.018	12	0.0	5.577	A
C-A	51			51			
A-B	105			105			
A-C	39			39			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	31	368	0.085	31	0.1	10.683	B
B-A	380	566	0.672	377	1.9	18.778	C
C-AB	14	651	0.022	14	0.0	5.655	A
C-A	61			61			
A-B	126			126			
A-C	47			47			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	39	228	0.169	38	0.2	18.871	C
B-A	466	557	0.836	457	4.2	33.137	D
C-AB	18	642	0.028	18	0.0	5.765	A
C-A	75			75			
A-B	154			154			
A-C	57			57			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	39	211	0.182	38	0.2	20.808	C
B-A	466	557	0.836	464	4.6	37.557	E
C-AB	18	642	0.028	18	0.0	5.765	A
C-A	75			75			
A-B	154			154			
A-C	57			57			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	31	353	0.089	32	0.1	11.241	B
B-A	380	566	0.672	390	2.2	21.405	C
C-AB	14	651	0.022	14	0.0	5.657	A
C-A	61			61			
A-B	126			126			
A-C	47			47			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	428	0.062	26	0.1	8.961	A
B-A	318	573	0.556	322	1.3	14.550	B
C-AB	12	658	0.018	12	0.0	5.579	A
C-A	51			51			
A-B	105			105			
A-C	39			39			

2023 Base + Com + Dev, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		1.72	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D12	2023 Base + Com + Dev	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	495	100.000
B		✓	114	100.000
C		✓	98	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	417	78
	B	104	0	10
	C	66	30	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.02	7.57	0.0	A
B-A	0.22	8.97	0.3	A
C-AB	0.06	6.82	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	514	0.015	7	0.0	7.101	A
B-A	78	545	0.144	78	0.2	7.686	A
C-AB	23	602	0.038	23	0.0	6.213	A
C-A	50			50			
A-B	314			314			
A-C	59			59			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	503	0.018	9	0.0	7.289	A
B-A	93	533	0.175	93	0.2	8.186	A
C-AB	27	585	0.046	27	0.0	6.455	A
C-A	59			59			
A-B	375			375			
A-C	70			70			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	486	0.023	11	0.0	7.571	A
B-A	115	516	0.222	114	0.3	8.961	A
C-AB	33	561	0.059	33	0.1	6.816	A
C-A	72			72			
A-B	459			459			
A-C	86			86			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	486	0.023	11	0.0	7.572	A
B-A	115	516	0.222	114	0.3	8.973	A
C-AB	33	561	0.059	33	0.1	6.816	A
C-A	72			72			
A-B	459			459			
A-C	86			86			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	503	0.018	9	0.0	7.292	A
B-A	93	533	0.175	94	0.2	8.204	A
C-AB	27	585	0.046	27	0.0	6.459	A
C-A	59			59			
A-B	375			375			
A-C	70			70			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	514	0.015	8	0.0	7.108	A
B-A	78	545	0.144	78	0.2	7.716	A
C-AB	23	602	0.038	23	0.0	6.216	A
C-A	50			50			
A-B	314			314			
A-C	59			59			

2028 Base + Com + Dev, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		28.08	D

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D13	2028 Base + Com + Dev	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	200	100.000
B		✓	476	100.000
C		✓	86	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	146	54
	B	440	0	36
	C	70	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.24	29.15	0.3	D
B-A	0.87	46.04	5.8	E
C-AB	0.03	5.78	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	424	0.064	27	0.1	9.057	A
B-A	331	572	0.580	326	1.3	14.364	B
C-AB	12	656	0.018	12	0.0	5.589	A
C-A	53			53			
A-B	110			110			
A-C	41			41			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	32	348	0.093	32	0.1	11.385	B
B-A	396	565	0.700	392	2.2	20.424	C
C-AB	14	649	0.022	14	0.0	5.670	A
C-A	63			63			
A-B	131			131			
A-C	49			49			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	40	188	0.211	39	0.3	24.141	C
B-A	484	555	0.873	472	5.2	38.692	E
C-AB	18	640	0.028	18	0.0	5.785	A
C-A	77			77			
A-B	161			161			
A-C	59			59			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	40	163	0.244	39	0.3	29.153	D
B-A	484	555	0.873	482	5.8	46.042	E
C-AB	18	640	0.028	18	0.0	5.785	A
C-A	77			77			
A-B	161			161			
A-C	59			59			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	32	325	0.099	33	0.1	12.349	B
B-A	396	565	0.700	409	2.5	24.656	C
C-AB	14	649	0.022	14	0.0	5.673	A
C-A	63			63			
A-B	131			131			
A-C	49			49			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	416	0.065	27	0.1	9.271	A
B-A	331	572	0.579	336	1.4	15.514	C
C-AB	12	656	0.018	12	0.0	5.589	A
C-A	53			53			
A-B	110			110			
A-C	41			41			

2028 Base + Com + Dev, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		1.75	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D14	2028 Base + Com + Dev	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	514	100.000
B		✓	118	100.000
C		✓	100	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	433	81
	B	108	0	10
	C	69	31	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.02	7.63	0.0	A
B-A	0.23	9.15	0.3	A
C-AB	0.06	6.89	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	512	0.015	7	0.0	7.138	A
B-A	81	543	0.150	81	0.2	7.771	A
C-AB	23	598	0.039	23	0.0	6.258	A
C-A	52			52			
A-B	326			326			
A-C	61			61			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	500	0.018	9	0.0	7.336	A
B-A	97	530	0.183	97	0.2	8.304	A
C-AB	28	581	0.048	28	0.1	6.513	A
C-A	62			62			
A-B	389			389			
A-C	73			73			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	483	0.023	11	0.0	7.633	A
B-A	119	512	0.232	119	0.3	9.135	A
C-AB	34	557	0.062	34	0.1	6.893	A
C-A	76			76			
A-B	477			477			
A-C	89			89			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	482	0.023	11	0.0	7.635	A
B-A	119	512	0.232	119	0.3	9.150	A
C-AB	34	557	0.062	34	0.1	6.893	A
C-A	76			76			
A-B	477			477			
A-C	89			89			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	499	0.018	9	0.0	7.342	A
B-A	97	530	0.183	97	0.2	8.324	A
C-AB	28	581	0.048	28	0.1	6.514	A
C-A	62			62			
A-B	389			389			
A-C	73			73			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	511	0.015	8	0.0	7.142	A
B-A	81	543	0.150	82	0.2	7.803	A
C-AB	23	598	0.039	23	0.0	6.264	A
C-A	52			52			
A-B	326			326			
A-C	61			61			

2028 Base + Com + Dev (500 Spaces), AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		34.20	D

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D15	2028 Base + Com + Dev (500 Spaces)	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	206	100.000
B		✓	490	100.000
C		✓	87	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	152	54
	B	454	0	36
	C	71	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.34	45.74	0.5	E
B-A	0.90	55.16	7.1	F
C-AB	0.03	5.80	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	415	0.065	27	0.1	9.278	A
B-A	342	571	0.598	336	1.4	14.973	B
C-AB	12	655	0.018	12	0.0	5.599	A
C-A	53			53			
A-B	114			114			
A-C	41			41			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	32	331	0.098	32	0.1	12.055	B
B-A	408	564	0.723	404	2.4	21.923	C
C-AB	14	648	0.022	14	0.0	5.682	A
C-A	64			64			
A-B	137			137			
A-C	49			49			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	40	151	0.262	39	0.3	31.803	D
B-A	500	555	0.901	485	6.2	44.079	E
C-AB	18	638	0.028	18	0.0	5.800	A
C-A	78			78			
A-B	167			167			
A-C	59			59			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	40	117	0.338	39	0.5	45.739	E
B-A	500	555	0.901	496	7.1	55.159	F
C-AB	18	638	0.028	18	0.0	5.800	A
C-A	78			78			
A-B	167			167			
A-C	59			59			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	32	299	0.108	34	0.1	13.636	B
B-A	408	564	0.723	425	2.8	28.395	D
C-AB	14	648	0.022	14	0.0	5.685	A
C-A	64			64			
A-B	137			137			
A-C	49			49			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	404	0.067	27	0.1	9.550	A
B-A	342	571	0.598	347	1.5	16.395	C
C-AB	12	655	0.018	12	0.0	5.599	A
C-A	53			53			
A-B	114			114			
A-C	41			41			

2028 Base + Com + Dev (500 Spaces), PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Shevington's Lane / Pingwood Lane / Stopgate Lane	T-Junction	Two-way		1.83	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D16	2028 Base + Com + Dev (500 Spaces)	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	530	100.000
B		✓	126	100.000
C		✓	100	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	449	81
	B	116	0	10
	C	69	31	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.02	7.71	0.0	A
B-A	0.25	9.39	0.3	A
C-AB	0.06	6.95	0.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	509	0.015	7	0.0	7.185	A
B-A	87	543	0.161	87	0.2	7.883	A
C-AB	23	595	0.039	23	0.0	6.290	A
C-A	52			52			
A-B	338			338			
A-C	61			61			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	496	0.018	9	0.0	7.394	A
B-A	104	529	0.197	104	0.2	8.461	A
C-AB	28	577	0.049	28	0.1	6.555	A
C-A	62			62			
A-B	404			404			
A-C	73			73			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	478	0.023	11	0.0	7.712	A
B-A	128	511	0.250	127	0.3	9.373	A
C-AB	34	552	0.062	34	0.1	6.951	A
C-A	76			76			
A-B	494			494			
A-C	89			89			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	11	478	0.023	11	0.0	7.714	A
B-A	128	511	0.250	128	0.3	9.390	A
C-AB	34	552	0.062	34	0.1	6.954	A
C-A	76			76			
A-B	494			494			
A-C	89			89			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	9	496	0.018	9	0.0	7.400	A
B-A	104	529	0.197	105	0.2	8.483	A
C-AB	28	577	0.049	28	0.1	6.559	A
C-A	62			62			
A-B	404			404			
A-C	73			73			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	508	0.015	8	0.0	7.189	A
B-A	87	542	0.161	88	0.2	7.918	A
C-AB	23	595	0.039	23	0.0	6.296	A
C-A	52			52			
A-B	338			338			
A-C	61			61			

Junctions 9

PICADY 9 - Priority Intersection Module

Version: 9.5.1.7462
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Filename: Headbolt Lane_Pingwood Lane_Dale Lane.j9
Path: C:\Users\rachel.cornfoot\Arup\HBL New Station - Project Files\01 Engineering\04 Internal Project Data\Transport Planning\Junction Models
Report generation date: 14/05/2021 15:42:02

»2021 Base, AM
»2021 Base, PM
»2023 Base, AM
»2023 Base, PM
»2028 Base, AM
»2028 Base, PM
»2023 Base + Com, AM
»2023 Base + Com, PM
»2028 Base + Com, AM
»2028 Base + Com, PM
»2023 Base + Com + Dev, AM
»2023 Base + Com + Dev, PM
»2028 Base + Com + Dev, AM
»2028 Base + Com + Dev, PM
»2028 Base + Com + Dev (500 Spaces), AM
»2028 Base + Com + Dev (500 Spaces), PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2021 Base									
Stream B-C	D1	0.2	5.90	0.14	A	D2	0.3	7.51	0.25	A
Stream B-A		0.2	9.68	0.14	A		0.1	9.13	0.06	A
Stream C-AB		1.1	8.42	0.46	A		0.4	7.86	0.26	A
	2023 Base									
Stream B-C	D3	0.2	5.94	0.15	A	D4	0.3	7.61	0.26	A
Stream B-A		0.2	9.80	0.15	A		0.1	9.25	0.07	A
Stream C-AB		1.2	8.56	0.47	A		0.4	7.95	0.27	A
	2028 Base									
Stream B-C	D5	0.2	6.02	0.15	A	D6	0.4	7.80	0.27	A
Stream B-A		0.2	10.09	0.16	B		0.1	9.45	0.07	A
Stream C-AB		1.3	8.90	0.50	A		0.5	8.09	0.28	A
	2023 Base + Com									
Stream B-C	D7	0.2	5.94	0.15	A	D8	0.3	7.61	0.26	A
Stream B-A		0.2	9.80	0.15	A		0.1	9.25	0.07	A
Stream C-AB		1.2	8.56	0.47	A		0.4	7.95	0.27	A
	2028 Base + Com									
Stream B-C	D9	0.2	6.02	0.15	A	D10	0.4	7.80	0.27	A
Stream B-A		0.2	10.09	0.16	B		0.1	9.45	0.07	A
Stream C-AB		1.3	8.90	0.50	A		0.5	8.09	0.28	A
	2023 Base + Com + Dev									
Stream B-C	D11	0.2	6.00	0.15	A	D12	0.4	7.82	0.28	A
Stream B-A		0.2	9.98	0.15	A		0.1	9.42	0.08	A
Stream C-AB		1.2	8.91	0.49	A		0.5	8.08	0.28	A
	2028 Base + Com + Dev									
Stream B-C	D13	0.2	6.07	0.16	A	D14	0.4	8.03	0.29	A
Stream B-A		0.2	10.25	0.16	B		0.1	9.65	0.08	A
Stream C-AB		1.4	9.29	0.52	A		0.5	8.26	0.29	A
	2028 Base + Com + Dev (500 Spaces)									
Stream B-C	D15	0.2	6.15	0.17	A	D16	0.5	8.43	0.32	A
Stream B-A		0.2	10.52	0.17	B		0.1	9.96	0.10	A
Stream C-AB		1.6	9.96	0.55	A		0.5	8.50	0.31	A

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

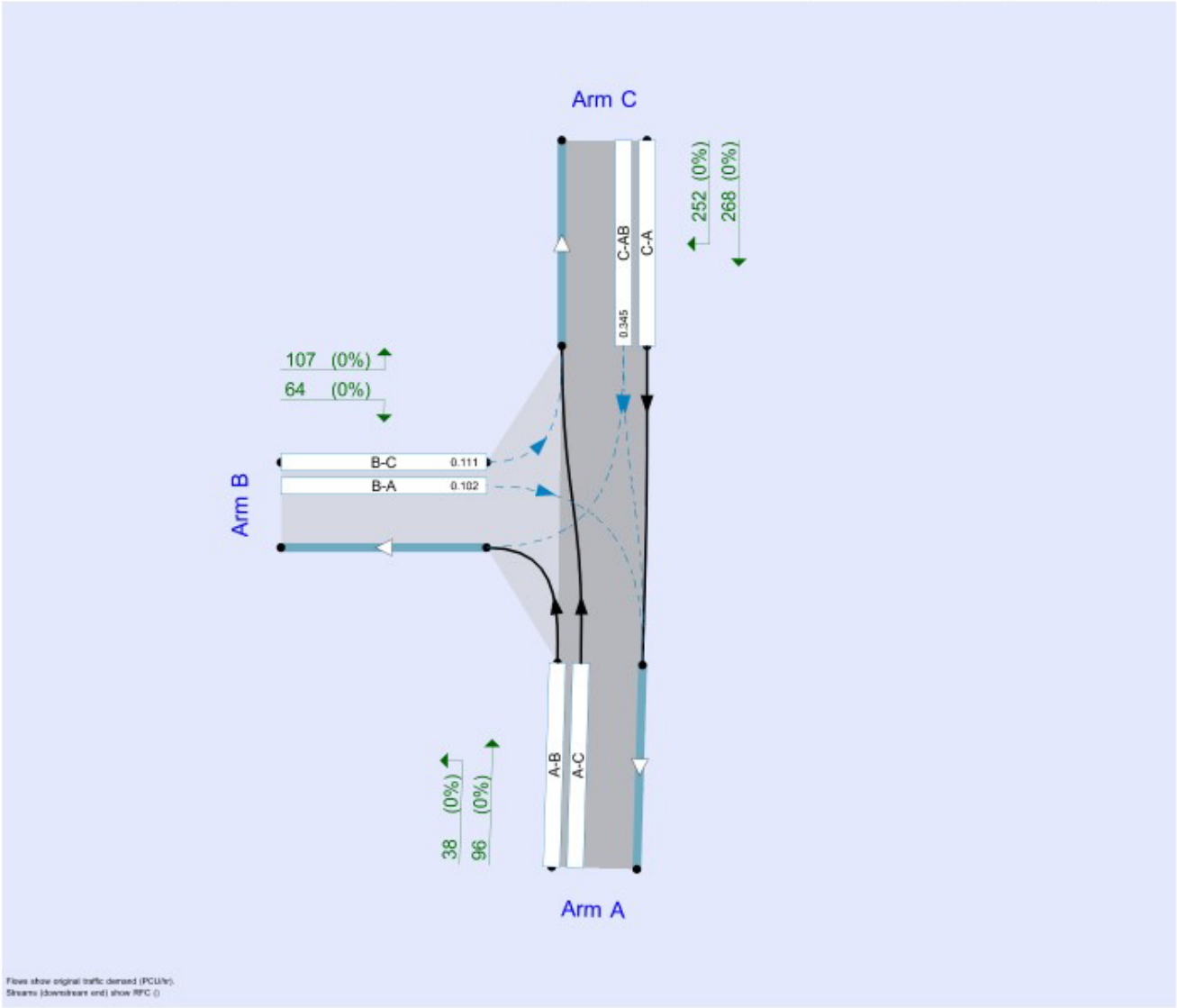
File summary

File Description

Title	
Location	
Site number	
Date	18/03/2021
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	GLOBAL\Rachel.Cornfoot
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Base	AM	ONE HOUR	07:30	09:00	15
D2	2021 Base	PM	ONE HOUR	16:00	17:30	15
D3	2023 Base	AM	ONE HOUR	07:30	09:00	15
D4	2023 Base	PM	ONE HOUR	16:00	17:30	15
D5	2028 Base	AM	ONE HOUR	07:30	09:00	15
D6	2028 Base	PM	ONE HOUR	16:00	17:30	15
D7	2023 Base + Com	AM	ONE HOUR	07:30	09:00	15
D8	2023 Base + Com	PM	ONE HOUR	16:00	17:30	15
D9	2028 Base + Com	AM	ONE HOUR	07:30	09:00	15
D10	2028 Base + Com	PM	ONE HOUR	16:00	17:30	15
D11	2023 Base + Com + Dev	AM	ONE HOUR	07:30	09:00	15
D12	2023 Base + Com + Dev	PM	ONE HOUR	16:00	17:30	15
D13	2028 Base + Com + Dev	AM	ONE HOUR	07:30	09:00	15
D14	2028 Base + Com + Dev	PM	ONE HOUR	16:00	17:30	15
D15	2028 Base + Com + Dev (500 Spaces)	AM	ONE HOUR	07:30	09:00	15
D16	2028 Base + Com + Dev (500 Spaces)	PM	ONE HOUR	16:00	17:30	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2021 Base, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		5.08	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	Dale Lane	Dale Lane	Major
B	Headbolt Lane	Headbolt Lane	Minor
C	Pingwood Lane	Pingwood Lane	Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	6.75			120.0	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B	One lane plus flare	10.00	10.00	8.40	4.30	3.50	✓	2.00	50	67

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	604	0.106	0.269	0.169	0.385
B-C	770	0.114	0.289	-	-
C-B	643	0.241	0.241	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2021 Base	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	117	100.000
B		✓	149	100.000
C		✓	468	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	27	90
	B	57	0	92
	C	252	216	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.14	5.90	0.2	A
B-A	0.14	9.68	0.2	A
C-AB	0.46	8.42	1.1	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	69	732	0.095	69	0.1	5.426	A
B-A	43	489	0.088	43	0.1	8.052	A
C-AB	218	746	0.292	216	0.5	6.773	A
C-A	134			134			
A-B	20			20			
A-C	68			68			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	83	723	0.114	83	0.1	5.618	A
B-A	51	466	0.110	51	0.1	8.671	A
C-AB	276	767	0.360	275	0.7	7.326	A
C-A	144			144			
A-B	24			24			
A-C	81			81			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	101	711	0.142	101	0.2	5.900	A
B-A	63	435	0.144	63	0.2	9.661	A
C-AB	366	796	0.460	365	1.1	8.357	A
C-A	149			149			
A-B	30			30			
A-C	99			99			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	101	711	0.142	101	0.2	5.904	A
B-A	63	435	0.144	63	0.2	9.681	A
C-AB	367	796	0.461	367	1.1	8.416	A
C-A	148			148			
A-B	30			30			
A-C	99			99			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	83	723	0.114	83	0.1	5.622	A
B-A	51	466	0.110	51	0.1	8.697	A
C-AB	277	768	0.361	278	0.7	7.397	A
C-A	144			144			
A-B	24			24			
A-C	81			81			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	69	732	0.095	69	0.1	5.436	A
B-A	43	488	0.088	43	0.1	8.087	A
C-AB	219	747	0.293	220	0.5	6.850	A
C-A	134			134			
A-B	20			20			
A-C	68			68			

2021 Base, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		2.95	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2021 Base	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	422	100.000
B		✓	170	100.000
C		✓	228	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	75	347
	B	24	0	146
	C	112	116	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.25	7.51	0.3	A
B-A	0.06	9.13	0.1	A
C-AB	0.26	7.86	0.4	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	110	682	0.161	109	0.2	6.279	A
B-A	18	480	0.038	18	0.0	7.789	A
C-AB	101	625	0.162	100	0.2	6.855	A
C-A	71			71			
A-B	56			56			
A-C	261			261			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	131	664	0.198	131	0.2	6.746	A
B-A	22	455	0.047	22	0.0	8.300	A
C-AB	125	622	0.200	124	0.3	7.235	A
C-A	80			80			
A-B	67			67			
A-C	312			312			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	161	640	0.251	160	0.3	7.499	A
B-A	26	421	0.063	26	0.1	9.121	A
C-AB	160	618	0.258	159	0.4	7.841	A
C-A	91			91			
A-B	83			83			
A-C	382			382			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	161	640	0.251	161	0.3	7.508	A
B-A	26	421	0.063	26	0.1	9.127	A
C-AB	160	619	0.258	160	0.4	7.858	A
C-A	91			91			
A-B	83			83			
A-C	382			382			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	131	664	0.198	132	0.2	6.761	A
B-A	22	455	0.047	22	0.1	8.309	A
C-AB	125	622	0.200	125	0.3	7.256	A
C-A	80			80			
A-B	67			67			
A-C	312			312			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	110	682	0.161	110	0.2	6.302	A
B-A	18	479	0.038	18	0.0	7.804	A
C-AB	101	625	0.162	101	0.2	6.885	A
C-A	71			71			
A-B	56			56			
A-C	261			261			

2023 Base, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		5.17	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2023 Base	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	120	100.000
B		✓	152	100.000
C		✓	477	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	28	92
	B	58	0	94
	C	257	220	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.15	5.94	0.2	A
B-A	0.15	9.80	0.2	A
C-AB	0.47	8.56	1.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	71	731	0.097	70	0.1	5.446	A
B-A	44	487	0.090	43	0.1	8.107	A
C-AB	223	748	0.299	221	0.5	6.814	A
C-A	136			136			
A-B	21			21			
A-C	69			69			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	85	722	0.117	84	0.1	5.644	A
B-A	52	463	0.113	52	0.1	8.747	A
C-AB	283	770	0.368	283	0.7	7.397	A
C-A	145			145			
A-B	25			25			
A-C	83			83			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	103	710	0.146	103	0.2	5.936	A
B-A	64	432	0.148	64	0.2	9.777	A
C-AB	376	799	0.471	375	1.1	8.495	A
C-A	149			149			
A-B	31			31			
A-C	101			101			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	103	710	0.146	103	0.2	5.939	A
B-A	64	431	0.148	64	0.2	9.799	A
C-AB	377	799	0.472	377	1.2	8.558	A
C-A	148			148			
A-B	31			31			
A-C	101			101			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	85	722	0.117	85	0.1	5.650	A
B-A	52	463	0.113	52	0.1	8.776	A
C-AB	284	770	0.369	286	0.8	7.471	A
C-A	145			145			
A-B	25			25			
A-C	83			83			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	71	731	0.097	71	0.1	5.456	A
B-A	44	486	0.090	44	0.1	8.143	A
C-AB	224	749	0.299	225	0.5	6.893	A
C-A	135			135			
A-B	21			21			
A-C	69			69			

2023 Base, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		3.00	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2023 Base	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	430	100.000
B		✓	174	100.000
C		✓	233	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	76	354
	B	25	0	149
	C	114	119	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.26	7.61	0.3	A
B-A	0.07	9.25	0.1	A
C-AB	0.27	7.95	0.4	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	112	680	0.165	111	0.2	6.325	A
B-A	19	477	0.039	19	0.0	7.847	A
C-AB	104	624	0.166	103	0.2	6.898	A
C-A	72			72			
A-B	57			57			
A-C	267			267			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	134	662	0.202	134	0.3	6.810	A
B-A	22	452	0.050	22	0.1	8.379	A
C-AB	128	621	0.206	128	0.3	7.295	A
C-A	81			81			
A-B	68			68			
A-C	318			318			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	164	637	0.257	164	0.3	7.589	A
B-A	28	417	0.066	27	0.1	9.241	A
C-AB	165	618	0.266	164	0.4	7.932	A
C-A	92			92			
A-B	84			84			
A-C	390			390			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	164	637	0.257	164	0.3	7.606	A
B-A	28	417	0.066	28	0.1	9.246	A
C-AB	165	618	0.267	165	0.4	7.949	A
C-A	92			92			
A-B	84			84			
A-C	390			390			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	134	662	0.202	134	0.3	6.825	A
B-A	22	452	0.050	23	0.1	8.390	A
C-AB	128	622	0.207	129	0.3	7.320	A
C-A	81			81			
A-B	68			68			
A-C	318			318			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	112	680	0.165	112	0.2	6.348	A
B-A	19	477	0.039	19	0.0	7.862	A
C-AB	104	624	0.167	104	0.2	6.931	A
C-A	71			71			
A-B	57			57			
A-C	267			267			

2028 Base, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		5.42	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2028 Base	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	125	100.000
B		✓	159	100.000
C		✓	497	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	29	96
	B	61	0	98
	C	268	229	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.15	6.02	0.2	A
B-A	0.16	10.09	0.2	B
C-AB	0.50	8.90	1.3	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	74	729	0.101	73	0.1	5.487	A
B-A	46	482	0.095	46	0.1	8.239	A
C-AB	236	753	0.313	233	0.6	6.910	A
C-A	139			139			
A-B	22			22			
A-C	72			72			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	88	720	0.122	88	0.1	5.698	A
B-A	55	458	0.120	55	0.1	8.933	A
C-AB	300	775	0.386	299	0.8	7.562	A
C-A	147			147			
A-B	26			26			
A-C	86			86			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	108	706	0.153	108	0.2	6.013	A
B-A	67	424	0.158	67	0.2	10.068	B
C-AB	399	806	0.495	397	1.3	8.821	A
C-A	148			148			
A-B	32			32			
A-C	106			106			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	108	706	0.153	108	0.2	6.016	A
B-A	67	424	0.158	67	0.2	10.092	B
C-AB	400	807	0.496	400	1.3	8.901	A
C-A	147			147			
A-B	32			32			
A-C	106			106			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	88	720	0.122	88	0.1	5.705	A
B-A	55	457	0.120	55	0.1	8.965	A
C-AB	300	776	0.387	302	0.8	7.648	A
C-A	146			146			
A-B	26			26			
A-C	86			86			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	74	729	0.101	74	0.1	5.500	A
B-A	46	481	0.095	46	0.1	8.279	A
C-AB	236	754	0.314	237	0.6	6.998	A
C-A	138			138			
A-B	22			22			
A-C	72			72			

2028 Base, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		3.07	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2028 Base	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	447	100.000
B		✓	181	100.000
C		✓	242	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	79	368
	B	26	0	155
	C	119	123	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.27	7.80	0.4	A
B-A	0.07	9.45	0.1	A
C-AB	0.28	8.09	0.5	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	117	676	0.173	116	0.2	6.414	A
B-A	20	472	0.041	19	0.0	7.946	A
C-AB	108	624	0.173	107	0.2	6.957	A
C-A	74			74			
A-B	59			59			
A-C	277			277			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	139	658	0.212	139	0.3	6.938	A
B-A	23	446	0.052	23	0.1	8.515	A
C-AB	134	621	0.215	133	0.3	7.382	A
C-A	84			84			
A-B	71			71			
A-C	331			331			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	171	632	0.270	170	0.4	7.791	A
B-A	29	410	0.070	29	0.1	9.445	A
C-AB	172	618	0.279	172	0.5	8.069	A
C-A	94			94			
A-B	87			87			
A-C	405			405			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	171	632	0.270	171	0.4	7.804	A
B-A	29	409	0.070	29	0.1	9.454	A
C-AB	172	618	0.279	172	0.5	8.089	A
C-A	94			94			
A-B	87			87			
A-C	405			405			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	139	658	0.212	140	0.3	6.954	A
B-A	23	446	0.052	23	0.1	8.527	A
C-AB	134	621	0.216	134	0.3	7.407	A
C-A	84			84			
A-B	71			71			
A-C	331			331			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	117	676	0.173	117	0.2	6.441	A
B-A	20	472	0.041	20	0.0	7.962	A
C-AB	108	624	0.174	109	0.2	6.994	A
C-A	74			74			
A-B	59			59			
A-C	277			277			

2023 Base + Com, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		5.17	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2023 Base + Com	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	120	100.000
B		✓	152	100.000
C		✓	477	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	28	92
	B	58	0	94
	C	257	220	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.15	5.94	0.2	A
B-A	0.15	9.80	0.2	A
C-AB	0.47	8.56	1.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	71	731	0.097	70	0.1	5.446	A
B-A	44	487	0.090	43	0.1	8.107	A
C-AB	223	748	0.299	221	0.5	6.814	A
C-A	136			136			
A-B	21			21			
A-C	69			69			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	85	722	0.117	84	0.1	5.644	A
B-A	52	463	0.113	52	0.1	8.747	A
C-AB	283	770	0.368	283	0.7	7.397	A
C-A	145			145			
A-B	25			25			
A-C	83			83			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	103	710	0.146	103	0.2	5.936	A
B-A	64	432	0.148	64	0.2	9.777	A
C-AB	376	799	0.471	375	1.1	8.495	A
C-A	149			149			
A-B	31			31			
A-C	101			101			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	103	710	0.146	103	0.2	5.939	A
B-A	64	431	0.148	64	0.2	9.799	A
C-AB	377	799	0.472	377	1.2	8.558	A
C-A	148			148			
A-B	31			31			
A-C	101			101			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	85	722	0.117	85	0.1	5.650	A
B-A	52	463	0.113	52	0.1	8.776	A
C-AB	284	770	0.369	286	0.8	7.471	A
C-A	145			145			
A-B	25			25			
A-C	83			83			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	71	731	0.097	71	0.1	5.456	A
B-A	44	486	0.090	44	0.1	8.143	A
C-AB	224	749	0.299	225	0.5	6.893	A
C-A	135			135			
A-B	21			21			
A-C	69			69			

2023 Base + Com, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		3.00	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2023 Base + Com	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	430	100.000
B		✓	174	100.000
C		✓	233	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	76	354
	B	25	0	149
	C	114	119	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.26	7.61	0.3	A
B-A	0.07	9.25	0.1	A
C-AB	0.27	7.95	0.4	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	112	680	0.165	111	0.2	6.325	A
B-A	19	477	0.039	19	0.0	7.847	A
C-AB	104	624	0.166	103	0.2	6.898	A
C-A	72			72			
A-B	57			57			
A-C	267			267			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	134	662	0.202	134	0.3	6.810	A
B-A	22	452	0.050	22	0.1	8.379	A
C-AB	128	621	0.206	128	0.3	7.295	A
C-A	81			81			
A-B	68			68			
A-C	318			318			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	164	637	0.257	164	0.3	7.589	A
B-A	28	417	0.066	27	0.1	9.241	A
C-AB	165	618	0.266	164	0.4	7.932	A
C-A	92			92			
A-B	84			84			
A-C	390			390			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	164	637	0.257	164	0.3	7.606	A
B-A	28	417	0.066	28	0.1	9.246	A
C-AB	165	618	0.267	165	0.4	7.949	A
C-A	92			92			
A-B	84			84			
A-C	390			390			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	134	662	0.202	134	0.3	6.825	A
B-A	22	452	0.050	23	0.1	8.390	A
C-AB	128	622	0.207	129	0.3	7.320	A
C-A	81			81			
A-B	68			68			
A-C	318			318			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	112	680	0.165	112	0.2	6.348	A
B-A	19	477	0.039	19	0.0	7.862	A
C-AB	104	624	0.167	104	0.2	6.931	A
C-A	71			71			
A-B	57			57			
A-C	267			267			

2028 Base + Com, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		5.42	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2028 Base + Com	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	125	100.000
B		✓	159	100.000
C		✓	497	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	29	96
	B	61	0	98
	C	268	229	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.15	6.02	0.2	A
B-A	0.16	10.09	0.2	B
C-AB	0.50	8.90	1.3	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	74	729	0.101	73	0.1	5.487	A
B-A	46	482	0.095	46	0.1	8.239	A
C-AB	236	753	0.313	233	0.6	6.910	A
C-A	139			139			
A-B	22			22			
A-C	72			72			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	88	720	0.122	88	0.1	5.698	A
B-A	55	458	0.120	55	0.1	8.933	A
C-AB	300	775	0.386	299	0.8	7.562	A
C-A	147			147			
A-B	26			26			
A-C	86			86			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	108	706	0.153	108	0.2	6.013	A
B-A	67	424	0.158	67	0.2	10.068	B
C-AB	399	806	0.495	397	1.3	8.821	A
C-A	148			148			
A-B	32			32			
A-C	106			106			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	108	706	0.153	108	0.2	6.016	A
B-A	67	424	0.158	67	0.2	10.092	B
C-AB	400	807	0.496	400	1.3	8.901	A
C-A	147			147			
A-B	32			32			
A-C	106			106			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	88	720	0.122	88	0.1	5.705	A
B-A	55	457	0.120	55	0.1	8.965	A
C-AB	300	776	0.387	302	0.8	7.648	A
C-A	146			146			
A-B	26			26			
A-C	86			86			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	74	729	0.101	74	0.1	5.500	A
B-A	46	481	0.095	46	0.1	8.279	A
C-AB	236	754	0.314	237	0.6	6.998	A
C-A	138			138			
A-B	22			22			
A-C	72			72			

2028 Base + Com, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		3.07	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2028 Base + Com	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	447	100.000
B		✓	181	100.000
C		✓	242	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	79	368
	B	26	0	155
	C	119	123	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.27	7.80	0.4	A
B-A	0.07	9.45	0.1	A
C-AB	0.28	8.09	0.5	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	117	676	0.173	116	0.2	6.414	A
B-A	20	472	0.041	19	0.0	7.946	A
C-AB	108	624	0.173	107	0.2	6.957	A
C-A	74			74			
A-B	59			59			
A-C	277			277			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	139	658	0.212	139	0.3	6.938	A
B-A	23	446	0.052	23	0.1	8.515	A
C-AB	134	621	0.215	133	0.3	7.382	A
C-A	84			84			
A-B	71			71			
A-C	331			331			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	171	632	0.270	170	0.4	7.791	A
B-A	29	410	0.070	29	0.1	9.445	A
C-AB	172	618	0.279	172	0.5	8.069	A
C-A	94			94			
A-B	87			87			
A-C	405			405			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	171	632	0.270	171	0.4	7.804	A
B-A	29	409	0.070	29	0.1	9.454	A
C-AB	172	618	0.279	172	0.5	8.089	A
C-A	94			94			
A-B	87			87			
A-C	405			405			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	139	658	0.212	140	0.3	6.954	A
B-A	23	446	0.052	23	0.1	8.527	A
C-AB	134	621	0.216	134	0.3	7.407	A
C-A	84			84			
A-B	71			71			
A-C	331			331			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	117	676	0.173	117	0.2	6.441	A
B-A	20	472	0.041	20	0.0	7.962	A
C-AB	108	624	0.174	109	0.2	6.994	A
C-A	74			74			
A-B	59			59			
A-C	277			277			

2023 Base + Com + Dev, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		5.43	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D11	2023 Base + Com + Dev	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	124	100.000
B		✓	158	100.000
C		✓	486	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	32	92
	B	60	0	98
	C	257	229	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.15	6.00	0.2	A
B-A	0.15	9.98	0.2	A
C-AB	0.49	8.91	1.2	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	74	730	0.101	73	0.1	5.479	A
B-A	45	484	0.093	45	0.1	8.187	A
C-AB	233	748	0.311	230	0.6	6.941	A
C-A	133			133			
A-B	24			24			
A-C	69			69			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	88	721	0.122	88	0.1	5.688	A
B-A	54	460	0.117	54	0.1	8.861	A
C-AB	295	769	0.384	294	0.8	7.592	A
C-A	142			142			
A-B	29			29			
A-C	83			83			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	108	708	0.152	108	0.2	5.997	A
B-A	66	427	0.155	66	0.2	9.955	A
C-AB	392	798	0.491	390	1.2	8.833	A
C-A	143			143			
A-B	35			35			
A-C	101			101			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	108	708	0.152	108	0.2	6.000	A
B-A	66	427	0.155	66	0.2	9.979	A
C-AB	393	799	0.492	393	1.2	8.913	A
C-A	142			142			
A-B	35			35			
A-C	101			101			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	88	721	0.122	88	0.1	5.692	A
B-A	54	459	0.117	54	0.1	8.892	A
C-AB	298	770	0.384	298	0.8	7.678	A
C-A	141			141			
A-B	29			29			
A-C	83			83			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	74	730	0.101	74	0.1	5.492	A
B-A	45	483	0.094	45	0.1	8.226	A
C-AB	233	748	0.312	234	0.6	7.031	A
C-A	132			132			
A-B	24			24			
A-C	69			69			

2023 Base + Com + Dev, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		3.18	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D12	2023 Base + Com + Dev	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	432	100.000
B		✓	188	100.000
C		✓	238	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	78	354
	B	29	0	159
	C	114	124	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.28	7.82	0.4	A
B-A	0.08	9.42	0.1	A
C-AB	0.28	8.08	0.5	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	120	679	0.176	119	0.2	6.422	A
B-A	22	476	0.046	22	0.0	7.927	A
C-AB	108	624	0.173	107	0.2	6.958	A
C-A	71			71			
A-B	59			59			
A-C	267			267			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	143	660	0.216	143	0.3	6.949	A
B-A	26	450	0.058	26	0.1	8.492	A
C-AB	134	621	0.215	133	0.3	7.382	A
C-A	80			80			
A-B	70			70			
A-C	318			318			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	175	635	0.276	175	0.4	7.808	A
B-A	32	414	0.077	32	0.1	9.412	A
C-AB	172	618	0.278	171	0.5	8.063	A
C-A	90			90			
A-B	86			86			
A-C	390			390			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	175	635	0.276	175	0.4	7.823	A
B-A	32	414	0.077	32	0.1	9.421	A
C-AB	172	618	0.278	172	0.5	8.082	A
C-A	90			90			
A-B	86			86			
A-C	390			390			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	143	660	0.216	143	0.3	6.966	A
B-A	26	450	0.058	26	0.1	8.503	A
C-AB	134	621	0.215	134	0.3	7.406	A
C-A	80			80			
A-B	70			70			
A-C	318			318			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	120	679	0.176	120	0.2	6.447	A
B-A	22	475	0.046	22	0.0	7.943	A
C-AB	108	624	0.174	109	0.2	6.995	A
C-A	71			71			
A-B	59			59			
A-C	267			267			

2028 Base + Com + Dev, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		5.68	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D13	2028 Base + Com + Dev	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	129	100.000
B		✓	164	100.000
C		✓	506	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	33	96
	B	62	0	102
	C	268	238	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.16	6.07	0.2	A
B-A	0.16	10.25	0.2	B
C-AB	0.52	9.29	1.4	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	77	728	0.105	76	0.1	5.519	A
B-A	47	479	0.097	46	0.1	8.310	A
C-AB	245	752	0.325	242	0.6	7.043	A
C-A	136			136			
A-B	25			25			
A-C	72			72			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	92	719	0.128	92	0.1	5.740	A
B-A	56	454	0.123	56	0.1	9.032	A
C-AB	311	774	0.402	310	0.8	7.766	A
C-A	143			143			
A-B	30			30			
A-C	86			86			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	112	705	0.159	112	0.2	6.071	A
B-A	68	420	0.163	68	0.2	10.221	B
C-AB	415	805	0.516	413	1.4	9.195	A
C-A	142			142			
A-B	36			36			
A-C	106			106			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	112	705	0.159	112	0.2	6.074	A
B-A	68	419	0.163	68	0.2	10.251	B
C-AB	416	806	0.516	416	1.4	9.293	A
C-A	141			141			
A-B	36			36			
A-C	106			106			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	92	719	0.128	92	0.1	5.745	A
B-A	56	453	0.123	56	0.1	9.068	A
C-AB	312	775	0.403	314	0.9	7.868	A
C-A	143			143			
A-B	30			30			
A-C	86			86			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	77	728	0.105	77	0.1	5.529	A
B-A	47	478	0.098	47	0.1	8.350	A
C-AB	246	753	0.326	247	0.6	7.139	A
C-A	135			135			
A-B	25			25			
A-C	72			72			

2028 Base + Com + Dev, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		3.27	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D14	2028 Base + Com + Dev	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	449	100.000
B		✓	195	100.000
C		✓	248	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	81	368
	B	30	0	165
	C	119	129	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.29	8.03	0.4	A
B-A	0.08	9.65	0.1	A
C-AB	0.29	8.26	0.5	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	124	675	0.184	123	0.2	6.514	A
B-A	23	470	0.048	22	0.0	8.033	A
C-AB	113	624	0.182	112	0.3	7.033	A
C-A	73			73			
A-B	61			61			
A-C	277			277			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	148	656	0.226	148	0.3	7.082	A
B-A	27	444	0.061	27	0.1	8.639	A
C-AB	140	621	0.226	140	0.3	7.489	A
C-A	83			83			
A-B	73			73			
A-C	331			331			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	182	630	0.288	181	0.4	8.016	A
B-A	33	406	0.081	33	0.1	9.640	A
C-AB	181	617	0.293	180	0.5	8.234	A
C-A	92			92			
A-B	89			89			
A-C	405			405			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	182	630	0.288	182	0.4	8.033	A
B-A	33	406	0.081	33	0.1	9.649	A
C-AB	181	617	0.293	181	0.5	8.257	A
C-A	92			92			
A-B	89			89			
A-C	405			405			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	148	656	0.226	149	0.3	7.104	A
B-A	27	443	0.061	27	0.1	8.651	A
C-AB	140	621	0.226	141	0.3	7.516	A
C-A	82			82			
A-B	73			73			
A-C	331			331			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	124	675	0.184	124	0.2	6.543	A
B-A	23	470	0.048	23	0.1	8.052	A
C-AB	114	624	0.182	114	0.3	7.069	A
C-A	73			73			
A-B	61			61			
A-C	277			277			

2028 Base + Com + Dev (500 Spaces), AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		6.14	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D15	2028 Base + Com + Dev (500 Spaces)	AM	ONE HOUR	07:30	09:00	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	134	100.000
B		✓	171	100.000
C		✓	520	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	38	96
	B	64	0	107
	C	268	252	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.17	6.15	0.2	A
B-A	0.17	10.52	0.2	B
C-AB	0.55	9.96	1.6	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	81	727	0.111	80	0.1	5.561	A
B-A	48	475	0.102	48	0.1	8.423	A
C-AB	259	751	0.345	257	0.6	7.254	A
C-A	132			132			
A-B	29			29			
A-C	72			72			

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	96	717	0.134	96	0.2	5.793	A
B-A	58	449	0.128	57	0.1	9.199	A
C-AB	330	774	0.427	329	0.9	8.103	A
C-A	137			137			
A-B	34			34			
A-C	86			86			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	118	703	0.168	118	0.2	6.150	A
B-A	70	413	0.170	70	0.2	10.485	B
C-AB	440	804	0.547	438	1.5	9.836	A
C-A	132			132			
A-B	42			42			
A-C	106			106			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	118	703	0.168	118	0.2	6.154	A
B-A	70	413	0.171	70	0.2	10.519	B
C-AB	441	805	0.548	441	1.6	9.963	A
C-A	131			131			
A-B	42			42			
A-C	106			106			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	96	717	0.134	96	0.2	5.801	A
B-A	58	448	0.129	58	0.1	9.241	A
C-AB	331	775	0.427	333	1.0	8.232	A
C-A	136			136			
A-B	34			34			
A-C	86			86			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	81	727	0.111	81	0.1	5.574	A
B-A	48	473	0.102	48	0.1	8.470	A
C-AB	260	752	0.346	262	0.7	7.371	A
C-A	131			131			
A-B	29			29			
A-C	72			72			

2028 Base + Com + Dev (500 Spaces), PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	Headbolt Lane / Pingwood Lane / Dale Lane	T-Junction	Two-way		3.57	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D16	2028 Base + Com + Dev (500 Spaces)	PM	ONE HOUR	16:00	17:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	453	100.000
B		✓	217	100.000
C		✓	256	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	85	368
	B	36	0	181
	C	119	137	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	0
	B	0	0	0
	C	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-C	0.32	8.43	0.5	A
B-A	0.10	9.96	0.1	A
C-AB	0.31	8.50	0.5	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:00 - 16:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	136	673	0.202	135	0.3	6.683	A
B-A	27	468	0.058	27	0.1	8.165	A
C-AB	120	623	0.193	119	0.3	7.139	A
C-A	72			72			
A-B	64			64			
A-C	277			277			

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	163	654	0.249	162	0.3	7.324	A
B-A	32	440	0.074	32	0.1	8.829	A
C-AB	149	620	0.240	149	0.4	7.641	A
C-A	81			81			
A-B	76			76			
A-C	331			331			

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	199	627	0.318	199	0.5	8.406	A
B-A	40	401	0.099	40	0.1	9.944	A
C-AB	192	616	0.311	191	0.5	8.469	A
C-A	90			90			
A-B	94			94			
A-C	405			405			

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	199	626	0.318	199	0.5	8.427	A
B-A	40	401	0.099	40	0.1	9.956	A
C-AB	192	616	0.312	192	0.5	8.496	A
C-A	90			90			
A-B	94			94			
A-C	405			405			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	163	653	0.249	163	0.3	7.349	A
B-A	32	440	0.074	32	0.1	8.845	A
C-AB	149	620	0.241	150	0.4	7.671	A
C-A	81			81			
A-B	76			76			
A-C	331			331			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	136	673	0.203	137	0.3	6.716	A
B-A	27	467	0.058	27	0.1	8.186	A
C-AB	121	623	0.194	121	0.3	7.183	A
C-A	72			72			
A-B	64			64			
A-C	277			277			

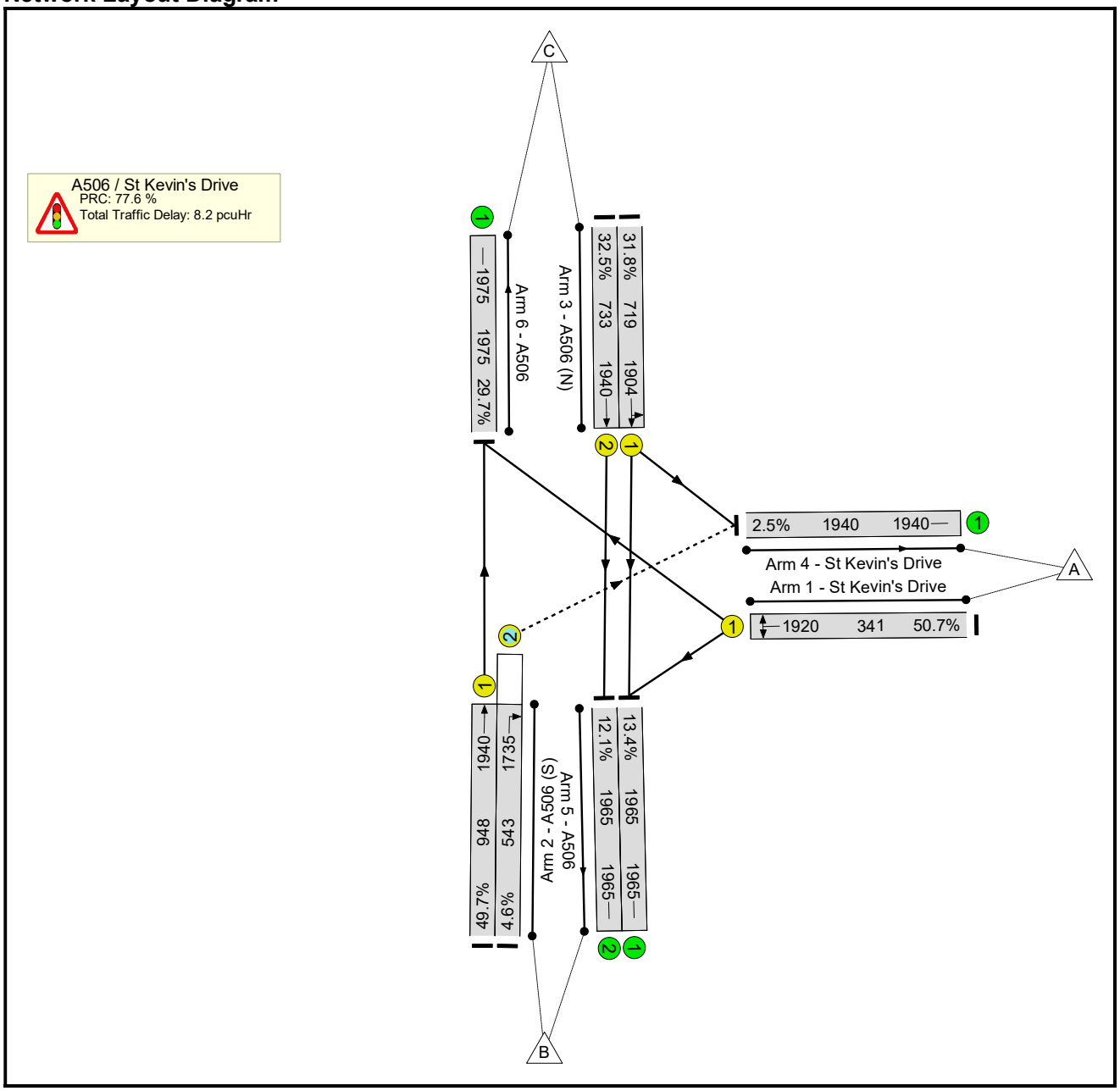
Basic Results Summary

User and Project Details

Project:	
Title:	
Location:	
File name:	St Kevins Drive.lsg3x
Author:	
Company:	
Address:	
Notes:	

Scenario 1: '2023 AM Base' (FG1: '2023 AM Base', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

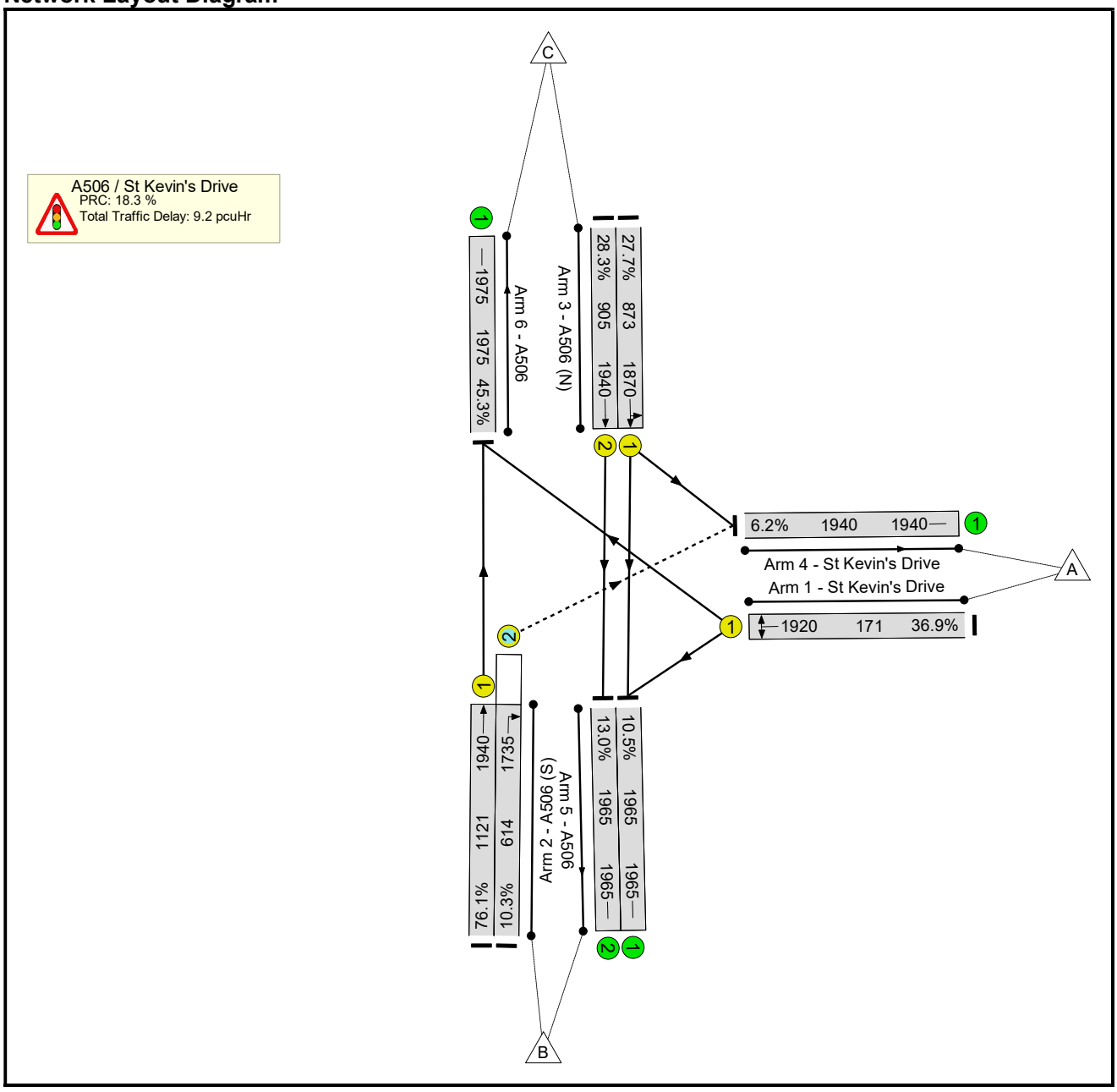
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**50.7%**	**22**	**2**	**1**	**8.2**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**50.7%**	**22**	**2**	**1**	**8.2**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	15	-	173	1920	341	50.7%	-	-	-	2.1	44.1	4.4
2/1	A506 (S) Ahead	U	A		1	43	-	471	1940	948	49.7%	-	-	-	2.5	19.3	8.3
2/2	A506 (S) Right	O	A	D	1	43	4	25	1735	543	4.6%	22	2	1	0.1	19.6	0.3
3/1	A506 (N) Left Ahead	U	B		1	33	-	229	1904	719	31.8%	-	-	-	1.5	23.5	4.2
3/2	A506 (N) Ahead	U	B		1	33	-	238	1940	733	32.5%	-	-	-	1.6	23.5	4.4
4/1	St Kevin's Drive	U	-		-	-	-	48	1940	1940	2.5%	-	-	-	0.0	1.0	0.0
5/1	A506	U	-		-	-	-	264	1965	1965	13.4%	-	-	-	0.1	1.1	0.1
5/2	A506	U	-		-	-	-	238	1965	1965	12.1%	-	-	-	0.1	1.0	0.1
6/1	A506	U	-		-	-	-	586	1975	1975	29.7%	-	-	-	0.2	1.3	0.2

C1 PRC for Signalled Lanes (%): 77.6 Total Delay for Signalled Lanes (pcuHr): 7.82 Cycle Time (s): 90
PRC Over All Lanes (%): 77.6 Total Delay Over All Lanes(pcuHr): 8.19

Basic Results Summary

Scenario 2: '2023 PM Base' (FG2: '2023 PM Base', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**76.1%**	**55**	**6**	**2**	**9.2**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**76.1%**	**55**	**6**	**2**	**9.2**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	7	-	63	1920	171	36.9%	-	-	-	1.0	55.3	1.8
2/1	A506 (S) Ahead	U	A		1	51	-	853	1940	1121	76.1%	-	-	-	5.0	21.0	17.4
2/2	A506 (S) Right	O	A	D	1	51	4	63	1735	614	10.3%	55	6	2	0.3	15.3	0.7
3/1	A506 (N) Left Ahead	U	B		1	41	-	242	1870	873	27.7%	-	-	-	1.2	17.6	3.9
3/2	A506 (N) Ahead	U	B		1	41	-	256	1940	905	28.3%	-	-	-	1.2	17.5	4.1
4/1	St Kevin's Drive	U	-		-	-	-	120	1940	1940	6.2%	-	-	-	0.0	1.0	0.0
5/1	A506	U	-		-	-	-	206	1965	1965	10.5%	-	-	-	0.1	1.0	0.1
5/2	A506	U	-		-	-	-	256	1965	1965	13.0%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	895	1975	1975	45.3%	-	-	-	0.4	1.7	0.4

C1

PRC for Signalled Lanes (%): 18.3
PRC Over All Lanes (%): 18.3

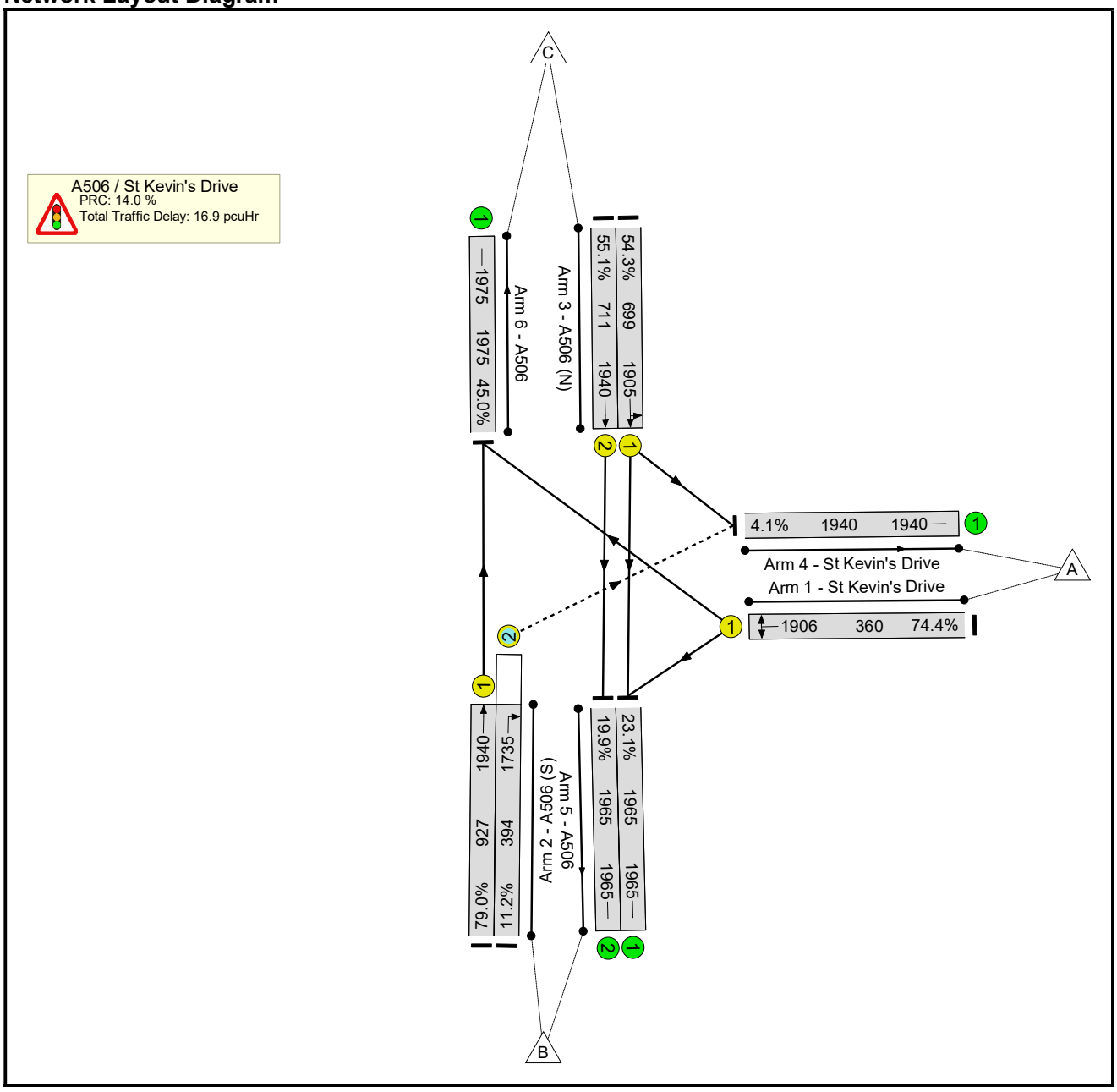
Total Delay for Signalled Lanes (pcuHr): 8.63
Total Delay Over All Lanes(pcuHr): 9.21

Cycle Time (s): 90

Basic Results Summary

Scenario 3: '2023 AM Base + Com' (FG7: '2023 AM Base + Com', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

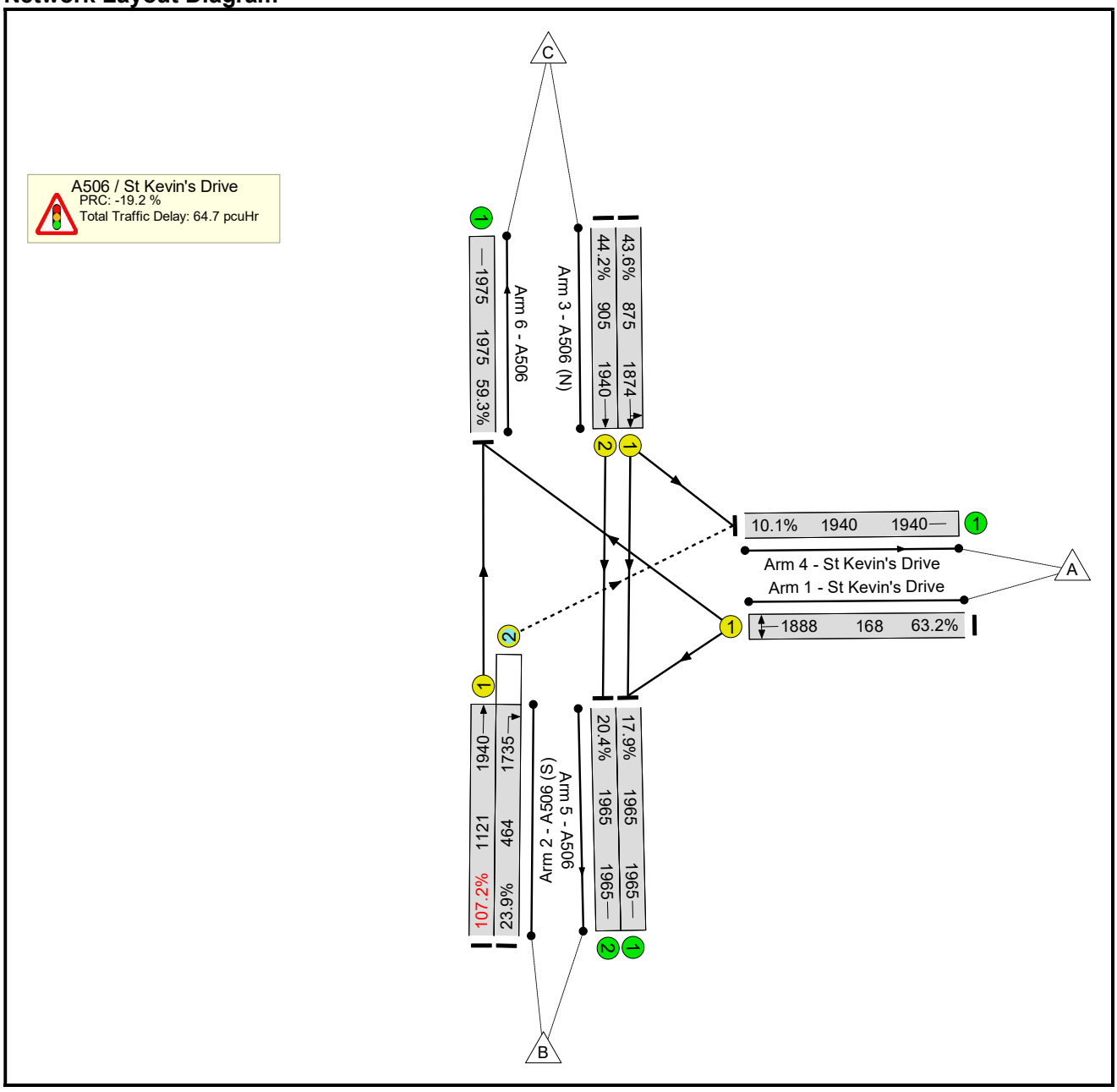
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**79.0%**	**39**	**4**	**1**	**16.9**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**79.0%**	**39**	**4**	**1**	**16.9**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	16	-	268	1906	360	74.4%	-	-	-	4.0	53.4	7.7
2/1	A506 (S) Ahead	U	A		1	42	-	732	1940	927	79.0%	-	-	-	5.9	28.8	17.1
2/2	A506 (S) Right	O	A	D	1	42	4	44	1735	394	11.2%	39	4	1	0.3	27.5	0.6
3/1	A506 (N) Left Ahead	U	B		1	32	-	379	1905	699	54.3%	-	-	-	3.0	28.1	8.1
3/2	A506 (N) Ahead	U	B		1	32	-	392	1940	711	55.1%	-	-	-	3.1	28.2	8.3
4/1	St Kevin's Drive	U	-		-	-	-	80	1940	1940	4.1%	-	-	-	0.0	1.0	0.0
5/1	A506	U	-		-	-	-	454	1965	1965	23.1%	-	-	-	0.2	1.2	0.2
5/2	A506	U	-		-	-	-	392	1965	1965	19.9%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	889	1975	1975	45.0%	-	-	-	0.4	1.7	0.4

C1 PRC for Signalled Lanes (%): 14.0 Total Delay for Signalled Lanes (pcuHr): 16.20 Cycle Time (s): 90
PRC Over All Lanes (%): 14.0 Total Delay Over All Lanes(pcuHr): 16.91

Basic Results Summary

Scenario 4: '2023 PM Base + Com' (FG8: '2023 PM Base + Com', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**107.2%**	**97**	**10**	**4**	**64.7**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**107.2%**	**97**	**10**	**4**	**64.7**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	7	-	106	1888	168	63.2%	-	-	-	2.0	67.9	3.4
2/1	A506 (S) Ahead	U	A		1	51	-	1202	1940	1121	107.2%	-	-	-	56.7	169.8	79.0
2/2	A506 (S) Right	O	A	D	1	51	4	111	1735	464	23.9%	97	10	4	0.7	22.2	1.4
3/1	A506 (N) Left Ahead	U	B		1	41	-	381	1874	875	43.6%	-	-	-	2.1	19.7	6.7
3/2	A506 (N) Ahead	U	B		1	41	-	400	1940	905	44.2%	-	-	-	2.2	19.7	7.1
4/1	St Kevin's Drive	U	-		-	-	-	195	1940	1940	10.1%	-	-	-	0.1	1.0	0.1
5/1	A506	U	-		-	-	-	352	1965	1965	17.9%	-	-	-	0.1	1.1	0.1
5/2	A506	U	-		-	-	-	400	1965	1965	20.4%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	1253	1975	1975	59.3%	-	-	-	0.7	2.2	0.7

C1

PRC for Signalled Lanes (%): -19.2
PRC Over All Lanes (%): -19.2

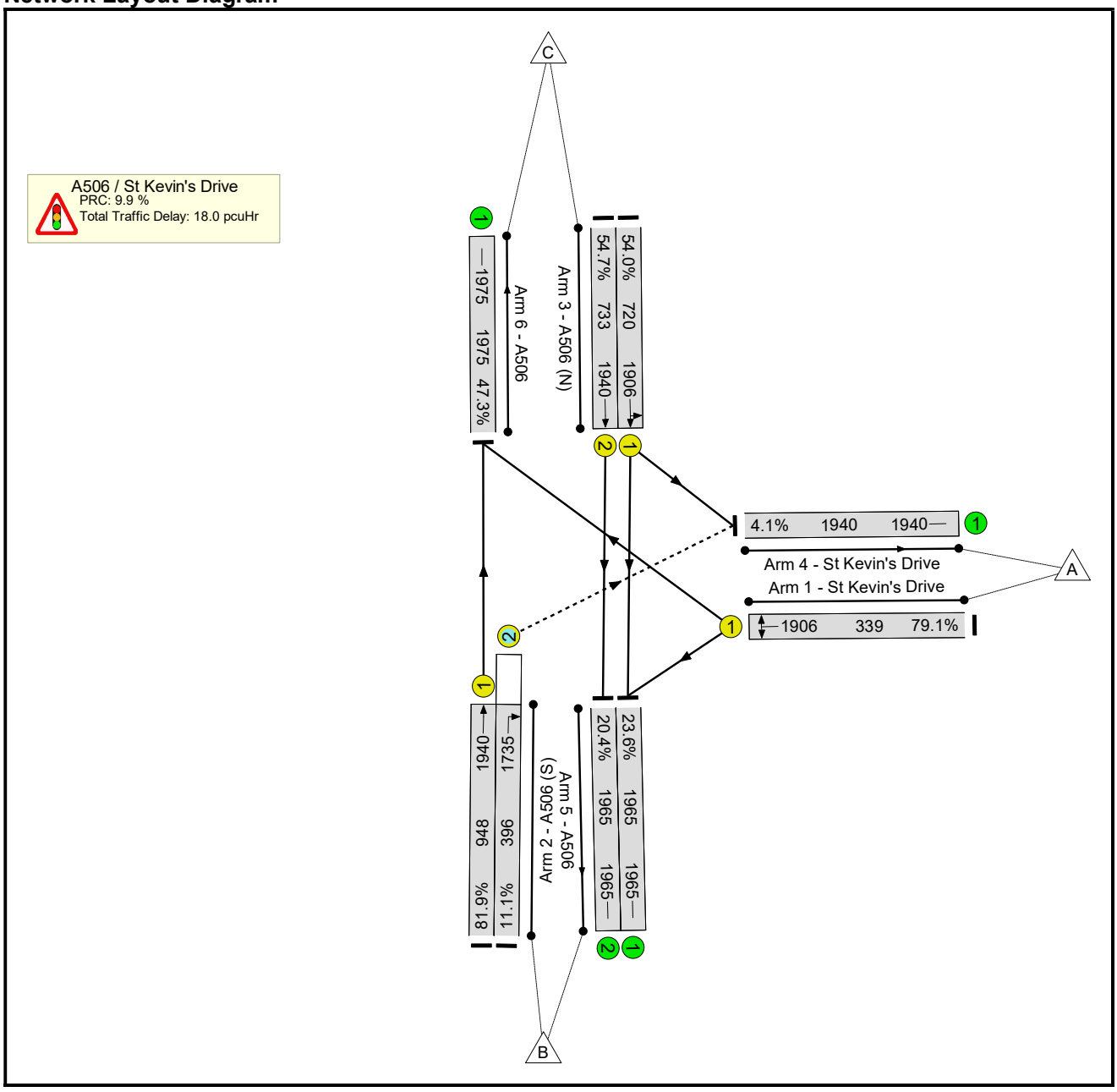
Total Delay for Signalled Lanes (pcuHr): 63.65
Total Delay Over All Lanes(pcuHr): 64.67

Cycle Time (s): 90

Basic Results Summary

Scenario 5: '2023 AM Base + Com + Dev' (FG9: '2023 AM Base + Com + Dev', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**81.9%**	**39**	**4**	**1**	**18.0**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**81.9%**	**39**	**4**	**1**	**18.0**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	15	-	268	1906	339	79.1%	-	-	-	4.4	59.6	8.2
2/1	A506 (S) Ahead	U	A		1	43	-	777	1940	948	81.9%	-	-	-	6.4	29.8	18.6
2/2	A506 (S) Right	O	A	D	1	43	4	44	1735	396	11.1%	39	4	1	0.3	26.8	0.6
3/1	A506 (N) Left Ahead	U	B		1	33	-	389	1906	720	54.0%	-	-	-	3.0	27.3	8.1
3/2	A506 (N) Ahead	U	B		1	33	-	401	1940	733	54.7%	-	-	-	3.0	27.4	8.4
4/1	St Kevin's Drive	U	-		-	-	-	80	1940	1940	4.1%	-	-	-	0.0	1.0	0.0
5/1	A506	U	-		-	-	-	464	1965	1965	23.6%	-	-	-	0.2	1.2	0.2
5/2	A506	U	-		-	-	-	401	1965	1965	20.4%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	934	1975	1975	47.3%	-	-	-	0.4	1.7	0.4

C1

PRC for Signalled Lanes (%): 9.9
PRC Over All Lanes (%): 9.9

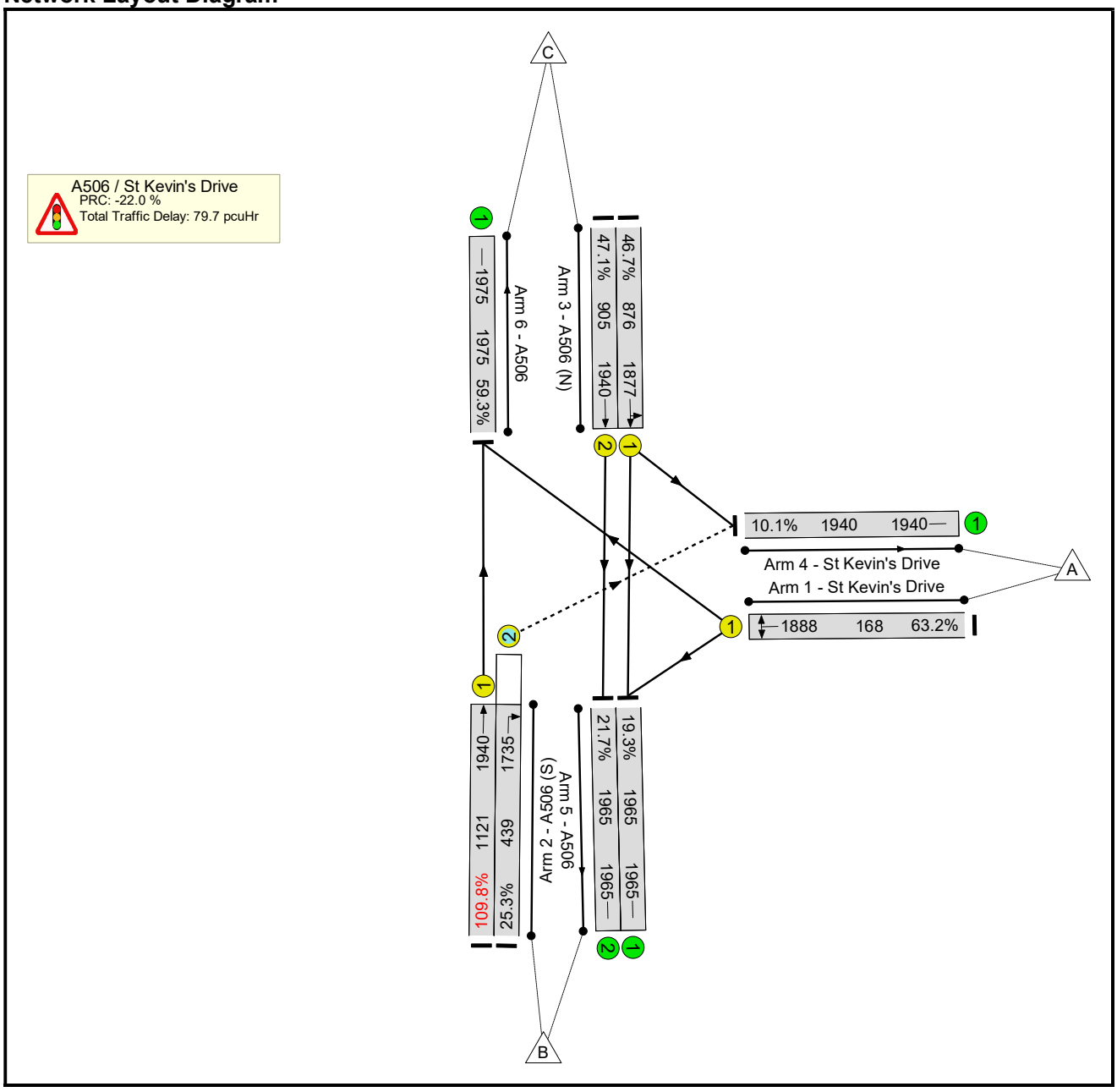
Total Delay for Signalled Lanes (pcuHr): 17.20
Total Delay Over All Lanes(pcuHr): 17.96

Cycle Time (s): 90

Basic Results Summary

Scenario 6: '2023 PM Base + Com + Dev' (FG10: '2023 PM Base + Com + Dev', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**109.8%**	**97**	**10**	**4**	**79.7**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**109.8%**	**97**	**10**	**4**	**79.7**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	7	-	106	1888	168	63.2%	-	-	-	2.0	67.9	3.4
2/1	A506 (S) Ahead	U	A		1	51	-	1231	1940	1121	109.8%	-	-	-	71.3	208.4	93.7
2/2	A506 (S) Right	O	A	D	1	51	4	111	1735	439	25.3%	97	10	4	0.7	23.8	1.4
3/1	A506 (N) Left Ahead	U	B		1	41	-	409	1877	876	46.7%	-	-	-	2.3	20.2	7.4
3/2	A506 (N) Ahead	U	B		1	41	-	426	1940	905	47.1%	-	-	-	2.4	20.2	7.7
4/1	St Kevin's Drive	U	-		-	-	-	195	1940	1940	10.1%	-	-	-	0.1	1.0	0.1
5/1	A506	U	-		-	-	-	380	1965	1965	19.3%	-	-	-	0.1	1.1	0.1
5/2	A506	U	-		-	-	-	426	1965	1965	21.7%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	1282	1975	1975	59.3%	-	-	-	0.7	2.2	0.7

C1

PRC for Signalled Lanes (%): -22.0
PRC Over All Lanes (%): -22.0

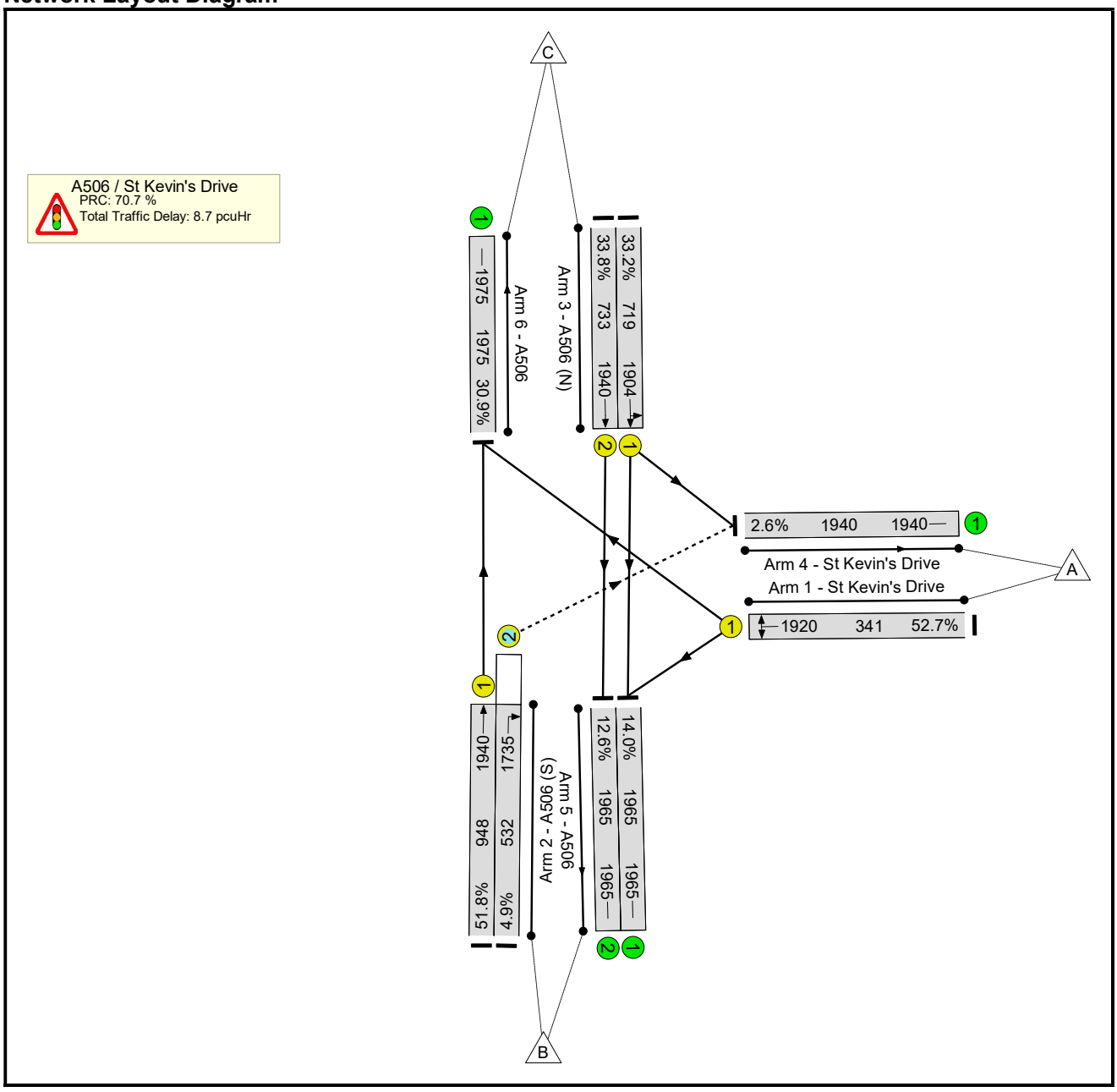
Total Delay for Signalled Lanes (pcuHr): 78.69
Total Delay Over All Lanes(pcuHr): 79.73

Cycle Time (s): 90

Basic Results Summary

Scenario 7: '2028 AM Base' (FG11: '2028 AM Base', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

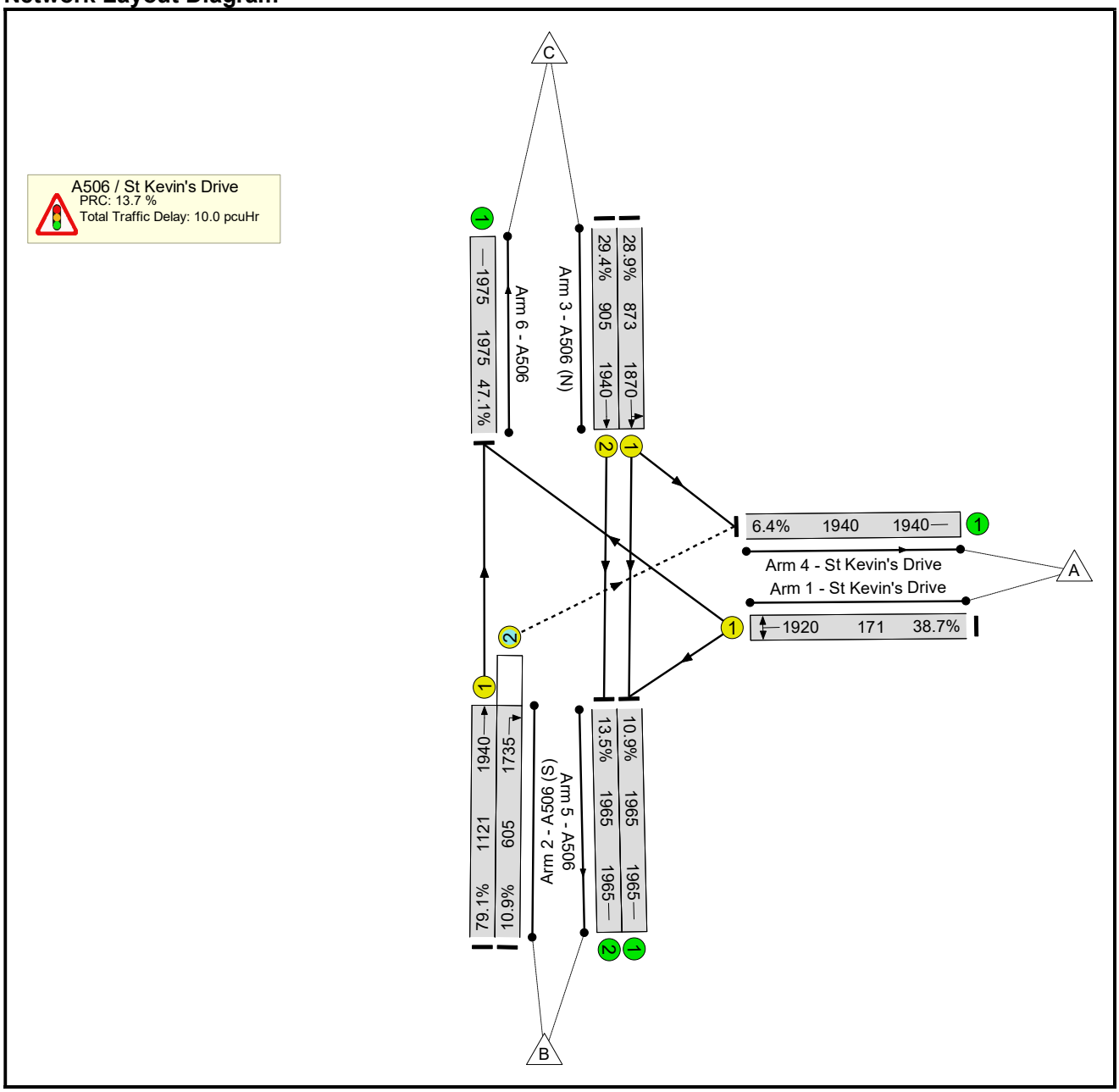
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**52.7%**	**23**	**2**	**1**	**8.7**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**52.7%**	**23**	**2**	**1**	**8.7**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	15	-	180	1920	341	52.7%	-	-	-	2.2	44.7	4.6
2/1	A506 (S) Ahead	U	A		1	43	-	491	1940	948	51.8%	-	-	-	2.7	19.7	8.9
2/2	A506 (S) Right	O	A	D	1	43	4	26	1735	532	4.9%	23	2	1	0.1	19.9	0.4
3/1	A506 (N) Left Ahead	U	B		1	33	-	239	1904	719	33.2%	-	-	-	1.6	23.7	4.5
3/2	A506 (N) Ahead	U	B		1	33	-	248	1940	733	33.8%	-	-	-	1.6	23.7	4.7
4/1	St Kevin's Drive	U	-		-	-	-	50	1940	1940	2.6%	-	-	-	0.0	1.0	0.0
5/1	A506	U	-		-	-	-	275	1965	1965	14.0%	-	-	-	0.1	1.1	0.1
5/2	A506	U	-		-	-	-	248	1965	1965	12.6%	-	-	-	0.1	1.0	0.1
6/1	A506	U	-		-	-	-	611	1975	1975	30.9%	-	-	-	0.2	1.3	0.2

C1 PRC for Signalled Lanes (%): 70.7 Total Delay for Signalled Lanes (pcuHr): 8.26 Cycle Time (s): 90
PRC Over All Lanes (%): 70.7 Total Delay Over All Lanes(pcuHr): 8.65

Basic Results Summary

Scenario 8: '2028 PM Base' (FG12: '2028 PM Base', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**79.1%**	**58**	**6**	**2**	**10.0**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**79.1%**	**58**	**6**	**2**	**10.0**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	7	-	66	1920	171	38.7%	-	-	-	1.0	55.8	1.9
2/1	A506 (S) Ahead	U	A		1	51	-	887	1940	1121	79.1%	-	-	-	5.5	22.4	19.1
2/2	A506 (S) Right	O	A	D	1	51	4	66	1735	605	10.9%	58	6	2	0.3	15.5	0.8
3/1	A506 (N) Left Ahead	U	B		1	41	-	252	1870	873	28.9%	-	-	-	1.2	17.7	4.1
3/2	A506 (N) Ahead	U	B		1	41	-	266	1940	905	29.4%	-	-	-	1.3	17.7	4.3
4/1	St Kevin's Drive	U	-		-	-	-	125	1940	1940	6.4%	-	-	-	0.0	1.0	0.0
5/1	A506	U	-		-	-	-	215	1965	1965	10.9%	-	-	-	0.1	1.0	0.1
5/2	A506	U	-		-	-	-	266	1965	1965	13.5%	-	-	-	0.1	1.1	0.1
6/1	A506	U	-		-	-	-	931	1975	1975	47.1%	-	-	-	0.4	1.7	0.4

C1

PRC for Signalled Lanes (%): 13.7
PRC Over All Lanes (%): 13.7

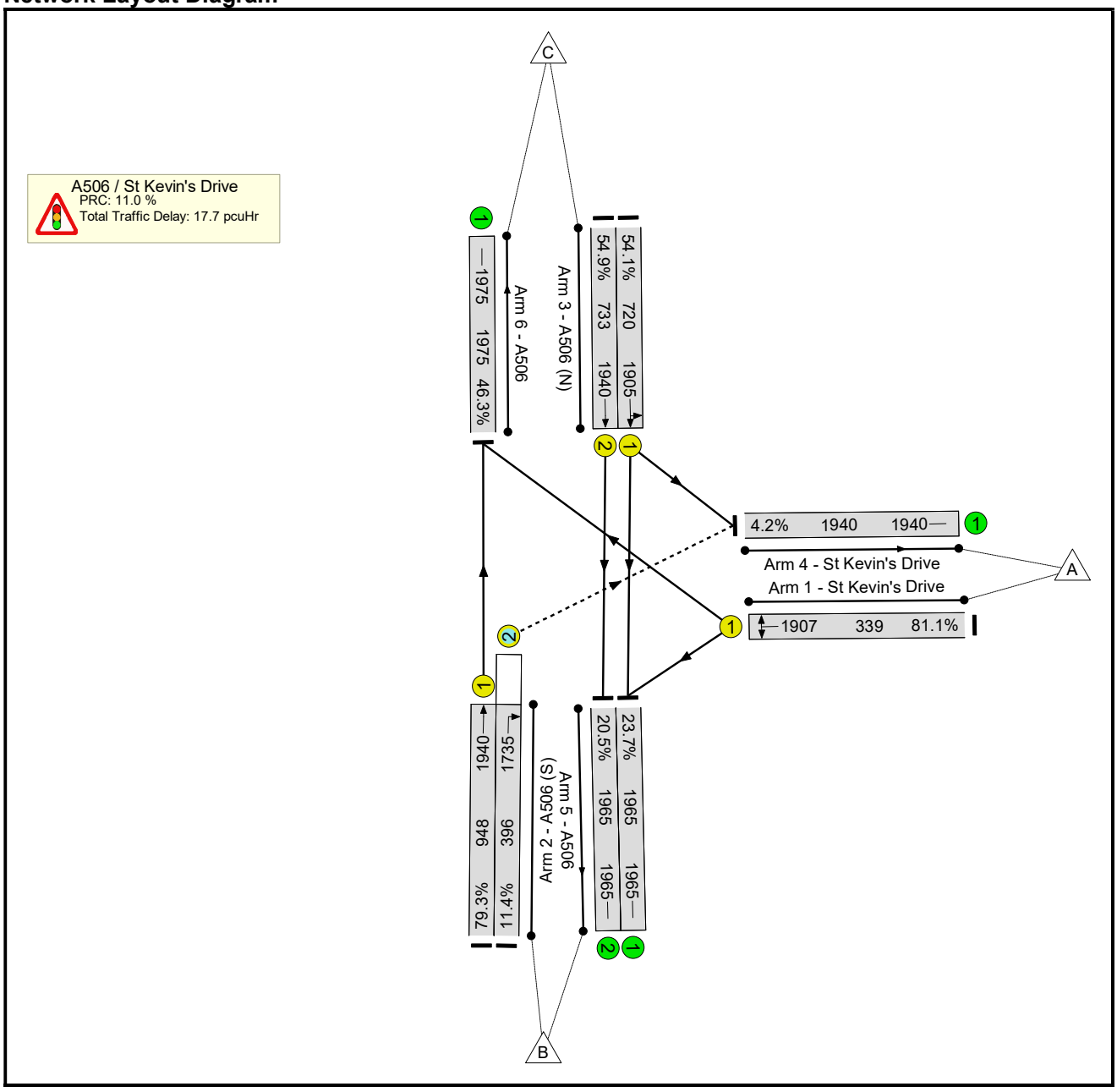
Total Delay for Signalled Lanes (pcuHr): 9.36
Total Delay Over All Lanes(pcuHr): 9.98

Cycle Time (s): 90

Basic Results Summary

Scenario 9: '2028 AM Base + Com' (FG13: '2028 AM Base + Com', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

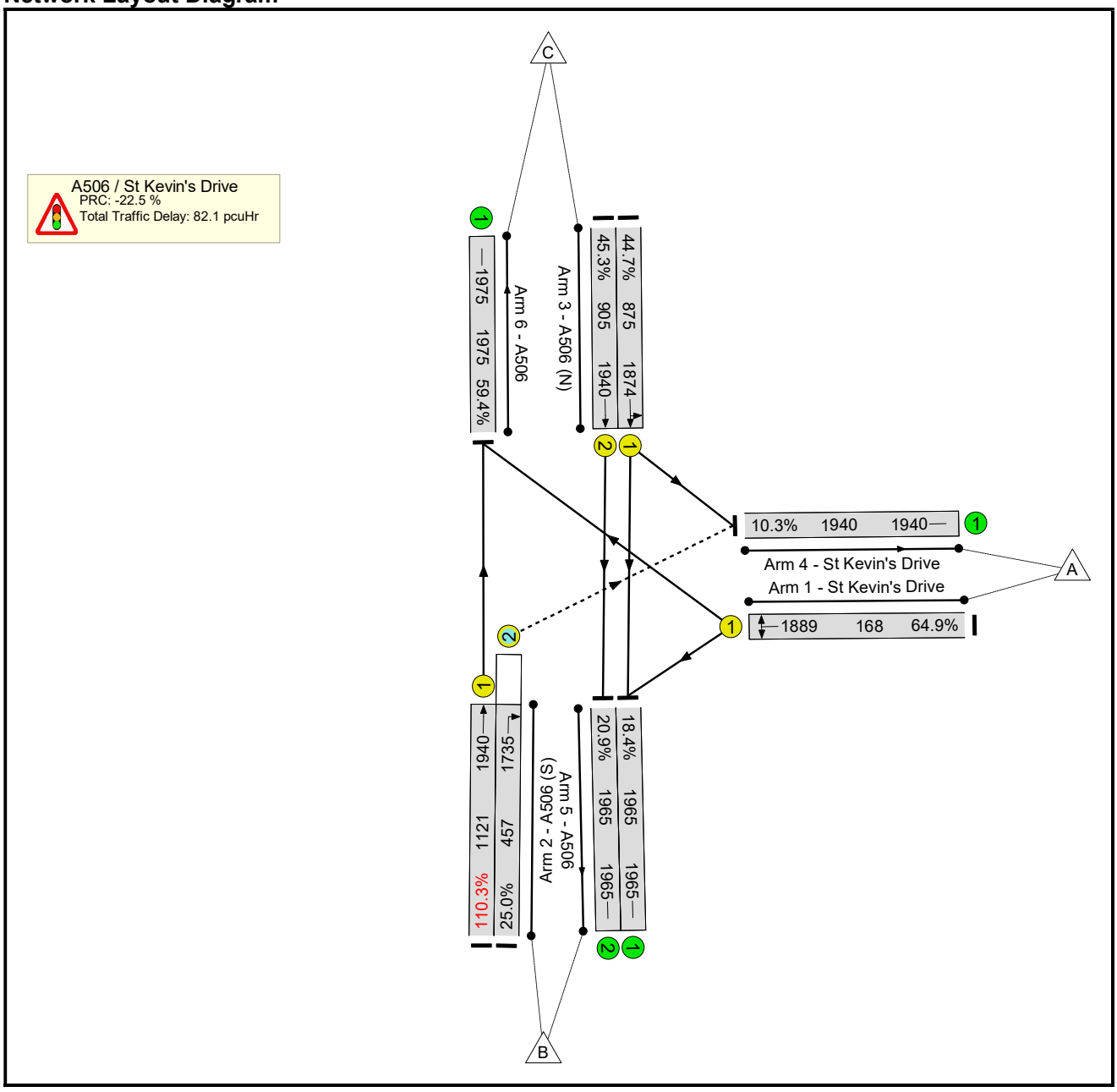
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**81.1%**	**40**	**4**	**2**	**17.7**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**81.1%**	**40**	**4**	**2**	**17.7**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	15	-	275	1907	339	81.1%	-	-	-	4.7	62.0	8.6
2/1	A506 (S) Ahead	U	A		1	43	-	752	1940	948	79.3%	-	-	-	5.9	28.2	17.5
2/2	A506 (S) Right	O	A	D	1	43	4	45	1735	396	11.4%	40	4	2	0.3	26.8	0.7
3/1	A506 (N) Left Ahead	U	B		1	33	-	389	1905	720	54.1%	-	-	-	3.0	27.3	8.2
3/2	A506 (N) Ahead	U	B		1	33	-	402	1940	733	54.9%	-	-	-	3.1	27.4	8.4
4/1	St Kevin's Drive	U	-		-	-	-	82	1940	1940	4.2%	-	-	-	0.0	1.0	0.0
5/1	A506	U	-		-	-	-	465	1965	1965	23.7%	-	-	-	0.2	1.2	0.2
5/2	A506	U	-		-	-	-	402	1965	1965	20.5%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	914	1975	1975	46.3%	-	-	-	0.4	1.7	0.4

C1 PRC for Signalled Lanes (%): 11.0 Total Delay for Signalled Lanes (pcuHr): 16.97 Cycle Time (s): 90
PRC Over All Lanes (%): 11.0 Total Delay Over All Lanes(pcuHr): 17.71

Basic Results Summary

Scenario 10: '2028 PM Base + Com' (FG14: '2028 PM Base + Com', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**110.3%**	**100**	**10**	**4**	**82.1**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**110.3%**	**100**	**10**	**4**	**82.1**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	7	-	109	1889	168	64.9%	-	-	-	2.1	69.3	3.5
2/1	A506 (S) Ahead	U	A		1	51	-	1236	1940	1121	110.3%	-	-	-	73.8	215.1	96.3
2/2	A506 (S) Right	O	A	D	1	51	4	114	1735	457	25.0%	100	10	4	0.7	22.6	1.4
3/1	A506 (N) Left Ahead	U	B		1	41	-	391	1874	875	44.7%	-	-	-	2.2	19.9	6.9
3/2	A506 (N) Ahead	U	B		1	41	-	410	1940	905	45.3%	-	-	-	2.3	19.9	7.2
4/1	St Kevin's Drive	U	-		-	-	-	200	1940	1940	10.3%	-	-	-	0.1	1.0	0.1
5/1	A506	U	-		-	-	-	361	1965	1965	18.4%	-	-	-	0.1	1.1	0.1
5/2	A506	U	-		-	-	-	410	1965	1965	20.9%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	1289	1975	1975	59.4%	-	-	-	0.7	2.2	0.7

C1

PRC for Signalled Lanes (%): -22.5
PRC Over All Lanes (%): -22.5

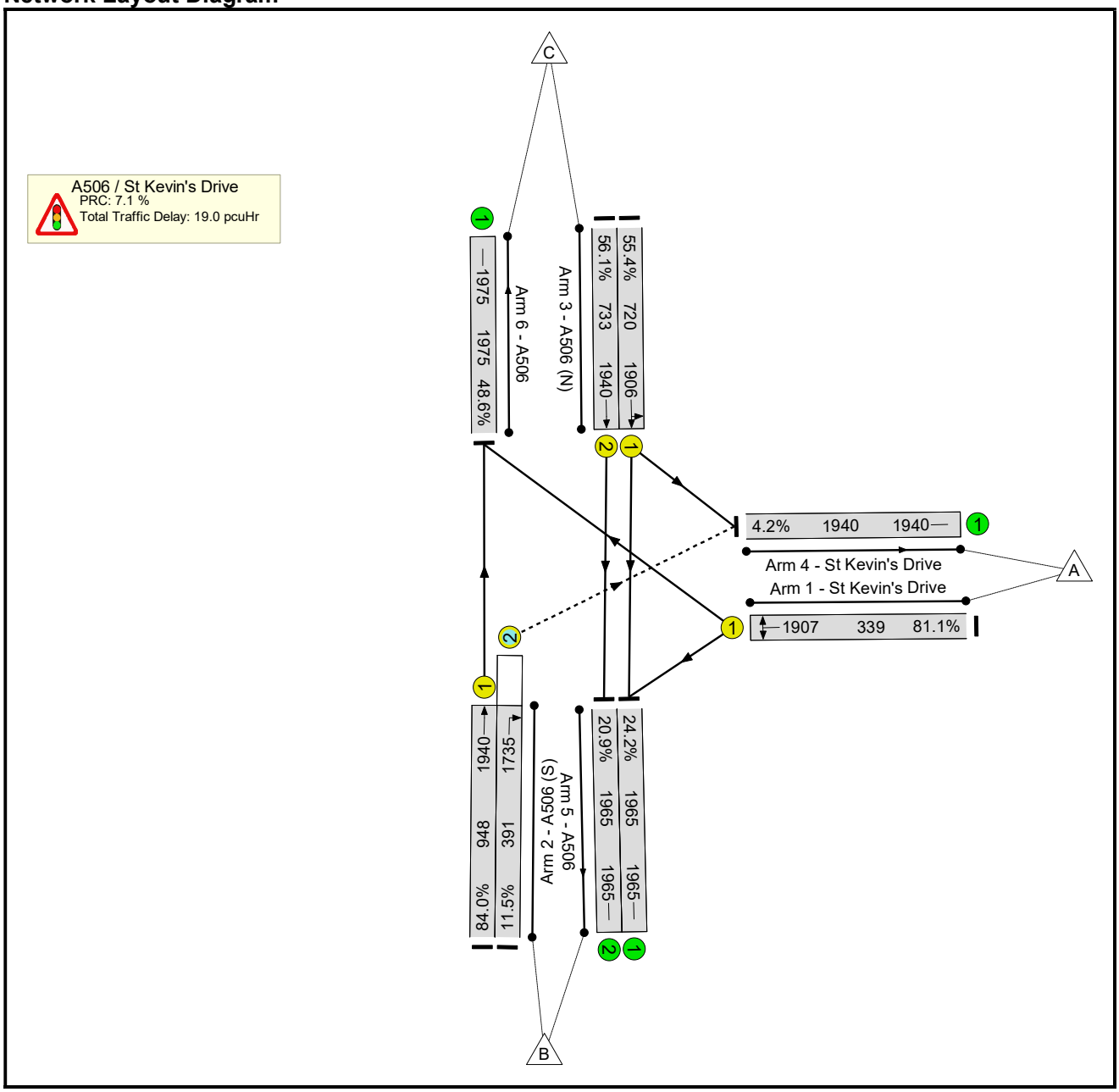
Total Delay for Signalled Lanes (pcuHr): 81.07
Total Delay Over All Lanes(pcuHr): 82.11

Cycle Time (s): 90

Basic Results Summary

Scenario 11: '2028 AM Base + Com + Dev' (FG15: '2028 AM Base + Com + Dev', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

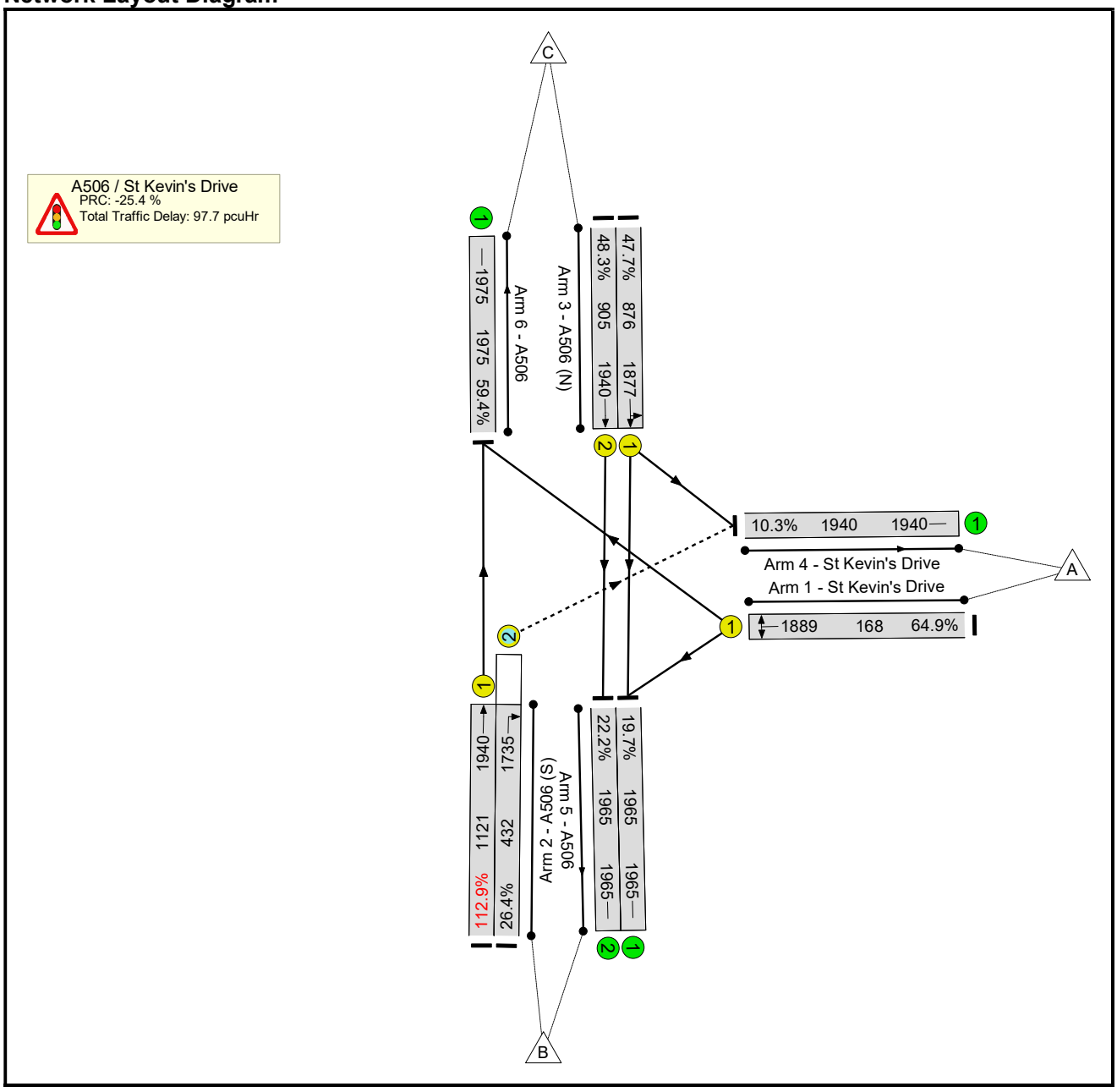
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**84.0%**	**40**	**4**	**2**	**19.0**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**84.0%**	**40**	**4**	**2**	**19.0**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	15	-	275	1907	339	81.1%	-	-	-	4.7	62.0	8.6
2/1	A506 (S) Ahead	U	A		1	43	-	797	1940	948	84.0%	-	-	-	7.0	31.5	19.8
2/2	A506 (S) Right	O	A	D	1	43	4	45	1735	391	11.5%	40	4	2	0.3	27.1	0.7
3/1	A506 (N) Left Ahead	U	B		1	33	-	399	1906	720	55.4%	-	-	-	3.1	27.6	8.4
3/2	A506 (N) Ahead	U	B		1	33	-	411	1940	733	56.1%	-	-	-	3.2	27.7	8.7
4/1	St Kevin's Drive	U	-		-	-	-	82	1940	1940	4.2%	-	-	-	0.0	1.0	0.0
5/1	A506	U	-		-	-	-	475	1965	1965	24.2%	-	-	-	0.2	1.2	0.2
5/2	A506	U	-		-	-	-	411	1965	1965	20.9%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	959	1975	1975	48.6%	-	-	-	0.5	1.8	0.5

C1 PRC for Signalled Lanes (%): 7.1 Total Delay for Signalled Lanes (pcuHr): 18.26 Cycle Time (s): 90
PRC Over All Lanes (%): 7.1 Total Delay Over All Lanes(pcuHr): 19.04

Basic Results Summary

Scenario 12: '2028 PM Base + Com + Dev' (FG16: '2028 PM Base + Com + Dev', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**112.9%**	**100**	**10**	**4**	**97.7**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**112.9%**	**100**	**10**	**4**	**97.7**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	7	-	109	1889	168	64.9%	-	-	-	2.1	69.3	3.5
2/1	A506 (S) Ahead	U	A		1	51	-	1265	1940	1121	112.9%	-	-	-	88.9	253.0	111.4
2/2	A506 (S) Right	O	A	D	1	51	4	114	1735	432	26.4%	100	10	4	0.8	24.3	1.4
3/1	A506 (N) Left Ahead	U	B		1	41	-	418	1877	876	47.7%	-	-	-	2.4	20.4	7.5
3/2	A506 (N) Ahead	U	B		1	41	-	437	1940	905	48.3%	-	-	-	2.5	20.4	7.9
4/1	St Kevin's Drive	U	-		-	-	-	200	1940	1940	10.3%	-	-	-	0.1	1.0	0.1
5/1	A506	U	-		-	-	-	388	1965	1965	19.7%	-	-	-	0.1	1.1	0.1
5/2	A506	U	-		-	-	-	437	1965	1965	22.2%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	1318	1975	1975	59.4%	-	-	-	0.7	2.2	0.7

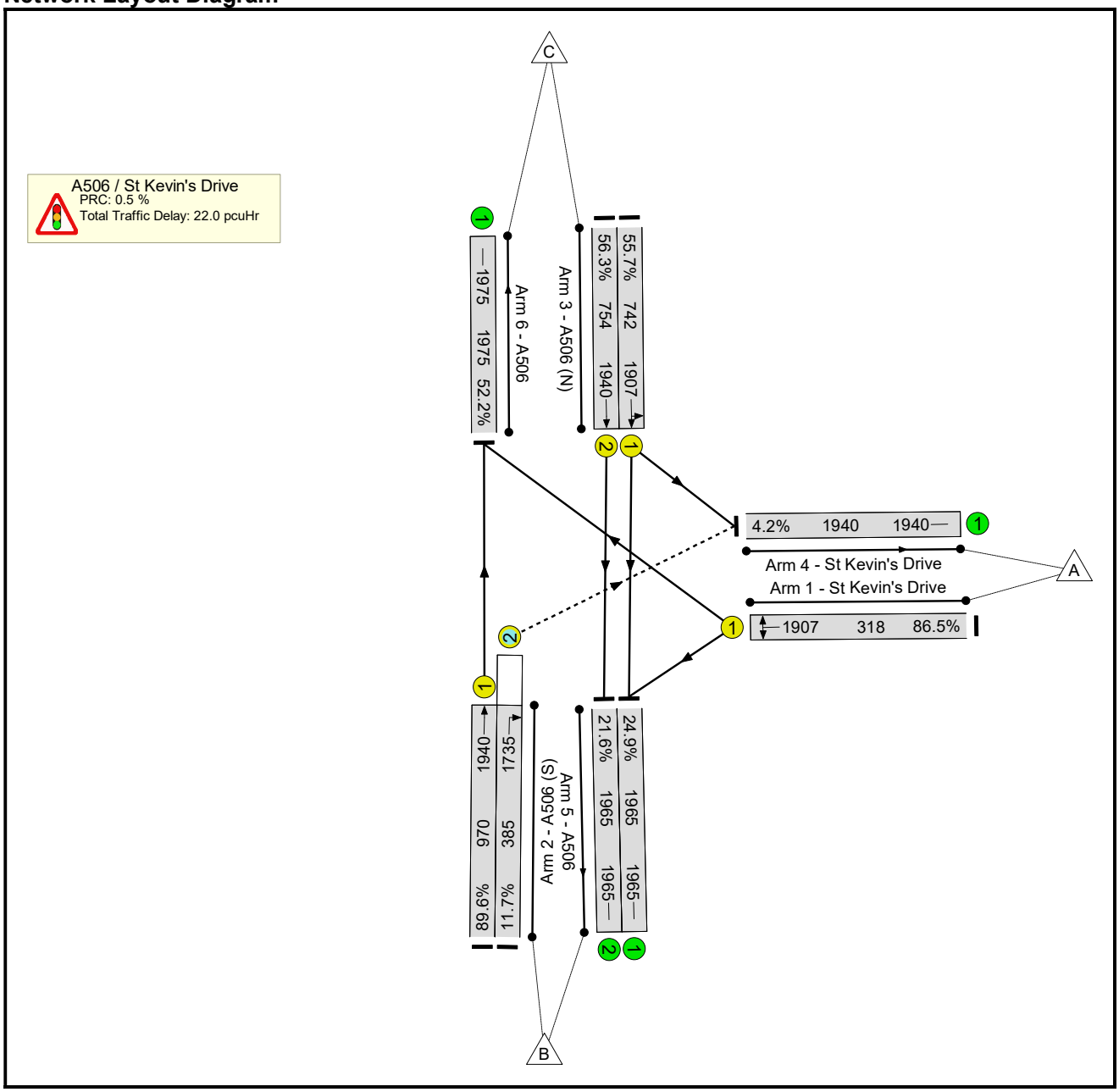
C1 PRC for Signalled Lanes (%): -25.4 Total Delay for Signalled Lanes (pcuHr): 96.61 Cycle Time (s): 90

PRC Over All Lanes (%): -25.4 Total Delay Over All Lanes(pcuHr): 97.67

Basic Results Summary

Scenario 13: '2028 AM Base + Com + Dev (Future Provision)' (FG19: '2028 AM Base + Com + Dev (Future Provision)', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**89.6%**	**40**	**4**	**2**	**22.0**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**89.6%**	**40**	**4**	**2**	**22.0**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	14	-	275	1907	318	86.5%	-	-	-	5.6	73.6	9.5
2/1	A506 (S) Ahead	U	A		1	44	-	869	1940	970	89.6%	-	-	-	8.9	36.9	23.5
2/2	A506 (S) Right	O	A	D	1	44	4	45	1735	385	11.7%	40	4	2	0.3	27.2	0.6
3/1	A506 (N) Left Ahead	U	B		1	34	-	413	1907	742	55.7%	-	-	-	3.1	26.9	8.7
3/2	A506 (N) Ahead	U	B		1	34	-	425	1940	754	56.3%	-	-	-	3.2	27.0	8.9
4/1	St Kevin's Drive	U	-		-	-	-	82	1940	1940	4.2%	-	-	-	0.0	1.0	0.0
5/1	A506	U	-		-	-	-	489	1965	1965	24.9%	-	-	-	0.2	1.2	0.2
5/2	A506	U	-		-	-	-	425	1965	1965	21.6%	-	-	-	0.1	1.2	0.1
6/1	A506	U	-		-	-	-	1031	1975	1975	52.2%	-	-	-	0.5	1.9	0.5

C1

PRC for Signalled Lanes (%): 0.5
PRC Over All Lanes (%): 0.5

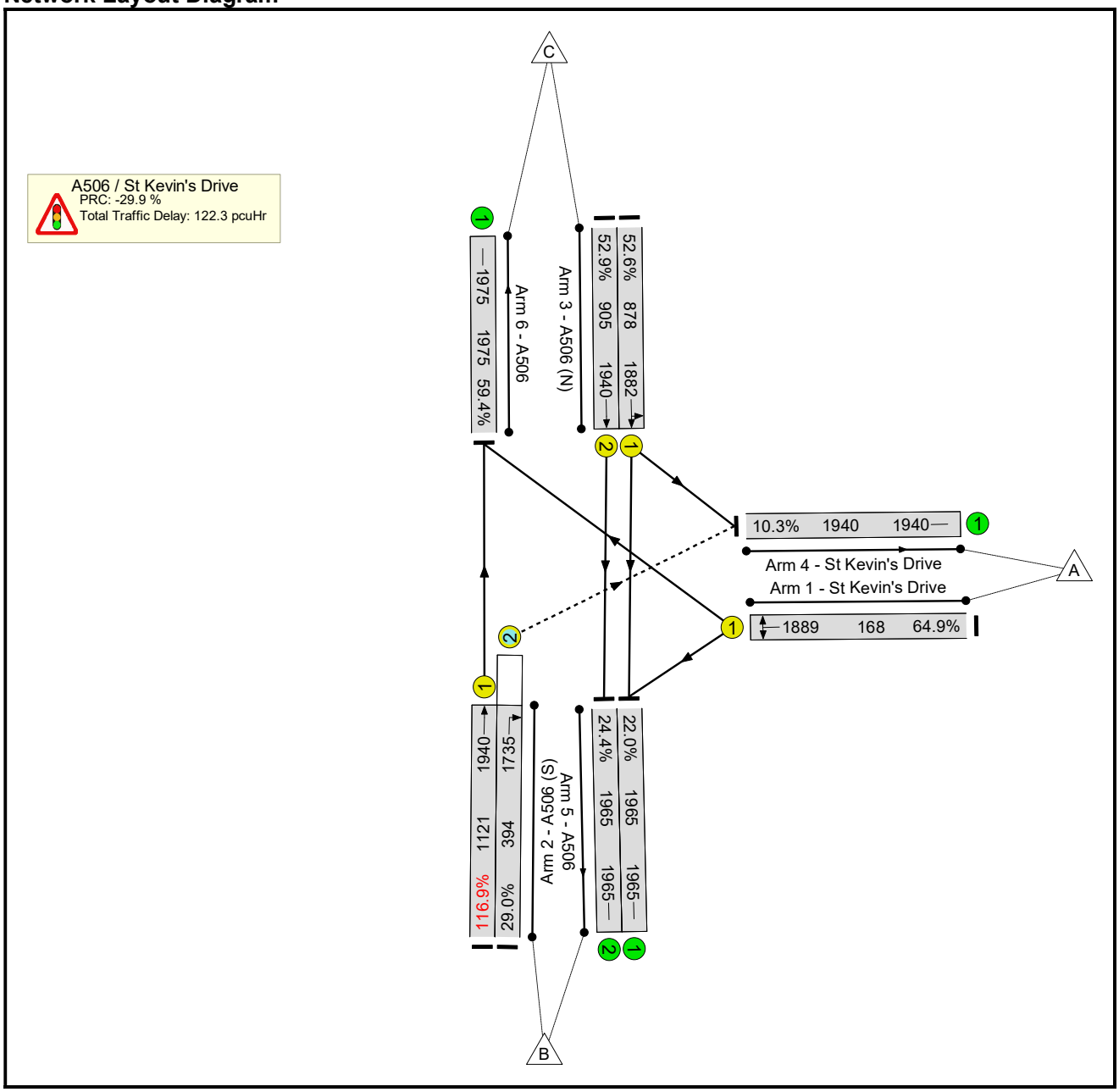
Total Delay for Signalled Lanes (pcuHr): 21.14
Total Delay Over All Lanes(pcuHr): 22.01

Cycle Time (s): 90

Basic Results Summary

Scenario 14: '2028 PM Base + Com + Dev (Future Provision)' (FG20: '2028 PM Base + Com + Dev (Future Provision)', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**116.9%**	**100**	**10**	**4**	**122.3**	-	-
A506 / St Kevin's Drive	-	-	-		-	-	-	-	-	-	**116.9%**	**100**	**10**	**4**	**122.3**	-	-
1/1	St Kevin's Drive Left Right	U	C		1	7	-	109	1889	168	64.9%	-	-	-	2.1	69.3	3.5
2/1	A506 (S) Ahead	U	A		1	51	-	1310	1940	1121	116.9%	-	-	-	112.7	309.8	135.4
2/2	A506 (S) Right	O	A	D	1	51	4	114	1735	394	29.0%	100	10	4	0.9	28.0	1.5
3/1	A506 (N) Left Ahead	U	B		1	41	-	462	1882	878	52.6%	-	-	-	2.7	21.3	8.6
3/2	A506 (N) Ahead	U	B		1	41	-	479	1940	905	52.9%	-	-	-	2.8	21.2	8.9
4/1	St Kevin's Drive	U	-		-	-	-	200	1940	1940	10.3%	-	-	-	0.1	1.0	0.1
5/1	A506	U	-		-	-	-	432	1965	1965	22.0%	-	-	-	0.1	1.2	0.1
5/2	A506	U	-		-	-	-	479	1965	1965	24.4%	-	-	-	0.2	1.2	0.2
6/1	A506	U	-		-	-	-	1363	1975	1975	59.4%	-	-	-	0.7	2.2	0.7

C1

PRC for Signalled Lanes (%): -29.9
PRC Over All Lanes (%): -29.9

Total Delay for Signalled Lanes (pcuHr): 121.26
Total Delay Over All Lanes(pcuHr): 122.35

Cycle Time (s): 90

Appendix 4B

Headbolt Lane Framework Travel Plan

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Appendices

Appendix A

Policy Review

1 Introduction

1.1 Context

Ove Arup and Partners Ltd (Arup) has been commissioned by Buckingham Group Contracting Limited (BCGL) on behalf of Network Rail to produce a Framework Travel Plan (FTP) to accompany a planning application for the proposed construction of a new railway station at Headbolt Lane.

Headbolt Lane is an infrastructure project that will extend the Merseyrail network from the existing terminating station at Kirkby to a new station to be constructed at Headbolt Lane.

The existing rail corridor comprises a single line. The Merseyrail network will be extended east from the existing terminating station at Kirkby, and a new turnout will provide access to a new twin-track arrangement.

The existing Northern Rail platform at Kirkby Station will be decommissioned and a new station interchange provided at Headbolt Lane. This new station will comprise three platforms, with two platform faces serving Merseyrail and a single platform face serving Northern Rail. Buffer stops will be provided to Merseyrail and Northern Rail to delineate between the two Train Operating Companies. The platforms will be connected by a station access arrangement replicating the operational functionality at the existing Kirkby station.

A new 300 space car park and public transport interchange facilities will be provided at Headbolt Lane. Parking facilities for 100 cycles will be provided with passive provision for a further 200 cycles.

The scheme has been developed to GRIP 3 by Network Rail. BGCL has been appointed to develop the design to GRIP 4, who in turn have appointed Arup to undertake design services.

1.2 Role of Travel Plans

This document forms the Framework Travel Plan and sets out the aspirations of Network Rail to encourage alternative travel to single-occupancy car journeys to the station as one of the ways to reduce the environmental impact of the development and to ensure station users and staff have access to, and a choice of, a range of travel options. This document should be read in conjunction with the Transport Assessment (TA) that has been prepared for the proposed development as part of the planning application.

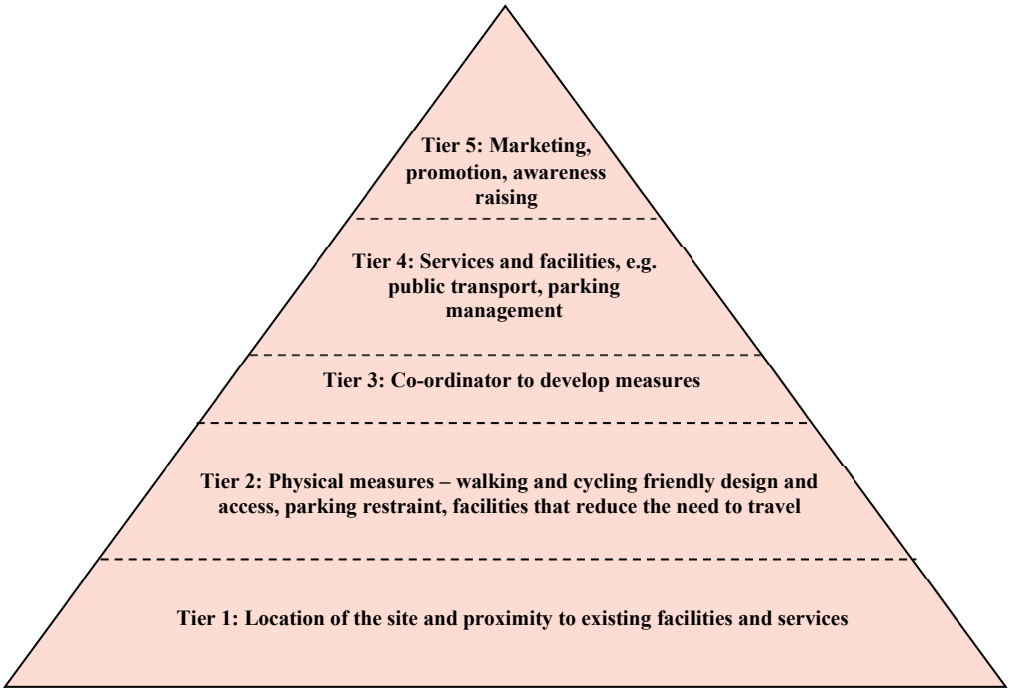
As the site is not yet operational, travel surveys cannot be conducted and the travel patterns of station users and staff cannot be identified. This FTP is an overarching document which covers all potential users of the site.

This FTP has been produced in accordance with local and national planning requirements. Travel Plans are cited by the Government as an important tool in reducing the number of unnecessary single occupancy car trips made to and from a particular business, organisation, facility or residential area. These single

occupancy trips should be conducted by a sustainable mode of transport such as public transport, walking or cycling. A reduction in the number of unsustainable journeys has the potential to reduce the type and volume of pollutants released into the atmosphere, which are contributing to climate change and a detrimental effect on health. The FTP for Headbolt Lane will seek to influence travel behaviour and achieve an increased use of sustainable transport.

The Department for Transport's '*Good Practice Guidelines'* outlines that the construction of Travel Plans can be viewed as a pyramid of activities and actions, which forms the foundation of the FTP for the proposed development. The Travel Plan Pyramid is presented in Figure 1.

Figure 1: Travel Plan Pyramid



1.2 Travel Plan structure

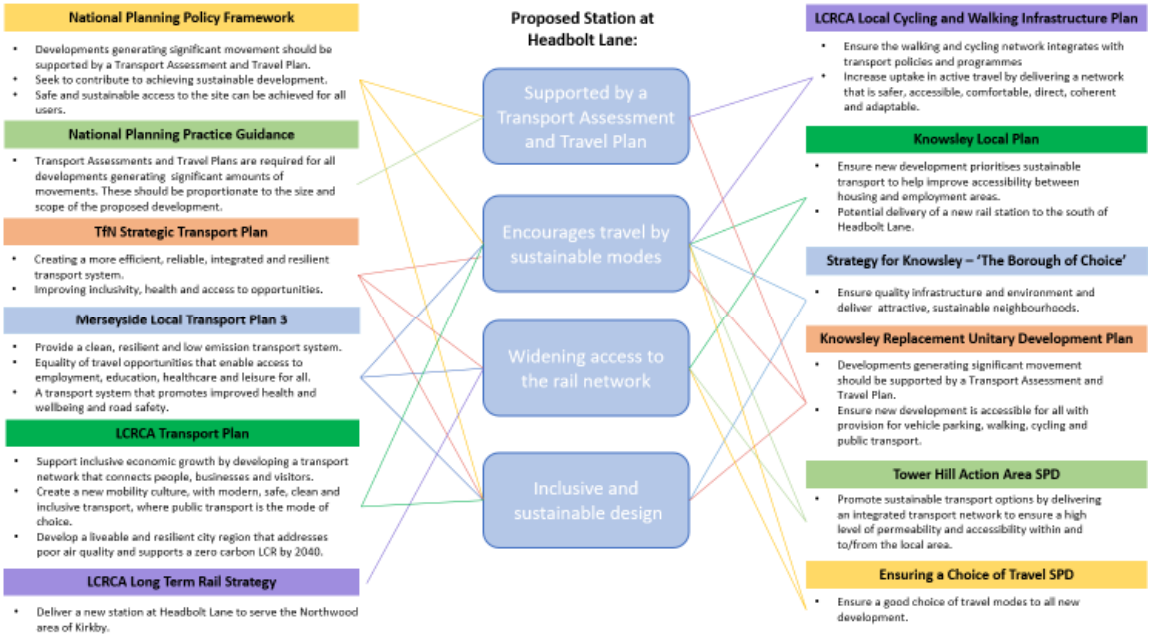
The structure of the FTP is as follows:

- **Section 2** provides an overview of local and national transport and planning policy;
- **Section 3** describes the site location and surrounding transport networks;
- **Section 4** presents the development proposals;
- **Section 5** outlines the aims and objectives of the TP, along with the roles and responsibilities for its implementation;
- **Section 6** sets out the communication strategy and a series of proposed measures to encourage sustainable travel;
- **Section 7** describes the process for monitoring and reviewing the TP; and
- **Section 8** provides an action plan for next steps.

2 Policy Review

The proposed development has been designed with full regard to national and local transport and planning policies. A summary of the key relevant policies is provided in Figure 2. A detailed analysis of these policies in relation to the proposed development is provided in Appendix A.

Figure 2: Policy review



All relevant policy documents emphasise the need for sustainable development in accessible locations. The proposed development itself would provide a sustainable travel option for local residents and increased accessibility for all its users.

National and local policy identifies the need for all developments that generate a significant level of vehicle movements to provide a Transport Statement or Transport Assessment and Travel Plan. This Travel Plan has been prepared for the development to encourage access by sustainable modes through a variety of measures. A Transport Assessment for the development has also been prepared.

A key theme across all policy documents is ensuring development supports inclusive and sustainable access. Policies state that developments should seek to improve people's health, wellbeing and environment by reducing traffic emissions, improving road safety and creating safer places for cycling and walking.

The aim of the proposed development is to minimise longer-distance vehicle trips and encourage multi-modal trips by more sustainable modes, which fully supports these key policies. Access to the site by all modes has been considered and designed for. The provision of cycle infrastructure, cycle parking, and electric vehicle charging further enhances the sustainability of the development.

The policy review demonstrates that the proposed station development at Headbolt Lane aligns with both national and local policies.

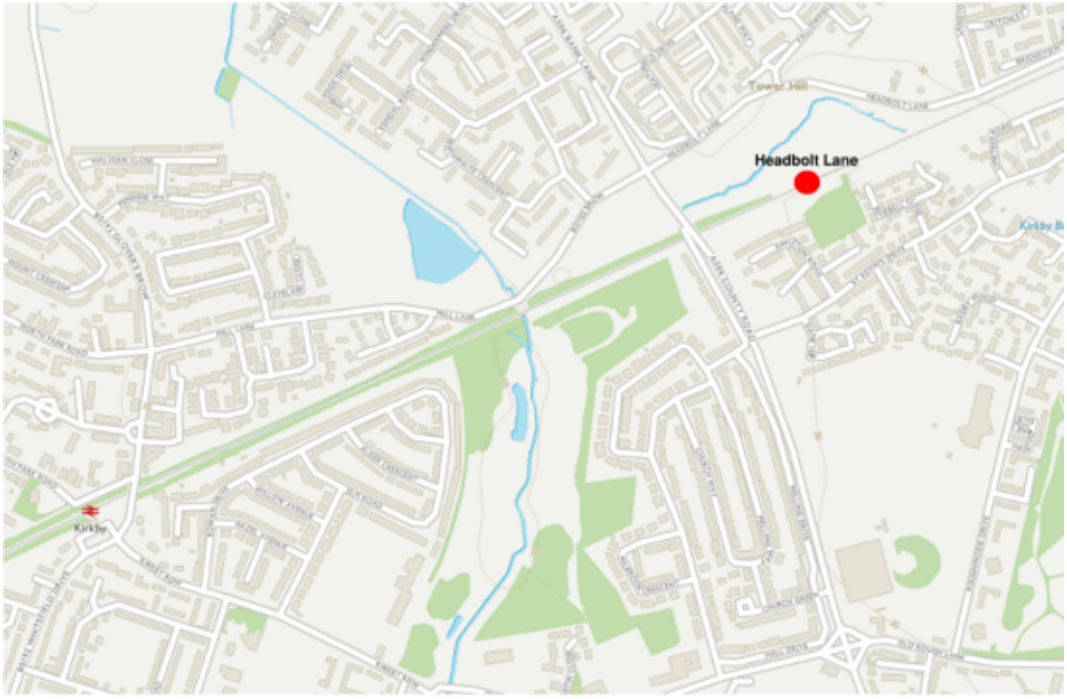
3 Existing Conditions

3.1 Site description

Headbolt Lane lies within the in the Northwood area of Kirkby, Merseyside.

The site is located on greenspace bounded by the A506 to the west, Headbolt Lane to the north and east and the Kirkby Branch railway line to the south. Kirkby Brook crosses under the railway and into the site from the south-east, before running through the centre of the site and leaving the site downstream to the west. The surrounding area is primarily low-density housing, with Kirkby town centre located approximately 800m to the south of the site.

Figure 3: Site location



3.2 Site audit

The proposed development site is an area of green space with a pedestrian route traversing from east to west. Headbolt Lane runs in an east-west alignment along the northern boundary of the site, connecting with the A506 to the west and Pingwood Lane / Dale Lane to the east.

To the north of the development site is the residential area of Tower Hill. To the south is the rail line running east to west with the residential area of Northwood and Kirkby town centre beyond. Kirkby rail station and surrounding residential areas lie to the west, and agricultural land and the William Brothers Industrial Park lie to the east.

Figure 4 shows the key transport infrastructure serving the development site.

Figure 4: Key transport infrastructure



3.2.1 Active travel

Figure 5 provides an overview of the key walking and cycling infrastructure serving the development site.

Figure 5: Active travel infrastructure serving the development site

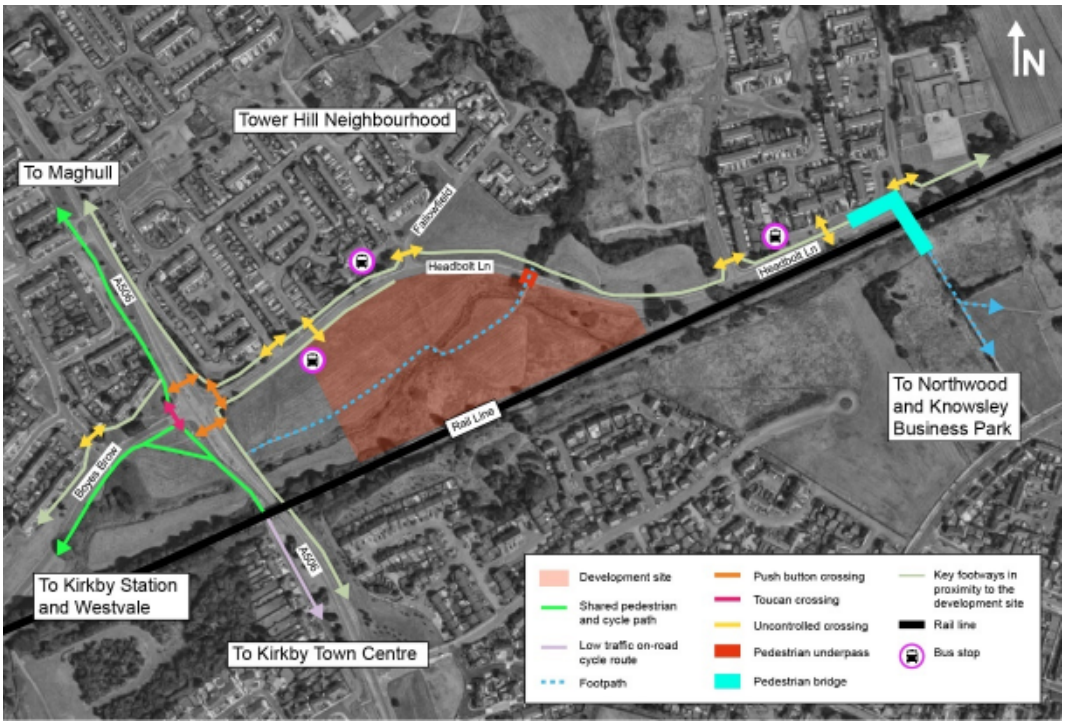
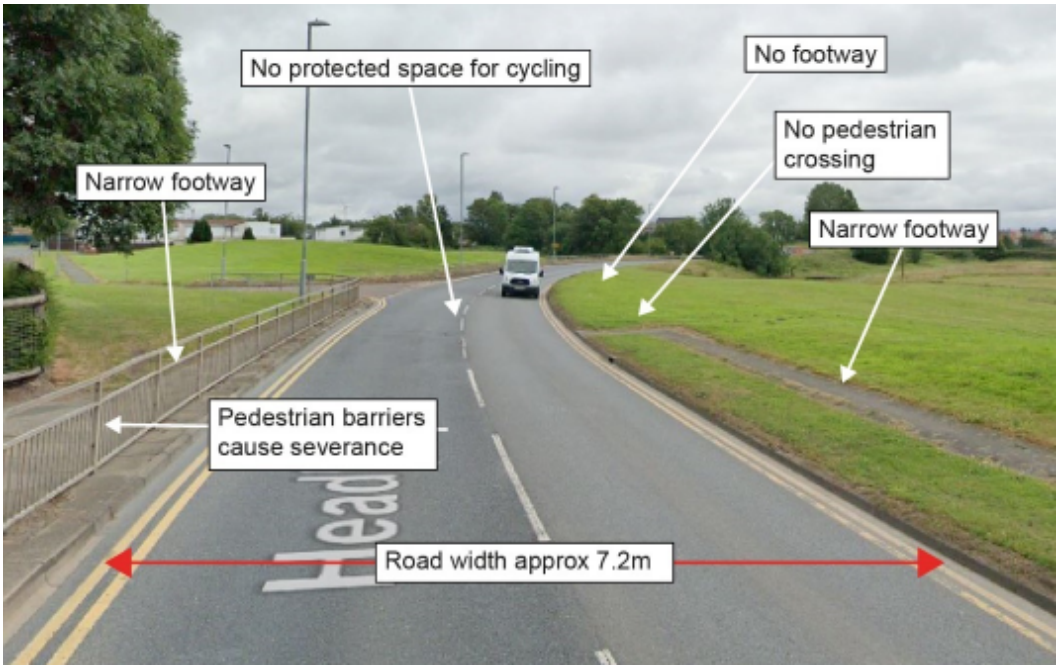


Figure 6 provides an overview of existing conditions on Headbolt Lane.

Figure 6: Analysis of existing conditions on Headbolt Lane

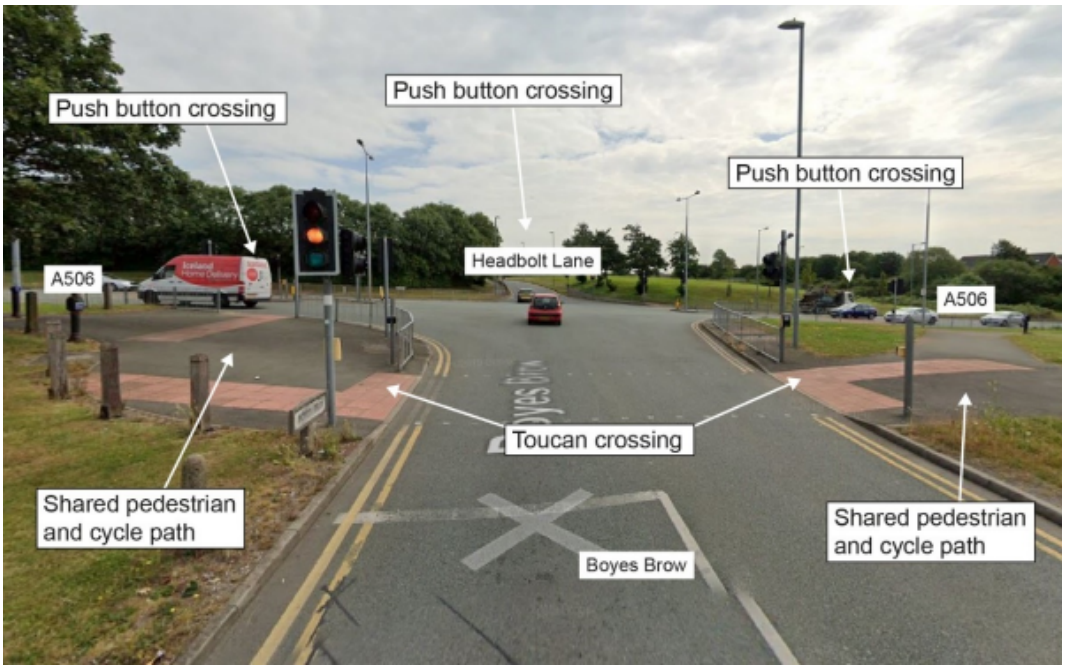


The footway on the northern side of Headbolt Lane is below the recommended 2m minimum width and guardrails separate the footway from the road, creating a degree of severance between the residential areas to the north and the proposed development site.

There is a limited section of footway (approx. 220m) on the southern side of Headbolt Lane from the junction with the A506 to Fallowfield. At its eastern extent, the footway ends without providing for access to the footways on the opposite side of the road.

There are three uncontrolled crossings with dropped kerbs and tactile paving along the length of the road and signalised pedestrian crossings on all arms of the A506 / Boyes Brow / Headbolt Lane junction, as shown in Figure 7.

Figure 7: Pedestrian and cycle crossings at A506 / Headbolt Lane / Boyes Brow junction



The rail line to the south of the proposed development site causes a degree of severance for areas to the north and south. There is a pedestrian bridge approximately 300m to the east of the development site which provides access over Headbolt Lane and the rail line, as shown in Figure 8. It provides a link between the site and the Northwood area to the south, including Knowsley Business Park beyond.

Figure 8: Pedestrian bridge located to the east of the development site



There is an existing footpath that runs in an east-west alignment across the development site from the A506 to the junction of Headbolt Lane and Southcroft Drive, as shown in Figure 9. The footway is relatively narrow with an uneven surface. At its western end the path uses an underpass below the highway, which although it minimises conflict with vehicles, may be an unattractive route choice for some pedestrians. It is understood that KMBC plans to close the underpass and raise the footpath to the level of the road.

Figure 9: Footway crossing the development site, viewed looking east from the A506



There is a shared use pedestrian and cycle path to the west of the development site along the A506 (see Figure 10), providing a link towards Kirkby town centre to the south and neighbourhoods to the north of the proposed development site. There is a toucan crossing on the western arm of the Headbolt Lane / A506 / Boyes Brow junction.

A shared footway / cycleway is also in place on Boyes Brow on approach to the A506. However, there are no cycle crossings on the northern or southern arms of the Headbolt Lane / A506 / Boyes Brow junction meaning there is no formal cycle connection across the A506.

Figure 10: Shared use pedestrian and cycle path located to the north of the A506 / Headbolt Lane / Boyes Brow junction



The Tower Hill area to north of development site has a street network which encourages low traffic speeds, creating a more pleasant environment for pedestrians and cyclists.

3.2.2 Bus

The number 20 bus is the only service which serves Headbolt Lane, connecting Tower Hill with Liverpool city centre via Kirkby. The service runs in an eastbound direction on Headbolt Lane before circling Tower Hill via Pingwood Drive and Shevington's Lane, returning to Liverpool via the A506.

Figure 11: Bus stop on northern side of Headbolt Lane



Source: Google Maps (2021)

There are three bus stops on the northern side of Headbolt Lane and a bus stop on the southern side of Headbolt Lane adjacent to the junction with Freckleton Drive. The stop on the southern side of Headbolt Lane is not currently operational.

The 14a, 14c, and 133 bus services operate along the A506. These services can be accessed from bus stops adjacent to Windemere Drive in a northerly direction and adjacent to St Kevin's Drive in a southerly direction. Both stops are approximately 400m walk from the proposed development site.

The number 21 service operates to the south of the proposed development site, connecting the Northwood area with Liverpool. Currently, accessing this service requires crossing the rail line over the pedestrian bridge approximately 300m to the east of the proposed development site.

Table 1 provides further details of the bus services serving the area around the development site.

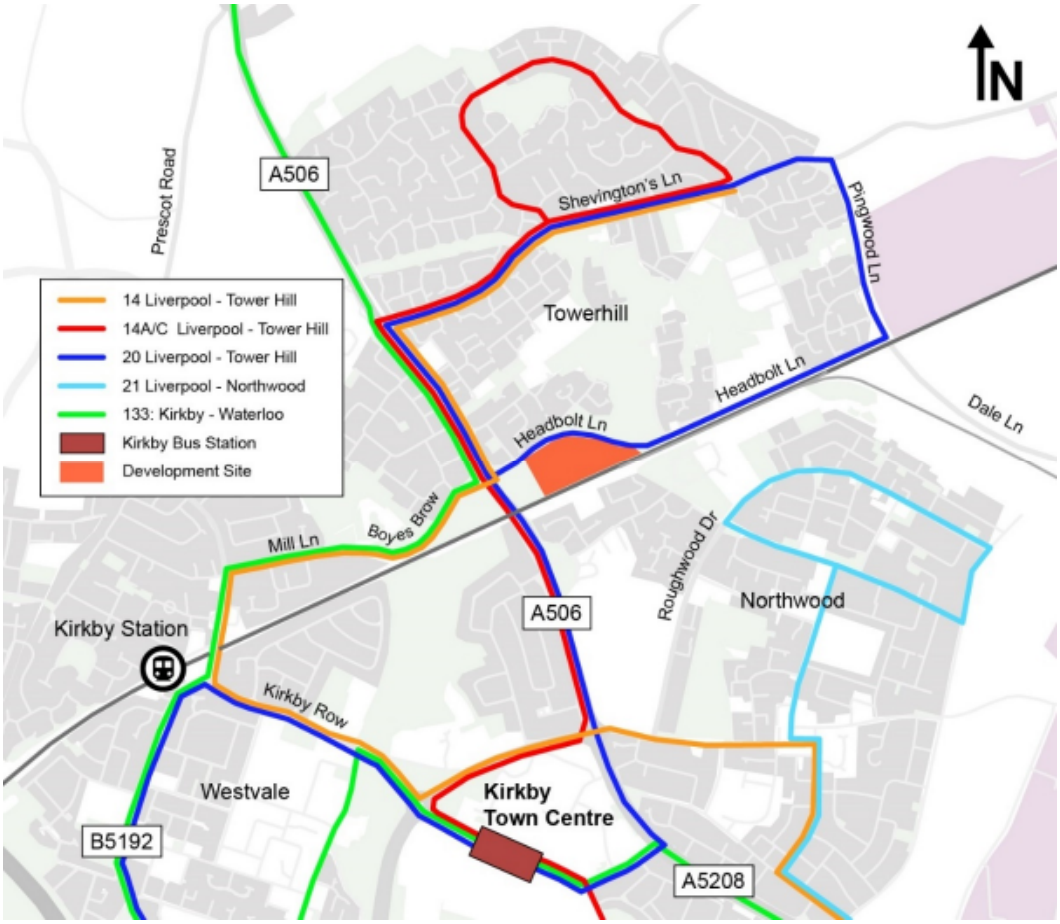
Table 1: Bus services operating in the vicinity of the site

Service	Route	Stop location	Service frequency*
14**	Liverpool – Tower Hill	Boyes Brow	0
14A / 14C	Liverpool – Tower Hill	A506	2
20	Liverpool – Tower Hill	Headbolt Lane (towards Tower Hill) A506 (towards Liverpool)	5
21	Liverpool – Northwood	Roughwood Drive	5
133	Waterloo – Kirkby	Boyes Brow	1

*Services per hour in one direction
**14 only runs to and from Tower Hill before 6am.

Bus routes operating in the local area are shown in Figure 12.

Figure 12: Bus routes in proximity to the proposed development site



3.2.3 Rail

Kirkby Rail Station lies 1.3km to the southwest of the development site. It is the current terminus of the Merseyrail Northern Line and the Kirkby Branch Line from Wigan. It serves as an interchange between Merseyrail services from Liverpool Central and Northern services from Manchester Victoria via Wigan Wallgate.

There are four services per hour from Kirkby to Liverpool Central and one service per hour to Wigan Wallgate. There are also infrequent services between Manchester Victoria with two services arriving at Kirkby and four services departing on weekdays between 06:00 and 10:00. Two services also arrive at Kirkby from Manchester Victoria and one service departs between 18:00 and 20:00. The proposed Headbolt Lane station will serve as the future terminus of these services.

3.2.4 Local highway network

Headbolt Lane is a two-way single carriageway road, providing access to several residential areas within Tower Hill. The road is subject to a 30mph speed limit.

At its western end, Headbolt Lane connects with the A506 Bank Lane. This is the main vehicle route accessing M58 Junction 1 and Maghull to the north and Kirkby town centre, Knowsley Business Park, and the residential areas of Northwood and Southdene to the south. Boyes Brow forms the western arm of the junction of Headbolt Lane and the A506 Bank Lane.

At its eastern end, Headbolt Lane joins Pingwood Lane and Dale Lane via a priority-controlled T-junction. Dale Lane leads south providing access to Knowsley Business Park and on towards the A580 East Lancashire Road. Pingwood Lane provides access to Shevington's Lane and Stopgate Lane to the north.

Figure 13: Local highway network

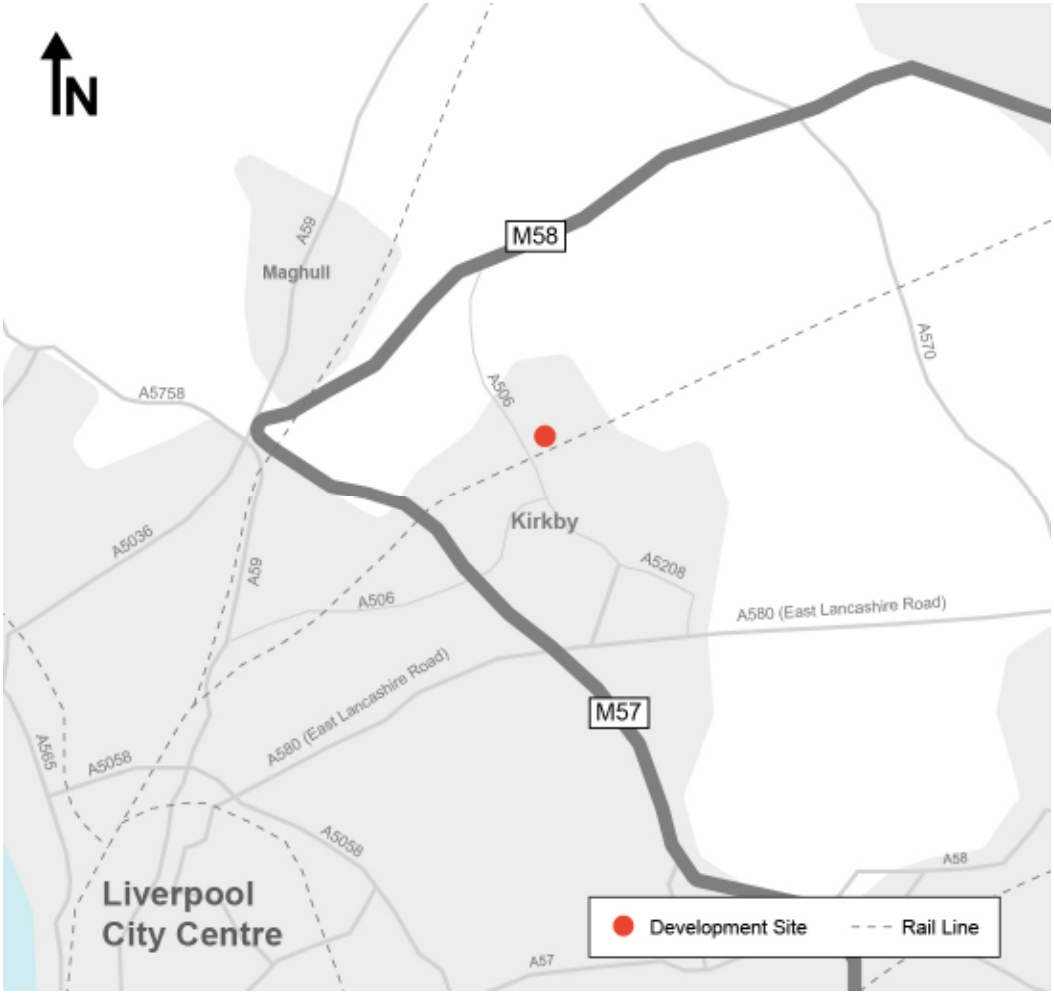


3.2.5 Wider network

The wider highway network includes the M57, M58, and M62 motorways as well as the A580 East Lancashire Road. These routes connect the proposed development site with Liverpool to the west and Manchester to the east.

As previously noted, the Strategic Road Network can be directly accessed directly from the northern end of A506 Bank Lane via M58 Junction 1.

Figure 14: Wider highway network



3.2.6 Parking / waiting restrictions

There are currently no parking or waiting opportunities on Headbolt Lane, with double yellow lines on both sides of the carriageway for the entire length.

There are limited on-street parking restrictions in the residential area of Tower Hill, directly north of the proposed development site. The only restrictions are no stopping outside the entrance to Eastcroft Park Primary School between 08:00-17:00. Similarly, in the Northwood area to the south of the rail line, parking restrictions are limited to areas outside schools as well as at junctions on Roughwood Drive. There are permitted parking zones in areas adjacent to Kirkby town centre to the southwest, restricting parking to those with permits.

4 Proposed Development

The proposed development comprises a new rail station at Headbolt Lane, to facilitate the extension of the Merseyrail network beyond the existing terminating station at Kirkby. The proposed station comprises three platforms, with two platform faces serving Merseyrail and a single platform face serving Northern Rail.

4.1 Rail services

A summary of the rail services that will be provided by the proposed station is shown in Table 2.

Table 2: Headbolt Lane station rail service summary

Line	Weekday / Saturday services	Sunday service frequency
Merseyrail	4 services per hour in each direction to / from Headbolt Lane and Liverpool Central	2 services per hour in each direction to / from Headbolt Lane and Liverpool Central
Northern	1 service per hour in each direction to / from Headbolt Lane and Wigan Wallgate	1 service per hour in each direction to / from Headbolt Lane and Wigan Wallgate

4.2 Car parking

A new 300 space car park is proposed to serve the new station at Headbolt Lane. 30no. of the proposed parking spaces will be disabled access bays, comprising 15no. blue badge spaces and 15no. enlarged bays. 12no. electric vehicle charging bays will be provided on site.

In addition to the 300-space car park, 3no. staff spaces and 2no. Network Rail maintenance bays are to be provided, along with a parking area for 5no. motorcycles.

A taxi and pick-up / drop-off area is also proposed outside the station building, with space for 4no. vehicles.

4.3 Vehicle access

Vehicular site access will be taken via a new access junction on Headbolt Lane. The proposed site access junction is a signalised crossroads in the location of the existing priority-controlled T-junction of Fallowfield / Headbolt Lane.

The proposed access road is a 7.3m wide two-way carriageway, running in a north-south alignment through the development site. It provides access to the car parking areas, bus interchange and pick-up / drop-off area.

4.4 Bus

Proposals for bus facilities and services at Headbolt Lane station have been developed through discussions with Merseytravel.

A key feature of the new station design is that it will provide a high-quality bus-rail interchange facility, consisting of two bus stops directly in front of the station building accessed via a turning loop. The bus stops will be designed to the latest standards, incorporating enclosed passenger waiting shelters and high kerbs to minimise the step off the bus and ease passenger access.

With the provision of these facilities the station will be capable of accommodating up to 10 buses per hour, divided by direction of travel and destination. Merseytravel will also work with the bus operators though the Bus Alliance in order to integrate the station within the overall bus network.

The installation of MOVA at the proposed site access junction will help to prioritise buses accessing and egressing the site, therefore minimising delay for bus services.

4.5 Walking and Cycling

The new station access junction includes signalised pedestrian crossings on all arms of the crossroads.

It is understood that KMBC plans to deliver a new cycleway on the southern side of Headbolt Lane. The proposed station access junction design has been developed to enable the future cycleway to tie into the junction.

A 3m wide bi-directional cycleway is proposed alongside the vehicle access road. This will provide a continuous off-road cycle route between Headbolt Lane and the station cycle parking. Parking facilities for 100 cycles will be provided adjacent to the station building, with passive provision for a further 200 cycles.

Pedestrian footways are to be provided within the site on key desire lines. A series of zebra crossings are included within the design to facilitate safe and convenient pedestrian movements through the site.

The existing footpath which crosses the site from east to west will be diverted and incorporated into the site access proposals. The existing western footbridge over Kirkby Brook shall be removed and the eastern footbridge retained. An additional footbridge is proposed over Kirkby Brook to the east of the station building. The eastern bridge provides a link to the eastern section of Headbolt Lane and allows pedestrians arriving from this area to easily cross Kirkby Brook in order to reach the station building. A new uncontrolled crossing with dropped kerbs and tactile paving to provide a connection across Headbolt Lane and to the residential area to the east is also proposed.

An at-grade pedestrian route within the station will provide a connection to/from Platform 2, and a new footway from the residential estate to the south will form a secondary access to the station.

5 Developing the Travel Plan

This Framework Travel Plan (FTP) is a dynamic working document that will develop over time and in accordance with the changing circumstances of the development. It is a continuous improvement process for all the travel-related activities aiming to reduce the number of single occupancy vehicles travelling to Headbolt Lane Station.

The FTP recognises that there is not one specific mode of transport suitable for all travel associated with Headbolt Lane Station, and there needs to be a number of alternatives in place to encourage sustainable travel. This plan is intended to promote flexibility and choice, focusing efforts on encouraging a reduction in car use rather than prohibiting it. As the new station is primarily intended to serve a local catchment, particular emphasis has been given to promoting walking and cycling to / from the station.

The development itself will help to encourage sustainable travel behaviours by offering an alternative mode to car travel, thus reducing the number and length of journeys travelled by car.

5.1 Travel Plan Aims

The main aims of this FTP are to promote sustainable travel behaviours and to minimise any adverse traffic or parking impacts associated with Headbolt Lane Station.

5.2 Travel Plan Objectives

The overall objectives of the Headbolt Lane station FTP are to:

- reduce travel by private car, particularly single occupancy car journeys;
- minimise any negative impacts of the station development upon the local community, such as increased noise or air pollution;
- manage car parking at the site;
- promote healthy and environmentally friendly transport choices among users of the site;
- increase the attractiveness of walking and cycling to make it the obvious choice for most local journeys to the station;
- provide seamless integration with the bus network in Headbolt Lane for journeys that cannot be made by walking and cycling;
- maximise transport choice through innovative measures; and
- increase the attractiveness of rail instead of car travel for longer distance journeys.

5.3 Roles and Responsibilities

Given that the majority of people visiting the site will be station users (i.e. rail passengers), the FTP is primarily focused on this group. However, the FTP also considers staff travel and potential impacts on local residents.

5.4 Travel Plan Co-ordinator (TPC)

Prior to site occupation, a Travel Plan Co-ordinator (TPC) would be appointed, so they can begin implementing and shaping the TP from the outset. On appointment, the TPC will contact KMBC to advise that work has commenced on delivering the TP. Subsequent changes in contact details will be passed to KMBC in a timely manner.

The responsibilities of the TPC will evolve over time, and when the position is filled, their specific role and responsibilities can be discussed. Some potential responsibilities are outlined below:

- Implementation and day-to-day running of the TP, demonstrating full commitment and enthusiasm towards it;
- Undertake the monitoring of the TP and ensure that the results are communicated to relevant stakeholders such as KMBC, Northern Rail and Merseyrail.
- Acting as a point of contact for staff, station users and the wider community;
- Communicating the TP within the station, including promotion of the benefits of Travel Planning — good visual communications will be essential for communicating the TP;
- Periodically reviewing the TP, updating the document as necessary (for example, updating the site audit);
- To explore the possibility of setting up any staff, passenger, or local resident forums if and when appropriate; and
- Liaise with local residents, as well as external organisations, stakeholders, and transport operators as necessary.

Whilst the TPC will be an ongoing permanent role, given the scale of the development it is unlikely to be a full-time position and, as such, this task could be undertaken as part of a wider management role for the development (for example by the station manager).

Key Action:	Appoint Travel Plan Co-ordinator (TPC)
To be completed by:	1 month prior to occupation
Responsibility of:	Site operator

6 Travel Plan Measures

The proposed development is in an area that benefits from good public transport links and has a large local population within walking and/or cycling distance of the site. The development proposals include a number of features that will help to foster sustainable travel behaviour at the site, as summarised below:

- 100 cycle parking spaces, with passive provision for an additional 200 cycles, positioned close to the station entrance in a prominent, visible location;
- New pedestrian crossing facilities on Headbolt Lane;
- A bus interchange facility with 2no. bus stops; and
- A new at-grade station pedestrian route, providing access from the residential area to the south;
- 12no. electric vehicle charging spaces; and
- Dedicated, continuous pedestrian and cycle routes through the site with appropriate crossing facilities.

Nonetheless, key measures for encouraging walking, cycling, public transport and reducing single occupancy car journeys are set out below, and could be considered for implementation at the station. These measures primarily apply to rail passengers, but could also be relevant to station staff.

6.1 General measures

- 'Consider car last' in any travel information provided to staff and passengers. Any information provided on travel options should encourage people to use sustainable modes of travel rather than the private car, with information for travel by car coming last and given least prominence.
- Promote active travel through travel information displayed within the station, with further sources of information and organisations to promote active travel, including:
    - Information about the TP and its aims, objectives and benefits;
    - Contact details of the Travel Plan Co-ordinator;
    - Bus route and ticketing information;
    - Maps of local walking / cycling routes;
    - Details of bus operator websites; and
    - Telephone numbers of local private hire firms.

6.2 Walking

- Promote the health benefits of walking within any travel information. Walking regularly can help to contribute towards a healthy lifestyle, and emphasising the health benefits of walking may encourage more people to walk to / from the station as part of their journey.

- Create a map showing pedestrian routes serving the station, and associated journey times to be displayed within station travel information sources.

6.3 Cycling

- Monitor usage of on-site cycle parking and expand provision to meet demand.
- Explore opportunity to provide bicycle maintenance equipment in cycle parking area.
- Create a map showing local cycling routes serving the station, and associated journey times to be displayed within station travel information sources.
- If there is interest from regular station users, create a Bicycle User Group to bring together those who cycle to the station and provide a forum for suggesting further improvements to promote cycling.
- Explore potential of offering a 'Cycle to Work' scheme to staff.
- Promote the health benefits of cycling within any travel information.

6.4 Public Transport

- Provide information on local bus services, routes and ticketing information within station travel information sources.

6.5 Car Parking

- Reserve parking spaces closer to the station building for use by car sharers to promote car / lift sharing.
- Provide information on local car share schemes within station travel information sources.
- Monitor usage of blue badge spaces, enlarged bays and electric vehicle charging spaces, and expand provision if demand exceeds supply.

Key Action:	Identify and agree initial measures for implementation at the site
To be completed by:	Prior to occupation of the site
Responsibility of:	Site Operator / Travel Plan Co-ordinator

7 Targets, Monitoring and Review

7.1 Travel Plan Targets

In order to meet the overarching aim of maximising sustainable travel to and from Headbolt Lane station, targets should be set. It should be recognised that for the targets to be effective in encouraging sustainable travel, they need to be 'SMART':

Specific

Measurable

Achievable

Realistic

Time-bound

It is important to set realistic targets to measure the success of Travel Plans. Developing modal share targets ensures that the TP is monitored and reviewed and there is a benchmark on which to judge its success.

As the site is not yet occupied, there are no existing travel patterns to use as a baseline for setting targets. An initial snapshot travel survey will be undertaken to identify where station users are travelling from, how they are travelling, why they travel this way and what alternative forms of transport they would consider. This data will be used to establish a baseline position and inform which measures will likely be most effective in helping to achieve the TP targets.

It is important that this survey is undertaken at the earliest opportunity upon occupation of the site. This will assist the Travel Plan Co-ordinator to identify opportunities for implementing measures and encouraging sustainable travel before commuter travel habits become embedded.

Key Action:	Complete initial travel survey
To be completed by:	Within first 3 months of occupation
Responsibility of:	Travel Plan Co-ordinator

Key Action:	Set modal shift targets for next 5 years
To be completed by:	Within 1 month of undertaking travel survey
Responsibility of:	Travel Plan Co-ordinator

7.2 Monitoring

Monitoring of the TP will show how well it is performing in meeting the target mode shares and any other targets that are set throughout the life of the plan. New targets will be established by the TPC in consultation with KMBC as appropriate.

The Travel Plan is a continuous and on-going process of monitoring and review, rather than a one-off event. The TPC will engage with KMBC in the early stages of the development of the Travel Plan and a key action is the agreement of a monitoring framework, assigning persons responsible for tasks that need to be carried out as part of the monitoring exercise. The TPC and KMBC would also decide on production of action plans and mitigation, where these are required.

The TPC will be responsible for ensuring monitoring is undertaken and will coordinate the overall monitoring strategy. The TPC will also be responsible for reporting the results to KMBC.

The Monitoring Framework for the proposed development will include the following:

- Participation in snapshot travel surveys to understand the modal split for travel to the station;
- Surveys to assess the use of cycle parking, electric vehicle charging points, blue badge and enlarged bays;
- Surveys to monitor car park occupancy;
- Record comments relating to transport and travel made by station users and staff; and
- Record uptake of Travel Plan measures.

Key Action:	Produce monitoring framework
To be completed by:	Within first 3 months of occupation
Responsibility of:	Travel Plan Co-ordinator

Key Action:	Undertake monitoring in accordance with the monitoring framework
To be completed by:	Ongoing
Responsibility of:	Travel Plan Co-ordinator

7.3 Monitoring Report

An Annual Monitoring Report will be prepared by the TPC. The Monitoring Report will present monitoring information and will compare this against the targets set out in the TP post- occupation. The Monitoring Report will be produced within one month of the completion of the monitoring surveys undertaken as part of the monitoring framework.

The results of the monitoring report will be used to assist in the implementation of the TP. This will be achieved in many ways including the review of targets (and setting of new targets if appropriate) and the identification of barriers to implementation of a successful TP.

If the Monitoring Report indicates that the TP targets are not being met, it would be the responsibility of the TPC to identify an Action Plan for the following 12 months. The Action Plan would contain a programme of measures and tasks such that the TP targets are achieved, alongside the person(s) responsible and timescales for delivery.

Key Action:	Produce Monitoring Report
To be completed by:	Annually and within 1 month of completion of monitoring surveys
Responsibility of:	Travel Plan Co-ordinator

Key Action:	Develop and implement Action Plan
To be completed by:	Within 1 month of completion of Monitoring Report
Responsibility of:	Travel Plan Co-ordinator

8 Implementation

Key actions have been identified throughout this document and an Action Plan has been developed based on these. The purpose of the Action Plan is to help inform and guide the development of the full Travel Plan for the station.

Key action	To be completed by	Responsibility of
Prior to occupation		
Appoint Travel Plan Co-ordinator	1 month prior to occupation	Site operator
Identify and agree initial measures for implementation at the site	1 month prior to occupation	Site operator / TPC
On occupation		
Complete initial travel survey	Within 3 months of occupation	TPC
Set modal shift targets	Within 1 month of undertaking initial travel survey	TPC
Produce Monitoring Framework	Within 3 months of occupation	TPC
Ongoing		
Undertake monitoring in accordance with the Monitoring Framework	Ongoing	TPC
Produce Monitoring Report	Annually and within 1 month of completion of monitoring surveys	TPC
Develop and implement Action Plan	Within 1 month of completion of annual Monitoring Report	TPC

Appendix A

Policy Review

National Planning Policy Framework

The National Planning Policy Framework (NPPF) was originally published by the Department for Communities and Local Government (DCLG) in March 2012, with the most recent revision being published in February 2019.

The NPPF details the Government's planning policies for England and how these are to be applied. The document seeks to contribute to promoting sustainable transport, and states that 'transport issues should be considered from the earliest stages of plan-making and development proposals, so that:

- the potential impacts of development on transport networks can be addressed;
- opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;
- opportunities to promote walking, cycling and public transport use are identified and pursued;
- the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and
- patterns of movement, streets, parking and other transport considerations are integral to the design of schemes and contribute to making high quality places.'

Paragraph 109 states that 'development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe'.

In addition, paragraph 110 sets out development design guidelines. Where practical, developments should be designed to:

- 'give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitate access to high quality public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;
- address the needs of people with disabilities and reduced mobility in relation to all modes of transport;
- create places that are safe, secure and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards; and
- allow for the efficient delivery of goods, and access by service and emergency vehicles.'

The development site is located within a residential area and the proposed development seeks to enhance the connectivity of the area by public transport. A number of measures to promote sustainable travel to / from the station, such as cycle parking facilities and appropriate bus provision, have been incorporated into the proposals.

National Planning Practice Guidance

The National Planning Practice Guidance (NPPG) was last updated in October 2019 and contains guidance on Travel Plans and Transport Assessments, setting out that they are required for all developments which generate significant amounts of movements. The NPPG states that these should be:

- Proportionate to the size and scope of the proposed development to which they relate and build on existing information wherever possible;
- Established at the earliest practicable possible stage of a development proposal;
- Be tailored to particular local circumstances (other locally-determined factors and information beyond those which are set out in this guidance may need to be considered in these studies provided there is robust evidence for doing so locally); and
- Be brought forward through collaborative ongoing working between the local planning authority/transport authority, transport operators, rail network operators, Highways Agency where there may be implications for the strategic road network and other relevant bodies. Engaging communities and local businesses in Travel Plans, Transport Assessments and Statements can be beneficial in positively supporting higher levels of walking and cycling (which in turn can encourage greater social inclusion, community cohesion and healthier communities).

A Transport Assessment and accompanying Travel Plan have been developed in line with this guidance to appropriately assess the potential transport impacts of the proposals and promote a sustainable development.

TfN Strategic Transport Plan

The Strategic Transport Plan (STP) sets out Transport for the North's (TfN) investment priorities for transport across the North and identifies key areas for enhanced connectivity.

The objectives of the STP are to:

- Transform economic performance;
- Create a more efficient, reliable, integrated and resilient transport system;
- Improve inclusivity, health and access to opportunities; and
- Promote the built, historic and natural environment.

By providing a new rail station with facilities for bus interchange, the proposed development will contribute to TfN's aim of creating a creating a more efficient and integrated transport system. It will also improve access to a range of opportunities for residents. This enhanced connectivity and accessibility will support transformational economic growth in the North.

Merseyside Local Transport Plan 3

The Merseyside LTP3, adopted in April 2011, outlines the transport strategy for Merseyside. The LTP3 is a collaborative strategy created by the five Merseyside Local Authorities, which includes Knowsley Metropolitan Borough Council.

The plan sets out a vision for Merseyside's transport network:

'A city region committed to a low carbon future which has a transport network and mobility culture that positively contributes to a thriving economy and the health and wellbeing of its citizens and where sustainable travel is the option of choice.'

The above vision will be achieved by pursuing six goals:

1. Create conditions to enable sustainable economic growth by supporting the priorities of the Liverpool City Region, the Local Enterprise Partnership and the Local Strategic Partnerships.
2. Provide a clean, resilient and low emission transport system.
3. Ensure the transport system promotes health and wellbeing and road safety.
4. Ensure equal travel opportunities for all and promote a transport network that enables access to employment, education, healthcare, leisure and recreation for all.
5. Ensure the transport system supports economic success for the LCR through the efficient movement of people and goods.
6. Maintain assets to a high standard.

The proposed rail station at Headbolt Lane will provide a new, convenient and sustainable transport option for local people. It will increase the accessibility of a range of opportunities, which in turn which help to support economic growth in the LCR.

LCRCA Transport Plan

The Liverpool City Region Combined Authority (LCRCA) Transport Plan (2019) sets out a strategic framework and delivery plan for transport in the LCR. The strategic objectives of the plan include:

- supporting inclusive economic growth by developing a transport network that connects people, businesses and visitors;
- creating a new mobility culture with modern, safe, clean and inclusive transport, where public transport is the mode of choice, which in turn will help to enhance health and wellbeing;
- developing a liveable and reliant city region that addresses poor air quality and supports a zero carbon LCR by 2040;
- providing a safe, well maintained and resilient transport network.

The LCRCA Transport Plan emphasises the importance of connecting people, business and visitors whilst promoting sustainability, health and wellbeing. The proposed development itself would provide a sustainable travel option for local residents and increased accessibility for all its users, which will help to support the LCRCA's goal of making public transport the mode of choice.

LCRCA Long Term Rail Strategy

The LCRCA Long Term Rail Strategy, most recently updated in April 2018, has been developed to ensure the rail network meets the LCR's needs for the next 30 years and

beyond. It seeks to support the development of the network to increase connectivity, capacity and frequency to generate a clustering effect and in turn, increased productivity.

The Strategy notes areas of weaker connectivity within the LCR, including the Merseyrail line to Kirkby, which should be prioritised for growth.

It also identifies some existing constraints on the rail network, such as lack of connectivity between places where people live and employment areas. The Strategy goes on to identify how a new station at Headbolt Lane would open up the rail network to a population that does not currently have easy access to it. It is therefore considered that the proposed station at Headbolt Lane is an important component to achieving the aims of the LCRCA Long Term Rail Strategy.

LCRCA Local Cycling and Walking Infrastructure Plan

The Local Cycling and Walking Infrastructure Plan (LCWIP) is a 'strategic approach to developing a cohesive network of high standard active travel routes across the region' between 2019-29. The LCWIP has been developed in accordance with the Department for Transport's Cycling and Walking Investment Strategy.

A key objective of the LCWIP is to develop a walking and cycling network that increases active travel by providing safe, accessible, comfortable, direct and coherent routes.

The proposed station at Headbolt Lane has been developed with the aim of maximising the connectivity of the site for pedestrians and cyclists, for example, through the provision of new pedestrian crossing infrastructure on Headbolt Lane and high-quality cycle parking adjacent to the station building. The Travel Plan produced in support of the proposed development will also help to encourage walking and cycling trips to/from the station. It is therefore considered that the proposals align with the aims of the LCWIP.

Knowsley Local Plan: Core Strategy

The Knowsley Local Plan Core Strategy (2016) sets out a strategic framework for the development of Knowsley up to 2028 and beyond.

Strategic Objective 6 relates to sustainable transport. It states that new development should seek to prioritise sustainable transport to help improve accessibility between housing and employment areas, as well as shopping leisure, healthcare, education and other services.

The Core Strategy contains a number of policies pertaining to transport and the proposed development.

Policy SD1 states that a positive approach will be adopted when considering development proposals, in accordance with the NPPF's presumption in favour of sustainable development. Planning applications that accord with Local Plan policies will be approved without delay.

Policy CS7 states that planning powers will be used to support an integrated and sustainable transport system within the borough that:

- supports the development needs of the borough up to 2029;
- enables people to travel by walking, cycling and public transport;
- enhances road safety;

- strives to reduce carbon emissions; and
- supports local people's health and wellbeing.

New development will need to be:

- located and designed to maximise accessibility by sustainable modes, with developer contributions required where deficiencies are identified;
- designed to ensure large scale proposals are in the most accessible locations;
- supported by a Transport Assessment and Travel Plan;
- compliant with adopted parking standards; and
- supported by measured to reduce carbon emissions and improve air quality.

The Council will work with partners to deliver schemes which support the Merseyside LTP3 priorities including:

- improvements to the rail network such as electrification, improvements to stations and interchange facilities and provision of Park and Ride facilities;
- enhanced bus provision, including improved facilities and enhancement of key bus routes through Quality Bus Partnerships and Quality Bus Contracts; and
- provision of walking and cycling routes as part of the Green Infrastructure Network.

Policy CS8 seeks to maximise the benefits of green infrastructure for the borough. Planning powers will be used to manage and enhance green infrastructure in order to provide sustainable transport links between residential areas, employment areas, community services and leisure opportunities.

Policy CS12 identifies Tower Hill as a principal regeneration area. Redevelopment of the area will be supported through:

- public realm and green infrastructure enhancements with a focus on quality, accessibility and integration with new development;
- infrastructure improvements including enhanced public transport, walking and cycling provision to increase accessibility in Tower Hill and surrounding area; and
- flexibility to integrate the potential delivery of a new rail station / Park and Ride facility to the south of Headbolt Lane.

Policy CS19 sets out the expectations for design quality and accessibility in new development:

- complement and enhance existing green infrastructure where possible;
- create places that facilitate social interaction and active lifestyles, and integrate high quality public realm; and
- deliver safe and convenient routes for movement that prioritise walking, cycling and public transport and meet the needs of all users.

Strategy for Knowsley: 'The Borough of Choice'

The Strategy for Knowsley: The Borough of Choice, adopted in 2013, focuses on actions to deliver the short-terms priorities for the borough. By 2023, the Strategy wants Knowsley to have:

- attractive, sustainable neighbourhoods and vibrant, welcoming town centres;
- residents who are enabled to make positive lifestyle choices;
- high quality employment areas to support economic growth in the LCR; and
- narrowed the deprivation gap between areas in Knowsley and elsewhere.

The proposed development would provide sustainable travel options for the local community, whilst improving accessibility to a wider range of opportunities for residents. The Travel Plan for the station further helps to support these aims. The proposed development is therefore considered to be in accordance with the Strategy for Knowsley: The Borough of Choice.

Knowsley Replacement Unitary Development Plan

The Knowsley Replacement Unitary Development Plan (UDP), adopted in June 2006, sets out KMBC's strategy for development in the borough. Following the adoption of the Knowsley Local Plan, 39 UDP policies remain active, a number of which pertain to transport and new development.

Policy T5 states that all major traffic generating developments should be well located for access by walking, cycling and public transport.

Policy T7 outlines how new development should seek to enhance the walking and cycling network in order to promote health and wellbeing for all.

Policy T8 states that any development proposals that generate a material increase in traffic on the highway network should be supported by a Transport Assessment, and any associated impacts mitigated as appropriate. Similarly, **Policy T9** states that all major traffic generating developments must be supported by a Travel Plan.

Policy T10 outlines how new development must provide suitable access for the less mobile in accordance with the Disability Discrimination Act 1995 and its successors.

By proving new rail connections, the proposed development would support a number of the policies outlined in the UDP. The proposals have been developed to ensure sustainable and inclusive access for users of the station. Furthermore, a Transport Assessment and Travel Plan have been produced to support the planning application for the new station. The proposed development is therefore considered to be in accordance with the above policies outlines in the UDP.

Ensuring a Choice of Travel SPD

The 'Ensuring a Choice of Travel' Supplementary Planning Document was published by KMBC in 2010. It sets out how new developments can satisfy the accessibility requirements of policies within the Knowsley Replacement Unitary Development Plan.

The main objective of the SPD is to ensure a good choice of travel modes to all new development. The proposed development includes provision for access by a range of sustainable travel modes, including rail, bus, walking and cycling.

The SPD states that parking areas should be designed to ensure pedestrians and cyclists are given priority over motor vehicles where possible. The internal layout of the proposed development has been designed as such. A 3m wide bi-directional cycleway is proposed alongside the vehicle access road and dedicated pedestrian footways and zebra crossings are provided throughout the car park.

In terms of cycle parking, the SPD states that a wide range of cycle storage options should be considered when designing facilities. A high level of cycle parking provision is proposed adjacent to the station building to ensure convenient access for cyclists.

Tower Hill Action Area SPD

The Tower Hill (Kirkby) Action Area Supplementary Planning Document was published by KMBC in April 2007. The purpose of the SPD is to guide future development proposals for the Tower Hill Action Area. The objectives of the SPD include:

- **Urban quality –** to provide a high quality, sustainable and accessible village centre that serves as the focus for the wider Tower Hill regeneration. This requires the delivery of comprehensive development, redevelopment and improvement.
- **Community cohesion –** to create attractive, safe, and well-designed neighbourhoods with good connectivity to each other and the village centre. This requires the delivery of high-quality, accessible public realm that provides facilities for the whole community**.**
- **Sustainable transport –** to promote sustainable transport by providing an integrated, well-connected network of roads, footways, cycleways, and public transport facilities that ensure permeability and accessibility within and to / from Tower Hill.

The SPD also notes the aspiration for a rail station to be provided on the Headbolt Lane site. It states the importance of providing a bus link within the proposed station site to enhance connectivity within Tower Hill.

Appendix 4C

KMBC Personal Injury Accident (PIA) data



7
1701
638
18
2000
192
10
1800
393
20
2000
794
13
1801
351
16
1910
006
24
2001
794
22
2001
371
25
2002
067
TOWER HILL
TOWER HILL
1
1701
409
17
1912
484
Millbrook Park
Millennium Green
Northwood Community Primary School
Old Road
NORTHWOOD
Playing Field
Northwood Forest Hills
12
1801
020
19
2000
589
8
1701
810
9
1702
140
15
1840
728
14
1840
477
21
2001
143
26
23
2002
494

N	Ar	L	Reference	Severi	Day	Date	Tim	Grid Coords	Link/Nod	Street
1		E08000011	1601781	Slight	Monday	30/05/2016	22:15	341251/39950		

Location: JUNCTION COUNTY ROAD/ST KEVINS DRIVE COUNTY ROAD **1st Rd:** U **2nd Rd:** A506

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	Other Give	Dark/lights lit	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	M/cycle 125 - 500	No	Going ahea	N	S								
					On main	Mid junction	No	None		None	Male	50	-ve
2	Car	No	Wt turn rt	N	S								
					On main	Mid junction	No	None		None	Female	34	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Drv/Rider	Male	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: VEHICLE 002 CAME TO A STOP ON COUNTY ROAD AND HAD HER RIGHT INDICATOR ON READY TO TURN, AT THIS TIME VEHICLE 001, A SCOOTER, HAS BEEN OVERTAKING ANOTHER VEHICLE AND AS IT HAS COME BACK ONTO THE CORRECT SIDE OF THE ROAD THE RIDER HASN'T SEEN THE STATIOARY VEHICLE AND GONE INTO THE REAR OF THE CAR CAUSING SLIGHT INJURY

User Information:

2		E08000011	1603753	Slight	Friday	25/11/2016	16:00	341253/39949		

Location: COUNTY ROAD and ST KEVINS DRIVE **1st Rd:** A506 **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	T/Stag ATS	Daylight	Fine	Dry	None	Ped Phase	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Waiting	N	NE								
					On main	Junt appr	No	None		None	Female	45	N/R
2	Car	No	Waiting	N	NE								
					On main	Junt cleared	No	None		None	Male	57	N/R
3	Car	No	Waiting	N	NE								
					On main	Junt appr	No	None		None	Female	52	N/R

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: VEVHICLE 003 IN STATIONARY TRAFFIC. VEHICLE 002 COLLIDES WITH REAR OF VEHICLE 003. VEHICLE 001 COLLIDES WITH REAR OF VEHICLE 002.

User Information:

3		E08000011	1604037	Fatal	Tuesday	20/12/2016	16:00	341253/39949		

Location: COUNTY ROAD and ST KEVINS DRIVE **1st Rd:** A506 **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	T/Stag ATS	Dark/lights lit	Fine	Wet	None	Ped Phase	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	M/cycle 125 - 500	No	Going ahea	S	NW								
					On main	Mid junction	No	None		None	Male	27	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Pedestrian	Male	#	Fatal	No	South wes	Nearside	Ped x'ing	Other
2	1	Drv/Rider	Male	#	Serious	No	Not ped	Not ped	Not ped	Other
3	1	Passenger	Male	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: PEDESTRAIN HAS BEEN EITHER CROSSING OR ABOUT TO AS VEHICLE 1 HAS COME AWAY FROM KIRKBY FILTERING DOWN THE TRAFFIC WHEN THE LIGHTS HAVE CHANGED TO GREEN THE MOTORBIKE HAS PASSED THE FIRST CAR TRAVELLING TOWARDS THE CROSSING WHERE THE COLLISION HAS OCURRED

User Information:

4		E08000011	1700715	Slight	Monday	20/03/2017	07:50	340998/39990		

Location: BANK LANE SEGMENT BANK LANE **1st Rd:** A506 **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	NotJCT	Daylight	Rain	Wet	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	S	N								
					On main	Not at	No	None		None	Male	27	N/C

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Pedestrian	Male	0	Slight	No	East	Nearside	In c'way	Other

Description: CASUALTY RUNS OUT INTO ROAD AND COLLIDES WITH NEARSIDE OF VEH001

User Information:

5 E08000011 1701317 Slight Friday 02/06/2017 12:25 341093/39976

Location: COUNTY ROAD and HEADBOLT LANE **1st Rd:** A506 **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	X-Rds ATS	Daylight	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Right turn	SE	E								
					On main	Mid junction	No	None		None	Female	57	-ve
2	Pedal Cycle	No	Going ahea	N	S								
					On main	Mid junction	No	None		None	Male	32	N/A

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	2	Drv/Rider	Male	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: V1 TURNS RIGHT ACROSS PATH OF ONCOMMING VEHICLE V2 CAUSING COLLISION

User Information:

6 E08000011 1701409 Slight Tuesday 13/06/2017 17:10 341256/39949

Location: COUNTY ROAD and ST KEVINS DRIVE **1st Rd:** A506 **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	T/Stag ATS	Daylight	Fine	Dry	None	Ped Phase	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Van/Goods < 3.5t	No	Going ahea	SE	N								
					On main	Junt appr	No	None		None	Male	35	-ve
2	Car	No	Going ahea	S	N								
					On main	Junt appr	No	None		None	Male	44	-ve
3	Car	No	Going ahea	S	N								
					On main	Junt appr	No	None		None	Male	34	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	2	Drv/Rider	Male	#	Slight	No	Not ped	Not ped	Not ped	Other
2	3	Drv/Rider	Male	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: VEHICLE 001, 002 AND 003 ARE ALL TRAVELLING ALONG COUNTY ROAD OUT OF KIRKBY IN HEAVY TRAFFIC AS THEY REACH THE JUNCTION OF SAINT KEVINS DRIVE THE TRAFFIC AHEAD STOPS. VEHICLE;E 003 AND 002 STOP AND VEHICLE 001 FAILS TO STOP IN TIME AND COLLIDES INTO THE REAR OF VEHICLE 002 WHICH THEN COLLIDES INTO THE REAR OF VEHICLE 003.

User Information:

7 E08000011 1701638 Slight Thursday 06/07/2017 08:49 340705/40036

Location: BANK LANE SEGMENT BANK LANE **1st Rd:** A506 **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	NotJCT	Daylight	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	N	S								
					On main	Not at	No	None		None	Female	34	-ve
2	Car	No	Waiting	N	S								
					On main	Not at	No	None		None	Female	29	-ve
3	Van/Goods < 3.5t	No	Waiting	N	S								
					On main	Not at	No	None		None	Male	76	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	2	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: VEH 001 HAS FAILED TO LOOK AND NOTE THE VEHICLES SLOWING STOPPING AHEAD. COLLIDES INTO REAR OF QUE

User Information:

8 E08000011 1701810 Serious Wednesday 26/07/2017 17:35 341999/40034

Location: CHAMBERLAIN DRIVE SEGMENT 1 TO 37 CHAMBERLAIN DRIVE **1st Rd:** U **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	NotJCT	Daylight	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	N	S								
					On main	Not at	No	P'd veh u/l		None	Untra.	-1	N/C
2	Car	No	Parked	P	P								
					On main	Not at	No	None		None	Male	47	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	2	Pedestrian	Female	#	Serious	No	Stand	Unknown	On footway	Other

Description: STOLEN VEHICLE COLLIDES WITH STATIONARY VEHICLE AND COLLIDES WITH PEDESTRIAN

User Information:

9 E08000011 1702140 Serious Friday 01/09/2017 14:11 342194/40051

Location: PINGWOOD LANE SEGMENT PINGWOOD LANE **1st Rd:** U **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	NotJCT	Daylight	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Van/Goods < 3.5t	No	Going ahea	E W								
				On main	Not at	No	None	Nearside	Wall or	Male	53	N/P

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Drv/Rider	Male	#	Serious	No	Not ped	Not ped	Not ped	Other

Description: DRIVER SUFFERED MEDICAL EPISODE CAUSING MINOR DAMAGE TO VEHICLE.

User Information:

10 E08000011 1800393 Slight Monday 19/02/2018 20:50 340772/40023

Location: BANK LANE and SHEVINGTONS LANE **1st Rd:** U **2nd Rd:** A506

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Dual c'way	T/Stag ATS	Dark/lights lit	Fine	Wet	None	Pelican	None	None

V	Vehicle type	Towing	Manoeuvre	Di Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Stop	NW SE								
				On main	Junt appr	No	P'd veh u/l		None	Untra.	-1	N/C
2	Car	No	Waiting	NW SE								
				On main	Junt appr	No	None		None	Male	43	N/R

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	2	Drv/Rider	Male	#	Slight	No	Not ped	Not ped	Not ped	Other
2	2	Passenger	Female	#	Slight	Front	Not ped	Not ped	Not ped	Other
3	2	Passenger	Female	#	Slight	Rear	Not ped	Not ped	Not ped	Other

Description: CORSA IS WAITING AT THE JUNCTION TO GO STRAIGHT AHEAD (HELD AT RED ATS). THE MERCESED HITS TO REAT OF THE VECHILE, THEN GOES THROUGH THE RED LIGHT AND MAKES GOOD. VRM NOTED BY THE OCCUPANTS OF THE CORSA

User Information:

11 E08000011 1800606 Slight Sunday 18/03/2018 03:00 340914/40027

Location: ASTER DRIVE and SHEVINGTONS LANE **1st Rd:** U **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	T/Stag ATS	Dark/lights lit	Snow	Wet	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	E W								
				On main	Junt cleared	Yes	Kerb	Offside	Lamp	Untra.	-1	N/C

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Passenger	Male	#	Slight	Rear	Not ped	Not ped	Not ped	Other

Description: APPEARS VEHICLE HAS CLIPPED NEARSIDE KERB CAUSING LOSS OF CONTROL. FROM TRACKS IN FINE SNOW COVERING, VEHICLE APPEARS TO HAVE COMPLETED A 180 DEGREE SPIN BEFORE MOUNTING OPPOSITE PAVEMENT AND COLLIDING WITH LAMP POST AND COMING TO REST AGAINST A COUNCIL FENCE

User Information:

12 E08000011 1801020 Slight Wednesday 09/05/2018 19:49 341792/39995

Location: HEADBOLT LANE and HOLLINGHURST ROAD **1st Rd:** U **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	T/Stag Give	Daylight	Fine	Wet	None	Footbrid	None	None

V	Vehicle type	Towing	Manoeuvre	Di Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Right turn	N W								
				On main	Enter main	No	None		None	Female	54	N/R
2	Car	No	Going ahea	W E								
				On main	Junt appr	No	None		None	Male	35	N/R

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other
2	1	Passenger	Female	#	Slight	Front	Not ped	Not ped	Not ped	Other

Description: VEH 1 HAS BEEN COMING OUT OF A SIDE ROAD, VIEW TO THE RIGHT WHERE VEH 2 HAS BEEN COMING FROM HAS BEEN RESTRICTED DUE TO THE BRIDGE STRUCTURE, ALSO REPORTED VEH 2 IS TRAVELLING AT EXCESS SPEED.

User Information:

13 E08000011 1801351 Serious Sunday 10/06/2018 17:15 341136/40034

Location: EBONY WAY and SHEVINGTONS LANE **1st Rd:** U **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	T/Stag Give	Dark/no lights	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	NW	SE								
					On main	Leav main	No	None		None	Untra.	-1	N/C

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Pedestrian	Male	#	Serious	No	North eas	Off masked	In c'way	Other

Description: PEDESTRIAN CROSSES ROAD FROM RIGHT TO LEFT, FROM BEHIND A VEHICLE PARKED UP. GETS APPROXIMATELY HALF WAY INTO ROAD AND VEHICLE COMES ROUND CORNER, FAILING TO SEE PEDESTRIAN AND COLLIDING WITH HIM. VEHICLE THEN REVERSED ONTO MAIN ROAD AND MAKES OFF.

User Information:

14 E08000011 1840477 Slight Monday 26/11/2018 22:50 342131/40067

Location: PINGWOOD LANE SEGMENT PINGWOOD LANE **1st Rd:** U **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	T/Stag Give	Dark/lights lit	Fine	Wet	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Right turn	W	S								
					On main	Junt cleared	Yes	None		None	Male	39	+ve
2	Goods 3.5 - 7.5t	No	Going ahea	S	N								
					On main	Junt appr	No	None		None	Male	28	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Drv/Rider	Male	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: DRIVER OF VEHICLE 1 HAS LOST CONTROL AS HE TURNED RIGHT INTO PINGWOOD LANE FROM SHEVINGTONS LANE. HE HAS THEN COLLIDED WITH VEHICLE 2 WHICH WAS TRAVELLING NORTH ALONG PINGWOOD LANE, TOWARDS SHEVINGTONS LANE.

User Information:

15 E08000011 1840728 Fatal Thursday 20/12/2018 17:08 342208/40047

Location: PINGWOOD LANE SEGMENT PINGWOOD LANE **1st Rd:** U **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	NotJCT	Dark/lights lit	Fine	Wet	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	S	N								
					On main	Not at	No	None		None	Male	37	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Pedestrian	Male	#	Fatal	No	West	Offside	In centre	Other

Description: C001 WAS A PEDESTRIAN AND IN THE PROCESS OF CROSSING THE CARRIAGEWAY WHEN THEY HAVE BEEN STRUCK BY V001. V001 REMAINED AT SCENE.

User Information:

16 E08000011 1910006 Serious Tuesday 01/01/2019 07:35 340940/40015

Location: DOMINGO DRIVE SEGMENT 2 DOMINGO DRIVE **1st Rd:** U **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	NotJCT	Dark/lights lit	Fine	Wet	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	SE	NW								
					On main	Not at	No	None	Nearside	Wall or	Untra.	-1	N/C

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Pedestrian	Male	#	Serious	No	Unknown	Unknown	Unknown or	Other

Description: UNKNOWN AT THIS TIME - MALE STATES WAS CHASED, HIT BY A CAR AND ASSAULTED

User Information:

17 E08000011 1912484 Slight Thursday 12/09/2019 15:00 341333/39917

Location: MELLING DRIVE SEGMENT 1 TO 44 MELLING DRIVE **1st Rd:** U **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	NotJCT	Daylight	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea(	S	N								
					On main	Not at	No	None		None	Male	73	N/C

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Pedestrian	Male	#	Slight	No	North	Back	c'way not c:	Other

Description: PEDESTRIANS WALKING IN THE ROAD ON THEIR WAY HOME FROM SCHOOL. LOW SPEED COLLISION BETWEEN VEHICLE AND PEDESTRIAN ALTHOUGH UNCLEAR AS TO CAUSE.

User Information:

18 E08000011 2000192 Slight Friday 17/01/2020 21:30 340736/40029

Location: BANK LANE and SHEVINGTONS LANE **1st Rd:** A506 **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	NotJCT	Dark/lights lit	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea(	NW	SE								
					On main	Not at	No	None		None	Untra.	-1	N/C
2	Car	No	Going ahea(	NW	SE								
					On main	Not at	No	None		None	Female	20	N/C

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	2	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: THIS IS A SLIGHT INJURY/DAMAGE RTC.
V002 WAS DRIVING ALONG BANKS LANE TOWARDS KIRBY IN TRAFFIC. V001 COLLIDED WITH THE REAR OF V002 CAUSING MINOR INJURY TO GREGORY AND MINOR DAMAGE TO HER VEHICLE.
V001 FTS AND VRM WAS NOT OBTAINED.
I HAVE BEEN UNABLE TO CONTACT GREGORY DESPITE NUMEROUS ATTEMPTS, MESSAGE LEFT.

User Information:

19 E08000011 2000589 Slight Monday 02/03/2020 11:15 342277/40017

Location: DALE LANE and PINGWOOD LANE **1st Rd:** U **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	Priv	Give Daylight	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Goods unknown wei(	No	Going ahea(	SE	NW								
					On main	Junt appr	No	None		None	Female	28	N/R
2	Car	No	Going ahea(	NW	SE								
					On main	Junt cleared	No	None		None	Female	32	N/R
3	Car	No	Going ahea(	SE	NW								
					On main	Junt appr	No	None		None	Female	49	N/R
4	Goods > 7.5t	No	Going ahea(	SE	NW								
					On main	Junt appr	No	None		None	Male	25	N/R

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other
2	2	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other
3	3	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other
4	3	Passenger	Male	#	Slight	Front	Not ped	Not ped	Not ped	Other

Description: VEHICLE 4 - DAF HGV ON TRADE PLATES TRAVELLING ALONG DALE LANE TOWARDS HEADBOLT LANE. ROYAL MAIL VEHICLE BRAKES HEAVILY TO TURN INTO PRIVATE DRIVEWAY. VEHICLE 4 BRAKES. VEHICLE 3 BRAKES, VEHICLE 1 COLLIDES WITH REAR OFFSIDE OF VEHICLE 3 CAUSING DAMAGE PRIOR TO DRIVING ONTO OFFSIDE CARRIAGEWAY COLLIDING HEAD ON WITH VEHICLE 2.
VEHICLE 4 - NO DAMAGE
VEHICLE 3 - REAR OFFSIDE DAMAGE
VEHICLE 2 HEAVY FRONT DAMAGE POSSIBLE WRITE OFF
VEHICLE 1 - FRONT DAMAGE

CASUALTY 1 - COMPLAINS OF LEG INJURY
CASUALTY 2 - POSS BROKEN THUMB , LEG INJURY , HEADACHE
CASUALTY 3 & 4 - SUFFERING SHOCK AND HEADACHE

User Information:

20 E08000011 2000794 Slight Thursday 27/02/2020 11:05 340916/40027

Location: ASTER DRIVE and SHEVINGTONS LANE **1st Rd:** U **2nd Rd:** U

Spee #	M	C'Way	Jct	Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	T/Stag	Give	Daylight	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Right turn	N	W								
					On main	Enter main	No	None		None	Female	31	-ve
2	Goods 3.5 - 7.5t	No	Going ahea	W	E								
					On main	Mid junction	No	None		None	Male	50	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: VEHCILE 001 HAS PULLED OUT OF GIVE WAY AT ASTER DRIVE INTO THE PATH OF VEHICLE 002.

User Information:

21 E08000011 2001143 Slight Monday 08/06/2020 18:00 342118/40070

Location: SHEVINGTONS LANE and STOPGATE LANE **1st Rd:** U **2nd Rd:** U

Spee #	M	C'Way	Jct	Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	T/Stag	Give	Daylight	Fine	Dry	None	None	Rdworks	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Left turn	S	N								
					On main	Junt appr	No	None		None	Female	18	-ve
2	Pedal Cycle	No	Rt hand ber	S	N								
					On main	Junt appr	No	None		None	Male	63	N/A

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	2	Drv/Rider	Male	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: V001 HAS BEEN DRIVING ALONG PINGWWOD TOWARDS STOPGATE AND SHEVINGTONS LANE V001 DRIVER WHO IS A NEW DRIVER HAS NOT REALISED THAT SHEVINGTONS LANE HAS A GIVE WAY AND OVERTAKEN THE CYCLIST APPROACHING THE JUNCTION WITH THE CYCLIST FOLLOWING THE NATURAL ROUTE OF THE ROAD. DRIVE HAS TURNED INTO SHEVINGTONS LANE AND INTO THE CYCLIST WHO THEY THOUGHT WOULD ALSO BE TURNING IN TO SHEVINGTONS COLLIDING WITH THEM.

User Information:

22 E08000011 2001371 Slight Thursday 09/07/2020 01:40 341004/39990

Location: COUNTY ROAD SEGMENT COUNTY ROAD **1st Rd:** A506 **2nd Rd:**

Spee #	M	C'Way	Jct	Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Dual c'way	Not	JCT	Dark/lights lit	Rain Wind	Wet	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	S	N								
					On main	Not at	No	None		None	Untra.	-1	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Pedestrian	Male	#	Slight	No	West	Offside	In c'way	Other

Description: XXX PEDESTRAIN SLIPS FROM KERB INMTO PATH OF VEHICLE, ELBOW HITS WINDSCREEN PEDESTARIN FALLS TO ROAD

User Information:

23 E08000011 2001482 Slight Thursday 30/07/2020 18:30 342158/40071

Location: STOPGATE LANE SEGMENT B STOPGATE LANE **1st Rd:** U **2nd Rd:**

Spee #	M	C'Way	Jct	Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	Not	JCT	Daylight	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	W	E								
					On main	Not at	No	None		None	Untra.	-1	N/C
2	Pedal Cycle	No	Going ahea	W	E								
					On main	Not at	No	None		None	Male	15	N/A

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	2	Drv/Rider	Male	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: V2 HAS BEEN RIDING ALONG WHEN HE HAS HEARD A VEHICLE COMING UP QUICKLY BEHIND HIM. V1 HAS STRUCK THE REAR WHEEL OF V2 CAUSING THE RIDER TO HIT THE BONNET THE FLOOR. V1 STOPPED BRIEFLY AND THEN MADE OFF WITHOUT EXCHANGING DETAILS. REPORTS THAT V1 SMELT OF CANNABIS

User Information:

24 E08000011 2001794 Slight Friday 04/09/2020 18:18 340924/40003

Location: BANK LANE SEGMENT A BANK LANE **1st Rd:** A506 **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	NotJCT	Daylight	Fine	Dry	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	W	E								
					On main	Not at	No	None	Nearside	Wall or	Male	36	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Passenger	Female	#	Slight	Front	Not ped	Not ped	Not ped	Other

Description: V001 TRAVELLING TOWARDS KIRKBY, WHEN DRIVER HAS COLLIDED WITH ROAD SIDE PROECTIVE FENCING CAUSING DAMAGE TO THE FRONT N/S, AXEL COMPLETELY RIPPED FROM THE VEHICLE. DRIVER LATER TESTED POSTIVE FOR DRUGS AT THE ROADSIDE, ARRESTED ON RELATED OCC

User Information:

25 E08000011 2002067 Slight Wednesday 07/10/2020 18:40 341094/39976

Location: BOYES BROW and HEADBOLT LANE **1st Rd:** U **2nd Rd:** U

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		Single c'way	Multi ATS	Dark/lights lit	Rain	Wet	None	None	None	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Right turn	E	N								
					On main	Mid junction	No	None		None	Female	53	-ve
2	Car	No	Going ahea	W	E								
					On main	Mid junction	No	None		None	Female	63	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other
2	2	Drv/Rider	Female	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: V001 DRIVER THOMPSON IS DRIVING ALONG HEADBOLT LANE APPROACHING THE JUNCTION WITH COUNTY ROAD, TOWARDS KIRKBY. AT THIS TIME THE ATS IS ON RED AND THOMPSON STOPPED. THE LIGHTS HAVE CHANGED AND THOMPSON IN V001 HAS PROCEEDED THROUGH THE JUNCTION TURNING INTO THE PATH OF V002.

User Information:

26 E08000011 2002494 Slight Friday 04/12/2020 11:35 342148/40071

Location: STOPGATE LANE SEGMENT B STOPGATE LANE **1st Rd:** **2nd Rd:**

Spee #	M	C'Way	Jct Det/Ctrl	Lighting	Weather	Rd Surf	PedX -	- Phy Fac	Special	Hazar
		0.00	NotJCT	Daylight	Rain	Wet	None	None	Mud	None

V	Vehicle type	Towing	Manoeuvre	Di	Veh loc	Junct. loc	Skiddi	Hit obj in	Left cway	Hit obj	Se	Ag	B/
1	Car	No	Going ahea	W	E								
					On main	Not at	Over	None	Offside	Ditch	Male	26	-ve

Cas	Veh ref	Cas Class	Sex	Age	Severity	Car Pass	Ped	Ped	Ped location	School Pupil
1	1	Drv/Rider	Male	#	Slight	No	Not ped	Not ped	Not ped	Other

Description: V001 TRAVELLING ALONG NATIONAL SPEED LIMIT COUNTRY LANE WITH CORNERS AND BENDS. LOTS OF MUD ON THE ROAD AND DRIVER LOSES CONTROL, GOES THROUGH A HEDGE AND ENTERS A FIELD CAUSING THE VEHICLE TO FLIP ONTO ITS ROOF.

User Information:

Appendix 5A

Construction Dust Assessment

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5A1.1 Construction dust assessment

Table 5A.1: Dust emission magnitude

Dust emission magnitude		
Small	**Medium**	**Large**
Demolition		
• total building volume <20,000m^3 • construction material with low potential for dust release (e.g. metal cladding or timber) • demolition activities <10m above ground • demolition during wetter months	• total building volume 20,000 - 50,000m^3 • potentially dusty construction material • demolition activities 10 - 20m above ground level	• total building volume >50,000m^3 • potentially dusty construction material (e.g. concrete) • on-site crushing and screening • demolition activities >20m above ground level
Earthworks		
• total site area <2,500m^2 • soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • formation of bunds <4m in height • total material moved <10,000 tonnes • earthworks during wetter months	• total site area 2,500m^2 - 10,000m^2 • moderately dusty soil type (e.g. silt) • 5 – 10 heavy earth moving vehicles active at any one time • formation of bunds 4 – 8m in height • total material moved 20,000 - 100,000 tonnes	• total site area >10,000m^2 • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • formation of bunds >8m in height • total material moved >100,000 tonnes
Construction		
• total building volume <25,000m^3 • construction material with low potential for dust release (e.g. metal cladding or timber)	• total building volume 25,000 - 100,000m^3 • potentially dusty construction material (e.g. concrete) • on-site concrete batching	• total building volume >100,000m^3 • on-site concrete batching • sandblasting
Trackout		
• <10 HDV (>3.5t) outward movements in any one day • surface material with low potential for dust release • unpaved road length <50m	• 10 – 50 HDV (>3.5t) outward movements in any one day • moderately dusty surface material (e.g. high clay content) • unpaved road length 50 – 100m;	• >50 HDV (>3.5t) outward movements in any one day • potentially dusty surface material (e.g. high clay content) • unpaved road length >100m

Table 5A.2: Sensitivity of the area to dust soiling effects

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		< 20	< 50	< 100	< 350
High	> 100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	< 10	Medium	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low
Low	> 1	Low	Low	Low	Low

Table 5A.3: Sensitivity of the area to human health impacts

Background PM_{10} concentrations (annual mean)	Number of receptors	Distance from the source (m)				
		< 20	< 50	< 100	< 200	< 350
High receptor sensitivity						
> 32µg/m^3	> 100	High	High	High	Medium	Low
	10 – 100			Medium	Low	
	< 10		Medium	Low		
28 – 32µg/m^3	> 100	High	High	Medium	Low	Low
	10 – 100		Medium	Low		
	< 10					
24 – 28µg/m^3	> 100	High	Medium	Low	Low	Low
	10 – 100					
	< 10	Medium	Low			
< 24µg/m^3	> 100	Medium	Low	Low	Low	Low
	10 – 100	Low				
	< 10					
Medium receptor sensitivity						
> 32µg/m^3	> 10	High	Medium	Low	Low	Low
	< 10	Medium	Low			
28 – 32µg/m^3	> 10	Medium	Low	Low	Low	Low
	< 10	Low				
24 – 28µg/m^3	> 10	Low	Low	Low	Low	Low
	< 10					
< 24µg/m^3	> 10	Low	Low	Low	Low	Low
	< 10					
Low receptor sensitivity						
–	> 1	Low	Low	Low	Low	Low

Table 5A.4: Sensitivity of the area for ecological impacts

Receptor sensitivity	**Distance from the source (m)**	
	< 20	**< 50**
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table 5A.5: Risk of dust impacts

Sensitivity of area	**Dust emission magnitude**		
	Large	**Medium**	**Small**
Demolition			
High	High risk site	Medium risk site	Medium risk site
Medium	High risk site	Medium risk site	Low risk site
Low	Medium risk site	Low risk site	Negligible
Earthworks			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Construction			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Trackout			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Low risk site	Negligible
Low	Low risk site	Low risk site	Negligible

Appendix 6A

Terminology

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6A1 Glossary of acoustic terminology

6A1.1 Decibel (dB)

The ratio of sound pressures which we can hear is approximately 106:1 (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

6A1.2 dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as L_{A10}, L_{A90}, and L_{Aeq}.

6A1.3 Equivalent continuous sound level

An index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq}. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Therefore, fluctuating levels can be described in terms of a single figure level.

6A1.4 Frequency

Frequency is the rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the hertz (Hz), which is identical to cycles per second. A 1000Hz is often denoted as 1kHz, eg 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes the octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

6A1.5 Maximum noise level

The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125ms duration and fast time weighting (F) has an exponential time constant of 125ms which reflects the ear's response. Slow time weighting (S) has an exponential time constant of 1s and is used to allow more accurate estimation of the average sound level on a visual display.

The maximum level measured with fast time weighting is denoted as $L_{Amax,F}$. The maximum level measured with slow time weighting is denoted $L_{Amax,S}$.

6A1.6 Sound power level

The sound power level (L_w) of a source is a measure of the total acoustic power radiated by a source. The sound power level is an intrinsic characteristic of a source (analogous to its volume or mass), which is not affected by the environment within which the source is located.

6A1.7 Sound pressure level

The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound.

The sound pressure level (L_p) is ten times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of 2 x 10-5Pa (the threshold of hearing).

Thus L_p (dB) = 10 log $(P/P_{ref})^2$ where P_{ref}, the lowest pressure detectable by the ear, is 0.00002 pascals (ie 2×10^{-5} Pa).

The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dBL_{pA} and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

6A1.8 Statistical noise levels

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{10} is the level exceeded for 10% of the time period under consideration, and can be used for the assessment of road traffic noise (note that L_{Aeq} is used in BS 8233 for assessing traffic noise). The L_{90}, the level exceeded for 90% of the time, has been adopted to represent the background noise level. The L_1, the level exceeded for 1% of the time, is usually a good indicator of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted L_{A10}, dBL_{A90} etc. The reference time period (T) is normally included, e.g. dB$L_{A10,5min}$ or dB$L_{A90,8hr}$.

6A1.9 Typical levels

Some typical dB(A) noise levels are given below:

Table 6A.1: Typical noise levels and examples

Noise Level, dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber

6A1.10 Vibration

Vibration may be expressed in terms of displacement, velocity and acceleration. Velocity and acceleration are most commonly used when assessing human comfort or structureborne noise issues.

Vibration magnitude may be quantified as a peak value, or as a root mean squared (rms) value. The rms value is of benefit because it takes into account both time history variation and energy content. The rms value is equal to 0.707 times the peak value.

The peak value, expressed as the peak particle velocity (PPV) is commonly used for construction vibration and is the parameter best correlated with building damage. PPV can also be related to the perceptible to people of vibration.

Generally humans are more sensitive to changes in vibration amplitude than they are to changes in the duration of the exposure to vibration.

6A1.11 Vibration dose value (VDV)

This is a complex metric that has been identified as being the best objective measure of human disturbance from intermittent/transient vibration. The VDV is the fourth root of the time integral of the fourth power of the weighted acceleration. VDV are measured in units of $ms^{-1.75}$. The frequency weightings are defined in BS 6472-1: 2008 and in BS 6841: 1987.

The VDV doubles in magnitude with a doubling of vibration amplitude. However, a 16-fold increase in the duration of exposure to the vibration is required to double the VDV (without any change in amplitude).

Appendix 6B

Policy, Legislation, and Guidance

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6B1 National planning policy

6B1.1 National Planning Policy Framework (NPPF)

Paragraphs 170 and 180 of the National Planning Policy Framework[1] (NPPF) contain key information regarding the assessment of environmental noise.

Paragraph 170 requires planning policies and decisions to *"contribute to and enhance the natural and local environment by … Preventing both new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of … noise pollution"*.

Paragraph 123 of NPPF states that *"… planning policies and decisions should ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life."*

6B1.2 Noise Policy Statement for England

In the case of environmental noise, the NPPF planning objectives are addressed through the Noise Policy Statement for England[2] (NPSE).

The NPSE states the following aims:
"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse health impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life."*

Within these aims, the NPSE uses the key phrases "significant adverse" and "adverse". In clarifying what these mean the policy notes that "…*there are two established concepts from toxicology that are currently being applied to noise effects, for example, by the WHO*". These concepts are:

- NOEL - no observed effect level, the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise; and

[1] Ministry of Housing, Communities & Local Government (2019); *National Planning Policy Framework*
[2] Department for Environment, Food & Rural Affairs (2010); *Noise Policy Statement for England*

- LOAEL - lowest observed adverse effect level, the level above which adverse effects on health and quality of life can be detected.

The policy extends these concepts to include:

- SOAEL - significant observed adverse effect level, the level above which significant adverse effects on health and quality of life occur.

6B1.3 Planning Practice Guidance – Noise (PPG-N)

Planning Practice Guidance - Noise[3] (PPG-N) draws on the principles of the NPSE in particular the concepts of No Observed Effect Level (NOEL), Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL). PPG-N presents example outcomes to help characterise these effects (see Table 6B.1).

[3] Ministry of Housing, Communities & Local Government (2019); *Planning Practice Guidance - Noise*

Table 6B.1: Noise exposure hierarchy according to likely average response (based on PPG-N)

← Increasing noise level →	Perception	Examples of outcomes	Increasing effect level	Action
	Not noticeable	No effect	No observed effect	No specific measures required
	NOEL			
	Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
	LOAEL			
	Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
	SOAEL			
	Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed adverse effect	Avoid

The NPSE notes that it is not possible to have a single objective noise-based measure to define SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL threshold is likely to vary for depending on many factors such as the types of noise sources, the sensitivity of receptors and the time period(s) in question. It is for individual assessments to identify relevant SOAEL thresholds, taking account of the different sources of exposure and different receptors.

Where the overall noise exposure from the proposed Scheme exceeds the relevant SOAEL threshold at a specific receptor, that receptor is identified as being subject to a significant adverse impact on health and quality of life under Government noise policy, and is hence identified as a likely significant adverse effect.

Where the overall noise exposure from the proposed Scheme falls between the LOAEL and SOAEL thresholds, the NPSE states:

"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

Other factors, such as the number of dwellings affected and the magnitude of noise change, can result in impacts between the LOAEL and SOAEL thresholds being reported as likely significant effects in EIA terms. The EIA process requires that likely significant effects are identified along with the envisaged mitigation to avoid or reduce these significant effects.

6B2 Legislation

6B2.1 The Control of Pollution Act, 1974

The Control of Pollution Act[4] provides Local Authorities with the power to control noise from construction sites. This may include specific controls to restrict certain activities identified as causing noise problems. Conditions regarding hours of operation will generally be specified and noise and vibration limits at certain locations may be applied in some cases.

Powers include prosecution for failure to comply with the requirements of a notice served under the act, and a system of providing prior consents for works to be carried out in a specified manner so as to reduce the likelihood of causing disturbance (Section 61 consents). Noise-generating parties can use the defence that 'best practicable means', as defined in Section 72, have been employed to minimise noise emissions.

6B2.2 Environmental Protection Act, 1990

The Environmental Protection Act[5] provides Local Authorities and individuals with powers to serve, or request a magistrate to serve, abatement notices against noise and/or vibration from premises that are considered to be a nuisance. Noise-generating parties can use the defence that 'best practicable means' have been used to control noise emissions or, in relation to construction noise, that the alleged nuisance arose from activities that were compliant with an extant consent under Section 61 of the Control of Pollution Act (prior consent).

[4] HM Government (1974); *Control of Pollution Act*
[5] HM Government (1990); *Environmental Protection Act*

6B2.3 Noise Insulation (Railways and Other Guided Transport Systems) Regulations, 1996

The Noise Insulation (Railways and Other Guided Transport Systems) Regulations[6] (NIRR) consider the noise impact of railways and other systems on existing residential properties, and describe the process and criteria to be used when determining eligibility for noise insulation to dwellings.

6B3 Guidance

6B3.1 Design Manual for Roads and Bridges LA111 – Noise and vibration (formerly HD213/11)

Design Manual for Roads and Bridges LA111 – Noise and vibration (LA111)[7] sets out the requirements for assessing and reporting the effect of operational highways noise. Whilst not directly applicable to the proposed Scheme, it provides a good practice basis for assessing the impact of changes in operational noise levels (see Table 6B.2 reproduced from Table 3.54a/3.54b in LA111).

Table 6B.2: Magnitude of road traffic noise change from LA111

Magnitude of change	**Short term noise change (dB $L_{A10,18h}$ or L_{night})**	**Long term noise change (dB $L_{A10,18hr}$ or L_{night})**
Major	Greater than or equal to 5.0	Greater than or equal to 10.0
Moderate	3.0 to 4.9	5.0 to 9.9
Minor	1.0 to 2.9	3.0 to 4.9
Negligible	Less than 1.0	Less than 3.0

6B3.2 Calculation of Railway Noise (CRN)

The Department of Transport Memorandum Calculation of Railway Noise (CRN)[8] presents a procedure for the prediction of railway noise. The relevant parts of this procedure have been used to predict the baseline noise level for operational railway traffic.

6B3.3 Calculation of Road Traffic Noise (CRTN)

The Department of Transport Memorandum Calculation of Road Traffic Noise (CRTN)[9] presents a procedure for the prediction of road traffic noise. The relevant p

[6] HM Government (1996); *Noise Insulation (Railways and Other Guided Transport Systems) Regulations*
[7] Highways England (2020); *Design Manual for Roads and Bridges LA111 Noise and vibration*
[8] Department of Transport (1995); *Calculation of Railway Noise*
[9] Department of Transport Welsh Office (1988); *Calculation of Road Traffic Noise*

arts of this procedure have been used to predict, for a given road at a reference distance, the change in noise level resulting from the change in road traffic between the baseline and the assessment case for operational road traffic.

Appendix 6C

Baseline Information

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6C1 Introduction

This appendix presents the input information and assumptions made when establishing the baseline and future noise environments through prediction.

6C2 Modelling approach

The environmental noise software SoundPLANnoise v8.2 (SoundPLAN GmbH) was used to predict noise levels due to existing and proposed road and rail sources. The software provides implementations of both CRN and CRTN methodologies for modelling road traffic noise and rail noise respectively, along with an implementation of ISO 9613 for modelling industrial point, line and area sources.

6C3 Road traffic flow information

Road traffic flow data used for establishing the baseline and future scenarios are provided in Table 6C.1.

Table 6C.1: Traffic data used for noise modelling

Link	18hr (day)									6hr (night)								
	18hr AAWT			% HGVs			Average speed, kph			18hr AAWT			% HGVs			Average speed, kph		
	2021	2023	2028	2021	2023	2028	2021	2023	2028	2021	2023	2028	2021	2023	2028	2021	2023	2028
	BL	DM	DS	BL	DM	DS	BL	DM	DS	BL	DM	DS	BL	DM	DS	BL	DM	DS
Bank Lane (north of Shevington's Lane)	14149	20952	21005	5%	4%	4%	48	48	48	561	831	856	5%	4%	4%	48	48	48
Shevington's Lane (W)	11873	12105	12327	2%	2%	2%	48	48	48	471	480	508	2%	2%	2%	48	48	48
Bank Lane (south of Shevington's Lane)	15431	22259	22533	4%	3%	3%	48	48	48	612	883	918	4%	3%	3%	48	48	48
Bank Lane (north of Headbolt Lane)	14877	21694	22064	4%	3%	3%	48	48	48	590	861	899	4%	3%	3%	48	48	48
Boyes Brow	6250	6372	6381	1%	1%	1%	48	48	48	248	253	263	1%	1%	1%	48	48	48
A506 County Road (N)	14798	21614	22192	5%	3%	3%	48	48	48	587	857	904	5%	3%	3%	48	48	48
A506 County Road (S)	14677	21790	22367	5%	3%	3%	48	48	48	582	864	910	5%	3%	3%	48	48	48
St Kevin's Drive	2047	3469	3469	1%	0%	0%	48	48	48	81	138	141	1%	0%	0%	48	48	48

Headbolt Lane (west of site access)	5802	5916	6872	3%	3%	2%	48	48	48	230	235	282	3%	3%	2%	48	48	48
Site access			*1196*			*0%*			*49*		*0*	*47*			*0%*			*49*
Fallowfield	342	349	349	1%	1%	1%	48	48	48	14	14	15	1%	1%	1%	48	48	48
Headbolt Lane (east of site access)	6367	6492	6732	3%	3%	3%	48	48	48	253	258	281	3%	3%	3%	48	48	48
Headbolt Lane (E)	3557	3627	3781	3%	3%	3%	48	48	48	141	144	158	3%	3%	3%	48	48	48
Dale Lane	5161	5263	5307	6%	6%	6%	48	48	48	205	209	221	6%	6%	6%	48	48	48
Pingwood Lane	6764	6896	7006	6%	6%	6%	48	48	48	268	274	292	6%	6%	6%	48	48	48
Shevington's Lane (E)	5885	6000	6108	2%	2%	2%	48	48	48	233	238	255	2%	2%	2%	48	48	48
Stopgate Lane	1811	1847	1849	6%	6%	6%	64	64	64	72	73	77	6%	6%	6%	64	64	64
Windermere Drive	554	565	660	1%	1%	1%	48	48	48	22	22	27	1%	1%	1%	48	48	48

6C4 Rail noise model

6C4.1 Rolling stock and movements

Information pertaining to train classification, CRN sound exposure level corrections and operation frequency is presented for each situation as follows.

6C4.1.1 2021 Baseline

Operating company	Train classification	CRN vehicle description	CRN correction dB(A)	Frequency of operation (day)	Frequency of operation (night)
Merseyrail	507 & 508/1	465 EMU	+8.4	97	14
Northern Rail	150	165 DMU	+7	22	2

Table 6C.2: Rail rolling stock assumptions, baseline

6C4.1.2 2023 Do-Minimum

Operating company	Train classification	CRN vehicle description	CRN correction dB(A)	Frequency of operation (day)	Frequency of operation (night)
Merseyrail	507 & 508/1	465 EMU	+8.4	97	14
Northern Rail	150	165 DMU	+7	22	2

Table 6C.3: Rail rolling stock assumptions, Do-Minimum

6C4.1.3 2028 Do-Something

Operating company	Train classification	CRN vehicle description	CRN correction dB(A)	Frequency of operation (day)	Frequency of operation (night)
Merseyrail	777	465 EMU	+8.4	120	24
Northern Rail	95	165 DMU	+7	30	6

Table 6C.4: Rail rolling stock assumptions, Do-Something

6C4.2 Other assumptions

The following key assumptions have been made when undertaking the operational rail noise modelling.

- In order to quantify a baseline suitable for a reasonable worst-case assessment, the actual speeds of trains were assumed to be 60% of the maximum allowed line speed.
- Changes in train speed when arriving at or leaving a station have been accounted for by segmenting the track into 200m sections, and applying typical acceleration/deceleration profiles to segments as necessary.

- In line with guidance in CRN, a minimum train speed of 20km/h has been adopted.
- A standard correction of 2.5dB has been applied to the track segment containing the new points.

Appendix 6D

Construction assumptions

Contents

D1 Construction phases 1

D2 Construction activities 1

D1 Construction phases

This section provides the construction activity assumptions which form the basis for the prediction of construction noise in accordance with British Standard 5228-1:2009+A1:2014[1].

Noise levels from the rationalised construction phases in Table 6D.1 have been predicted at the closest assessment locations to identify potential significant effects.

Table 6D.1: Rationalised construction phases for assessment of noise impact

Construction phase		Working hours
A	Temporary power supply	07:30 – 17:30
B	Hoarding installation	07:30 – 17:30
C	Main compound construction	07:30 – 17:30
D	Road rail access point (RRAP) installation	Sat 20:30 – Mon 05:30
E	Haul road construction	07:30 – 17:30
F	Bailey bridge install	07:30 – 17:30
G	Devegetation of rail corridor	Sun 08:00 – 18:00
H	Earthworks (Kingpost)	Sat 20:30 – Mon 05:30
I	Plain line install	Sat 20:30 – Mon 05:30
J	Track drainage	Sat 20:30 -Mon 05:30
K	Cable routing	20.30 – 05.30, 7 day working
L	LOC/signal, hardstandings and signage installation	20.30 – 05.30, 7 day working
M	Switches and crossings (S&C)	Sat 20:30 -Mon 05:30
N	Car park drainage	07:30 – 17:30
O	Car park construction	07:30 -17:30
P	Railway underbridge construction	24/7 working
Q	Platform construction	20.30 – 05.30, 7 day working
R	Station building construction	07:30 -17:30
S	Rail systems install and commissioning	24/7 working

D2 Construction activities

Construction works would be managed in accordance with the principles of ‘best practicable means’ (BPM) as required by the Control of Pollution Act. Screening in additional to existing buildings may be provided for particularly noisy activities but have not been accounted for in these calculations.

[1] British Standards Institute (2014); *Code of practice for noise and vibration control on construction and open sites. Noise*

The equipment activity levels presented represent the worst case for a single phase of the construction programme. It is assumed that activities within a phase will generally occur sequentially rather than simultaneously, but that different phases of construction could overlap.

A worst case has been assumed, using the shortest distance between each receptor group and the edge of the construction works for each phase. There would be some variability in noise level during the working hours and for different locations, depending on variations in distance and the amount of screening present.

For linear activities, the closest point of approach to the relevant receptor has been used to calculate noise levels. In reality, activities would be at the nearest location for only a short duration, and noise levels would decrease as the construction activity moved further away.

Due to operational constraints and to avoid disruption to the surrounding road and rail network, it is assumed that some critical construction works at night would be required that could not be caried out during the day. Details of the night activity assumptions are summarised in Table 6D.2

Table 6D.2: Assumed construction activities at night with durations

Construction phase	**Night Activity**	**Duration**
P	Construction of underbridge UB 56 at County Road UB 55. Only working daytime for 5 days of heavy breaking requirements at County Road. No breaking activities for UB 56. Use of plant including cranes, excavator, pump, generator, and power tools.	5 days for UB 56 1 month for UB 55
H	Installation of King Post Piles. Cannot pile next to railway without possession. Longer possession disrupts train operations. Use of plant including RRVs excavators, MOVAX piling equipment (piling next to closest receptors and any percussive piling required due to ground constraints assumed to occur during daytime on a Sunday), generator, and power tools.	9 weeks
H	Installation of planks and subsequent earthworks. Use of plant including RRVs excavators, generator, and power tools.	10 weeks
Q	Installation of platforms. Use of plant including excavators, generator, and other small plant. Use of saws avoided at night.	4 months
I, J and M	Plain line install. Use of plant including RRVs excavators, train haulage and compaction equipment. Haulage trains will mostly be idle. Working weekends and school holidays with one three-week blockade.	20 weekends plus 2x1 week and 1x3 weeks
K and L	Installing cable route, small bases and signalling cabling and assets. Use of plant including excavators, generator, and other small plant.	4 months

For each construction phase, a set of assumptions have been made regarding operational plant types, source levels and typical durations of time for which plant would be operating. Details of these assumptions are summarised in Table 6D.3.

Table 6D.3: Construction activity assumptions

Activity	Equipment	Quantity	% on-time	Lw dB(A)	Source
Temporary power supply LOC/Signal, hardstanding and signage RRAP installation	Bobcat (mini excavator)	1	50	96	BS5228 Table C 3-20
	Concrete Pump + Cement Mixer Truck (Discharging)	1	50	95	BS5228 Table C 4-24
	Concrete Mixer Truck	1	10	108	BS5228 Table C 4-20
	Poker vibrator	1	20	97	BS5228 Table C 4-34
	Electric Drill	1	20	104	BS5228 Table D 6-54
	Diesel Generator	1	100	93	BS5228 Table C 4-86
	Roller	1	25	101	BS5228 Table C 2-38
	Hand-held circular saw	1	10	112	BS5228 Table C 4-73
	Breakers (kango)	1	10	111	BS5228 Table C 1-6
	Vibratory plate	1	20	108	BS5228 Table C 2-41
Hoarding installation	Tracked Excavator	1	30	105	BS5228 Table C 2-2
	Diesel Generator	1	100	93	BS5228 Table C 4-86
	Handheld Cordless Nail Gun	2	10	101	BS5228 Table C 4-95
	Compressor for Hand-held Pneumatic Breaker	1	30	93	BS5228 Table C 5-5
	Wheeled mobile Crane	1	25	98	BS5228 Table C 4-43
Main compound construction Underbridge construction Platform construction Station building Bailey bridge construction	Wheeled Excavator	1	20	105	BS5228 Table C 4-12
	Lorry with Lifting Boom	1	10	105	BS5228 Table C 4-53
	Hand-held Circular Saw (Petrol-Cutting concrete blocks)	1	10	107	BS5228 Table C 4-72
	Wheeled mobile Crane	1	25	98	BS5228 Table C 4-43
	Road Breaker (Hand-held Pneumatic)	1	5	110	BS5228 Table C 5-3
	Angle Grinder (Grinding Steel)	1	10	108	BS5228 Table C 4-93
	Concrete Mixer Truck (Discharging) & Concrete Pump (Pumping)	1	30	103	BS5228 Table C 4-28
	Vibratory Roller	1	20	103	BS5228 Table C 5-20
Car park construction Haul road construction	Wheeled Excavator	2	40	105	BS5228 Table C 4-12
	Lorry with Lifting Boom	1	10	105	BS5228 Table C 4-53
	Wheeled mobile Crane	1	10	98	BS5228 Table C 4-43
	Road Breaker (Hand-held Pneumatic)	1	5	110	BS5228 Table C 5-3
	Vibratory Roller	1	40	103	BS5228 Table C 5-20
Earthworks (Kingpost)	Tracked Excavator	1	50	105	BS5228 Table C 2-19
	Dumper	1	70	104	BS5228 Table C 4-3
	Telescopic Handler	1	30	99	BS5228 Table C 2-35
	Lorry with Lifting Boom	1	5	105	BS5228 Table C 4-53
	Piling Rig	1	20	116	BS5228 Table C 3-8

Activity	Equipment	Quantity	% on-time	Lw dB(A)	Source
	Vibratory Plate (Petrol)	2	10	108	BS5228 Table C 2-41
	Roller	1	70	101	BS5228 Table C 2-38
Devegetation of rail corridor	RRV (mini excavator)	1	50	93	BS5228 Table C 4-68
	Hand tools	1	50	100	Estimated
	Electric Drill	1	20	104	BS5228 Table D 6-54
	Generator	1	100	93	BS5228 Table C 4-86
	Strimmer (Stihl FR 130T brush cutter)	1	50	105	measured
Track drainage Cable routing	Bobcat (mini excavator)	1	50	96	BS5228 Table C 3-20
	Hiab delivery lorry	1	5	105	BS5228 Table C 4-53
	Generator	1	100	93	BS5228 Table C 4-86
	Hand tools	1	20	100	Estimated
	Roller	1	25	101	BS5228 Table C 2-38
	Breakers (kango)	1	10	111	BS5228 Table C 1-6
Plain line install	Generators	1	100	93	BS5228 Table C 4-86
	RRV	1	20	105	BS5228 Table C 4-12
	Power tools	1	25	105	measured
	Hand-Held Welder (Welding Piles)	1	20	101	BS5228 Table C 3-31
	Rail saw 14inch	1	10	119	BS5228 Table C 4-70
	Bance / airgun	2	10	105	measured
	Engineering Train	1	10	114	BS5228 Table C 6-3
	Angle Grinder (Grinding Steel)	1	10	108	BS5228 Table C 4-93
Switches and crossings	RRV	1	10	114	BS5228 Table C 6-3
	Engineering Train	1	25	107	
	Kirow Crane	2	10	108	BS5228 Table C 2-41
	Vibratory Plate (Petrol)	1	10	119	BS5228 Table C 4-70
	Rail saw 14inch	1	100	93	BS5228 Table C 4-86
	Generators	1	25	95	Estimated
	Bance impact wrench	2	20	101	BS5228 Table C 3-31
	Hand-Held Welder (Welding Piles)	2	10	105	measured
	Bance / airgun	2	10	106	BS5228 Table C 6-41
	Compressor	1	10	114	BS5228 Table C 6-3
Systems install and commissioning	RRV	2	25	105	BS5228 Table C 4-12
	Hand tools	1	25	100	Estimated
	Angle Grinder (Grinding Steel)	1	10	108	BS5228 Table C 4-93
	Generators	1	100	93	BS5228 Table C 4-86

Appendix 6E

Road Traffic Noise Assessment

Contents

6E1 Road traffic noise assessment results 1

6E1 Road traffic noise assessment results

This appendix provides the results of the traffic noise modelling study; refer to Table 6E.1.

The basic noise level (BNL), which is the level at 10m from the kerb, has been calculated in accordance with CRTN based on data provided by the transport consultant. Results are presented in terms of BNL because this enables a direct comparison of the change in noise level associated with particular sections of road.

The method for determining potential significant effects is described in Chapter 6. In summary, the traffic noise levels for the Do-Something (DS) (with scheme) scenario have been compared with the Do-Minimum (DM) (without scheme) scenario to establish the magnitude of change. Depending on the policy effect level, impact magnitudes and potential significant effects can then be determined.

The baseline (BL) information has also been provided for reference.

Table 6E.1: Results of operational road traffic noise assessment

Link	18hr AAWT			% HGVs			Average speed, kph			BNL at 10m, $dBL_{A10,18hr}$			Change in noise, dB			Policy effect level	Impact magnitude
	2021	2023	2028	2021	2023	2028	2021	2023	2028	2021	2023	2028	2021	2023	2028		
	BL	DM	DS	BL	DM	DS	BL	DM	DS	BL	DM	DS	BL	DS-B	DS-DM		
Bank Lane (north of Shevington's Lane)	14149	20952	21005	5%	4%	4%	48	48	48	70	71	71	1.2	1.2	0.0	Above SOAEL	No change
Shevington's Lane (W)	11873	12105	12327	2%	2%	2%	48	48	48	68	68	68	0.1	0.2	0.1	Above SOAEL	Negligible
Bank Lane (south of Shevington's Lane)	15431	22259	22533	4%	3%	3%	48	48	48	70	71	71	1.2	1.2	0.0	Above SOAEL	No change
Bank Lane (north of Headbolt Lane)	14877	21694	22064	4%	3%	3%	48	48	48	69	71	71	1.2	1.3	0.1	Above SOAEL	Negligible
Boyes Brow	6250	6372	6381	1%	1%	1%	48	48	48	65	65	65	0.1	0.1	0.0	Between LOAEL and SOAEL	No change
A506 County Road (N)	14798	21614	22192	5%	3%	3%	48	48	48	69	71	71	1.2	1.3	0.1	Above SOAEL	Negligible
A506 County Road (S)	14677	21790	22367	5%	3%	3%	48	48	48	69	71	71	1.2	1.3	0.1	Above SOAEL	Negligible
St Kevin's Drive	2047	3469	3469	1%	0%	0%	48	48	48	59	62	62	2.2	2.2	0.0	Between LOAEL and SOAEL	No change
Headbolt Lane (west of site access)	5802	5916	6872	3%	3%	2%	48	48	48	65	65	65	0.1	0.6	0.5	Above SOAEL	Negligible
Site access			*1196*			*0%*			*49*	*0*	*0*	*57*	*0.0*	*57.0*	*57.0*	*N/A*	*N/A*

Fallowfield	342	349	349	1%	1%	1%	48	48	48	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	N/A	N/A
Headbolt Lane (east of site access)	6367	6492	6732	3%	3%	3%	48	48	48	65	65	65	0.1	0.2	0.1	Above SOAEL	Negligible
Headbolt Lane (E)	3557	3627	3781	3%	3%	3%	48	48	48	63	63	63	0.1	0.2	0.1	Between LOAEL and SOAEL	Negligible
Dale Lane	5161	5263	5307	6%	6%	6%	48	48	48	65	65	65	0.1	0.1	0.0	Above SOAEL	No change
Pingwood Lane	6764	6896	7006	6%	6%	6%	48	48	48	66	67	67	0.1	0.1	0.0	Above SOAEL	No change
Shevington's Lane (E)	5885	6000	6108	2%	2%	2%	48	48	48	65	65	65	0.1	0.1	0.1	Between LOAEL and SOAEL	Negligible
Stopgate Lane	1811	1847	1849	6%	6%	6%	64	64	64	62	62	62	0.1	0.1	0.0	Between LOAEL and SOAEL	No change
Windermere Drive	554	565	660	1%	1%	1%	48	48	48	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	N/A	N/A

Appendix 6F

Buckingham Group Contracting Ltd (BGCL)
Construction Noise Mitigation Strategy

Contents

F1 Construction Noise Mitigation Strategy 1

F1.1 Constraints 1

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F2 Best Practicable Means 2

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F1 Construction Noise Mitigation Strategy

The strategy is to deliver the station with minimum disruption to rail services whilst also minimising the impact of the project to our lineside neighbours.

The following constraints, construction activity information and Best Practicable Means have been provided in conjunction with BGCL.

F1.1 Constraints

The following constraints have been identified as major influences for construction activities and possession strategies.

F1.2 Northern Trains

- Serving Kirkby to Wigan and Manchester with hourly service
- Able to carry out works on or near the track overnight and also all day Sunday

F1.3 Freight Service

- Regular freight trains serving the waste re-cycling centre
- Northern and Freight use the same track but only 1 train can operate at a time.
- If an engineering train on the line neither Northern or freight trains can operate

F1.4 Merseyrail

- Intensive train service Kirkby serving 3 million passengers per year
- No potential for day time working on or near the line.
- Overnight very little time to allow works to be carried at midweek nights (less than 4 hours working time available)
- Only opportunity for working on this section of line is Sat Night/Sunday Morning

F1.5 General

- In respect of the freight trains any disruption would require a fleet of replacement HGV lorries to transport waste to the incineration plant in Middlesborough which, having that many additional HGV's on the road network raises issues both environmentally and from a safety perspective
- Therefore, key element of the plan is to avoid any disruption to the freight yard and waste operations
- Working at night impacts on residents so project has looked to carry out key activities during minimum number of blockades of the line, allowing nosier work works to be carried out during the day.

F2 Best Practicable Means

The following Best Practicable Means have been identified for the Proposed Scheme with regards to noise mitigation, these will change as construction needs and activities develop throughout the duration of construction of the Proposed Scheme:

- All work shall be carefully planned, sequenced and executed in order to minimise noise and vibration
- Night-time deliveries will be avoided, materials will be delivered and stored at or near the site during daytime and components will be prefabricated off-site, where practicable
- Vehicles shall be loaded/ unloaded with care in designated areas and engine idling is prohibited
- Equipment will be modern, quiet and well-maintained and shall comply with relevant noise and other emissions standards
- Plant and equipment with the potential to create noise and vibration will be located away from sensitive receptors and the use of barriers or other structures to absorb and/or deflect noise away from noise sensitive receptors
- All staff and operatives will be briefed on the requirement to minimize nuisance from site activities, via briefings, toolbox talks etc.
- Layout of the site will be designed where possible to reduce the need for reversing and reversing alarms shall include one or more noise reducing feature i.e. non-tonal signals, self-adjusting output, flashing warning lights. Alarms shall be set to the minimum output for safety compliance
- Modern silenced piling methods shall be used (with the use of driven impact piles avoided, where possible), and rigs shall be carefully operated
- Vehicles and mechanical plant utilised on the work sites will be fitted with effective exhaust silencers and shall be examined on a daily basis and maintained in good working order and operated in a manner such that noise emissions are controlled
- All compressors and generators should be ‘sound reduced’ models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools should be fitted with mufflers or suppressers of the type recommended by the manufacturers and should be kept in a good state of repair
- Any plant, equipment, or item found to have defective noise control equipment shall not be operated until it is repaired
- Fixed items of construction plant will be electrically powered from the mains supply in preference to being diesel or petrol driven
- Screws and drills shall be used (rather than hammer and nails) for fixing hoardings, etc.
- All materials, scaffolding, tools and waste shall be carefully handled, e.g. by lowering rather than dropping items
- Small power tools and temporary power shall make use of Alternative Power Technology where possible: Such as Battery Power Sources, instead of small generators, Hybrid and Solar Powered equipment

- Site Vehicles shall be EV or Zero/ Low Emission Technology where possible to reduce noise, emissions, and other sources of nuisance
- Noise screens will be used where possible
- Machines will be turned on sequentially to reduce the impact of sudden noises
- Equipment should be switched off when not required
- Internal haul routes should be well maintained and avoid steep gradients.
- Plant will be turned off when not in use.

F3 Construction Phase Activities

Best Practicable Means

- All work shall be carefully planned, sequenced and executed in order to minimise noise and vibration
- Night-time deliveries will be avoided, materials will be delivered and stored at or near the site during daytime and components will be prefabricated off-site, where practicable
- Vehicles shall be loaded/ unloaded with care in designated areas and engine idling is prohibited
- Equipment will be modern, quiet and well-maintained and shall comply with relevant noise and other emissions standards
- Plant and equipment with the potential to create noise and vibration will be located away from sensitive receptors and the use of barriers or other structures to absorb and/or deflect noise away from noise sensitive receptors
- All staff and operatives will be briefed on the requirement to minimize nuisance from site activities, via briefings, toolbox talks etc.
- Layout of the site will be designed where possible to reduce the need for reversing and reversing alarms shall include one or more noise reducing feature i.e. non-tonal signals, self-adjusting output, flashing warning lights. Alarms shall be set to the minimum output for safety compliance
- Modern silenced piling methods shall be used (with the use of driven impact piles avoided, where possible), and rigs shall be carefully operated
- Vehicles and mechanical plant utilised on the work sites will be fitted with effective exhaust silencers and shall be examined on a daily basis and maintained in good working order and operated in a manner such that noise emissions are controlled

Best Practicable Means

- All compressors and generators should be ‘sound reduced’ models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools should be fitted with mufflers or suppressers of the type recommended by the manufacturers and should be kept in a good state of repair
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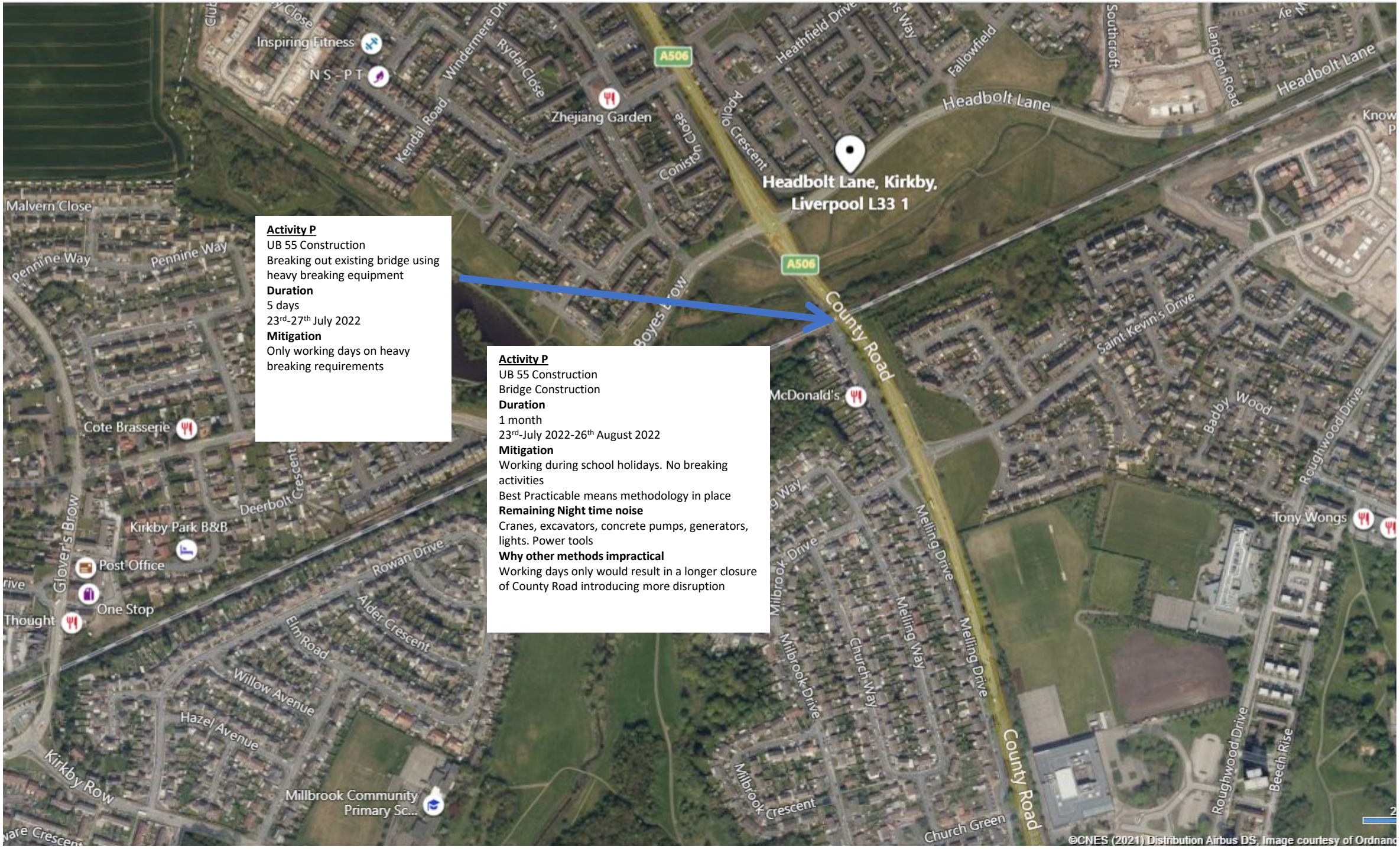
- All materials, scaffolding, tools and waste shall be carefully handled, e.g. by lowering rather than dropping items
- Small power tools and temporary power shall make use of Alternative Power Technology where possible: Such as Battery Power Sources, instead of small generators, Hybrid and Solar Powered equipment
- Site Vehicles shall be EV or Zero/ Low Emission Technology where possible to reduce noise, emissions, and other sources of nuisance
- Noise screens will be used where possible;.
- Machines will be turned on sequentially to reduce the impact of sudden noises; .
- Equipment should be switched off when not required;
- Internal haul routes should be well maintained and avoid steep gradients;
- Plant will be turned off when not in use; and.

Table 6D.1: Rationalised construction phases for assessment of noise impact

Construction phase		Working hours
A	Temporary power supply	07:30 – 17:30
B	Hoarding installation	07:30 – 17:30
C	Main compound construction	07:30 – 17:30
D	Road rail access point (RRAP) installation	Sat 20:30 – Mon 05:30
E	Haul road construction	07:30 – 17:30
F	Bailey bridge install	07:30 – 17:30
G	Devegetation of rail corridor	Sun 08:00 – 18:00
H	Earthworks (Kingpost)	Sat 20:30 – Mon 05:30
I	Plain line install	Sat 20:30 – Mon 05:30
J	Track drainage	Sat 20:30 -Mon 05:30
K	Cable routing	20.30 – 05.30, 7 day working
L	LOC/signal, hardstandings and signage installation	20.30 – 05.30, 7 day working
M	Switches and crossings (S&C)	Sat 20:30 -Mon 05:30
N	Car park drainage	07:30 – 17:30
O	Car park construction	07:30 -17:30
P	Railway underbridge construction	24/7 working
Q	Platform construction	20.30 – 05.30, 7 day working
R	Station building construction	07:30 -17:30
S	Rail systems install and commissioning	24/7 working


Inspiring Fitness
NS-PT
Windermere Dr
Rydal Close
Kendal Road
Zhejiang Garden
A506
Heathfield Drive
Fallowfield
Southcroft
Langton Road
Headbolt Lane
Headbolt Lane, Kirkby, Liverpool L33 1
Apollo Crescent
Coniston Close
Malvern Close
Pennine Way
Pennine Way
Activity P
UB 55 Construction
Breaking out existing bridge using heavy breaking equipment
Duration
5 days
23rd-27th July 2022
Mitigation
Only working days on heavy breaking requirements
A506
County Road
Saint Kevin's Drive
Activity P
UB 55 Construction
Bridge Construction
Duration
1 month
23rd-July 2022-26th August 2022
Mitigation
Working during school holidays. No breaking activities
Best Practicable means methodology in place
Remaining Night time noise
Cranes, excavators, concrete pumps, generators, lights. Power tools
Why other methods impractical
Working days only would result in a longer closure of County Road introducing more disruption
McDonald's
Cote Brasserie
Deerbolt Crescent
Badby Wood
Roughwood Drive
Tony Wongs
Glover's Brow
Kirkby Park B&B
Post Office
One Stop
Thought
Rowan Drive
Alder Crescent
Elm Road
Willow Avenue
Hazel Avenue
Kirkby Row
Millbrook Community Primary Sc...
Milbrook Drive
Melling Drive
Melling Way
Church Way
Milbrook Crescent
Church Green
Beech Rise
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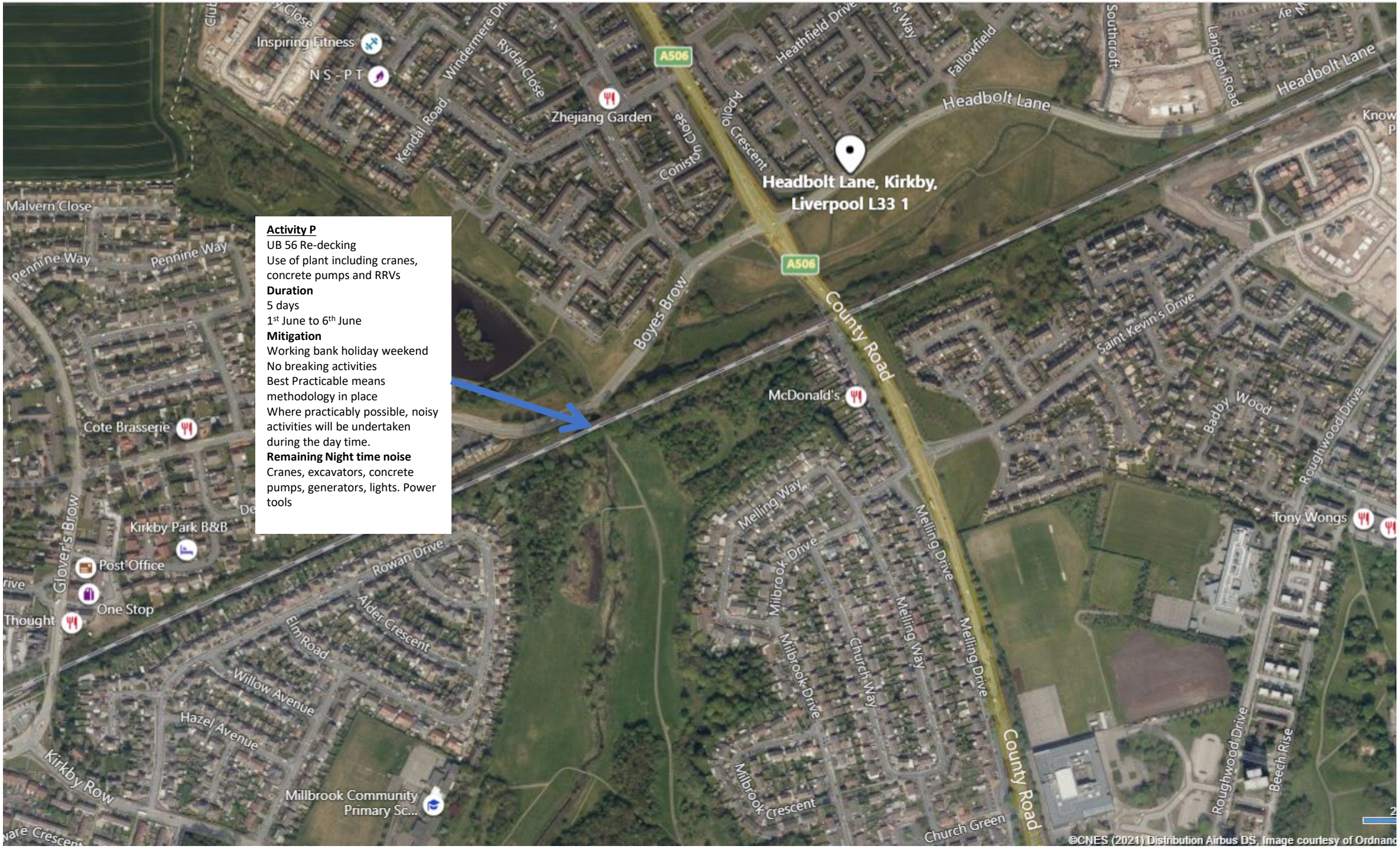
Activity P
UB 56 Re-decking
Use of plant including cranes, concrete pumps and RRVs
Duration
5 days
1st June to 6th June
Mitigation
Working bank holiday weekend
No breaking activities
Best Practicable means methodology in place
Where practicably possible, noisy activities will be undertaken during the day time.
Remaining Night time noise
Cranes, excavators, concrete pumps, generators, lights. Power tools
Headbolt Lane, Kirkby, Liverpool L33 1
A506
A506
Inspiring Fitness
NS-PT
Zhejiang Garden
Kendal Road
Windermere Dr
Rydal Close
Coniston Close
Apollo Crescent
Heathfield Drive
Fallowfield
Southcroft
Langton Road
Headbolt Lane
Headbolt Lane
Malvern Close
Pennine Way
Pennine Way
Boyes Brow
County Road
McDonald's
Saint Kevin's Drive
Badby Wood
Roughwood Drive
Cote Brasserie
Kirkby Park B&B
Post Office
One Stop
Thought
Glover's Brow
Rowan Drive
Alder Crescent
Elm Road
Willow Avenue
Hazel Avenue
Kirkby Row
Millbrook Community Primary Sc...
Melling Way
Melling Drive
Milbrook Drive
Church Way
Milbrook Crescent
Church Green
County Road
Tony Wongs
Roughwood Drive
Beech Rise
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Activity H
Installation of King Post Piles, Planks and subsequent Earthworks
Use of plant including RRV with Piling Movax and RRVs
Duration
6th March to 9th May Kingpost Piles
5th April 10th June Regrading
Mitigation
Working Sunday day next to closest receptors. See next page Best Practicable means methodology in place
MOVAX quietest way of piling
If hammering required on a Sunday day only
Why other methods impractical
CFA piling takes too long
Cannot pile next to railway without possession. Longer possession disrupts train operations. Doing all the works on Sunday day would result in programme delays and further disruption
Remaining Night time noise
RRVs excavators, MOVAX piling equipment, generators, lights. Power tools
Headbolt Lane, Kirkby, Liverpool L33 1
A506
County Road
Mill Lane
Boyes Brow
Rowan Drive
Deerbolt Crescent
Glover's Brow
Kirkby Park B&B
Post Office
One Stop
Kirkby Row
Millbrook Community Primary Sc...
Inspiring Fitness
NS-PT
Zhejiang Garden
Kendal Road
Windermere Dr
Rydal Close
Coniston Close
Apollo Crescent
Heathfield Drive
Fallowfield
Southcroft
Langton Road
Headbolt Lane
McDonald's
Saint Kevin's Drive
Badby Wood
Roughwood Drive
Tony Wongs
Melling Way
Melling Drive
Milbrook Drive
Church Way
Milbrook Crescent
Church Green
Beech Rise
Alder Crescent
Elm Road
Willow Avenue
Hazel Avenue
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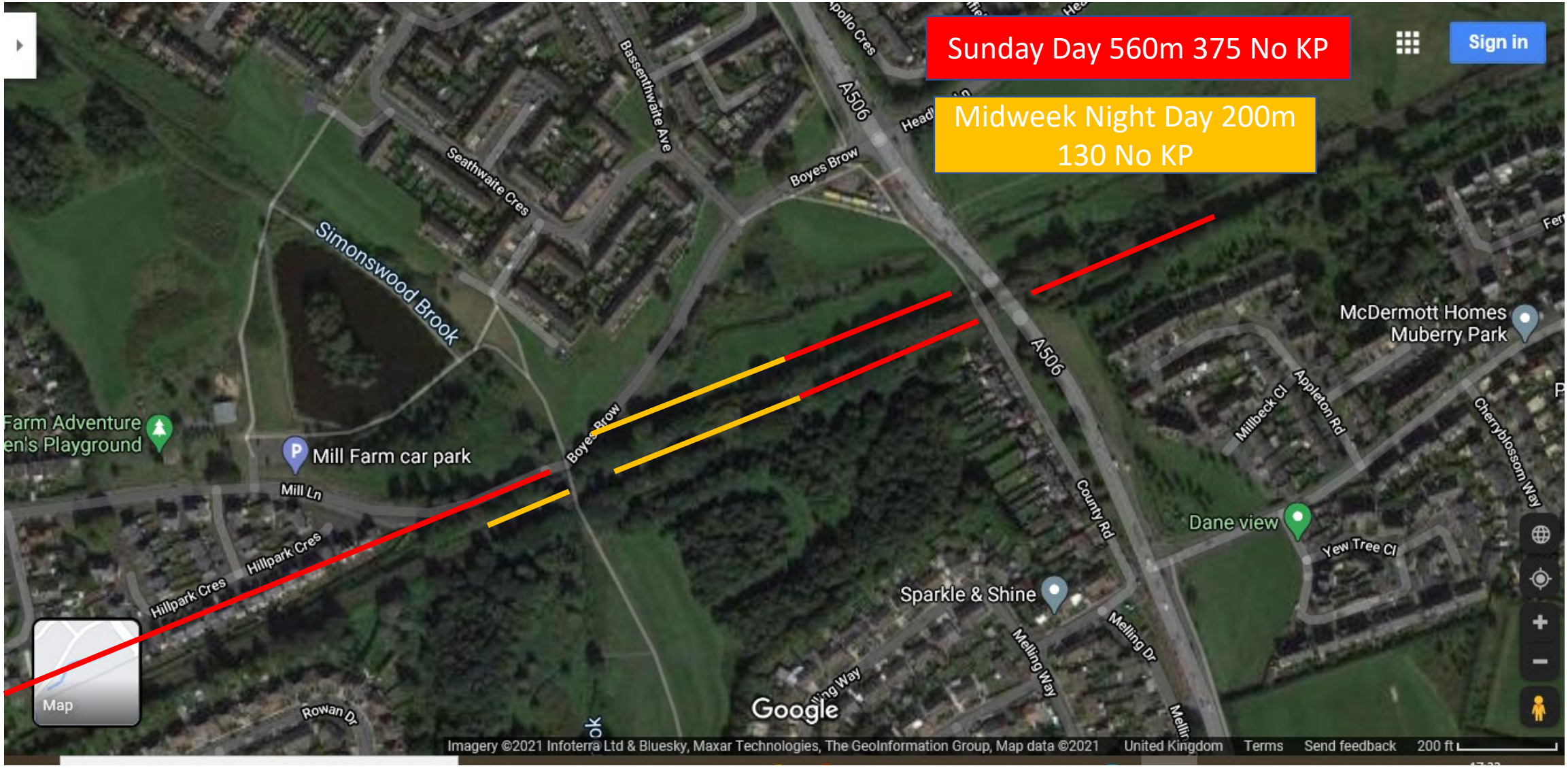
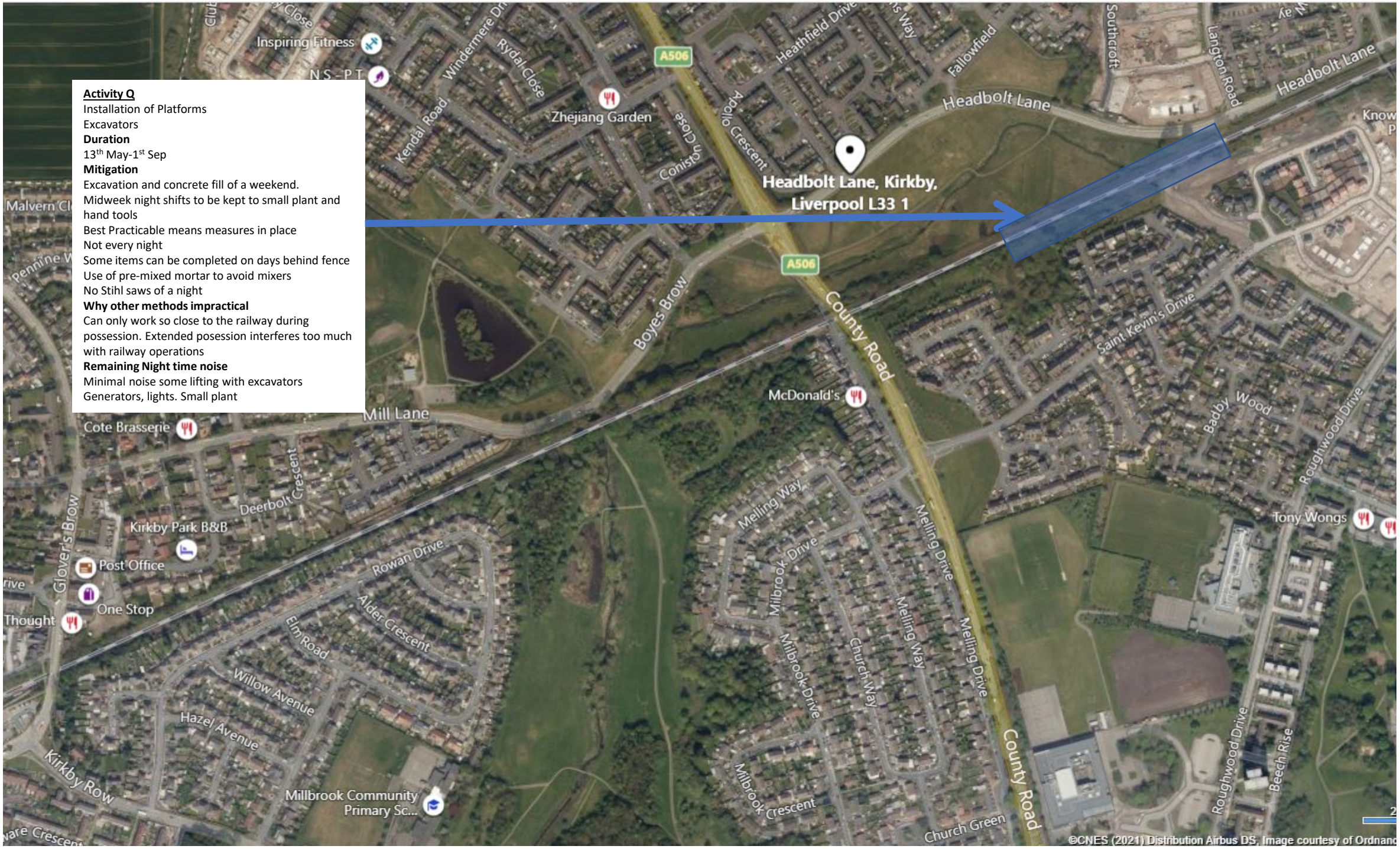

Sunday Day 560m 375 No KP
Midweek Night Day 200m
130 No KP
Sign in
Bassenthwaite Ave
Apollo Cres
A506
Seathwaite Cres
Boyes Brow
Simonswood Brook
McDermott Homes
Muberry Park
Millbeck Cl
Appleton Rd
Cherryblossom Way
Farm Adventure
en's Playground
Mill Farm car park
Mill Ln
Hillpark Cres
Hillpark Cres
County Rd
Dane view
Yew Tree Cl
Sparkle & Shine
Melling Way
Melling Dr
Rowan Dr
Map
Google
Imagery ©2021 Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2021
United Kingdom
Terms
Send feedback
200 ft


Activity Q
Installation of Platforms
Excavators
Duration
13th May-1st Sep
Mitigation
Excavation and concrete fill of a weekend.
Midweek night shifts to be kept to small plant and hand tools
Best Practicable means measures in place
Not every night
Some items can be completed on days behind fence
Use of pre-mixed mortar to avoid mixers
No Stihl saws of a night
Why other methods impractical
Can only work so close to the railway during possession. Extended posession interferes too much with railway operations
Remaining Night time noise
Minimal noise some lifting with excavators
Generators, lights. Small plant
Headbolt Lane, Kirkby, Liverpool L33 1
Headbolt Lane
County Road
Mill Lane
Boyes Brow
Zhejiang Garden
McDonald's
Cote Brasserie
Kirkby Park B&B
Post Office
One Stop
Thought
Millbrook Community Primary Sc...
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Saint Kevin's Drive
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Melling Way
Melling Drive
Rowan Drive
Alder Crescent
Elm Road
Willow Avenue
Hazel Avenue
Kirkby Row
Glover's Brow
Deerbolt Crescent
Kendal Road
Windermere Dr
Rydal Close
Apollo Crescent
Heathfield Drive
Fallowfield
Southcroft
Langton Road
A506
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Activity I , J and M

Plain Line Install

Use of plant RRVs, train haulage and compaction equipment. Haulage trains will cover the length of the footprint but mostly be idle

Duration

Sat Night to Monday Morning

2022

23rd -25thApril

4th -6thJune

11th -13th June

18th -20th June

25th -28th June

16th-23rd July (Midweek but within school holidays)

27th Aug to5th Sept (Midweek but within school holidays)

10th-11th Sept

17th-18th Sept

24th-25th Sept

1st-2nd Oct

8th-9th Oct

15th-16th Oct

22-23rd Oct

29-30th Oct

5t-6th Nov

12-13th Nov

19th-20th Nov

26-27th Nov

3rd-4th Dec

2023

28th Jan -20th Feb

Mitigation

Working weekends and school holidays

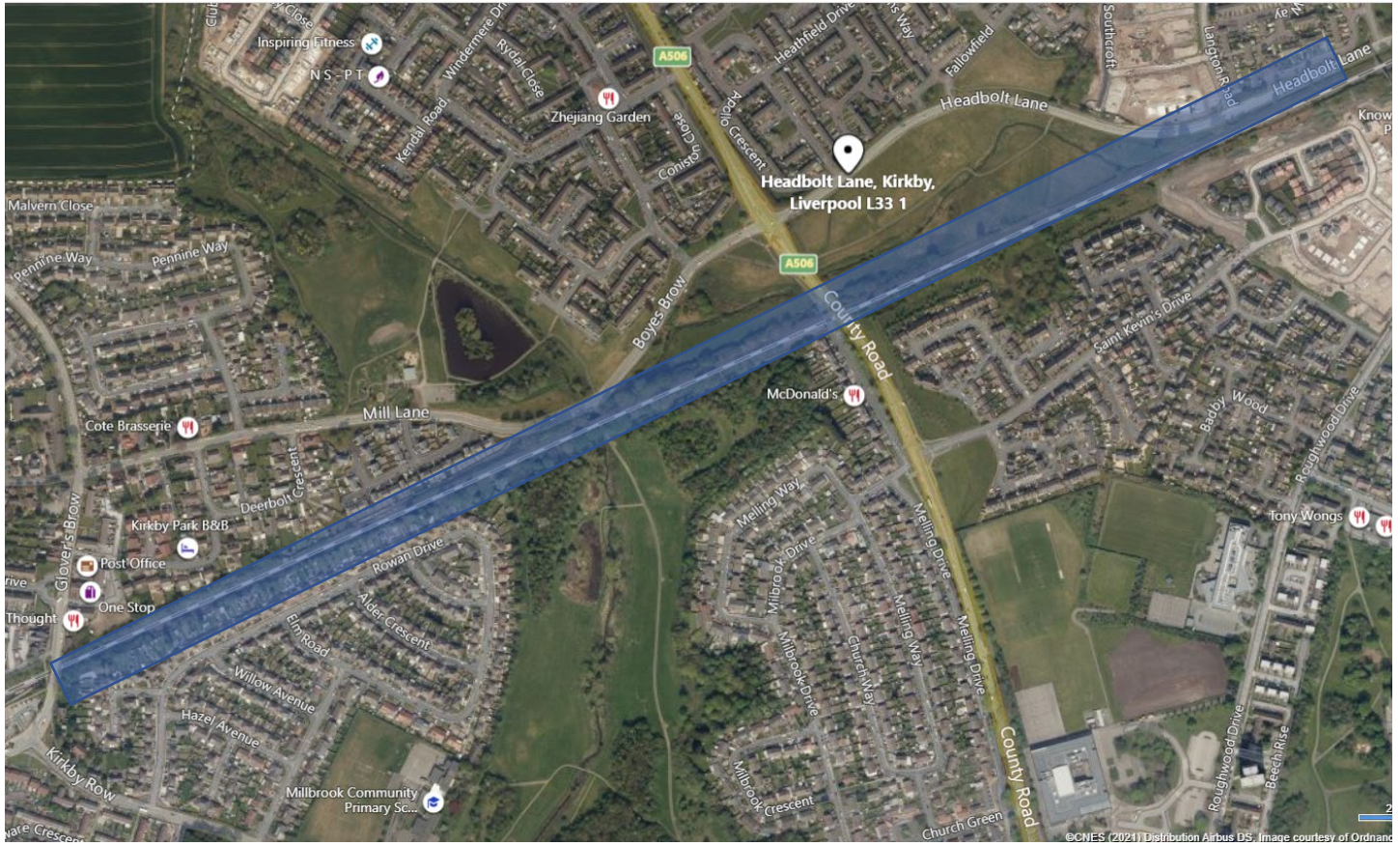
Best Practicable means methodology in place

Why other methods impractical

Haulage trains cannot block up Potter Space freight terminal so need to be within work site. Can only replace 150m of track per weekend. Phasing of work necessitates 2 week long blockades in Summer 2022 and a 3 week long blockade in 2023 **.** Engineering trains must access and egress outside of passenger train hours. Impractical to rail operations for lengthy line closures.

Remaining Night time noise

Loading /Unloading of rail wagons. Effort will be made to do as much of this of a day but impractical to do it all of a day. Compaction equipment and Tampers vibrating the track into place. Excavation of existing ground. Burning of rail. Lifting of rail into place. Top Ballast drops




Activity K, L
Installing cable route, small bases and signalling cabling and assets
Duration
Sat Night to Monday Morning and midweek nights
1st June to 31st September
Mitigation
As much as practical to be behind fencing of a day shift
Best Practicable measures in place
Any notable excavation to be completed of a Sunday day
Why other methods impractical
Can only work so close to the railway during possession. Extended possession interferes too much with railway operations
Remaining Night time noise
Minimal noise some lifting with excavators. Generators, lights. Small plant
Headbolt Lane, Kirkby, Liverpool L33 1
Headbolt Lane
A506
County Road
Mill Lane
Boyes Brow
Inspiring Fitness
NS-PT
Zhejiang Garden
Apollo Crescent
Heathfield Drive
Fallowfield
Southcroft
Langton Road
Windermere Drive
Rydal Close
Coniston Close
Malvern Close
Pennine
McDonald's
Cote Brasserie
Saint Kevin's Drive
Badby Wood
Roughwood Drive
Tony Wongs
Deerbolt Crescent
Kirkby Park B&B
Post Office
One Stop
Thought
Glover's Brow
Rowan Drive
Alder Crescent
Elm Road
Willow Avenue
Hazel Avenue
Kirkby Row
Millbrook Community Primary Sc...
Melling Way
Melling Drive
Milbrook Drive
Church Way
Milbrook Crescent
Church Green
Beech Rise
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Appendix 7A

NLG Ecology Ltd (2021) Preliminary Ecological Appraisal Report

Headbolt Lane, Kirkby

Preliminary Ecological Appraisal Report

nlg ecology ltd

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Macclesfield
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Tel: 01625 560789
E-mail: sally@nlgecology.com
July 2021

Project No/Title: **NLG2996**

Title: **Headbolt Lane/ Buckingham**
Preliminary Ecological Appraisal Report

Client: **Buckingham**

Date: May 2021

Status	Date	Prepared by	Reviewed by	Approved by
V1	27/07/2020	Rowena Tylden-Pattenson Assistant Ecologist	Neil Lee-Gallon Principal Ecologist	Neil Lee-Gallon Principal Ecologist
V2	07/10/2020	Rowena Tylden-Pattenson Assistant Ecologist		
V3	10/05/2021	Sally Conyers Ecologist	Rebecca Ratcliffe Ecologist	Neil Lee-Gallon Principal Ecologist
V4	28/07/2021	Sally Conyers Ecologist	Neil Lee-Gallon Principal Ecologist	Neil Lee-Gallon Principal Ecologist

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Data supplied by the client or from other sources have been used - it has been assumed that the information is correct. No responsibility can be accepted by NLG for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work. This work has been undertaken in accordance with the quality management system of NLG Ecology Ltd. No part of this report may be copied or duplicated without the express permission of NLG Ecology Ltd and the party for whom it was prepared.

SUMMARY

NLG Ecology Ltd (NLG) was commissioned by Buckingham Group to undertake a Preliminary Ecological Appraisal in relation to the proposed construction of a new rail station 'Headbolt Lane' along with associated works to create a second track between Kirby Station and Headbolt Lane, the demolition of the Northern Rail platform at Kirkby station, and the construction of a proposed sub-station and supply bulk point. The survey area is centred at OS Grid Reference SJ 41325 99798, with its nearest postcode being L33 1WD; the site location is shown on Figure 1, along with any recorded habitats and features of ecological interest which are shown on Figure 2, Appendix 1 and in Photographs 1 to 23 in Appendix 3.

The appraisal was required to inform proposals to construct a new station at Headbolt Lane, and associated engineering works at Kirkby Station and the adjacent track. In general, and facilitated by the Preliminary Ecological Appraisal report, for all rail projects that may affect any plants and/or animals, biodiversity risks and opportunities must be identified and managed in accordance with the 'Biodiversity Mitigation Hierarchy'. This comprises sequential steps to avoid, minimise, rehabilitate/restore and offset any negative impacts on biodiversity, aiming ultimately to achieve a net gain in biodiversity.

The Preliminary Ecological Appraisal of the site has comprised of an open-source and local records centre search to 2km radius, an Extended Phase 1 Habitat Survey in accordance with Joint Nature Conservation Committee (JNCC) guidelines (2010) and an evaluation of the key ecological constraints to the project. The data collected have been used to form a baseline for the site and to inform any necessary recommendations for further surveys, mitigation and enhancement measures. In addition, Defra's Biodiversity Metric v2.0 Toolkit has been used to assess the baseline biodiversity of the survey area, the comparative ecological value of the various features recorded and the level of habitat loss to the project.

The appraisal, including the Extended Phase 1 Habitat Survey completed on 13th and 14th July 2020, has been undertaken by Rowena Tylden-Pattenson (Assistant Ecologist at NLG, Graduate CIEEM member), with an update survey of the full area undertaken by Sally Conyers (Ecologist at NLG, ACIEEM) on the 21st and 28th March 2021.

The site baseline habitat area for the proposed new station construction area of Headbolt Lane is 43,500m², the works to the platform at Kirkby station and track widening works between Kirkby Station and Headbolt Lane equate to 33,986m². Within these areas, habitat loss will be significant, which includes areas of notable semi-natural habitat including; woodland, scrub and neutral grassland.

The total study area surveyed for this Preliminary Ecological Appraisal Report is 11.41ha / 114,100m², which equates to 69.74 habitat units; of this, habitat areas are included outside of the red line boundary which may be suitable for off-site compensation and enhancement to mitigate for the habitat loss within the works area.

A calculation of the site baseline habitat areas with descriptions of the location within the scheme, the condition and ecological connectivity of each habitat is attached within a second document titled "Biodiversity Metric 2.0 Calculation Tool Headbolt Lane July 2021" which will be updated following completion of the landscaping plan which will allow for final input of the areas of habitat to be retained, enhanced, proposed succession and lost (within the development footprint).

Recommendations are made with respect to bats, amphibians including great crested newt, nesting birds, rabbit, fox, riparian mammals, reptiles, invasive non-native plant species, and small mammals. All recommendations are located in Section 4.4.

The data contained within this report are considered to be valid for a period of 18 months from the date of the last survey on site (i.e. until 28/09/2022).

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1 INTRODUCTION

1.1 Background

1.1.1 NLG Ecology Ltd (NLG) was commissioned by Buckingham Group to undertake a Preliminary Ecological Appraisal of a site subject to works pertaining to the construction of a new station located at Headbolt Lane, Kirkby. The survey area is centred at OS Grid Reference SJ 41325 99798, with its nearest postcode being L33 1WD; the site location is shown on Figure 1, along with any recorded habitats and features of ecological interest are shown on Figure 2, Appendix 1 and in Photographs 1 to 35 in Appendix 3.

1.1.2 The appraisal was required to inform proposals to construct a new station at Headbolt Lane, and associated engineering works at Kirkby Station and the adjacent track. In general, and facilitated by the Preliminary Ecological Appraisal report, for all rail projects that may affect any plants and/or animals, biodiversity risks and opportunities must be identified and managed in accordance with the 'Biodiversity Mitigation Hierarchy'. This comprises sequential steps to avoid, minimise, rehabilitate/restore and offset any negative impacts on biodiversity, aiming ultimately to achieve a net gain in biodiversity.

1.1.3 The Preliminary Ecological Appraisal has mainly comprised of an open-source desk study to 2km radius, an Extended Phase 1 Habitat Survey and an evaluation of the key ecological constraints to the project. In order to identify ecological opportunities and constraints in respect of the proposals, this report collates the data gathered and seeks to fulfil the following objectives:

- To establish an ecological baseline for the site;
- To assess the potential for, or to confirm actual presence of, protected and notable species;
- To make recommendations for further appraisal and ecological survey where required; and
- To make recommendations for habitat retention and enhancement, so as to ensure opportunities for biodiversity gain are considered in line with the Defra 2.0 Biodiversity Calculator where applicable, along with national and local planning policy and strategies for nature conservation (e.g. the UK Post-2010 Biodiversity Framework, the NERC Act 2006 (Section 41) and the National Planning Policy Framework 2018).

1.1.4 The Extended Phase 1 Habitat Survey of the Headbolt Lane Station site was completed on 13th and 14th July 2020, by Rowena Tylden-Pattenson (Assistant Ecologist at NLG, Graduate CIEEM member), along with Versions 1 and 2 of this appraisal report. A further update walkover survey of the entire study area was undertaken by Sally Conyers (Ecologist at NLG, Associate CIEEM member) on the 21st and 28th March 2021, to gather additional data for the final version (Version 3) of the Preliminary Ecological Assessment.

1.2 Relevant Legislation

1.2.1 Legislation that is applicable to the site is listed below, which covers the UK and Wales only. For a more definitive statement of law it is recommend that the full legislative acts are sighted.

- ***The Conservation of Habitats and Species Regulations 2017*** (the 'Habitats Regulations'): These Regulations consolidate and update the Conservation (Natural Habitats, &c.) Regulations 2010, and previously Regulations 1994 ("the 2010 Regulations" and "the 1994 Regulations"). The Habitats Regulations, which are made under section 2(2) of the European Communities Act 1972, are the principal means by which Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the "Habitats Directive") is transposed for England and Wales and territorial seas.

- ***The Wildlife and Countryside Act 1981 (as amended)*** gives general protection measures for wildlife and special measures for species included on Schedules of the Act. Schedule 1 lists birds that are afforded special protection, Schedules 4-6 protects various wild animal species from injury, killing or disturbance, and Schedule 8 confers protection to certain plant species. Section 14 prohibits the establishment of non-native invasive plant species (as listed within Schedule 9) to grow in the wild. This includes the moving of contaminated soil or plant cuttings. The statutory designation of Sites of Special Scientific Interest (SSSI) is the main site protection measure in the UK established under the WCA.

- ***The Countryside and Rights of Way Act (CROW Act) 2000*** amended the Wildlife and Countryside Act 1981 to also make it an offence to intentionally or recklessly damage, destroy or obstruct a place that a species, listed on Schedules of the Wildlife and Countryside Act, uses for shelter or protection. The repealed Section 74 of the CROW Act listed habitats and species important to biological diversity in England, in accordance with the 1992 UN Convention on Biodiversity (Habitats and Species Action Plans under The UK Biodiversity Action Plan is the means by which the government complied with its duty under Section 74).

- ***Section 41 of the Natural Environment and Rural Communities Act (2006)*** replaces Section 74 of the Countryside and Rights of Way Act, 2000 and refers to the list of organisms and habitats of principal importance published under the repealed Section 74 of the CROW Act 2000. The Secretary of State must take such steps to further the conservation of the living organisms and types of habitat included in the list and promote the taking by others of such steps.

- **The National Planning Policy Framework (NPPF) (Department of Housing Communities and Local Government, 2019)**: sets out the UK Government's planning policies for England and provides guidance on how these policies are expected to be applied. The NPPF includes a chapter on biodiversity, Chapter 15 – Conserving and Enhancing the Natural Environment. In addition to being concerned with the protection of statutorily designated sites, the Chapter outlines ways in which the planning system is required to contribute to and enhance the natural and local environment and sets out guidance for local authorities in respect of the consideration of biodiversity and green infrastructure. The NPPF is a material planning consideration.

- **The 'UK Post-2010 Biodiversity Framework**': succeeded the UK Biodiversity Action Plan (UKBAP) in July 2012. The post-2010 framework is underpinned by the biodiversity and environment strategies of the four countries of the UK and sets out their common purpose and shared priorities. The UKBAP list of priority species remains as a reference source and has been used to help draw up statutory lists of priorities.

- **Biodiversity 2020**: is a strategy for England's wildlife and ecosystem services. Published in 2011, it is the most recent biodiversity strategy for England, and has as its mission to halt overall biodiversity loss, support healthy well-functioning ecosystems, and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.

- ***Bats***. Receive full protection under the Wildlife and Countryside Act 1981 (as amended). They are also protected under the Conservation of Habitats and Species Regulations 2017. The legislation makes it an offence to intentionally kill, injure or take a wild bat uses for shelter or protection whether present or not, and to intentionally disturb any wild bat while it is occupying a structure or place that it uses for shelter or protection.

- ***The Protection of Badgers Act (1992)*** relates to protecting badgers from activities that result in disturbing or interfering with a badger's sett.

- ***Nesting Birds.*** Under the Wildlife and Countryside Act 1982 (as amended) all wild birds, their nests and eggs are protected by law and it is an offence to internationally kill, injure and wild bird, to intentionally take, damage or destroy the nest of any wild bird while it is in use or being built, and to intentionally take or destroy the egg of any wild bird.

- ***Great Crested Newt*** is a European Protected Species (EPS), receiving full protection under the 1981 Wildlife and Countryside Act (as amended), the 2017 Conservation and Species Regulations and the Countryside and Rights of Way Act (CROW) 2000.

- ***Reptiles.*** All UK reptile species are protected under the Wildlife and Countryside Act 1981 (as amended), making it illegal to intentionally kill or injure a common reptile. Rare reptiles (smooth snake and sand lizard) are also protected under the Conservation of Habitats and Species Regulations 2010. This makes it an offence to deliberately injure, kill, capture or disturb a rare reptile, or to damage or obstruct any place used by the species for shelter or protection.

    - ***Hedgehogs*** are protected in England under Schedule 6 of the Wildlife and Countryside Act (1981) and are also listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006). This lists English species that were formerly identified as requiring action under the UK Biodiversity Action Plans and which continue to be regarded as conservation priorities under many Local Biodiversity Action Plans (LBAP) and the current UK Post-2010 Biodiversity Framework.

    - ***Otter*** are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981 (as amended). This makes it an offence to: intentionally or recklessly disturb an individual while it is occupying a structure or place which it uses for shelter or protection (S9:4b) and to intentionally or recklessly obstruct access to any structure or place used for shelter or protection by an individual (S9:4c). It is also an offence to deliberately capture, injure or kill an otter or to impair their ability to survive or reproduce.

    - ***Rabbit (and Fox).*** The Wild Mammals Protection Act (1996) makes it an offence to crush or asphyxiate any wild mammal. This may apply during site clearance works, particularly where burrowing mammals such as rabbit and fox are present, as such animals could be crushed or asphyxiated in their burrows by heavy machinery.

    - ***Water Vole*** are protected under Schedule 5 of the Wildlife and Countryside Act (1981 as amended), which makes it an offence to: intentionally capture, kill or injure water voles, damage, destroy or block access to their places of shelter or protection (on purpose or by not taking enough care) or to disturb them in a place of shelter or protection (on purpose or by not taking enough care).

2 METHODOLOGY

2.1 Project and Survey Scope

2.1.1 A brief description of the works, as described within the document "Multidisciplinary Survey Requirements for AiP" (Iss. 1.0, 06/03/2020), along with updated figures and proposals provided by ARUP in March 2021, including the Environmental Constraints Plan as part of the GRIP 4 planning stage, is as follows:

- Construction of a substation for Kirkby station;
- Northern platform and walkway of Kirkby station to be demolished;
- Second track to be built from Kirkby station to the proposed Headbolt Lane station; and
- Construction of supply bulk point, substation for Headbolt Lane, two platform station, walkway and associated non-rail transport infrastructure at proposed Headbolt Lane site.

2.1.2 The aim of the Preliminary Ecological Appraisal, including the desk study, is to inform the scheme in recording the ecological baseline for the site and/or identifying key features. Where possible, the ecological value of the features present on site is assessed in accordance with guidelines issued by the Chartered Institute of Ecology and Environmental Management (CIEEM 2016), although the values are usually provisional upon data obtained from further survey effort where required.

2.2 Desk Study

2.2.1 A desk study provides background information on the ecological context of a site and complements data collected in the field. The search area extended up to 2km and incorporated the following resources:

- Defra's Multi-Agency Geographic Information for the Countryside (MAGIC) www.magic.gov.uk was searched for European and National Statutory designated sites, including Special Protected Areas (SPAs), Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNRs). The site was also searched for records of nearby granted European Protected Species (EPS) mitigation licences;
- MAGIC also provided a basis for highlighting the location of nearby UK BAP (Biodiversity Action Plan – now covered by the UK Post-2010 Biodiversity Framework) priority habitats;
- The National Biodiversity Network (NBN) Atlas (https://records.nbnatlas.org) was consulted with reference to relevant and notable species records on, or within 1km of, the site; and
- Aerial imagery from Google Maps (www.google.co.uk/maps), and Ordnance Survey mapping from Bing (https://www.bing.com/maps/), was reviewed to help determine terrestrial and hydrological connectivity with the wider landscape. This particularly related to the presence of ponds within 250m of the proposal site. Where potential water bodies are identified, further ground investigation of their presence and suitability for great crested newt (*Triturus cristatus*) is recommended.

2.2.2 An updated desk study was undertaken in October 2020, with information requested from Merseyside Biobank for records of non-statutory designated sites and protected, notable and invasive species records.

2.3 Extended Phase 1 Habitat Survey

2.3.1 The Phase 1 Habitat Survey broadly followed the standard methodology as detailed in the JNCC (2010) *Handbook for Phase 1 Habitat Survey - A technique for environmental audit*, and further developed in Guidance for Baseline Ecological Assessment (Institute of Environmental Assessment, 1995). This involved mapping and describing the broad habitats and compiling a general plant species list to reflect the floristic assemblage of each habitat type. All botanical names follow the nomenclature of Stace (2010).

2.3.2 Target notes (TN) were used to illustrate key features of interest (i.e. over mature trees / dead standing wood) or to draw attention to areas considered too small to map or for the purpose of highlighting the location of an invasive plant species.

2.3.3 The survey was 'extended' in accordance with the Institute of Environmental Assessment, (1995) to assess faunal potential through, and adjacent to, the survey area. The level of scoping does not necessarily constitute full survey effort, although reasonable effort is made to provide informed conclusions for the potential requirement of further survey.

2.4 Biodiversity Calculations – DEFRA 2.0

2.4.1 Biodiversity calculations were undertaken via the "Biodiversity Metric 2.0 Calculation Tool Beta Test - December 2019 Update" tool.

1.1.1 Habitat areas were calculated from the Phase 1 Habitat Plan (Figure 1, Appendix 1), using polygon sizes per habitat parcel calculated, using MapInfo Pro V17, utilising habitat notes gathered from site survey data and satellite imagery.

2.4.2 Condition assessments were undertaken utilising the Biodiversity metric 2.0 Technical supplement – JP029 (BETA).

2.5 Constraints

2.5.1 Some areas of dense scrub were impenetrable and therefore could not be fully surveyed for evidence of mammal burrows. However, during the walkover carried out in March 2021 only rabbit burrows were notable, and although the entire slope was not accessed, the embankment was viewed from trackside and vegetation was considered sparse enough to identify badger setts and paths, if present.

2.5.2 Whilst desk study records can help to inform and complement survey effort, they should not be treated as a comprehensive list of species present within the search area. Many species are under-recorded and a lack of records can reflect a lack of survey effort in certain areas rather than confirming absence of a species.

3 FINDINGS

3.1 Desk Study

Designations and Notable Habitats

3.1.1 Headbolt Lane is located north of Kirkby, Knowsley, Merseyside. The surrounding habitats are suburban, with rural agricultural land in close proximity. Mill Brook and Simonswood Dell woodland, run beneath the railway track to the west of the proposed station location, the woodland is located within Millbrook Park which extends to the south of the track adjacent to the site.

3.1.2 Habitats recorded by MAGIC within 2km of the site include deciduous woodland, which is considered to be of 'priority' conservation status in accordance with the UK Post-2010 Biodiversity Framework.

3.1.3 Connectivity from the proposed development is moderate, with linear features present in the form of watercourses including Simonswood Brook, Simonswood dell and Millbrook Park which run north to south under the rail line and Kirkby Brook which runs within the station development area east to west, and other linear features including the railway track and areas of open grassland connecting to the wider rural landscape.

Protected, Notable and Invasive Species Records

3.1.4 No European Protected Species (EPS) mitigation licence records were returned within 1km of the main works proposals. Three EPS mitigation licence records for common pipistrelle (*Pipistrellus pipistrellus*) were returned within 2km of the site: EPSM2013-5715 1.56km away; 2017-30556-EPS-MIT 1.58km away and 2015-7259-EPS-MIT 1.67km away.

3.1.5 The NBN Atlas was used to search for records of protected or notable species within 2km of the Headbolt Lane Station development from the past 10 years. These records are summarised as follows:

- Mammals: Four hedgehog (*Erinaceus europaeus*), four brown hare (*Lepus europaeus*), four water vole (*Arvicola amphibius*), four common pipistrelle (*Pipistrellus pipistrellus*) nine red squirrel (*Sciurus vulgaris*) and two red fox (*Vulpes vulpes*).

- Birds (Schedule 1 birds within the Wildlife and Countryside Act 1981, as amended): seven fieldfare (*Turdus pilaris*), one peregrine (*Falco peregrinus*) and 15 redwing (*Turdus iliacus*). 116 bird species were recorded within 2km of the site.

- Plants: Two bluebell (*Hyacinthoides non-scripta*).

- Key invasive non-native plant species: ten records of Himalayan balsam (*Impatiens glandulifera*), and three records of Japanese knotweed (*Fallopia japonica*).

3.1.6 During the search, no reptile or amphibian records were returned.

3.1.7 Desk study data from Merseyside Biobank was received on the 5th October 2020, this was further updated to cover the entire red line boundary in March 2021 to include the troughing works area, within a 1km search radius of the site. This data is included within Appendix 6 and further summarised below. Merseyside Biobank provided information for non-statutory designations. These include:

- *Simonswood Brook:* a site north-west of Headbolt Lane that supports neutral grassland, notable bird species and a population of water vole. The brook runs south towards the railway line and therefore has habitat connections to the proposal site via the brook water and adjacent riparian habitats. Located 650m north of the proposed track extension at SD 405001.

- *Mill Brook, Westvale:* a site south of Headbolt Lane that supports neutral grassland, notable invertebrate species, and a population of water vole. The brook runs south from the railway line and therefore has habitat connections to the proposal site via the brook water and adjacent riparian habitats. Located 800m south at SJ 405988.

- *Kirkby Brook, including Mill Brook:* a site south of Headbolt Lane that supports neutral grassland, woodland and ponds, common amphibian species, notable invertebrate species, and a population of water vole. The brook runs south under the rail line (Bridge 56) and therefore has habitat connections to the proposal site via the brook water and adjacent riparian habitats. Located 200m of the proposed rail track extension at SJ 407990.

- *Northwood Forest Hills:* a site that supports woodland and neutral grassland, and notable plant species. Located south east of the Headbolt Lane Station development at SJ 425998.

- *River Alt and M57 Corridor:* a nature improvement area along the Alt valley and M57 corridor which is dominated by woodland –to the south west of Kirkby station at SJ 394987.

- *Kirkby Brook, Northwood:* Open watercourse with habitat suitable for water voles. Located to the east of Headbolt Lane development at SJ 427992.

- *Meadow, Kirkby (Mill) Brook, South of Old Hall Lane:* A meadow within a wet flush on the banks of Kirkby Brook. Sandstone exposures on the banks add to the diversity. Located 700m south of the proposed rail track extension at SJ 407988.

- *Kirkby Brook Waterfall:* geographical site (not ecology) for bedrock of Kirkby Brook – located within Headbolt Lane Station development site.

3.1.8 Merseyside Biobank also provided information on protected or notable species and habitats within 1km from the past 10 years. These records are summarized as follows:

- Amphibians: 1 great crested newt from 2011 situated within Mill Brook Park (200m south of the works);

- Mammals: 5 common pipistrelle (*Pipistrellus pipistrellus*) / unspecified pipistrelle *(Pipistrellus* sp.) species from 2010 - 2016, 11 red squirrel from 2010 to 2013, 12 water vole between 2010 and 2017, 1 badger (*Meles meles*) record from 2010, 4 hedgehog (*Erinaceus europeaus*) between 2015 and 2020 and 1 brown hare (*Lepus europaeus*) from 2011;

- Key invasive plant species: Records of Himalayan balsam between 2010 and 2016 and Japanese knotweed in 2017; and

- Habitats: Lowland acid grassland, lowland meadow, neutral grassland, ponds and broadleaved deciduous woodland are present along the Simonswood and Kirkby Brook corridors, based on ecological network mapping 2016 – these are considered locally valuable habitats

3.2 Extended Phase 1 Habitat Survey

3.2.1 The habitat survey findings are illustrated on Figures 2.1 – 2.4 (Appendix 1) and are described further below, with target notes (TN) tabulated in Appendix 2 and cross referenced within the text below. Photographic plates are presented in Appendix 3.

Habitats

Grassland communities

Neutral grassland – Tall ruderal

3.2.2 Tall ruderal grassland (TN3, photograph 3) with ragwort (*Jacobaea vulgaris*), red campion (*Silene dioica*), immature silver birch (*Betula pendula*), immature oak (*Quercus sp*), common nettle (*Urtica dioica*), Himalayan balsam (*Impatiens glandulifera)*, rosebay willowherb (*Chamaenerion angustifolium*), cow parsley (*Anthriscus sylvestris*), common hogweed (*Heracleum spondylium*) and rapeseed (*Brassica napus*).

Neutral grassland - Semi-improved neutral grassland

3.2.3 Semi-improved neutral grassland (TN4, photographs 5 and 6), with lesser stitchwort (*Stellaria graminea*), great willowherb (*Epilobium hirsutum*), ragwort, common sorrel (*Rumex acetosa*), creeping thistle (*Cirsium arvense*), common nettle, yarrow (*Achillea millefolium*), sweet vernal grass (*Anthoxanthum odoratum*), cocksfoot (*Dactylis glomerata*), ribwort plantain (*Plantago lanceolata*), dandelion (*Taraxacum* sp.), hogweed (*Heracleum spondylium*), creeping buttercup (*Ranunculus repens*), cleavers (*Galium aparine*), bindweed (*Convolvulus arvensis*), dock (*Rumex* sp.), rosebay willowherb, white dead-nettle (*Lamium album*), hawkbit (*Leontodon* sp.), borage (*Borago officinalis*) and garlic mustard (*Alliaria petiolata*), with two ash (*Fraxinus excelsior*) trees.

3.2.4 A small cluster of immature trees (TN5, photograph 6) within semi-improved neutral grassland, including sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*) and elm (*Ulmus procera*), with an understorey of Yorkshire fog (*Holcus lanatus*), meadow cranesbill (*Geranium pratense*), nettle, ragwort, ribwort plantain, mallow (*Malva sylvestris*), herb Robert (*Geranium robertianum*) and hawkbit.

3.2.5 Unmown areas of semi-improved neutral grassland (TN7, photograph 6), with hawkbit, sweet vernal grass, common sorrel, white clover, Yorkshire fog, thistle, dock, ribwort plantain, creeping buttercup, ragwort, weld (*Reseda luteola*), yarrow, bird's foot trefoil (*Lotus corniculatus*) and selfheal (*Prunella vulgaris*).

3.2.6 Semi-improved neutral grassland sloping down to embankment (TN11, photograph 9). Species include garlic mustard, creeping thistle, feverfew (*Tanacetum parthenium*), rosebay willowherb, dock, sweet vernal grass, chickweed (*Stellaria media*), horsetail (*Equisetum* sp.), poppy (*Papaver somniferum*), great willowherb, bramble (*Rubus fruticosus*), ribwort plantain, hawkbit, common vetch (*Vicia sativa*), bindweed, red fescue (*Festuca rubra*), pineappleweed (*Matricaria discoidea*) and creeping buttercup.

Neutral grassland – Poor semi-improved

3.2.7 Mown grassland (TN6, photograph 6) with white clover (*Trifolium repens*), ragwort, ribwort plantain, dandelion, Yorkshire fog, creeping buttercup, black medick (*Medicago lupulina*) and shining cranesbill (*Geranium lucidum*).

3.2.8 Mown grassland (TN12, photograph 9), with infrequent thistle, ribwort plantain, Yorkshire fog, garlic mustard, feverfew, horsetail, white clover, greater plantain (*Plantago major*) and areas of bare ground.

Urban – Amenity grassland

3.2.9 Mown grassland (TN1, photograph 1) with cocksfoot, perennial rye grass and broadleaved dock. Lombardy poplars (*Populus nigra 'Italica'*), one with a broken knot hole (photograph 2) with low bat roosting potential.

3.2.10 Additional small areas of amenity grassland are present on road sides and within housing estates, dominated by perennial rye grass and frequently mown.

Scrub communities

Heathland and Shrub - Mixed Scrub

3.2.11 Mixed scrub which is very dense is present along the railway boundary (TN10, photograph 8). Species include hawthorn (*Crataegus monogyna*), cherry (*Prunus* sp.), elder (*Sambucus nigra*), ash, field rose (*Rosa arvensis*) and oak, with an understory of bird's foot trefoil, bindweed, bramble, nettle, creeping buttercup, cocksfoot, rosebay willowherb, raspberry (*Rubus idaeus*), hogweed, ragwort, and dock.

3.2.12 Railway embankment scrub vegetation east of Kirkby station (TN15, photographs 11 and 12), with species including oak, goat willow (*Salix caprea*), sycamore, silver birch, elder, common lime (*Tilia x europaea*), Lombardy poplar, field maple (*Acer campestre*), cherry, privet (*Ligustrum vulgare*), field rose, hawthorn, gooseberry (*Ribes uva-crispa*), cotoneaster (*Cotoneaster horizontalis*) and Leyland cypress (*Cupressus × leylandii*). Behind the northern platform, trees include laburnum (*Laburnum anagyroides*), sycamore, elder and laurel (*Laurus nobilis*). Ground flora includes horsetail, bramble, ragwort, cocksfoot, red fescue, rosebay willowherb, bindweed, nettle, cleavers, old man's beard (*Clematis vitalba*), bracken (*Pteridium aquilinum*), thistle, hawkbit, ivy (*Hedera helix*), yellow flag iris (*Iris pseudacorus*), goldenrod (*Solidago virgaurea*), raspberry, yarrow, variegated yellow archangel (*Lamiastrum galeobdolon* subsp. *argentatum*), foxglove (*Digitalis purpurea*), common vetch, buddleija (*Buddleja davidii*), groundsel (*Senecio vulgaris*) and herb Robert.

3.2.13 Railway embankment scrub vegetation opposite the Merseyrail Kirkby station platform (TN14); includes bramble, hawthorn, cleavers, rosebay willowherb, buddleja, elder, ragwort, bracken, nettle, raspberry, dogwood (*Cornus sanguinea*) and ash. The platform comprises a mixture of planted and seeded species, including hart's tongue fern (*Asplenium scolopendrium*), ribwort plantain, nettle, ivy, sycamore, hawthorn, dogwood, laurel, field rose, horsetail, St John's wort (*Hypericum perforatum*), dandelion and cotoneaster.

3.2.14 Along the railway embankment from Millbrook Bridge (TN16), species include ash, sycamore, hawthorn, oak, osier (*Salix viminalis*), ivy, cherry species, elder, field rose, Himalayan balsam, ragwort, rosebay willowherb, bracken, bramble, horsetail, nettle, greater willowherb and common toadflax (*Linaria vulgaris*), the last found above County Road Bridge WKL2 55.

3.2.15 Railway embankment species adjacent to Headbolt Lane (TN17) include goat willow, bracken, tormentil (*Potentilla erecta*), yarrow, hawkbit, bindweed, sage (*Salvia officinalis*), common vetch, cherry species, apple species (*Malus* sp.), and wood forget-me-not (*Myosotis sylvatica*). A large mammal run was observed partway down the track on the southern embankment (photograph 13).

Heathland and Shrub – Bramble Scrub

3.2.16 Dense scrub dominated by bramble (TN9), with Himalayan balsam, nettle and coarse grasses including sweet vernal grass at edge of track. A fly tipped shed underneath an English elm may provide suitable refuge for amphibians.

3.2.17 Dense bramble scrub dominates the northern embankment to the north east of the proposed Headbolt Lane development with willowherb and rank grasses of cock's-foot, fescue species (*Festuca* sp.) and false oat grass.

3.2.18 Bramble scrub is present connecting the rail embankment to Kirkby brook within the Headbolt Lane development area.

Woodland communities

Woodland: Lowland mixed deciduous woodland

3.2.19 Semi-natural broadleaved woodland is present within a small area to the south of Mill brook over-bridge predominantly off-network either side of the brook and public walkway. The canopy is dominated by mature sycamore, with oak and an occasional elder scrub layer and an under storey of bramble, hogweed and nettle. This area is a priority habitat on Defra's Magic mapping.

Woodland: Other woodland; broad-leaved

3.2.20 Semi-mature plantation broadleaved woodland is present along the north and south rail embankments to the south west of Kirkby station, which are dominated by oak and sycamore with occasional hawthorn.

3.2.21 A small section of plantation broadleaved woodland is present to the east of Mill brook crossing, and the southern rail embankment on the network, which is dominated by sycamore with rare ash and occasional oak species.

3.2.22 Scattered semi-mature broadleaved trees are present within dense scrub between Kirkby Station and Headbolt Lane.

Running water

3.2.23 The confluence of Mill Brook and Kirkby Brook is located between Mill Lane and the rail bridge over Mill brook (labelled Simonswood Brook further north on OS mapping) (TN2, photograph 3) which emerge from two culverts – Millbrook flows in a southern direction from the North under Mill Lane and Kirkby Brook flows in a westerly direction and is culverted into Mill brook between Mill Lane and the rail bridge, it then flows south through Mill brook Park. Mill brook at the time of the survey had a depth of up to 50cm and a width of 1.5m with a relatively slow flow. Some glossy film was observed on the water's surface, and large pieces of litter were observed on the bed. Bankside vegetation included rosebay willowherb, Himalayan balsam, thistle, nettle, horsetail, cleavers, bindweed, Yorkshire fog, bramble, cow parsley and common reed (*Phragmites australis*), with immature oak.

3.2.24 Kirkby Brook is a generally slow-flowing stream (TN8, photograph 7), at a width of 1m or more, and a depth of 30cm. Some shallower sections have a faster current. The bed is silty, with banks varying in height between 20cm to 1m, and heavily vegetated. Some undercutting of the embankments from current and fluctuations in water depth is notable within natural meanders. No mammal or crayfish holes were visible at the time of the survey. Bankside vegetation includes Himalayan balsam, rosebay willowherb, ragwort, thistle, nettle, common reed, yarrow, sorrel, cocksfoot and creeping buttercup, with areas of bare ground.

Urban environment

Bare ground

3.2.25 An area of bare ground (TN13, photograph 10), with buddleja, bramble, broadleaved dock, rosebay willowherb, hop (*Humulus lupulus*) and Japanese knotweed present adjacent to the security fence alongside track. Trees include field rose, sycamore, silver birch, hawthorn and cherry.

Urban built environment

3.2.26 Built up infrastructure is present within the rail network which includes un-vegetated permeable ballast stone and associated trackway, bridge structures, watercourse crossing points and tarmac pedestrian walkways throughout the proposed Headbolt Lane station area.

Invasive non-native plant communities

3.2.27 Himalayan balsam was identified along the banks of the stream running through Headbolt Lane (TN2, TN8). Japanese knotweed was identified near Kirkby station, just north east of the platform (TN15) on the southern embankment within scrub / woodland vegetation and also to the north of the rail boundary (TN13, photograph 10), in an area of bare ground proposed to be developed for a new substation.

Faunal Species

3.2.28 The survey has identified potential for, or the confirmed presence of, the following protected species within the survey area.

Breeding Birds

3.2.29 Opportunities for nesting birds are prevalent throughout the vegetation within the survey area, including railway embankments and bridges, where trees, scrub and tall ruderal vegetation are present. The dense bramble scrub within the proposed development is of notable value for nesting long tailed tit (*Aegithalos caudatus*), blackbird (*Turdus merula*) and dunnock (*Prunella modularis*).

3.2.30 Old bird's nests (photograph 17) identified as being from prior to the 2020 nesting season were observed underneath the steel crossbeams of a metal footbridge adjacent to Glovers Brow Bridge (SJ 40249 99256).

Rabbit or fox

3.2.31 A cluster of shallow mammal holes were identified along the railway embankment at SJ 41369 99759 (photograph 14). Two mammal pathways, likely used by foxes or domestic cat, were identified at the opposite side of the railway track at SJ 41275 99709 (photograph 13) and at SJ 40753 99478 through thick scrub vegetation. As the vegetation is dense along the railway embankment and in some area of the proposed development area at Headbolt Lane, it is possible that other evidence of badger, rabbit or fox including mammal holes may have been missed. Therefore, as a precaution, recommendations for badger, rabbit and fox are included within the Conclusion and Recommendations section, below.

Amphibians

3.2.32 Two waterbodies are present within 250m of the proposed development between Kirkby Station and Headbolt Lane station. Of these, one comprises a large fishing pond with a population of Canada geese (*Branta Canadensis*) and mallard ducks (*Anas platyrhynchos*) present, situated 100m to the north of bridge 56 at OSGR SJ 40759 99646 within an amenity area. This pond has both inflows and outflows into Simonswood Brook. The pond has a small wooded island within the center of the pond, and a small area of ephemeral vegetation of yellow flag iris (*Iris pseudacorus*) and bulrush (*Typha latifolia*) are present within the northern corner, otherwise no other notable macrophytes were noted within the pond. The entire pond has man-made wooden banking throughout the perimeter. A second pond is present 90m south of the rail line within Millbrook Park at OSGR SJ 40883 99372. This pond has dense common reed around the perimeter, with a relatively small open water area within the center; aquatic mint (*Mentha aquatica*), willowherb, bulrush and yellow flag iris are present frequently within an ephemeral area of the pond.

Reptiles

3.2.33 South facing rail embankments and cuttings with a mosaic of scrub, woodland and open grassland habitat are present within the scheme area with suitable connecting habitat of semi-improved grassland. Although no records of reptile are present within the locality, suitable habitat is present for common reptile species within the survey area. Due to the highly disturbed nature of the area within the proposed Headbolt Lane station development, it is considered unlikely that reptiles would be present in this area, as they are likely to be predated and there is a lack of suitable refugia opportunities.

Bats

Proposed Headbolt Lane station site and railway embankments

3.2.34 The area within the proposed Headbolt Lane station site offers suitable and ecologically well-connected habitat for foraging and commuting bat species, predominantly due to the presence Kirkby Brook and of areas of diverse grassland which are suitable for invertebrates.

3.2.35 A Preliminary Ground Level Roost Assessment was carried out for the trees within the survey area, in accordance with best practice guidance (Collins, 2016). This included any trees along the railway embankments where track works are proposed.

3.2.36 A mature Lombardy poplar is present adjacent to Headbolt Lane at SJ 41536 99849. The tree has a knot hole approximately 2.5m high, facing east (photograph 2). The extent of the knot hole could not be fully observed during the preliminary ground-level roost appraisal. Due to the potential of the features to support roosting bats and the suitable surrounding habitat, the tree has been assessed to hold a **moderate** bat roosting potential.

3.2.37 All other trees within the Headbolt Lane station site were assessed as offering **negligible** potential for roosting bats based on their age and/or a lack of suitable roosting features.

3.2.38 Along the railway embankments, multiple trees including mature sycamore and oak have ivy growth along the length of the trunks. This ivy growth conceals a number of trunks from being directly observed, therefore, due to the maturity of some trees along the embankments, it is considered likely that this ivy may have concealed potential bat roosting features. Due to the maturity of some trees along the railway embankments and highly suitable foraging habitat for foraging bat species, all mature trees have collectively been assessed to hold a **low** bat roosting potential.

County Road Bridge A502 UB WKL2 55

3.2.39 County Road Bridge is a reinforced steel and stone structure (photograph 18), with no signs of weathering or colonisation by plant species. There are no gaps or cracks present that

could provide potential spaces for roosting bats. No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.

3.2.40 Therefore, County Road Bridge was assessed as having **negligible** potential for roosting bats due to a lack of evidence of bat use and the absence of any suitable roosting features.

Millbrook Bridge UB WKL2 56

3.2.41 Millbrook Bridge is a stone structure with some vegetation growth present on the elevations and underside.

3.2.42 Gaps are present above the arch ring (photograph 19), on the north-west elevation, under the river arch on the western side (photograph 21) and under the arch of the bridge deck (photograph 20); the depth of these gaps are unknown, and therefore may provide suitable roosting opportunities for bats. It is possible that the presence of ivy growing across the wing walls and above the arch rings may have obscured potential bat roosting features; however, the presence of this vegetation is likely to lessen the likelihood of bats roosting in this particular location due to the decrease in available space and the overly cluttered nature of the vegetation which is thought to obstruct a direct flight path. No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.

3.2.43 Millbrook Bridge was assessed as having **moderate** potential for roosting bats due to presence of multiple small features, however no evidence of bat use was observed.

Glovers Brow Bridge OB WKL2 57

3.2.44 Glovers Brow Bridge is of solid concrete and sandstone construction, with a section of metal plating underneath the arch. Gaps are present between the concrete arch and metal plating (photograph 16) that may provide suitable roosting opportunities for bats, although cobwebs present suggest that these spaces have not been used recently. Some small pockmarks and cracks were present in the eastern sandstone elevation (photograph 15). No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.

3.2.45 Glovers Brow Bridge was assessed as having **low** potential for roosting bats due to a lack of evidence of bat use, and the presence of only minor superficial roosting features.

Riparian mammals

3.2.46 Kirkby Brook which runs through the proposed site for Headbolt Lane Station appears sub-optimal for otter as the watercourse appears too shallow and narrow with limited refuge opportunities and is isolated from larger watercourses and waterbodies by an extensive pipe culvert and multiple unsuitable crossing points over major roads, with bridges having no suitable mammal passes.

3.2.47 No evidence of water vole was recorded during the survey; however, the banks of the brook are densely vegetated predominantly by tall herb and ruderal species, therefore evidence may have been concealed. The embankments are considered to be of a suitable substrate and gradient for the construction of burrows by this species. Overall, it is considered that Kirkby Brook has some potential to support water vole.

3.2.48 Simonswood / Mill Brook bisects the scheme, with proposed works to the bridge being over the water course. The Brook is generally slow flowing and within the proposed works area is culverted and heavily shaded offering negligible potential for water vole, however within

250m upstream and down-stream of the works suitable habitat is present to support water vole.

Other

3.2.49 The scrub habitats on site offer refuge opportunities to small mammals, such as hedgehogs.

3.3 Biodiversity Value of Habitats within Development Site

3.3.1 Land within the proposed Headbolt Lane development site supports semi-natural habitats comprising a mosaic of semi-improved neutral grassland, tall ruderal, dense bramble scrub, running water and linear built features amounting to approximately 6.72Ha (67,200m²), of which 4.35ha will be lost within the development footprint. The habitats within the footprint of the development range from poor to moderate condition and of low to high habitat distinctiveness with low ecological connectivity to the wider area and of medium strategic significance in Knowsley.

3.3.2 The proposed work at Kirkby station to remove the platform is relatively confined to within current built urban features which are of negligible ecological value. The track extension works between Kirkby Station and Headbolt lane totals an area of 33,986m², habitats present within the proposed works include broadleaved woodland, plantation broadleaved woodland, dense scrub and scattered broadleaved trees. Vegetation clearance required to facilitate the works will be approximately 14m either side of the cess – which is an approximate loss of 14,000m² of bankside vegetation.

3.3.3 An assessment of the habitat loss will be carried out utilising the DEFRA Biodiversity Metric, following completion of the design and finalised landscaping plans to allow for an accurate calculation of biodiversity units lost through the development. At present, the baseline habitats present are set out in a separate document – ""Biodiversity Metric 2.0 Calculation Tool Headbolt Lane July 2021"

3.3.4 Table 1 below details the habitat types and areas that will be impacted by the proposed development.

Table 1: Habitats within the study area and the calculated biodiversity units

Habitat type	Description, species and TN Habitat Condition & Distinctiveness	Estimated Area of habitat / distance of linear feature	
		Hectares (ha) / Metres (m)	Biodiversity units
Neutral grassland: Tall ruderal	Tall ruderal with ragwort, rosebay willowherb, Himalayan balsam and immature trees. The habitat is considered to be in poor condition and of medium distinctiveness with moderate connectivity. Habitat within Headbolt Lane development area.	0.45ha	3.27
Neutral grassland: Semi-improved neutral grassland	Mixed grassland species, including wildflowers but excluding sedges, undesirable species such as ragwort, hogweed and bramble on the embankments of Kirkby brook within the Headbolt Lane development area, regularly mown. The habitat is considered to be in moderate condition and of medium distinctiveness.	2.70ha	26.14
Neutral grassland: Poor semi improved neutral grassland	Poorer species composition with more extensive broadleaved dock, perennial rye grass and cocksfoot (rank grassland) than the semi-improved neutral surrounding which is more frequently mown. The habitat is considered to be in fairly poor condition and of medium distinctiveness. Habitat within Headbolt Lane development area.	2.21ha	10.70
Urban amenity grassland	Areas of mown grassland, with stress-tolerant species. The habitat is considered to be in moderate condition and of low distinctiveness.	0.11ha	0.36
Mixed scrub	Areas of dense or very dense scrub characterized by a mosaic of bramble, birch, willow, introduced shrubs with Himalayan balsam, nettle, thistle and un-grazed tall herb edges. The habitat is considered to be in fairly poor condition and of medium distinctiveness.	1.79ha	11.81
Bramble Scrub	Dense areas of bramble scrub on the rail network, dominate sections of the embankments, also notable bramble scrub areas are present within the Headbolt Lane development area along Kirkby Brook. The habitat is considered fairly poor due to	1.37ha	9.95

	low species diversity and medium distinctiveness.		
Lowland mixed deciduous woodland	A small area of broadleaved deciduous trees, all of similar ages, with a developed ground flora to the south of rail line (outside of the rail boundary) either side of Mill brook. The habitat is considered to be in moderate condition and of high distinctiveness.	0.23ha	2.28
Other woodland: broad-leaved	Semi-mature broadleaved plantation woodland, well-established along the rail embankment. The habitat is considered to be in fairly poor condition and of moderate distinctiveness. Habitat is frequent throughout the entire study area.	0.5ha	3.30
Other woodland: broad-leaved (Scattered mature trees)	Dominated by mature sycamore with occasional semi-mature oak, predominantly notable on the northern embankment between Kirkby Station and Headbolt Lane around the Mill Brook crossing. The habitat is considered to be in moderate condition and of moderate distinctiveness.	0.2ha	1.94
Planted shrub	Not included in biodiversity metric due to small size.		
Bare ground	Not included in biodiversity metric due to small size.		
Running water	Three watercourses are present within the scheme area, of these Kirkby Brook is to be impacted by the proposed development of the Headbolt Lane Station via additional road crossings, however the brook is to remain in place and, where possible, bankside vegetation retained and enhanced. Mill Brook over bridge is to have work carried out to dual the trackway. The watercourses are to be included within the separate metrics and Kirkby Brook within a separate River MoRPH survey report.	Kirkby Brook – 445m in length within headbolt lane area	4.14
Urban Habitat: Built environment	Linear built features include; the rail, road and pathway infrastructure throughout the survey area. Developed land; sealed surface represents buildings and the platforms at Kirkby station All urban built environment is considered to be of very low distinctiveness and the condition is not attainable.	Rail: 1.71ha Roads: 0.1 Buildings: 0.02ha	0

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Habitats

4.1.1 The habitats recorded on site within the footprint of the development proposal are relatively common and widespread and support commonly occurring botanical species. However, within the context of the urban environment, they are of relatively high ecological value in the local context. When assessed under the criteria of the DEFRA Biodiversity Metric 2.0, the mosaic of semi-improved neutral grassland, tall ruderal, scrub, woodland and bare ground habitats that will be lost to the development range from poor to moderate condition; and from low to moderate habitat distinctiveness.

4.1.2 High distinctiveness broadleaved woodland, which is a priority habitat, is present to the south of the rail line within close proximity to Mill Brook – this habitat should be retained and works within this area avoided unless for the purpose of enhancement to improve the condition of the woodland.

4.1.3 Grassland present within the Kirkby Brook valley was identified in 2016 as being lowland meadow and acid grassland BAP habitat, however during the phase 1 habitat survey of the area, neither of these criterias were met. The bankside (up to 10m) vegetation along Kirkby Brook within the Headbolt Lane development area, previously been identified as 'lowland meadow' BAP habitat, had extensive Himalayan balsam, nettle, hogweed with limited species diversity, the predominant grass species is cocksfoot, in general this is indicative of tall ruderal and rank grassland with presence of an invasive species. Areas previously assigned as 'lowland acid grassland' BAP habitat have been assessed as semi-improved neutral grassland due to a lack of indicator species for acid grassland with likely nitrification from use of the area by dogs with species such as broad-leaved dock, nettle and hogweed recorded. Areas of the grassland that are unmanaged and have become rank with low species diversity are mapped as poor semi-improved grassland.

4.1.4 These habitats provide valuable places of refuge, shelter and foraging opportunities for common amphibian and reptile species, small mammals and birds. Any trees should be retained and incorporated into the landscaping design if possible; any necessary de-vegetation should be undertaken in accordance with the advice given for nesting birds, common amphibian species and small mammals. It is generally recommended that the amount of de-vegetation is restricted to the minimum required to facilitate the proposals and that any bounding vegetation or habitats remain protected and unaffected by the works.

4.2 Invasive Species

4.2.1 The survey has confirmed the presence of two small and localised stands of Japanese knotweed on site. To prevent further spread the works will be carried out in accordance with a site-specific Japanese knotweed management plan to include strict biosecurity measures to prevent the spread of this highly invasive plant along the railway embankments and other locations. There is potential that the stand present within 20m of the Kirkby station platform will require removal prior to the works.

4.2.2 Site operatives should be made aware of the presence of Himalayan Balsam within the proposed working area; an identification guide has been included in Appendix 4. Control measures will be required prior to the works to prevent the spread of this species. Control of this species entails manual hand pulling or strimming (below the first node) of any Himalayan balsam plants within any work areas. This management should be undertaken outside the seeding period (July to October, inclusive), accompanied by the burying or composting (in a designated, contained area) of plant fragments; arisings must not be removed from site. Biosecurity measures would be integral to the plan, including cleaning of plant, tools and footwear used within any contaminated areas.

4.3 Water Pollution Control Measures

4.3.1 All works will be conducted in line with Network Rail Environment Contract Requirements (NR/SP/ENV/015) and all industry standard best practice. This will avoid the risk of polluting the watercourse through chemical contamination or substrate run off.

- Any chemicals (if required) will be stored in designated places and bunded to prevent leakages.
- Spill kits will be on site to deal with any leakage of fuel, wet concrete or chemicals.
- Vehicles will be inspected regularly to identify leaks, fuelling will be carried out off site.
- On completion of the works, the working area will be reinstated on a like-for-like basis.

4.4 Protected Species

4.4.1 The survey has confirmed the potential for or actual presence of nesting birds, bats, small mammals, reptiles, riparian mammals and amphibian species on site. The following is therefore recommended in respect of these species:

Nesting Birds

4.4.2 Nesting opportunities for a range of common bird species exist across the site, including within the proposed development area in grassland, tall ruderal, scrub, under bridges and within trees.

4.4.3 It is recommended that all de-vegetation works are undertaken outside the main nesting bird season (March to August inclusive), and maintained occasionally to deter any uptake prior to the commencement of works. If this timing is not possible and dense scrub or mature trees need to be removed during the main nesting bird season, checks of the affected areas will need to be undertaken by an ecologist no more than 48 hours prior to removal/management. If any active nests are identified, a buffer of at least 5m in all directions would be required, to protect the nest from disturbance until any chicks have fledged.

Bats

Structures

4.4.4 Bridge 56 – the Mill brook overbridge has been assessed as having **moderate** potential to support roosting bats with significant disturbance likely due to the proposed works. The bridge will require further assessment prior to works via aerial inspection and/or with an endoscope by a suitably qualified ecologist or through further survey effort in the form of bat emergence and return survey, in-line with best practice guidelines (Collins, 2016). Should bats be confirmed to be present at this stage, a Natural England mitigation licence would be required for bridge covering the works likely to cause significant disturbance.

4.4.5 County Road road-over-rail bridge situated at Kirkby station has been assessed as having **low** potential to support roosting bats, with significant disturbance likely due to the proposed works. The bridge will require further assessment prior to the proposed works via aerial inspection and/or with an endoscope by a suitably qualified ecologist or through further survey effort in the form of a single bat emergence or return survey, in-line with best practice guidelines (Collins, 2016). Should bats be confirmed to be present at this stage, a Natural England mitigation licence would be required for bridge covering the works likely to cause significant disturbance.

4.4.6

Trees

4.4.7 A single mature Lombardy poplar tree within the red line boundary was assessed as holding **moderate** bat roosting potential which is likely to require removal to facilitate the works. The poplar, and any further trees identified during pre-construction walkovers prior to the works being carried out which were assessed as holding a **moderate** bat roosting potential that are to be impacted by the works, should be assessed via aerial inspection and/or with an endoscope by a suitably qualified ecologist to confirm the assessment of bat roosting potential and to check for bat occupation. If bat roosting potential is confirmed to be moderate or higher, further survey effort in the form of bat emergence surveys (at least one dusk and one dawn emergence survey) would be required to determine if the roosting features are being utilised by bats, in-line with best practice guidelines (Collins, 2016). Should bats be confirmed to be present at this stage, a Natural England mitigation licence would be required for any trees with confirmed bat roosts, to be removed to facilitate the works.

4.4.8 Numerous trees were recorded as holding **low** bat roosting potential within the rail network. Trees assessed as holding low bat roosting potential can be de-vegetated adhering to an ecological precautionary working method statement in regards roosting bats, which will be included within the PWMS / CEMP for the site works.

4.4.9 A bat survey report will be produced detailing the methods of further survey and results of the two structures (Bridge 56 and County Road bridge) and the single poplar tree. In addition, the report will present the locations of any trees or structures which will require precautionary working methods if there is likely to be any impacts or significant disturbance due to the works directly to or within close proximity, will require precautionary working methods to ensure legislation with regards to bats is upheld during the works.

Badgers, foxes and rabbits

4.4.10 Whilst no evidence of badger was recorded during the survey, burrows within the proposed troughing route belonging to rabbit were notable in areas within close proximity to Kirkby Municipal golf course and to the west of Kirkby Station, however these burrows are unlikely to be impacted by the works. Signs of rabbit (foraging, small scrapes and droppings) were also notable between Kirkby Station and the proposed Headbolt Lane development, however no burrows were recorded. A couple of fox scat were noted along the line within the scheme but no large burrows were recorded.

4.4.11 As a precaution, if any holes suspected to be badger sett entrances are unexpectedly discovered during any future works, work in that area must cease and an ecologist must be contacted for advice on how to proceed, a site visit may be required to assess the hole(s). Badger sett entrances are typically in the shape of a capital 'D' with the flat side down, measuring on average 25-35cm in width and maintaining a wide tunnel within. Fresh spoil is often present outside regularly used entrances.

4.4.12 With regards to rabbit and fox, these species are protected under the Wild Mammals Protection Act (1996) from asphyxiation and crushing. It is recommended that if any mammal holes are identified then these holes should be avoided – this includes trampling, obstruction, machinery and temporary storage of materials. If avoidance is not possible, an ecologist should be contacted so that the species to which the hole belongs to can be identified. This information will then be used to provide further advice (a site visit may be required to assess the hole(s)).

Reptiles

4.4.13 The site is considered suitable for commonly occurring reptile species. It is recommended that during de-vegetation works, should a suspected reptile be observed on site, that works cease and that a 10m exclusion zone be demarcated around the reptile and that the reptile be left to disperse on its own accord. A competent ecologist should also be notified immediately. The ecologist will then attend site, assess the situation and establish any required mitigation measures.

Riparian Mammals

4.4.14 Kirkby Brook and Mill Brook watercourses within the site are been considered to offer limited potential for otter and is of sub-optimal potential for water vole. However, there may be more suitable habitat within the wider surrounding area and further survey is recommended due to historic records of water vole on both Kirkby and Mill Brook. As a precaution, during any pre-construction works such as ground investigations, if an otter or water vole is sighted at any point, works should cease in that area until the animal(s) has dispersed of its own accord. In addition, as a precaution throughout the proposed works, the watercourse should remain open to wildlife passage; i.e. in-channel scaffolding or machinery, if required, should not fully block access for wildlife to pass through. No overnight lighting should be used.

Amphibian Species

4.4.15 Any ponds within 250m of the proposed scheme should be subject to a pond habitat suitability index assessment to inform requirements for further survey for great crested newt (within the main working area).

4.4.16 Ponds identified with potential to support amphibian species, following a pond habitat suitability index assessment, within 250m of the main works (Headbolt Lane, Kirkby Station platform demolition and track extension) should be subject to a presence / absence survey for great crested newt, either through traditional survey or use of environmental DNA (eDNA).

Other

4.4.17 The scrub habitats present on site offer refuge opportunities to small mammals such as hedgehog.

4.4.18 Any dense scrub on site, if removal is required, should be carefully cut back in stages by hand in accordance with previous recommendations, taking care to look for hedgehogs in particular. If any hedgehogs are found, these should be safely relocated to a nearby, suitably dense/well-vegetated area or brash pile that will remain undisturbed by the works.

4.4.19 If there is any doubt over translocating the hedgehog to a different part of the site, or if the hedgehog appears to be harmed or underweight, an ecologist will take the hedgehog into care and will contact a local wildlife hospital for advice.

4.4.20 As part of the site's landscaping, enhancement opportunities for wildlife could be considered, including: the installation of bird boxes on nearby mature trees; the planting of pollen rich species of benefit to insects; the planting of a small number of fruit trees; and the addition of shrubs to provide a variable vegetative structure.

4.4.21 Provision of artificial or natural hedgehog boxes could also be considered for quiet undisturbed areas on site with ground covering vegetation, preferably against a wall or fence. For example, three or four logs may be arranged to leave an appropriately sized hole for a hedgehog to nest in, and covered with masses of twigs and leaves. Retaining wood piles attracts invertebrates and fungi, providing a good local food source for hedgehogs and other species, and possible nesting sites (materials from site works could be used for this purpose).

4.5 Suggested Ecological Enhancement

4.5.1 In line with Defra's 'Biodiversity Metric v2.0 Toolkit' and Network Rail's commitment to the 'Mitigation Hierarchy', which comprises sequential steps to avoid, minimise, rehabilitate/restore and offset any negative impacts on biodiversity, calculations of the project's baseline biodiversity units before the works have been made – see relevant pages in the separate document, titled 'Biodiversity Metric 2.0 Calculation Tool Headbolt Lane May 2021'. Calculations were made using the 'Beta Test - December 2019 Update' version of the Biodiversity Metric 2.0 Calculation Tool.

4.5.2 The study area baseline habitat size is 11.31ha, this area includes habitat parcels accessed within the red line boundary and buffer zones/off-site areas which have potential for enhancement around the proposed site boundaries. The ecological baseline within the study area comprises a total of 69.74habitat units.

4.5.3 The site baseline habitat for the proposed new station construction area at Headbolt Lane comprises a total area of 43,500m², which includes the works to the platform at Kirkby station and track widening works between Kirkby Station and Headbolt lane which equates

to 33,986m. Within these areas, habitat loss is to be significant, which includes notable semi-natural habitats including; woodland, scrub and neutral grassland.

4.5.4 The calculations for habitats to be retained, enhanced, proposed succession and lost will be completed as part of the Environmental Impact Assessment following the finalisation of the landscaping plan and agreement for off-site mitigation which will be required due to the extensive loss of semi-natural habitat within the Headbolt Lane Station development and track widening scheme.

4.5.5 It should be noted that calculations that support this report have been carried out with the December 2019 BETA biodiversity calculator, the most recent release at the time of this report. All further updated calculation should take place with this version to ensure comparability to the calculations above. Future versions of the calculator may yield differing results.

4.5.6 The railway embankments offer value to wildlife, as they act as a habitat corridor for wildlife foraging and commuting within the wider landscape. Therefore, it is suggested that de-vegetation within the proposed working areas is kept to a minimum and that any vegetation removed is reinstated, and enhanced, where possible.

4.5.7 Dependent upon an on-site habitat management plan that would ensure the quality and diversity of habitats generated post-works, off-site mitigation is anticipated to be required for the site to achieve a net-gain in biodiversity.

4.5.8 It is recommended that any wood or brash arising from the proposed de-vegetation should be used to create habitat piles in nearby suitable undisturbed locations along the railway embankments/rail corridor or within the compound area where appropriate. This may provide suitable habitat for sheltering and hibernating hedgehogs and provide refuge to other small mammals. The habitat piles should be created by lining up logs or brash horizontally (each layer in alternating directions) in layered, compact piles. Soil and any stones can also be added. Large diameter pieces of wood are the most valuable. The location of the habitat piles should be where feasible to install, but ideally within areas which are unlikely to be disturbed and remain ecologically well-connected to other habitats.

4.5.9 To best achieve a net gain in biodiversity, the following interventions should be implemented on site:

- Any vegetation cleared will be allowed to naturally re-colonise; opening up small areas of vegetation will increase opportunities for successional plants to take hold; and
- Any areas of scrub and tall ruderal vegetation cleared as part of the works should be allowed to naturally re-colonise. Removal of small areas will diversify the structure of the scrub with open areas, providing disturbance features and an opportunity for other successional plants to grow.
- A landscape plan should be developed to include habitat creation post-development of the works area, subject to temporary construction impacts.

5 REFERENCES

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- Stace, C. (2010). New Flora of the British Isles (3rd Ed). Cambridge University Press.
- The National Biodiversity Network Atlas (https://nbnatlas.org/)
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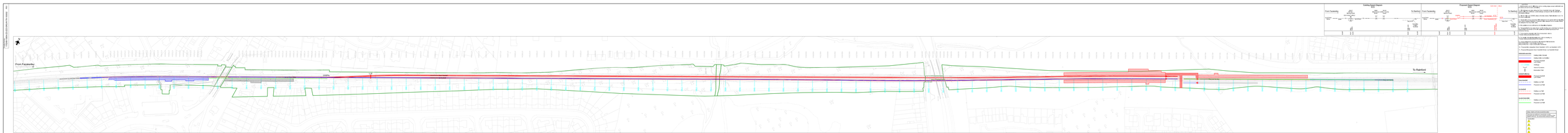
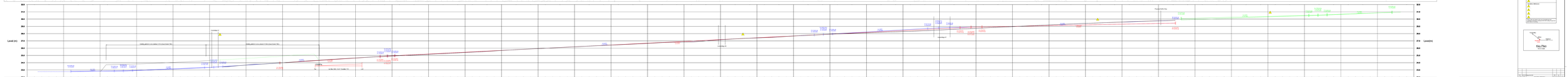
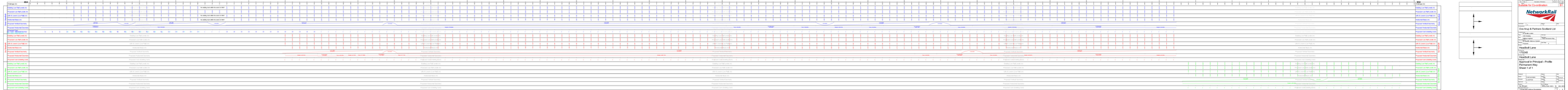
APPENDIX 1: FIGURES

Figure 1: Location of proposed Headbolt Lane station and engineering works, showing extent of the proposed works areas

Plotted: 13/08/2025 10:37:23 AM By: Hawkins, Jack







1. Proposals
1.1. Re-lay up line (UL) and down line (DL) between two outer rails from ch 1m 0mm to ch 1m 1,000m.
1.2. Re-align UL and DL to the East by 1metre from ch 1m 0mm to ch 1m 1,000m.
1.3. Re-lay UL and DL with new outer rails, flat bottom from ch 1m 0mm to ch 1m 1,000m.
1.4. The Down Slow Line (DSL) Diagram 0012 will be renumbered 0013 and the Down Goods Loop (DGL) Diagram 0013 will be renumbered 0012.
1.5. No variations to the Sectional Appendix.
1.6. Throughout the route, ballast, sub-ballast and formation will be renewed to the depths shown on the Typical Cross Section Drawing.
1.7. Proposals Required to be Clear of Gauge - see Separate Report.

Historically Identified
Cutting Wall, Unidentified Ownership
Cutting Wall, Network Rail Ownership
Cutting Wall, Third Party Ownership
Bridge
Bridge Abutment
Retaining Wall
Bridge Wall
Culvert
Culvert Extended

Cutting Wall, Unidentified Ownership
Proposed Cutting Wall, Unidentified Ownership
Cutting Wall, Network Rail Ownership
Proposed Cutting Wall, Network Rail Ownership
Cutting Wall, Third Party Ownership
Proposed Cutting Wall, Third Party Ownership
Bridge
Proposed Bridge
Bridge Abutment
Proposed Bridge Abutment
Retaining Wall
Proposed Retaining Wall
Bridge Wall
Proposed Bridge Wall
Culvert
Proposed Culvert
Culvert Extended
Proposed Culvert Extended

Key Plan
Not to Scale

Suitable for Co-ordination

Rev	Description	Date	Drawn	Chkd
P01	First Issue	13/08/25	JH	SH

NetworkRail

Scale: 1:1000 @ A1 | 1:2000 @ A3

Civil Engineering

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EH1 2BB
United Kingdom
www.arup.com

Route: Freight

Headcliff Lane

Project:
1T52/a5

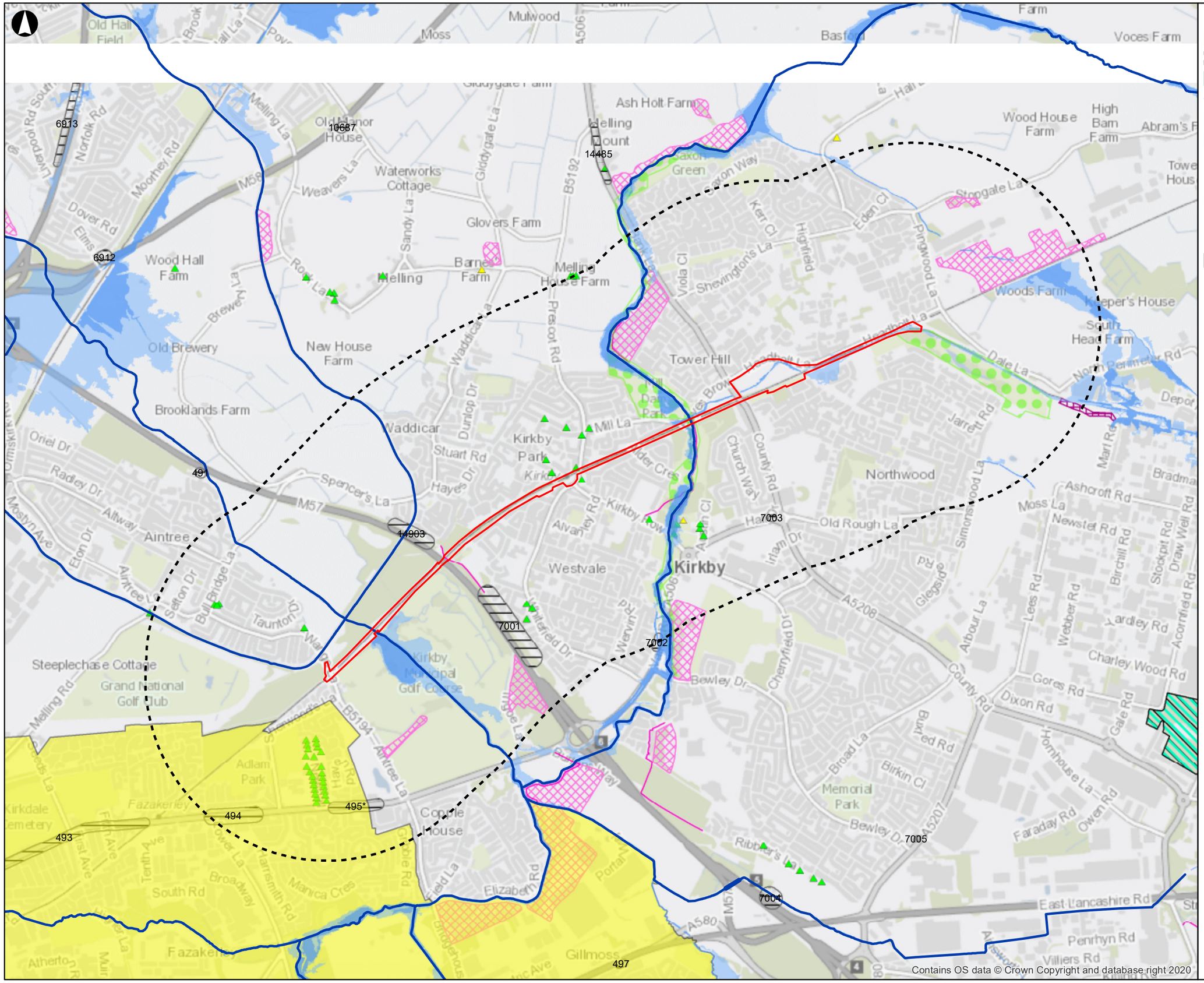
Title:
Headcliff Lane

Drawing Title:
Approval in Principal - Profile
Permanent Way
Sheet 1 of 1

Signed:		Date:	Dwg No:
Checked:	S.Hawkins	13/08/25	Rev: P01
Signed:	S.Hawkins	13/08/25	Size: A1
Approved:		Date:	Scale: 1:1000 @ A1
Key Person:			1:2000 @ A3

1T52/a5-ARP-XX-ZZZ-DR-PW-100002

A3



Legend

- Indicative Red Line Boundary
- 1km Study Area
- Ancient Woodland
- WFD Watercourse
- Flood Zone 2
- Flood Zone 3
- Air Quality Management Area
- Noise Action Planning Important Area
- Local Nature Reserve
- Local Wildlife Site
- Public Right of Way
- National Nature Reserve
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- Scheduled Monument
- Historic Landfill
- Authorised Landfill Site

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Issue	Date	By	Chkd	Appd
P1	11-03-21	SM	EB	EC

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Client

Buckingham Group Contracting Ltd

Job Title

170248 Headbolt Lane New Station GRIP 4

Environmental Constraints Plan

Scale at A3

1:20,000

Job No	Drawing Status
276736-00	**Issue**

Drawing No	Issue
170248-ARU-DRG-EEN-000001	**P1**

MXD Location

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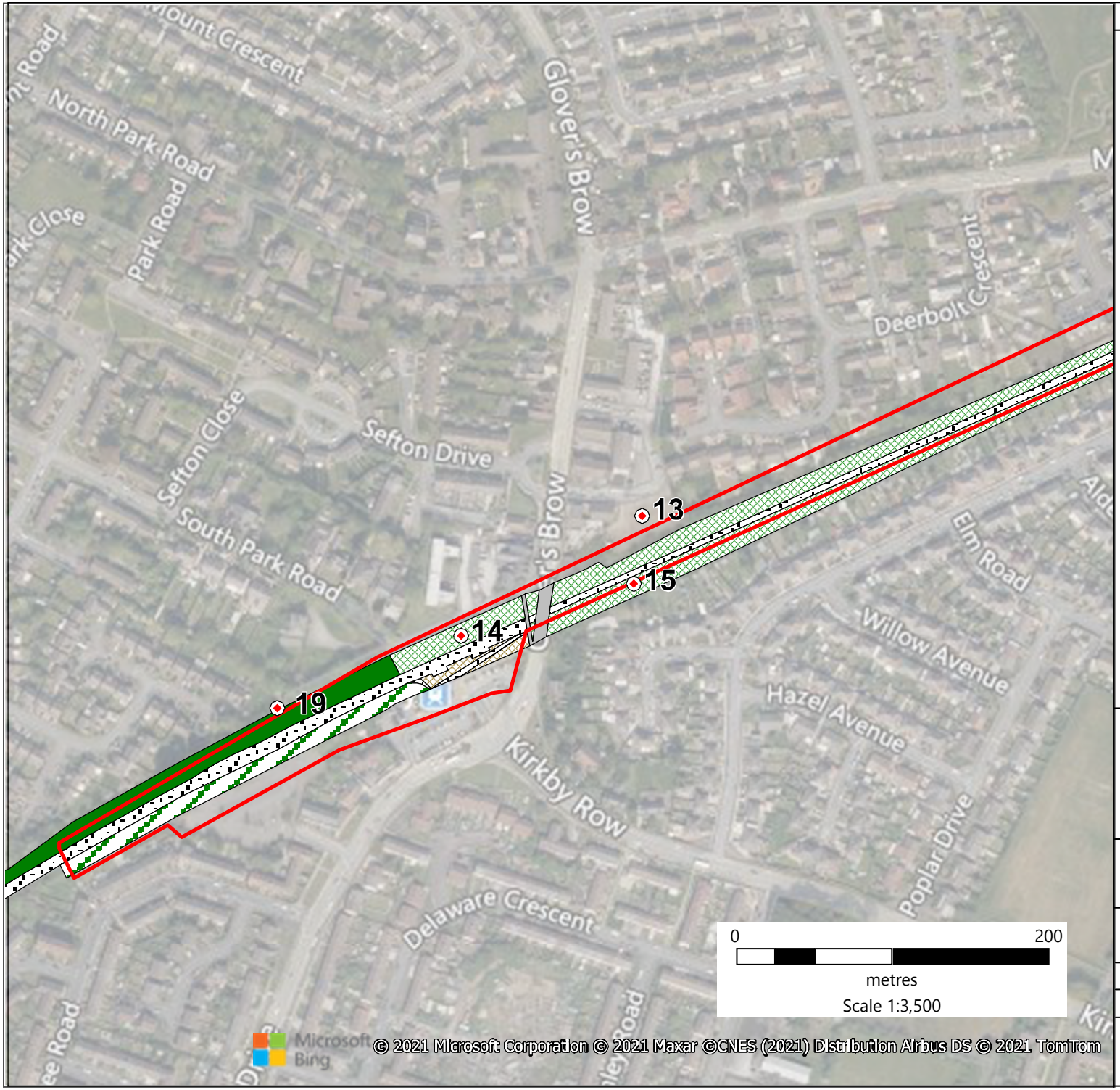
Figure 2: Extended Phase 1 Habitat Survey map



Key

- Semi-natural broadleaved woodland
- Broadleaved plantation woodland
- Dense scrub
- Scattered broadleaved trees
- SI — Semi-impoved neutral grassland
- SI — Poor-quality semi-improved grassland
- Tall ruderal
- Watercourse
- Open water
- A — Amenity grassland
- Building
- Bare ground
- Proposed Red Line Boundary
- Target note

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Headbolt Lane

Figure 1.1: Extended Phase 1 Habitat Plan

Rev	Date	Drawn	Checked	Approved
01	02/08/2021	LK + LF	SC	NLG

N

Scale at A4
1:3500

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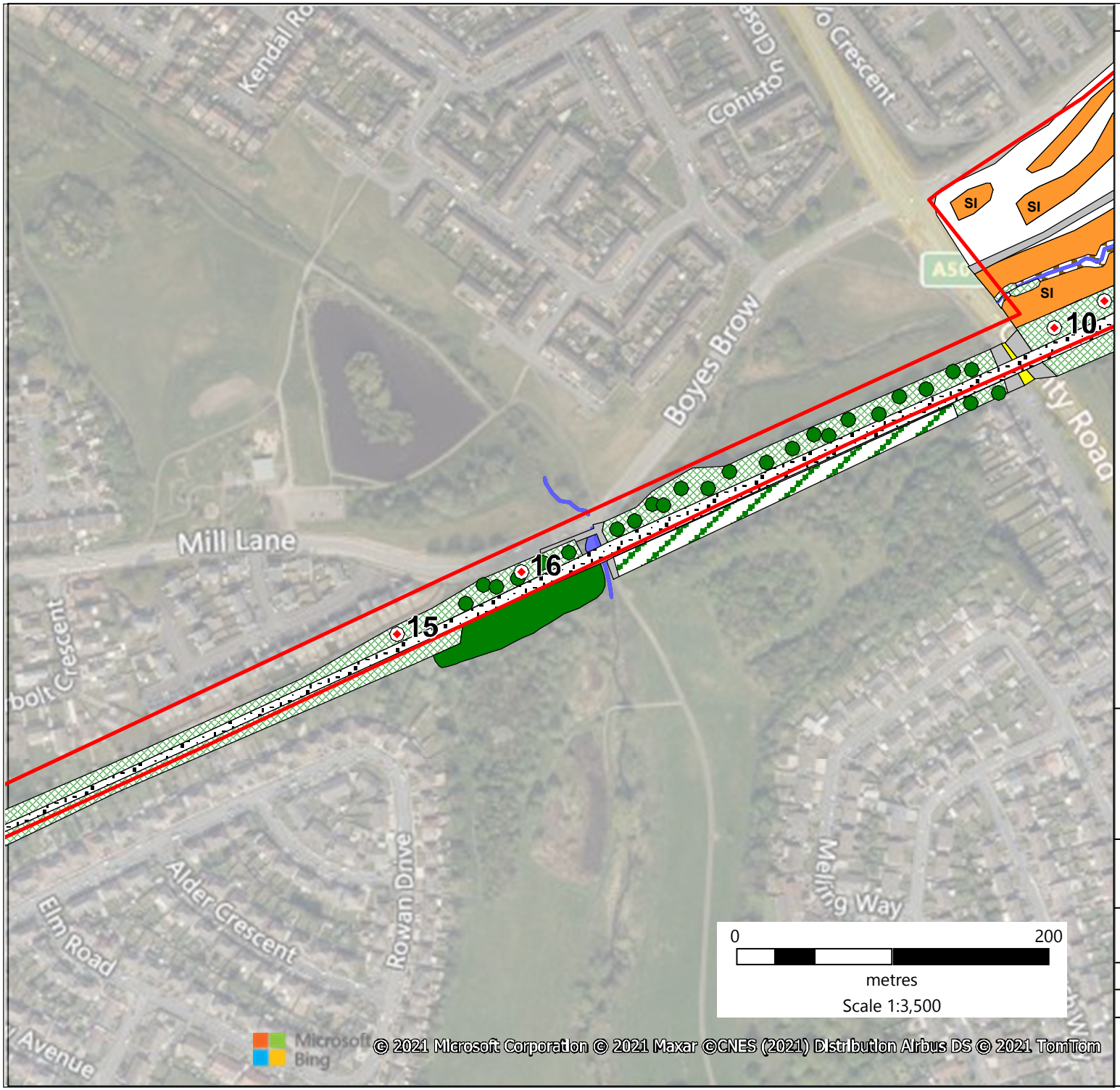

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- Building
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- Proposed Red Line Boundary
- Target note

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Figure 1.2: Extended Phase 1 Habitat Plan

Rev	Date	Drawn	Checked	Approved
01	02/08/2021	LK + LF	SC	NLG

N

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1:3500

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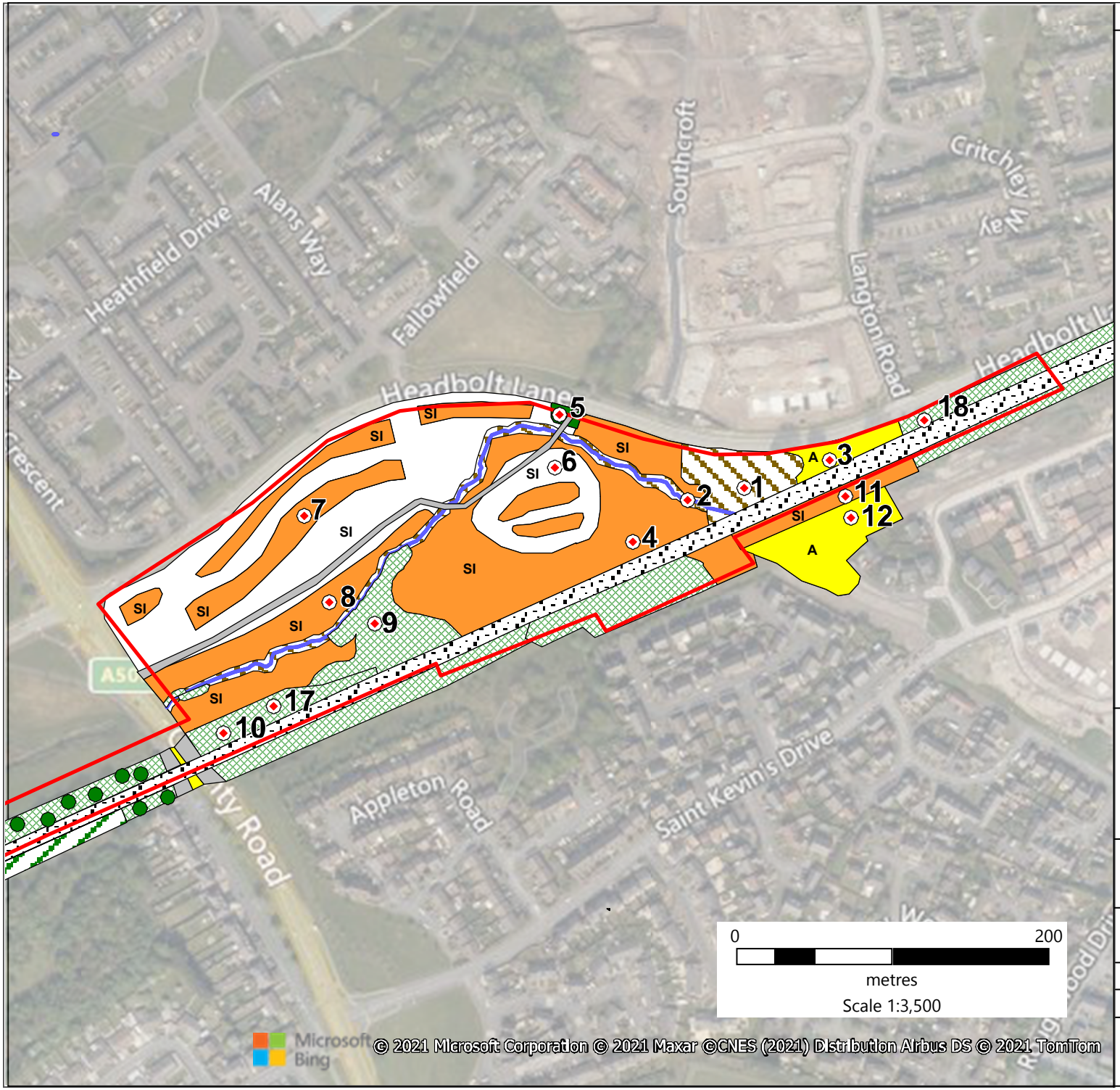

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- Tall ruderal
- Watercourse
- Open water
- A — Amenity grassland
- Building
- Bare ground
- Proposed Red Line Boundary
- Target note

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Headbolt Lane

Figure 1.3: Extended Phase 1 Habitat Plan

Rev	Date	Drawn	Checked	Approved
01	02/08/2021	LK + LF	SC	NLG

N

Scale at A4
1:3500

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APPENDIX 2: TARGET NOTES

Target note (TN)	Description
1	Mown amenity grassland with Lombardy poplars (*Populus nigra 'Italica'*), one with a broken knot hole with low bat roosting potential.
2	Very slow flowing stream emerging from two culverts under the rail track, with a depth of 50cm and a width of 1.5m. Some glossy film was observed on the water's surface, and large pieces of litter were observed on the bed. Bankside vegetation included rosebay willowherb (*Chamaenerion angustifolium*), Himalayan balsam (*Impatiens glandulifera*), thistle (*Cirsium arvense*), nettle (*Urtica dioica*), horsetail (*Equisetum* sp.), cleavers (*Galium aparine*), bindweed (*Convolvulus arvensis*), Yorkshire fog (*Holcus lanatus*), bramble (*Rubus fruticosus*), cow parsley (Anthriscus sylvestris) and common reed (*Phragmites australis*), with immature oak (*Quercus robur*).
3	Tall ruderal grassland with ragwort (*Jacobaea vulgaris*), red campion (*Silene dioica*), immature silver birch (*Betula pendula*), immature oak, nettle, Himalayan balsam, rosebay willowherb, cow parsley, hogweed (*Heracleum spondylium*) and rapeseed (*Brassica napus*).
4	Semi-improved neutral grassland, with lesser stitchwort (*Stellaria graminea*), great willowherb (*Epilobium hirsutum*), ragwort, sorrel (*Rumex acetosa*), thistle, nettle, yarrow (*Achillea millefolium*), sweet vernal grass (*Anthoxanthum odoratum*), cocksfoot (*Dactylis glomerata*), ribwort plantain (*Plantago lanceolata*), dandelion (*Taraxacum* sp.), hogweed (*Heracleum spondylium*), creeping buttercup (Ranunculus repens), cleavers, dock (*Rumex* sp.), rosebay willowherb, white dead-nettle (*Lamium album*), hawkbit (*Leontodon* sp.), bindweed, borage (*Borago officinalis*) and garlic mustard (*Alliaria petiolata*), with two ash (*Fraxinus excelsior*) trees.
5	Small cluster of immature trees within semi-improved neutral grassland, including sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*) and elm (*Ulmus procera*), with an understorey of Yorkshire fog, meadow cranesbill (*Geranium pratense*), nettle, ragwort, ribwort plantain, mallow (*Malva sylvestris*), herb Robert (*Geranium robertianum*) and hawkbit.
6	Mown amenity grassland with white clover (*Trifolium repens*), ragwort, ribwort plantain, dandelion, Yorkshire fog, creeping buttercup, black medick (*Medicago lupulina*) and shining cranesbill (*Geranium lucidum*).
7	Unmown areas of semi-improved neutral grassland, with hawkbit, sweet vernal grass, sorrel, white clover, Yorkshire fog, thistle, dock, ribwort plantain, creeping buttercup, ragwort, weld (*Reseda luteola*), yarrow, bird's foot trefoil (*Lotus corniculatus*) and selfheal (*Prunella vulgaris*).
8	A generally slow-flowing stream, at a width of 1m or more, and a depth of 30cm. Some shallower sections have a faster current. The bed is silty, and banks varying between a height of 20cm to 1m, and heavily vegetated. Some undercutting of river banks from current present at points, but no mammal or crayfish holes visible. Bankside vegetation includes Himalayan balsam, rosebay willowherb, ragwort, thistle, nettle, common reed, yarrow, sorrel, cocksfoot (*Dactylis glomerata*) and creeping buttercup, with areas of bare ground.
9	Dense scrub dominated by bramble, with Himalayan balsam, nettle and sweet vernal grasses at edges. A fly-tipped shed underneath an English elm may provide cover for reptiles or amphibians.
10	Very dense scrub along the railway boundary. Species include hawthorn (*Crataegus monogyna*), cherry (*Prunus* sp.), elder (*Sambucus nigra*), ash, field rose (*Rosa arvensis*) and oak, with an understory of bird's foot trefoil, bindweed, bramble, nettle, creeping buttercup, cocksfoot, rosebay willowherb, raspberry (*Rubus idaeus*), hogweed, ragwort, and dock.
11	Semi-improved neutral grassland sloping down to embankment. Species include garlic mustard, thistle, feverfew (*Tanacetum parthenium*), rosebay willowherb, dock, sweet vernal grass, chickweed (*Stellaria media*), horsetail, poppy (*Papaver somniferum*), great willowherb, bramble, ribwort plantain, hawkbit, common vetch (*Vicia sativa*), bindweed, red fescue (*Festuca rubra*), pineappleweed (*Matricaria discoidea*) and creeping buttercup.
12	Mown amenity grassland, with infrequent thistle, ribwort plantain, Yorkshire fog, garlic mustard, feverfew, horsetail, white clover, greater plantain (*Plantago major*) and areas of bare ground.
13	An area of bare ground, with buddleja (*Buddleja davidii*), bramble, dock, rosebay willowherb, hop (*Humulus lupulus*) and Japanese knotweed (*Fallopia japonica*) present at security fence alongside track. Trees include field rose, sycamore, silver birch, hawthorn and cherry.
14	Railway embankment scrub vegetation opposite the Merseyrail Kirkby station platform, includes bramble, hawthorn, cleavers, rosebay willowherb, buddleja, elder, ragwort, bracken, nettle, raspberry, dogwood (*Cornus sanguinea*) and ash. The platform is a mixture of planted and seeded species, including hart's tongue fern (*Asplenium scolopendrium*), ribwort plantain, nettle, ivy, sycamore, hawthorn, dogwood,

	laurel, field rose, horsetail, St John's wort (*Hypericum perforatum*), dandelion and cotoneaster.
15	Railway embankment scrub vegetation east of Kirkby station, with species including oak, goat willow (Salix caprea), sycamore, silver birch, elder, common lime (*Tilia x europaea*), Lombardy poplar, field maple (*Acer campestre*), cherry, privet (*Ligustrum vulgare*), field rose, hawthorn, gooseberry (*Ribes uva-crispa*), cotoneaster (*Cotoneaster horizontalis*) and Leyland cypress (*Cupressus × leylandii*). Behind the northern platform, trees include laburnum (*Laburnum anagyroides*), sycamore, elder and laurel (*Laurus nobilis*). Ground flora includes horsetail, bramble, ragwort, cocksfoot, red fescue, rosebay willowherb, bindweed, nettle, cleavers, old man's beard (*Clematis vitalba*), bracken (*Pteridium aquilinum*), thistle, hawkbit, ivy (*Hedera helix*), yellow flag iris (*Iris pseudacorus*), goldenrod (*Solidago virgaurea*), raspberry, yarrow, variegated yellow archangel (*lamiastrum galeobdolon* subsp.*argentatum*), foxglove (*Digitalis purpurea*), common vetch, buddleija, groundsel (*Senecio vulgaris*) and herb Robert.
16	Along the railway embankment from Millbrook Bridge, species include ash, sycamore, hawthorn, oak, osier (*Salix viminalis*), ivy, cherry species, elder, field rose, Himalayan balsam, ragwort, rosebay willowherb, bracken, bramble, horsetail, nettle, greater willowherb and common toadflax (*Linaria vulgaris*), the last found above County Road Bridge WKL2 55.
17	Railway embankment species adjacent to Headbolt Lane include goat willow, bracken, tormentil (*Potentilla erecta*), yarrow, hawkbit, bindweed, sage (*Salvia officinalis*), common vetch, cherry species, apple species (*Malus* sp.), and wood forget-me-not (*Myosotis sylvatica*). A large mammal run was observed partway down the track on the southern embankment.
18	Himalayan balsam present extensively within rail embankments, to the east of Headbolt Lane development, rail embankment is dominated by extensive bramble scrub with herb species present such as willowherb and rough grasses such as false oat grass
19	Mature oak within woodland to east of Kirkby station with small knot hole feature; **low** bat roosting potential. Oak tree is within broad-leaved deciduous woodland which is a mixture of semi-mature oak and sycamore on the northern cutting, the cutting is a mixture of woodland and bramble scrub.

APPENDIX 3: PHOTOGRAPHIC PLATES

Photograph 1. Mature Lombardy poplar trees (TN1); tree with knot hole seen to left hand side.	Photograph 2. Knot hole in Lombardy poplar with moderate bat roosting potential (TN1).
	

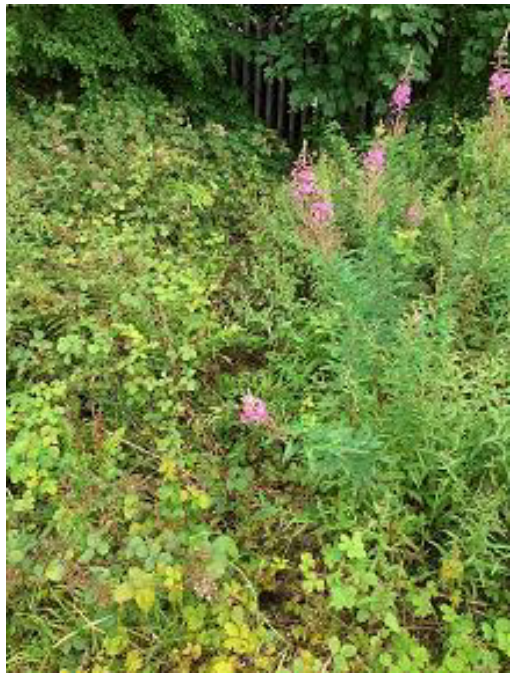
Photograph 3. Slow-flowing culverted stream (TN2) – Kirkby Brook which runs through the proposed Headbolt Lane station site.	Photograph 4. Tall ruderal (TN3) with potential for herptiles.
	

Photograph 5. Semi-improved neutral grassland (TN4) looking west.	Photograph 6. Mosaic of semi-neutral grassland (left side, TN4), small cluster of immature trees (background left side, TN5), mown amenity grassland (foreground, TN6) and unmown grassland (right side, TN7).
	

Photograph 7. Undercutting of stream banks (TN8).	Photograph 8. Thick bramble scrub outside of railway embankment (TN10).
	

Photograph 9. Scrub and semi-improved neutral grassland sloping down to culvert under railway embankment (TN11). Mown grassland (TN12) present to far right.	Photograph 10. Japanese knotweed present on bare ground for proposed substation (TN13).
	

Photograph 11. Northern platform of Kirkby (TN15), with bankside vegetation opposite including Japanese knotweed at base of bare ground for substation (TN13).	Photograph 12. Embankment vegetation (TN15), large numbers of garden escape shrubs are present between Kirkby Station and the Mill Brook crossing (bridge 56).
	

Photograph 13. Mammal path (TN17) at SJ 41275 99709.	Photograph 14. Shallow mammal holes (TN17) at SJ 41369 99759.
	

Photograph 15. Glovers Brow Bridge (eastern elevation) with crack to left and pockmark to right highlighted (red circles).	Photograph 16. Metal plate underneath Glovers Brow Bridge with low bat potential.
	

Photograph 17. Old bird nest present underneath Glovers Brow footbridge.	Photograph 18. County Road Bridge with no bat potential.
	

Photograph 19. Millbrook Bridge with gap present above arch ring. Wing walls have ivy present which may obscure further crevices within the stone work. Considered **moderate** bat roosting potential.	Photograph 20. Gap in arch of Millbrook Bridge near northern elevation, above footpath.
	

Photograph 21. Cracks and pockmarks in Millbrook Bridge over stream.	
	

On network additional records between Kirkby Station and Headbolt Lane – March 2021 update survey	
Photograph 22. Japanese knotweed stand within close proximity to Northern Rail platform east of Kirkby station	Photograph 23. Stands of Japanese knotweed approximately 3m off network between Kirkby Station and the Mill Brook bridge at OSGR SJ 40741 99466
	

APPENDIX 4: HIMALAYAN BALSAM IDENTIFICATION GUIDE

This plant is listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). It is an offence to plant or otherwise cause spread in the wild.

	Seedling in moss Seedlings begin to appear in March (depending on weather and climate) The first 'leaves' are nearly-round, pale green and un-toothed with a nick at the end

	Real, toothed leaves begin to come through and may have reddish mid-ribs

	Immature plant Leaves are slender with finely serrated edges. They are opposite or in whorls along the stem and may have a reddish mid-rib

	Flowers begin to show in June/July and range in colour from pink to white. Stems are round, hollow and range in colour from red (early in year) to pink (summer). Stems can be up to 10cm thick, although usually 3cm. Adult plants can grow up to 2m tall.

	Flowers are trumpet shaped with wide petals and sweetly scented. Flowers are present from June to October.

	Seed pods can form from July to October. Seed pods are droplet shaped and 'explode' when touched. Seeds themselves range from white (unripe) to brown (ripe)
	Winter 'hay' like remains It may be difficult to identify in winter although you can look for 'hay' like remains from last year's growth Old stems are hollow and light. Often areas of high infestation are left bare following annual die-off.

Images used in this identification sheet were adapted from http://dinns.sketchfiles.co.uk/en/invasive-species/on-the-dee/himalayan-balsam.aspx http://wildflowerfinder.org.uk/Flowers/B/Balsam(Himalayan)/Balsam(Himalayan).htm and nonnativespecies.org/

APPENDIX 5: NATURAL ENGLAND TECHNICAL INFORMATION NOTE 003

Rabbits: management options for preventing damage

The European rabbit *Oryctolagus cuniculus* has once again established itself as the major vertebrate pest of British agriculture, causing economic losses estimated to be in excess of £100 million annually. The total winter population is estimated to be at 35% to 40% of the pre-myxomatosis level (circa 1952) and is increasing by about 2% annually. This is due primarily to the reduced effect of myxomatosis, resulting from increased levels of genetic resistance. Given the problems associated with rabbits, this increase in numbers is likely to be accompanied by a corresponding rise in the amount of serious crop damage reported. It is essential, therefore, that effective control strategies are available to ensure that crops vulnerable to rabbit damage are adequately protected. This will serve to benefit landowners and occupiers who have a statutory responsibility to manage rabbit infestations on their land and to prevent them causing damage to neighbouring properties.

Damage

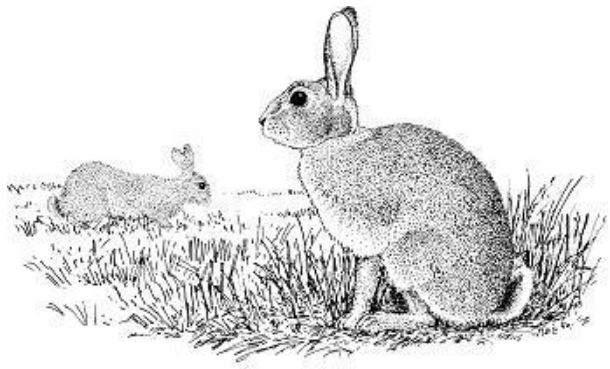
Cereals

It is estimated that farmers are losing about £50 million per annum as a consequence of rabbit damage to cereals. Winter wheat, barley and oats appear to be most vulnerable. Rye and triticale suffer smaller losses and spring barley appears to be the least susceptible to rabbit damage. In terms of annual yield, a loss of 1% per rabbit per hectare (2.5 acres) has been recorded for winter wheat and 0.33% per rabbit per hectare for spring barley.

The effects of grazing on winter cereals are most obvious during the winter, when plant growth is slow, and become less apparent when crops grow more rapidly in the spring.

In fact, by harvest, plants grazed by as many as 20 rabbits per hectare can be the same height as plants that have never been grazed. Yields, however, can be reduced by about 20%.

This clearly illustrates not only the scale of the problem but also the difficulties in accurately assessing the impact of grazing.



Rabbits

Grassland

The effect of rabbit grazing on pasture is less obvious than on cereals. Grazing of newly sown grassland may result in poor establishment or complete failure of the sward. Over-winter grazing of established grassland reduces early grass that is needed in the spring. Yields of crops cut later for silage or hay may also be substantially reduced.

Continuous grazing soon reduces the vigour of species such as Italian ryegrass or meadow fescue.

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Permanent grass on good soils is better able to withstand close defoliation, but grazing by large numbers of rabbits can weaken or kill even persistent leafy ryegrass. Scratching and burrowing can degrade pasture still further by encouraging the establishment of weeds such as nettles, thistles and ragwort. In terms of annual yield, recent studies have indicated the loss to be almost 1% per rabbit per hectare.

Other crops

Rabbit damage has been recorded to a wide range of crops in Britain. Besides cereals and grassland, some of the most important include roots, brassicas and market garden crops, which can all suffer severe damage, both to the growing plants and the marketable end product.

Trees

Rabbits can damage or kill planted nursery stock and young trees of many species. Damage to the bark of large trees can also be serious and semi-mature hedgerows may also be vulnerable. In extreme circumstances, rabbits may prevent natural regeneration in woodlands. Damage ranges from the eating of young seedlings to the destruction of leading shoots, the browsing of branches and removal of bark. The burrowing activities of rabbits can also undermine root systems.

Damage to archaeological sites, monuments and landscapes

Animal burrowing on archaeological sites results in the disturbance and sometimes destruction of artefacts, ecofacts and buried land surfaces. It also leads to the destabilisation of monuments, which in turn can lead to an altering of a monuments profile. Damage by burrowing should be prevented or avoided because our archaeological resource is finite and contains irreplaceable information that is important to the study of the human past.

Management

Rabbit populations can withstand high mortality from natural causes, therefore control efforts must add to, and not merely replace, these causes if direct control is to be effective.

Because of the size of the effort required, and the rabbit's inherent capacity for population increase, complete eradication is impractical.

Instead the aim should be to reduce rabbit numbers to levels at which the damage they cause is economically acceptable. Where access can be gained to burrows, gassing - accompanied by careful habitat management to reduce rabbit harbourage, if necessary - is the most effective method of control. In some situations, other techniques may be appropriate.

The most effective time for control is from November to March, although earlier action may be needed on autumn cereals showing signs of heavy grazing. There are four main reasons for this recommendation:

- Mortality from natural causes will have reduced rabbit numbers to their lowest level by the winter. Up to 90% of young rabbits born during the summer will have died by this time without human intervention.
- Action at this time will reduce the adult breeding population before the next breeding season begins. Each doe killed during this period can mean at least 20 fewer young rabbits born next summer.
- Reduction of numbers during this period will reduce damage to vulnerable autumn sown crops.
- Vegetation is dying back, making access to burrows easier.

More effective results will be achieved if adjoining land is treated at the same time in a co-operative exercise. Rabbits do not respect boundaries, and joint action will remove animals that use burrows on one holding and feed on another. Control over a substantial block of land will also reduce the rate of re-infestation.

The quality and amount of harbourage are major factors that can determine the number of rabbits in a particular area. Habitat management should therefore play an integral part of any successful rabbit control programme. Scrub and ground cover may need to be thinned sufficiently to give access to all burrows; this is essential where gassing is planned. Also, where practicable,

burrow systems should be destroyed following control operations.

Appropriate measures should be taken to minimise damage to other wildlife and habitats. For example, scrub clearance should be avoided during the bird-nesting season.

Legal considerations

Under the Wild Mammals (Protection) Act 1996 it is an offence to intentionally inflict unnecessary suffering, as specified by the Act, on any wild mammal. This legislation may need to be considered where the destruction of occupied warrens and burrow systems is being contemplated.

Under the Animal Welfare Act 2006 a rabbit becomes a Protected Animal once it is caught in a trap or snare, making it an offence to cause unnecessary suffering. Traps and snares should therefore be inspected at least once and preferably twice a day and, wherever possible, be placed where the trapped animal will not be exposed to extremes of weather.

Under Section 12 of the Pests Act 1954, it is an offence to knowingly spread myxomatosis to uninfected rabbits. The Specified Animal Pathogens Order 1998 (S.I. 1998/463) prohibits the introduction into an animal of the live virus causing viral haemorrhagic disease (VHD) of rabbits, except where such introduction is undertaken under the authority of a licence. These prohibitions mean that the deliberate spreading of myxomatosis or VHD cannot be used as a legal method of controlling rabbits.

An Order has been made under Section 1 of the Pests Act 1954 by which England and Wales (except for the City of London, the Isles of Scilly and Skokholm Island) have been designated a Rabbit Clearance Area. In this area, every occupier of land is responsible for the killing or taking of wild rabbits on his land. Where it is not reasonably practical to destroy the rabbits, occupiers must take the necessary steps to prevent them causing damage.

Under section 98 of the Agricultural Act 1947, Defra has the power to serve a Notice under the Agriculture Act 1947, requiring rabbit control to be carried out; if this is not done, they may arrange for the necessary work to be undertaken at the expense of the occupier, who could also be liable to a fine.

To help manage infestations, the Ground Game Act 1880 gives every occupier of land a limited right to kill and take rabbits and hares concurrently with the right of any other person entitled to do so on the same land. An occupier may use any legal method to kill rabbits and should ensure that they comply with other legislative controls on the methods of killing and taking animals, the most relevant of which are discussed further below.

The occupier may, in writing, authorise other persons to assist him, however only he and one other person authorised by him are entitled to kill using a firearm. The Ground Game Act 1880 exempts an occupier, and persons authorised by him, from the need to hold a game licence when killing or taking rabbits on the occupier□s land.

Monuments that are being damaged by burrowing animals may be Scheduled. Any proposals to control rabbits on Scheduled Monuments should be discussed with English Heritage before work starts, to determine whether Scheduled Monument Consent is required.

Control methods: gassing

Gassing is the most effective method of reducing rabbit numbers where burrows are accessible. When correctly used, under the right conditions, gassing can reduce the rabbit population by up to 80%. However, effectiveness decreases in porous soils, when soil moisture is low and also when air temperatures fall below 5 ^{o}C. For best results, it is essential to drive rabbits to ground before gassing and to find and treat every entrance to the warren system.

On monuments and archaeological sites the soil used for closing up burrow holes should be brought in from off-site as any further digging on site will further damage the monument and add to its disfigurement. On Scheduled Monuments this should have already been agreed with

English Heritage as part of the Scheduled Monument Consent.

Selective scrub clearance may be necessary to gain access to burrows. Before embarking on a gassing programme, particular attention should be paid to the possible presence of badger setts, as it is illegal to gas badgers. Care should also be taken to avoid gassing fox earths, as no fumigant is approved for use against foxes. Burrows in or around badger setts and fox earths must not therefore be treated. The impact on other wildlife living in burrows, for example adders, may also need to be considered.

Since the withdrawal of Cymag as a vertebrate control agent, the only commercially available fumigants are formulations that generate phosphine gas on contact with moisture. These are available either in tablet or pellet form.

All fumigants must be approved under the Control of Pesticides Regulations 1986 and must be used according to label instructions.

Gassing should only be undertaken by persons trained in the use of aluminium phosphide, and familiar with the precautionary measures to be observed. Fumigants can be lethal to humans and it is essential that users follow the instructions on safety aspects.

Users should be aware of the need to comply with the Control of Substances Hazardous to Health Regulations 2002 (S.I. 2002/2677), in respect both of its general provisions and those which relate specifically to fumigations. Further guidance is provided in the Health and Safety Executive Agriculture Information Sheet No. 22 Gassing of rabbits and vertebrate pests (see Further information).

Use of phosphine

The only available phosphine generating formulations are Phostoxin and Talunex. Both are extremely toxic to rabbits with inhalation resulting in rapid death.

Phostoxin is formulated as a spherical 3 gram tablet and can be introduced into the burrow system either by hand (protected by suitable gloves) or via an applicator. One tablet should be inserted into each hole. This should then be sealed with a piece of turf, grass side downwards. Care must be taken not to drop soil onto the tablet.

Talunex consists of 0.6 gram pellets that are injected into the burrow system using a Topex applicator, specifically designed for use with this product. The system has the advantage of minimising operator exposure to the formulation. Treatment of infested areas should be the same as with Phostoxin, with the exception that 4 or 5 pellets should be introduced into each hole.

Follow-up action

The effectiveness of all gassing treatments should be monitored by inspecting treated areas for signs of fresh activity 48 hours after the initial treatment. In many situations, a follow-up treatment of re-opened holes will be necessary. Ideally, the procedure should be repeated until no re-opened burrows are found.

Control methods: fencing

Fencing is a particularly useful management tool where the nature of the rabbit harbourage makes other techniques impractical, or when complete exclusion is the aim. In many situations, fencing can be more cost-effective than control methods that have to be undertaken year after year. Traditionally, permanent wire-netting fences have been used to deny rabbits access to vulnerable areas but more recently, temporary electric fences, either netting or multi-strand wire systems, have become popular methods of crop protection.

When correctly erected and maintained, wire-netting and electric fences can reduce rabbit numbers on protected fields by 85% to 90%, and both have a useful life of about ten years. Electric fencing is cheaper to purchase and erect than wire-netting, but its maintenance costs are higher.

Wire-netting

Netting fences should be constructed of 18 gauge, 31 mm (1 1/4 in) hexagonal mesh. They should be a minimum of 750 mm (2 ft 6 in) high with a further 150 mm (6 in) lapped on the surface of the ground towards the rabbit

harbourage. Turfs of grass should be placed on the lapped netting at 1 m (about 1 yard) intervals to hold it firmly in place (vegetation should later grow through the mesh to complete this job). The netting should be attached to two 2.65 mm (1/8 in) high tensile spring steel straining wires (one at the bottom of the fence and one at the top) with galvanised fence rings. The straining wires should be supported by wooden stakes 1.8 m (5 ft 11 in) x 80 mm (3 in). The stakes can be placed up to 15 m (48 ft 9 in) apart although ground undulations may dictate closer spacing. End posts 2 m (6 ft 6 in) x 100 mm (4 in) braced by struts 2 m (6 ft 6 in) x 80 mm (3 in) should be placed at the ends of the fence and at bends.

Local site conditions or other considerations may demand a variation to these specifications. For example, particular attention should be paid to the presence of potential weak spots such as uneven ground, dry stone-walls and watercourses. In areas such as young farm woodlands, where it is especially important to prevent invasion by rabbits, the fence specification can be improved by projecting the top 150 mm (6 in) of the fence outwards at 45° towards the harbourage. It is recommended that any proposed changes to the specification are first discussed with one of Natural England's Wildlife Management Advisers (see *Further information*).

Ideally, wire-netting fences should be erected to surround fully the area to be protected. If this is not practical, a strip fence, which extends at least 150 m beyond either end of the problem area, may be used.

The number of gates in a fence should be kept to a minimum because they make maintenance more difficult. They should be hung on supports independent of fence straining posts, as the latter will inevitably move and so affect the hang of the gates. A wooden sill must be dug into the ground to prevent burrowing underneath, and gates should shut against a post. Badger gates should be installed in the netting if the fence crosses any badger tracks or paths.

An advisory leaflet, describing the design and installation of badger gates in rabbit-proof fencing (TIN026) is available (see under *Further information*).

Regular monthly inspections and maintenance of fences are essential to block burrows dug under the fences and to repair damage caused by farm machinery, fallen tree branches and vegetation. This safeguards the long-term effectiveness of the fence.

Electric fences

There are two types of electric fence in common use: netting and strained-wire. Both have been shown to be as effective as wire-netting fences.

Electric-netting fences are available in a number of commercial designs. Basically, they all consist of a heavy-duty polythene twine mesh in which the horizontal strands are interwoven with electrically conductive stainless steel wire. To prevent shorting, the steel wires are omitted from the bottom strand. They are between 0.5 to 0.75 m (1 ft 8 in to 2 ft 5 in) high and are supplied in 25 m (82 ft) or 50 m (164 ft) rolls in which the fence posts are already fitted. This type of fence is very quick and easy to erect and take down.

The electric strained-wire system consists of seven parallel electrified conducting wires (7-strand, 16 gauge medium tensile mild steel) at heights of 5, 10, 15, 20, 25, 30, and 40 cm (2, 4, 6, 8, 10, 12 and 16 in) above the ground. The lowest wire is earthed and the remaining six are live (a small length of wire should be wound around each of the top six wires to electrically connect them). Adjustable plastic insulators supported on metal stakes hold the wires. The stakes can be placed up to 7 m apart (about 8 yards), although ground undulations may dictate closer spacing. Where the fence line bends, anchor posts replace the normal metal stakes. The whole system is tensioned at a reel post placed at the end of the fence.

Both electric fence types must be powered by an energiser capable of producing an output of at least 1 joule when measured into a 500 ohm resistance. Most mains-operated energisers, and the more powerful battery-powered units, have this capability. Batteries should be

changed regularly (a fully charged 70 Ah battery will need to be changed every 2 to 3 weeks). A wide range of energisers is available and users are advised to discuss specific requirements with their supplier. To effectively deter rabbits, it is important to maintain a minimum of 2.5 kV throughout the fenceline. A good earthing system is essential to achieve this.

Ideally, as for wire-netting fences, electric fences should be erected to surround fully the area to be protected. If this is not practical a strip fence, which extends at least 150 m beyond either end of the problem area, may be used. Prior to erection, a 450 mm to 600 mm (1 ft 6 in to 2 ft) wide strip should be mown along the fence line or the vegetation killed off using an approved herbicide. This ensures that the conducting wires are kept clear of vegetation that would otherwise short-circuit the system thereby draining power and reducing effectiveness. Initially, fences should be inspected every few days but this can later be extended to 2 to 3 week intervals.

A more detailed advisory leaflet on the use of fencing (TIN023) is available (see *Further information*).

Lethal control methods

Shooting

Shooting is a popular method of rabbit control and is most effective when conducted at night, using a spotlight.

The Ground Game Act 1880 gives an occupier the right to shoot rabbits on his land during the day and to authorise in writing one other person to do so. The person must be a member of the occupier's household or staff or be employed for reward. Under the Pests Act 1954, an occupier may apply to Natural England for authority to use a reasonable number of extra guns, if the owner of the shooting rights will neither permit the occupier to bring on extra guns, nor undertake to destroy the rabbits himself, and it is necessary to use more guns than the occupier has the right to authorise.

Under the Ground Game Act 1880 as amended by the Wildlife and Countryside Act 1981, the following are allowed to shoot at night:

- An owner-occupier with shooting rights.
- A landlord who has reserved his shooting rights.
- A shooting tenant not in occupation who has derived his shooting rights from the owner.
- An occupier or one other person authorised by him provided he has written authority from another person with shooting rights.

The Firearms Act 1968 requires any person possessing, purchasing or acquiring a shotgun to obtain a shotgun certificate from the police. A firearms certificate is required for rifle use.

Single shooting operations are not particularly effective and reduce rabbit numbers by only about 30%. The technique should only be used therefore as an adjunct to more effective control methods or to remove problem individuals that cannot be disposed of by other means. Shooting also tends to target adult males and therefore has a relatively limited effect on the breeding potential of the population the following spring unless considerable time and effort are expended.

Baited cage trapping

This technique involves the live capture of wild rabbits in galvanised wire-mesh cages baited with carrot. The technique can be used throughout the year, but is most effective at catching adult rabbits during the winter. Additional benefits are that the technique does not require access to burrows and non-target species can be released unharmed.

The traps should be set in short open vegetation and checked twice a day, early morning and late afternoon. Captured rabbits must be dispatched humanely. Cage trapping has been shown to reduce numbers by about 65% and is most appropriate for protecting high value crops where manpower is available for frequent checking of traps. A detailed advisory leaflet on the use of cage trapping is available from Natural England (see under *Further information*).

Drop box trapping

Drop boxes are designed to be used in conjunction with wire-mesh netting. A tunnel is either inserted into the fence line at right angles or placed parallel to the netting on the harbourage side of the barrier. Rabbits are caught when they enter the tunnel and fall through a hinged flap into a box that has been buried in the ground. The lid returns to place by means of a counter balance weight fixed to it.

Drop box traps should be visited at least once a day, when set, preferably early in the mornings. Captured rabbits must be despatched humanely. Traps should not be installed where they may be at risk from flooding. Permanently sited traps can be an effective method of capturing rabbits where fences are newly erected and where rabbits are passing through holes in established fences.

Spring trapping

Under the Pests Act 1954 only approved spring traps, designed to catch and kill rabbits humanely, may be used. Those currently approved by the Spring Traps Approval Order 1995 are the Imbra Trap Mark I and Mark II, Juby Trap, Fenn Rabbit Trap Mark I, Fenn Vermin Trap Mark VI (Dual Purpose), Springer No. 6 (Multi Purpose), Victor Conibear 120-2, BMI Magnum 116, and clones of any of these listed spring traps.

Spring traps generally consist of a pair of clamps that are triggered to catch rabbits that step onto a plate mechanism. The traps should be set firmly in position with the treadle plate flush with the floor. The plate should be concealed by covering lightly with soil. To minimise the risk to non-target species, stock and pets should be excluded from the trapping area and the traps must be set only within the overhang of natural or artificial tunnels.

The Protection of Animals Act 1911 requires that all spring traps set for the purpose of catching rabbits (or hares) should be inspected at reasonable intervals and at least once every day between sunrise and sunset.

Snaring

Snares are intended for use to tether animals for subsequent humane despatch. They are made from stranded brass wires that run freely through a small eye made in one end of the wire. The looped end of the wire (100 mm (4 in) diameter), into which the animal places its head, is positioned about 90 mm (3 in), above the ground using a short, notched stick (the 'pricker' or 'feeler'). The free end of the wire is securely tethered by a strong rot-proof cord to a peg, which is driven firmly into the ground. This prevents captured animals from escaping. Snares with a 'stop' or knot about 140 mm (5 in) from the eye can be used. The 'stop' prevents the loop from closing fully, thus ensuring the snare tethers rather than kills the rabbit. Snares should be set on well-used rabbit runs, in short vegetation, close to the harbourage from which rabbits are gaining access to crops. Where rabbits are numerous, the use of well-placed snares can catch animals quickly and efficiently, but results are poor during dry weather and frost.

The Wildlife and Countryside Act 1981 prohibits the use of self-locking snares and requires free-running snares to be inspected daily. All reasonable precautions should be taken to avoid catching non-target animals. Under the Wildlife and Countryside Act 1981 it is illegal to set a snare to catch certain animals, such as badgers and otters. Under the Deer Act 1991 it is an offence to use snares to kill or take deer. It is recommended that they are inspected at dawn and dusk, and that they are not set where livestock are present or if there is a risk to domestic pets.

Ferreting

This involves the introduction of ferrets into the burrow system. The ferrets drive rabbits into nets, which are placed over the burrow entrances or to waiting guns that shoot them as they bolt from tunnel entrances. Ferreting is most successful outside of the breeding season and, having the advantage of capturing more females than males, may serve as a valuable technique for dealing with intransigent populations. However, the method is time consuming and, when used in isolation, is

unlikely to produce effective control of rabbit infestations.

Damage reduction methods

Tree-guards

Individual tree guards and shelters can be used to protect young trees and shrubs from rabbit browsing and bark stripping where it is impractical or uneconomic to enclose them with fencing. There are many types available including plastic net guards, split plastic tubes, spiral plastic sleeves and welded mesh cylinders. Spiral plastic sleeves are perhaps the least successful because they tend to be displaced by wind or animals. The effectiveness of split plastic sleeves and net guards is greater because they are more robust. To effectively reduce rabbit damage tree guards should be at least 60 cm (2 ft) high.

Repellents

The use of repellents can be expensive, and does not always provide long-term protection from attack by rabbits. Any benefit they can provide is often offset when, as is often the case, repeated applications are necessary. Their use should therefore be restricted to small plantations or to areas that cannot be protected in any other way. Only repellents approved under the Control of Pesticides Regulations 1986 may be used. Users must comply fully with the label instructions.

Further information

In England further advice on dealing with rabbit problems, as well as problems caused by other mammals and birds can be obtained by contacting Wildlife Management and Licensing at: Natural England, Wildlife Licensing Unit, First Floor, Temple Quay House, 2 The Square, Bristol, BS1 6EB
Tel: 0845 601 4523 (local rate). Email: **wildlife@naturalengland.org.uk**

A range of leaflets on wildlife topics is available online **www.naturalengland.org.uk.** In particular see:

- TIN023: *Rabbits: use of fencing to prevent agricultural damage*
- TIN024: *Rabbits: use of cage-trapping to prevent agricultural damage*
- TIN026 : *Badger gates in rabbit-proof fencing*

The Forestry Commission produces a number of publications and these can be obtained from Publication Section, Forest Research Station, Alice Holt Lodge, Wrecclesham, Farnham, Surrey GU10 4LH. Tel: 01420 23337.

The Health and Safety Executive Agriculture Information Sheet No. 22 Gassing of rabbits and vertebrate pests is available via their Infoline (Tel: 08701 545500) or online at **www.hse.gov.uk/pubns/ais22.pdf**

This leaflet was produced by Natural England and the Central Science Laboratory, now known as the Food and Environmental Research Agency (FERA).

Appendix 7B

NLG Ecology Ltd (2021) Riparian Mammal Habitat Suitability and Survey Report

Headbolt Lane Station

Riparian Mammal Habitat Suitability and Survey Report

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October 2020

Project No: 2593 – Headbolt Lane

Title: Headbolt Lane Station; Riparian Mammal Habitat Suitability and Survey Report

Client: Buckingham Group Ltd

Date: October 2020

Status	Date	Prepared by	Reviewed by	Approved by
V1	October 2020	Sally Conyers Ecologist	Kelly Lomas Senior Ecologist	Kelly Lomas Senior Ecologist
V2				
Final				

NLG Ecology Ltd has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the agreement of the client and NLG Ecology Ltd. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by NLG for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work. This work has been undertaken in accordance with the quality management system of NLG Ecology Ltd. No part of this report may be copied or duplicated without the express permission of NLG Ecology Ltd and the party for whom it was prepared.

SUMMARY

Buckingham Group Ltd commissioned NLG Ecology Ltd to undertake a habitat suitability and a riparian mammal survey of Simonswood Brook and an unlabelled tributary of the brook, located in Kirkby, Merseyside (see Appendix 1, Study Area and Survey Results). Simonswood Brook was surveyed from Ordnance Survey grid reference SJ 40893 99562 to SJ 40892 99301, approximately 250m upstream (north) and downstream (south) of the rail line crossing at Mill Lane. The unlabelled tributary was surveyed from OSGR SJ 40893 99562 downstream (west) to SJ 41498 99820 upstream (east). The survey was required in respect of the proposed new station development, including construction of associated utilities at Headbolt Lane, which is within close proximity to the unlabelled tributary. Additionally, as part of the new station development, improvement works to bridge 55 at Mill Lane are likely to be required; the bridge crosses Simonswood brook at OSGR SJ 40879 99554.

The habitat suitability and riparian mammal survey aimed to assess Simonswood Brook and the unlabelled tributary for riparian mammals, to include standard survey effort for determining potential presence / absence of water vole and otter. Where evidence is confirmed, recommendations will be made for appropriate mitigation and habitat enhancement. The riparian mammal survey was undertaken on the 29th September 2020 by Sally Conyers (ACIEEM) of NLG Ecology Ltd, ecologist with seven years consultancy experience.

No evidence of water vole or otter was noted during the survey. Simonswood Brook and the tributary are considered to offer suboptimal habitat for water vole, principally due to culverting and bank modifications removing opportunities for burrowing, extensive human disturbance and dominance of Himalayan balsam reducing the diversity of food plants. This assessment is further supported by an absence of small mammal burrows and presence of rat signs within the study area.

No holts were identified on Simonswood Brook and the unlabelled tributary, in general the area was heavily disturbed by humans, therefore any dense scrub was not suitable for laying up otter or couches. The watercourses are tributaries of the River Alt and therefore could be utilised by foraging and commuting otter, however no signs of otter were recorded during the survey.

The survey findings therefore conclude there to be no constraints in respect of the proposed works, it is however recommended a second survey is carried out within Spring 2021 to assess for presence / absence of riparian to adhere to good survey practice.

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1 INTRODUCTION

1.1 Background

1.1.1 Buckingham Group Ltd commissioned NLG Ecology Ltd to undertake an assessment of the habitat suitability and a riparian mammal survey of Simonswood Brook and an unlabelled tributary of the brook, located in Kirkby, Merseyside (see Appendix 1, Study Area and Survey Results). Simonswood Brook was surveyed from Ordnance Survey grid reference (OSGR) SJ 40893 99562 to SJ 40892 99301, approximately 250m upstream (north) and downstream (south) of the rail line crossing at Mill Lane. The unlabelled tributary was surveyed from OSGR SJ 40893 99562 downstream (west) to SJ 41498 99820 upstream (east). The survey was required in respect of the proposed new station development, including construction of associated utilities such as a substation and bulk supply unit (see Appendix 2 – Proposed Works) at Headbolt Lane, which is within close proximity to the unlabelled tributary. Additionally, as part of the new station development, improvement works to bridge 55 at Mill Lane are likely to be required; the bridge crosses Simonswood brook at OSGR SJ 40879 99554.

1.1.2 The survey was required as part of the planning permission application for the development, requested by the Environment Agency.

1.1.3 The riparian mammal survey was undertaken on the 29th September 2020 by Sally Conyers (ACIEEM) of NLG Ecology Ltd, ecologist with seven years consultancy experience.

1.2 Legislation

Legislation that is applicable to the site survey is listed below, which covers the UK and Wales only. For a more definitive statement of law it is recommend that the full legislative acts are sighted.

Otter

1.2.1 Otters are protected under the Wildlife and Countryside Act (WCA) 1981, which has also been amended by various later legislation including the Countryside and Rights of Way (CRoW) Act 2000 and the Conservation of Habitats and Species Regulations 201 (as amended), and this legislation is applicable to England and Wales. Otters are listed on Schedule 5 of the WCA and, are therefore, subject to some the provisions of Section 9 which, with the amendments, make it an offence to:

- Intentionally or recklessly disturb an otter while it is occupying a structure or place which it uses for shelter or protection;
- Intentionally or recklessly obstruct access to any structure or place used for shelter or protection by an otter; and
- There are additional offences in relation to buying and selling any live or dead animal of this species or anything derived from them.

Otters are also listed on The Conservation of Habitats and Species Regulations (2017), where it is an offence to:

- deliberately capture, injure or kill any wild animal of a European protected species;

- deliberately disturb wild animals of any such species, in such a way as to impair their ability to survive, to breed or reproduce, or to rear their young, or in the case of animals of a hibernating or migratory species, to hibernate or migrate;

- to affect significantly the local distribution or abundance of the species to which they belong; and

- damage or destroy a breeding site or resting place of such an animal.

1.2.2 Under these Regulations it is an offence to damage or destroy a breeding site or resting place, whether the animal is in occupation or not, and protection extends to all life stages of the animal in question. There are additional offences relating to possession, control and sale of a live or dead otter or part of such an animal.

1.2.3 In addition, otters are listed as a 'Priority Species' under the UK Post-2010 Biodiversity Framework. Such species are also referred to as 'species of principal importance' for the conservation of biodiversity in England and Wales within Section 74 of the CRoW Act 2000, and Sections 41 (England) and 42 (Wales) of the Natural Environment and Rural Communities (NERC) Act 2006.

Water Vole

1.2.4 Water voles are protected under the Wildlife and Countryside Act 1981, as amended, and this legislation is applicable to England and Wales. Water voles are listed on Schedule 5 of the Act and are, therefore, subject to some the provisions of Section 9 which, with the amendments, make it (in brief) an offence to:

- Intentionally kill, injure or take a water vole;

- Intentionally or recklessly damage or destroy a structure or place used for shelter or protection by a water vole;

- Intentionally or recklessly disturb a water vole while it is occupying such a place; and

- Intentionally or recklessly obstruct access to any structure or place a water vole uses for shelter or protection.

1.2.5 There are additional offences in relation to possessing, controlling, and buying and selling any live or dead animal of this species or anything derived from them.

1.2.6 Water voles are also listed as a 'Priority Species' under the UK Post-2010 Biodiversity Framework. Such species are also referred to as 'species of principal importance' for the conservation of biodiversity in England and Wales within Section 74 of the CRoW Act 2000, and Sections 41 (England) and 42 (Wales) of the Natural Environment and Rural Communities (NERC) Act 2006.

1.2.7 Water vole are a Local Biodiversity Action Plan (LBAP) species for Merseyside.

2 METHODOLOGY

2.1.1 The riparian mammal survey adhered to standard methodology as outlined in the 'New Rivers and Wildlife Handbook' (RSPB et al, 1994), the water vole survey methodology as set out in the 'Water Vole Conservation Handbook' (Strachan, 2006) and survey design as set out in 'The Water Vole Mitigation Handbook' (Dean et al, 2016). This comprised of surveying the extent of the unlabelled tributary from the confluence with Simonswood Brook to the rail line, which extends for an approximate distance of 740m, and Simonswood Brook 250m upstream and downstream of Mill Lane bridge crossing. The specific approach for otter and water vole is summarised further below.

2.1.2 The riparian survey took place during a spell of dry, mild weather and perhaps most importantly, the surveys took place during a time of low water levels, meaning that water vole field signs such as droppings are unlikely to have been washed away. The vegetation levels meant that accessing the channel edges and being able to clearly walk along them was essential. The majority of the survey was carried out by wading within channel, which increases the likelihood of finding signs of riparian mammals.

Water Vole

2.1.3 Prime water vole sites are generally found along densely vegetated banks of slow flowing watercourses and wetlands where water is present throughout the year. The survey entailed a thorough search of a strip approximately 4m wide on each side of the watercourses.

2.1.4 The survey consisted of a search for signs indicative of the presence of water vole, including:

- latrines/droppings;
- burrows, footprints;
- pathways;
- feeding remains and 'lawns' around burrow entrances; and
- water vole sighting.

Otter

2.1.5 Otter field signs can be found at any time of the year. Otters will utilise a wide variety of riparian habitats and will often forage for food quite a considerable distance from their place of rest. This remains exclusively along watercourses, as otters are entirely dependent on aquatic habitats for food.

2.1.6 The survey consisted of a search for signs indicative of the presence of otters, including:

- otter spraint (faeces);
- footprints within soft sediment;
- feeding remains e.g. fish carcasses;
- actual or potential resting sites such as underground 'holts' e.g. beneath the roots of bankside trees; or above ground 'couches' e.g. in riparian vegetation; and
- slides or other well-used access points to watercourses.

2.1.7 In general, the surveys encompassed suitable riparian habitat to a distance of 10m from the brook.

3 SURVEY FINDINGS

3.1 Habitat Assessment

3.1.1 Mapping and photographs of the study area can be found in Appendix 1, which provide further insight to the habitat suitability assessment. The surrounding habitat for both watercourses was publically accessible 'green area' which was occasionally managed grassland with tarmac and gravel paths providing safe connectivity between urban areas.

Simonswood Brook

3.1.2 Within the survey area, Simonswood Brook had a channel width of 1-2m, water depth ranged from 0.1 – 0.5m, flow was slow to moderate throughout, and in general, the flow was smooth in a southerly direction with only occasional riffles and pools. The channel was generally culverted with stone slabs, of which some had become dislodged through age and wear. Banks were steep (approximately 60°), under-cutting and signs of erosion were present in sections, and bank height was between 0.3m – 1m. The high water line was visible approximately 0.3m above the water level during the survey, which indicates the brook is prone to fluctuating water levels.

3.1.3 The bankside vegetation of Simonswood Brook was dominated by herbs such as common nettle (*Urtica dioica*), ruderal such as willowherb (*Epilobium* sp.) and bramble (*Rubus fruticosus* agg.) scrub, with large swathes of the banks being dominated by Himalayan balsam (*Impatiens glandulifera*). The bankside vegetation extended approximately 4 – 8m from the water's edge. There were limited aquatic plants present, with occasional marginal species such as reed canary grass (*Phalaris arundinacea*) and rare amounts of branched bur reed (*Sparganium erectum*). Trees were locally abundant in parts; willow (*Salix* sp.) was abundant, with occasional silver birch (*Betula pendula*) and ash (*Fraxinus excelsior*).

3.1.4 Within the study area, Simonswood Brook is culverted under Mill Lane; this was an arched stone culvert with no mammal passageway - an additional pedestrian walkway was also present at Mill Lane. The rail line bridge crossing is a stone structure, which was 5m in height above the brook; the bridge has two arches, one for the brook passage and the other which is used for pedestrian access to the south. Additionally within the study area, three smaller pedestrian crossing bridges were present; these were generally metal structures.

Unlabelled Tributary

3.1.5 Within the survey area, the unlabelled tributary had a channel width of 0.7 – 1.2m wide, water depth ranged from 0.05-0.4m, flow was slow to moderate throughout and in general, the flow was smooth in a westerly direction; a number of smaller pools were present on meanders. The channel had some signs of modification and culverting in sections; at the confluence with Simonswood Brook and at the crossing of County Road (A506). Banks were steep with signs of bank erosion in sections, with occasional terraced ledges; banks were between 0.2 – 0.7m in height.

3.1.6 Bankside vegetation of the unlabelled tributary was dominated by coarse grasses such as false oat (*Arrhenatherum elatius*), herbs such as common nettle, ruderal such as willowherb and bramble scrub, with large swathes of the banks being dominated by Himalayan balsam. The bankside vegetation extended approximately 5 – 10m from the water's edge. Occasional marginal vegetation of reed canary grass was present within areas to the east of the study area.

3.1.7 The unlabelled tributary is culverted at the confluence with Simonswood Brook – this was a flat slab culvert with no mammal underpass. The stream is culverted under the A506, which was a concrete flat slab design with no mammal underpass. Additionally, two small pedestrian bridges were present to the east of the study area.

3.2 Survey Results

Simonswood Brook

3.2.1 No signs of water vole or otter were recorded during the survey.

3.2.2 Plentiful vegetation was available for water vole in isolated sections of the brook, however Himalayan balsam dominance and tree shading reduces the suitability for water vole to small isolated sections of the watercourse. Therefore, in general, the watercourse was sub-optimal for water vole.

3.2.3 Small fish are likely to be present within Simonswood Brook, although none were observed. Due to the extensive disturbance within the area (multiple dog walkers encountered during the survey) it is unlikely any suitable laying up sites for otter are present, despite there being dense vegetation. No suitable holt sites were recorded. In general, the watercourse was of low suitability for otter.

Unlabelled Tributary

3.2.4 No signs of water vole or otter were recorded during the survey, although numerous rat droppings were recorded along the reach of the stream.

3.2.5 Plentiful vegetation was available for water vole in parts; however Himalayan balsam and bramble scrub dominance reduces the suitability for water vole to small isolated sections of the watercourse. Therefore, in general, the watercourse was sub-optimal for water vole.

3.2.6 Small fish are likely to be present within the tributary, although none were observed. Due to the extensive disturbance within the area (multiple dog walkers encountered during the survey) it is unlikely any suitable laying up sites for otter are present despite there being dense vegetation. No presence of trees or structures for suitable holt sites are present within the area. In general, the watercourse was of low suitability for otter.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

4.1.1 The survey has confirmed that no field evidence was found to indicate the presence of water vole or otter within the study area in September 2020.

4.1.2 Simonswood Brook and the unlabelled tributary are considered to offer sub-optimal habitat for water vole due to: extensive sections of culverting which prevent burrowing within the embankment, reduced diversity of feeding plants due to the dominance of Himalayan balsam, and extensive disturbance by humans and dogs.

4.1.3 The presence of numerous rat droppings on the unlabeled tributary also reduces the suitability for water vole as rat will predate water vole young.

4.1.4 Simonswood Brook and the unlabelled tributary, due to high levels of disturbance and the generally urban surroundings, had no suitable sites for otter lay-ups or couches within the study area. No suitable holt sites were recorded. Prey availability within the watercourses is likely to be limited to small fish species, however the fishing pond to the north west may be utilised by otter. As no signs of otter, such as spraints or slides, were recorded it is unlikely that otter regularly use the area, however watercourses may potentially be used by commuting or foraging otter infrequently.

4.1.5 The survey findings conclude there to be no constraints in respect of riparian mammals and the proposed works at present, However it is considered good practice to carry out a minimum of two presence / absence surveys for riparian mammals.

4.2 Recommendations

4.2.1 A second presence / absence survey is recommended in Spring 2021 to adhere to good practice, especially as the survey was carried out in late September when water vole activity is lower than within late spring. Otter have large territories and utilise different areas seasonally may move within the study area.

4.2.2 It is recommended that good practice procedures are followed relating to working within or near a watercourse, including:

- Pollution prevention measures and measures to prevent the spread of Himalayan balsam;
- Where possible, night works should be avoided to allow for normal behaviours of nocturnal species that utilise the riparian channel; and
- Blocking of the channel should be avoided. If there is a requirement to block or change the course of the channel, a safe pathway should be put in place for species such as otter that may infrequently use the watercourse for commuting.

5 REFERENCES

- Conroy, J.W.H. and French, D.D., 1991. Seasonal patterns in sprainting behaviour of otters (*Lutra lutra*) in Shetland. Habitat, 6, 159-166.

- Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.

- Royal Society for the Protection of Birds, National Rivers Authority and Royal Society for Nature Conservation (1994, reprinted 2001). The new rivers and wildlife handbook. RSPB.

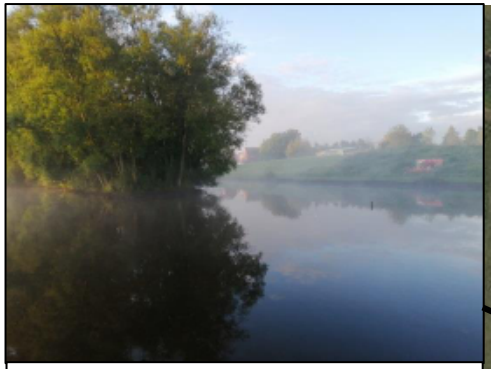
- Strachan, R., and Moorhouse, T. (2006). Water vole conservation handbook, Second edition. Environment Agency.

APPENDIX 1. HABITAT ASSESSMENT AND SURVEY RESULTS

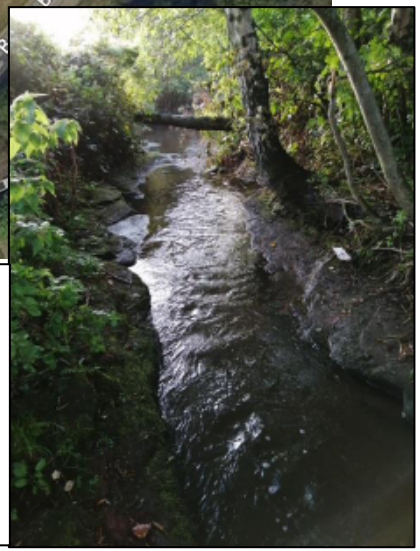
Simonswood Brook, north of Mill Lane
(SJ 40692 99743 to SJ 40874 99564)



The northern section of Simonswood Brook; embankments were dominated by ruderal and herb species including Himalayan balsam (d), common nettle (a), bramble (f), willowherb (f) and reed canary grass (o). Occasional in-channel vegetation included reed canary grass and bur reed.
Bankside gradient ranged from 60° to undercut and banks were culverted with large stone slabs. The flow was slow to moderate with a rock, pebble and silt sediment - water depth 0.1 – 0.3m and channel 1.5m wide.
Surrounding land use is a publicly accessible 'green area' and parkland - the scrub, ruderal and herb vegetation is approximately 5m wide on either side of the brook. Human disturbance is high within the area.



A man-made fishing lake is present to the west of Simonswood Brook; the banks are wooden and concrete, however a central island has more naturalised earth banks. Heavy disturbance from people due to tarmac paths around the lake perimeter, however a heron, moorhen and mallards were noted utilising the lake. A small area of bulrush planting is present within the northern corner of the lake.



Trees become more dominant on the bankside to the south of the section of Simonswood Brook, The bank profile remains similar, however notable sections of the channel are fairly flat rock (see photograph). Channel is relatively shaded and bankside vegetation is sparse in wooded areas. Himalayan balsam, common nettle and bramble dominate the vegetation on the banks in locations where trees are not present.

Simonswood Brook South
(SJ 40879 99554 to SJ 40892 99301)



View under road and pedestrian bridge at confluence of Simonswood Brook and unnamed tributary – no suitable ledges for riparian mammal use.



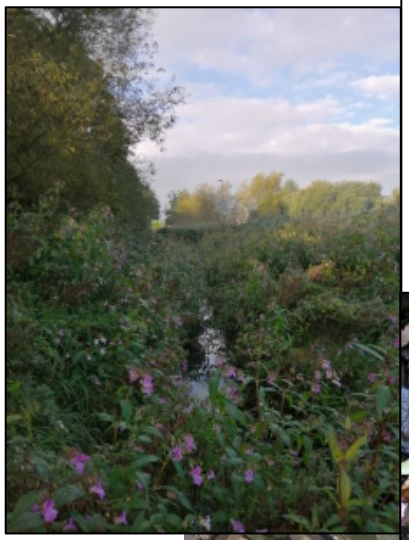
View facing north of the brook profile; banksides dominated by ruderal vegetation and scrub with occasional willow trees. Himalayan balsam dominant / abundant throughout. Banks are steep 60 - 90° with signs of culverting - large slabs in place. Sediment is sandy silt with some clay and pebble. Flow is slow to moderate, water depth 0.1 – 0.3m and channel 1.5m wide.



Common reed-dominated swamp area with soft rush, willow scrub and bulrush present. The area of swamp was very dense and inaccessible, and embankments were not suitable for burrows, however water vole nests could be present within dense common reed vegetation.



Unnamed tributary of Simonswood Brook
(SJ 40893 99562 to SJ 41498 99820)



Stream is approximately 0.75 – 1.25m wide throughout and relatively shallow; 0.05 – 0.15m depth with a slow current. Sediment was rock and pebble with steep earth banks (~75°). Banks were between 0.5 – 1.5m in height and densely vegetated with rank grasses, Himalayan balsam, common nettle and bramble.
Rat droppings were observed in multiple locations along the length of the watercourse.



North east of the section of the stream; bank height is maximum of 0.5m, sediment is pebble and stone, with more visible undercutting of banks. Himalayan balsam less prevalent, with coarse grasses dominating the bankside including reed canary grass, cock's-foot and false oat-grass.

Habitat surrounding the stream is an urban greenway of semi-improved grassland which is managed through mowing. A margin of vegetation approximately 5-10m in width has been set aside along the stream embankments.



APPENDIX 2. PROPOSED WORKS

Signalling

- Signal Sighting Committee Visit
- Condition Survey at Sandhills IECC
- Signaller Workload Survey at Sandhills IECC
- Survey of lineside signalling equipment (Fazakerley to Knowsley Freight Terminal)

Telecoms

- Existing equipment survey at Sandills IECC
- Existing equipment survey at Rainford Junction Signal Box
- Survey of FTN nodes at Kirkby Station and Rainford Station
- Cable Route Survey (Ch 0m - Ch 3000m)
- SISS survey at existing Kirkby Station
- Existing equipment survey at Fazarkerley Substation

Tracked Survey

- Automatic Ballast Sampling at 100m intervals (Ch 1000m - Ch 2500m) = 15No.
  - To include ballast contamination testing.
- Windowless sampling alongside existing track at 100m intervals to 5m (Ch 1300m - Ch 2250m) = 9No.
  - Kh-obs testing (SPT).
  - Geotechnical lab testing (full depth): index/classification testing (PSD/Pl/mc) & strength testing (undrained triaxial)
  - Geo-env testing: on samples from upper 1m only

Bridge 56
1.Scour survey of foundations adjacent to Simonswood Brook to verify foundations.
2.Core through pier to verify it is solid
3.Cores to confirm thickness of abutments, that they are solid, and material behind.
4.Trial pits from above to determine depth of backing to the abutment. (4No.)
5.Trial pits to determine depth of pier and abutment foundations, or alternatively cores (6No.).
6. Testing of cores to determine material strength of arches.
7. Dimensional survey of spandrel walls / parapets - 2No. trial pits required.

Survey of existing drainage manholes in vicinity of proposed connections (TBC prior to survey)

Utilities Scanning to prove buried services records at key points (TBC prior to survey)

Bridge 55
1. Tactile inspection of structure (access to be provided).
2.Trial pits to confirm depth of foundations of both piers and abutment to Span#1. It may be possible to core for foundation depths in the masonry pier and backing to the abutment. (4No.)
3.Trial pits to confirm depth of cover to deck Span#3 (2No.).
4.Cores to verify thickness of Span#3 abutment, and that it is solid (2No. 50mm diam).
5.Dimensional survey of Span 3 deck, including thickness of steel plates.
7.Paint testing to confirm (or otherwise) presence of hazardous materials, such as lead.

Environmental Surveys
- Baseline Acoustic Survey
- Extended Phase 1 Habitat Survey
- Arboricultural survey

Notes:
1) Survey Control Report & Witness Diagrams to be provided for supplementary survey control.
2) Topographical survey to be tied-in to previously established survey control.
2) Consider use of UAV-mounted scanner for topographical survey of large areas of open ground.

Bridge 57 & Bridge 57A
Laser Sweep - SCO format

Glovers Brow Bridge
OB WKL2 57

Kirkby Station

Mersey Rail platform to be gauged (if not previously undertaken in 2019)

Existing services survey within Northern Rail platform to be abolished

Existing Lineside Boundary Fencing Survey to be undertaken (Ch 700m - Ch 2800m).

Permanent Way Condition and Materials Survey (Ch 700m - Ch 2800m, including Knowsley Freight Terminal). To include existing conductor rail and associated traction equipment.

Track Drainage Survey (where present). To include condition, connectivity, invert levels and outfall details (Ch 700m - Ch 2800m).

Existing fence line assumed - Network Rail property line

Millbrook Bridge
UB WKL2 56

Bridge 56
Point Cloud Survey
Laser Sweep - SCO format

County Road Bridge A502
UB WKL2 55

Proposed
UB WKL2 55

Bridge 55
Point Cloud Survey
Laser Sweep - SCO format

Headbolt Lane Station

Tower Hill Footbridge
WKL2 54A

Plan View - 1:1000

Traffic Surveys

Manual Classified Traffic Counts (2No. Junctions)
To be undertaken between 07:00 – 10:00 and 16:00 – 19:00 on a Tues/Weds/Thurs outside of school holidays

Geotechnical Surveys (station area)

Machine dug trial pits with in-situ plate load testing
- 20No. within car park area

Boreholes (shallow rock – assume boreholes CP + IEC follow-on)
- In former quarry area - with monitoring. (1No).
- In vicinity of culvert crossing (3No.)
- Within footprint of station building - to allow ground gas monitoring (1No.)
- Future footbridge (2 No)

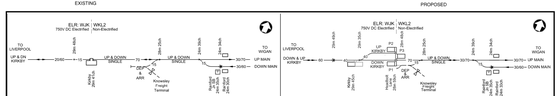
Windowless Samples
- New platform area (9No)
- In vicinity of possible culvert crossing (4No)

Geotechnical Testing
- Index/classification + strength in Boreholes, BRE SD1 testing
- Gas & groundwater monitoring in boreholes/WLS
- Contamination testing to allow controlled waters/human health risk assessments to be undertaken
- Water samples of Brook on-site/upstream/downstream

Arch Culvert (4' 2")
- CCTV survey
- Hand-dug trial pits to confirm depth to crown (3No.)

Key
- Extents of supplementary topographical/gauging surveys
- Bridges-related surveys
- Geotechnical surveys
- Signalling and Telecoms
- Environmental
- Utilities
- Traffic
- Lineside Fencing
- Track / Track Drainage

EXISTING



PROPOSED

Headbolt Lane Station
Multidisciplinary Survey Requirements for AIP
Version 1.0 (06/03/20)

ARUP

Appendix 7C

NLG Ecology Ltd (2021) Great Crested Newt (GCN) Pond Habitat Suitability Index (HSI) and eDNA Survey Report

Headbolt Lane, Kirkby

Great Crested Newt (*Triturus cristatus*) Pond Habitat Suitability Index (HSI) and eDNA Survey Report

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Updated in July 2021

Introduction

This survey report has been prepared by NLG Ecology Ltd. in respect of Buckingham Group's proposals with regards to:

- Construction of a new station including transport infrastructure at Headbolt Lane, Kirkby;
- Track widening from single to dual track way between Kirkby Station and the proposed Headbolt Lane Station development;
- The demolition of the Northern Rail platform at Kirkby station;
- The construction of a proposed sub-station and supply bulk point; and
- Troughing works that extend from Fazakerley sub-station, off Wango Lane at the south western extent to the points of freight line, 200m west of Dale Lane.

The report outlines the findings of one environmental DNA (eDNA) survey and Habitat Suitability Index (HSI) assessment of nine ponds. Pond HSI assessments and the eDNA survey were carried out by Sally Conyers, NLG Ecologist (ACIEEM, Natural England Class Licence Level 1 survey licence holder for great crested newt (GCN) 2015-9488-CLS-CLS), the pond HSI surveys were carried out during a number of site visits between March and April 2021, with the eDNA survey being carried out on the 26th April 2021.

Following discussion with Joe Whittick, the ecologist for Knowsley Planning Authority on the 14th April 2021 and an update to the red line boundary to be submitted for planning permission in July 2021, the scope for carrying out presence / absence surveys for GCN through eDNA and/or traditional surveys required was defined as suitable ponds within 250m of the Headbolt Lane and Kirkby Station development only.
Ponds within 250m of the proposed troughing works were assessed for pond HSI only, but no further survey has been undertaken for GCN; works within 250m of these ponds will be carried out under a Precautionary Working Method Statement (PWMS), which will be implemented as part of the Construction Environmental Management Plan (CEMP) due to the low impacting nature of the work proposals in these areas.

Legislation

Great crested newts are protected by the Wildlife and Countryside Act, 1981 (as amended) and under the Conservation of Habitats and Species Regulations 2017. It is an offence to:

- Kill, injure or knowingly disturb a great crested newt;
- Take a great crested newt from the wild;
- Damage/obstruct a place of shelter/protection used by a great crested newt; and
- Disturb a great crested newt while in a place of shelter.

Methodology

Habitat Suitability Index (HSI) Assessments for Great Crested Newt

The HSI assessments are designed to reflect a water body's suitability for great crested newt, using a range of parameters and undertaken in accordance with Oldham *et al.* (2000). The results (and parameters used) are shown in Table 2.

The methodology for assessing the ponds for their potential to support great crested newt adhered to the HSI devised by Oldham *et al.* (2000). The calculation of a HSI requires that the following 10 key habitat variables are recorded and assigned a numerical value, as shown in Table 1, below.

The calculation of the Habitat Suitability Index (HSI) is according to the formula: HSI = (SI1 x SI2 x SI3 x SI4 x SI5 x SI6 x SI7 x SI8 x SI9 x SI10)1/10. This is a geometric mean, the tenth root of the product of all the suitability indices. The resulting HSI score is then allocated to the following categories of habitat suitability for great crested newt.

- <0.5 = poor
- 0.5 - 0.59 = below average
- 0.6 – 0.69 = average
- 0.7 – 0.79 = good
- >0.8 = excellent

Table 1: Habitat Suitability Index Criteria for Assessment

No	HSI Category	HSI Criteria / Score
1	**Location**	Location A: optimal (1), north, central & southern England; Location B: marginal (0.5), northern Pennies, north/southern Scotland & small areas of Wales; Location C: unsuitable (0.01) Scotland, west of Wales & Cornwall.
2	**Pond Area**	Calculated based on pond area in metre squared.
3	**Pond Drying**	Never dries = 0.9; Rarely Dries = 1.0; Sometimes dries = 0.5; Dries annually = 0.1.
4	**Water quality**	Good = 1.0; Moderate = 0.67; Poor = 0.33; Bad = 0.01.
5	**Shade**	Calculated as a percentage, with shading up to 60% considered suitable for great crested newt. Shade cover greater than 60% progressively declines in value.
6	**Fowl**	Absent = 1; Minor = 0.67; Major = 0.01.
7	**Fish**	Absent = 1; Possible = 0.67; Minor = 0.33; Major = 0.01.
8	**Ponds**	Number of ponds occurring within 1km of survey pond and divided by Pi (3.14). Exclude ponds where major barrier such as roads exist.
9	**Terrestrial Habitat**	Good =1; Moderate = 0.67; Poor = 0.33; Bad = 0.01.
10	**Macrophytes**	Estimated percentage value of macrophyte cover (sum of emergent, floating, submerged plants reaching the surface, except duckweed).

eDNA survey

The eDNA survey was carried out following the guidance provided by SureScreen Scientifics whom the eDNA kit was provided and samples analysed by. This follows the standard methodology for eDNA surveys set out by Biggs *et al* (2014) within the accepted seasonal period for accurate assumption of presence / absence of GCN through eDNA sampling as defined by Natural England.

Results

Following review of Ordnance Survey (OS) mapping and a walk over survey, nine ponds were recorded within 250m (see Figures 1.1 – 1.3) of the Scheme; of these only two ponds are within 250m of the main Headbolt Lane development works (ponds 4 and 5).

Table 2: Pond Habitat Suitability Assessment Results

HSI Category	Northwood Hills Fishing Lake - Pond 1	Northwood Hills - Pond 2	Northwood Hills - Pond 3	**Mill brook Park - Pond 4***	**North of Mill Lane Fishing Lake - Pond 5***	Golf course – Pond 6	Golf course – Pond 7	Kirkby Rail Network - Pond P8	Kirkby Off network - Pond 9
	SJ 42307 99946	SJ 42328 99881	SJ 42177 99978	**SJ 40883 99372**	**SJ 40759 99646**	SJ 39198 98380	SJ 39448 98668	SJ 39630 98908	SJ 39630 98919
Location	1	1	1	**1**	**1**	1	1	1	1
Pond Area	5,500m - omit factor	0.4	0.4	**0.9**	**Omit factor - 8700m**	1	1	0.2	0.2
Pond Drying	0.9	1	0.5	**0.9**	**0.9**	0.9	0.1	0.1	0.1
Water Quality	0.67	0.67	0.67	**0.67**	**0.33**	0.33	0.33	0.33	0.33
Shade	1	1	1	**1**	**1**	1	1	0.2	0.2
Fowl	0.67	0.67	0.67	**0.67**	**0.01**	0.67	0.67	1	1
Fish	0.01	0.67	0.67	**0.67**	**0.01**	0.67	0.67	1	1
Ponds	0.85	0.85	0.85	**0.6**	**0.6**	0.65	0.65	0.55	0.55
Terrestrial Habitat	1	1	1	**1**	**0.33**	0.67	0.67	1	1
Macrophytes	0.3	0.35	0.3	**0.35**	**0.3**	0.3	0.3	0.3	0.3
HSI Score	0.47	0.72	0.66	**0.74**	**0.23**	0.67	0.54	0.43	0.43
Pond Suitability	Poor	Good	Average	**Good**	**Poor**	Average	Below Average	Poor	Poor

*only ponds highlighted in bold are within 250m of the proposed works at Kirkby Station and Headbolt Lane development, all other ponds will be covered under a CEMP as part of permitted development.

Based on the HSI assessment results, two of the nine ponds were assessed as having 'good' suitability for GCN, and two were assessed as having 'average' suitability for GCN. The remaining ponds were assessed as having below average to poor suitability for GCN.

An eDNA survey was carried out on 'Mill Brook Park' pond 4 only; the eDNA result returned was negative, indicating that it is highly unlikely GCN are present within the main works area at this time.

Conclusions and Recommendations

The two ponds within 250m of the main Headbolt Lane development and track extension, ponds 4 and 5, were assessed as offering good and poor suitability for GCN. Pond 4 was surveyed for presence / absence of GCN and the result was negative, therefore it is unlikely GCN are present within the main works area. However, pond 4 had notable tadpoles present during the eDNA survey and therefore is a breeding pond for common amphibian species; as a result, precautionary measures and care should be taken during vegetation clearance on the rail network to avoid injuring or killing species such as common toad (*Bufo bufo*) and common frog (*Rana temporaria*). Pond 5 is well fish stocked with negligible macrophyte vegetation and was therefore scoped out from requiring further survey due to the poor suitability to support GCN.

Ponds 1-3 within the Northwood Hills area had potential to support amphibian species, however it was notable during the survey that a large housing development situated 100m west of pond 3 had no GCN fencing present, indicating that GCN are likely absent from the locality.

Pond 6 within Kirkby Golf Course is a man-made pond; a common frog and toad were recorded under a piece of wood next to the pond, therefore it is considered highly likely common amphibians are present within the rail network in this area. Pond 7 is an ephemeral pond / wet area within the north eastern corner of the golf course which is likely to dry annually, however may support common amphibians during the breeding season. The proposed troughing works in this area will require some vegetation clearance, therefore precautionary working measures are recommended to avoid accidental injury or death of amphibian species.

Ponds 8 and 9 are situated approximately 170m north east of the M57 rail crossing. Pond 8 is situated within the rail network; during a walkover in March 2021 a small amount of water was present, however on re-inspection on April 26th both water bodies were dry with no aquatic vegetation present and were heavily shaded within a willow (*Salix sp.*) carr woodland giving a habitat suitability score of poor. Due to the proximity of the ponds to the rail network and associated troughing works, precautionary working measures are recommended to avoid accidental injury or death of amphibian species.

An Ecological Precautionary Working Method Statement in relation to GCN will be issued by NLG Ecology with regards to the proposed works on site as part of the Construction Ecological Management Plan. This document should be followed at all times during the works and should be sighted for full recommendations in to regards GCN for the proposed works. An identification guide is provided in Appendix 4 of this survey report.

References

Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R. A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. & Dunn, F. (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067. Freshwater Habitats Trust: Oxford.

NLG Ecology Ltd (2021) Headbolt Lane, Kirkby Preliminary Ecological Appraisal

Oldham, R. S., Keeble, J., Swan, M.J.S. & Jeffcote, M. (2000). Evaluating the suitability of habitat for the great crested newt. The Herpetological Journal Vol 10, No 4. Pages 143-156.

Appendix 1 – Figures



Key

Pond HSI Score

- Good
- Average
- Below average
- Poor

Red line boundary

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Headbolt Lane

Figure 1.2: Pond location Plan

Rev	Date	Drawn	Checked	Approved
00	28/07/2021	LK	SC	SC

N

Scale at A4
1:4000

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Key

Pond HSI Score

- Good
- Average
- Below average
- Poor

Red line boundary

nlg ecology ltd

Headbolt Lane

Figure 1.1: Pond location Plan

Rev	Date	Drawn	Checked	Approved
00	28/07/2021	LK	SC	SC

N

Scale at A4
1:4000

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Key

Pond HSI Score

- Good
- Average
- Below average
- Poor

- Red line boundary

nlg ecology ltd

Headbolt Lane

Figure 1.3: Pond location Plan

Rev	Date	Drawn	Checked	Approved
00	28/07/2021	LK	SC	SC

N

Scale at A4
1:4000

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Appendix 2 – eDNA Survey Results

SureScreen Scientifics

Folio No: E9804
Report No: 1
Purchase Order: HBL-001
Client: NLG ECOLOGY LTD
Contact: Sally Conyers

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By colle cting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 29/04/2021
Date Reported: 02/05/2021
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
1770	HBL-001	SJ 40883 99372	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chris Troth **Approved by:** Chris Troth

METHODOLOGY

The samples detailed above have been analysed for t he presence of GCN eDNA following the protocol stat ed in DEFRA WC1067 'Analytical and methodological development f or improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a s ingle sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning t hat there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to d etail to prevent risk of contamination. True positi ve controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-labor atory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they a re inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are asses sed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors can not always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of GCN eDNA** [Positive/Negative/Inconclusive]
Positive: GCN DNA was identified within the sample, indicativ e of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positi ve for GCN presence. It may be assumed that small fractions of positive analyses suggest low level pr esence, but this cannot currently be used for population studies. In accordance with Natural Engl and protocol, even a score of 1/12 is declared positive. 0/12 indicates negative GCN presence.
Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, ho wever, does not exclude the potential for GCN presence below the limit of detection.

Appendix 3: Pond Descriptions and Photographs

Photograph 1. Pond 1 - Northwood fishing pond: situated within Northwood Local Wildlife Site (LWS), small lake with multiple fishing platforms, extensive common reed is present around the margins with occasional yellow flag iris and bulrush. Lily pads and broad-leaved pond were present sporadically within the channel.	Photograph 2. Pond 2 – Northwood pond: situated south of the fishing lake. The pond is dominated by marginal vegetation with limited open water present.
	
Photograph 3. Pond 3 within Northwood Hills: Seasonally wet ephemeral pond with presence of yellow flag iris and soft rush. Shallow pond within a flooded area, likely to dry annually.	Photograph 4. Pond 4 within Mill Brook Park: margins dominated by common reed throughout with small areas of open water within the centre. Aquatic mint, yellow flag iris and soft rush present. Tadpoles were present during the HSI survey.
	

Photograph 5. Pond 5, large fishing lake north of Mill Lane within recreational area: Man-made with a wooded island present in the centre. No aquatic or marginal vegetation present. Heavily fish stocked with large numbers of wildfowl present.



Photograph 6. Pond 6, man-made pond on Kirkby golf course: Some recent management and extension to the area of the pond, water was silty and very turbid with occasional marginal vegetation of soft rush and yellow flag iris. A common frog and toad were observed under a piece of wood sheeting next to the pond.



Photograph 7. Pond 7, seasonally wet ephemeral pond in north east corner of golf course: soft rush was present within the waterbody with creeping bent and floating sweet grass noted within the channel, likely to dry annually.



Photograph 8. Pond 8, on-network waterbody: Pond within willow carr woodland which had dried in April 2021. No signs of aquatic vegetation, however water was present in March 2021 and the channel sediment was damp, likely to be seasonally wet.



Photograph 9. Pond 9, off-network waterbody approximately 10m north of pond 8: Pond is present on OS mapping, however was dry at the time of survey in April 2021, depression in ground was damp, although no signs of aquatic vegetation present. Likely to be seasonally wet.	
	

Appendix 4 - Physical description of great crested newt

Should a newt be found, a description and photographs of great crested newt are given below to aid identification. In the UK, great crested newts may grow up to 17cm long (body and tail). They are the largest species of newt found in Britain. Great crested newts have dark grey-brown backs and flanks, and are covered with darker coloured spots so that they appear almost black in colour. They also have fine white spots on their lower flanks, which are more obvious in breeding males. Their undersides are either yellow or orange-coloured and are covered in large black blotches. Males can be distinguished from females by the presence of a jagged crest that runs along their backs, dipping at the rear of the abdomen to a smoother-edged crest above and below the tail. They also have a silver-grey stripe that runs along the tail. The male's crest is more pronounced during the breeding season, and lies flat to the body when the newt is out of water. Females lack a crest, but have a yellow-orange stripe along the lower edge of their tails.



Male and female adult great crested new



Underside of female great crested newt



Smooth newt (at top, smaller and brown) and great crested newt (large and black)

Description of other newt species

Smooth newts are Britain's most common and widespread newt species. Adults are up to 10 cm in length. Skin is varying shades of grey or brown. Males develop a wavy crest along the back during the breeding season. Belly is yellow or orange, usually with black spots and/or blotches. Throat is spotted. Females and none breeding males have smooth brown skin as visible in the photograph above.

Palmate Newts look very similar to smooth newts but they have more of a preference for shallow ponds on acidic soils. Adults up to 9 cm in length. Smooth skin that is brown, green or grey. Yellow belly, often with dark spots. Unspotted pink or yellow throat (unlike Smooth Newts, which have spotted throats). During the breeding season males develop a filament at the tip of their tail and black webbing on their back feet.

Appendix 7D

NLG Ecology Ltd (2021) Bat Survey Report

Bat Survey Report
Headbolt Lane, Kirkby

nlg ecology ltd

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Report drafted by;
Rowena Tylden-Pattenson (Assistant Ecologist)

Supervisor;
Neil Lee-Gallon (Natural England Level II Survey Licence 2015-10739-CLS-CLS)
(Natural England Barn Owl Survey Licence **CL29/00163**)

Project No: NLG 2593

Title: **Headbolt Lane**
Bat Activity Survey Report

Client: Buckingham

Date: July 2021

Status	Date	Prepared by	Reviewed by	Approved by
V1	18/06/21	Rowena Tylden-Pattenson Assistant Ecologist	Sally Conyers Ecologist	Neil Lee-Gallon Principal Ecologist
Draft V2	29/07/2021	Sally Conyers Ecologist	Ewa Tomalak Assistant Ecologist	
Final				

NLG Ecology Ltd has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the agreement of the client and NLG Ecology Ltd. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Data supplied by the client or from other sources have been used, it has been assumed that the information is correct.. No responsibility can be accepted by NLG for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work. This work has been undertaken in accordance with the quality management system of NLG Ecology Ltd. No part of this report may be copied or duplicated without the express permission of NLG Ecology Ltd and the party for whom it was prepared.

SUMMARY

NLG Ecology Ltd (NLG) was commissioned by Buckingham Group Ltd. (Buckingham) in May 2021 to undertake a bat inspection/assessment and subsequent bat activity surveys of trees and bridge structures at Headbolt Lane, Kirkby, Liverpool. The site is shown in Figure 1 (Appendix 1) and is centred on National Grid Reference SJ 41324 99762.

The appraisal was required to inform proposals to construct a new station at Headbolt Lane, and associated engineering works at Kirkby Station and the adjacent track.

The surveys in respect of bats were to determine the potential presence of bat roosting within trees throughout the site and bridge structures subject to repair / expansion. Field data has also been collated for evidence of bat foraging at the proposal site, to take into context the presence of surrounding habitats. In addition, consideration has been given to the potential presence of breeding birds and other notable species such as barn owl (*Tyto alba*).

The initial tree and structure surveys of the Headbolt Lane Station site was completed on 13th and 14th July 2020, by Rowena Tylden-Pattenson (Assistant Ecologist at NLG, Graduate CIEEM member). A further update walkover survey of the study area was undertaken by Sally Conyers (Ecologist at NLG, Associate CIEEM member) on the 21st and 28th March 2021, to gather additional data. Subsequent to these initial surveys the bat activity survey have been completed by surveyors Neil Lee-Gallon (Natural England Level II Survey Licence 2015-10739-CLS-CLS, Registered Consultant under Natural England's Bat Mitigation Class Licence Ref: RC164 and Natural England Barn Owl Survey Licence CL29/00163), Laura Kershaw (Natural England Level I Survey Licence 2015-14818-CLS-CLS), Chloe Warren, Megan Williams (Natural England Level I Survey Licence 2019-38752-CLS-CLS) and Sally Conyers.

Millbrook Bridge UB WKL2 56 was assessed to have '**moderate**' potential for roosting bats. This structure was subject to further survey efforts in the form of two emergence / re-entry surveys for bats in May and June 2021 with no roosts confirmed. As the immediate habitats surrounding Millbrook Bridge provide optimal foraging habitats for bats, then as a precautionary measure, Millbrook Bridge should be inspected from a Mobile elevating work platform (MEWP) by a licensed bat ecologist in advance of any construction activities. If any evidence of opportunistically roosting bats is found then to avoid any compromise of the legal protection afforded the species, works will be completed under a European Protected Species Licence.

Glovers Brow Bridge OB WKL2 57 was assessed to have '**low**' potential for roosting bats. This structure was subject to further survey efforts in the form of one emergence survey for bats in June 2021. No bats were recorded to emerge from the structure during the survey. Therefore, bats are not considered to pose a constraint to the future proposed works to the structure and the future works can proceed without further survey effort for roosting bats.

A Lombardy poplar situated at the eastern extent of the Headbolt Lane development (SJ 41536 99849) was assessed in July 2020 to have 'moderate' potential for roosting bats; however on visiting in May and June 2021 the feature was inspected using an endoscope downgraded to '**negligible**' potential for roosting bats.

An ecological precautionary working method statement in regards to roosting bats as detailed within Section 4 should be followed for removal of mature trees within the rail boundary within the proposed track extension area between Kirkby Station and Headbolt Lane.

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1 INTRODUCTION

1.1 Background

1.1.1 NLG Ecology Ltd (NLG) was commissioned by Buckingham in May 2021 to undertake a bat inspection/assessment and subsequent bat activity survey of trees and bridge structures at Headbolt Lane, Kirkby, Liverpool. The site is shown as Figure 1 (Appendix 1) and is centred on National Grid Reference SJ 41324 99762.

1.1.2 The appraisal was required to inform proposals to construct a new station at Headbolt Lane, and associated engineering works at Kirkby Station and the adjacent track.

1.1.3 The surveys in respect of bats were to determine the potential presence of bat roosting within trees throughout the site and bridge structures subject to repair. Field data has also been collated for evidence of bat foraging at the proposal site, to take into context the presence of surrounding habitats. In addition, consideration has been given to the potential presence of breeding birds and other notable species such as barn owl (*Tyto alba*).

1.1.4 The initial tree and structure surveys of the Headbolt Lane Station site was completed on 13th and 14th July 2020, by Rowena Tylden-Pattenson (Assistant Ecologist at NLG, Graduate CIEEM member). A further update walkover survey to include the extension of the toughing works was undertaken by Sally Conyers (Ecologist at NLG ltd., Associate CIEEM member) on the 21st and 28th March 2021, to gather additional data. Subsequent to these initial surveys the bat activity survey have been completed by surveyors Neil Lee-Gallon (Natural England Level II Survey Licence 2015-10739-CLS-CLS, Registered Consultant under Natural England's Bat Mitigation Class Licence Ref: RC164 and Natural England Barn Owl Survey Licence CL29/00163), Laura Kershaw (Natural England Level I Survey Licence 2015-14818-CLS-CLS), Chloe Warren, Megan Williams (Natural England Level I Survey Licence 2019-38752-CLS-CLS) and Sally Conyers.

1.1.5 Relevant legislations that have informed survey effort are detailed as Appendix 1. Note that the text provides a brief summary of the legislation in relation to bats in England and Wales and the original Acts, Regulations and any amendments should be referred to for the precise wording.

1.2 Bat Biology

1.2.1 Within the British Isles there are 17 resident (i.e. breed) species of bat. Bats are nocturnal and feed entirely on insects. They use echolocation, a complex sonar system, to navigate around their surroundings and to forage.

1.2.2 Depending on the species of bat, habitat requirements vary widely although features such as traditional pasture, woodland edges, parkland, and wetland are particularly good for bats as insects are abundant within these areas (Mitchell-Jones 2004). Linear features such as hedgerows, tree lines and watercourses are important for commuting as they assist navigation.

1.2.3 Bats utilise different roosts at different times of the year, and roost requirements vary between species. Typical roost sites include caves, mines, trees, and buildings. Bats hibernate between October and March and usually within a damp, unexposed roost which can maintain a relatively stable temperature such as caves, cellars, mines. Around March bats emerge from hibernation and gradually move to their summer roosts and during spring females gather together to form maternity colonies to give birth and rear their young. Summer and maternity roosts are typically found within man-made structures or suitable crevices in trees.

1.2.4 Birthing usually occurs late June – mid July, with the young able to fly within three to five weeks (Altringham 2003). By the end of August, most of the young bats are independent and the colony begins to break up. Mating takes place between August and December either at autumn swarming sites or winter hibernation sites. Bat roost sizes can vary from individual bats found within summer roosts, to hundreds of bats found within maternity colonies or hibernation sites.

2 METHODOLOGY

2.1 Desk Study

2.1.1 A desk study provides background information on the ecological interest of a site and compliments data collected in the field by providing ecological context for the site and its wider landscape. The search area extended up to 2km and incorporated the following resources:

- Multi-Agency Geographic Information for the Countryside (MAGIC) www.magic.gov.uk was searched for European and National Statutory designated sites, to identify designations with criteria for bats;
- UK Biodiversity Action Plan (BAP) (http://jncc.defra.gov.uk/) and Local BAPS (LBAP) (LBAP WEB Link) were reviewed in respect of those bats;
- The National Biodiversity Network (NBN) Atlas (https://records.nbnatlas.org) was consulted with reference to relevant and notable species records on, or within 1km of, the site;
- Google Maps (www.google.co.uk/maps) were reviewed to help provide wides site context in respect of bat commuting. i.e. the presence of a continuous network of surrounding hedgerows may support findings drawn from field survey; and
- An updated desk study was undertaken in October 2020, with information requested from Merseyside Biobank for records of non-statutory designated sites and bat species records.

2.2 Structure Assessment

2.2.1 The structure assessment, adhered to guidance within the Bat Mitigation Guidelines (Mitchell-Jones 2004) and the Bat Surveys Good Practice Guidelines (Collins 2016), involved a detailed external and internal inspection of the following bridge structures: County Road Bridge A502 UB WKL2 55; Millbrook Bridge UB WKL2 56; Glovers Brow Bridge OB WKL2 57; M57 Motorway bridge; an unnamed underpass; and the River Alt Overbridge. (see Figure 1). Equipment used to support the assessment included close-focussing binoculars, an endoscope, high powered torches and ladders to aid access.

2.2.2 Throughout the inspection, evidence of use by bats was searched for in addition to suitable potential access and roosting points. This evidence includes staining and scratch marks around potential entrance points, bat droppings, and feeding remains. The structures were also assessed for their potential to provide suitable roosting conditions for bats.

2.2.3 Each structure was assigned a value for its bat roost potential, as described in Table 1 and adapted from Collins (2016).

Table 1: Visual Assessment Criteria for Buildings

Roost Potential Value	Value description	Reasoning
Confirmed Roost	Evidence of current or recent bat use	Sighting/hearing of bats (inc emergence) Presence of fresh droppings/staining Small numbers of old droppings/staining, Smoothing near gaps, lacking cobwebs Roosts identified from reliable source (i.e. land owner)
High	Building with numerable bat roost features	Buildings with numerous access points; gaps under eves, loose lead flashing and roof tiles. Holes in brick work, open windows of old barns. Undisturbed voids that remain dark and of suitable humidity with available flying spaces. Good local context to include a good network of habitats that offer commuting and foraging opportunities.
Medium	Building with some bat roost features	Buildings with some of the above features, although to a lesser extent that they do not warrant High Roost Potential.
Low	Building with limited bat roost features	Well maintained buildings (i.e. sheet steel open structures) with few potential access points for bats. High levels of disturbance and regular lighting. Local context, to include poor surrounding habitats.
Negligible	Building with no features suitable for bats	No features throughout building that could be utilised by bats.

2.3 Tree Assessment

2.3.1 All trees were visually inspected for their potential to accommodate roosting bats. The assessment involved identifying suitable features that could support roosting bats, such as bark lift, holes, crack/crevices and dense ivy, along with signs of bat usage such as droppings and staining.

2.3.2 Each tree was categorised relative to its potential for supporting roosting bats, as defined by the category descriptions in Table 2, as published within the Bat Surveys Good Practice Guidelines (Collins 2016).

Table 2: Visual Assessment Criteria for Trees

Suitability	Description of roosting habitats	Commuting and foraging habitats.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter protection, conditions and surrounding habitat.	Continuous, high quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined water courses and grazed parkland. Site is close and connected to known roosts.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high concentration status (with respect to roost type only – the assessments in this table are irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used for bats for commuting such as lines of trees or scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used for bats for foraging such as trees, scrub, grassland or water.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suit surrounding habitat to be used on a regular basis by larger numbers of bats. (i.e. unlikely to be suitable for maternity or hibernation).	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.

2.4 Activity Surveys

2.4.1 Survey data drawn from the tree and structure assessment provided the basis for identifying the requirement for additional survey effort, in the form of a bat activity survey. This specifically related to Glovers Brow Bridge OB WKL2 57 which was identified as having low, potential for roosting bats; Millbrook Bridge UB WKL2 56, and an unnamed underpass which were both identified as having moderate potential for roosting bats. Trees included in the activity surveys included a mature Lombardy poplar with moderate potential for roosting bats.

2.4.2 In accordance with Collins (2016) additional survey effort comprised of one dusk and one dawn survey for moderate potential structures, and one dusk survey for the low potential structure. One dawn survey was undertaken for the mature tree, followed by survey with an endoscope.

- During the dusk surveys surveyors adopted position 15 minutes prior to sunset and continued for approximately 1.5hrs after sunset. The purpose was to observe and record bat emergence and wider commuting and foraging activity.

- The Dawn survey surveyors adopted position 1.5 hrs before sunrise to recorded evidence of bat swarming before returning to the roost. Wider commuting and foraging was also recorded.

2.4.3 Species identification was aided by Echometer EM3 real time expansion bat detectors. The dates and weather conditions for the dusk and dawn surveys are presented in Table 3.

Table 3: Dates and Weather Condition for the Bat Activity Survey (2021)

Date	Dusk / Dawn	Surveyed structures/trees	Sunset/Sunrise	Cloud	Wind	Weather
18/05/21	Dawn	Poplar tree and Millbrook Bridge WKL2 56	05:06	1	2	10°c, clear, mild, light breeze
09/06/21	Dusk	Millbrook Bridge WKL2 56, Glovers Brow Bridge WKL2 57, and poplar tree endoscope surveyed	21:37	3	2	18°c, light breeze, dry, humid.

2.5 Breeding Birds

2.5.1 The tree and building assessment included a visual search for breeding bird activity, to include identification of bird species either observed to be building or occupying a nest.

2.5.2 Relevant legislation afforded to birds is presented as Appendix 1.

3 SURVEY FINDINGS

Designations and Notable Habitats

3.1.1 Headbolt Lane is located north of Kirkby, Knowsley, Merseyside. The surrounding habitats are suburban, with rural agricultural land in close proximity. Mill Brook and Simonswood Dell woodland, run beneath the railway track to the west of the proposed station location, the woodland is located within Millbrook Park which extends to the south of the track adjacent to the site.

3.1.2 Habitats recorded by MAGIC within 2km of the site include deciduous woodland, which is considered to be of 'priority' conservation status in accordance with the UK Post-2010 Biodiversity Framework.

3.1.3 Connectivity from the proposed development is moderate, with linear features present in the form of watercourses including Mill Brook, Simonswood Dell and Millbrook Park which run north to south under the rail line and Kirkby Brook which runs within the station development area east to west, and other linear features including the railway track and areas of open grassland connecting to the wider rural landscape.

Protected, Notable and Invasive Species Records

3.1.4 No European Protected Species (EPS) mitigation licence records were returned within 1km of the main works proposals. Three EPS mitigation licence records for common pipistrelle (*Pipistrellus pipistrellus*) were returned within 2km of the site: EPSM2013-5715 1.56km away; 2017-30556-EPS-MIT 1.58km away and 2015-7259-EPS-MIT 1.67km away.

3.1.5 The NBN Atlas was used to search for records of bat species within 2km of the Headbolt Lane Station development from the past 10 years. These records are summarised as follows:

- Mammals: Four common pipistrelle.

3.1.6 Desk study data from Merseyside Biobank was received on the 5th October 2020, this was further updated to cover the entire red line boundary in March 2021 to include the troughing works area, within a 1km search radius of the site. This data is included within Appendix 6 and further summarised below. Merseyside Biobank provided information for non-statutory designations. These include:

- *Simonswood Brook:* a site north-west of Headbolt Lane that supports neutral grassland, notable bird species and a population of water vole. The brook runs south towards the railway line and therefore has habitat connections to the proposal site via the brook water and adjacent riparian habitats. Located at SD 405001.

- *Mill Brook, Westvale:* a site south of Headbolt Lane that supports neutral grassland, notable invertebrate species, and a population of water vole. The brook runs south from the railway line and therefore has habitat connections to the proposal site via the brook water and adjacent riparian habitats. Located 800m south at SJ 405988.

- *Kirkby Brook, including Mill Brook:* a site south of Headbolt Lane that supports neutral grassland, woodland and ponds, common amphibian species, notable invertebrate species, and a population of water vole. The brook runs south under the rail line (Bridge 56) and therefore has habitat connections to the proposal site via the brook water and adjacent riparian habitats. Located 200m of the proposed rail track extension at SJ 407990.

- *Northwood Forest Hills:* a site that supports woodland and neutral grassland, and notable plant species. Located directly south of the troughing works at the points with the freight terminal at SJ 425998.

- *River Alt and M57 Corridor:* a nature improvement area along the Alt valley and M57 corridor which is dominated by woodland – this area is within the troughing improvement works to the south west of Kirkby station at SJ 394987.

- *Kirkby Brook, Northwood:* Open watercourse with habitat suitable for water voles. Located to the east of Headbolt Lane development at SJ 427992.

- *Meadow, Kirkby (Mill) Brook, South of Old Hall Lane:* A meadow within a wet flush on the banks of Kirkby Brook. Sandstone exposures on the banks add to the diversity. Located 700m south of the proposed rail track extension at SJ 407988.

- *Kirkby Brook Waterfall:* geographical site (not ecology) for bedrock of Kirkby Brook – located within Headbolt Lane Station development site.

3.1.7 Merseyside Biobank also provided information on bat species and habitats within 1km from the past 10 years. These records are summarized as follows:

- Mammals: Five common pipistrelle (*Pipistrellus pipistrellus*) / unspecified pipistrelle *(Pipistrellus* sp.) species from 2010 – 2016.

3.2 Structure Assessment

3.2.1 Three structures (County Road Bridge A502 UB WKL2 55; Millbrook Bridge UB WKL2 56; and Glovers Brow Bridge OB WKL2 57) on site were assessed for their potential value to roosting bats – see Figure 1, Appendix 1 for their locations. These structures were originally inspected by NLG in July 2020, with a further update walkover survey in March 2021 in accordance with best practice guidance (Collins, 2016), and were considered to be have a range of potential with respect to roosting bats from **negligible** to **moderate**; dusk emergence surveys of structures with roosting potential above **low** were subsequently undertaken in May and June 2021.

3.2.2 The following table includes structure descriptions and assessments of their potential to roosting bats.

Table 4 – Structure Inspections for Bat Roosting Potential: Results Summary 2021

Building	Description	Bat Roosting Potential
County Road Bridge A502 UB WKL2 55	County Road Bridge is a reinforced steel and stone structure, with no signs of weathering or colonisation by plant species. There are no gaps or cracks present that could provide potential spaces for roosting bats. No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge. No further surveys are required due to a lack of evidence of bat use and the absence of any suitable roosting features.	**Negligble**

Millbrook Bridge UB WKL2 56	Millbrook Bridge is a stone structure with some vegetation growth present on the elevations and underside. Gaps are present above the arch ring, on the north-west elevation, under the river arch on the western side and under the arch of the bridge deck; the depth of these gaps are unknown, and therefore may provide suitable roosting opportunities for bats. It is possible that the presence of ivy growing across the wing walls and above the arch rings may have obscured potential bat roosting features; however, the presence of this vegetation is likely to lessen the likelihood of bats roosting in this particular location due to the decrease in available space and the overly cluttered nature of the vegetation which is thought to obstruct a direct flight path. No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.	**Moderate**
Glovers Brow Bridge UB WKL2 57	Glovers Brow Bridge is of solid concrete and sandstone construction, with a section of metal plating underneath the arch. Gaps are present between the concrete arch and metal plating that may provide suitable roosting opportunities for bats, although cobwebs present suggest that these spaces have not been used recently. Some small pockmarks and cracks were present in the eastern sandstone elevation. No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.	**Low**

3.3 Tree Assessment

3.3.1 A mature Lombardy poplar is present adjacent to Headbolt Lane at SJ 41536 99849. The tree has a knot hole approximately 2.5m high, facing east. The extent of the knot hole could not be fully observed during the preliminary ground-level roost appraisal. Due to the potential of the features to support roosting bats and the suitable surrounding habitat, the tree has been assessed to hold a **moderate** bat roosting potential.

3.3.2 All other trees within the Headbolt Lane station site were assessed as offering **negligible** potential for roosting bats based on their age and/or a lack of suitable roosting features.

3.3.3 Along the railway embankments, multiple trees including mature sycamore and oak have ivy growth along the length of the trunks. This ivy growth conceals a number of trunks from being directly observed, therefore, due to the maturity of some trees along the embankments, it is considered likely that this ivy may have concealed potential bat roosting features. Due to the maturity of some trees along the railway embankments and highly suitable foraging habitat for foraging bat species, all mature trees have collectively been assessed to hold a **low** bat roosting potential. Trees assessed as holding low bat roosting potential can be de-vegetated adhering to an ecological precautionary working method statement (PWMS) in regards to roosting bats, which will be included within the PWMS / Construction Environmental Management Plan (CEMP) for the site works.

3.4 Activity Surveys

3.4.1 Detailed results for the emergence and re-entry surveys undertaken are provided in Appendix 3, with a summary of the findings in Table 3.2 below.

Table 5 - Results of the Emergence/ Re-entry Surveys : May and June 2021

Structure	Emergence/re-entry	
	18/05/2021 (Dawn)	09/06/2021 (Dusk)
Millbrook Bridge UB WKL2 56	Low levels of bat activity in the local area. No re-entry of bats to the structure observed.	No emergences observed. Pipistrelle bats commuting along tree lines to wards bridge with constant foraging in local area along watercourse and adjacent tree lines.
Glovers Brow Bridge UB WKL2 57	-	No emergences. No local activity.
Mature Lombardy poplar tree	No re-entries.	Feature with bat roosting potential inspected with endoscope and no bats found. The original feature is a knot hole with a branch tear out identified in 2020. The feature has significantly rotted since the initial inspection. No cavity was found behind the rotted limb within the knot hole, and the small hole had a slug present. This tree can be downgraded to having negligible potential roosting suitability for bats.

3.4.2 In summary, no bats were recorded to emerge from Glovers Brow Bridge or the mature Lombardy poplar tree during any of the activity surveys. For Millbrook Bridge, no confirmed emergences or re-entries were observed, however due to levels of bat activity around the bridge precautionary working measures are recommended in advance of works.

3.5 Breeding Birds

3.5.1 Opportunities for nesting birds are prevalent throughout the vegetation within the survey area, including railway embankments and bridges, where trees, scrub and tall ruderal vegetation are present. The dense bramble scrub within the proposed development is of notable value for nesting long tailed tit (*Aegithalos caudatus*), blackbird (*Turdus merula*) and dunnock (*Prunella modularis*).

3.5.2 Old bird's nests identified as being from prior to the 2020 nesting season were observed underneath the steel crossbeams of a metal footbridge adjacent to Glovers Brow Bridge (SJ 40249 99256).

4 CONCLUSION AND RECOMENDATIONS

4.1 Bats

4.1.1 Millbrook Bridge UB WKL2 56 was assessed to have '**moderate**' potential for roosting bats. This structure was subject to further survey efforts in the form of two emergence/ re-entry surveys for bats in May and June 2021 with no roosts confirmed. As the immediate habitats surrounding Millbrook Bridge provide optimal foraging habitats for bats, as a precautionary measure, Millbrook Bridge will be inspected from a Mobile Elevating Work Platform (MEWP) by a licensed bat ecologist in advance of any construction activities. If any evidence of opportunistically roosting bats is found then to avoid any compromise of the legal protection afforded the species, works will be completed under a European Protected Species Licence.

4.1.2 Glovers Brow Bridge OB WKL2 57 was assessed to have '**low**' potential for roosting bats. This structure was subject to further survey efforts in the form of one emergence survey for bats in June 2021. No bats were recorded to emerge the structure during the survey. Therefore, bats are not considered to pose a constraint to the future proposed works to the structure and the future works can proceed without further survey effort for roosting bats. However, there is always a low risk that any structure can be used on occasion by roosting bats. As a legal requirement, should bat presence be suspected at any time during the works, works must cease and the project ecologist must be contacted immediately. The ecologist will attend site, if necessary, to assess the situation and advise on how to proceed. This may involve seeking further advice from Natural England and the Bat Conservation Trust.

4.1.3 Along the railway embankments, multiple trees including mature sycamore and oak have ivy growth along the length of the trunks. This ivy growth conceals a number of trunks from being directly observed, therefore, due to the maturity of some trees along the embankments, it is considered likely that this ivy may have concealed potential bat roosting features. Due to the maturity of some trees along the railway embankments and highly suitable foraging habitat for foraging bat species, all mature trees have collectively been assessed to hold a **low** bat roosting potential. Trees assessed as holding low bat roosting potential can be de-vegetated adhering to an ecological precautionary working method statement in regards roosting bats as detailed below:

Method statement for precautionary works

- Ideally carry out work on trees with potential to support roosting bats in autumn; this avoids periods when bats are particularly vulnerable – during hibernation or when non-flying young are present.

- When preparing to cut a tree look for evidence of bat occupancy, these include – woodpecker hole; staining around the hole; maze of tiny scratch marks around the hole; noise coming from a hole; on close inspection the hole may contain droppings. The hole should be inspected with an endoscope by a suitably qualified person prior to felling.

- Bats may be anywhere inside a hole, try to cut as far above a hole as possible.

- If in doubt it is a roost, do not cut and seek ecological advice.

- Bats may be inside cracks held open by the weight of a branch, which will close when branch taken off. Search such splits for bats before removing large limbs.

- Where possible ring bark and leave up to 15 metres standing dead wood (trunk), with due regard to Health and Safety issues.

If bats are found:

- If the roost is still intact and bats are not injured, seek ecological advice immediately. If help is not available allow bats to fly out of harms way.

- If the timber is felled, the roost is not exposed and the bats are not injured, temporarily seal and isolate roost and seek ecological advice immediately and contact Natural England. If help not readily available, position the roost off the ground, re-open it and allow bats to relocate of their own accord.

- If roost has been exposed, and bats have been injured, collect bats into a secure box or bag (using a glove) and seek ecological advice immediately. Do not handle bats without gloves.

- In all cases where bats are found to occupy a tree, inform ecologist and Natural England immediately.

4.2 Nesting Birds

4.2.1 Opportunities for nesting birds are present in and around the structures and mature Lombardy poplar. Old bird's nests identified as being from prior to the 2020 nesting season were observed underneath the steel crossbeams of a metal footbridge adjacent to Glovers Brow Bridge.

4.2.2 Any proposed works to the structures should ideally be carried out outside of the main bird breeding season (which runs from March to August inclusive), i.e. carry out works between September and February inclusive. If this is not possible and proposed works are scheduled within the nesting season, then the surrounding vegetation and structure must be checked by a suitably qualified ecologist for active nests no more than 48 hours prior to the start of works. If nests are present, then a minimum 5m exclusion zone should be established around the nest(s) and no de-vegetation or works to the structure (the latter to be advised by an ecologist in the context of the proposals) should be carried out within the exclusion zone(s) until a suitably qualified ecologist has confirmed that the nest(s) is completed and that the young have fledged.

5 REFERENCES

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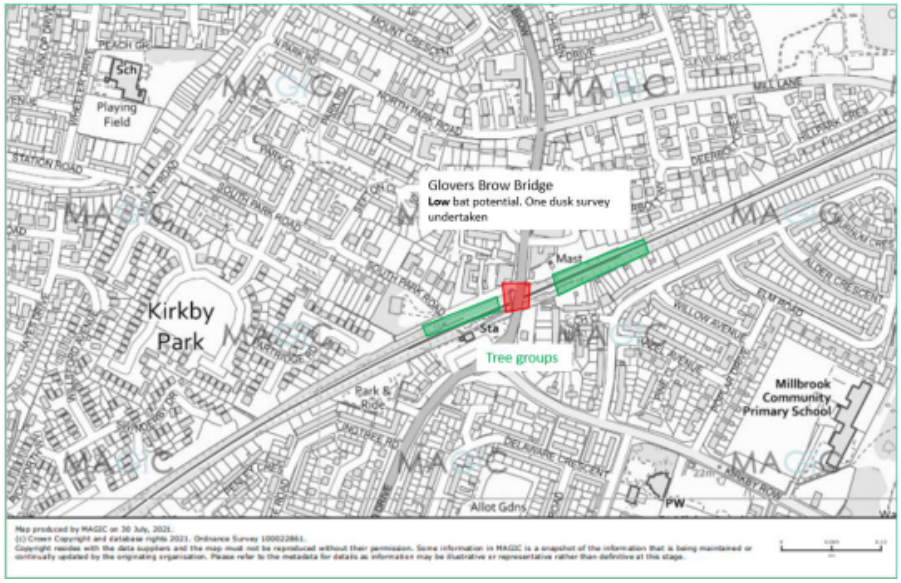
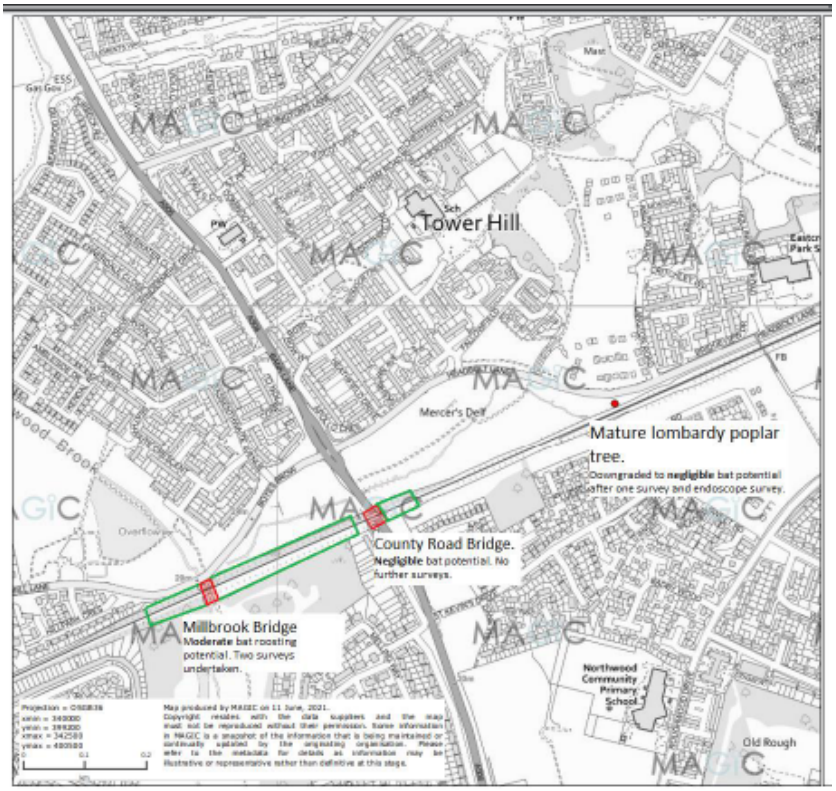
APPENDIX 1: FIGURE AND PHOTOGRAPHIC PLATES

Figure 1: Location of structures and mature tree surveyed for bats





Photograph 1. Mature Lombardy poplar trees; tree with knot hole seen to left hand side.	Photograph 2. Knot hole in Lombardy poplar with moderate bat roosting potential. After inspection with an endoscope, this has been downgraded to **negligible** bat potential.
	
Photograph 3. Glovers Brow Bridge (eastern elevation) with crack to left and pockmark to right highlighted (red circles).	Photograph 4. Metal plate underneath Glovers Brow Bridge with **low** bat potential.
	
Photograph 5. Old bird nest present underneath Glovers Brow footbridge.	Photograph 6. County Road Bridge with **negligible** bat potential.
	

Photograph 7. Millbrook Bridge with gap present above arch ring. Wing walls have ivy present which may obscure further crevices within the stone work. Considered **moderate** bat roosting potential.	Photograph 8. Gap in arch of Millbrook Bridge near northern elevation, above footpath.
	
Photograph 9. Cracks and pockmarks in Millbrook Bridge over stream.	
	

APPENDIX 2: LEGISLATION

Bats

All seventeen wild bat species receive full protection (Schedule 5 species) under the Wildlife and Countryside Act 1981, which is further amended by the Countryside and Rights of Way Act 2000 and the Conservation of Habitats and Species Regulations 2010. Taking these Acts together, it is an offence to:

- Intentionally or recklessly disturb a bat while it is occupying a structure or place which it uses for shelter or protection (S9:4b).

- Intentionally or recklessly obstruct access to any structure or place used for shelter or protection by a bat (S9:4c).

- The term 'reckless' is defined by the case of Regina v Caldwell 1982. The prosecution has to show that a person either deliberately took an unacceptable risk, or failed to notice or consider an obvious risk.

A bat roost has been interpreted to mean any structure or place which is used for shelter or protection whether or not bats are present at the time. Bat roosts may be defined (Hunt, L, 2012) as either (i) Transition Roosts, (ii) Maternity roosts, (iii) Satellite Roosts, (iv) Mating Roost, (v) Hibernation roosts, (vi) Night Roost, (vii) Day Roost, (viii) Feeding Roost or (ix) Swarming Sites.

Bats are listed under Annexes IIa and IVa of the EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, or the 'Habitats Directive'. Inclusion on Annex IVa means bats are a European Protected Species (EPS) and protected under the Conservation of Habitats and Species Regulations 2010, thus it is an offence to:

- (a) deliberately capture, injure or kill any wild animal of an EPS,

- (b) deliberately disturb wild animals of any such species, in such a way as –

    - (i) to impair their ability to survive, to breed or reproduce, or to rear their young, or

    - (ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate, or

    - (iii) to affect significantly the local distribution or abundance of the species to which they belong;

A licence to disturb or take bats can be issued for certain purposes under Section 16 of the Wildlife and Countryside Act 1981 and under Regulation 44 of the Conservation of Habitats and Species Regulations 2010 permitting activities that would otherwise be illegal under the legislation. Licences can take up to thirty working days to be issued by Natural England. Where impacts on bats are unavoidable, mitigation will be required to maintain and enhance the favourable conservation status of bats. Losses of bat roosts must be compensated for by the provision of new roosting sites and planting of new foraging habitat. Mitigation measures will need to be designed on a site specific basis and only in consultation with an expert. All mitigation proposals must be agreed with Natural England and put in place prior to the commencement of works.

Birds

Under the Wildlife and Countryside Act 1981 (as amended) all wild birds, their nests and eggs are protected by law and it is an offence to;

- Intentionally kill, injure or take any wild bird
- Intentionally take, damage or destroy the nest of any wild bird while it is in use or being built
- Intentionally take or destroy the egg of any wild bird.

Barn owl (*Tyto alba*) is listed on Schedule 1 of the Wildlife and Countryside Act, 1981; therefore the birds, their nests, eggs and young are fully protected at all times throughout the UK. It is also an offence to intentionally or recklessly disturb barn owls at an active nest site with eggs or young or before eggs are laid, or to disturb the dependent young.

Loss of barn owl roosts to development must be compensated for by the provision of alternative roost and nest sites within 200 metres of the development, these should be made available at least 30 days prior to the start of works though the longer the better. Timing constraints will apply to avoid the periods when barn owl are nesting and raising dependant young. The provision of permanent roost and nest sites will be required within the redevelopment.

APPENDIX 3: FIELD SURVEY DATA

Bat Activity Findings

Dawn Re-entry Survey Results– 18/05/2021:
Millbrook Bridge UB WKL2 56

Chloe Warren was positioned to the south of the structure, using an EM3+.

Time	Species	No. of Passes	Description of Activity
04:26	Common pipistrelle	1	Seen passing underneath bridge towards lake.

Laura Kershaw was positioned to the north of the structure, using an EM3+.

Time	Species	No. of Passes	Description of Activity
04:04	Common pipistrelle	-	Heard not seen, a single pass.
04:11	Common pipistrelle	Continuous	Until 04:19. Foraging in woodland along railway from park side and back into woodland.
04:20	Common pipistrelle	Continuous	Foraging in woodland.
04:24	Common pipistrelle	-	Heard not seen.

Mature Lombardy poplar tree

Sally Conyers was positioned to the north of the tree, using an EM3+. No bat activity was recorded during the survey.

Dusk Emergence Survey Results- 09/06/2021:

Millbrook Bridge UB WKL2 56

Sally Conyers was positioned to the north of the structure, using an EM3+.

Time	Species	No. of Passes	Description of Activity
22:08	Common pipistrelle	2	Commuting along tree lines dropping down to brook from track level
22:09	Common pipistrelle	Multiple	Foraging around bridge until 22:20.
22:22	Common pipistrelle	2 individuals	Foraging along brook.

Laura Kershaw was positioned to the south of the structure, using an EM touch.

Time	Species	No. of Passes	Description of Activity
22:08	Soprano pipistrelle	1	Commuting along brook.
22:12	Common pipistrelle	-	Heard not seen, until 22:19
22:23	Common pipistrelle	Continuous	From north, foraging under bridge and along brook.

Glovers Brow Bridge UB WKL2 57

Neil Lee-Gallon was positioned to the east of the structure, and Megan Williams was positioned to the west of the structure, both using a EM3+. No bat activity was recorded during the survey.

Appendix 8A

LVIA Methodology

Contents

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8A1 LVIA Assessment Methodology and Significance Criteria

8A1.1 Purpose and Structure

This appendix has been produced to support Chapter 8: Landscape and Visual Impact Assessment. It describes the methods used to determine the baseline conditions, sensitivity of the receptors and magnitude of change and sets out the approach to judging the level and significance of likely landscape and visual effects.

Landscape assessment deals with the assessment of effects on the landscape as a resource in its own right (landscape receptors), whilst assessment of visual effects considers the changes to specific views and on the general visual amenity experienced by people (visual receptors). Although assessed separately, landscape and visual effects are closely linked, which means there is some overlap of methodology.

The assessment of effects is undertaken as part of the iterative design process, and has informed changes to both the development and the evolution of mitigation measures to help avoid or reduce adverse effects wherever possible.

The appendix is structured as follows:

- best practice guidance - specific to the assessment of landscape and visual effects;
- approach – considers the overall approach;
- evaluating landscape and visual sensitivity – this describes the criteria for value, susceptibility and how judgements on sensitivity are made;
- judging magnitude of change – this describes the criteria for scale of change, geographical extent, duration and reversibility and how judgements on magnitude are made; and
- judging levels of landscape effects and significance – describes the criteria used to assess the level of effect and significance.

8A1.2 Guidance Specific to Landscape and Visual Assessment

The approach and methodology used in the preparation of this landscape and visual impact assessment (LVIA) is based on guidance provided in the Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA3)[1].

GLVIA3 is the established best practice guidance for landscape and visual impact assessment.

[1] Landscape Institute and Institute of Environmental Management & Assessment (2013), Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3)

The assessment of landscape effects is described by the Landscape Institute in GLVIA3 as follows:

'An assessment of landscape effects deals with the effects of change and development on landscape as a resource. The concern ... is with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.... The area of landscape that should be covered in assessing landscape effects should include the site itself and the full extent of the wider landscape around it which the proposed development may influence in a significant manner.' Paragraphs 5.1 and 5.2.

As the proposed development site is within the suburban fringe of Kirkby, the term 'landscape' is taken to mean the combination of both built development and open landscape.

The term 'visual effects', as defined in paragraph 2.21 of the GLVIA3, means impacts or changes to 'specific views and on the general visual amenity experienced by people'.

In accordance with GLVIA3, the assessment focuses on public views experienced by those groups of people who are likely to be most sensitive to change due to the project. These include:

- local communities (where views contribute to the landscape setting enjoyed by residents in the area);
- people using recreational routes including public rights of way and cycle routes; and
- people visiting recreational features and attractions (some of which may have historic or cultural heritage importance).

8A1.3 Approach to the Landscape and Visual Assessment

The landscape and visual assessment follows a standard four-step approach:

- establish baseline conditions against which the impacts of the project are assessed. This includes consideration of the future baseline, which is the way the site is likely to develop irrespective of the proposed development;
- determine the susceptibility and sensitivity of the landscape and visual receptors likely to be affected. This combines judgements about the susceptibility of the receptors to change arising from a specific proposal, with judgements about the value attached to them;
- predict the nature or magnitude of the change likely to occur, which combines judgements about the likely size and scale of the change, the extent of the area over which it is likely to occur, whether the effect would be direct or indirect, reversible or irreversible, short, medium or long term in duration and whether it is positive, neutral or negative; and
- assess the level of importance of any landscape and visual effects and whether they are likely to be significant. This is done by considering the predicted magnitude of change together with the sensitivity of the landscape, taking into account any proposed mitigation measures.

The landscape and visual assessments involves a combination of quantitative and qualitative assessment and the application of professional judgement within a structured assessment framework. GLVIA3 notes that:

'...whilst there is some scope for quantitative measurement of some relatively objective matters, ...much of the assessment must rely on qualitative judgement, for example what effect the introduction of a new development or land use change may have on visual amenity, or about the significance of change in the character of the landscape and whether it is positive or negative.' Paragraph 2.23

'In all cases there is a need for judgements that are made to be reasonable and based on clear and transparent methods so that the reasoning applied at different stages can be traced and examined by others.' Paragraph 2.24

8A1.4 Baseline Data Gathering

The landscape and visual baseline descriptions form the basis for the identification and description of the landscape and visual changes that may result from the development.

Information is gathered from a wide range of sources including:

- OS maps and aerial photography;
- Local Development Plans and planning policy;
- feedback from planning officers
- existing landscape character assessments;
- management plans; and
- site visits.

Where existing information is to be used, this is verified on site to ensure that the information is accurate and appropriate for the purposes of the LVIA.

8A1.4.1 Landscape Baseline

The purpose of the baseline landscape study is to provide an understanding of the landscape within and surrounding the site – its constituent elements and features, its character and the way this varies spatially, its history, condition, the way it is experienced and the value attached to it. The baseline describes the landscape as it appears now, together with any known changes, which would arise without the proposed development.

The baseline study also establishes the relative value of the landscape across the site and the wider area. An area of landscape may be valued for many reasons for example its quality or condition, scenic beauty, tranquillity or remoteness, its recreation opportunities, nature conservation or its historic and cultural associations. Development will not necessarily be incompatible with the valued qualities of a landscape as this will depend on the nature of the proposal and the characteristics of the landscape.

Nationally and internationally designated landscapes are generally accorded the highest value. The absence of a formal landscape designation however, does not

necessarily imply that a landscape is of lower value. GLVIA3 describes value as *'.... the relative value that is attached to different landscapes by society, bearing in mind that a landscape may be valued by different stakeholders for a whole variety of reasons.... a review of existing landscape designations is usually the starting point in understanding landscape value, but the value attached to undesignated landscapes also needs to be carefully considered...Landscapes or their component parts may be valued at the community, local, national or international level.....'* Paragraph 5.19

In response to this, Table 1 explains what is meant by landscapes of international/ national, regional/ local, community and limited importance.

Table 1: Typical Importance of Landscape Receptors

Category	Description
International/ National	Landscapes which are internationally or nationally designated for their landscape value.
	Regionally or locally designated landscapes including Special Landscape Areas (SLAs)
Community Importance	Everyday landscape, which may be valued by the local community but has little or no wider recognition of its value.
Limited	Despoiled or degraded landscape with little or no evidence of being valued by a community.

The quality of a valued landscape is often explained in a citation for a designation, but where this isn't available, value can be assessed through the application of a criteria based comparative landscape approach supported by published documentation such as tourist leaflets, art and literature. This is in line with the latest guidance from Natural England (2019)[2] and the European Landscape Convention (2006)[3], which promote an 'all-landscapes approach', founded on the recognition of value in all landscapes.

The appraisal of landscape value considers the following factors:

- landscape character and quality;
- scenic quality;
- conservation interests;
- recreation value;
- perceptual aspects and tranquillity; and
- associations.

Based on these and the indicators shown in Table 2, the relative value of the landscape is described as very high, high, medium or low.

2 Natural England (2019), An approach to landscape sensitivity assessment – to inform spatial planning and land management

3 The UK is a signatory to the European Landscape Convention (signed 2006), a convention of the Council of Europe. The status of this convention has not been affected by Brexit.

Table 2: Indicative criteria for assessing the value of the landscape

Category	Indicators
Very High	Beautiful, rare, outstanding landscape with clearly distinctive characteristics, features and elements, which is typically internationally or nationally designated for their landscape value. Very strong landscape or urban structure, legibility characteristic patterns and balanced combination of built form and open space. Widespread use of quality materials. Very good condition/ very well-managed and intact. Historic interest of designated national or international importance and which contributes significantly to landscape character. Very high recreational value which contributes significantly to recreational/ visitor experience. Rich and valued cultural associations. Unique sense of place. No detracting features.
High	Attractive landscape with some distinctive characteristics, features and elements, which may be regionally or locally designated as, for example, a Special Landscape Area (SLAs). Recognisable landscape or urban structure, legibility, characteristic patterns and combinations of built form and open space. Good condition/ well-managed and largely intact. Historic interest which contributes to landscape character. Recreational value which contributes to recreational/ visitor experience. Valued cultural associations. Strong sense of place. Occasional detracting features.
Medium	Typical, commonplace and unremarkable landscape with limited variety or distinctiveness, which may be valued by the local community but has little or no wider recognition of its value. Distinguishable and landscape or urban structure, characteristic patterns and combinations of built form and open space. Average condition with some intactness but scope to improve management for land use. Limited historic interest. Limited recreational value and few visitors. No or very few recorded cultural associations. Some features worthy of conservation. Some dominant detracting features.
Low	Landscape degraded or in obvious decline, with poor sense of place, limited value and with little or no evidence of being valued by a community. Weak or degraded landscape pattern or urban structure, characteristic patterns and combination of built form and open space. Lack of management has resulted in degradation and poor condition. Limited to no historic interest. Limited to no recreational value. No recorded cultural associations. Frequent dominant detracting features. Disturbed or derelict land requires treatment.

8A1.4.2 Visual Baseline

The purpose of the visual baseline study is to establish the general area from where the proposed development may be seen, the different groups of people who may have views of the project, the locations or viewpoints where they would be affected and the relative value or nature of the existing views experienced at those locations. The assessment is informed by site surveys from a series of viewpoints, the selection of which is informed by the preparation of a Zone of Theoretical Visibility (ZTV) map, together with a study of Google Earth. Viewpoints are agreed in advance with the relevant authority as being representative of the range of views and receptor types in the locality. They are all publicly accessible locations.

It should be noted that it is the people who would be experiencing the view from the viewpoint that are the receptor, not the viewpoint itself. The location affords the view to the recipient, and whilst the location cannot change, the opinion of the viewer can vary as people will generally have different responses to a change in view depending on their location, the activity they are engaged in and other factors, including the weather and the time of day/ year.

The value attached to a particular view depends on:

- recognition of the value attached to particular views, for example in relation to heritage assets, or through planning designations; and
- character and quality of the view experienced.

Viewpoint analysis involves visiting each viewpoint location and viewing wireframes prepared for each location. To ensure optimal visibility, the viewpoints were visited in fine weather. Photographs are taken and used to illustrate each of the viewpoints.

Using the indicative criteria in Table 3, the relative value of the view is described as very high, high, medium or low.

Table 3: Indicative criteria for assessing visual receptor value

Category	Indicators
Very High	View of national or international importance, or a view which is associated with nationally designated landscapes or important heritage assets, or is promoted as a visitor designation for its scenic beauty. The view is widely known and well-frequented. (For example public open spaces where focus is on views, public rights of way through highly valued landscape, views from important tourist routes or promoted viewpoint, popular visitor attractions where the view forms a recognised part of the visitor experience, or which have important cultural associations).

High	View of regional or local importance. The view may be valued locally but is not widely known or well-frequented. (For example a public right of way through a landscape of moderate value, setting of elements of local and/ or regional cultural heritage value or national value whose settings are already compromised).
Medium	Although the viewpoint may be valuable to the local community, the location has no formal planning status, is in an area of ordinary landscape value, or reasonably good landscape value but with detracting elements or features. People are unlikely to visit the viewpoint to experience the view.
Low	Viewpoint is within an area of very low landscape quality (e.g. industrial estate/ busy main road) that has very few positive characteristics)

8A1.4.3 Determining Landscape and Visual Sensitivity

A1.4.3.1 Determining Landscape Sensitivity

An assessment of the sensitivity of landscape is made by combining judgements about the relative value attached to the landscape (which is established and reported as part of the baseline) with judgements about the susceptibility of the landscape to change arising from the development. Judgements on the value attached to the landscape baseline are unrelated to the nature of a development proposed and are determined as part of the baseline study, whilst judgements on susceptibility may vary in response to the type of development proposed and the attributes of the area in which it is to be located.

The susceptibility of the landscape to change is the ability of the landscape receptor (whether it be the overall character or quality/ condition of a particular landscape area, or an individual element and/ or feature, or a particular aesthetic and perceptual aspect) to accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/ or the achievement of landscape planning policies and strategies. Susceptibility varies depending on the character of the landscape and the nature of the development being proposed.

Using the indicative criteria in Table 4, the sensitivity of the landscape to change arising from the proposed development is described as high, medium or low.

Table 4: Indicative criteria for assessing landscape receptor sensitivity

Category	Indicators
High	The landscape receptor is less able to accommodate the type of development proposed without undue negative consequences for the baseline situation. Attributes that make up the character of the landscape offer limited opportunities for accommodating the change without its key characteristics being fundamentally altered, leading to a different landscape character. The proposed development does not accord with planning policies and strategies
Medium	The landscape receptor has some ability to accommodate the proposed development without undue negative consequences for the baseline situation. Attributes that make up the character

	of the landscape offer some opportunities for accommodating the change without key characteristics being fundamentally altered. There would be some consequences for the achievement of landscape planning policies and strategies.
Low	The landscape receptor is more able to accommodate the proposed development without undue negative consequences for the baseline situation. Attributes that make up the character of the landscape are more resilient to being changed by the type of development proposed. Only individual elements and/ or features, or a particular aesthetic and perceptual aspect may be affected. The proposed development accords with planning policies and strategies.

An overall assessment of landscape sensitivity using a three-point scale of high, medium and low is then made for each landscape receptor based on informed professional judgement. Although the relationship between landscape value and susceptibility to change can be complex and is not linear, high value/ high susceptibility receptors are likely to be highly sensitive to change, with lower value/ low susceptibility receptors likely to be of low sensitivity to change.

A1.4.3.2 Determining Visual Sensitivity

The first step in assessing the significance of visual effects is to determine the sensitivity of the visual receptors to the proposed development. This comprises judgements about the:

- value attached to the view – as explained above, this is determined as part of the baseline conditions of the assessment. It is a professional judgement made separately from the context of the specific proposals, and,
- susceptibility of the receptor to change – this is a function of the occupation or activity of people experiencing the view at a particular location and the extent to which their attention or interest may therefore be focused on the view and the visual amenity they experience.

The sensitivity of visual receptors is always determined based on site specific conditions, e.g. a driver within an urban area would be considered of low sensitivity but if the road was part of a scenic route through the countryside, the sensitivity would increase.

Views will often be experienced by a number of different receptors types at the same location. For instance, a viewpoint on a footpath immediately adjacent to residential properties and a road will be experienced differently by each receptor type and the different receptor groups will have differing susceptibility to change. In such locations, the overall sensitivity of the receptor is assessed as those with the highest susceptibility; in this example, the residential receptor who is more likely to be focused on the view.

The susceptibility to change of visual receptors is assessed as high, medium or low by considering the indicators contained in Table 5.

Table 5: Indicators of visual receptor sensitivity	
Category	Indicators

High	People with high quality views, leisure users whose attention or interest is likely to be focused on the view and viewpoints within nationally or regionally designated landscape. The viewpoint location may be in a nationally designated landscape or have been specifically created to for its view and/ or is experienced by people, whether residents or visitors, whose attention or interest is likely to be focused on the view. Examples include: • residents at home • people engaged in outdoor recreation whose interest is likely to be focused on the landscape/ landscape • visitors to identified viewing places or heritage assets where the surrounding landscape makes an important contribution to the experience • communities where views contribute to the landscape setting.
Medium	The view may be experienced by people who are drawn to the view yet do not feel compelled to stop and take it in. Examples include: • pedestrians and recreational motorists on minor roads, rail or other transport routes; and • people taking part in outdoor sport or residential receptors.
Low	The viewpoint location may be transient and/ or experienced only in passing by people, whether residents or visitors, whose attention or focus is on other activities, not on their surroundings. Examples include: • commuting pedestrians and motorists • people at their place of work where the setting is not important to the quality of working life.

Paragraph 6.35 of GLVIA3 notes that:

'These divisions are not black and white and in reality there will be gradation in susceptibility to change. Each project needs to consider the nature of the groups of people who will be affected and the extent to which their attention is likely to be focused on views and visual amenity'.

An overall assessment of visual sensitivity using a three-point scale of high, medium and low is made for each visual receptor and is based on informed professional judgement. Although the relationship between the value of the view and the susceptibility of the visual receptor to the change in that view can be complex and is not linear, high value/ high susceptibility receptors are likely to be highly sensitive to change, with lower value/ low susceptibility receptors likely to be of low sensitivity to change.

8A1.5 6 Predicting the Magnitude of Change

8A1.5.1 Magnitude of Landscape Change

Predicting the likely magnitude of landscape effect comprises judgements about the size and scale of the effect, the geographical extent of the area affected and the duration of effect and its reversibility.

Paragraph 5.37 of GLVIA3 sets out the criteria which should be used in reaching a judgement on the nature or magnitude of effect. These include but are not necessarily restricted to:

- the degree to which the proposal fits with existing character; and
- the contribution to the landscape that the development may make in its own right, usually by virtue of good design, even if it is in contrast to existing character.

The magnitude of predicted change is assessed as high, medium, low or very low by considering the indicators listed in Table 6.

Table 6 : Predicting the magnitude of landscape change

Category	Indicators
High	Large-scale removal or addition of landscape features or removal of localised but unusual or distinctive landscape features and/ or addition of new conspicuous features and elements, which may alter the character of the landscape (with uncharacteristic features being negative and characteristic features being positive). Physical loss of landscape features that are not replaceable or are replaceable only in the long term. The duration of this effect may be permanent and irreversible.
Medium	Medium-scale removal or addition of landscape features and/ or addition of new noticeable features and elements, which would be clearly visible but would not alter the overall character of the landscape (with uncharacteristic features being negative and characteristic features being positive). Physical loss of landscape features that are replaceable in the medium term. The duration of this effect may be semi-permanent and irreversible.
Low	Small-scale removal or addition of landscape features and/ or addition of new discrete features and elements which would be perceptible within but would not alter the overall character of the landscape (with uncharacteristic features being negative and characteristic features being positive). The duration of this effect may be temporary and reversible.
Very Low	Barely perceptible removal or addition of landscape features and the proposed development would be barely perceptible in visual/ landscape character terms.

The predicted change is classed as being either a beneficial or adverse where for:

- beneficial change - the development, or part of it, would appear in keeping with existing landscape character and/ or would make a positive visual and/ or physical contribution to key characteristics. Removal of uncharacteristic or unsightly features would also be a beneficial change; and
- adverse change - the development, or part of it, would be perceived as an uncharacteristic or intrusive component in the context of existing landscape character and would have a negative visual and/ or physical effect on key characteristics.

8A1.5.2 Magnitude of Visual Change

Predicting the likely magnitude of visual effect comprises judgements about the size and scale of the effect, the geographical extent of the area affected and the duration of effect and its reversibility.

Paragraph 5.37 of GLVIA3 sets out the criteria which should be used in reaching a judgement on the nature or magnitude of effect. These include but are not necessarily restricted to:

- extent – the extent of the baseline view that would be occupied by the development – full (unobstructed by vegetation, topography or intervening structures) or partial (obstructed to some extent) or glimpsed;
- proportion of development visible – full (all), most (more than 75%), half (50%), small amount (<25%) or none;
- contrast – how would the visible parts of the development relate to the surrounding baseline features: high, medium or low levels of contrast;
- angle of view – direct (head on or close to), oblique (45° to head on) or peripheral (>45° i.e. on the edge of vision);
- distance – between the site and the receptor: close (0 to100m), middle (100 to 500m) and long (0.5km or more); and
- duration and reversibility – the relative time over which the view is experienced (short term <12 months, medium term 1 to 3 years or long term 3 years plus), temporary or permanent, intermittent or continuous e.g. transient (views which are normally experienced when in motion) and seasonal (views which would be subject to seasonal leaf cover).

Other considerations include the level of activity in a scene, presence of noise or lighting, traffic movement, peoples' likely preferences and expectations, quality of the existing view (inevitably a point of judgement), nature of the scene (open and directionless, or closed and bounded) and any other elements that affect human perception.

The magnitude of change is assessed as high, medium, low or very low by applying professional judgement and consideration of the indicators listed in Table 7.

Table 7: Indicative criteria for assessing likely magnitude of visual change

Category	Indicators
High	The project would be a prominent feature and result in a substantial change to the character and quality of the existing view and how it is perceived. Typically this would be where the project would be seen in close proximity with a large proportion of the view affected by little filtering or backgrounding. The development would affect the main focus of the view and potentially be seen by many people. The duration of its effect is likely to be long-term, and permanent and non-reversible.

Medium	The project would be a conspicuous element in the view and result in a noticeable change to the character and quality of the existing view and how it is perceived. Typically this would be where the project would be seen in views where a moderate proportion of the view is affected, although there may be some screening or backgrounding. The development would be well-defined and clearly visible to a number of people. The duration of its effect is likely to be medium-long-term, or permanent and non-reversible.
Low	The development would form a small part of the view and result in a slight change to the character and quality of the existing view and how it is perceived. Typically this would be where the project would be seen in distant views, where only a small proportion of the view is affected, where the magnitude is reduced due to a high degree of filtering of backgrounding or where there is a low scale of change from the existing view. The development would be visible but be indistinct and/ or partially obscured. It would be seen only briefly and by few people.
Very Low	The development would be almost indiscernible and likely to be visible only under certain weather or lighting conditions. It would have no consequences for the character and quality of the existing view and how it is perceived. Typically this would be where the development would form a very small part of a long distance panoramic view.

The predicted change is classed as being either a beneficial or adverse where for:

- beneficial change the development, or part of it, would be perceived as a positive addition in the context of the existing view even if uncharacteristic; and
- adverse change the development, or part of it, would be perceived as an intrusive component in the context of the existing view.

8A1.6 Judging Levels of Landscape and Visual Effect and Significance

The final step in the assessment requires the judgements of sensitivity and magnitude of landscape or visual effect to be considered together to make an informed professional assessment on the level and significance of each visual effect. This determination requires the application of professional judgement and experience to take on board the many different variables which are given different weight according to site-specific and location-specific considerations in every instance. Judgements are made on a case by case basis, guided by the definitions in Table 8.

A rigid matrix-type approach, which does not take on board professional judgement and experience, and where the level of effect is defined simply based on the level of sensitivity (nature of receptor) combined with the magnitude of change (nature of effect), is not used. As such, the conclusion on the level of

effect is not always the same for similar receptors or determined through a formulaic process.

Levels of effect are identified as major, moderate or minor. Where 'no effect' is anticipated this is also stated. The nature of the effects is described as either positive (beneficial), neutral or negative (adverse).

Any effect identified as moderate or major is considered significant.

Each of the categories covers a broad range of effects and represents a continuum or sliding scale. Because the categories cover effects across a relatively wide range, judgements are sometimes made about whether particular effects are at the higher or lower end of a category with explanations of why these conclusions have been reached.

Paragraph 6.42 of GLVIA3 notes that significance of visual effects is not absolute and 'can only be defined in relation to each development and its specific location.'

Paragraph 6.44 of GLVIA3 notes that:

- 'effects on people who are particularly sensitive to changes in views and visual amenity are more likely to be significant;
- effects on people at recognised and important viewpoints or from recognised scenic routes are more likely to be significant;
- large-scale changes which introduce new, non-characteristic or discordant or intrusive components into the view are more likely to be significant than small changes or changes involving features already present in the view; and
- where assessments of significance place visual effects between these extremes, judgements must be made about whether or not they are significant, with full explanations of why these conclusions have been reached.'

Each of these categories covers a broad range of effects and represents a continuum or sliding scale. Because these categories cover effects across a relatively wide range, judgements are sometimes made about whether particular effects are at the higher or lower end of a category with explanations of why these conclusions have been reached.

The significance of landscape and visual effects are classified as being major, moderate, minor or negligible. Where magnitude is determined as 'no change', no effect is stated. Effects are also described as being beneficial, neutral or adverse.

Table 8: Levels of Importance

Category	Description
Beneficial effect of major importance	The proposed development would be in keeping with and would provide a major improvement to the character of the landscape or the value of an existing view.
Beneficial effect of moderate importance	The proposed development would be in keeping with and would provide a noticeable improvement to the character of the landscape or the value of an existing view.

Beneficial effect of minor importance	The proposed development would be in keeping with and would provide a perceptible improvement in the character of the landscape or the value of an existing view.
Negligible	The proposed development would be barely perceptible and have very little effect on the character of the landscape or the value of the existing view.
Adverse effect of minor importance	The proposed development would cause a perceptible deterioration in the character of the landscape or the value of an existing view.
Adverse effect of moderate importance	The proposed development would cause a noticeable deterioration in the character of the landscape or the value of an existing view.
Adverse effect of major importance	The proposed development would be the dominant feature and cause a major deterioration in the character of the landscape or the value of an existing view.

8A1.7 Photography and Visualisation Methodology

8A1.7.1 General Site Photography

At each of the viewpoint locations, a panoramic photo is taken for use on viewpoint sheets and as a record of the site visits using the following method:

- an overlap of at least 25% between shots;
- in relation to panoramic photography professional judgement is exercised. Full 360 degree photography is only be taken where access (e.g. no proximity to residential properties) and safety allows. In all other cases photographic coverage is proportionate to the coverage required to illustrate the visual effects of the development in context. Generally for panoramic images, 180 degree coverage is sufficient. In many instances in more built up locations photographs single frame or one to two frame images only will be appropriate;
- when taking photographs, the photographer turns the camera round with the lens directly over their left foot in portrait orientation. This is regarded as best practice for taking panoramic photography in the field without a tripod;
- the camera is focused once to the middle distance and then set to manual focus to ensure all shots are consistent in focus distance; and
- all images are captured in jpeg and raw format.

Panoramas are produced by stitching multiple site photographs into single panoramic images (using PTGui stitching software).

Single shot images are also captured where required to capture particular landscape features/ elements for use in the understanding of landscape character.

8A1.7.2 Photomontages

For a selection of viewpoints, photo-realistic photomontages - Type 3 in the Landscape Institute's (2019) TGN 06/19 Visual Representation of Development Proposals are produced. Type 3 visualisations are photomontages where site photography forms the basis of the imagery, which is then overlaid by a 3D

rendered model. Their purpose is to represent design, form and context to a reasonable degree of objectivity and accuracy, one which can be understood and relied on by competent authorities and others. Images are presented as two related sheets: baseline photograph and photomontage. These are presented at the same size to allow direct comparison.

GILLESPIES

APPENDIX C: VIEWPOINT ASSESSMENT

HEADBOLT LANE NEW STATION

P20566-00-001-GIL-0701-03

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GILLESPIES		PROJECT TITLE	DOCUMENT TITLE		CLIENT
		HEADBOLT LANE NEW STATION	APPENDIX C - VIEWPOINT ASSESSMENT P20566-00-001-GIL-0701-03		BUCKINGHAM GROUP CONTRACTING LTD
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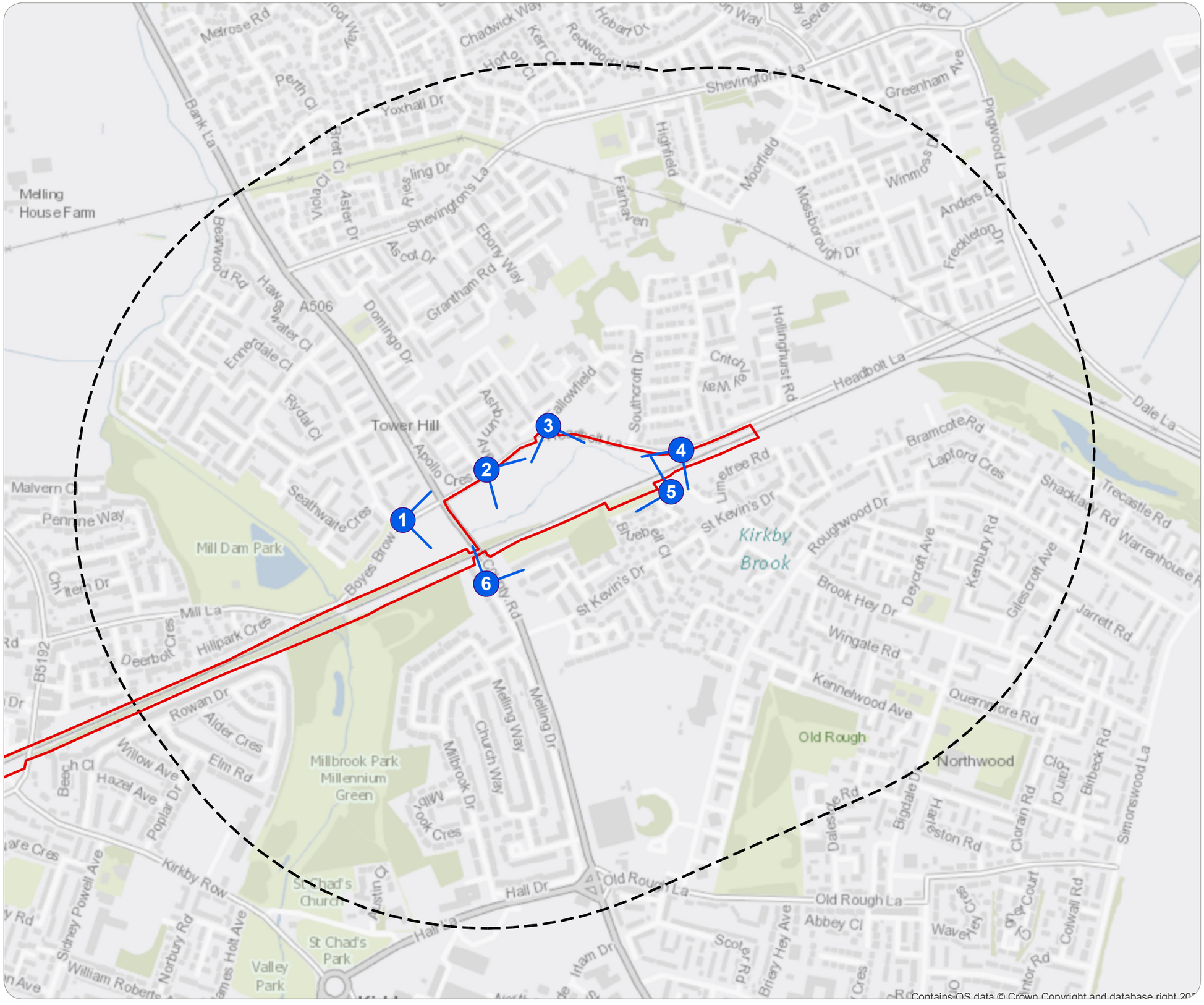
02	18.08.2021	AMENDED RED LINE BOUNDARY	RSB	SG	SG

VIEW SOUTH FROM HEADBOLT LANE



VIEWPOINT LOCATION OVERVIEW MAP



KEY

- Indicative Red Line Boundary
- Study Area
- Viewpoint

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VIEWPOINT 01: JUNCTION OF BASSENTHWAITE AVENUE WITH BOYES BROW

Location: Located at the junction of Bassenthwaite Avenue joining Boyes Brow.
Grid Reference: E 341564 N 399867
Approx Elevation: 26m
General Direction of View: Looking south-east
Approximate distance to nearest site boundary: 90m

Description of Visual Baseline

Receptors in this location have slightly elevated, south-easterly and near distance views across Boyes Brow with its broad grassed verge and occasional mature trees towards an area of open amenity green space. The latter comprises short mown grass with occasional mature trees and some overgrown shrubs. Beyond, in the near to middle distance, is the vegetated embankment of the existing railway line. This vegetation obscures most views of passing trains and visually merges into the tops of the mature trees within Millbrook Park Millennium Green, to the south of the railway line. To the east receptors also have oblique middle distance views across the busy Boyes Lane/ A506 Bank Lane junction, towards a larger area of amenity green space. Mature trees around the road junction partially obscure houses along Apollo Crescent. Views across the amenity green space, although open, are foreshortened due to the relatively flat topography. New housing in Northwood off St Kevin's Drive can be seen above the belt of vegetation, which is found along the railway line embankments and within the adjoining Northwood Woodland. Some tall residential tower blocks at Northwood are distant skyline features. Although passing traffic creates visual disturbance, the overall outlook is attractive and typical of the type of amenity green space found areas of ongoing residential expansion.

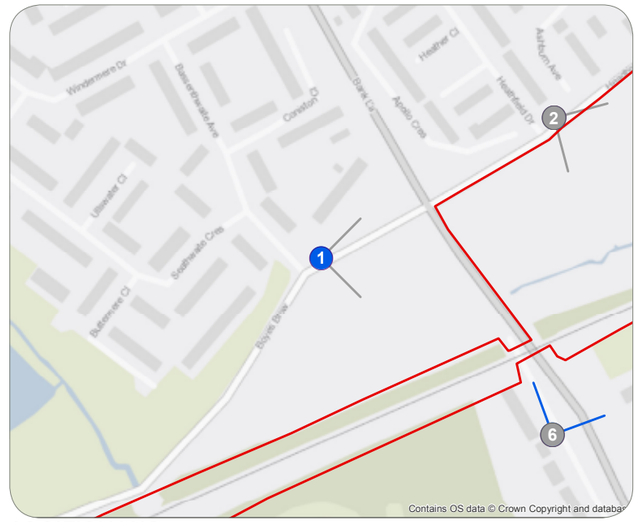
Reasons for Selection:

To represent the views experienced by receptors including occupants of the properties around the Bassenthwaite Avenue/ Boyes Brow junction whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of the nearby roads, whose attention may be partially focussed on the view but it will not be their primary focus.

Value of view: Medium

Receptor susceptibility: High

Receptor sensitivity: Medium



LOCATION MAP

Construction Effects

The most noticeable part of the works will be the removal of trees and shrubs along the railway embankment and construction of the railway line upgrade to the south of Boyes Brow. These works will be very noticeable in the near distance from both the roads and the properties. Beyond the A506 Bank Lane, residents and road users will also have oblique middle distance views of the works to construct Headbolt Lane Station, the car park and electricity substation. Tree removal and construction of the railway line upgrade will also be visible. The views currently experienced from this location include a busy road junction and passing traffic. The disturbance introduced by the construction activity will not be entirely out of keeping and will be of short-term duration.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor will therefore be medium. The effect during construction is anticipated to be **moderate adverse**.

Operational Effects - Year 1

Receptors will have views of the retaining wall (max height 1.1 m) and railway line embankment behind a 2.4m high palisade security fence at the base of the embankment. Due to the clearance of vegetation during construction and the closer proximity of rail infrastructure (including the railway line), passing trains will be more noticeable than at present Receptors will also have oblique middle distance views across the A506 Bank Lane towards Headbolt Lane Station, the car park and electricity substation and there will be increased visual disturbance from vehicles.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor during operation is anticipated to be medium. The effect during operation at Year 1 is anticipated to be **moderate adverse.**

Lighting from the proposed development will add to the overall amount of night time lighting but, given the well-lit suburban location, will not affect the predicted magnitude of visual change or overall level of effect.

Operational Effects - Year 15

By Year 15, the there will be some regeneration of scrub vegetation on the railway embankment but the retaining wall and security fencing will remain noticeable. The maturing hedge and trees along the site boundary with the A506 Bank Lane and Headbolt Lane will partially obscure oblique middle distance views towards Headbolt Lane station, car park, and passing trains. The upper parts of the lighting columns associated with the proposed Scheme will remain visible but will not be an unusual feature in this location.

Based on the above, the magnitude of change in relation to this medium sensitivity receptor will reduce to low The effect during operation at Year 15 is anticipated to be **moderate adverse**.



VIEWPOINT 02: JUNCTION OF HEATHFIELD DRIVE WITH HEADBOLT LANE

Location: Located at the junction of Heathfield Drive joining Headbolt Lane.
Grid Reference: E 341174 N 399827
Approx Elevation: 30m
General Direction of View: Looking south-east
Approximate distance to nearest site boundary: 10m

Description of Visual Baseline

Receptors in this location have slightly elevated, south-easterly near distance but oblique views across Headbolt Lane with its broad grassed verge and mature trees towards a large area of open amenity green space with some overgrown shrubs and occasional mature trees. Views across the amenity green space are foreshortened by the rolling landform, which also obscures Kirkby Brook. The route of a tarmac footpath, which broadly follows the course of the brook through the middle of the grassed area is highlighted by a series of lighting columns. On the far side of the amenity green space in the near to middle distance, the vegetation along the railway line embankment visually merges into Northwood Woodland, which lies beyond. New housing in Northwood off St Kevin's Drive can be seen above the trees, and becomes more noticeable to the east as the tree cover diminishes and views become more open. Some tall residential tower blocks at Northwood are distant skyline features. To the east receptors have views along Headbolt Lane with the open amenity green space to the south and housing along Oakworth Road and new housing off Southcroft Drive to the north. Although passing traffic creates some visual disturbance, the overall outlook is attractive and typical of the type of amenity green space found areas of ongoing residential expansion.

Construction Effects

Receptors will have near distance but oblique views of the construction activity. This will include extensive ground modelling to achieve the required levels. It will also include works to construct Headbolt Lane Station, the car park and electricity substation, which will introduce considerable disturbance into much of the view and will particularly affect road users who have very open views across the site. Receptors will also have middle distance views of the removal of trees and shrubs along the railway line and construction of the railway line upgrade. The effects at any one time will depend on the phasing of the construction works but overall they will be of short-term duration.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor will therefore be high. The effect during construction is anticipated to be **major adverse**.

Operational Effects - Year 1

Receptors will have views of the Headbolt Station, car park and railway line upgrade. The new hedge along Headbolt Lane and A506 Bank Lane, and tree planting within the site, will be too immature to provide substantial screening at Year 1, although the embankment will provide some foreshortening of views of the car park. Due to the clearance of vegetation during construction and the closer proximity of rail infrastructure (due to the additional track), passing trains will be more noticeable than at present both to the north and south of the A506 Bank Lane. Whilst Kirkby Brook will be retained, the rolling landform will be substantially levelled and the outlook will change from open greenspace to one which is much more urban in character.

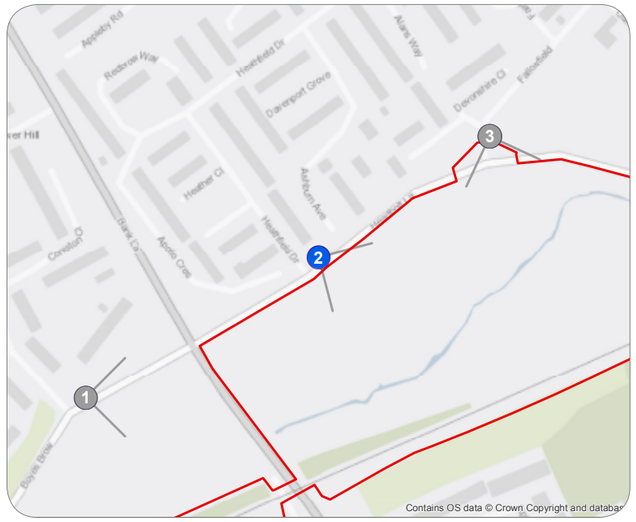
Reasons for Selection:

To represent the views experienced by receptors including occupants of the properties off Heathfield Drive on Apollo Crescent and Ashburn Drive whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of the nearby roads, whose attention may be partially focussed on the view but it will not be their primary focus.

Value of view: Medium

Receptor susceptibility: High

Receptor sensitivity: Medium



LOCATION MAP

There will be a noticeable loss of amenity green space in the view and visual disturbance across the site due to moving vehicles and pedestrians. This will particularly affect views from Headbolt Lane which are very open.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor during operation is anticipated to be medium. The effect during operation at Year 1 is anticipated to be **moderate adverse.**

Lighting from the proposed development will add to the overall amount of night time lighting but, given the well-lit suburban location, will not affect the predicted magnitude of visual change or overall level of effect.

Operational Effects - Year 15

By Year 15, the maturing hedge and tree planting both along Headbolt Lane and within the site, will substantially obscure views of the proposed Scheme from ground level, including the parked vehicles, Headbolt Lane Station, electricity substation and passing trains. Some first floor views will also be screened by the maturing trees, which will create a more enclosed view than currently experienced.

The upper parts of the lighting columns associated with the proposed Scheme will remain visible but will not be an unusual feature in this location.

Based on the above, the magnitude of change in relation to this medium sensitivity receptor is anticipated to reduce to low. The effect during operation at Year 15 is anticipated to be **minor adverse.**



VIEWPOINT 03: JUNCTION OF FALLOWFIELD LANE WITH HEADBOLT LANE

Location: Located on pavement adjacent to Headbolt Lane joining Fallowfield.
Grid Reference: E 341298 N 399915
Approx Elevation: 30m
General Direction of View: Looking south
Approximate distance to nearest site boundary: 30m

Description of Visual Baseline

Receptors in this location have south and south-easterly near distance views across Headbolt Lane with its broad grass verge and mature trees towards a large area of open amenity greenspace with some overgrown shrubs and occasional mature trees. Views across the amenity greenspace are foreshortened by the rolling landform, which also obscures Kirkby Brook, which flows through the middle of the grassed areas. The route of the informal footpath which broadly follows the stream is highlighted by a series of lighting columns. Beyond the amenity greenspace, in the near to middle distance, is the vegetated corridor of the existing railway line with its mature trees. To the south this vegetation obscures most views of passing trains and merges visually merges into Northwood Woodland, which lies beyond. New housing along Lime Tree Road can be seen above the mature trees along the railway line embankment and Northwood Woodland. This is more noticeable to the south-east as the tree cover diminishes and views become more open. Although passing traffic and construction of new housing creates some visual disturbance, the overall outlook is attractive and typical of the type of amenity greenspace found areas of ongoing residential expansion.

Construction Effects

Receptors will have near distance views of large-scale construction activity. This will include extensive ground modelling to achieve the required levels and widening of the Headbolt Lane/ Fallowfield Lane junction as part of the works to construct the main access road into the site. It will also include construction of Headbolt Lane Station, the car park and electricity substation, which will introduce considerable disturbance into much of the view and will particularly affect residents fronting onto Fallowfield Lane and road users who have very open views across the site. In addition, receptors will have middle distance views of the removal of trees and shrubs along the railway line and construction of the railway line upgrade. The effects at any one time will depend on the phasing of the construction works but overall they will be of short-term duration.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor will therefore be high. The effect during construction is anticipated to be **major adverse.**

Operational Effects - Year 1

Receptors will have views along the new access road into the site, which will be directly opposite the Headbolt Lane/ Fallowfield Road junction. Headbolt Lane Station, the large ground level car park and electricity substation will also be very noticeable. The new hedge along Headbolt Lane and tree planting within the site, will be too immature to provide substantial screening at Year 1. Due to the clearance of vegetation during construction and the closer proximity of rail infrastructure (due to the additional track), passing trains will be more noticeable than at present, particularly towards the A506 Bank Lane. Whilst Kirkby Brook will be retained, the rolling landform will be substantially levelled and the outlook will change from open greenspace to one which is much more urban in character.

There will be a noticeable loss of amenity green space in the view and visual disturbance across the site due to moving vehicles and pedestrians. This will particularly affect views from Headbolt Lane and Fallowfield Lane, which are very open. Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor during operation is anticipated to be medium. The effect during operation at Year 1 is anticipated to be **moderate adverse.**

Lighting from the proposed development will add to the overall amount of night time lighting but, given the well-lit suburban location, will not affect the predicted magnitude of visual change or overall level of effect.

Operational Effects - Year 15

By Year 15, the maturing hedge and tree planting both along Headbolt Lane and within the site, will substantially obscure views of the proposed Scheme from ground level, including vehicles and pedestrians in the car park, Headbolt Lane Station, the electricity substation and passing trains. Some first floor views will also be screened by the maturing trees, which will create a more enclosed view than currently experienced. The upper parts of the lighting columns associated with the proposed Scheme will remain visible but will not be an unusual feature in this location.

Based on the above, the magnitude of change in relation to this medium sensitivity receptor is anticipated to reduce to low. The effect during operation at Year 15 is anticipated to be **minor adverse.**

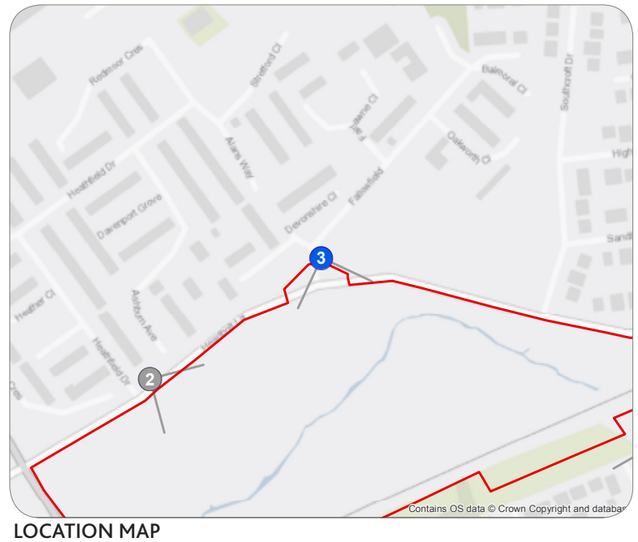
Reasons for Selection:

To represent the views experienced by receptors including occupants of the properties around the Headbolt Lane/ Fallowfield Lane junction whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of the nearby roads, whose attention may be partially focussed on the view but it will not be their primary focus.

Value of view: Medium

Receptor susceptibility: High

Receptor sensitivity: Medium



LOCATION MAP


BASELINE PANORAMA - 90° HORIZONTAL FIELD OF VIEW. LI TGN 06/19 TYPE 1. HEIGHT OF LENS ABOVE GROUND: 1.5M FOR ILLUSTRATIVE PURPOSES ONLY TO SHOW ELEMENTS VISIBLE FROM THIS VIEWPOINT

Photographs taken with a Canon EOS 6D, Canon EF 50mm f/1.8 fixed focal lens on 26th April 2021. Weather clear with good visibility. Time of photo: 11.29

VIEWPOINT 04: CHATHAM TERRACE OFF HEADBOLT LANE

Location: Located on Chatham Terrace off Headbolt Lane to the south of new housing development.
Grid Reference: E 341564 N 399867
Approx Elevation: 30m
General Direction of View: Looking south-west
Approximate distance to nearest site boundary: 10m

Description of Visual Baseline

Receptors in this location have south and south-westerly, near distance views across Chatham Terrace and Headbolt Lane with its broad grass verge and occasional mature trees, towards the palisade security fence, which runs along the north side of the railway line. Passing trains are very noticeable.

Vegetation on the opposite side of the railway line partially obscures views towards the new housing in Northwood to the north of St Kevin's Drive, some of which at the time of survey (April 2021) was still under construction. Other than the tops of some tall residential tower blocks at Northwood, which are distant skyline features, longer views beyond the new housing are foreshortened by the relatively flat topography.

Passing road and rail traffic creates visual disturbance in a roadside view, which is commonplace in this area.

Construction Effects

Receptors will have near distance views of construction activity. This includes works to construct a new overbridge across Kirkby Brook to provide new pedestrian access from Headbolt Lane to the Headbolt Lane Station. There will also be middle distance south-westerly views of construction of Headbolt Lane Station, the car park and electricity substation. In addition, receptors will have middle distance views of the removal of trees and shrubs along the railway line and construction of the railway line upgrade. The construction activity will be of short-term duration.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor will therefore be medium. The effect during construction is anticipated to be **moderate adverse.**

Operational Effects - Year 1

Receptors will have near distance views of the railway line upgrade and more noticeably the new pedestrian access route off Headbolt Lane, to the south-west of the viewpoint. Beyond this to the south-west, there will be middle distance views of Headbolt Lane Station and some of the ground level car park. The new tree planting within the site to along the northern valley side of Kirkby Brook will be too immature to provide substantial screening at Year 1.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor during operation is anticipated to be low. The effect during operation at Year 1 is anticipated to be **minor adverse.**

Reasons for Selection:

To represent the views experienced by receptors including occupants of the new properties fronting onto Chatham Terrace whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of Headbolt Lane, whose attention may be partially focussed on the view.

Value of view: Medium

Receptor susceptibility: High

Receptor sensitivity: Medium



LOCATION MAP

Lighting from the proposed development will add to the overall amount of night time lighting visible in the middle distance to the south-west but, given the well-lit suburban location, will not affect the predicted magnitude of visual change or overall level of effect.

Operational Effects - Year 15

By Year 15, the maturing tree planting along the northern valley side of Kirkby Brook, will partially obscure views of the proposed Scheme, including vehicles and pedestrians in the car park, Headbolt Lane Station and passing trains. Some first floor views will also be screened by the maturing trees and, in time, a well-treed view will develop.

The upper parts of the lighting columns associated with the proposed Scheme will remain visible but will not be an unusual feature in this location.

Based on the above, the magnitude of change in relation to this medium sensitivity receptor is anticipated to remain low. The effect during operation at Year 15 is anticipated to be **minor adverse.**



Photographs taken with a Canon EOS 6D, Canon EF 50mm f/1.8 fixed focal lens on 26th April 2021. Weather clear with good visibility. Time of photo: 11.40

VIEWPOINT 05: MULBERRY PARK NEAR LIME TREE ROAD

Location: Located at Mulberry Park near Lime Tree Road.
Grid Reference: E 341544 N 399783
Approx Elevation: 28m
General Direction of View: Looking north-west
Approximate distance to nearest site boundary: 20m

Description of Visual Baseline

Receptors in this location have near distance northerly views across an area of close mown amenity grass in front of the houses towards the palisade security fence on the south side of the railway line, which in this location is on low embankment. To the north-west is the existing pedestrian access route into the linear amenity green space, which lies to the south of the railway line and forms part of the Mersey Forest's Northwood Woodland Creation project.

Trees and overgrown shrubs along the railway corridor and within Northwood Woodland partially obscure middle distance views across the railway line to the proposed site for Headbolt Lane Station, which can be seen through the green railings along the north side of the railway line. Beyond on the skyline are the tops of the new houses at Highfield Place, although these are partially obscured by mature trees along Headbolt Lane.

Although passing trains create visual disturbance, the overall outlook is attractive and typical of the new housing developments in this area.

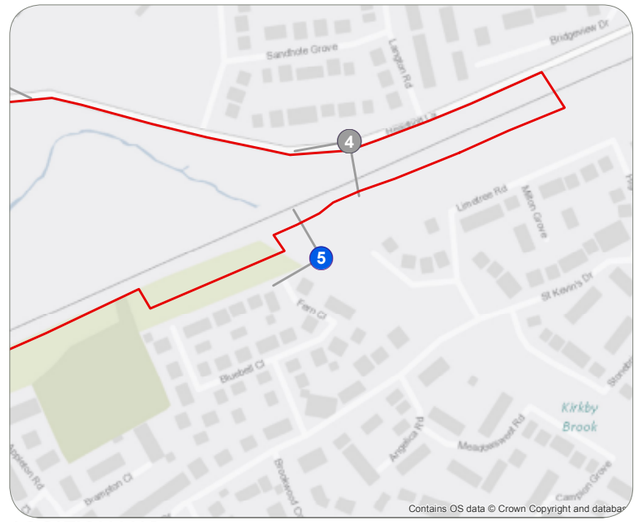
Reasons for Selection:

To represent the views experienced by receptors including occupants of the new properties at Mulberry Park in Northwood, which front onto the newly created grassed amenity area between the railway and the housing, and whose attention or interest is likely to be focussed on the view.

Value of view: Medium

Receptor susceptibility: High

Receptor sensitivity: Medium



LOCATION MAP

Construction Effects

The most noticeable part of the works will be the works to construct Headbolt Lane Station including the new platforms and associated bridge. These works will be visible in the near to middle distance to the north-west. To the north, construction of a new bridge across Kirkby Brook will be visible in the middle distance. Tree removal and construction of the railway line upgrade will open up more views of the construction works, but these will be of short-term duration. To the north-west, this includes vegetation removal will facilitate the widening of the existing pedestrian access into the linear amenity greenspace to provide station maintenance access for railway lighting. The construction activity will be of short-term duration.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor will therefore be medium. The effect during construction is anticipated to be **moderate adverse.**

Operational Effects - Year 1

Receptors will have near to middle distance views of Headbolt Lane Station to the north-west of the viewpoint, including the platforms and associated bridge. To the north there will be middle distance views of the new pedestrian access route and bridge over Kirkby Brook, linking the station to Headbolt Lane. The view to the north-west will noticeably change to become more urban in character, but the view to the north will remain open green space albeit with a new pedestrian bridge across Kirkby Brook.

The new tree planting within the site will be too immature to provide substantial screening at Year 1.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor during operation is anticipated to be low. The effect during operation at Year 1 is anticipated to be **minor adverse.**

Lighting from the proposed development will add to the overall amount of night time lighting visible but, given the well-lit suburban location, will not affect the predicted magnitude of visual change or overall level of effect.

Operational Effects - Year 15

By Year 15, the maturing tree planting around Headbolt Lane Station, including the platforms and associated station overbridge, will partially obscure views of the proposed Scheme, including vehicles and pedestrians in the car park, Headbolt Lane Station and passing trains. Some first floor views will also be screened by the maturing trees and, in time, a well-treed view will develop. The upper parts of the lighting columns associated with the proposed Scheme will remain visible but will not be an unusual feature in this location.

Based on the above, the magnitude of change in relation to this medium sensitivity receptor is anticipated to remain low. The effect during operation at Year 15 is anticipated to be **minor adverse.**


BASELINE PANORAMA - 90° HORIZONTAL FIELD OF VIEW. LI TGN 06/19 TYPE 1. HEIGHT OF LENS ABOVE GROUND: 1.5M FOR ILLUSTRATIVE PURPOSES ONLY TO SHOW ELEMENTS VISIBLE FROM THIS VIEWPOINT

Photographs taken with a Canon EOS 6D, Canon EF 50mm f/1.8 fixed focal lens on 26th April 2021. Weather clear with good visibility. Time of photo: 12.19

VIEWPOINT 06: A506 COUNTY ROAD NEAR EXISTING RAILWAY UNDERBRIDGE

Location: Located on the A506 County Road near an existing railway underbridge.
Grid Reference: E 341173 N 399599
Approx Elevation: 25m
General Direction of View: Looking northeast
Approximate distance to nearest site boundary: 50m

Description of Visual Baseline

Receptors in this location have slightly elevated, north-easterly and near distance views across the original County Road (now a cul-de-sac providing access to the properties) towards the railway underbridge on the A506 County Road in the near distance. A wide grass verge slopes down from the original County Road towards the A506 County Road as it descends to pass under the railway line. The railway in this location is on high embankment, which to the west of the bridge is mostly devoid of vegetation. Some evergreen conifer tree in the front gardens of the houses and occasional mature trees in the sloping grass verge provide some partial screening of the underbridge but the view is typically open and the rail infrastructure and associated road and rail traffic are very noticeable in this location. On the far side of the A506 County Road, the grass verge slopes up to trees and shrubs within the wester end of Northwood Woodland.

Beyond the railway underbridge, the rising landform curtails longer views but there are glimpses of lighting columns and the mature trees around the Headbolt Lane/ A506 County Road junction.

Passing trains and road traffic contribute to a busy semi-urban outlook.

Construction Effects

Removal of trees and shrubs along the railway embankment and the works to the railway overbridge, will be prominent in near distance views from both the properties and the road. However, the views currently experienced from this location include a busy road and passing trains. The disturbance introduced by the construction activity will not be entirely out of keeping and will be of short-term duration.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor will therefore be low. The effect during construction is anticipated to be **moderate adverse.**

Operational Effects - Year 1

Receptors will have oblique near distance views of the chan.g es to the existing bridge, which will be slightly wider and closer (<2 m in either direction) to the viewpoint to accommodate the additional track. Due to the clearance of vegetation during construction, passing trains will be more noticeable than at present.

Based on the above, the magnitude of visual change in relation to this medium sensitivity receptor during operation will be low. The effect during operation at Year 1 is anticipated to be **minor adverse.**

Reasons for Selection:

To represent the views experienced by receptors including occupants of the properties fronting onto County Road whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of the A506 County Road, whose attention may be partially focussed on the view but it will not be their primary focus.

Value of view: Medium

Receptor susceptibility: High

Receptor sensitivity: Medium



LOCATION MAP

Operational Effects - Year 15

There are no landscape proposals for this location therefore the view experienced at Year 15 will be broadly the same as at Year 1.

Based on the above, the magnitude of change in relation to this medium sensitivity receptor is anticipated to remain low. The effect during operation at Year 15 is anticipated to be **minor adverse.**



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Appendix 9A

Flood Risk Assessment (FRA)

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Proposed Site Drainage

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Knowsley CC SuDS Pro-Forma

Executive Summary

A new railway station is proposed on the Kirkby branch line at Headbolt Lane, Kirkby, with associated parking, substation, and interchange facilities.

This Flood Risk Assessment has been prepared by Arup on behalf of Buckingham Group Contracting Limited (BGCL) to assess the risk of flooding both to and as a result of the proposed development.

The existing site is open grassland, bounded by Headbolt Lane to the north and east, the A506 to the west and the Kirkby Branch railway to the south. Ground levels vary between 28-30m AOD along the northern boundary and between 22-31m AOD along the southern boundary.

Kirkby Brook bisects the site from east to west and is an Environment Agency designated main river. Bed levels vary between 20-25m AOD.

The proposed station building is to have a threshold level of approximately 30m AOD. Site car parks and access routes vary in level from 27-30m AOD. The proposed substation compound has a floor level at approximately 27m AOD.

A road bridge and one footbridges are proposed over Kirkby Brook (currently in development at the time of writing).

Modifications are also proposed to the existing railway and Kirkby Station west of the new station site. These works are within the existing railway corridor and do not include modifications to drainage systems and are therefore not assessed as part of this flood risk assessment.

Fluvial flood mapping indicates that the flood extents of Kirkby Brook are limited to the immediate vicinity of the watercourse, with flood levels for the 0.1% annual exceedance probability (AEP) event with 30% uplift for climate change ranging from 22.08m AOD at the downstream end and 25.91m AOD at the upstream end.

The risk of fluvial flooding to the station building and site infrastructure is therefore negligible.

Flood risk from other sources including surface water (pluvial) flooding, groundwater, reservoirs and sewers is also considered to be negligible.

To ensure the proposed development does not result in an increase in flood risk on or off the site, the following measures are proposed:

- Bridges constructed over Kirkby Brook shall have abutments positioned beyond the extents of the highest modelled flood scenario. Soffit levels shall be a minimum of 600mm above the maximum modelled flood level.
- A surface water drainage strategy has been developed based on Knowsley Metropolitan Borough Council (KMBC) guidance which aims to maintain discharge rates into Kirkby Brook as close as is reasonably practicable to greenfield runoff rates. The drainage strategy will be developed during detailed design in consultation with KMBC.

1 Introduction

Arup was commissioned by Buckingham Group Contracting Limited (BGCL) to undertake a Flood Risk Assessment in support of a planning application for the Headbolt Lane New Station development site.

This report has been compiled in response to the requirements of the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance (PPG) relating to Flood Risk and Coastal Change[1]

The principles of the NPPF encourage sustainability by avoiding development in areas at risk of flooding and ensuring that where development is necessary in such areas, it is made safe for its lifetime without increasing flood risk elsewhere.

As Lead Local Flood Authority, Knowsley Metropolitan Borough Council (KMBC) have also prepared Level 1 and Level 2 Strategic Flood Risk Assessments (SFRAs) which reinforce the requirements and principles of the NPPF and provide local context and historic information relating to flood risk.

This report has been prepared with due regard to the PPG requirement for assessments to be "proportionate to the scale, nature and location of the development" and to "make optimum use of information already available". The scope of this assessment has therefore comprised:

- Gathering existing information pertaining to flood risk to the site;
- Identification of potential sources and mechanisms of flooding;
- Assessment of flood risk to the development, and potential off-site impacts of the proposals; and,
- Identification of measures for mitigation and management, where appropriate, to reduce flood risk to acceptable levels.

This report has been prepared by Arup for BGCL for the Headbolt Lane New Station site. It shall not be relied upon for use on any other project. Whilst Arup does not guarantee, nor accept liability for the accuracy of any information derived from secondary sources, endeavours have been made to verify the suitability of information used in this report.

[1] https://www.gov.uk/guidance/flood-risk-and-coastal-change

2 Development Site and Location

2.1 Location

The Headbolt Lane New Station site is located south of the settlement of Northwood. The site is bounded by Headbolt Lane to the north and east, the A506 to the west and the Kirkby Branch railway line to the south. Liverpool city centre is located approximately 12km south west of the proposed station.



Figure 1 - Site Location (boundary shown in red)

The approximate Ordnance Survey coordinates of the site are E341319, N399806.

2.2 Site Characteristics

2.2.1 Site Layout

The site is currently greenfield land approximately 5.0ha in area. A footpath crosses the site from west to east, connecting the A506 to residential areas north-east of the site via an underpass beneath Headbolt Lane.

2.2.2 Watercourses

The site is divided by Kirkby Brook which crosses under the Kirkby Branch Railway and emerges into the site to the east before turning west and heading downstream in a westerly direction and exiting the site under the A506.

Kirkby Brook is a designated main river maintained by the Environment Agency.

There are two existing footbridges over Kirkby Brook within the site.

2.2.3 Flood Zone

EA Flood Map for Planning data indicates that the site is predominantly in Flood Zone 1 (see Appendix A). The flood zone 2 and 3 extents relating to Kirkby Brook are largely constrained to the immediate vicinity of the watercourse.

2.2.4 Topography

Site level information is based on a 2020 InoRail Topographical Survey. Ground levels vary between 28-30m AOD along the northern boundary and between 22-31m AOD along the southern boundary. Kirkby Brook forms a valley within the site with a bed level varying between 20-25m AOD.

2.2.5 Artificial Drainage

United Utilities (UU) sewer records indicate surface water and foul water public sewer networks within the site boundary (see Appendix B).

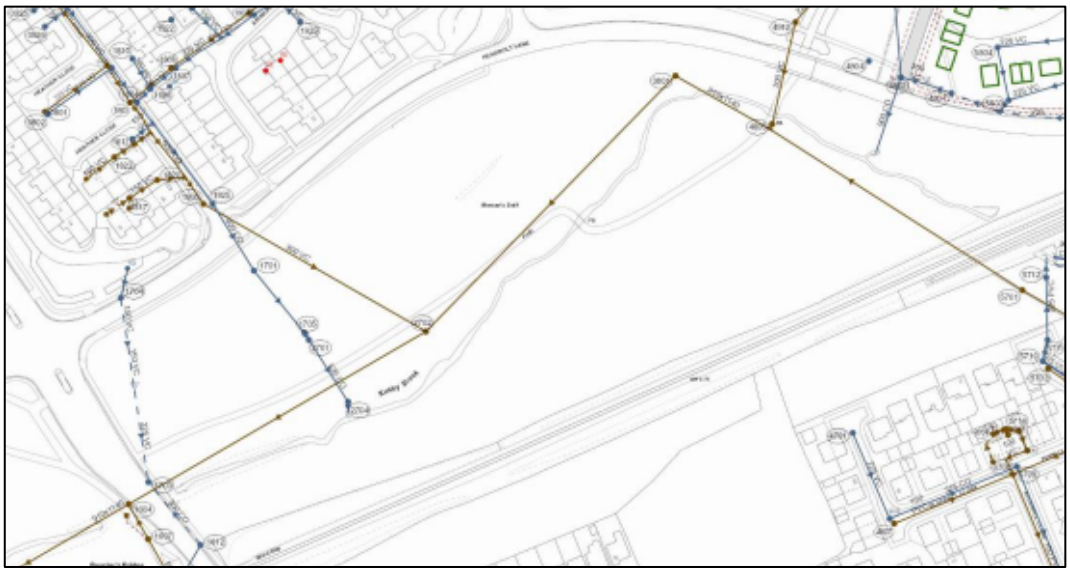


Figure 2 – Extract from United Utilities records showing sewers within the site.

A 900mm surface water sewer discharges into Kirkby Brook at the east of the site. A 525mm surface water sewer also discharges to the brook at the west of the site.

A 910mm x 1140mm foul water culvert crosses the railway to the east of the site and passes beneath Kirkby Brook. The culvert then flows south-west parallel to Kirkby Brook and leaves the site under the A506.

Public sewers are typically subject to an easement set 6m either side from the centreline of the sewers (to be confirmed by UU). Any works within such easements will be subject to agreement with UU.

Highway drainage records indicate a 225mm surface water sewer crossing the site at the western boundary. Records also indicate gullies along Headbolt Lane connecting to small sections of carrier pipework with unconfirmed outfalls along the northern boundary of the site (see Appendix C).

2.2.6 Geotechnical Information

A ground investigation factual report for the site was issued by CC Geotechnical Ltd in November 2020.

Trial pits indicate sand and gravel subsoils with some areas of made ground.

Two soakaway tests were undertaken near to Kirkby Brook in accordance with BRE Digest 365. Test were undertaken at a level of 22.5m AOD and 24.2m AOD within sand strata and the infiltration rates were in the order of 10^{-5}m/s, indicating good potential for infiltration of surface water runoff.

Groundwater was not encountered in any of the trial pits undertaken on site or in either of the four boreholes undertaken down to a maximum depth of 24.51m AOD (boreholes were terminated at 1.3m to 2.7m depth as sandstone was encountered). Boreholes generally remained dry during groundwater monitoring at three intervals in the preceding 7-week period, with limited amounts of water encountered close to the bottom of two boreholes.

3 Development Proposals

Merseytravel is seeking to extend the Merseyrail network beyond the existing terminus at Kirkby Station to a new transport interchange at Headbolt Lane. The station will become the new interchange location between Merseyrail services to Liverpool and Northern Rail services to Wigan

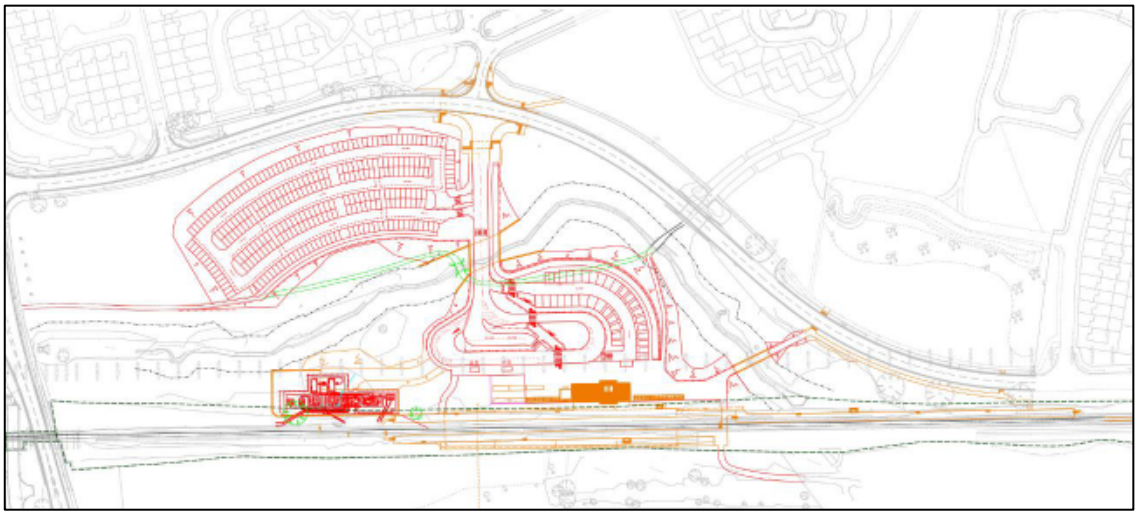


Figure 3 - Headbolt Lane New Station development proposals.

Headbolt Lane will be a three-platform station with a ticketing office, car park, cycle storage, drop-off area and bus interchange facilities. A substation serving the railway will also be located on the site.

Building threshold levels are set at approximately 30.0m AOD.

Vehicular access to the site will be provided from Headbolt Lane to the north with a new bridge over Kirkby Brook. Pedestrian and cycle access will also be provided to the east and to the west via new bridges over Kirkby Brook.

Earthworks are required to regrade the site into a profile suitable for the car park and access routes. Levels are to be increased south of Kirkby Brook to achieve the required levels for the station building and platforms and provide accessible gradients in the forecourt and parking areas.

North of Kirkby Brook site levels shall be reduced and raised to the north and south of the main car park respectively in order to achieve a favourable cut and fill balance across the site.

One of the two existing footbridges over Kirkby Brook is to be removed.

Modifications are also proposed to the existing railway and Kirkby Station west of the new station site. These works are within the existing railway corridor and do not include modifications to drainage systems and are therefore not assessed as part of this flood risk assessment.

3.1 Flood Vulnerability Classification

Flood vulnerability classifications are described in Table 2 of the Planning Practice Guidance for Flood Risk and Coastal Erosion.

Station buildings are considered as ‘less vulnerable’ development. The substation and associated electrical equipment are considered ‘essential infrastructure’. However, all development will be located within Flood Zone 1.

Bridges over Kirkby Brook shall be considered as ‘essential infrastructure’ for the purpose of determining climate change allowances.

4 Sequential Test

Paragraphs 157 and 158 of the NPPF describe the sequential, risk-approach to the location of development to avoid flood risk where possible. The sequential test seeks to steer new development away from areas of high flood risk to areas of lower flood risk.

As the development is entirely within Flood Zone 1, the Sequential Test does not apply to this site.

Proposed bridges crossing Kirkby Brook shall be designed in consultation with the Environment Agency to avoid increases in flood risk (see section 6).

5 Climate Change

To minimise vulnerability and provide resilience against the potential impacts of climate change, the proposed development will consider the potential for increases in peak river flow and peak rainfall intensity.

Climate change allowances are specified by the Environment Agency for different scenarios over different epochs2.

Peak river flow climate change allowances for the North West river basin area are provided in Table 1.

Table 1: EA peak river flow allowances (North West basin)

Allowance Category	Total Potential Change Anticipated for the '2020s' (2015-2039)	Total Potential Change Anticipated for the '2050s' (2040-2069)	Total Potential Change Anticipated for the '2080s' (2070-2115)
H++	25%	45%	95%
Upper End (90th percentile)	20%	35%	70%
Higher Central (70th percentile)	20%	30%	35%
Central (50th percentile)	15%	25%	30%

The upper end allowance shall be applied to the design of bridges spanning Kirkby Brook to determine span lengths and soffit heights.

Peak rainfall intensity climate change allowances are provided in Table 2.

Table 2: EA peak rainfall intensity allowances in small catchments (all of England)

Allowance Category	Total Potential Change Anticipated for the '2020s' (2015-2039)	Total Potential Change Anticipated for the '2050s' (2040-2069)	Total Potential Change Anticipated for the '2080s' (2070-2115)
Upper End (90th percentile)	10%	20%	40%
Central (50th percentile)	5%	10%	20%

Drainage systems shall be designed to ensure there is no increase in the rate of runoff discharged from the site for the upper end allowance during the life of the development.

[2] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

6 Site Specific Flood Risk

6.1 Fluvial Flood Risk

6.1.1 Environment Agency (EA) Flood Data

Flood risk information (product 4 data) was provided by the EA on 30 September 2020 (see Appendix D).

The flood zone map (Figure 4) shows that most of the site is located within flood zone 1, with the exception of areas immediately adjacent to Kirkby Brook. There are no formal EA raised defences associated with Kirkby Brook.

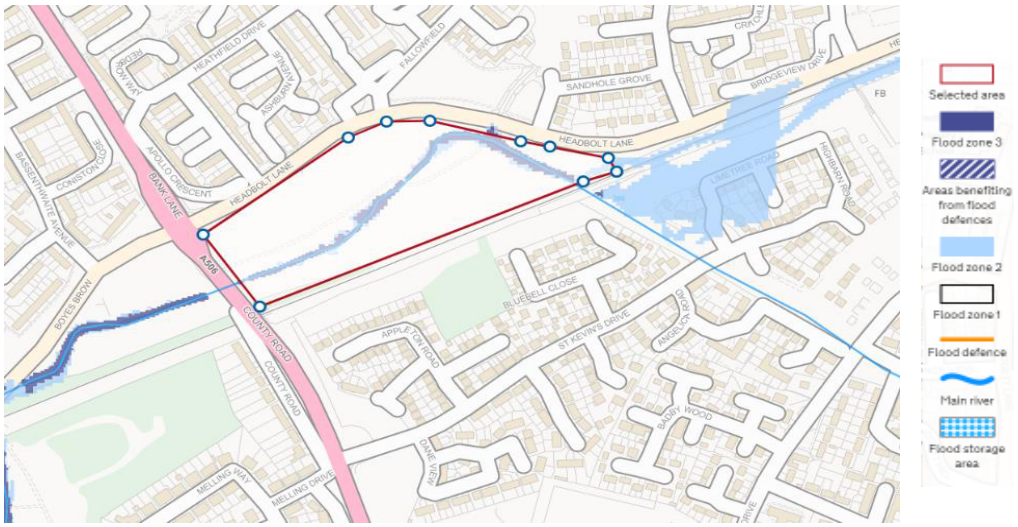


Figure 4 - EA Flood Zones

Hydraulic modelling data was also provided, showing flood flows and river levels for various node points along Kirkby Brook at different return periods.

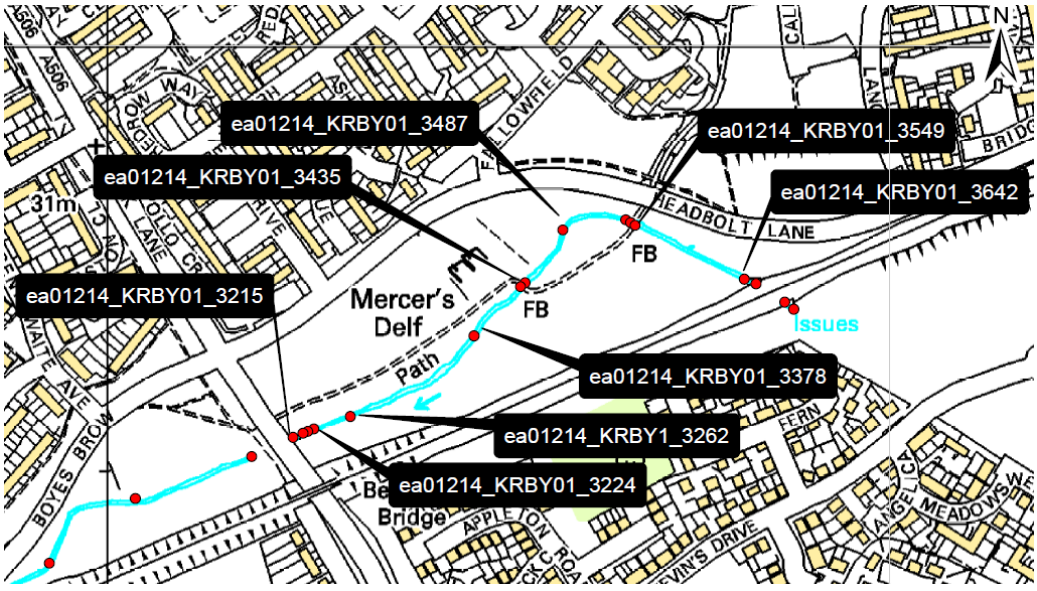


Figure 5 - Kirkby Brook Node Points

Node Point	Flood Flow (m^3s^{-1}) and Level (mAOD) data for a range of annual probability of flooding													
	0.1%+Climate change (+30%)		0.1%		1%+Climate Change (+70%)		1%+Climate Change (+35%)		1%+Climate Change (+30%)		1.0%		4.0%	
	Undefended		Undefended		Undefended		Undefended		Undefended		Undefended		Undefended	
Map ID	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
ea01214_KRBY01_3215	22.09	8.89	21.71	6.99	21.69	6.86	21.52	5.82	21.50	5.67	21.23	4.23	21.01	3.08
ea01214_KRBY01_3224	22.2	8.86	21.87	6.96	21.85	6.84	21.75	5.80	21.74	5.65	21.58	4.21	21.44	3.07
ea01214_KRBY01_3262	22.3	8.7	22.11	6.84	22.10	6.72	22.02	5.71	22.01	5.57	21.90	4.14	21.80	3.02
ea01214_KRBY01_3378	23.55	5.03	23.49	3.90	23.48	3.88	23.43	3.61	23.42	3.59	23.34	3.32	23.27	2.82
ea01214_KRBY01_3435	23.88	7.81	23.82	6.15	23.82	6.08	23.82	5.10	23.82	5.00	23.82	3.79	23.77	2.78
ea01214_KRBY01_3487	24.84	5.24	24.63	5.22	24.62	5.24	24.45	4.95	24.43	4.85	24.28	3.70	24.15	2.71
ea01214_KRBY01_3549	25.61	3.04	25.53	3.03	25.52	3.04	25.47	3.03	25.45	3.03	25.30	3.04	25.03	2.63
ea01214_KRBY01_3642	25.91	6.6	25.83	5.40	25.83	5.39	25.77	4.53	25.76	4.37	25.68	3.36	25.58	2.49
Level data in mAOD (metres above ordnance datum). Flow data in m^3 per second														
Data taken from 2017 Upper Alt Tributaries study														

Figure 6 - Kirkby Brook Node Point Data

The station building and substation are to be set at a level of approximately 30m AOD and 27m AOD respectively. The flood level at node point 3435 for the 0.1% annual exceedance probability with climate change (30%) is 23.88m AOD.

The risk of fluvial flooding to buildings and critical infrastructure is therefore considered to be negligible.

Furthermore, access routes and car parking are also to be positioned significantly higher than the maximum flood levels, resulting in negligible fluvial flood risk.

6.1.2 KMBC Strategic Flood Risk Assessment

As the Lead Local Flood Authority (LLFA), KMBC produced a Strategic Flood Risk Assessment (SFRA) in 2016. The report supports the EA data in confirming that the fluvial flood extents are confined within the immediate locality of Kirkby Brook. It also confirms that there is no risk to the site from tidal flooding.

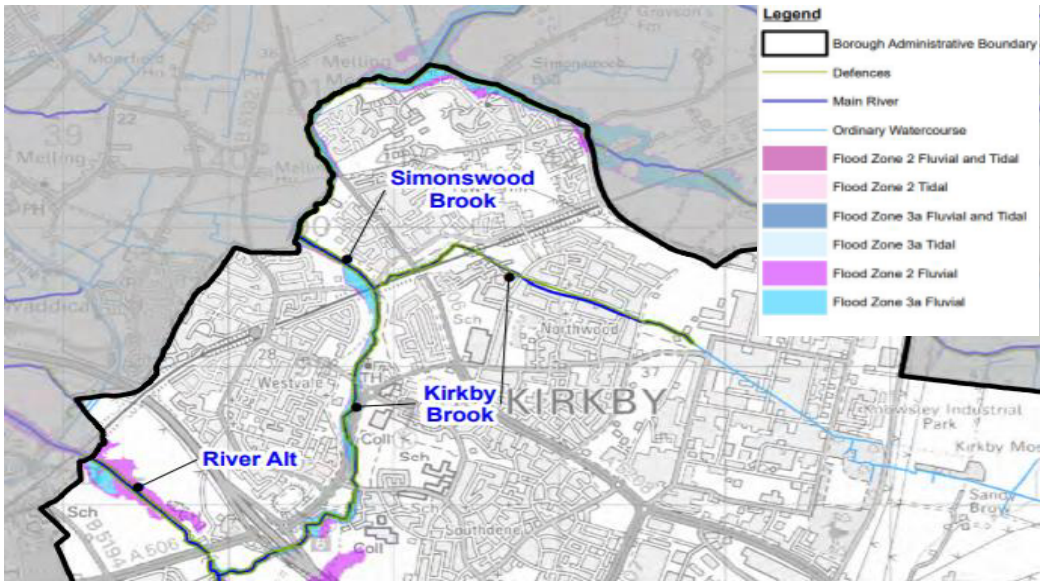


Figure 7 - KMBC Flood Risk Map - Extract from SFRA Figure B2-1 (2016)

6.1.3 Works adjacent to Kirkby Brook

To provide access to the new station, new crossings of Kirkby Brook are required. Works are also required in proximity to Kirkby Brook to provide the station car parks and supporting infrastructure.

A meeting was held with the Environment Agency on 9th September 2020 where the development proposals were discussed. The following points were noted:

- Activities within 8m of the banks of a main river are regulated activities under the Land Drainage Act 1991 requiring permits from the Environment Agency.
- Standard rules apply to some activities. Activities not included within the standard rules require bespoke permits.
- Bridges over Kirkby Brook are preferred over culverting.
- An unobstructed 8m corridor either side of the watercourse was requested for maintenance purposes.
- A blockage scenario should be considered for any bridges / culverts.
- A maintenance management plan is required.
- Temporary works permits may also be required, such as a Flood Risk Activity Environmental Permit for any temporary bridges or structures.

In response to the above meeting, an 8m buffer has been applied between the watercourse and the development proposals. Crossings of Kirkby Brook are also to be designed as bridges rather than culverts.

6.1.4 Bridge Design

Standard Rules SR2015 No28 for clear span bridges up to 8m span and 4.2m wide across a main river do not apply to this project.

The bridges crossing Kirkby Brook shall have a design life of 120 years. The minimum soffit levels have therefore been positioned above the 0.1% annual exceedance probability flood level of Kirkby Brook, with a further allowance for climate change. In accordance with CD 356[3], an additional freeboard allowance of 600mm shall be applied above the maximum flood level to determine the minimum soffit level.

For the road bridge the nearest available node from the Product 4 data is ‘ea012414_KRBY01_3435’ which indicates a 0.1% + CC undefended value of 23.88m AOD. Figure 8 below shows a proposed section for the new road bridge.

As indicated on the section there is a clearance of approximately 3.4m from this indicated flood level. Additionally, the proposed abutments have been positioned outside of the 8m easement from the top of bank. As a result, the proposed abutments sit clear of the extent of the flood extents and the bridge poses no impact on the exist functional floodplain.

[3] CD 356: Design of Highway Structures for Hydraulic Action, Rev01, Highways England, 2020

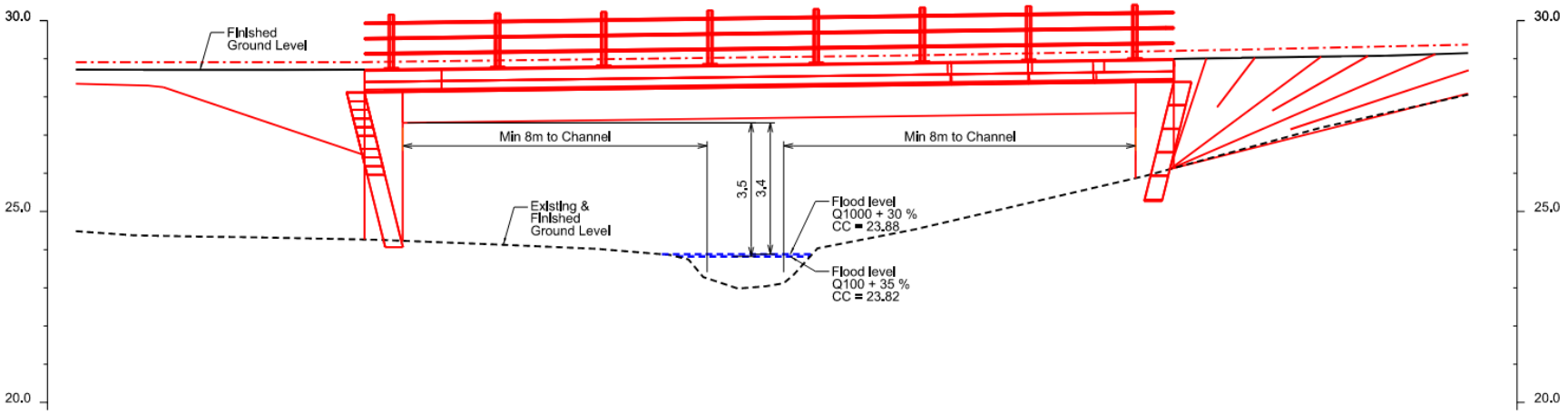


Figure 8 - Proposed Road Bridge Section

For the proposed footbridge the nearest available node from the Product 4 data is ‘ea012414_KRBY01_3642’ which indicates a 0.1% + CC undefended value of 25.91m AOD. Figure 9 below shows a proposed section for the new footbridge. As indicated on the section there is a clearance of approximately 1.3m from this indicated flood level. Additionally, the proposed abutments have been positioned outside of the 8m easement from the top of bank.

The two small concrete footbridges over Kirkby Brook are to be removed. It is not anticipated that this will have any detrimental effect on flood risk, either within the site or downstream.

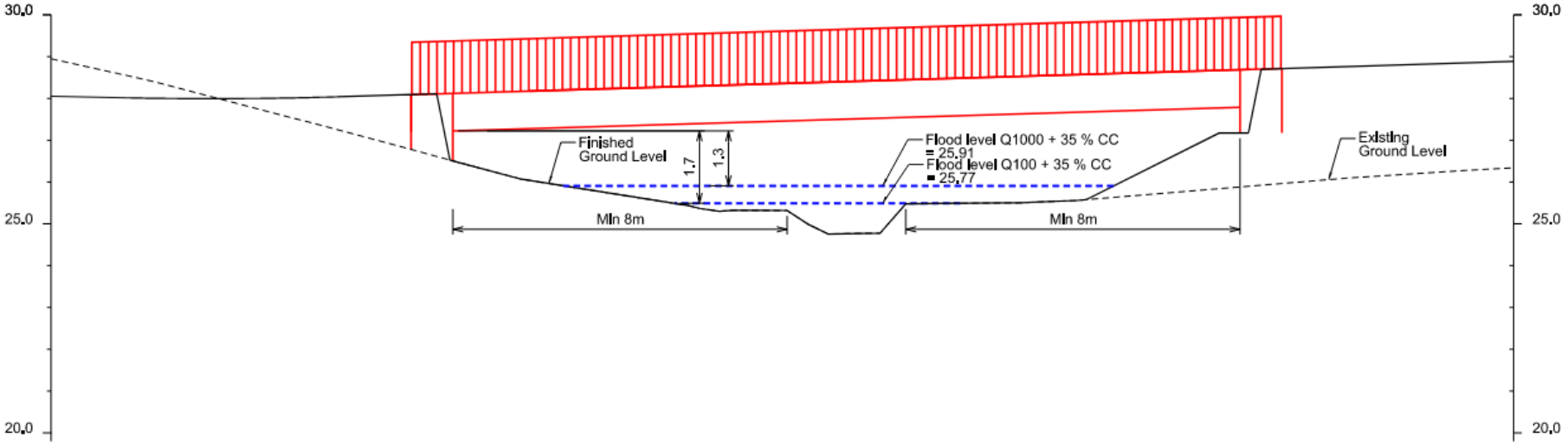


Figure 9 - Proposed Footbridge Section

6.2 Surface Water (Pluvial) Flood Risk

6.2.1 EA Flood Risk Data

The EA surface water flood map (Figure 10) indicates that there is a very low risk of surface water flooding across the majority of the site, with areas of increased flood risk constrained to the immediate vicinity of Kirkby Brook.

The EA surface water flood risk map is based on a rainfall modelling applied to the site topography. It is therefore expected that accumulations of surface water will occur along the lowest site levels coincident with Kirkby Brook. When assessing flood risk from Kirkby Brook, it is however considered more appropriate to use the fluvial flood modelling described in section 7.1.

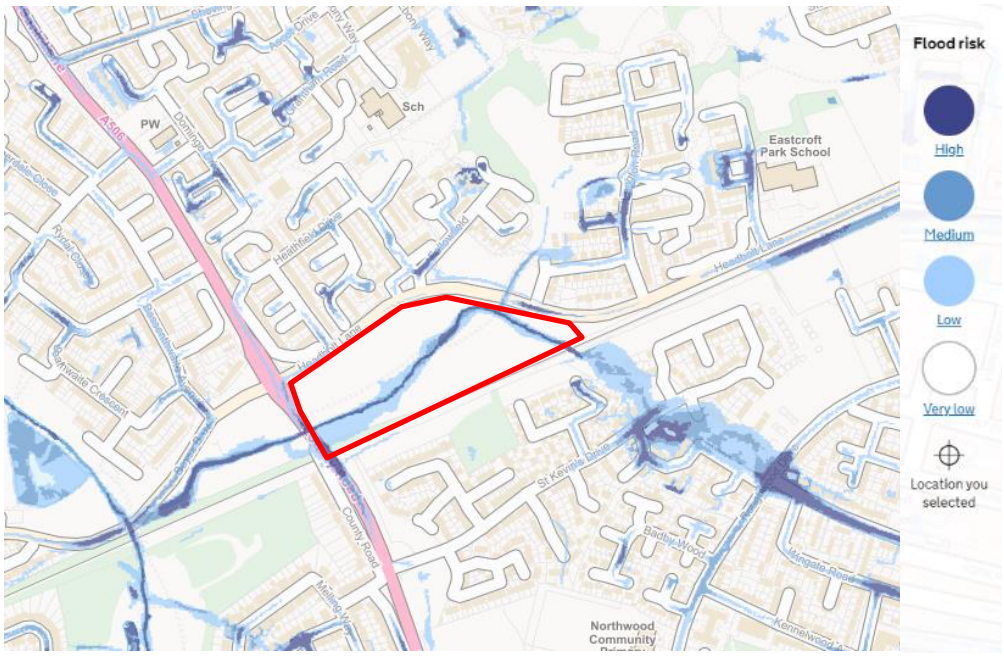


Figure 10 - Environment Agency Surface Water Flooding (site boundary shown in red).

6.2.2 KMBC Flood Risk Data

Within the Preliminary Flood Risk Assessment Report produced by KMBC in June 2011, a surface water flood event is recorded at the A506 County Road, adjacent to the Headbolt Lane site.



Figure 11 - Extract of Historic Surface Water Flooding Incidents from PFRA

KMBC were contacted to ascertain if any historic flooding records were kept for the proposed development site and surrounding area. The LLFA stated that historic records of flooding were not kept (see Appendix E).

Surface water flood risk posed by the new development shall be mitigated by ensuring surfaces drain away from buildings and critical infrastructure, and that exceedance paths are created to divert flows towards Kirkby Brook in the event of a failure of the drainage systems.

6.3 Sewer Flood Risk

United Utilities were contacted for records of any historic sewer flooding in the area. At the time of writing, no response had been provided (see Appendix F).

KMBC were contacted for records of highway drainage flooding in the area. There were no records of highway drainage flooding (see Appendix E).

6.4 Groundwater Flood Risk

Data within the KMBC Preliminary Flood Risk Assessment (PFRA) indicates that the Headbolt Lane site is not at risk from groundwater flooding.

Furthermore, no groundwater was encountered in trial pit excavations undertaken as part of the ground investigations, and borehole monitoring identified limited groundwater above the base of the boreholes during the monitoring period.

The risk from groundwater flooding is therefore considered to be very low.

6.5 Other Sources of Flood Risk

The risk of flooding from reservoirs considers the inundation predicted to occur following failure of major water retention structures.

Environment Agency data does not identify any flood risk to the Headbolt Lane site from reservoirs.

6.6 Flood Risk Summary

Fluvial flood risk associated with Kirkby Brook is constrained within the immediate vicinity of the watercourse and is unlikely to pose a risk to the development based on the proposed elevations.

All other sources of flood risk are considered to be negligible.

Bridges over Kirkby Brook should be designed in accordance with EA requirements to ensure flood risk is not increased and maintenance operations are not adversely impacted.

Surface water should be managed in accordance with EA and LLFA requirements to ensure flood risk is not increased (see Section 7).

7 Surface Water Management

7.1 Existing Surface Water Drainage

There are currently no artificial drainage systems providing drainage for the site. Surface water is assumed to infiltrate and travel over land to Kirkby Brook.

7.2 Proposed Surface Water Drainage

7.2.1 Design Basis

Surface water run-off shall be collected, conveyed, treated (where appropriate) and discharged in accordance with the following hierarchy:

1. Infiltration to ground,
2. Discharge to watercourse,
3. Discharge to surface water sewer,
4. Discharge to combined water sewer.

Due to the severance imposed by Kirkby Brook, the site has been divided into two catchment areas:

- Northern catchment; incorporating car parking and access routes.
- Southern catchment; incorporating parking, drop-off facilities, station building, substation, platforms, public realm and track drainage.

Although some infiltration may be possible, it is anticipated that an outfall will still be required for each catchment into Kirkby Brook.

In accordance with KMBC requirements[4] the site is considered to be 'greenfield'. Peak surface water run-off rates and volumes are therefore to be limited as close as reasonably practicable to greenfield runoff rates.

The theoretical greenfield run-off rates for each catchment are provided in Table 3 (based on the IH124 method. SAAR=856mm, SOIL Type 2, SPR=0.3).

Table 3: Catchment area greenfield run-off rates

Catchment	Area (Ha)	Greenfield Run-off Rates (l/s)			
		QBar	Q1yr	Q30yr	Q100yr
Northern	0.71	1.64	1.42	2.78	3.41
Southern	1.41	3.25	2.83	5.53	6.76

[4] Knowlsey MBC Sustainable Drainage & Surface Water Management Technical Guidance for Developers, Knowsley MBC, August 2016

Following a meeting with KMBC on 4th September 2020, it was agreed that in order to reduce the risk of blockages which may increase flood risk, discharge rates to Kirkby Brook should be limited to the greenfield run-off rate applicable to the catchment or 5l/s; whichever is greater (see Appendix E).

KMBC technical guidance requires the flows up to the 1 in 30-year critical rainfall event are retained within the drainage system. However, in the absence of detailed proposals to understand exceedance flows resulting from 100-year return period rainfall events, it has been assumed that 100-year return period volumes shall also be contained within the site drainage systems.

The attenuation volumes required to achieve the agreed discharge rates for each catchment are presented in Table 4 based on Microdrainage Quick Storage Estimates, both with and without infiltration. Volumes are based on an M5-60 of 19.700 and a Ratio R of 0.382. A 40% uplift in rainfall rates to allow for climate change (see section 5) has also been included.

Table 4 - Catchment Attenuation Estimates

Catchment	Area (Ha)	Required Attenuation for different scenarios (m^3) (100-year return period +40% climate change allowance)		
		No infiltration 5l/s outfall	$1x10^{-5}$ m/s Infiltration Rate 5l/s outfall	$1x10^{-5}$ m/s Infiltration Rate No outfall
Northern	0.71	418 – 577	217 – 492	228 – 577
Southern	1.41	1003 – 1360	442 – 1051	453 – 1147

The volumes shown in Table 4 may be reduced during detailed design to accommodate only the 30-year return period if it can be demonstrated that exceedance flows for the 100-year return period can be safely managed within the curtilage of the site with minimal risk to people or property.

The feasibility of infiltration systems will be investigated further during detailed design, and will be dependent on:

- Spatial constraints.
- Presence of rock strata or areas of lower infiltration potential.
- Proximity of buildings, railway infrastructure and Kirkby Brook.
- Long term groundwater levels.

Measures to control water quality will be incorporated into the design. Where SuDS features can provide both an attenuation and treatment function these will be considered. Where attenuation does not provide a treatment function (e.g. storage tanks) a secondary treatment system may be required (e.g. petrol interceptors).

7.2.2 Drainage Strategy

An outline drainage strategy has been developed for the two catchments as shown in drawing 170248-15854-ZZ-ZZZ-DRG-Z-MF-243009 (see Appendix G)

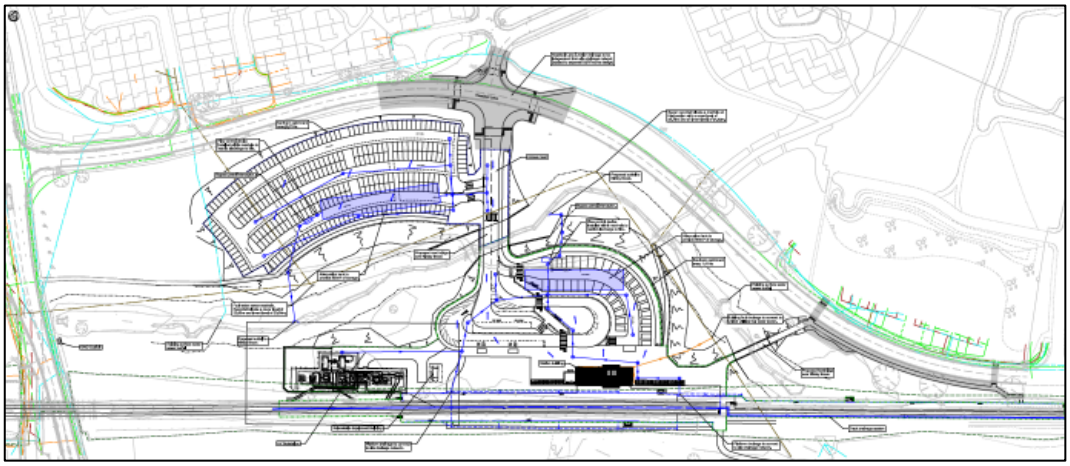


Figure 12 - Outline Drainage Strategy

The northern catchment consists of the main 270 space car park and northern portion of the access road up to the road bridge. This area will be drained to an attenuation tank beneath the car park, discharging into Kirkby Brook via a flow control device and petrol interceptor. An allowance has been made in the sizing of the northern catchment attenuation tank to allow for potential future expansion of the car park.

The southern catchment consists of the southern access roads, drop off area, public realm, station building, platforms and track drainage. An under-track crossing (UTX) is required to connect the southern Merseyrail platform into the downstream drainage network. Some attenuation within the track drainage catchment is anticipated, reducing the size of the car park attenuation system.

The proposed sustainable drainage system components will all be maintained by Merseytravel for the design life of the development.

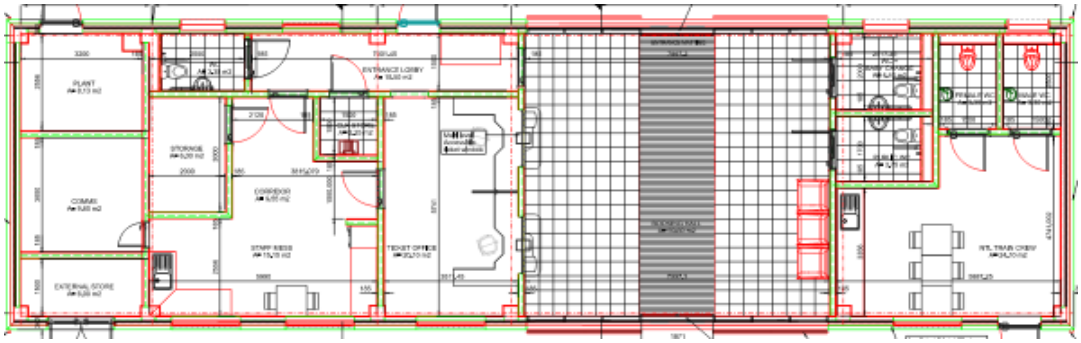
A Knowsley CC SuDS pro-forma has been completed for the site based on the current level of design and is provided in Appendix H. An updated pro-forma or reserved matters pro-forma shall be submitted following detailed design.

7.2.3 Highway Drainage

A new signalised junction is to be provided on Headbolt Lane to provide access to the site. Alterations to the highway drainage systems are to be designed under a separate design package implemented under Section 278/38 agreements. Drainage systems shall be designed in accordance with the Highway Authority and LLFA technical and sustainability requirements.

8 Foul Drainage

Station building foul flows have been determined based on the sanitary appliances shown on architectural layout 170248-15854-ZZ-ZZZ-DRG-A-AR-013002 A02.



The estimated peak foul discharge rate has been determined using the Discharge Unit Method (System III) in accordance with *BS EN 12056-2: Gravity drainage systems inside buildings – Part 2: Sanitary pipework, layout and calculation.*

Table 5 - Calculated Station Building Discharge Units

Appliance	Discharge Units (DU) per appliance	Quantity	ΣDU
Wash Basin	0.3	5	1.5
WC with 6.0l cistern	1.5	5	7.5
Kitchen Sink	1.3	2	2.6
Dishwasher	0.2	2	0.4
Cleaner's Sink	1.3	1	1.3
		Total	13.3

Table 6: Estimated Peak Foul Flow Rate

ΣDU	Frequency Factor	Discharge Rate (l/s)
13.3	0.7	2.55

The external foul drainage network is proposed to discharge into the United Utilities foul sewer running through the site (subject to application).

An indicative discharge route is shown on drawing 170248-15854-ZZ-ZZZ-DRG-Z-MF-243009 (see Appendix G).

9 Residual Flood Risk

The residual flood risk from all sources is considered to be very low.

Fluvial risk to the development is negligible, and any potential increases in flood risk off site will be mitigated through effective surface water management.

During Kirkby Brook flood events the flood extents shall be contained within the immediate vicinity of the watercourse and pose little risk to users of the site. However, should the bridge routes be deemed unsafe for any reason during a flood event, alternative egress routes are available to the south of the station.

Blockages beneath the bridge structures can be mitigated by providing clear spans over the watercourse and applying freeboard above the maximum flood levels to account for debris. The likelihood of large items of debris occurring is however low, given the throttling effect of the upstream culvert under the railway and minimal trees and vegetation along the watercourse within the site.

Should the site drainage infrastructure fail, exceedance routes would channel flows away from buildings and critical infrastructure and into Kirkby Brook. The probability of failure can be managed and reduced by effective and routine maintenance of the site drainage systems.

10 Conclusions

This Flood Risk Assessment has been prepared by Arup on behalf of BGCL to assess the risk of flooding both to and as a result of the proposed development at the time of writing.

Proposals have been considered in relation to the NPPF and the sequential test is deemed not to apply, as all development is to be within Flood Zone 1.

Information relating to historical and potential future flooding has been obtained, and the risk to the site from fluvial, pluvial, sewer, groundwater, tidal and reservoir flooding has been assessed.

The risk of fluvial flooding from Kirkby Brook is considered to be very low. All buildings and railway infrastructure are to be significantly higher than the maximum predicted flood level.

The risk of flooding from other sources is negligible.

Bridges and surface water drainage system designs should be undertaken in accordance with EA and LLFA requirements to ensure flood risk is not increased, both on and off-site.

An outline drainage strategy has been presented which demonstrates how surface water can be attenuated and infiltrated (if possible) to achieve the allowable discharge rates agreed with KMBC. Highway drainage systems shall be designed as a separate S278/38 package in agreement with KMBC.

The residual risks associated with fluvial and pluvial flooding can be mitigated through effective and ongoing maintenance of the drainage systems and bridges.

Appendix A

EA Flood Map

Flood map for planning

Your reference	Location (easting/northing)	Created
Headbolt Lane	**341362/399767**	**12 Nov 2020 12:35**

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/



Environment Agency

Flood map for planning

Your reference
Headbolt Lane

Location (easting/northing)
341362/399767

Scale
1:2500

Created
12 Nov 2020 12:35

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

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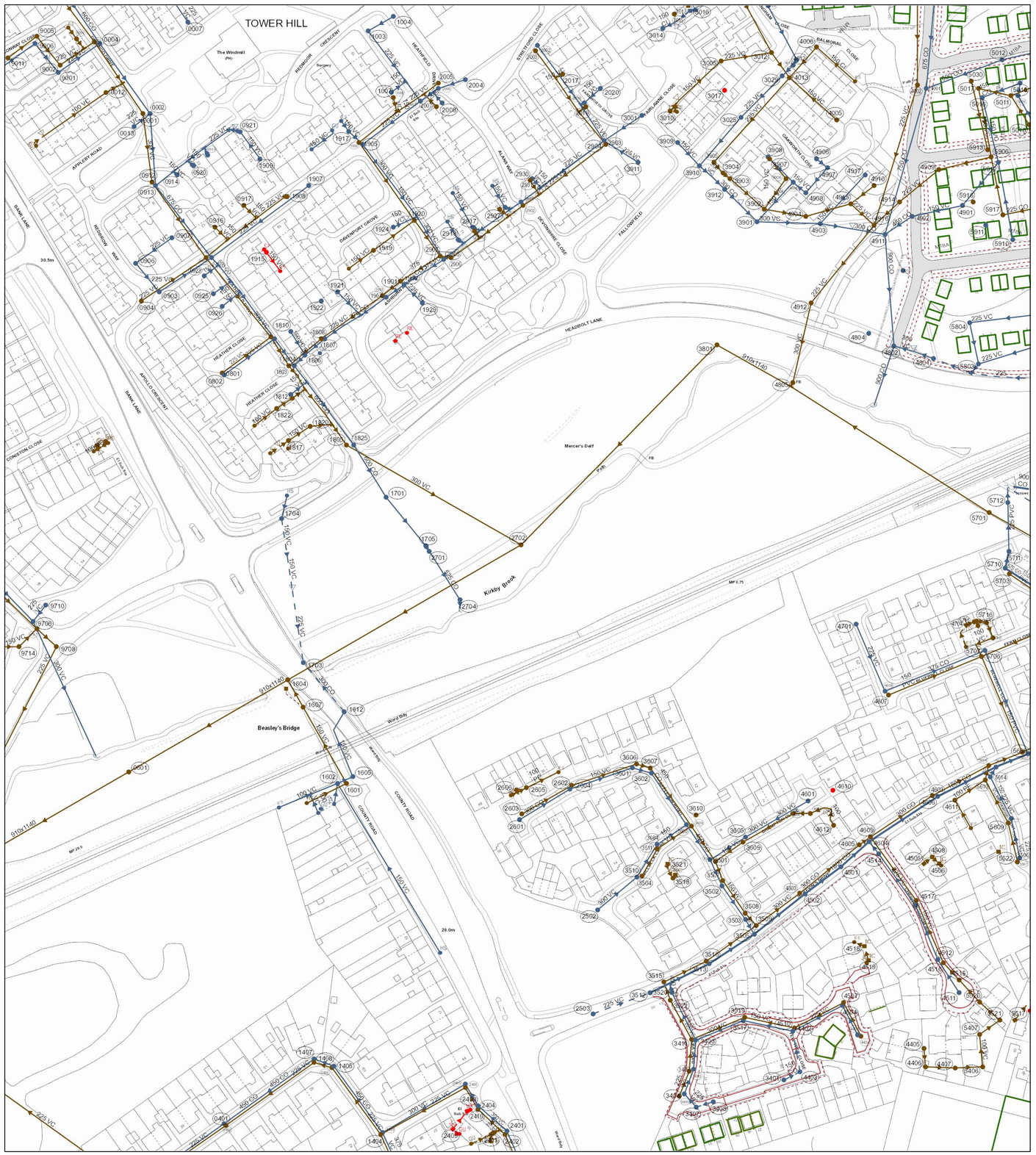
Appendix B

UU Sewer Records



The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
1807	31.43	FO	27.12	225			VC	23.43075	1 in 123
2403	29.5	SW	25.17	300			VC	13.89244	1 in 99
1917		SW		150			VC	10.48044	
0925	31.46	SW	29.7	150			VC	12.20656	
0901	31.3	FO	27.25	300			VC	56.85068	1 in 203
2020	30.83	SW	29.98	150			VC	12.04159	1 in 50
2903	30.68	SW	29.35	225			VC	57.20193	1 in 204
3410	30.78	FO	28.58	150			VC	17.7279	1 in 35
3404	30.61	SW	28.95	225			VC	14.67051	1 in 82
0916	31.79	SW	28.48	150			VC	14.899495	
5407		FO		100			VC	13.684	
5407		FO		100			VC	13.684	
3601	30.26	SW	27.89	375			CO	10.95046	1 in 68
9005	31.34	FO	29.26	225			VC	20.61553	1 in 129
9005	31.34	FO	29.26	225			VC	20.61553	1 in 34
2503	30.27	SW	28.3	225			CO	33.81273	1 in 23
3001	30.57	SW	29.44	225			VC	25.23886	1 in 315
9001	31.45	SW	29.65	225			VC	28.01785	1 in 140
9001	31.45	SW	29.65	225			VC	28.01785	1 in 140
4909	29.54	FO	25.54	225			VC	28.42534	1 in 60
4909	29.54	FO	25.54	225			VC	28.42534	1 in 60
4909	29.54	FO	25.54	225			VC	28.42534	1 in 60
2003	32.1	FO	29.1	225			VC	65.05355	1 in 107
4908	29.97	SW	27.96	150			VC	9.215544	1 in 77
3906	30.29	FO	29.13	150			VC	20.80865	1 in 110
4403	31.59	SW	29.8	225			CO	22.96506	1 in 64
5801		SW	0	225			CO	42.29657	
2704	23.82	SW	22.48	525			CO	5	
5803		SW	0	225			VC	6.403124	
5803		SW	0	225			VC	6.403124	
3401	31.57	SW	30	150			CO	10.04265	1 in 50
4013	31.06	FO	27.6	225			VC	63.03174	1 in 75
9714		FO		150			VC	14.01302	
9714		FO		150			VC	14.01302	
6707	29.26	SW	25.11	910			VC	132.0016	1 in 73
4402	31.2	SW	29.44	300			VC	28.05552	1 in 60
2401	30.87	SW	29.31	300			VC	21.26029	1 in 177
4502	31.35	SW	26.78	1800			CO	25.00203	1 in 833
3509	31.04	FO	25.86	300			VC	30.02096	1 in 143
9704	27.32	FO	25.63	225			VC	43.13931	1 in 34
5017	29.76	FO	26.26	225			VC	38.63936	
5017	29.76	FO	26.26	225			VC	38.63936	
5012	29.76	FO	26.26	225			VC	38.63936	
1825		SW	0	225			CO	34.1321	
2602	29.79	SW	28.09	375			CO	36.75352	1 in 184
5016		SW	0	150			VC	37.10795	
5016		SW	0	150			VC	37.10795	
5016		SW	0	150			VC	37.10795	
0917	31.82	FO	28.87	150			VC	9.899495	
4601	31.38	SW	27.17	300			VC	40.2027	1 in 236
3510	30.36	FO	27.46	150			VC	17.21804	1 in 44
3501	31.02	SW	27.43	525			CO	15.87348	1 in 397
5711	28.9	SW	26.78	225			PVC	27.05519	1 in 193
5711	28.9	SW	26.78	225			PVC	27.05519	1 in 193
4917	29.94	SW	28.67	150			VC	36.79674	1 in 78
5603	30.72	SW	26.63	1800			CO	19.25487	
5603	30.72	SW	26.63	1800			CO	19.25487	
2002	32.01	SW	29.57	225			VC	64.65813	1 in 359
4907	29.95	SW	28.32	150			VC	18.43909	1 in 58
5707	29.8	SW	28.3	375			CO	62.18846	1 in 311
5707	29.8	SW	28.3	375			CO	62.18846	1 in 311
2406	29.56	FO	25.18	225			VC	53.7122	1 in 244
1929	31.13	SW	29.56	225			VC	14.14214	1 in 17
5917		FO	0	225			CO	32.83871	
5917		FO	0	225			CO	32.83871	
5917		FO	0	225			CO	32.83871	
1701	30.84	SW	26.62	600			CO	34.82815	1 in 59
2917	31.71	SW	29.7	150			VC	4.472136	
3909	30.37	SW	27.76	150			VC	17.69181	1 in 111
4504	31.88	SW	29.94	225			VC	31.03691	1 in 62
3911	30.6	SW	29.39	225			VC	22.4722	
1612		SW		300			CO	35.47498	
4605	31.39	FO	25.42	300			CO	7.582403	1 in 13
9006	31.29	SW	29.73	225			VC	20.61553	1 in 258
9006	31.29	SW	29.73	225			VC	20.61553	1 in 258
1908	31.64	FO	29.87	225			VC	1	
4613		FO		150			PE	9.47537	
5019	30.26	SW	27	450			CO	20.59126	1 in 206
5019	30.26	SW	27	450			CO	20.59126	1 in 206
3504	30	SW	27.98	300			VC	21.3102	1 in 118
4606	31.09	FO	25.21	300			CO	35.53006	1 in 209
4606	31.09	FO	25.21	300			CO	35.53006	1 in 209
0920	31.61	SW	29.28	150			VC	4.24264	
5906		FO	0	225			VC	29.83287	
5906		FO	0	225			VC	29.83287	
5906		FO	0	225			VC	29.83287	
1601		FO	0	225			VC	17.43475	
4914	28.91	FO	25.07	225			VC	19.10497	1 in 478
3803	30.27	FO	26.39	225			VC	25.4951	1 in 121
4405		FO		100			VC	10.21893	
4405		FO		100			VC	10.21893	
0914	31.57	SW	29.32	150			VC	2.828427	
4512	32.01	SW	29.81	225			VC	32.63921	1 in 80
4512	32.01	SW	29.81	225			VC	32.63921	1 in 80
0002	31.71	SW	28.99	675			CO	40.11234	1 in 267
4912	26.31	FO	23.24	300			VC	45.40496	1 in 91
1811	31.05	SW	28.58	150			VC	11.40175	
3406	30.43	SW	28.42	375			CO	29.65708	1 in 135
9011	31.22	FO	29.42	225			VC	20	1 in 133
9011	31.22	FO	29.42	225			VC	20	1 in 133
2604	29.85	FO	27.28	150			VC	37.81775	1 in 14
5703	28.86	FO	27.31	150			PVC	34.08995	1 in 62
5703	28.86	FO	27.31	150			PVC	34.08995	1 in 62
3605	31.21	SW	27.59	300			VC	23.31446	1 in 123
0906	30.66	SW	29.38	225			VC	20.61553	
9710	26.74	SW	24.77	225			VC	11.40175	1 in 19
9710	26.74	SW	24.77	225			VC	11.40175	1 in 19
1810	31.35	SW	29.75	150			VC	15.26434	1 in 39
5009	30.32	SW	26.9	450			CO	7.071068	
5009	30.32	SW	26.9	450			CO	7.071068	
5009	30.32	SW	26.9	450			CO	7.071068	
1915		CO		150			VC	13.00664	
2902	31.12	FO	28.16	225			VC	49.41649	1 in 176
1004	32.14	SW	29.6	225			VC	16.12452	
4802	28.05	SW	24.93	900			CO	34.78505	1 in 72
3507	31.09	FO	26.37	150			VC	22.07093	1 in 123
1903	31.29	FO	27.49	225			VC	41.61731	1 in 122
5521		FO		100			VC	14.9993	
5521		FO		100			VC	14.9993	
1909	31.76	SW	30.07	150			VC	18.60108	1 in 124
4605	31.39	FO	26	300			CO	41.18535	1 in 52
5011	29.98	FO	26.35	225			VC	18.43909	1 in 205
5011	29.98	FO	26.35	225			VC	18.43909	1 in 205
1705	28.46	SW		300			VC	3.605551	
4404	31.77	FO	30.1	150			VC	21.0787	1 in 60
1605		SW		150			VC	39.84798	
1704	28.35	SW	26.72	150			VC	40.4475	1 in 22
1008	31.74	SW	30.44	150			VC	10	
2006	31.71	SW	30.39	225			VC	12.20788	1 in 136
4515	32.16	FO	30.01	150			VC	13.06205	1 in 59
4515	32.16	FO	30.01	150			VC	13.06205	1 in 59
2402	29.36	FO	25.43	225			VC	20.51828	1 in 410
1805	29.66	FO	0	300			VC	111.7183	
4407		FO		100			VC	15.21325	
4407		FO		100			VC	15.21325	
5506		FO	0	150			VC	22.11762	
5506		FO	0	150			VC	22.11762	
2930	31.18	SW	28.86	150			VC	9.433981	
3519	31.04	FO	28.77	150			VC	31.93406	1 in 46
5910		SW	0	150			VC	43.73785	
5910		SW	0	150			VC	43.73785	
5910		SW	0	150			VC	43.73785	
2008	31.81	SW	30.54	150			VC	7.81025	
4511	32.25	SW	30.08	225			VC	21.75632	1 in 81
4511	32.25	SW	30.08	225			VC	21.75632	1 in 81
4516	32.05	FO	29.79	150			VC	37.71054	1 in 82
4516	32.05	FO	29.79	150			VC	37.71054	1 in 82
4701	30.24	SW	28.89	225			VC	40.61703	1 in 156
1902	31.03	SW	28.57	375			CO	12.20656	1 in 94
1002	31.65	SW	30.3	225			VC	40	1 in 93
0012		FO		100			VC	10.4666	
0012		FO		100			VC	10.4666	
1003		SW	0	225			VC	48.60147	
3901	30.03	SW	26.94	300			VC	35.01428	1 in 74
0902	31.3	SW	28.64	600			CO	57.07134	1 in 89
4503	31.34	FO	25.65	300			CO	42.7296	1 in 188
3608	30.76	FO	26.63	150			VC	23.81714	1 in 140
2901	31.11	SW	29.06	300			VC	53.63418	1 in 173
5008	29.89	FO	26.52	225			VC	16.15549	1 in 124
5008	29.89	FO	26.52	225			VC	16.15549	1 in 124
0003	31.38	FO	28.72	300			VC	48.25971	1 in 322
0003	31.38	FO	28.72	300			VC	48.25971	1 in 322
4910	29.99	FO	28.54	225			VC	16.40122	1 in 32
5912		SW	0	150			VC	31.241	
5912		SW	0	150			VC	31.241	
5912		SW	0	150			VC	31.241	
9707	26.31	FO	24.36	225			VC	14.86607	1 in 31
9707	26.31	FO	24.36	225			VC	14.86607	1 in 31
5520		FO		100			VC	16.67292	
5520		FO		100			CO	16.67292	
3502	31.06	SW	27.39	525			CO	22.81267	1 in 456
4916	28.45	FO	24.96	225			VC	55.44366	1 in 32
3010		FO		150			VC	7.853765	
1907	31.53	SW	30.25	225			VC	67.20119	1 in 103
4915	29.58	FO	25.23	225			VC	17.69181	1 in 68
3609	31.2	FO	28.55	150			VC	18.57282	1 in 56
3905	30.46	FO	26.75	225			VC	7.81025	1 in 71
1820		FO		150			VC	12.3454	
1806	31.36	SW	28.09	450			CO	8.485281	1 in 106
2701	28.07	SW	23.11	525			CO	31.99611	1 in 55
1607	27.85	SW	24.16	450			CO	31.61159	1 in 137
3505	31.06	SW	26.84	1800			CO	35.94825	1 in 599
1904	31.29	SW	29.42	375			CO	28.86655	
3607	30.35	FO	26.9	150			VC	39.37163	1 in 146
5802		SW	0	225			VC	40.80441	
4602	31.47	FO	28.28	150			VC	32.2106	1 in 119
4611		FO		100			PE	20.19467	
4611		FO		100			PE	20.19467	
0004	31.38	SW	29.11	675			CO	48.01041	1 in 400
0004	31.38	SW	29.11	675			CO	48.01041	1 in 400
1404	27.76	FO	24.94	225			VC	45.80393	1 in 229
1405	27.95	SW	24.22	450			CO	11.7047	1 in 195
3520	30.57	SW	28.2	450			CO	5.322576	1 in 4
5012	30.11	SW	28.1	600			CO	44.94441	1 in 562
5012	30.11	SW	28.1	600			CO	44.94441	1 in 562
5012	30.11	SW	28.1	600			CO	44.94441	1 in 562
4012	31.16	SW	28.59	225			VC	8.485281	1 in 849
5804		SW	0	225			VC	23.5372	
5804		SW	0	225			VC	23.5372	
2931	31.16	SW	29.76	150			VC	7.071068	

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
4005		FO		150			VC	35.14705	
2702	22.93	FO	20.06	910			BR	149.8072	1 in 161
3512	30.97	SW	26.86	1800			CO	36.61511	1 in 915
4903	29.61	SW	26.44	300			VC	18.24829	1 in 65
4911	28.52	SW	25	900			CO	62.20129	1 in 622
9002	31.44	FO	29.08	225			VC	23.02173	1 in 64
9002	31.44	FO	29.08	225			VC	23.02173	1 in 64
4003	31.74	SW	28.29	675			CO	56.22277	1 in 156
2019	30.84	FO	29.14	150			VC	5	
3905		FO	0	225			VC	28.36666	
2904	30.64	FO	28.47	225			VC	57.21708	1 in 191
1604	22.47	FO	18.48	910			BR	101.9333	1 in 170
0907	30.79	SW	29.9	225			VC	24.41311	1 in 50
3508	31.02	FO	26.19	150			VC	9.081024	1 in 48
3409	30.63	FO	28.76	150			VC	14.94252	1 in 83
4906	30.01	SW	28.34	150			VC	7.81025	1 in 391
3408	30.59	SW	29.15	225			VC	9.875487	1 in 99
2411		FO		150			VC	4.448529	
5604	30.75	FO	25.04	300			CO	19.99973	
5604	30.75	FO	25.04	300			CO	19.99973	
1007	31.81	FO	29.38	150			VC	8.246211	
3910	30.23	SW	27.52	300			VC	9.215544	1 in 51
3411	30.5	FO	28.08	225			VC	24.79506	1 in 14
4510	31.25	FO	29.25	150			VC	28.28353	1 in 59
0912	31.38	FO	28.35	300			VC	51.61395	1 in 215
5712	28.42	SW	26.64	225			PVC	8.550988	1 in 143
5712	28.42	SW	26.64	225			PVC	8.550988	1 in 143
0913	31.36	SW	28.81	675			CO	50.60632	1 in 361
5406		FO		100			VC	18.0211	
5406		FO		100			VC	18.0211	
2007	31.83	FO	29.75	150			VC	9.899495	
3407	30.7	SW	29.05	225			CO	9.662057	1 in 99
5701	28.07	FO	22.66	910			BR	177.588	1 in 171
5701	28.07	FO	22.66	910			BR	177.588	1 in 171
2017	31.44	FO	29.16	150			VC	4.472136	
1403	27.82	SW	24.43	450			CO	45.80393	1 in 241
3917	30.96	SW	28.97	300			CO	28.56327	1 in 52
4603	31.06	SW	26.93	1800			CO	36.26271	1 in 121
4603	31.06	SW	26.93	1800			CO	36.26271	1 in 121
9708	26.1	FO	23.88	225			VC	4.472136	
4011	31.22	SW	28.62	225			VC	3.605551	1 in 120
2906	31.18	FO	27.86	225			VC	6.082763	1 in 608
0923	31.37	SW	29.57	150			VC	10	
0904	31.13	FO	28.25	225			VC	43.26662	1 in 155
1803	30.3	FO	0	300			VC	7.81025	
2404	29.5	FO	25.37	225			VC	13.89244	1 in 99
5610		FO	0	150			VC	8.181245	
5610		FO	0	150			VC	8.181245	
3801	24.75	FO	21.62	910			BR	155.331	1 in 177
4006		FO		150			VC	22.74706	
1408	27.88	FO	24.73	225			CO	60.21628	1 in 68
1802	30.57	SW	27.98	600			CO	18.60108	1 in 116
4901	28.77	SW	0	150			VC	28.63564	
4901	28.77	SW	0	150			VC	28.63564	
4004	32.17	FO	27.75	225			VC	53	1 in 120
5507		SW	0	225			VC	22.49528	
5507		SW	0	225			VC	22.49528	
1906	31.42	SW	29.87	300			VC	25	
2927	31.28	FO	28.41	150			VC	6.403124	
0802	30.49	SW	28.89	225			VC	34.4093	1 in 58
0901	22.24	FO	17.18	910			BR	108.7633	1 in 175
0901	22.24	FO	17.18	910			BR	108.7633	1 in 175
2916	31.71	FO	28.41	150			VC	6	
4501		SW	26.75	1800			CO	20.94382	1 in 62
5709	29	SW	27.07	675			CO	36.0834	1 in 172
1812	31.09	FO	27.43	150			VC	8.602325	
3912	30.22	SW	27.12	300			CO	12.72792	1 in 141
3516	30.9	FO	26.06	300			CO	34.0735	1 in 170
5607	30.1	FO	0	300			VC	18.32638	
5607	30.1	FO	0	300			VC	18.32638	
3503	31.02	SW	26.41	525			CO	9.427285	1 in 236
3506	31.04	FO	26.46	150			VC	11.34394	1 in 126
3405	30.74	SW	28.77	225			VC	16.12307	1 in 46
0001	31.68	FO	28.57	300			VC	38.32754	1 in 192
2405	29.57	SW	25.02	300			CO	53.33854	1 in 121
2005	31.72	FO	29.82	225			VC	55.04627	1 in 43
4902	28.66	SW	25.87	450			CO	18.02776	1 in 53
4902	28.66	SW	25.87	450			CO	18.02776	1 in 53
4902	28.66	SW	25.87	450			CO	18.02776	1 in 53
2601	29.47	SW	28.32	300			CO	32.60588	1 in 172
2603	29.5	FO	27.5	150			VC	31.86081	1 in 145
2605		FO		100			PP	19.74957	
2606		FO		100			PP	1.552101	
1905	31.38	FO	28.52	225			VC	53.04955	1 in 78
1919		FO		150			VC	28.14326	
1920		FO		225			VC	24.37537	1 in 36
5705	29.15	FO	26.63	150			PVC	39.67769	1 in 159
5706	29.8	FO	26.38	150			PVC	57.84915	1 in 46
5706	29.8	FO	26.38	150			PVC	57.84915	1 in 46
5716		FO		100			VC	5.530885	
5716		FO		100			VC	5.530885	
5715		FO		100			VC	1.401912	
5715		FO		100			VC	1.401912	
5717		FO		100			VC	9.498813	
5717		FO		100			VC	9.498813	
5702		FO		100			VC	17.58364	
5702		FO		100			VC	17.58364	
4607	30.31	FO	28.36	150			PVC	55.94927	1 in 147

LEGEND

Abandoned · Foul · Surface Water · Combined

- Public Sewer
- Private Sewer
- Section 104
- Rising Main
- Sludge Main
- Overflow
- Water Course
- Highway Drain

All point assets follow the standard colour convention:
red - combined · blue - surface water
brown - foul · purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement
BR	Brick
PE	Polyethylene
RP	Reinforced Plastic Matrix
CO	Concrete
CSB	Concrete Segment Bolted
CSU	Concrete Segment Unbolted
CC	Concrete Box Culverted
PSC	Plastic / Steel Composite
GRC	Glass Reinforced Plastic
DI	Ductile Iron
PVC	Polyvinyl Chloride
CI	Cast Iron
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
PP	Polypropylene
PF	Pitch Fibre
MAC	Masonry, Coursed
MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

Headbolt Lane,

OS sheet Number: SJ4199NW
Scale: 1:1250 **Date:** 26/07/2020
Nodes: 399
Sheet: 7 of 9

Printed by: Property Searches

SEWER RECORDS

United Utilities — helping life flow smoothly

Appendix C

Highway Drainage Records

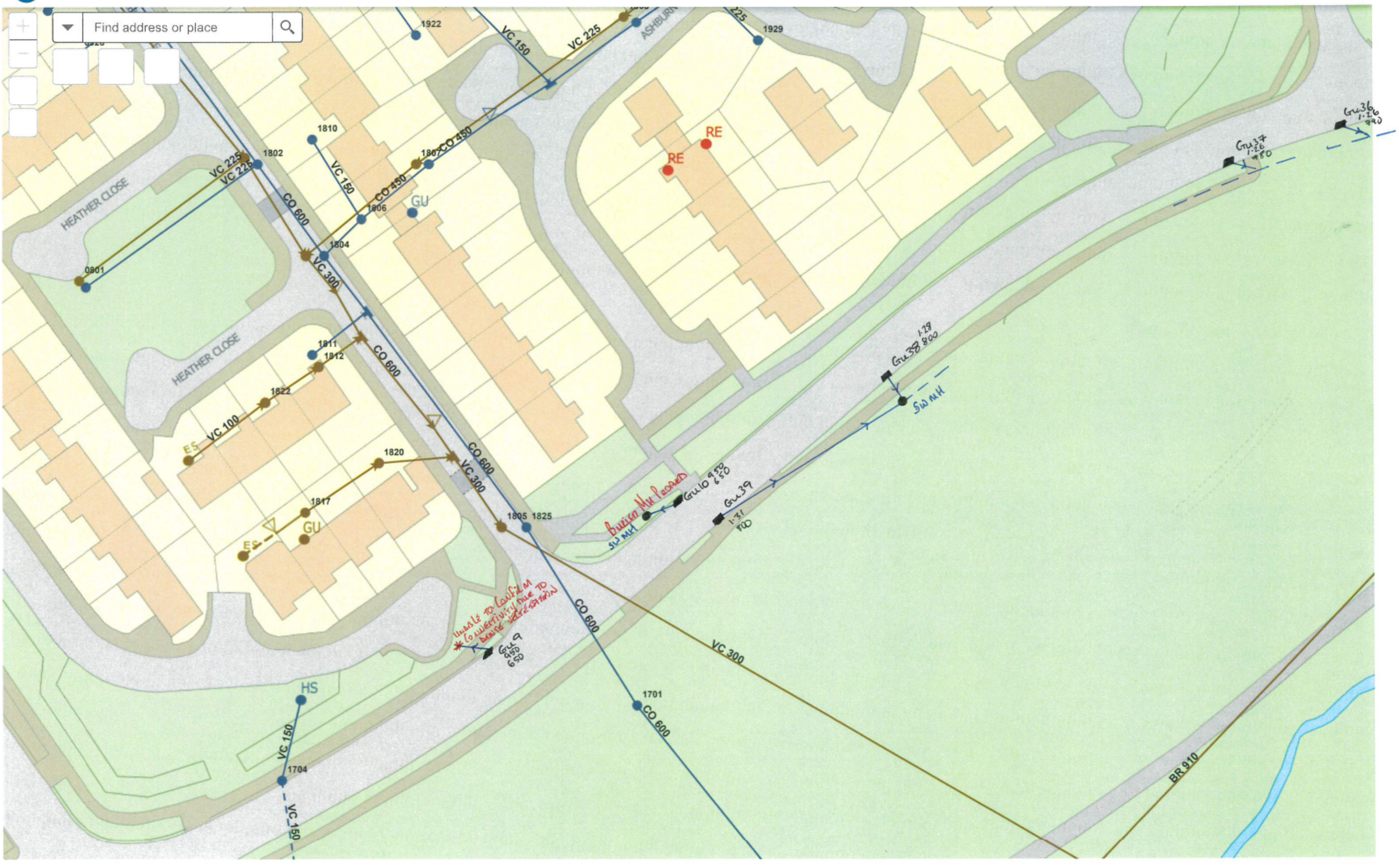
UUGIS Waste Water Viewer (beta)

Find address or place



20m

UUGIS Waste Water Viewer (beta)



UUGIS Waste Water Viewer (beta)

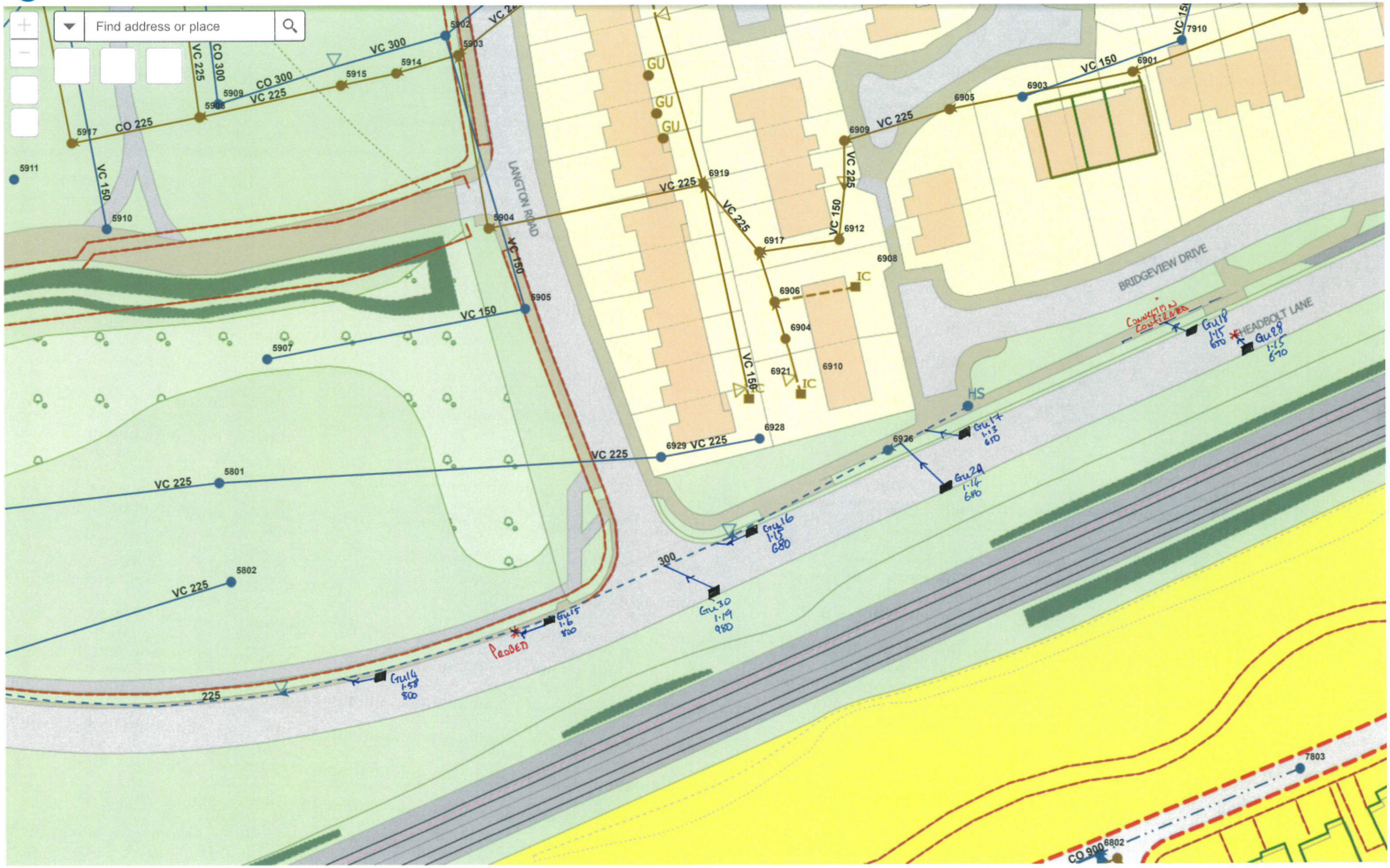
Find address or place

FALLOWFIELD

CO 300 3912
VC 225
VC 150
4905
4908
4910
4914
4915
5916
4901
5917
5911
4902
VC 300 3901
3902
4904
4903
4916
4911
CO 450
CO 750
4918
CO 900
4912
VC 300
4805
4804
4802
4801
5804
5803
225
BR 910
3801
Gu35 1:15 780
Gu34 1:15 780
SW MH
Gu33 1:15 780
CONNECTION CONFIRMED
Gu32 1:15 780
Gu31 1:15 780
Gu11 1:26 800mm
Gu12 1:28 800mm
Gu13 1:38 960
South Croft Drive.
* HOUSING DEVELOPMENT *

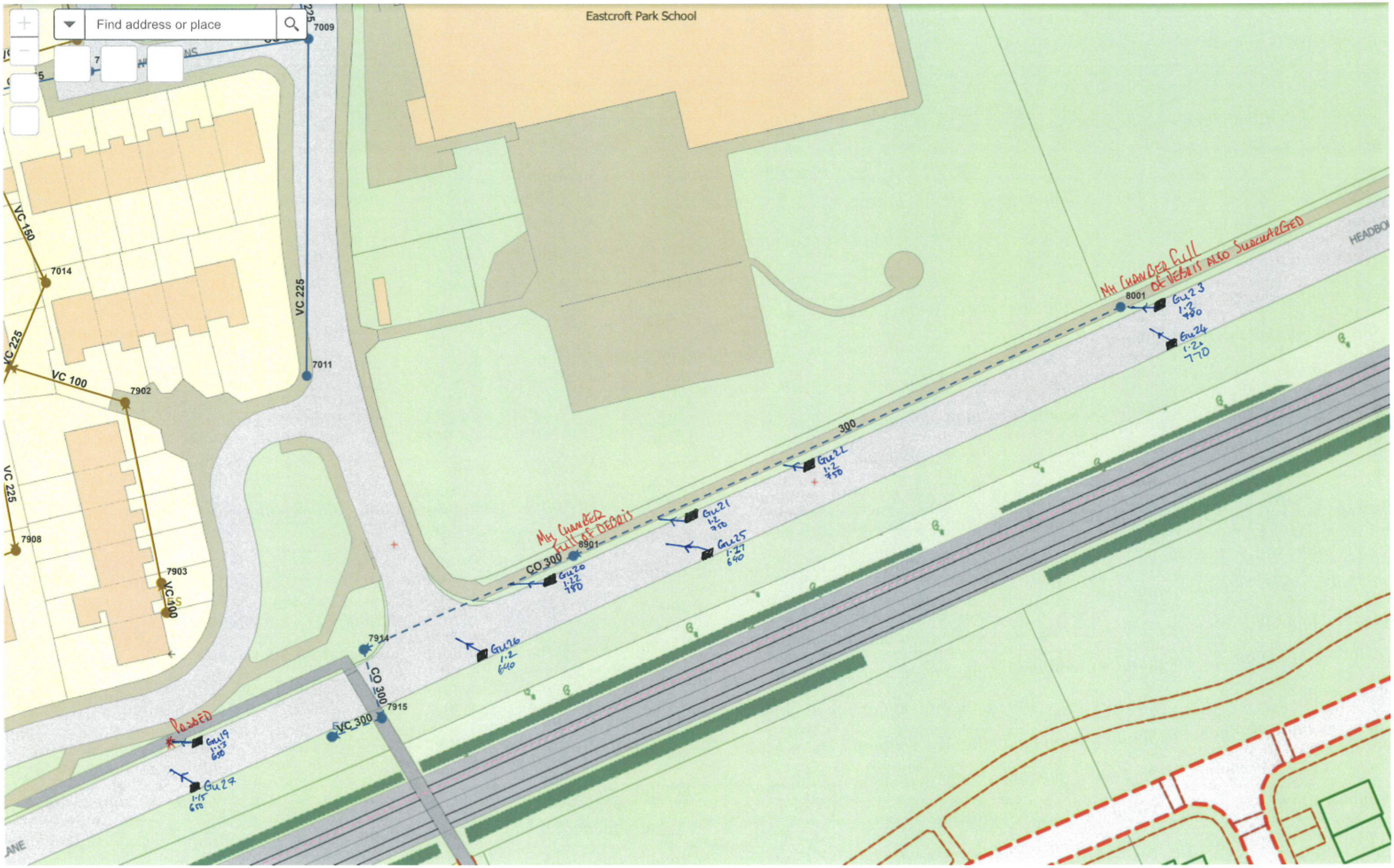
20m

UUGIS Waste Water Viewer (beta)



20m

UUGIS Waste Water Viewer (beta)



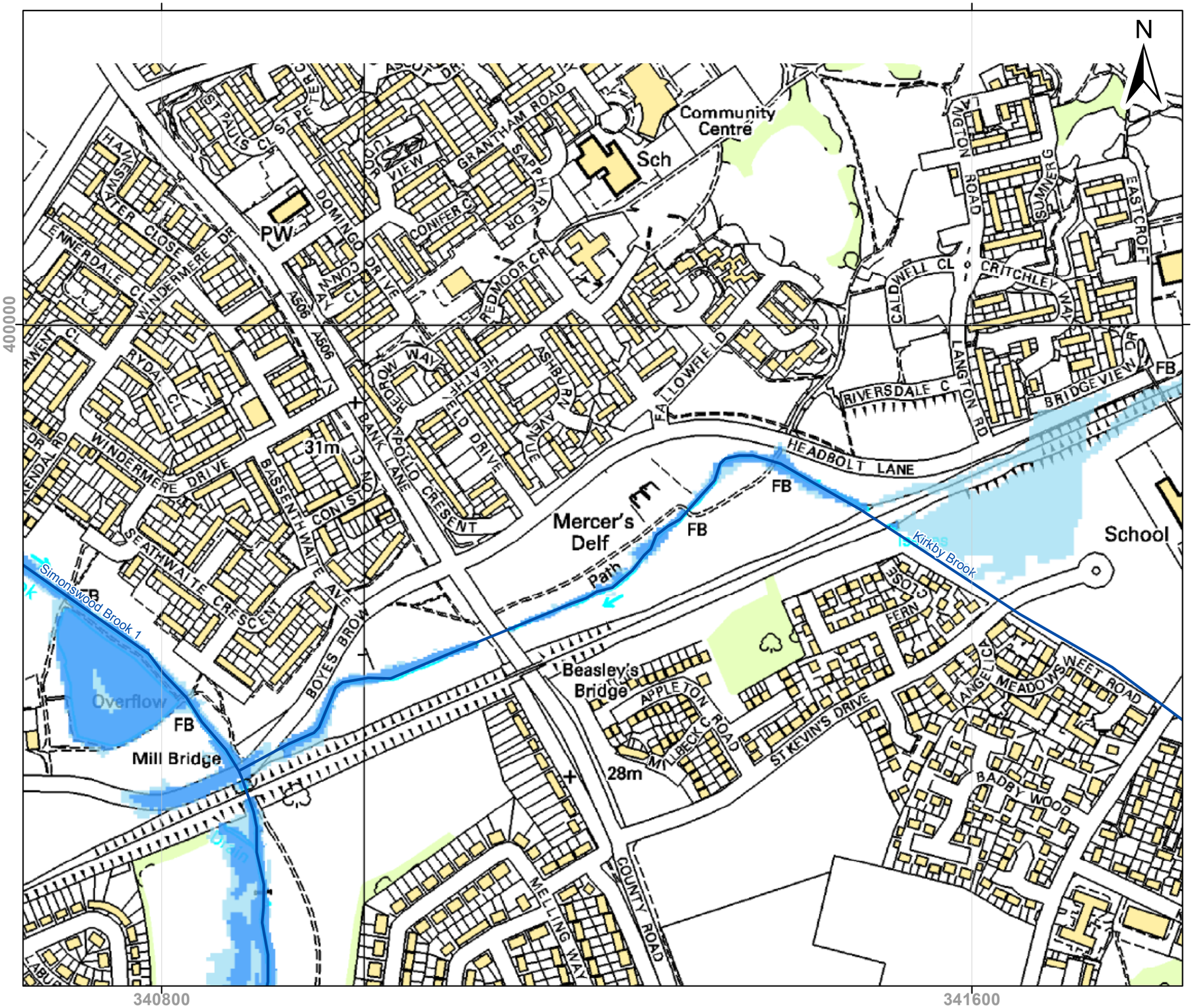
20m

Appendix D

EA Flood Data

Flood Zones Map:
new station and car park Facility at Headbolt Lane, Kirkby

Produced: 18 September 2020
Our Ref: CL183228
NGR: 341289,399800



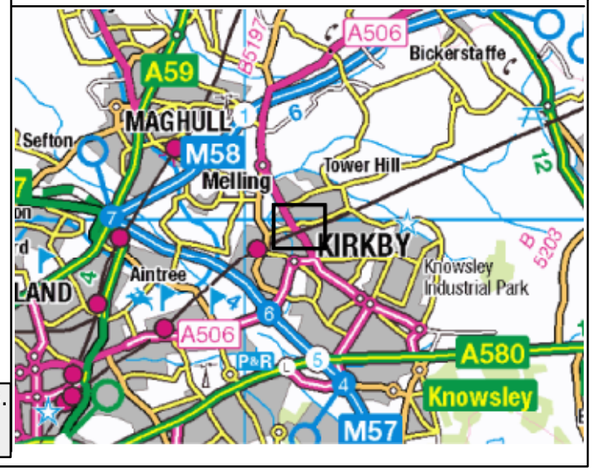
Key

- Main River
- Areas Benefitting from Defences
- Flood Zone 3
- Flood Zone 2

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



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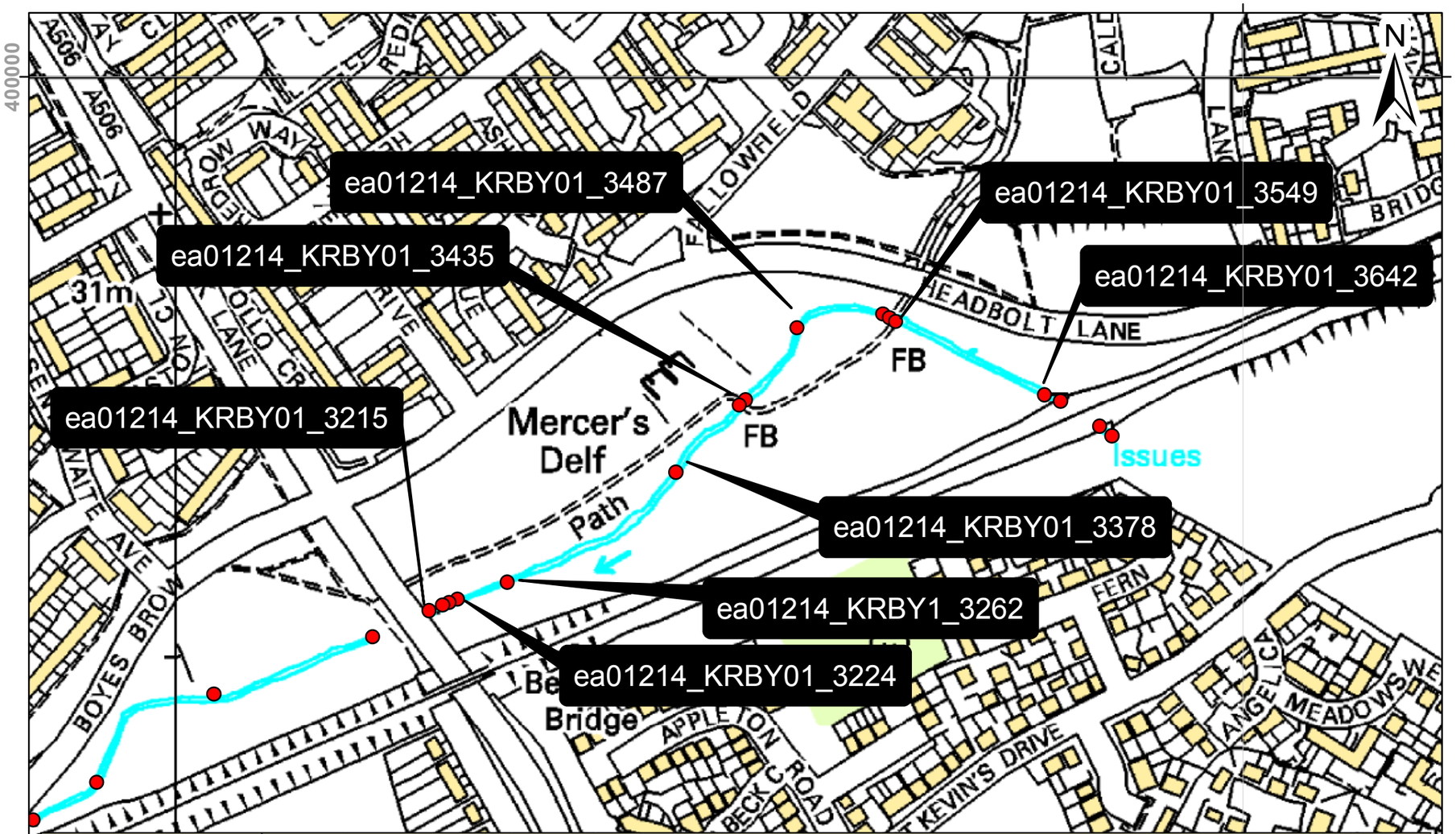


Node Point	Flood Flow (m^3s^{-1}) and Level (mAOD) data for a range of annual probability of flooding													
	0.1%+Climate change (+30%)		0.1%		1%+Climate Change (+70%)		1%+Climate Change (+35%)		1%+Climate Change (+30%)		1.0%		4.0%	
	Undefended		Undefended		Undefended		Undefended		Undefended		Undefended		Undefended	
Map ID	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
ea01214_KRBY01_3215	22.09	8.89	21.71	6.99	21.69	6.86	21.52	5.82	21.50	5.67	21.23	4.23	21.01	3.08
ea01214_KRBY01_3224	22.2	8.86	21.87	6.96	21.85	6.84	21.75	5.80	21.74	5.65	21.58	4.21	21.44	3.07
ea01214_KRBY01_3262	22.3	8.7	22.11	6.84	22.10	6.72	22.02	5.71	22.01	5.57	21.90	4.14	21.80	3.02
ea01214_KRBY01_3378	23.55	5.03	23.49	3.90	23.48	3.88	23.43	3.61	23.42	3.59	23.34	3.32	23.27	2.82
ea01214_KRBY01_3435	23.88	7.81	23.82	6.15	23.82	6.08	23.82	5.10	23.82	5.00	23.82	3.79	23.77	2.78
ea01214_KRBY01_3487	24.84	5.24	24.63	5.22	24.62	5.24	24.45	4.95	24.43	4.85	24.28	3.70	24.15	2.71
ea01214_KRBY01_3549	25.61	3.04	25.53	3.03	25.52	3.04	25.47	3.03	25.45	3.03	25.30	3.04	25.03	2.63
ea01214_KRBY01_3642	25.91	6.6	25.83	5.40	25.83	5.39	25.77	4.53	25.76	4.37	25.68	3.36	25.58	2.49

Level data in mAOD (metres above ordnance datum). Flow data in m^3 per second

Data taken from 2017 Upper Alt Tributaries study

Environment Agency

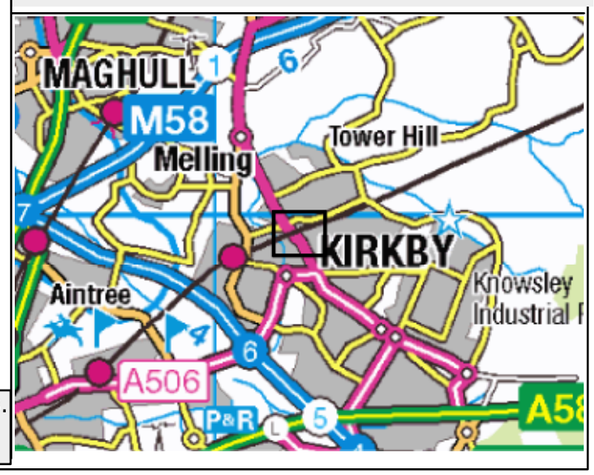
Fluvial flood levels Map: new station and car park Facility at Headbolt Lane, Kirkby

Produced: 18 September 2020
Our Ref: CL183228
NGR: 341289,399800

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



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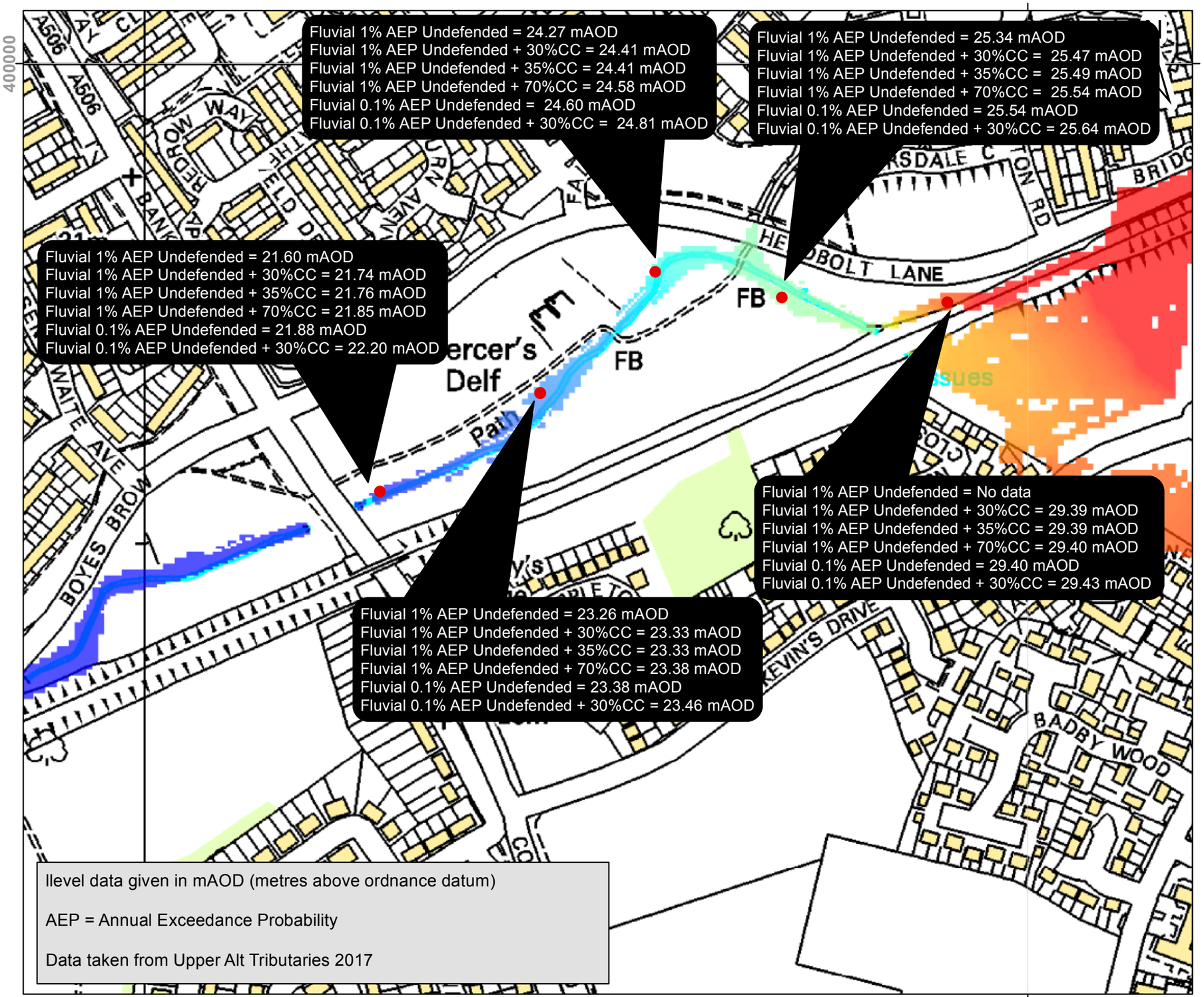


llevel data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Upper Alt Tributaries 2017

Fluvial flood levels Map: new station and car park Facility at Headbolt Lane, Kirkby

Produced: 18 September 2020
Our Ref: CL183228
NGR: 341289,399800

Key

Fluvial 0.1% AEP Undefended + 30% Climate Change (largest extent)

mAOD

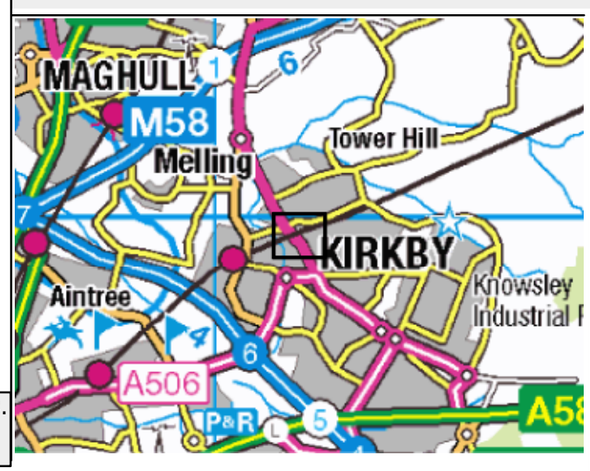
High : 30

Low : 22

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



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Appendix E

KMBC Correspondence

Richard Scrivener

From: Barry, Maria <Maria.Barry@knowsley.gov.uk>
Sent: 15 September 2020 11:37
To: Liam Bromiley
Subject: [External] RE: External Mail: FW: Headbolt Lane Station, Kirkby
Attachments: FW: Headbolt Lane - Flooding Advice - 29.7.20; RE: Headbolt Lane - Flooding Advice - 29.7.20

Hi Liam

Please see attached emails with Kevin McKeown's comments on drainage/flooding for this scheme. We have no further information on historic flooding.

As discussed yesterday, Kevin has previously advised that a minimum 5l/s discharge rate would be required.

Regards

Maria Barry
Lead Engineer
MDT & DC
Highways and Transportation

Tel: (0151)- 443 2349 Mob: 07384 900841
Email: maria.barry@knowsley.gov.uk
Knowsley Council | Yorkon Buildings | Archway Road | Huyton | L36 9YU

From: Liam Bromiley <Liam.Bromiley@arup.com>
Sent: 10 September 2020 15:25
To: Lead Local Flood Authority <LLFA@knowsley.gov.uk>
Cc: McKeown, Kevin <Kevin.McKeown@knowsley.gov.uk>; Barry, Maria <Maria.Barry@knowsley.gov.uk>
Subject: External Mail: FW: Headbolt Lane Station, Kirkby

CAUTION: This email originated from an external source. If you suspect a potential phishing email, report it via the IT Self Service Portal which can be found within the Quick Links section on Bertha

Good Afternoon,

Could I please chase up the progress on the below request?

In particular would you please be able to advise where I can obtain the historic flooding data for the location?

Many thanks,

Liam

From: Liam Bromiley
Sent: 07 September 2020 16:54
To: LLFA@knowsley.gov.uk
Cc: maria.barry@knowsley.gov.uk; Gregory Courtney <gregory.courtney@arup.com>; Richard Scrivener

<Richard.Scrivener@arup.com>; Kevin.McKeown@knowsley.gov.uk
Subject: Headbolt Lane Station, Kirkby

Good afternoon,

I am working on the drainage design for the Headbolt Lane Station development, which I believe you have recently discussed with my colleagues Richard Scrivener and Gregory Courtney?

They mention that you agreed to a minimum discharge of 5 l/s, if so could I please have confirmation of it in writing?

Addistionally, I am interested in obtaining information regarding the historic flooding and existing highway drainage at the location. Would you have a relevant contact within the council who could provide this information?

Many thanks,

Liam

Liam Bromiley
Civil Engineer | Infrastructure, Transport and Cities
MEng GMICE

Arup
9th Floor, 3 St Paul's Place, Norfolk Street, Sheffield, S1 2JE United Kingdom
t: +44 114 283 3767 x:43767
www.arup.com

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Appendix F

UU Correspondence

Richard Scrivener

From: Liam Bromiley
Sent: 13 November 2020 17:05
To: EIRREQUEST@UUPLC.CO.UK
Subject: FW: [External] Query reference: 567456
Attachments: 259202003885.msg



Good Evening,

Could you please provide an update regarding the progress of the below query?

Thanks,

Liam

From: Liam Bromiley
Sent: 16 October 2020 09:53
To: EIRREQUEST@UUPLC.CO.UK
Subject: FW: [External] Query reference: 567456 [Filed 16 Oct 2020 09:53]

Good Morning,

I am putting together a flood risk assessment for a proposed development in Knowsley, Merseyside. Therefore I am interested in knowing if United Utilities have any records of historic flooding at the site?

The approximate grid reference for the site is: E 341319, N 399806

Many thanks,

Liam

From: no-reply@uuplc.co.uk <no-reply@uuplc.co.uk>
Sent: 25 September 2020 16:46
To: Liam Bromiley <Liam.Bromiley@arup.com>
Subject: [External] Query reference: 567456

Dear Liam Bromiley,

Query Reference: UUPS-QRY-567456

Query Text: I am putting together a flood risk assessment for a proposed development in Knowsley, Merseyside. Therefore I am interested in knowing if United Utilities have any records of historic flooding at the site?

Query Response: Thank you for your email. Please see below an email address where you can request flooding information. EIRREQUEST@UUPLC.CO.UK

Kind regards,
The Property Searches team

EMGateway3.uuplc.co.uk made the following annotations

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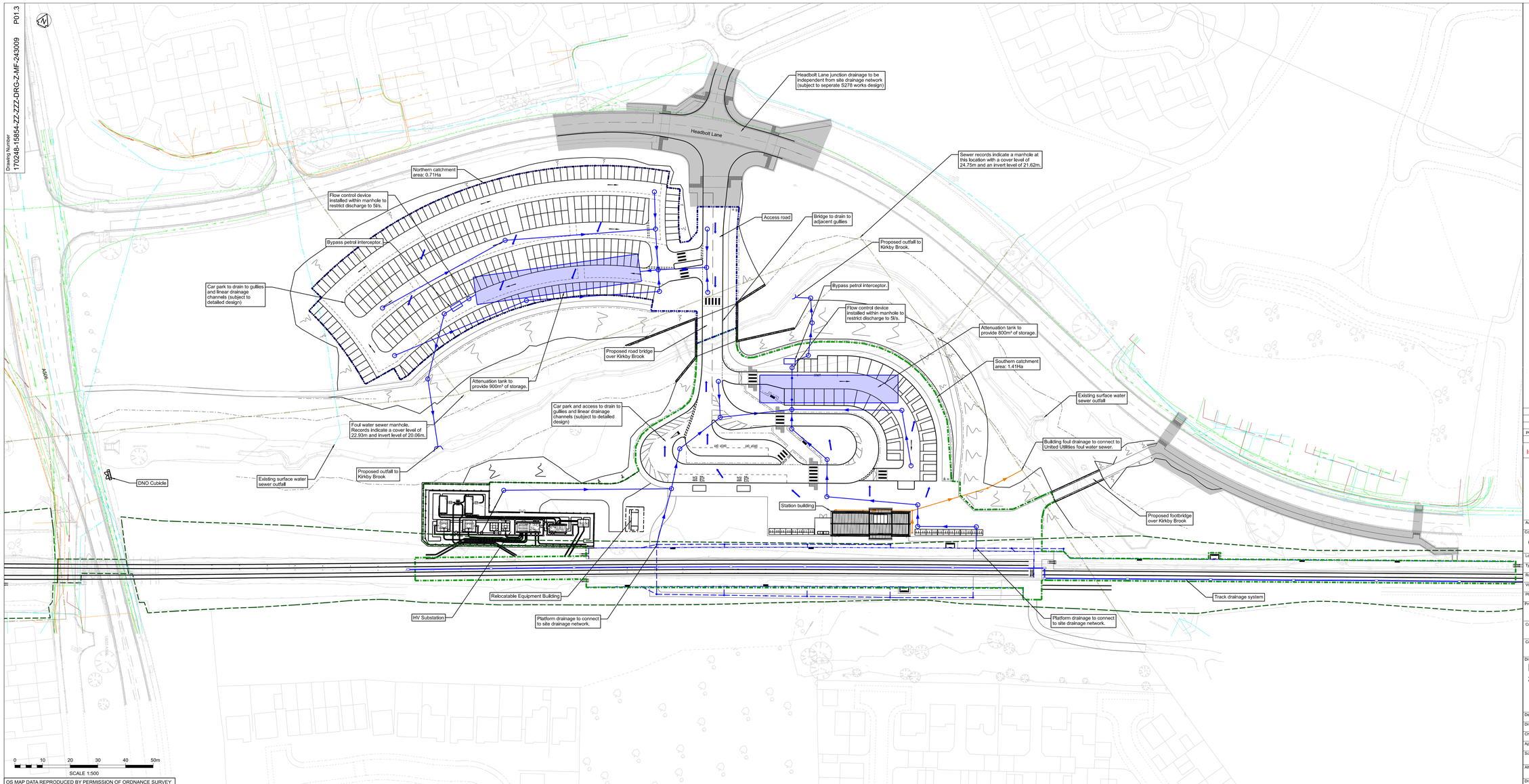
Appendix G

Proposed Site Drainage



OS MAP DATA REPRODUCED BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HMSO. © CROWN COPYRIGHT 2016. ALL RIGHTS RESERVED. ORDNANCE SURVEY LICENCE NUMBER 0100040692

Drawing Number
170248-15854-ZZ-ZZZ-DRG-Z-MF-243009 P01.3

Legend/Notes

1. Do not scale from this drawing.
2. All dimensions are in metres unless stated otherwise.
3. All levels are in metres above Ordnance Datum.
4. Attenuation volumes are based on Microdrainage Quick Storage Estimates.
5. Proposed discharge rates are as agreed with Knowsley MBC.
6. Surface collection features (gullies, linear drains, etc.) to be confirmed at detailed design.
7. Proposals subject to approval from the Lead Local Flood Authority and Environment Agency.
8. Road gullies are to be trapped as part of pollution prevention.
9. Surface water run-off from isolated footpaths shall drain to adjacent landscaping.
10. Run-off from soft landscaping is assumed to infiltrate and discharge to Kirkby Brook as existing.
11. Refer to document 170248-ARU-REP-ECV-000003 for further details of flood risk associated with the site.

Drainage key:

- Network Rail Existing Ownership Boundary
- Northern Catchment Area: 0.71Ha
- Southern Catchment Area: 1.41Ha
- Proposed Surface Drainage Network
- Proposed Foul Drainage Network
- Proposed Attenuation Tank
- Indicative Surface Fall
- Existing Foul Sewer
- Existing Surface Water Sewer
- Proposed Works subject to S278 Agreement

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01.3	18/07/21	First Revision	---	---	---

Status: Issued for Planning
Suitability: S0

NetworkRail

Authorised: ---
Signed: ---
Date:

Contractor(s): Ove Arup & Partners

Location/Level: No Specific Location
Type: CAD Drawing
Sub-type: Plan
Role: General (non-disciplinary)
Discipline: Multi-Functional
Volume/System: No Specific Volume or System
Phasing: Proposed
Grip Stage: 4

Project: Headbolt Lane
Contract No.: 170248
Contract Title: Headbolt Lane
Drawing Title: Planning Application Drawing Site Drainage

Designed		Signed ---	Date
Drawn	---	Signed ---	Date
Checked	---	Signed ---	Date
Approved	--	Signed ---	Date

Scale(s): ELR & Mileage: WKL2 28.1232 to 29.0913
Alternative Reference:
Sheet: of

Drawing Number: 170248-15854-ZZ-ZZZ-DRG-Z-MF-243009
Revision: P01.3

Appendix H

Knowsley CC SuDS Pro-Forma

PRO-FORMA 1: Sustainable Drainage System: Planning Permission

This pro-forma is a requirement of the Planning Validation Checklist. You **must complete all white boxes in full** and submit this pro-forma along with your supporting evidence to the Local Planning Authority for any application which seeks planning permission for major development (as defined in section 2 of Statutory Instrument 2015 No. 595).

This pro-forma supports developers and regulators in **summarising and confirming** how surface water from a development will be managed sustainably under current and future conditions. It should be completed in conjunction with the Council's 'Completing your Pro Forma' document and your sustainable drainage system should be designed in accordance with CIRIA The SuDS Manual C753.

The pro-forma follows Policy CS24 of Knowsley MBC's Local Plan, National Planning Policy Framework, House of Commons Written Statement (HWSW 161) on SuDS, Planning Practice Guidance and Defra's Non-Statutory Technical Standards for Sustainable Drainage Systems. It is supported by the Defra/EA Guidance on Rainfall Runoff Management and can be completed using freely available tools such as Tools for Sustainable Drainage Systems or approved Industry Standard surface water management design software. The Council's Sustainable Drainage & Surface Water Management Technical Guidance document also provides further information.

Section 1: Development Details

Development Name		Headbolt Lane New Station			
Development Address *(including postcode)*		Headbolt Lane, Knowsley, Merseyside (L33 1WD nearest)	**Planning Application Reference** *(if available)*		N/A
Development Grid Reference	**Northings**	399806	**Expected lifetime of development** *(years)*		120
	Eastings	341319	**Have you submitted a Flood Risk Assessment?**		Yes ■ No ☐
Total Development Site Area (Ha)		5.0	**Type of Planning Application** (✓)	**Outline**	☐
Site area served by proposed drainage system (excluding open space) (Ha)*		2.12		**Full**	✔
Is your surface water drainage system designed to a *(tick all that apply)*:				**Hybrid**	☐
Greenfield Standard • *Site is undeveloped and a new drainage system will be installed; OR* • *Site is already developed and a new surface water drainage system will be installed to serve the new development.*		✔		**Reserved Matters**	☐
Previously Developed Standard • *Site is already developed and the entirety of the existing surface water drainage system will be used to serve the new development.*		☐			

Knowsley Council

PRO-FORMA 1: Sustainable Drainage System: Planning Permission

Section 2: Impermeable Area and Existing Drainage For outline or reserved matters applications, go to Section 3

	Existing (E)	Proposed (P)	Difference (P □ E)		Evidence Checklist
Impermeable Area (Ha)	0	2.12	2.12	☑	Plans showing development layout of site with existing and proposed impermeable areas.
State Drainage Method	N/A	Discharge to watercourse	N/A	☑	Plans showing current and proposed locations of sustainable drainage system.
Are there existing sewers, watercourses, water bodies, highway drains, soakaways or filter drains on the site?			Yes ■ No ☐	☑	Plans showing existing layout to include: • Watercourses, open or culverted • Water bodies – ponds, swales etc. • Sewers, including manholes • Highway drains, include manholes • Soakaways, filter drains

Section 3: Surface Water Discharge Hierarchy □ Planning Practice Guidance

Surface Water Discharge Method	Proposed?	If YES - Evidence Checklist		If NO - Evidence Checklist	
1. Infiltration to ground	Yes ■ No ☐	☑	Completed Infiltration Checklist from CIRIA The SuDS Manual C753 Appendix B *An editable version of this form is available on SusDrain website.*	☐	Geotechnical Survey, including Soil Permeability Testing stating Percolation Coefficient, in accordance with BRE 365 **AND** Statement providing justification in your Sustainable Drainage Strategy
2. Discharge to watercourse or surface water body *(Main River or Ordinary)*	Yes ■ No ☐	☑	Watercourse and/or Water Body Survey Report	☐	Plan showing nearby watercourses and water bodies **AND** Statement providing justification in your Sustainable Drainage Strategy
3. Discharge to surface water sewer	Yes ☐ No ■	☐	Water and Sewerage Company written agreement for the Right to Connect.	☑	Plan showing nearby sewers **AND** Statement providing justification in your Sustainable Drainage Strategy
4. Discharge to combined sewer	Yes ☐ No ■				

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PRO-FORMA 1: Sustainable Drainage System: Planning Permission

Section 4: Calculate Peak Discharge Rates □ Technical Standards S2 and S3 (unless S1 applies)

Rainfall Event	Existing Rate (l/s)	Greenfield Rate (l/s)	Proposed Rate (l/s) *Brownfield sites must reduce discharge rates by 50%*	Evidence Checklist	
Qbar	1.64(N)/3.25 (S)	1.64(N)/3.25(S)	5(N)/5(S)	☑	MicroDrainage (or equivalent) calculations
1:1 Year Event	1.42(N)/2.83(S)	1.42(N)/2.83(S)	5(N)/5(S)		
1:30 Year Event	2.78(N)/5.53(S)	2.78(N)/5.53(S)	5(N)/5.53(S)		
1:100 Year Event	3.41(N)/6.76(S)	3.41(N)/6.76(S)	5(N)/6.76(S)		

Section 5: Calculate Discharge Volume □ Technical Standards S4 and S6 (unless S1 applies)

Rainfall Event	Existing Volume (m^3)	Greenfield Volume (m^3)	Proposed Volume (m^3)	Evidence Checklist	
1:100 Year 6 Hour Event	TBC	TBC	TBC	☐	MicroDrainage (or equivalent) calculations

Section 6: Infiltration

Site Information	✓	Evidence Checklist	
Do your sustainable drainage proposals include any infiltration?	Yes ■ No ☐ *If NO, please move on to Section 7*	☑	Proposed sustainable drainage plans
You should submit an alternative 'Plan B' sustainable drainage design utilising an alternative discharge method if site specific ground conditions are unknown at this stage. This will become the default design in the event infiltration proposals are not feasible upon site specific ground investigation. **Have you submitted an alternative `Plan B' sustainable drainage design?**	Yes ■ No ☐	☑	'Plan B' conceptual sustainable drainage plans and statement of approach

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PRO-FORMA 1: Sustainable Drainage System: Planning Permission

Section 7: Storage Technical Standards S7, S8 and S9

Storage Details	Details	Evidence Checklist	
State climate change allowance used (%)	40	☑	State / use in MicroDrainage
State storage volume provided (m^3) *(excluding non-void spaces)* *Must include an allowance for climate change and urban creep.*	900m3 (Northern catchment)/800m3 (Southern catchment)	☑	Drainage plans showing location of attenuation and all flow control devices and any supporting calculations
Summarise how storage will be provided for 1:30 year event on site. *Storage must be designed to ensure that at no flooding occurs onsite in a 1 in 30 year event except in designed areas **and** no flooding occurs offsite in a 1 in 100 year (+ climate change allowance) event.*	2 attenuation tanks, a 900m3 tank for the southern catchment and a 800m3 for the southern catchment	☑	Plans showing size and location of storage and supporting calculations
Summarise how storage will be provided for 1:100 year (+ climate change) 6 hour event on site. *Where storage above the 1:30 year rainfall event is provided in designated areas designed to accommodate excess surface water volumes, plans showing storage locations and surface water depths and supported by MicroDrainage (or equivalent) calculations.*	2 attenuation tanks, a 900m3 tank for the northern catchment and a 800m3 for the southern catchment	☑	Plans showing size and location of storage and supporting calculations

Section 8: Operation and Maintenance Technical Standard S12 and HCWS161

Consideration	Select ALL that apply (✓)		Evidence Checklist	
State how ALL components of the sustainable drainage system will be maintained for the design life of the development.	**Sustainable drainage features are at property level**	☑	☑	Statement provided within your Sustainable Drainage Strategy
	Sustainable drainage system to be adopted by Water and Sewerage Company through a Section 104 agreement *(Water Industry Act 1991)*	☐		
	Applicant to secure maintenance of sustainable drainage features by entering into a Section 106 agreement *(Town and Country Planning Act 1990)*	☐		

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PRO-FORMA 1: Sustainable Drainage System: Planning Permission

Declaration and Submission

This pro-forma has been completed using evidence from information which has been submitted with my planning application.

The information submitted in the Sustainable Drainage Strategy and site-specific Flood Risk Assessment (FRA), where submitted, is proportionate to the site conditions, flood risks and magnitude of development and I agree that this information can be used as evidence to this sustainable drainage approach.

Submitter Details			
Form completed by	Peace Madzoke	**Email Address**	richard.scrivener@arup.com
		Daytime Telephone	0113 237 3750
Form signed off by	Richard Scrivener	**Accreditation(s) and/or Qualification(s) of Signatory**	Chartered Civil Engineer MEng CEng MICE FIHE MCIHT
Date *(dd/mm/yyyy)*	12/08/2021	**Company**	Ove Arup & Partners Ltd
Client Details			
Name	Tom Highton	**Company**	Buckingham Group Contracting Limited

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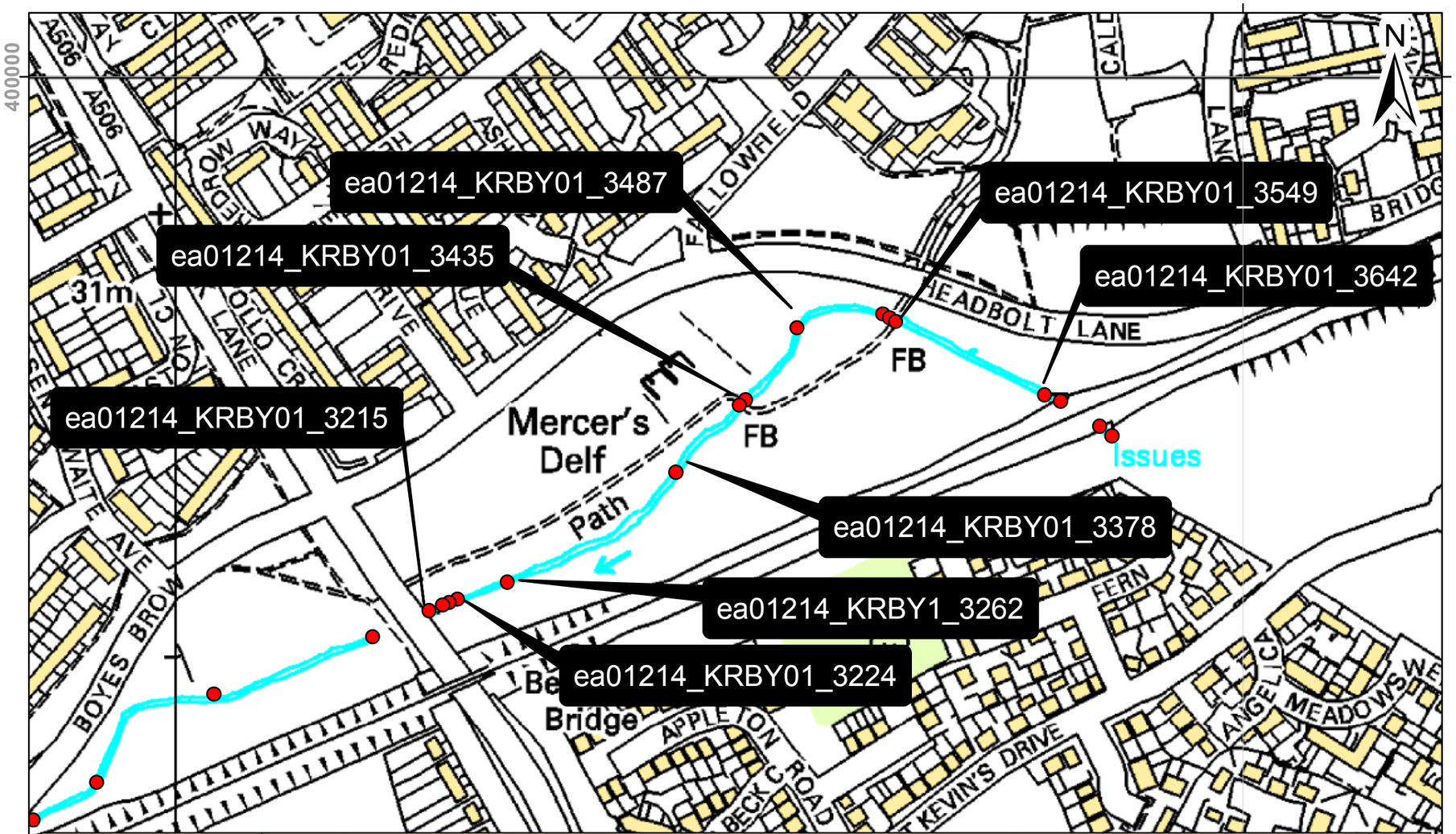
Appendix 9B

Node points along Kirkby Brook



Node Point	Flood Flow (m^3s^{-1}) and Level (mAOD) data for a range of annual probability of flooding													
	0.1%+Climate change (+30%)		0.1%		1%+Climate Change (+70%)		1%+Climate Change (+35%)		1%+Climate Change (+30%)		1.0%		4.0%	
	Undefended		Undefended		Undefended		Undefended		Undefended		Undefended		Undefended	
Map ID	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
ea01214_KRBY01_3215	22.09	8.89	21.71	6.99	21.69	6.86	21.52	5.82	21.50	5.67	21.23	4.23	21.01	3.08
ea01214_KRBY01_3224	22.2	8.86	21.87	6.96	21.85	6.84	21.75	5.80	21.74	5.65	21.58	4.21	21.44	3.07
ea01214_KRBY01_3262	22.3	8.7	22.11	6.84	22.10	6.72	22.02	5.71	22.01	5.57	21.90	4.14	21.80	3.02
ea01214_KRBY01_3378	23.55	5.03	23.49	3.90	23.48	3.88	23.43	3.61	23.42	3.59	23.34	3.32	23.27	2.82
ea01214_KRBY01_3435	23.88	7.81	23.82	6.15	23.82	6.08	23.82	5.10	23.82	5.00	23.82	3.79	23.77	2.78
ea01214_KRBY01_3487	24.84	5.24	24.63	5.22	24.62	5.24	24.45	4.95	24.43	4.85	24.28	3.70	24.15	2.71
ea01214_KRBY01_3549	25.61	3.04	25.53	3.03	25.52	3.04	25.47	3.03	25.45	3.03	25.30	3.04	25.03	2.63
ea01214_KRBY01_3642	25.91	6.6	25.83	5.40	25.83	5.39	25.77	4.53	25.76	4.37	25.68	3.36	25.58	2.49

Level data in mAOD (metres above ordnance datum). Flow data in m^3 per second

Data taken from 2017 Upper Alt Tributaries study

Environment Agency

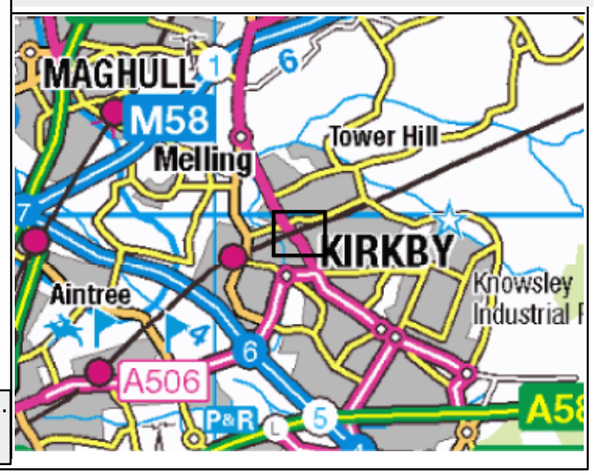
Fluvial flood levels Map: new station and car park Facility at Headbolt Lane, Kirkby

Produced: 18 September 2020
Our Ref: CL183228
NGR: 341289,399800

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Appendix 10A

Existing Track Geo-environmental Desk Study, Skelmersdale Rail Link

MOTT MACDONALD

Existing Track Geo-Environmental Desk Study

Skelmersdale Rail Link

02 March 2020

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Existing Track Geo-Environmental Desk Study

Skelmersdale Rail Link

02 March 2020

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Executive summary

Mott MacDonald Limited has been commissioned by Network Rail to develop the Skelmersdale Rail Link to GRIP 3A and Track AIP. The scheme comprises new rail tracks with junctions on WLK2 (Liverpool to Wigan Railway line) to the proposed station site at the former Glenburn Sports College site; a new station at Skelmersdale and at Headbolt Lane; modifications/platform extensions at the existing stations at Rainford and Kirby; and modifications along the existing WJK and WLK2 railway lines between Up Holland and the M57. This study focuses on proposed track bed renewal along the existing rail from Up Holland to the M57 and platform extensions at the existing Rainford and Kirkby Stations.

The purpose of this geo-environmental desk study is to provide information on the ground conditions likely to be encountered during the proposed work, and subsequently identify and reduce the risks to the project.

Mapping from the British Geological Survey shows that superficial and bedrock deposits vary along the study area but generally comprise the following: Blown Sand (Shirdley Hill Formation) and/or Glacial Till overlying Weathered Sandstone and Sandstone (Sherwood Sandstone Group) to the west; and Peat or Blown Sand, Glacial Till and Glaciofluvial Deposits overlying Mudstone, Siltstone and Sandstone of the Pennine Lower Coal Measures Formation to the east. Made Ground (Undivided) is also shown across the rail corridor at Kirkby Valley Golf Course and Simonswood Industrial Estate.

The full extent of the rail corridor is shown to have been built by 1850, which is the earliest OS map available. At this time the land around the corridor largely comprised undeveloped or farmed fields with some areas of woodland and minor urban developments. Many existing track crossings were already present. Holland Colliery and Rainford Collieries (and associated ponds) were also operational at the eastern half of the study area, as well as a corn mill and two sandstone delfs (quarries) around the crossings with Simonswood Brook. By 1893 industrial activity had increased. The main developments were around the collieries which encroached onto the rail corridor via sidings. There was also a pumping station to the east of County Road, and a sand washing works built on the track with connecting mineral railways. There were then few significant changes until 1956 where the collieries and associated infrastructure became disused and were shortly after infilled/remediated. Other types of works started to become prevalent at this time which resulted in new rail links joining the existing corridor. This includes the Kirkby Sorting Deposit near the centre of the study area. Following this, there was significant development of infrastructure, housing estates, schools and other buildings through the 1960's and 1970's. Areas of historic industries had either been redeveloped as unused woodland/fields, housing, or a more modern type of workings – as with Kirkby Sorting Depot which became a timber yard and then Simonswood Industrial Estate. The rail corridor matched present day by 1976 with the removal of the Rainford Junction and the construction of the M57 at its western edge. By 2005 the land surrounding the rail corridor matched present day after further residential developments.

A summary of key geotechnical and geo-environmental risks is given below:

- Features of historic coal mining, including shafts, and shallow and deep workings.
- Poor ground conditions associated with deposits of Made Ground, Peat and Blown Sand.
- Contamination from historic collieries, landfills, a munitions distribution depot and the railway.
- Obstructions from historic sidings and buildings, and foundations of existing bridges.

- Unexploded ordnance.
- Heat generation and spontaneous combustion within coal seams during drilling/construction.
- Services including high pressure gas mains, an ethylene pipeline and electrical cables.

A ground investigation is required in order to assess the existing ground conditions present beneath the site; validate the geotechnical and geo-environmental risks; and identify remedial requirements. Investigation works will also enable the collection of samples for chemical and geotechnical testing

1 Introduction

1.1 Scope of Work

Mott MacDonald Limited has been commissioned by Network Rail to develop the Skelmersdale Rail Link to GRIP 3A and Track AIP. This report is to inform the design as part of the GRIP 3A activities.

1.2 Proposed Scheme

The Skelmersdale Rail Link Project will create new transport hub within the town of Skelmersdale to provide a direct rail link between Skelmersdale, Wigan and Liverpool. A study commissioned by Lancashire County Council has found that improved transportation links to Wigan and Liverpool will provide job opportunities for Skelmersdale residents and this will create further employment in the area.

The scheme comprises the following: new rail tracks for about 3km over land from new junctions on WLK2 (Liverpool to Wigan Railway line) to the proposed station site at the former Glenburn Sports College site; a new station at Skelmersdale and at Headbolt Lane; modifications/platform extensions at the existing stations at Rainford and Kirby; and modifications along the existing WJK and WLK2 railway lines between Up Holland and the M57.

This report focuses on the existing rail corridor from Up Holland to the M57 and the proposed works at the existing Rainford and Kirkby Stations.

The proposed works will require geotechnical input related to but not limited to the following:

- Track bed foundations;
- Earthworks/Cuttings/retaining structures along the track alignment at the location of station platform extensions; and
- Station platform foundations

1.3 Report Objectives

The purpose of this geo-environmental desk study is to provide information on the ground conditions likely to be encountered during the proposed work along the rail corridor from Up Holland to the M57. This desk study reviews and summarises information obtained from several sources noted in Section 1.4 of this report. The report summarises potential geohazards associated with the site.

1.4 Sources of Information

The following sources of information were used in the preparation of this report:

- British Geological Survey, 1970. Geological Survey of England and Wales 1:63,360 Wigan Sheet 84, Drift (Keyworth, Nottingham: British Geological Survey).
- British Geological Survey, 1977. Geological Survey of England and Wales 1:50,000 Wigan Sheet 84, Solid (Keyworth, Nottingham: British Geological Survey).
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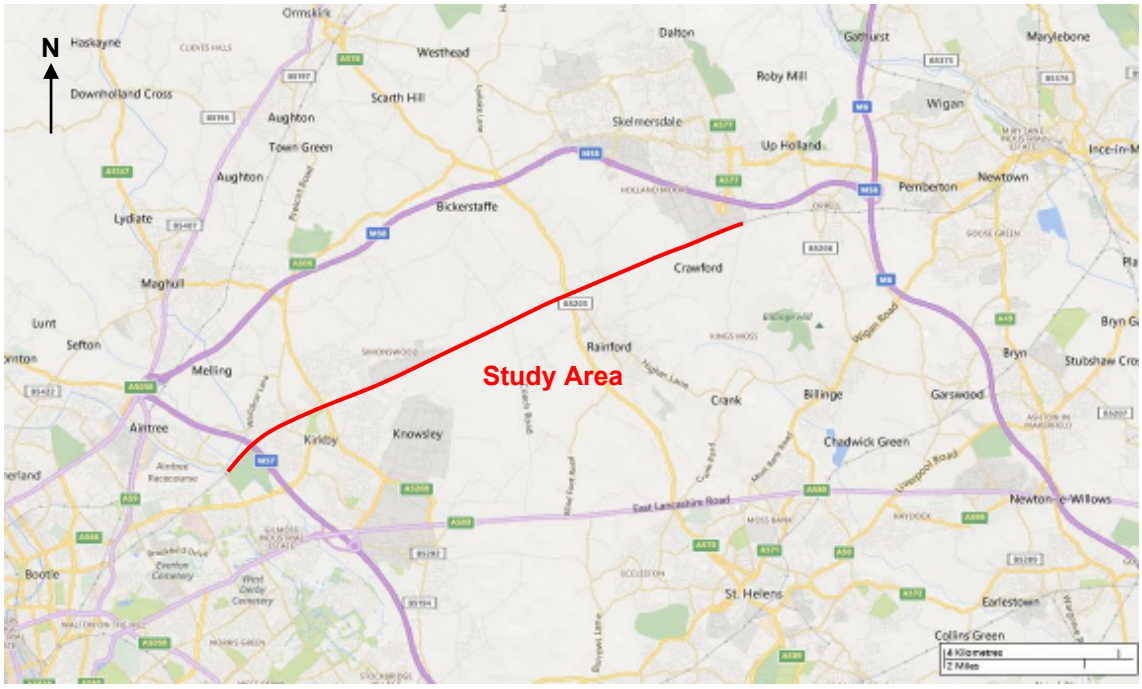
2 Geo-environmental Baseline

2.1 Study Location

The study area for this report follows a linear route along the Liverpool to Wigan rail line which spans Merseyside and West Lancashire. The start and end points are at Engineer's Line Reference (ELR) WJK and mileage 30m 308yds near the M57 south of Kirkby (National Grid Reference (NGR) 339437, 398704) and WKL2 22m 1378yds south of Up Holland (NGR 350185, 403577). The site location plan is shown in Figure 1 and the site layout plan in Figure 2 and Figure 3. These figures have been subdivided into three segments to ease description and have been annotated with details of the existing/proposed numbers of tracks.

Figure 1: Site Location Plan



Source: Microsoft product screenshot reprinted with permission from Microsoft Corporation, captured via Holebase SI

Figure 2: Site Layout Plan A



Source: Microsoft product screenshot reprinted with permission from Microsoft Corporation, captured via Holebase SI

Figure 3: Site Layout Plan B



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2.2 Site Description and Topography

The study area is subdivided into three segments in this section only for ease of description, starting at WJK 30m 308yds and travelling east to WKL2 22m 1378yds. The ELR changes from WJK to WKL2 at approximately 29m 900yds. The full study area is confined within the existing rail corridor of the Liverpool to Wigan line and currently comprises one track, although historically there were more tracks.

2.2.1 WJK/WKL2 28m 0yds to 30m 308yds – Segment 1

The route starts between Kirkby Vale Golf Course to the south and undefined woodland to the north of the rail corridor. It travels along the M57 overbridge to the northeast and continues alongside housing developments to the north and the south before reaching Kirkby Station where the B5192 and a footbridge cross the railway. Further housing developments and undefined woodland and fields are situated to the north and the south as the line passes over a pedestrian footpath, Simonswood Brook on a viaduct and County Road on a bridge. The bridge is single-track, however, the abutment on the western side looks as though it was constructed for two tracks. To the north of the track is the open grassed area of the proposed location of Headbolt Lane Station (approximately 28m 1350yds) and to the south is a narrow strip of rough open land before more residential housing. A freight train line runs northeast for approximately 700m, from just north of the proposed Headbolt Lane station before joining a spur into Knowsley Industrial Park. A footbridge crosses these two tracks opposite Hollinghurst Road to the housing

development to the south. There appears to be new house being built on a section of open land. Dale Lane overbridge crosses the railway line to the north of the spur into Knowsley Industrial Park and south of the Simonswood Industrial Estate to the north of the corridor. To the south of the Simonswood Industrial Estate is open land, farmland and woodland.

Elevation rises from 20m AOD to 22m AOD as the route travels to the east on an embankment and underbridge over the M57. Embankment height peaks in the region of 6m before the track enters a cutting on approach to Kirkby Station. Cutting height peaks at Kirkby Station in the region of 5m with track level around 23m AOD. This level rises slowly to the northeast as the earthworks transition again into embankment, reaching heights in the region of 6m and elevations of 28m AOD on approach and exit of the County Road underbridge. The track then continues at grade/short cutting as elevation continues to rise slowly for the remainder of the segment, reaching 33m AOD just past the Dale Lane overbridge where the track is on a 1-2m high embankment.

2.2.2 WKL2 28m 0yds to 25m 0yds – Segment 2

The segment travels to the northeast with farmed fields to the south and Simonswood Industrial Estate to the north. The industrial estate extends approximately 2km along the edge of the track. A un-named track passes over the railway at the eastern boundary of the industrial park, where it gives way to farm land and woodland areas on both sides of the rail corridor. On the north side of the railway line is a quarry which is now a construction waste recycling facility (W. Maher & Sons, 2018). At 500m to the northeast Simonswood Brook and an unnamed road pass back under the railway. A further 700m to the northeast Coach Road passes over the railway as the line continues to the northeast through similar land. To the north is Siding Lane Woodland Nature Reserve. The segment ends at the crossing over the Rainford By-Pass next to a small area of housing developments to the north.

The track starts on a 1-2m high embankment and changes between sections at grade and in cuttings, with maximum high around 6-7m at Simonswood Industrial Estate. Track elevation rises slowly through the area from 33m AOD at the start of the segment to 40-41m AOD at the edge of the quarry. This level remains as the track passes over approach embankments, a bridge over Simonswood Brook and an unnamed road, reaching a maximum height in the region of 5m. Along the remainder of the segment, the track travels at grade/on embankment that is less than 2m high until it reaches the Rainford By-Pass, where it crosses approach embankments and an bridge reaching 5-6m high. The rise in elevation along this section is still gradual, reaching 49-50m AOD on the eastern side of the by-pass where the track becomes at grade once more.

2.2.3 WKL2 25m 0yds to 22m 1378yds – Segment 3

The final section of the study area starts to the east of the Rainford By-Pass surrounded by farmed land and woodland. A track crosses over the railway halfway between the by-pass and a housing development to the north. At west of the houses there is a pedestrian level crossing and an allotment to the south. Rainford Station is at the eastern edge of the developed area where there is a pedestrian footway bridge between the platforms and where News Lane crosses over the railway. Beyond this the route continues largely through farmed fields and woodland, passing beneath two tracks leading to a farm at Maggots Nook Road. At Duke's Wood Lane there is a level crossing. The study area ends just past this point as land on the northern side of the rail corridor transitions into a Pimbo Industrial Estate

The track traverses the remainder of the study area at grade or in a 1-2m cutting. Elevation starts at 49-50m AOD and slowly climbs to 56m AOD at Rainford Station; 63m AOD at the two

bridges leading to a farm at Maggots Nook Road; 73m AOD at the level crossing of Duke's Wood Lane; and 78m AOD where the segment ends next to Pimbo Industrial Estate.

2.3 Site History

Historical OS maps at 1:10,560, 1:10,000 and 1:2,500 scales from between 1850 and 2018 have been reviewed to understand the historical development of the study area. A detailed review is provided in Appendix B and a summary given below.

The full extent of the rail corridor is shown to have been built by 1850, which is the earliest map available. At this time the land around the corridor largely comprised undeveloped or farmed fields with some areas of woodland and minor urban developments around Glovers Brow and County Road at the western end of the study area. Many existing track crossings are already present at this time, including those of County Road, Glovers Brow, Simonswood Brook (at the western and central parts of the study area), Coach Road, Rainford Road, New Lane, Maggots Nook Road and Duke's Wood Lane. Kirkby Station and Rainford Station are present (though Rainford Station moves 900m to the east by 1893 to its existing location) and the Lancashire and Yorkshire Railway connects to the corridor at the Rainford Junction, to the south of the current station. Concerning heavy industries, Holland Colliery and Rainford Collieries (and associated ponds) are operational at the eastern section of the study area. At the western section, there is Kirkby Mill (corn) on Simonswood Brook and two delfs (quarries) for sandstone.

By 1893 industrial activity had increased, with expansions at the collieries onto the study area – sidings in the case of Rainford Collieries and a mineral railway near Rainford Station. There was also a pumping station to the east of County Road and a sand washing works built on the track at this time.

There were few significant changes until 1956 where the collieries and associated infrastructure became disused and were infilled/remediated. Other types of works started to become prevalent at this time which resulted in new rail links joining the existing corridor. This includes the Kirkby Sorting Deposit (later the Simonswood Industrial Estate) near the centre of the study area and the Kirkby Industrial Estate to the south of the study area.

There was significant development of infrastructure, housing estates, schools and other buildings through the 1960's and 1970's. Areas of historic industries had either been redeveloped as housing, modern type of workings or left unused as woodland/fields. By 1976 the Rainford Junction had been removed and the M57 constructed northwest-southeast over the track at western edge of the site.

Additional residential developments occurred by 2005, after which there has been no further significant developments affecting the rail corridor or surrounding land.

2.4 Geology

2.4.1 Geological Summary

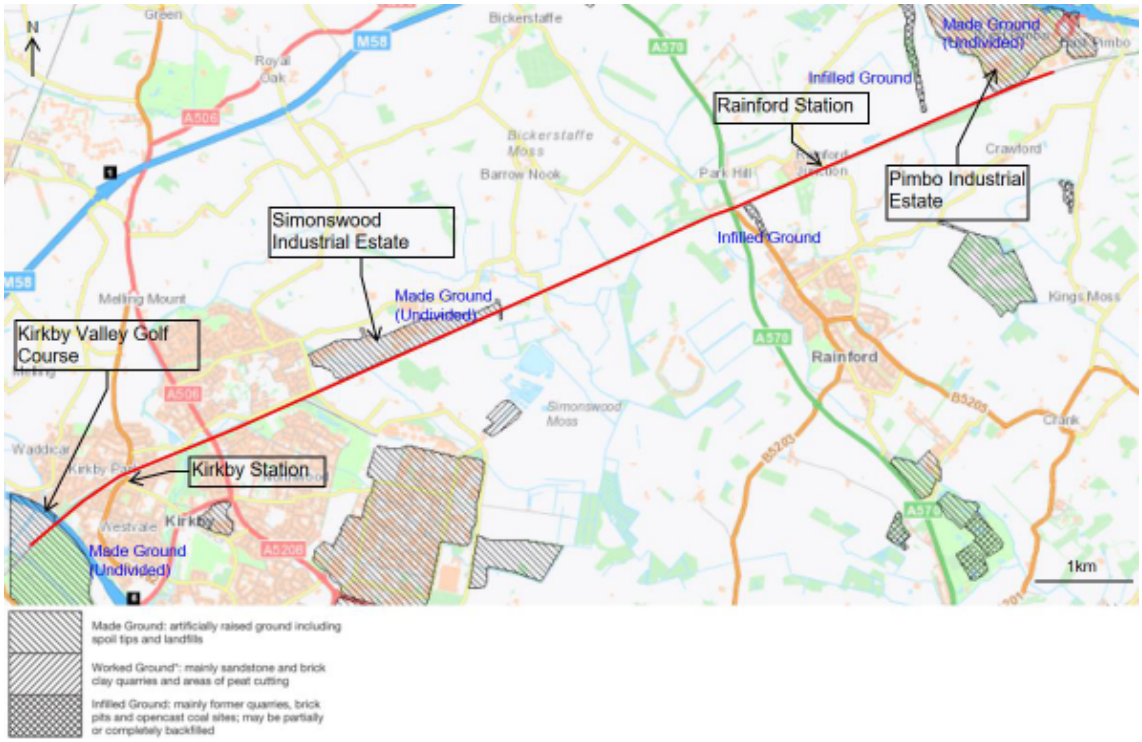
This section refers to information taken from British Geological Survey (BGS) 1:50,00 geological mapping for Wigan, Sheet 84, the BGS Onshore GeoIndex, and the Geological Memoir of Wigan District.

2.4.1.1 Artificial Deposits

Made Ground (Undivided) is shown across the rail corridor at Kirkby Valley Golf Course across the western end of the study area and at Simonswood Industrial Estate (previously Kirkby

Sorting Depot and a timber yard) across the centre of the study area. It is also shown on the edge of the corridor at the Pimbo Industrial Estate at the eastern edge of the study area. Further areas of Made Ground (infilled) are present within 100m of the corridor at the Rainford By-Pass and at Holland Moss. Figure 4 shows artificial deposits across the study area.

Figure 4: Artificial Deposits

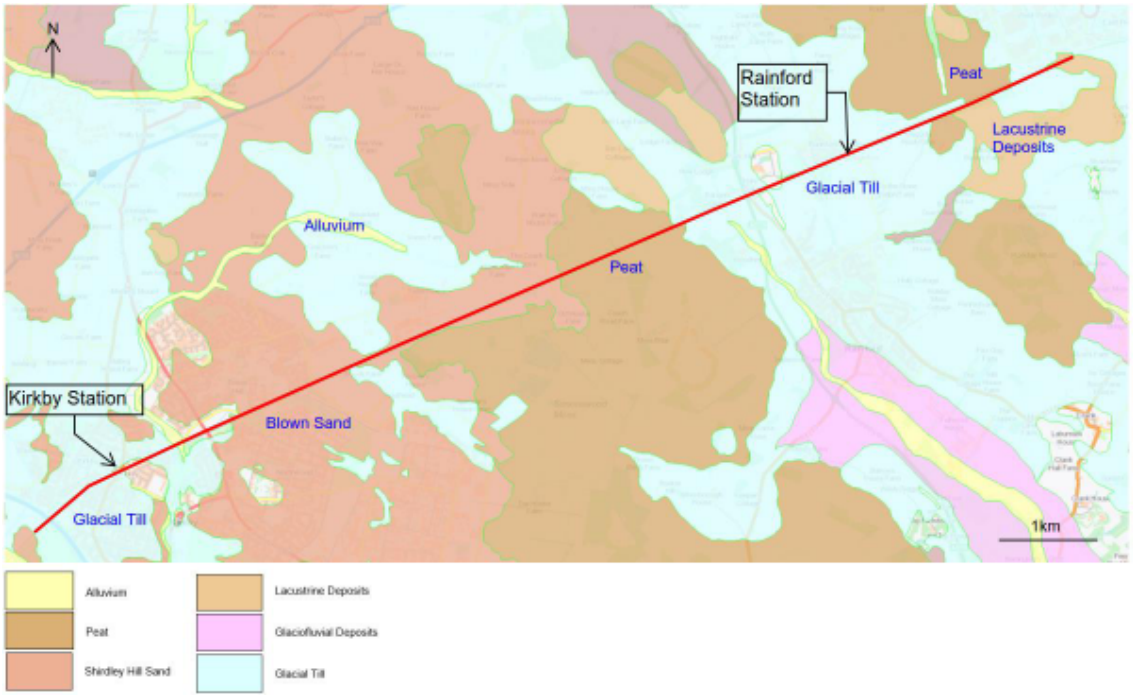


Contains British Geological Survey Materials © NERC 2018

2.4.1.2 Superficial Deposits

A variety of superficial deposits are mapped across the study area. Glacial Till predominates from the western end of the study area to Simonswood Brook (near County Road) and from the west of Rainford By-Pass to the eastern end of the study area. The BGS Memoir divides the stratum into Lower Boulder Clay (grey to red clay with erratics and boulders), Middle Sands (bedded sands interbedded with silts and silty sands) and Upper Boulder Clay (red to reddish brown clay which varies in thickness from 0.3m to 18m). Shirdley Hill Sand (blown sand) typically comprising well-sorted fine-grained sand with possible layers of Peat up to 5m thick is mapped from the east of County Road to the eastern crossing of Simonswood Brook. Deposits of Peat are mapped from the eastern crossing of Simonswood Brook to Siding Lane and to the west of Duke's Wood Lane crossing. Small deposits of Alluvium and Lacustrine deposits (typically silt and clay, and possibly organic) are also mapped where the corridor crosses Simonswood Brook and at the eastern tip of the study area respectively. Superficial deposits across the study area are shown in Figure 5.

Figure 5: Superficial Deposits



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2.4.1.3 Bedrock Deposits

Bedrock deposits across the western half of the study area comprise Triassic sandstones of the Chester Formation and Wilmslow Sandstone Formation (Sherwood Sandstone Group - SSG), where the former transitions into the latter at Kirkby Station. Just to the west of the western Simonswood Brook crossing, these rocks are faulted against Carboniferous Mudstone and Sandstone bands of the Lower Pennine Coal Measures Formation (Pennine Coal Measures Group - PCMG). Small areas of Pennine Middle Coal Measures are also mapped beneath the corridor, typically comprising Siltstone and Sandstone as well as Mudstone. Bedrock deposits across the study are shown in Figure 6.

Rocks of the SSG dip 5-6° to the northwest and outcrop around Kirkby Station and County Road as the Wilmslow Sandstone Formation. Those of the PCMG are heavily faulted with fault strikes typically trending NW-SE and blocks dipping up to 11° to the west around Moss Farm and up to 7° to the north around Rainford and Up Holland. They outcrop to the east of the Rainford By-Pass as the Pennine Lower Coal Measures Formation.

Mapping in Figure 7 shows the main areas where coal seams cross the study area, highlighted in yellow. The Ivy House Fault and Rainford Fault confines the Skelmersdale Earthy Delf, Ravine, Park and Skelmersdale Seven Foot coal seams around the Rainford By-Pass. The Blaguegate Fault and Up Holland Fault confines the Skelmersdale Seven Foot, Skelmersdale Dam, Skelmersdale Earthy Delf and Ravine coal seams.

Figure 6: Bedrock Deposits

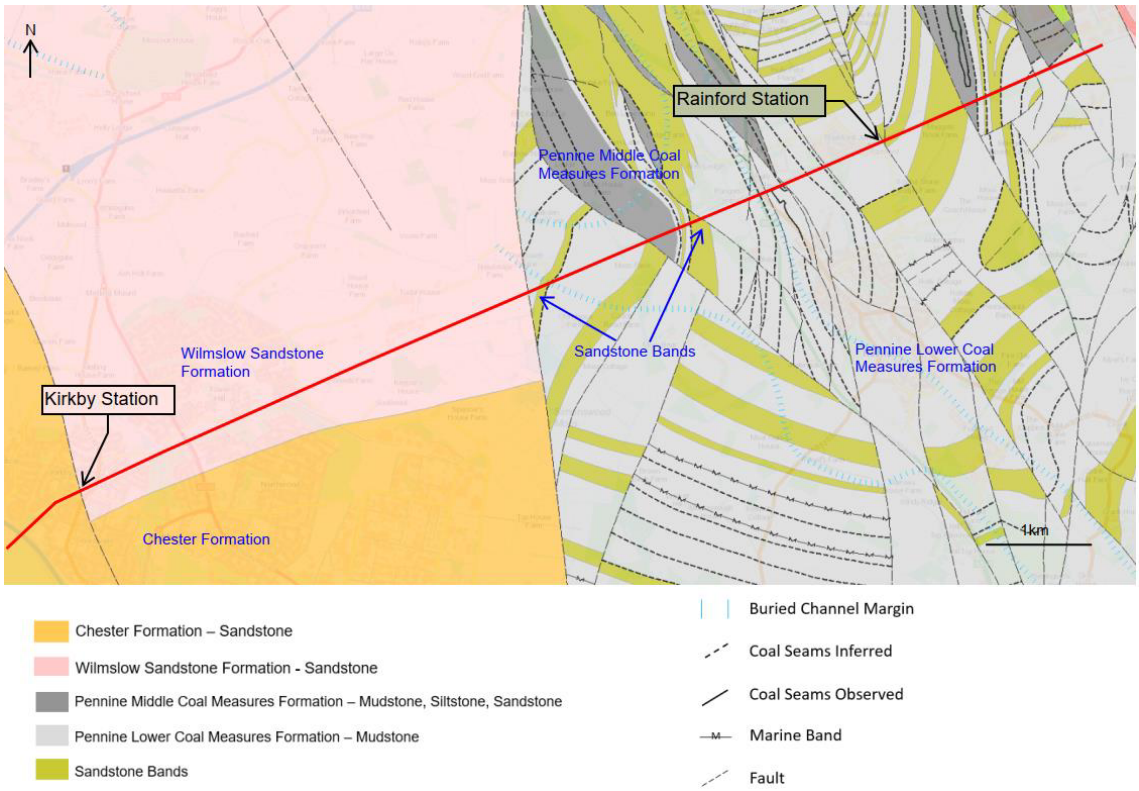

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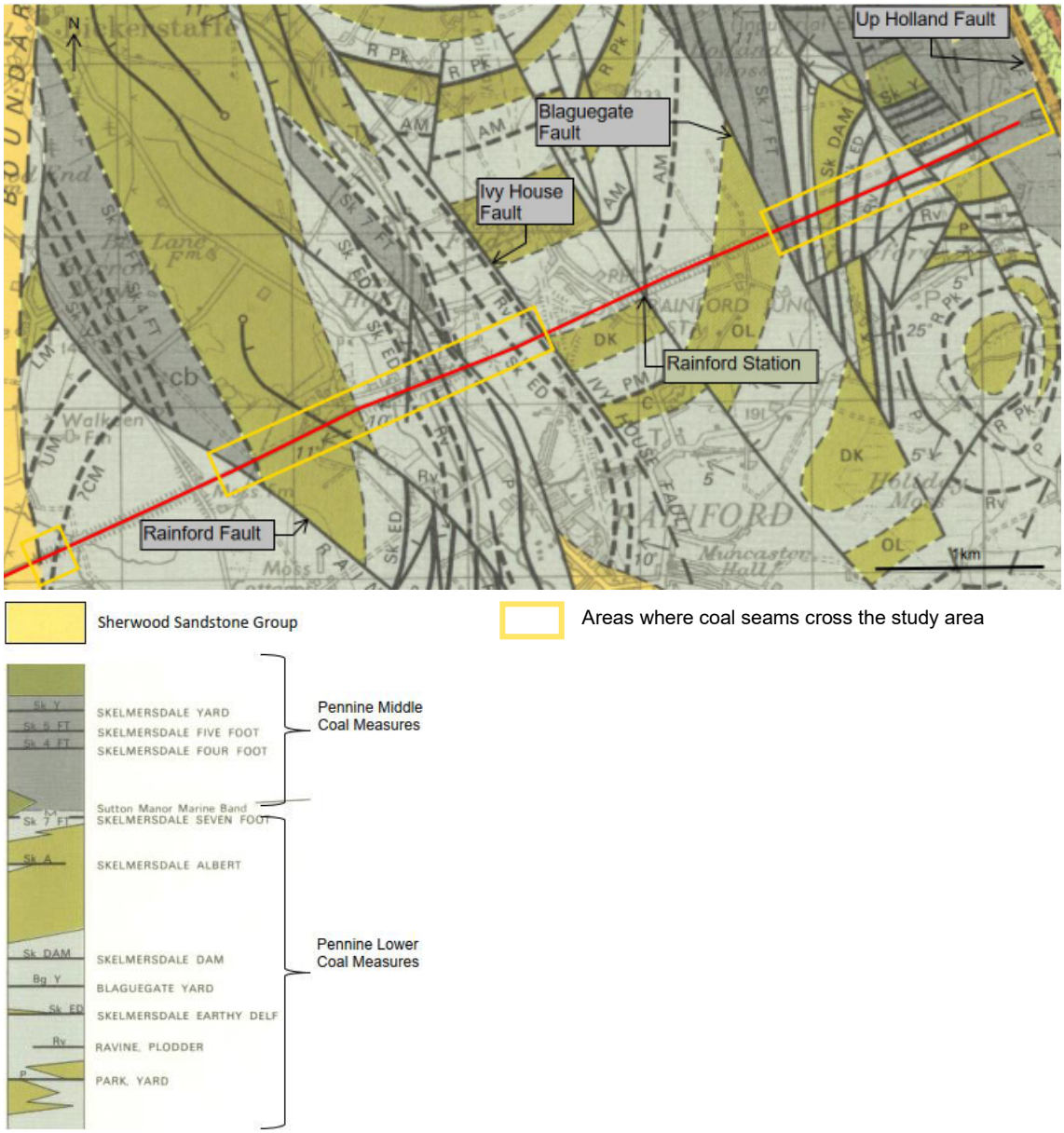
Figure 7: Bedrock Deposits in the Western area - Coal Seams and Faults



Extract from BGS Geological Mapping Sheet 84. Contains British Geological Survey Materials © NERC 2018

2.4.2 Historical Boreholes

Historical boreholes have been accessed via the BGS Onshore GeoIndex (NERC, 2018). They are predominantly located around the M57 and Rainford By-Pass crossings, the eastern half of Simonswood Industrial Estate and Pimbo Industrial Estate. BGS borehole locations are shown in Figure 8 and Figure 9. Available borehole logs have been used to inform ground conditions along the route and are presented in the Table 1 to Table 3. However, it should be noted that the data is limited mainly to soil descriptions of ground away from the rail corridor, and the quality of the data available may vary depending on the age and purpose of the boreholes.

Figure 8: BGS Boreholes Plan A

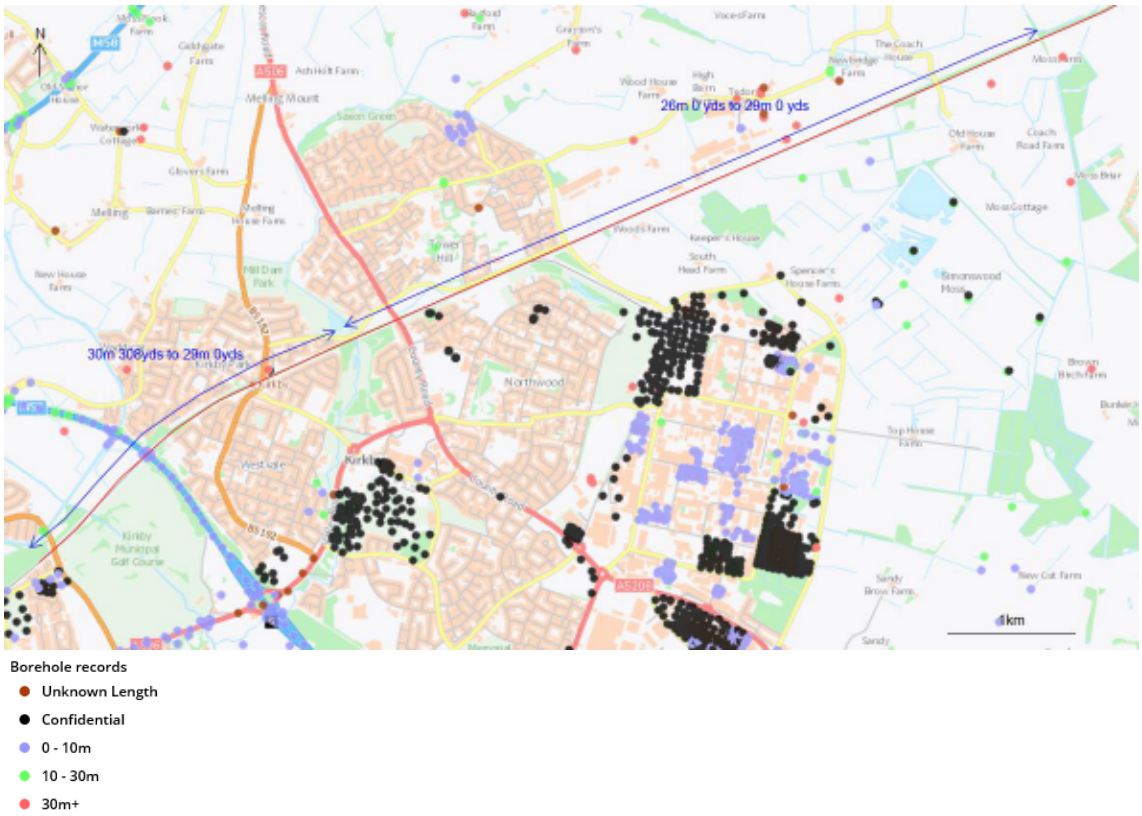


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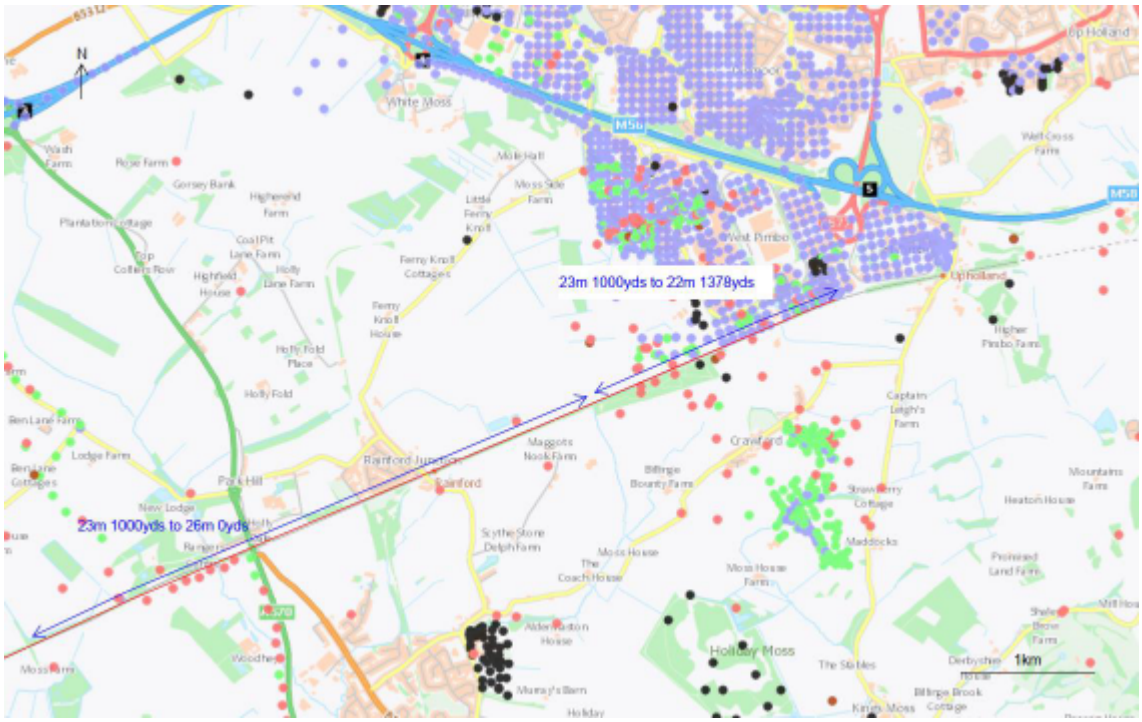
Figure 9: BGS Boreholes Plan B



Contains British Geological Survey Materials © NERC 2018

Table 1: Ground Model 30m 308yds to 29m 0yds

Strata	Typical Thickness (m) [Range, m]	Depth (mbgl)	Typical Description	Comments on Distribution
Glacial Till	2 [1.7 – 2.9]	1.7 – 2.9	Firm to very stiff red to brown sandy clay with cobbles (boulder clay)	All boreholes
Weathered Sandstone (Chester Formation SSG)	0.5 [0.2 – 0.5]	2.0 – 3.2	Red Sand	Discontinuous lens N and W of the M57 crossing
Sandstone (Chester Formation SSG)	>2.2*	>4.7*	Red Sandstone	*Base of stratum not proven All boreholes
Groundwater Level: Not Encountered				

Source: NERC (2018). Boreholes sunk in 1967, focused along the M57

Table 2: Ground Model 26m 0yds to 29m 0yds

Strata	Typical Thickness (m) [Range, m]	Depth (mbgl)	Typical Description	Comments on Distribution
Blown Sand (Shirdley Hill Formation)	1.7 [1.7 – 2.0]	1.7 – 2.0	Grey brown clayey sand	Isolated occurrences to the north of Headbolt Lane and at Simonswood Industrial Estate
Glacial Till	5 [0.15 – 8.3]	1.8 – 10.3	Brown sandy gravelly clay	All boreholes
Weathered Sandstone (Wilmslow Sandstone Formation, SSG)	1 [1.0 – 1.2]	3.1 – 7.6	Red sand / soft rock	Isolated occurrences to the north of Headbolt Lane and at Simonswood Industrial Estate
Sandstone (Wilmslow Sandstone Formation, SSG)	>59*	>62.0*	Red sandstone	*Base of stratum not proven Only the deepest boreholes
Groundwater Level: Not Encountered				

Source: NERC (2018). Boreholes sunk in 1976, 1996 and 2001 to the north of Headbolt Lane (one borehole only) and around the eastern side of Simonswood Industrial Estate

Table 3: Ground Model 23m 1000yds to 26m 0yds

Strata	Typical Thickness (m) [Range, m]	Depth (mbgl)	Typical Description	Comments on Distribution
Peat	1.7*	3.7*	Very soft reddish brown clayey fibrous Peat	*Base of stratum not proven Only in one borehole on the northern edge of the corridor at 19m 900yds
Blown Sand (Shirdley Hill Formation)	3.3 [2.6 – 5]	3.0 – 5.4	Sand	Most boreholes
Glacial Till	6 [0.5 – 18.9]	7.7 – 37.3	Firm sandy clay with bands of sand and cobbles (boulder clay)	Most boreholes
Glaciofluvial Deposits	0.8 [0.4 – 1.2]	7.7 – 21.7	Sand and gravel / gravel	Thin bands within Glacial Till
Pennine Lower Coal Measures Formation	>105*	>115*	Mudstone/Siltstone, Sandstone	*Base of stratum not proven
Groundwater Level: Not Encountered				

Source: NERC (2018). Boreholes sunk in 1990 for the North Western Ethylene Pipeline and in 2008 at Maggots Nook Farm (one borehole)

Table 4: Ground Model 23m 1000yds to 22m 1378yds

Strata	Typical Thickness (m) [Range, m]	Depth (mbgl)	Typical Description	Comments on Distribution
Peat	3.2 [2.7 – 4.9]	2.7 – 4.9	'Bog'	Boreholes in fields to the west of Pimbo Industrial Estate
Glaciolacustrine Deposits	1.0 [0.6 – 1.5]	0.9 – 3.4	Sandy yellow or mottled brown clay Clayey sand	Boreholes at Pimbo Industrial Estate
Glacial Till	3.0 [1.7 – 4.9]	3.7 – 5.3	Firm to stiff brown sandy clay with cobbles	All boreholes
Glaciofluvial Deposits	1.0 [0.3* – 2.1]	2.0 – 3.7*	Sand and gravel	*Base of stratum not proven Often thin bands within Glacial Till
Pennine Lower Coal Measures Formation	>1.5*	>21*	Grey shale with coal	*Base of stratum not proven
Groundwater Level: 18m bgl, with perched water in granular lenses above clay				

Source: NERC (2018). Boreholes mainly sunk in 1965 for Pimbo Industrial Estate and an unrecorded date for Holland Colliery

2.5 Hydrology

There are a number of controlled water features which have the potential to affect the proposed works, the main one being Simonswood Brook. Simonswood Brook is an Environment Agency (EA) main river which flows to the north from Rainsford to Simonswood and then South through Kirkby, and crosses the rail corridor at the following locations:

- to the west and east of Coach Road at WKL2 26m 813yds and WKL2 25m 1325yds respectively;
- as a tributary through Simonswood Industrial Estate at WKL2 27m 1290yds; and,
- as a tributary near Headbolt Lane at WKL2 28m 1148yds which then joins the main path of the brook on the north side before the brook passes beneath the railway at WKL2 29m 136yds.

Rainford Brook flows to the north across the track to the west of Rainsford By-Pass at WKL2 25m 369yds.

Off-site features include the River Alt (EA main river) and the Leeds & Liverpool Canal located 400m and 220m to the west of the start of the study area, flowing to the northwest and south and west respectively. There are also a number of small water bodies/ponds within 100m of the study area near Bowes Brow, Woods Farm, Siding Lane Woodland Nature Reserve, the allotments at Rainford, and Maggots Nook Farm/Red House Farm.

2.6 Flooding

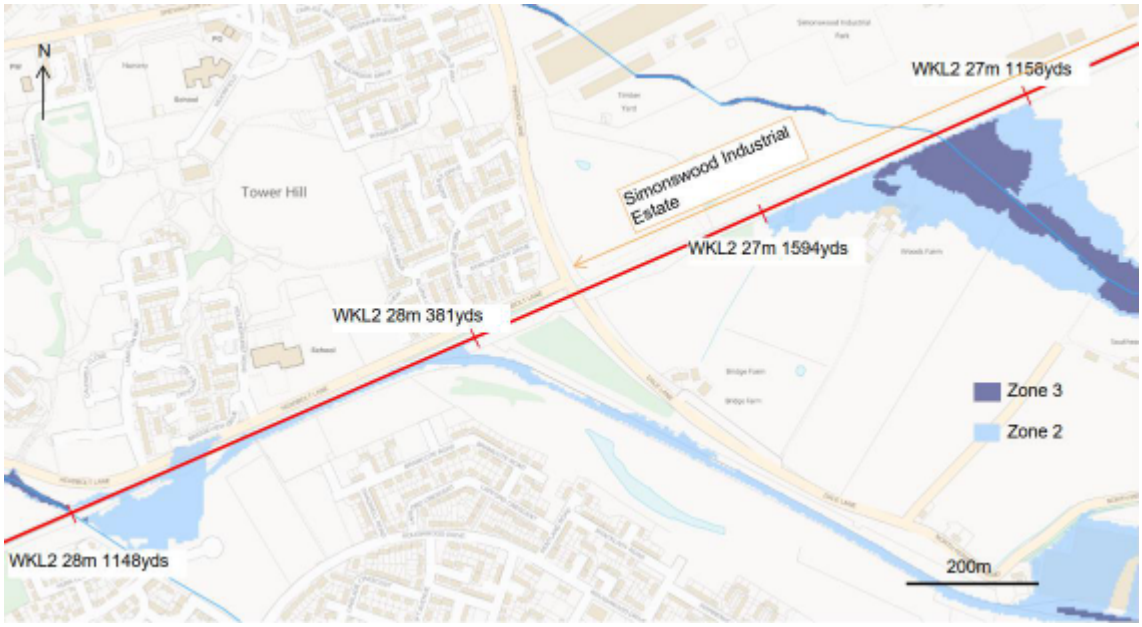
EA flood zones define the probability of flooding from rivers and seas and are split into the following:

- Zone 1 – Low Probability (<1 in 1000 annual probability of flooding. All undesignated land)

- Zone 2 – Medium Probability (between 1 in 100 and 1 in 1,000 annual probability of river flooding; or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding)
- Zone 3a – High Probability (≥1 in 100 annual probability of river flooding; or (≥1 in 200 annual probability of sea flooding)
- Zone 3b – Functional Floodplain (land where water has to flow or be stored during times of flooding)

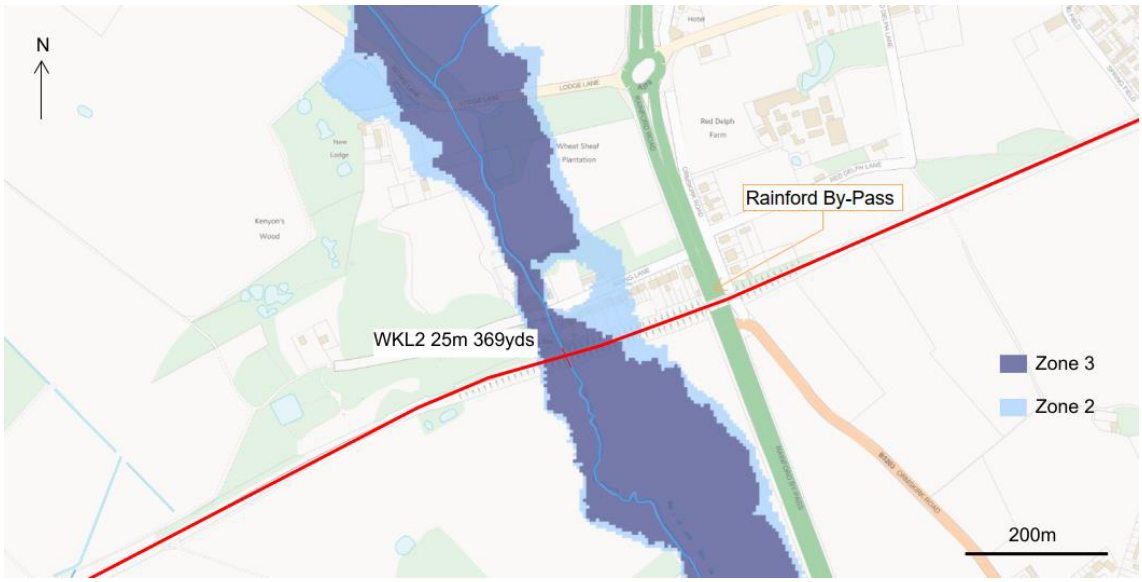
There are only two areas of the study area which are within a designated Flood Zone: a section of the corridor within Zone 2 which runs parallel to Headbolt Lane (WKL2 28m 1148yds to 28m 381yds) and within Zone 2-3 at the crossing of Rainford Brook (WKL2 25m 369yds). There is also an area of Zone 2-3 at Woods Farm (WKL2 27m 1158yds to WKL2 27m 1594yds) along the southern boundary of the corridor which follows Simonswood Brook. These areas are shown below in Figure 10 and Figure 11 whilst the full maps are provided in Appendix H. There are also no recorded areas of historic flooding across the study area.

Figure 10: Flood Map Extract A



Source: Environment Agency Flood Map for Planning

Figure 11: Flood Map Extract B



Source: Environment Agency Flood Map for Planning

2.7 Hydrogeology

Peat is classified as an Unproductive Strata, which means it has a low permeability and have negligible significance for water supply or river base flow. Glacial Till is classified as a Secondary Undifferentiated Aquifer, given to layers which may be permeable and capable of supporting water supplies at a local scale, or less permeable and capable of storing and yielding limited amounts of groundwater due to localised features. Glaciolacustrine Deposits, Glaciofluvial Deposits, Alluvium and deposits of Shirdley Hill Formation blown sand are classified as Secondary A Aquifers, defined as permeable layers capable of supporting water supplies at a local scale and in some cases forming an important source of base flow to rivers.

Sandstones of the SSG are classified as Principal Aquifers, which are defined as strata with a high intergranular and/or fracture permeability, usually providing a high level of water storage that may support water supply/river base flow on a strategic scale. Rocks of the PCMG are classified as Secondary A Aquifers, which defined as above.

Source Protection Zones (SPZs) are zones around wells, boreholes and springs used for public drinking supply which show the risk of contamination from activities that might cause pollution. In the area. The EA (via Groundsure.io) shows an active well at the northern side of Simonswood Industrial Estate and two wells 1.8km and 2.4km to the north of Kirkby near Melling Mount. As a result the western half of the site, up to the quarry at Simonswood Industrial Estate is within Zone 3 of these sources (2250m radius), and from WKL2 27m 620yds to 26m 1606yds within Zone 2 of the source at Simonswood Industrial Estate (500m radius).

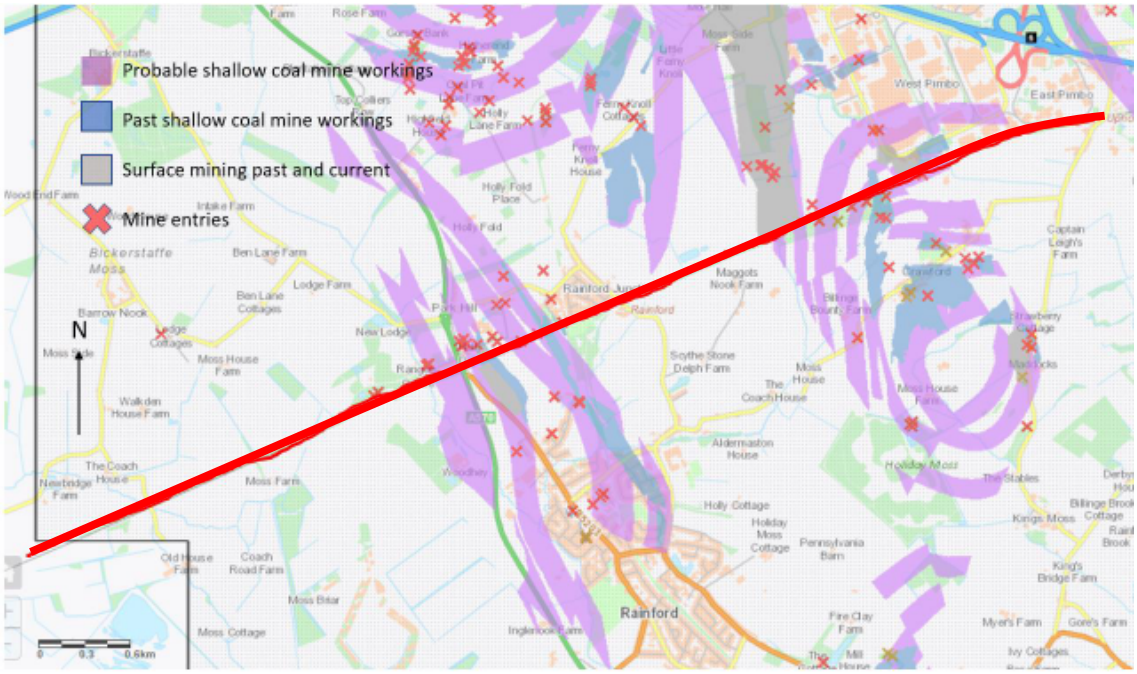
2.8 Mining

2.8.1 Coal Mines

Mining across the study area has been assessed using Historical OS maps, Coal Authority mining plans and a Network Rail Mining Report. They reveal two distinct areas of coal mining within the Lancashire Coal Field which affect the eastern half of the study area: Rainford Collieries on the northern side of the rail corridor to the west of the Rainford By-Pass (between WKL2 24m 1010yds and 25m 1340yds) and Holland Colliery (between WKL2 22m 1627yds to

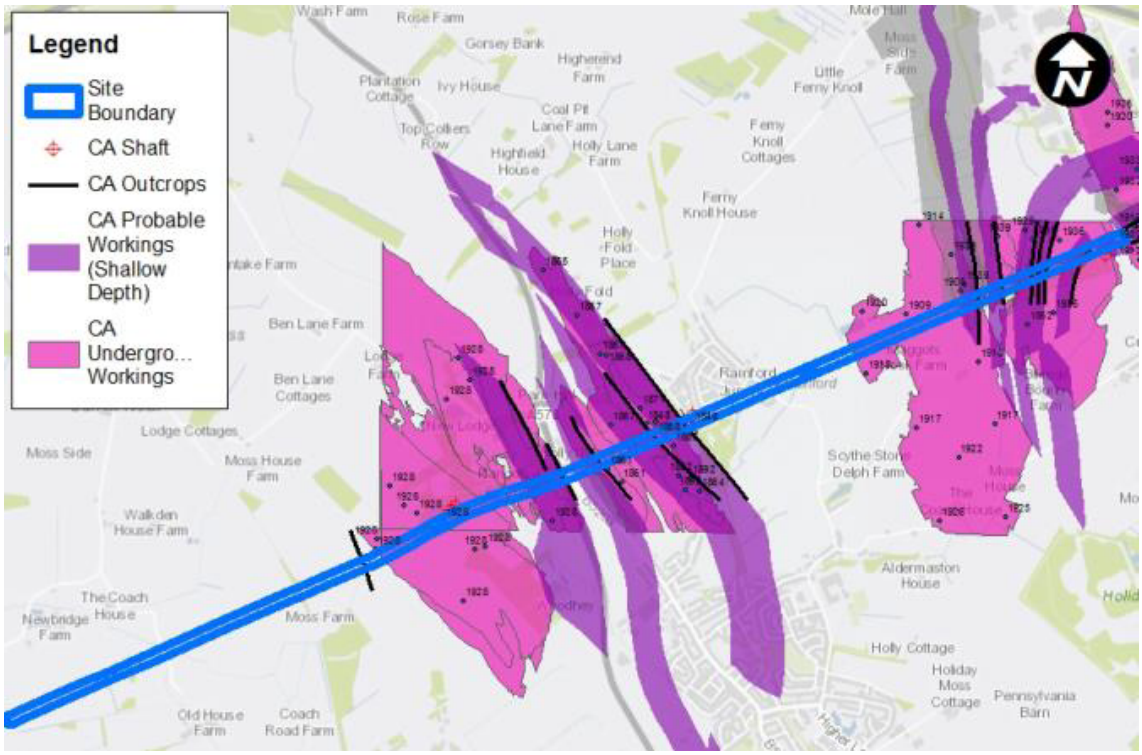
24m 120yds) south of Pimbo Industrial estate. Figure 12 and Figure 13 show significant areas of past and probable shallow coal mine workings and mine entries which may affect the study area. The available mine plans and reports including the Network Railing Mining Report (Stage 1 & 2) and Consultants Coal Mining Report for the Skelmersdale Station Desk Study, which encompasses part of the study area around Holland Moss, are provided in Appendix D.

Figure 12: Summary of Shallow Coal Mine Workings



Source: Coal Authority Interactive Map Viewer (2018)

Figure 13: Map Extract from Network Rail Mining Report

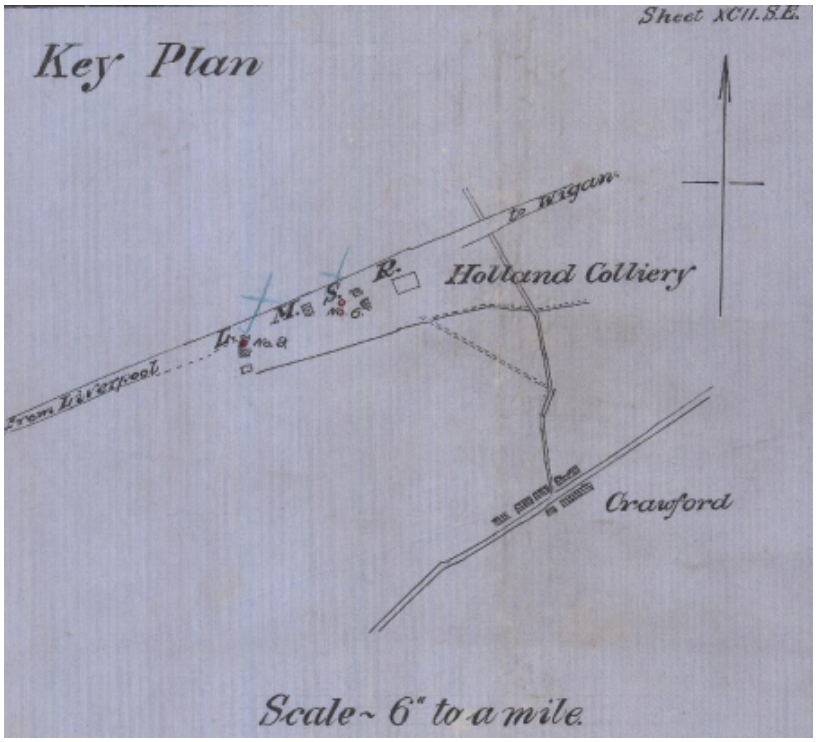


Source: Network Rail Mining Report LM-MISC-2448 (2018)

One of the sets of mining plans are for Holland Colliery, which appears to be operational until the late 1930s. They show there to have been two pits (No. 6 and No. 9) on the southern side of the railway and another two No. 8 and Day-Eye. All of the pits are connected to tunnels and/or workings directly beneath the rail corridor which work a range of coal seams including the Arley, Park, Rushy and Earthy seams. A plan and cross section is shown in Figure 14 and Figure 15 which show the succession of coal seams and depths from the surface at No. 6 and No. 9 pits. Whilst only shown to be partly worked by 1920, the Earthy seam is the shallowest and was worked at a depth of 59m at No. 9 Pit. The seam could have been further worked since the plan was produced, with potential shallow workings from No. 9 Pit to the east of No. 6 Pit where the seam outcrops. Underlying seams in the Park Mine, Rushy Park Mine and Arley Mine are shown to be completely worked to the east of No. 6 Pit by 1920, with workings becoming increasingly shallow to the east. Workings or tunnels to the west of No. 9 Pit are also shown to be as shallow as 35m, and Albert Mine to the west of Duke's Wood Lane appear to indicate workings as shallow as 15m from the surface beneath the track.

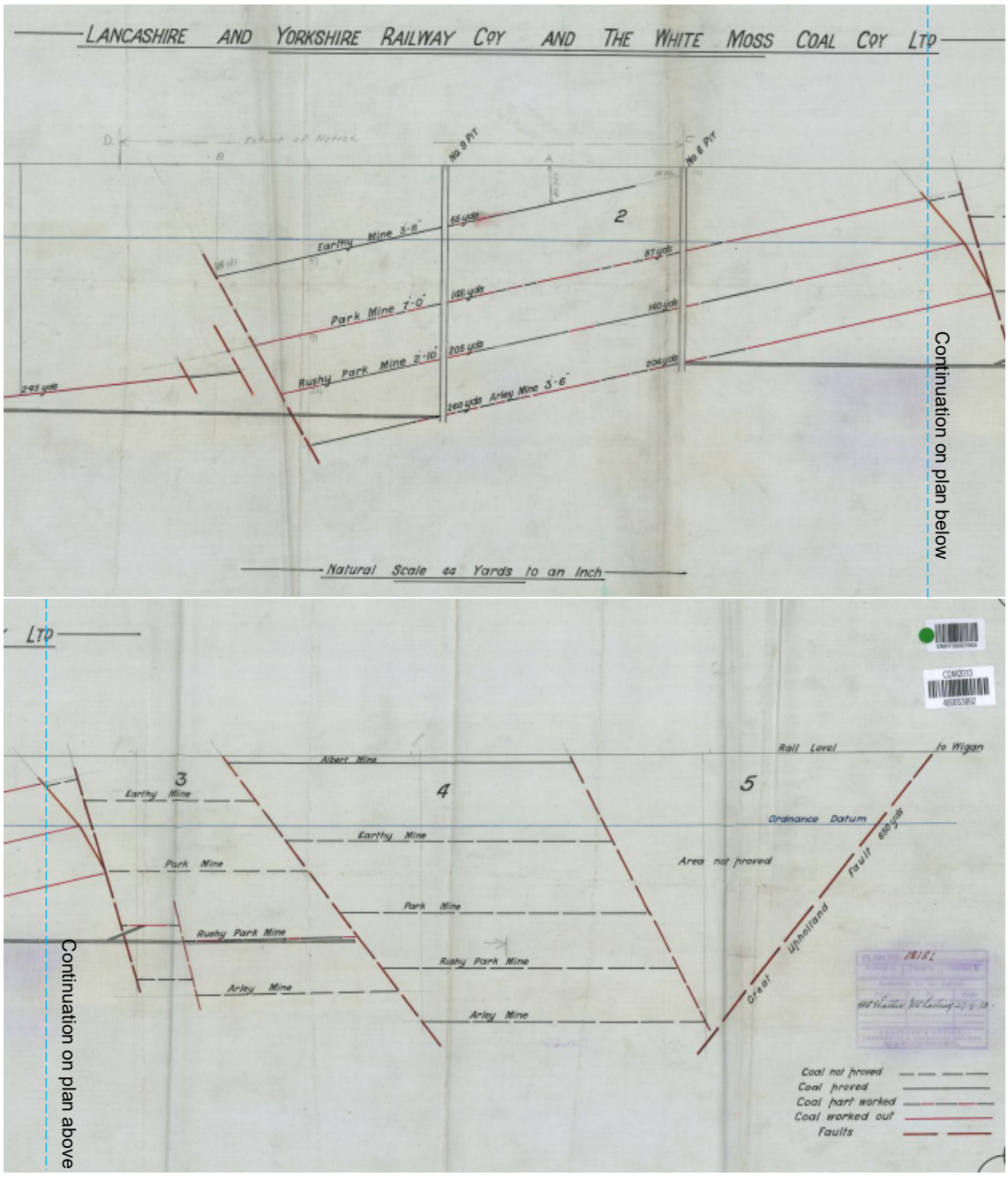
Further evidence of shallow tunnels is given in Figure 16 in the form of access roads which connect the King Coal Mine (Earthy Mine) to Day-Eye Pit and No. 9 Pit beneath the rail corridor. The end of the road section which directly joins to No. 9 Pit (surface level) is at 23m bgl, with an estimated depth beneath the rail track of around 10m bgl.

Figure 14: Plan showing No. 6 and No. 9 Pits at Holland Colliery



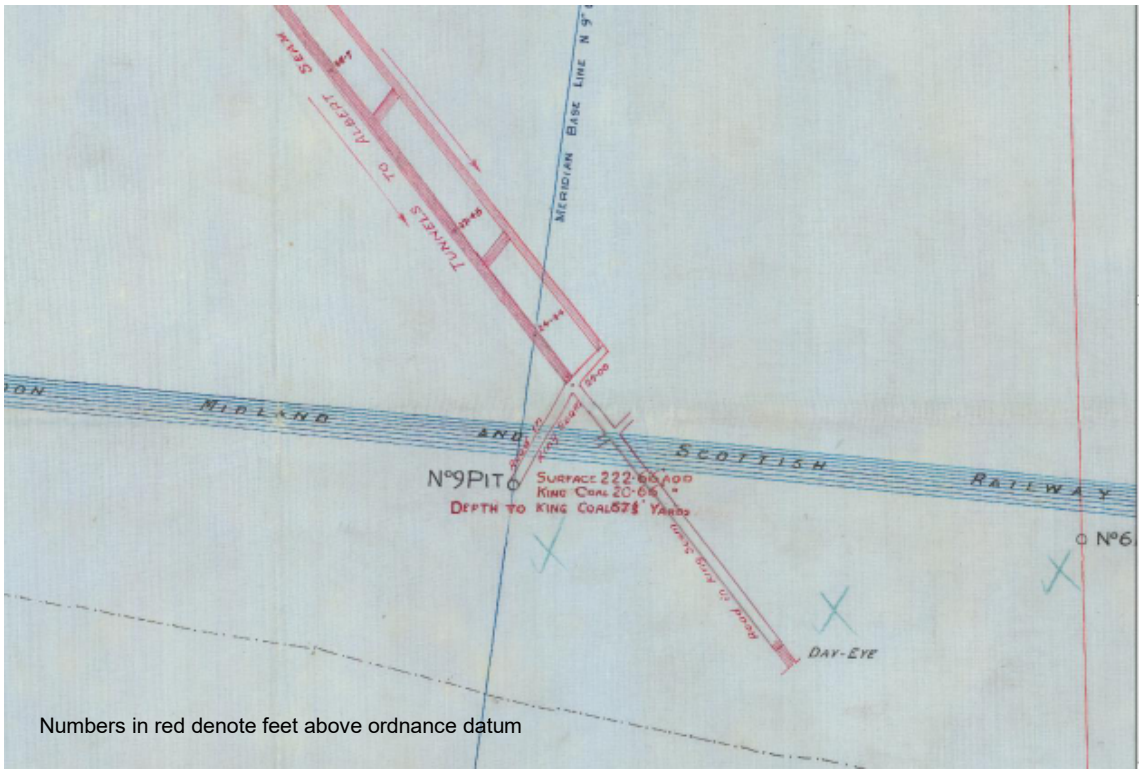
Source: CA Mine Plan 10207

Figure 15: Cross Section of Coal Seams at Holland Colliery



Source: CA Mine Plan 400053892 (1920)

Figure 16: Shallow Access Tunnels at Holland Colliery



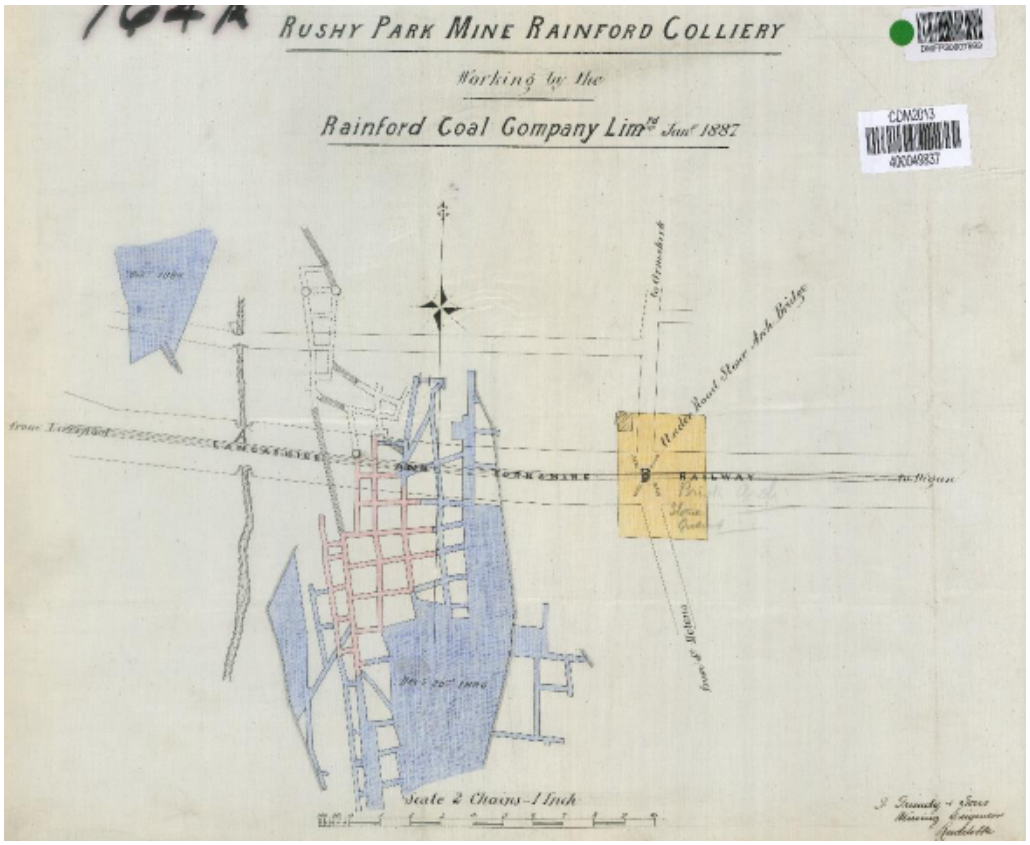
Source: CA Mine Plan 12484 5 of 5.

Rainford Collieries were operational until around the same time as Holland Colliery. Mining plans show No, 1, No. 2 and No. 4 pits on the northern side of the rail corridor, with No. 4 located between Rainford Brook and the present-day Ranford By-Pass, and No. 1 and No. 2 approximately 300m to the west of Rainford Brook. Workings and access tunnels are shown across the area and beneath the rail corridor as shown in Figure 17. Figure 18 shows a cross section (1887) from Rainsford Brook (A) to what is now the Rainford By-Pass (B). The Five Feet Mine is recorded to be 23m below the surface at Rainford By-Pass and the corresponding plans indicate where coal has been removed. The available plans it indicates that coal was not completely removed from the shallowest Five Feet Mine.

A second cross section (date unknown), shown in Figure 19, illustrates the seams/mines along the study area in more detail. Seams dip to the west and the shallowest workings are those within the Seven Feet seam (Five Feet seam on previous plan), shown as being 146m deep at No. 2 Pit and 30m deep at No. 4 Pit, becoming increasingly shallower to the east until the seam outcrops just to the east of what is now the Rainford By-Pass (labelled Arch Bridge in the Figure 19).

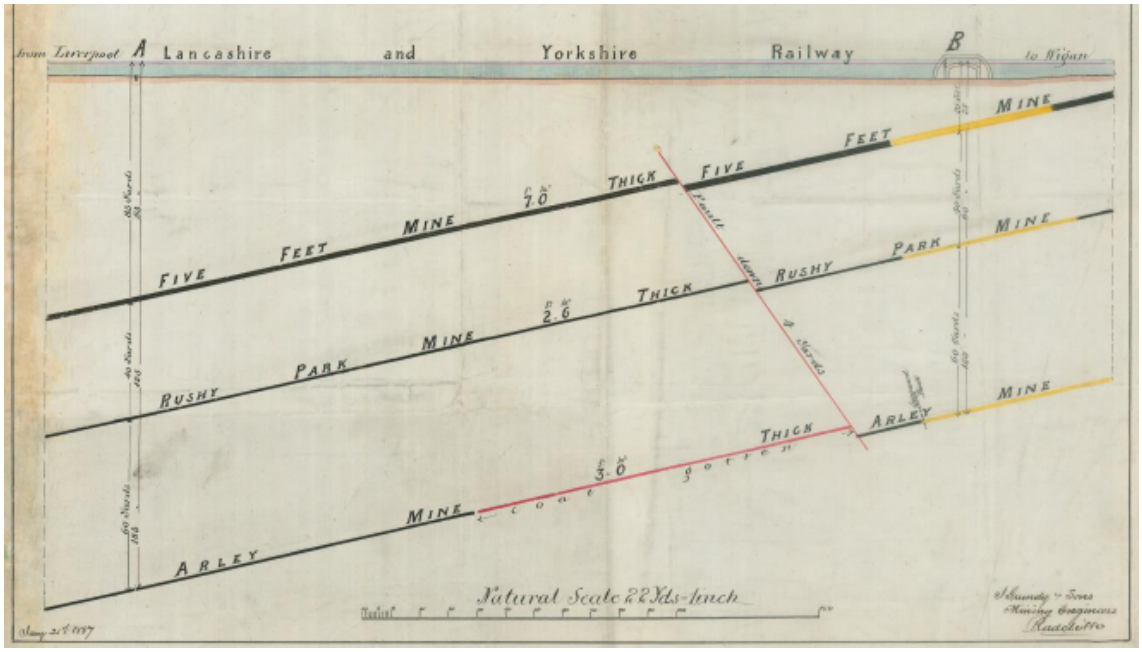
It should be noted that the information given on the plans is variable, referenced to historic roads/features and in some cases very limited. It should also be remembered that typically their purpose was quantity measurements rather than survey accuracy and could be inaccurate due to deliberate intent (e.g. avoidance of royalties) (CIRIA C758). However, they do indicate that mining has been undertaken around two localities beneath the railway line.

Figure 17: Pits Proximal to The Rail Corridor at Rainford Collieries



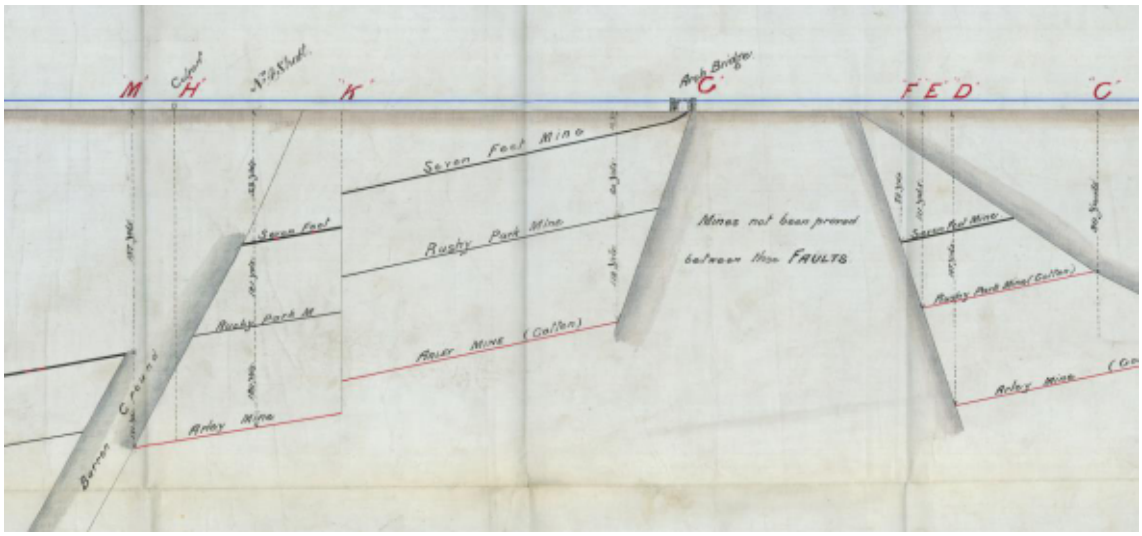
Source: CA Mine Plan 40009837

Figure 18: Cross Section Extract of Coal Seams at Rainford Collieries



Source: CA Mine Plan 400053186

Figure 19: Cross Section Extract of Coal Seams at Rainford Collieries



Source: CA Mine Plan 400049838

2.8.2 Mining Summary

There are significant areas of coal mine workings beneath the rail corridor. Records suggest that workings rarely come within distance of the ground surface to affect the proposed works (≤ 25m bgl) but there are at least two examples at Holland Colliery of tunnels which appear to directly underlie the corridor at depths of up to 15m bgl. There are also a number of shafts proximal to the corridor. The remedial status of all shafts, tunnels and workings is currently unknown. The proposed works mainly take the form of track bed renewal, which is not expected to cause significant loading or disturbance of the ground surface such that subsidence or ground collapse would occur where shallow voids are present. Where more intrusive/disturbing construction methods are required, such as at Rainford Station where platform extension is proposed, there are not shown to be any potential shallow workings or shafts in the area. Nonetheless, the overall risk to the proposed works is considered to be high due to the potential impact of collapsing ground. Once the final proposals are known a mining risk assessment should be carried out to further define the risk.

2.9 Railway Earthwork Records

Table 5 below summarises earthwork sections along the study area based on records from the JBA-Network Rail Earthwork Record Database (the full report of which is provided in Appendix E). The records separate earthworks into 110yd (100m) sections and include the earthwork type, Earthwork Hazard Category (EHC) and Risk Category. Network Rail does not classify cutting/embankment which are less than 3m high. These are defined as being at grade. EHC relates to the statistical likelihood of failure (A – E, where E is most likely) and Risk Category defines the risk posed to the track for a variety of failure types. All earthwork sections along the study area have an EHC A - C. Approximately 86% of sections have a Risk Category of Low Risk, 8% have a Medium Risk and a further 6% are noted to be ‘not applicable’, referring to at grade/no earthworks. Date of inspection for the records range from 2012 to 2019, so it is possible there has been some degradation in earthworks quality during recent time. A summary of all 100m sections for up and down sides of the corridor is given in Appendix E.

During a typographic survey carried out in 2018 along the railway line the presence of potential sandstone blocks (used as pitching) was noted along the track next to Simonswood Industrial

estate. However, there is no information available to confirm the whether the blocks are pitching and the extent that they cover.

Table 5: Earthworks Summary

ELR	Start Mileage	End Mileage	Earthwork type	EHC	Risk Category
WKL2	22.1320	24.1650	No Earthwork		
WKL2	24.1650	25.0660	Soil Embankment	A	Low Risk
WKL2	25.0660	26.0440	No Earthwork		
WKL2	26.0440	26.0990	Soil Embankment	A	Low Risk
WKL2	26.0990	26.1430	No Earthwork		
WKL2	26.1430	26.1760	Soil Cutting	A	Low Risk
WKL2	26.1760	27.0440	No Earthwork		
WKL2	27.0440	27.1100	Soil Cutting	A	Low Risk
WKL2	27.1100	27.1540	Soil Embankment	A	Low Risk
WKL2	27.1540	28.0220	No Earthwork		
WKL2	28.0220	28.0330	Soil Cutting	A-C	Low-Average Risk
WKL2	28.0330	28.1430	No Earthwork		
WKL2	28.1430	29.0440	Soil Embankment	A	Low-Average Risk
WKL2	29.0440	29.0550	No Earthwork		
WKL2/WJK	29.0550	29.1320	Soil Cutting	A-C	Low-Average Risk
WJK	29.1320	30.0330	Soil Embankment	A-C	Low-Average Risk

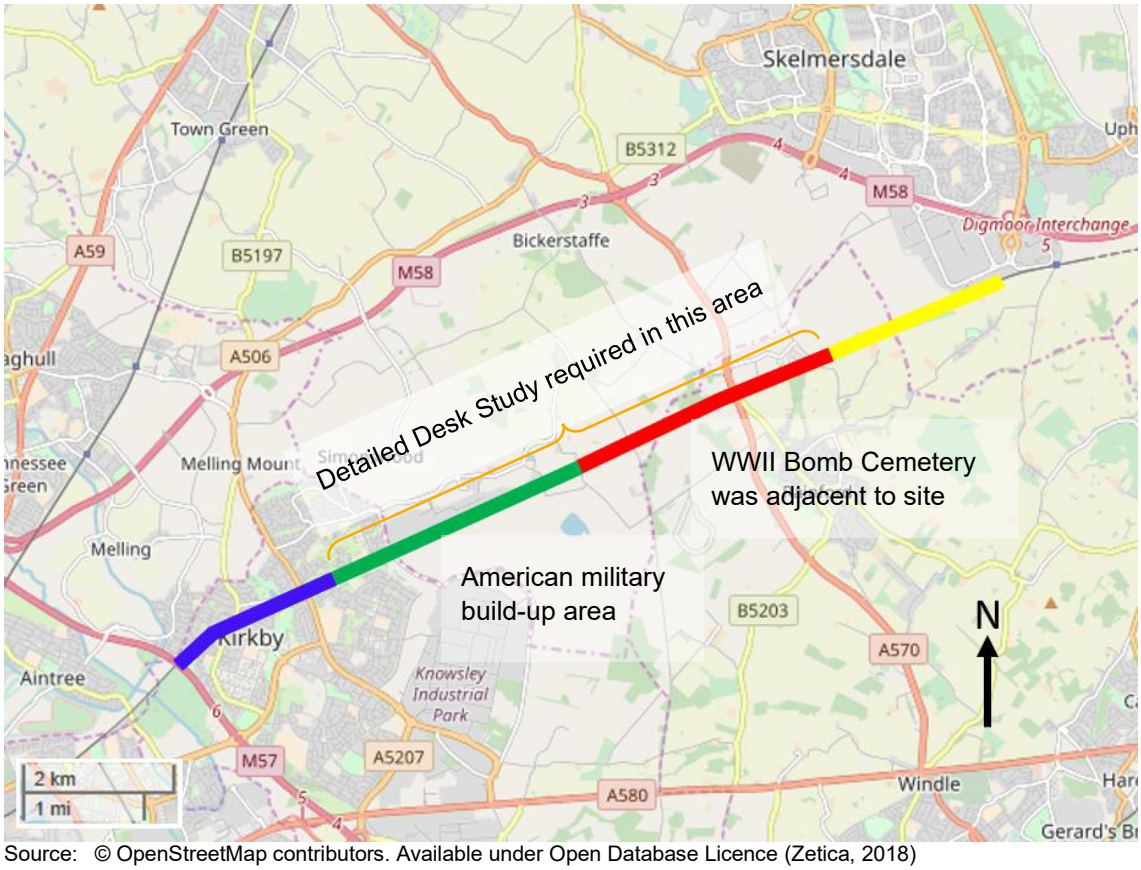
Source: JBA-Network Rail Earthwork Asset Database

2.10 Unexploded Ordnance (UXO)

Four Pre-Desk Study Assessments (PDSA) for unexploded ordnance (UXO) were obtained from Zetica for separate segments of the study area. The PDSAs state that a number of strategic WWII targets were located within 5km of the site including infrastructure, industries important to the war effort, and military barracks and depots. One of these was the Kirkby Inland Sorting Depot (at the existing location of Simonswood Industrial Estate) which was used by the American military to store and distribute imported war materials. A bomb cemetery is also recorded adjacent to the eastern part of the study area, although no further detail on this is known at this time.

The PDSA recommend that a detailed desk study is commissioned to assess, and potentially zone, the UXO hazard level across the central section of the study area. A summary is shown below in Figure 20 and the PDSAs in Appendix F.

Figure 20: PDSA Summary Plan



Source: © OpenStreetMap contributors. Available under Open Database Licence (Zetica, 2018)

2.11 Landfill

There are a number of landfills within range to affect the ground conditions along the study area. Historic landfills within 1km are summarised in Table 6 and active landfills in Table 7 below.

Table 6: Historic Landfills

Site Name	Location (NGR)	Distance from Study Area	Dates of Operation	Recorded Waste
Ingoe Lane	Ingoe Lane 339900, 398000	660m S	Unknown	Unknown
Nico Trading Limited	Bank Lane 340500, 400100	430m N	1992 – 1993	Inert
Simonswood Industrial Estate	Simonswood Industrial Estate 342600, 400400	<5m N	Unknown	Unknown
Stopgate Lane North and South	Stopgate Lane 342300, 400700	460m N	Unknown	Unknown
Siding Lane Tip	Siding Lane 346300, 402200	70m N	1952 – unknown	Commercial
Holland Colliery	Duke's Wood Lane 349200, 403100	<5m S	1939 - 1986	Inert, Industrial, Commercial

Site Name	Location (NGR)	Distance from Study Area	Dates of Operation	Recorded Waste
Pimbo Landfill Site	Chequer Lane 351300, 403900	1000m E	1960 – 1996	Inert, Industrial, Commercial, Household, Special, Liquid/Sludge

Source: Environment Agency

Table 7: Active Landfills

Site Name	Location (NGR)	Distance from Study Area	Date of License Issue	Recorded Waste
Holland Colliery	Duke's Wood Lane 349200, 403100	5m S	1992	Other Wastes
Marl Road/Woodward Road Inert Landfill	Woodward Road 343326, 399466	700m S	1992	Non-Biodegradable Wastes

Source: Environment Agency

2.12 Services/Utilities

The rail corridor crosses a number of active services/utilities which have been identified from the 5-Mile Plans provided by Network Rail. A summary, including material type and dimensions where known, is provided below in Table 8. Most of these are culverts but also included are water mains, gas mains, sewer pipes and electrical cables.

Table 8: Summary of Utilities

ELR	Miles	Yards	Service/ Utility
WKL2	22	1340	24" stone culvert
WKL2	22	1612	12" stone culvert
WKL2	23	443	3ft stone arch culvert
WKL2	23	882	NM 9"EW pipe
WKL2	24	000	NM 3ft brick arch culvert
WKL2	24	444	NM water main (LA Maint)
WKL2	24	449	NM 13" X7 Drain pipe
WKL2	24	884	NM 24" Brick barrel culvert
WKL2	24	887	NM Elec cable assumed
WKL2	24	968	Four concrete pipes
WKL2	24	1105	3Ft Stone culvert
WKL2	25	2	Elec Cable Assumed
WKL2	25	4	NM Water Main (LA Maint)
WKL2	25	7	NM Gas Main (LA Maint)
WKL2	25	9	NM 18" Timber Truck culvert
WKL2	25	882	NM 24" Trunk culvert
WKL2	25	400	Sankey Brook Culvert
WKL2	25	1342	M 30" Timber trunk culvert
WKL2	26	1160	24" Stone Culvert
WKL2	27	882	NM 18" stone culvert
WKL2	27	883	NM3FT 6" Stone culvert
WKL2	27	1315	3FT 10" stone arch culvert
WKL2	27	1452	NW 30" stone culvert

ELR	Miles	Yards	Service/ Utility
WKL2	27	1572	30" stone arch culvert
WKL2	27	1716	24" stone culvert
WKL2	28	882	NM 18" stone arch culvert
WKL2	28	1160	4Ft 2" stone arch culvert
WKL2	28	1322	NM 18" stone pipe
WKL2	29	195	3FT 10" stone arch culvert (Millstream)
WJK	29	1323	18" stone culvert
WJK	29	1324	18" stone culvert
WJK	29	1725	12" sewer pipe
WJK	30	2	Elec cable
WJK	30	4	Elec cable
WJK	30	74	18" stone culvert
WJK	30	203	18" stone culvert
WJK	30	409	18" stone culvert
WJK	30	442	3□culvert
WJK	30	556	18" stone culvert
WJK	30	882	24" Brick culvert
WJK	30	1105	Elec Cable (Manweb)

Source: Network Rail

2.13 Network Rail Hazard Directory

A hazard directory has been provided by Network Rail for the extents of the study area. The most commonly listed hazards refer to mine workings/shafts, buried services, overheard cables and landfill gases. Summarised below are items from the hazard directory which relate to shallow coal mine workings or shafts and landfill gases. The full hazard directory is provided in Appendix G.

Table 9: Extract from Network Rail Hazard Directory

ELR	Start	End	Type	Name	Comments
WKL2	22.165	23.1496	Landfill Gases	Holland Colliery	At risk from the migration of landfill gasses. Appropriate precautions should be taken.
WKL2	23.0066	23.0066	Mineworking - Pitshaft	Shaft	Mineshaft
WKL2	23.0374	23.0506	Mineworking - Mine	Culvert at 23M 20C	Shallow Mineworking
WKL2	23.0484	23.0484	Mineworking - Pitshaft	Shaft	Mineshaft
WKL2	23.0627	23.0627	Mineworking - Pitshaft	Shaft	Mineshaft
WKL2	23.0814	23.0869	Mineworking - Mine	Holland Colliery	Shallow Mineworking
WKL2	23.0869	23.0869	Mineworking - Pitshaft	Shaft	Mineshaft
WKL2	23.1078	23.1166	Mineworking - Mine	Holland Colliery	Shallow Mineworking
WKL2	23.1188	23.1243	Mineworking - Mine	Holland Colliery	Shallow Mineworking
WKL2	24.1100	24.1100	Mineworking - Pitshaft	Shaft	Mineshaft

ELR	Start	End	Type	Name	Comments
WKL2	24.1188	24.1364	Mineworking - Mine	Rainford Colliery	Shallow Mineworking
WKL2	25.0286	25.033	Mineworking - Mine	Rainford Colliery	Shallow Mineworking
WKL2	25.0308	25.0308	Mineworking - Pitshaft	Shaft	Mineshaft
WKL2	25.0308	25.0924	Landfill Gases	Sidings Lane. Rainford	At risk from the migration of landfill gasses. Appropriate precautions should be taken.
WKL2	25.0781	25.0781	Mineworking - Pitshaft	Shaft	Mineshaft
WKL2	27.0704	28.0462	Landfill Gases	Stopgate Lane. Simonswood	At risk from the migration of landfill gasses. Appropriate precautions should be taken.

Source: Network Rail Hazard Directory. For all items shown above, additional comments of 'contact NST Mining for advice – 01332 262716'.

3 Ballast Contamination Assessment

A large part of the proposed works will involve excavating, handling and potentially disposing of track bed material off-site. It is important to identify potential areas of contaminated ground that can be targeted as part of the ground investigation (GI) so that the contamination status of the excavated ballast can be determined, and potential hotspots can be identified which may pose an increased risk to construction workers. A summary of potential areas of contamination affecting the track bed is provided below in Table 10.

Table 10: Areas of Potential Contamination

Start (mi.yds)	End (mi.yds)	Source	Comments
26.1376	28.0000	Historic Kirkby Inland Sorting Depot	Located in the existing footprint of Simonswood Industrial Estate, the sorting depot was established in 1941 and is known to have been used to store and distribute imported war materials. It was directly connected to the rail corridor via private sidings and therefore the possibility of track bed contamination exists. Although war materials were not manufactured on site, potential contaminants may include those associated with munitions factories, including a variety of propellants (organic and inorganic solvents and compounds), metals and fuels.
25.0290	25.1086	Rainford Collieries	Holland Colliery and Rainford Collieries were located on the borders of the rail corridor connected via sidings and were both disused by 1956. Given the age of closure, it is likely that the sites were infilled with colliery spoil with no formal remediation undertaken. Historic landfills are recorded at both colliery sites, with Sidings Lane Tip (Rainford Collieries) reporting commercial waste and Holland Colliery Landfill reporting commercial, industrial and inert waste. Contaminated material may be buried within the track bed from when the collieries were operational or from the leachate of landfill waste in more recent times.
23.330	23.1190	Holland Colliery	
Entire Site		Rail Corridor	The rail corridor of the study area pre-dates the earliest historic map available (1850). Whilst the track bed is likely to have been maintained and possibly replaced in part since this time, the original track bed (and any contamination within it) may still be present beneath the upper layer of ballast. By nature, even modern railways are considered to be contaminative. Potential sources of contamination are likely to include the following: • Ash ballast (containing metals, phenols, sulphates and polycyclic aromatic hydrocarbons (PAHs)) which may be buried below modern ballast layers. • Fuel oils, lubricating oils and greases in areas of historic sidings (Kirkby Inland Sorting Depot, Holland Colliery and Rainford Collieries) • Herbicides from trackside farmland • Spillages and leakages of fuels • General contamination through the wind dispersal of airborne contaminations, including coal dust and asbestos fibres. • Buried asbestos from trackside buildings, such as the historic sand washing works (Simonswood Industrial Estate). The presence of contaminated material within the track bed is considered to be very likely.

4 Potential Ground Related Constraints and Risks

The potential ground related constraints for the proposed railway line and associated buildings have been summarised into a risk register provided in. Table 11 and Table 12 show the impact index and likelihood index respectively for assessing a hazard. Table 13 presents the Risk Matrix, which shows the actual risk level, rated from 'Severe' (max. risk level) to 'Negligible' (min. risk level). These constraints and risks require further investigation or consideration as the scheme progresses to reduce and minimise the impacts of these on the scheme.

Table 11: Negative Consequence Score Table

Impact		Health and Safety	Time	Cost	Reputation	Environment
Very Low	negligible	negligible	negligible effect on programme	negligible	negligible	negligible
Low	minor	minor injury	5% effect on programme	1% budget	minor effect on local company image/ business relationship mildly affected	minor environmental incident
Medium	serious	major injury	12% effect on programme	10%budget	local media exposure/ business relationship affected	environmental incident requiring management input
High	threat to future work and client relations	fatality	25% effect on programme	20% budget	nationwide media exposure / business relationship greatly affected	environmental incident leading to prosecution or protestor action
Very High	threat to business survival and credibility	multiple fatalities	50% effect on programme	50% budget	permanent nationwide effect on company image/ significant impact on business relationship	major environmental incident with irreversible effects and threat to public health or protected natural resource

Table 12: Likelihood Score Table

	Likelihood	Probability
Very Low	negligible / improbable	<1%
Low	unlikely / remote	>1%
Medium	likely / possible	>10%
High	probable	>50%
Very High	very likely / almost certain	>90%

Table 13: Risk Matrix

		Likelihood				
		Very Low	Low	Medium	High	Very High
Negative Consequence	Very Low	N	N	N	N	T
	Low	N	N	T	T	S
	Medium	N	T	T	S	S
	High	N	T	S	S	I
	Very High	T	S	S	I	I

Risk Key

intolerable	RED	I
significant	AMBER	S
tolerable	YELLOW	T
negligible / trivial	GREEN	N

GEOTECHNICAL RISK REGISTER

Date: 24/02/2020 **Project Phase: GRIP 3A** **Project:** **Skelmersdale Rail Link**

Risk Assessment carried out by: Scott Myles

Ref No.	Affected area (station/ track)	Threat	Consequences	IMPACT	LIKELIHOOD	RISK	RISK TYPE	Potential Risk Control Measures / Actions	IMPACT	LIKELIHOOD	RESIDUAL RISK	OWNER	Action (by whom and when)
1	Eastern half of the study area near Holland and Rainford Collieries	Presence of mine shafts along the rail alignment.	* Potential for gradual or sudden collapse of capping above mine shaft. * Leading to damage to railway line and potential derailment of the train.	VH	L	S	HSCR	1) Consult Coal Authority/Network Rail records and historical maps for the presence of shafts. 2) Review risk as part of Mining Risk Assessment. 3) Where deemed necessary, GI to target shafts through intrusive and/or geophysical techniques and inform remediation methods prior to construction	VH	VL	T	Designer/Client	Designer prior to detailed design. Client to enable access for additional surveys and works required to mitigate this risk.
2	Eastern half of the study area	Construction over known historical shallow coal mine workings	* Potential for gradual or sudden collapse of ground beneath the railway line. * Leading to damage to railway line and potential derailment of the train. Low likelihood if track bed loading is unchanged after the works are completed	VH	L	S	HSCR	1) Carry out a desk study and consult with Coal Authority and Network rail mining engineers for coal abandonment plans 2) Ground investigation to relevant depths for track bed renewal and platform extensions, and to probe for voids along the route 3) Ground improvement works may be required to stabilise abandoned workings. Mitigation measures need to be carefully designed not to interfere with services or alter local transmissity of near surface mine gas and water.	VH	VL	T	Designer/Client	Designer prior to detailed design. Client to enable access for additional surveys and works post-GI to mitigate this risk if required
3	Eastern half of the study area	Construction over unknown historical shallow coal mine workings	* Potential for gradual or sudden collapse of ground beneath the railway line. * Leading to damage to railway line and potential derailment of the train. Low likelihood if track bed loading is unchanged after the works are completed	VH	L	S	HSCR	1) Carry out a desk study and consult historical mapping, Coal Authority and Network rail mining engineers for coal abandonment plans and any ancillary information about possible unknown/unrecorded workings. 2) Ground investigation to relevant depths for track bed renewal and platform extensions, and to probe for voids along the route 3) Ground improvement works may be required to stabilise abandoned workings. Mitigation measures need to be carefully designed not to interfere with services or alter local transmissity of near surface mine gas and water.	VH	VL	T	Designer/Client	Designer prior to detailed design. Client to enable access for additional surveys and works post-GI to mitigate this risk if required
4	Entire Route	Contamination within the rail corridor	* Harm to site staff. * Mobilisation of pollutant into local environmental receptors. * Additional costs for the ground investigation. * Additional costs for treatment and disposal of excavated soil and groundwater.	H	M	S	HSE	1) Consult with historical mapping and industrial records to identify potential sources of contamination. 2) Site staff to wear appropriate PPE. Vigilance by site staff during Ground Investigation/ Construction. 3) Adequate GI to include contamination testing for ballast contamination assessment. 4) Material to be screened by appropriately trained/competent sub-contractor if the material is being removed and replaced. 5) Findings of the ground investigation to be incorporated into the detailed design and construction planning.	H	L	T	Construction contractor/Designer/Client	Construction contractor prior to and during construction works. Designer to do desk study and design GI. Client to enable access for ground investigation.
8	Entire Route	Obstructions encountered during construction. Potential obstructions at locations of historic sidings and buildings within the corridor (sand washing works), as well as existing bridge foundations	* Delays in the construction progress. * Damage to the existing infrastructure. * Leading to delays and extra costs.	M	M	T	TCR	1) Carry out ground investigation to identify the nature and depth of the track bed and deeper at locations of platform extensions, and the possibility of encountering obstructions. 2) Risk mitigation strategy for obstructions to be developed based on proposed construction methodology and technology to be deployed.	M	L	T	Designer/Client/ Construction contractor	Designer prior to detailed design. Client to enable access for additional surveys and works required to mitigate this risk. Contractor to monitor during constructions
9	Entire Route	Unforeseen ground conditions.	* Inappropriate design and construction methodologies. * Impact on suitability and stability of design. * Impact on cost and project programme.	VH	M	S	HSTCR	1) Carry out ground investigation to further understand the ground conditions of the track bed and beneath it 2) Construction Control - logging of excavation and pile arisings during works, where required.	VH	VL	T	Designer Construction contractor	Designer prior to detail design. Construction contractor during planning of works and construction.
10	Kirkby and Rainford Stations	Incomplete knowledge of groundwater conditions at the site.	* Inaccurate assumptions for design of platform extensions * Leading to damage and instability issues for structures.	VH	M	S	HSTCR	1) Install groundwater monitoring installations. 2) Long term monitoring of standpipes. 3) Design to make conservative groundwater assumptions.	VH	VL	T	Designer	Designer to make appropriate assumptions in detailed design.

GEOTECHNICAL RISK REGISTER

Date: **24/02/2020** **Project Phase: GRIP 3A** **Project:** **Skelmersdale Rail Link**

Risk Assessment carried out by: Scott Myles

Ref No.	Affected area (station/ track)	Threat	Consequences	IMPACT	LIKELIHOOD	RISK	RISK TYPE	Potential Risk Control Measures / Actions	IMPACT	LIKELIHOOD	RESIDUAL RISK	OWNER	Action (by whom and when)
11	Central part of route	Construction on peat and other soft/loose deposits beneath the track bed	* Excessive differential settlement * Leading to damage and instability issues for the track and proposed structures	M	H	S	HSTC	1) Ground investigation to identify the nature and depth of the track bed material and the ground beneath it 2) Appropriate construction methodologies to be adopted if required, which may include: - dig and replace - ground improvement - to be considered in foundation design in case of platform extensions	M	L	T	Designer/Client	Designer prior to detailed design. Client to enable access for additional surveys and works required to mitigate this risk.
12	Entire Route	Encountering services including culverts, high pressure gas mains, ethylene pipeline, and electrical cables	* Damage to services/culvert. * Possible damage to rig/construction equipment * Delay to construction programme. * Human helath risk to construction workers	H	M	S	HSTCRE	1) All available services information/drawings for the site area to be passed to the GI Contractor and Construction Contractor by designer in pre-construction information. 2) Service diversion to be designed where required. 3) Construction Contractor to satisfy himself as to the adequacy of available information and make additional enquires as necessary. 4) Appropriate methods to be utilised whist constructing the diversion and the main proposed works.	H	L	T	Designer/Construction Contractor	Designer prior to construction. Construction Contractor prior to and during construction works.
13	Kirkby and Rainford Stations	During construction process contaminants and/or grout/cement can be pushed down into the groundwater table.	* Groundwater contamination from piling for platforms or retaining walls (where required)	H	M	S	TCRE	1) Review the results of the ground investigation for contamination risk 2) Appropriate construction methodologies to be adopted 3) Construction contractor to use appropriate temporary works design. 4) Consultation with the Environment Agency/Coal Authority may be required regarding the proposed construction method and mitigation strategies to be put in place.	H	L	T	Construction Contractor	Construction contractor prior to and during construction.
14	Kirkby and Rainford Stations	Aggressive ground conditions	* Degradation of foundations and pile caps, leading to long term repairs and maintenance.	M	M	T	TCR	1) Results of chemical test suites to be reviewed to determine appropriate concrete class to use.	M	VL	N	Designer	Designer at detailed design stage.
16	Rainford Station	Heat generation and spontaneous combustion within coal seams during drilling/construction.	* Fire * Generation of CO which migrates via pathways to receptors, leading to injury or death. * Damage to equipment and inury to personnel.	VH	M	S	HSTCRE	1) Use only approved construction methods which minimise this risk such as water flush 2) Install monitoring wells and monitoring points near to receptors.	VH	VL	T	Designer/Construction Contractor	Designer prior to construction. Construction Contractor prior to and during construction works.
17	Entire Route	Ground gases encountered near historical mine shafts/workings, coal measures or landfill deposits	* Ground gas (methane, oxygen deflicent, radon etc) could cause an explosive or asphyxiation hazard. * Risk to site workers	VH	VL	T	HSTCR	1) No action to be taken at this stage 2) Risk to be re-assessed following a change in scope of the proposed works	VH	VL	T	Designer/Client	To be re-assessed following a change in scope
18	Entire Route	Slope instability associated with track bed excavation and cutting into slopes as part of platform extensions or track realignment.	* Damage to equipment and existing or partially constructed elements of the proposed work. * Risk to of injury to the site workers.	M	M	T	HSTCR	1) GI to establish ground conditions 2) Stability analysis should be carried out to assess the temporary and permanent case for the slopes at locations of platform extensions 3) Suitable retaining structures to be adopted if required	M	VL	N	Designer/Client	Designer to design GI. Client to enable additional study/assessment to be carried out.
20	Central part of route	Encountering UXO	* Damage to equipment and existing or partially constructed elements of the proposed work. * Risk to of injury or death to the site workers.	VH	M	S	HSTCR	1) Desk study to consult with UXO risk maps and PDSA. 2) Review assessments and use additional mitigation measures if necessary, including a detailed UXO risk assessment	H	L	T	Designer	Designer to carry out desk study prior to design.

NOTES: RISK TYPES; HS = Health & Safety, T = Time, C = Cost, R = Reputation, E = Environment

Risk level: I = Intolerable, S = Significant, T = Tolerable, N = Negligible

		Likelihood				
		Very Low	Low	Medium	High	Very High
Impact	Very Low	N	N	N	N	T
	Low	N	N	T	T	S
	Medium	N	T	T	S	S
	High	N	T	S	S	I
	Very High	T	S	S	I	I

5 Conclusions and Recommendations

5.1 Geotechnical

Ground models have been produced in Section 2 based on a review of available information. Superficial and bedrock deposits vary along the study area but generally comprise the following: Blown Sand (Shirdley Hill Formation) and/or Glacial Till overlying Weathered Sandstone and Sandstone (Sherwood Sandstone Group) to the west; and Peat or Blown Sand, Glacial Till and Glaciofluvial Deposits overlying Mudstone, Siltstone and Sandstone of the Pennine Lower Coal Measures Formation to the east.

The review has highlighted a number of geotechnical hazards (detailed in Section 4) that require further investigation to reduce the risks. A summary of key risks is given below:

- Recorded and unrecorded features associated with historic coal mining, including shafts, and shallow and deep workings.
- Poor ground conditions associated with deposits of Made Ground, Peat and Blown Sand, particularly over the eastern half of the study area.
- Contamination associated with historic collieries and works, landfills, railways (including historical tramways and present day) and a munitions distribution depot.
- Obstructions at locations of historic sidings and buildings, and foundations of existing bridges within the corridor.
- Unexploded ordnance.
- Heat generation and spontaneous combustion within coal seams during drilling/construction.
- Recorded and unrecorded services and utilities, including culverts, high pressure gas mains, ethylene pipeline, and electrical cables.

The main risk to the proposed works stems from historic coal mining activities, as discussed in Section 2.8. There are two distinct areas of coal mining which affect the eastern half of the study area: on the northern side of the rail corridor to the west of the Rainford By-Pass and to the south of Pimbo industrial estate. Within both areas are a significant number of past and probable, shallow and deep coal mine workings and shafts which are proximal to the rail corridor. Records suggest that workings rarely come within distance of the ground surface to affect the proposed work but there are examples of tunnels which directly underlie the corridor at shallower than 15m bgl. The proposed works mainly take the form of track bed renewal, which is not expected to cause significant loading or disturbance of the ground surface. Deeper proposed construction works are not within areas of historic coal mining. As such, the likelihood of subsidence or collapse is considered to be low but the impact high. Regardless, approval will need to be sought from the Coal Authority prior to the ground investigation and construction where the works are expected to encroach onto Coal Authority mining interests, and to ensure that the risks are appropriately managed. In addition, shaft locations will need to be confirmed prior to construction and mine workings should be considered as potentially susceptible to collapse due to natural degradation over time.

There is a risk of potentially compressible ground from soft or loose deposits of Peat, Blown Sand and Made Ground, which are unsuitable as subgrade materials. However, it is anticipated that many of these would have been excavated as part of the historic corridor construction/ maintenance. Once the ground conditions are known following the ground investigation, actions can be taken to minimise this risk where needed.

Another significant risk is posed from buried obstructions, utilities and services, which can have impacts on construction costs and delays. The risk can be mitigated by in part by an intrusive ground investigation and by considering the existing location of services and utilities in construction and design.

5.2 Geo-environmental

A ballast contamination assessment has been undertaken in Section 4 which identifies and reviews areas of potential contamination affecting the rail corridor. They are summarised as follows:

- Simonswood Industrial Estate (historic Kirkby Inland Sorting Depot) – possible contamination associated with the distribution of munitions, as well as more recent contamination from activities at the existing industrial estate.
- Collieries – Rainford Collieries and Holland Colliery on the corridor borders were likely infilled with spoil with no remediation strategies in place. They are now classified as landfill sites and may pose a source of contamination following the leaching of landfill material.
- Rail Corridor – the rail corridor pre-dates the earliest historic map available (1850). Rail corridors are contaminated environments by nature. This is particularly true for older railways, which were not controlled by modern regulations and which have had time to accumulate potentially large amounts of contamination.

The main risk is to construction workers, who will need to excavate into the ground as part of the proposed works. It is also important to identify the contamination status of the ground for material being removed and disposed of off-site. There may be a requirement for treatment prior to disposal where contaminated ground is identified, resulting in increased costs and programme time.

The ecological constraints of the study area are currently unknown and will be assessed during a subsequent phase of the project.

5.3 Recommendations

5.3.1 Walkover Survey

A physical walkover was not undertaken during the desk study phase. A virtual walkover has been undertaken during the course of this desk study through the review of aerial imagery and the Network Rail Route viewer website. A walkover would primarily serve two purposes:

1. Field reconnaissance to record any visible evidence of features that are not present from maps and aerial photographs such as recent construction, suspicious depressions, colour, odour and condition of standing water, vegetation die-back, fly-tipping etc.
2. Assist in scoping of the ground investigation.

5.3.2 Ground Investigation

A ground investigation is required in order to assess the existing ground conditions present beneath the site; validate the geotechnical and geo-environmental risks; and identify remedial requirements. Investigation works will also enable the collection of samples for chemical and geotechnical testing, which are all required to inform a Track Bed Investigation Report/Ground Investigation Report for the study area.

5.3.3 Mining Risk Assessment

Whist this desk study details the potential risks from the historic mine workings in the area it does not constitute a detailed Mining Risk Assessment. It is recommended that this risk assessment is produced at the next GRIP stage. Depending on the outcome of the risk assessment and if voids are encountered during the ground investigation voids are encountered, ground treatment (e.g. drilling and grouting) may be required to reduce the risks.

Appendices

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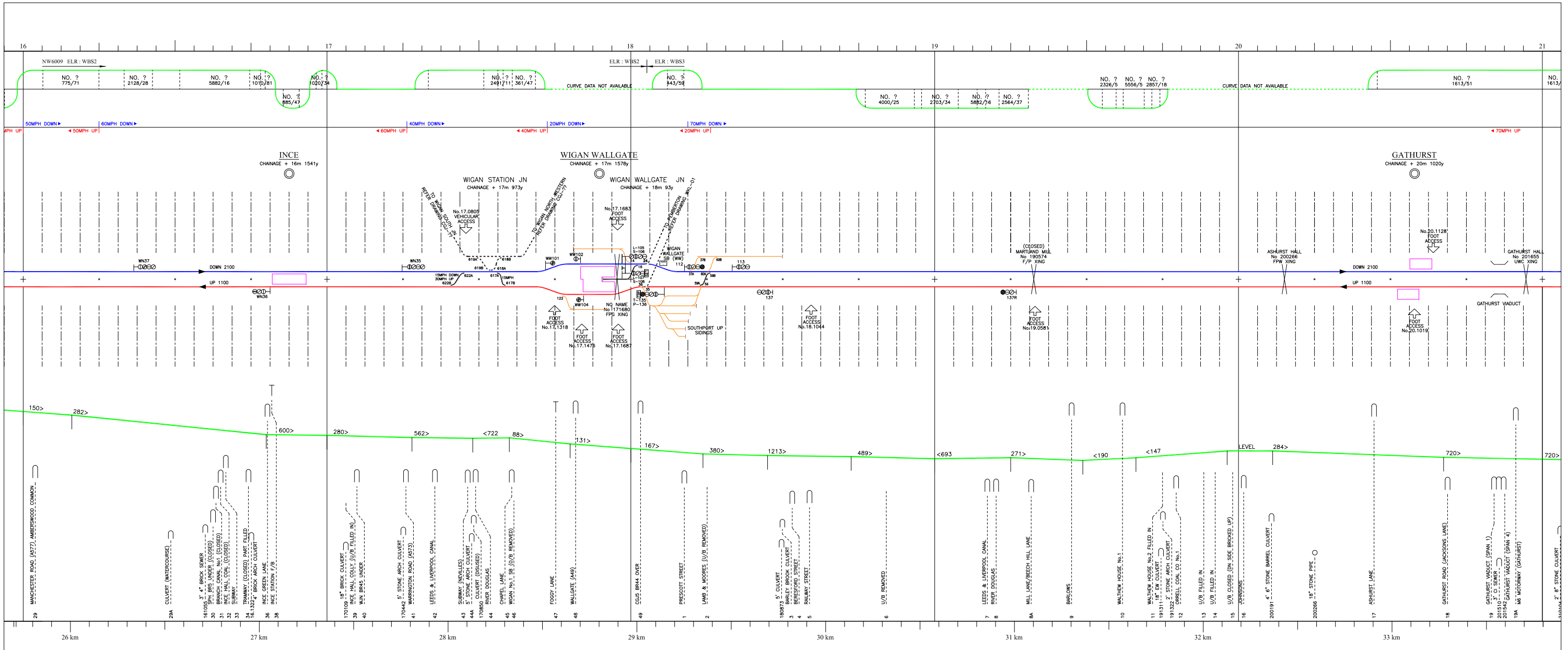
A. Drawings and Plans



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NOTE: THE INFORMATION SHOWN ON THIS DRAWING WAS EXTRACTED FROM EXISTING NETWORK RAIL DOCUMENTS AND HAS NOT NECESSARILY BEEN VALIDATED BY ON SITE INSPECTION BY THE CLIENT. ANY ERRORS OR OMISSIONS PLEASE ADVISE WATERMAN

DATE	REVISION	SOURCE	DRN	CHK
25-06-04	SOUTHPORT SIDINGS MARKED OUT OF USE (844)	NR N WEST WON 14	DMR	NB
07-12-04	SOUTHPORT SIDINGS RETURNED TO USE, SPEED LIMIT CHANGED (1000)	NR N WEST WON 29	JRAK	NB
02-11-07	LINE SPEEDS UPDATED	SECTIONAL APPENDIX	MAC	NB
02-11-11	TRACK DETAILS & CROSSOVER SPEED AMENDED AT WIGAN STATION JUNCTION (4844)	NR LNW (N) WON 32	MAC	NB
18-02-13	SIGNALS CHECKED INCE - WIGAN WALLGATE (5509)	NR SIGNAL PLANS	MAC	NB
22-02-13	SIGNALLING AND S&C UPDATED. TRACK CIRCUITS ADDED 16m TO INCE. (5484)	NETWORK RAIL	SDH	NB

CLIENT

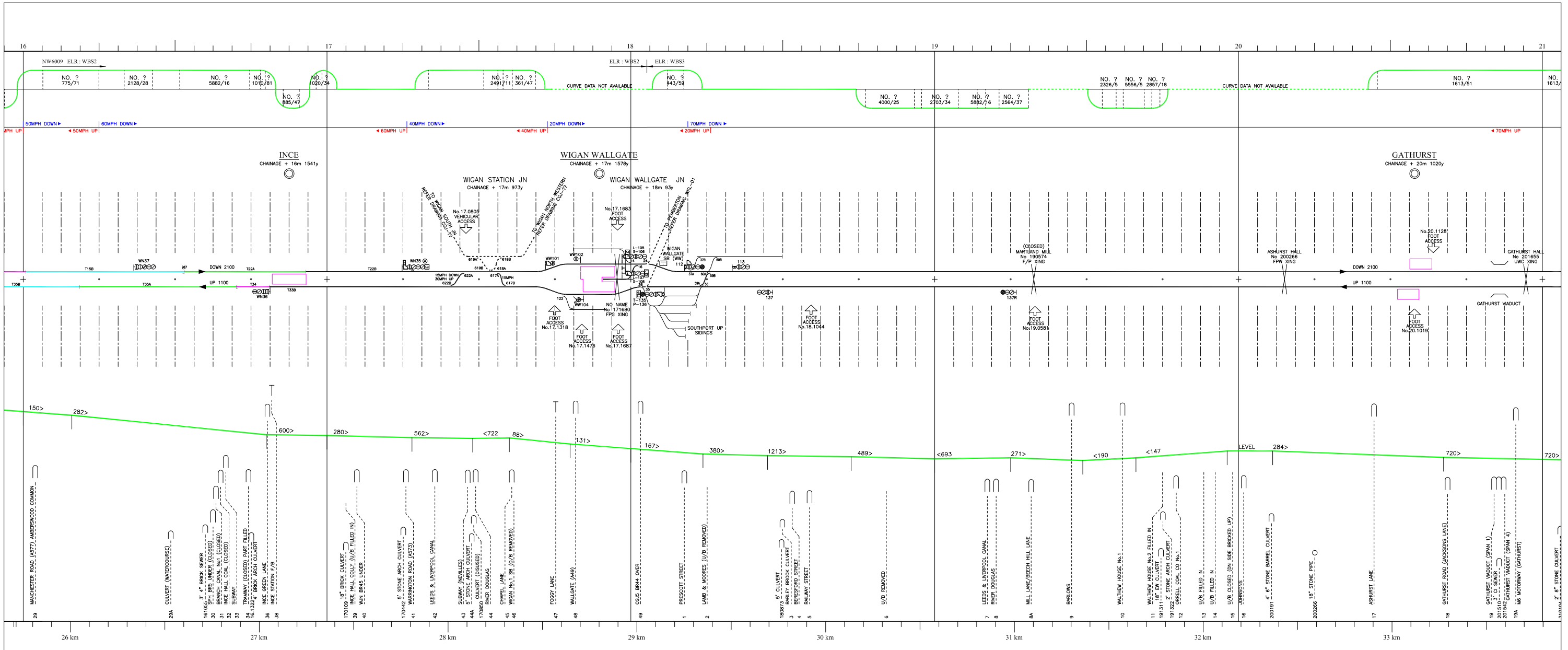
Territory
London North Western
Area
LNW Central

TITLE

INCE - WIGAN WALLGATE - GATHURST

CIVIL ENGINEERING PLAN

PROJECT No.	31972091		
DIAGRAM No.	WBS-04		
ROUTE	NW6009	ELR	WBS2/3
MILEAGE	16 MILE TO 21 MILE		
VALIDATED/DRAWN	22-08-03		



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DATE	REVISION	SOURCE	DRN	CHK
25-06-04	SOUTHPORT SIDINGS MARKED OUT OF USE (844)	NR N WEST WON 14	DMR	NB
07-12-04	SOUTHPORT SIDINGS RETURNED TO USE, SPEED LIMIT CHANGED (1000)	NR N WEST WON 29	JRAK	NB
02-11-07	LINE SPEEDS UPDATED	SECTIONAL APPENDIX	MAC	NB
02-11-11	TRACK DETAILS & CROSSOVER SPEED AMENDED AT WIGAN STATION JUNCTION (4844)	NR LNW (N) WON 32	MAC	NB
18-02-13	SIGNALS CHECKED INCE - WIGAN WALLGATE (5509)	NR SIGNAL PLANS	MAC	NB
22-02-13	SIGNALLING AND S&C UPDATED. TRACK CIRCUITS ADDED 16m TO INCE. (5484)	NETWORK RAIL	SDH	NB

CLIENT

Territory
London North Western
Area
LNW Central

TITLE

INCE - WIGAN WALLGATE - GATHURST

SIGNALLING PLAN

PROJECT No.	31972091		
DIAGRAM No.	WBS-04		
ROUTE	NW6009	ELR	WBS2/3
MILEAGE	16 MILE TO 21 MILE		
VALIDATED/DRAWN	22-08-03		

ELECTRICAL PLAN NOT AVAILABLE

Waterman

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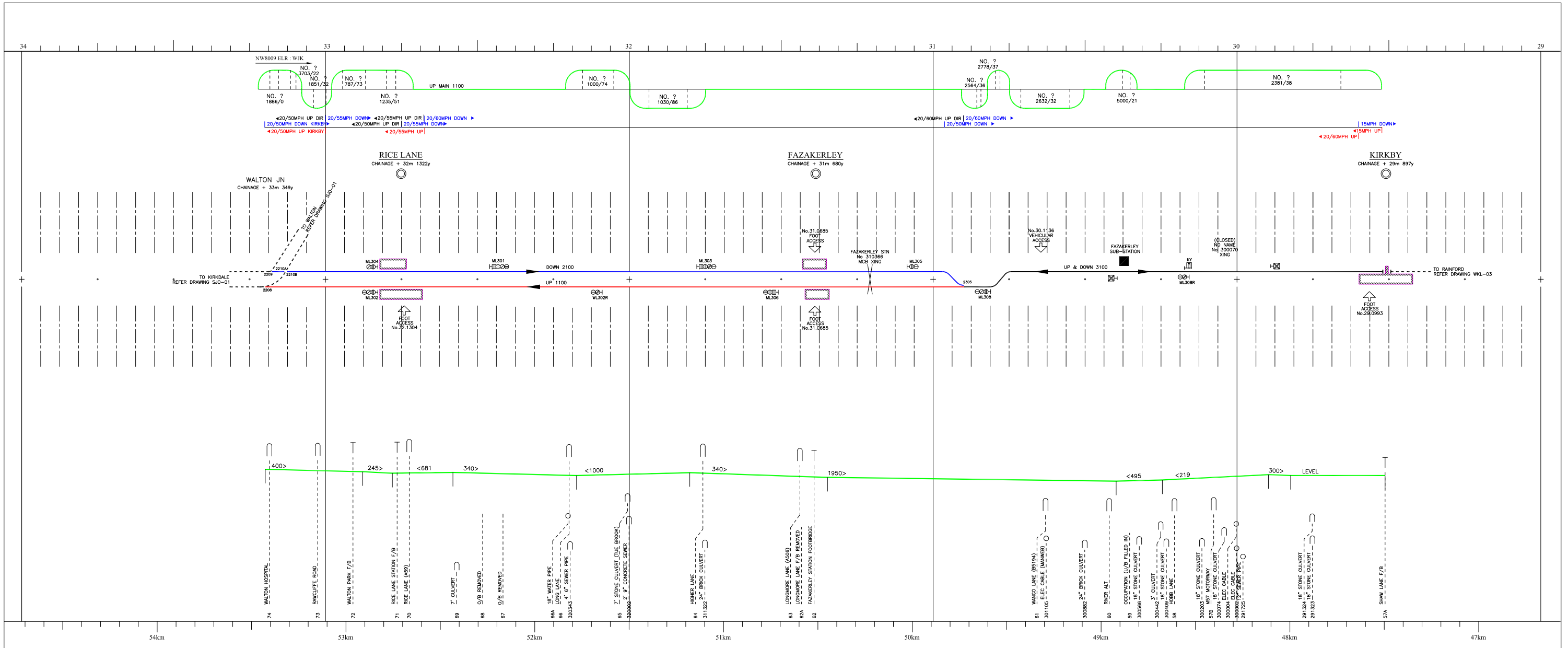
DATE	REVISION	SOURCE	DRN	CHK

CLIENT: Network Rail — Territory: Territory — Area: Area

TITLE: SOMEWHERE - SOMEPLACE

ELECTRICAL PLAN			
PROJECT No.	XXX		
DIAGRAM No.	XXX-01		
ROUTE	XX1234	ELR	XYZ1
MILEAGE	XX MILE TO XX MILE		
LAST VALIDATED	XX/XX/XX		



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DATE	REVISION	SOURCE	DRN	CHK
05-11-07	LINE SPEEDS UPDATED	SECTIONAL APPENDIX	MC	NB

CLIENT

Territory
London North Western
Area
LNW Central

TITLE

WALTON JN - KIRKBY

CIVIL ENGINEERING PLAN

PROJECT No.	31972084		
DIAGRAM No.	WJK-01		
ROUTE	NW8009	ELR	WJK
MILEAGE	33 MILE 16C TO 29 MILE 42C		
VALIDATED/DRAWN	22-08-03		

SIGNALLING DIAGRAM NOT AVAILABLE

Waterman Burrow Crocker
Civil & Transportation Consulting Engineers

Pickfords Wharf Clink Street London SE1 9DG
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DATE	REVISION	SOURCE	DRN	CHK
-	-	-	-	-

CLIENT

TITLE

-

-

SIGNALLING PLAN			C S E
DRAWING No.	-		MAP
DIAGRAM No.	-		
BRS	-	ELR	-
MILEAGE	-		
LAST VALIDATED	-		

ELECTRICAL DIAGRAM NOT AVAILABLE

Waterman Burrow Crocker
Civil & Transportation Consulting Engineers

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DATE	REVISION	SOURCE	DRN	CHK
-	-	-	-	-

CLIENT

TITLE

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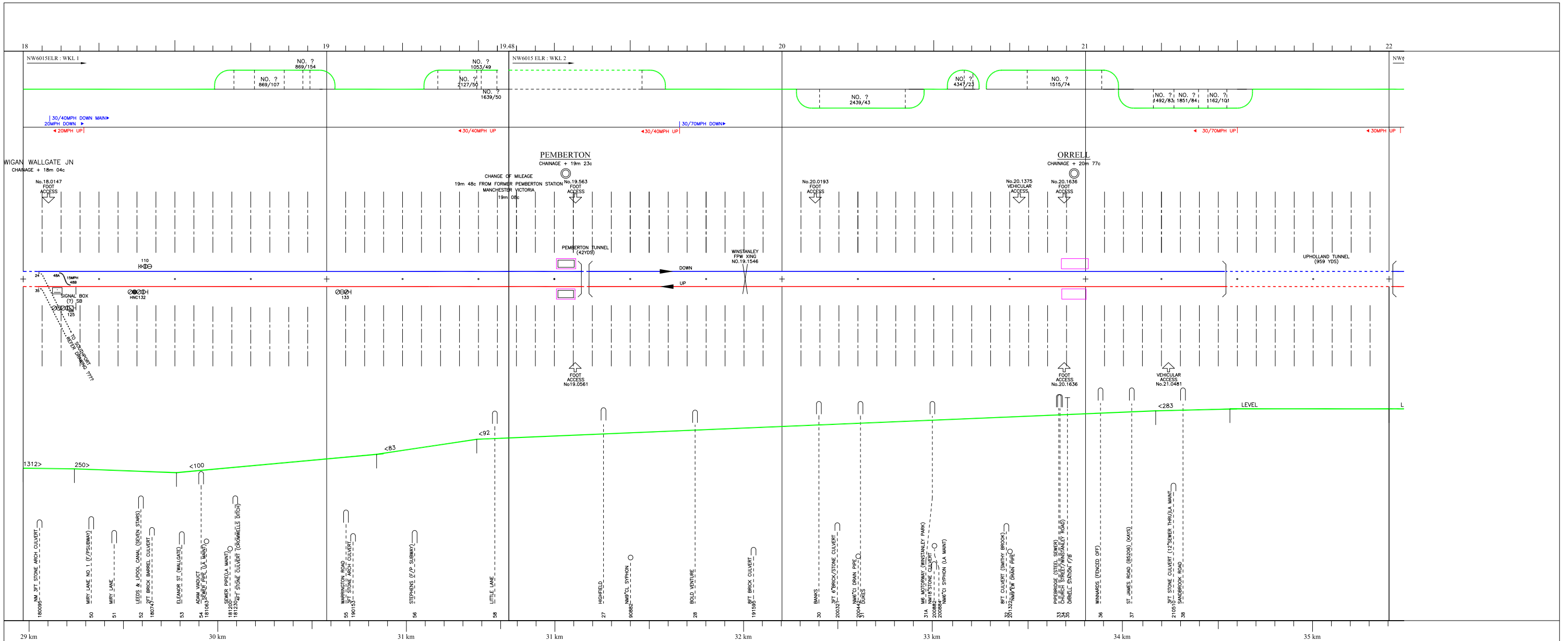
-

ELECTRICAL PLAN			C S E
DRAWING No.	-		MAP
DIAGRAM No.	-		
BRS	-	ELR	-
MILEAGE	-		
LAST VALIDATED	-		



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QA CHECK	WBC	CLIENT
QUAIL	✓	
SIGNAL DIAGRAM	✓	
SECTIONAL APP.	✓	
STRUCTURES	✓	
S&C		
LEVEL CROSSINGS	✓	
ACCESS POINTS	✓	
CURVES	PART	
GRADIENTS	✓	

DRAFT

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DATE	REVISION	SOURCE	DRN	CHK
07-12-04	SPEED LIMIT CHANGES AT WIGAN WALLGATE JN (1001)	NR N WEST WON 29	JRAK	NB
07-02-05	SPEED CHANGE ARROWS REMOVED @ 22M	LNW (N) WON 452004/5	GMT	NB
05-11-07	LINE SPEEDS UPDATED	SECTIONAL APPENDIX	MC	NB
22-12-11	PLATFORM EXTENDED ON DOWN LINE AT ORRELL (4913)	NR LNW (N) WON 38	MAC	NB

CLIENT

Territory
London North Western
Area
LNW Central

TITLE

WIGAN WALLGATE - ORRELL

CIVIL ENGINEERING PLAN

PROJECT No.	31972085-		
DIAGRAM No.	WKL-01		
ROUTE	NW6015	ELR	WKL1/2
MILEAGE	18M 4C TO 19M 48C/19M 8C TO 22M		
VALIDATED/DRAWN	-		

SIGNALLING DIAGRAM NOT AVAILABLE

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Civil & Transportation Consulting Engineers

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DATE	REVISION	SOURCE	DRN	CHK
-	-	-	-	-

CLIENT

TITLE

-

-

SIGNALLING PLAN			C S E
DRAWING No.	-		MAP
DIAGRAM No.	-		
BRS	-	ELR	-
MILEAGE	-		
LAST VALIDATED	-		

ELECTRICAL DIAGRAM NOT AVAILABLE

Waterman Burrow Crocker
Civil & Transportation Consulting Engineers

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DATE	REVISION	SOURCE	DRN	CHK
-	-	-	-	-

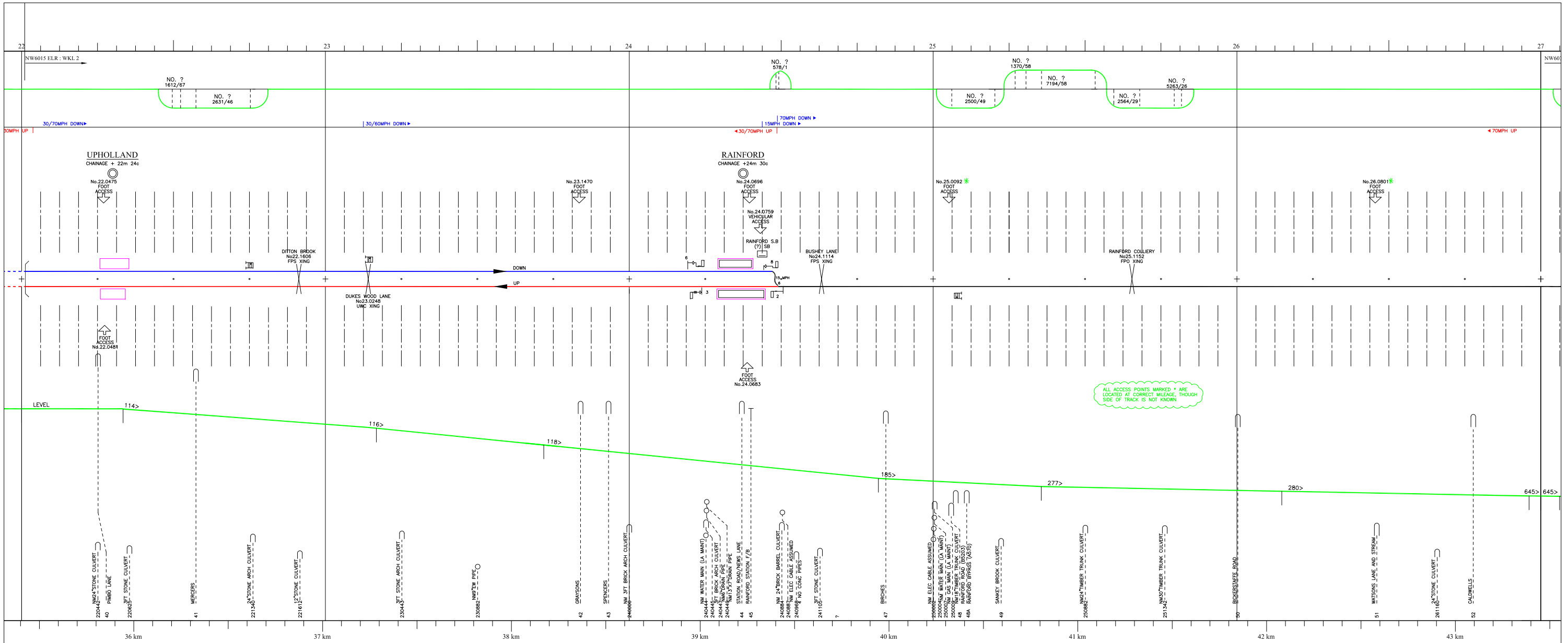
CLIENT

TITLE

-

-

ELECTRICAL PLAN			C S E
DRAWING No.	-		MAP
DIAGRAM No.	-		
BRS	-	ELR	-
MILEAGE	-		
LAST VALIDATED	-		



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QA CHECK	WBC	CLIENT
QUAIL	✓	
SIGNAL DIAGRAM	✓	
SECTIONAL APP.	✓	
STRUCTURES	✓	
S&C		
LEVEL CROSSINGS	✓	
ACCESS POINTS	✓	
CURVES	PART	
GRADIENTS	✓	

DRAFT

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DATE	REVISION	SOURCE	DRN	CHK
07-02-05	30MPH SPEED CHANGE @22M 3CH UP LINE	LNW (N) WON 452004/5	GMT	NB
02-11-07	LINE SPEEDS UPDATED	SECTIONAL APPENDIX	MC	NB
22-12-11	PLATFORM ON DOWN LINE EXTENDED AT UPHOLLAND (4913)	NR LNW (N) WON 38	MAC	NB

CLIENT: LNR PLC

Territory: *London North Western*
Area: *LNW Central*

TITLE: **UPHOLLAND - RAINFORD**

CIVIL ENGINEERING PLAN			
PROJECT No.	31972086-		
DIAGRAM No.	WKL-02		
ROUTE	NW6015	ELR	WKL2
MILEAGE	22 MILE TO 27 MILE		
VALIDATED/DRAWN	-		

SIGNALLING DIAGRAM NOT AVAILABLE

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Civil & Transportation Consulting Engineers

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DATE	REVISION	SOURCE	DRN	CHK
-	-	-	-	-

CLIENT

TITLE

-

-

SIGNALLING PLAN			C S E
DRAWING No.	-		MAP
DIAGRAM No.	-		
BRS	-	ELR	-
MILEAGE	-		
LAST VALIDATED	-		

ELECTRICAL DIAGRAM NOT AVAILABLE

Waterman Burrow Crocker
Civil & Transportation Consulting Engineers

Pickfords Wharf Clink Street London SE1 9DG
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DATE	REVISION	SOURCE	DRN	CHK
-	-	-	-	-

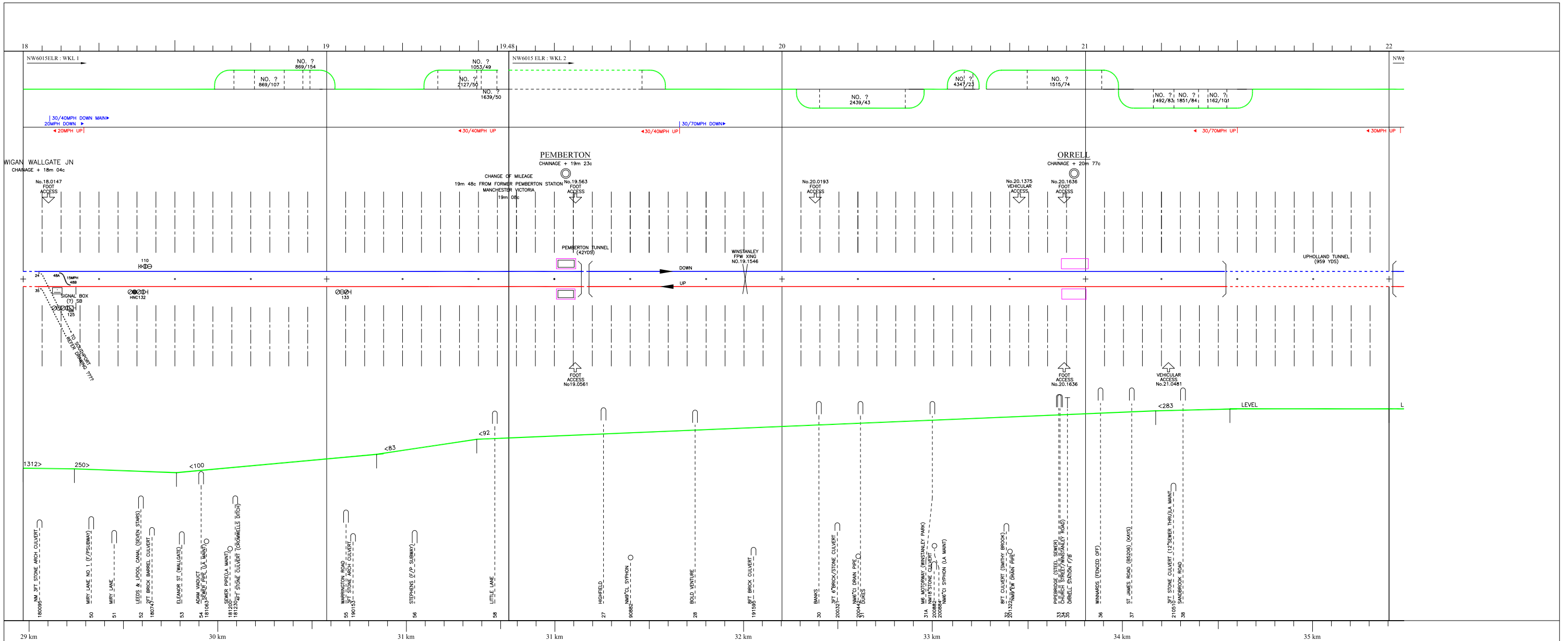
CLIENT

TITLE

-

-

ELECTRICAL PLAN			C S E
DRAWING No.	-		MAP
DIAGRAM No.	-		
BRS	-	ELR	-
MILEAGE	-		
LAST VALIDATED	-		



Waterman

Pickfords Wharf Clink Street London SE1 9DG
t 020 7928 7888 f 020 7902 0992 e p.a,t.goldsmith@waterman-group.co.uk

QA CHECK	WBC	CLIENT
QUAIL	✓	
SIGNAL DIAGRAM	✓	
SECTIONAL APP.	✓	
STRUCTURES	✓	
S&C		
LEVEL CROSSINGS	✓	
ACCESS POINTS	✓	
CURVES	PART	
GRADIENTS	✓	

DRAFT

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DATE	REVISION	SOURCE	DRN	CHK
07-12-04	SPEED LIMIT CHANGES AT WIGAN WALLGATE JN (1001)	NR N WEST WON 29	JRAK	NB
07-02-05	SPEED CHANGE ARROWS REMOVED @ 22M	LNW (N) WON 452004/5	GMT	NB
05-11-07	LINE SPEEDS UPDATED	SECTIONAL APPENDIX	MC	NB
22-12-11	PLATFORM EXTENDED ON DOWN LINE AT ORRELL (4913)	NR LNW (N) WON 38	MAC	NB

CLIENT: LNR LIMITED

Territory: *London North Western*
Area: *LNW Central*

TITLE: **WIGAN WALLGATE - ORRELL**

CIVIL ENGINEERING PLAN

PROJECT No.	31972085-		
DIAGRAM No.	WKL-01		
ROUTE	NW6015	ELR	WKL1/2
MILEAGE	18M 4C TO 19M 48C/19M 8C TO 22M		
VALIDATED/DRAWN	-		

B. Detailed Review of Historical Mapping

Table 15: Summary of Historical Mapping WJK/WKL2 28m 0yds to 30m 308yds

Year	Map Scale	Significant development along the rail corridor	Significant development around the rail corridor
1850	1:10,560	• Rail corridor in existing footprint • Kirkby Station present • Simonswood Brook present flowing beneath the track • Crossing of County Road and Glovers Brow present in existing footprint • Crossing of Dale Road present in historic footprint (NW-SE)	• Undeveloped or farmed fields with urban developments around Glovers Brow and County Road. • Mawdsley's Farm at side of corridor near Dale Lane and • Row Farm at southern side of Kirkby Station • Kirkby Mill (corn) and a mill pond to the north of the corridor on Simonswood Brook • Dearbolt Delf (quarry) for sandstone to the north of the rail corridor on Glovers Brow • Mercer's Delf for sandstone off County Road to the north of the rail corridor
1893	1:2,500	• Crossing which joins to existing position of Bramcote Walk	• Pumping Station at side of corridor to the east of County Road • Small pond on northern side of the corridor near the start of the segment • Dearbolt Delf disused
1894	1:10,560	• No significant changes	• No significant changes
1908	1:2,500	• No significant changes	• Bridge Farm on Dale Lane on southern side of the rail corridor • Well to south of the corridor at existing position of Bramcote Walk
1909	1:10,560	• No significant changes	• No significant changes
1927	1:2,500	• No significant changes	• No significant changes
1928	1:10,560	• No significant changes	• No significant changes
1955-1956	1:10,560	• Additional rail lines joining and crossing the track at the eastern edge of the segment – connecting the track with Kirkby Industrial Estate (approx. 1km to the south) and Kirkby Inland Sorting Depot	• Development of Kirkby on the northern side of the rail corridor

Year	Map Scale	Significant development along the rail corridor	Significant development around the rail corridor
		(approx. 500m to the west).	
1961-1962	1:1,250	• Crossing which joined to existing position of Bramcote Walk no longer shown.	• Significant housing and school developments around Kirkby both sides of the Rail Corridor. • Undefined works on northern side of the rail corridor near the segment start • Redevelopment of Kirkby Mill, Row Farm • Significant development (mainly housing and schools) to the south of the rail corridor between County Road and Dale Lane
1962-1975	1:1,250	• No significant changes	• No significant changes
1966 (partial)	1:10,560	• No significant changes	• No significant changes
1974 (Russian)	1:10,000	• No significant changes	• Further housing developments to the south of the corridor at Kirkby
1976	1:2,500	• M57 present crossing the start of the segment in its existing footprint. • Dale Lane rebuilt into existing footprint	• Significant housing developments to the north of the rail corridor at the eastern edge of the segment
1976-1978	1:10,000	• Track connecting to Kirkby Inland Sorting Depot no longer shown	• Areas of development in line with existing footprints
1989-1999	1:10,000	• No significant changes	• No significant changes
2000 (aerial imagery)	-	• No significant changes	• Works to straighten out the track which joins the eastern edge of the segment to Kirkby Industrial Estate • Mercer's Delf filled in • Pumping station no longer shown
2005 (aerial imagery)	-	• No significant changes	• Housing developments over school fields on southern side of the rail corridor, east of County Road
2018 (aerial imagery)	-	• No significant changes	• No significant changes

Table 16: Summary of Historical Mapping WKL2 25m 0yds to 28m 0yds

Year	Map Scale	Significant development along the rail corridor	Significant development around the rail corridor
1850	1:10,560	• Rail corridor in existing footprint • Track crossing of an unnamed road (at eastern edge of the existing quarry); Simonswood Brook; Coach Road; and Rainford Road in existing footprints • Two track crossings at western end of the segment • Two track crossing to the east of Coach Road. • Rainford Brook flowing beneath the track in its existing footprint	• Undeveloped or farmed fields with several woodlands/"wood plantations" at the western end of the segment • Woods Farm to the south of the rail corridor at the western edge of the segment • Moore's Farm to the north of the rail corridor at the eastern edge of the segment
1893	1:2,500	• Rainford Collieries at the eastern edge of the segment with tracks and sidings joined to the northern side of the rail corridor. Includes reservoirs, clay pits and houses on the eastern side • Sand Washing Works shown near the crossing at the western edge of the segment (only one crossing now shown) • Two track crossings at the western edge of the segment no longer shown	• No significant changes
1894	1:10,560	• No significant changes	• No significant changes
1908	1:2,500	• No significant changes	• Brickworks and reservoir included at Rainford Collieries
1909	1:10,560	• No significant changes	• No significant changes
1927	1:2,500	• No significant changes	• Bridge Farm at northern side of the corridor at Coach Road
1955-1956	1:10,560	• Kirkby Inland Sorting Depot shown at western edge of the segment with sidings/tracks joining the rail corridor. Built over the woods plantation	• Rainford Collieries shown as disused

Year	Map Scale	Significant development along the rail corridor	Significant development around the rail corridor
		• Rainford By-Pass built in existing footprint	
1961-1962	1:1,250	• No significant changes	• Two ponds shown on the southern side of the sorting depot near Woods Farm • Rainford Collieries shown to partially redeveloped with woodland. Still ponds/reservoirs and disused shafts shown.
1962-1975	1:1,250	• No significant changes	• No significant changes
1976	1:2,500	• No significant changes	• Refuse tip and Wood Yard at location of historic collieries
1976-1978	1:10,000	• Kirkby Sorting Depot no longer shown. Replaced with a timber yard and works (to be Simonswood Industrial Estate)	• No significant changes
1989-1999	1:10,000	• No significant changes	• Bridge Farm now a cottage • Rainford Collieries now fully remediated with trees with ponds remaining
2000 (aerial imagery)	-	• No significant changes	• No significant changes
2005 (aerial imagery)	-	• Further expansion of Simonswood Industrial Estate into woodland	• No significant changes
2018 (aerial imagery)	-	• No significant changes	• No significant changes

Table 17: Summary of Historical mapping WKL2 22m 1378yds to 25m 0yds

Year	Map Scale	Significant development along the rail corridor	Significant development around the rail corridor
1850	1:10,560	• Rail corridor in existing footprint • Rainford Station present 900m to the west of existing location • Track crossing of New Lane (Rainford Station); Maggots Nook Road to Maggots Nook Farm; and Duke's Wood Lane in existing footprints • Track crossing to Maggots Nook Farm • Track crossing to Long Lane	• Undeveloped or farmed fields • News Lane Farm and Maggots Nook Farm at the southern side of the corridor near the centre of the segment • Holland Colliery at the southern side of the corridor at the eastern section of the segment • Rainford Collieries at the northern side of the corridor near Rainford Station

Year	Map Scale	Significant development along the rail corridor	Significant development around the rail corridor
		• Lancashire and Yorkshire Railway running N-S across the western edge of the segment with chords joining the track near the location of the existing Rainford Station (named Rainford Junction)	
1893	1:2,500	• Track leading to Maggots Nook Farm rebuilt into existing footprint • Mineral railway joining the track at the western end of the segment • Rainford Station appears to have moved to Rainford Junction (existing footprint)	• Holly Farm to the north of the corridor at Rainford Junction • Expansion of Holland Colliery • Minor development around the eastern end of the segment (houses and bowling green) • Old shaft at edge of the corridor where the mineral railway meets the western edge of the segment • Multiple ponds near Maggots Nook Farm • Red Delf Farm to north of the corridor at the western end of the segment
1894	1:10,560	• No significant change	• No significant change
1908	1:2,500	• Mineral railway no longer shown at the western end of the segment • Sidings joining the track at Holland Colliery	• Reservoir at Holland Colliery
1927	1:2,500	• No significant change	• News Lane Farm now Bridge Farm • Expansion westward of Holland Colliery • Bowling green at eastern end of the segment now Balcarres Farm
1955-1956	1:10,560	• No significant change	• Holland Colliery now disused
1961-1962	1:1,250	• No significant change	• Holland Colliery appears to be infilled/remediated
1976	1:2,500	• Rainford Junction removed and developed into housing	• Works/business park (Pimbo Industrial Estate) and a gas distribution station now to the north of the eastern end of the segment

Year	Map Scale	Significant development along the rail corridor	Significant development around the rail corridor
			• Significant development around Rainford to the south
1976-1978	1:10,000	• No significant change	• No significant change
1989-1999	1:10,000	• No significant change	• No significant change
2000 (aerial imagery)	-	• No significant change	• No significant change
2005 (aerial imagery)	-	• No significant change	• No significant change
2018 (aerial imagery)	-	• No significant change	• No significant change

C. Historical Borehole Records

LANCASHIRE COUNTY COUNCIL

BOREHOLE DATA SHEET

SJ 39 NE/454
SJ 39491 98736
BOREHOLE NO. 5766/4

DATE 21st MARCH, 1967 JOB NO. 247/B.

JOB LIVERPOOL OUTER RING ROAD (A59 to A580) DEPTH 15'4" (15.86)

LOCATION HOBB RAILWAY BRIDGE. GROUND LEVEL 52.03' A.O.D

Description	Depth (metres)	Symbol	M.C.	L.L.	P.L.	P.I.	Class.	Sign.	Remarks
SANDY TOPSOIL	2'-0" (0.61)						TS		
STIFF BROWN SANDY BOULDER CLAY with GREY SAND-FILLED FISSURES	9'-6" (2.90)		19.2						
			19.1	32	14	18	CL		5'-0" to 6'-6"
			14.2						
								R	9'-6" to 10'-9" N = 64 for 3"
RED BUNTER SANDSTONE			14.1				S		
								R	12'-6" to 13'-2" N = 50 for 2"
	15'4" (4.67)								
BOREHOLE DRY									BOREHOLE CASED to 14'-0"

Undisturbed Sample ■ Raymond Penetration Test □R. N=No. of Blows
Bulk Sample ● Kilner Jar Sample KJ.
Water Entry WE. Final Water Level FWL.

Depth of Sample		5'-0" / 6'-6"							
Bulk Density	lb/ft³	128							
Dry Density	lb/ft³	107							
Moisture Content	%	19.1							
Compressive Stress	lbs/ft² ~~lb/in²~~								
Shear—Cohesion	lbs/ft² lb/in²	2870							
Shear—Angle of Friction	°	0°							
B.S. COMPACTION									
Maximum Dry Density	lb/ft³								
Optimum Moisture Content	%								
Remoulded Dry Density	lb/ft³								
Field Moisture Content	%								
B.S. (HEAVY) COMPACTION									
Maximum Dry Density	lb/ft³								
Optimum Moisture Content	%								
Remoulded Dry Density	lb/ft³								
Field Moisture Content	%								
Specific Gravity									
Air Voids at ..... MC	%								
CBR at ..... MC	%								
Consolidation Test									

5M.7/64.P542.L17264.

LANCASHIRE COUNTY COUNCIL

BOREHOLE DATA SHEET

SJ 39 NE/452
SS 3952 1 98766

DATE 20th MARCH, 1967 JOB NO. 247/B BOREHOLE NO. 5766/2

JOB LIVERPOOL OUTER RING ROAD (A59 to A580) DEPTH 14' 1½"

LOCATION HOBB RAILWAY BRIDGE GROUND LEVEL 52.98 (16.15) AOD

Description	Depth (metres)	Symbol	M.C.	L.L.	P.I.	P.I.	Class.	Sign.	Remarks
SANDY TOPSOIL	2'-0" (0.61)		17.3						
FIRM BROWN SANDY, BOULDER CLAY with GREY SAND-FILLED FISSURES			18.0				CL	■	3'0" to 4'-0"
			20.8					■	5'0" to 6'6"
	8'-9" (2.67)		12.2	33	14	19		●	8'-9" to 9'-6" N=75 for 9"
RED BUNTER SANDSTONE							S	HR	11'-9" to 11'-10½" N=50 for 1½"
	14'-1½" (4.31)								
BOREHOLE DRY									BOREHOLE NOT CASED

Undisturbed Sample ■ Raymond Penetration Test □R. N=No. of Blows
Bulk Sample ● Kilner Jar Sample KJ.
Water Entry WE. Final Water Level FWL.

Depth of Sample		3'0" 4'0"	5'0" 6'6"					
Bulk Density	lb/ft³	127	127					
Dry Density	lb/ft³	107	105					
Moisture Content	%	18.0	20.8					
Compressive Stress	lbs/ft² lb/in²							
Shear—Cohesion	lbs/ft² lb/in²	1490	910					
Shear—Angle of Friction	°	0°	0°					
B.S. COMPACTION								
Maximum Dry Density	lb/ft³							
Optimum Moisture Content	%							
Remoulded Dry Density	lb/ft³							
Field Moisture Content	%							
B.S. (HEAVY) COMPACTION								
Maximum Dry Density	lb/ft³							
Optimum Moisture Content	%							
Remoulded Dry Density	lb/ft³							
Field Moisture Content	%							
Specific Gravity								
Air Voids at ..... MC	%							
CBR at ..... MC	%							
Consolidation Test								

5M.7/64.P548.L17264.

LANCASHIRE COUNTY COUNCIL

BOREHOLE DATA SHEET

SJ 39 NE/453
SJ 39507 98751

DATE 20th and 21st MARCH, 1967 JOB NO. 247/B BOREHOLE NO. 5766/3

JOB LIVERPOOL OUTER RING ROAD (A59 to A580) DEPTH 13'9"

LOCATION HOBB RAILWAY BRIDGE GROUND LEVEL 52.08' A.O.D (15.87)

Description	Depth (metres)	Symbol	M.C.	L.L.	P.L.	P.I.	Class.	Sign.	Remarks
SANDY TOPSOIL	2'-0" (0.61)						TS.		
VERY STIFF BROWN SANDY BOULDER CLAY	6'-6" (1.98)		22.7	●			CL		
			14.2					■	5'0" to 6'6"
								□R	7'6" to 8'3" N = 100 for 9"
RED BUNTER SANDSTONE	13'9" (4.19)								
BOREHOLE DRY									BOREHOLE CASED TO 5'0"

Undisturbed Sample ■ Raymond Penetration Test □R. N=No. of Blows
Bulk Sample ● Kilner Jar Sample KJ.
Water Entry WE. Final Water Level FWL.

Depth of Sample		5'0" / 6'6"						
Bulk Density	lb/ft³	133						
Dry Density	lb/ft³	116						
Moisture Content	%	14.2						
Compressive Stress	~~lbs/ft²~~ ~~lb/in²~~							
Shear—Cohesion	~~lbs/ft²~~ ~~lb/in²~~	7800						
Shear—Angle of Friction	°	0°						
B.S. COMPACTION								
Maximum Dry Density	lb/ft³							
Optimum Moisture Content	%							
Remoulded Dry Density	lb/ft³							
Field Moisture Content	%							
B.S. (HEAVY) COMPACTION								
Maximum Dry Density	lb/ft³							
Optimum Moisture Content	%							
Remoulded Dry Density	lb/ft³							
Field Moisture Content	%							
Specific Gravity								
Air Voids at .....MC	%							
CBR at .....MC	%							
Consolidation Test								

5M.7/64.P542.L17264.

LANCASHIRE COUNTY COUNCIL

BOREHOLE DATA SHEET

SJ 39 NE / 456
SJ 39478 98773

DATE 16th MARCH 1967 JOB NO. 247/B BOREHOLE NO. 5766/6

JOB LIVERPOOL OUTER RING ROAD (A59 to A580) DEPTH 12'0" (15.37)

LOCATION HOBB RAILWAY BRIDGE GROUND LEVEL 50.43' AOD

Description	(metres) Depth	Symbol	M.C.	L.L.	P.L.	P.I.	Class.	Sign.	Remarks
SANDY TOPSOIL	2'0" (0.61)						TS		
FIRM BROWN SANDY BOULDER CLAY	(1.65) 5'5"		17.1						
RED SAND or WEATHERED SANDSTONE	6'6" (1.98)		15.8	44	19	25	C1	■	5'0" to 5'6"
RED BUNTER SANDSTONE	12'0" (3.66)								
BOREHOLE DRY									BOREHOLE CASED TO 11'6"

Undisturbed Sample ■ Raymond Penetration Test □R. N=No. of Blows
Bulk Sample ● Kilner Jar Sample KJ.
Water Entry WE. Final Water Level FWL.

Depth of Sample		5'0" / 5'6"							
Bulk Density	lb/ft³	131							
Dry Density	lb/ft³	113							
Moisture Content	%	15.8							
Compressive Stress	~~lbs/ft²~~ lb/in²								
Shear—Cohesion	~~lbs/ft²~~ lb/in²	1080							
Shear—Angle of Friction	°	0°							
B.S. COMPACTION									
Maximum Dry Density	lb/ft³								
Optimum Moisture Content	%								
Remoulded Dry Density	lb/ft³								
Field Moisture Content	%								
B.S. (HEAVY) COMPACTION									
Maximum Dry Density	lb/ft³								
Optimum Moisture Content	%								
Remoulded Dry Density	lb/ft³								
Field Moisture Content	%								
Specific Gravity									
Air Voids at ..... MC	%								
CBR at ..... MC	%								
Consolidation Test									

5M.7/64.P542.L17264.

LANCASHIRE COUNTY COUNCIL

BOREHOLE DATA SHEET SJ 39 NE/451

SE 39492 98790

DATE 16th MARCH, 1967 JOB NO. 247/B BOREHOLE NO. 5766/1

JOB LIVERPOOL OUTER RING ROAD (A59 to A580) DEPTH 12'2" (15.67)

LOCATION ... HOBB RAILWAY BRIDGE GROUND LEVEL 51.40' A.O.D.

Description	Depth (metres)	Symbol	M.C.	L.L.	P.L.	P.I.	Class.	Sign.	Remarks
SANDY TOPSOIL	2'-0" (0.61)		20.5						
FIRM BROWN SANDY, STONY BOULDER CLAY	(1.98) 6'-6"		15.5	28	10	18	CL	■	5'-0" to 6'-6"
WEATHERED BUNTER SANDSTONE	7'-0" (2.13)							□R	7'-0" to 8'-0" N = 60 for 6"
RED BUNTER SANDSTONE	12'-2" (3.71)								
BOREHOLE DRY.									BOREHOLE CASED TO 12'-0"

Undisturbed Sample ■ Raymond Penetration Test □R. N=No. of Blows

Bulk Sample ● Kilner Jar Sample KJ.

Water Entry WE. Final Water Level FWL.

Depth of Sample		5'-0" / 6'-6"						
Bulk Density	lb/ft³	131						
Dry Density	lb/ft³	113						
Moisture Content	%	15.5						
Compressive Stress	~~lb/ft²~~ ~~lb/in²~~							
Shear—Cohesion	lb/ft² ~~lb/in²~~	1,100						
Shear—Angle of Friction	°	0°						
B.S. COMPACTION								
Maximum Dry Density	lb/ft³							
Optimum Moisture Content	%							
Remoulded Dry Density	lb/ft³							
Field Moisture Content	%							
B.S. (HEAVY) COMPACTION								
Maximum Dry Density	lb/ft³							
Optimum Moisture Content	%							
Remoulded Dry Density	lb/ft³							
Field Moisture Content	%							
Specific Gravity								
Air Voids at ..... MC	%							
CBR at ..... MC	%							
Consolidation Test								

5M.7/64.P542.L17264.

LANCASHIRE COUNTY COUNCIL SJ 39522 98738

BOREHOLE DATA SHEET

THERE IS NO No. 37
SJ 39 NE / 457

DATE 13th FEBRUARY, 1967 JOB NO. 247/R BOREHOLE NO. 38

JOB LIVERPOOL OUTER RING ROAD (A59 to A580) DEPTH 10'-6" (16.14)

LOCATION CH 96+80 - ℄ GROUND LEVEL 52.95 FEET A.O.D.

Description	(metric) Depth	Symbol	M.C.	L.L.	P.L.	P.I.	Class.	Sign.	Remarks
TOPSOIL	1'-0" (0.31)		22.6				C1		
STIFF MOTTLED BOULDER CLAY			18.6					■	3'-0" to 3'-6"
	5'-0" (1.52)		18.8						
FIRM BOULDER CLAY							C1		
			13.7						
	9'-0" (2.74)		12.3	% age PASSING				■	8'-0" to 8'-6"
WEATHERED BUNTER SANDSTONE			5.5	100% N°25 70% N°52 40% N°100 3% N°200				●	9'-0" to 9'-6"
	10'-6" (3.20)								
BOREHOLE DRY									

Undisturbed Sample ■ Raymond Penetration Test □R. N=No. of Blows
Bulk Sample ● Kilner Jar Sample KJ.
Water Entry WE. Final Water Level FWL.

Depth of Sample		3'-0" / 3'-6"	8'-0" / 8'-6"	9'-0" / 10'-6"				
Bulk Density	lb/ft³	132	141					
Dry Density	lb/ft³	111	125					
Moisture Content	%	18.6	12.3					
Compressive Stress	lbs/ft² ~~lb/in²~~	4820	3670					
Shear—Cohesion	lbs/ft² ~~lb/in²~~	2410	1835					
Shear—Angle of Friction								
B.S. COMPACTION								
Maximum Dry Density	lb/ft³							
Optimum Moisture Content	%							
Remoulded Dry Density	lb/ft³			106.8				
Field Moisture Content	%			5.2				
B.S. (HEAVY) COMPACTION								
Maximum Dry Density	lb/ft³							
Optimum Moisture Content	%							
Remoulded Dry Density	lb/ft³							
Field Moisture Content	%							
Specific Gravity								
Air Voids at ..... MC	%							
CBR at ..... FIELD ..... MC	%			3.9				
Consolidation Test								

5M.7/64.P540.L17264.

LANCASHIRE COUNTY COUNCIL

BOREHOLE DATA SHEET

SJ 39 NE/455
SJ 3946 98760

DATE 17th MARCH 1967 JOB NO. 247/B BOREHOLE NO. 5766/5

JOB LIVERPOOL OUTER RING ROAD (A59 to A580) DEPTH 12'-11"

LOCATION HOBB RAILWAY BRIDGE GROUND LEVEL (15.00) 49.21 A.O.D

Description	Depth (metres)	Symbol	M.C.	L.L.	P.L.	P.I.	Class.	Sign.	Remarks
SANDY TOPSOIL	2'-0" (0.61)						TS		
FIRM REDDISH BROWN SANDY, STONY CLAY.	5'-10" (1.78)		20.3				CL		
WEATHERED BUNTER SANDSTONE	7'-6" (2.29)		18.5	29	13	16		■	5'-10" to 6'-6"
REDDISH BROWN BUNTER SANDSTONE	12'-11" (3.94)						S	□R	7'-0" to 8'-0" N = 90
								□R	10'-6½" to 10'-8½" N = 50 for 2½"
BOREHOLE DRY									BOREHOLE CASED TO 12'-6"

Undisturbed Sample ■ Raymond Penetration Test □R. N=No. of Blows
Bulk Sample ● Kilner Jar Sample KJ.
Water Entry WE. Final Water Level FWL.

Depth of Sample		5'10" 6'6"							
Bulk Density	lb/ft³	128							
Dry Density	lb/ft³	108							
Moisture Content	%	18.5							
Compressive Stress	lbs/ft² ~~lb/in²~~								
Shear—Cohesion	lbs/ft² ~~lb/in²~~	950							
Shear—Angle of Friction	°	0°							
B.S. COMPACTION									
Maximum Dry Density	lb/ft³								
Optimum Moisture Content	%								
Remoulded Dry Density	lb/ft³								
Field Moisture Content	%								
B.S. (HEAVY) COMPACTION									
Maximum Dry Density	lb/ft³								
Optimum Moisture Content	%								
Remoulded Dry Density	lb/ft³								
Field Moisture Content	%								
Specific Gravity									
Air Voids at ..... MC	%								
CBR at ..... MC	%								
Consolidation Test									

5M.7/64.P548.L17264.

SD40SW12

NGR 4142 0054

Test WELL BORING at Headbolt Lane County Lancs SD 40 SW 84/34 12

Geol. map 1 in. map New Series 84 6 in. map 100 NW

Made by Date

~~Sunk~~ feet. Bored feet.

Communicated by Southport & W. Lancs. Water Board

Height above Ordnance Datum 105½ ft. Rest level of water 53 ft.

Yield

Quality (with copy of analysis on separate sheet)

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
	Soil	1	6	1	6
	Sand	4	-	5	6
	Clay	-	6	6	-
	Soft rock	4	-	10	-
	Red rock	55	-	65	-

Copied from tracing supplied to Water Board by A. Rose & Son Engineers, 8 Victoria St. SW.1.

SD 46 SW/12

0	46	0	46
1	22	1	68
0	15	1	83
1	22	3	05
16	76	19	81

GEOLOGICAL SURVEY AND MUSEUM, JERMYN STREET, LONDON, S.W. 1.

(B10619). Wt. 15824—S123. 2500. 11/25. Gp. 160. O.A.

British Geological Survey

CLASSIFIED SHEET SD40/159

C. ***TEST PUMPING SUMMARY*** (Please supply fully details on Form WR - 39)

Test Pumping Datum (if different from borehole datum)	_____ (mbd)	above / m below borehole datum
Pump Suction Depth	_____	mbd
Water Level (Start of Test)	_____	mbd
Water Level (End of Test)	_____	mbd
Pumping rate	_____	m^3/d : l/s
for	_____	days/hours
Recovery to (from end of pumping)	_____ mbd in _____	mins : hrs : days
Date(s) of measurements	_____	

Please Supply Chemical Analysis If Available

D. ***STRATA LOG***

Geological Classification	Description of Strata	Thickness	Depth
(BGS only)		m	m
PH SHERWOOD SANDSTONE GROUP	HARDCORE	0.8	0.8
	CLAY	5.8	6.6
	RED SAND	1.0	7.6
	SANDSTONE (RED)	52.4	60.0

[continue on separate page if necessary]

Other Comments (eg gas encountered, saline water intercepted, etc)

FOR OFFICIAL USE ONLY

FILE ..... CONSENT NO ..... BGS REF NO .....

LICENCE NO ..... USE OF BH ..... NGR .....

FORM WR - 38

Agency No:

ENVIRONMENT AGENCY

SD40/159

BOREHOLE RECORD

A. SITE DETAILS

Borehole drilled for	CITY CENTRE COMMERCIALS LIMITED	
Location	SIMONSWOOD INDUSTRIAL PARK, KIRBY	
NGR (8 fig) Ground Level (if known)	SD4365|0084	Please attach site plan
Drilling Company	BLAIR DRILLING	
Date of drilling	Commenced: 12|12|2000 Completed: 20|12|2000	

B. CONSTRUCTION DETAILS

Borehole datum (if not ground level)..... _____ above / m below GL
(point from which all measurements of depth are taken eg flange, edge of chamber, etc)

Borehole drilled diameter ..... 300 mm from 0 to 16 m/depth
200 mm from 16 to 60 m/depth
_____ mm from _____ to _____ m/depth

Casing material STEEL diameter 200 mm from 0 to 15 m/depth
and type (eg plain steel, plastic slotted)
_____ diameter _____ mm from _____ to _____ m/depth
_____ diameter _____ mm from _____ to _____ m/depth
_____ diameter _____ mm from _____ to _____ m/depth

Grouting details ..15m.....

Water struck at ..... 15.8 m (depth below datum - mbd)
_____ m (depth below datum - mbd)

Rest water level on completion 5.75 m (depth below datum - mbd)

Name of site Simonswood Moss, Kirkby.

Bh 10 of 11

W R B No. SD 40/ 134 D

Owner White Moss Peat Co. | Licence no. / Appn no. / Cancelled

Occupier Drilled by Merseyside CC | IGS ref. no.

Nat. grid ref. SD 4386 0060

Status Site Investn (waste disposal)

Ground level m OD ft. OD

Level of well top m OD ft. OD

Rest water level m bwt ft. bwt

(Date) m OD ft. OD

Aquifer Liverpool & Otwestry.

Code 118·05

Construction: Method Date

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type
10·5m	150mm	GL	1·6	19mm	Plain pipe

Summary of geological section	Thickness	Depth
Soil		0·7
Sand		2·0
Clay		10·3
SST		10·5

Abstraction rates

gph PWL

gpd

Type of pump

Chem./bact. anal. YES/NO

Well driller Davis Bros

If insufficient space has been allowed, continue in 'Notes' overleaf.

I/5/79/207

British Geological Survey

British Geological Survey

FORM WR-38 (cont.)

(Please type)

GROUNDWATER

DATE RECEIVED 26 · 2 · 96

NRA No. SD40/145

D. STRATA LOG

Geological Classification (BGS only)	Description of strata	Thickness m	Depth m
Till (undiff)	HARD CORE + FILL	1	1
	BOULDER CLAY	2	3
Sherwood Sst. Grp. (undiff.)	RED SANDSTONE	59	62
A Howard 1/12/97.			

[continue on separate page if necessary]

Other Comments (eg gas encountered, saline water intercepted, etc)

FOR OFFICIAL USE ONLY

FILE ..... CONSENT NO ..... BGS REF NO .....

LICENCE NO ..... USE OF BH ..... NGR

FORM WR-38 SD 40 SW 55

National Rivers Authority
North West Region
BOREHOLE RECORD

(Please type)

GROUNDWATER
DATE RECEIVED 26 · 2 · 96

NRA No. SD40/145

A. SITE DETAILS

Borehole drilled for	SLOYAN DOYLE DEMOLITION 813.
Location	SIMONSWOOD, SKELMERSDALE, LIVERPOOL
NGR (8 fig.)	SD 4382 0095 — Please attach site plan
Ground Level (If known) ..	
Drilling Company	DALES WATER SERVICES LTD
Date of drilling	Commenced: Completed:

B. CONSTRUCTION DETAILS

Borehole datum (If not ground level)..... EDGE OF MANHOLE RIM above m below GL
(point from which all measurements of depth are taken eg flange, edge of chamber, etc)

Borehole drilled diameter ..... 200 mm from GL to 62 m/depth
_____ mm from _____ to _____ m/depth
_____ mm from _____ to _____ m/depth

Casing material and type (eg plain steel, plastic slotted) PLAIN STEEL diameter 200 mm from GL to 23 m/depth
_____ diameter _____ mm from _____ to _____ m/depth
_____ diameter _____ mm from _____ to _____ m/depth
_____ diameter _____ mm from _____ to _____ m/depth

Grouting details .....

Water struck at ..... 18 m (depth below datum - mbd)
24 m (depth below datum - mbd)

Rest water Level on completion ..... 10 mbd

C. TEST PUMPING SUMMARY (Please supply full details on Forms WR-38)

Test Pumping Datum (If different from borehole datum) _____ above m below borehole datum (mbd)

Pump Suction Depth ..... 36 mbd

Water Level (Start of Test) ..... 9.99 mbd

Water Level (End of Test) ..... 9.74 mbd

Pumping rate ..... 488.25 m^3/d ~~l/s~~

for 2 days/hours

Recovery to ..... 9.74 mbd in 24 HRS 15 MINS ~~hrs / days~~
(from end of pumping)

Date(s) of measurements ..... 3/2/96 To 10/2/96.

Please Supply Chemical Analysis If Available

SD40SW109-113

BOREHOLE RECORD

Contract No. 5557/96 Client DENHOLM SHIPPING SERVICES LTD

Ground Level Location STOPGATE LANE, SIMONSWOOD, LIVERPOOL

BOREHOLE No. TP 1 Date APRIL 1996

Depth	Thick-ness	Legend	Description of Strata	Type of Sample	C kN/m2	M %	Ø	Density kg/m3	N
	0.800		Made up ground. Brick rubble and concrete with reinforcements						
0.800									
	0.400		Brown sandy, gravelly clay						
1.200			*Seepage 0.800m.						
			TRIAL PIT 2						
	0.600		Made up ground. Brick rubble fill with concrete (Reinforced)						
0.600									
	1.400		Made up ground. Loose crushed concrete with rubble fill						
2.000									

Water Struck at Standing Water Level

Undisturbed Sample	U
Disturbed Sample	O
Penetration Test	P
Cohesion	C
Angle of Internal Friction	Ø
Moisture Content %	M
Standard Penetration Value	N

J. T. HYMAS (Site Investigation) LTD.

12 Yarm Road, Stockton-on-Tees,
Cleveland TS18 3NE
Tel. 01642 607083 Fax.01642 612355



BOREHOLE RECORD

Contract No. 5557/96 Client DENHOLM SHIPPING SERVICES LTD

Ground Level Location STOPGATE LANE, SIMONSWOOD, LIVERPOOL

BOREHOLE No. TP 3 Date APRIL 1996

Depth	Thick-ness	Legend	Description of Strata	Type of Sample	C kN/m2	M %	Ø	Density kg/m3	N
0.250	0.250		Made up ground. Hardcore						
0.450	0.200		Made up ground. Brick rubble						
1.100	0.550		Brown slight silty sandy, gravelly clay						
			TRIAL PIT 4						
0.100	0.100		Made up ground. Hardcore						
0.350	0.250		Made up ground. Brick rubble fill						
1.000	0.650		Brown sandy, gravelly clay						
			TRIAL PIT 5						
0.400	0.400		Made up ground. Soil						
0.700	0.300		Made up ground. Ash and brick rubble fill						
0.900	0.200		Brown sand						
1.300	0.400		Brown clay with sand partings						

Water Struck at Standing Water Level

Undisturbed Sample	U
Disturbed Sample	O
Penetration Test	P
Cohesion	C
Angle of Internal Friction	Ø
Moisture Content %	M
Standard Penetration Value	N

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British Geological Survey

BOREHOLE RECORD

Contract No. 5557/96 Client DENHOLM SHIPPING SERVICES LTD

Ground Level _____ Location STOPGATE LANE, SIMONSWOOD, LIVERPOOL

BOREHOLE No. TP 6 Date _____

Depth	Thick-ness	Legend	Description of Strata	Type of Sample	C kN/m²	M %	Ø	Density kg/m³	N
0.500	0.500		Made up ground. Ash and brick rubble fill						
0.750	0.250		Grey brown clayey sand						
1.100	0.350		Brown sandy sand parted clay						
			TRIAL PIT 7						
0.550	0.550		Made up ground. Soil over brick rubble fill						
1.600	1.050		Grey brown sandy, gravelly, stoney clay						
			TRIAL PIT 8						
0.450	0.450		Made up ground. Brick rubble fill						
0.600	0.150		Made up ground. Soil						
1.000	0.400		Grey brown sand parted clay						

Water Struck at _____ Standing Water Level _____

Undisturbed Sample	U
Disturbed Sample	O
Penetration Test	P
Cohesion	C
Angle of Internal Friction	Ø
Moisture Content %	M
Standard Penetration Value	N

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Tel. 01642 607083 Fax.01642 612355



British Geological Survey

BOREHOLE RECORD

Contract No. 5557/96 Client DENHOLM SHIPPING SERVICES LTD

Ground Level Location STOPGATE LANE, SIMONSWOOD, LIVERPOOL

BOREHOLE No. TP 9 Date APRIL 1996

Depth	Thick-ness	Legend	Description of Strata	Type of Sample	C kN/m2	M %	Ø	Density kg/m3	N
0.500	0.500		Made up ground. Brick rubble fill						
0.800	0.300		Made up ground. Soil ash fill						
1.100	0.300		Brown sand parted clay						
			TRIAL PIT 10						
0.100	0.100		Made up ground. Hardcore						
0.500	0.400		Made up ground. Brick rubble fill						
0.900	0.400		Brown sandy clay with sand bands						
			TRIAL PIT 11						
0.400	0.400		Made up ground. Ash with brick rubble fill						
1.000	0.600		Brown gravelly sand parted clay						

Water Struck at Standing Water Level

Undisturbed Sample	U
Disturbed Sample	O
Penetration Test	P
Cohesion	C
Angle of Internal Friction	Ø
Moisture Content %	M
Standard Penetration Value	N

J. T. HYMAS (Site Investigation) LTD.

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Cleveland TS18 3NE
Tel. 01642 607083 Fax.01642 612355



BOREHOLE RECORD

Contract No. 5557/96 Client DENHOLM SHIPPING SERVICES LTD

Ground Level _____ Location STOPGATE LANE, SIMONSWOOD, LIVERPOOL

BOREHOLE No. TP 12 Date APRIL 1996

Depth	Thick-ness	Legend	Description of Strata	Type of Sample	C kN/m²	M %	Ø	Density kg/m³	N
	0.500		Made up ground. Ash with brick rubble fill						
0.500									
	0.500		Brown sandy, gravelly clay						
1.000									
			TRIAL PIT 13						
	0.100		Made up ground. Hardcore						
0.100									
	0.300		Made up ground. Brick rubble fill						
0.400									
	0.600		Brown sandy, gravelly clay						
1.000									

Water Struck at _____ Standing Water Level _____

Undisturbed Sample	U
Disturbed Sample	O
Penetration Test	P
Cohesion	C
Angle of Internal Friction	Ø
Moisture Content %	M
Standard Penetration Value	N

J. T. HYMAS (Site Investigation) LTD.

12 Yarm Road, Stockton-on-Tees,
Cleveland TS18 3NE
Tel. 01642 607083 Fax.01642 612355



SD 40 SE 145

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R170/14J

Sheet 1 of 5

Machine BOYLES B.B.S.
Flush AIR Bit size (mm) 76
Method Open Hole

Date 25/07/90-26/07/90
Coords 346154E 401812N
Ground Level 42.67 m OD

Site NWEP
Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
					25/07/90	0.32	42.35	Sandy TOPSOIL (0.32)	
								SAND (3.26)	
						3.58	39.09	Sandy boulder CLAY (6.83)	

Remarks
Casing size Hx from ground level to 18.50m
Casing size Px from 18.50m to 38.00m

Logged by JC | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %
RQD Rock Quality Designation %
SCR Solid Core Recovery %
FI Fracture Index

British Geological Survey

SD 40 SE 145

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R170/14J

Sheet 2 of 5

Machine BOYLES B.B.S.	Date 25/07/90-26/07/90	Site NWEP	
Flush AIR Bit size (mm) 76	Coords 346154E 401812N		
Method Open Hole	Ground Level 42.67 m OD	Client SCUK/BECHTEL	

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
								Sandy boulder CLAY	
						10.41	32.26	SAND and GRAVEL (1.22)	
						11.63	31.04	Firm sandy boulder CLAY (6.13)	
						17.76	24.91	GRAVEL (0.63)	
						18.39	24.28	Firm sandy boulder CLAY (5.61)	

Remarks: Casing size Hx from ground level to 18.50m
Casing size Px from 18.50m to 38.00m

Logged by JC | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %

RQD Rock Quality Designation %

SCR Solid Core Recovery %

FI Fracture Index

SD 40 SE 145

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R170/14J

Sheet 3 of 5

Machine BOYLES B.B.S.

Flush AIR Bit size (mm) 76

Method Open Hole

Date 25/07/90-26/07/90

Coords 346154E 401812N

Ground Level 42.67 m OD

Site NWEP

Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
								Firm sandy boulder CLAY with sand and gravel bands	
					25/07/90 26/07/90	24.00	18.67	Firm sandy boulder CLAY with bands of sand and gravel (13.32)	

Remarks Casing size Hx from ground level to 18.50m
Casing size Px from 18.50m to 38.00m

Logged by JC | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %

SCR Solid Core Recovery %

RQD Rock Quality Designation %

FI Fracture Index

British Geological Survey

SD 40 SE 145

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R170/14J

Sheet 4 of 5

Machine BOYLES B.B.S.

Flush AIR Bit size (mm) 76

Method Open Hole

Date 25/07/90-26/07/90

Coords 346154E 401812N

Ground Level 42.67 m OD

Site NWEP

Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
								Firm sandy boulder CLAY with sand and gravel bands	
						37.32	5.35	Red sandy MUDSTONE, sandstone bands (12.68)	

Remarks Casing size Hx from ground level to 18.50m
Casing size Px from 18.50m to 38.00m

Logged by JC | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %

SCR Solid Core Recovery %

RQD Rock Quality Designation %

FI Fracture Index

British Geological Survey

SD 40 SE 145

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R170/14J

Sheet 5 of 5

Machine BOYLES B.B.S.
Flush AIR Bit size (mm) 76
Method Open Hole

Date 25/07/90-26/07/90
Coords 346154E 401812N
Ground Level 42.67 m OD

Site NWEP
Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
								Red sandy MUDSTONE, sandstone bands	
					26/07/90	50.00	-7.33		

Remarks
Casing size Hx from ground level to 18.50m
Casing size Px from 18.50m to 38.00m

Logged by JC | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %
RQD Rock Quality Designation %
SCR Solid Core Recovery %
FI Fracture Index

British Geological Survey

SD 40 SE 149

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R171/05J

Sheet 1 of 4

Machine BOYLES B.B.S.
Flush AIR Bit size (mm) 76
Method Open Hole

Date 29/06/90-29/06/90
Coords 346537E 401993N
Ground Level 41.24 m OD

Site NWEP
Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
					29/06/90			Sandy TOPSOIL (0.39)	
						0.39	40.85	SAND (5.04)	
						5.43	35.81	Sandy boulder CLAY, bands of sand (wet) (15.42)	

Remarks Casing size Px to 23.10m

Logged by DG | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %
RQD Rock Quality Designation %
SCR Solid Core Recovery %
FI Fracture Index

British Geological Survey

SD 40 SE 149

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R171/05J

Sheet 2 of 4

Machine BOYLES B.B.S.
Flush AIR Bit size (mm) 76
Method Open Hole

Date 29/06/90-29/06/90
Coords 346537E 401993N
Ground Level 41.24 m OD

Site NWEP
Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
								Sandy boulder CLAY, bands of sand (wet)	

Remarks Casing size Px to 23.10m

Logged by DG | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %
SCR Solid Core Recovery %
RQD Rock Quality Designation %
FI Fracture Index

SD40 SE 149

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R171/05J

Sheet 3 of 4

Machine BOYLES B.B.S.
Flush AIR Bit size (mm) 76
Method Open Hole

Date 29/06/90-29/06/90
Coords 346537E 401993N
Ground Level 41.24 m OD

Site NWEP
Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
								Sandy Boulder CLAY, bands of sand	
						20.85	20.39	GRAVEL (0.86)	
						21.71	19.53	Sandy boulder CLAY (0.48)	
						22.19	19.05	Red SANDSTONE, fairly hard (8.33)	

R. ...s Casing Size Px to 23.10m

Logged by DG | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %
RQD Rock Quality Designation %
SCR Solid Core Recovery %
FI Fracture Index

British Geological Survey

SD 40 SE 151

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R171/07J

Sheet 1 of 5

Rig BOYLES B.B.S.

Flush AIR Bit size (mm) 76

Method Open Hole

Date 28/06/90-29/06/90

Coords 346682E 402055N

Ground Level 41.67 m OD

Site NWEP

Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
					28/06/90			Sandy TOPSOIL (0.34)	
						0.34	41.33	SAND (4.50)	
						4.84	36.83	Sandy boulder CLAY, bands of sand (5.79)	

Remarks Casing size Px to 14.50m

Logged by DG | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %

SCR Solid Core Recovery %

RQD Rock Quality Designation %

FI Fracture Index

British Geological Survey

SD40SE151

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R171/07J

Sheet 2 of 5

Machine BOYLES B.B.S.
Flush AIR Bit size (mm) 76
Method Open Hole

Date 28/06/90-29/06/90
Coords 346682E 402055N
Ground Level 41.67 m OD

Site NWEP
Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
								Sandy Boulder CLAY,bands of sand	
						10.63	31.04		
								GRAVEL (0.43)	
						11.06	30.61		
								Sandy boulder CLAY (wet) (3.37)	
						14.43	27.24		
								Grey MUDSTONE, sandstone bands (5.94)	

R :s Casing size Px to 14.50m

Logged by DG | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %

RQD Rock Quality Designation %

SCR Solid Core Recovery %

FI Fracture Index

SD40SE 151

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R171/07J

Sheet 3 of 5

Machine BOYLES B.B.S.
Flush AIR Bit size (mm) 76
Method Open Hole

Date 28/06/90-29/06/90
Coords 346682E 402055N
Ground Level 41.67 m OD

Site NWEP
Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
						20.37	21.30	Grey MUDSTONE, sandstone bands	
								Grey SANDSTONE (0.80)	
						21.17	20.50	Dark grey MUDSTONE (1.15)	
						22.32	19.35	Grey MUDSTONE, sandstone bands (1.49)	
						23.81	17.86	Grey SANDSTONE (1.29)	
						25.10	16.57	Black MUDSTONE coaly (2.35)	
						27.45	14.22	Grey MUDSTONE (1.55)	
					28/06/90 29/06/90	29.00	12.67	Grey MUDSTONE, sandstone bands (7.16)	

Remarks Casing size Px to 14.50m

Logged by DG | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %
RQD Rock Quality Designation %
SCR Solid Core Recovery %
FI Fracture Index

SD 40 SE 152

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R171/08J

Sheet 1 of 3

Rig Type BOYLES B.B.S.

Flush AIR Bit size (mm) 76

Method Open Hole

Date 28/06/90-28/06/90

Coords 346781E 402070N

Ground Level 42.14 m OD

Site NWEP

Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
					28/06/90			Sandy TOPSOIL (0.38)	
						0.38	41.76	SAND (2.63)	
						3.01	39.13	Sandy boulder CLAY (wet) (4.65)	
						7.66	34.48	GRAVEL (0.42)	
						8.08	34.06	Sandy boulder CLAY (dry) (3.63)	

Remarks Casing size Px to 12.00m

Logged by DG | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %

SCR Solid Core Recovery %

RQD Rock Quality Designation %

FI Fracture Index

British Geological Survey

SD 40 SE 152

FUGRO - McCLELLAND LIMITED

ROTARY LOG

Borehole R171/08J

Sheet 2 of 3

Rig BOYLES B.B.S.

Flush AIR Bit size (mm) 76

Method Open Hole

Date 28/06/90-28/06/90

Coords 346781E 402070N

Ground Level 42.14 m OD

Site NWEP

Client SCUK/BECHTEL

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (m OD)	Depth (m)	Strata Description (thickness in metres)	Legend
								Sandy boulder CLAY	
						11.71	30.43		
								Grey SANDSTONE (wet) (1.49)	
						13.20	28.94		
								Grey MUDSTONE, sandstone bands (2.74)	
						15.94	26.20		
								Grey MUDSTONE (dry) (2.74)	
						18.68	23.46		
								Dark grey MUDSTONE (1.68)	

Remarks Casing size Px to 12.00m

Logged by DG | Scale 1:50 | Job No. 901235

Sample/Test Key

TCR Total Core Recovery %

RQD Rock Quality Designation %

SCR Solid Core Recovery %

FI Fracture Index

British Geological Survey

SD 40 SE 118

FUGRO - McCLELLAND LIMITED

BOREHOLE LOG

Borehole B170/03A

Sheet 1 of 2

Method	Date	Site
Shell & Auger.	06/06/90 - 06/06/90	NWEP

Dia mm	Coord	Ground Level m.OD	Client
200	345992mE,401819mN	41.18	SCUK/BECHTEL

Soil Samples/Tests		Water & Progress	OD Level m.	Depth m.	Description of Strata	Legend
Type/Test	Depth m.					
B1	0.00 - 0.50	06/06/90			MADE GROUND(very dense ashes and bricks with timber) (1.50)	
C2 (51)	0.50 - 0.95					
B3	0.95 - 1.50					
U4 (n/r)	1.50 - 1.95		39.68	1.50		
B4	1.50 - 1.95				Very soft dark reddish-brown clayey fibrous PEAT (1.70)	
B5 ( )	1.95 - 2.50					
U6 (n/r)	2.50 - 2.95					
B6	2.50 - 2.95					
B7 ( )	2.95 - 3.20					
S8 (15)	3.20 - 3.65		37.98	3.20	Very soft to soft grey sandy silty CLAY with occasional pockets of peat and sand layers (0.45)	
		06/06/90	37.53	3.65		

Remarks

No ground-water encountered
Moving and setting up 2.5 hours

Logged by	Scale	End Casing Depth m.	Job No.
AT	1:25	3.00	901235

Sample/Test key:

U ()	U100 sample (blows)
D	Disturbed sample
B	Bulk sample
W	Water sample
-	Progress & Day

Penetration Tests

S ()	Standard (N value)
C ()	Cone (N value)
*	Blows and penetration when 300mm not achieved

British Geological Survey

SD40SE 118

FUGRO - McCLELLAND LIMITED

BOREHOLE LOG

Borehole B170/03A

Sheet 2 of 2

Method	Date	Site
Shell & Auger.	06/06/90 - 06/06/90	NWEP

Dia mm	Coord	Ground Level m.OD	Client
200	345992mE 401819mN	41.18	SCUK/BECHTEL

Soil Samples/Tests		Water & Progress	OD Level m.	Depth m.	Description of Strata	Legend
Type/Test	Depth m.					

i. Chiselling from 0.00 to 1.50 for 1.0 hour.
ii. Install standpipe to 3.00.
iii. Water added from 0.00 to 3.00.

GROUNDWATER OBSERVATIONS

Date	Time	Borehole Depth	Casing Depth	Water Level
06/06/90	1500	3.65	3.00	DRY

Remarks

No ground-water encountered
Moving and setting up 2.5 hours

Logged by	Scale	End Casing Depth m.	Job No.
AT	1:25	3.00	901235

Sample/Test key:
U () U100 sample (blows)
D Disturbed sample
B Bulk sample
W Water sample
- Progress & Day

Penetration Tests
S () Standard (N value)
C () Cone (N value)
* Blows and penetration when 300mm not achieved

British Geological Survey

SD40SE911

British Geological Survey

FORM WR – 38

Consent No:

BGS No:

BOREHOLE RECORD

A. SITE DETAILS

Borehole drilled for: T. WILSON & SONS LTD.

Location: HAGGOD NOOK FM - RAINFORD - ST HELENS WA11 8PL

NGR (8 fig): Please attach site plan

Ground Level (if known):

Drilling Company: BLAIR DRILLING LTD

Date drilling Commenced: 10-8-08 Completed:

B. CONSTRUCTION DETAILS

Borehole datum (if not ground level) …….. m below GL
(point from which all measurements of depth are taken eg flange, edge of chamber, etc)

Borehole drilled diameter

300 ..... diameter .... mm from G/L to 12 m/depth
200 diameter .... mm from 12 to 115 m/depth
..... diameter .... mm from .....to .....m/depth

Casing material and type (eg plain steel, plastic slotted)

..... diameter .... mm from .....to .....m/depth
..... diameter .... mm from .....to .....m/depth
..... diameter .... mm from .....to .....m/depth
..... diameter .... mm from .....to .....m/depth

Grouting details: OPC 8" steel casing 0 - 12 m.

Water struck at: 18 m (depth below datum - mbd)
6.6 m (depth below datum - mbd)

Rest water level on completion .....m (depth below datum - mbd)

C. TEST PUMPING SUMMARY (Please supply fully details on Form WR-39)

Test Pumping Datum .....m (depth below datum - mbd)
(if different from borehole datum)
Pump Suction Depth .....mbd
Water Level (Start of Test) .....mbd
Water Level (End of Test) .....mbd
Pumping rate .....m^3/d:l/s
.....for.....days/hours
Recovery to .....mbd in.....mins : hrs : days
(from end of pumping)
Date(s) of measurements
Please Supply Chemical Analysis if Available

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FORM WR - 38

Consent No:
BGS No:

D. STRATA LOG

Geological Classification (BGS only)	Description of Strata	Thickness m	Depth m
	SOIL	1.5	0
	BOULDER CLAY	8.00	1.5
	MUDSTONE/SILTSTONE	89.5	9.5
	HARD SANDSTONE	16.00	99
	TOTAL DEPTH 115 m.		
	[continue on separate page if necessary]		
	Other Comments (eg gas encountered, saline water intercepted, etc)		

FOR OFFICIAL USE ONLY

FILE ..... CONSENT NO ..... BGS REF NO .....

LICENCE NO ..... USE OF BH ..... NGR.....

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(B11887) Wt. 17852—3154—5,000 12/26 Gp. 160. O.A.

SD 40 SE 8 Drawer 7

SECTION OF No. 9 Pit **at** Holland Colliery

Maps: One-inch 84 Six-inch 9 25E? County Lancashire

Height above O.D. Latitude Longitude

Communicated by Copied from Book of Sections belonging to the White Moss Coal Co. Book seen at Holland Colliery. Date of Sinking 1 in 3.

Made by Dip of Strata

	Thickness.			Depth from Surface.		
	m			m		
Bog	2·8956	9	6	2·8956	9	6
Sand	1·9303	6	4	4·8259	15	10
Bog	0·1016	–	4	4·9274	16	2
Gravel	1·4222	4	8	6·3499	20	10
Sand & loam	0·9906	3	3	7·3406	24	1
Gravel	0·1778	–	7	7·4929	24	7
Sand & loam	1·3208	4	4	8·8138	28	11
White rock	24·4348	80	2	33·2486	109	1
Rubbly rock	1·1174	3	8	34·3662	112	9
Blue loam	0·4572	1	6	34·8234	114	3
Black metal	1·4478	4	9	36·2712	119	–
Coal	0·3302	1	1	36·6014	120	1
Warrant	1·2192	4	–	37·8206	124	1
Blue metal	0·3048	1	–	38·1254	125	1
Lin & wool	1·524	5	–	39·6494	130	1
Dun metal	2·286	7	6	41·9354	137	7
White rock	1·0922	3	7	43·0274	141	2
Lin & wool	0·2539	–	10	43·2816	142	–
White rock	0·5079	1	8	43·7894	143	8
Blue metal with stone bands	3·2509	10	8	47·0407	154	4
Bass Coal & Hard Cannel	1·143	3	9	48·1838	158	1
Warrant	0·6604	2	2	48·8442	160	3
Grey rock	3·6576	12	–	52·5018	172	3
Fault comes in see note on next page. Blue metal	6·8326	22	5	59·3342	194	8
KING MINE OR EARTHY DELF — Coal	0·6858	2	3	60·0202	196	11
Warrant	1·015	3	4	61·0362	200	3
Coal	0·4572	1	6	61·4934	201	9
Warrant	0·3302	1	1	61·8235	202	10

40

Holland No. 35 70 32 56 Drawn up.

(B11857) Wt. 17852—3154—5,000 12/26 Gp. 160. O.A.

SD 40 SE 32

SECTION OF No. 35 Borehole at In the field called "Old Close" on Valentine's Farm. [130 yds WSW. of No 6 Pit]

Maps: One-inch 84 Six-inch 92SE. County Lancashire

Height above O.D. Latitude Longitude

Communicated by Copied from Holland Colliery's Date of Sinking

Made by Book of Sections Site identified on mine plans & marked on field slip Dip of Strata

	Thickness.			Depth from Surface.		
	m			m		
Bog	3.2004	10	6	3.2004	10	6
Blue loam	0.5588	1	10	3.7591	12	4
Clay	0.7874	2	7	4.5466	14	11
Stony marl	1.4986	4	11	6.0452	19	10
Gravel	0.1778	-	7	6.2229	20	5
Marl	0.2029	-	8	6.4262	21	1
Sand & gravel	0.3302	1	1	6.7562	22	2
Marl & loam	4.1402	13	7	10.8966	35	9
Blue metal	2.0574	6	9	12.954	42	6
Grey rock	1.4986	4	11	14.4526	47	5
Dark lin & wool	2.0828	6	10	16.5354	54	3
Blue metal	5.1308	16	10	21.6662	71	1
Dun metal with small specks of coal	0.7112	2	4	22.3774	73	5
Coal	0.7112	2	4	23.0886	75	9
Warren	0.1778	-	7	23.2663	76	4
Sud	0.0762	-	3	23.3426	76	7
Coal & Bass	0.0762	-	3	23.4188	76	10
Sud	0.0508	-	2	23.4696	77	-
Dun metal with small specks of coal	0.5334	1	9	24.003	78	9
Coal	0.4318	1	5	24.4348	80	2
Dun metal with sud & coal	0.4064	1	4	24.8412	81	6
Warren	1.2192	4	-	26.0604	85	6
Flaggy rock	0.6604	2	2	26.7206	87	8
Lin & wool	3.2258	10	7	29.9466	98	3
Blue metal with brown stone bands	1.6256	5	4	31.5722	103	7
Dun metal	0.2029	-	8	31.7754	104	3
Blue metal with grey bands	2.0574	6	9	33.8328	111	-

57 31 6

(B11857) Wt. 17352—8154—5,000 12/26 Gp. 160. O.A.

SD 40 SE 7

SECTION OF No. 6 Pit **at** Holland Colliery,

Maps: One-inch 84 Six-inch 92 SE¼ County Lancashire

Height above O.D. Latitude Longitude

Communicated by Copied from Book of Sections belonging Date of Sinking

Made by to the White Moss Coal Co.. Book seen at Holland Colliery Dip of Strata 1 in 4.

	Thickness.			Depth from Surface.		
	m			m		
Bog	2.7432	9	-	2.7432	9	-
Sand	0.9144	3	-	3.6576	12	-
Blue loam	0.0762	-	3	3.7338	12	3
Marl	5.6642	18	7	9.3979	30	10
Grey rock	4.3179	14	2	13.716	45	-
Hard stone	0.3302	1	1	14.0462	46	1
Blue metal	0.4572	1	6	14.5034	47	7
Light metal	2.4384	8	-	16.9418	55	7
Grey rock	1.0922	3	7	18.0339	59	2
Dark metal	4.2672	14	-	22.3012	73	2
Dark metal with seams of Coal	6.4516	21	2	28.7528	94	4
Coal	0.2667	-	10½	29.0195	95	2½
Sug metal + Coal	0.4318	1	5	29.4513	96	7½
Metal	0.4826	1	7	29.9339	98	2½
Coal	0.2159	-	8½	30.4546	99	11
Metal	6.8834	22	7	37.338	122	6
Rock	0.6858	2	3	38.0238	124	9
Metal	2.4129	7	11	40.4366	132	8
Rock	2.0066	6	7	42.4434	139	3
Brown stone	0.4063	1	4	42.8498	140	7
Metal	1.3969	4	7	44.2466	145	2
Flaggy rock	2.0574	6	9	46.3042	151	11
Metal	0.5842	1	11	46.8884	153	10
Grey rock	0.8636	2	10	47.7518	156	8
Metal	1.5748	5	2	49.3268	161	10
Coal	0.5079	1	8	49.8348	163	6
Warren Earth	0.3048	1	-	50.1396	164	6
Metal	3.8354	12	7	53.9749	177	1

39

Holland No. 8. 45

Drawn up.

(B11857) Wt. 17852—S154—5,000 12/26 Gp. 160. O.A.

SD 40 SE 12 31

SECTION OF No 8 Boring **at** Valentine Moss, near Holland Colliery Upholland.

Maps: One-inch 84 Six-inch 92 SE^E County Lancashire

Height above O.D. _____ Latitude _____ Longitude _____

Communicated by Copied from Holland Colliery's Date of Sinking _____

Made by Book of Sections. Site identified on mine plans, & marked on field slip. Dip of Strata About 1 in 3.

	Thickness.			Depth from Surface.		
	m			m		
Bog	2.7432	9	-	2.7432	9	-
Sand	0.9144	3	-	3.6576	12	-
Blue loam	0.0762	-	3	3.7338	12	3
Marl	5.6642	18	7	9.3979	30	10
Grey rock	4.3178	14	2	13.716	45	-
Hard stone	0.3302	1	1	14.0462	46	1
Blue metal	0.4572	1	6	14.5034	47	7
Light metal	2.4384	8	-	16.9418	55	7
Grey rock	1.0922	3	7	18.0339	59	2
Dark metal	4.2672	14	-	22.3009	73	2
Dark metal with seams of coal	6.4514	21	2	28.7527	94	4
Coal	0.2667	-	10½	29.0195	95	2½
Sug metal & coal.	0.4318	1	5	29.4513	96	7½
Metal	0.4826	1	7	29.9339	98	2½
Coal	0.2159	-	8½	30.1498	98	11
Metal	6.8834	22	7	37.0332	121	6
Rock	0.6858	2	3	40.4622	123	9
Metal	2.4129	7	11	40.1318	131	8
Rock	2.0066	6	7	42.1386 ~~5.5626~~	138	3
Brown stone	0.4064	1	4	42.5449	139	7
Metal	1.3969	4	7	43.9418	144	2
Flaggy rock	2.0574	6	9	45.9994	150	11
Metal	0.5842	1	11	46.5835	152	10
~~Coal~~ Grey rock	0.8636	2	10	47.4469	155	8
Metal ~~Warren earth~~	1.5748	5	2	49.0219	160	10
Coal	0.5079	1	8	49.53	162	6
Warren earth	0.3048	1	-	49.8348	163	6
Metal	3.8354	12	7	53.6702	176	1

HIGHWAY & FOUNDATION SURVEYS LTD.,
BROOK LANE, PEMBERTON, WIGAN, LANCS.

BOREHOLE RECORD SHEET

Date	Scale	Job No.	Location	Borehole
NOVEMBER 1974	1:50	143	WORTHINGTON NURSERIES.	18

Method	Client
SHELL & AUGER	SKELMERSDALE DEV. CORP.

Drilling & Casing Progress	Water Notes & Levels	Sample Type & Depths	S.P.T. 'N' value or Cohesion*	Description	O.D. Level	Legend	Depth
					64.9		0.0
14th				TOPSOIL	64.4		0.5
		U 1.0 – 1.5	25.1	Brown, mottled CLAY			
	Slight seepage 2.0			Moist, clayey SAND with stones	63.6		1.3
				Firm, brown, sandy BOULDER CLAY with sand bands.	63.3		1.6
		U 2.5 – 3.0	79.8	Firm, brown, sandy BOULDER CLAY with bands of SILT.	62.4		2.5
	Medium 3.6 seepage 4.5	U 3.5 – 4.0	6 (11)		61.3		3.6
				Wet, brown SAND + GRAVEL	60.7		4.2
		U 5.5 – 6.0		Stiff, brown, sandy, stony CLAY with occasional large boulders.			
13th					58.9		6.0
				END OF BORE			

Bore depth
Cased depth
U Undisturbed sample
D Disturbed sample
X Standard penetration test
W Water sample

SOUTH LANCS. BORING Co. LTD.

WINDY ARBOUR · WINSTANLEY · WIGAN

BOREHOLE RECORD SHEET

Job No. 465 Date 4. 12. 65'

Location Pimbo Estate.

Carried out for Skelmersdale Development Corporation

Borehole No. F17. Diameter 6"

Ground Level ..... Scale 1/50

Description	M/C %	O.S.D.	Legend	Depth	Thickness	Sample	Water Levels
Topsoil				0'-0	1'-0		
Medium fine grey SAND				1'-0		1'0	▽ 1'0 8.45 am. 6.12.65'
GRAVEL				2'-6	1'-6	2'6	▽ WATER ENTRY 2'6
					4'-0	4'0	
						5'6	
Firm to Soft Silty CLAY with				6'-6	2'-0	6'-6 7'0	
Hard brown boulder CLAY				8'-6	5'-6	8'-6 10-0 10'-0	
Grey SHALE				14'-0	2'-0	13'-6 15'-0 15'-0	
				16'-0	End of bore.		

Undisturbed Sample □ Disturbed Sample ○ Water Sample ▲ Standard Penetration X

SOUTH LANCS. BORING Co. LTD.

WINDY ARBOUR · WINSTANLEY · WIGAN

BOREHOLE RECORD SHEET

Job No. 465 Date 4. 12. 65"

Location Pimbo Estate.

Carried out for Skelmersdale Development Corporation

Borehole No. F18. Diameter 6"

Ground Level Scale 1/50.

Description	M/C %	O.S.D.	Legend	Depth	Thickness	Sample	Water Levels
				0' 0			
Topsoil					1'6		(Water entry 1/6)
				1'-6			▽ 2'0 9pm
Wet clayey SAND							4.12.65.
					3'6	2'6	
						4'0	
				5'-0			
Firm brown Sandy CLAY ramps.					1'6		
				6'-6		6'6	
Hard brown boulder CLAY.						8'0	
						8'0	
					5'6		
						10'6	
						Cln'o	
				12'-0	End of bore		

Undisturbed Sample □ Disturbed Sample ○ Water Sample A Standard Penetration X

1 BAL WOOD

Grid Ref. 5010/0356

Sheet No SD 5003

Bore Hole No 2

Information from NCB (OPEN CAST)

Date carried out July 14th 1953

Dia. of B.H.

Ground Level 250'

Water Table Level

Total depth of Bore 70'-0"

THICKNESS	NATURE OF GROUND	PROGRESSIVE DEPTH
1'-0"	SOIL	1'-0"
7'-0"	SAND & GRAVEL	8'-0"
7'-0"	SANDY CLAY & GRAVEL	15'-0"
12'-0"	GREY SHALE	27'-0"
1'-0"	COAL	28'-0"
4'-3"	DARK GREY SHALE COAL TRACES	32'-3"
9"	COAL	33'-0"
16'-0"	GREY SHALE	49'-0"
4'-0"	SANDY SHALE	53'-0"
10'-0"	—— " ——	~~63~~ 63'-0"
1'-0"	COAL	64'-0"
1'-0"	DARK GREY SHALE	65'-0"
5'-0"	SANDY SHALE	70'-0"

SKELMERSDALE DEVELOPMENT CORPORATION

BORE HOLE RECORD

scales

drawn

checked

date

D. H. GARSIDE. a.m.i.c.e. a.m.i.mun.e. CHIEF ENGINEER.

W. D. C. LYDDON. b.a. [arch] a.r.i.b.a. CHIEF ARCHITECT - PLANNER. dip.t.p. a.m.t.p.i.

British Geological Survey

SOUTH LANCS. BORING Co. LTD.

WINDY ARBOUR · WINSTANLEY · WIGAN

BOREHOLE RECORD SHEET

Job No. 465 Date 3. 12. 63

Location Pimbo Estate

Carried out for Skelmersdale Development Corporation

Borehole No. F 19. Diameter 6"

Ground Level ..... Scale 1/50

Description	M/C %	O.S.D.	Legend	Depth	Thickness	Sample	Water Levels
Topsoil				0'0	1'0		
Mottled brown CLAY with pockets of medium brown Sand.				1'0	2'0	1'0 / 2'6	
Firm brown boulder CLAY, pockets of brown SAND.				3'0	9'0	3'6 / 5'0 / 6'0-7'0 / 8'6 / 10'0 / 11'0-12'0	None encountered
				12'0		End of bore.	

Undisturbed Sample □ Disturbed Sample ○ Water Sample ▲ Standard Penetration X

SOUTH LANCS. BORING Co. LTD.

WINDY ARBOUR · WINSTANLEY · WIGAN

BOREHOLE RECORD SHEET

Job No. 465 Date 2. 12. 66

Location Pimbo Estate

Carried out for Skelmersdale Development Corporation

Borehole No. F20 Diameter 6"

Ground Level Scale 1/50

Description	M/C %	O.S.D.	Legend	Depth	Thickness	Sample	Water Levels
Topsoil				0' 0	1'6		
Stiff to hard brown boulder CLAY, sandy				1' 6		1'6 3'0 3'0	
							WATER ENTRY 5'0
					16'0	6'6 8'0 8'0	
						11'6 13'0 13'0	
							▽ 17'0 4.30pm 2. 12. 65
Hard dark grey SHALE				17' 6		17'6	
					2'6		
				20'-0	End of bore		

Undisturbed Sample □ Disturbed Sample ○ Water Sample A Standard Penetration X

SKELMERSDALE DEVELOPMENT CORPORATION

BOREHOLE LOG — CONTRACT E8/64

Area: 4 Site: Simbo

Borehole No.: J 15 Borehole Diam.: 6 in

Method of Boring: Percussion Ground Level:

Date of Boring—From: 12/5/65 Water Level—Struck:

—To: 12/5/65 —Standing: DRY.

Scale: 1 in to 5 feet

Description of Strata	Sample	Depth	B.H.	Depth	O.D.	Remarks
Topsoil	D	1'0"		0'9"		
Brown Sandy CLAY	D	3'0"				
	D	4'0"		4'3"		
	C	5'0"				
	D	5'6"				
Firm to stiff brown Sandy boulder CLAY.	D	9'0"				
	U	10'6"				
				12'0"		
End of borehole.						

FORM 25

U—Undisturbed : D—Disturbed : W—Water : B—Bulk Sample

J 18

Grid Ref. 4982/0344 Sheet No° 4903

Bore Hole No° 89

Information from D.P.I

Date carried out 14-6-65 Dia of B.H. 6"

Ground Level Water Table Level

Total depth of Bore 12'-0"

THICKNESS	NATURE OF GROUND	PROGRESSIVE DEPTH
0'-6"	SOIL	0'-6"
7'-0"	BROWN CLAY	7'-6"
3'-6"	BOULDER CLAY	11'-0"
1'-0"	SAND & SMALL GRAVEL	12'-0"

SKELMERSDALE DEVELOPMENT CORPORATION

BORE HOLE RECORD

scales .

drawn .

checked .

date .

D. H. GARSIDE. a.m.i.c.e. a.m.i.mun.e. CHIEF ENGINEER.

W. B. C. LYCDON. b.a. (arch) a.r.i.b.a. dip.t.p. a.m.t.p.i. CHIEF ARCHITECT - PLANNER.

British Geological Survey

SKELMERSDALE DEVELOPMENT CORPORATION

BOREHOLE LOG — CONTRACT E8/64

Area: 4 Site: Pimbo

Borehole No.: J 20 Borehole Diam.: 6 in

Method of Boring: Percussion Ground Level:

Date of Boring—From: 18/5/65 Water Level—Struck: DRY.

—To: 18/5/65 —Standing:

Scale: 1 in to 5 feet.

Description of Strata	Sample	Depth	B.H.	Depth	O.D.	Remarks
Sandy clay	D	1'0"				
Yellow clay	D	6'0"		6'0"		
	D U	5'0"		5'0"		
firm to stiff brown						
Sandy boulder clay	D	9'0"				
	U	10'0"				
	U	15'0"				
				16'6"		
Shale with some coal						
Grey shale	U	18'6"		18'6"		
	D	20'0"		20'0"		
End of borehole.						

FORM 125

U—Undisturbed : D—Disturbed : W—Water : B—Bulk Sample

J 17

Grid Ref. ~~4976/037~~ 4976/0342

Sheet No 4903

Bore Hole No 88

Information from D.D.I

Date carried out 14-5-65

Dia. of B.H. 6"

Ground Level

Water Table Level

Total depth of Bore 20'-0"

THICKNESS	NATURE OF GROUND	PROGRESSIVE DEPTH
0'-6"	SOIL	0'-6"
1'-0"	SANDY SOIL	1'-6"
6'-6"	BROWN CLAY	8'-0"
3'-9"	BOULDER CLAY	11'-9"
1'-3"	SAND & GRAVEL	13'-0"
3'-0"	BOULDER CLAY	16'-0"
4'-0"	GREY SHALE	20'-0"

SKELMERSDALE DEVELOPMENT CORPORATION

BORE HOLE RECORD

scales .

drawn .
checked .
date .

D. H. GARSIDE. a.m.i.c.e. a.m.i.mun.e. CHIEF ENGINEER.

W. G. C. LYSDON. b.a. (arch) a.r.i.b.a. dip.t.p. a.m.t.p.i. CHIEF ARCHITECT - PLANNER.

British Geological Survey

D. Consultants Coal Mining Report, Network Rail Mining Report and Mining Plans

Consultants Coal Mining Report and Network Rail Mining Report provided below. Mining plans to be provided separately due to file size.

The Coal Authority

Summary of findings

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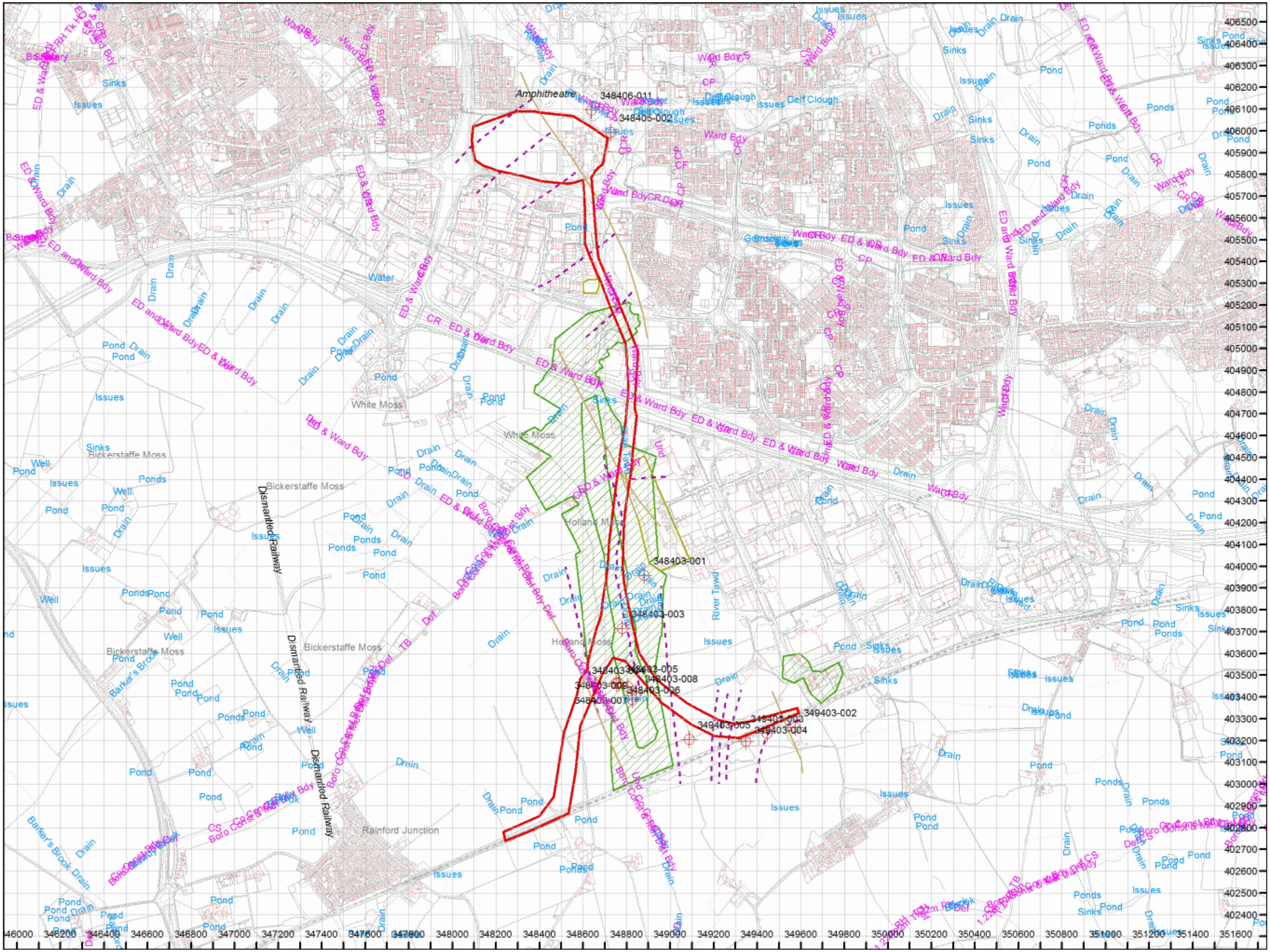
The map highlights any specific surface or subsurface features within or near to the boundary of the site.

Key

- Approximate position of the enquiry boundary shown
- Disused mine shaft
- Outcrop (Conjectured)
- Geological faults
- Unlicensed opencast site
- Site investigations



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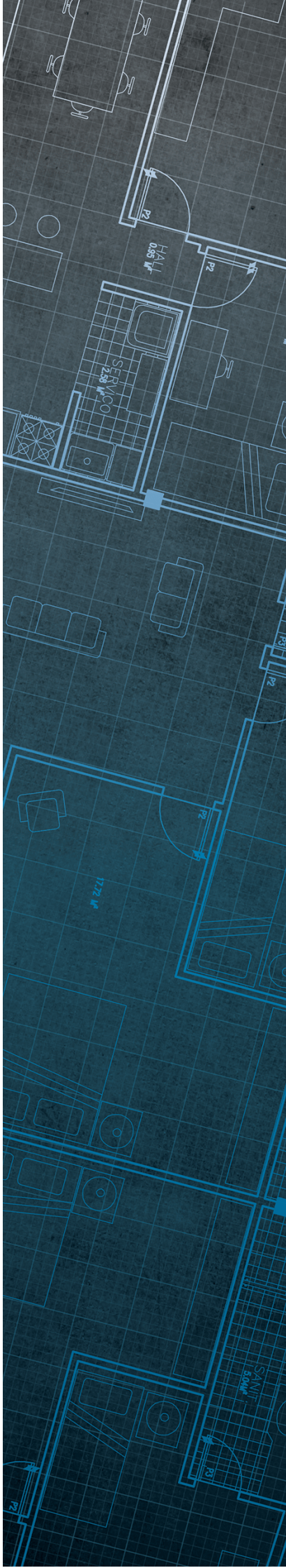
The Coal Authority

Consultants

Coal Mining Report

Skelmersdale Station
Lancashire
WN8 9UU



Date of enquiry:	**30 May 2018**
Date enquiry received:	**30 May 2018**
Issue date:	**30 May 2018**
Our reference:	**51001863245001**
Your reference:	**GS-5084312**

Consultants

Coal Mining Report

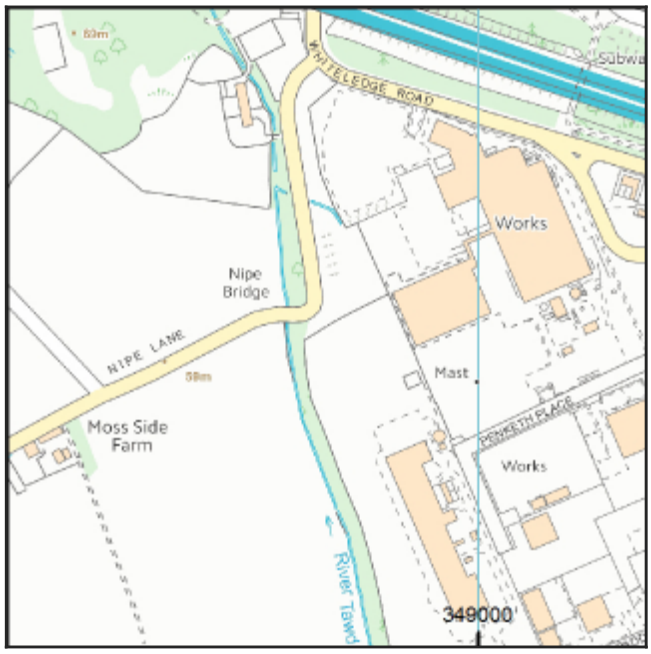
This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

GROUNDSURE LIMITED

Enquiry address

Skelmersdale Station
Lancashire
WN8 9UU



Approximate position of property

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Section 1 – Mining activity and geology

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	HIGHER FLORIDA	Coal	319Y	0	Beneath Property	11.3	North-West	170	1921
unnamed	WIGAN FIVE FEET	Coal	319R	21	Beneath Property	15.2	West	100	1939
unnamed	RUSHY PARK	Coal	31BH	24	Beneath Property	20.4	West	80	1936
unnamed	WIGAN TWO FEET	Coal	31C3	27	Beneath Property	13.1	West	60	1939
unnamed	DOE	Coal	319K	29	Beneath Property	11.4	West	260	1939
unnamed	WIGAN TWO FEET	Coal	319J	32	Beneath Property	14.1	West	60	1939
unnamed	HAIGH YARD	Coal	31BW	59	Beneath Property	10.0	West	220	1929
unnamed	DOE	Coal	319N	60	Beneath Property	10.3	North	280	1927
unnamed	DOE	Coal	31BN	64	South-East	12.0	West	260	1939
unnamed	KING	Coal	31BL	65	Beneath Property	17.9	West	70	1939
unnamed	HIGHER FLORIDA	Coal	3172	66	Beneath Property	3.7	North-West	170	1921
unnamed	LOWER FLORIDA	Coal	31A0	72	Beneath Property	2.9	North-West	100	1885
unnamed	KING	Coal	31BM	78	Beneath Property	17.9	West	70	1939
unnamed	HIGHER FLORIDA	Coal	3170	84	Beneath Property	4.4	South-East	170	1921
unnamed	HIGHER FLORIDA	Coal	316C	86	Beneath Property	4.2	South-East	170	1921
unnamed	HIGHER FLORIDA	Coal	3171	86	Beneath Property	2.9	North-West	170	1921
unnamed	DOE	Coal	3166	93	South-West	11.3	South-West	280	1928
unnamed	LOWER FLORIDA	Coal	3178	99	Beneath Property	2.9	North-West	90	1885
unnamed	DOE	Coal	319M	109	Beneath Property	7.1	North-West	280	1927
unnamed	WIGAN FIVE FEET	Coal	31C6	110	Beneath Property	18.4	West	100	1939
unnamed	ARLEY	Coal	31BS	117	Beneath Property	16.1	West	120	1936
unnamed	LOWER FLORIDA	Coal	3169	119	Beneath Property	7.1	South-East	90	1885

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Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	ARLEY	Coal	318Y	128	Beneath Property	10.5	West	120	1936
unnamed	LOWER FLORIDA	Coal	317A	133	East	2.9	North-West	90	1885
unnamed	LOWER FLORIDA	Coal	3177	137	Beneath Property	4.8	North-West	90	1886
unnamed	DOE	Coal	316X	138	Beneath Property	4.7	North-West	280	1927
unnamed	HAIGH YARD	Coal	319E	140	Beneath Property	14.9	North-West	220	1929
unnamed	WIGAN FIVE FEET	Coal	319S	145	Beneath Property	14.0	North	130	1921
unnamed	LOWER FLORIDA	Coal	3176	145	Beneath Property	7.1	South-East	90	1885
unnamed	LOWER FLORIDA	Coal	3168	146	Beneath Property	7.1	South-East	90	1885
unnamed	WIGAN FIVE FEET	Coal	31GW	152	Beneath Property	3.9	North	130	1921
unnamed	FLAGGY DELF	Coal	319C	153	South-West	18.5	West	50	1900
unnamed	FLAGGY DELF	Coal	31C2	159	South-West	18.5	West	50	1900
unnamed	RUSHY PARK	Coal	3195	171	Beneath Property	10.0	North-West	80	1936
unnamed	HAIGH YARD	Coal	319G	178	Beneath Property	11.3	West	180	1925
unnamed	WIGAN FIVE FEET	Coal	316V	180	Beneath Property	3.9	North	130	1921
unnamed	HAIGH YARD	Coal	31BV	182	North-East	20.0	North-West	200	1932
unnamed	DOE	Coal	3164	184	Beneath Property	6.3	South-East	290	1899
unnamed	RUSHY PARK	Coal	31BE	184	East	18.4	North-West	90	1912
unnamed	RUSHY PARK	Coal	31BF	184	East	18.4	North-West	90	1912
unnamed	HAIGH YARD	Coal	319I	189	North-East	20.0	North-West	220	1932
unnamed	DOE	Coal	316W	196	Beneath Property	6.3	South-East	290	1899
unnamed	ARLEY	Coal	31BQ	209	East	16.0	North-West	110	1912
unnamed	RUSHY PARK	Coal	31BG	222	North-East	18.4	North-West	90	1912
unnamed	KING	Coal	3161	243	Beneath Property	8.0	South-West	170	1921
unnamed	UPPER MOUNTAIN	Coal	31BO	247	Beneath Property	6.8	North-West	70	1920
unnamed	FLAGGY DELF	Coal	319D	249	Beneath Property	7.1	North-East	50	1920
unnamed	HAIGH YARD	Coal	316P	249	South	7.1	West	180	1925

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Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	UPPER MOUNTAIN	Coal	3191	255	Beneath Property	7.1	West	70	1915
unnamed	RUSHY PARK	Coal	3193	255	North-East	18.4	North-West	90	1900
unnamed	HAIGH YARD	Coal	315R	275	Beneath Property	6.3	South-East	175	1899
unnamed	HAIGH YARD	Coal	316S	277	Beneath Property	6.3	South-East	175	1899
unnamed	HALF YARD	Coal	3199	281	West	8.1	West	50	1927
unnamed	RUSHY PARK	Coal	3196	290	Beneath Property	7.2	South-West	70	1921
unnamed	RUSHY PARK	Coal	316N	294	Beneath Property	7.0	West	70	1921
unnamed	HALF YARD	Coal	316O	307	South	6.7	West	50	1927
unnamed	ARLEY	Coal	3190	311	East	10.5	West	100	1936
unnamed	KING	Coal	316U	316	Beneath Property	0.0	East	170	1921
unnamed	HAIGH YARD	Coal	319F	320	Beneath Property	18.4	North	180	1925
unnamed	ARLEY	Coal	316K	329	Beneath Property	7.1	West	100	1927
unnamed	HAIGH YARD	Coal	315T	329	Beneath Property	8.1	North-West	180	1925
unnamed	HALF YARD	Coal	315Z	335	South	8.1	West	50	1927
unnamed	RUSHY PARK	Coal	3197	335	West	10.7	North-West	80	1936
unnamed	RUSHY PARK	Coal	315J	340	Beneath Property	7.3	South-West	70	1921
unnamed	ARLEY	Coal	318Z	355	Beneath Property	7.0	West	100	1927
unnamed	KING	Coal	316T	369	Beneath Property	0.0	East	160	1895
unnamed	HAIGH YARD	Coal	316R	416	Beneath Property	8.1	West	180	1925
unnamed	ARLEY	Coal	315C	419	Beneath Property	7.1	West	100	1927
unnamed	HAIGH YARD	Coal	316Q	486	Beneath Property	8.0	South-West	180	1925
unnamed	ARLEY	Coal	316L	505	Beneath Property	7.1	North-West	120	1894
unnamed	ARLEY	Coal	315D	561	North	7.1	South-East	120	1894
unnamed	ARLEY	Coal	316M	573	North	7.1	South-East	120	1894

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Probable unrecorded shallow workings
Yes.

Spine roadways at shallow depth
No spine roadway recorded at shallow depth.

Mine entries

Entry type	Reference	Grid reference	Treatment description	Mineral	Conveyancing details
Shaft	348403-001	348883 403958		Coal	
Shaft	348403-003	348782 403714		Coal	
Shaft	348403-004	348662 403456	Our records indicate that a search was made for this shaft in 2001 by International Mining Consultants Ltd but no evidence of a shaft was found	Coal	
Shaft	348403-005	348753 403463	This shaft was located by International Mining Cons^ts in 2001 and was found to have been infilled with colliery waste. The shaft fill was then drilled and grouted with 21.8 tonnes of grout to the base of the shaft. A reinforced concrete cap 6.6m x 6.6m x 0.75m was then constructed.	Coal	
Shaft	348403-006	348764 403464	This shaft was located in 2001 by International Mining Consultants Ltd. The shaft was found to have been infilled with colliery waste. The shaft fill was then grouted for its full depth with 19 tonnes of grout. The shaft and surrounding area was then excavated to a depth of 5.1m BGL and a 6.6m x 6.6m reinforced concrete cap was constructed and the area backfilled.	Coal	
Shaft	348403-007	348807 403446		Coal	
Shaft	348403-008	348845 403417		Coal	
Shaft	348403-009	348829 403387		Coal	
Shaft	348405-002	348727 405994	This shaft has been sealed at the surface by means of a 1.85 metres thick conical concrete plug founded on stiff boulder clay. These works were carried out by J W Bradley and Co in 1971	Coal	Skelmersdale Development Corporation 24/04/1968
Shaft	348406-011	348640 406097	This shaft has been sealed by means of a conical concrete plug 1.85 metres thick. The plug is 3.87 metres diameter at the bottom and 5.16 metres at the top and founded on rockhead. These works were carried out by J Murphy in 1971	Coal	Skelmersdale Development Corporation 24/04/1968
Shaft	349403-002	349575 403261		Coal	
Shaft	349403-003	349448 403232		Coal	
Shaft	349403-004	349348 403197		Coal	
Shaft	349403-005	349090 403205		Coal	

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Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

13878	10741	NW787
13887	9802	NW788
NW296	NW404	12484

Our records show we have more plans than those shown above which could affect the enquiry boundary.

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
BULLDOG	Coal	Yes	10.1	N/A	51
BULLDOG	Coal	Yes	Within	N/A	51
BULLDOG	Coal	Yes	Within	N/A	54
BULLDOG	Coal	Yes	Within	N/A	231
DOE	Coal	Yes	Within	N/A	164
DOE	Coal	Yes	Within	N/A	348
FAIR BOTTOM	Coal	Yes	Within	N/A	83
KING	Coal	Yes	Within	N/A	13
LONDON DELPH (BIN)	Coal	Yes	Within	N/A	51
LONDON DELPH (BIN)	Coal	Yes	Within	N/A	51
LONDON DELPH (BIN)	Coal	Yes	Within	N/A	54
LOWER FLORIDA	Coal	Yes	Within	N/A	347
LOWER FLORIDA	Coal	Yes	Within	N/A	348
PEACOCK	Coal	Yes	Within	N/A	10
PLODDER	Coal	Yes	Within	N/A	41
UNNAMED 1	Coal	Yes	Within	N/A	45
WIGAN FIVE FEET	Coal	Yes	Within	N/A	353
WIGAN FIVE FEET	Coal	Yes	0.4	North-East	354
WIGAN TWO FEET	Coal	Yes	Within	N/A	5
WIGAN TWO FEET	Coal	Yes	29.6	South-East	66

Geological faults, fissures and breaklines

Please refer to the 'Summary of findings' map (on separate sheet) for details of any geological faults, fissures or breaklines either within or intersecting the enquiry boundary.

Faults under or close to the property recorded.

Opencast mines

Please refer to the “Summary of findings” map (on separate sheet) for details of any opencast areas within 500 metres of the enquiry boundary.

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Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

Distance to site investigation (m)	Direction
Within	N/A
3.9	South-West

See Section 4 for further information.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

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Section 3 – Licensing and future mining activity

Future underground mining
None recorded.

Coal mining licensing
None recorded within 200 metres of the enquiry boundary.

Court orders
None recorded.

Section 46 notices
No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices
The property is in an area where a notice to withdraw support was given in 1948.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land
The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

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Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

Development advice

The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.

Site investigations

The site is within an area of previous interest. It is close to where the Coal Authority has received information relating to past site investigations.

The site requires further investigation and may influence how you approach your risk assessment.

For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.

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Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk.**

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

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Opencast mines
Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips
Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations
Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites
Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence
Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas
Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission.

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Mine water treatment schemes
Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining
Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing
Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders
Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices
Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices
Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land
Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

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Stage 2 Mining Report (Pre-Construction Information - Mining)

created in accordance with NR/L2/OHS/0047/F0002 Section 4.3 Site Specific Hazards - Old Mine Workings

Executive Summary

(Refer to report LM-MISC-2448)

Coal Authority Data Plan:

The site is on coal bearing strata.

Plan summarises Coal Authority Data.

Numerous coal seams outcrop beneath the site.

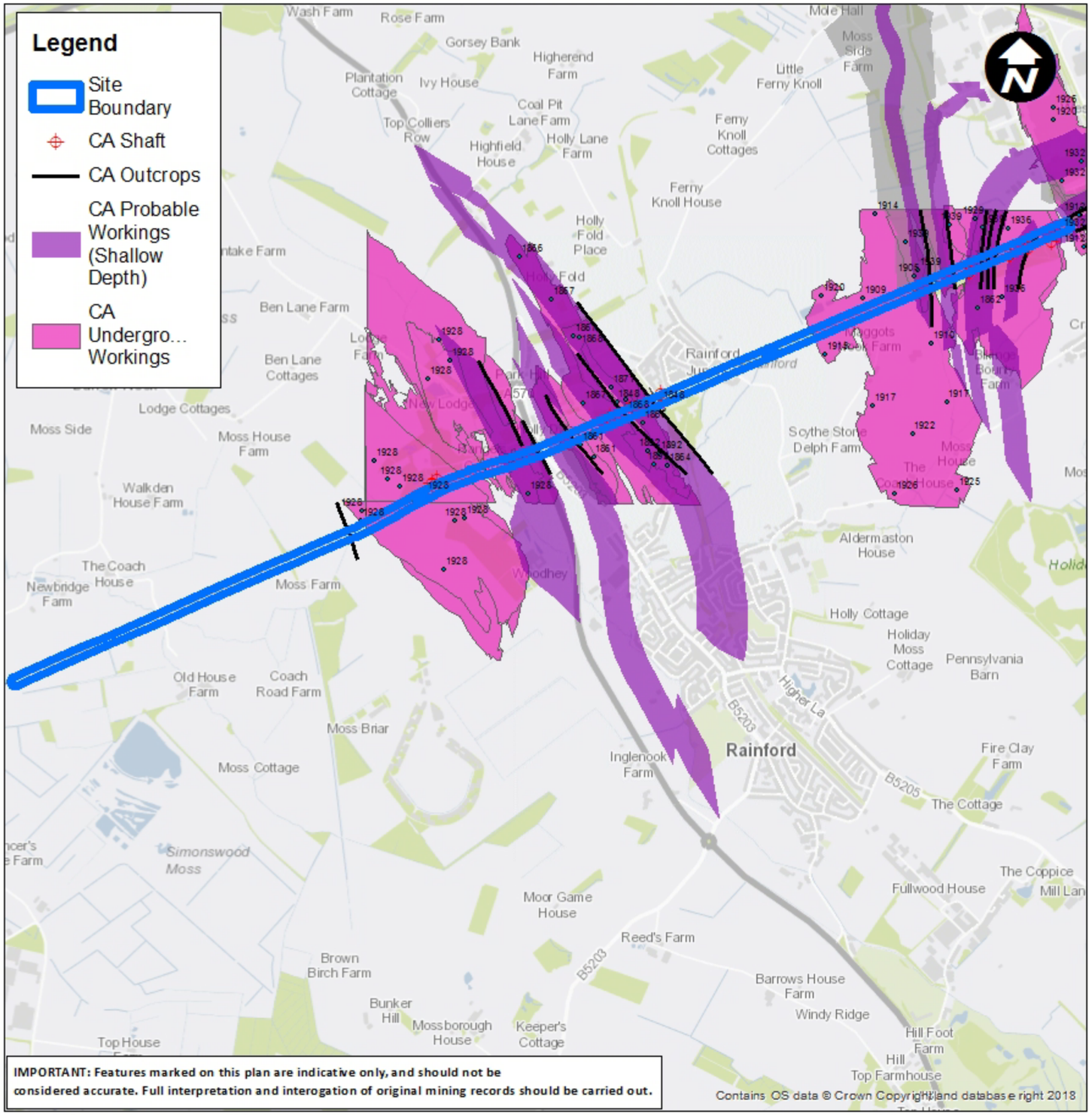
Probable shallow workings exist beneath the site.

Next Steps

The project manager should appoint a suitably competent consultant to undertake a review of this report and where appropriate take action(s) to mitigate the identified mining risks to the design and construction of the proposed works.

Project Name Skelmersdale Rail Link
Project Code 139606
Report reference LM-MISC-2448
Date 06/08/2018
ELR WKL2 **Mileage From** 25.088 **Mileage To** 27 **Plan Scale** 1:25,000

Author Joe Milton
Position Senior Mining Engineer



Stage 2 Mining Report (Pre-Construction Information - Mining)

created in accordance with NR/L2/OHS/0047/F0002 Section 4.3 Site Specific Hazards - Old Mine Workings

Executive Summary

(Refer to report LM-MISC-2448)

Environment Agency Landfill Records

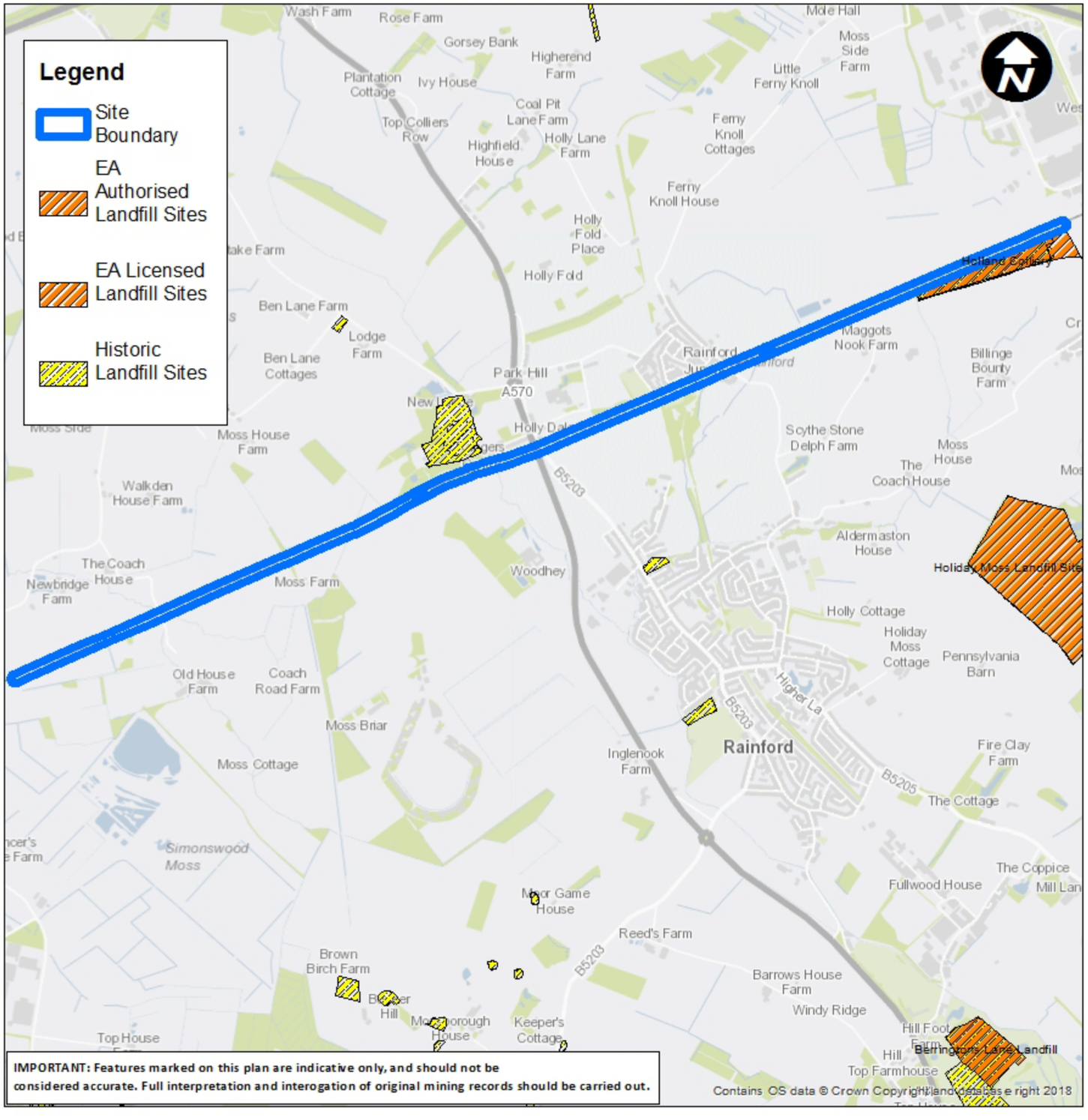
3 No. Landfill sites are recorded within 250 metre of the site

Next Steps

The project manager should appoint a suitably competent consultant to undertake a review of this report and where appropriate take action(s) to mitigate the identified mining risks to the design and construction of the proposed works.

Project Name Skelmersdale Rail Link
Project Code 139606
Report reference LM-MISC-2448
Date 06/08/2018
ELR WKL2 **Mileage From** 25.088 **Mileage To** 27 **Plan Scale** 1:25,000

Author Joe Milton
Post Senior Mining Engineer



E. Summary of Earthwork Records

Table 18: Summary of Earthwork Records

ELR	Start Mileage	Side	EHC	Risk Category	Earthwork Type	Inspection Date
WJK	29.0897	D	C	Average Risk	Soil Cutting - SCHI	08/02/2019
WJK	29.0897	U	A	Low Risk	Soil Cutting - SCHI	19/02/2014
WJK	29.0990	D	B	Average Risk	Soil Cutting - SCHI	08/02/2019
WJK	29.0990	U	A	Low Risk	Soil Cutting - SCHI	14/04/2013
WJK	29.1100	D	C	Low Risk	Soil Cutting - SCHI	06/03/2018
WJK	29.1100	U	A	Average Risk	Soil Cutting - SCHI	14/04/2013
WJK	29.1210	D	N	Low Risk	Grade / No Earthwork	01/08/2016
WJK	29.1210	U	A	Low Risk	Soil Cutting - SCHI	08/02/2019
WJK	29.1320	D	N	Low Risk	Grade / No Earthwork	30/03/2016
WJK	29.1320	U	A	Not Inspected	Soil Embankment - SEHI	09/03/2010
WJK	29.1430	D	A	Low Risk	Soil Embankment - SEHI	01/08/2016
WJK	29.1430	U	B	Low Risk	Soil Embankment - SEHI	26/03/2015
WJK	29.1540	D	A	Low Risk	Soil Embankment - SEHI	01/08/2016
WJK	29.1540	U	B	Low Risk	Soil Embankment - SEHI	26/03/2015
WJK	29.1650	D	A	Average Risk	Soil Embankment - SEHI	26/03/2015
WJK	29.1650	U	C	Average Risk	Soil Embankment - SEHI	26/03/2015
WJK	30.0000	D	B	Average Risk	Soil Embankment - SEHI	20/07/2015
WJK	30.0000	U	B	Average Risk	Soil Embankment - SEHI	08/02/2019
WJK	30.0110	D	B	Average Risk	Soil Embankment - SEHI	02/04/2015
WJK	30.0110	U	B	Average Risk	Soil Embankment - SEHI	02/04/2015
WJK	30.0220	D	B	Average Risk	Soil Embankment - SEHI	02/04/2015
WJK	30.0220	U	B	Average Risk	Soil Embankment - SEHI	02/04/2015
WKL2	22.1320	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	22.1320	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	22.1430	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	22.1430	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	22.1540	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	22.1540	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	22.1650	D	N	Low Risk	Grade / No Earthwork	10/07/2014

WKL2	22.1650	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0000	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0000	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0110	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0110	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0220	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0220	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0330	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0330	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0440	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0440	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0550	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0550	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0660	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0660	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0770	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0770	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0880	D	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0880	U	N	Low Risk	Grade / No Earthwork	10/07/2014
WKL2	23.0990	D	N	Low Risk	Grade / No Earthwork	11/07/2014
WKL2	23.0990	U	N	Low Risk	Grade / No Earthwork	11/07/2014
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WKL2	23.1430	D	N	Low Risk	Grade / No Earthwork	11/07/2014
WKL2	23.1430	U	N	Low Risk	Grade / No Earthwork	11/07/2014
WKL2	23.1540	D	N	Low Risk	Grade / No Earthwork	11/07/2014
WKL2	23.1540	U	N	Not Applicable	Grade / No Earthwork	11/07/2014
WKL2	23.1650	D	N	Average Risk	Grade / No Earthwork	11/07/2014
WKL2	23.1650	U	N	Average Risk	Grade / No Earthwork	11/07/2014
WKL2	24.0000	D	N	Low Risk	Grade / No Earthwork	11/07/2014
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WKL2	24.0110	D	N	Low Risk	Grade / No Earthwork	11/07/2014
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WKL2	24.0660	D	N	Low Risk	Grade / No Earthwork	11/07/2014
WKL2	24.0660	U	N	Low Risk	Grade / No Earthwork	11/07/2014
WKL2	24.0770	D	N	Low Risk	Grade / No Earthwork	11/07/2014
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WKL2	24.0880	D	N	Low Risk	Grade / No Earthwork	11/07/2014
WKL2	24.0880	U	N	Low Risk	Grade / No Earthwork	11/07/2014
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WKL2	24.1430	U	N	Low Risk	Grade / No Earthwork	15/07/2014
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WKL2	24.1540	U	N	Low Risk	Grade / No Earthwork	15/07/2014
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WKL2	24.1650	U	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	25.0000	D	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	25.0000	U	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	25.0110	D	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	25.0110	U	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	25.0220	D	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	25.0220	U	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	25.0330	D	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	25.0330	U	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	25.0440	D	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	25.0440	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.0550	D	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	25.0550	U	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	25.0660	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.0660	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.0770	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.0770	U	N	Low Risk	Grade / No Earthwork	15/07/2014
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WKL2	25.0880	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.0990	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.0990	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.1100	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.1100	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.1210	D	N	Low Risk	Grade / No Earthwork	15/07/2014
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WKL2	25.1320	D	N	Low Risk	Grade / No Earthwork	15/07/2014
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WKL2	25.1430	D	N	Low Risk	Grade / No Earthwork	15/07/2014
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WKL2	25.1540	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.1540	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	25.1650	D	N	Not Applicable	Grade / No Earthwork	02/03/2012
WKL2	25.1650	U	N	Not Applicable	Grade / No Earthwork	02/03/2012
WKL2	26.0000	D	N	Not Applicable	Grade / No Earthwork	02/03/2012

WKL2	26.0000	U	N	Not Applicable	Grade / No Earthwork	02/03/2012
WKL2	26.0110	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.0110	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.0220	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.0220	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.0330	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.0330	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.0440	D	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	26.0440	U	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	26.0550	D	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	26.0550	U	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	26.0660	D	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	26.0660	U	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	26.0770	D	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	26.0770	U	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	26.0880	D	A	Low Risk	Soil Embankment - SEHI	24/01/2013
WKL2	26.0880	U	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	26.0990	D	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	26.0990	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.1100	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.1100	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.1210	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.1210	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.1320	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.1320	U	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.1430	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.1430	U	A	Low Risk	Soil Cutting - SCHI	24/01/2013
WKL2	26.1540	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	26.1540	U	A	Low Risk	Soil Cutting - SCHI	15/04/2013
WKL2	26.1650	D	N	Not Applicable	Grade / No Earthwork	02/03/2012
WKL2	26.1650	U	A	Low Risk	Soil Cutting - SCHI	15/04/2013
WKL2	27.0000	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	27.0000	U	N	Not Applicable	Grade / No Earthwork	02/03/2012
WKL2	27.0110	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	27.0110	U	N	Not Applicable	Grade / No Earthwork	05/03/2012
WKL2	27.0220	D	N	Low Risk	Grade / No Earthwork	15/07/2014
WKL2	27.0220	U	N	Not Applicable	Grade / No Earthwork	05/03/2012
WKL2	27.0330	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.0330	U	N	Not Applicable	Grade / No Earthwork	05/03/2012
WKL2	27.0440	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.0440	U	A	Low Risk	Soil Cutting - SCHI	23/01/2013
WKL2	27.0550	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.0550	U	A	Low Risk	Soil Cutting - SCHI	23/01/2013
WKL2	27.0660	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.0660	U	A	Low Risk	Soil Cutting - SCHI	23/01/2013
WKL2	27.0770	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.0770	U	A	Low Risk	Soil Cutting - SCHI	23/01/2013
WKL2	27.0880	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.0880	U	A	Low Risk	Soil Cutting - SCHI	23/01/2013

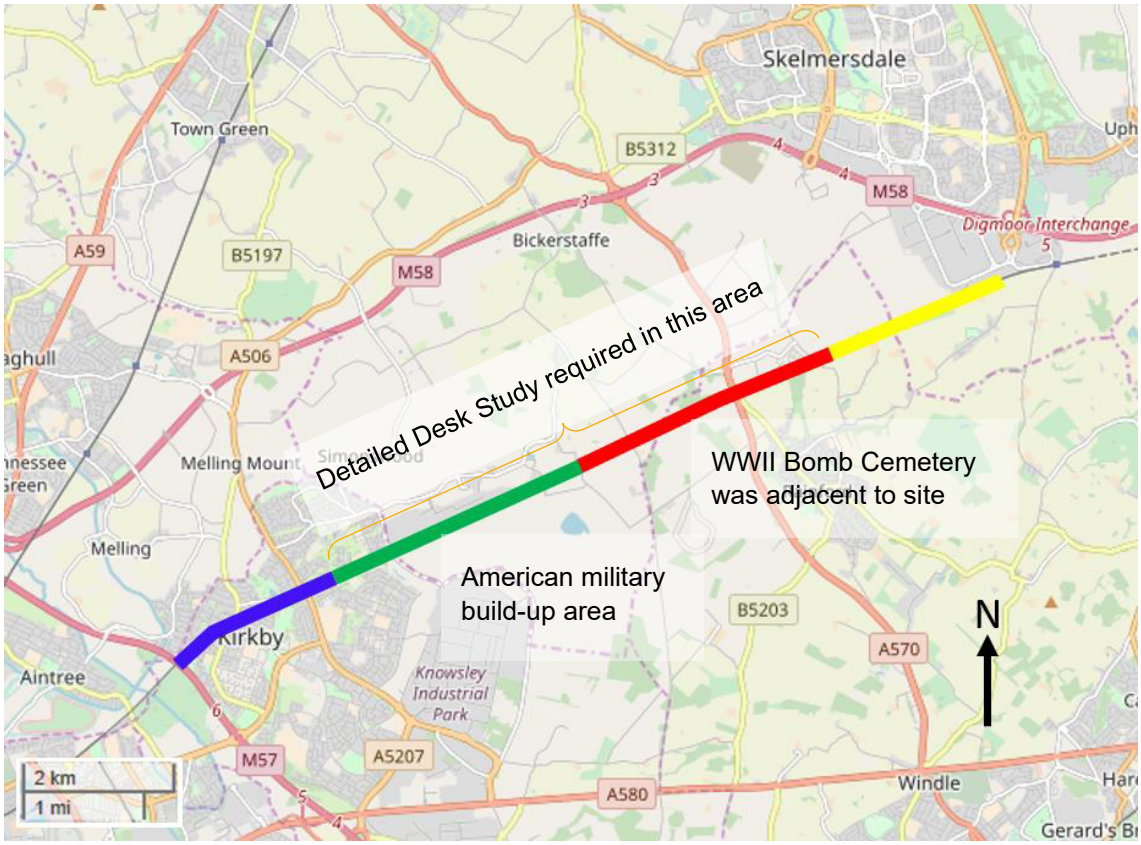
WKL2	27.0990	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.0990	U	A	Low Risk	Soil Cutting - SCHI	23/01/2013
WKL2	27.1100	D	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	27.1100	U	N	Not Applicable	Grade / No Earthwork	23/01/2013
WKL2	27.1210	D	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	27.1210	U	N	Not Applicable	Grade / No Earthwork	23/01/2013
WKL2	27.1320	D	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	27.1320	U	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.1430	D	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	27.1430	U	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.1540	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.1540	U	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.1650	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	27.1650	U	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	28.0000	D	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	28.0000	U	N	Low Risk	Grade / No Earthwork	17/07/2014
WKL2	28.0110	D	N	Not Applicable	Grade / No Earthwork	23/01/2013
WKL2	28.0110	U	N	Not Applicable	Grade / No Earthwork	23/01/2013
WKL2	28.0220	D	C	Average Risk	Soil Cutting - SCHI	08/02/2019
WKL2	28.0220	U	A	Low Risk	Soil Cutting - SCHI	23/01/2013
WKL2	28.0330	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0330	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0440	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0440	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0550	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0550	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0660	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0660	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0770	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0770	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0880	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0880	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0990	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.0990	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.1100	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.1100	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.1210	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.1210	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.1320	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.1320	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	28.1430	D	A	Low Risk	Soil Embankment - SEHI	23/01/2013
WKL2	28.1430	U	A	Average Risk	Soil Embankment - SEHI	09/03/2018
WKL2	28.1540	D	A	Low Risk	Soil Embankment - SEHI	23/01/2013
WKL2	28.1540	U	A	Low Risk	Soil Embankment - SEHI	09/03/2018
WKL2	28.1650	D	A	Average Risk	Soil Embankment - SEHI	24/02/2014
WKL2	28.1650	U	A	Low Risk	Soil Embankment - SEHI	09/03/2018
WKL2	29.0000	D	A	Low Risk	Soil Embankment - SEHI	09/03/2018
WKL2	29.0000	U	A	Low Risk	Soil Embankment - SEHI	23/01/2013
WKL2	29.0110	D	A	Average Risk	Soil Embankment - SEHI	09/03/2018

WKL2	29.0110	U	A	Low Risk	Soil Embankment - SEHI	23/01/2013
WKL2	29.0220	D	A	Low Risk	Soil Embankment - SEHI	23/01/2013
WKL2	29.0220	U	A	Low Risk	Soil Embankment - SEHI	09/03/2018
WKL2	29.0330	D	A	Low Risk	Soil Embankment - SEHI	24/02/2014
WKL2	29.0330	U	A	Low Risk	Soil Embankment - SEHI	25/02/2014
WKL2	29.0440	D	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	29.0440	U	N	Low Risk	Grade / No Earthwork	21/07/2014
WKL2	29.0550	D	A	Low Risk	Soil Cutting - SCHI	24/02/2014
WKL2	29.0550	U	A	Low Risk	Soil Cutting - SCHI	23/01/2013
WKL2	29.0660	D	B	Low Risk	Soil Cutting - SCHI;Rock Cutting - RSHI	29/03/2018
WKL2	29.0660	U	A	Low Risk	Soil Cutting - SCHI	23/01/2013
WKL2	29.0770	D	A	Low Risk	Soil Cutting - SCHI	23/01/2013
WKL2	29.0770	U	N	Not Applicable	Grade / No Earthwork	24/02/2014

Source: JBA-Network Rail Earthwork Asset Database, Feb 2020

F. UXO Pre-Desk Study Assessments

PDSA Summary Plan (included as Figure 20)



Source: © OpenStreetMap contributors. Available under Open Database Licence (Zetica, 2018)

Pre-Desk Study Assessment	
Site:	Skelmersdale Rail Link – Track, Lancashire (Blue)
Client:	Mott MacDonald
Contact:	Kevin Wells
Date:	26th October 2018
Pre-WWI Military Activity on or Affecting the Site	None identified.

WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway on the Site. ■ Public utilities, including reservoirs.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway on the Site. ■ Military barracks and depots. ■ Public utilities, including reservoirs. ■ Industries important to the war effort, including Royal Ordnance Factories (ROFs) and munitions plants. ■ Anti-Aircraft (AA) defences.
WWII Bombing Decoys (within 5km of Site)	1No. located approximately 4km southeast of the Site.
WWII Bombing	During WWII the Site was located in the Rural District (RD) of Whiston which officially recorded 280No. High Explosive (HE) bombs with a regional bombing density of 9.5 bombs per 405ha. No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	A detailed desk study, whilst always prudent, is not considered essential in this instance.
This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary.	

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

Pre-Desk Study Assessment

Site:	Skelmersdale Rail Link – Track, Lancashire (Green)
Client:	Mott MacDonald
Contact:	Kevin Wells
Date:	26th October 2018
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway on the Site. ■ Public utilities, including reservoirs.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	In 1941 Kirkby Inland Sorting Depot was established on the Site. The depot was used by American military units to store and distribute imported war materials as part of 'Operation Bolero', the American military build-up in Britain prior to the D-Day landings.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway on the Site. ■ Military barracks and depots. ■ Public utilities, including reservoirs. ■ Industries important to the war effort, including Royal Ordnance Factories (ROFs) and munitions plants. ■ Anti-Aircraft (AA) defences.

WWII Bombing Decoys (within 5km of Site)	1No. located approximately 4.4km southwest of the Site.
WWII Bombing	During WWII the Site was located in the Rural Districts (RDs) of West Lancashire and Whiston. Whiston RD officially recorded 280No. High Explosive (HE) bombs with a regional bombing density of 9.5 bombs per 405ha. West Lancashire RD officially recorded 495No. HE bombs with a regional bombing density of 7.5 bombs per 405ha. Readily available records indicate that at least 1No. HE bomb and Incendiary Bombs (IBs) fell in close proximity to the Site.
Post-WWII Military Activity on or Affecting the Site	Kirkby Inland Sorting Depot was retained by the Mersey Docks and Harbour Board post-WWII. It was subsequently converted for industrial use.
Recommendation	It is recommended that a detailed desk study is commissioned to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the Site.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary.

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

Pre-Desk Study Assessment	
Site:	Skelmersdale Rail Link – Track, Lancashire (Red)
Client:	Mott MacDonald
Contact:	Kevin Wells
Date:	26th October 2018
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway on the Site. ■ Public utilities, including reservoirs.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	Readily available records indicate that during WWII 1No. bomb cemetery was located adjacent to the Site.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway on the Site. ■ Military barracks and depots. ■ Public utilities, including reservoirs. ■ Industries important to the war effort, including Royal Ordnance Factories (ROFs) and munitions plants. ■ Anti-Aircraft (AA) defences.
WWII Bombing Decoys (within 5km of Site)	None.

WWII Bombing	During WWII the Site was located in the Rural District (RD) of West Lancashire and the Urban District (UD) of Rainford. West Lancashire RD officially recorded 495No. HE bombs with a regional bombing density of 7.5 bombs per 405ha. Rainford UD officially recorded 22No. HE bombs with a regional bombing density of 3.7 bombs per 405ha. No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	It is recommended that a detailed desk study is commissioned to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the Site.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary.

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

Pre-Desk Study Assessment

Site:	Skelmersdale Rail Link - Track, Lancashire (Yellow)
Client:	Mott MacDonald
Contact:	Kevin Wells
Date:	26th October 2018
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.

WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway on the Site. ■ Public utilities, including reservoirs.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway on the Site. ■ Military barracks and depots. ■ Public utilities, including reservoirs. ■ Industries important to the war effort, including Royal Ordnance Factories (ROFs) and munitions plants. ■ Anti-Aircraft (AA) defences.
WWII Bombing Decoys (within 5km of Site)	None.
WWII Bombing	During WWII the Site was located in the Urban Districts (UDs) of Rainford and Upholland. Rainford UD officially recorded 22No. HE bombs with a regional bombing density of 3.7 bombs per 405ha. Upholland UD officially recorded 1No. HE bomb with a regional bombing density of 0.2 bombs per 405ha. No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	A detailed desk study, whilst always prudent, is not considered essential in this instance.
This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary.	

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

G. Network Rail Hazard Directory

SYSID	ELR	START	END	Item Code	Type	Name	Track	Freetext
1.1E+08	WKL2	19.0186	19.0299	HWGR	Gradient Greater Than 1 In 50		All/Multiple Tracks	The Gradient at this location is 1 in 50 or greater. This MUST be considered in the planning and use of ON TRACK PLANT and HAND TROLLEYS.
40042220	WKL2	19.0186	19.0352	EKF	Landfill Gases	Little Lane. Goose Green.	Pemberton	LANDFILL GAS. This stretch of railway has been identified as being at risk from the migration of landfill gasses. Appropriate precautions should be taken. For further information please contact NST Mining 01332 262716.
40573560	WKL2	19.0186	19.048	HBG	Buried Gas Pipe	Little Lane	Down Main/Fast	12 3/4 inch <324 mm> Gas pipeline laid by NWGB Grant 8/4/1970 MA 17741 <Also WKL1>. LP 619.
40570112	WKL2	19.033	19.0528	HMM	Mineworking - Mine	Germans Colliery	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40487008	WKL2	19.0352	19.0352	HBG	Buried Gas Pipe	Pemberton	Down Main/Fast	. not shown on LP 619.
40570113	WKL2	19.0418	19.0528	HMM	Mineworking - Mine	Pemberton Station	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40570114	WKL2	19.0429	19.0429	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40487009	WKL2	19.043	19.043	HBG	Buried Gas Pipe	Pemberton	Down Main/Fast	. not shown on LP 619.
40099803	WKL2	19.044	19.044	HXE	Buried & Overhead Electric Cable	Pemberton	Unknown	*MILEAGE INCORRECT*. not shown on LP 619.
40099540	WKL2	19.044	19.044	HXE	Buried & Overhead Electric Cable	Pemberton	Unknown	Voltage: 33000 <> Bridge 17 Poolstock Lane. Cables *MILEAGE INCORRECT*. not shown on LP 619.
40099332	WKL2	19.044	19.044	HXE	Buried & Overhead Electric Cable	Pemberton	Unknown	Level Level Crossing Victoria St Newtown *MILEAGE INCORRECT*. not shown on LP 619.
40039277	WKL2	19.044	19.044	HB	Buried Service	Pemberton	Unknown	Diameter: 9 Inches <> IRON sewer pipe. WIGAN METROPOLITAN BOROUGH COUNCIL. *MILEAGE INCORRECT*. not shown on LP 619.
40570115	WKL2	19.0462	19.0462	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570116	WKL2	19.0495	19.0495	HMP	Mineworking - Pitshaft	Pemberton Station	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40486934	WKL2	19.0561	19.0561	MAP	Authorised Access Point - Pedestrian	PEMBERTON STATION	Up Main/Fast	
40486935	WKL2	19.0563	19.0563	MAP	Authorised Access Point - Pedestrian	PEMBERTON STATION	Down Main/Fast	
40044342	WKL2	19.0594	19.0638	HST	Hazard Associated With Tunnel	Perrnberton		Length: 40 <>
40098926	WKL2	19.0604	19.0639	HXE	Buried & Overhead Electric Cable	Billinge Road	All/Multiple Tracks	U/G cable laid by GPO. Corres. 49/270/68. LP 619.
40098928	WKL2	19.0605	19.064	HXE	Buried & Overhead Electric Cable	Billinge Road	All/Multiple Tracks	Elec. Cables laid by the Wigan Corp. Consents 1/9/1931 & 30/9/1935. LP 619.
40098927	WKL2	19.0605	19.064	HXE	Buried & Overhead Electric Cable	Billinge Road	All/Multiple Tracks	3 elec. Cables laid by NWEB. Corres 1678/67. LP 619.
40098905	WKL2	19.0725	19.1256	HXE	Buried & Overhead Electric Cable	Pemberton	Unknown	Between Bridges 27 & 28. not shown on LP 619.
40098904	WKL2	19.0725	19.1256	HXE	Buried & Overhead Electric Cable	Pemberton	Up Main/Fast	O/H Elec. Cable, poles and stays erected by NWEB Between Bridges 27 & 28. Agmt. 1/12/1955. LP 619.
40098942	WKL2	19.0747	19.0747	HXE	Buried & Overhead Electric Cable	Bridge 27	All/Multiple Tracks	Elec. Cable laid by NWEB. Agmt. 4/5/1967. LP 619.
40098941	WKL2	19.0749	19.0749	HXE	Buried & Overhead Electric Cable	Bridge 27	All/Multiple Tracks	Voltage: 6600 <> 2 Electric cables laid by NWEB. Agmt. 23/3/1956. LP 619.
40573561	WKL2	19.11	19.11	HBF	Buried Foul Water Service	Unknown	All/Multiple Tracks	12 inch C.I. Sewer between two 18 inch C.I. Sewers linking 3 M.H.'s and 33 inch sewer from boundary to nearest M.H. on the North side of the track. LP 619.
40570118	WKL2	19.1144	19.1144	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570117	WKL2	19.1144	19.1144	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570119	WKL2	19.1518	19.1518	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40487010	WKL2	19.1519	19.1519	HBG	Buried Gas Pipe	Winstanley	All/Multiple Tracks	. not shown on LP 619.
1.1E+08	WKL2	19.154	19.154	HMM	Mineworking - Mine		All/Multiple Tracks	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40570120	WKL2	19.154	19.154	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570121	WKL2	19.1562	19.1562	HMM	Mineworking - Mine	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40573562	WKL2	19.1572	20.0805	HBG	Buried Gas Pipe	Dukes Wood	Down Main/Fast	12 3/4 inch <324 mm> Gas pipeline laid by NWGB Grant 8/4/1970 MA 17741. LP 619.
40570123	WKL2	19.1584	19.165	HMM	Mineworking - Mine	Unknown	All/Multiple Tracks	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40570125	WKL2	19.1606	19.1606	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570124	WKL2	19.1606	19.1606	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570126	WKL2	19.1606	20.0044	HMM	Mineworking - Mine	Water Level	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40570127	WKL2	19.1617	19.1617	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40573563	WKL2	19.1685	19.1685	HXE	Buried & Overhead Electric Cable	Dukes Wood	Down Main/Fast	Elec. Cable to Pump House. LP 619.
40570129	WKL2	19.1694	19.1694	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570128	WKL2	19.1694	19.1694	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570130	WKL2	19.1738	19.1738	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570131	WKL2	20.0055	20.0055	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570132	WKL2	20.0077	20.0077	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40487011	WKL2	20.0136	20.0136	HBW	Buried Water Main	Orrell	Down Main/Fast	. not shown on LP 619.
40570133	WKL2	20.0154	20.0154	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40486936	WKL2	20.0193	20.0193	MAP	Authorised Access Point - Pedestrian	OB 30	Down Main/Fast	
40570134	WKL2	20.0198	20.0198	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40573564	WKL2	20.0204	20.0213	HBW	Buried Water Main	Bridge 30	All/Multiple Tracks	6 inch water main laid by Wigan Corp. Corres. 2709/42. LP 619.
40038343	WKL2	20.0214	20.0214	HB	Buried Service	Orrell	Unknown	Drain/manholes. North West Water. not shown on LP 619.
40038342	WKL2	20.0214	20.0214	HB	Buried Service	Orrell	Unknown	THRUST pipe UNDER TRACK manhole. BRITISH GAS PLC. not shown on LP 619.
40573565	WKL2	20.0217	20.0222	HBW	Buried Water Main	near Bridge 30	All/Multiple Tracks	18 inch dia. Water main laid by Makerfield W.B. Agmt. 4/7/1969 MA 17265. LP 619.
40570135	WKL2	20.0242	20.0418	HMM	Mineworking - Mine	Culvert at 20M 14C	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40570136	WKL2	20.0275	20.0275	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570137	WKL2	20.0286	20.0286	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570138	WKL2	20.0308	20.0308	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40487012	WKL2	20.0313	20.0809	HBG	Buried Gas Pipe	Orrell	Up Main/Fast	. not shown on LP 619.
40570139	WKL2	20.0451	20.0451	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40038352	WKL2	20.0612	20.0612	HBG	Buried Gas Pipe	Church Street	Down Main/Fast	Diameter: 6 Inches <> Main. BRITISH GAS PLC. not shown on LP 619.
40573566	WKL2	20.0762	20.1024	HXE	Buried & Overhead Electric Cable	M6 Motorway	Up Main/Fast	U/G and O/H elec. Cable and poles laid and erected by NWEB. Agmt. 18/7/1961. LP 619.
40573567	WKL2	20.0808	20.092	HBG	Buried Gas Pipe	M6 Motorway	All/Multiple Tracks	8 5/8 inch <219mm> pipeline laid by NWGB. Grant 1/3/1970 MA 17740 Crosses perpendicular to South embankment and track, turns a right angle to run parallel to track, turns again to cross North embankment. LP 619.
40487013	WKL2	20.0809	20.0809	HBG	Buried Gas Pipe	Orrell	All/Multiple Tracks	24 inch dia. Gas Main laid by NWGB Grant 19/5/1969 MA 17250. LP 619.
40353797	WKL2	20.0814	20.1672	EKF	Landfill Gases	Orrell Brick and Tile Works		LANDFILL GAS. This stretch of railway has been identified as being at risk from the migration of landfill gasses. Appropriate precautions should be taken. For further information please contact NST Mining 01332 262716.
40547200	WKL2	20.0842	20.0901	HBE	Buried Electrical Cables	Orrell	Up Main/Fast	Buried Electricity Cables 3 at 33kv & 1 low voltage Sig Cable~Running Paralell to Track under M6 Bridge. Laid by NORWEB, supplemental wayleave Agmt. 14/02/2001 ZNW 12003. LP 619.
40487014	WKL2	20.0953	20.0953	HOE	Overhead Electrical Cables	Orrell	All/Multiple Tracks	132KV x 6. not shown on LP 619.
40573568	WKL2	20.1229	20.1304	HBF	Buried Foul Water Service	Smithy Brook	Down Main/Fast	24 inch dia. S.W. drain laid by M.O.T. Grant 10/8/1962. No.3205/1. LP 619.
40353798	WKL2	20.1232	21.011	EKF	Landfill Gases	Orrell Reservoir		LANDFILL GAS. This stretch of railway has been identified as being at risk from the migration of landfill gasses. Appropriate precautions should be taken. For further information please contact NST Mining 01332 262716.
40573569	WKL2	20.133	20.133	HBW	Buried Water Main	Smithy Brook	All/Multiple Tracks	Water pipe - formerly North West Water Authority. The authority relinquish all interest in pipe 8/7/1983. LP 619.
40573570	WKL2	20.137	20.137	HBW	Buried Water Main	Edge Hall Road	All/Multiple Tracks	7 inch water pipes laid by Pemberton Local Board Agmt. 3/3/1890. LP 619.
40486937	WKL2	20.1375	20.1375	MAV	Authorised Access Point - Vehicle	NR ORRELL STATION	Down Main/Fast	
40573571	WKL2	20.1386	21.0147	HXE	Buried & Overhead Electric Cable	Church Street	Up Main/Fast	U/G and O/H elec. cable, poles and stays erected by NWEB. Agmt. 1/12/1955. LP 619.
40570140	WKL2	20.1452	20.1452	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570141	WKL2	20.1474	20.1474	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570142	WKL2	20.1595	20.1595	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40038303	WKL2	20.1595	20.1598	HBF	Buried Foul Water Service	Orrell	All/Multiple Tracks	WIGAN METROPOLITAN BOROUGH COUNCIL 12 inch sewer over pipe bridge. 29/3/1974 NO. MA 19043. LP 619.
40038302	WKL2	20.1595	20.1598	HB	Buried Service	Orrell	All/Multiple Tracks	pipe BRIDGE. NORTH WEST WATER ENGINEERING. LP 619.
40573573	WKL2	20.1598	20.1611	HBE	Buried Electrical Cables	Church Street	All/Multiple Tracks	Elec. Cables laid by NWEB. Corres. 1884/64
40573572	WKL2	20.1598	20.1611	HBW	Buried Water Main	Church Street	All/Multiple Tracks	9 inch water main laid by Wigan Corp. on West side. Corres. 5331/49. LP 619.
40097265	WKL2	20.1598	20.1611	HXE	Buried & Overhead Electric Cable	Church Street	All/Multiple Tracks	Elec. Cables over Bridge 34 laid by Wigan Corp. on East side following Winstanley Road. LP 619.
40039280	WKL2	20.1598	20.1611	HBG	Buried Gas Pipe	Church Street	All/Multiple Tracks	Diameter: 6 Inches <> Main. British Gas. Transco. on West side of bridge. Original corres. 1662/53. LP 619.
40573574	WKL2	20.1613	21.0375	HBW	Buried Water Main	Church Street	Down Main/Fast	21 inch water main easement for Makerfield Water Board. Grant 17/5/66. 3427-2. LP 619.
40486939	WKL2	20.1636	20.1636	MAP	Authorised Access Point - Pedestrian	ORRELL STATION	Down Main/Fast	
40486938	WKL2	20.1636	20.1636	MAP	Authorised Access Point - Pedestrian	ORRELL STATION	Up Main/Fast	
40573575	WKL2	20.1638	21.0264	HBF	Buried Foul Water Service	Church Street	Down Main/Fast	12 inch sewer laid by Orrell U.D.C. 29/3/1974 NO. MA 19043. LP 619.
40099802	WKL2	21	21	HXE	Buried & Overhead Electric Cable	Orrell	Unknown	Voltage: 33000 <> *MILEAGE INCORRECT*. not shown on LP 619.
40099345	WKL2	21	21	HXE	Buried & Overhead Electric Cable	Orrell	Unknown	In former Goods Yard *MILEAGE INCORRECT*. not shown on LP 619.
40097445	WKL2	21	21	HXE	Buried & Overhead Electric Cable	Orrell	Unknown	Park-200 Yds South of Station Bridge 3 *MILEAGE INCORRECT*. not shown on LP 619.
40039278	WKL2	21	21	HB	Buried Service	Orrell	Unknown	Diameter: 6 Inches <> sewer, DISCHARGE FROM FARM. North West Water. *MILEAGE INCORRECT*. not shown on LP 619.
40039279	WKL2	21	21	HB	Buried Service	Orrell	Unknown	Thrust Pipe. British Gas. Transco. *MILEAGE INCORRECT*. not shown on LP 619.
40570143	WKL2	21.0088	21.0088	HMP	Mineworking - Pitshaft	Bridge 36	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40573576	WKL2	21.0266	21.0266	HBE	Buried Electrical Cables	St James Road	All/Multiple Tracks	Elec. Cables over Br 37 laid by Wigan Corp. LP 619.
40573577	WKL2	21.0267	21.0267	HBW	Buried Water Main	St James Road	All/Multiple Tracks	6 inch dia. Water main laid by Makerfield W.B. Corres. 244/65. LP 619.
40486940	WKL2	21.0481	21.0481	MAV	Authorised Access Point - Vehicle	ORRELL COAL YARD	Up Main/Fast	
40573578	WKL2	21.0486	21.0488	HBF	Buried Foul Water Service	Boundary Brook	All/Multiple Tracks	8 inch syphon pipe near Boundary Brook used by Sandbrook Spinnign Co. Agmt. 15/10/1902. LP 619.
40573579	WKL2	21.049	21.049	HBF	Buried Foul Water Service	Boundary Brook	All/Multiple Tracks	12 inch sewer laid by Upholland U.D.C. Agmt. 22/10/1914 <Boundary Brook>. LP 619.
40573580	WKL2	21.0504	21.0504	HBF	Buried Foul Water Service	Orrell West	All/Multiple Tracks	15 inch dia. Sewer laid by Skelmersdale and Holland U.D.C. Agmt. 21/2/1972. MA 18324. LP 619.
40573581	WKL2	21.0566	21.0566	HBE	Buried Electrical Cables	Sandbrook Road	All/Multiple Tracks	Elec cable over Br 38 laid by Wigan Corp. Consent 4/10/1929. LP 619.
40573582	WKL2	21.0567	21.0567	HBE	Buried Electrical Cables	Sandbrook Road	All/Multiple Tracks	3 elec. cables laid by NWEB. Corres. 260/67. LP 619.
40573583	WKL2	21.0568	21.0568	HBW	Buried Water Main	Sandbrook Road	All/Multiple Tracks	3 inch water main over Br 38 laid by Upholland U.D.C. Agmt 12/4/1897. LP 619.
40312540	WKL2	21.0814	22.0044	EPL	Listed Building	UPHOLLAND		EAST AND WEST PORTALS OF UPHOLLAND TUNNEL. ELR CHANGED FROM WBS3 TO WKL2.
40044284	WKL2	21.0814	22.0044	HST	Hazard Associated With Tunnel	Upholland		Length: 959 <>
40100238	WKL2	21.0822	22.0942	HCC	Restricted Clearance	Upholland Tunnel	All/Multiple Tracks	UP & DOWN
40573584	WKL2	21.0867	21.0886	HBW	Buried Water Main	Upholland Tunnel	All/Multiple Tracks	18 inch dia. Water pipe laid by Makerfield Water Board Agmt. 29/5/1969 MA 17207. LP 619.
40091245	WKL2	21.088	22	HCF	Restricted Sighting	UPHOLLAND TUNNEL	All/Multiple Tracks	All Lines <>
40570144	WKL2	21.1034	21.1166	HMM	Mineworking - Mine	Bridge 39	All/Multiple Tracks	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40570145	WKL2	21.1056	21.1188	HMM	Mineworking - Mine	Bridge 39	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40042226	WKL2	21.1166	22.044	EKF	Landfill Gases	Pimbo. Upholland		LANDFILL GAS. This stretch of railway has been identified as being at risk from the migration of landfill gasses. Appropriate precautions should be taken. For further information please contact NST Mining 01332 262716.
40570146	WKL2	21.1298	21.1298	HMP	Mineworking - Pitshaft	Bridge 39	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570147	WKL2	21.1386	21.1496	HMM	Mineworking - Mine	Bridge 39	All/Multiple Tracks	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40042213	WKL2	21.1441	21.1441	EKO	Other Contamination	Shaft		Shaft 10 metres outside the line of the tunnel on the down Side. Exact location. treatment on abandonment and present condition are not known.
40098790	WKL2	21.1529	21.1529	HXE	Buried & Overhead Electric Cable	Rainford Jn	Unknown	Voltage: 275000 <> 21/2 Mile North East of Station. not shown on LP 619.
40573585	WKL2	22.0424	22.0447	HBW	Buried Water Main	Pimbo Lane	All/Multiple Tracks	4 inch water main laid over Bridge 40 by Upholland U.D.C. Agmt. 12/4/1897. LP 619.
40098797	WKL2	22.0425	22.0448	HXE	Buried & Overhead Electric Cable	Pimbo Lane	All/Multiple Tracks	Pimbo Lane - 2 Cables laid over Bridge 40 by Wigan Corp. Consent 13/5/1935. LP 619.
40039276	WKL2	22.044	22.044	HB	Buried Service	West Upholland	Unknown	ICI. *MILEAGE INCORRECT*. not shown on LP 619.
40039275	WKL2	22.044	22.044	HB	Buried Service	Upholland Dukes Wood	Unknown	ICI. *MILEAGE INCORRECT*. not shown on LP 619.
40486941	WKL2	22.0475	22.0475	MAP	Authorised Access Point - Pedestrian	UPHOLLAND STATION	Down Main/Fast	
40486942	WKL2	22.0481	22.0481	MAP	Authorised Access Point - Pedestrian	UPHOLLAND STATION	Up Main/Fast	
40312541	WKL2	22.0528	22.0528	EPL	Listed Building	UPHOLLAND		BRIDGE NO. 38 SANDBROOK ROAD. ELR CHANGED FROM WBS3 TO WKL2.
40487015	WKL2	22.1016	23.0164	HBG	Buried Gas Pipe	OB 41	Up Main/Fast	8 5/8 inch <219mm> pipeline laid by NWGB. Grant 1/3/1970 MA 17740. LP 619.
40042228	WKL2	22.165	23.1496	EKF	Landfill Gases	Holland Colliery. Crawford Village		LANDFILL GAS. This stretch of railway has been identified as being at risk from the migration of landfill gasses. Appropriate precautions should be taken. For further information please contact NST Mining 01332 262716.
40573586	WKL2	22.1688	22.1688	HBE	Buried Electrical Cables	Dukes Wood	All/Multiple Tracks	Elec. Cable laid by NWEB Agmt. 6/10/1948. LP 619.
40570150	WKL2	23.0066	23.0066	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40487016	WKL2	23.0164	23.0164	HBG	Buried Gas Pipe	Dules Wood	All/Multiple Tracks	10 inch dia. Gas main laid by NWGB Grant 23/2/1966 No. 3202-3. LP 619.
40487017	WKL2	23.0239	23.0239	HXE	Buried & Overhead Electric Cable	Dules Wood	All/Multiple Tracks	33KV x 3. Elec. cable laid by NWEB Agmt. 23/11/1966. LP 619.
40487018	WKL2	23.0276	23.0276	HBG	Buried Gas Pipe	Dules Wood	All/Multiple Tracks	. not shown on LP 619.
40570151	WKL2	23.0374	23.0506	HMM	Mineworking - Mine	Culvert at 23M 20C	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40098744	WKL2	23.044	23.044	HXE	Buried & Overhead Electric Cable	Upholland	Unknown	Voltage: 11000 <>. not shown on LP 619.
40570152	WKL2	23.0484	23.0484	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40487019	WKL2	23.0506	23.0506	HOE	Overhead Electrical Cables	Dukes Wood	All/Multiple Tracks	132KV x 6. not shown on LP 619.
40573587	WKL2	23.0594	23.0603	HBG	Buried Gas Pipe	Dukes Wood	Up Main/Fast	6 inch dia. Gas main laid by NWGB Grant 8/10/1968 No. 3121c. Runs parallel to track to LC beyond boundary. LP 619.
40570153	WKL2	23.0627	23.0627	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570154	WKL2	23.0814	23.0869	HMM	Mineworking - Mine	Holland Colliery	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40570155	WKL2	23.0869	23.0869	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570156	WKL2	23.1078	23.1166	HMM	Mineworking - Mine	Holland Colliery	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40573588	WKL2	23.1166	23.1166	HBG	Buried Gas Pipe	Holland Moss	All/Multiple Tracks	42 inch dia. Gas main laid by British Gas Corp. d/d 16/9/1985 No. NWMA 222. LP 619.
40570157	WKL2	23.1188	23.1243	HMM	Mineworking - Mine	Holland Colliery	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40573589	WKL2	23.1295	23.1455	HBG	Buried Gas Pipe	Graysons	All/Multiple Tracks	6 inch dia gas main laid by NWGB. Grant 8/10/1968. No. 3121c. Runs at side of track, turning to cross Bridge 42. <Part 2>. LP 619.
40573590	WKL2	23.1455	23.146	HBG	Buried Gas Pipe	Graysons	Up Main/Fast	6 inch dia gas main laid by NWGB. Grant 8/10/1968. No. 3121c. Runs at side of track, turning to cross Bridge 42. <Part 1>. LP 619.
40486943	WKL2	23.147	23.147	MAP	Authorised Access Point - Pedestrian	OB 42	Down Main/Fast	
40573591	WKL2	24.0641	24.0641	HBW	Buried Water Main	Station Road	All/Multiple Tracks	6 inch water main laid by Rainford U.D.C. LP 619.
40573592	WKL2	24.0643	24.0643	HBE	Buried Electrical Cables	Station Road	All/Multiple Tracks	Elec. Cable laid by MANWEB. Corres. 1677/67. LP 619.
40573593	WKL2	24.0645	24.0645	HBG	Buried Gas Pipe	Station Road	All/Multiple Tracks	6 inch dia. gas main laid by NWGB. Corres. 980/68. LP 619.
40486944	WKL2	24.0683	24.0683	MAP	Authorised Access Point - Pedestrian	RAINFORD STATION	Up Main/Fast	
40486945	WKL2	24.0696	24.0696	MAP	Authorised Access Point - Pedestrian	RAINFORD STATION	Down Main/Fast	
40486946	WKL2	24.0759	24.0759	MAV	Authorised Access Point - Vehicle	RAINFORD SIGNAL BOX	Down Main/Fast	
40090650	WKL2	24.077	24.077	HA	Authorised Walking Route	From Rainford Station to Signalbox		Leave down platform via wicket gate. turn right along car park. Turn right through gateway to foot of signalbox steps.
40570158	WKL2	24.11	24.11	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570159	WKL2	24.1188	24.1364	HMM	Mineworking - Mine	Rainford Colliery	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40486947	WKL2	25.0092	25.0092	MAP	Authorised Access Point - Pedestrian	UB 48	Rev Single	
40573594	WKL2	25.0099	25.0101	HBF	Buried Foul Water Service	Rainford Road	All/Multiple Tracks	9 inch dia. Sewer laid by Rainford U.D.C. Corres. 891/55. LP 619.
40570160	WKL2	25.0286	25.033	HMM	Mineworking - Mine	Rainford Colliery	Unknown	Shallow Mineworking - contact NST Mining <01332 262716> for further details and advice.
40570161	WKL2	25.0308	25.0308	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40042182	WKL2	25.0308	25.0924	EKF	Landfill Gases	Sidings Lane. Rainford		LANDFILL GAS. This stretch of railway has been identified as being at risk from the migration of landfill gasses. Appropriate precautions should be taken. For further information please contact NST Mining 01332 262716.
40570162	WKL2	25.0737	25.0737	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
40570163	WKL2	25.0781	25.0781	HMP	Mineworking - Pitshaft	Shaft	Unknown	Mineshaft - contact NST Mining <01332 262716> for further details and advice.
1.1E+08	WKL2	25.1057	25.1057	HBG	Buried Gas Pipe		All/Multiple Tracks	SHELL GAS PIPELINE RAIL CROSSING
40098698	WKL2	26.0005	26.0005	HXE	Buried & Overhead Electric Cable	Bickerstaffe Road	All/Multiple Tracks	Elec. Cable over Bridge No. 50 M.S.&N.W.E.B. Agmt. 19/2/1974. LP 619.
40038284	WKL2	26.0005	26.0005	HBW	Buried Water Main	Rainford Jn	Unknown	Diameter: 2 Inches <> RT.HON EARL OF DERBY M.C. not shown on LP 619.
40486948	WKL2	26.0801	26.0801	MAP	Authorised Access Point - Pedestrian	UB 51	Rev Single	
40038209	WKL2	26.1369	26.1369	HBW	Buried Water Main	Rainford Jn	Unknown	Diameter: 3 Inches <> North West Water. not shown on LP 618.
40487020	WKL2	26.1406	26.1406	HOE	Overhead Electrical Cables	Unknown	Rev Single	275KV x 6. not shown on LP 618.
40098641	WKL2	27.044	27.044	HXE	Buried & Overhead Electric Cable	Kirkby	Unknown	Cotts Siding Lane. Supply. not shown on LP 618.
40487021	WKL2	27.0505	27.0505	HXE	Buried & Overhead Electric Cable	Kirkby	Rev Single	33KV x 3. not shown on LP 618.
40098642	WKL2	27.0517	27.0517	HXE	Buried & Overhead Electric Cable	Kirkby	Unknown	Simonswood. not shown on LP 618.
40098643	WKL2	27.0517	27.0517	HXE	Buried & Overhead Electric Cable	Kirkby	Unknown	Near Simonswood Siding Level Crossing Cottage. not shown on LP 618.
40042183	WKL2	27.0704	28.0462	EKF	Landfill Gases	Stopgate Lane. Simonswood		LANDFILL GAS. This stretch of railway has been identified as being at risk from the migration of landfill gasses. Appropriate precautions should be taken. For further information please contact NST Mining 01332 262716.
40573595	WKL2	27.174	27.174	HBW	Buried Water Main	Simon's Wood	All/Multiple Tracks	Water main laid by MOPBAW Agmt. 21/7/66. 3169-8, LP 618.
40573596	WKL2	28.0233	28.0233	HBW	Buried Water Main	Dale Lane	All/Multiple Tracks	36 inch dia. Water main laid by NW Water Authority 15/6/1978 No.166/2006. LP 618.
40098617	WKL2	28.027	28.028	HXE	Buried & Overhead Electric Cable	Dale Lane	All/Multiple Tracks	Dale Lane, Kirkby. Overhead High Tension Cable. LP 618.
40487022	WKL2	28.0402	28.0402	HOE	Overhead Electrical Cables	Unknown	Rev Single	132KV x 6. not shown on LP 618.
40573597	WKL2	28.1174	28.1194	HBF	Buried Foul Water Service	Kirkby Brook	All/Multiple Tracks	45 x 36 inch Sewer laid by Whiston RDC Agmt. 23/3/1956. LP 618.
40487023	WKL2	28.1309	28.1309	HXE	Buried & Overhead Electric Cable	Kirkby	Rev Single	. not shown on LP 618.
40098597	WKL2	28.132	28.132	HXE	Buried & Overhead Electric Cable	Kirkby	Unknown	North East of Station. Line 1 Pole. not shown on LP 618.
40573598	WKL2	28.1587	28.1587	HB	Buried Service	School Lane	All/Multiple Tracks	18 inch Trunk main laid by St. Helens Corp. Corres 2771/64. LP 618.
40098606	WKL2	28.159	28.159	HXE	Buried & Overhead

H. Flood Maps

Flood map for planning

Your reference	Location (easting/northing)	Created
Skelmersdale1	**341713/399753**	**23 Oct 2018 9:32**

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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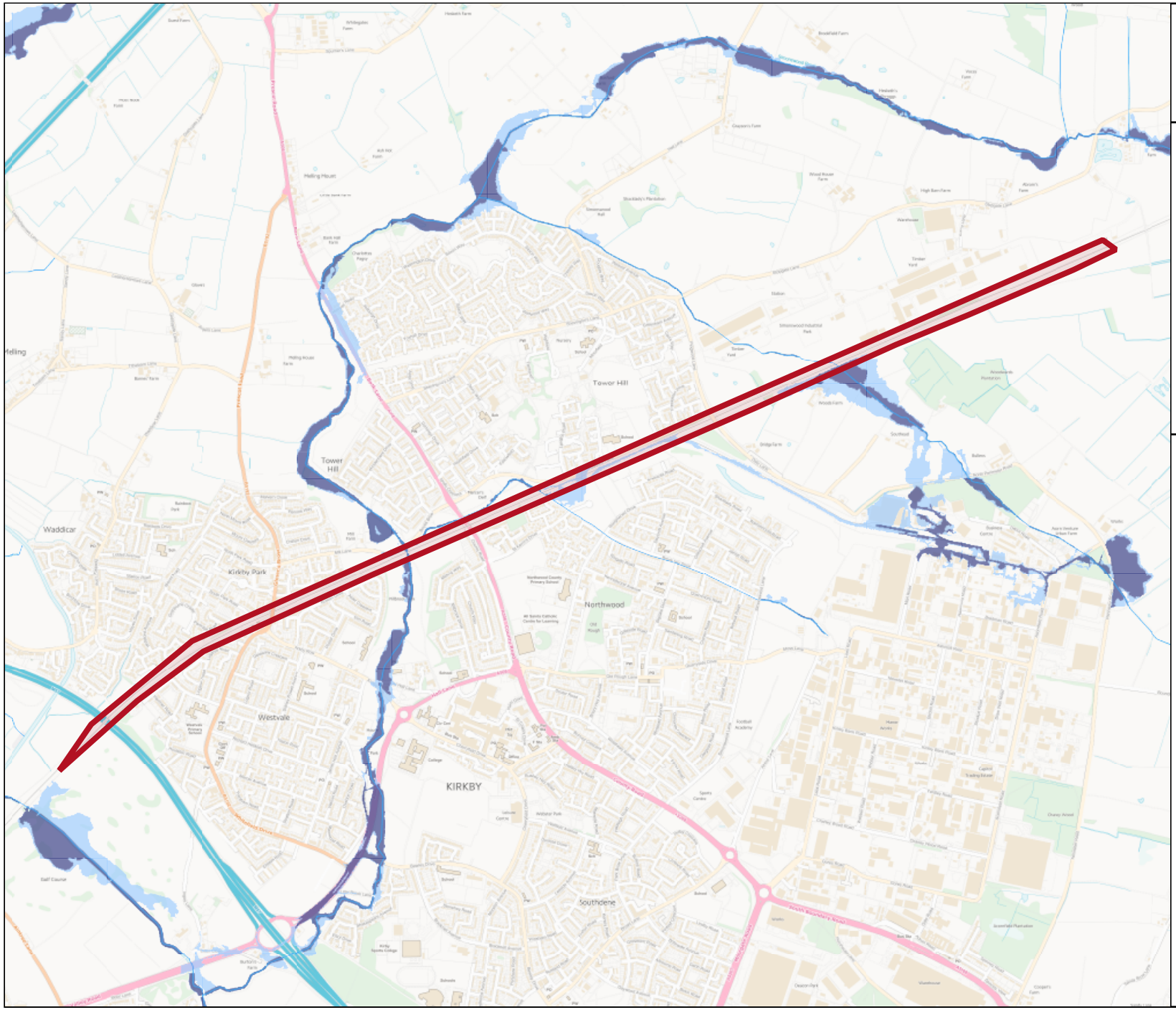

Environment Agency

Flood map for planning

Your reference
Skelmersdale1

Location (easting/northing)
341713/399753

Scale
1:25000

Created
23 Oct 2018 9:32

- Selected area
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 200 400 600m

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Flood map for planning

Your reference	Location (easting/northing)	Created
Skelmersdale2	**345783/401686**	**23 Oct 2018 9:53**

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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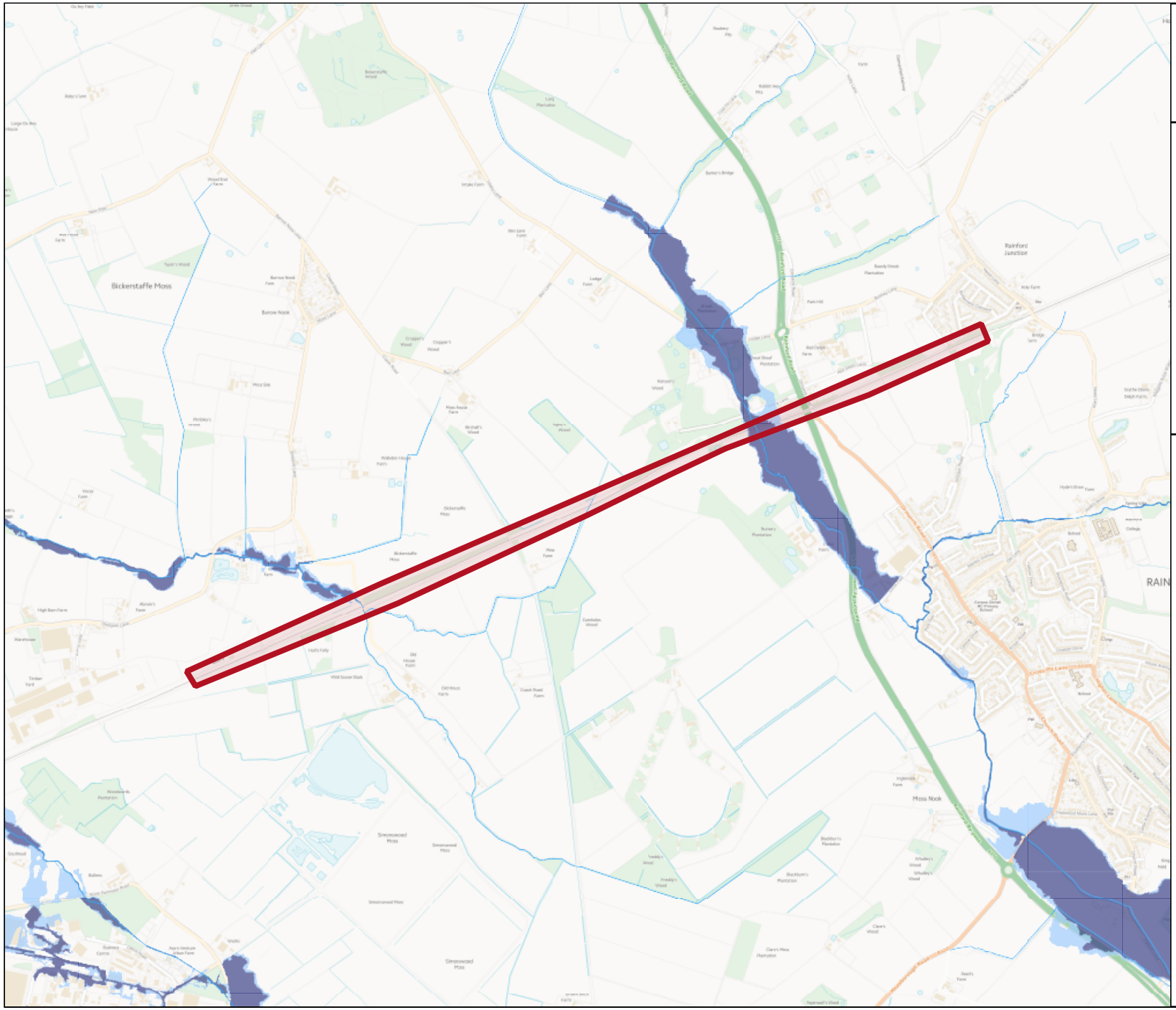

Environment Agency

Flood map for planning

Your reference
Skelmersdale2

Location (easting/northing)
345783/401686

Scale
1:25000

Created
23 Oct 2018 9:53

- Selected area
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 200 400 600m

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Flood map for planning

Your reference	Location (easting/northing)	Created
Skelmersdale3	**348926/403033**	**23 Oct 2018 9:54**

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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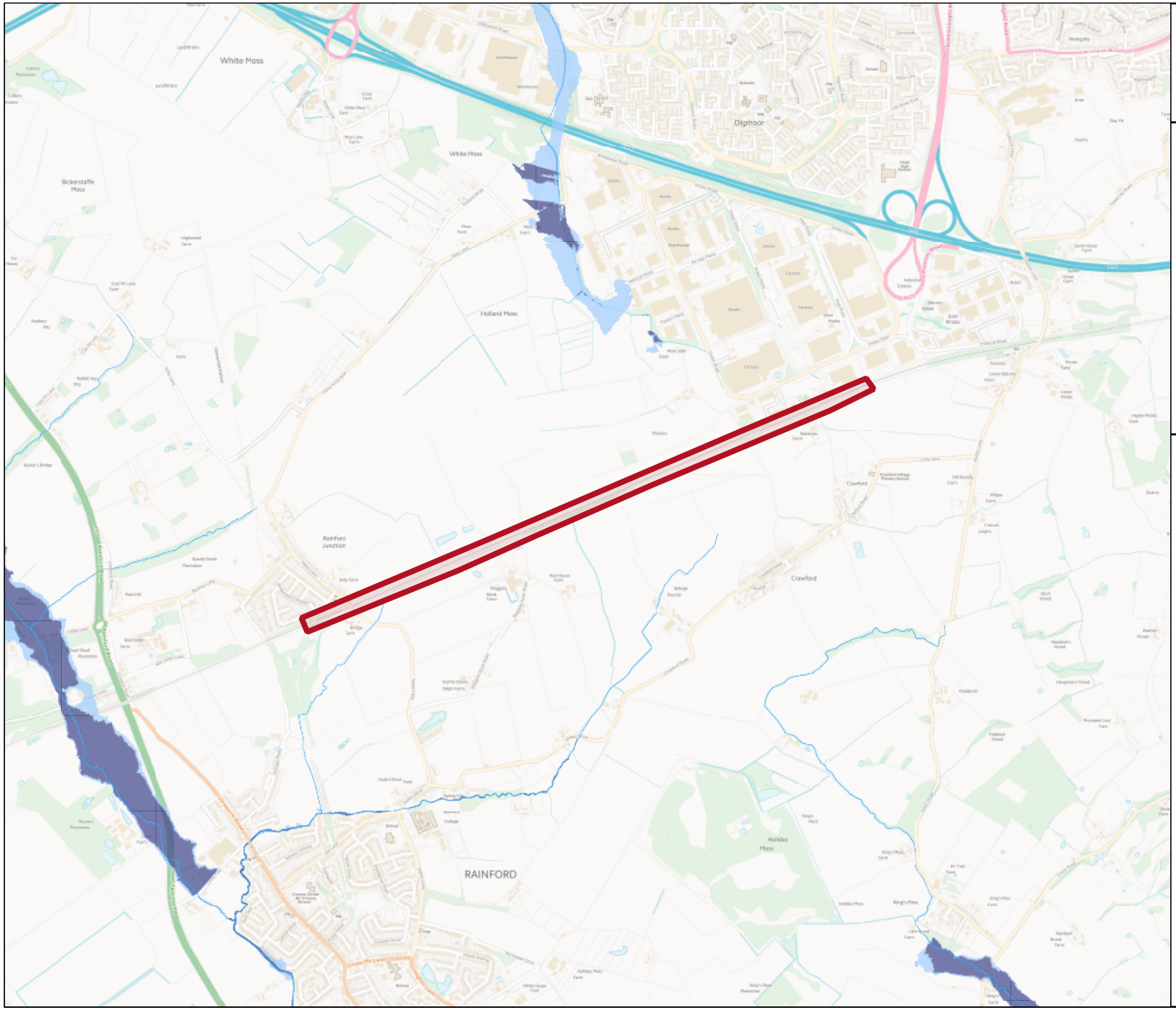

Environment Agency

Flood map for planning

Your reference
Skelmersdale3

Location (easting/northing)
348926/403033

Scale
1:25000

Created
23 Oct 2018 9:54

- Selected area
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 200 400 600m

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mottmac.com

Appendix 10B

Geo-environmental Desk Study

MOTT MACDONALD

Geo-Environmental Desk Study

Headbolt Lane Station

24 August 2018

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Geo-Environmental Desk Study

Headbolt Lane Station

24 August 2018

Mott MacDonald Limited. Registered in England and Wales no. 1243967.
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Executive Summary

Mott MacDonald Limited has been commissioned by Network Rail to develop the Skelmersdale Rail Link to GRIP 3A and Track AIP. As part of this work a Geo-environmental Desk Study and this report covers the proposed Headbolt Lane Station site. This site is situated 1.2km north east of Kirby Station, on a section of open land between Headbolt Lane, Country Road and the existing Liverpool to Wigan railway line.

The overall aim of this desk study is to define and reduce risks to the project with the objective of ensuring that critical issues specific to the site including nature and geotechnical properties of the ground are addressed. The desk study will inform the ground investigations (GI) to be undertaken as part of the works. This will allow project risks to be efficiently managed at an early stage. The proposed works comprise a new station which includes a station building, car and bicycles parking areas, bus stops and a pedestrian bridge over the railway.

The existing railway line has been present along the southern boundary of the site since the earliest map in 1850, with the majority of the surrounding area being agricultural land. A small sandstone quarry was present to the north of the site at the end of the 1800's, next to the property called Tanpit House. The property was no longer present after the 1990s. Rigby Brook flows through the middle of the site and appears to have been realigned in 1960s away from the foot of the railway embankment. The detailed review of the historical mapping has indicated the possibility for the presence of made ground and alluvium on the site associated with the historical quarry, house and realignment of Rigby Brook.

The BGS mapping indicate that there are no superficial deposits over the majority of the site with wind blown sands of the Shirdley Hill Sand Formation present in the extreme east of the site. However, as mentioned above there is an indication that alluvium and made ground could be present. The nearest historical boreholes were 50m to the south of the site and indicated the bedrock of the Wilmslow Sandstone Formation is anticipated to be within 2m of the ground level.

A preliminary qualitative contaminated land risk assessment has determined that for the majority of source-pathway-receptor scenarios the risk is low to moderate to human health and controlled waters. The most significant risk is considered to apply to human health and controlled waters through human health pathways, overland flow of surface water, and horizontal and vertical migration of contaminants in the soil.

The key geo-environmental risks relate to potential variability of and potential contamination within the Made Ground, possibility of subsurface obstructions and the variability of the topography of the site leading to significant cut/fill works across the site. The site is outside of a High-Risk Coal Mining Area.

To mitigate the risks highlighted in this report, an intrusive ground investigation is recommended to:

- define the ground conditions across the site for foundation design,
- assess the suitability of the near surface strata for reuse in earthworks, cut/fill design; and
- assess the extent of the geotechnical constraints highlighted in this desk study; and
- understand and define the presence of contamination and the geo-environmental risks at the site.

1 Introduction

1.1 Scope of Work

Mott MacDonald Limited has been commissioned by Network Rail to develop the Skelmersdale Rail Link to GRIP 3A and Track AIP. This report is to inform the design as part of the GRIP 3A activities.

1.2 Proposed Scheme

The Skelmersdale Rail Link Project will create new transport hub within the town to provide a direct rail link between Skelmersdale, Wigan and Liverpool. A study commissioned by Lancashire County Council has found that improved transportation links to Wigan and Liverpool will provide job opportunities for Skelmersdale residents and this will create further employment in the area.

The scheme comprises of new tracks for about 3km over land from new junctions on WLK2 (Liverpool to Wigan Railway line) to the proposed station site at the former Glenburn Sports College site, a new station at Skelmersdale and at Headbolt Lane with modifications required to the existing stations at Rainford and Kirby.

The proposed works at Headbolt Lane will require geotechnical input related to but not limited to the following:

- Station building foundations and earthworks to create level carpark area;
- Foundations for new pedestrian bridges to cross the railway line; and
- Some modification to the track layout to allow the additional train services to operate through the station.

1.3 Report Objectives

The purpose of this geo-environmental desk study is to provide information on the ground conditions that are likely to be encountered during the proposed works at Headbolt Lane, where a new station is proposed. A site location plan is provided in Figure 1.

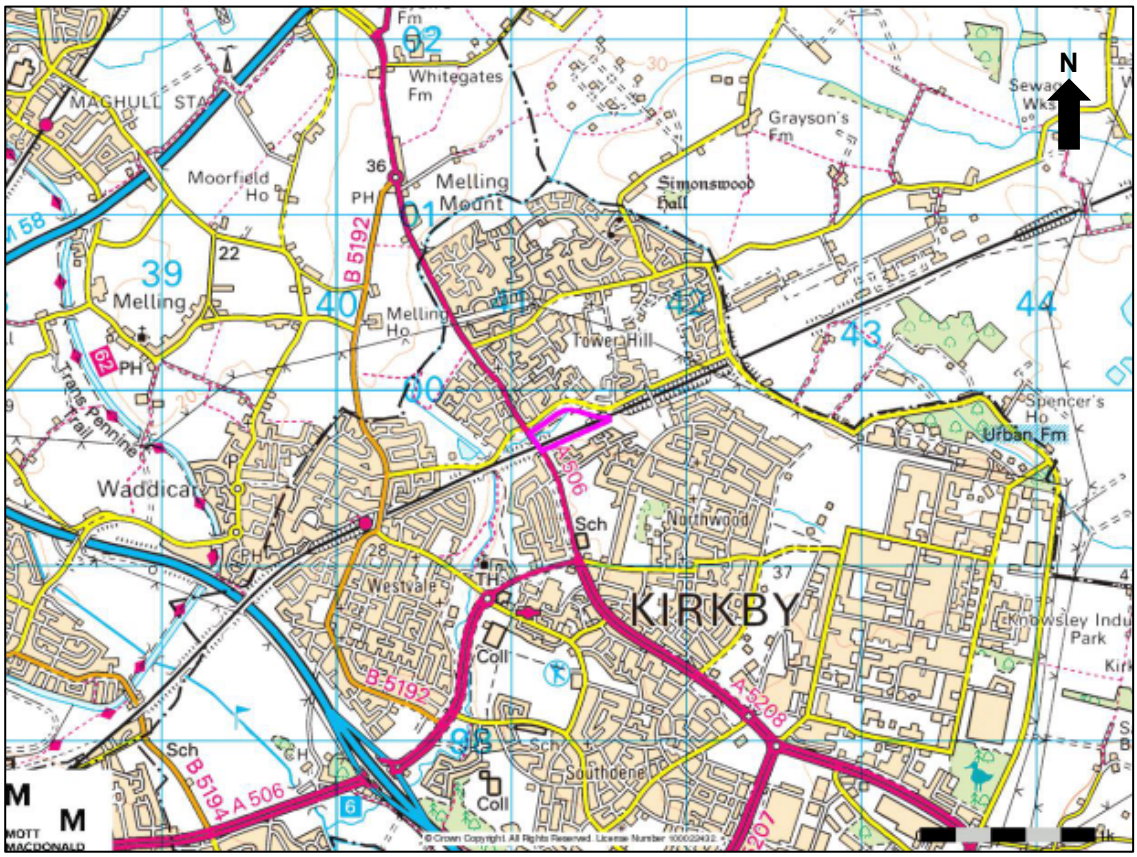
Designs for the Headbolt Lane Station are still to be developed but it is understood that the station is to have a capacity for 400,000 passengers a year, a carpark with space for at least 250 cars within 200m of the station, 4 bus stops within 25m of the station, and provision for at least 100 bicycles to be parked. There should also be an allowance for 500 parking spaces within 2minutes of the station, and passive provision for at least 300 bicycles to be parked.

This desk study reviews and summaries information for the site obtained from several sources, as detailed in Section 1.4 of this report. The objectives of this Geo-environmental Desk Study are to:

- Establish the geological and hydrogeological conditions for the site using existing available information;
- Summarise available information and identify site specific geotechnical and/or geo-environmental hazards which may place a constraint or risk upon the proposed development;

- Produce a preliminary Conceptual Site Model and preliminary qualitative contamination risk assessment identifying plausible potential linkages between contamination sources, pathways and receptors and,
- Provide objectives and recommendations with regards to an intrusive ground investigation (GI) and other further assessments that may be required.

Figure 1: Study Area shown in Pink



Source: Envirocheck, (2018)

1.4 Sources of Information

The following sources of information were used in the preparation of this report:

- Envirocheck, (2018). Envirocheck Report Order number: 167815730_1_1 including site sensitivity data, 1:10,000 scale geological mapping, Historical Land Use Database and historical maps (Appendix C)
- NERC. (2017). BGS Open Geoscience Borehole Scans. Available from http://mapapps.bgs.ac.uk/geologyofbritain/home.html Last accessed June 2018. (Appendix D)
- British Geological Survey (1970). Geological Survey of England and Wales 1:63,360 Wigan Sheet 84, Drift (Keyworth, Nottingham: British Geological Survey).
- British Geological Survey (1977). Geological Survey of England and Wales 1:50,000 Wigan Sheet 84, Solid (Keyworth, Nottingham: British Geological Survey).

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- Coal Authority, (2017). Coal Authority Interactive Map Viewer. Available from http://mapapps2.bgs.ac.uk/coalauthority/home.html. Last accessed May 2018.
- Network Rail, 2018. Stage 1 Preliminary Mining Assessment. Report Reference: LM-MISC-2448, dated 17/07/2018.
- Zetica, (2018). Unexploded Bomb Risk maps (Available from https://zeticauxo.com/downloads-and-resources/risk-maps/ Last accessed May 2018)
- Zetica, (2018). Pre-Desk Study Assessment for Skelmersdale Rail Link and Headbolt Lane, Kirkby dated 1 June 2018.
- NERC. (2018). GeoIndex Onshore. Available: http://mapapps2.bgs.ac.uk/geoindex/home.html. Last accessed 6 June 2018
- JBA Consulting, (2018). Network Rail Earthworks Asset Database. Available from http://www.jbamap.co.uk/map/NetworkRail/Examinations Last accessed June 2018.
- WLBC-Walter, Barry, (2018) Barry.Walters@westlancs.gov.uk Contaminated land enquiry. 20/06/2018

2 Geo-Environmental Baseline Summary

2.1 Site Location

The site is located approximately 1.3km northeast of the existing Kirby Railway Station, immediately adjacent to the Liverpool to Wigan Railway line (WLK2, 28m 1000yds to 28m 1570yds), and is centred on approximate National Grid Reference (NGR) 341330, 399790. A detailed site located plan is provided in Figure A1 (Appendix A).

2.2 Site Description and Topography

The 5 Ha site is roughly rectangular in shape and is bounded to the south by the Liverpool to Wigan Railway Line (WKL2), the east and north by Headbolt Lane, and to the west by the A506, Bank Lane. A stream, the Kirkby Brook, is indicated to enter the east of the site from the south, via a culvert beneath the railway, flow north-west to the centre of the site, before flowing south-west through the middle of the site to exit beneath the A506.

The land is undulating and slopes down from the northern and southern boundaries to the stream in the centre of the site forming a valley. Headbolt Lane is at an approximately elevation of 30 m AOD on the northern boundary of the site, reducing to 25m AOD on the eastern boundary of the site, although the road appears to be located on an approximately 2m high embankment at this eastern edge.

The stream in the centre of the site is at an elevation of approximately 23m AOD in the east of the site, reducing to 20m AOD in the west of the site. The railway along the southern boundary of the site is indicated to be at grade (approximately 30m AOD) between 28m 1000yds and 28m 1430 yds (eastern part of the site) and on embankment on the approach to the crossing of the A506 at 28m 1570yds. The embankment has a maximum height of 5m, approximately 35m AOD.

2.3 Site History

The historical maps at 1:10,560, 1:10,000 and 1:2500 scales from between 1850-2018 (Envirocheck, 2018) have been reviewed to understand the development of the study area. A detailed review of the site history is presented in Table **10** in Appendix B.

In summary in the earliest available map from 1850, the site is shown to comprise agricultural land with a stream, the Rigby Brook, flowing through the centre of the site east-west. A building, Tanpit House, located in the centre north of the site, and a sandstone quarry, Mercer's Delf, is located in the centre of the site north of the Rigby Brook. The southern boundary of the site comprises a railway line that is indicated to be on embankment in the west of the site. The site is indicated to be bounded to the north and west by roads, with the surrounding area comprising agricultural land with occasional houses and cottages.

In the map from 1893 the quarry on site is no longer present, and a pumping station is shown to 50m south of the site. No significant changes are noted until 1966 where housing developments are shown to have been constructed to the north and east of the site, and Headbolt Lane has been re-aligned around the northern and eastern boundaries of the site. On site the stream is indicated to have been re-aligned away from the railway embankment in the west of the site, and a footpath is indicated to cross the site east-west.

Tanpit House is no longer indicated to be present by 1990, and the crest of hill on northern site boundary has moved southwards indicating a change in ground levels. No other significant changes are noted on any of the maps to present day with the exception of the pumping station shown to be absent from 1999.

2.4 Geology

The geology underlaying the study area has been summarised from the BGS geological maps, Envirocheck report and Geological Memoir of Wigan District as detailed in Section 1.4. A conceptual cross section N-S through the centre of the site is presented in Figure 4.

2.4.1 Made Ground

No Made Ground is indicated to be present on the site from the geological mapping, although Made Ground is expected on the site associated with the following:

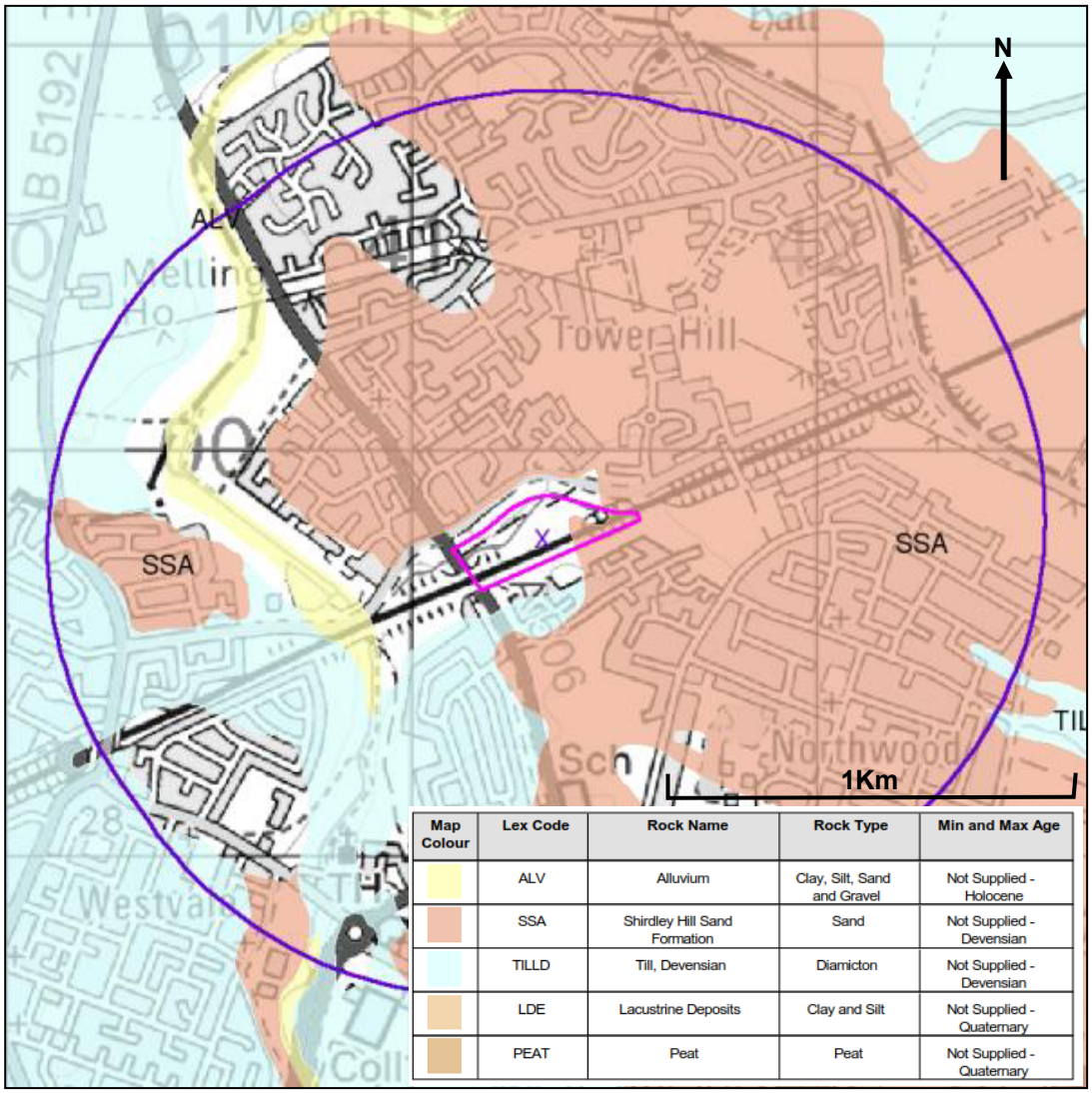
- railway line;
- embankment on the western boundary of the site associated with Headbolt Lane;
- former sandstone quarry;
- backfilling of the former stream channel, adjacent to the railway line where it crosses the A506; and
- former Tanpit House in the north of the site.

Made Ground is also expected to be present in the northern half of the site as the 30m AOD elevation line on the northern boundary of the site is indicated to move southwards between the historical 1:10,000 scale maps from 1974-1978 and 1990 (Figure A.2, Appendix A). This coincides with the demolition of Tanpit House and may be associated with the spreading of demolition waste across the site, or with construction with the residential housing to the north and west of the site. The areas of expected Made Ground are presented in Drawing 394359-HBL-GEO-01 (Appendix A).

2.4.2 Superficial Deposits

No superficial deposits are indicated to be present over the majority of the site, however wind blown sands of Shirdley Hill Sand Formation are indicated to be present in the extreme east of the site. These post glacial deposits are indicated to comprise moderately to well-sorted, fine grained sand with peat layers in the lower part. An extract of a map of the superficial geology is provided in Figure 2. Whilst it is not indicated on the geological mapping, Alluvium could be expected along the alignment of the stream/brook and beneath the backfilled stream channel.

Figure 2: Superficial Geology Extract



Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	SSA	Shirdley Hill Sand Formation	Sand	Not Supplied - Devensian
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	LDE	Lacustrine Deposits	Clay and Silt	Not Supplied - Quaternary
	PEAT	Peat	Peat	Not Supplied - Quaternary

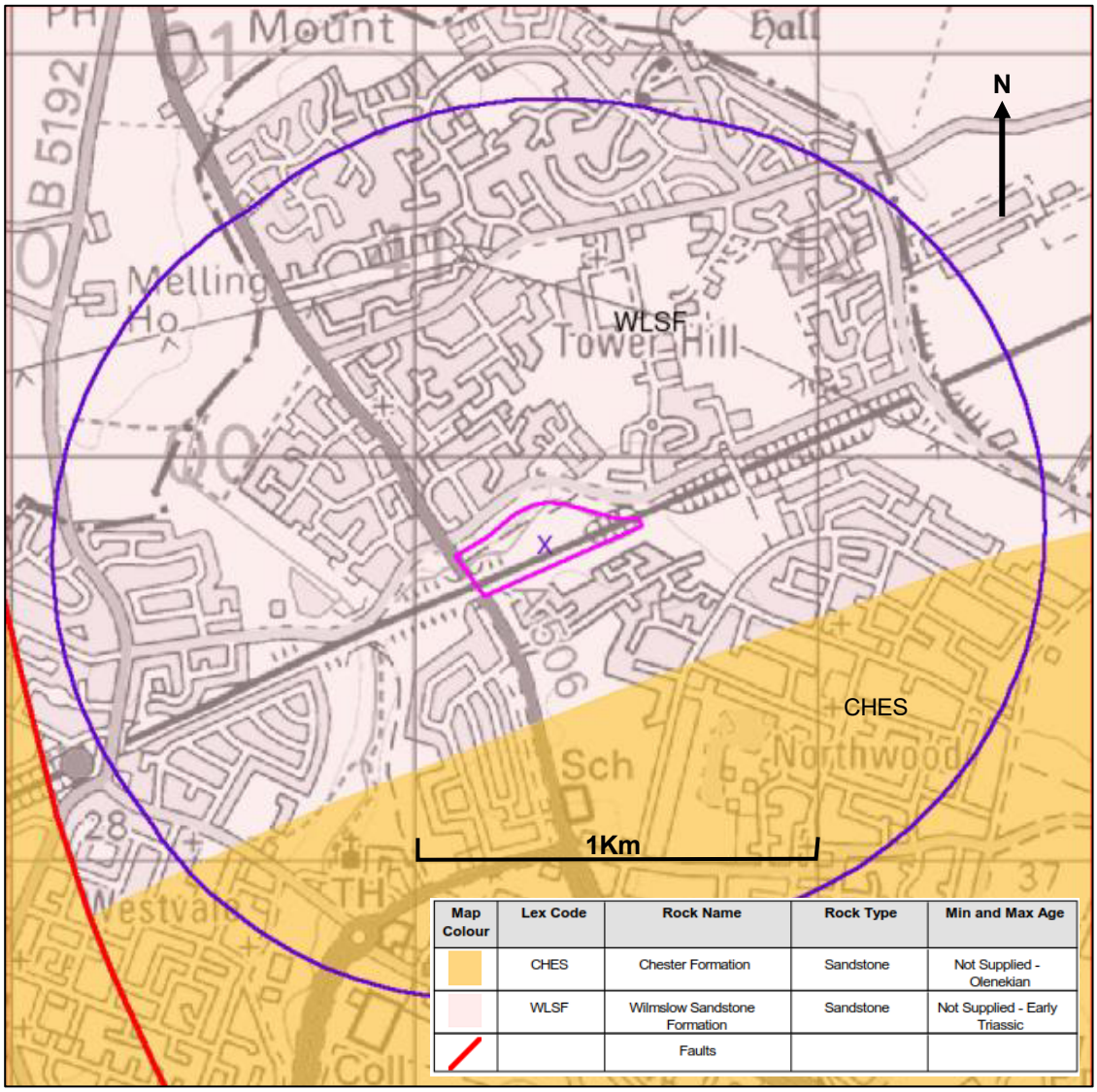
Source: Envirocheck, (2018)

2.4.3 Solid Geology

The bedrock Geology beneath the site is indicated to comprise Wilmslow Sandstone Formation of the Sherwood Sandstone Group. The underlying Chester Formation is indicated to subcrop 400m south of the site. An extract of the solid geology map is provided in Figure 3.

The Wilmslow Sandstone is indicated to comprise a red-brown to brick-red fine to medium grained generally pebble-free cross-bedded sandstone, whilst the underlying Chester Formation is indicated to comprise conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown mudstone.

Figure 3: Solid Geology Map Extract



Source: Envirocheck, (2018)

2.4.4 Structural Geology

A northeast – southwest trending fault is indicated to be present 1.1km west of the site (Figure 3). The bedrock geology is indicated to dip gently at 5° to the northwest.

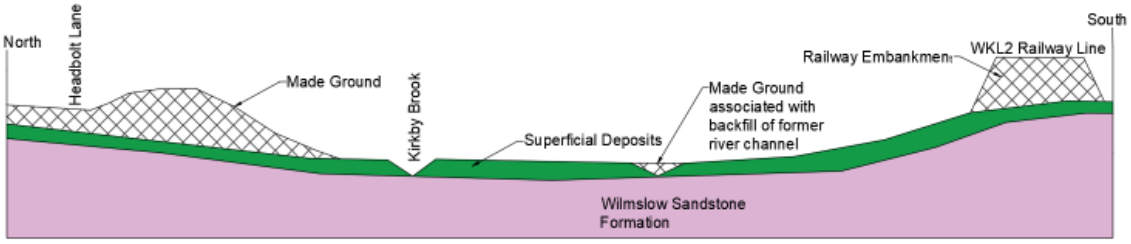
2.4.5 BGS Historical Boreholes

Two BGS publicly available borehole logs (SJ49NW1, SJNW10) are located 50m south of the site that were drilled in the 1950s at the St Helens Corporation Water Works (Pumping Station). These encountered 0.45m – 0.6m of topsoil, over 0.6m to 1m of clay. Sandstone is encountered at depths of 1.2m to 1.5m bgl and is weathered to sand in its upper 0.5m. The sandstone is proven to a maximum depth of 150m bgl. A conceptual cross section is shown in Figure 4.

A further borehole record is located 270m north of the site (SD40SW12) where the ground conditions were found to comprise topsoil to 0.46m bgl, sand to 1.68m bgl, clay to 1.83m bgl and weathered rock to 3.05m. Competent rock is proven to 19.81m bgl.

The BGS borehole logs are provided in Appendix C. The location of these holes is shown on drawing 394359-HBL-GEO-01 in Appendix A.

Figure 4: Conceptual Cross Section



2.5 Hydrology and Flooding

The Envirocheck report indicates the closest surface water is the Kirkby Brook which is indicated the flow through the centre of the site. This joins the Simonswood Brook 300m west of the site before flowing south.

The site is not indicated to be at risk of flooding from rivers or sea.

A strip of land in the middle the site, orientated along the Kirkby Brook at the lowest elevation point on the site is indicated to be at risk from fluvial and surface water flooding.

2.6 Hydrogeology

The Environment Agency classify the Shirdley Hill Sand Formation as a Secondary A Aquifer. This classification is assigned to permeable layers capable of supporting water supplies at a local scale, and in some cases can supply an important base flow to rivers.

The Wilmslow Sandstone Formation is classified as a Principle Aquifer due to its high intergranular and/or fracture permeability, meaning it can provide a high level of water storage and may provide water supply and/or base river flow on a strategic scale.

The site is indicated to be within a Source Protection Zone (SPZ) 3. A Zone 3 status covers the entire catchment area for a protected groundwater abstraction source. The nearest source is located over 1.5km to the northwest of the site.

2.7 Water Abstractions and Discharge Consents

A discharge consent is located 11m south east of the site. This was for the discharge of process water to a freshwater stream, and the consent was held by Suez Recycling & Recovery Limited. This consent was revoked in 2010.

A groundwater abstraction is located 55m south of the site and is operated by United Utilities of public water supply. It is not known if this is still active. However, the historical maps indicate that the pumping station has not been present since 1999.

2.8 Mining

The site is not reported to be within a Coal Mining Area.

A Stage 1 Preliminary Mining Assessment has been undertaken which states no further action is required (Network Rail, 2018).

2.9 BGS Recorded Mineral Sites

There is one BGS recorded mineral site located within the site boundary. This is reported to ne Mercer's Delf which mined sandstone from an opencast quarry and is indicated to have ceased operation by the late 1800's. There are two other sandstone quarries, Old Rough Delf and Dearbolt Delf reported 760m and 890m to the south and the west of the site respectively.

2.10 Network Rail Earthwork Records

Network rails Earthwork inspection records have been interrogated from the Network Rail JBA Earthworks Examinations Portal. The railway earthworks within the site boundary comprise embankments on the approach to the crossing of the A506. These increase in height from 1m to 5m by the crossing A506, with slope angles of 32º and a cess width of 2m. They are indicated to comprise fine granular and ash material, and show little evidence of distress. The available earthwork records results are summarised in Table 1 and copies of the earthwork record reports are included in Appendix E. Typically, these earthworks classify as Earthwork Hazard Category (EHC) A (good condition) and of Low Risk

Table 1: Earthwork Condition Summary

ELR	Start	End	Side	Type	Risk Category	EHC
WKL2	28.1430	28.1540	D	Soil Embankment	Low	A
WKL2	28.1430	28.1540	U	Soil Embankment	Average	A
WKL2	28.1540	28.1650	D	Soil Embankment	Low	A
WKL2	28.1540	28.1650	U	Soil Embankment	Low	A

Source: Network Rail JBA Examinations Portal

2.11 BGS Geotechnical Hazards

The Envirocheck report states the following potential risk level for the following geotechnical hazards:

- Collapsible Ground Stability Hazard – Very Low
- Compressible Ground Stability Hazard – Very Low
- Ground Dissolution Stability Hazard – No risk
- Landslide Ground Stability Hazard – Very Low
- Running Sand Ground Stability Hazard – Low in areas of the Shirdley Hill Sands Formation, no risk across the rest of the site.
- Shrinking or Swelling Clay – No risk

An area of potentially infilled land is indicated to be present in the north of the site. This is likely associated with the former Mercer's Delf sandstone quarry.

The site is indicated to be in a Lower Probability Radon area (less than 1% of homes are estimated to be at or above the Action level). No radon protection measures are necessary in the construction of station.

2.12 UXO

A Pre-Desk Study Assessment obtained from Zetica Limited on the 1 June 2018 indicates that the site has a low risk potential from UXO and a detailed desk study for the site is not considered essential.

2.13 Pollution Incidents to Controlled Waters

There is 1No. pollution incident to controlled waters within the site boundary, and a further 11No. pollution incidents to controlled waters within 500m of the site as detailed Table 2 and in the Envirocheck Report.

Table 2: Pollution Incidents to Controlled Waters

Distance from Site	Receiving Water	Date	Pollutant	Category
0m	Kirkby Brook	04/11/1994	Miscellaneous – Other (Leak from Underground Pipe)	Cat 3 - Minor
20m (NE)	Kirkby Brook	16/07/97	Miscellaneous – Other	Cat 3 - Minor
245m (W)	Not Given	14/05/92	Not Given	Cat 3 – Minor
305m (W)	Kirkby Mill Dam Pond	08/04/94	Oils – unknown	Cat 2 - Significant
310m (W)	Simonswood Brook	07/07/92	Miscellaneous – Other	Cat 2 - Significant
340 (W)	Not Given	09/09/92	Not Given	Cat 3 - Minor
400 (W)	Mill Dam Pond	12/05/95	Unknown	Cat 3 – Minor
405 (W)	Not Given	23/09/94	Crude Sewage (Leak from underground pipe)	Cat 2 - Significant
400 (W)	Kirkby Brook	18/04/95	Rubble/Litter or Solids	Cat 3 - Minor
430 (W)	Simonswood Brook	31/03/93	Not Given	Cat 3 – Minor
430 (W)	Simonswood Brook	19/09/93	Rubble/Litter or Solids (Burnt out cars)	Cat 3 – Minor
430 (W)	Mill Dam Pond	29/06/94	Miscellaneous – Unknown	Cat 3 – Minor

Source: Envirocheck, (2018)

2.14 Local Authority Pollution Prevention Controls

There are no Local Authority Pollution Prevention Controls within 950m of the site.

2.15 Integrated Pollution Prevention and Control

There are no Integrated Pollution Prevention and Control measures within 500m of the site.

2.16 Contemporary Trade Entries

There are only two Contemporary Trade Entries within 500m of the site. One of which is active and related to a carpet, curtain and upholstery cleaners located 170m west of the site. The inactive entry related to a recycling centre that was located 470m to the southeast.

2.17 Fuel Entries

There is one active fuel entry located 885m southeast of the site, Essar Bigdale Service Station. An inactive fuel station, Kirkby Service Station, was located 775m south of the site.

2.18 Landfills

A historical landfill is located 540m northwest of the site, that is also a recorded Local Authority Recorded Landfill Site, and a Registered Landfill Site. This was operated by Nico Trading Limited and stopped receiving waste in December 1993. It was authorised to receive brick, stone, concrete, inert spoil, soils and clays.

A Licenced Waste Management Facility is located 900m northeast of the site. This is operated by William Bros Industry Limited and involves treating waste to produce soil. The licence was surrendered in 2013.

2.19 Hazardous Substances

No hazardous substances are reported within 1000m of the site boundary.

2.20 Consultation with Contaminated Land Officer

The site is not on the councils list of potentially contaminated sites and has no other information on the site (WLBC, 2018).

2.21 Past Land Use, Contamination Potential

As the land use on site only comprises a railway, a quarry that stopped operating in the late 1800s, a house, and agricultural and park land, no significant contamination is expected on site.

However, localised contamination may be expected in the areas of the former development and alongside the railway line in the south of the site.

2.22 Sensitive Land Use and Statutory Designations

The only sensitive land uses within 1000m of the site are areas of adopted green belt, the closest of which is located 675m northwest of the site.

2.23 Services/Utilities

A detailed utility search for the site is still to be undertaken, therefore no information on utilities is currently available.

2.24 Network Rail Hazard Directory

An extract from Network Rail Hazard Directory relevant to section of affected track is shown in Table 3. The comments given in Table 3 are as given in the directory, no further details are provided.

Table 3: Extract from Network Rail Hazard Directory

ELR Start	ELR End	Type	Name	Track	Comment
28.1174	28.1194	Buried Foul Water Service	Kirkby Brook	All/Multiple Tracks	45 x 36 inch Sewer laid by Whiston RDC Agmt. 23/3/1956. LP 618.
28.1309	28.1309	Buried & Overhead Electric Cable	Kirkby	Rev Single	not shown on LP 618.
28.132	28.132	Buried & Overhead Electric Cable	Kirkby	Unknown	North East of Station. Line 1 Pole. not shown on LP 618.

ELR Start	ELR End	Type	Name	Track	Comment
28.1587	28.1587	Buried Service	School Lane (Country Road A506)	All/Multiple Tracks	18 inch Trunk main laid by St. Helens Corp. Corres 2771/64. LP 618.
28.159	28.159	Buried & Overhead Electric Cable	School Lane (Country Road A506)	All/Multiple Tracks	Voltage: 33000 <> School Lane Bridge 55. Elec. Cable laid by MANWEB Corres. 631/65. LP 618.
28.1593	28.1593	Buried Water Main	School Lane (Country Road A506)	All/Multiple Tracks	18 inch water main. LP 618.

Source: Network Rail Hazard Directory

3 Qualitative Contaminated Land Risk Assessment

3.1 Regulatory Context

The primary legislative regime under which historic contaminated land is managed in the UK is Part IIA of the Environmental Protection Act (EPA), 1990. The framework for the assessment of potential land contamination adopted in this report is based on current guidance documents regarding the implementation of Part IIA of the EPA and the assessment of potentially contaminated land, with particular reference to:

- Department of the Environment Food and Rural Affairs (DEFRA) (2012): "Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance", April 2012;
- Environment Agency (2009): Human Health Toxicological Assessment of Contaminants in Soil", Science Report – SC050021/SR2;
- Environment Agency (2009): "Updated Technical Background to the CLEA Model", Science Report - SC050021/SR3;
- British Standard (BS) 10175: 2011, "Investigation of Potentially Contaminated Sites";
- Environment Agency (2012): "Groundwater Protection Policy and Practice, GP3";
- NHBC, EA, CIEH (2008): "Guidance for the Safe Development of Housing on Land Affected by Contamination", R&D Publication 66: 2008
- Department for Communities and Local Government (2012): "National Planning Policy Framework".

Elimination of liability under Part IIA is not always achievable largely because of the inherent risk basis of the statutory regime, the technical difficulty in establishing levels of contamination that are likely to represent Significant Potential of Significant Harm (SPOSH), and the variable distribution of contamination at many sites. Statutory guidance on Part IIA (DEFRA, 2012) recognises that sites require prioritisation by Local Authorities under the statutory Part IIA site inspection programme to ensure that only those sites likely to present the greatest risks are identified. However, it should be recognised that considerable investigation is often required to establish whether sites are likely to meet the definition of contaminated land under Part IIA.

Such investigation may be beyond the scope of project budgets for nominally "low risk sites" necessitating judgement on an acceptable level of investigation. Since the designation of Contaminated Land is the responsibility of the local Authority, it is advised that consensus is sought on any recommendations regarding the significance of contaminated land risks and remedial measures through consultation with the Regulator(s).

Section 161 of the Water Resources Act 1991 states that the Environment Agency can recover clean-up costs on person(s) who caused or knowingly permitted the entry or presence of any poisonous, noxious or polluting matter or any solid waste into controlled waters. Contamination and environmental considerations are studied by developing a conceptual model of the site that describes the environmental features of the site together with the expected interaction of potential contamination sources and the wider environment.

3.2 Planning Context

The National Planning Policy Framework (Department for Communities and Local Government, 2012) includes the following policies in relation to contaminated land:

Policy 109: "The planning system should contribute to and enhance the natural and local environment by:

- preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and
- remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate"

Policy 120: "To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner."

Policy 121: "Planning policies and decisions should also ensure that:

- the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;
- after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and
- adequate site investigation information, prepared by a competent person, is presented."

The glossary states the following relation to "site investigation information":

- "Site investigation information: Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures [such as BS10175 (2011) Code of Practice for the Investigation of Potentially Contaminated Sites]. The minimum information that should be provided by an applicant is the report of a desk study and site reconnaissance."

3.3 Qualitative Contaminated Land Risk Assessment

A qualitative risk assessment in accordance with NHBC, EA, CIEH (2008) has been undertaken. This is described below:

3.3.1 Conceptual Model

A key element of an environmental risk assessment is the development of a conceptual model which is done undertaking a Source-Pathway-Receptor analysis of the site:

- Sources (S) are potential or known contaminant sources e.g. a former land use;
- Pathways (P) are environmental systems thorough which a contaminant could migrate e.g. air, groundwater;

- Receptors (R) are sensitive environmental receptors that could be adversely affected by a contaminant. e.g. Site occupiers, groundwater resources.

Where a source, relevant pathway and receptor are present, a pollutant linkage is considered to exist whereby there is a circumstance through which environmental harm could occur and a potential environmental liability is considered to exist. The sources, pathways and receptors expected on the site are summarised below:

3.3.1.1 Sources

- **S1: Made Ground** - Potential for contaminated soil in Made Ground associated with the Liverpool to Wigan Railway Line, the former Tanpit House, the former Quarry, and the infilled stream channel.
- **S2: Ground Gas** - Potential for ground gas associated with the infilled quarry, peat within the Shirdley Hill Sand Formation and Made Ground across the northern extent of the site.

3.3.1.2 Pathways

- **P1**: Human uptake pathways;
  - Ingestion of exposed soils;
  - Inhalation of soil/dust/volatilised compounds via migration through permeable strata and conduits; and
  - Dermal contact with exposed soils.
- **P2**: Overland flow of surface water
- **P3**: Vertical and horizontal percolation within the unsaturated zone
- **P4:** Vertical and lateral migration of ground gases
- **P5**: Wind blown dust
- **P6**: Horizontal and vertical migration of contaminants within groundwater
- **P7**: Direct contact of soils with construction materials
- **P8**: Root Uptake

3.3.1.3 Receptors

- **R1**: Future End Users (Commercial)
- **R2**: Construction/Maintenance Workers
- **R3**: Controlled Surface Waters (Kirkby Brook)
- **R4**: Controlled Groundwaters (Wilmslow Sandstone Principal Aquifer)
- **R5**: Flora and Fauna
- **R6**: Off-site receptors e.g. Residential Properties
- **R7**: Subsurface Infrastructure (Foundations and Utilities)

For each potential pollutant linkage identified with the conceptual Model detailed in Table 4, the potential risk to each receptor has been evaluated using a preliminary Qualitative Risk Assessment based on the probability of the pollution event, and the severity it may have on site users and the environment. The methodology of this assessment is provided in Appendix F. The results of this assessment are presented in Table 5.

Table 4: Site Conceptual Model

Potential Sources	Potential Receptors	Potential Pathways
S1: Made Ground **S2: Ground Gas**	**R1**: Future End Users (Commercial)	• **P1**: Human uptake pathways; – Ingestion – Inhalation – Dermal contact with exposed soils. • **P4**: Vertical and lateral migration of ground gases • **P5**: Wind blown dust.
S1: Made Ground **S2: Ground Gas**	**R2:** Construction/Maintenance Workers	• **P1**: Human uptake pathways; – Ingestion – Inhalation – Dermal contact with exposed soils. • **P2**: Overland flow of surface water • **P4**: Vertical and lateral migration of ground gases • **P5**: Wind blown dust • **P6**: Horizontal and vertical migration of contaminants within groundwater • **P7**: Direct contact of soil with construction materials
S1: Made Ground	**R3**: Controlled Surface Waters (Kirkby Brook)	• **P2**: Overland flow of surface water • **P3**: Vertical and horizontal percolation within the unsaturated zone • **P5**: Wind blown dust • **P6**: Horizontal and vertical migration of contaminants within groundwater
S1: Made Ground	**R4**: Controlled Groundwaters (Wilmslow Sandstone Principal Aquifer)	• **P2**: Overland flow of surface water • **P3**: Vertical and horizontal percolation within the unsaturated zone • **P6**: Horizontal and vertical migration of contaminants within groundwater
S1: Made Ground	**R5**: Flora and Fauna	• **P8**: Root Uptake
S1: Made Ground **S2: Ground Gas**	**R6**: Off-site receptors e.g. Residential	• **P1**: Human uptake pathways; – Ingestion – Inhalation – Dermal contact with exposed soils. • **P2**: Overland flow of surface water • **P4**: Vertical and lateral migration of ground gases • **P5**: Wind blown dust • **P6**: Horizontal and vertical migration of contaminants within groundwater

Potential Sources	Potential Receptors	Potential Pathways
S1: Made Ground	**R7**: Subsurface Infrastructure (Foundations and Utilities)	• **P3**: Vertical and horizontal percolation within the unsaturated zone • **P6**: Horizontal and vertical migration of contaminants within groundwater • **P7**: Direct contact of soils with construction materials

Table 5: Initial Qualitative Risk Assessment for the Proposed Development Site at Headbolt Lane

Potential Source	Potential Receptor	Potential Pathway	Consequence	Probability	Risk	Comments
S1: Made Ground **S2: Ground Gas**	**R1**: Future End Users (Commercial)	• **P1**: Human uptake pathways; – Ingestion – Inhalation – Dermal contact with exposed soils. • **P4**: Vertical and lateral migration of ground gases • **P5**: Wind-blown dust • **P6**: Horizontal and vertical migration of contaminants within groundwater	Mild	Likely	Moderate/Low	The probability of occurrence for this source-pathway-receptor linkage is considered to be low for the majority of the site. Localised areas of Made Ground are likely only present along the railway line and in the location of the former quarry and house. It is also unlikely that the end users will come into direct contact with the ground as the majority of the area will be covered in hardstanding. An appropriate ground investigation will need to be undertaken in order investigate further the likelihood of encountering contamination on site and what remedial measures may be required. There is considered to be low risk of ground gas, however gas monitoring standpipes should be installed in areas of Made Ground to assess the risk of ground gases associated with these areas.
S1: Made Ground **S2: Ground Gas**	**R2:** Construction/ Maintenance Workers	• **P1**: Human uptake pathways; – Ingestion – Inhalation – Dermal contact with exposed soils. • **P4**: Vertical and lateral migration of ground gases • **P5**: Wind-blown dust • **P6**: Horizontal and vertical migration of contaminants within groundwater	Mild	Likely	Moderate/Low	The probability of occurrence for this source-pathway-receptor linkage is considered to be low. Localised areas of Made Ground are likely only present along the railway line and in the location of the former quarry and house in the north of the site. An appropriate ground investigation will need to be undertaken in order investigate further the likelihood of encountering contamination on site and what remedial measures may be required. There is considered to be low risk of ground gas, however gas monitoring standpipes should be installed in areas of Made Ground to assess the risk of ground gases associated with these areas. During construction the contaminant pathway can be prevented through the use of PPE and good site safety practice.

Potential Source	Potential Receptor	Potential Pathway	Consequence	Probability	Risk	Comments
						Good site practice during construction incorporating dust suppression will mitigate risks associated with wind blown dust.
S1: Made Ground	**R3**: Controlled Surface Waters (Kirkby Brook)	• **P2**: Overland flow of surface water • **P3**: Vertical and horizontal percolation within the unsaturated zone • **P6**: Horizontal and vertical migration of contaminants within groundwater	Mild	Likely	Moderate/Low	The Kirkby Brook flows through the centre of the site at a topographic low, and therefore any surface water onsite is likely to flow into the brook. Surface water should be controlled during construction works to mitigate the risk of surface water contamination entering the Kirkby Brook. The proposed development should incorporate a strategic drainage system to prevent surface water entering controlled waters without the correct consents.
S1: Made Ground	**R4**: Controlled Groundwaters (Wilmslow Sandstone Principal Aquifer)	• **P3**: Vertical and horizontal percolation within the unsaturated zone • **P6**: Horizontal and vertical migration of contaminants within groundwater	Mild	Likely	Moderate/Low	The ground conditions onsite are likely to comprise Made Ground over a thin (<1.5m) layer of sand and clay directly above the Wilmslow Sandstone which is a principal aquifer. Therefore, it is considered likely that a linkage may be present between the Made Ground and the bedrock aquifer. A suitable ground investigation is required to determine the levels, if any, of contamination across the site and will allow appropriate mitigation measures to be implemented during construction.
S1: Made Ground	**R5**: Flora and Fauna	• **P8**: Root Uptake	Mild	Unlikely	Very Low	Any ecological constraints such as protected or invasive species, and TPO's should be identified and considered during any design works and again before commencing on site. This will ensure no harm is caused to flora or fauna. An appropriate ground investigation will identify any potential contamination across the site and allow appropriate mitigation measures, such as importing clean fill to landscaped areas, to be recommended.
S1: Made Ground **S2: Ground Gas**	**R6**: Off-site receptors e.g. Residential	• **P1**: Human uptake pathways; – Ingestion – Inhalation	Mild	Unlikely	Very Low	There is a potential for contaminated shallow soils to impact surrounding land uses during future construction and development works through windblown dust.

Potential Source	Potential Receptor	Potential Pathway	Consequence	Probability	Risk	Comments
		– Dermal contact with exposed soils. • **P2**: Overland flow of surface water • **P4**: Vertical and lateral migration of ground gases • **P5**: Wind blown dust • **P6**: Horizontal and vertical migration of contaminants within groundwater				Suitable investigation to address the levels, if any, of contamination will allow appropriate mitigation measure to be implemented during construction.
S1: Made Ground	**R7**: Subsurface Infrastructure (Foundations and Utilities)	• **P3**: Vertical and horizontal percolation within the unsaturated zone • **P6**: Horizontal and vertical migration of contaminants within groundwater • **P7**: Direct contact of soils with construction materials	Mild	Likely	Moderate/Low	Soils and groundwater may come into direct contact with buried concrete and potable water supply pipe materials. An assessment of the chemical properties of the underlying soils will enable an assessment of the risk to these receptors.

4 Potential Ground Related Constraints

The potential ground related constraints for the proposed station have been summarised into a risk register provided in Table 9. Table 6 and Table 7 show the impact index and likelihood index respectively for assessing a hazard. Table 8 presents the Risk Matrix, which shows the actual risk level, rated from 'Severe' (max. risk level) to 'Negligible' (min risk level). These constraints require further investigation or consideration as the scheme progresses to reduce and minimise the impacts of these on the scheme. The locations of potential geotechnical and geo-environmental risks (where easily identifiable) have been mapped on to the Geo-environmental constraints plan (Drawing 394359-HBL-GEO-01) provided in Appendix A.

Table 6: Negative Consequence Score Table

Impact	Health and Safety	Time	Cost	Reputation	Environment
Very Low	negligible	negligible	negligible effect on programme	negligible	negligible	negligible
Low	minor	minor injury	5% effect on programme	1% budget	minor effect on local company image/ business relationship mildly affected	minor environmental incident
Medium	serious	major injury	12% effect on programme	10%budget	local media exposure/ business relationship affected	environmental incident requiring management input
High	threat to future work and client relations	fatality	25% effect on programme	20% budget	nationwide media exposure / business relationship greatly affected	environmental incident leading to prosecution or protestor action
Very High	threat to business survival and credibility	multiple fatalities	50% effect on programme	50% budget	permanent nationwide effect on company image/ significant impact on business relationship	major environmental incident with irreversible effects and threat to public health or protected natural resource

Table 7: Likelihood Score Table

Likelihood		Probability
Very Low	negligible / improbable	<1%
Low	unlikely / remote	>1%
Medium	likely / possible	>10%
High	probable	>50%
Very High	very likely / almost certain	>90%

Table 8: Risk Matrix

Negative Consequence		Likelihood				
		Very Low	Low	Medium	High	Very High
	Very Low	N	N	N	N	T
	Low	N	N	T	T	S
	Medium	N	T	T	S	S
	High	N	T	S	S	I
	Very High	T	S	S	I	I

Risk Key

intolerable	RED	I
significant	AMBER	S
tolerable	YELLOW	T
negligible / trivial	GREEN	N

GEOTECHNICAL RISK REGISTER

Date: 01/07/2018 **Project Phase: GRIP 3A** **Project: Skelmersdale Rail Link - Headbolt Lane Station**

Risk Assessment carried out by: Kevin Wells

Ref No.	Threat	Consequences	IMPACT	LIKELIHOOD	RISK	RISK TYPE	Potential Risk Control Measures / Actions	IMPACT	LIKELIHOOD	RESIDUAL RISK	OWNER	Action (by whom and when)
1	Made Ground. Localised areas of Made Ground are expected on site associated with former Tanpit House, the former quarry, the railway line, and the road embankment.	*Made Ground should not be considered as suitable as founding strata due to its variable geotechnical properties and high potential for differential settlement. *Potential contamination within the Made Ground material may present a risk of harm to sensitive receptors. *If Made Ground is identified as hazardous, there will be increased costs associated with disposal of the material to a suitable landfill.	M	H	S	HS/T/C/E	1) Carry out a full geo-environmental site investigation to determine extent, properties, and contamination status of Made Ground. 2) Findings of ground investigation to be incorporated into detailed design and construction planning. 3)Site staff to wear appropriate PPE.	M	L	T	Construction contractor/Designer/Client	Construction contractor prior to and during construction works. Designer to design GI. Client to enable access for ground investigation.
2	Obstructions encountered during construction. Potential old foundation obstructions are likely present in the north of the site in the location of the former Tanpit House.	* Delays in the construction progress. * Leading to delay in overall construction programme.	M	M	T	T/C/R	1) Carry out ground investigation to identify presence and nature of any obstructions. 2) Risk mitigation strategy for obstructions to be developed based on proposed construction methodology and technology to be deployed.	M	L	T	Construction contractor	Construction contractor during planning of works
3	Unforeseen ground conditions. The geology on site is thought to comprise Alluvium, Made Ground, Shirdley Hill Sand and Topsoil as a thin (<2m) superficial deposit above sandstone bedrock. However, the thicknesses and distribution of these deposits are unknown.	* Inappropriate design and construction methodologies. * Impact on suitability and stability of design. * Impact on cost and project programme.	VH	M	S	HSTCR	1) Carry out ground investigation to further understand the ground conditions. 2) Construction Control - logging of excavation and pile arisings during works.	VH	VL	T	Designer Construction contractor	Designer prior to detail design. Construction contractor during planning of works and construction.
4	Compressible ground conditions - could be present in the alluvium/Shirdley Hill Sand Formation/made ground	* Settlement of the car park and other hardstanding areas * Additional reinternment/maintenance costs.	M	L	T	HSTCR	1) Carry out ground investigation to further understand the ground conditions. 2) Construction Control - logging of excavation and pile arisings during works.	M	VL	N	Designer Construction contractor	Designer prior to detail design. Construction contractor during planning of works and construction.
5	Incomplete knowledge of groundwater conditions at the site.	* Inaccurate assumptions for design. * Leading to damage and instability issues for structures.	VH	M	S	HSTCR	1) Install groundwater monitoring installations. 2) Long term monitoring of standpipes. 3) Design to make conservative groundwater assumptions.	VH	VL	T	Designer	Designer to make appropriate assumptions in detailed design.
6	Existing Services. Potential for underground services to cross the site.	* Damage to services/culvert. * Possible damage to rig/construction equipment through encountering a void. * Loss of concrete into drain. * Delay to construction programme.	M	M	T	TCRE	1) All available services information/drawings for the site area to be passed to the Construction Contractor by designer in pre-construction information. 2) Service diversion to be designed where required. 3) Construction Contractor to satisfy himself as to the adequacy of available information and make additional enquires as necessary. 4) Appropriate methods to be utilised whist constructing the diversion and the main proposed works.	M	VL	N	Designer/Construction Contractor	Designer prior to construction. Construction Contractor prior to and during construction works.
7	Aggressive Ground. Site soils, including the Made Ground, have the potential to be aggressive to concrete and steel.	* Degradation of foundations and pile caps, leading to long term repairs and maintenance.	H	M	S	TCR	1) Results of chemical test suites to be reviewed to determine appropriate concrete class to use.	H	VL	N	Designer	Designer at detailed design stage.
8	Instability in excavations due to the presence of loose peat and sand in the Shirdley Hill Sand Formation	* Potential collapse of excavations * Risk to site workers and future users.	H	M	S	HSTCR	1) Carry out ground investigation to further understand the ground conditions. 2) Construction Control - logging of excavation and pile arisings during works.	H	L	T	Designer Construction contractor	Designer prior to detail design. Construction contractor during planning of works and construction.

GEOTECHNICAL RISK REGISTER

Date: 01/07/2018 **Project Phase: GRIP 3A** **Project: Skelmersdale Rail Link - Headbolt Lane Station**

Risk Assessment carried out by: Kevin Wells

Ref No.	Threat	Consequences	IMPACT	LIKELIHOOD	RISK	RISK TYPE	Potential Risk Control Measures / Actions	IMPACT	LIKELIHOOD	RESIDUAL RISK	OWNER	Action (by whom and when)
9	Ground gases. There is a potential for ground gas generation from any Made Ground and peat deposits within the Shirdley Hill Sand Formation on Site.	* Ground gas from Made Ground could cause the development of an explosive or asphyxiation hazard. * Risk to site workers and future users.	VH	M	S	HSTCR	1) GI to identify the nature and thickness of Made Ground and other strata that may produce hazardous gases. 2) Ground Investigation to include ground gas monitoring to determine the levels of ground gas on site. 3) Reports to consider appropriate mitigations measures to protect future users.	VH	VL	T	Designer/Client	Designer to design GI to include contamination testing. Contamination land specialist to review ground investigation results and produce reports as required.

NOTES: RISK TYPES; HS = Health & Safety, T = Time, C = Cost, R = Reputation, E = Environment
Risk level: I = Intolerable, S = Significant, T = Tolerable, N = Negligible

		Likelihood				
		Very Low	Low	Medium	High	Very High
Impact	Very Low	N	N	N	N	T
	Low	N	N	T	T	S
	Medium	N	T	T	S	S
	High	N	T	S	S	I
	Very High	T	S	S	I	I

5 Conclusion and Recommendations

5.1 Geotechnical

The information summarised in Section 2, indicates that ground conditions on the site comprise a thin (<2m) layer of superficial deposits above sandstone bedrock of the Wilmslow Sandstone Formation. Made ground is anticipated beneath the railway line and the mound to the north of site. The Shirdley Hill Sand Formation is indicated to be present in the extreme east of the site, and superficial deposits in the rest of the site are expected to comprise topsoil over clay and/or sand, alluvium or Made Ground.

Although no Made Ground is shown to be present on the site it is to be expected in the railway embankment in the south of the site, the road embankment in the east of the site, and the former quarry and Tanpit House in the north of the site. The ground level in the north of the site is also indicated to have changed in the past possibly as a result of Made Ground material being placed on the site during the construction of the surrounding residential developments and/or from the demolition of Tanpit House.

Several potential geotechnical risks have been identified to the proposed development as detailed in Table 9; these include Made Ground of varying thickness and material properties, the possibility of subsurface obstructions such as foundations in the area of Tanpit House, and the variable topography of the site that will necessitate cut/fill requirements to produce a level platform for construction of the station development and the river will need culverting. Despite these risks however, the overall geotechnical risk for the site is considered to be low.

It is recommended that suitable ground investigation works are undertaken across the site to define the ground conditions for foundation design, to assess the suitability of the near surface strata for reuse in earthworks, cut/fill design, and to assess the geotechnical constraints highlighted in this desk study.

5.2 Geo-Environmental

The initial qualitative contamination risk assessment has shown that there are feasible contamination linkages present which may pose a low to moderate risk to human health (future end users, construction works and adjacent site users) and controlled waters (Kirkby Brook and Wilmslow Sandstone Principal Aquifer). At present the risks relate predominantly from the potential for localised areas of Made Ground associated with the former quarry and house in the north of the site, and the railway on the southern boundary of the site which may be potentially contaminated.

The most significant risk is considered to apply to human health and controlled waters through human uptake pathways, overland flow of surface water, and horizontal and vertical migration of contaminants in the soil. The actual level of risk should be reviewed once a site specific geo-environmental ground investigation has taken place.

Where contamination is encountered within site, soils which are required to be disposed of offsite, may be classified as potentially hazardous. In order to dispose of this material there may be a requirement for treatment prior to disposal resulting in increased costs.

Potential geo-environment constraints to the development have been identified and are listed in Table 5.

5.3 Recommendations

5.3.1 Walkover Survey

A walkover survey was not possible during the desk study phase however, it is highly recommended that a walkover is carried out prior to the ground investigation. The walkover would primarily serve two purposes:

1. Field reconnaissance to record any visible evidence of features that are not present from maps and aerial photographs such as suspicious depressions, colour and condition of standing water etc.
2. Assist in scoping of the ground investigation.

5.3.2 Ground Investigation

5.3.2.1 Objectives

The ground investigation is required in order to validate the geotechnical and geo-environmental risks and identify remedial requirements. It is recommended that an intrusive ground investigation be undertaken to assess the existing ground and groundwater conditions present beneath the site. Investigation works will enable the collection of geo-environmental samples for chemical and geotechnical testing which are required to inform both:

- A Geotechnical Report (GIR and GDR) for the site together with an appropriate foundation strategy; and
- A generic quantitative risk assessment (GQRA) and if required, detailed quantitative risk assessment (DQRA) facilitating the completion of a robust Remediation Strategy and Materials Management Plan.

The ground investigation and testing should be done in accordance with BS 5930, BS EN 1997-2, BS 10175 and BS 8576.

5.3.2.2 Techniques

Given the proposed development it is considered that an appropriate preliminary ground investigation scope will comprise a mixture of the following ground investigation techniques with associated geotechnical testing of the samples;

- Windowless Samples;
- Trial pits;
- Rotary Cored Boreholes; and
- Automatic Ballast Samplers.

In situ testing is likely to comprise standard penetration tests (SPT), plate load tests and soakaway tests. Groundwater/gas monitoring points will be required in some of the investigation locations with groundwater sampling.

5.3.2.3 Laboratory Testing

Geotechnical testing laboratory used should be UKAS accredited and is recommended to include, but not limited to classification, strength, compaction and compressibility testing.

The chemical testing laboratory used should be UKAS and MCerts accredited and all samples are to be accompanied by appropriate chain of custody documentation.

Testing of soils, soil leachates and groundwater are recommended to include, but not limited to the following:

- **Soils:** Metals and metalloids (to include lead and speciated chromium), Total Petroleum Hydrocarbons (Carbon Working Group banding), speciated PAHs, VOCs (where visual/olfactory evidence of hydrocarbons, otherwise on selected samples only to be advised by contamination specialist), MTBE, pH, soil organic matter (SOM), sulphate, asbestos screen.
- **Leachates**: Metals and metalloids (to include lead and speciated chromium), speciated PAHs, VOCs (where visual/olfactory evidence of hydrocarbons, otherwise on selected samples only to be advised by contamination specialist), MTBE, pH, sulphate.
- **Groundwaters**: Metals and metalloids (to include lead and speciated chromium), Total Petroleum Hydrocarbons (Carbon Working Group banding), speciated PAHs, VOCs (where visual/olfactory evidence of hydrocarbons, otherwise on selected samples only to be advised by contamination specialist), MTBE, PCBs on samples within close proximity to substations and transformers (screen then speciated if detected), pH, sulphate, carbonate hardness.

Chemical testing in accordance with the aforementioned suites will enable detailed contamination risk of the site to be determined and allow an assessment of the chemical suitability for reuse of site won materials or whether off-site disposal will be required.

The soil testing suite identified above incorporates a standard soil asbestos screen. Any samples taken during the ground investigation works which are found to be positive will be further quantified to determine concentrations in soil through standard testing procedures. Quantification testing will assist in a risk assessment to be undertaken by a suitably qualified asbestos specialist, and will also assist in defining remedial requirements. The requirements for any additional asbestos testing should be defined by a specialist asbestos advisor prior to remedial and/or construction works.

Chemical testing of soil samples, in accordance with UK Water Industry Research (UKWIR) publication 10/WM/03/21 “Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites” is recommended once the proposed route of any potable water supply pipes has been finalised. This should include the appropriate in situ tests (pH, conductivity) and soils testing to include speciated TPHs, VOCs and SVOCs where potable supply pipes are to be laid.

5.3.2.4 Groundwater and Gas Monitoring

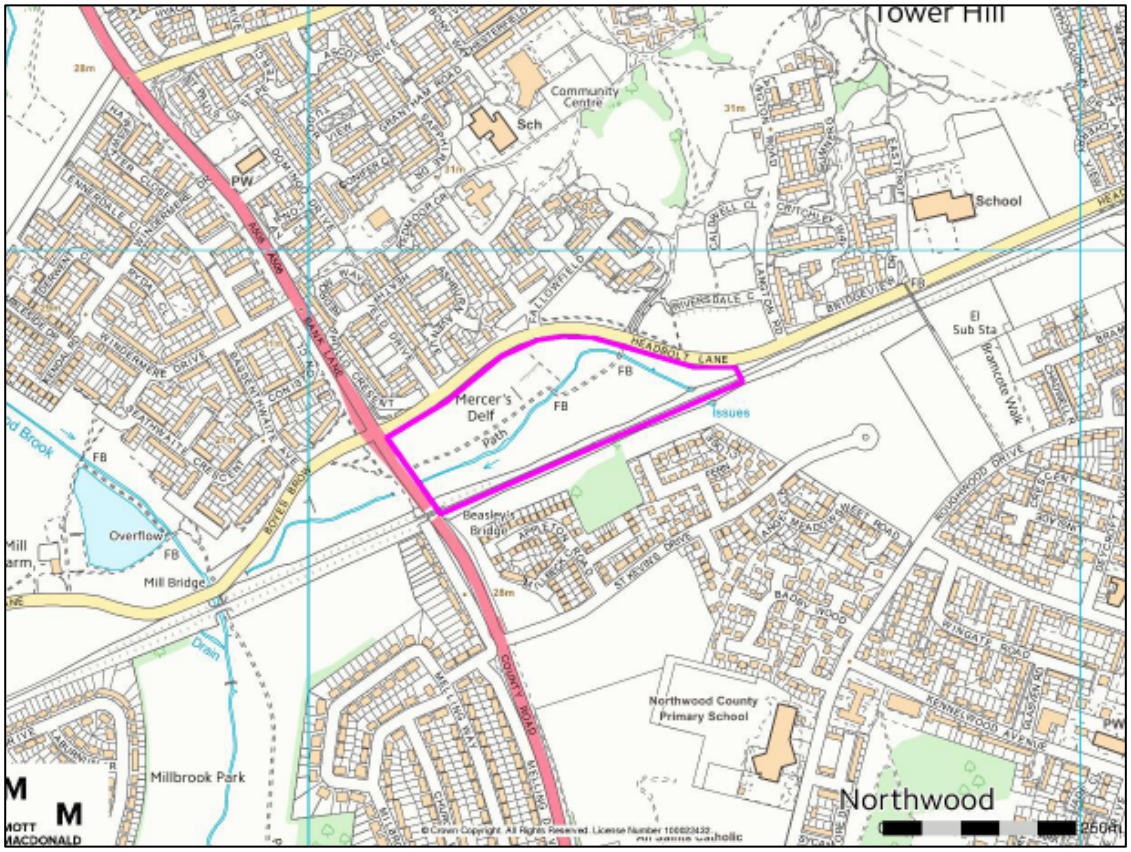
Following completion of ground investigation works, a programme of groundwater and gas monitoring is recommended to determine the groundwater and gassing regime together with a minimum of two rounds of groundwater sampling. Groundwater should only be sampled following a full (3x well volume) purge. Ground gas monitoring should include carbon dioxide, methane, oxygen, carbon monoxide and hydrogen sulphide concentrations along with atmospheric pressure and flow rates. At least one round should be completed at a time of falling atmospheric pressure. Up to date comprehensive ground gas monitoring will inform whether any gas mitigation measures are required within the proposed building design.

Appendices

A. Drawings 29
B. Detailed Review of Historical Mapping 32
C. Historical Borehole Records 33
D. Envirocheck Report 34
E. Network Rail Earthwork Inspection Records 35
F. Qualitative Risk Assessment Methodology 36

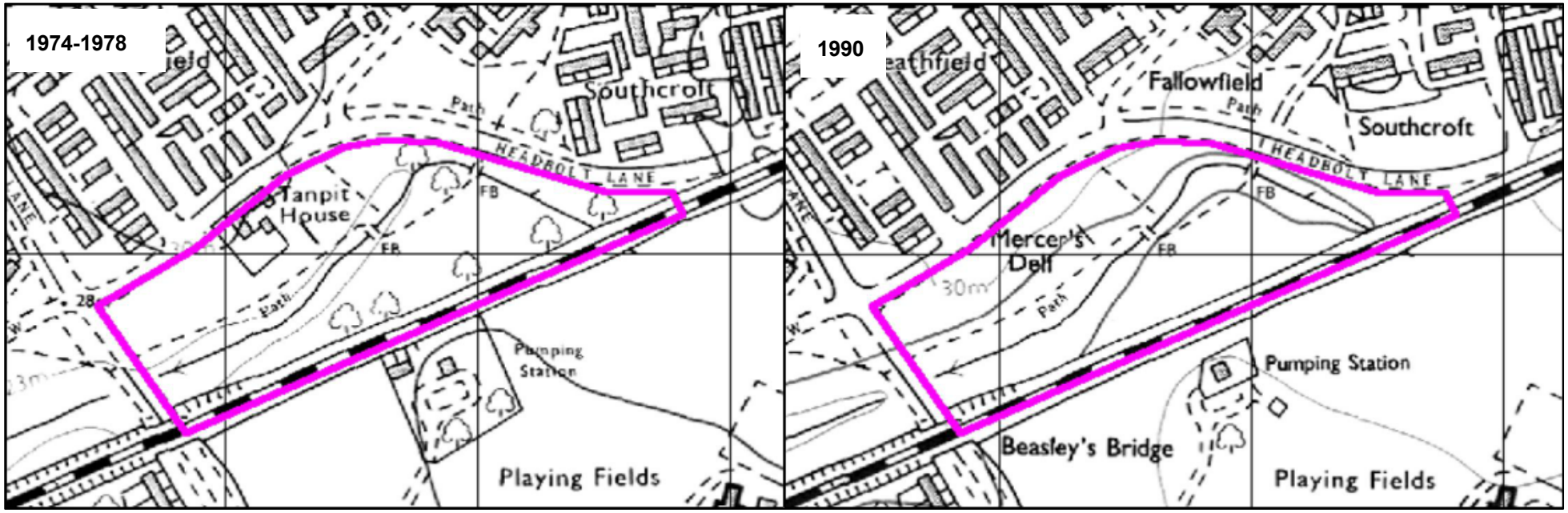
A. Drawings

Figure A1: Site Location Plan



Source: Envirocheck, (2018)

Figure A2: Historical Map Extract Showing Change in Ground Levels



Source: Envirocheck, (2018)

SJ40SW12

Former watercourse identified on historical maps prior to 1927

Culvert discharge to Kirkby Brook

Kirkby Brook culverted beneath railway

Liverpool to Wigan
Railway Line (WKL2)

SJ49NW1

SJ49NW10

Former route of Kirkby Book pre-1962

Railway constructed on embankment
on approach to the crossing of A506

Beasley's Bridge

Kirkby Brook

Kirkby Brook

0 50 100 Meters

Notes

This drawing should be read in conjunction with the Headbolt Lane Station Geo-Environmental Desk Study Ref. 394539-GEO2-A.

Key to symbols

SJ49NW10 Location of Historical BGS Boreholes

Approximate location of former Mercer's Delf Sandstone Quarry Lancashire and Furness Plan, 1850, 1:10,560

Approximate Location of former Tanpit House Farm Steading Lancashire & Furness Plan, 1908, 1:2,500

Approximate extent of Made Ground expected on site from review of historical mapping (Envirocheck, 2018).

Location of railway embankments

Former watercourses/strean channels

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	24/08/2018	KW	First Issue	KM	CH

MOTT MACDONALD

Mott MacDonald House
Spring Bank House
Manchester
WA14 1ES
United Kingdom
T +44 (0)161 926 4000
F -
W mottmac.com

Client: NetworkRail

Title: Headbolt Lane Station
Geo-Environmental Constraints Plan

Designed	K Wells		Eng check	K McInnes	
Drawn	K Wells		Coordination	K McInnes	
Dwg check	K McInnes		Approved	C Hurst	

Scale at A1	Status	Rev	Securily
1:1250	PRE	P1	STD

Drawing Number: 394359-HBL-GEO-01

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C:\Users\wel78498\Mott MacDonald\394359 - Skelmersdale Station GRIP3 - 07. GEOTECHNICAL (394359GE)\Headbolt Lane Desk Study\Drawings\Headbolt Lane Plan.dwg Aug 24, 2018 - 1:39PM WEL78498

B. Detailed Review of Historical Mapping

Table 10: Review of historical maps around the proposed Headbolt Lane Station

Year	OS Map Scale	On Site	Off Site
1850	1:10,560	• Land comprises agricultural land. • A railway line is aligned along the southern boundary of the site, that is indicated to be located on embankment in the west of the site. • A stream is culverted under the railway line in the east of the site. Towards the north it joins Rigby's Brook and flows out of the site towards the south-western corner of the site. • A building is present in the centre north of the site, labelled Tanpit House. • A small sandstone quarry, Mercer's Delf, is present to the north of Rigby's Brook in the centre of the site.	• A road is present on the northern and western boundaries of the site. • An Inn and a blacksmiths is located 100m northeast of the site. • Some cottages and houses are present along the road on the western boundary of the site. • A large area of woodland is situated 250m to the south of the site call 'Old Rough'
1893 1894	1:2,500 1:10,560	• Quarry no longer indicated to be present.	• A pumping station is located 50m south of the site. • Road on northern boundary is labelled Headbolt Lane.
1908	1:2,500	• Change in layout of Tanpit House	• No significant change
1909 1927 1928 1955	1:10,560 1:2,500 1:10,560 1:10,000	• No significant change	• No significant change
1962 – 1973 1962 - 1975	1:2,500 1:2,500	• No significant change	• Additional houses built to the south of the site along Bank Lane to the south of the railway line. • School built to the south in the location of 'Old Rough' woodland.
1966-1972	1:2,500	• The stream has been realigned, away from railway embankment, in west of the site. • Footpath is indicated to cross centre of the site east-west	• Headbolt Lane has been re-aligned to follow the northern and eastern boundaries of the site. • Significant housing developments have been constructed immediately to north and east of the site.
1974-1978	1:10,000	• No significant change	• No significant change
1987	1:1,250	• The stream is now called Kirkby Brook.	• The southern section of Bank Lane (called County Road in this location) changed alignment and created a by-pass for the houses along this section of County Road.
1990	1:10,000	• Tanpit House no longer indicated on the map. • Crest of hill on northern site boundary has indicated to have moved southwards. Change in ground levels.	• No significant change
1993 1993 – 1994 1996	1:2,500 1:2,500	• No significant change	• No significant change
1999	1:10,000	• No significant change	• Pumping Station is no longer indicated to be present.
2006 2018	1:10,000	• No significant change	• No significant change

Source: Envirocheck, (2018)

C. Historical Borehole Records

NOTE 4142 0039

SD 40 SW/12

Test BORING at Headfield Road, Cobham Avenue

Grid map | Lin. map No. | Lin. map Ref. | Grid map Ref. | Map No.

Made by | Date

Date | Ref. | Date | Ref.

Commenced by Southport & W. Lancs Water Board

Height above Ordnance Datum 108 ft. | Test level of water 53 ft.

Field

Quality (with copy of its lines on separate sheet)

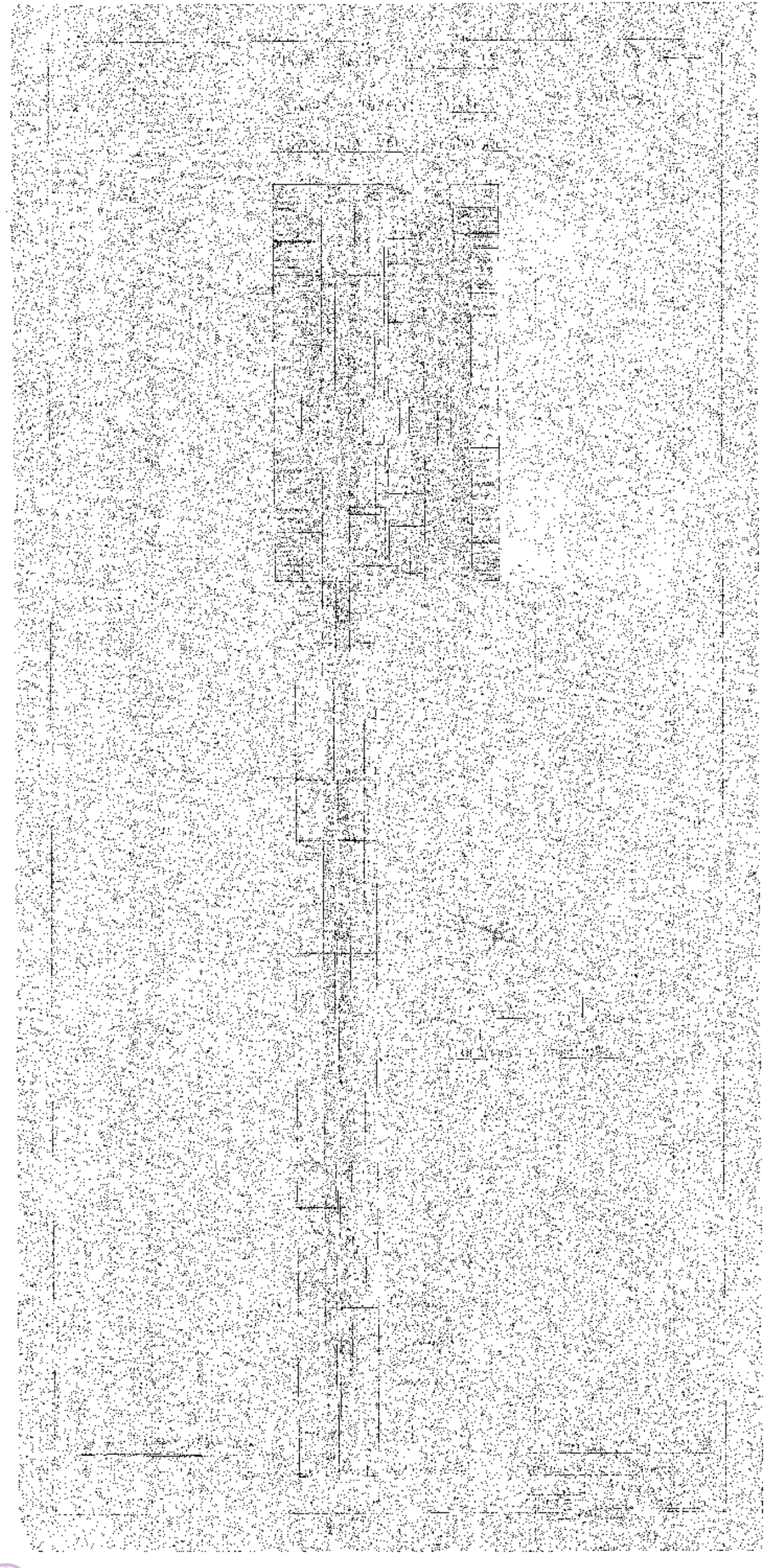
GEOLOGICAL FORMATION	NATURE OF STRATA	THICKNESS Ft.	THICKNESS Inches	DEPTH Ft.	DEPTH Inches
	Soil	1	6	1	6
	Sand	4	-	5	6
	Clay		6	6	-
	Soft rock	4	-	10	-
	Red rock	55	-	65	-

Copied from tracing supplied to Dale Board by W. Rose & Son Engineers, 5 Victoria St. S.W.1.

SD 40 SW/12			
0	46	0	46
1	22	1	68
0	15	1	83
1	22	3	05
16	76	19	81

Geological Survey and Museum
Exhibition Street, London S.W.1

[illegible]



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[SJ49NW BJ 1 .]

NGR (A) SJ 4137 9970 ② 84/39 SJ49/4CB

WELL BORING at Kirkby (Pilot well) Sheet 84/39

Geol. map 1 in. to mile Scale 100 N.W.

Made by Date 1889

Sunk Ft. Total Ft.

Superintended by Prof P F Kendall — pilot well

Height above Ordnance Datum Rest water in St Helens Corp W W

Yield

Quality (with copy of analysis on separate sheet)

GEOLOGICAL Classification	STRATA	THICKNESS Feet	THICKNESS Inches	DEPTHS Feet	DEPTHS Inches
DRIFT	Soil	1	6	1	6
	Clay	3	6	5	–
	Red Sand	2	–	7	–
	Sandstone	6	3	13	3
TRIASSIC	Yellow " marly	2	3	15	6
	Sandy marl	1	3	17	9
	Red Sandstone	1	3	19	–
BUNTER Sst	" with pebbles	11	–	30	–
	" and small pebbles	5	–	35	–
	"	–	6	35	6
	" with pebbles	22	10	58	4
	" "	40	–	98	4
	" very few pebbles	25	–	123	4
	" with sands white	5	–	128	4
	" few pebbles	7	–	135	4
	" no pebbles	7	–	142	4
	" with pebbles	8	–	150	4
	More water met with				
	Variegated sandstone	3	–	153	4
	Sandstone with pebbles	3	–	156	4

54. (84/39). Kirkby: Kirkby Pumping Station of School Lane.
Public supply for St. Helens Corporation.
(a) 250 yds. E. of railway bridge.
Pilot Well. Surface 101 O.D. Shaft 150 x 11; bore 150-360½ x 24 in. to 18 in. Heading: 31 x 9 x 6, N.N.W. to Well (b), floor 144.
Lining tubes: none. Water struck at 32. R.W.L. 32.
(b) 10 yds. N. 30 W. of (a).
Pump Well. Surface 101 O.D. Shaft 150 x 10. Heading: see under (a). Lining tubes: none. Water struck at 32. R.W.L. 32.
Suction 150. Yield 50,000 g.p.h. 15 hrs.p.day. Hardness: 14½.
Anal. (1890).

(a)

DRIFT	Drift	Sand & clay ...	7		7
	Bunter (?Upper Mottled Sst.)	Red sandstone with thin earl band ...	9		16
		Red sandstone with pebbles	39		55
		Red sandstone ...	40		95
TRIASSIC	Bunter (Pebble Beds) 344½	Red sandstone with occasional pebbles ...	65		160
		Red sandstone ...	24		184
		Red sandstone with pebbles	108½		292½
		Red sandstone ...	68		360½

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SJ 4155 9971

SJ49/40B

4/39B

WELL BORING at Kirkley (Loan) Lancs

Grid Ref. (In map Sheet) Date 100 NW

Made by Date 1885

Sunk Dia. Diam. Depth

Communicated by Prof. P F Kendall

Height above Ordnance Datum Rest level of water

Yield

Quality (with copy of analysis on separate sheet)

Geological Formation	Nature of Strata	Thickness Feet	Thickness Inches	Depth Feet	Depth Inches
	Soil	1	6	1	6
DRIFT	Clay	4	-	5	6
	Red Sand	2	6	8	-
	Red Sandstone	2	-	10	-
TRIASSIC	Yellow "	2	6	12	6
	Red "	4	-	16	6
(BUNTER	" " coarse	3	-	19	6
	Mottled sandstone	3	-	22	6
SST)	Red sandstone with patches of white and pebbles	5	6	28	-
	Greystone with pebbles	6	6	34	6
	Red sandstone with pebbles	11	6	46	-
	" " "	51	-	97	-
	" few pebbles	18	-	115	-
	" with white patches	3	-	118	-
	" few pebbles	10	-	128	-
	"	7	-	135	-
	with pebbles	9		144	
	variegated	3	-	147	
	few pebbles	3	-	150	

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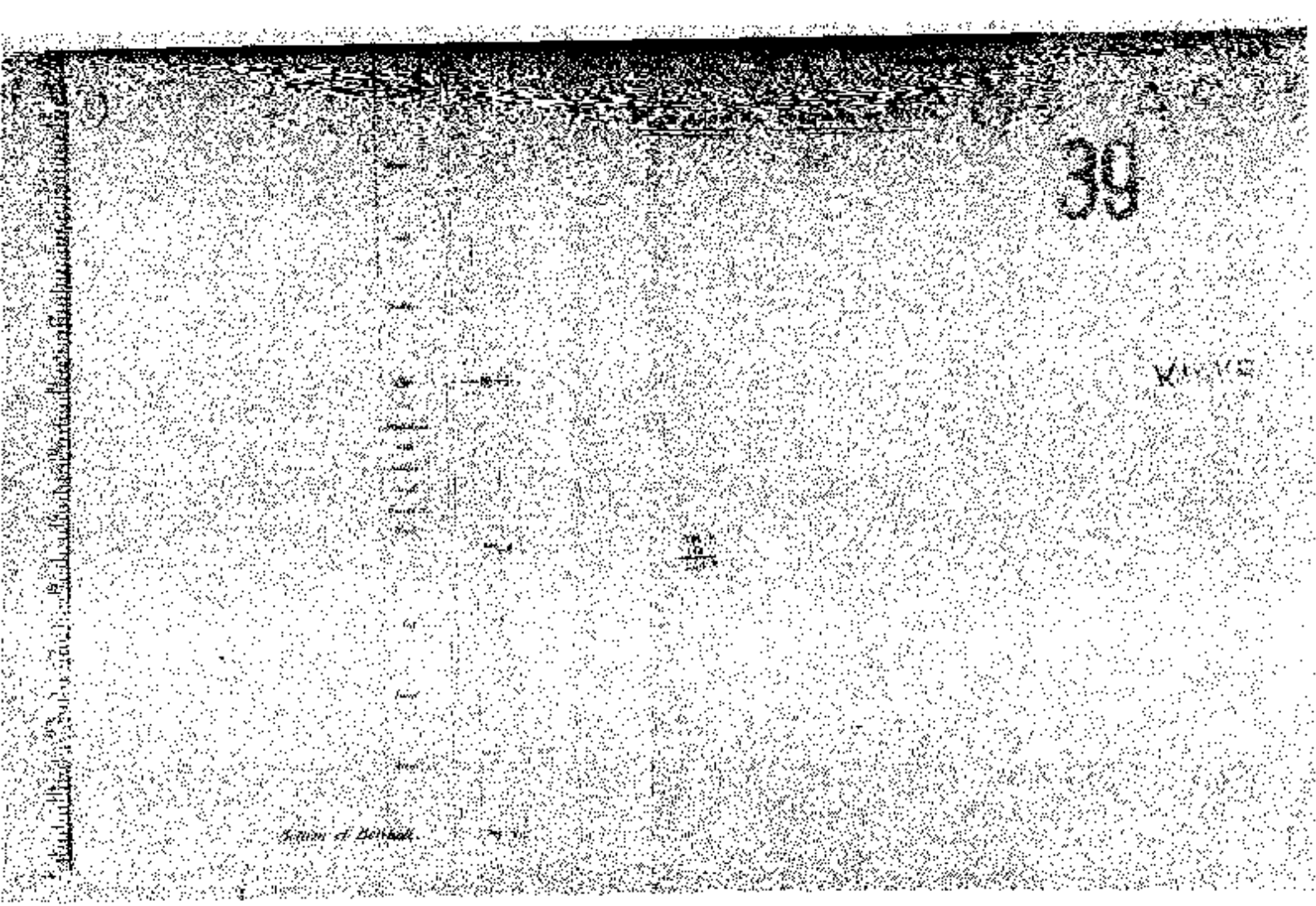

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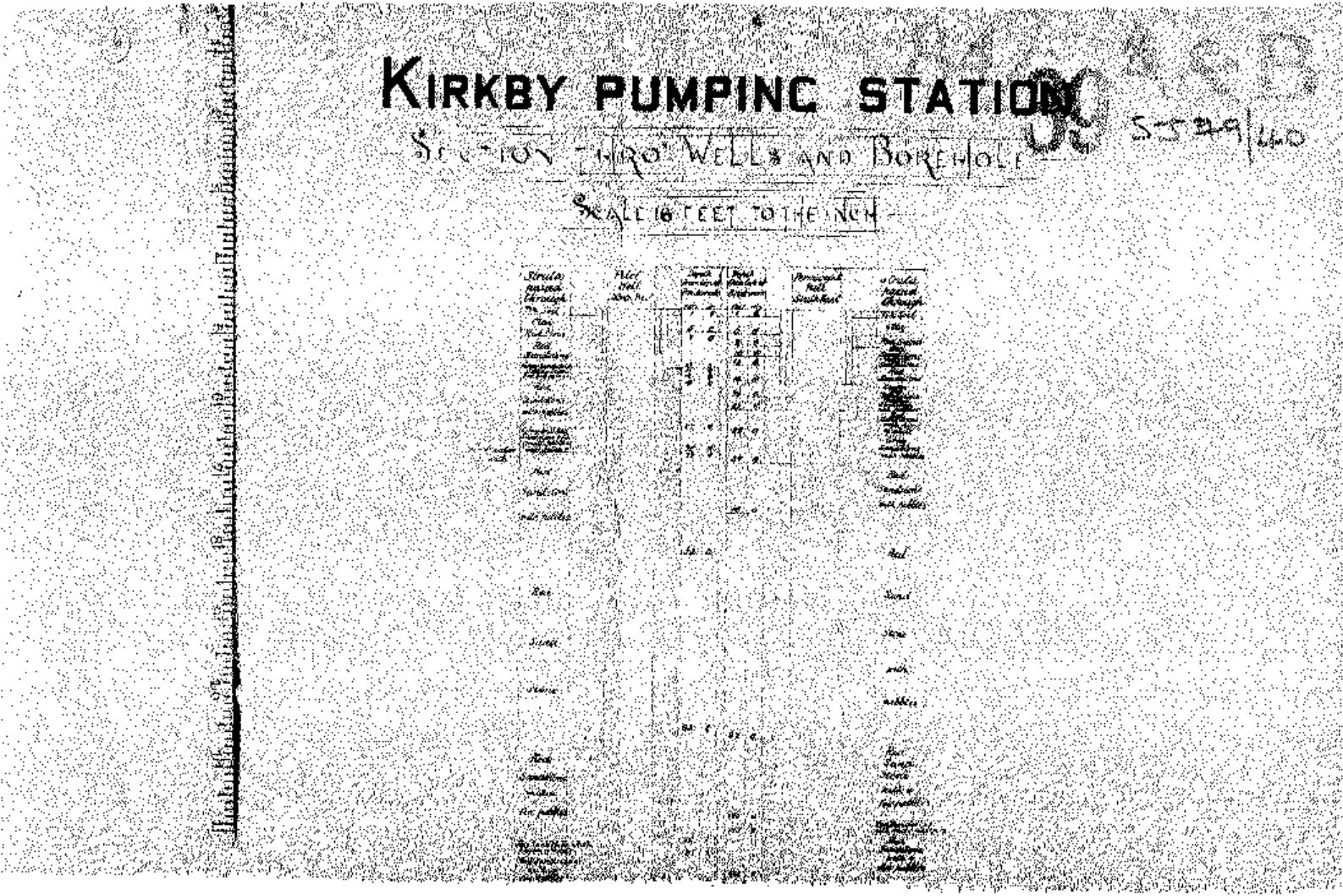
KIRKBY PUMPING STATION

SJ 39/40

SECTION THRO' WELLS AND BOREHOLE

SCALE 10 FEET TO THE INCH



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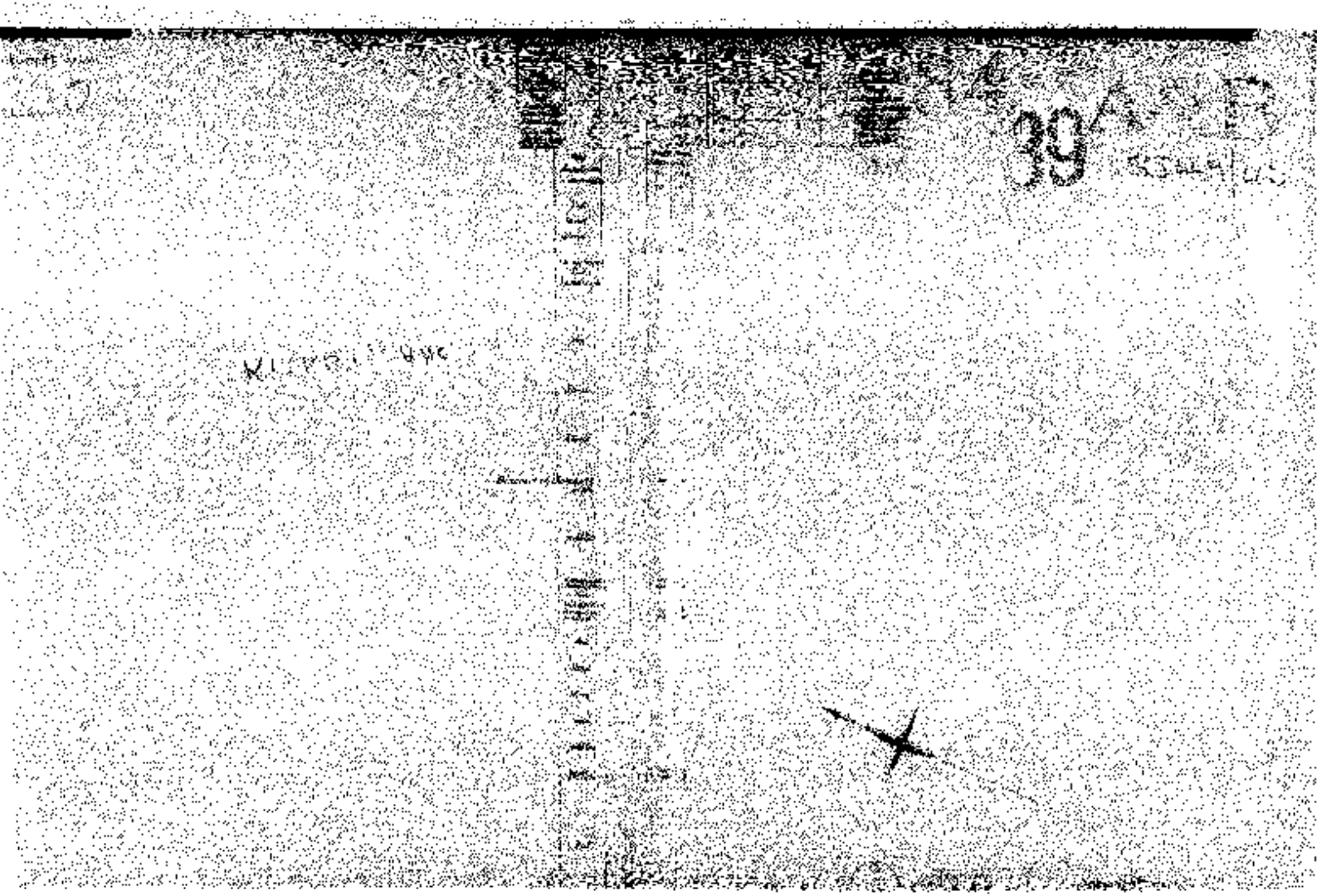

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WELL BORING at Kirkby County Lancs

Geol. map 1 in. map New Series 6 in. map 10 N

Made by Date 1885

Sunk feet. Bored feet.

Communicated by Prof. P. F. Kendall. Permanent Pilot Well. St Helens Corporation W/W

Height above Ordnance Datum Rest level of water

Yield

Quality (with copy of analysis on separate sheet)

SJ 49 NW/1

County

6" Quarter Sheet

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	Inches.	DEPTH. Feet.	Inches.	THICKNESS Thickness metric		DEPTH. metric	
	Soil	1	6	[illegible]	6	0	46	0	46
	Clay	4	—	[illegible]	6	1	22	1	68
	Red Sand	2	6	8	[illegible]	0	76	2	44
	Red Sandstone	2	—	10	[illegible]	0	61	3	05
	Yellow "	2	6	12	6	0	76	3	81
	Red "	4	—	16	6	1	22	5	03
	" " Coarse	3	—	19	6	0	91	5	94
	Mottled sandstone	3	—	22	6	0	92	6	86
	Red sandstone with patches of white and pebbles	5	6	28	[illegible]	1	67	8	53
	Graystone with pebbles.	6	6	34	[illegible]	1	99	10	52
	Red sandstone with pebbles	11	6	46	—	3	50	14	02
	" " " "	51	—	97	—	15	55	29	57
	" " few pebbles.	18	—	115	—	5	48	35	05
	" " with white patches	3	—	118	—	0	92	35	97
	" " few pebbles	10	—	128	—	3	04	39	01
	" "	7	—	135	—	2	14	41	15
	" " with pebbles	9	—	144	—	2	74	43	89
	" " variegated	3	—	147	—	0	92	44	81
	" " few pebbles.	3	—	150	—	0	91	45	72

[redacted]

GEOLOGICAL SURVEY AND MUSEUM,
JERMYN STREET, LONDON S.W. 1.

(B10619). Wt. 15824—S123. 2500. 11/25. Gp. 160. O.A.

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SECTION OF Well AT Kirkby, Liverpool 100 SW

One inch Map (NS) 95 4 Six-inch Map

Made by Date 1885

Communicated by Prof Kendall (+ [illegible])

HEIGHT ABOVE O.D. WATER LEVEL

YIELD

SJ49NW 1

	THICKNESS. Feet.	Inches.	DEPTH. Feet.	Inches.
Soil	1	6	1	6
Clay	4		5	6
Red Sand	2	6	8	
Red Sandstone	2	-	10	-
Yellow do	2	6	12	6
Red Sandstone	4		16	6
do Coarse	3	-	19	6
Mottled Sandstone	3	-	22	6
Red Sandstone with patches of white pebbles	5	6	28	-
Greystone with pebbles.	6	6	34	6
Red Sandstone with pebbles	11	6	46	-
do	51	-	97	-
do few pebbles	18	-	115	-
Red Sandstone with white patches	3		118	-
Red Sandstone few pebbles.	10	-	128	-
Red Sandstone	7		135	-
do with pebbles.	9	-	144	-
do variegated	3	-	147	
do few pebbles	3	-	150	-

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1 (2).

WELL BORING at Kirkby (Pilot Well) County Lancs 84/39

Geol. map 1 in. map New Series 6 in. map 100 NW a

Made by Date 1885

Sunk feet. above feet.

Communicated by Prof. P. F. Kendall.

Height above Ordnance Datum Rest level of water

Yield

Quality (with copy of analysis on separate sheet)

SJ 49 NW 1 A

Prof Pilot Well
St Helens Corp.
W W

(5)

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
	Soil	1	6	1	6
	Clay	3	6	5	—
	Red Sand	2	—	7	—
	" Sandstone	6	3	13	3
	Yellow " , marly		3	13	6
	Sandy marl	1	3	14	9
	Red Sandstone	1	3	16	—
	" " with pebbles.	11	—	27	—
	" " and small pebbles	5	—	32	—
	" " " " "	—	4	32	4
	" " with pebbles	22	10	55	2
	" " " "	40	—	95	2
	" " very few pebbles	25	—	120	2
	" " with bands, white	3	—	123	2
	" " few pebbles	7	—	130	2
	" " no pebbles	7	—	137	2
	" " with pebbles	8	—	145	2
	More water met with				
	Variegated sandstone	3	—	148	2
	Sandstone with pebbles	3	—	151	2

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(B10619). Wt. 15824—S123. 2500. 11/25. Gp. 160 O.A.

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WELL BORING at Kirkby

County Lancs

Geol. map

1 in. map New Series

6 in. map 100 NW

Made by

Date 1887

SJ 49 NW 1BA (5)

Communicated by Prof. P. F. Kendall.

Kirkby Park

Height above Ordnance Datum

Rest level of water

Yield

Pilot Well Boring

Quality (with copy of analysis on separate sheet)

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
	From the bottom of the well it rose 150 ft.				
144	Red Sandstone with pebbles	10	–	10	–
189	" " no pebbles	15	–	25	–
198	Close red sandstone	9	–	34	–
268	Red Sandstone and pebbles	70	–	104	–
268	Variegated stones	–	6	104	6
275	Sandstone	7	–	111	6
276	Variegated Stone	–	6	112	–
314	Red sandstone and pebbles	38	–	150	–
314	White sandstone	–	3	150	3
410	Red sandstone and pebbles.	102	–	252	3
416	Red marl		3	252	6
456	Red sandstone and pebbles	40	–	292	6
[illegible]	" " no pebbles	68	–	360	6

GEOLOGICAL SURVEY AND MUSEUM, JERMYN STREET, LONDON, S.W. 1.

(E10619). Wt. 16824—S123. 2500. 11/25. Gp. 160. O.A.

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C... out to m/c DG 12.8.64

SJ49/41

For Survey use only

N. 7399

84/39C

RECORD OF WELL (SHAFT OR BORE)

NGR (C) SJ 4138 9965

Licence No. 9123/76/191

EXACT SITE OF WELL

At KIRKBY, LANCASHIRE.

Town or Village KIRKBY

County LANCASHIRE. Six-inch quarter sheet LANCS. SHEET No. 100 NW/W

For ST. HELENS C.B. State whether owner, tenant, builder, contractor, consultant, etc.:— OWNER

Address (if different from above)

Level of ground surface above sea-level (O.D.) ft. If well-top is not at ground level, state how far above: below; ft.

SHAFT ft.; diameter ft.; Full details of headings (dimensions and directions)

BORE 502 ft.; diameter of bore: at top 30 ins.; at bottom 24 ins.

Full details of permanent lining tubes (position, length, diameter, plain, slotted etc.)

16'8½" OF 27"I.D. TUBES DOWN TO 16'8½" (WITHDRAWN), 69'7" OF 24"ID. TUBES DOWN TO 69'7".

Water struck at depths of NOT KNOWN ft. below well-top.

TEST CONDITIONS

Rest level of water ft. above/below well-top. Suction at ft. Yield on hours'/days' test pumping at galls. per with depression to ft. below well-top.

Recovery to rest-level in mins./hours Capacity of pump g.p.h. Date of measurements

NORMAL CONDITIONS

DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:

Make and/or type Motive power

Capacity gallons per hour. Suction at ft.

Amount pumped galls. per day. Estimated consumption galls. per week.

Well made by JOHN THOM LIMITED. Date of well 1956

Information from JOHN THOM LTD., CHADDOCK LANE, BOOTHSTOWN, WALKDEN.

ADDITIONAL NOTES

ANALYSIS (please attach copy if available) JOHN THOM LIMITED, DID NOT CARRY OUT A PUMPING TEST AT THE ABOVE SITE.

Sited by O on 6" Lancs: 100 · NW/W · 7.3.62.

LOG OF STRATA OVERLEAF.

Geological Survey and Museum, South Kensington, London, S.W.7.		Section 6. 8/3/62	Date Received 20.12.61	1" O.S. Map No.	Site marked on 1" Map ⊙	(use symbol) on 6" Map ⊙

(1527) D4574/W137583 12,000 8/51 JC&S G6659

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(For Survey use only) Geological Classification	NATURE OF STRATA If measurements start below ground surface, state how far ..	Thickness Feet ..	 Inches ..	Depth Feet	 Inches
Drift.	Sandy soil	2	0	2	0
	Clay	2	0	4	0
Triassic	Sandstone	12	0	16	0
	Marl	1	0	17	0
	Sandstone	3	0	20	0
	Red sandstone	7	0	27	0
	Sandstone	57	4	84	4
	" and pebbles	175	2	259	6
Bunter	Sandstone pebbles and marl pellets	4	6	264	0
	Sandstones and pebbles	57	4	321	4
Sst.	Red sandstone	15	8	337	0
	Sandstone & pebbles	6	0	343	0
	Sandstone marl pellets	7	5	350	5
	Sandstone and pebbles	51	0	401	5
	Sandstone	13	7	415	0
	" and pebbles	3	0	418	0
	Sandstone	25	0	443	0
	Marly sandstone	3	0	446	0
	Sandstone	56	0	502	0

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PLAN ANNEXED TO LICENCE ISSUED
UNDER SECTION 14 OF THE WATER ACT 1945

TO

ON IN RESPECT OF

AT

Ministry of Housing and Local Government
Reference No.

SITE OF
LICENCED WORK

L.8.

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[SJ49NW BJ 10 .]

PLAN ANNEXED TO LICENCE ISSUED UNDER SECTION 14 OF THE WATER ACT 1945

TO The Council of the County Borough of St Helens.

ON 18 JU 1954 IN RESPECT OF

Abstracting water by pumping from a lower level to restore the former yield from the existing works.

AT Kirkby. SJ49/41

Ministry of Housing and Local Government
Reference No 91222/16/191.

SITE OF LICENCED WORK

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Mon. 41 # 4968 18 Sheet

SJ49NW10

SJ 49 NW 10

119321. Wt.30370/0370 10,000 9/39 A.& E.W.Ltd. Gp.685

RECORD OF SHAFT OR BORE FOR MINERALS

Co...

6" Quarter Sheet

1" N.S. Geol. Map

1" O.S. Geol. Map

Whether Confidential

Name and Number of Shaft or Bore given by Geological Survey: Kirkby Pumping Station (1956)

Name and Number given by owner (if different from above):

Town or Village: New Kirkby Date of sinking

Exact site: In corner of P.S. yard in trees

A sketch-map or tracing from a large-scale map is desirable.

Purpose for which made: Water

Level at which bore commenced relative to O.D. If not down bore, state if horizontal or up

Made by: John Thom Ltd for Messrs

Information from: Cores. Date received

Specimens: Dip of strata

Geological Classification	Description	Thickness Metres	Thickness Ft		Depth Metres	Depth Ft	
	Soil & red sand	3.05	10		3.05	10	
	Chocolate to red soft mud	0.61	2		3.66	12	
	Red Sand	0.61	2		4.27	14	
	Massive reddish brown sst	3.05	10		7.32	24	
	Sandstone rather broken	0.61	2		7.93	26	
	Sandstone reddish with frequent small quartzite pebbles	10.66	35		18.59	61	
	Sandstone with very frequent pebbles almost a band of pebbles	1.22	4		19.81	65	
Brunter Sst Pebble Beds to 319'	Sandstone dark red to brown, medium grained with pebbles up to one inch in diameter, here & there	12.80	42		32.61	107	
	Rather yellowish sandstone	0.03		3	32.69	107	3
	Sandstone light red with occ. pebbles, frequent from 130 onward	8.46	27	9	41.15	135	0
	Sand only	1.22	4	0	42.37	139	0
	Sandstone with pebbles	6.09	20	0	48.46	159	0
	Red Sandstone with bands of quartzite quartz & andesite pebbles	3.05	10	0	51.51	169	0
	Sandstone massive red with pebbles also red mudstone nodules & pellets here and there	9.15	20		60.66	199	
	Sandstone mottled light yellow in bands	0.45	1	6	61.11	200	6
	Sandstone red with profuse pebbles, mudstone lenses, inclusions with halves around	0.54	1	9	61.65	202	3
	Sandstone yellow	0.07		3	61.72	202	6
	Sandstone reddish with very frequent pebbles in places	14.18	46	6	75.90	249	0
	The same	3.04	10	0	78.94	259	0
	Sandstone with pebbles of various colours & some yellow banding	3.05	10	0	81.99	269	
	Sandstone red with occ to rare pebbles showing and a 9" yellow sst band at 276 ft, occ other yellow bands, false bedding	12.19	40	0	94.18	309	

Geological Survey and Museum,
South Kensington,
London, S.W.7.

G.S.M. Office File No.	Site marked on 6" Map by	Site marked on 1" Map by

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(2781) *Dd0586/Wt64575 6,000 4/55 JC&S Gp669 Sheet 19

SJ49NW 10

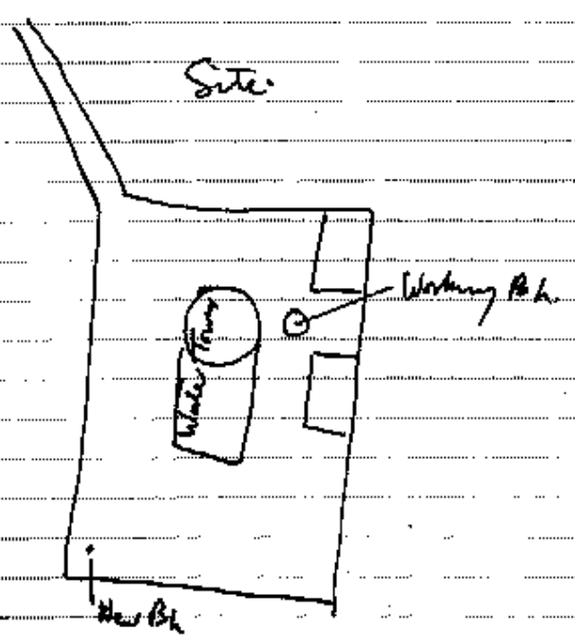
Name and Number of Shaft or Bore given by Geological Survey: Kirkby Pumping Station BL (1956)

County

6" Quarter Sheet

Geological Classification	Description	Thickness			Depth		
					94.18	309	
Base of P. Beds	Sandstone red with pebbles	3.05	10		97.23	319	
	Sandstone red showing current bedding 6" yellow sst band at 341 ft 6 and at 347 ft 6	9.45	31		106.68	350	
Lower Mottled Sst	Sandstone red	0.46	1	6	107.14	351	6
	Sandstone yellow	0.15		6	107.29	352	0
	Sandstone red continues, fine to medium grained but massive in texture with occasional bands of yellow sandstone occ mudstone nodules, and jointing from 409 – 419	29.11	95	6	136.40	447	6
	Mudstone chocolate	0.23		9	136.63	448	3
	Sandstone pale to red, medium grained to fine grained, with occasional coarser bands but no pebbles. Some ripple bedding seen here and there	16.38	53	9	153.01	502	
	Bottom of hole.						

NB When the boring reached 300' drilling water found its way into the working well polluting it temporarily.



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RECORD OF WELL (SHAFT OR BORE)

Not Safety Use only
N. 7399

84/9 C

Licence No. 91222/16/191

EXACT SITE OF WELL

At KIRKBY, LANCASHIRE.

Town or Village KIRKBY

County LANCASHIRE. Six-inch quarter sheet LANCS. SHEET No. 100 NW/w

For ST. HELENS C.B. State whether owner, tenant, builder, contractor, consultant, etc.:— OWNER

Address (if different from above)

Level of ground surface above sea-level (O.D.) ft. If well-top is not at ground level, state how far { above: / below: } ft.

SHAFT ft.; diameter ft.; Full details of headings (dimensions and directions)

BORE 502 ft.; diameter of bore: at top 30 ins.; at bottom 24 ins.

Full details of permanent lining tubes (position, length, diameter, plain, slotted etc.)

16'8½" OF 27"I.D. TUBES DOWN TO 16'8½" (WITHDRAWN), 69'7" OF 24"ID. TUBES DOWN TO 69'7".

TEST CONDITIONS

Water struck at depths of NOT KNOWN ft. below well-top.

Rest level of water ft. above / below well-top. Suction at ft. Yield on hours' / days' test pumping at galls. per with depression to ft. below well-top.

Recovery to rest-level in mins. / hours Capacity of pump g.p.h. Date of measurements

NORMAL CONDITIONS

DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:

Make and/or type Motive power

Capacity gallons per hour. Suction at ft.

Amount pumped galls. per day. Estimated consumption galls. per week.

Well made by JOHN THOM LIMITED. Date of well 1956

Information from JOHN THOM LTD., CHADDOCK LANE, ROCHDALE, WALKDEN.

ADDITIONAL NOTES

ANALYSIS (please attach copy if available) JOHN THOM LIMITED, DID NOT CARRY OUT A PUMPING TEST AT THE ABOVE SITE.

Sites by ○ on 6" Lancs: 100 · NW/w · 7.3.62.

LOG OF STRATA OVERLEAF.

Geological Survey and Museum, South Kensington, London, S.W.7.		Section 6	Date Received	1" O.S. Map No.	Site marked on 1" Map	(use symbol) on 6" Map
		923 5/3½	20-12-61		○	○

(1957) Dd 574/W137368 12,000 8/54 JCGS Gp 829

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[SJ49NW BJ 10 .]

SJ 49 NW 10

(For Survey use only) Geological Classification	NATURE OF STRATA If measurements start below ground surface, state how far ..	Thickness Feet	Thickness Inches	Depth Feet	Depth Inches
	Sandy soil	2	0	2	0
	Clay	2	0	4	0
	Sandstone	12	0	16	0
	Marl	1	0	17	0
	Sandstone	3	0	20	0
	Red sandstone	7	0	27	0
	Sandstone	57	4	84	4
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	Sandstones and pebbles	57	4	321	4
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	Sandstone marl pellets	7	5	350	5
	Sandstone and pebbles	51	0	401	5
	Sandstone	13	7	415	0
	" and pebbles	3	0	418	0
	Sandstone	25	0	443	0
	Marly sandstone	3	0	446	0
	Sandstone	56	0	502	0

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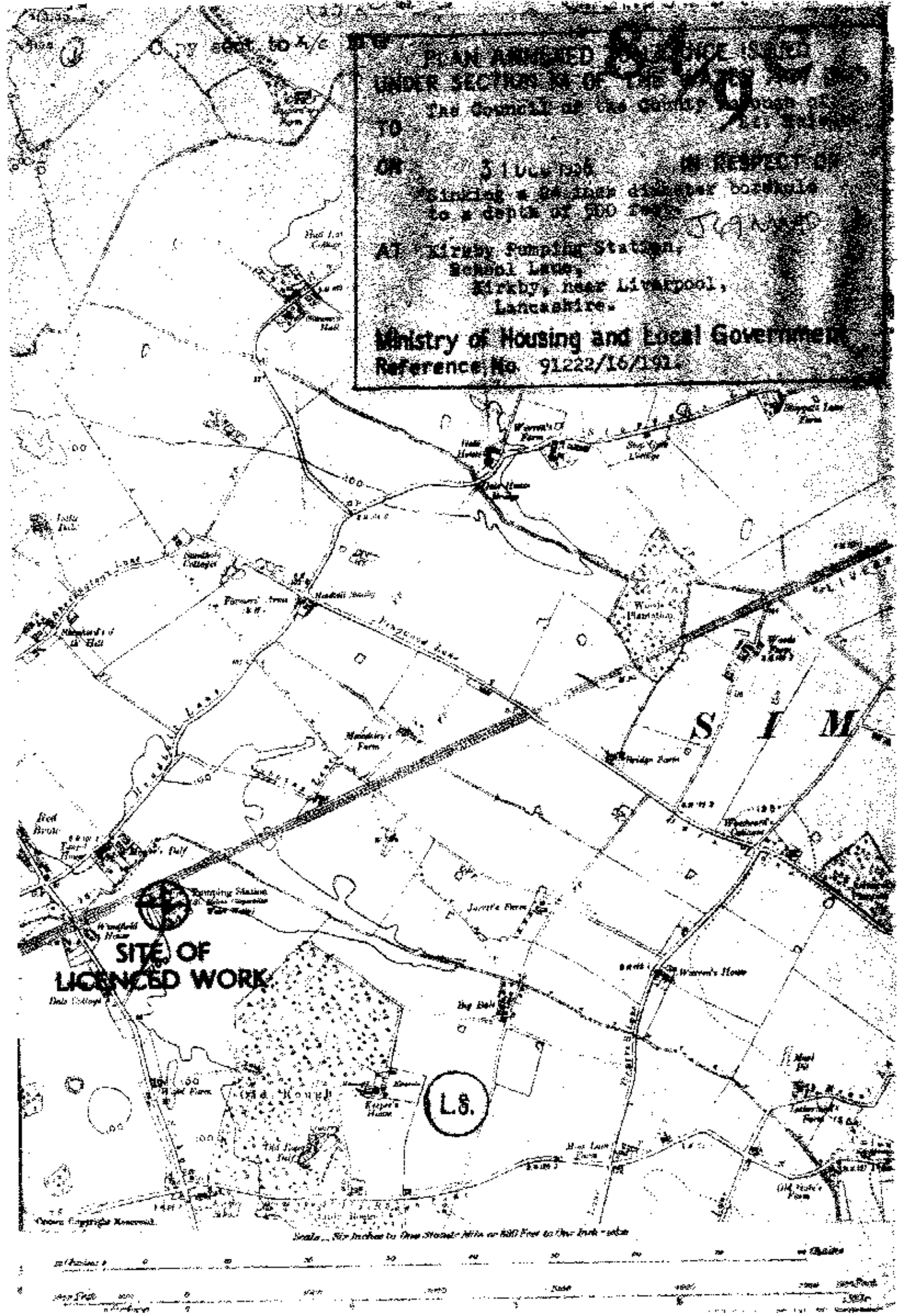

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D. Envirocheck Report

MOTT MACDONALD

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
167915730_1_1

Customer Reference:
394359GE05

National Grid Reference:
341330, 399790

Slice:
A

Site Area (Ha):
5.08

Search Buffer (m):
1000

Site Details:

Headbolt Lane Station
LIVERPOOL
L33 3AU

Client Details:

Mr S Myles
Mott Macdonald
Spring Bank House
33 Stamford Street
Altrincham
Manchester
WA14 1ES

MOTT MACDONALD

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Report Section	Page Number
Summary	-
Agency & Hydrological	1
Waste	14
Hazardous Substances	-
Geological	19
Industrial Land Use	25
Sensitive Land Use	31
Data Currency	32
Data Suppliers	38
Useful Contacts	39

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.
In the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

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MOTT MACDONALD

Report Version v53.0

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MOTT MACDONALD

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Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
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BGS Groundwater Flooding Susceptibility	pg 1	Yes	Yes	Yes	n/a
Contaminated Land Register Entries and Notices					
Discharge Consents	pg 1		1		
Prosecutions Relating to Controlled Waters			n/a	n/a	n/a
Enforcement and Prohibition Notices					
Integrated Pollution Controls					
Integrated Pollution Prevention And Control					
Local Authority Integrated Pollution Prevention And Control					
Local Authority Pollution Prevention and Controls	pg 1				1
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature	pg 1	Yes			
Pollution Incidents to Controlled Waters	pg 1	1	2	9	13
Prosecutions Relating to Authorised Processes					
Registered Radioactive Substances					
River Quality	pg 5			2	
River Quality Biology Sampling Points					
River Quality Chemistry Sampling Points					
Substantiated Pollution Incident Register	pg 6			2	
Water Abstractions	pg 6		1	1	(*16)
Water Industry Act Referrals					
Groundwater Vulnerability	pg 10	Yes	n/a	n/a	n/a
Drift Deposits			n/a	n/a	n/a
Bedrock Aquifer Designations	pg 10	Yes	n/a	n/a	n/a
Superficial Aquifer Designations	pg 10	Yes	n/a	n/a	n/a
Source Protection Zones	pg 10	1			
Extreme Flooding from Rivers or Sea without Defences				n/a	n/a
Flooding from Rivers or Sea without Defences				n/a	n/a
Areas Benefiting from Flood Defences				n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences				n/a	n/a
OS Water Network Lines	pg 11	5	3	7	10

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Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
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Historical Landfill Sites	pg 14				2
Integrated Pollution Control Registered Waste Sites					
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Licensed Waste Management Facilities (Locations)	pg 14				2
Local Authority Landfill Coverage	pg 14	2	n/a	n/a	n/a
Local Authority Recorded Landfill Sites	pg 15				2
Potentially Infilled Land (Non-Water)	pg 15	1		1	2
Potentially Infilled Land (Water)	pg 15			10	47
Registered Landfill Sites	pg 18				1
Registered Waste Transfer Sites					
Registered Waste Treatment or Disposal Sites					
Hazardous Substances					
Control of Major Accident Hazards Sites (COMAH)					
Explosive Sites					
Notification of Installations Handling Hazardous Substances (NIHHS)					
Planning Hazardous Substance Consents					
Planning Hazardous Substance Enforcements					

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Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Geological					
BGS 1:625,000 Solid Geology	pg 19	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry	pg 19	Yes	Yes	Yes	Yes
BGS Recorded Mineral Sites	pg 22	1			2
BGS Urban Soil Chemistry					
BGS Urban Soil Chemistry Averages					
CBSCB Compensation District			n/a	n/a	n/a
Coal Mining Affected Areas			n/a	n/a	n/a
Mining Instability			n/a	n/a	n/a
Man-Made Mining Cavities					
Natural Cavities					
Non Coal Mining Areas of Great Britain				n/a	n/a
Potential for Collapsible Ground Stability Hazards	pg 23	Yes	Yes	n/a	n/a
Potential for Compressible Ground Stability Hazards				n/a	n/a
Potential for Ground Dissolution Stability Hazards				n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 23	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 23	Yes	Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 23	Yes	Yes	n/a	n/a
Radon Potential - Radon Affected Areas			n/a	n/a	n/a
Radon Potential - Radon Protection Measures			n/a	n/a	n/a
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Contemporary Trade Directory Entries	pg 25		1	1	39
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MOTT MACDONALD

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
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Forest Parks					
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Ramsar Sites					
Sites of Special Scientific Interest					
Special Areas of Conservation					
Special Protection Areas					
World Heritage Sites					

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NW (SW)	0	1	341325 399786
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NW (N)	112	1	341325 400000
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A12SE (SW)	304	1	340950 399450
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A12SE (W)	320	1	340800 399650
1	**Discharge Consents** Operator: Suez Recycling & Recovery Uk Limited Property Type: GROUNDWATER REMEDIATION SITES/CIVIL ENGINEERING Location: Knowsley Rail Transfer Loading Stn Woodward Road, Knowsley Industrial Park, Liverpool, Merseyside, L33 7uz Authority: Environment Agency, North West Region Catchment Area: Not Supplied Reference: Eprcb3995vz Permit Version: 1 Effective Date: 14th September 2015 Issued Date: 14th September 2015 Revocation Date: 13th June 2016 Discharge Type: Trade Discharge - Process Water Discharge Environment: Freshwater Stream/River Receiving Water: 2 Outlets 2 Watercourses **Status: Revoked under EPR 2010** Positional Accuracy: Located by supplier to within 10m	A13NE (E)	11	2	341523 399802
2	**Local Authority Pollution Prevention and Controls** Name: Johnsons Dry Cleaners Location: 11 St Chads Parade, Kirkby, L32 8rd Authority: Knowsley Metropolitan Borough Council, Environmental Health and Consumer Protection Division Permit Reference: B/0806/7/3 Dated: 8th October 2007 Process Type: Local Authority Pollution Prevention and Control Description: PG6/46 Dry cleaning **Status: Permitted** Positional Accuracy: Manually positioned to the address or location	A3NW (S)	954	3	341194 398705
	Nearest Surface Water Feature	A13NE (E)	0	-	341500 399817
3	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Miscellaneous - Other Note: Kirkby Brook; Mains Water Incident Date: 4th November 1994 Incident Reference: 94440147 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Leaking Underground Pipe Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A13SW (SW)	0	2	341200 399700
4	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Kmec Cleaning, Gullies In Kirby Bk Authority: Environment Agency, North West Region Pollutant: Miscellaneous - Other Note: Kirkby Bk; Gully Washing Incident Date: 16th July 1997 Incident Reference: 97440090 Catchment Area: Alt Receiving Water: Freshwater Stream/River Cause of Incident: Other Cause Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A13NE (NE)	21	2	341400 399900

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
5	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Merseyside Authority: Environment Agency, North West Region Pollutant: Not Given Note: Not Supplied Incident Date: 14th May 1992 Incident Reference: 92440064 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12NE (W)	246	2	340900 399900
6	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Oils - Unknown Note: Kirkby Mill Dam Pond Incident Date: 8th April 1992 Incident Reference: 92440042 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	307	2	340800 399700
6	**Pollution Incidents to Controlled Waters** Property Type: Connection To Surface Drains Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Miscellaneous - Other Note: Simonswood Brook; Poss X Connections Incident Date: 7th July 1992 Incident Reference: 92440093 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	308	2	340800 399695
7	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Merseyside Authority: Environment Agency, North West Region Pollutant: Not Given Note: Not Supplied Incident Date: 9th October 1992 Incident Reference: 92450018 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	340	2	340800 399600
8	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Merseyside Authority: Environment Agency, North West Region Pollutant: Unknown Note: Mill Dam Pond Incident Date: 12th May 1995 Incident Reference: 95440079 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Miscellaneous/Other Pollution Type Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	401	2	340705 399695
8	**Pollution Incidents to Controlled Waters** Property Type: Private Sewage (Non-PLC): Sewerage Systems Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Crude Sewage Note: Not Supplied Incident Date: 23rd September 1994 Incident Reference: 94440136 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Leaking Underground Pipe Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	406	2	340700 399695

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
9	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Rubble/Litter Or Solids Note: Kirkby Brook Incident Date: 18th April 1995 Incident Reference: 95440060 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Deliberate Disposal To Drain Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12NE (W)	403	2	340700 399800
10	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Merseyside Authority: Environment Agency, North West Region Pollutant: Not Given Note: Simsonwood Brook; None Pollution Found Incident Date: 31st March 1993 Incident Reference: 93450038 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	428	2	340705 399595
10	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Rubble/Litter Or Solids Note: Simonswood Brook; Burnt Out Cars Incident Date: 19th October 1993 Incident Reference: 93440130 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	431	2	340700 399600
10	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Miscellaneous - Unknown Note: Mill Dam Pond Incident Date: 29th June 1994 Incident Reference: 94440078 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Other Incident/Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	433	2	340700 399595
11	**Pollution Incidents to Controlled Waters** Property Type: Connection To Surface Drains Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Sewage - Wrong Connection Note: Simonswood Brook Incident Date: 13th January 1992 Incident Reference: 92440005 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A12NW (W)	503	2	340600 399800
12	**Pollution Incidents to Controlled Waters** Property Type: Private Sewage (Non-PLC): Sewerage Systems Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Unknown Sewage Note: Simonswood Brook Incident Date: 25th July 1992 Incident Reference: 92440099 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SW (W)	525	2	340600 399600

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
13	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Merseyside Authority: Environment Agency, North West Region Pollutant: Not Given Note: Not Supplied Incident Date: 9th April 1992 Incident Reference: 92440043 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7NE (SW)	590	2	340800 399200
14	**Pollution Incidents to Controlled Waters** Property Type: Private Sewage (Non-PLC): Sewerage Systems Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Unknown Sewage Note: Simonswood Brook Incident Date: 7th August 1992 Incident Reference: 92440105 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 1 - Major Incident Positional Accuracy: Located by supplier to within 100m	A12NW (W)	702	2	340400 399800
15	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Miscellaneous - Unknown Note: Simonswood Brook Incident Date: 30th May 1991 Incident Reference: 91440034 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A12SW (W)	747	2	340400 399500
16	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Merseyside Authority: Environment Agency, North West Region Pollutant: Not Given Note: Kirkby Brook; None Pollution Found Incident Date: 17th August 1993 Incident Reference: 93450105 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (SW)	756	2	340800 399000
17	**Pollution Incidents to Controlled Waters** Property Type: Farm Drainage Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Agricultural: General Note: Not Supplied Incident Date: 7th October 1992 Incident Reference: 92230235 Catchment Area: Leven Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A18NW (N)	812	2	341300 400700
18	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Rubble/Litter Or Solids Note: Boots Catalogues Incident Date: 31st December 1992 Incident Reference: 92450036 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A8SE (S)	868	2	341600 398900

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
19	**Pollution Incidents to Controlled Waters** Property Type: Private Sewage (Non-PLC): Sewerage Systems Location: Location Description Not Available Authority: Environment Agency, North West Region Pollutant: Unknown Sewage Note: Simonswood Brook Incident Date: 8th March 1993 Incident Reference: 93450025 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A17NW (NW)	896	2	340600 400500
20	**Pollution Incidents to Controlled Waters** Property Type: Private Sewage (Non-PLC): Sewerage Systems Location: Merseyside Authority: Environment Agency, North West Region Pollutant: Crude Sewage Note: Kirkby Brook; Crude Sewage Incident Date: 24th June 1996 Incident Reference: 96440090 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Other Incident/Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (SW)	980	2	340700 398800
20	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Merseyside Authority: Environment Agency, North West Region Pollutant: Unknown Note: None Pollution Found Incident Date: 18th January 1996 Incident Reference: 96440007 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Other Incident/Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A7SE (SW)	984	2	340700 398795
21	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Merseyside Authority: Environment Agency, North West Region Pollutant: Not Given Note: Simonswood Brook; None Pollution Found Incident Date: 16th July 1991 Incident Reference: 91440054 Catchment Area: Alt Receiving Water: Not Given Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A24SW (NE)	983	2	341800 400800
22	**Pollution Incidents to Controlled Waters** Property Type: Industrial Premises Location: Simonswood Brook Authority: Environment Agency, North West Region Pollutant: Oils - Gas Oil Note: Oil; Simonswood Broo; Oil/Diesel Incident Date: 10th September 1997 Incident Reference: 97440122 Catchment Area: Alt Receiving Water: Freshwater Stream/River Cause of Incident: Unknown Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A19NE (NE)	992	2	342200 400600
	River Quality Name: Simonswood Bk GQA Grade: River Quality D Reach: Qsl At Voces Farm To Kirkby Bk Estimated Distance (km): 5.2 Flow Rate: Flow less than 0.31 cumecs Flow Type: River Year: 2000	A12SE (SW)	273	2	340891 399568

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	River Quality Name: Simonswood Bk GQA Grade: River Quality C Reach: Kirkby Bk To Alt Estimated Distance (km): 3 Flow Rate: Flow less than 0.62 cumecs Flow Type: River Year: 2000	A12SE (SW)	286	2	340906 399540
23	**Substantiated Pollution Incident Register** Authority: Environment Agency - North West Region, South Area Incident Date: 17th April 2009 Incident Reference: 671238 Water Impact: Category 2 - Significant Incident Air Impact: Category 4 - No Impact Land Impact: Category 4 - No Impact Positional Accuracy: Located by supplier to within 10m Pollutant: Oils - Diesel (Including Agricultural)	A12SE (W)	300	2	340837 399616
24	**Substantiated Pollution Incident Register** Authority: Environment Agency - North West Region, South Area Incident Date: 22nd April 2009 Incident Reference: 672939 Water Impact: Category 2 - Significant Incident Air Impact: Category 4 - No Impact Land Impact: Category 4 - No Impact Positional Accuracy: Located by supplier to within 10m Pollutant: Oils - Diesel (Including Agricultural)	A12SE (W)	343	2	340764 399694
25	**Water Abstractions** Operator: United Utilities Water Ltd Licence Number: 2569031018 Permit Version: 100 Location: Well,Borehole And Well With Boreholeat Kirkby Pumping Statio Authority: Environment Agency, North West Region Abstraction: Public Water Supply: Potable Water Supply - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): 7001 Yearly Rate (m3): 1659290 Details: Well Borehole And Well With Borehole Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 16th January 1995 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A13SE (SE)	55	2	341400 399700
26	**Water Abstractions** Operator: Metropolitan Borough Of Knowsley Licence Number: 2569031026 Permit Version: 100 Location: Bank Brk At Premises, Mill Dam, Milllane, Kirkby, Merseyside Authority: Environment Agency, North West Region Abstraction: General Agriculture: Transfer Between Sources Abstraction Type: Water may be abstracted from a single point Source: Surface Daily Rate (m3): 2409 Yearly Rate (m3): 454600 Details: Premises,Mill Dam,Mill Lane,Kirkby Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 14th January 1969 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A12SE (W)	405	2	340700 399700
	Water Abstractions Operator: Liverpool Football Club & Athletic Grounds Limited Licence Number: 2569031131 Permit Version: 2 Location: Borehole At Kirkby Authority: Environment Agency, North West Region Abstraction: Sports Grounds/Facilities: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Liverpool Way, Kirkby Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 23rd October 2014 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A5NW (SE)	1507	2	342445 398610

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Sonae (Uk) Limited Licence Number: 2569031146 Permit Version: 1 Location: Sonae Borehole, Knowsley, Merseyside Authority: Environment Agency, North West Region Abstraction: Other Industrial/Commercial/Public Services: Dust Suppression Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 17th October 2008 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A10NE (E)	1515	2	342984 399310
	Water Abstractions Operator: Sonae (Uk) Limited Licence Number: 2569031146 Permit Version: 1 Location: Sonae Borehole, Knowsley, Merseyside Authority: Environment Agency, North West Region Abstraction: Other Industrial/Commercial/Public Services: Process Water Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 17th October 2008 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A10NE (E)	1515	2	342984 399310
	Water Abstractions Operator: Sonae (Uk) Limited Licence Number: 2569031146 Permit Version: 1 Location: Sonae Borehole, Knowsley, Merseyside Authority: Environment Agency, North West Region Abstraction: Other Industrial/Commercial/Public Services: Non-Evaporative Cooling Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 17th October 2008 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A10NE (E)	1515	2	342984 399310
	Water Abstractions Operator: Liverpool Football Club Soccer Academy Licence Number: 2569031131 Permit Version: 1 Location: Borehole A At Kirkby Authority: Environment Agency, North West Region Abstraction: General Agriculture; General Use (Medium Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 28th September 1999 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A5NW (SE)	1534	2	342450 398580

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Liverpool Football Club Soccer Academy Licence Number: 2569031131 Permit Version: 1 Location: Borehole A At Kirkby Authority: Environment Agency, North West Region Abstraction: Sports Grounds/Facilities: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 28th September 1999 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A5NW (SE)	1534	2	342450 398580
	Water Abstractions Operator: Liverpool Football Club Soccer Academy Licence Number: 2569031131 Permit Version: 1 Location: Borehole B At Kirkby Authority: Environment Agency, North West Region Abstraction: General Agriculture; General Use (Medium Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 28th September 1999 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A5NW (SE)	1548	2	342460 398570
	Water Abstractions Operator: Liverpool Football Club Soccer Academy Licence Number: 2569031131 Permit Version: 1 Location: Borehole B At Kirkby Authority: Environment Agency, North West Region Abstraction: Sports Grounds/Facilities: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 28th September 1999 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A5NW (SE)	1548	2	342460 398570
	Water Abstractions Operator: North West Turf Licence Number: Nw/069/0031/002 Permit Version: 1 Location: Borehole At Bickerstaffe, Ormskirk Authority: Environment Agency, North West Region Abstraction: General Agriculture: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Land At Simonswood Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st April 2010 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A25NW (NE)	1789	2	342350 401450

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: North West Turf Licence Number: Nw/069/0031/002 Permit Version: 1 Location: Borehole At Bickerstaffe, Ormskirk Authority: Environment Agency, North West Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Not Supplied Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st April 2010 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A25NW (NE)	1789	2	342350 401450
	Water Abstractions Operator: North West Turf Licence Number: 2569031128 Permit Version: 100 Location: Borehole At Bickerstaffe, Ormskirk Authority: Environment Agency, North West Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): 2975 Yearly Rate (m3): 175226 Details: Land At Simonswood Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 6th October 1998 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A25NW (NE)	1789	2	342350 401450
	Water Abstractions Operator: North West Turf Licence Number: 2569031128 Permit Version: 100 Location: Borehole At Bickerstaffe, Ormskirk Authority: Environment Agency, North West Region Abstraction: General Agriculture: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Land At Simonswood Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 6th October 1998 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A25NW (NE)	1789	2	342350 401450
	Water Abstractions Operator: Premier Turf Company Licence Number: 2569031125 Permit Version: 100 Location: Borehole At Simonswood, Ormskirk Authority: Environment Agency, North West Region Abstraction: Horticulture And Nurseries: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): 180 Yearly Rate (m3): 15000 Details: Land At Simonswood Authorised Start: 31 March Authorised End: 01 November Permit Start Date: 1st April 2006 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	(N)	1829	2	341610 401700

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: B.I.C.C Ltd. Licence Number: 2569031002 Permit Version: Not Supplied Location: Borehole, Melling, LIVERPOOL Authority: Environment Agency, North West Region Abstraction: Cooling & Boiler Feed & Drinking; Cooking; Sanitary; Washing For Industrial Premises Abstraction Type: Not Supplied Source: Groundwater Daily Rate (m3): 273 Yearly Rate (m3): 99330 Details: Additional Purposes: Boiler feed; Domestic - industrial; Licence Status: Revoked Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(W)	1858	2	339300 399300
	Water Abstractions Operator: British Waterways Board Licence Number: 2569030047 Permit Version: Not Supplied Location: Leeds & Liverpool Canal Authority: Environment Agency, North West Region Abstraction: Not Supplied Abstraction Type: Not Supplied Source: Canal Daily Rate (m3): 0 Yearly Rate (m3): 0 Details: Not Supplied Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(W)	1935	2	339200 399400
	Water Abstractions Operator: British Waterways Board Licence Number: 2569030996 Permit Version: Not Supplied Location: Leeds & Liverpool Canal, Melling, LIVERPOOL Authority: Environment Agency, North West Region Abstraction: Manufacturing Abstraction Type: Not Supplied Source: Canal Daily Rate (m3): 0 Yearly Rate (m3): 455 Details: Licence Status: Revoked Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(W)	1935	2	339200 399395
	Groundwater Vulnerability Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise Map Sheet: Sheet 16 West Cheshire Scale: 1:100,000	A13NW (SW)	0	2	341325 399786
	Drift Deposits None				
	Bedrock Aquifer Designations Aquifer Designation: Principal Aquifer	A13NW (SW)	0	1	341325 399786
	Superficial Aquifer Designations Aquifer Designation: Secondary Aquifer - A	A13NE (NE)	0	1	341395 399848
	Superficial Aquifer Designations Aquifer Designation: Secondary Aquifer - Undifferentiated	A13NE (NE)	0	1	341380 399879
27	**Source Protection Zones** Name: Not Supplied Source: Environment Agency, Head Office Reference: Not Supplied Type: Zone III (Total Catchment): The total area needed to support the discharge from the protected groundwater source.	A13NW (SW)	0	2	341325 399786

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Extreme Flooding from Rivers or Sea without Defences None				
	Flooding from Rivers or Sea without Defences None				
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				
	Flood Defences None				
28	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 35.4 Watercourse Level: Underground Permanent: True Watercourse Name: Kirkby Brook Catchment Name: Alt Primacy: 1	A13SW (SW)	0	4	341143 399699
29	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 220.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Kirkby Brook Catchment Name: Alt Primacy: 1	A13NW (NW)	0	4	341309 399805
30	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 161.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A13NW (N)	0	4	341317 399815
31	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 5.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A13NE (NE)	0	4	341442 399844
32	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 97.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A13NE (NE)	0	4	341442 399844
33	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 1101.5 Watercourse Level: Not Supplied Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A13NE (E)	15	4	341526 399798
34	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 232.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Kirkby Brook Catchment Name: Alt Primacy: 1	A13SW (SW)	34	4	341111 399685

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
35	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 50.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Kirkby Brook Catchment Name: Alt Primacy: 1	A12SE (SW)	250	4	340919 399582
36	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 598.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Simonswood Brook Catchment Name: Alt Primacy: 1	A12SE (SW)	298	4	340874 399561
37	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 97.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Kirkby Brook Catchment Name: Alt Primacy: 1	A12SE (SW)	299	4	340874 399561
38	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 50.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A12SE (SW)	332	4	340886 399487
39	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 2.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A12SE (SW)	336	4	340893 399470
40	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 40.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Kirkby Brook Catchment Name: Alt Primacy: 1	A12SE (SW)	337	4	340894 399467
41	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 5.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A7NE (SW)	351	4	340906 399429
42	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 1442.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Kirkby Brook Catchment Name: Alt Primacy: 1	A7NE (SW)	356	4	340900 399428
43	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 839.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Simonswood Brook Catchment Name: Alt Primacy: 1	A17SW (NW)	676	4	340605 400228

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
44	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 108.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A12NW (W)	682	4	340425 399844
45	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 106.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Simonswood Brook Catchment Name: Alt Primacy: 1	A12NW (W)	706	4	340419 399937
46	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 1.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A12NW (W)	706	4	340419 399937
47	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 7.8 Watercourse Level: Not Supplied Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A12NW (W)	707	4	340417 399937
48	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 525.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A12NW (W)	725	4	340434 400041
49	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 39.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A17SW (NW)	780	4	340531 400290
50	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 181.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A15NW (E)	951	4	342487 400049
51	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 47.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A11NE (W)	962	4	340155 399933
52	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 41.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Alt Primacy: 1	A11NE (W)	979	4	340152 399995

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
53	**Historical Landfill Sites** Licence Holder: Nico Trading Limited Location: Bank Lane, Kirby, Merseyside, Knowsley Name: Nico Trading Limited Operator Location: 1 Derby Buildings, Wavertree Road Boundary Accuracy: As Supplied Provider Reference: EAHLD07415 First Input Date: 1st March 1992 Last Input Date: 31st December 1993 Specified Waste Type: Deposited Waste included Inert Waste EA Waste Ref: 0 Regis Ref: Not Supplied WRC Ref: Not Supplied BGS Ref: Not Supplied Other Ref: K1/17/216, 371/01, GDO 216	A17SE (NW)	543	2	340720 400169
54	**Historical Landfill Sites** Licence Holder: Not Supplied Location: Stopgate Lane, Knowsley, Lancashire Name: Simonswood Industrial Estate Operator Location: Not Supplied Boundary Accuracy: As Supplied Provider Reference: EAHLD06982 First Input Date: Not Supplied Last Input Date: Not Supplied Specified Waste Type: Deposited Waste included Unknown Material EA Waste Ref: 0 Regis Ref: Not Supplied WRC Ref: 2300/0365 BGS Ref: Not Supplied Other Ref: K1/08/083, GDO 104	A19SE (NE)	907	2	342259 400419
55	**Licensed Waste Management Facilities (Locations)** Licence Number: 400278 Location: William Bros Ind Est, Pingwood Lane, Simonswood, Lancashire, L33 4XZ Operator Name: Kealshore Limited Operator Location: Not Supplied Authority: Environment Agency - North West Region, North Area Site Category: Treatment of waste to produce soil <75,000 tpy **Licence Status: Issued** Issued: 29th July 2013 Last Modified: Not Supplied Expires: Not Supplied Suspended: Not Supplied Revoked: Not Supplied Surrendered: Not Supplied IPPC Reference: Not Supplied Positional Accuracy: Located by supplier to within 100m	A19NE (NE)	898	2	342212 400459
55	**Licensed Waste Management Facilities (Locations)** Licence Number: 101154 Location: Williams Bros Ind Park, Pingwood Lane, Kirkby, Liverpool, Merseyside, L33 4XZ Operator Name: P D Port Services Ltd Operator Location: Not Supplied Authority: Environment Agency - North West Region, North Area Site Category: Materials Recycling Facility **Licence Status: Surrendered** Issued: 19th May 2010 Last Modified: Not Supplied Expires: Not Supplied Suspended: Not Supplied Revoked: Not Supplied Surrendered: 12th July 2013 IPPC Reference: Not Supplied Positional Accuracy: Located by supplier to within 10m	A19NE (NE)	898	2	342208 400463
	Local Authority Landfill Coverage Name: Knowsley Metropolitan Borough Council - Has supplied landfill data		0	5	341325 399786
	Local Authority Landfill Coverage Name: Merseyside Waste Disposal Authority - Has supplied landfill data		0	6	341325 399786
	Local Authority Landfill Coverage Name: Sefton Metropolitan Borough Council - Has no landfill data to supply		678	7	340605 400228
	Local Authority Landfill Coverage Name: West Lancashire District Council - Has supplied landfill data		813	8	342279 400213

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Local Authority Landfill Coverage Name: Lancashire County Council - Had landfill data but passed it to the relevant environment agency		814	9	342270 400236
56	**Local Authority Recorded Landfill Sites** Location: Nico Trading Limited, Knowsley Reference: K013 Authority: Merseyside Waste Disposal Authority **Last Reported Status:** **Unknown** Types of Waste: Not Supplied Date of Closure: Not Supplied Positional Accuracy: Located by supplier to within 100m Boundary Quality: Not Applicable	A17SW (NW)	668	6	340600 400200
57	**Local Authority Recorded Landfill Sites** Location: Stopgate Lane, Knowsley Reference: GDO104 Authority: Knowsley Metropolitan Borough Council **Last Reported Status:** **Closed** Types of Waste: Not Supplied Date of Closure: Not Supplied Positional Accuracy: Positioned by the supplier Boundary Quality: Good	A19SE (NE)	902	5	342256 400414
58	**Potentially Infilled Land (Non-Water)** Bearing Ref: NW Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A13NW (NW)	0	-	341258 399849
59	**Potentially Infilled Land (Non-Water)** Bearing Ref: SE Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A8NE (SE)	481	-	341548 399299
60	**Potentially Infilled Land (Non-Water)** Bearing Ref: SE Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A9NW (SE)	701	-	341705 399128
61	**Potentially Infilled Land (Non-Water)** Bearing Ref: W Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A12SW (W)	803	-	340344 399489
62	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1956	A12SE (W)	288	-	340832 399654
63	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14NW (NE)	289	-	341718 400086
64	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (S)	298	-	341177 399361
65	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19SW (NE)	316	-	341713 400120
66	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (S)	322	-	341227 399342
67	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19SW (NE)	367	-	341755 400155
68	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SW (E)	382	-	341914 399683
69	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (S)	392	-	341126 399269
70	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (SW)	433	-	341022 399252

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
71	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19SW (NE)	467	-	341894 400167
72	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SW (SE)	523	-	341950 399479
73	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	523	-	342054 399654
74	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	524	-	342081 399761
75	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18SE (NE)	525	-	341652 400364
76	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A12SW (W)	548	-	340553 399751
77	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	608	-	342125 399603
78	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8SW (S)	610	-	341091 399054
79	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (N)	654	-	341548 400516
80	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	656	-	342170 399584
81	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (N)	679	-	341619 400525
82	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A12NW (W)	682	-	340421 399813
83	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (NE)	682	-	341665 400521
84	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	688	-	342078 399376
85	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A14NE (E)	712	-	342270 399906
86	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A14SE (E)	723	-	342275 399712
87	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	750	-	342221 399474
88	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19NW (NE)	756	-	341858 400540
89	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19NW (NE)	761	-	341810 400565
90	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NW (N)	774	-	341229 400656
91	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	777	-	342207 399398

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
92	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	796	-	340310 399847
93	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (E)	796	-	342243 399419
94	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A14NE (E)	798	-	342317 400090
95	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A19SE (NE)	803	-	342250 400248
96	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	809	-	340303 399887
97	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	809	-	342062 399195
98	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	821	-	340495 400312
99	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (N)	828	-	341515 400702
100	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	836	-	340288 399950
101	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	852	-	340457 400315
102	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (W)	861	-	340351 400182
103	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	861	-	342257 399323
104	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	870	-	340257 399969
105	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	877	-	342146 399176
106	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	882	-	340348 400216
107	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	892	-	340264 400065
108	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A7SE (S)	902	-	340985 398776
109	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A23SE (N)	904	-	341339 400793
110	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	904	-	342333 399360
111	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A16SE (W)	907	-	340276 400133
112	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	909	-	340492 400433

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
113	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A15NW (E)	909	-	342468 399897
114	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A20SW (NE)	923	-	342369 400278
115	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	943	-	340439 400428
116	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A23SW (N)	954	-	341133 400824
117	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A23SE (N)	965	-	341569 400831
118	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1909	A6NE (W)	993	-	340207 399325
119	**Registered Landfill Sites** Licence Holder: Nico Trading Ltd Licence Reference: 371/01 Site Location: Bank Lane, Kirkby, Liverpool, Merseyside Licence Easting: 340600 Licence Northing: 400100 Operator Location: 1 Derby Buildings, Wavertree Road, LIVERPOOL, Merseyside, L7 3ES Authority: Environment Agency - North West Region, South Area Site Category: Landfill Max Input Rate: Very Large (Equal to or greater than 250,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Status: Site exempt from licenceExempt Dated: 1st July 1992 Preceded By Licence: Not Given Superseded By Licence: Not Given Positional Accuracy: Manually positioned to the address or location Boundary Accuracy: Not Applicable Authorised Waste: Brick, Stone, Concrete Inert Spoil, Soils, Clays Prohibited Waste: Biodegradable Mat□s Clinical Wastes Household + Commercial Waste Liquid/Sludge Wastes Special Wastes	A12NW (NW)	607	2	340600 400100

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: Triassic Rocks (Undifferentiated)	A13NW (SW)	0	1	341325 399786
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 90 - 120 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: 15 - 30 mg/kg	A13NE (NE)	0	1	341395 399848
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: 15 - 30 mg/kg	A13NW (SW)	0	1	341325 399786
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 90 - 120 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: <15 mg/kg	A13NW (N)	112	1	341317 400000
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: 15 - 30 mg/kg	A13NW (N)	112	1	341325 400000
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: 1.8 - 2.2 mg/kg Chromium Concentration: 90 - 120 mg/kg Lead Concentration: 200 - 300 mg/kg Nickel Concentration: 15 - 30 mg/kg	A14NW (E)	438	1	342000 399786
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: 1.8 - 2.2 mg/kg Chromium Concentration: 90 - 120 mg/kg Lead Concentration: 300 - 600 mg/kg Nickel Concentration: <15 mg/kg	A14NW (E)	470	1	342000 400000

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: 15 - 30 mg/kg	A8NW (S)	528	1	341320 399153
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: 15 - 30 mg/kg	A8NE (SE)	593	1	341606 399203
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: 15 - 30 mg/kg	A7NE (SW)	620	1	340677 399284
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: 15 - 30 mg/kg	A7SE (SW)	642	1	340859 399098
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 90 - 120 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A12SW (W)	654	1	340500 399500
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 90 - 120 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A8SW (S)	681	1	341000 399000

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A8SW (S)	689	1	341000 398992
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A7NW (SW)	703	1	340500 399395
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 90 - 120 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A7SE (SW)	738	1	340839 399000
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: 15 - 30 mg/kg	A17SW (NW)	773	1	340493 400248
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 90 - 120 mg/kg Lead Concentration: 200 - 300 mg/kg Nickel Concentration: <15 mg/kg	A19NW (NE)	790	1	342000 400500
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A7SE (SW)	813	1	340694 399000

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: 100 - 200 mg/kg Nickel Concentration: 15 - 30 mg/kg	A18NW (N)	891	1	341185 400768
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A17NW (NW)	955	1	340500 400500
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A17NW (NW)	991	1	340445 400500
120	**BGS Recorded Mineral Sites** Site Name: Mercer'S Delf Location: Not Supplied Source: British Geological Survey, National Geoscience Information Service Reference: 95031 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Permian, Triassic Geology: Sherwood Sandstone Group Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A13NW (NW)	0	1	341301 399824
121	**BGS Recorded Mineral Sites** Site Name: Old Rough Delf Location: Not Supplied Source: British Geological Survey, National Geoscience Information Service Reference: 95032 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Permian, Triassic Geology: Sherwood Sandstone Group Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A9SW (SE)	765	1	341749 399078
122	**BGS Recorded Mineral Sites** Site Name: Dearbolt Delf Location: Not Supplied Source: British Geological Survey, National Geoscience Information Service Reference: 95022 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Permian, Triassic Geology: Sherwood Sandstone Group Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A6NE (W)	892	1	340276 399419
	BGS Measured Urban Soil Chemistry No data available				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Urban Soil Chemistry Averages No data available				
	Coal Mining Affected Areas In an area that might not be affected by coal mining				
	Non Coal Mining Areas of Great Britain No Hazard				
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	341395 399848
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	341380 399879
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (NW)	46	1	341255 399918
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (S)	51	1	341342 399668
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341317 400000
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	341380 399879
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (S)	51	1	341342 399668

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341317 400000
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
123	**Contemporary Trade Directory Entries** Name: Buffer Boys Location: 1, Seathwaite Crescent, Liverpool, L33 2DN Classification: Carpet, Curtain & Upholstery Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A12SE (W)	170	-	340935 399719
124	**Contemporary Trade Directory Entries** Name: Knowsley Community Recycling Services Location: 83, Kennelwood Avenue, Liverpool, L33 6UE Classification: Recycling Centres **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9NW (SE)	468	-	341766 399409
125	**Contemporary Trade Directory Entries** Name: Printer Specialists Ltd Location: The Barn, Shevingtons Lane, Liverpool, L33 1XA Classification: Office Equipment Servicing & Maintenance **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18SW (NW)	529	-	341075 400365
126	**Contemporary Trade Directory Entries** Name: A P W Electrical Supplies Ltd Location: A, 2, Church Green, Kirkby, Liverpool, Merseyside, L32 1TB Classification: Electrical Goods Sales, Manufacturers & Wholesalers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8NW (S)	581	-	341327 399100
127	**Contemporary Trade Directory Entries** Name: Roofline Plastics Location: 18, St. Andrews View, Liverpool, L33 1ZF Classification: Fascias and Soffits **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18NE (N)	627	-	341506 400499
128	**Contemporary Trade Directory Entries** Name: Rts The Print & Copy Centre (Uk) Ltd Location: Roughwood Drive, Liverpool, L33 8XF Classification: Copying & Duplicating Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8NE (S)	652	-	341551 399114
129	**Contemporary Trade Directory Entries** Name: Kirkby Family Centre Location: Hall Lane, Kirkby, Liverpool, Merseyside, L32 1TZ Classification: Car Breakdown & Recovery Services **Status: Inactive** Positional Accuracy: Manually positioned within the geographical locality	A8SW (S)	676	-	341127 398984
130	**Contemporary Trade Directory Entries** Name: Lovejo-X Location: 9, Deerbolt Crescent, Liverpool, L32 2BE Classification: Jewellery Manufacturers & Repairers **Status: Active** Positional Accuracy: Automatically positioned to the address	A12SW (W)	681	-	340490 399458
131	**Contemporary Trade Directory Entries** Name: Headland Haulage Ltd Location: 17, Anders Drive, Liverpool, L33 1TA Classification: Road Haulage Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A19SE (NE)	697	-	342058 400329
132	**Contemporary Trade Directory Entries** Name: Telegraph Service Stations Ltd Location: Irlam Drive, Liverpool, L32 8RJ Classification: Petrol Filling Stations **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	722	-	341363 398963
133	**Contemporary Trade Directory Entries** Name: Future Cleaning Location: 177, Saxon Way, Liverpool, Merseyside, L33 4HG Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18NW (N)	726	-	341181 400601
134	**Contemporary Trade Directory Entries** Name: Apple Logistics Location: 14, Chiltern Drive, Liverpool, L32 2BW Classification: Road Haulage Services **Status: Active** Positional Accuracy: Automatically positioned to the address	A12SW (W)	736	-	340381 399605

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
135	**Contemporary Trade Directory Entries** Name: Special Effects Location: 8, Telegraph Way, Liverpool, L32 8US Classification: Clothing Accessory Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SW (S)	773	-	341275 398893
136	**Contemporary Trade Directory Entries** Name: Dtf Electrical Contractors Limited Location: 67, Redwood Way, Kirkby, Liverpool, L33 4EJ Classification: Electrical Engineers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A18NE (N)	779	-	341367 400667
137	**Contemporary Trade Directory Entries** Name: Press 2 Dress Location: 31, Bigdale Drive, Liverpool, L33 6XQ Classification: Ironing & Home Laundry Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9NW (SE)	788	-	342001 399177
138	**Contemporary Trade Directory Entries** Name: Melling Carpet Care Location: 52, Moorfoot Way, Liverpool, L33 1WY Classification: Carpet, Curtain & Upholstery Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A17NE (NW)	824	-	340852 400585
139	**Contemporary Trade Directory Entries** Name: Kirkby Blinds Location: In Shops, Telegraph Way, Liverpool, L32 8US Classification: Blinds, Awnings & Canopies **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SW (S)	857	-	341287 398810
139	**Contemporary Trade Directory Entries** Name: Solarshade Location: Unit 33, In Shops, Telegraph Way, Liverpool, L32 8US Classification: Blinds, Awnings & Canopies **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SW (S)	857	-	341287 398810
140	**Contemporary Trade Directory Entries** Name: Diamond Home Support - South Liverpool Location: 33, Rowan Drive, Liverpool, L32 0SF Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A7NW (SW)	862	-	340390 399270
141	**Contemporary Trade Directory Entries** Name: Supreme Finish Cleaning Services Ltd Location: 45, Scoter Road, Liverpool, L33 0XZ Classification: Cleaning Services - Domestic **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A8SE (S)	862	-	341525 398873
142	**Contemporary Trade Directory Entries** Name: Tops Pharmacy Location: 5, Glovers Brow, Liverpool, L32 2AE Classification: Chemists□& Pharmacists□Suppliers & Wholesalers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A6NE (W)	877	-	340313 399372
142	**Contemporary Trade Directory Entries** Name: Easy Iron Location: 6, Glovers Brow, Liverpool, Merseyside, L32 2AE Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A6NE (W)	880	-	340312 399369
143	**Contemporary Trade Directory Entries** Name: Essar Bigdale Service Station Location: Bigdale Drive, Liverpool, L33 6XG Classification: Petrol Filling Stations **Status: Active** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	886	-	341958 399038
143	**Contemporary Trade Directory Entries** Name: Auto Respray Location: Bigdale Drive, Liverpool, L33 6XG Classification: Car Body Repairs **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	886	-	341958 399038

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
143	**Contemporary Trade Directory Entries** Name: Bigdale Service Station Location: Bigdale Drive, Liverpool, L33 6XG Classification: Petrol Filling Stations - 24 Hour **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	886	-	341958 399038
143	**Contemporary Trade Directory Entries** Name: O K Tyres Location: Unit 4 Bigdale Drive, Liverpool, Merseyside, L33 6XG Classification: Tyre Dealers **Status: Active** Positional Accuracy: Manually positioned within the geographical locality	A9SW (SE)	886	-	341958 399038
144	**Contemporary Trade Directory Entries** Name: Hardwood Timber Sales Location: Pingwood La, Kirkby, Liverpool, Merseyside, L33 4XZ Classification: Wood Products, Except Furniture - Manufacturers **Status: Inactive** Positional Accuracy: Manually positioned to the road within the address or location	A19NE (NE)	896	-	342194 400474
144	**Contemporary Trade Directory Entries** Name: Williams Truck Centre Location: Pingwood Lane, Kirkby, Liverpool, Merseyside, L33 4XZ Classification: Commercial Vehicle Dealers **Status: Active** Positional Accuracy: Manually positioned to the road within the address or location	A19NE (NE)	908	-	342192 400493
145	**Contemporary Trade Directory Entries** Name: Lazer Electrics Location: 46, St. Chads Parade, Liverpool, L32 8RH Classification: Hardware **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	901	-	341180 398758
146	**Contemporary Trade Directory Entries** Name: Brighthouse Location: 82-84, St. Chads Parade, Liverpool, L32 8UG Classification: Electrical Goods Sales, Manufacturers & Wholesalers **Status: Active** Positional Accuracy: Automatically positioned to the address	A3NW (S)	920	-	341106 398741
146	**Contemporary Trade Directory Entries** Name: Klick Location: 29a, St. Chads Parade, Liverpool, L32 8UG Classification: Photographic Processors **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	928	-	341138 398731
146	**Contemporary Trade Directory Entries** Name: Iceland Frozen Foods Location: 31, St. Chads Parade, Liverpool, L32 8UG Classification: Frozen Food Processors & Distributors **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	940	-	341124 398720
147	**Contemporary Trade Directory Entries** Name: Liverprint Location: 26, St. Chads Parade, Liverpool, L32 8RH Classification: Printers Textile **Status: Active** Positional Accuracy: Automatically positioned to the address	A3NW (S)	928	-	341230 398733
147	**Contemporary Trade Directory Entries** Name: Johnson Cleaners (Uk) Ltd Location: 11b, St. Chads Parade, Liverpool, Merseyside, L32 8RD Classification: Dry Cleaners **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	954	-	341194 398705
147	**Contemporary Trade Directory Entries** Name: Heron Frozen Foods Location: Cherryfield Drive, Liverpool, L32 8RX Classification: Frozen Food Processors & Distributors **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	977	-	341165 398682
148	**Contemporary Trade Directory Entries** Name: Classic Colour Centres Ltd Location: 18, St. Chads Parade, Liverpool, L32 8RH Classification: Wallpapers & Wall Coverings **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	935	-	341264 398729

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
148	**Contemporary Trade Directory Entries** Name: Material Girls Location: 11, Market Square, Kirkby, Liverpool, L32 8RG Classification: Recycling Centres **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	939	-	341324 398732
148	**Contemporary Trade Directory Entries** Name: Kirkby Rollers Location: 8, St. Chads Parade, Liverpool, Merseyside, L32 8RH Classification: Blinds, Awnings & Canopies **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	940	-	341303 398728
148	**Contemporary Trade Directory Entries** Name: En Vogue Location: 12, St. Chads Parade, Liverpool, L32 8RH Classification: Homefurnishings - Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	942	-	341281 398723
148	**Contemporary Trade Directory Entries** Name: Kirkby Blinds Ltd Location: 8, St. Chads Parade, Liverpool, L32 8RH Classification: Blinds, Awnings & Canopies **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A3NW (S)	957	-	341296 398710
149	**Contemporary Trade Directory Entries** Name: A Perfect Ironing Service Location: 11, Gleneagles Close, Kirkby, LIVERPOOL, L33 4HA Classification: Ironing & Home Laundry Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A22SE (N)	964	-	340989 400798
150	**Fuel Station Entries** Name: Kirkby Service Station Location: Irlam Drive , Kirkby , Liverpool, Merseyside, L32 8US Brand: OBSOLETE Premises Type: Not Applicable **Status: Obsolete** Positional Accuracy: Automatically positioned to the address	A8SW (S)	773	-	341275 398893
151	**Fuel Station Entries** Name: Bigdale Service Station Location: Bigdale Drive , Kirkby , Liverpool, Merseyside, L33 6XQ Brand: Essar Premises Type: Petrol Station **Status: Open** Positional Accuracy: Automatically positioned to the address	A9SW (SE)	886	-	341958 399038
152	**Points of Interest - Commercial Services** Name: Knowsley Community Recycling Services Location: 83 Kennelwood Avenue, Liverpool, L33 6UE Category: Recycling Services Class Code: Recycling, Reclamation and Disposal Positional Accuracy: Positioned to address or location	A9NW (SE)	468	10	341766 399409
153	**Points of Interest - Commercial Services** Name: Madigan International Location: 17 Cleveland Close, Liverpool, L32 2BH Category: Transport, Storage and Delivery Class Code: Distribution and Haulage Positional Accuracy: Positioned to address or location	A12SW (W)	587	10	340524 399647
154	**Points of Interest - Commercial Services** Name: Headland Haulage Ltd Location: 17 Anders Drive, Liverpool, L33 1TA Category: Transport, Storage and Delivery Class Code: Distribution and Haulage Positional Accuracy: Positioned to address or location	A19SE (NE)	696	10	342057 400329
155	**Points of Interest - Commercial Services** Name: Apple Logistics Location: 14 Chiltern Drive, Liverpool, L32 2BW Category: Transport, Storage and Delivery Class Code: Distribution and Haulage Positional Accuracy: Positioned to address or location	A12SW (W)	736	10	340381 399605

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
156	**Points of Interest - Commercial Services** Name: The Removal Team Location: 21 Stockton Crescent, Liverpool, L33 4FD Category: Transport, Storage and Delivery Class Code: Distribution and Haulage Positional Accuracy: Positioned to address or location	A17NE (NW)	808	10	340946 400612
157	**Points of Interest - Commercial Services** Name: Marks Mobile Valeting Location: 12 Gleneagles Close, Kirkby, Liverpool, L33 4HA Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A22SE (N)	964	10	340980 400795
157	**Points of Interest - Commercial Services** Name: Marks Valeting Location: 12 Gleneagles Close, Kirkby, Liverpool, L33 4HA Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A22SE (N)	964	10	340980 400795
158	**Points of Interest - Manufacturing and Production** Name: Tanks Location: L33 Category: Industrial Features Class Code: Tanks (Generic) Positional Accuracy: Positioned to an adjacent address or location	A8SE (S)	703	10	341508 399039
159	**Points of Interest - Public Infrastructure** Name: Knowsley Community Recycling Services Location: 83 Kennelwood Avenue, Liverpool, L33 6UE Category: Infrastructure and Facilities Class Code: Recycling Centres Positional Accuracy: Positioned to address or location	A9NW (SE)	468	10	341766 399409
159	**Points of Interest - Public Infrastructure** Name: Knowsley Community Recycling Services Location: 83 Kennelwood Avenue, Liverpool, L33 6UE Category: Infrastructure and Facilities Class Code: Recycling Centres Positional Accuracy: Positioned to address or location	A9NW (SE)	468	10	341766 399409
160	**Points of Interest - Public Infrastructure** Name: Outfall Location: L32 Category: Infrastructure and Facilities Class Code: Waste Storage, Processing and Disposal Positional Accuracy: Positioned to an adjacent address or location	A7SE (SW)	878	10	340748 398890
160	**Points of Interest - Public Infrastructure** Name: Outfall Location: L32 Category: Infrastructure and Facilities Class Code: Waste Storage, Processing and Disposal Positional Accuracy: Positioned to an adjacent address or location	A7SE (SW)	883	10	340771 398872
161	**Points of Interest - Public Infrastructure** Name: Bigdale Service Station Location: Bigdale Drive, Liverpool, L33 6XG Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A9SW (SE)	886	10	341958 399038
161	**Points of Interest - Public Infrastructure** Name: Essar Bigdale Service Station Location: Bigdale Drive, Liverpool, L33 6XG Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A9SW (SE)	886	10	341958 399038
161	**Points of Interest - Public Infrastructure** Name: Bigdale Service Station Location: Bigdale Drive, Liverpool, L33 6XG Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A9SW (SE)	886	10	341958 399038
162	**Points of Interest - Public Infrastructure** Name: Outfall Location: L33 Category: Infrastructure and Facilities Class Code: Waste Storage, Processing and Disposal Positional Accuracy: Positioned to an adjacent address or location	A17NW (NW)	923	10	340563 400507

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
163	**Points of Interest - Public Infrastructure** Name: Outfall Location: L32 Category: Infrastructure and Facilities Class Code: Waste Storage, Processing and Disposal Positional Accuracy: Positioned to an adjacent address or location	A7SE (SW)	938	10	340773 398809
163	**Points of Interest - Public Infrastructure** Name: Outfall Location: L32 Category: Infrastructure and Facilities Class Code: Waste Storage, Processing and Disposal Positional Accuracy: Positioned to an adjacent address or location	A7SE (SW)	971	10	340757 398780
163	**Points of Interest - Public Infrastructure** Name: Outfall Location: L32 Category: Infrastructure and Facilities Class Code: Waste Storage, Processing and Disposal Positional Accuracy: Positioned to an adjacent address or location	A7SE (SW)	975	10	340776 398767
164	**Points of Interest - Public Infrastructure** Name: Bus Station Location: L32 Category: Public Transport, Stations and Infrastructure Class Code: Bus and Coach Stations, Depots and Companies Positional Accuracy: Positioned to address or location	A3NW (S)	971	10	341084 398692
165	**Points of Interest - Public Infrastructure** Name: Kirkby Police Station Location: Police Station, St. Chads Drive, Liverpool, L32 8RF Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A3NE (S)	973	10	341470 398733
166	**Points of Interest - Recreational and Environmental** Name: Playground Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A13NW (N)	225	10	341286 400110
166	**Points of Interest - Recreational and Environmental** Name: Playground Location: Ebony Way, L33 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A18SW (N)	301	10	341251 400182
167	**Points of Interest - Recreational and Environmental** Name: Playground Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A12SE (W)	462	10	340664 399610
167	**Points of Interest - Recreational and Environmental** Name: Playground Location: Mill Lane, L32 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A12SE (W)	462	10	340664 399610
168	**Points of Interest - Recreational and Environmental** Name: Playground Location: Quarry Dale, L33 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to address or location	A9SW (SE)	863	10	341887 399031
168	**Points of Interest - Recreational and Environmental** Name: Playground Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A9SW (SE)	867	10	341890 399028

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
169	**Areas of Adopted Green Belt** Authority: Sefton Metropolitan Borough Council Plan Name: Sefton Unitary Development Plan **Status: Adopted** Plan Date: 29th June 2006	A17SW (NW)	677	11	340606 400231
170	**Areas of Adopted Green Belt** Authority: West Lancashire District Council Plan Name: West Lancashire Local Plan **Status: Adopted** Plan Date: 16th October 2013	A19SE (E)	816	12	342316 400142
171	**Areas of Unadopted Green Belt** Authority: Sefton Metropolitan Borough Council Plan Name: Sefton Local Plan Core Strategy **Status: Submission Draft** Plan Date: 3rd August 2015	A17SW (NW)	677	11	340606 400230
172	**Nitrate Vulnerable Zones** Name: Alt Nvz Description: Surface Water Source: Environment Agency, Head Office	A13NW (SW)	0	13	341325 399786

Agency & Hydrological	Version	Update Cycle
Contaminated Land Register Entries and Notices		
West Lancashire District Council - Environmental Services	April 2014	Annual Rolling Update
St Helens Metropolitan Borough Council - Environmental Protection Department	December 2014	Annual Rolling Update
Liverpool City Council - Liverpool Environmental Health & Trading Standards Division	December 2015	Annual Rolling Update
Knowsley Metropolitan Borough Council - Department of Planning and Development	January 2015	Annual Rolling Update
Sefton Metropolitan Borough Council - Environmental Health Department	October 2017	Annual Rolling Update
Discharge Consents		
Environment Agency - North West Region	April 2018	Quarterly
Enforcement and Prohibition Notices		
Environment Agency - North West Region	March 2013	As notified
Integrated Pollution Controls		
Environment Agency - North West Region	October 2008	Variable
Integrated Pollution Prevention And Control		
Environment Agency - North West Region	April 2018	Quarterly
Local Authority Integrated Pollution Prevention And Control		
St Helens Metropolitan Borough Council - Environmental Health Department	April 2013	Variable
Liverpool City Council - Liverpool Environmental Health & Trading Standards Division	December 2015	Variable
Sefton Metropolitan Borough Council - Environmental Health Department	July 2015	Variable
Knowsley Metropolitan Borough Council - Environmental Health and Consumer Protection Division	June 2013	Variable
West Lancashire District Council - Environmental Health Department	October 2014	Variable
Local Authority Pollution Prevention and Controls		
St Helens Metropolitan Borough Council - Environmental Health Department	December 2014	Annual Rolling Update
Liverpool City Council - Liverpool Environmental Health & Trading Standards Division	December 2015	Annually
Knowsley Metropolitan Borough Council - Environmental Health and Consumer Protection Division	January 2015	Annual Rolling Update
Sefton Metropolitan Borough Council - Environmental Health Department	July 2015	Annual Rolling Update
West Lancashire District Council - Environmental Health Department	October 2014	Annual Rolling Update
Local Authority Pollution Prevention and Control Enforcements		
St Helens Metropolitan Borough Council - Environmental Health Department	December 2014	Variable
Liverpool City Council - Liverpool Environmental Health & Trading Standards Division	December 2015	Variable
Knowsley Metropolitan Borough Council - Environmental Health and Consumer Protection Division	January 2015	Variable
Sefton Metropolitan Borough Council - Environmental Health Department	July 2015	Variable
West Lancashire District Council - Environmental Health Department	October 2014	Variable
Nearest Surface Water Feature		
Ordnance Survey	September 2017	
Pollution Incidents to Controlled Waters		
Environment Agency - North West Region	January 2000	Not Applicable
Prosecutions Relating to Authorised Processes		
Environment Agency - North West Region	March 2013	As notified
Prosecutions Relating to Controlled Waters		
Environment Agency - North West Region	March 2013	As notified
Registered Radioactive Substances		
Environment Agency - North West Region	January 2015	
River Quality		
Environment Agency - Head Office	November 2001	Not Applicable
River Quality Biology Sampling Points		
Environment Agency - Head Office	July 2012	Annually
River Quality Chemistry Sampling Points		
Environment Agency - Head Office	July 2012	Annually

Data Currency

Agency & Hydrological	Version	Update Cycle
Substantiated Pollution Incident Register		
Environment Agency - North West Region - Central Area	April 2018	Quarterly
Environment Agency - North West Region - North Area	April 2018	Quarterly
Environment Agency - North West Region - South Area	April 2018	Quarterly
Water Abstractions		
Environment Agency - North West Region	April 2018	Quarterly
Water Industry Act Referrals		
Environment Agency - North West Region	October 2017	Quarterly
Groundwater Vulnerability		
Environment Agency - Head Office	April 2015	Not Applicable
Drift Deposits		
Environment Agency - Head Office	January 1999	Not Applicable
Bedrock Aquifer Designations		
British Geological Survey - National Geoscience Information Service	August 2015	As notified
Superficial Aquifer Designations		
British Geological Survey - National Geoscience Information Service	August 2015	As notified
Source Protection Zones		
Environment Agency - Head Office	January 2018	Quarterly
Extreme Flooding from Rivers or Sea without Defences		
Environment Agency - Head Office	February 2018	Quarterly
Flooding from Rivers or Sea without Defences		
Environment Agency - Head Office	February 2018	Quarterly
Areas Benefiting from Flood Defences		
Environment Agency - Head Office	February 2018	Quarterly
Flood Water Storage Areas		
Environment Agency - Head Office	February 2018	Quarterly
Flood Defences		
Environment Agency - Head Office	February 2018	Quarterly
OS Water Network Lines		
Ordnance Survey	January 2018	Quarterly
Surface Water 1 in 30 year Flood Extent		
Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 100 year Flood Extent		
Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 1000 year Flood Extent		
Environment Agency - Head Office	October 2013	As notified
Surface Water Suitability		
Environment Agency - Head Office	October 2013	As notified
BGS Groundwater Flooding Susceptibility		
British Geological Survey - National Geoscience Information Service	May 2013	As notified

Waste	Version	Update Cycle
BGS Recorded Landfill Sites		
British Geological Survey - National Geoscience Information Service	June 1996	Not Applicable
Historical Landfill Sites		
Environment Agency - Head Office	April 2018	Quarterly
Integrated Pollution Control Registered Waste Sites		
Environment Agency - North West Region	October 2008	Not Applicable
Licensed Waste Management Facilities (Landfill Boundaries)		
Environment Agency - North West Region - Central Area	April 2018	Quarterly
Environment Agency - North West Region - North Area	April 2018	Quarterly
Environment Agency - North West Region - South Area	April 2018	Quarterly
Licensed Waste Management Facilities (Locations)		
Environment Agency - North West Region - Central Area	April 2018	Quarterly
Environment Agency - North West Region - North Area	April 2018	Quarterly
Environment Agency - North West Region - South Area	April 2018	Quarterly
Local Authority Landfill Coverage		
Knowsley Metropolitan Borough Council	May 2000	Not Applicable
Lancashire County Council - Waste Management Group	May 2000	Not Applicable
Liverpool City Council - Liverpool Environmental Health & Trading Standards Division	May 2000	Not Applicable
Merseyside Waste Disposal Authority	May 2000	Not Applicable
Sefton Metropolitan Borough Council - Environmental Health Department	May 2000	Not Applicable
St Helens Metropolitan Borough Council	May 2000	Not Applicable
West Lancashire District Council - Environmental Health Department	May 2000	Not Applicable
Local Authority Recorded Landfill Sites		
West Lancashire District Council - Environmental Health Department	March 2004	Not Applicable
Knowsley Metropolitan Borough Council	May 2000	Not Applicable
Lancashire County Council - Waste Management Group	May 2000	Not Applicable
Liverpool City Council - Liverpool Environmental Health & Trading Standards Division	May 2000	Not Applicable
Merseyside Waste Disposal Authority	May 2000	Not Applicable
Sefton Metropolitan Borough Council - Environmental Health Department	May 2000	Not Applicable
St Helens Metropolitan Borough Council	May 2000	Not Applicable
Potentially Infilled Land (Non-Water)		
Landmark Information Group Limited	December 1999	Not Applicable
Potentially Infilled Land (Water)		
Landmark Information Group Limited	December 1999	Not Applicable
Registered Landfill Sites		
Environment Agency - North West Region - Central Area	March 2003	Not Applicable
Environment Agency - North West Region - North Area	March 2003	Not Applicable
Environment Agency - North West Region - South Area	March 2003	Not Applicable
Registered Waste Transfer Sites		
Environment Agency - North West Region - Central Area	March 2003	Not Applicable
Environment Agency - North West Region - North Area	March 2003	Not Applicable
Environment Agency - North West Region - South Area	March 2003	Not Applicable
Registered Waste Treatment or Disposal Sites		
Environment Agency - North West Region - Central Area	March 2003	Not Applicable
Environment Agency - North West Region - North Area	March 2003	Not Applicable
Environment Agency - North West Region - South Area	March 2003	Not Applicable

Hazardous Substances	Version	Update Cycle
Control of Major Accident Hazards Sites (COMAH)		
Health and Safety Executive	September 2017	Bi-Annually
Explosive Sites		
Health and Safety Executive	March 2017	Variable
Notification of Installations Handling Hazardous Substances (NIHHS)		
Health and Safety Executive	November 2000	Not Applicable
Planning Hazardous Substance Enforcements		
Knowsley Metropolitan Borough Council	August 2015	Variable
Lancashire County Council	February 2016	Variable
Sefton Metropolitan Borough Council	February 2016	Variable
St Helens Metropolitan Borough Council	February 2016	Variable
West Lancashire District Council	February 2016	Variable
Liverpool City Council	January 2016	Variable
Planning Hazardous Substance Consents		
Knowsley Metropolitan Borough Council	August 2015	Variable
Lancashire County Council	February 2016	Variable
Sefton Metropolitan Borough Council	February 2016	Variable
St Helens Metropolitan Borough Council	February 2016	Variable
West Lancashire District Council	February 2016	Variable
Liverpool City Council	January 2016	Variable

Geological	Version	Update Cycle
BGS 1:625,000 Solid Geology		
British Geological Survey - National Geoscience Information Service	January 2009	Not Applicable
BGS Estimated Soil Chemistry		
British Geological Survey - National Geoscience Information Service	October 2015	As notified
BGS Recorded Mineral Sites		
British Geological Survey - National Geoscience Information Service	May 2018	Bi-Annually
CBSCB Compensation District		
Cheshire Brine Subsidence Compensation Board (CBSCB)	August 2011	Not Applicable
Coal Mining Affected Areas		
The Coal Authority - Property Searches	March 2014	As notified
Mining Instability		
Ove Arup & Partners	October 2000	Not Applicable
Non Coal Mining Areas of Great Britain		
British Geological Survey - National Geoscience Information Service	May 2015	Not Applicable
Potential for Collapsible Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Compressible Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Ground Dissolution Stability Hazards		
British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Landslide Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Running Sand Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Shrinking or Swelling Clay Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	June 2015	As notified
Radon Potential - Radon Affected Areas		
British Geological Survey - National Geoscience Information Service	July 2011	As notified
Radon Potential - Radon Protection Measures		
British Geological Survey - National Geoscience Information Service	July 2011	As notified

Data Currency

Industrial Land Use	Version	Update Cycle
Contemporary Trade Directory Entries Thomson Directories	February 2018	Quarterly
Fuel Station Entries Catalist Ltd - Experian	April 2018	Quarterly
Gas Pipelines National Grid	July 2014	Quarterly
Points of Interest - Commercial Services PointX	March 2018	Quarterly
Points of Interest - Education and Health PointX	March 2018	Quarterly
Points of Interest - Manufacturing and Production PointX	March 2018	Quarterly
Points of Interest - Public Infrastructure PointX	March 2018	Quarterly
Points of Interest - Recreational and Environmental PointX	March 2018	Quarterly
Underground Electrical Cables National Grid	December 2015	Bi-Annually

Sensitive Land Use	Version	Update Cycle
Ancient Woodland		
Natural England	October 2017	Bi-Annually
Areas of Adopted Green Belt		
Knowsley Metropolitan Borough Council	February 2018	As notified
Liverpool City Council	February 2018	As notified
Sefton Metropolitan Borough Council	February 2018	As notified
St Helens Metropolitan Borough Council	February 2018	As notified
West Lancashire District Council	February 2018	As notified
Areas of Unadopted Green Belt		
Knowsley Metropolitan Borough Council	February 2018	As notified
Liverpool City Council	February 2018	As notified
Sefton Metropolitan Borough Council	February 2018	As notified
St Helens Metropolitan Borough Council	February 2018	As notified
West Lancashire District Council	February 2018	As notified
Areas of Outstanding Natural Beauty		
Natural England	February 2018	Bi-Annually
Environmentally Sensitive Areas		
Natural England	January 2017	
Forest Parks		
Forestry Commission	April 1997	Not Applicable
Local Nature Reserves		
Natural England	February 2018	Bi-Annually
Marine Nature Reserves		
Natural England	January 2018	Bi-Annually
National Nature Reserves		
Natural England	February 2018	Bi-Annually
National Parks		
Natural England	April 2017	Bi-Annually
Nitrate Vulnerable Zones		
Environment Agency - Head Office	December 2017	Bi-Annually
Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)	October 2015	
Ramsar Sites		
Natural England	February 2018	Bi-Annually
Sites of Special Scientific Interest		
Natural England	February 2018	Bi-Annually
Special Areas of Conservation		
Natural England	January 2018	Bi-Annually
Special Protection Areas		
Natural England	February 2018	Bi-Annually

Data Suppliers

A selection of organisations who provide data within this report

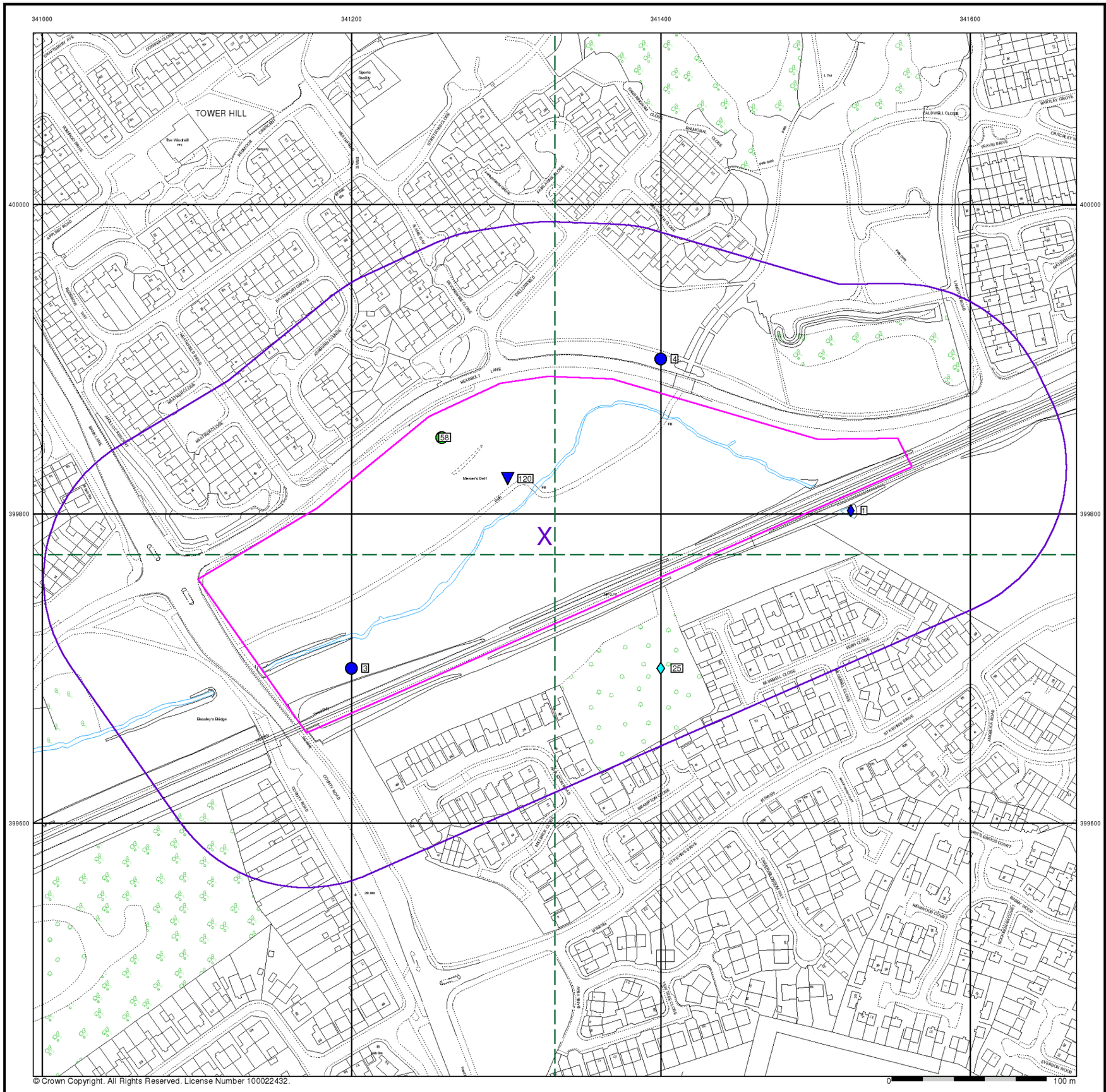
Data Supplier	Data Supplier Logo
Ordnance Survey	
Environment Agency	
Scottish Environment Protection Agency	
The Coal Authority	
British Geological Survey	
Centre for Ecology and Hydrology	
Natural Resources Wales	
Scottish Natural Heritage	
Natural England	
Public Health England	
Ove Arup	
Peter Brett Associates	

Contact	Name and Address	Contact Details
1	**British Geological Survey - Enquiry Service** British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
2	**Environment Agency - National Customer Contact Centre (NCCC)** PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 03708 506 506 Email: enquiries@environment-agency.gov.uk
3	**Knowsley Metropolitan Borough Council - Environmental Health and Consumer Protection Division** Municipal Buildings, Cherryfield Drive, Kirkby, Knowsley, Merseyside, L32 1TX	Telephone: 0151 443 4731 Fax: 0151 289 7488 Website: www.knowsley.gov.uk
4	**Ordnance Survey** Adanac Drive, Southampton, Hampshire, SO16 0AS	Telephone: 03456 05 05 05 Email: customerservices@ordnancesurvey.co.uk Website: www.ordnancesurvey.gov.uk
5	**Knowsley Metropolitan Borough Council** Archway Road, Huyton, Liverpool, Merseyside, L36 9YU	Telephone: 0151 489 6000 Fax: 0151 443 2298 Website: www.knowsley.gov.uk
6	**Merseyside Waste Disposal Authority** 2nd Floor, North House, 17 North John Street, Liverpool, Merseyside, L2 5QY	Telephone: 0151 2551444 Fax: 0151 2271848 Email: enquiries@merseysidewda.gov.uk
7	**Sefton Metropolitan Borough Council - Environmental Health Department** Balliol House, Bootle, Merseyside, L20 3AH	Telephone: 0151 934 4019 Fax: 0151 934 3587 Website: www.sefton.gov.uk
8	**West Lancashire District Council - Environmental Health Department** Westec House, 52 Derby Street, Ormskirk, Lancashire, L39 2DF	Telephone: 01695 577177 Fax: 01695 571079 Website: www.westlancsdc.gov.uk
9	**Lancashire County Council - Waste Management Group** Environment Directorate, Guild House, Cross Street, Preston, Lancashire, PR1 8RD	Website: www.lancashire.gov.uk
10	**PointX** 7 Abbey Court, Eagle Way, Sowton, Exeter, Devon, EX2 7HY	Website: www.pointx.co.uk
11	**Sefton Metropolitan Borough Council** Magdalen House, 30 Trinity Road, Bootle, Merseyside, L20 3NJ	Telephone: 0151 922 4040 Fax: 0151 934 3587 Website: www.sefton.gov.uk
12	**West Lancashire District Council** Westec House, 52 Derby Street, Ormskirk, Lancashire, L39 2DF	Telephone: 01695 577177 Fax: 01695 571079 Website: www.westlancsdc.gov.uk
13	**Environment Agency - Head Office** Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, Avon, BS32 4UD	Telephone: 01454 624400 Fax: 01454 624409
-	**Public Health England - Radon Survey, Centre for Radiation, Chemical and Environmental Hazards** Chilton, Didcot, Oxfordshire, OX11 0RQ	Telephone: 01235 822622 Fax: 01235 833891 Email: radon@phe.gov.uk Website: www.ukradon.org

Useful Contacts

Contact	Name and Address	Contact Details
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

Please note that the Environment Agency / Natural Resources Wales / SEPA have a charging policy in place for enquiries.



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MOTT MACDONALD

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location
- Pylon
- Overhead Transmission Line

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

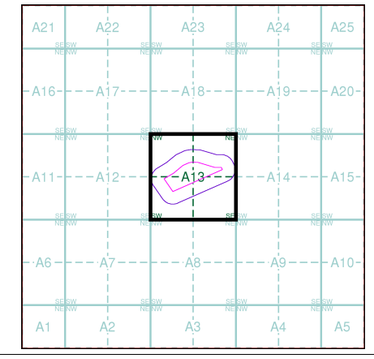
Geological

- BGS Recorded Mineral Site

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Segment A13



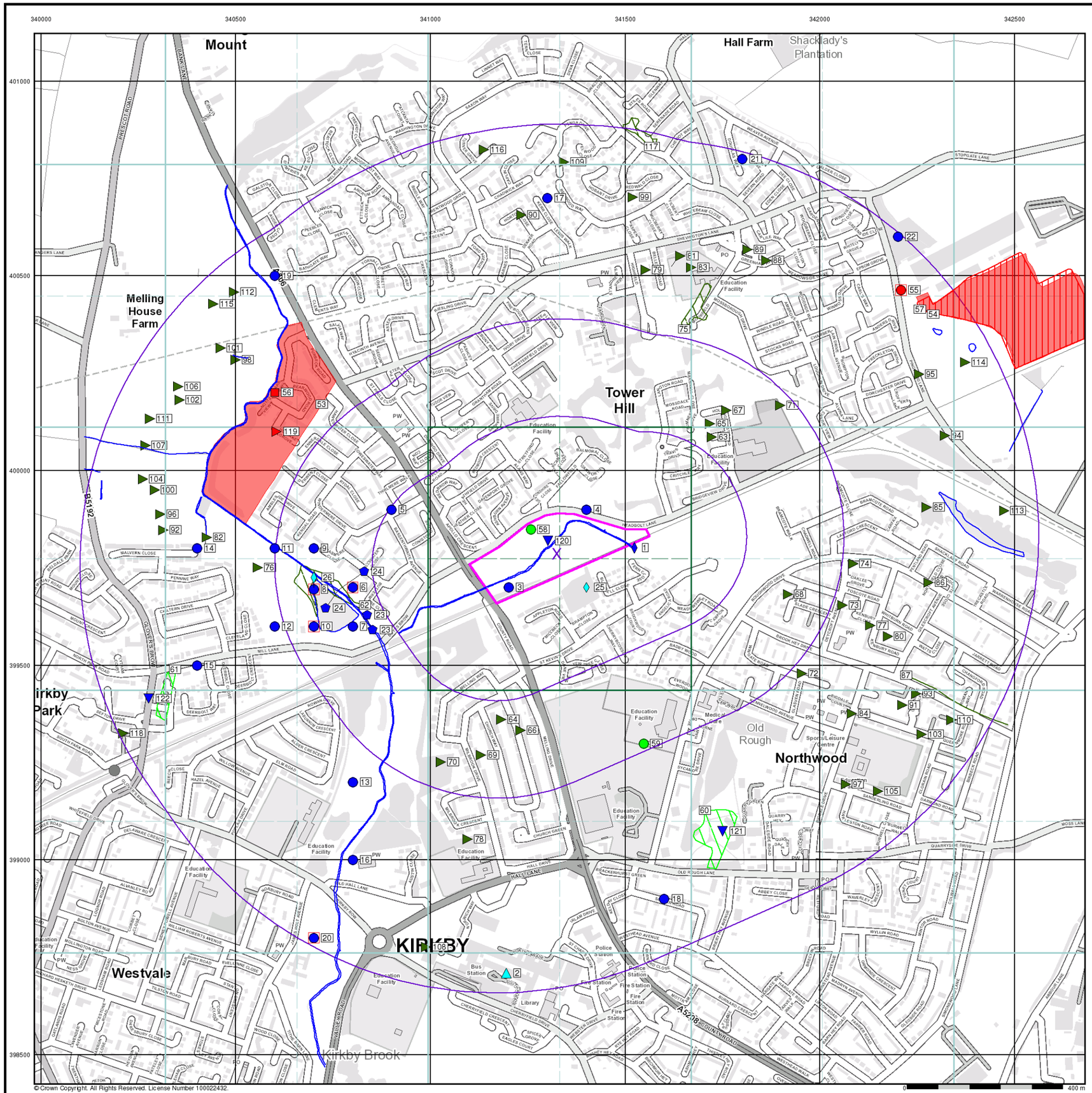
Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Plot Buffer (m):	100

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
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- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
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Geological

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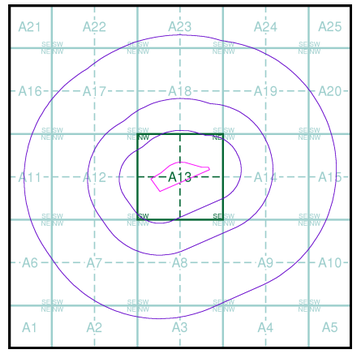
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Slice A



Order Details

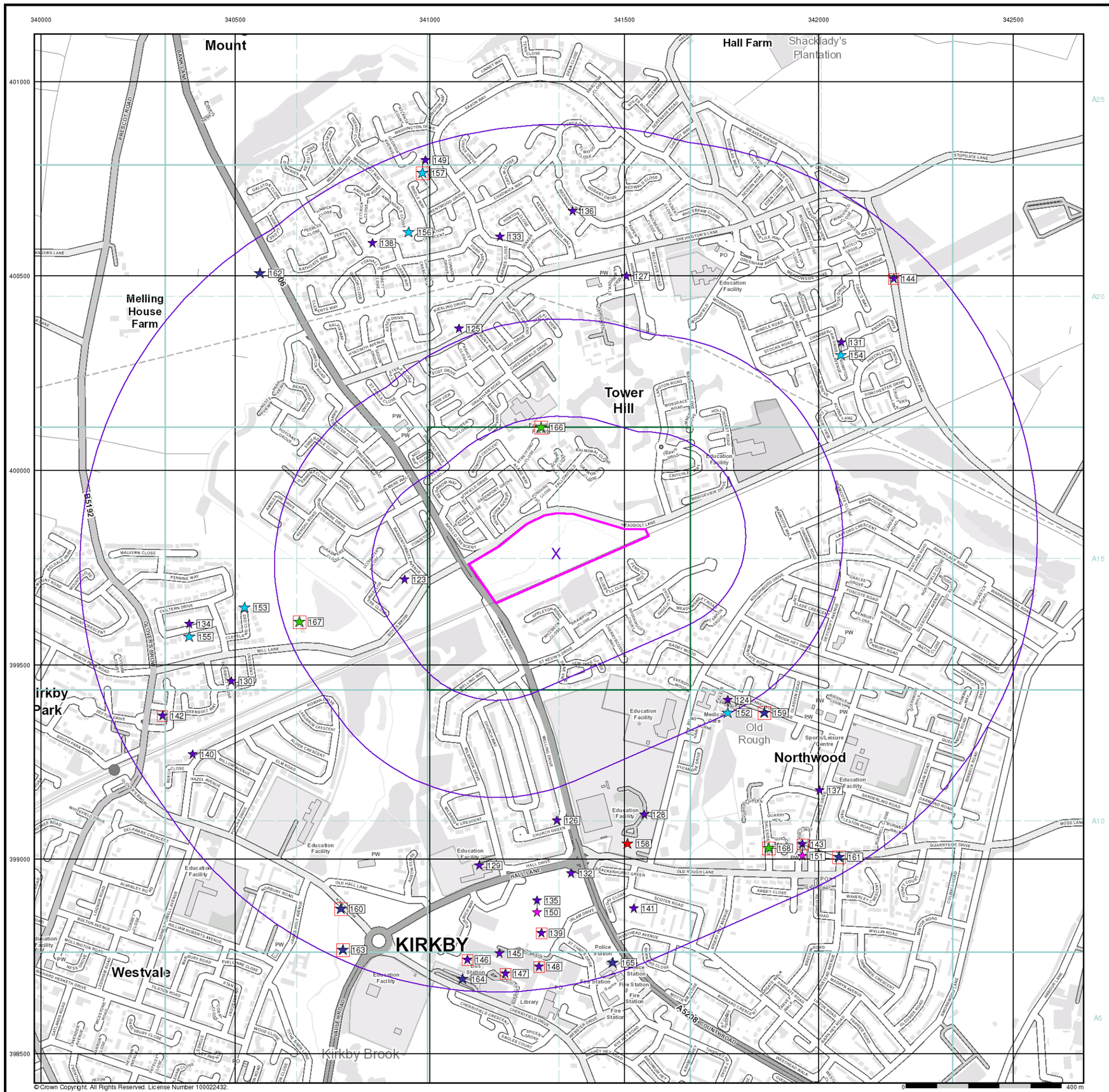
Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



M

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Industrial Land Use Map

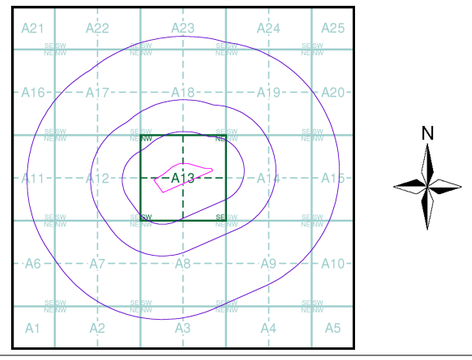
General

Specified Site
Specified Buffer(s)
Bearing Reference Point
Slice
Map ID

Industrial Land Use

Contemporary Trade Directory Entry
Fuel Station Entry
Gas Pipeline
Points of Interest - Commercial Services
Points of Interest - Education and Health
Points of Interest - Manufacturing and Production
Points of Interest - Public Infrastructure
Points of Interest - Recreational and Environmental
Underground Electrical Cables

Industrial Land Use Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

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Web: www.envirocheck.co.uk



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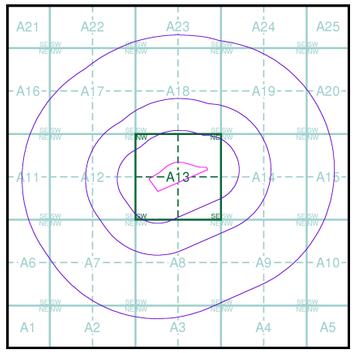
General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



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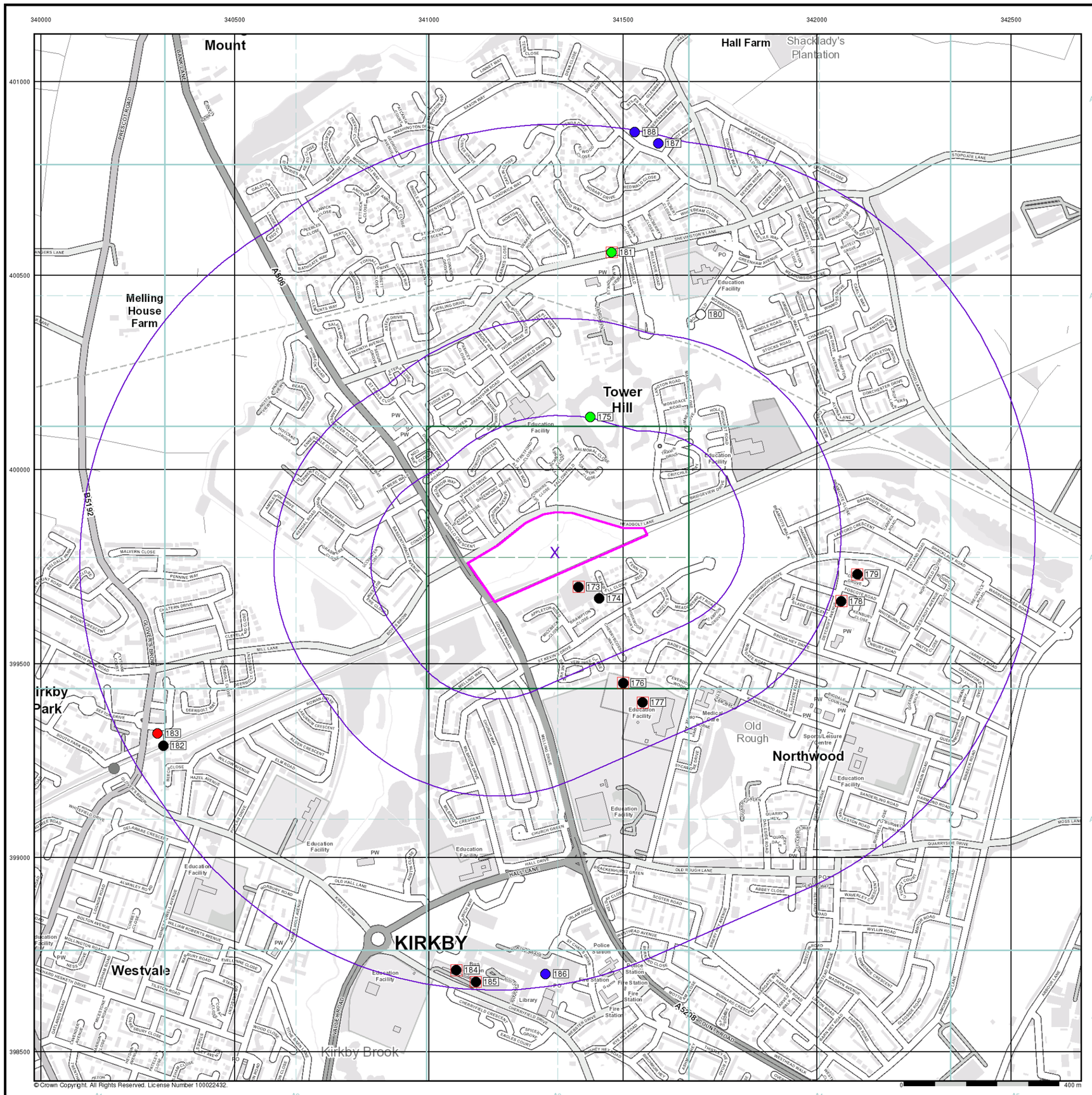

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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

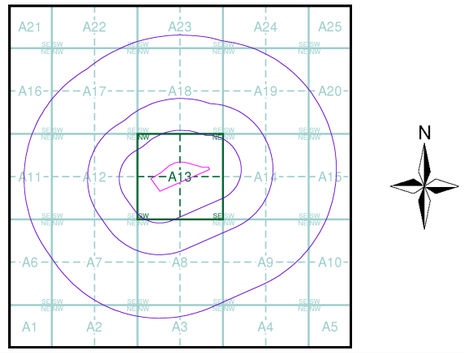
Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A



Order Details

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Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

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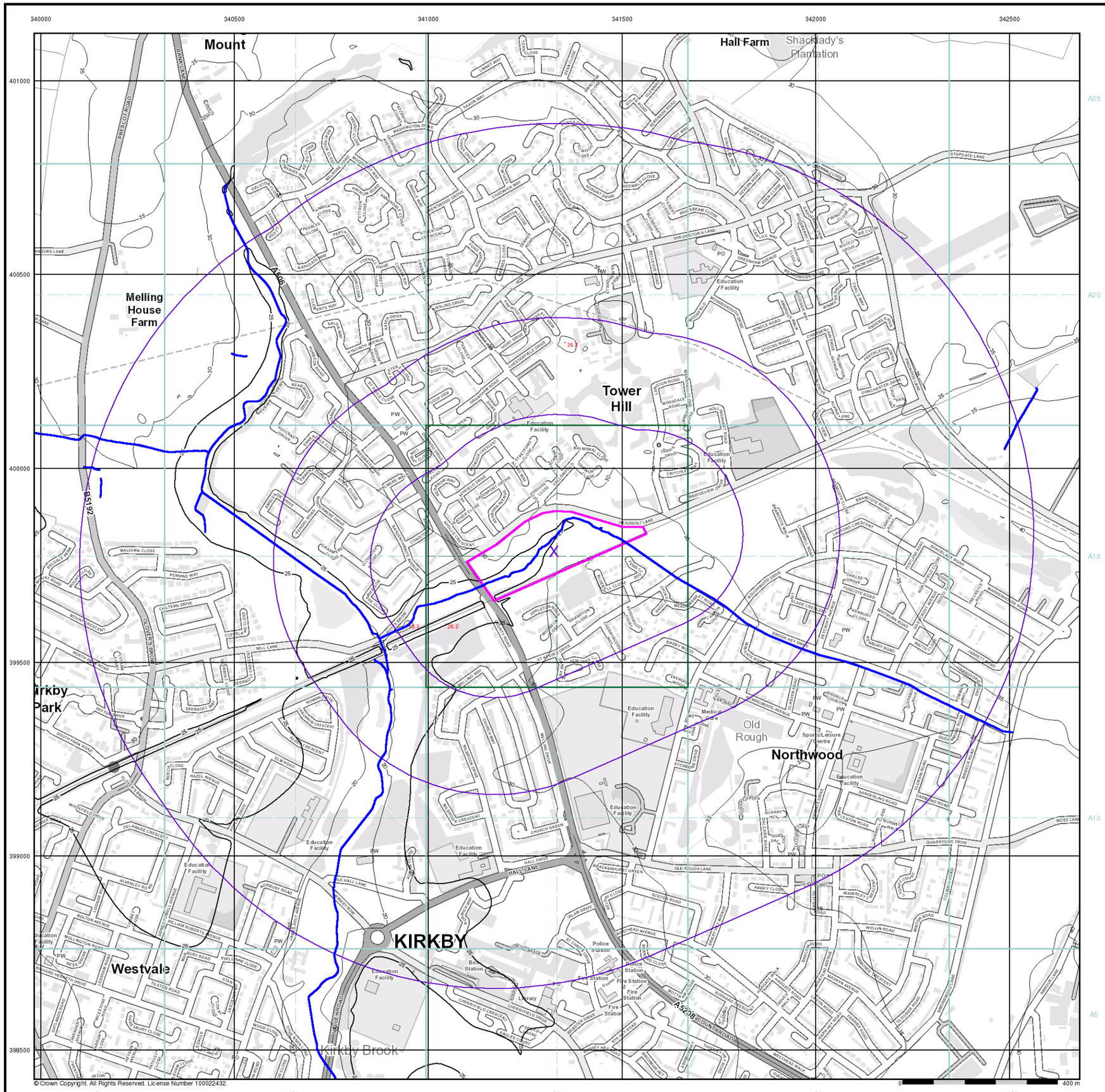

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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

OS Water Network Data

- Canal
- Reservoir
- Foreshore
- Marsh
- Tidal River
- Inland River
- Drain
- Other
- Lake
- Transfer
- Lock Or Flight Of Locks
- Sea

Contours (height in meters)

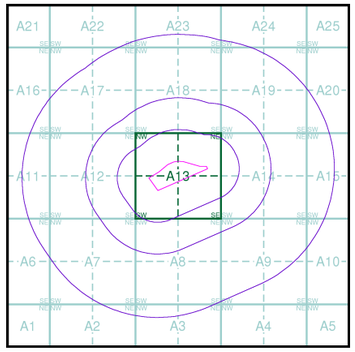
Standard Contour 105 100 95

Master Contour

Spot Height 167.3

- MLW Mean Low Water
- MHW Mean High Water

OS Water Network Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



MOTT MACDONALD

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Risk of Flooding from Surface Water

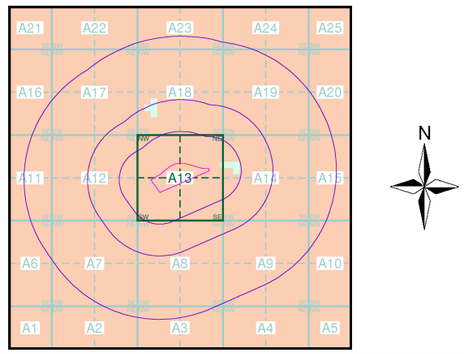
- High - 30 Year Return
- Medium - 100 Year Return
- Low - 1000 Year Return

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

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Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

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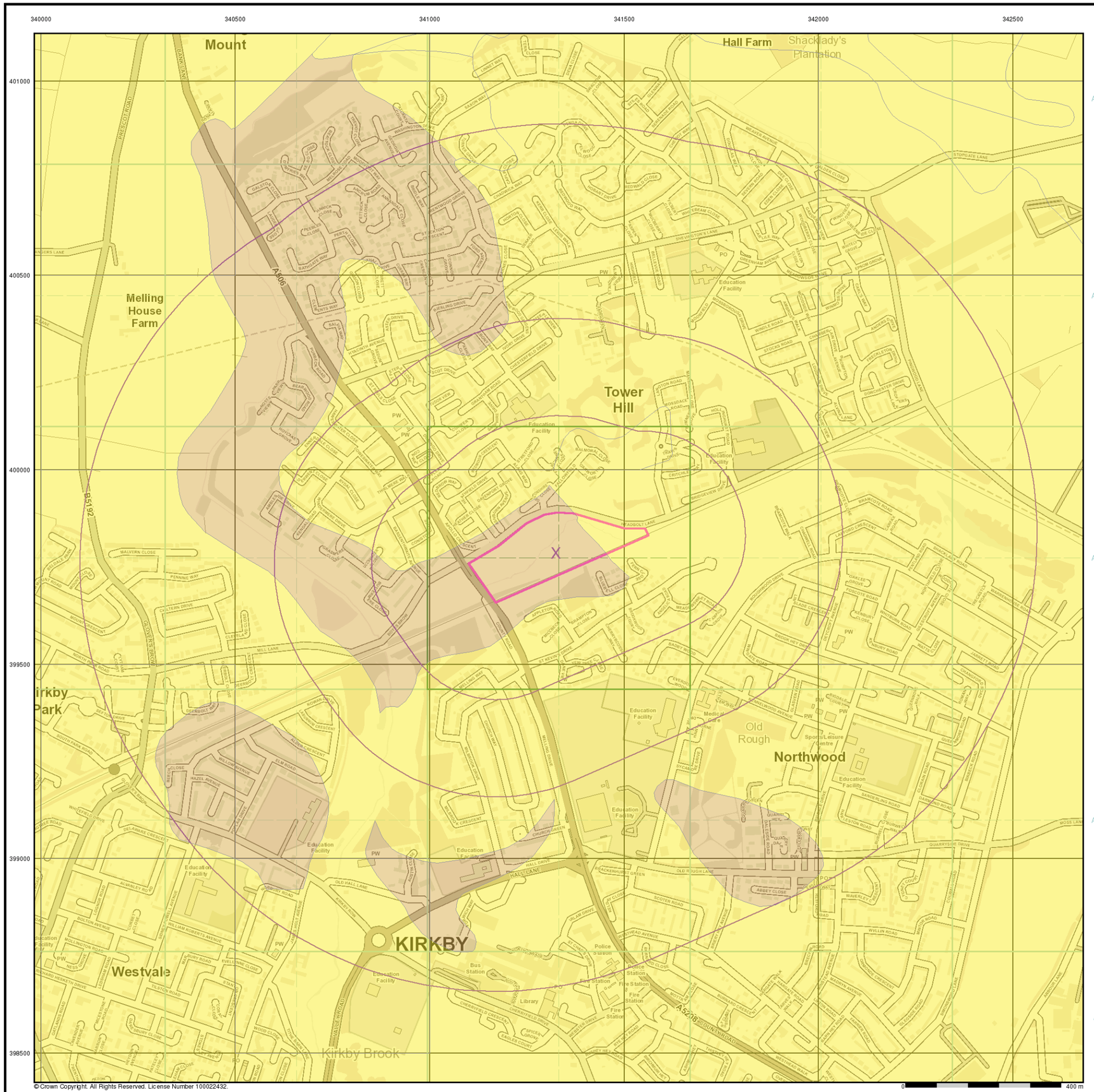

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MOTT MACDONALD

General

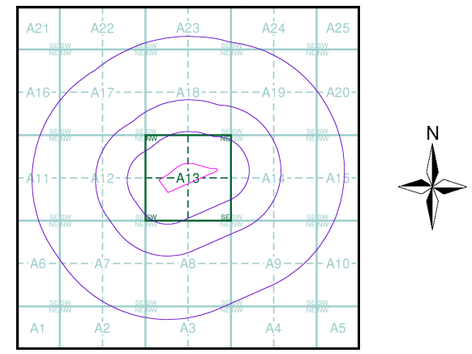
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Arsenic

Arsenic Concentrations mg/kg

- < 15
- 15 - 25
- 25 - 35
- 35 - 45
- 45 - 60
- 60 - 120
- > 120

Estimated Soil Chemistry Arsenic - Slice A



Order Details

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Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

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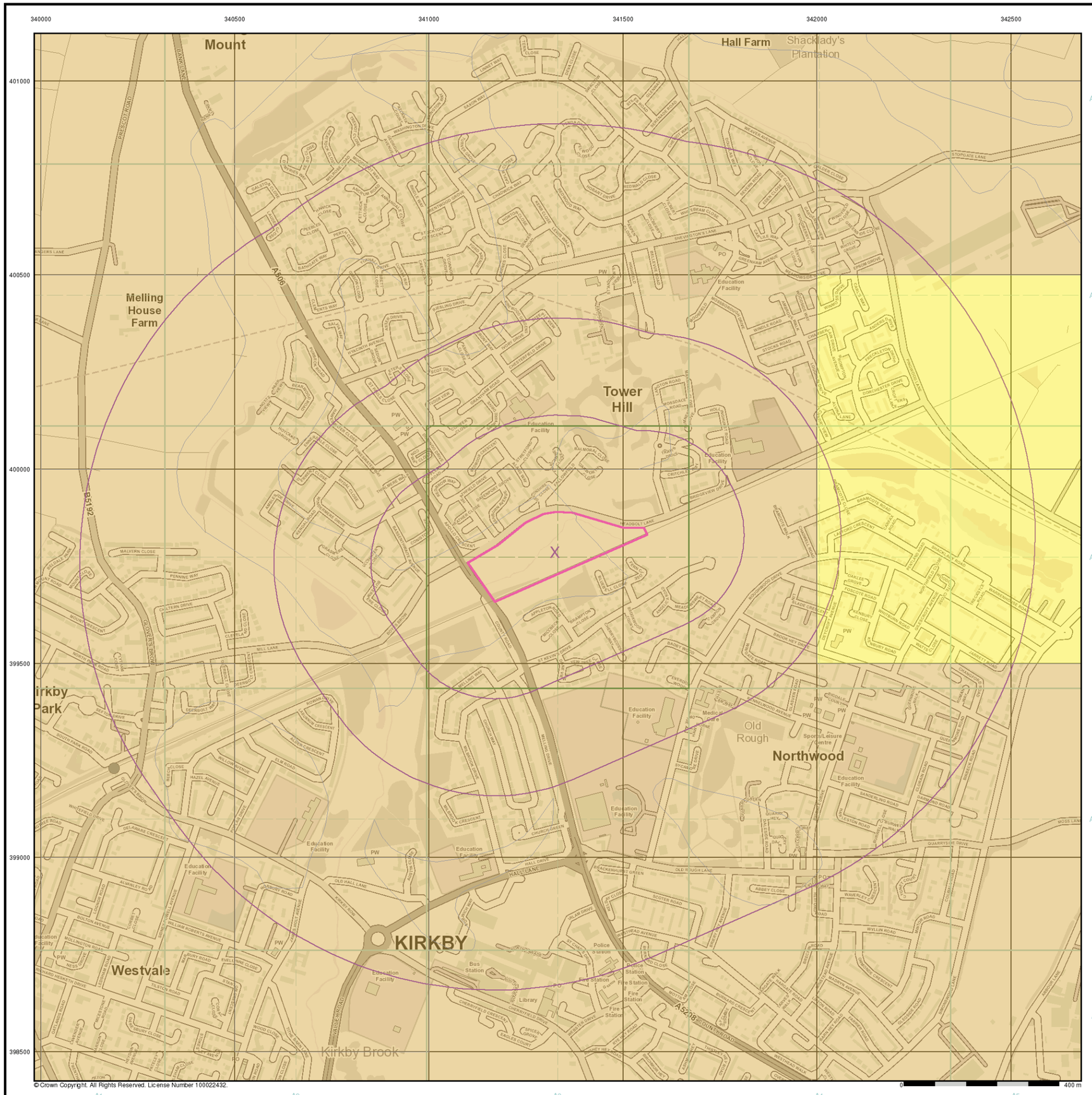

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MOTT MACDONALD

General

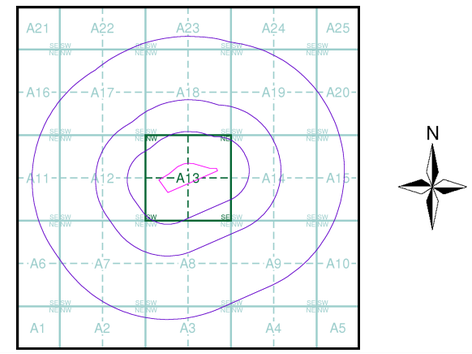
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Cadmium

Cadmium Concentrations mg/kg

- < 1.8
- 1.8 - 2.2
- 2.2 - 3.0
- > 3.0

Estimated Soil Chemistry Cadmium - Slice A



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Customer Ref:	394359GE05
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MOTT MACDONALD

General

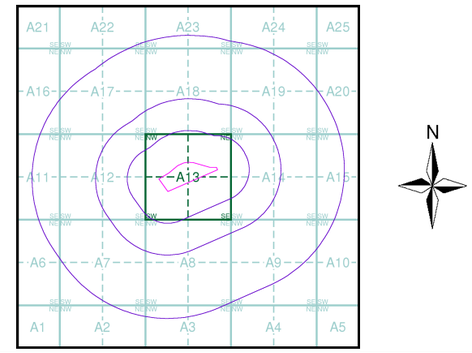
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Chromium

Chromium Concentrations mg/kg

- < 20
- 20 - 40
- 40 - 60
- 60 - 90
- 90 - 120
- 120 - 180
- > 180

Estimated Soil Chemistry Chromium - Slice A



Order Details

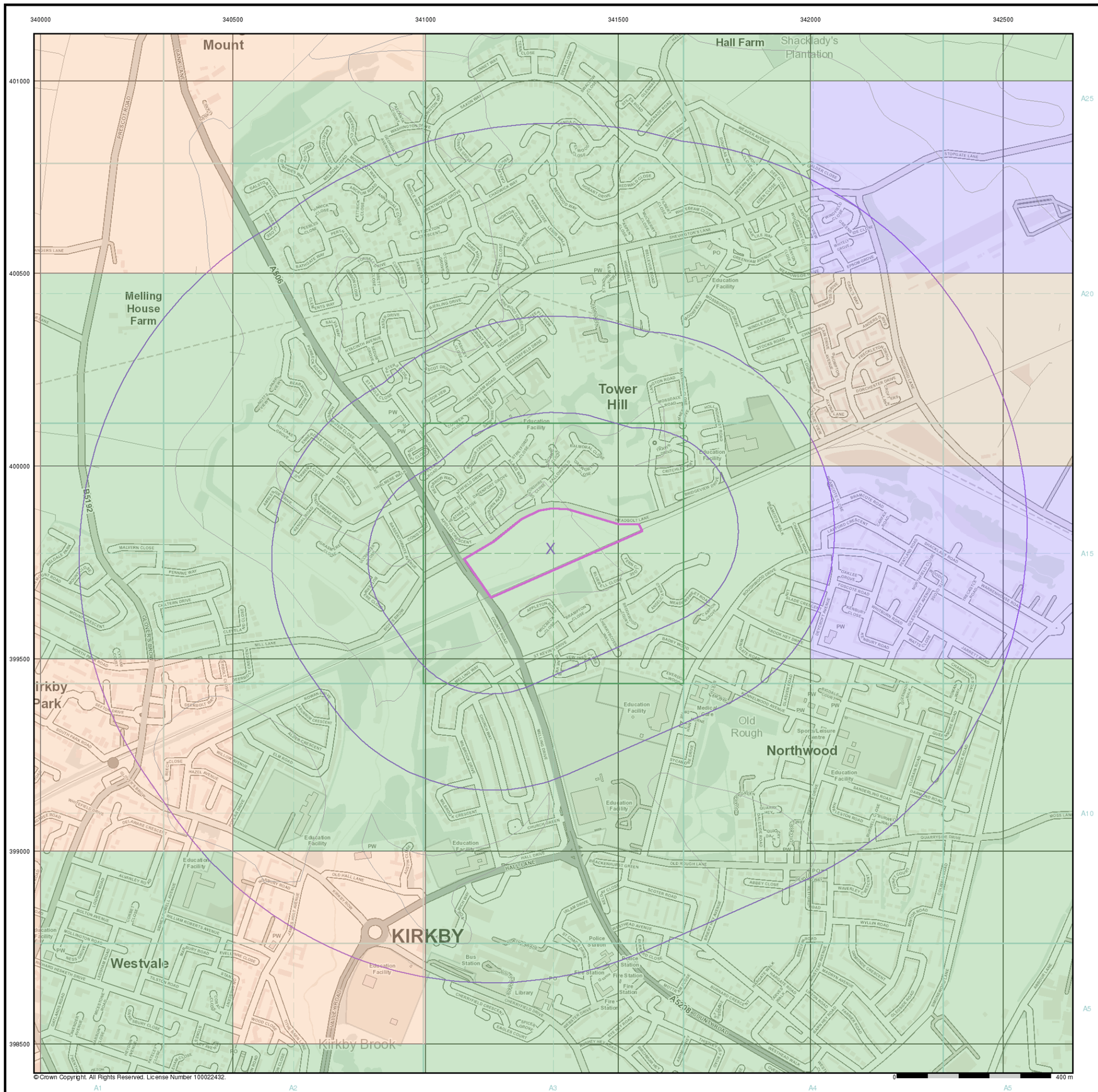
Order Details:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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General

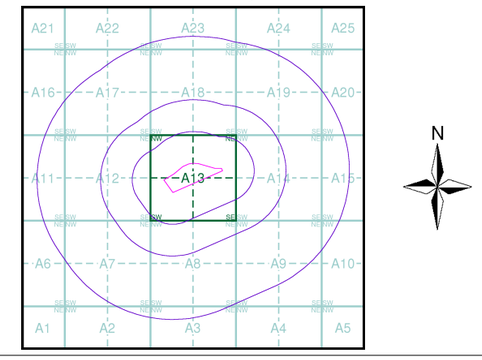
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Lead

Lead Concentrations mg/kg

- <100 mg/kg
- 100 - 200
- 200 - 300
- 300 - 600
- 600 - 1200
- >1200

Estimated Soil Chemistry Lead - Slice A



Order Details

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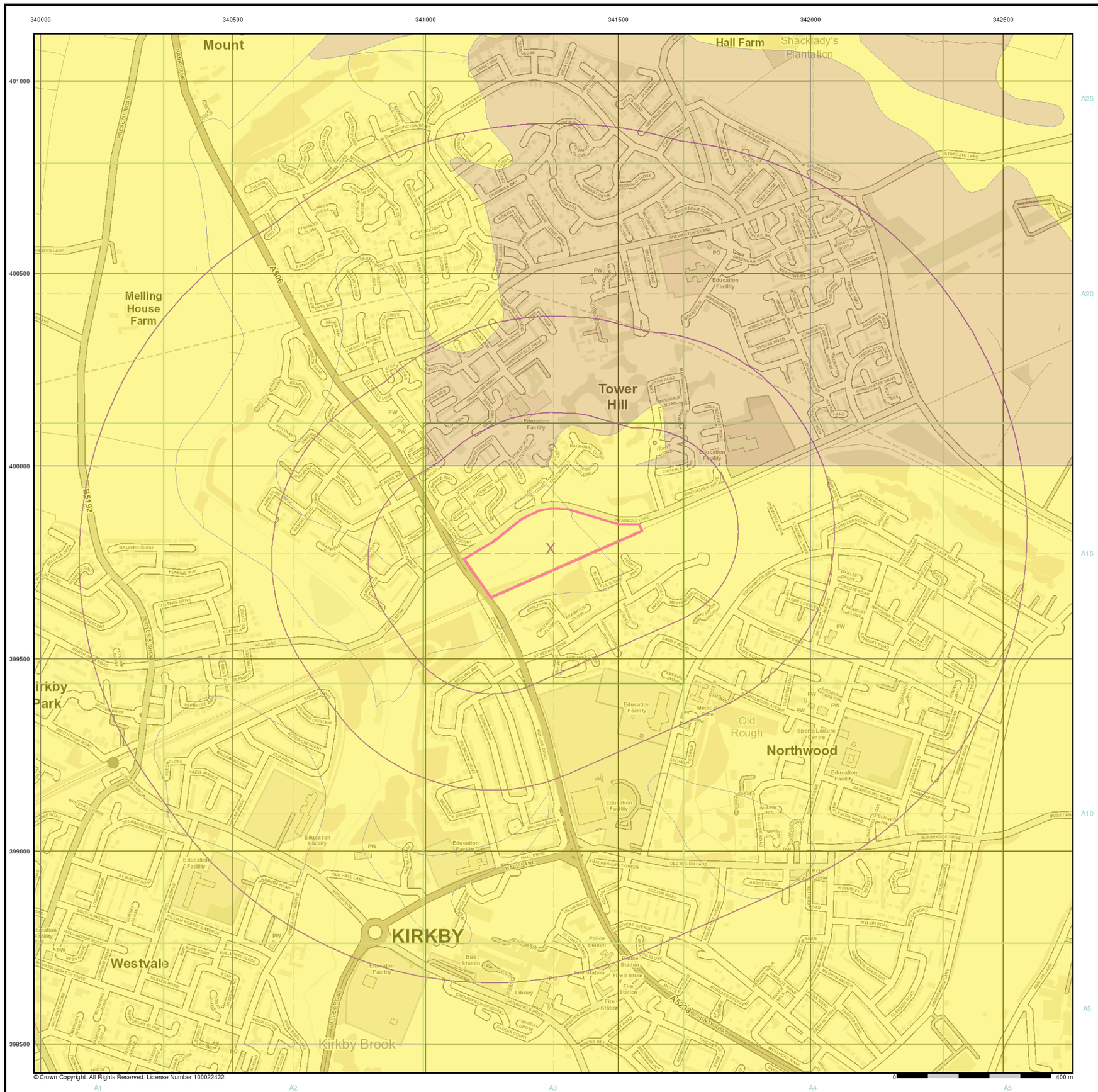

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General

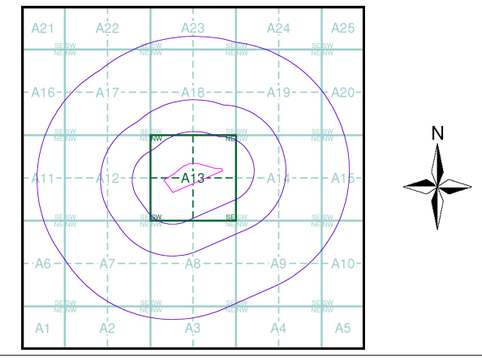
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Nickel

Nickel Concentrations mg/kg

- < 15
- 15 - 30
- 30 - 45
- 45 - 60
- 60 - 80
- 80 - 100
- > 100

Estimated Soil Chemistry Nickel - Slice A



Order Details

Order Details:	167915730_1_1
Customer Ref:	394359GE05
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Slice:	A
Site Area (Ha):	5.08
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Site Details

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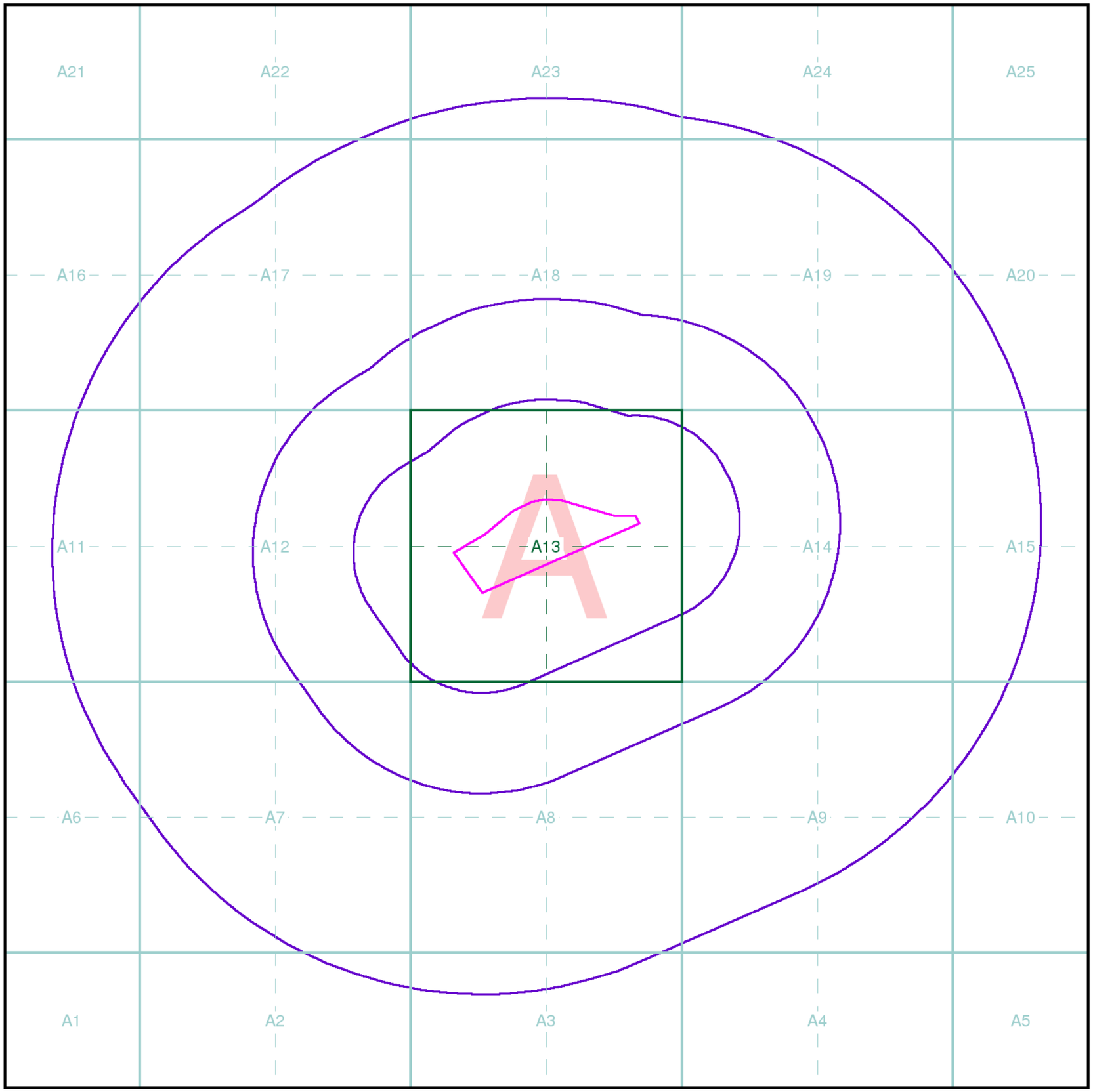

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Index Map

For ease of identification, your site and buffer have been split into Slices, Segments and Quadrants. These are illustrated on the Index Map opposite and explained further below.

Slice
Each slice represents a 1:10,000 plot area (2.7km x 2.7km) for your site and buffer. A large site and buffer may be made up of several slices (represented by a red outline), that are referenced by letters of the alphabet, starting from the bottom left corner of the slice "grid". This grid does not relate to National Grid lines but is designed to give best fit over the site and buffer.

Segment
A segment represents a 1:2,500 plot area. Segments that have plot files associated with them are shown in dark green, others in light blue. These are numbered from the bottom left hand corner within each slice.

Quadrant
A quadrant is a quarter of a segment. These are labelled as NW, NE, SW, SE and are referenced in the datasheet to allow features to be quickly located on plots. Therefore a feature that has a quadrant reference of A7NW will be in Slice A, Segment 7 and the NW Quadrant.

A selection of organisations who provide data within this report:

Map data

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Environment Agency

NATURAL ENGLAND

Envirocheck reports are compiled from 136 different sources of data.

Client Details

Mr S Myles, Mott Macdonald, Spring Bank House, 33 Stamford Street, Altrincham, Manchester, WA14 1ES

Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341300, 399790
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

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http://www.landmarkinfo.co.uk/Terms/Show/515

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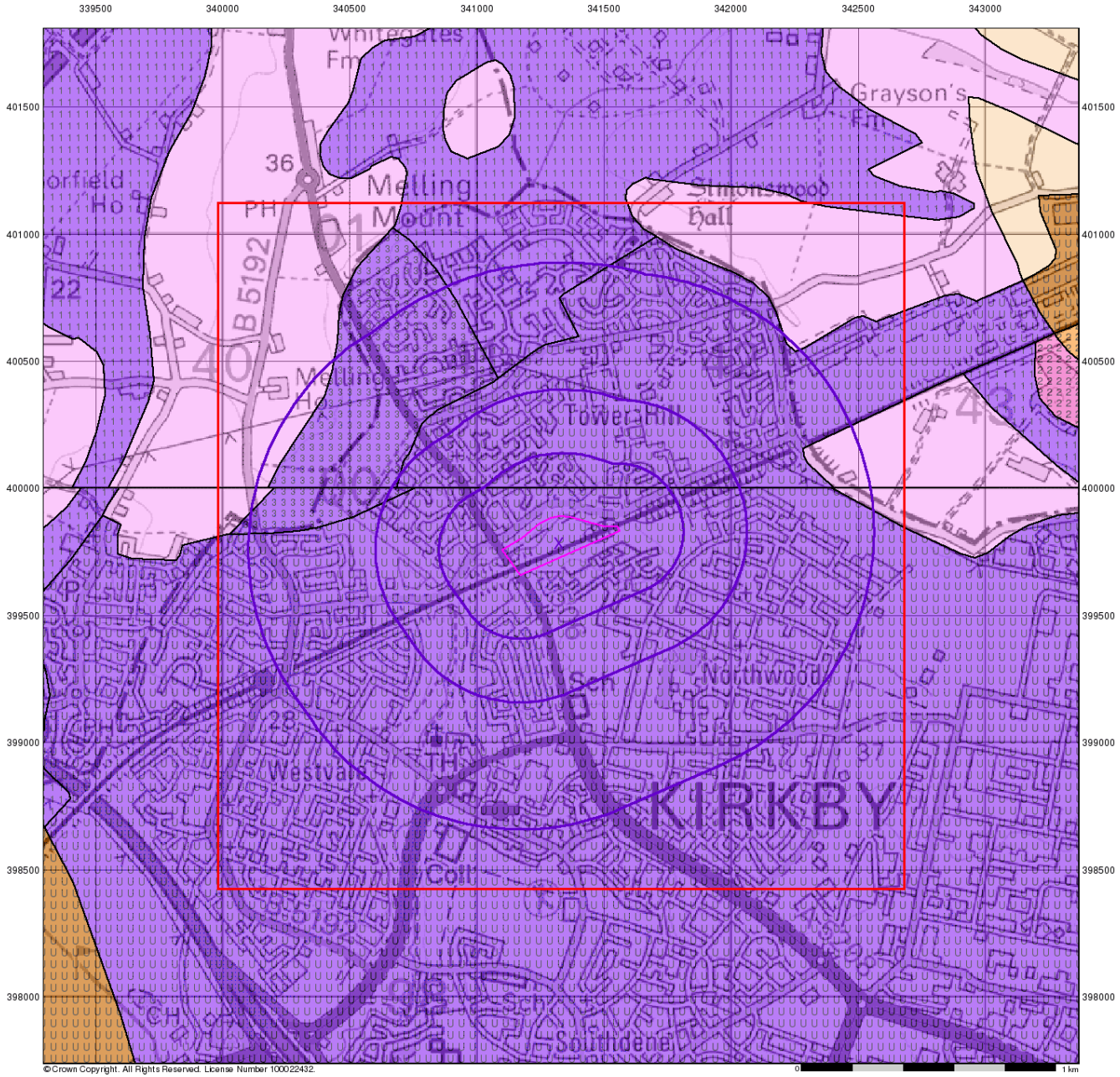

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Groundwater Vulnerability

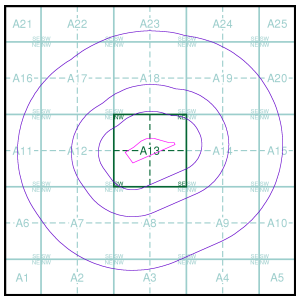
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes	Soil Classes
Major Aquifer (Highly Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Minor Aquifer (Variably Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Non Aquifer (Negligibly Permeable)	
Water or Sea	
Drift Deposit	

Site Sensitivity Context Map - Slice A



Order Details

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Site Details

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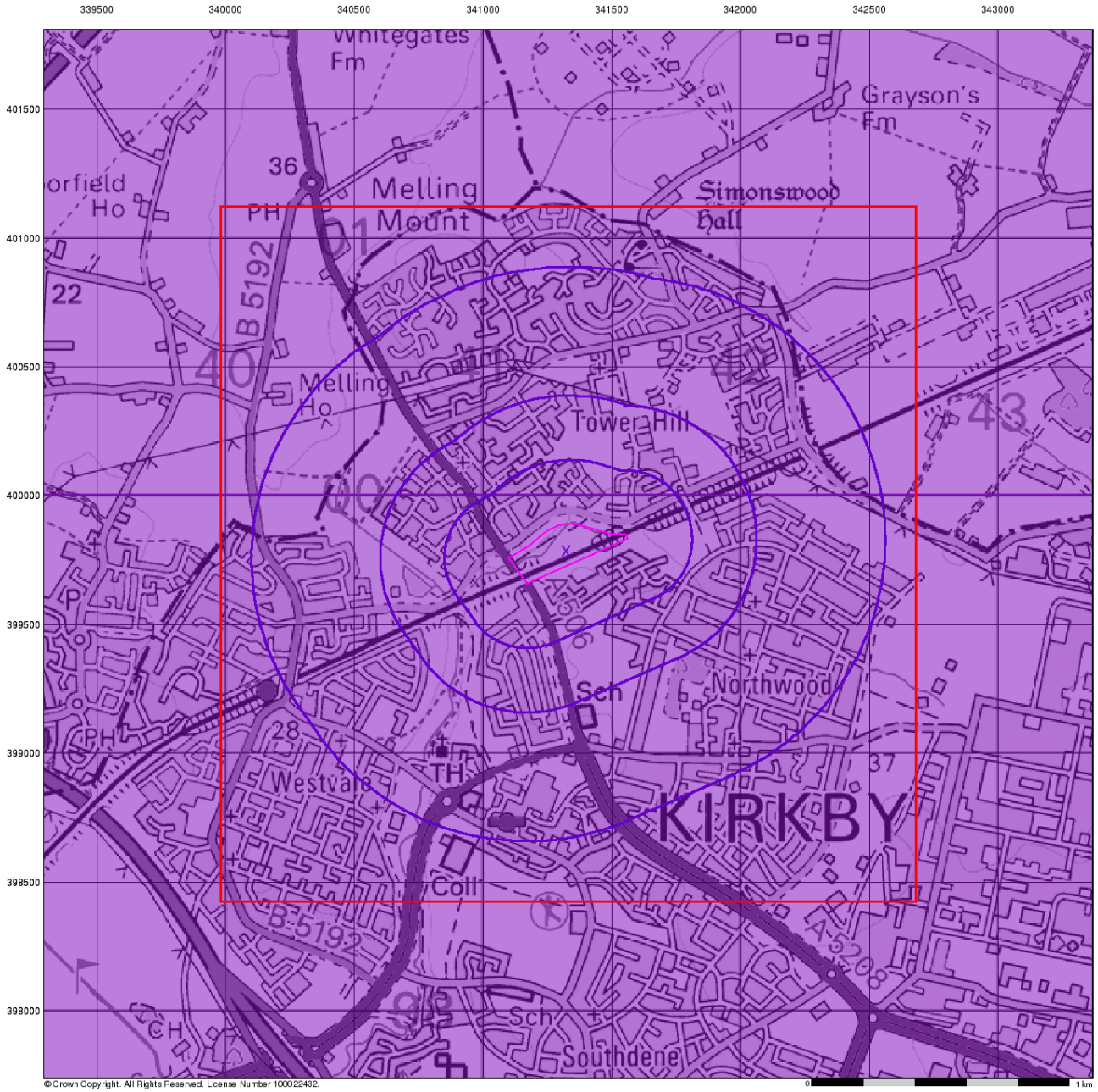

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Bedrock Aquifer Designation

General

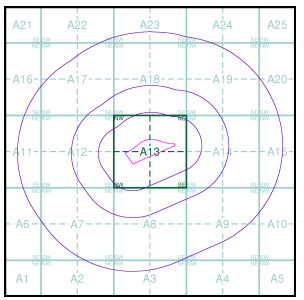
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
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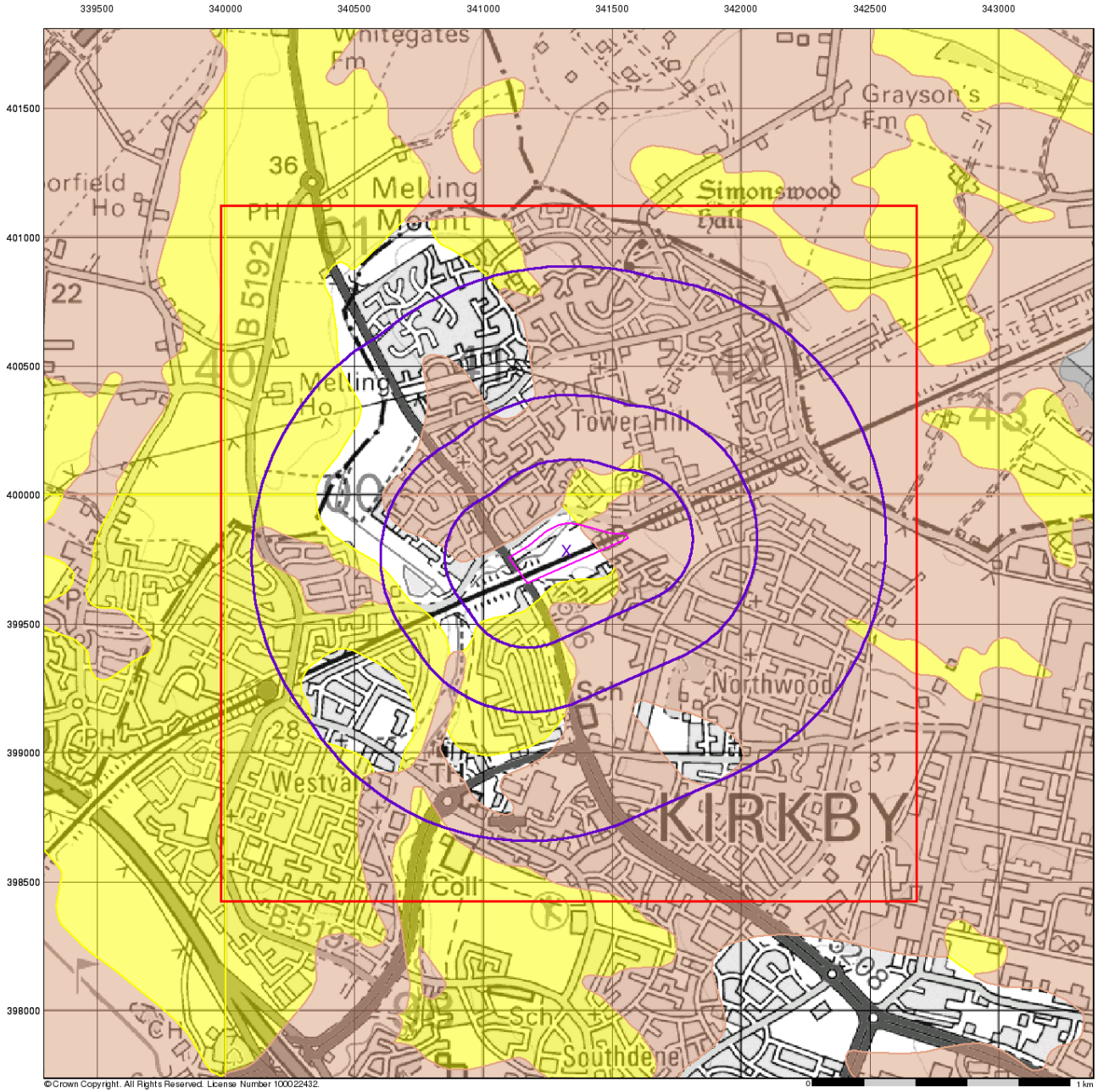
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU



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Superficial Aquifer Designation

General

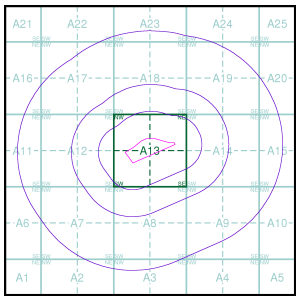
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

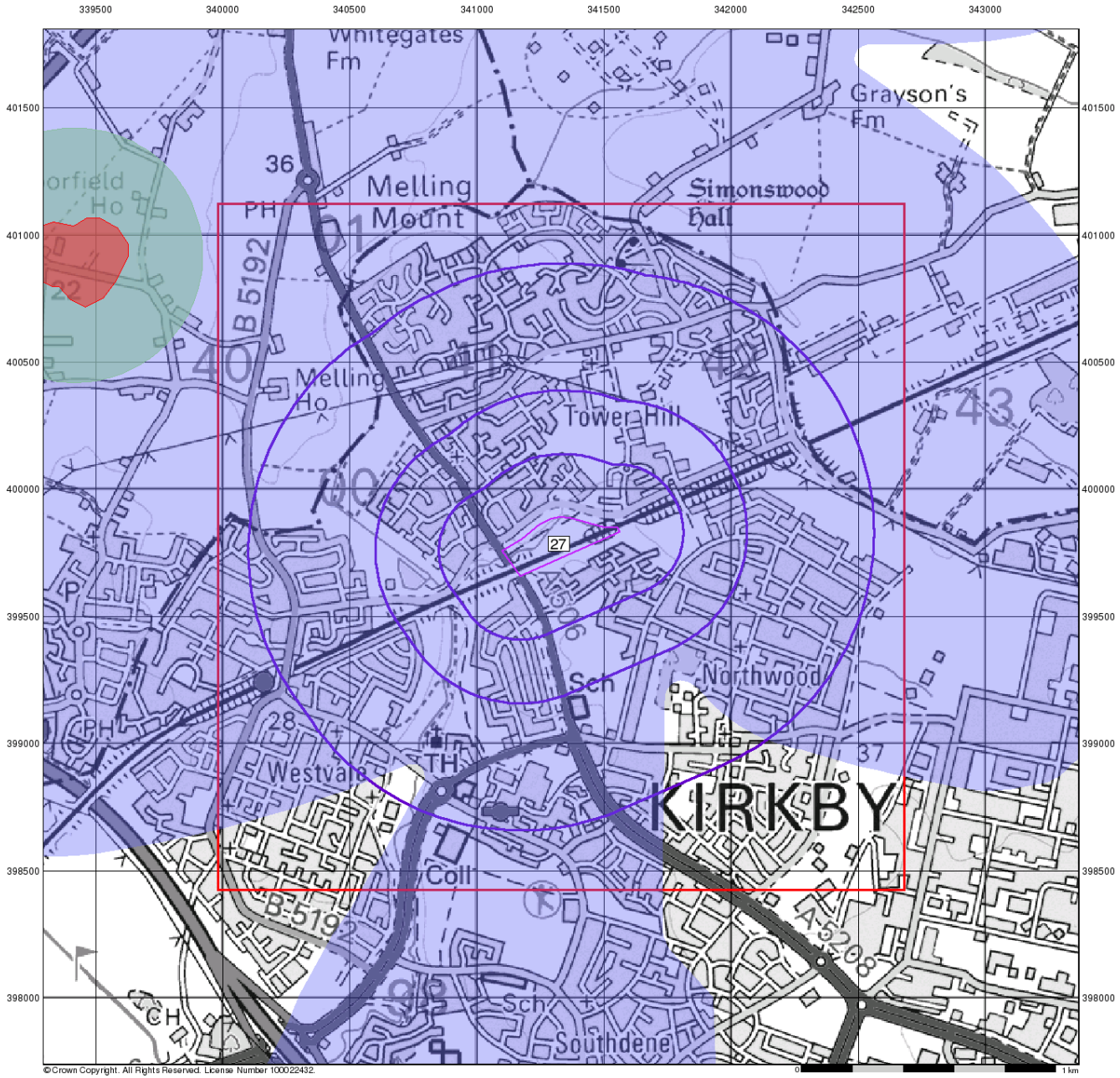


Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU



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Source Protection Zones

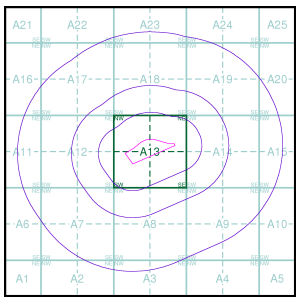
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)

Site Sensitivity Context Map - Slice A



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National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

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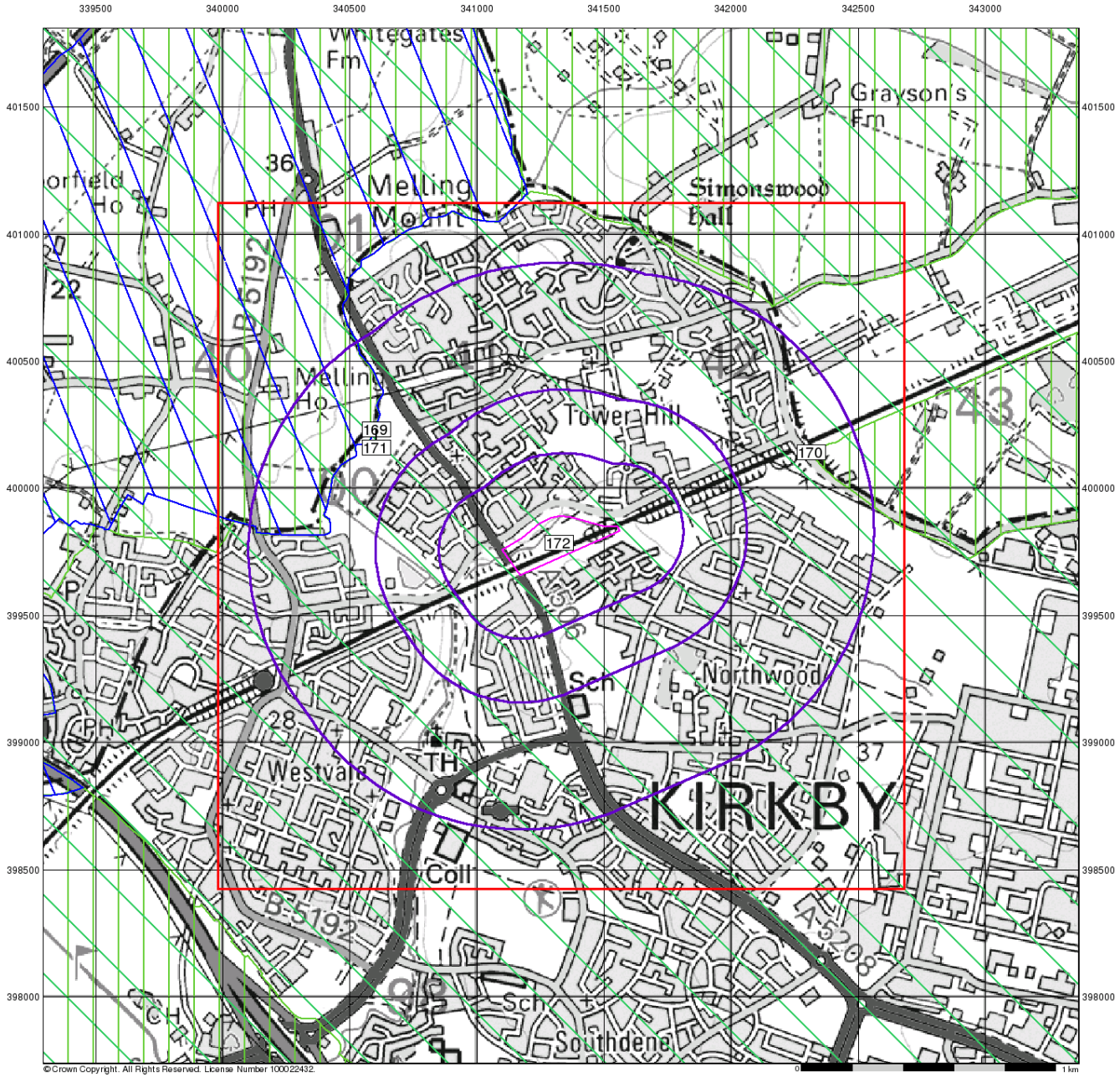
Web: www.envirocheck.co.uk



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Sensitive Land Uses

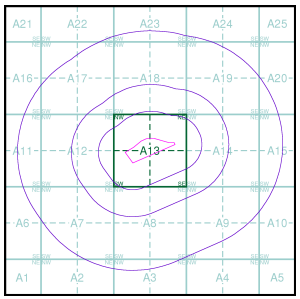
General

Specified Site | Specified Buffer(s) | Bearing Reference Point
Slice | Map ID

Sensitive Land Uses

- Ancient Woodland
- Area of Adopted Green Belt
- Area of Unadopted Green Belt
- Area of Outstanding Natural Beauty
- Environmentally Sensitive Area
- Forest Park
- Local Nature Reserve
- Marine Nature Reserve
- National Nature Reserve
- National Park
- Nitrate Sensitive Area
- Nitrate Vulnerable Zone
- Ramsar Site
- Site of Special Scientific Interest
- Special Area of Conservation
- Special Protection Area
- World Heritage Sites

Site Sensitivity Context Map - Slice A



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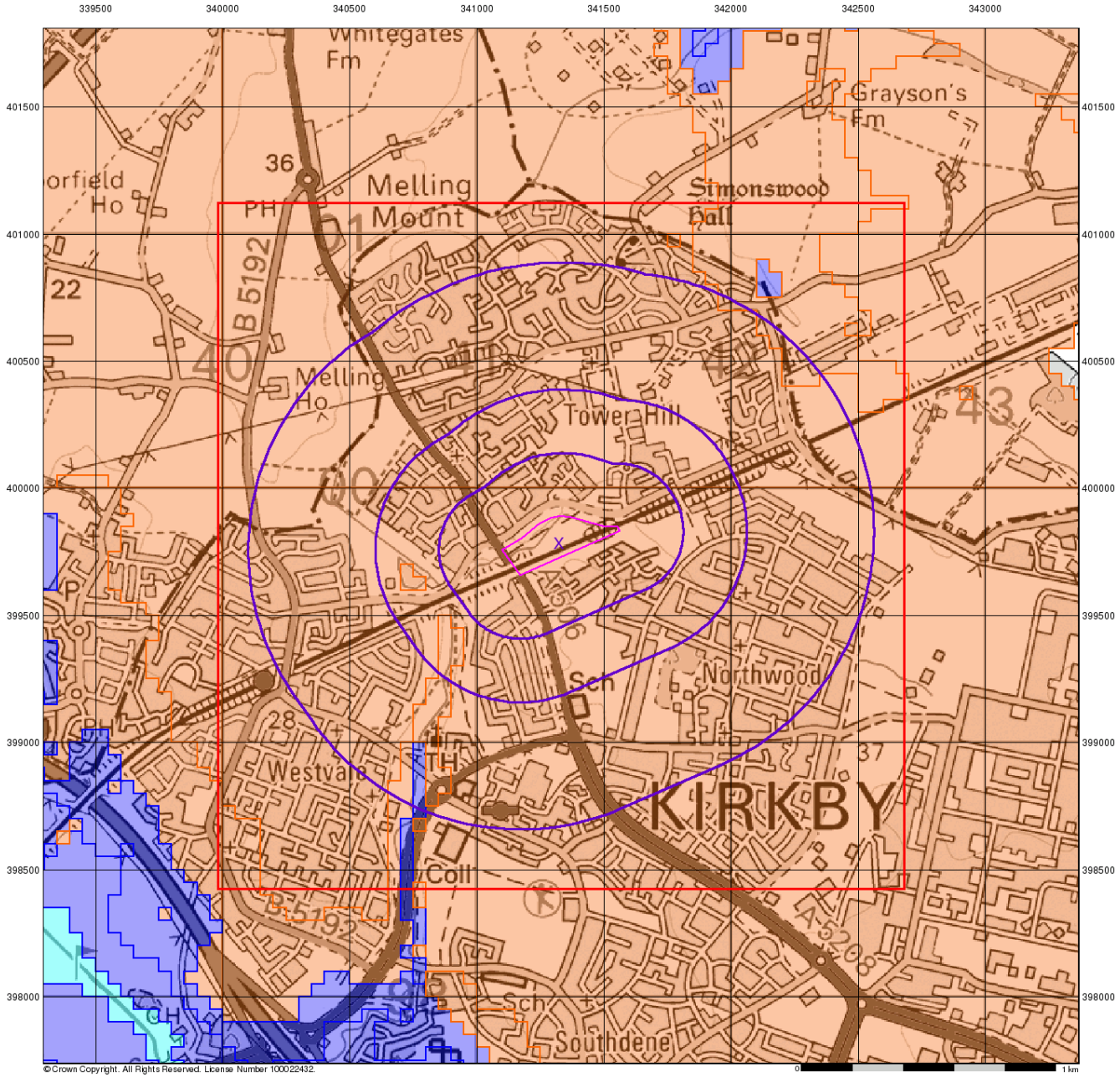
Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU



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BGS Flood GFS Data

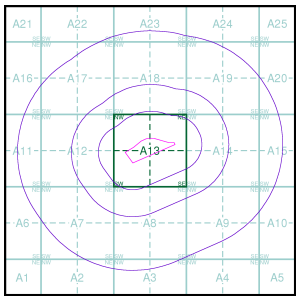
General

Specified Site
Specified Buffer(s)
Bearing Reference Point
Slice

Agency and Hydrological (Flood)

Limited Potential for Groundwater Flooding to Occur
Potential for Groundwater Flooding of Property Situated Below Ground Level
Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

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Envirocheck® Report:

Mining and Ground Stability Datasheet

Order Details:

Order Number:
167915730_1_1

Customer Reference:
394359GE05

National Grid Reference:
341330, 399790

Slice:
A

Site Area (Ha):
5.08

Search Buffer (m):
1000

Site Details:

Headbolt Lane Station
LIVERPOOL
L33 3AU

Client Details:

Mr S Myles
Mott Macdonald
Spring Bank House
33 Stamford Street
Altrincham
Manchester
WA14 1ES

MOTT MACDONALD

Contents

Report Section and Details	Page Number
Summary	-
The Summary section provides an overview of the data contained within the report, detailing the number of data set features or the existence of a data set in relation to the buffer selected. For ease of reference, the report is broken down into 4 sections of data; Mining and Natural Cavities Data, Historical Land Use Information (1:2,500), Historical Land Use Information (1:10,000) and Ground Stability Data (1:50,000).	
Mining and Natural Cavities Data	1
The Mining and Natural Cavities Data section features data sets related to the existence of mining areas and their potential hazards; and details of naturally formed cavities. Data sets within this section are not plotted, with the exception of BGS Recorded Mineral Sites and Potential Mining Areas which feature on the Historical Land Use Information (1:10,000) map.	
Historical Land Use Information (1:2,500)	2
The Historical Land Use Information (1:2,500) section contains data captured from analysis carried out by Landmark of 1:1,250 and 1:2,500 scale historical Ordnance Survey mapping, identifying areas where, historically, the land uses were potentially contaminative. For the purpose of this Envirocheck module, only historical data relating to mining and ground stability has been included and plotted on the corresponding Historical Land Use Information (1:2,500) map. This section also includes the Subterranean Features data set, which details various man-made and man-used underground spaces obtained from the Subterranea Britannica society.	
Historical Land Use Information (1:10,000)	3
The Historical Land Use (1:10,000) section covers data captured from the systematic analysis carried out by Landmark of 1:10, 560 and 1:10,000 scale historical Ordnance Survey mapping dating back to the mid-19th century, identifying potentially contaminative past industrial land uses. For the purpose of this Envirocheck module, only data relating to mining and ground stability has been included and plotted on the accompanying Historical Land Use Information (1:10,000) map.	
Ground Stability Data (1:50,000)	7
The Ground Stability (1:50,000) section includes the BGS Geosure data suite, reporting features to 250m and plotted onto 3 separate maps. Also reported is brine subsidence, brine mining and salt mining data sets, of which Brine Pumping and Salt Mining Related Features are plotted, and subsidence insurance claims and insurance investigations data, which is not plotted.	
Motion Map Data (1:2,500)	9
The Motion Map Data (1:2,500) section contains data which is plotted to indicate long-term stability trends from analysis of satellite radar data.	
Historical Map List	11
The Historical Map List section details the historical mapping that has been analysed for your site, in relation to the Historical Land Use Information sections.	
Data Currency	12
Data Suppliers	14
Useful Contacts	15

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The brine subsidence data relating to the Driotwich area as provided in this report is derived from JPB studies and physical monitoring undertaken annually over more than 35 years. For more detailed interpretation contact enquiries@jpb.co.uk. JPB retain the copyright and intellectual rights to this data and accept no liability for any loss or damage, including in direct or consequential loss, arising from the use of this data.

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Report Version v53.0

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Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m
Mining and Natural Cavities Data					
BGS Recorded Mineral Sites	pg 1	1			2
Coal Mining Affected Areas			n/a	n/a	n/a
Man Made Mining Cavities					
Mining Instability			n/a	n/a	n/a
Natural Cavities					
Non Coal Mining Areas of Great Britain				n/a	n/a
Potential Mining Areas					
Historical Land Use Information (1:2,500)					
Extractive Industries or Potential Excavations from 1855-1909 (100m)				n/a	n/a
Extractive Industries or Potential Excavations from 1893-1915 (100m)				n/a	n/a
Extractive Industries or Potential Excavations from 1906-1937 (100m)				n/a	n/a
Extractive Industries or Potential Excavations from 1924-1949 (100m)				n/a	n/a
Extractive Industries or Potential Excavations from 1950-1980 (100m)	pg 2	3	2	n/a	n/a
Subterranean Features (100m)				n/a	n/a
Historical Land Use Information (1:10,000)					
Air Shafts					
Disturbed Ground					
General Quarrying	pg 3	1			2
Heap, unknown constituents					
Mineral Railway					
Mining & quarrying general					
Mining of coal & lignite					
Quarrying of sand & clay, operation of sand & gravel pits	pg 3			1	
Former Marshes					
Potentially Infilled Land (Non-Water)	pg 3	1		1	2
Potentially Infilled Land (Water)	pg 3			10	47

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Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m
Ground Stability Data (1:50,000)					
CBSCB Compensation District			n/a	n/a	n/a
Brine Pumping Related Features					
Brine Subsidence Solution Area					
Potential for Collapsible Ground Stability Hazards	pg 7	Yes	Yes	n/a	n/a
Potential for Compressible Ground Stability Hazards	pg 7	Yes	Yes	n/a	n/a
Potential for Ground Dissolution Stability Hazards	pg 7	Yes	Yes	n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 7	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 7	Yes	Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 7	Yes	Yes	n/a	n/a
Salt Mining Related Features					
Subsidence Insurance Claims				n/a	n/a
Subsidence Investigations	pg 8		1	n/a	n/a
Motion Map Data (1:2,500)					
Motion Map (100m)	pg 9	1	26	n/a	n/a

Report Version v53.0

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Mining and Natural Cavities Data

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	**BGS Recorded Mineral Sites** Site Name: Mercers Delf Location: Not Supplied Source: British Geological Survey, National Geoscience Information Service Reference: 95031 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Permian, Triassic Geology: Sherwood Sandstone Group Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A13NW (NW)	0	1	341301 399824
2	**BGS Recorded Mineral Sites** Site Name: Old Rough Delf Location: Not Supplied Source: British Geological Survey, National Geoscience Information Service Reference: 95032 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Permian, Triassic Geology: Sherwood Sandstone Group Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A9SW (SE)	765	1	341749 399078
3	**BGS Recorded Mineral Sites** Site Name: Dearbolt Delf Location: Not Supplied Source: British Geological Survey, National Geoscience Information Service Reference: 95022 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Permian, Triassic Geology: Sherwood Sandstone Group Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A6NE (W)	892	1	340276 399419
	Coal Mining Affected Areas In an area which may not be affected by coal mining				
	Non Coal Mining Areas of Great Britain No Hazard				

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Historical Land Use Information (1:2,500)

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
4	**Extractive Industries or Potential Excavations from 1950-1980** Use: Railway Embankment First Map Published Date: 1962 Last Map Published Date: 1962	A13SW (SW)	0	-	341287 399719
5	**Extractive Industries or Potential Excavations from 1950-1980** Use: Railway Embankment First Map Published Date: 1962 Last Map Published Date: 1962	A13NE (E)	0	-	341419 399779
6	**Extractive Industries or Potential Excavations from 1950-1980** Use: Railway Cutting First Map Published Date: 1962 Last Map Published Date: 1962	A13SE (SE)	0	-	341343 399747
7	**Extractive Industries or Potential Excavations from 1950-1980** Use: Railway Cutting First Map Published Date: 1962 Last Map Published Date: 1962	A13NE (E)	26	-	341586 399838
8	**Extractive Industries or Potential Excavations from 1950-1980** Use: Railway Cutting First Map Published Date: 1961 Last Map Published Date: 1975	A13NE (E)	99	-	341649 399877

Historical Land Use Information (1:10,000)

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
9	**General Quarrying** Use: Not Supplied Date of Mapping: 1850 - 1894	A13NW (NW)	0	-	341275 399833
10	**General Quarrying** Use: Not Supplied Date of Mapping: 1850 - 1956	A9NW (SE)	701	-	341705 399128
11	**General Quarrying** Use: Not Supplied Date of Mapping: 1850	A12SW (W)	803	-	340344 399489
12	**Quarrying of sand & clay, operation of sand & gravel pits** Use: Not Supplied Date of Mapping: 1909 - 1928	A8NE (SE)	481	-	341548 399299
13	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A13NW (NW)	0	-	341258 399849
14	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A8NE (SE)	481	-	341548 399299
15	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A9NW (SE)	701	-	341705 399128
16	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A12SW (W)	803	-	340344 399489
17	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1956	A12SE (W)	288	-	340832 399654
18	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14NW (NE)	289	-	341718 400086
19	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (S)	298	-	341177 399361
20	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19SW (NE)	316	-	341713 400120
21	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (S)	322	-	341227 399342
22	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19SW (NE)	367	-	341755 400155
23	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SW (E)	382	-	341914 399683
24	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (S)	392	-	341126 399269
25	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (SW)	433	-	341022 399252
26	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19SW (NE)	467	-	341894 400167
27	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SW (SE)	523	-	341950 399479
28	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	523	-	342054 399654
29	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	524	-	342081 399761

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
30	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18SE (NE)	525	-	341652 400364
31	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A12SW (W)	548	-	340553 399751
32	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	608	-	342125 399603
33	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8SW (S)	610	-	341091 399054
34	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (N)	654	-	341548 400516
35	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	656	-	342170 399584
36	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (N)	679	-	341619 400525
37	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A12NW (W)	682	-	340421 399813
38	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (NE)	682	-	341665 400521
39	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	688	-	342078 399376
40	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A14NE (E)	712	-	342270 399906
41	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A14SE (E)	723	-	342275 399712
42	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	750	-	342221 399474
43	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19NW (NE)	756	-	341858 400540
44	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19NW (NE)	761	-	341810 400565
45	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NW (N)	774	-	341229 400656
46	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	777	-	342207 399398
47	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	796	-	340310 399847
48	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (E)	796	-	342243 399419
49	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A14NE (E)	798	-	342317 400090
50	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A19SE (NE)	803	-	342250 400248

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
51	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	809	-	340303 399887
52	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	809	-	342062 399195
53	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	821	-	340495 400312
54	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (N)	828	-	341515 400702
55	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	836	-	340288 399950
56	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	852	-	340457 400315
57	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (W)	861	-	340351 400182
58	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	861	-	342257 399323
59	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	870	-	340257 399969
60	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	877	-	342146 399176
61	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	882	-	340348 400216
62	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	892	-	340264 400065
63	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A7SE (S)	902	-	340985 398776
64	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A23SE (N)	904	-	341339 400793
65	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	904	-	342333 399360
66	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A16SE (W)	907	-	340276 400133
67	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	909	-	340492 400433
68	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A15NW (E)	909	-	342468 399897
69	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A20SW (NE)	923	-	342369 400278
70	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	943	-	340439 400428
71	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A23SW (N)	954	-	341133 400824

Historical Land Use Information (1:10,000)

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
72	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A23SE (N)	965	-	341569 400831
73	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1909	A6NE (W)	993	-	340207 399325

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	CBSCB Compensation District The site does not fall within the brine compensation area.				
	Brine Subsidence Solution Area The site does not fall within the brine subsidence solution area.				
74	**Potential for Collapsible Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
75	**Potential for Collapsible Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
76	**Potential for Landslide Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
77	**Potential for Landslide Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
78	**Potential for Running Sand Ground Stability Hazards** Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	341395 399848
79	**Potential for Running Sand Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	341380 399879
80	**Potential for Running Sand Ground Stability Hazards** Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (NW)	46	1	341255 399918
81	**Potential for Running Sand Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (S)	51	1	341342 399668
82	**Potential for Running Sand Ground Stability Hazards** Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341317 400000
83	**Potential for Running Sand Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786
84	**Potential for Shrinking or Swelling Clay Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	341380 399879
85	**Potential for Shrinking or Swelling Clay Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SE (S)	51	1	341342 399668
86	**Potential for Shrinking or Swelling Clay Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341325 400000
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	341325 399786

Ground Stability Data (1:50,000)

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	112	1	341317 400000
	Subsidence Investigations Site Investigation Date: 23rd May 2001 Root Survey: No CCTV Drain Survey: Yes Depth of Foundation Footing: Not Supplied Soil Classification: Not Supplied			-	

Motion Map Data (1:2,500)

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
87	**Motion Map** Average Velocity Gradient (mmyear): -0.2	A13SW (SW)	0	-	341218 399735
88	**Motion Map** Average Velocity Gradient (mmyear): 0.7	A13NE (NE)	9	-	341401 399887
89	**Motion Map** Average Velocity Gradient (mmyear): 0.7	A13SW (W)	16	-	341087 399750
89	**Motion Map** Average Velocity Gradient (mmyear): 0.1	A13SW (W)	18	-	341087 399746
89	**Motion Map** Average Velocity Gradient (mmyear): 1.0	A13SW (W)	20	-	341082 399751
90	**Motion Map** Average Velocity Gradient (mmyear): 1.1	A13SW (W)	19	-	341107 399717
91	**Motion Map** Average Velocity Gradient (mmyear): -0.2	A13NW (W)	38	-	341138 399824
91	**Motion Map** Average Velocity Gradient (mmyear): 0.2	A13NW (W)	41	-	341138 399828
92	**Motion Map** Average Velocity Gradient (mmyear): 1.4	A13NW (W)	43	-	341162 399846
93	**Motion Map** Average Velocity Gradient (mmyear): -0.5	A13NW (NW)	48	-	341243 399913
94	**Motion Map** Average Velocity Gradient (mmyear): 0.3	A13NW (NW)	52	-	341265 399927
95	**Motion Map** Average Velocity Gradient (mmyear): 0.8	A13NW (NW)	56	-	341173 399872
96	**Motion Map** Average Velocity Gradient (mmyear): 0.3	A13SW (SW)	58	-	341160 399602
96	**Motion Map** Average Velocity Gradient (mmyear): 0.7	A13SW (SW)	62	-	341157 399598
97	**Motion Map** Average Velocity Gradient (mmyear): 1.1	A13NW (NW)	66	-	341181 399891
97	**Motion Map** Average Velocity Gradient (mmyear): 1.0	A13NW (NW)	69	-	341181 399895
98	**Motion Map** Average Velocity Gradient (mmyear): 0.5	A13NW (W)	77	-	341034 399796
99	**Motion Map** Average Velocity Gradient (mmyear): -0.9	A13NW (NW)	85	-	341244 399953
99	**Motion Map** Average Velocity Gradient (mmyear): 1.5	A13NW (NW)	90	-	341236 399955
99	**Motion Map** Average Velocity Gradient (mmyear): 0.8	A13NW (NW)	91	-	341240 399958

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Motion Map Data (1:2,500)

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
99	**Motion Map** Average Velocity Gradient (mmyear): 0.9	A13NW (NW)	93	-	341237 399959
100	**Motion Map** Average Velocity Gradient (mmyear): 1.3	A13NW (NW)	87	-	341135 399882
101	**Motion Map** Average Velocity Gradient (mmyear): 0.1	A13NW (W)	93	-	341025 399810
102	**Motion Map** Average Velocity Gradient (mmyear): -0.1	A13NE (NE)	93	-	341617 399915
103	**Motion Map** Average Velocity Gradient (mmyear): -0.2	A13NE (N)	95	-	341384 399980
103	**Motion Map** Average Velocity Gradient (mmyear): -0.4	A13NE (N)	99	-	341385 399984
104	**Motion Map** Average Velocity Gradient (mmyear): 2.2	A13NW (NW)	97	-	341147 399903

Historical Map List

The following mapping has been analysed for Historical Land Use Information (1:2,500):

1:2,500	Mapsheet	Published Date
Ordnance Survey Plan	SJ4099	1962
Ordnance Survey Plan	SJ4199	1962
Ordnance Survey Plan	SD4000	1975
Ordnance Survey Plan	SD4100	1975

The following mapping has been analysed for Historical Land Use Information (1:10,000):

1:10,560	Mapsheet	Published Date
Lancashire And Furness	099_00	1850
Lancashire And Furness	100_00	1850
Lancashire And Furness	099_NE	1894
Lancashire And Furness	099_SE	1894
Lancashire And Furness	100_NW	1894
Lancashire And Furness	100_SW	1894
Lancashire And Furness	099_NE	1909
Lancashire And Furness	099_SE	1909
Lancashire And Furness	100_NW	1909
Lancashire And Furness	100_SW	1909
Lancashire And Furness	099_NE	1928
Lancashire And Furness	099_SE	1928
Lancashire And Furness	100_NW	1928
Lancashire And Furness	100_SW	1928
Ordnance Survey Plan	SD30SE	1955
Ordnance Survey Plan	SD40SW	1955
Ordnance Survey Plan	SJ39NE	1956
Ordnance Survey Plan	SJ49NW	1956
1:10,000	**Mapsheet**	**Published Date**
Ordnance Survey Plan	SD30SE	1986
Ordnance Survey Plan	SJ39NE	1988
Ordnance Survey Plan	SD40SW	1989
Ordnance Survey Plan	SJ49NW	1990

Data Currency

Mining and Cavities Data	Version	Update Cycle
BGS Recorded Mineral Sites British Geological Survey - National Geoscience Information Service	May 2018	Bi-Annually
Coal Mining Affected Areas The Coal Authority - Property Searches	March 2014	As notified
Man Made Mining Cavities Peter Brett Associates	May 2018	Bi-Annually
Mining Instability Ove Arup & Partners	October 2000	Not Applicable
Natural Cavities Peter Brett Associates	May 2018	Bi-Annually
Non Coal Mining Areas of Great Britain British Geological Survey - National Geoscience Information Service	May 2015	Not Applicable
Historical Land Use Information (1:2,500)	**Version**	**Update Cycle**
Subterranean Features Landmark Information Group Limited	February 2018	Bi-Annually
Ground Stability Data (1:50,000)	**Version**	**Update Cycle**
CBSCB Compensation District Cheshire Brine Subsidence Compensation Board (CBSCB)	August 2011	Not Applicable
Potential for Collapsible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Compressible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Ground Dissolution Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Landslide Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Running Sand Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Shrinking or Swelling Clay Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Subsidence Insurance Claims SP Property Services	February 2018	Quarterly
Subsidence Investigations CET Structures Ltd	February 2018	Quarterly
Brine Subsidence Solution Area Johnson Poole & Bloomer	January 2015	As notified

Motion Map Data (1:2,500)	Version	Update Cycle
Motion Map		
Nigel Press Associates - Hampshire	February 2011	As notified
Nigel Press Associates - Cambridge	January 2011	As notified
Nigel Press Associates - Ipswich	January 2011	As notified
Nigel Press Associates - Norwich	January 2011	As notified
Nigel Press Associates - Peterborough	January 2011	As notified
Nigel Press Associates - Barnstaple	July 2010	As notified
Nigel Press Associates - Derbyshire	July 2010	As notified
Nigel Press Associates - Humberside	July 2010	As notified
Nigel Press Associates - Kent	July 2010	As notified
Nigel Press Associates - Lincolnshire	July 2010	As notified
Nigel Press Associates - Nottinghamshire	July 2010	As notified
Nigel Press Associates - Birmingham	May 2009	As notified
Nigel Press Associates - Bournemouth	May 2009	As notified
Nigel Press Associates - Brighton	May 2009	As notified
Nigel Press Associates - Bristol	May 2009	As notified
Nigel Press Associates - Cardiff	May 2009	As notified
Nigel Press Associates - Central London	May 2009	As notified
Nigel Press Associates - Cheltenham	May 2009	As notified
Nigel Press Associates - Coventry	May 2009	As notified
Nigel Press Associates - Crawley	May 2009	As notified
Nigel Press Associates - Edinburgh	May 2009	As notified
Nigel Press Associates - Exeter	May 2009	As notified
Nigel Press Associates - Glasgow	May 2009	As notified
Nigel Press Associates - Isle of Wight	May 2009	As notified
Nigel Press Associates - Leeds	May 2009	As notified
Nigel Press Associates - Leicester	May 2009	As notified
Nigel Press Associates - Liverpool	May 2009	As notified
Nigel Press Associates - Manchester	May 2009	As notified
Nigel Press Associates - Milton Keynes	May 2009	As notified
Nigel Press Associates - Newcastle	May 2009	As notified
Nigel Press Associates - Northwich	May 2009	As notified
Nigel Press Associates - Nottingham	May 2009	As notified
Nigel Press Associates - Oxford	May 2009	As notified
Nigel Press Associates - Plymouth	May 2009	As notified
Nigel Press Associates - Portsmouth	May 2009	As notified
Nigel Press Associates - Preston	May 2009	As notified
Nigel Press Associates - Reading	May 2009	As notified
Nigel Press Associates - Sheffield	May 2009	As notified
Nigel Press Associates - Stoke	May 2009	As notified
Nigel Press Associates - Swindon	May 2009	As notified
Nigel Press Associates - Tonbridge	May 2009	As notified
Nigel Press Associates - North London	November 2008	As notified
Nigel Press Associates - Head Office	September 2008	As notified

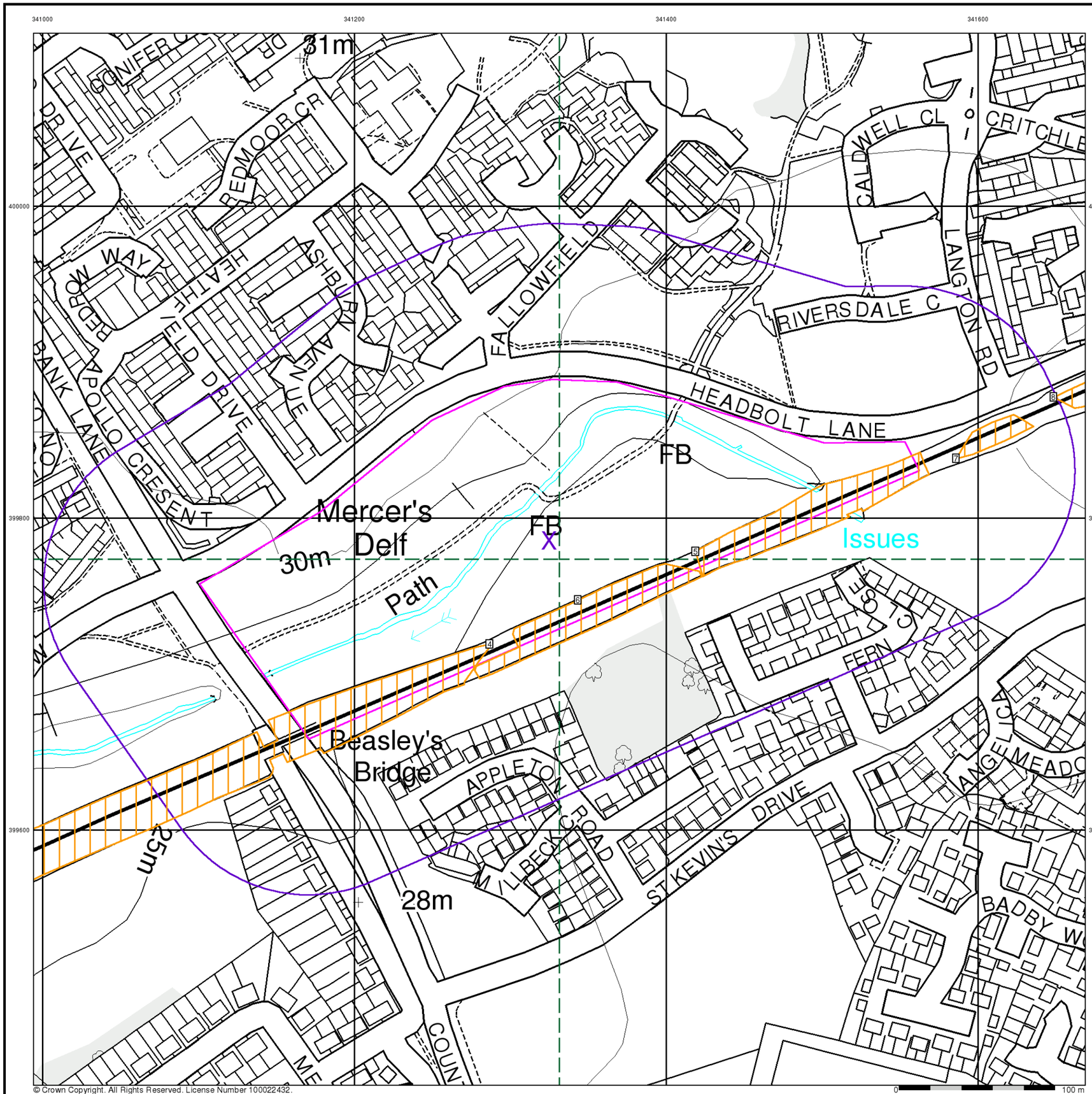
Data Suppliers

A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	Map data
British Geological Survey	British Geological Survey, NATURAL ENVIRONMENT RESEARCH COUNCIL
The Coal Authority	The Coal Authority
Ove Arup	ARUP
Peter Brett Associates	pba peterbrett
Wardell Armstrong	wardell armstrong, your earth our world
Johnson Poole & Bloomer	JPB

Useful Contacts

Contact	Name and Address	Contact Details
1	**British Geological Survey - Enquiry Service** British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk



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Historical Land Use Information (1:2,500)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Map ID | Several of Type at Location

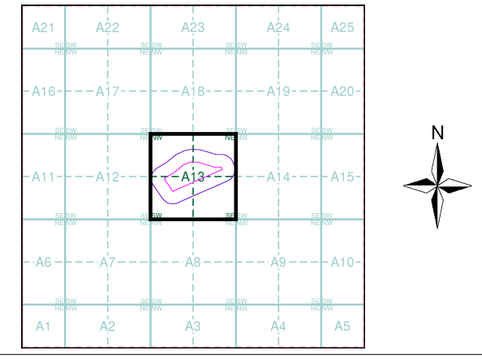
Potentially Contaminative Industrial Uses (Extractive Industries Activity)

	Point	Line	Polygon
Extractive Industries Activity from 1855 - 1909	▲	—	▭
Extractive Industries Activity from 1893 - 1915	▲	—	▨
Extractive Industries Activity from 1906 - 1937	▲	—	▭
Extractive Industries Activity from 1924 - 1949	▲	—	▨
Extractive Industries Activity from 1950 - 1980	▲	—	▭

Subterranean Features

	Point	Line	Polygon
Subterranean Features	▼	- - -	▭

Mining and Ground Stability - Segment A13



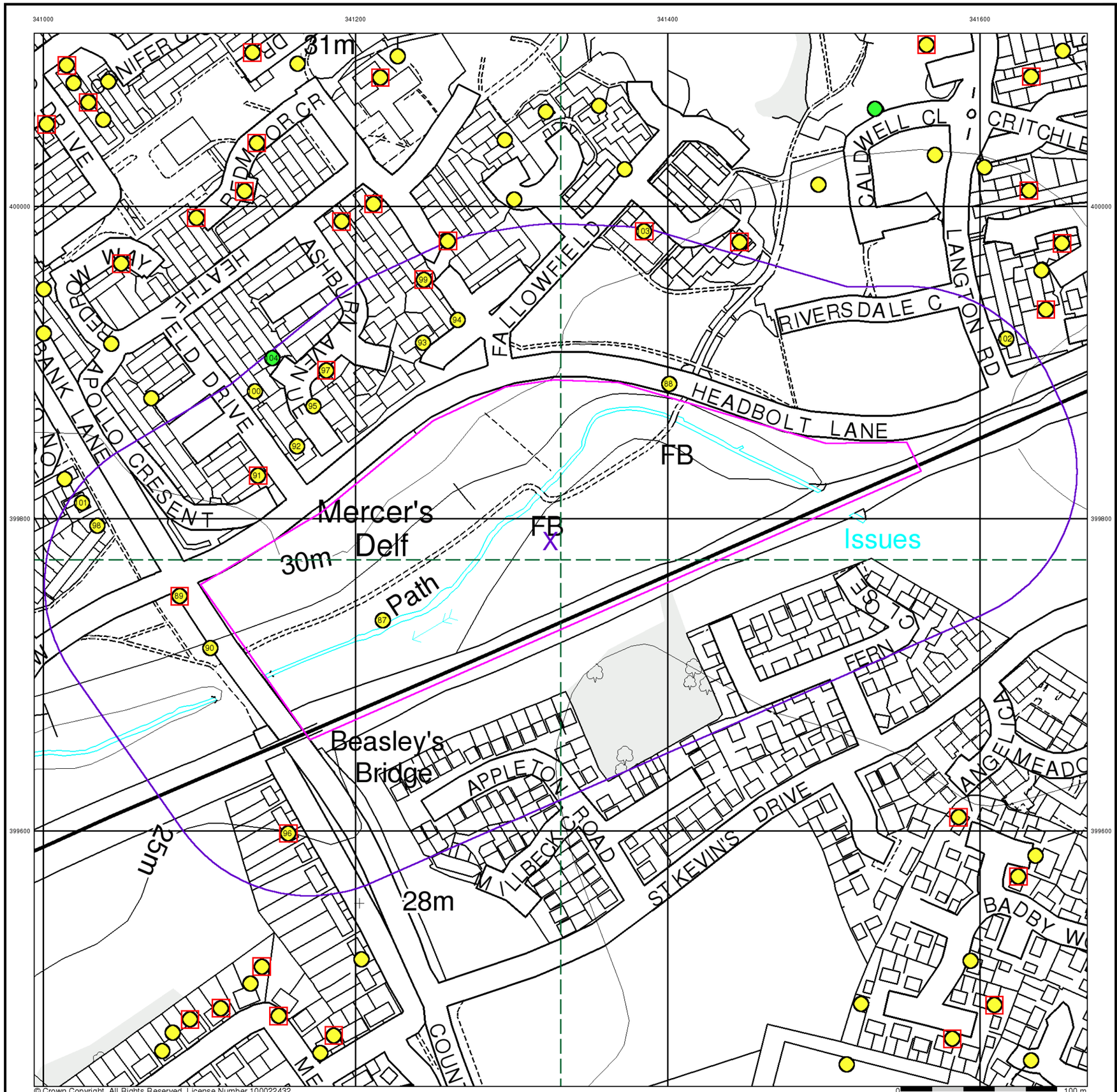
Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Plot Buffer (m):	100

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



M M

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Motion Map Data (1:2,500)

General

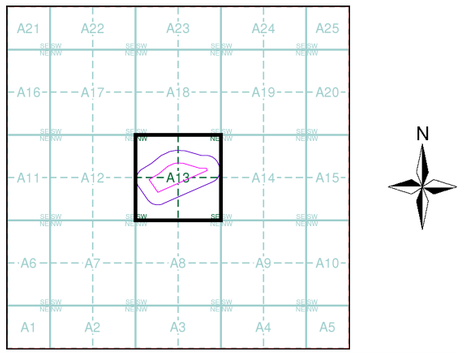
Specified Site | Specified Buffer(s) | Bearing Reference Point | Map ID

Several of Type at Location

Average Velocity Gradient

- Upward Movement > 3.5mm per year
- Upward Movement 1.5mm to 3.5mm per year
- Stable 1.5mm to -1.5mm per year
- Downward Movement -1.5mm to -3.5mm per year
- Downward Movement > -3.5mm per year

Mining and Ground Stability - Segment A13



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Site Details

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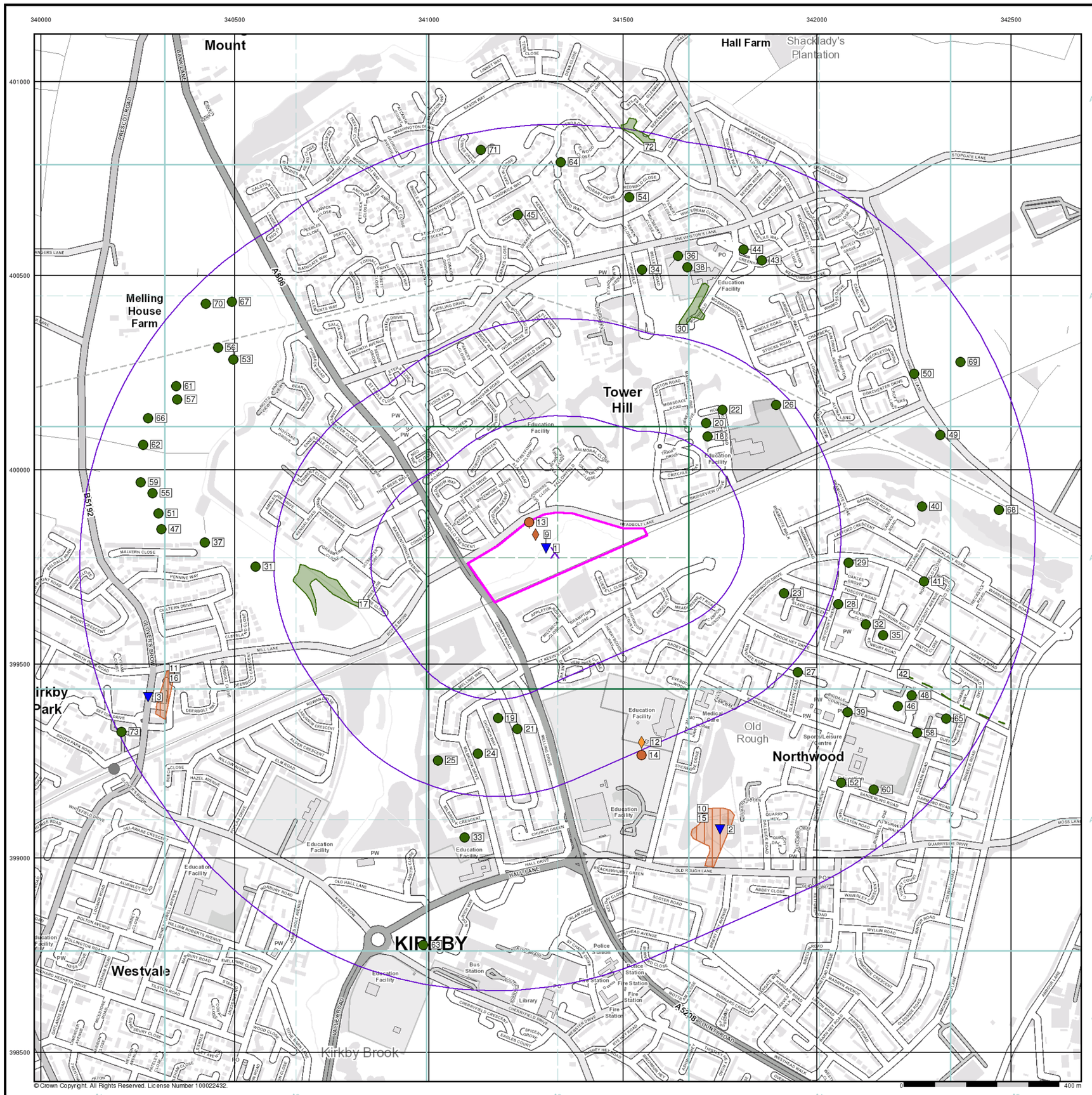

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M M

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Historical Land Use Information (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Map ID

Several of Type at Location

Potentially Contaminative Industrial Uses (Past Land Uses - Mining)

	Point	Line	Polygon
Air Shafts	◆	—	▨
Disturbed Ground	◆	—	▨
General Quarrying	◆	—	▨
Heap, unknown constituents	◆	—	▨
Mineral Railway	◆	—	▨
Mining and Quarrying General	◆	—	▨
Mining of Coal & Lignite	◆	—	▨
Quarrying of Sand and Clay, Operation of Sand and Gravel Pits	◆	—	▨

Historical Land Use

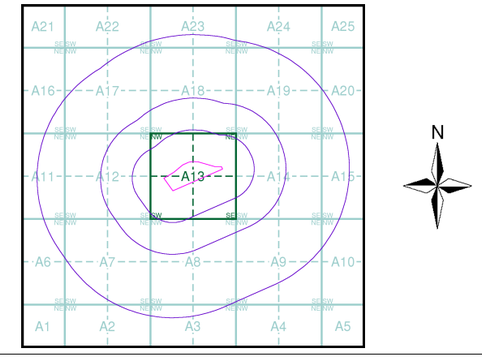
	Point	Line	Polygon
Potentially Infilled Land (Non-Water)	●	- - -	▭
Potentially Infilled Land (Water)	●	- - -	▭
Former Marsh	✠		

Mining Data

Potential Mining Area

BGS Recorded Mineral Site

Mining and Ground Stability - Slice A



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Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
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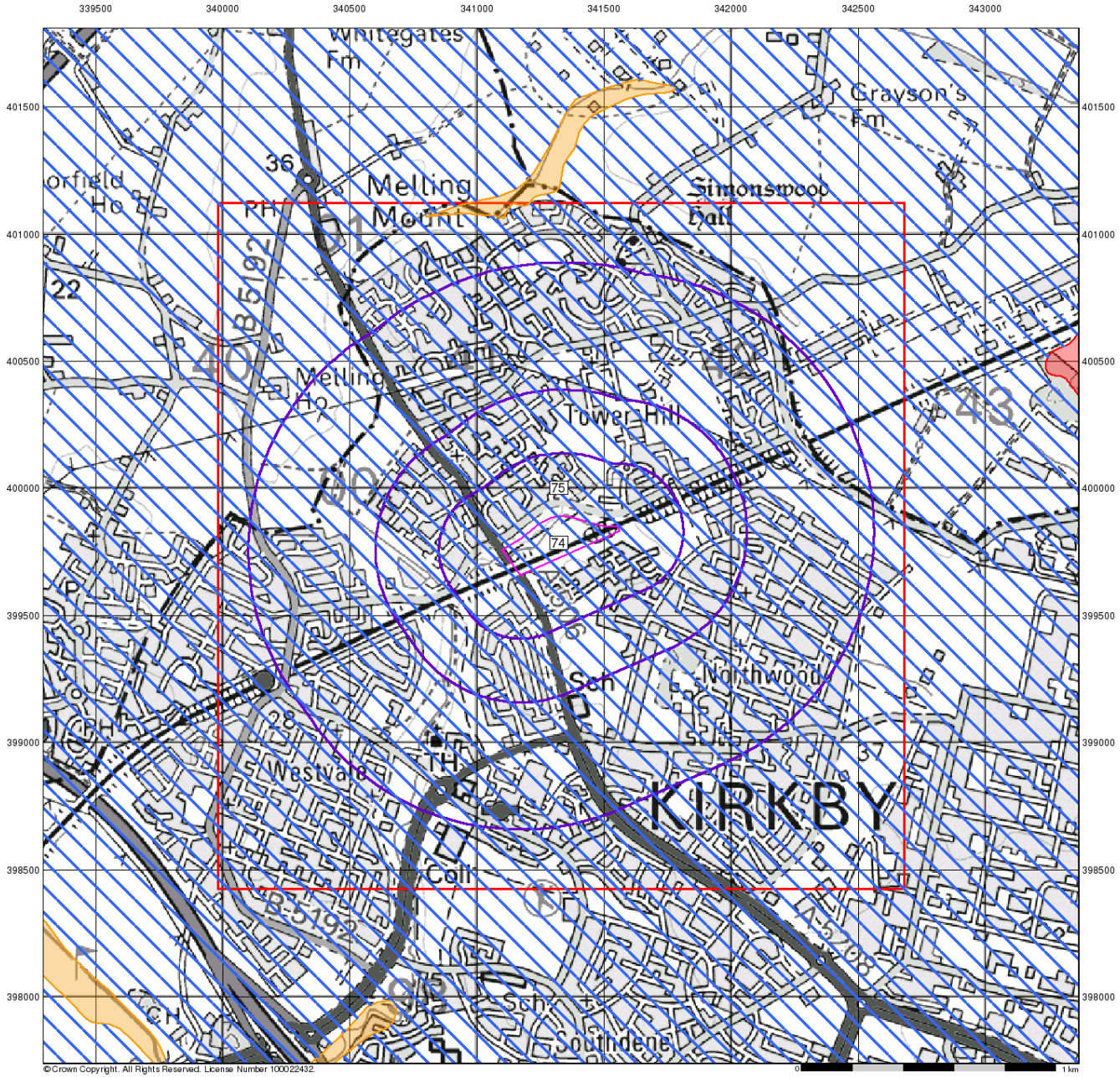

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Ground Stability Data (1:50,000)

General

Specified Site
Specified Buffer(s)
Bearing Reference Point
Slice
Map ID

Potential for Compressible Ground Stability Hazards

High
Low
Moderate
Very Low

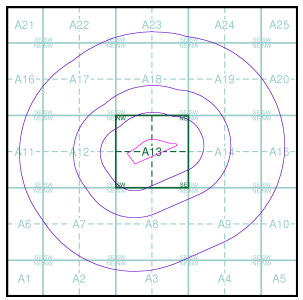
Potential for Collapsible Ground Stability Hazards

High
Low
Moderate
Very Low

Brine Pumping and Salt Mining

	Point	Polygon
Brine Pumping Related Feature	▲	
Salt Mining Related Feature	▲	

Mining and Ground Stability - Slice A



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Order Details

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Site Area (Ha):	5.08
Search Buffer (m):	1000

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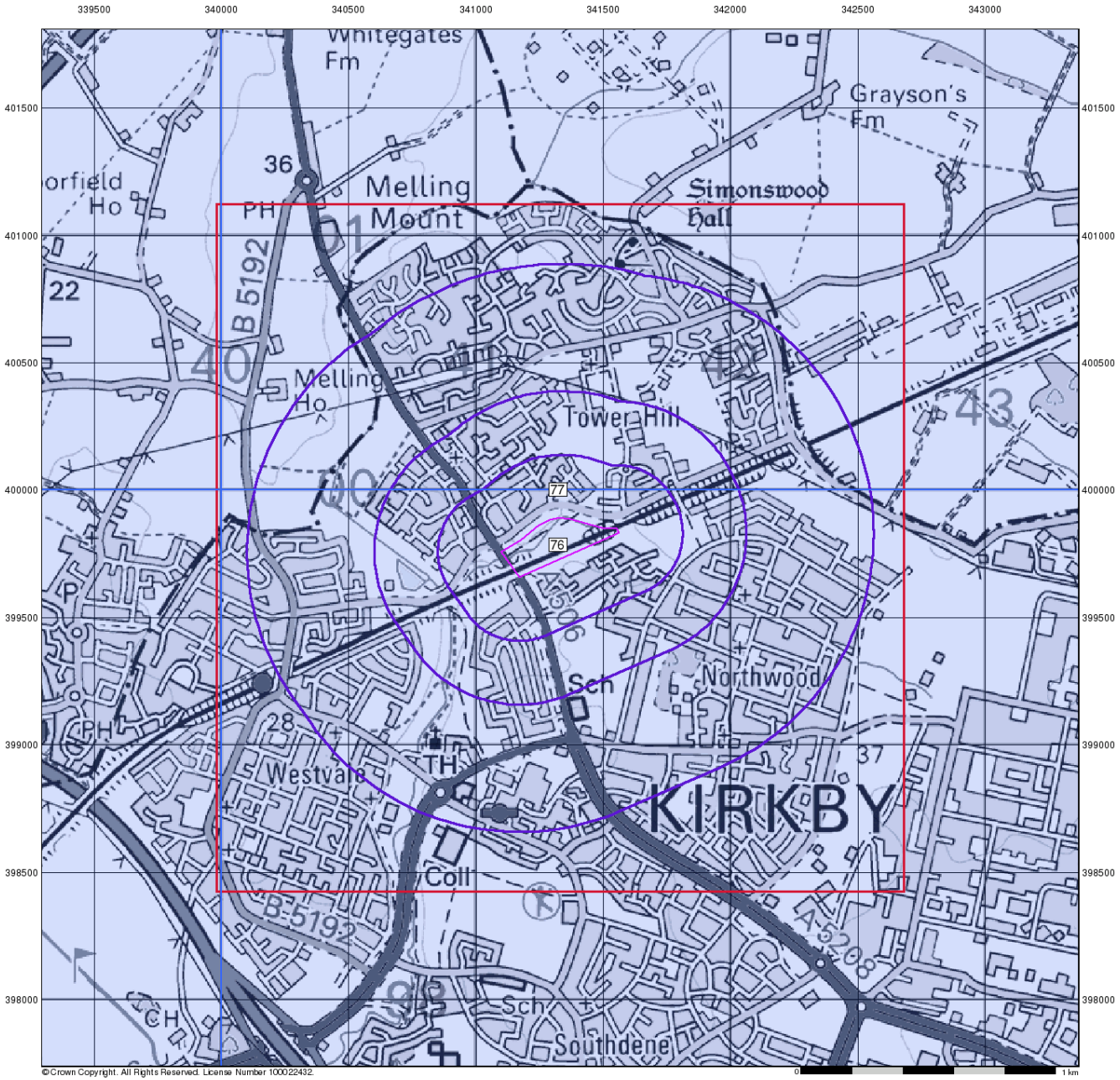

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Ground Stability Data (1:50,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

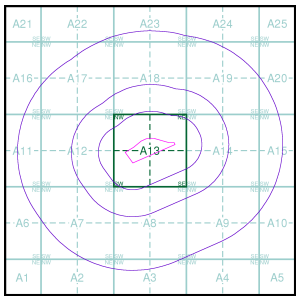
Potential for Landslide Ground Stability Hazards

High | Low | Moderate | Very Low

Potential for Ground Dissolution Stability Hazards

High | Low | Moderate | Very Low

Mining and Ground Stability - Slice A



Order Details

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Customer Ref:	394359GE05
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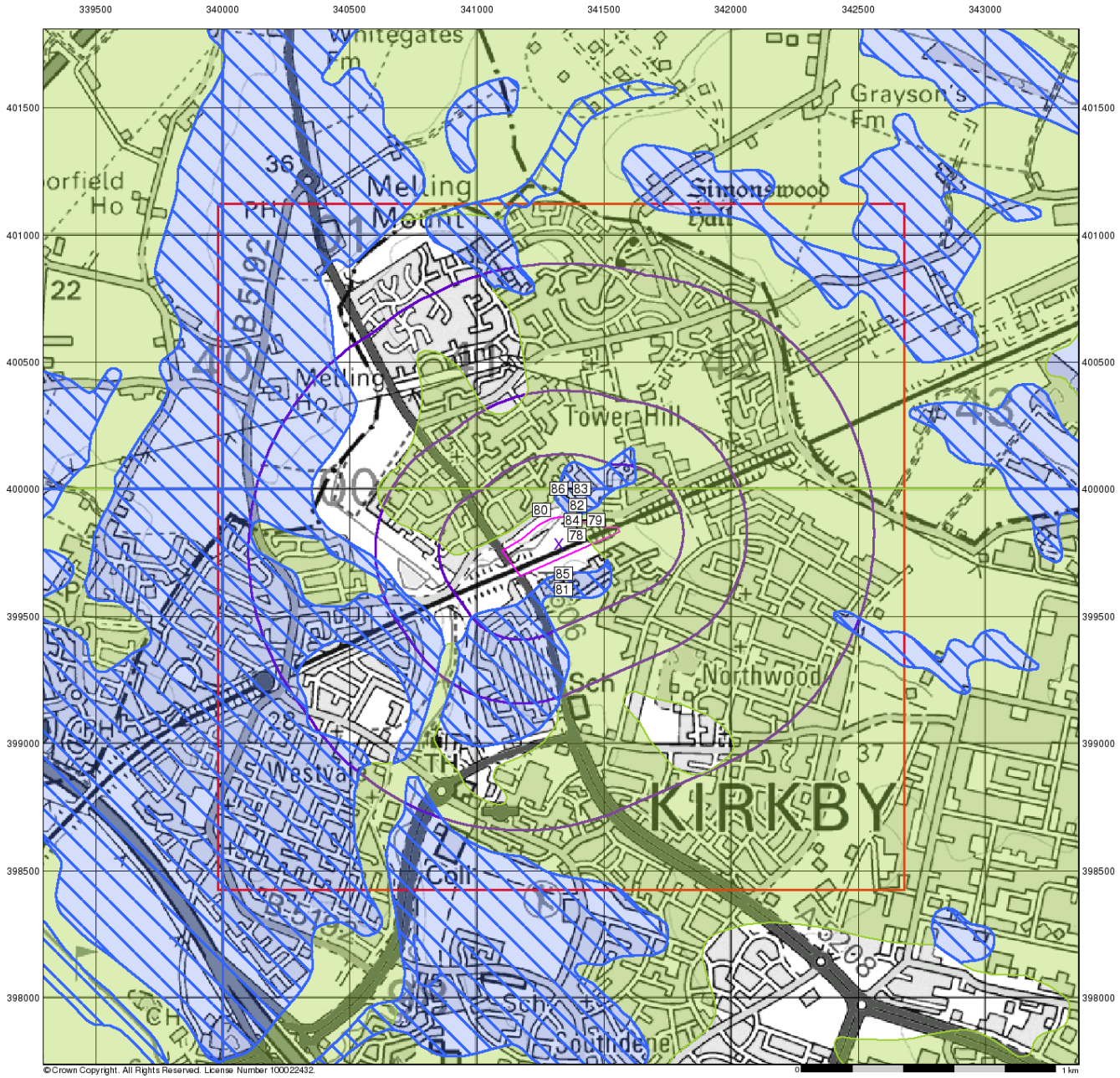
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU



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Ground Stability Data (1:50,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point
Slice | Map ID

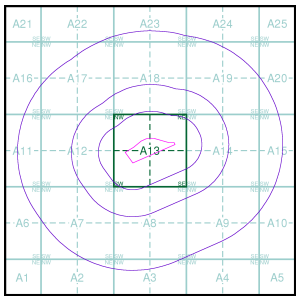
Potential for Running Sand Ground Stability Hazards

High | Low
Moderate | Very Low

Potential for Shrinking or Swelling Clay Ground Stability Hazards

High | Low
Moderate | Very Low

Mining and Ground Stability - Slice A



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National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Not Supplied - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	SSA	Shirdley Hill Sand Formation	Sand	Not Supplied - Devensian
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	LDE	Lacustrine Deposits	Clay and Silt	Not Supplied - Quaternary
	PEAT	Peat	Peat	Not Supplied - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	CHES	Chester Formation	Sandstone	Not Supplied - Olenekian
	WLSF	Wilmslow Sandstone Formation	Sandstone	Not Supplied - Early Triassic
		Faults		

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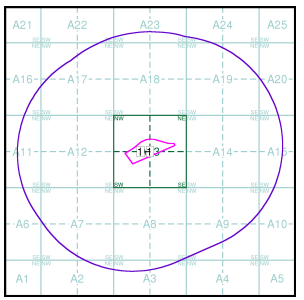
Geology 1:50,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	**1**
Map Sheet No:	**084**
Map Name:	**Wigan**
Map Date:	**2013**
Bedrock Geology:	**Available**
Superficial Geology:	**Available**
Artificial Geology:	**Available**
Faults:	**Not Supplied**
Landslip:	**Available**
Rock Segments:	**Not Supplied**

Geology 1:50,000 Maps - Slice A



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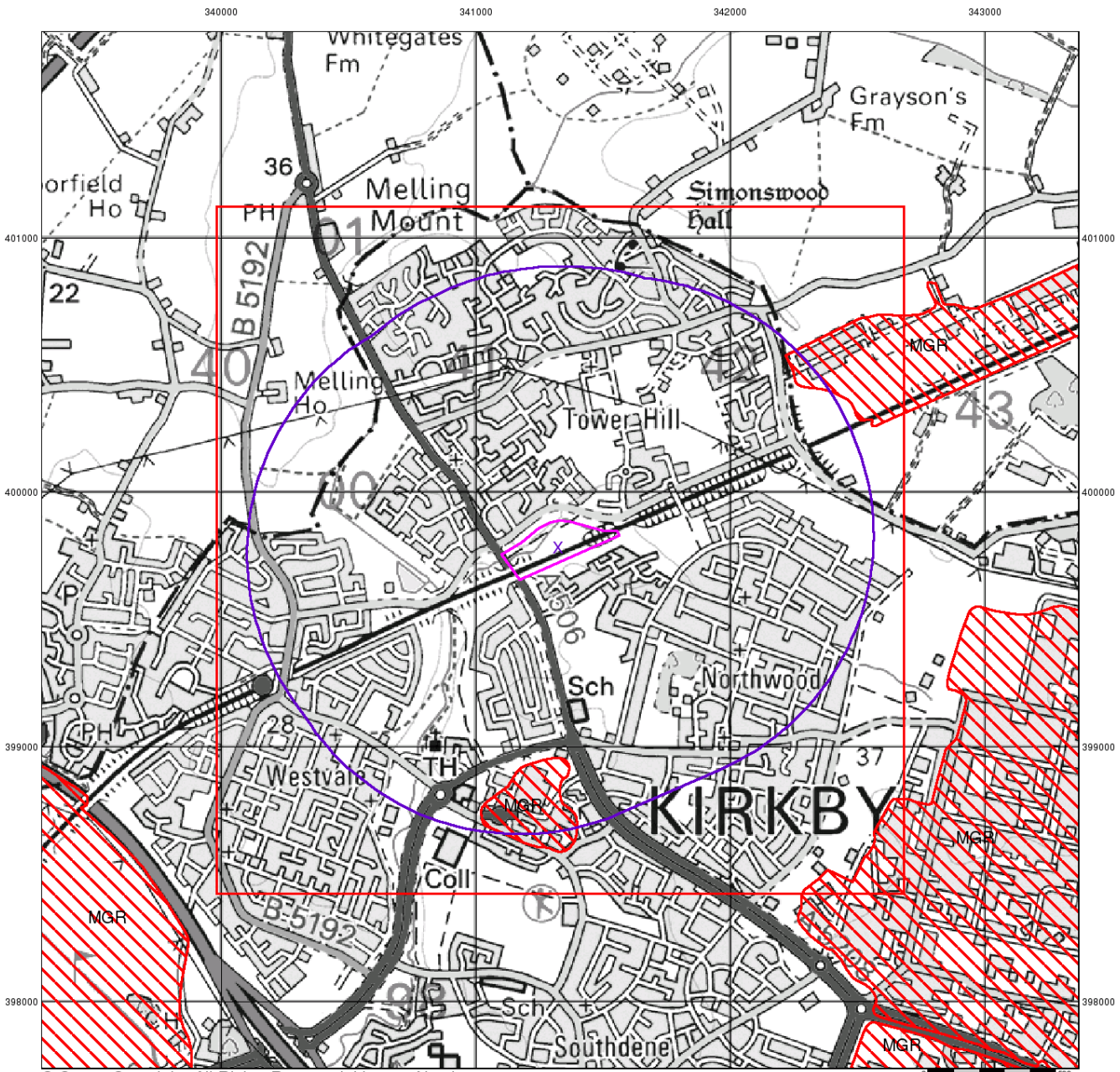

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Artificial Ground and Landslip

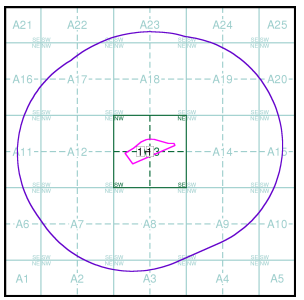
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



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National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details:

Headbolt Lane Station, LIVERPOOL, L33 3AU

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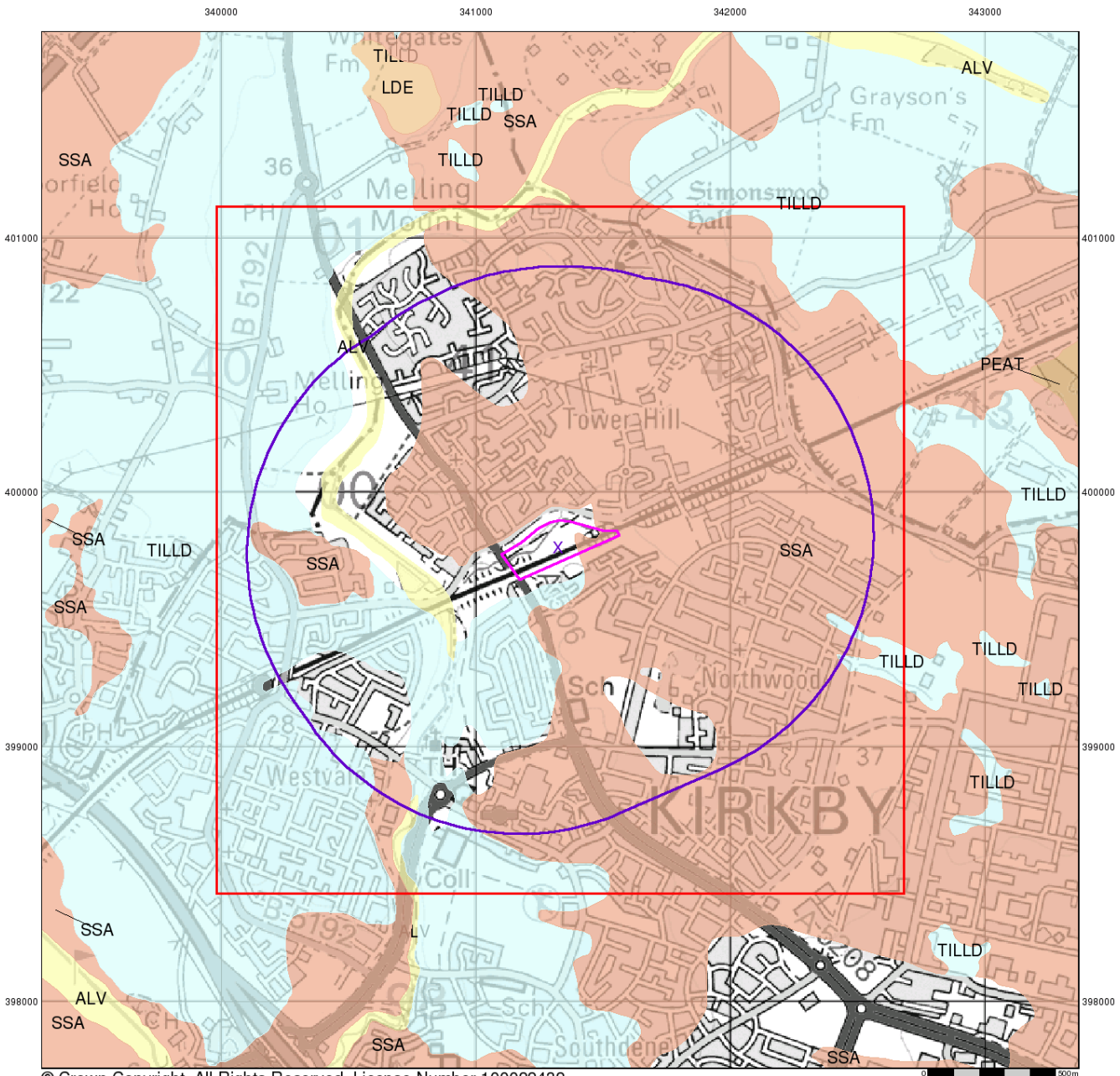
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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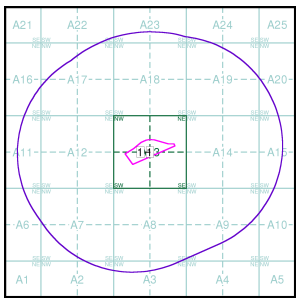
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and in place. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



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National Grid Reference:	341330, 399790
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Site Area (Ha):	5.08
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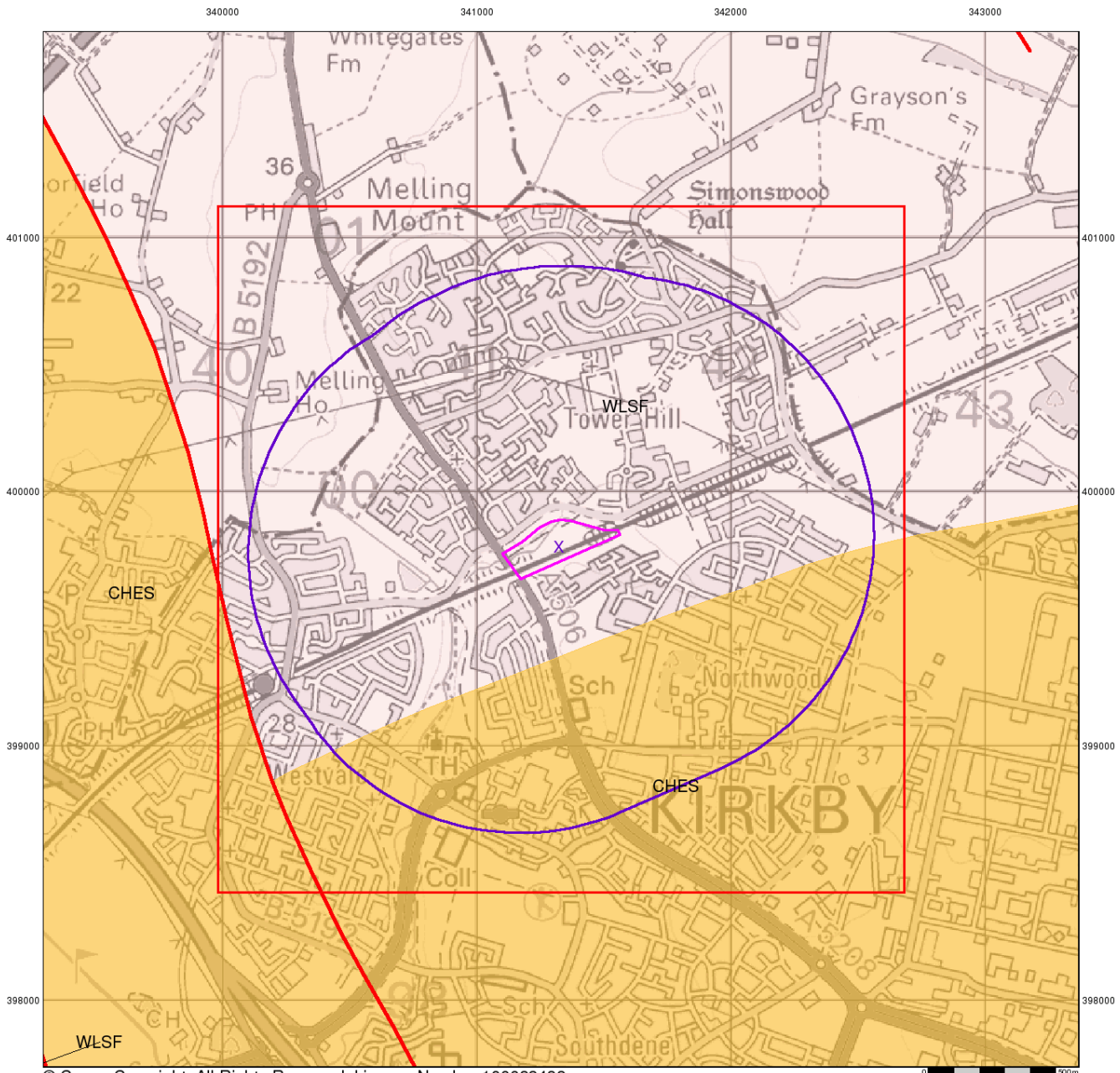

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Bedrock and Faults

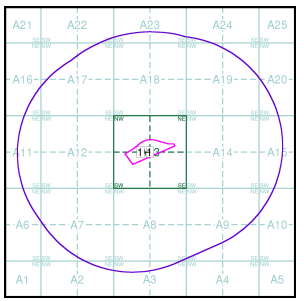
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



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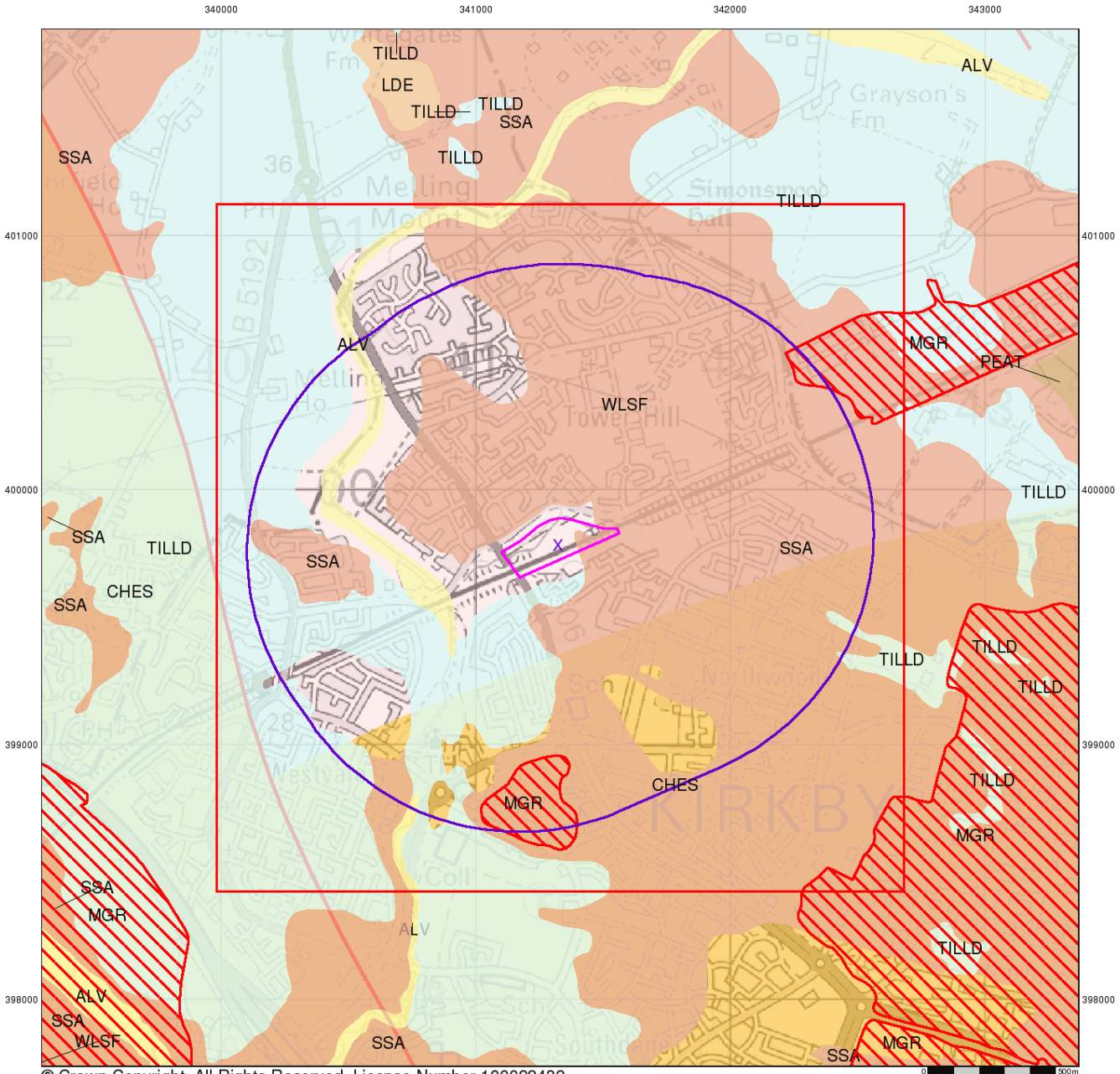

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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
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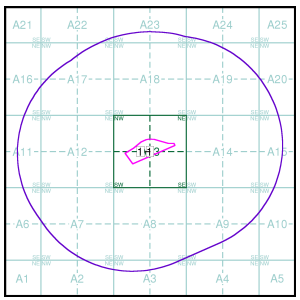
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



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Slice:	A
Site Area (Ha):	5.08
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MOTT
MACDONALD
0
100m
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TOWER HILL

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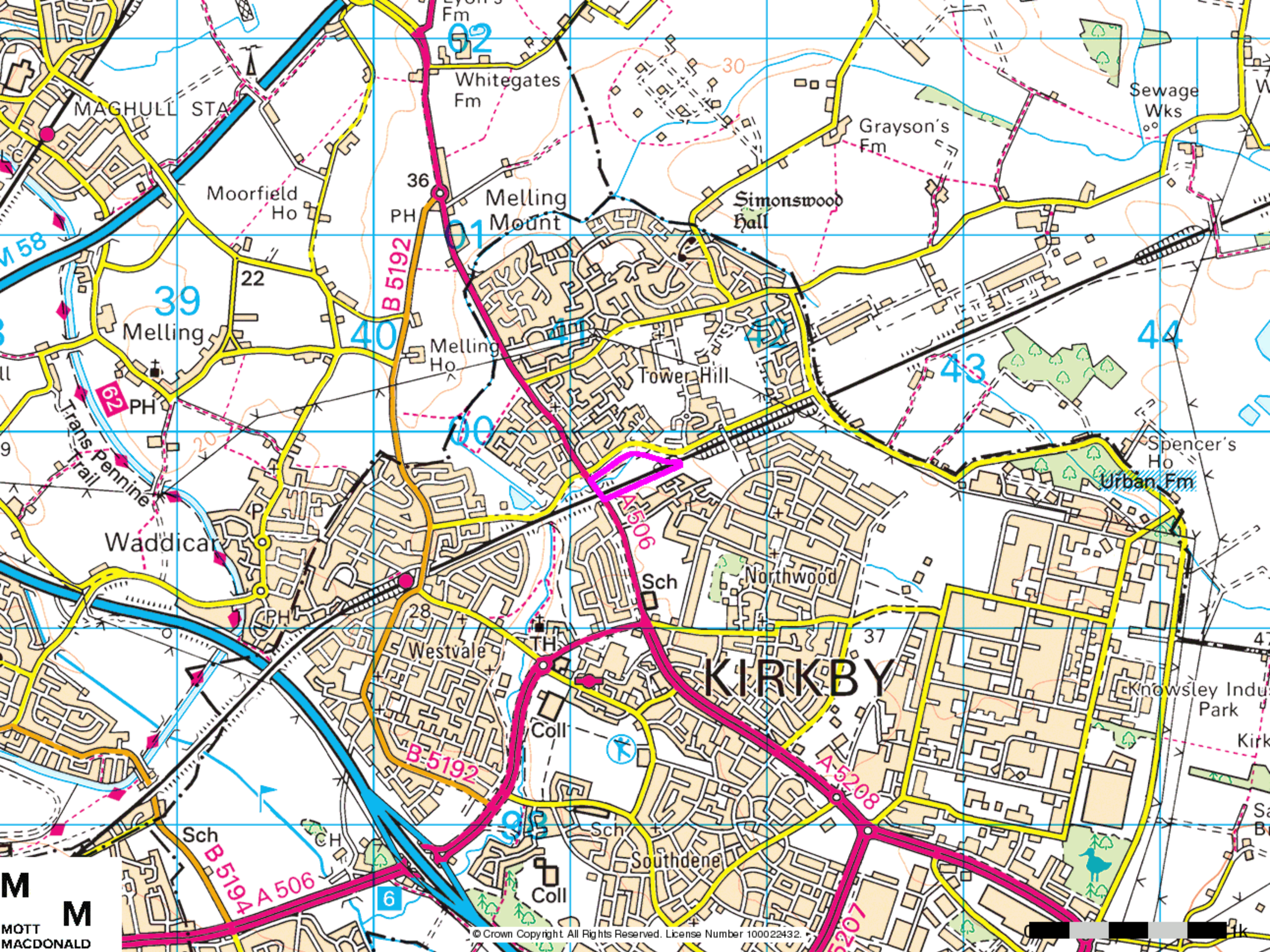
100m



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Tower Hill
Community Centre
Sch
School
PW
28m
31m
29m
27m
32m
A506
BANK LANE
HEADBOLT LANE
HEADBOLT LANE
COUNTY ROAD
BOYES BROW
GRANTHAM ROAD
ASCOT DRIVE
CHESTERFIELD DR
IVORY WAY
EBONY WAY
ST PETER CL
ST PAULS CL
TUDOR VIEW
DOMINGO DRIVE
CONWAY CL
CONIFER CL
SAPPHIRE DR
REDMOOR CR
REDMOOR WAY
APOLLO CRESCENT
HEATHFIELD DRIVE
ASHBURN AVENUE
FALLOWFIELD
HAWESWATER CLOSE
ENNERDALE CL
WINDERMERE DR
DERWENT CL
RYDAL CL
AMBLESIDE DR
KENDAL RD
WINDERMERE DRIVE
SEATHWAITE CRESCENT
SEATHWAITE AVE
CONISTON CL
BASSENTHWAITE
LANGTON ROAD
SUMMERG
EASTCROFT
CALDWELL CL
CRITCHLEY WAY
RIVERSDALE C
BRIDGEVIEW DR
LOUGHLIN DR
HEADLEY VIEW
Mercer's Delf Path
Issues
FB
El Sub Sta
Bramcote Walk
CHADWELL R
Beasley's Bridge
APPLETON
MILLBECK ROAD
ST KEVIN'S DRIVE
FERN CLOSE
ANGELICA
MEADOWSWEET ROAD
ROUGHWOOD DRIVE
CRESCENT
LINSLADE
DEYCROFT AVENUE
BADBY WOOD
WINGATE ROAD
KENNELWOOD AVENUE
GLASVEN RD
JADE CL
Northwood County Primary School
All Saints Catholic
Overflow
Mill Farm
Mill Bridge
Drain
Millbrook Park
Brook
MELLING WAY
MELLING D
MILLBROOK
CHURCH
SYCAMORE D
MOTT MACDONALD
Northwood
250m
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Historical Data Report Datasheet

Order Details:

Order Number:
167915730_1_1

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341330, 399790

Slice:
A

Site Area (Ha):
5.08

Search Buffer (m):
1000

Site Details:

Headbolt Lane Station
LIVERPOOL
L33 3AU

Client Details:

Mr S Myles
Mott Macdonald
Spring Bank House
33 Stamford Street
Altrincham
Manchester
WA14 1ES

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Contents

Report Section	Page Number
Summary	-
Historical Building Plans Information	-
Historical Land Use Information	1
Historical Tanks and Energy Facilities	5
Historical Map List	6
Useful Contacts and Further Information	8

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.

In the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

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Report Version v53.0

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Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m
Historical Building Plans Information					
Areas Cleared Due To Enemy Action					
Above Ground Fuel Tanks (100m)				n/a	n/a
Asbestos (100m)				n/a	n/a
Benzene/Benzole/Naphtha, Naphthalene/Kerosene (100m)				n/a	n/a
Electricity Generation (100m)				n/a	n/a
Electricity Sub-Stations (100m)				n/a	n/a
Gas Industry (100m)				n/a	n/a
Gas Storage (100m)				n/a	n/a
Gas Use (100m)				n/a	n/a
Oil Industry (100m)				n/a	n/a
Oil Storage (100m)				n/a	n/a
Oil Use (100m)				n/a	n/a
Paint based Oils (100m)				n/a	n/a
Paraffin (100m)				n/a	n/a
Petrol and Diesel Industry (100m)				n/a	n/a
Petrol and Diesel Storage (100m)				n/a	n/a
Petrol and Diesel Use (100m)				n/a	n/a
Potential Fuel Gas (100m)				n/a	n/a
Potential Fuel Oil (100m)				n/a	n/a
Potential Fuel Use (100m)				n/a	n/a
Potential Petrol and Diesel (100m)				n/a	n/a
Potential Tanks (100m)				n/a	n/a
Potentially Fuel-related Tanks (100m)				n/a	n/a
Underground Fuel Tanks (100m)				n/a	n/a
Historical Land Use Information					
Former Marshes					
Historical Flood Liabilities	pg 1			1	
Potentially Contaminative Industrial Uses (Past Land Use)	pg 1	2	1	1	12
Potentially Infilled Land (Non-Water)	pg 1	1		1	2
Potentially Infilled Land (Water)	pg 2			10	47

MOTT MACDONALD

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m
Historical Tanks and Energy Facilities					
Electrical Sub Station Facilities (100m)	pg 5		1	n/a	n/a
Electricity Industry Facilities (100m)				n/a	n/a
Gas Industry Facilities (100m)				n/a	n/a
Gas Monitoring Facilities (100m)				n/a	n/a
Miscellaneous Power Facilities (100m)				n/a	n/a
Oil Industry Facilities (100m)				n/a	n/a
Petroleum Storage Facilities (100m)				n/a	n/a
Potential Tanks (100m)				n/a	n/a
Tanks (100m)				n/a	n/a

MOTT MACDONALD

Historical Land Use Information

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	**Historical Flood Liabilities** Use: Area liable to flood Date of Mapping: 1850	A12SE (W)	393	1	340712 399700
2	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: General quarrying Date of Mapping: 1850 - 1894	A13NW (NW)	0	1	341275 399833
3	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Railways Date of Mapping: 1850 - 1990	A13SE (SE)	0	1	341346 399738
4	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Railways Date of Mapping: 1850 - 1988	A13SW (SW)	167	1	341014 399592
5	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Quarrying of sand & clay, operation of sand & gravel pits Date of Mapping: 1909 - 1928	A8NE (SE)	481	1	341548 399299
6	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Railways Date of Mapping: 1850 - 1989	A14NE (E)	547	1	342061 400054
7	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Railways Date of Mapping: 1955	A14NE (E)	547	1	342062 400052
8	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Sewage Date of Mapping: 1989	A17SE (NW)	683	1	340690 400302
9	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Railways Date of Mapping: 1955	A19NW (NE)	692	1	341770 400506
10	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: General quarrying Date of Mapping: 1850 - 1956	A9NW (SE)	701	1	341705 399128
11	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Railways Date of Mapping: 1894 - 1956	A7NW (SW)	751	1	340466 399357
12	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Cemetery or Graveyard Date of Mapping: 1850	A7SE (SW)	776	1	340870 398944
13	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Railways Date of Mapping: 1955	A14NE (E)	782	1	342333 399957
14	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: General quarrying Date of Mapping: 1850	A12SW (W)	803	1	340344 399489
15	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Factory or works - use not specified Date of Mapping: 1956	A15NW (E)	867	1	342428 399800
16	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Railways Date of Mapping: 1955	A20SW (E)	892	1	342374 400199
17	**Potentially Contaminative Industrial Uses (Past Land Use)** Use: Sawmilling, planing & impregnation [i.e. treatment of timber] Date of Mapping: 1989	A19SE (NE)	904	1	342259 400412
18	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A13NW (NW)	0	1	341258 399849
19	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A8NE (SE)	481	1	341548 399299
20	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A9NW (SE)	701	1	341705 399128
21	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A12SW (W)	803	1	340344 399489

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
22	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1956	A12SE (W)	288	1	340832 399654
23	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14NW (NE)	289	1	341718 400086
24	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (S)	298	1	341177 399361
25	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19SW (NE)	316	1	341713 400120
26	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (S)	322	1	341227 399342
27	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19SW (NE)	367	1	341755 400155
28	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SW (E)	382	1	341914 399683
29	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (S)	392	1	341126 399269
30	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8NW (SW)	433	1	341022 399252
31	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19SW (NE)	467	1	341894 400167
32	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SW (SE)	523	1	341950 399479
33	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	523	1	342054 399654
34	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	524	1	342081 399761
35	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18SE (NE)	525	1	341652 400364
36	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A12SW (W)	548	1	340553 399751
37	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	608	1	342125 399603
38	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A8SW (S)	610	1	341091 399054
39	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (N)	654	1	341548 400516
40	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	656	1	342170 399584
41	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (N)	679	1	341619 400525
42	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A12NW (W)	682	1	340421 399813

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
43	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (NE)	682	1	341665 400521
44	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	688	1	342078 399376
45	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A14NE (E)	712	1	342270 399906
46	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A14SE (E)	723	1	342275 399712
47	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A14SE (E)	750	1	342221 399474
48	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19NW (NE)	756	1	341858 400540
49	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A19NW (NE)	761	1	341810 400565
50	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NW (N)	774	1	341229 400656
51	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	777	1	342207 399398
52	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	796	1	340310 399847
53	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (E)	796	1	342243 399419
54	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A14NE (E)	798	1	342317 400090
55	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A19SE (NE)	803	1	342250 400248
56	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	809	1	340303 399887
57	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	809	1	342062 399195
58	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	821	1	340495 400312
59	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A18NE (N)	828	1	341515 400702
60	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	836	1	340288 399950
61	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	852	1	340457 400315
62	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (W)	861	1	340351 400182
63	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	861	1	342257 399323

Historical Land Use Information

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
64	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	870	1	340257 399969
65	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	877	1	342146 399176
66	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	882	1	340348 400216
67	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A11NE (W)	892	1	340264 400065
68	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A7SE (S)	902	1	340985 398776
69	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A23SE (N)	904	1	341339 400793
70	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A9NE (SE)	904	1	342333 399360
71	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A16SE (W)	907	1	340276 400133
72	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	909	1	340492 400433
73	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A15NW (E)	909	1	342468 399897
74	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1894	A20SW (NE)	923	1	342369 400278
75	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A17SW (NW)	943	1	340439 400428
76	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A23SW (N)	954	1	341133 400824
77	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1850	A23SE (N)	965	1	341569 400831
78	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1909	A6NE (W)	993	1	340207 399325

Historical Tanks and Energy Facilities

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
79	**Electrical Sub Station Facilities** Scale of Mapping: 1:1,250 Date of Mapping: 1972	A13NW (W)	90	1	341030 399813

Historical Map List

No Historical Building Plans information available.

The following mapping has been analysed for Historical Land Use Information:

1:10,560	Mapsheet	Published Date
Lancashire And Furness	099_00	1850
Lancashire And Furness	100_00	1850
Lancashire And Furness	099_NE	1894
Lancashire And Furness	099_SE	1894
Lancashire And Furness	100_NW	1894
Lancashire And Furness	100_SW	1894
Lancashire And Furness	099_NE	1909
Lancashire And Furness	099_SE	1909
Lancashire And Furness	100_NW	1909
Lancashire And Furness	100_SW	1909
Lancashire And Furness	099_NE	1928
Lancashire And Furness	099_SE	1928
Lancashire And Furness	100_NW	1928
Lancashire And Furness	100_SW	1928
Ordnance Survey Plan	SD30SE	1955
Ordnance Survey Plan	SD40SW	1955
Ordnance Survey Plan	SJ39NE	1956
Ordnance Survey Plan	SJ49NW	1956
1:10,000	**Mapsheet**	**Published Date**
Ordnance Survey Plan	SD30SE	1986
Ordnance Survey Plan	SJ39NE	1988
Ordnance Survey Plan	SD40SW	1989
Ordnance Survey Plan	SJ49NW	1990

Historical Map List

The following mapping has been analysed for Historical Tanks and Energy Facilities:

1:2,500	Mapsheet	Published Date
Ordnance Survey Plan	SJ4099	1962
Ordnance Survey Plan	SJ4199	1962
Ordnance Survey Plan	SD4000	1975
Ordnance Survey Plan	SD4100	1975
1:1,250	**Mapsheet**	**Published Date**
Ordnance Survey Plan	SJ4099NE	1962
Ordnance Survey Plan	SJ4099SE	1962
Ordnance Survey Plan	SJ4199NE	1962
Ordnance Survey Plan	SJ4199NW	1962
Ordnance Survey Plan	SJ4199SE	1962
Ordnance Survey Plan	SJ4199SW	1962
Ordnance Survey Plan	SJ4199SW	1966
Ordnance Survey Plan	SJ4099NE	1968
Ordnance Survey Plan	SJ4099SE	1968
Ordnance Survey Plan	SJ4199SE	1968
Ordnance Survey Plan	SJ4199NE	1972
Ordnance Survey Plan	SJ4199NW	1972
Ordnance Survey Plan	SD4000SE	1973
Ordnance Survey Plan	SD4100SE	1973
Ordnance Survey Plan	SD4100SW	1973

Useful Contacts and Further Information

Contact	Name and Address	Contact Details
1	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9966 Fax: 0844 844 9951 Email: helpdesk@landmark.co.uk Website: www.landmark.co.uk

Historical Building Plans Information

This data set contains potentially contaminative features such as asbestos, petrol, oil and tanks captured from Historical Building Plans. The Historical Building Plans were produced by the London-based firm Charles E. Goad Ltd. as fire insurance plans, dating back to 1885. The firm ceased production of fire insurance plans in 1970. Most of the important towns and cities of the British Isles are covered. Historical Building Plans are usually at the scales of 1:480 (1 inch to 40 feet) for the British Isles. They were updated every 5-6 years by means of revision sheets designed to be pasted on to the original plans.

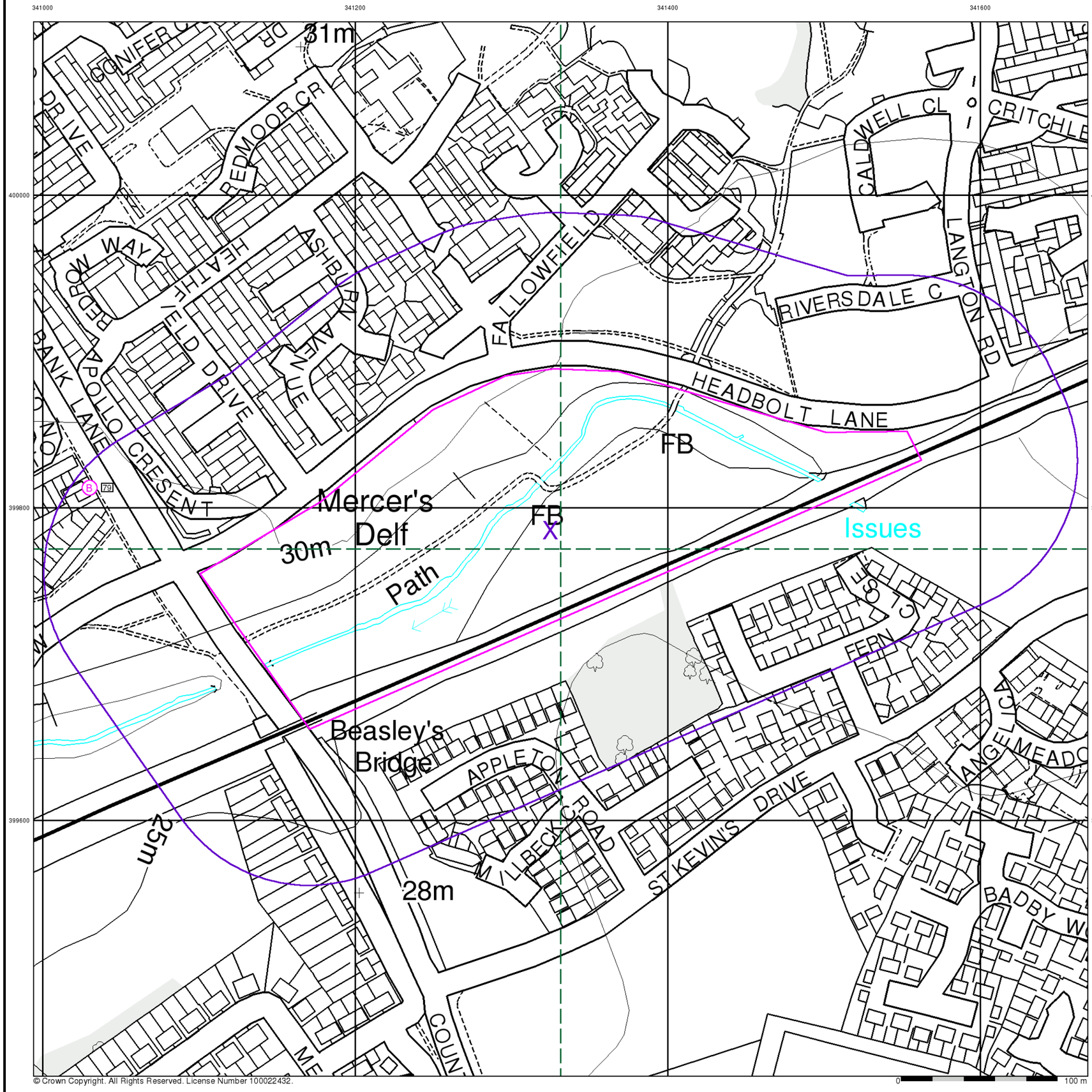
It should be noted that Historical Building Plans are only available for certain major towns and cities and in some cases there may only be partial coverage of the search area. It cannot therefore be assumed that the absence of responses under the Historical Building Plans section of this report indicates that no hazards exist. Please check the Historical Building Plans Map List table in the Historical Map List section of this report to establish if Historical Building Plans are available for this search area.

Historical Land Use Information

Landmark's Historical Land Use Data is the result of combined analysis of historical map data captured at 1:10,560 and 1:10,000. A unique comprehensive database of Historic Land Use from the 1840's to 1996 it includes 67 different types of potentially contaminated past industrial land use. This entailed analysing over 60,000 maps and is drawn from at least four, and up to six historical map editions. In addition a seventh layer was also created, known as the land use layer, containing areas of infilled land which are plotted via comparison between two or more map editions.

Historical Tanks and Energy Facilities

In addition to HLUD, additional analysis uncovered some of the most dangerous sources of contamination (past and present tanks, petrol storage, oil, gas, electricity, miscellaneous facilities). This data set covers over 390,000 Historical Tanks and Energy facilities in Great Britain and was captured from post war 1:2500 and 1:1250 Ordnance Survey historical mapping covering a period from 1943 to 1996.



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MOTT MACDONALD

General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Map ID
Several of Type at Location

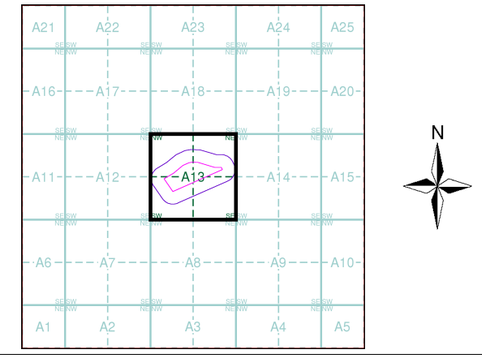
Historical Building Plans

- Area Cleared due to Enemy Action
- Asbestos
- Above Ground Fuel Tanks
- Benzene/Benzole/Naphtha, Naphthalene/Kerosene
- Electricity Generation
- Electricity Sub-Stations
- Gas Industry
- Gas Storage
- Gas Use
- Oil Industry
- Oil Storage
- Oil Use
- Paint based Oils
- Paraffin
- Petrol and Diesel Industry
- Petrol and Diesel Storage
- Petrol and Diesel Use
- Potential Fuel Gas
- Potential Fuel Oil
- Potential Fuel Use
- Potential Petrol and Diesel
- Potential Tanks
- Potentially Fuel-related Tanks
- Underground Fuel Tanks

Historical Tanks and Energy Facilities

- (B) Electrical Sub Station Facility
- (E) Electricity Industry Facility
- (G) Gas Industry Facility
- (V) Gas Monitoring Facility
- (M) Miscellaneous Power Facility
- (O) Oil Industry Facility
- (S) Petroleum Storage Facility
- (P) Potential Tank
- (T) Tank

Historical Data Report - Segment A13



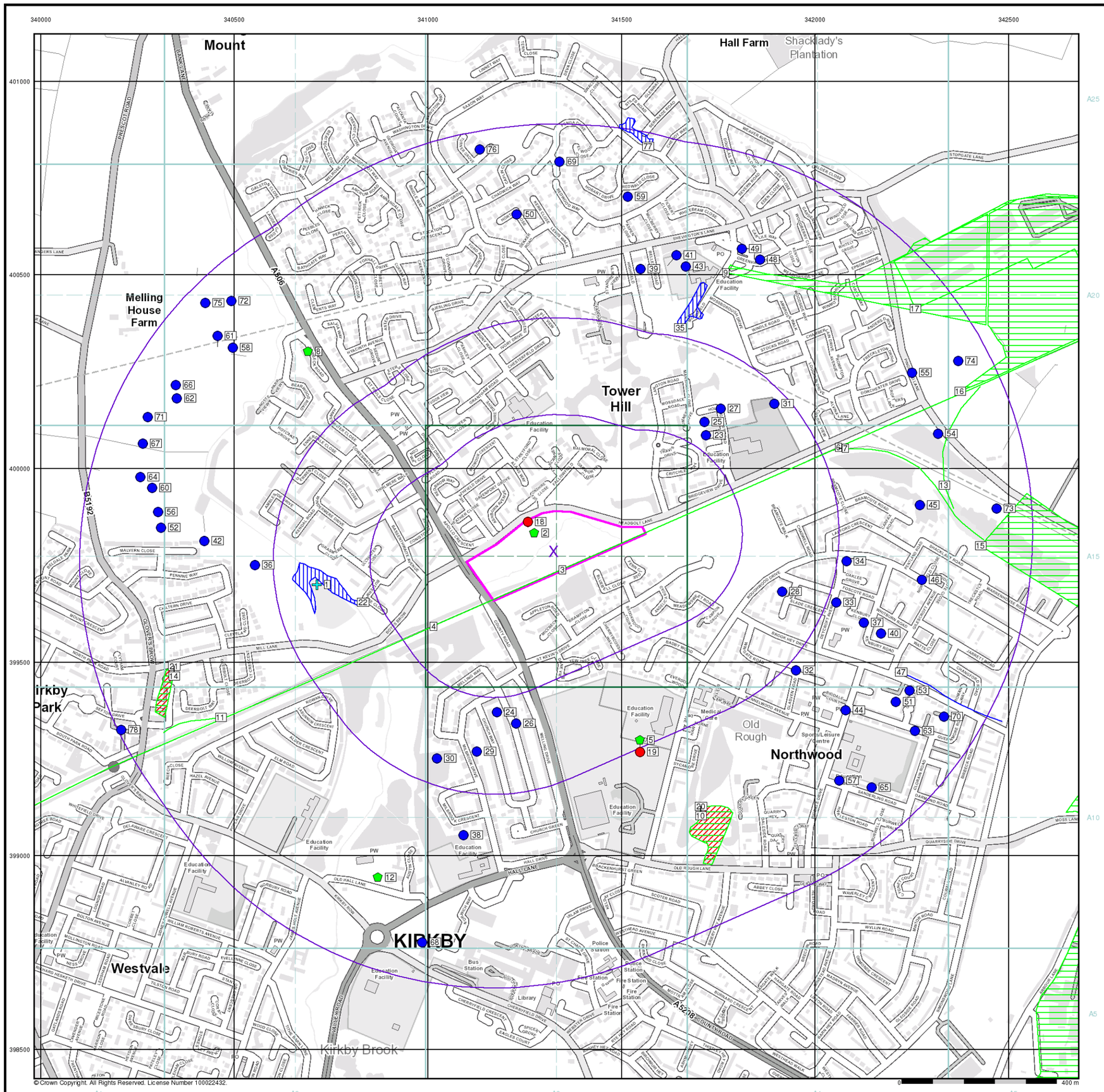
Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Plot Buffer (m):	100

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



M M

MOTT MACDONALD

General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Map ID

Several of Type at Location

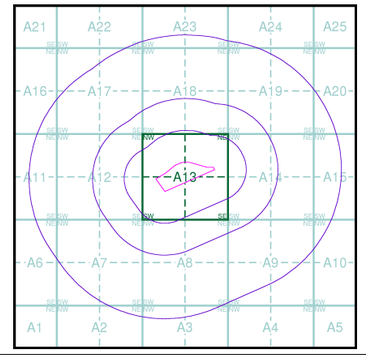
Historical Building Plans

Area Cleared due to Enemy Action

Historical Land Use

- Former Marsh
- Historical Flood Liability
- Historical Flood Liability (Location)
- Potentially Contaminative Industrial Use (Past Land Use)
- Potentially Contaminative Industrial Use (Past Land Use) (Linear)
- Potentially Contaminative Industrial Use (Past Land Use) (Location)
- Potentially Infilled Land (Non-Water)
- Potentially Infilled Land (Non-Water) (Linear)
- Potentially Infilled Land (Non-Water) (Location)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water) (Linear)
- Potentially Infilled Land (Water) (Location)

Historical Data Report - Slice Map A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
·285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Pylon
Electricity Transmission Line
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Mud
Sand
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

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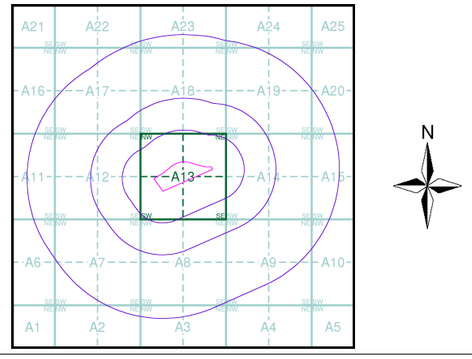
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:10,560	1850	3
Lancashire And Furness	1:10,560	1894	4
Lancashire And Furness	1:10,560	1909	5
Lancashire And Furness	1:10,560	1928	6
Lancashire And Furness	1:10,560	1928	7
Lancashire And Furness	1:10,560	1928	8
Lancashire And Furness	1:10,560	1938	9
Lancashire And Furness	1:10,560	1939	10
Ordnance Survey Plan	1:10,000	1955 - 1956	11
Ordnance Survey Plan	1:10,000	1956	12
Ordnance Survey Plan	1:10,000	1966 - 1968	13
Ordnance Survey Plan	1:10,000	1974 - 1978	14
Liverpool	1:10,000	1974	15
Ordnance Survey Plan	1:10,000	1986 - 1989	16
Ordnance Survey Plan	1:10,000	1990	17
10K Raster Mapping	1:10,000	1999	18
10K Raster Mapping	1:10,000	2006	19
VectorMap Local	1:10,000	2018	20

Historical Map - Slice A



Order Details

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Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

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Russian Military Mapping Legends

1:5,000 and 1:10,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Fireproof Building
- Prominent Fireproof Building
- Non-fireproof Building
- Non-fireproof Building (non-dwelling)
- Factory, mill, and flour mill, with chimneys
- Factory, mill, and flour mill, without chimneys
- Power Station, drawn to scale
- Hydroelectric Power Station
- Radio Station, drawn to scale
- Telephone Station, drawn to scale
- Abandoned Open-pit Mine or Quarry
- Open-pit Salt Mine
- Pit
- Oil Deposit or Well
- Oil Seepage
- Tailings Pile
- Fuel Storage Tanks
- Natural Gas Tank
- Bench Mark
- Drill Hole
- Burial Mound
- Triangulation Point on Burial Mound
- Single-track Railroad
- Double-track Railroad and Station Building
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Lawns
- Citrus Orchard
- Wet Ground
- Scattered Vegetation

243,8 Values for prominent elevations

186.0 Numbers for spot elevations, depth soundings, contour lines, etc.

0,2 Velocity of the current, width of river bed, depth of river

Fractional terms: length and capacity of bridges; depth of fords and condition of the river bottom; height of forest and the diameter of trees

Russian Alphabet (For reference and phonetic interpretation of map text)

А а (A)	З з (Z)	П п (P)	Ч ч (CH)
Б б (B)	И и (I)	Р р (R)	Ш ш (SH)
В в (V)	Й й (Y)	С с (S)	Щ щ (SHCH)
Г г (G)	К к (K)	Т т (T)	ъ (–)
Д д (D)	Л л (L)	У у (U)	ы (Y)
Е е (E)	М м (M)	Ф ф (F)	ь (')
Ё ё (YO)	Н н (N)	Х х (KH)	Э э (E)
Ж ж (ZH)	О о (O)	Ц ц (TS)	Ю ю (YU or IU)
			Я я (YA or IA)

1:25,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Partly Demolished Buildings
- Demolished Buildings
- Built-Up Area with Fireproof Buildings Predominant
- Built-Up Area with Non-Fireproof Buildings Predominant
- Individual Fireproof Building
- Prominent Industrial Building
- Individual Dwelling, Fireproof
- Ruins of an Individual Dwelling
- Factory or Mill Chimney
- Factory or Mill with Chimney
- Factory or Mill without Chimney
- Mine or Open Pit Mine
- Operating Shaft or Mine
- Non-Operating Shaft or Mine
- Salt Mine
- Tailings Pile
- Pit
- Stone Quarry
- Gas Pump or Service Station
- Fuel Storage or Natural Gas Tank
- Oil or Natural Gas Derrick
- Small Hydroelectric Power Station
- Power Station
- Transformer Station
- Cemetery
- Burial Mound (height in metres)
- Triangulation Point on Burial Mound
- Triangulation Point
- Bench Mark
- Bench Mark (monumented)
- Telegraph Office
- Telephone Station
- Radio Station
- Radio Tower
- Airfield or Seaplane Base
- Landing Strip
- Main Highway
- Highway under Construction
- Improved Dirt Road (former truck road)
- Double-track Railroad with First Class Station
- Dismantled Railroad
- Railroad Under Construction
- Shore Embankment
- River or Ditch with Embankment
- Well
- Water Reservoir or Rain Water Pit
- Spring
- Isobath with value
- Heavy (Index) Contour Line
- Contour Line and Value
- Half Contour Line
- Spot Elevation Value
- Coniferous
- Deciduous
- Mixed
- Scrub

Key to Numbers on Mapping

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Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
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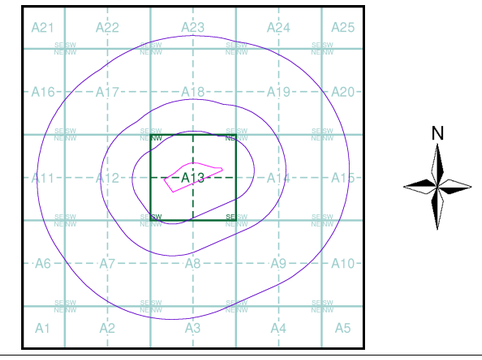
10K Raster Mapping	1:10,000	2006	19
VectorMap Local	1:10,000	2018	20

Russian Map - Slice A



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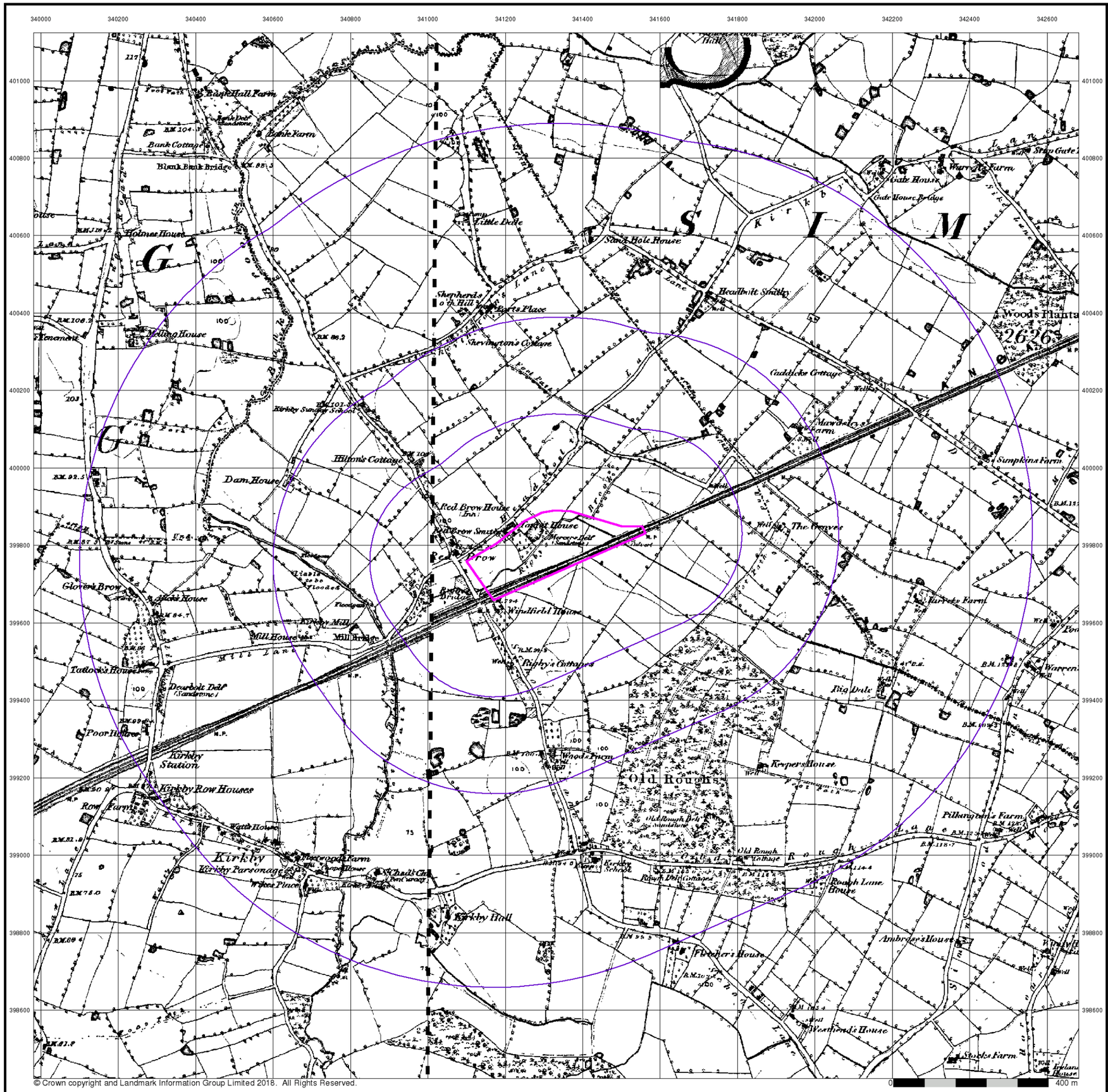

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0 400 m

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Lancashire And Furness

Published 1850

Source map scale - 1:10,560

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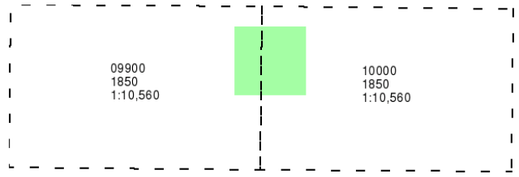
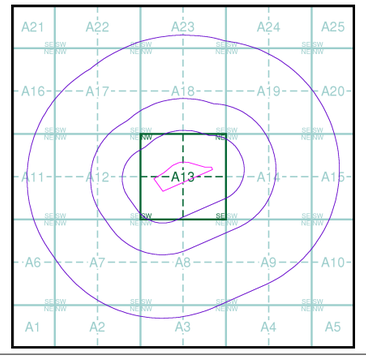
Map Name(s) and Date(s)



Historical Map - Slice A



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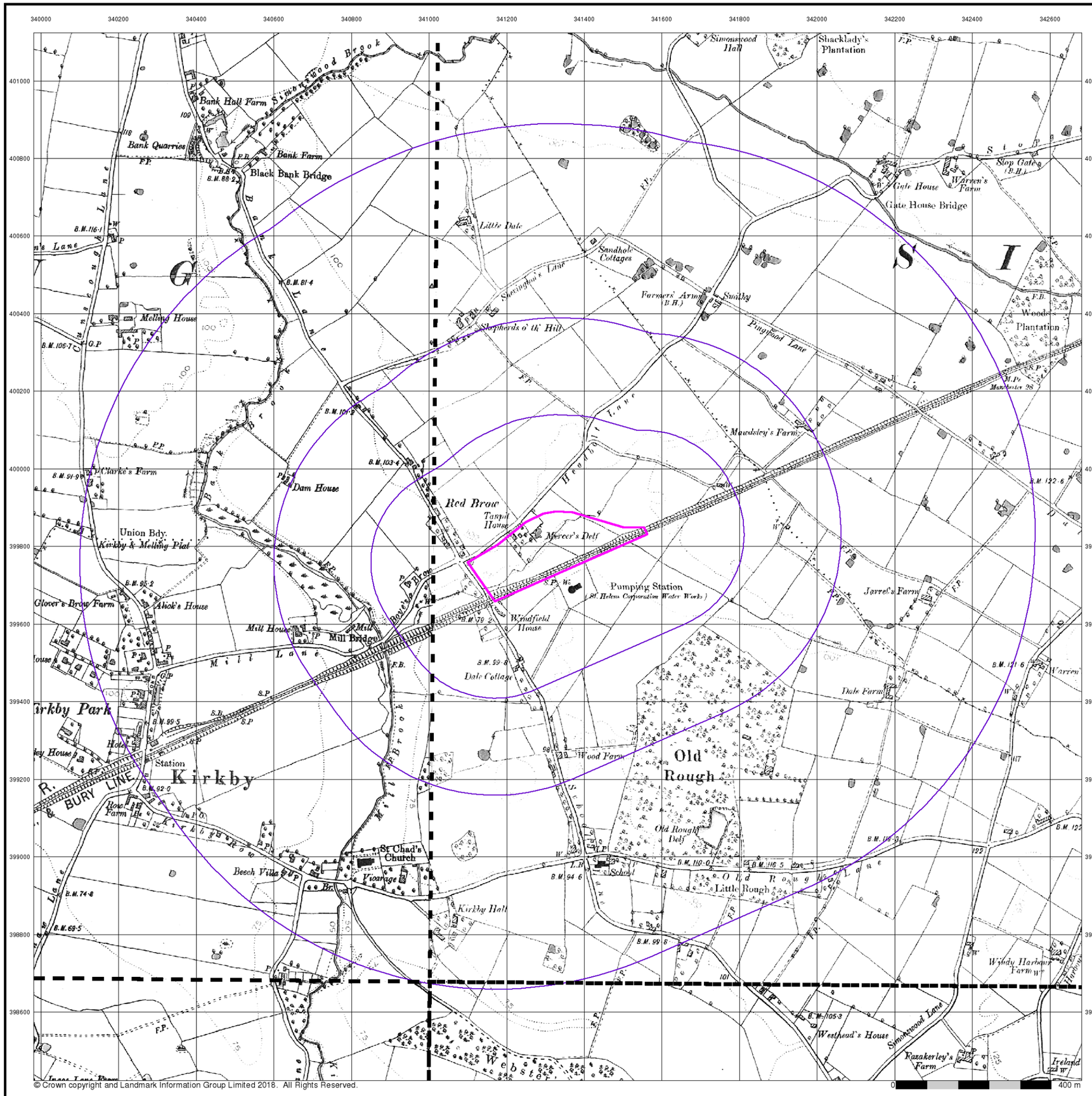

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MOTT MACDONALD

Lancashire And Furness

Published 1894

Source map scale - 1:10,560

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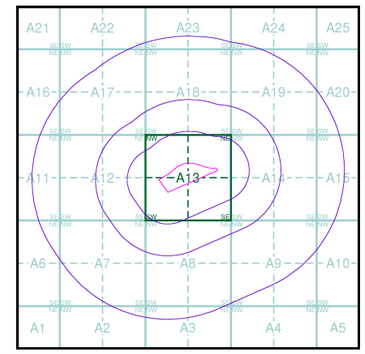
Map Name(s) and Date(s)

099NE 1894 1:10,560	100NW 1894 1:10,560
099SE 1894 1:10,560	100SW 1894 1:10,560

Historical Map - Slice A



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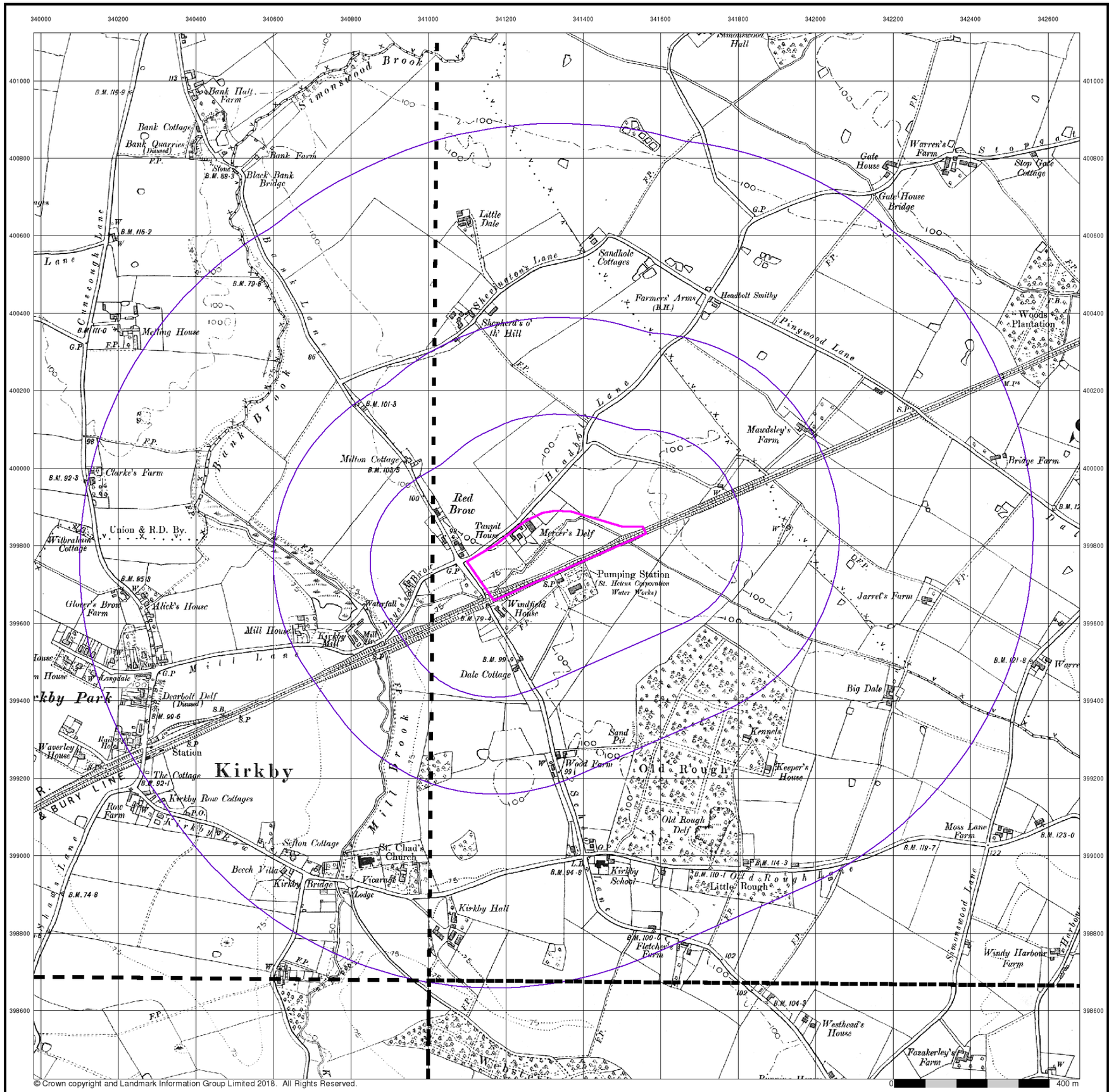

M M

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Lancashire And Furness

Published 1909

Source map scale - 1:10,560

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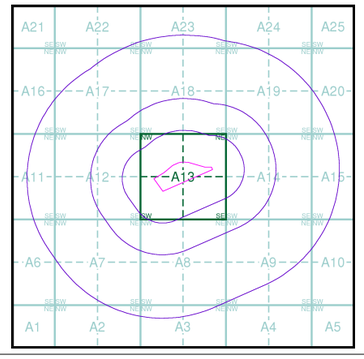
Map Name(s) and Date(s)

099NE 1909 1:10,560	100NW 1909 1:10,560
099SE 1909 1:10,560	100SW 1909 1:10,560

Historical Map - Slice A



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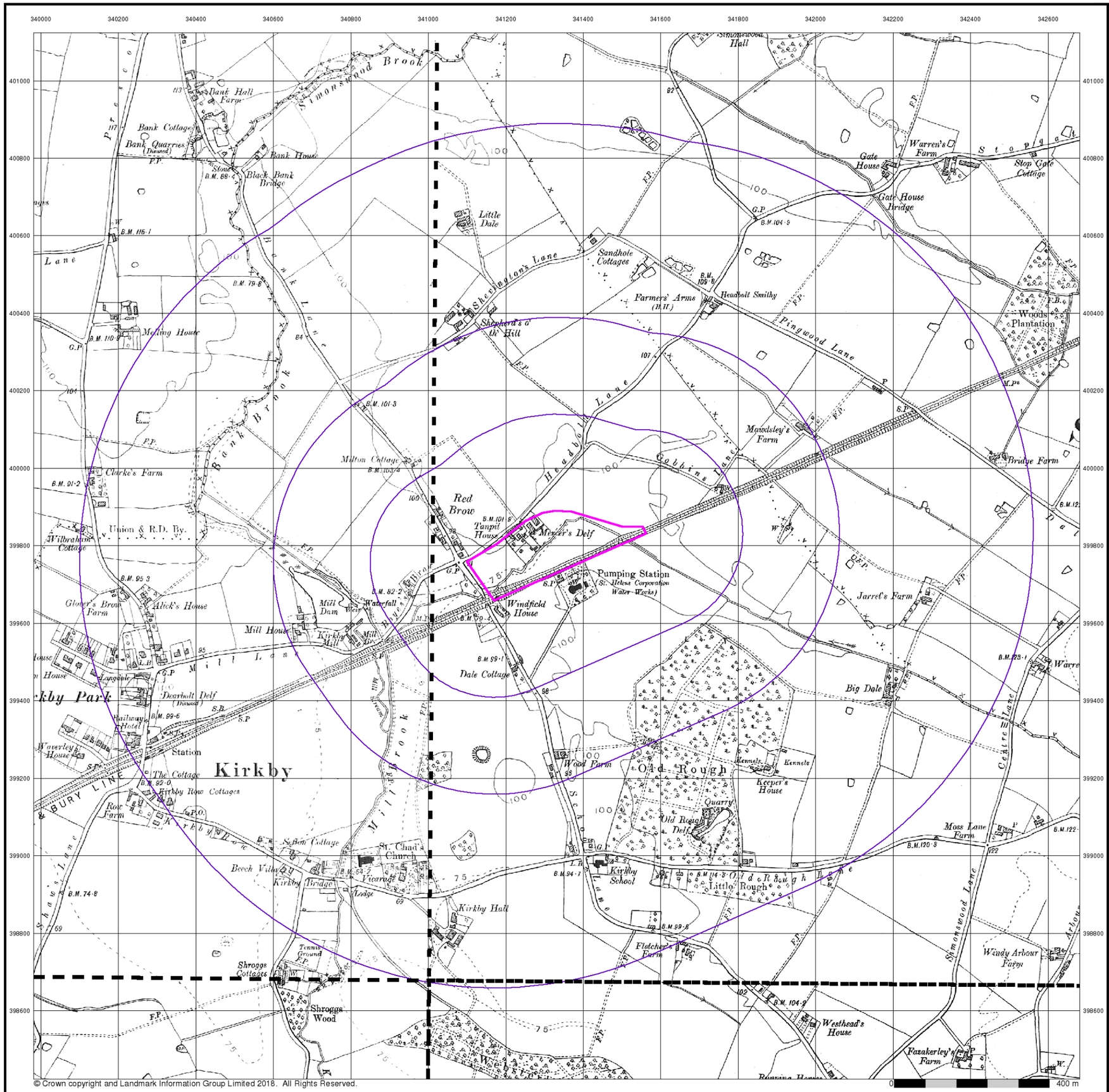

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MOTT MACDONALD

Lancashire And Furness

Published 1928

Source map scale - 1:10,560

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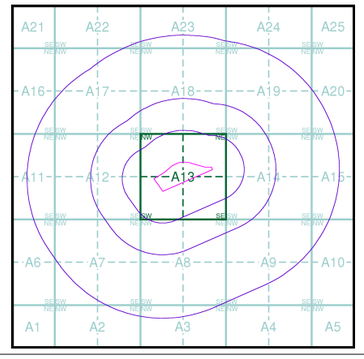
Map Name(s) and Date(s)

099NE 1928 1:10,560	100NW 1928 1:10,560
099SE 1928 1:10,560	100SW 1928 1:10,560

Historical Map - Slice A



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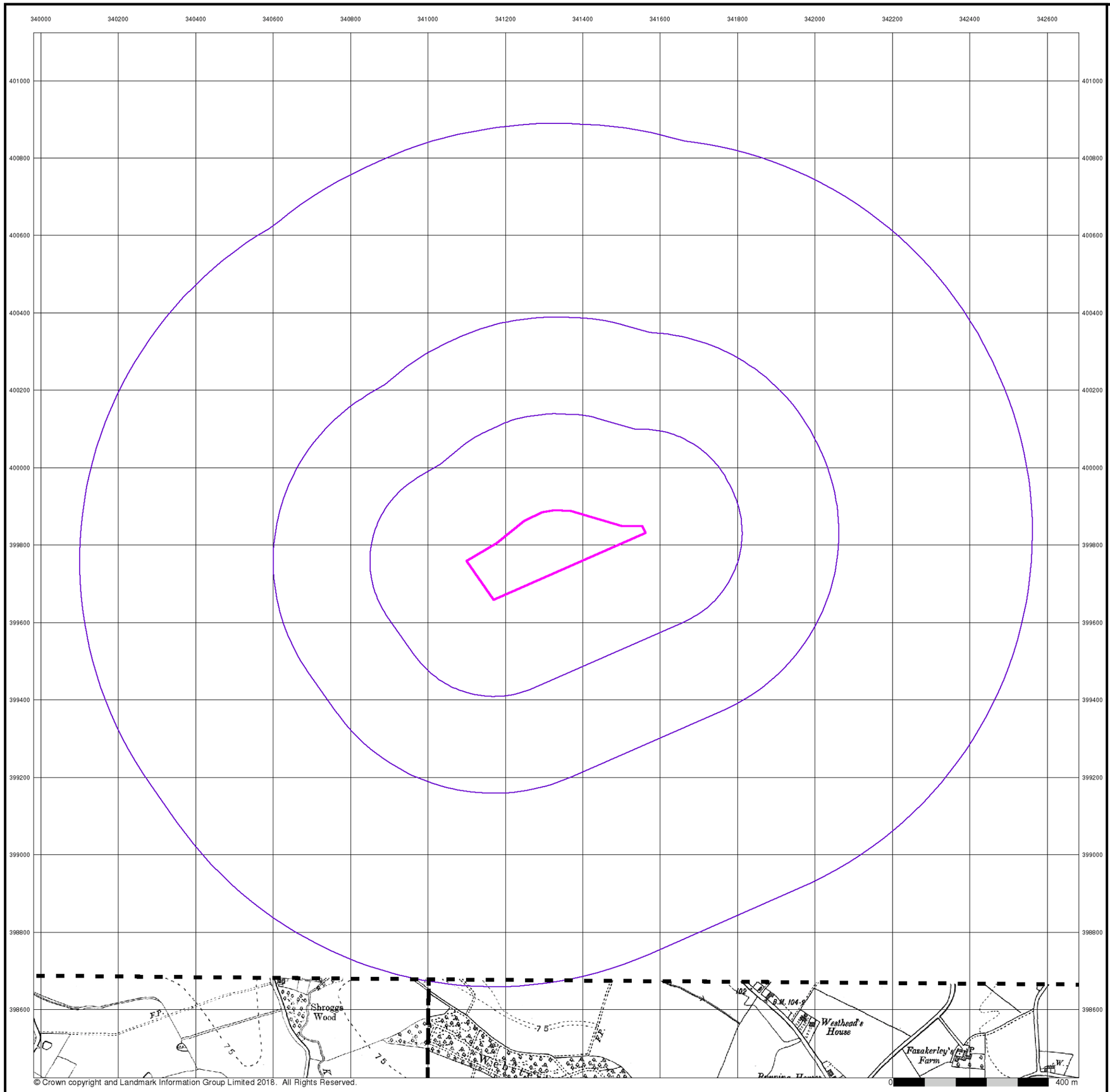

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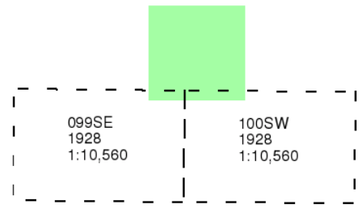
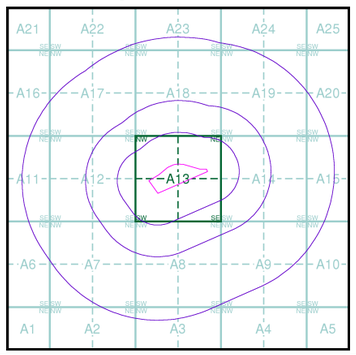


Historical Map - Slice A



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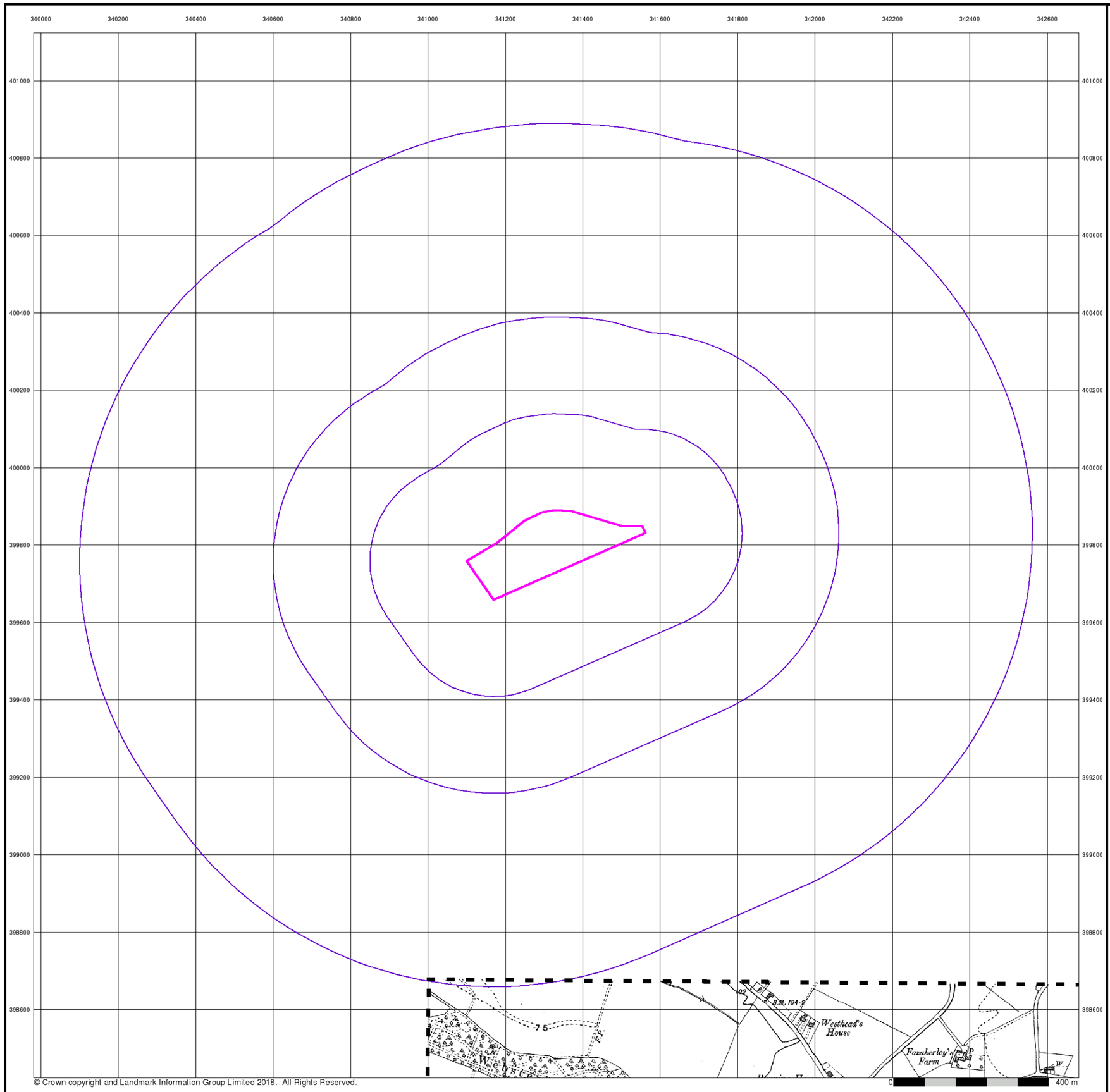

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MOTT MACDONALD

Lancashire And Furness

Published 1928

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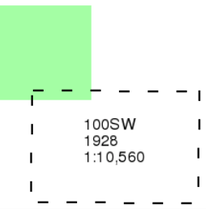
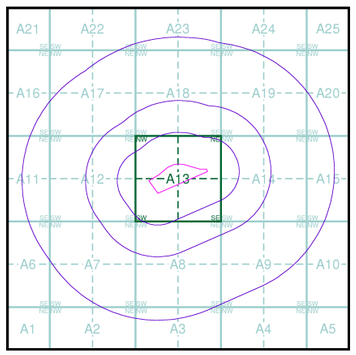


Historical Map - Slice A



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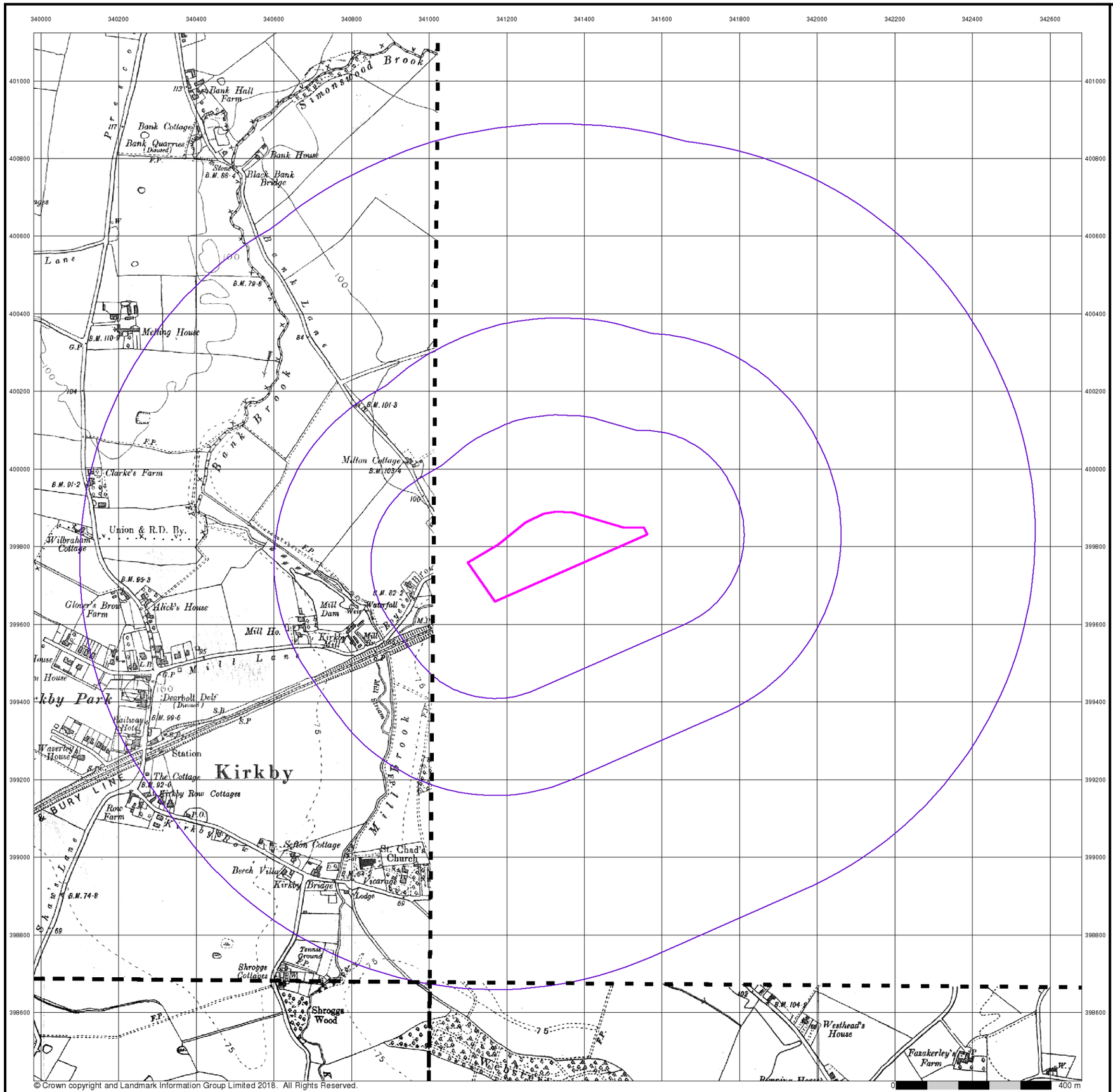

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MOTT MACDONALD

Lancashire And Furness

Published 1938

Source map scale - 1:10,560

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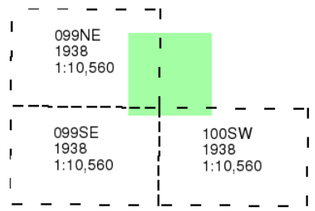
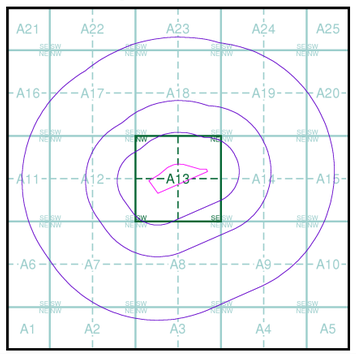
Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

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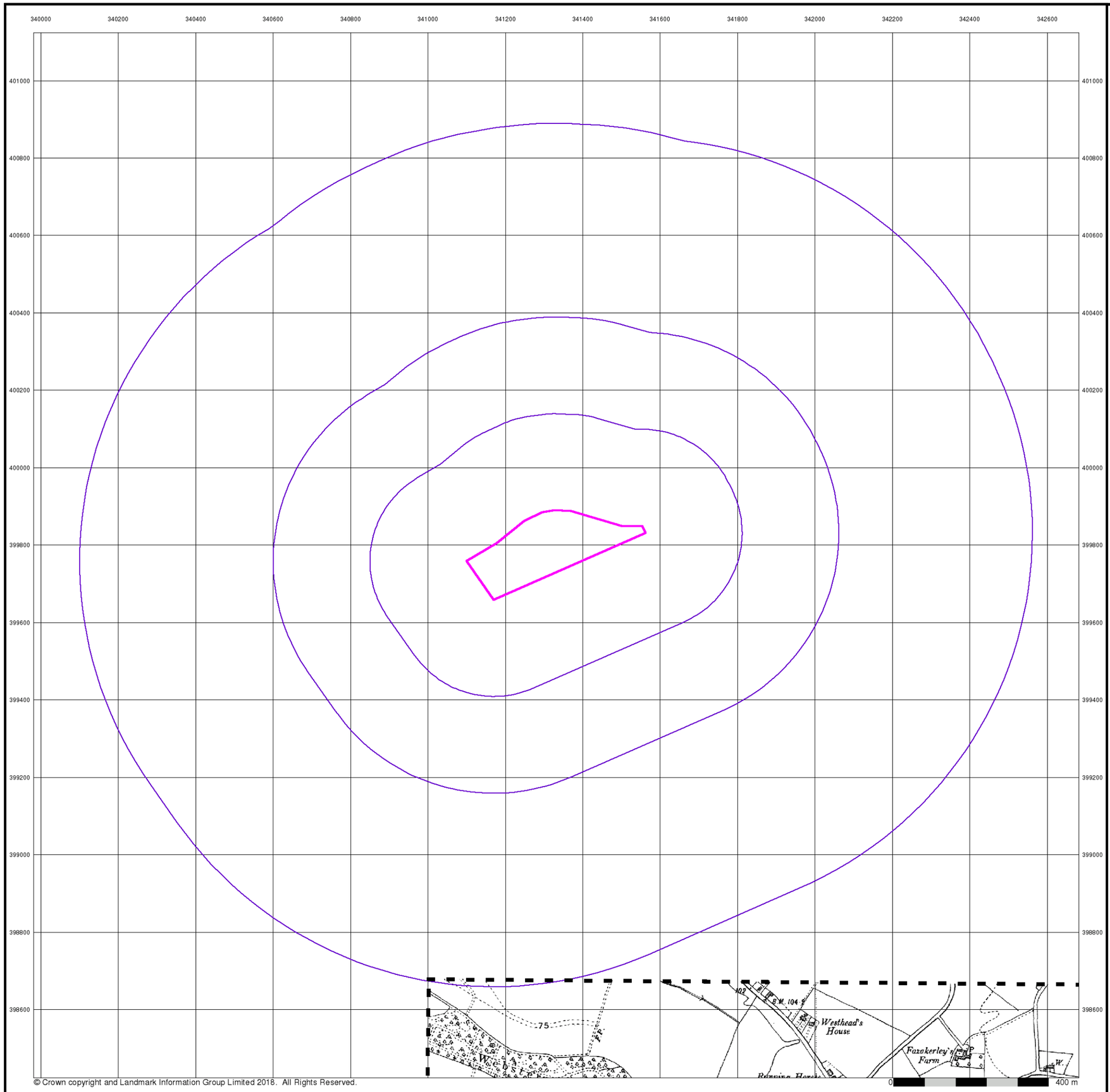
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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MOTT MACDONALD

Lancashire And Furness

Published 1939

Source map scale - 1:10,560

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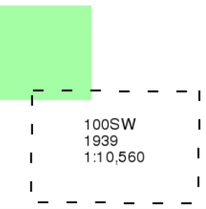
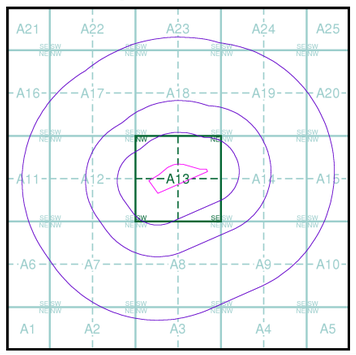
Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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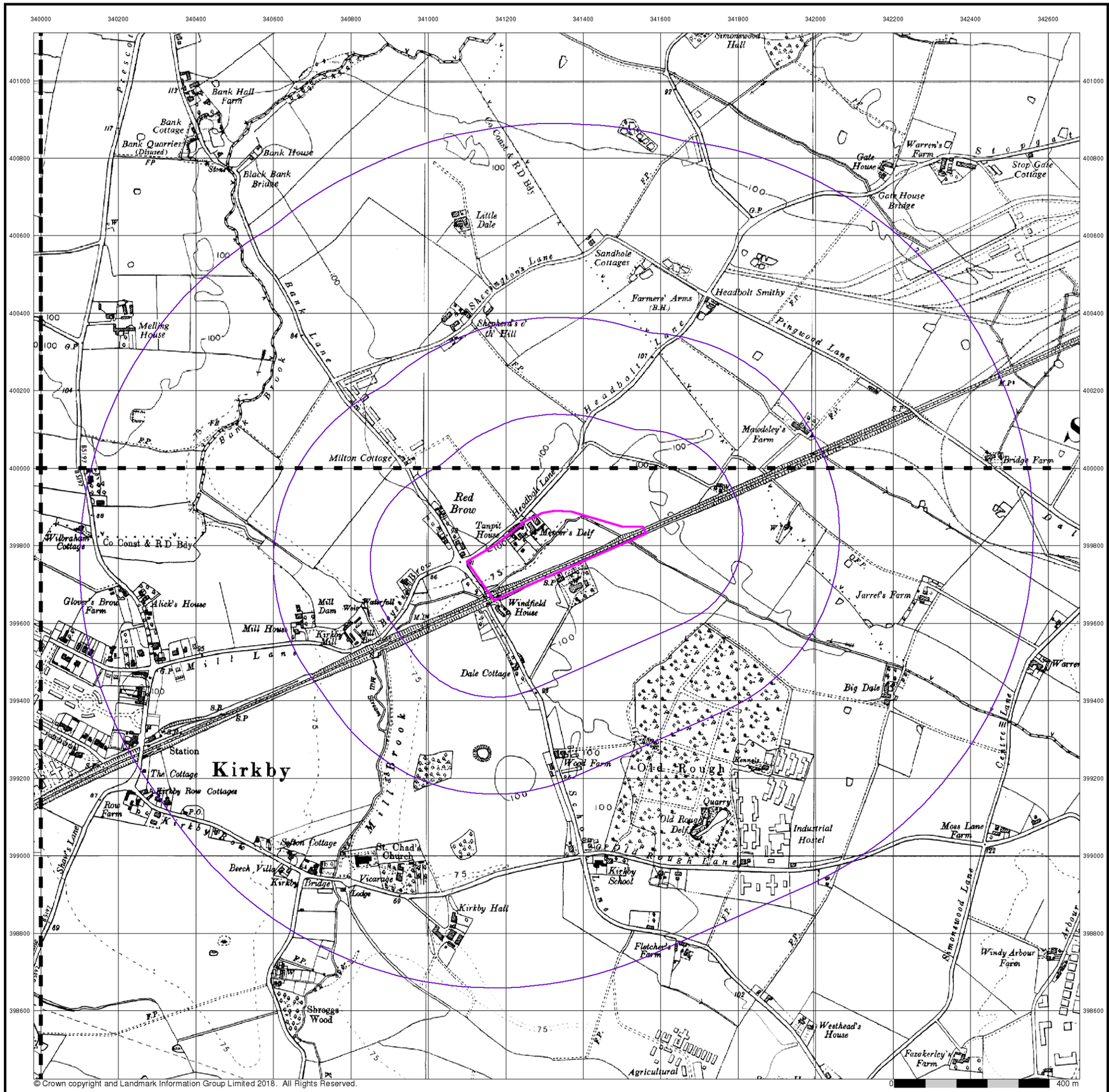
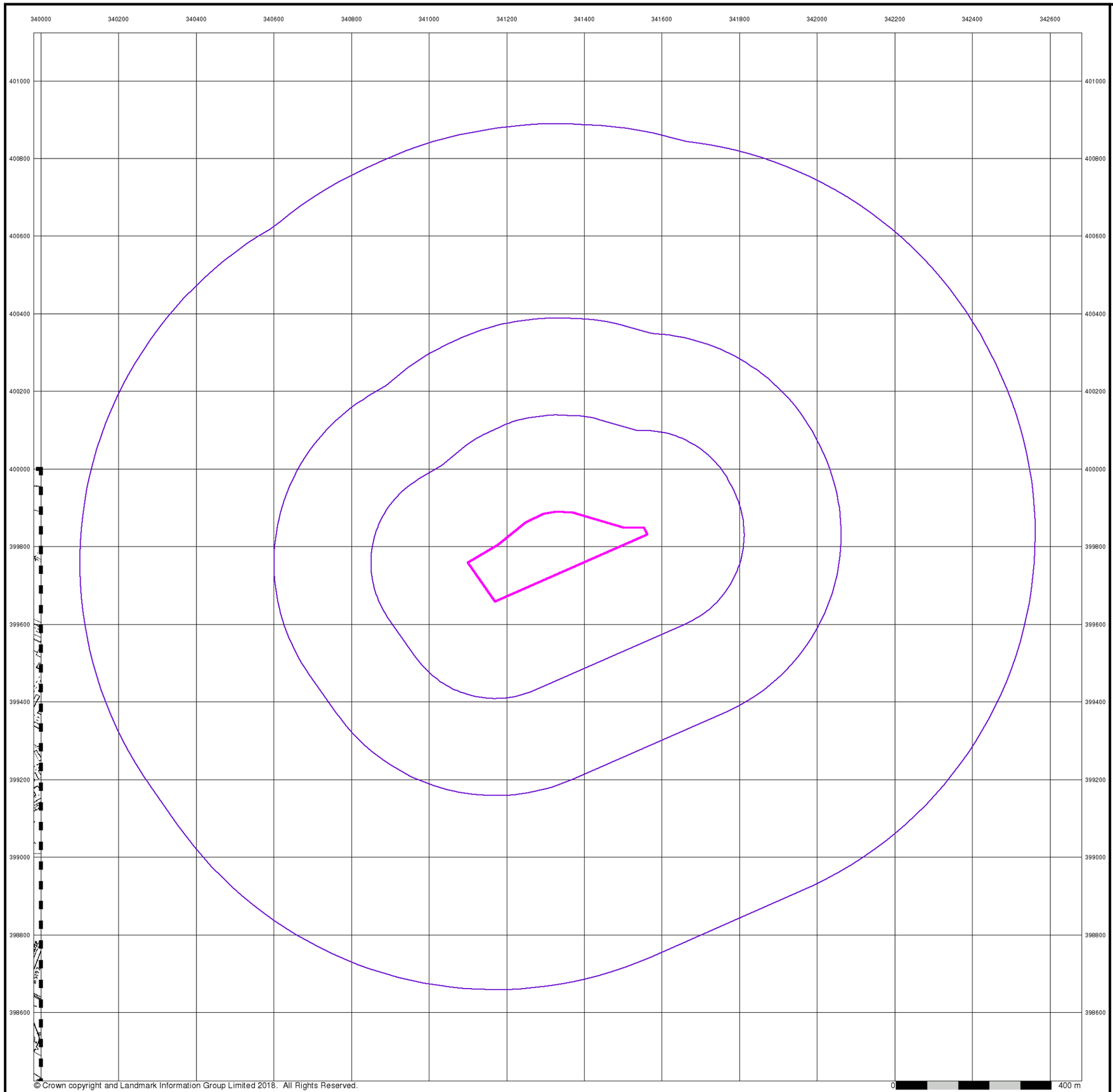

Kirkby
Old Rough
Bank Hall Farm
Bank Cottage
Bank Quarries (Disused)
Bank House
Black Bank Bridge
Little Dale
Sandhole Cottages
Farmers' Arms (B.H.)
Headbolt Smithy
Gate House
Warren's Farm
Stop Gate Cottage
Gate House Bridge
Simonswood Hall
Melling House
Milton Cottage
Red Brow
Tanpit House
Meyer's Delf
Windfield House
Mawdsley's Farm
Bridge Farm
Jarrel's Farm
Wilbraham Cottage
Glover's Brow Farm
Mill House
Mill Dam
Waterfall
Kirkby Mill
Dale Cottage
Big Dale
Wood Farm
Kennels
Quarry
Old Rough Delf
Industrial Hostel
Moss Lane Farm
Station
The Cottage
Kirkby Row Cottages
Row Farm
Sefton Cottage
St. Chad's Church
Vicarage
Beech Villa
Kirkby Bridge
Lodge
Kirkby School
Kirkby Hall
Fletcher's Farm
Windy Arbour Farm
Westhead's House
Fazakerley's Farm
Shroggs Wood
Agricultural
Bank Lane
Headbolt Lane
Pingwood Lane
Mill Lane
Centre Lane
Simonswood Lane
Sheephouse Lane
Shepherd's o' th' Hill
Co Const & R D Bdy
Mill Brook
Black Brook
Pinfold Lane
Old Rough Lane
Shovel's Lane
Rivington Lane
Rivington Cottage
Rivington Farm
Rivington Hall
Rivington Hall Farm
Rivington Hall Cottage
Rivington Hall Lodge
Rivington Hall Gate
Rivington Hall Gate Lodge
Rivington Hall Gate Cottage
Rivington Hall Gate Farm
Rivington Hall Gate House
Rivington Hall Gate Brid



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MOTT MACDONALD

Ordnance Survey Plan

Published 1956

Source map scale - 1:10,000

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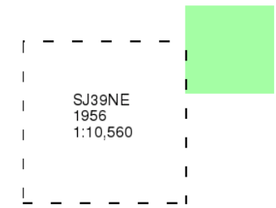
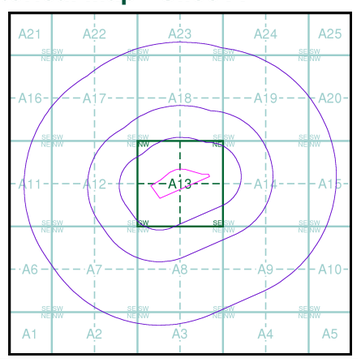
Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

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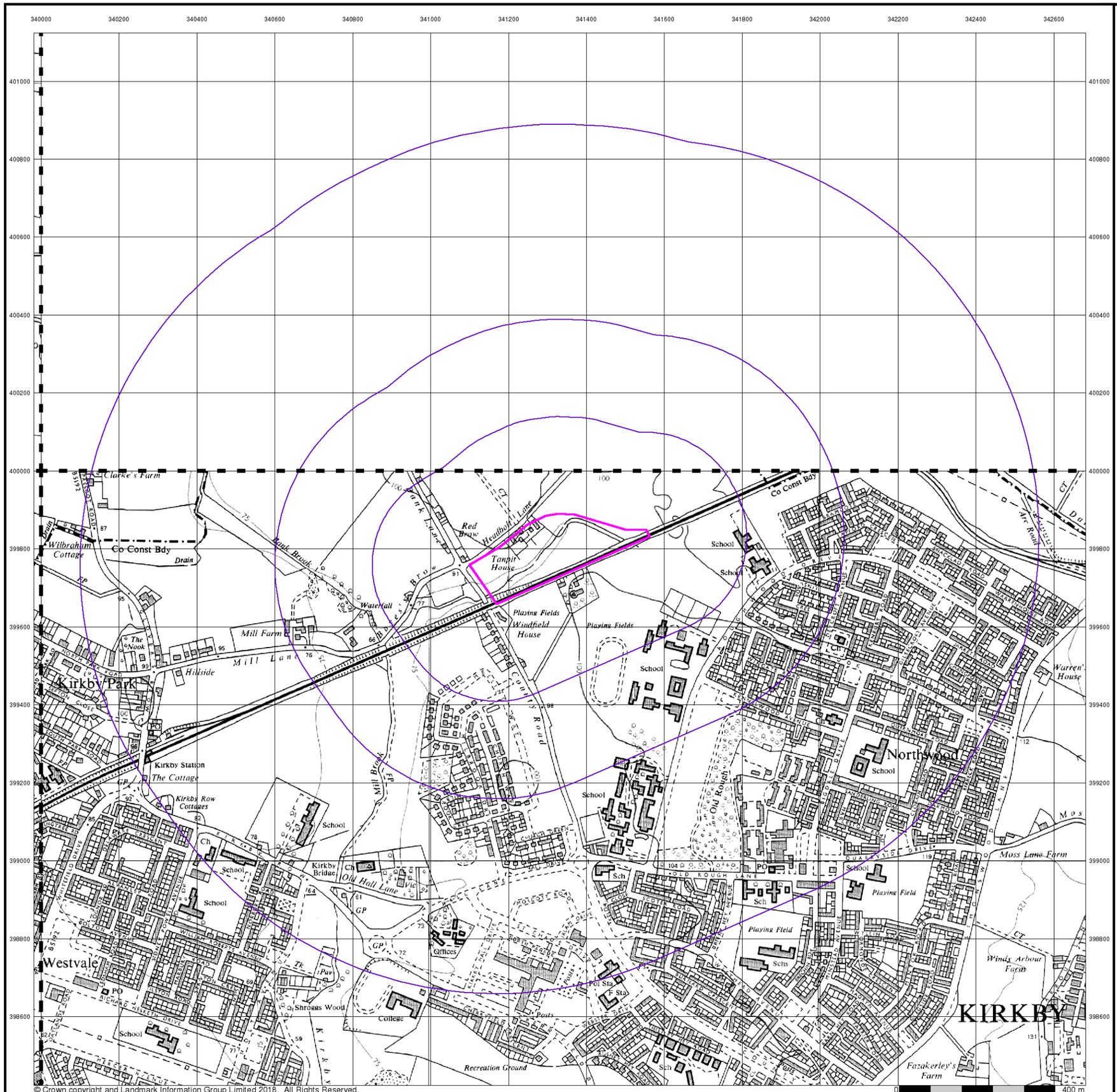

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MOTT MACDONALD

Ordnance Survey Plan

Published 1966 - 1968

Source map scale - 1:10,000

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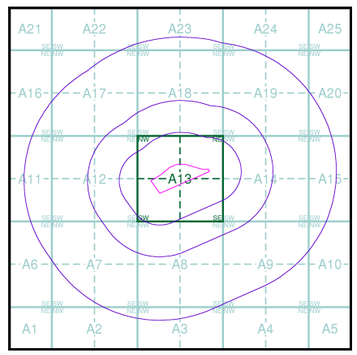
Map Name(s) and Date(s)

SD30SE
1968
1:10,560

SJ39NE
1967
1:10,560

SJ49NW
1966
1:10,560

Historical Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

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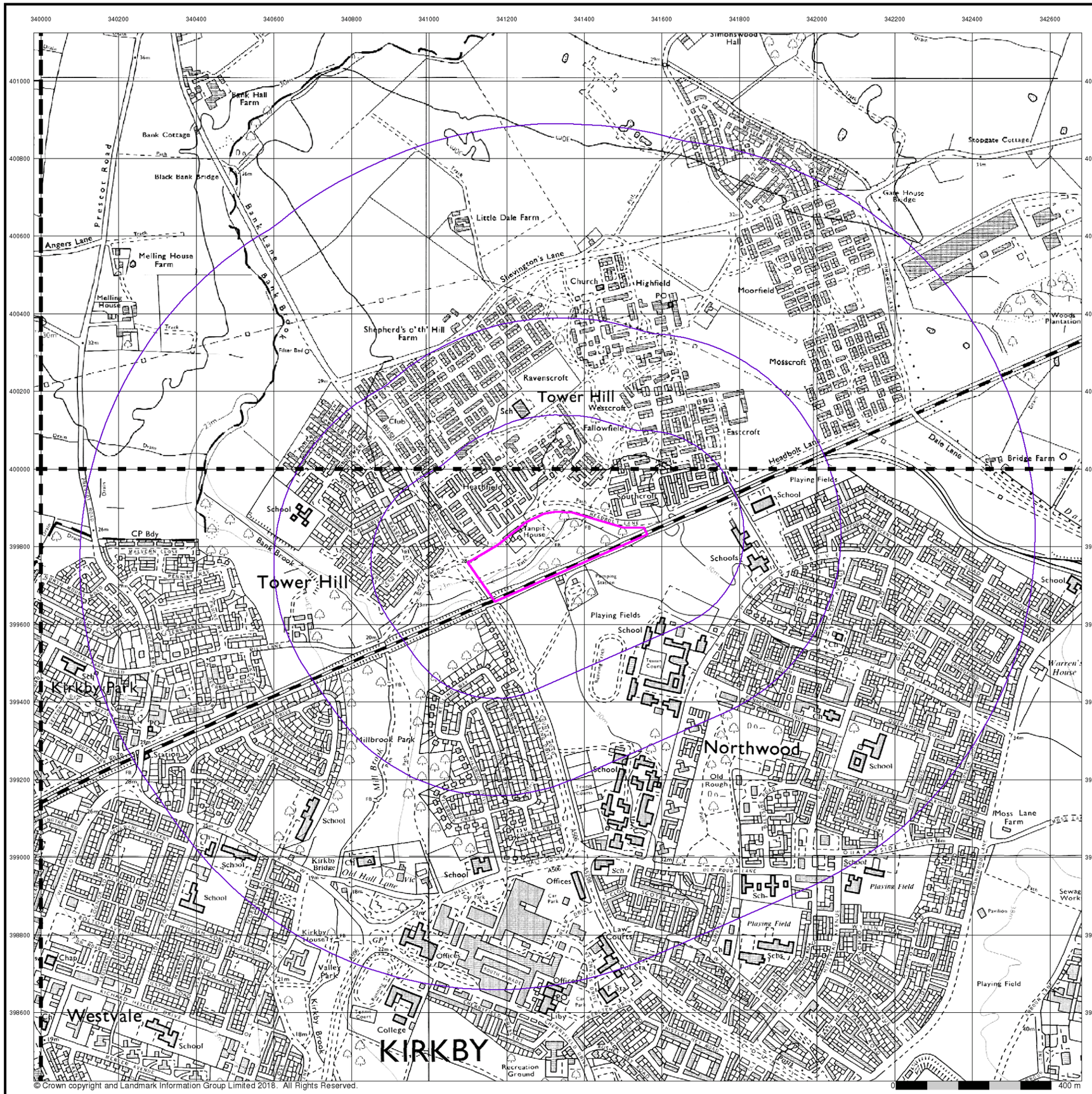

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MOTT MACDONALD

Ordnance Survey Plan

Published 1974 - 1978

Source map scale - 1:10,000

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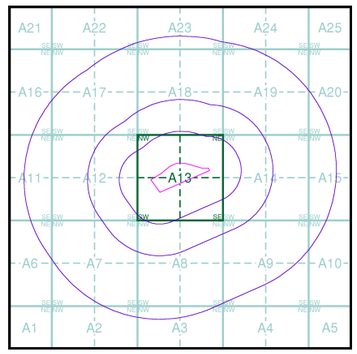
Map Name(s) and Date(s)

SD30SE 1975 1:10,000	SD40SW 1976 1:10,000
SJ39NE 1974 1:10,000	SJ49NW 1978 1:10,000

Historical Map - Slice A



Order Details

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Банк
35.7
28.8
Уорренс-Фарм
Мелинг
25.6
Шеперлс-оф-те-Хилл
32.6
Модслис-Фарм
Бридж
оз. Милл-Дам
Милл
вдкч.
ул. Наунти-Род
ул. Нернби-Род
ул. Холл-Лейн
ул. Сент-Чадс-Драйв
ул. Черрифилд-Драйв
ул. Уэбстер-Драйв
ул. Олд-Раф-Лейн-Драйв
ул. Милл-Лейн
ул. Керкби-Роад
ул. Уайтфилд-Драйв
ул. Сидни-Пауэлл-Авеню
ул. Болтон-Авеню
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ул. Уиллин-Роад
ул. Самюэлсон-Авеню
ул. Ламбет-Роад
ул. Ламберт-Драйв
ул. Бриджуотер-Драйв
ул. Бриан-Хеп-Драйв
ул. Кенсент
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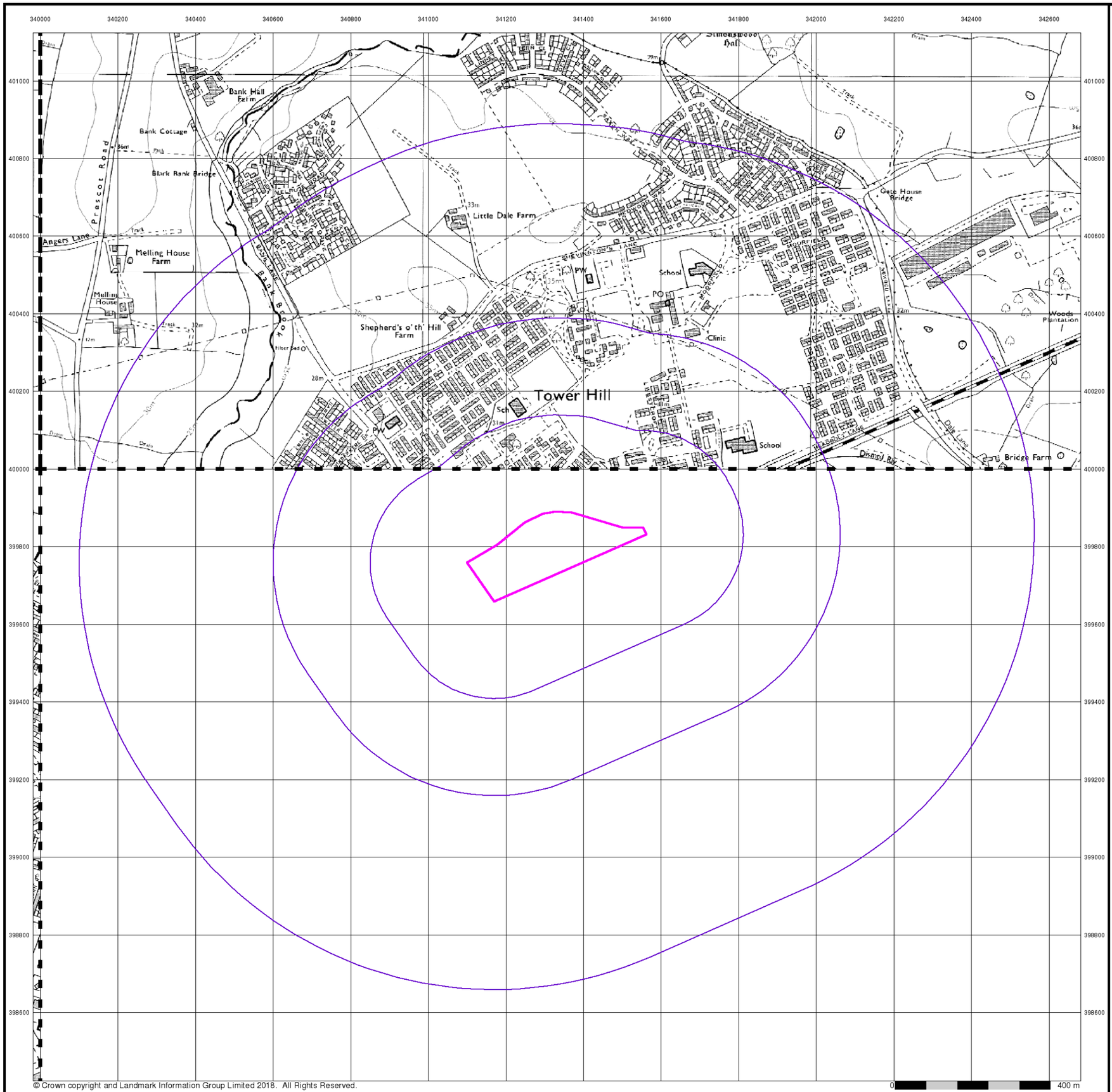


M M

MOTT MACDONALD

Ordnance Survey Plan

Published 1986 - 1989

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

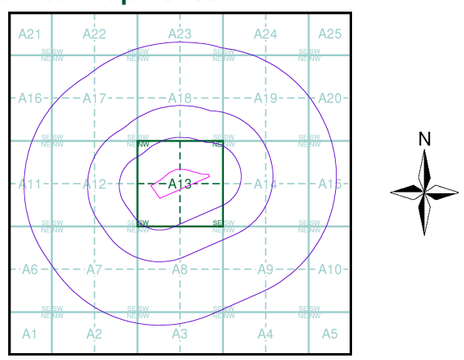
Map Name(s) and Date(s)

SD30SE 1986 1:10,000

SD40SW 1989 1:10,000

SJ39NE 1988 1:10,000

Historical Map - Slice A



Order Details

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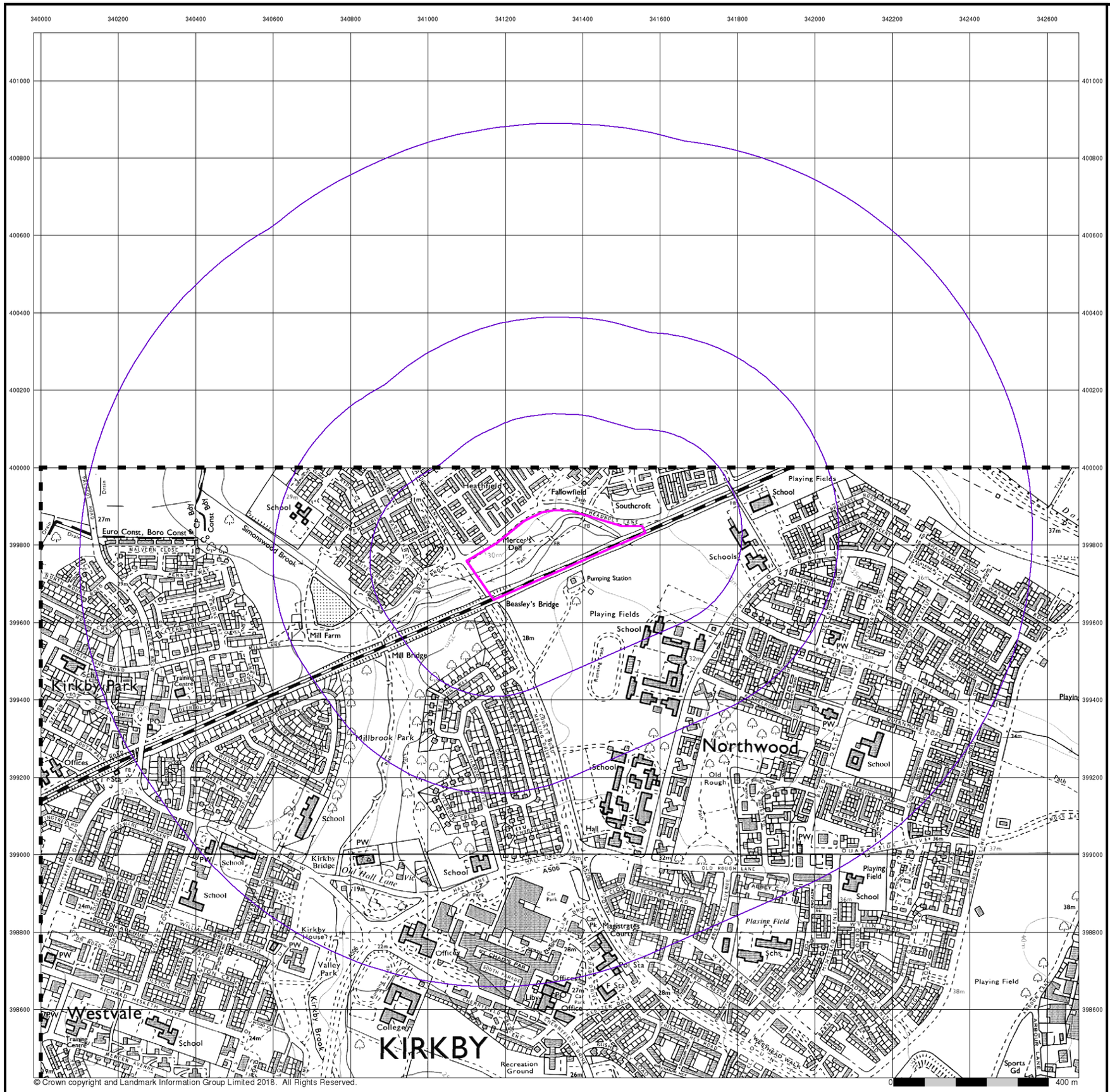
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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MOTT MACDONALD

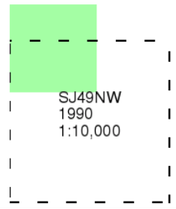
Ordnance Survey Plan

Published 1990

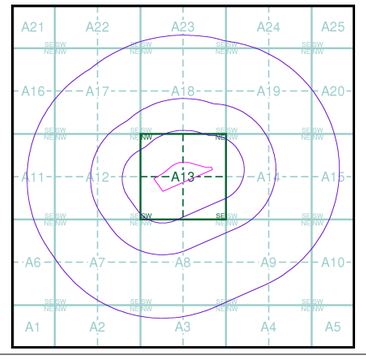
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840□s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940□s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

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M

MOTT MACDONALD

10k Raster Mapping

Published 1999

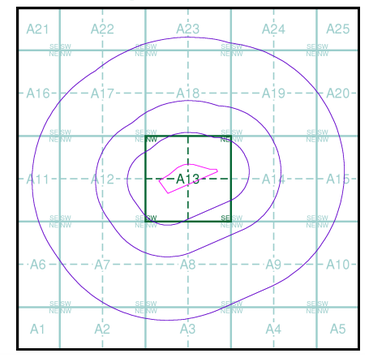
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

SD30SE 1999 1:10,000	SD40SW 1999 1:10,000
SJ39NE 1999 1:10,000	SJ49NW 1999 1:10,000

Historical Map - Slice A



Order Details

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Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

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M

MOTT MACDONALD

10k Raster Mapping

Published 2006

Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

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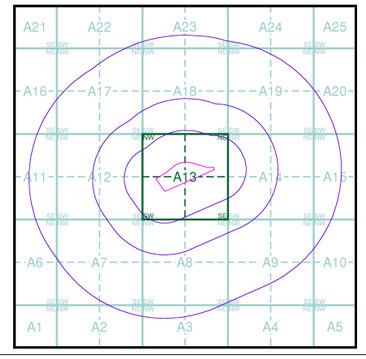
SJ39NE 2006 1:10,000	SJ49NW 2006 1:10,000

Historical Map - Slice A



Order Details

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Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
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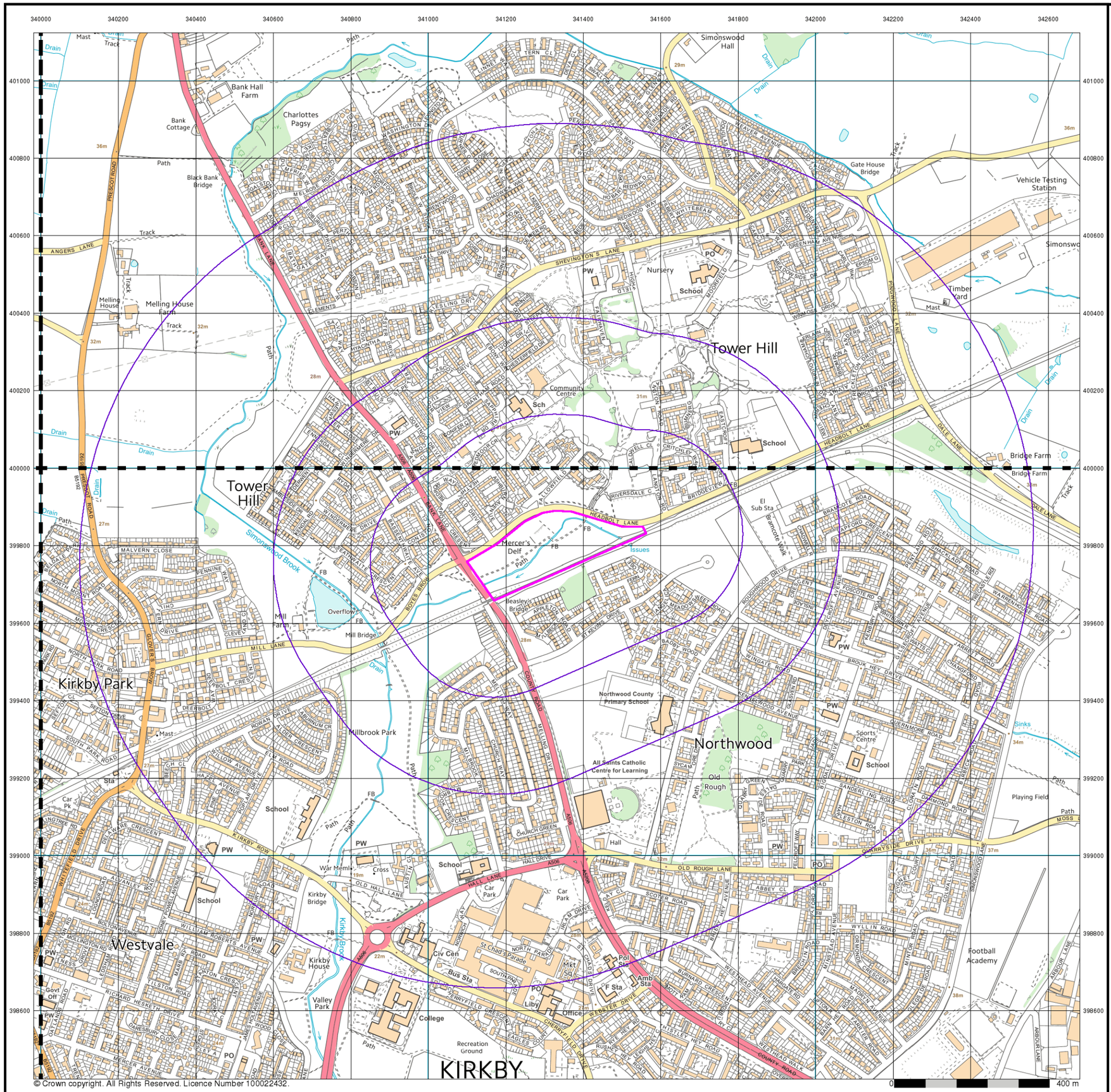

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M M

MOTT MACDONALD

VectorMap Local

Published 2018

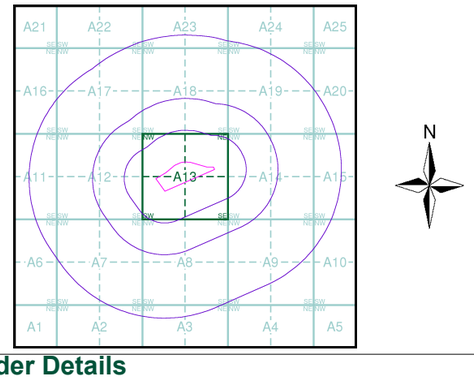
Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities),1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)

SD30SE 2018 Variable	SD40SW 2018 Variable
SJ39NE 2018 Variable	SJ49NW 2018 Variable

Historical Map - Slice A



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Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

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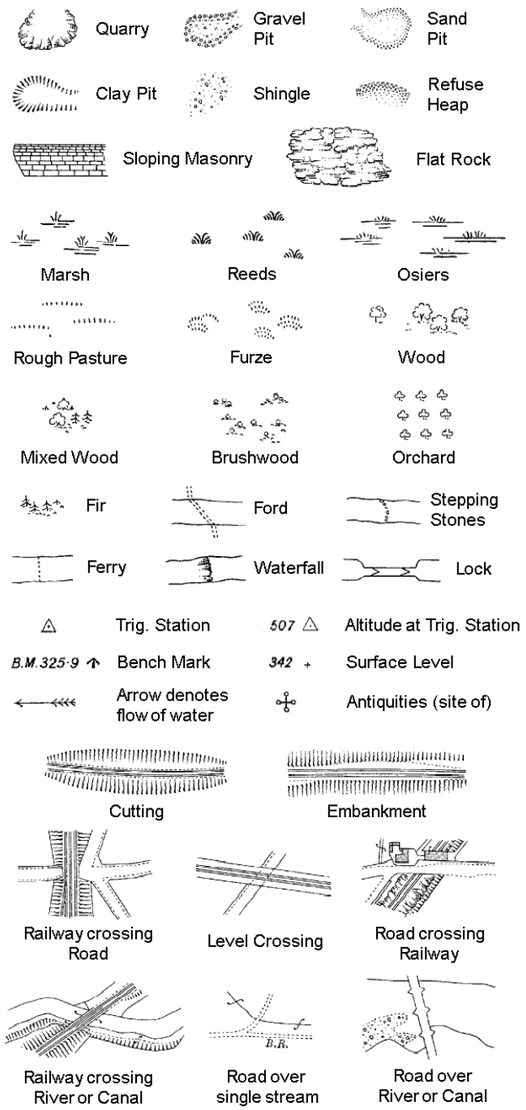
Historical Mapping Legends

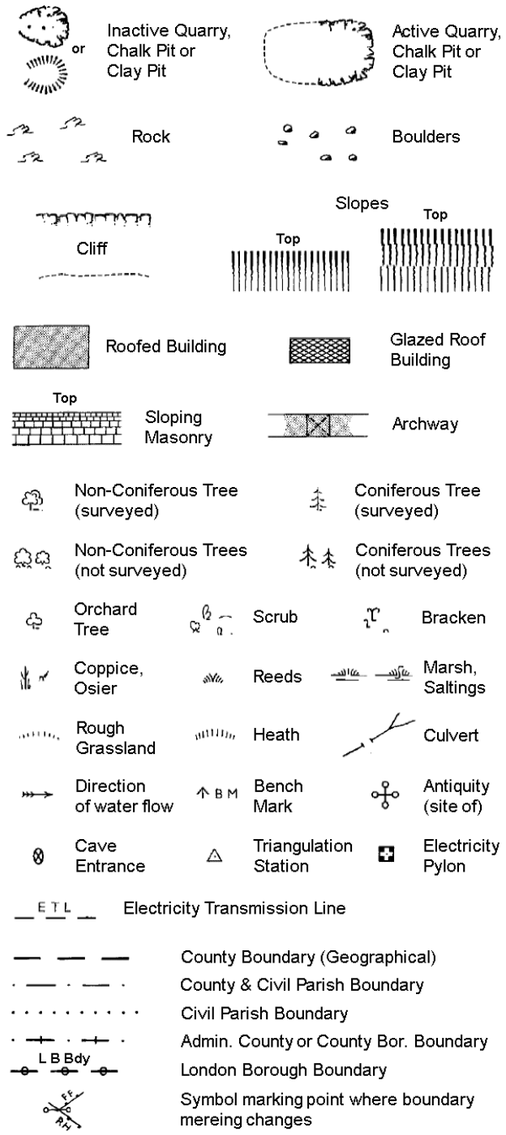
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	St.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

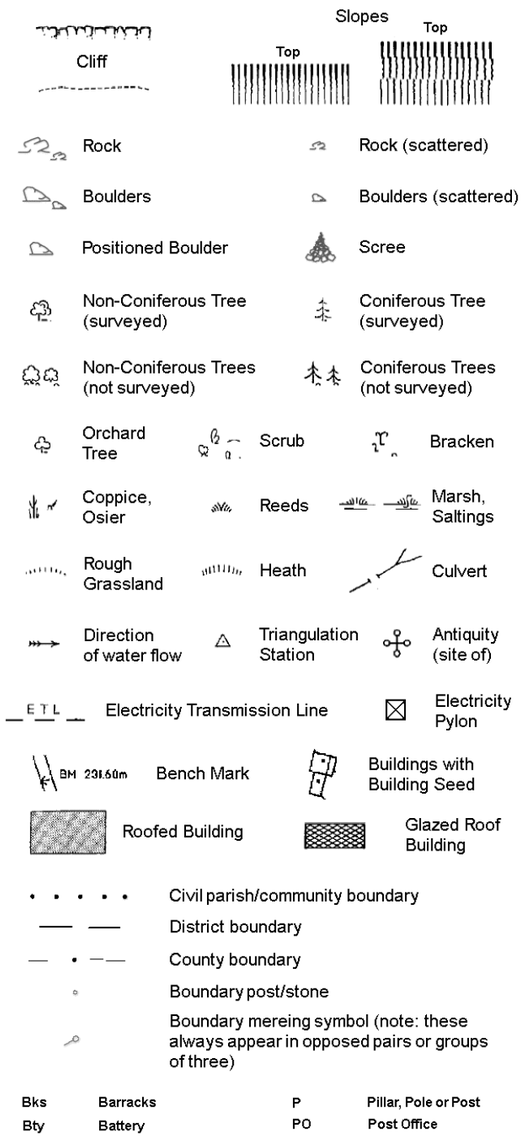
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
L B Bdy London Borough Boundary
Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

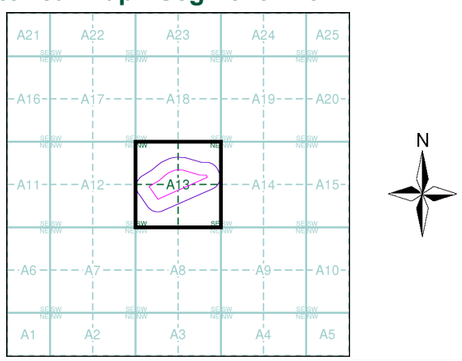
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

MOTT MACDONALD

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:2,500	1893	2
Lancashire And Furness	1:2,500	1908	3
Lancashire And Furness	1:2,500	1927	4
Lancashire And Furness	1:2,500	1939	5
Ordnance Survey Plan	1:1,250	1962 - 1973	6
Ordnance Survey Plan	1:2,500	1962 - 1975	7
Ordnance Survey Plan	1:1,250	1966 - 1972	8
Supply of Unpublished Survey Information	1:1,250	1974 - 1975	9
Supply of Unpublished Survey Information	1:2,500	1974	10
Additional SIMs	1:2,500	1979	11
Additional SIMs	1:1,250	1979 - 1989	12
Additional SIMs	1:1,250	1987	13
Large-Scale National Grid Data	1:1,250	1993	14
Large-Scale National Grid Data	1:1,250	1993 - 1994	15
Large-Scale National Grid Data	1:1,250	1994 - 1995	16
Large-Scale National Grid Data	1:1,250	1995	17
Large-Scale National Grid Data	1:1,250	1996	18
Large-Scale National Grid Data	1:1,250	1996	19
Large-Scale National Grid Data	1:1,250	1996	20
Historical Aerial Photography	1:2,500	2001	21

Historical Map - Segment A13



Order Details

Order Number: 167915730_1_1
Customer Ref: 394359GE05
National Grid Reference: 341330, 399790
Slice: A
Site Area (Ha): 5.08
Search Buffer (m): 100

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

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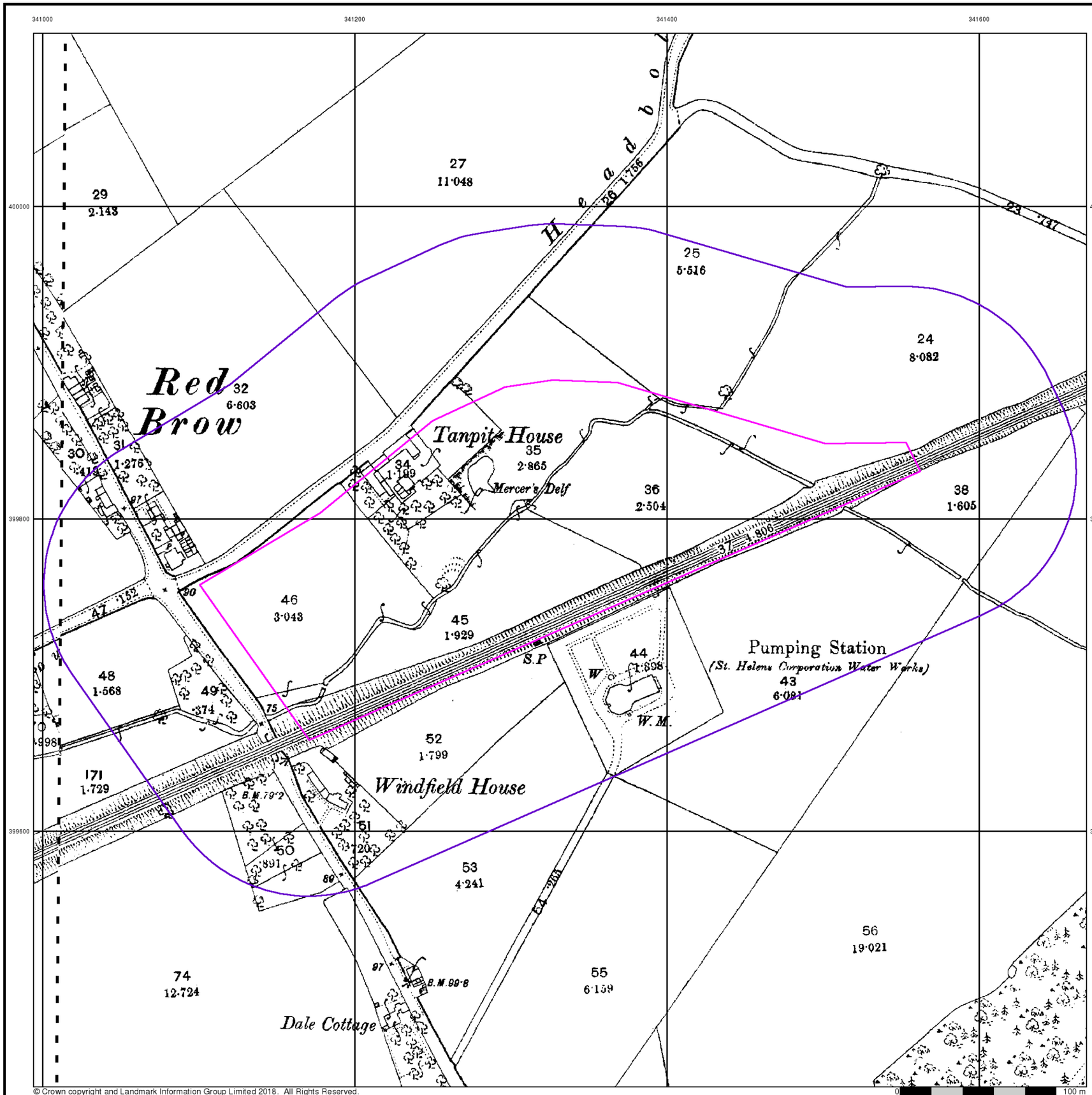

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Lancashire And Furness

Published 1893

Source map scale - 1:2,500

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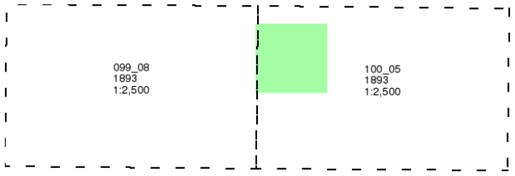
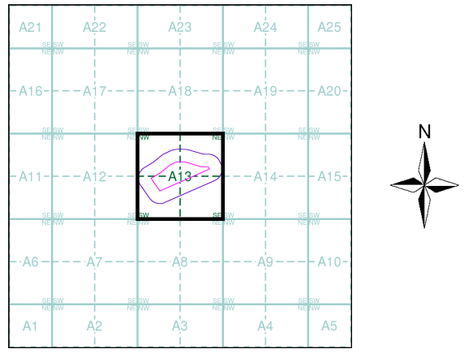
Map Name(s) and Date(s)



Historical Map - Segment A13



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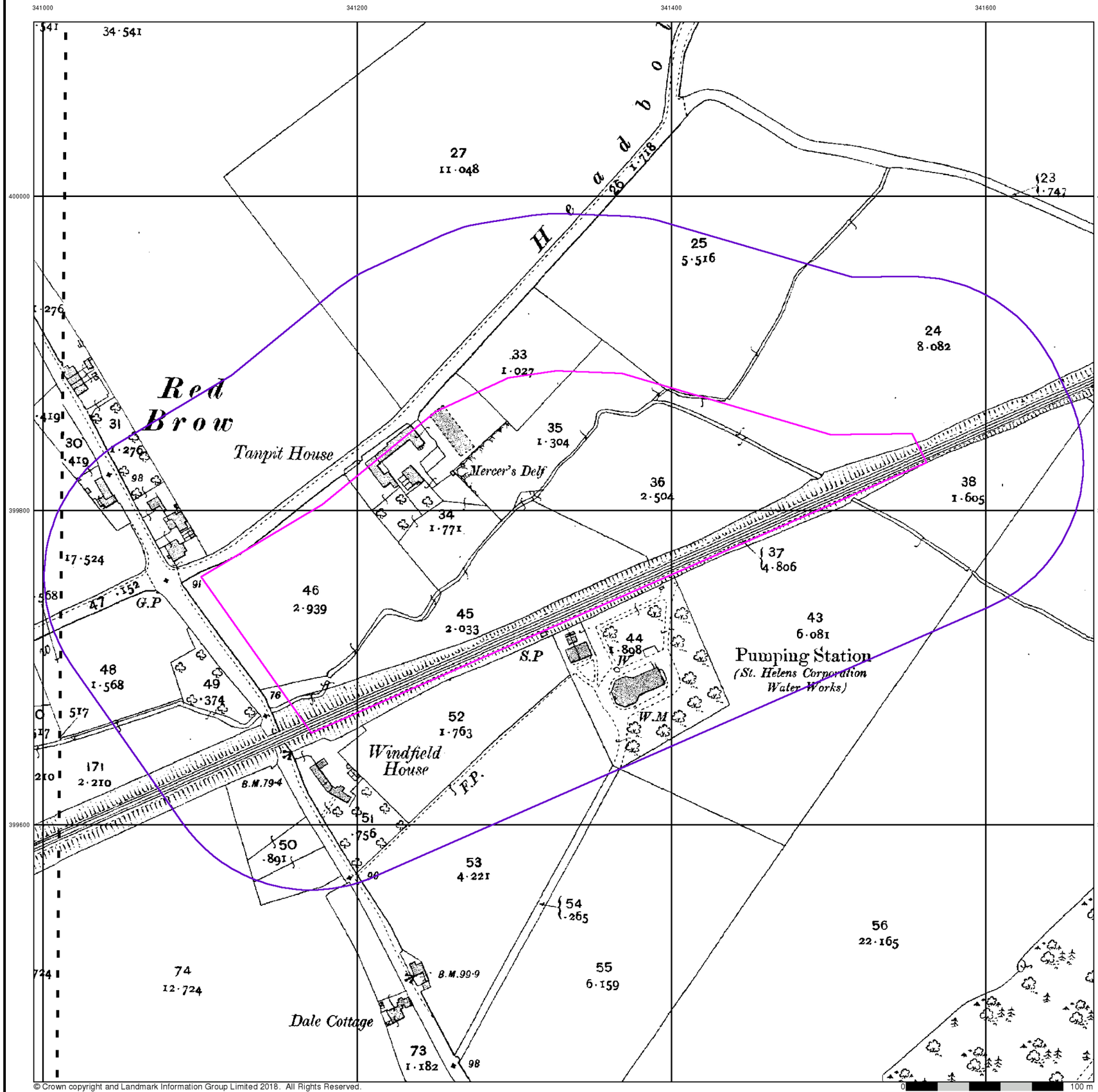

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Lancashire And Furness

Published 1908

Source map scale - 1:2,500

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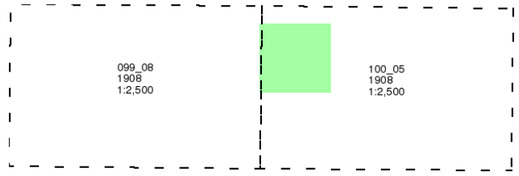
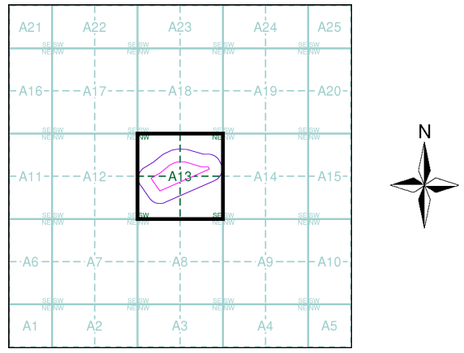


Historical Map - Segment A13



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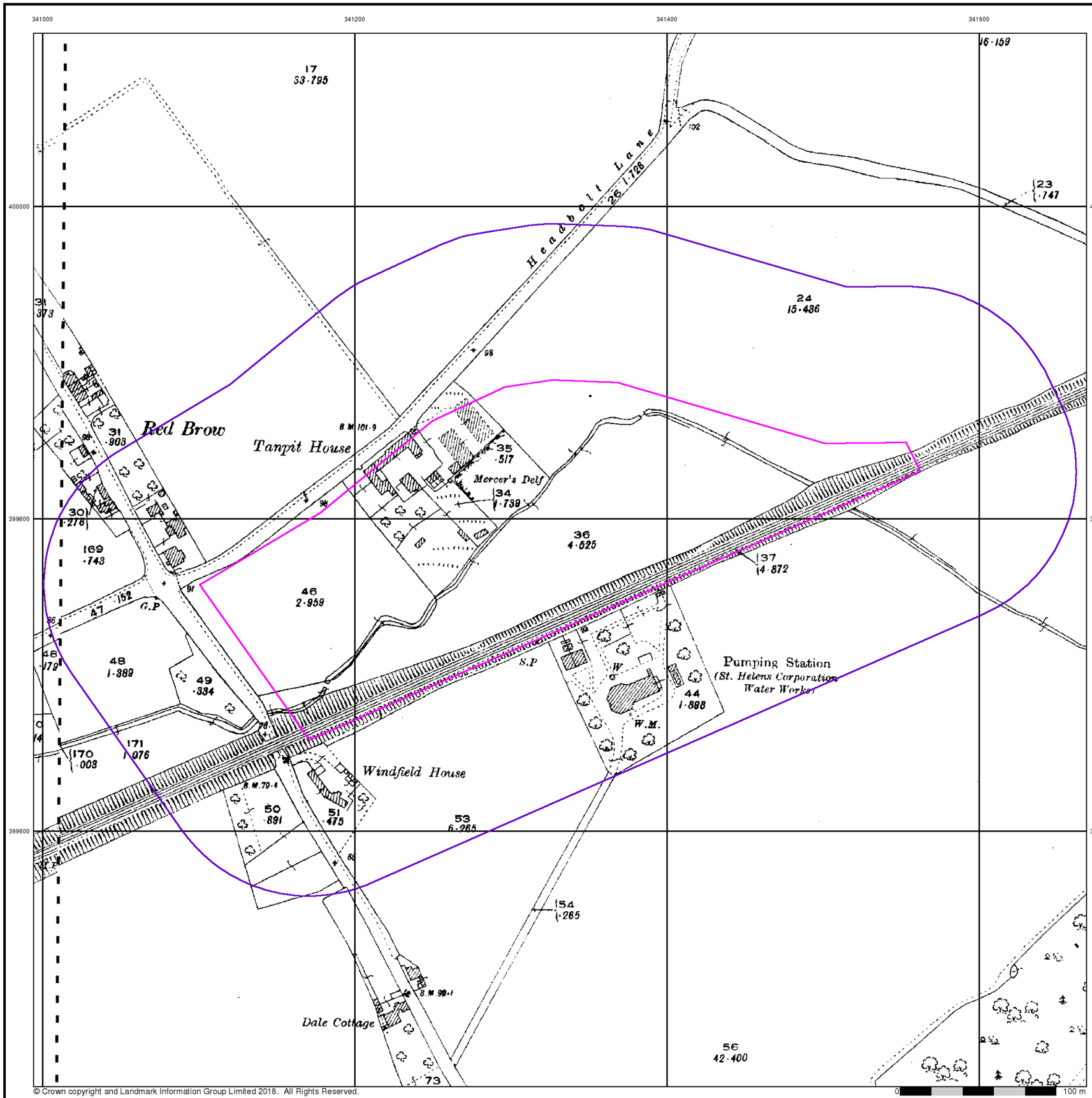

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Lancashire And Furness

Published 1927

Source map scale - 1:2,500

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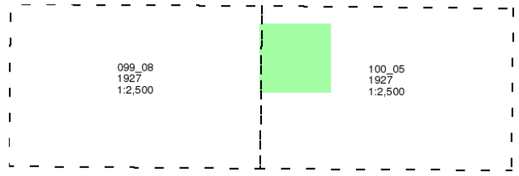
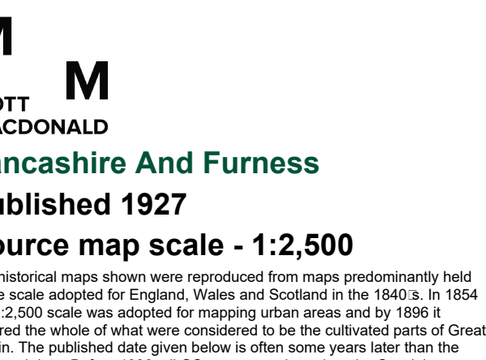


Historical Map - Segment A13



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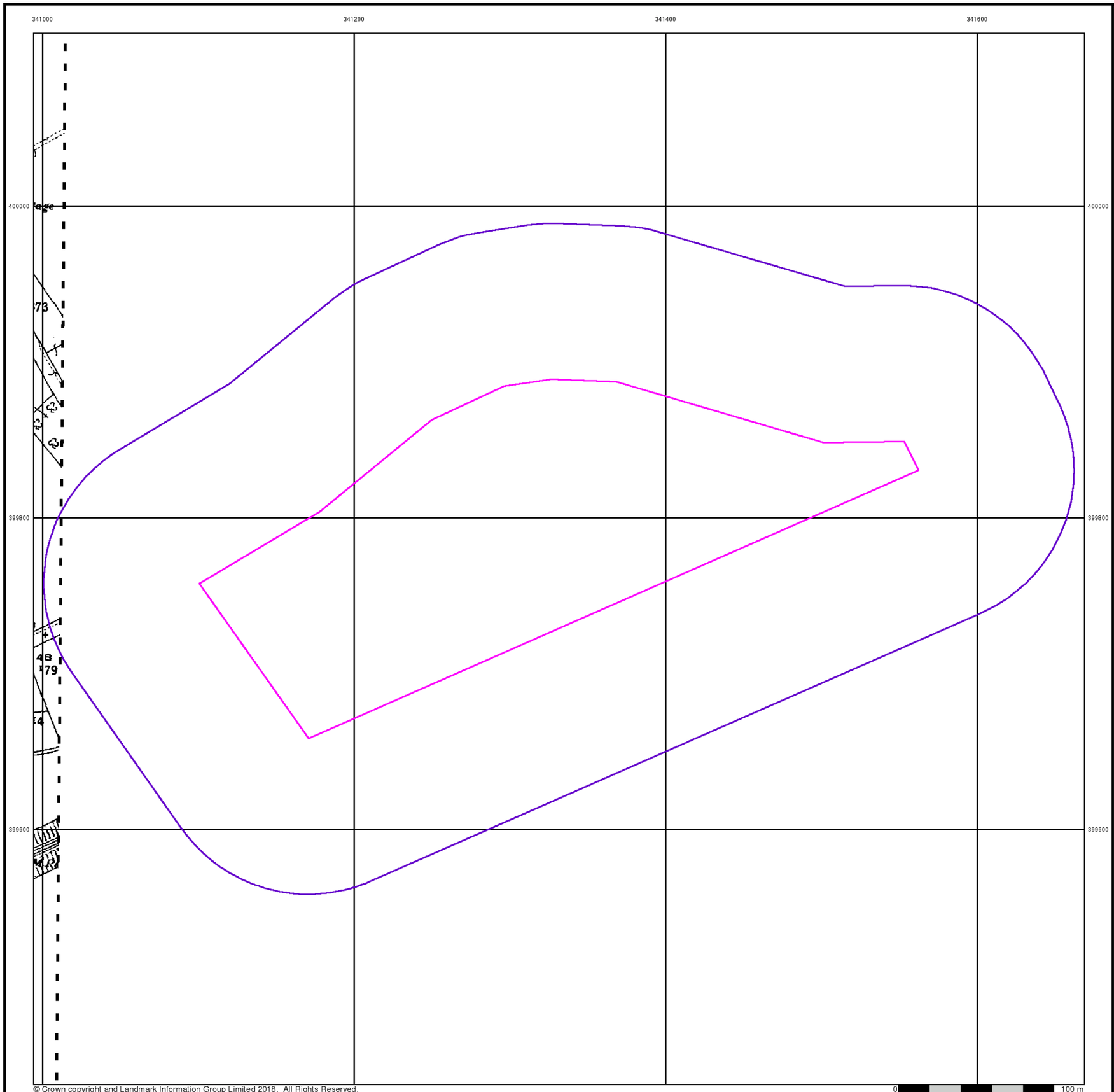

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Lancashire And Furness

Published 1939

Source map scale - 1:2,500

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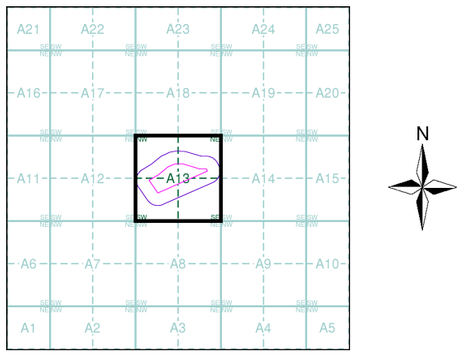
Map Name(s) and Date(s)



Historical Map - Segment A13



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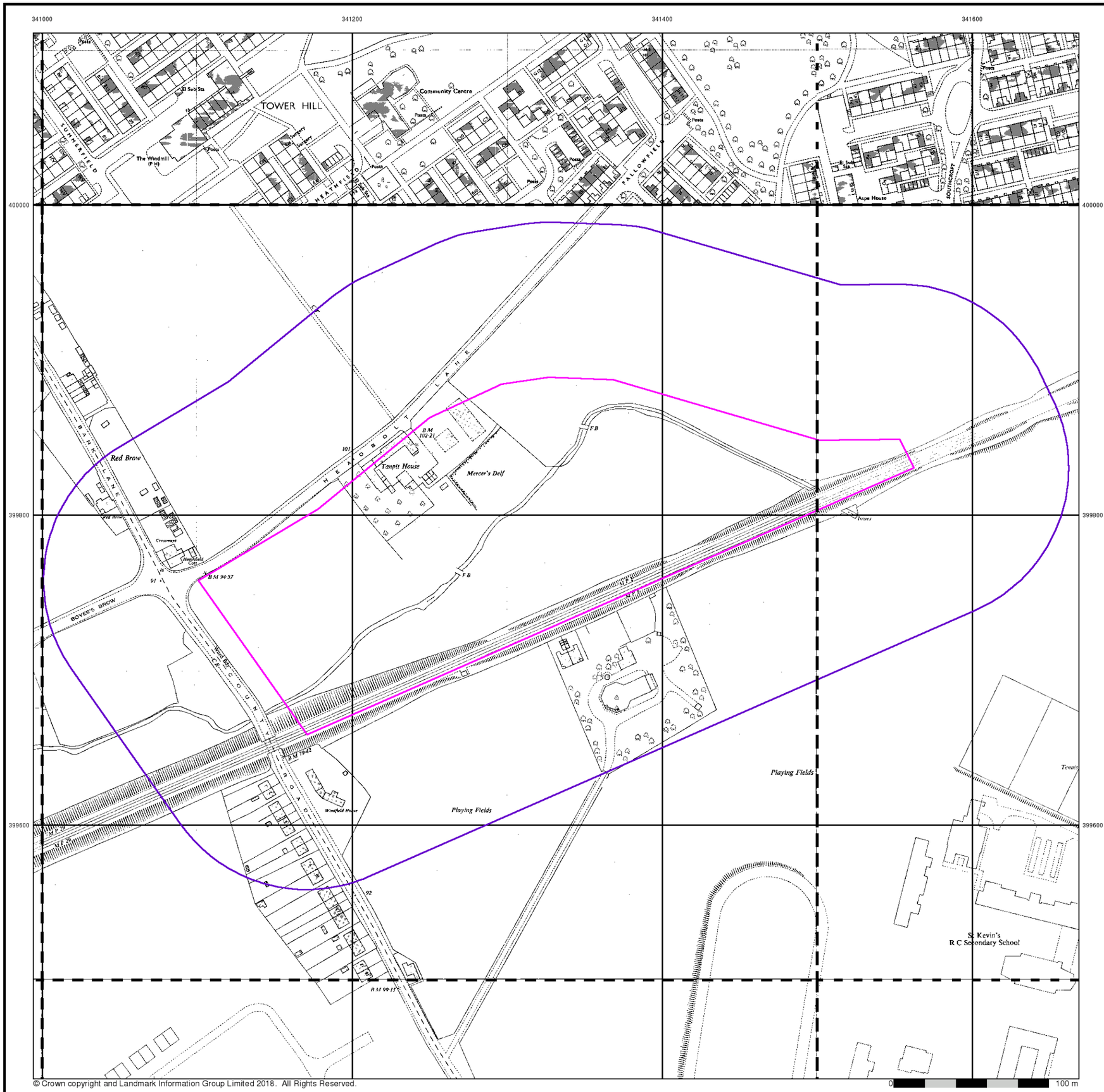

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Ordnance Survey Plan

Published 1962 - 1973

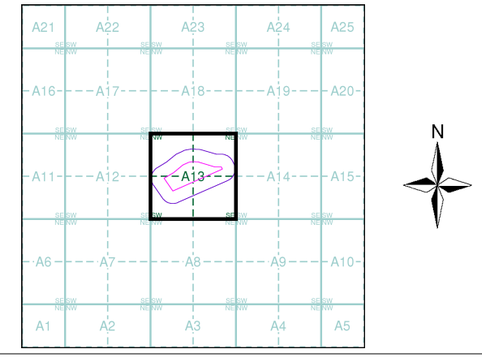
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SD4000SE 1973 1:1,250	SD4100SW 1973 1:1,250	SD4100SE 1973 1:1,250
SJ4099NE 1962 1:1,250	SJ4199NW 1962 1:1,250	SJ4199NE 1962 1:1,250
SJ4099SE 1962 1:1,250	SJ4199SW 1962 1:1,250	SJ4199SE 1962 1:1,250

Historical Map - Segment A13



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
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Site Details

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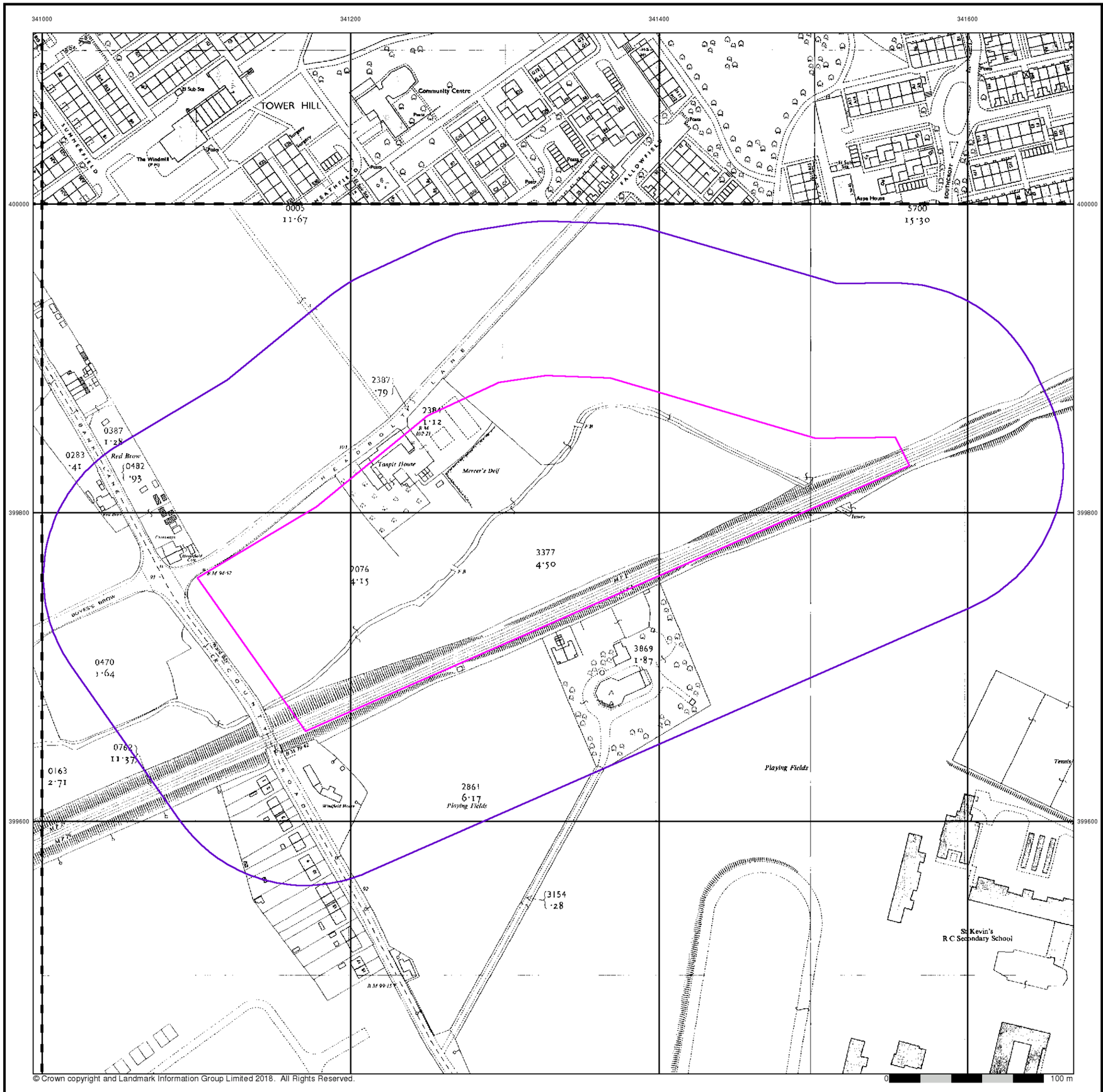


M M

MOTT MACDONALD

Ordnance Survey Plan

Published 1962 - 1975

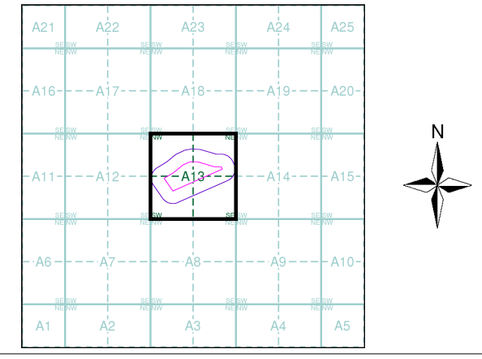
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SD4000 1975 1:2,500	SD4100 1975 1:2,500
SJ4099 1962 1:2,500	SJ4199 1962 1:2,500

Historical Map - Segment A13



Order Details

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Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	100

Site Details

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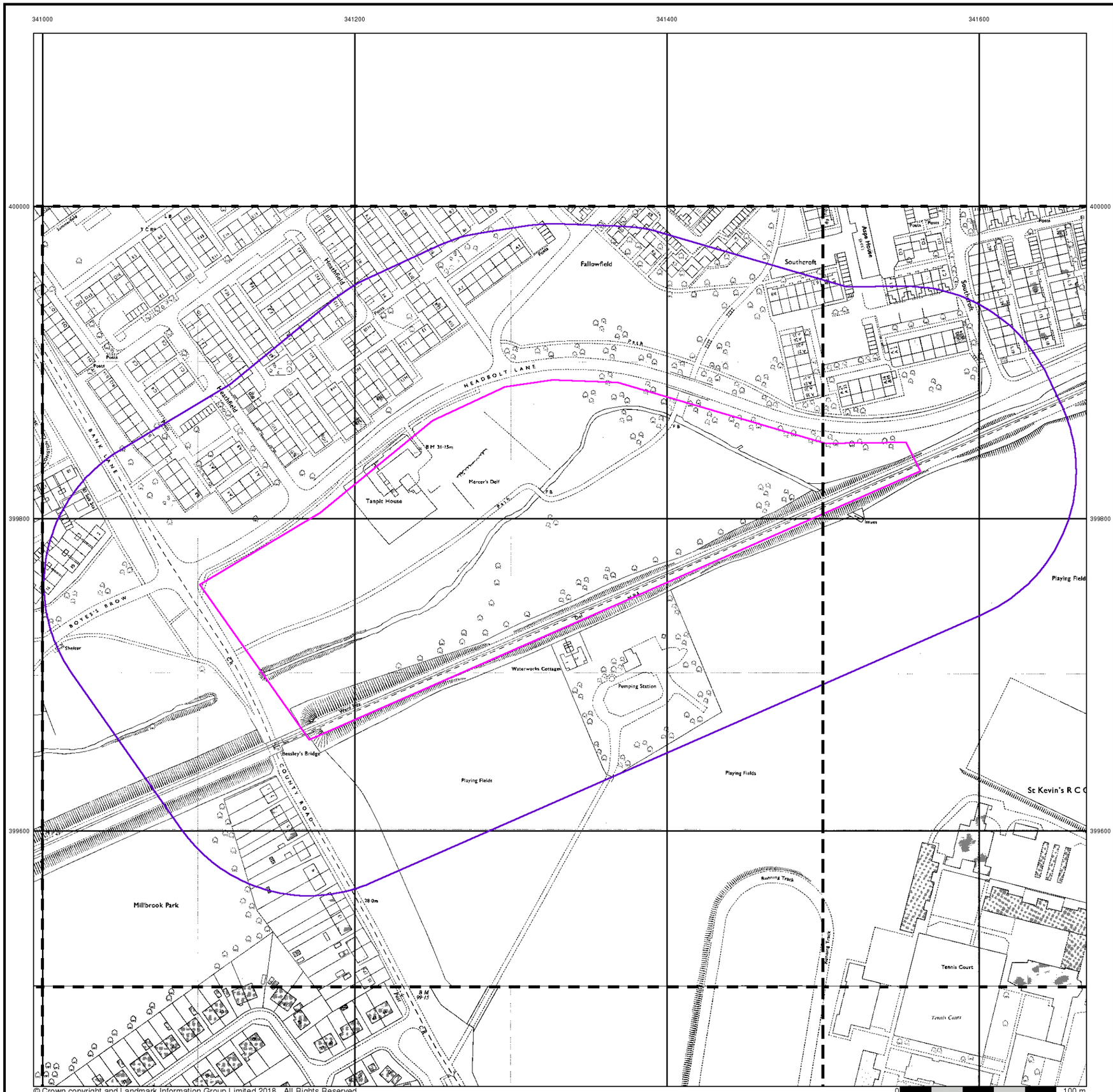

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MOTT MACDONALD

Ordnance Survey Plan

Published 1966 - 1972

Source map scale - 1:1,250

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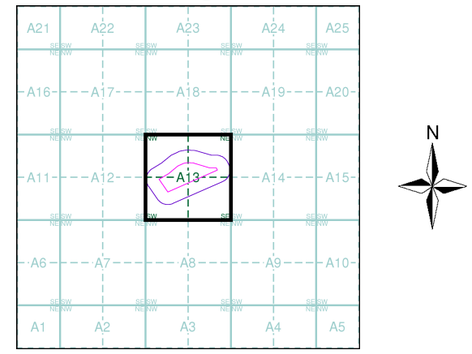
Map Name(s) and Date(s)

SJ4099NE 1968 1:1,250	SJ4199NW 1972 1:1,250	SJ4199NE 1972 1:1,250
SJ4099SE 1968 1:1,250	SJ4199SW 1966 1:1,250	SJ4199SE 1968 1:1,250

Historical Map - Segment A13



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	100

Site Details

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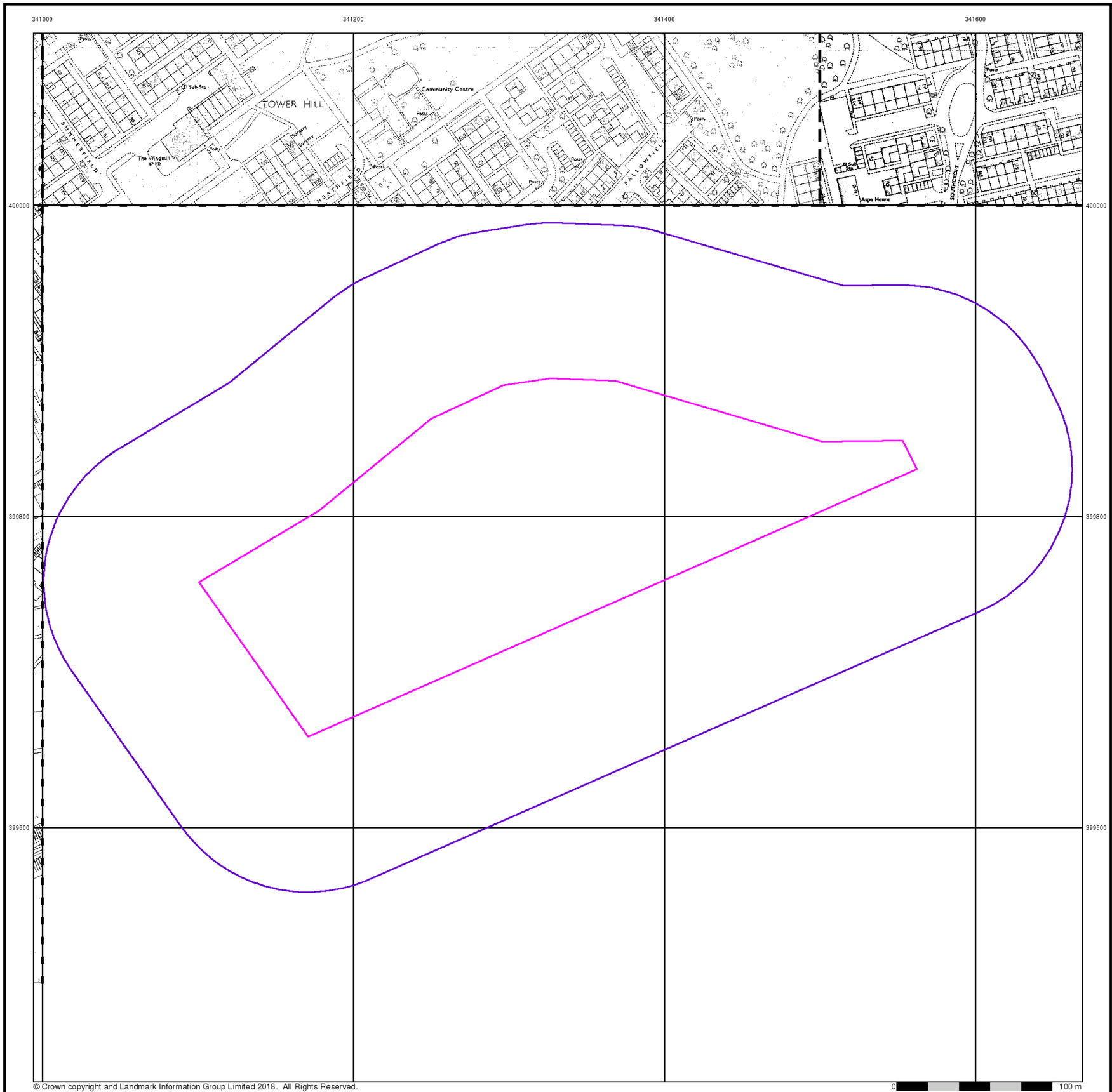

M M

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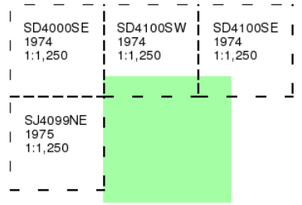
Supply of Unpublished Survey Information

Published 1974 - 1975

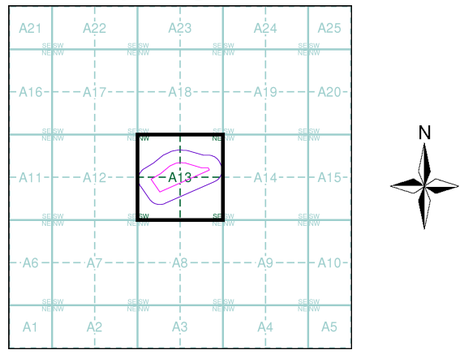
Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a 'work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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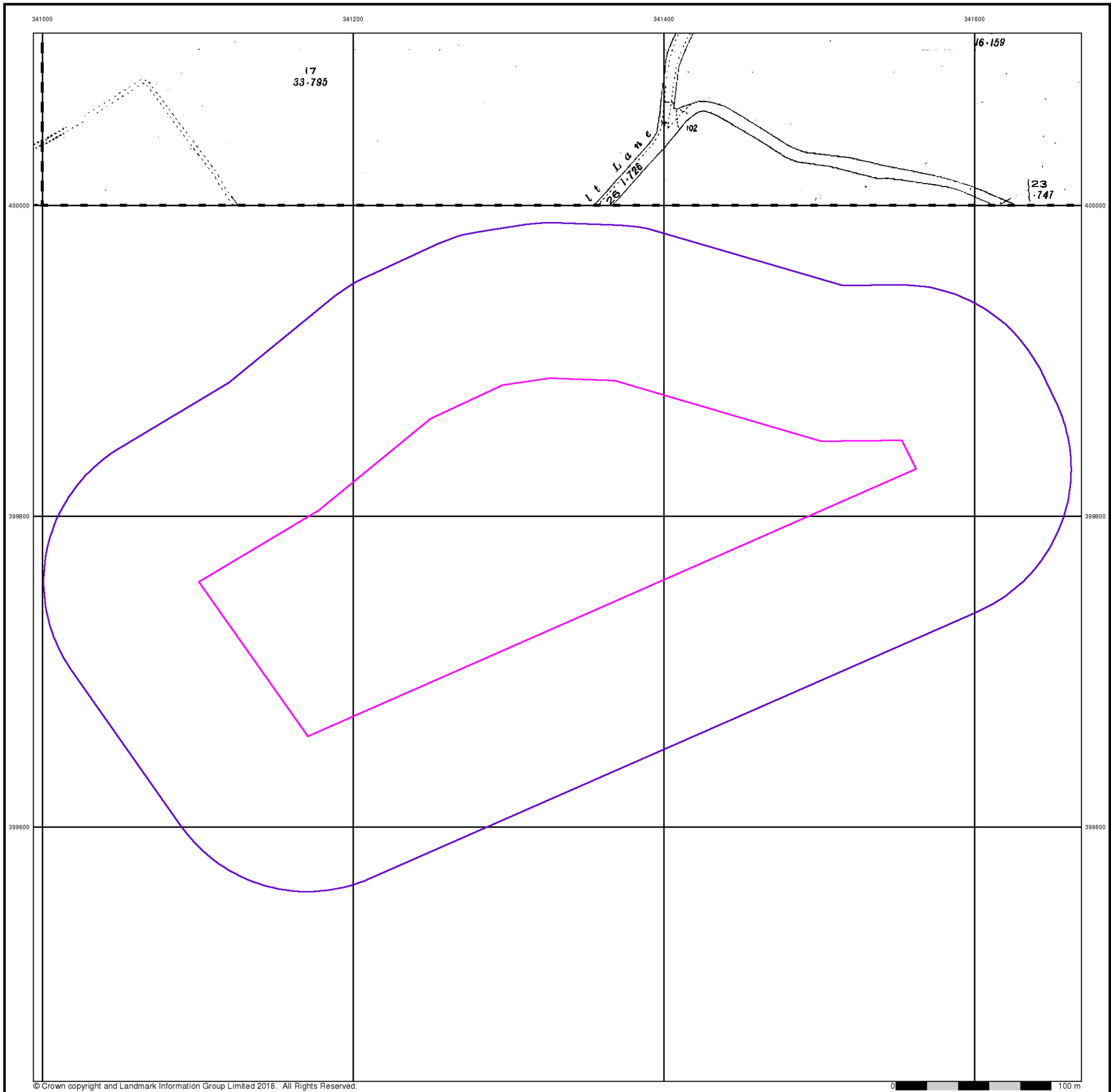


MOTT MACDONALD

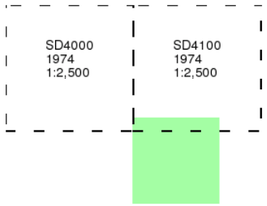
Supply of Unpublished Survey Information

Published 1974

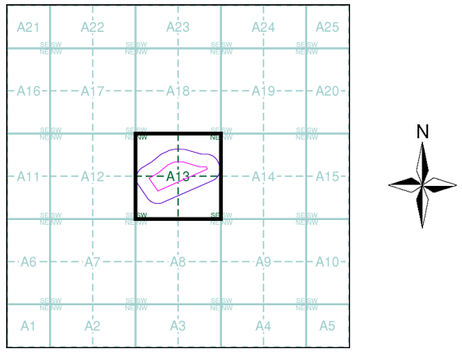
Source map scale - 1:2,500

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a 'work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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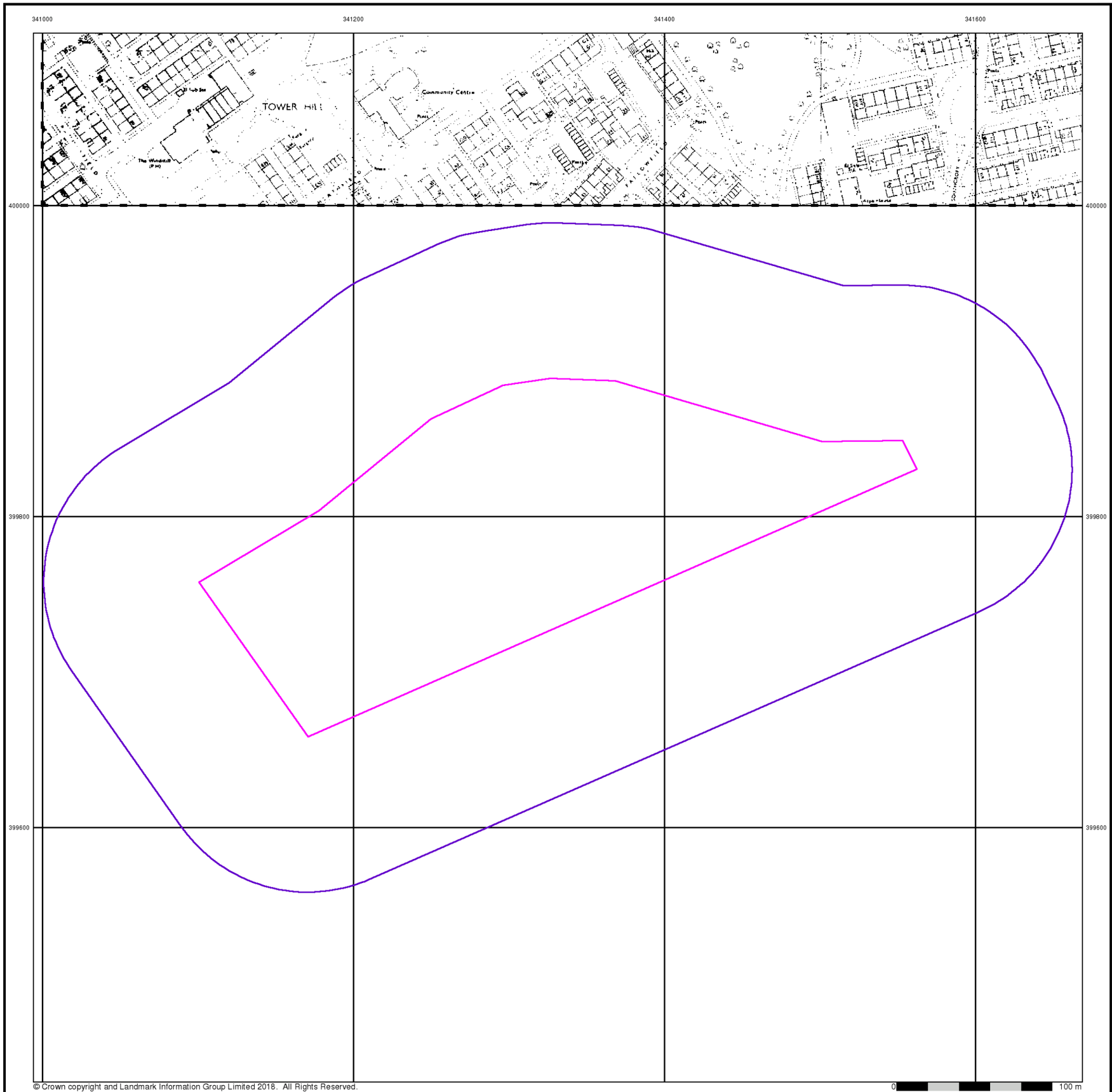

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MOTT MACDONALD

Additional SIMs

Published 1979

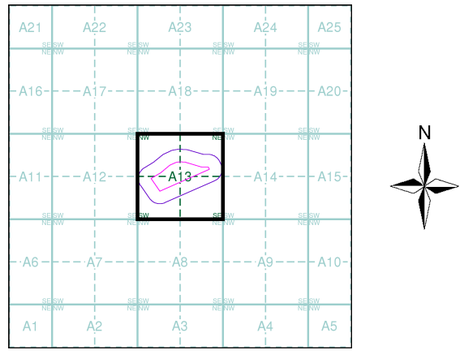
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's Survey of Information on Microfilm) are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SD4100
1979
1:2,500

Historical Map - Segment A13



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	100

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

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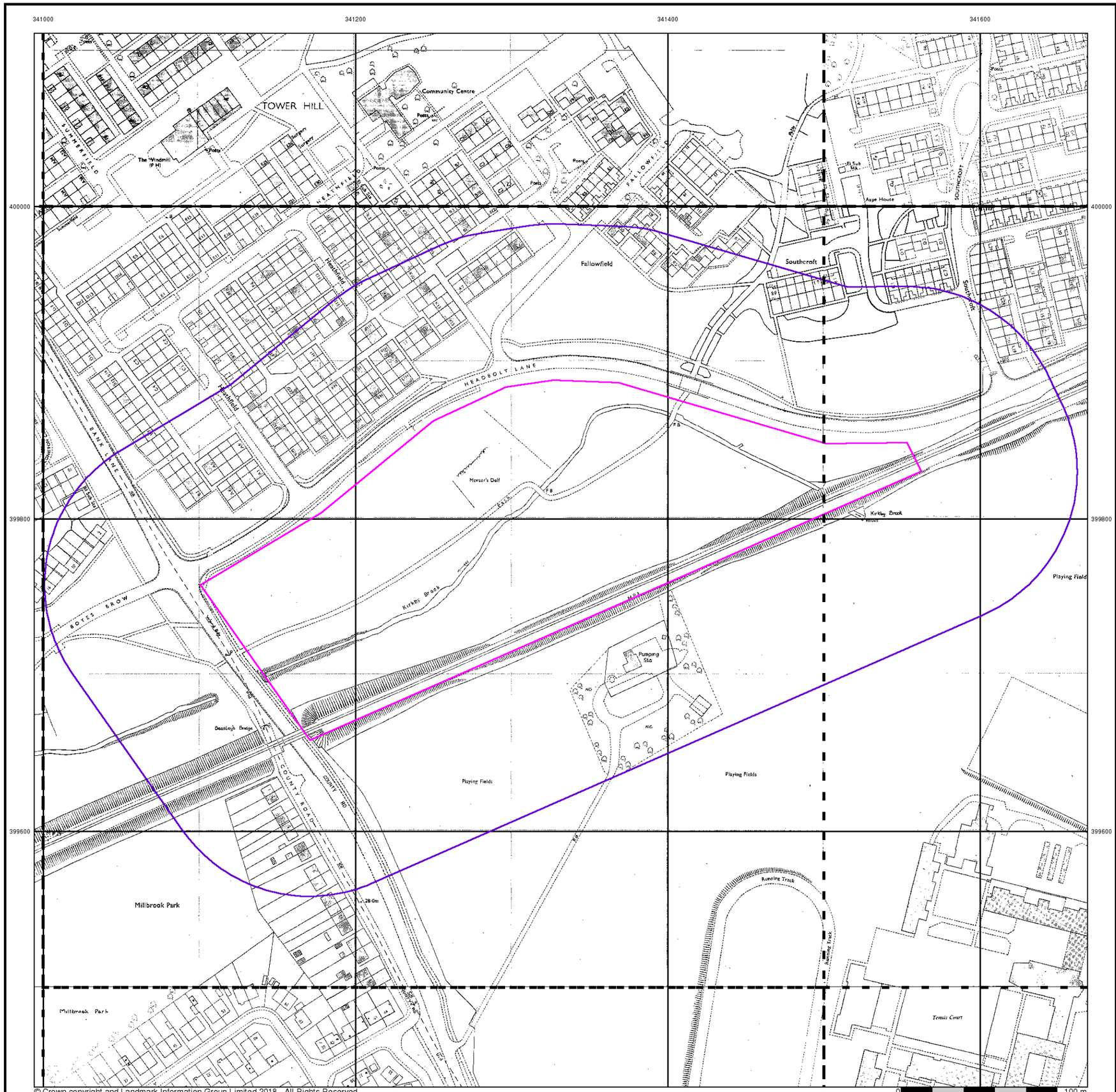
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



M

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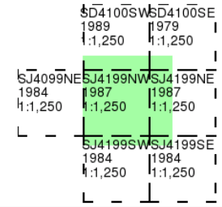
Additional SIMs

Published 1979 - 1989

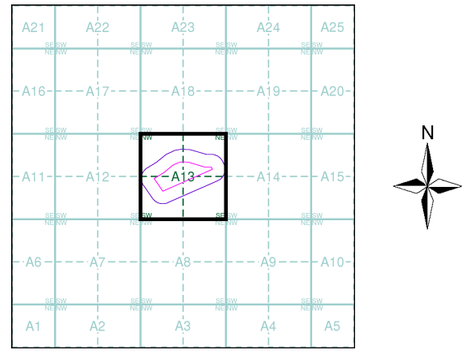
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's Survey of Information on Microfilm) are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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Slice:	A
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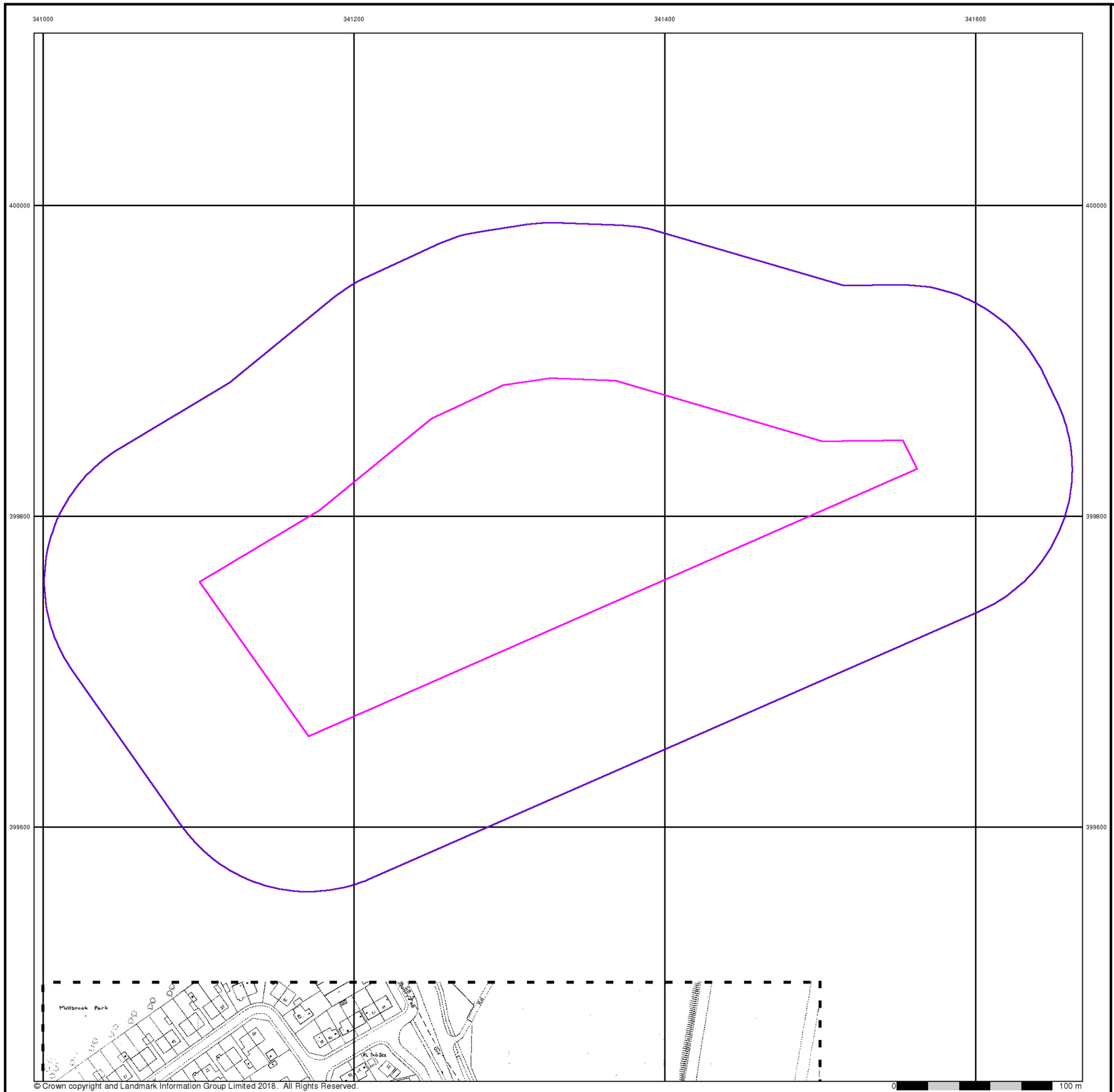

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Additional SIMs

Published 1987

Source map scale - 1:1,250

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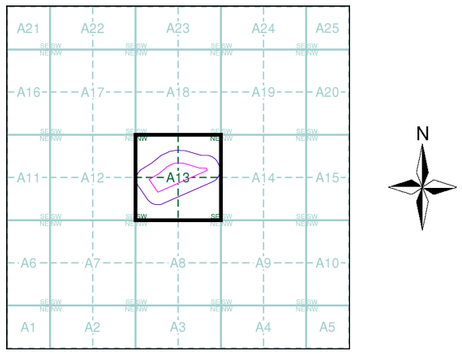
Map Name(s) and Date(s)

SJ4199SW
1987
1:1,250

Historical Map - Segment A13



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Slice:	A
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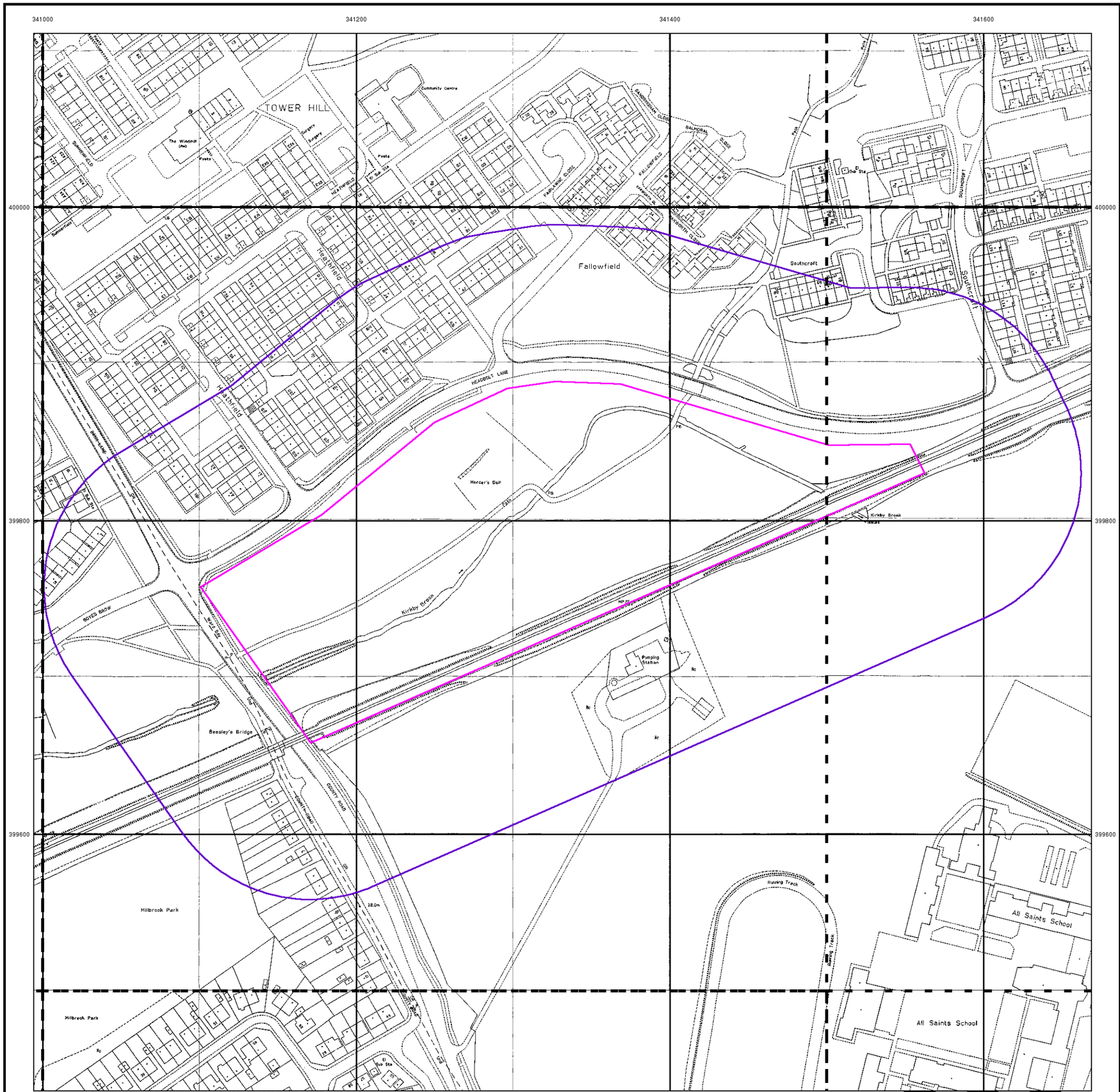

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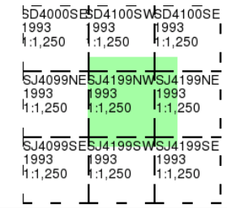
Large-Scale National Grid Data

Published 1993

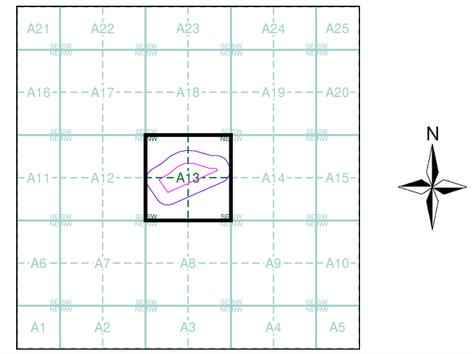
Source map scale - 1:1,250

Large Scale National Grid Data superseded SIM cards (Ordnance Survey's Survey of Information on Microfilm) in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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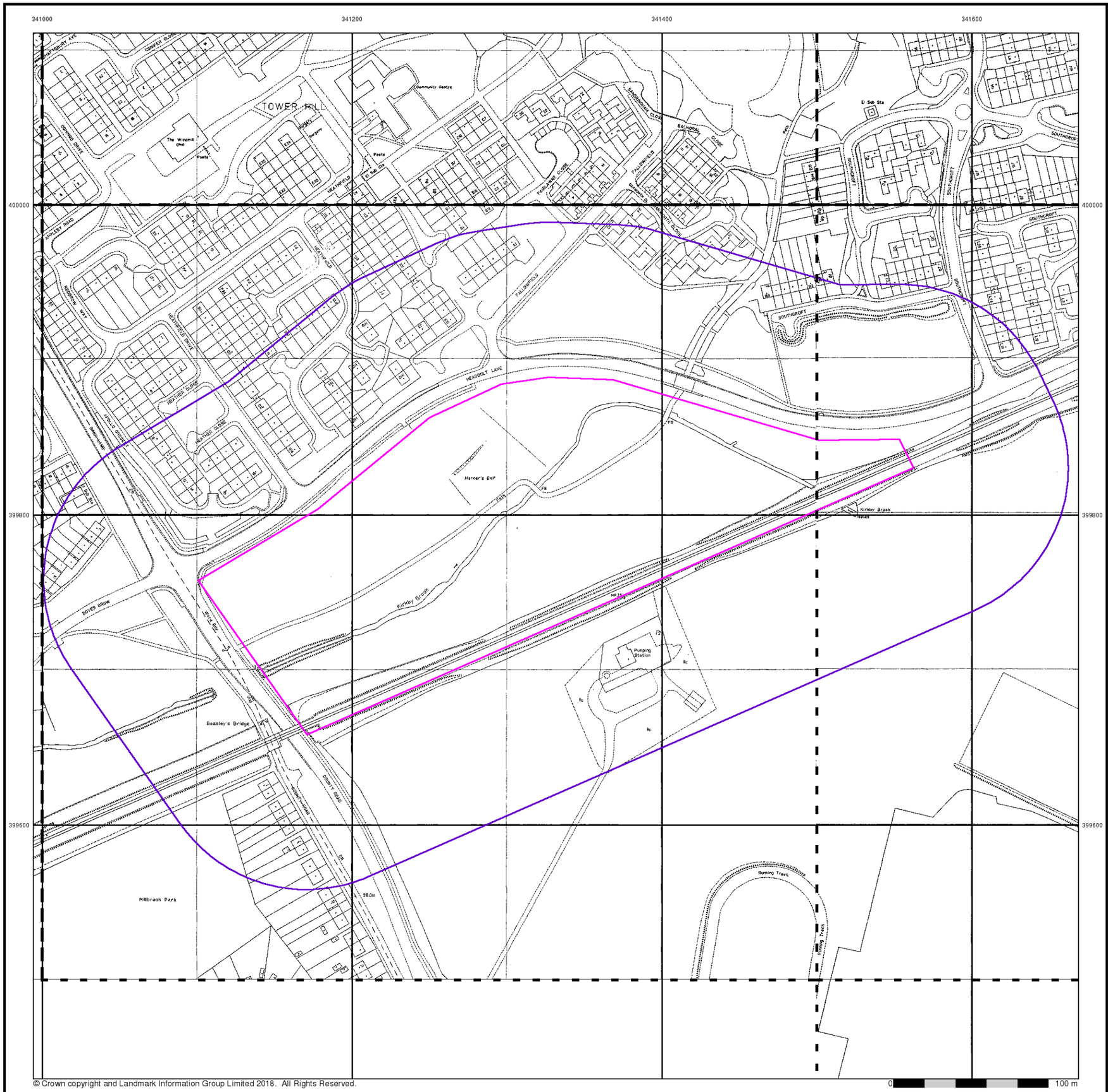

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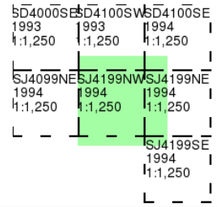
Large-Scale National Grid Data

Published 1993 - 1994

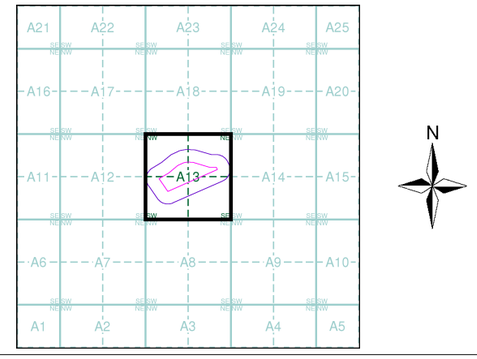
Source map scale - 1:1,250

Large Scale National Grid Data superseded SIM cards (Ordnance Survey's Survey of Information on Microfilm) in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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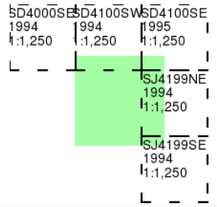
Large-Scale National Grid Data

Published 1994 - 1995

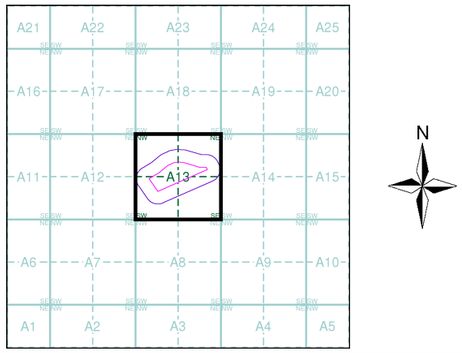
Source map scale - 1:1,250

Large Scale National Grid Data superseded SIM cards (Ordnance Survey's Survey of Information on Microfilm) in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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Slice:	A
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Large-Scale National Grid Data

Published 1995

Source map scale - 1:1,250

Large Scale National Grid Data superseded SIM cards (Ordnance Survey's Survey of Information on Microfilm) in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

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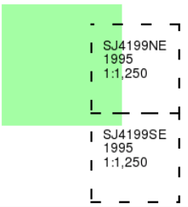
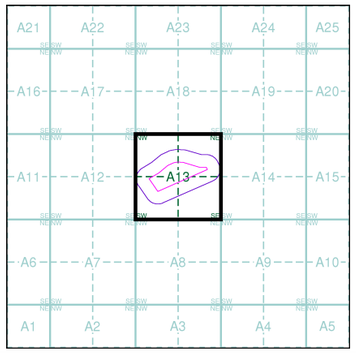


Historical Map - Segment A13



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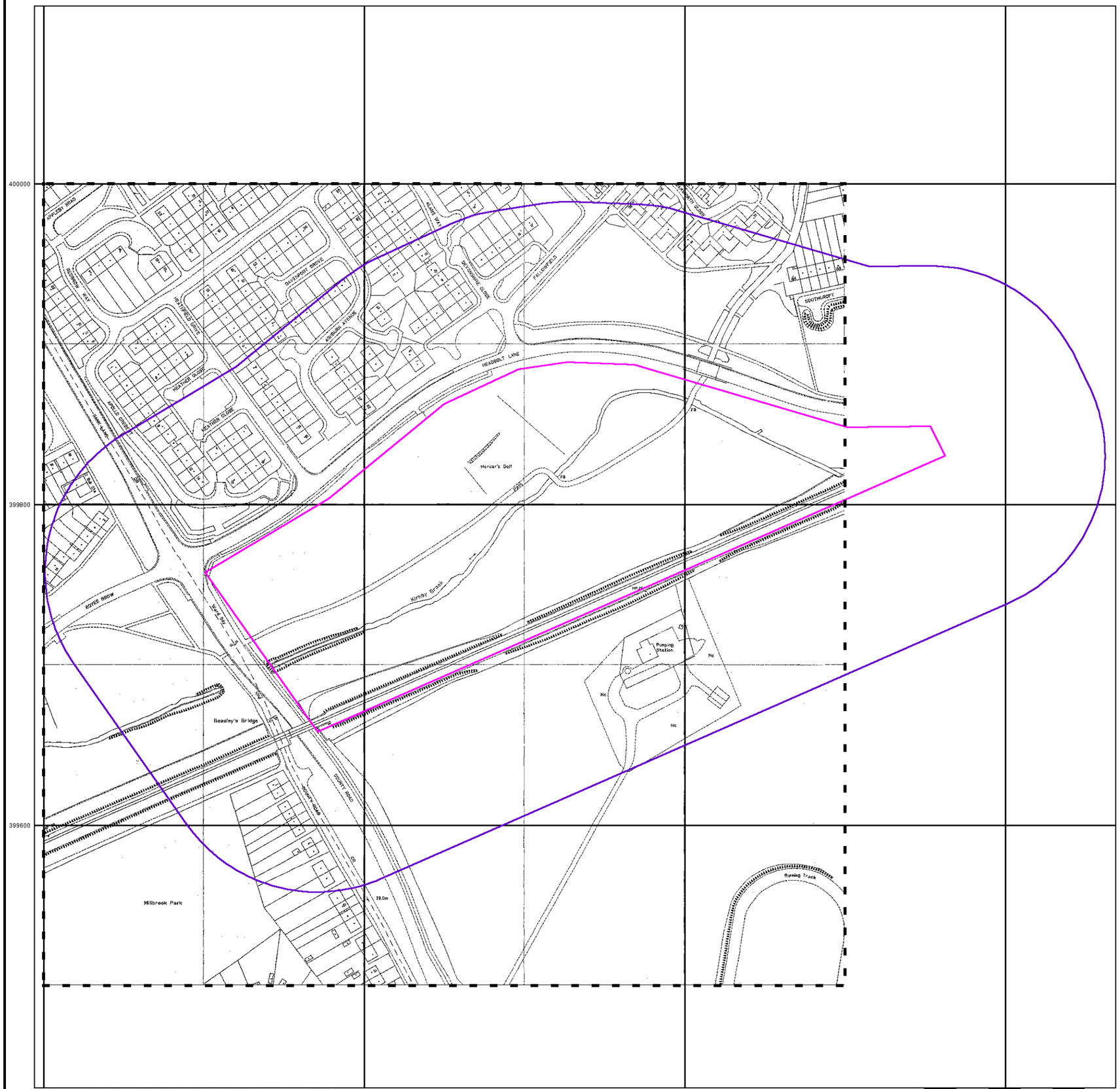

M

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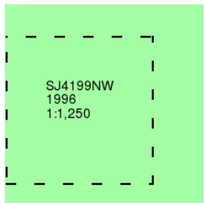
Large-Scale National Grid Data

Published 1996

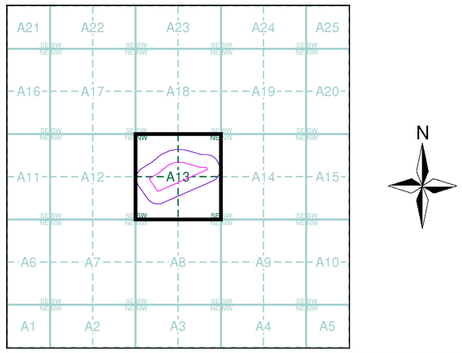
Source map scale - 1:1,250

Large Scale National Grid Data superseded SIM cards (Ordnance Survey's Survey of Information on Microfilm) in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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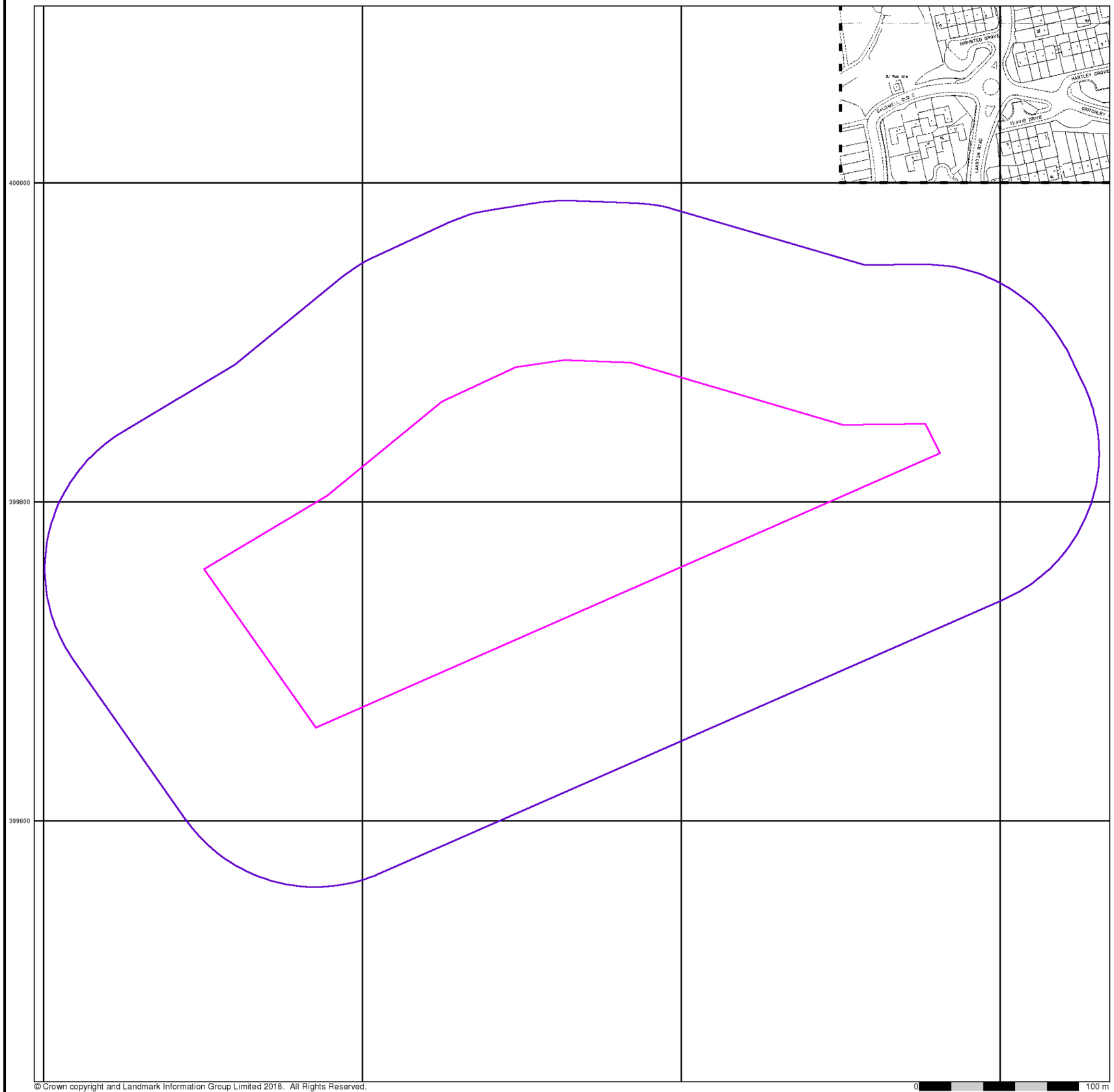
Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU



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Large-Scale National Grid Data

Published 1996

Source map scale - 1:1,250

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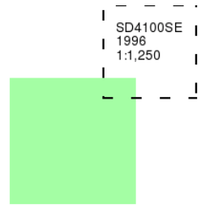
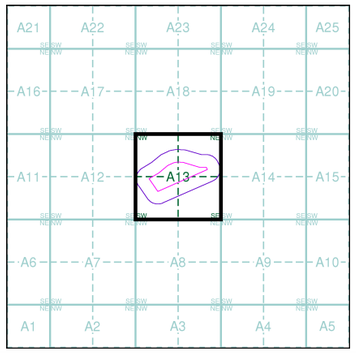


Historical Map - Segment A13



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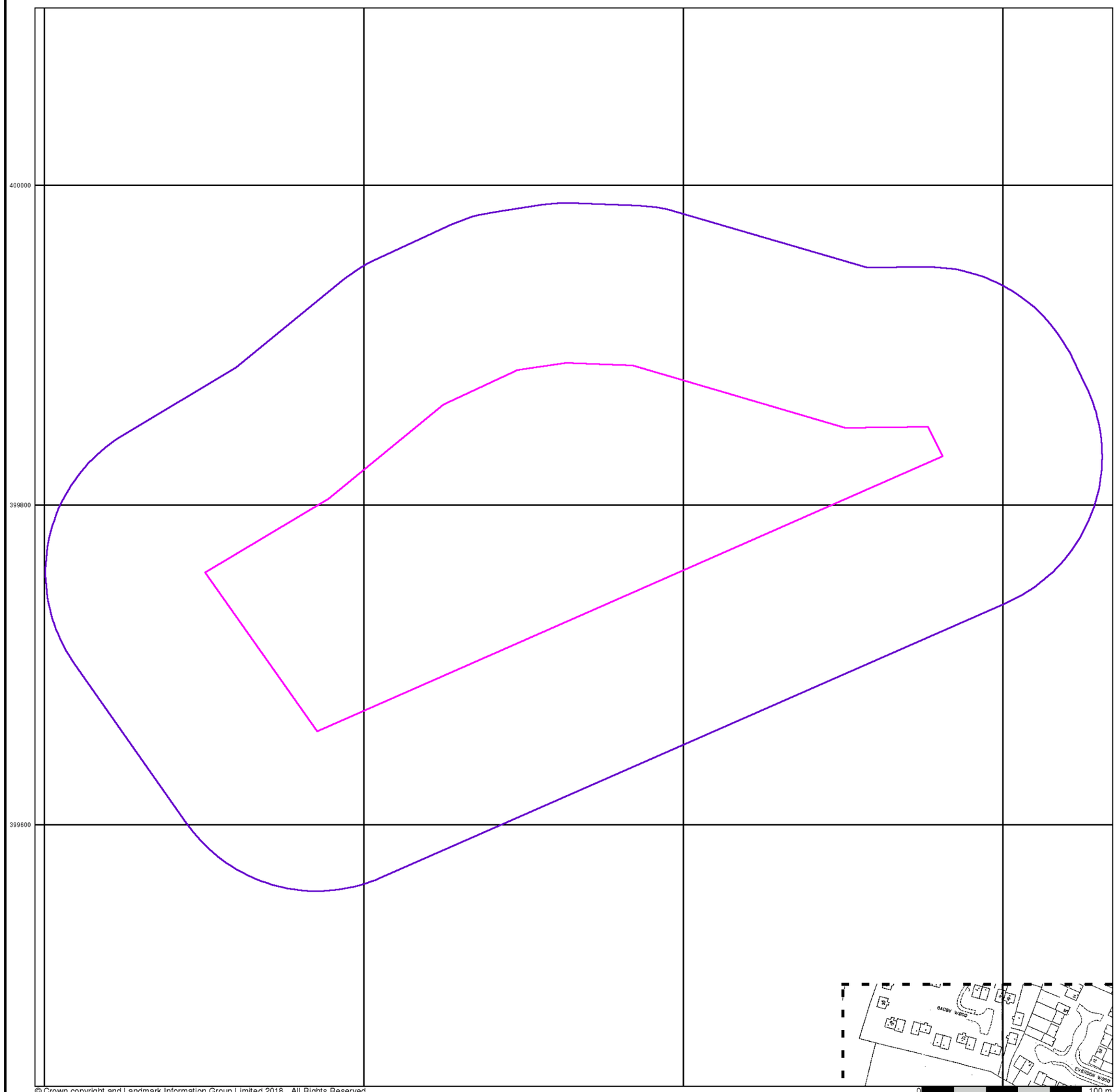

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Large-Scale National Grid Data

Published 1996

Source map scale - 1:1,250

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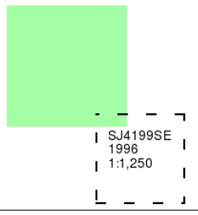
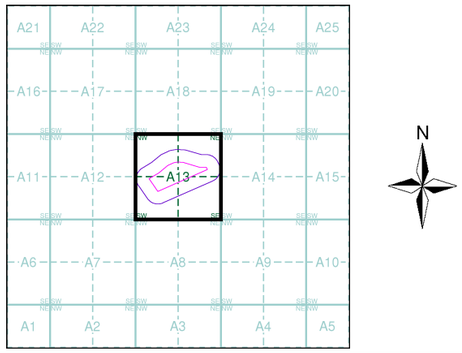


Historical Map - Segment A13



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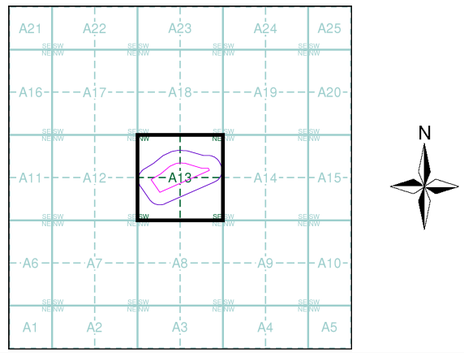
Historical Aerial Photography

Published 2001

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



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Envirocheck® Report:

Flood Screening Report Datasheet

Order Details:

Order Number:
167915730_1_1

Customer Reference:
394359GE05

National Grid Reference:
341330, 399790

Slice:
A

Site Area (Ha):
5.08

Search Buffer (m):
1000

Site Details:

Headbolt Lane Station
LIVERPOOL
L33 3AU

Client Details:

Mr S Myles
Mott Macdonald
Spring Bank House
33 Stamford Street
Altrincham
Manchester
WA14 1ES

MOTT MACDONALD

Contents

Report Section and Details	Page Number
Summary	-
The Summary section provides an overview of the data contained within the report, detailing the number of data set features or the existence of a data set in relation to the buffer(s) selected. For ease of reference, the report is broken down into seven sections of data.	
EA / NRW / CEH Flood Data	-
This section details data from the Environment Agency/Natural Resources Wales and the Centre for Ecology and Hydrology. The EA/NRW data is reported to a distance of 250m from the edge of the site polygon and details both Zone 2 (extreme) and Zone 3 flood extents, as well as flood defences, flood water storage areas and areas benefiting from flood defences. The CEH data is reported to a distance of 250m from the edge of the site polygon and covers flood data for Scotland, divided into levels based on the frequency and magnitude of a predicted 100 year term. All data sets within this section are plotted and feature on the EA / NRW / CEH Flood Data (1:10,000) map. For added value, OS Contour data is also plotted, detailing contours, spot heights and land water boundaries.	
JBA Flood Data	1
This section contains the Comprehensive Flood Map ("CFM") data from JBA Risk Management Limited. The data is based upon the likelihood of a flood occurrence for up to 4 flood return periods depending on the type of flooding; these being 75 years, 100 years, 200 years and 1000 years. Each layer being modelled at a 5m cell resolution. Each return period is depicted on a separate 1:10,000 scale map and reports features to a distance of 250m in the datasheet from the edge of the site polygon. For each return period the following three sources of flooding are identified, surface water or pluvial flooding, undefended river flooding or fluvial flooding and undefended coastal flooding. In each case the extent of the flooding source is displayed with the associated depth range. In addition, a 1:10,000 scale map depicting flooding from a Canal Failure and a coverage check for this dataset is included. Where coverage exists, information is reported in the datasheet where the site could be affected by flooding that results from a dam breach. For added value, OS Contour data is also plotted, detailing contours, spot heights and land water boundaries.	
BGS Flood Data	61
This section contains two BGS data sets; namely Geological Indicators of Flooding and Groundwater Flooding Susceptibility, both of which report features out to a possible 1000m, with coverage in England, Wales and Scotland. Each data set is plotted on a seperate BGS Flood Data (1:50,000) map.	
GeoSmart Information Groundwater Flood Data	62
This section contains data provided by GeoSmart Information who, building on their expertise, have developed algorithms and calibrated predictions of the risk of groundwater flooding occurring in Great Britain. The resulting map, classifies groundwater flood risk for each 5m x 5m into four categories, negligible, low, moderate and high. These classifications are based on the level of risk, combining severity and uncertainty that a site will suffer groundwater flooding within a return period of about 200 years.	
OS Water Network Data	63
This section details the MasterMap Water Network data sourced from the Ordnance Survey. The OS MasterMap Water Network data details a network representing the watercourse within Great Britain. The OS Water Network Lines data set details the approximate central alignment of a watercourse, including rivers, lakes and canals. The OS Water Network Nodes data set details features that represent a river's source, end, a junction where three of more links meet, and places where the real world related attribution changes; for example a watercourse becoming tidal. The data sets within this section are plotted and feature on the OS Water Network Map (1:10,000) . For added value, OS Contour data is also plotted, detailing contours, spot heights and land water boundaries.	

Contents

EA/NRW Historic Flood Events Data	**67**

This section details Historic Flood data sourced from the Environment Agency/Natural Resources Wales and from data held by Landmark. The EA/NRW Historic Flood Events data is reported to a distance of 1000m from the edge of the site polygon and details recorded historic flood events from 1703 to October 2008. The data also contains information on the source and cause of the flood, and how the flood outline was established.

Also included in this section is Landmark's Historical Flood Liabilities data set, which identifies areas that are liable to flood based on systematic analysis of historical mapping dating back to the mid 19th century.

Both data sets within this section are plotted and feature on the EA/NRW Historical Flood (1:10,000) map. For added value, OS Contour data is also plotted, detailing contours, spot heights and land water boundaries.

EA/NRW RoFRS Data	**68**

This section details the Risk of Flooding from Rivers and Sea (RoFRS) data sourced from the Environment Agency/Natural Resources Wales and is reported to a distance of 1000m from the edge of the site polygon. The RoFRS data provides an indication of areas of land at risk of flooding from rivers and the sea. These areas of land, called impacted cells, are represented as 50 metre squares, or smaller areas where a square is intersected by a river or coastline.

The average height information of the impacted cell, modelled river and sea levels and information about over 200,000 flood defences are used as inputs to a computer flood model run by the Environment Agency/Natural Resources Wales. The model compares the probability that the flood defences will overtop or breach and the distance of the impact cell from the river or the sea for 40 scenarios for probabilities of between 100% to 0.1%.

The results are then consolidated to calculate a single probability category for each impacted cell. These results have been validated by local staff using their local knowledge and expertise. RoFRS is a national flood risk assessment and does not contain information about property thresholds. Due to variations in the input data and the performance of the computer flood model at particular locations, the resulting category of an impacted cell should only be used at a specific study scale. In certain areas it would only be appropriate to compare risks between towns and counties whereas in other areas they would be more suitable for understanding risk at a street level. The level of suitability for a particular cell is indicated by the cell's suitability scale.

The data within this section is plotted and feature on the EA/NRW RoFRS Data (1:50,000) map. This dataset is not available in Scotland.

Flood Insurance Risk Data	**75**

This section contains flood risk data from Crawford and Company. This dataset is not plotted on any of the associated Flood maps.

Crawford & Co have generated an Insurance Claims rating for Flood Risk. The risk is determined by comparing the number of flood insurance claims made to the number of properties in the postcode sector. The data will also include flood claims from domestic accidents or blocked drains, as well as flooding from river or tidal events. Flood insurance claim ratings are reported for the site only.

Data Currency	**76**
Data Suppliers	**79**
Useful Contacts	**80**

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Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m
EA / NRW / CEH Flood Data					
Extreme Flooding from Rivers or Sea without Defences				n/a	n/a
Flooding from Rivers or Sea without Defences				n/a	n/a
Areas Benefiting from Flood Defences				n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences				n/a	n/a
JBA Flood Data					
JBA 75 Year Return (undefended) - Pluvial	pg 1	7	46	n/a	n/a
JBA 75 Year Return (undefended) - Fluvial	pg 3	95	122	n/a	n/a
JBA 75 Year Return (undefended) - Coastal				n/a	n/a
JBA 100 Year Return (undefended) - Fluvial	pg 13	99	147	n/a	n/a
JBA 100 Year Return (undefended) - Coastal				n/a	n/a
JBA 200 Year Return (undefended) - Pluvial	pg 24	5	61	n/a	n/a
JBA 200 Year Return (undefended) - Fluvial	pg 27	111	193	n/a	n/a
JBA 200 Year Return (undefended) - Coastal				n/a	n/a
JBA 1000 Year Return (undefended) - Pluvial	pg 41	14	93	n/a	n/a
JBA 1000 Year Return (undefended) - Fluvial	pg 46	132	186	n/a	n/a
JBA 1000 Year Return (undefended) - Coastal				n/a	n/a
JBA Canal Failure					
JBA Dam Break					
BGS Flood Data					
BGS Geological Indicators of Flooding					
BGS Groundwater Flooding Susceptibility	pg 61	1	1	2	3
GeoSmart Information Groundwater Flood					
GeoSmart Information Groundwater Flood Risk	pg 62	1	2		
OS Water Network Data					
OS Water Network Lines	pg 63	5	3	7	10
OS Water Network Nodes	pg 65	4	3	6	11
EA/NRW Historic Flood Events Data					
Historic Flood Events					
Historical Flood Liabilities	pg 67			1	
EA/NRW RoFRS Data					
RoFRS - Risk of Flooding from Rivers and Sea	pg 68			27	58
Flood Insurance Risk Data					
Postcode Sector Flood Insurance Claim Ratings	pg 75	5	n/a	n/a	n/a

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341160 399680
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341165 399675
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341170 399665
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341495 399820
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341490 399815
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341500 399815
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341505 399810
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	2	2	341150 399685
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	5	2	341470 399785
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	6	2	341495 399790
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341460 399780
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	7	2	341485 399786
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	7	2	341475 399785
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	8	2	341465 399780
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	14	2	341170 399645
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	17	2	341185 399645
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	26	2	341185 399635
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	35	2	341300 399920
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	63	2	341165 399875
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Equal to 0.1m	A13NW (NW)	76	2	341170 399895
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	121	2	341600 399715
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	121	2	341610 399720

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	125	2	341600 399710
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	129	2	341585 399690
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	135	2	341175 399975
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	141	2	341625 399700
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	144	2	341610 399695
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	148	2	341365 400035
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	150	2	341615 399690
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	152	2	341620 399690
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	157	2	341355 400045
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	159	2	341645 399695
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	162	2	341710 399765
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	172	2	341645 399680
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Equal to 0.1m	A14SW (E)	177	2	341700 399720
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	181	2	341705 399720
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	182	2	341545 400030
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	186	2	341130 400005
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	202	2	341130 400025
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	209	2	341750 399920
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	211	2	341755 399915
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14NW (E)	213	2	341755 399920
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	215	2	341755 399925
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	218	2	341765 399910

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	226	2	341655 399625
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 1.0m	A14NW (E)	227	2	341770 399920
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	231	2	341645 399615
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14NW (E)	231	2	341770 399930
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	233	2	341650 399615
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14NW (E)	236	2	341780 399920
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (SE)	241	2	341670 399615
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	242	2	341660 399610
	JBA 75 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	247	2	341790 399925
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341370 399870
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341355 399865
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341360 399865
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341390 399865
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341400 399865
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341350 399860
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341355 399860
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341400 399860
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341150 399700
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (W)	0	2	341300 399786
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341285 399785
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341295 399785
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (W)	0	2	341290 399780

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341275 399775
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341280 399775
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341285 399775
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (W)	0	2	341290 399775
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (W)	0	2	341275 399770
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	0	2	341270 399765
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341265 399760
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341255 399755
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341265 399755
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341240 399745
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341255 399745
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341250 399740
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341190 399715
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341160 399710
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341165 399710
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341170 399710
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341175 399710
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341145 399705
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341155 399705
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341260 399755
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341220 399735
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341225 399735

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341235 399735
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341240 399735
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341210 399730
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341220 399730
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341225 399730
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341195 399725
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341210 399725
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341215 399725
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341185 399720
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341190 399720
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341200 399720
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341170 399715
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341180 399715
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	0	2	341310 399805
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (NW)	0	2	341300 399800
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (NW)	0	2	341310 399800
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	0	2	341305 399795
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341290 399786
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341415 399860
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341360 399855
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341410 399855
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341415 399855

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (N)	0	2	341325 399815
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341485 399820
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341500 399820
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341320 399815
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	0	2	341490 399815
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341495 399815
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341500 399815
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (NW)	0	2	341315 399805
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341420 399855
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341345 399845
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341350 399850
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341355 399850
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341420 399850
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341425 399850
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341430 399850
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (N)	0	2	341340 399845
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341350 399845
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341425 399845
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341430 399845
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341435 399845
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341440 399845
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341335 399840

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341340 399840
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341440 399840
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341450 399840
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341335 399835
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341340 399835
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	0	2	341445 399835
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341450 399835
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	0	2	341460 399835
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341325 399830
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341335 399830
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341455 399830
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341465 399830
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	0	2	341470 399830
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (N)	0	2	341325 399825
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	0	2	341465 399825
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341470 399825
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	2	2	341140 399700
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	6	2	341135 399700
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	6	2	341540 399810
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	6	2	341530 399805
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	8	2	341540 399790
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	9	2	341525 399800

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	11	2	341530 399800
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	13	2	341130 399695
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	15	2	341540 399795
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	15	2	341530 399795
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	31	2	341115 399685
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	32	2	341110 399690
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	41	2	341560 399785
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	42	2	341105 399680
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	43	2	341100 399685
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	47	2	341095 399685
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	62	2	341080 399680
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	65	2	341580 399765
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	65	2	341080 399675
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	66	2	341075 399680
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	72	2	341590 399765
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	74	2	341585 399745
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	77	2	341065 399675
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	87	2	341060 399665
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	88	2	341055 399670
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	90	2	341610 399755
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	91	2	341055 399665
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	97	2	341595 399740

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	99	2	341625 399755
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	99	2	341600 399740
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	102	2	341045 399660
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	103	2	341610 399740
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	105	2	341615 399740
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	106	2	341630 399750
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	107	2	341625 399745
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	108	2	341620 399740
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	108	2	341035 399665
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	110	2	341615 399735
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	114	2	341615 399730
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	121	2	341600 399715
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	121	2	341620 399725
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	122	2	341630 399730
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	122	2	341025 399655
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	123	2	341610 399715
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	123	2	341605 399715
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	123	2	341020 399660
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	126	2	341600 399710
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	126	2	341630 399725
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	128	2	341600 399705
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	129	2	341595 399705

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	129	2	341635 399725
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	130	2	341015 399655
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	132	2	341625 399715
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	133	2	341590 399695
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	134	2	341620 399710
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	137	2	341635 399715
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	140	2	341590 399690
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	141	2	341005 399650
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	142	2	341000 399655
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	143	2	341645 399715
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	144	2	341600 399690
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	145	2	341655 399720
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	149	2	341600 399685
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	152	2	340995 399645
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	155	2	341615 399685
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	156	2	341595 399675
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	156	2	340990 399645
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	159	2	341665 399710
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	161	2	341630 399685
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	161	2	341595 399670
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (W)	161	2	340980 399650
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	162	2	341680 399720

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	162	2	341685 399725
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (W)	164	2	340980 399645
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	165	2	341655 399695
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	165	2	341605 399670
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	165	2	341595 399665
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	169	2	341605 399665
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	171	2	341620 399670
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	171	2	341610 399665
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	172	2	341645 399680
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (W)	172	2	340970 399645
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	174	2	340975 399635
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	175	2	341650 399680
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	175	2	341620 399665
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	176	2	341605 399655
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	176	2	341680 399700
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	177	2	341675 399695
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	177	2	341625 399665
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	178	2	341615 399660
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	183	2	341665 399680
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	184	2	340970 399625
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	185	2	341610 399650
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	185	2	340965 399630

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (SW)	188	2	340965 399625
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	190	2	341700 399700
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	191	2	341685 399685
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	195	2	341685 399680
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	195	2	340960 399620
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	197	2	340965 399610
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (SW)	198	2	340960 399615
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	202	2	340965 399600
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (SW)	205	2	340965 399595
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	205	2	340955 399610
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	206	2	340960 399600
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	208	2	341710 399685
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	208	2	341700 399675
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	212	2	340950 399605
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	216	2	341730 399695
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	219	2	340945 399600
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	223	2	340950 399585
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	224	2	341740 399695
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	226	2	341720 399670
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	228	2	341745 399695
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	233	2	341735 399675
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	234	2	340940 399580

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	234	2	340930 399595
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	236	2	341725 399660
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	240	2	341730 399660
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	242	2	341755 399685
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	244	2	341765 399695
	JBA 75 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	247	2	341765 399690
	JBA 75 Year Return (undefended) - Coastal None				
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341195 399725
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341210 399725
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341215 399725
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341185 399720
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341195 399720
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341200 399720
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341205 399720
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341210 399720
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341170 399715
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341180 399715
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341190 399715
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341215 399715
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341160 399710
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341165 399710
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341175 399710

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341210 399710
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341145 399705
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341155 399705
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341425 399850
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341430 399850
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341340 399845
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341350 399845
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341425 399845
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341430 399845
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341435 399845
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341440 399845
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341335 399840
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341340 399840
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341345 399840
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341440 399840
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341450 399840
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341335 399835
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341340 399835
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	0	2	341445 399835
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341450 399835
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	0	2	341460 399835
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341325 399830

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341335 399830
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341455 399830
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341465 399830
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341470 399825
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (N)	0	2	341325 399825
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	0	2	341465 399825
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (N)	0	2	341325 399815
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341485 399820
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341500 399820
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341320 399815
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	0	2	341490 399815
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341495 399815
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341500 399815
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (NW)	0	2	341315 399805
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	0	2	341310 399805
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (NW)	0	2	341300 399800
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (NW)	0	2	341310 399800
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341265 399760
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341220 399735
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341225 399735
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341240 399735
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341210 399730

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341220 399730
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341225 399730
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	0	2	341305 399795
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341290 399786
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (W)	0	2	341300 399786
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341285 399785
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341295 399785
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (W)	0	2	341290 399780
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341275 399775
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341280 399775
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341285 399775
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (W)	0	2	341290 399775
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (W)	0	2	341275 399770
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	0	2	341270 399765
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341255 399755
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341235 399745
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341240 399745
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341250 399740
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341210 399705
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341150 399700
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341195 399695
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341200 399695

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341360 399865
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341390 399865
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341400 399865
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341350 399860
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341355 399860
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341400 399860
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341415 399860
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341360 399855
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341410 399855
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341415 399855
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341420 399855
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341345 399845
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341350 399850
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341355 399850
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341420 399850
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341370 399870
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341385 399870
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341355 399865
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	2	2	341140 399700
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	4	2	341525 399805
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	6	2	341540 399810
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	6	2	341530 399805

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	6	2	341135 399700
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	8	2	341545 399805
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	9	2	341525 399800
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	10	2	341530 399800
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	13	2	341130 399695
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	14	2	341560 399810
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	14	2	341550 399805
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	15	2	341530 399795
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	16	2	341555 399805
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	17	2	341535 399795
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	19	2	341550 399800
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	22	2	341540 399790
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	24	2	341550 399795
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	31	2	341545 399786
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	31	2	341115 399685
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	32	2	341110 399690
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	37	2	341560 399786
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	42	2	341105 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	43	2	341100 399685
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	47	2	341575 399785
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	47	2	341095 399685
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	50	2	341570 399780

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	52	2	341575 399780
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	52	2	341565 399775
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	56	2	341575 399775
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	62	2	341080 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	65	2	341080 399675
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	66	2	341075 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	67	2	341590 399770
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	77	2	341065 399675
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	85	2	341600 399755
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	87	2	341595 399750
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	87	2	341060 399665
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	88	2	341055 399670
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	90	2	341610 399755
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	91	2	341055 399665
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	93	2	341050 399670
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	99	2	341600 399740
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	100	2	341620 399750
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	102	2	341045 399660
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	105	2	341615 399740
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	105	2	341605 399735
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	106	2	341630 399750
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	107	2	341610 399735

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	107	2	341625 399745
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	108	2	341620 399740
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	108	2	341035 399665
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	110	2	341615 399735
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	111	2	341035 399660
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	114	2	341615 399730
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	115	2	341030 399660
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	119	2	341595 399715
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	121	2	341610 399720
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	121	2	341600 399715
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	121	2	341605 399715
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	122	2	341025 399655
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	122	2	341630 399730
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	123	2	341020 399660
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	125	2	341635 399730
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	126	2	341600 399710
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	128	2	341600 399705
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	129	2	341590 399695
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	130	2	341015 399655
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	131	2	341590 399700
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	132	2	341625 399715
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	138	2	341585 399690

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	141	2	341005 399650
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	142	2	341595 399690
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	143	2	341645 399715
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	144	2	341600 399690
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	145	2	341625 399700
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	146	2	340995 399655
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	149	2	341600 399685
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	149	2	341590 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	151	2	341595 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	152	2	340995 399645
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	154	2	341590 399675
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	156	2	340990 399645
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	156	2	341595 399675
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	159	2	341665 399710
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	160	2	341605 399675
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (W)	161	2	340980 399650
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	161	2	341655 399700
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	162	2	341685 399725
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	163	2	341600 399670
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (W)	164	2	340980 399645
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	164	2	341645 399690
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	165	2	341605 399670

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	166	2	341630 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	166	2	341620 399675
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	167	2	341695 399730
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	169	2	341605 399665
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	170	2	341640 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	171	2	341610 399665
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (W)	172	2	340970 399645
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	172	2	341645 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	173	2	341680 399705
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	174	2	340975 399635
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	175	2	341665 399690
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	176	2	341690 399710
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	176	2	341600 399655
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	177	2	341685 399695
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	177	2	341625 399665
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	179	2	341630 399665
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	182	2	341655 399675
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	183	2	341665 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	184	2	340970 399625
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	185	2	341610 399650
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	185	2	340965 399630
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	187	2	341695 399700

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	187	2	340970 399620
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	188	2	341630 399655
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (SW)	188	2	340965 399625
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (SW)	190	2	340970 399615
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	191	2	341685 399685
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A12SE (SW)	192	2	340970 399610
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	193	2	341630 399650
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	194	2	341690 399685
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	195	2	341685 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	195	2	340960 399620
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	197	2	340965 399610
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	198	2	341690 399680
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (SW)	198	2	340960 399615
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	202	2	340965 399600
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	204	2	341705 399685
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (SW)	205	2	340965 399595
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	205	2	340955 399610
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	206	2	340960 399600
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	208	2	341700 399675
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	212	2	341720 399690
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	212	2	340950 399605
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	213	2	341730 399700

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	214	2	341735 399705
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	219	2	340945 399600
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	223	2	340950 399585
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	233	2	341735 399675
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	234	2	340930 399595
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	234	2	340940 399580
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	236	2	341725 399660
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	240	2	341730 399660
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	242	2	341755 399685
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	244	2	341765 399695
	JBA 100 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	247	2	341765 399690
	JBA 100 Year Return (undefended) - Coastal None				
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341490 399815
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341505 399810
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341160 399680
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341170 399665
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341165 399675
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	2	2	341150 399685
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	4	2	341525 399800
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	5	2	341470 399785
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341460 399780
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341530 399805

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	6	2	341495 399790
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341540 399810
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	7	2	341475 399785
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	7	2	341485 399786
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	8	2	341465 399780
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	11	2	341150 399670
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	14	2	341170 399645
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	17	2	341185 399645
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	30	2	341185 399630
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	31	2	341545 399786
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	35	2	341300 399920
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	38	2	341425 399910
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	53	2	341170 399865
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	55	2	341435 399925
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	66	2	341440 399935
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	67	2	341580 399765
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	75	2	341630 399860
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	80	2	341470 399940
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	107	2	341610 399735
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	114	2	341615 399730
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	119	2	341595 399715
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	121	2	341610 399720

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	125	2	341595 399700
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	131	2	341585 399690
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	135	2	341175 399975
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	142	2	341525 399990
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	148	2	341365 400035
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	152	2	341565 400000
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	154	2	341615 399685
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	157	2	341355 400045
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	158	2	341370 400045
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	160	2	341705 399760
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	172	2	341530 400020
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	176	2	341600 399655
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	179	2	341185 400030
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	180	2	341195 400035
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	182	2	341670 399685
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	183	2	341605 399650
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	185	2	341125 400000
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	186	2	341180 400035
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	207	2	341135 400035
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14NW (E)	209	2	341750 399920
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	211	2	341755 399915
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	214	2	341760 399910

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	215	2	341755 399925
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	223	2	341770 399910
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	226	2	341655 399625
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 1.0m	A14NW (E)	227	2	341770 399920
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14NW (E)	231	2	341770 399930
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	231	2	341645 399615
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	233	2	341650 399615
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14NW (E)	236	2	341780 399920
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (SE)	241	2	341670 399615
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	242	2	341660 399610
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	242	2	341780 399935
	JBA 200 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	247	2	341790 399925
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (W)	0	2	341300 399790
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341290 399786
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (W)	0	2	341300 399786
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341285 399785
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341295 399786
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (W)	0	2	341290 399780
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341275 399775
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341280 399775
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341285 399775
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (W)	0	2	341290 399775

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (W)	0	2	341275 399770
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	0	2	341270 399765
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341210 399715
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341190 399700
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341145 399700
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341145 399695
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341205 399695
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341150 399700
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341185 399700
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341185 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341190 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341365 399865
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341370 399870
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341355 399865
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341390 399865
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341400 399865
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341350 399860
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341355 399860
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341365 399860
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341400 399860
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341415 399860
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341360 399855

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341410 399855
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341415 399855
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341420 399855
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341345 399845
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341350 399850
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341355 399850
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341420 399850
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341430 399850
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341340 399845
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341350 399845
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341465 399830
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341470 399830
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (N)	0	2	341325 399825
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	0	2	341465 399825
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341470 399825
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341480 399820
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (N)	0	2	341325 399815
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341485 399820
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341500 399820
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341320 399815
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	0	2	341490 399815
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341495 399815

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341500 399815
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (NW)	0	2	341315 399805
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	0	2	341310 399805
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (NW)	0	2	341300 399800
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (NW)	0	2	341310 399800
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341425 399845
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341430 399845
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341435 399845
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (N)	0	2	341335 399840
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341340 399840
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341345 399840
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341435 399840
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341450 399840
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (N)	0	2	341330 399835
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341335 399835
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341340 399835
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	0	2	341445 399835
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341450 399835
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	0	2	341460 399835
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341325 399830
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341335 399830
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341455 399830

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341300 399795
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	0	2	341305 399795
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341185 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341235 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341215 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341220 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341225 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341240 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341245 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341235 399745
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341240 399745
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341270 399760
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341240 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341250 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341195 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341210 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341215 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341185 399720
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341195 399720
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341200 399720
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341210 399720
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341170 399715

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341180 399715
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341190 399715
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341215 399715
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341165 399710
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341175 399710
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341215 399710
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341145 399705
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341155 399705
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341160 399705
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341190 399705
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341210 399730
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341220 399730
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341225 399730
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	4	2	341525 399805
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341540 399810
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	6	2	341135 399700
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13NE (E)	7	2	341520 399800
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	8	2	341545 399810
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	9	2	341525 399800
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	11	2	341135 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	11	2	341530 399800
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	11	2	341520 399795

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	12	2	341555 399810
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	12	2	341545 399805
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	15	2	341535 399795
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	15	2	341530 399795
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	17	2	341545 399800
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	19	2	341550 399800
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	22	2	341545 399795
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	22	2	341535 399790
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	24	2	341545 399790
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	24	2	341120 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	27	2	341120 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	31	2	341545 399786
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	31	2	341115 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	32	2	341110 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	35	2	341545 399785
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	35	2	341585 399800
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	41	2	341560 399785
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	41	2	341560 399780
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	42	2	341105 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	43	2	341580 399786
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	43	2	341100 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	44	2	341550 399775

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	47	2	341575 399785
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	47	2	341095 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	54	2	341560 399770
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	56	2	341540 399760
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	59	2	341535 399755
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	60	2	341545 399755
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	61	2	341540 399755
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	62	2	341080 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	63	2	341580 399770
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	63	2	341590 399775
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	65	2	341080 399675
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	66	2	341575 399765
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	66	2	341075 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	72	2	341590 399765
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	73	2	341570 399755
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	74	2	341595 399765
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	77	2	341065 399675
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	78	2	341560 399745
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	79	2	341585 399755
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	79	2	341575 399750
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	81	2	341585 399745
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	82	2	341570 399745

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	84	2	341575 399745
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	84	2	341565 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	86	2	341580 399745
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	86	2	341570 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	87	2	341060 399665
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	88	2	341055 399670
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	89	2	341615 399760
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	89	2	341600 399750
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	91	2	341055 399665
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	93	2	341575 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	94	2	341610 399750
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	95	2	341580 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	95	2	341590 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	99	2	341600 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	99	2	341590 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	101	2	341605 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	102	2	341045 399660
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	105	2	341605 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	105	2	341615 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	106	2	341630 399750
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	106	2	341585 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	107	2	341625 399745

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	108	2	341620 399740
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	110	2	341615 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	111	2	341035 399660
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	112	2	341030 399665
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	112	2	341600 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	114	2	341615 399730
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	115	2	341030 399660
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (W)	116	2	341025 399665
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	118	2	341615 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	119	2	341625 399730
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	119	2	341595 399715
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	121	2	341615 399720
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	121	2	341610 399720
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	121	2	341600 399715
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	122	2	341025 399655
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	123	2	341020 399660
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	124	2	341640 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	125	2	341600 399705
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	125	2	341635 399730
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	129	2	341585 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	130	2	341015 399655
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	131	2	341590 399700

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	133	2	341635 399720
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	134	2	341585 399695
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	136	2	341580 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	141	2	341625 399700
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	141	2	341005 399650
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	142	2	341595 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	143	2	341585 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	144	2	341610 399695
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	144	2	341600 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	144	2	341660 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	146	2	341615 399695
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	147	2	341595 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	148	2	341665 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	149	2	341590 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	150	2	341615 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (W)	150	2	340990 399655
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	151	2	341595 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	151	2	341670 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	152	2	341640 399700
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	152	2	341620 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	152	2	340995 399645
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	154	2	341590 399675

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	155	2	341675 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	156	2	340990 399645
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	156	2	341595 399675
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	159	2	341645 399695
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (W)	161	2	340980 399650
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (W)	164	2	340980 399645
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (W)	165	2	340975 399650
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	166	2	341650 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	166	2	341630 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14SW (E)	166	2	341670 399705
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	167	2	341695 399730
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	168	2	341635 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	168	2	341700 399735
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	169	2	341610 399665
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	170	2	341650 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	170	2	341640 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (W)	172	2	340970 399645
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	172	2	341600 399660
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	173	2	341625 399670
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	174	2	340975 399635
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	176	2	341600 399655
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (SW)	177	2	340975 399630

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	177	2	341645 399675
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	177	2	341700 399720
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	178	2	341705 399725
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	179	2	341650 399675
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	179	2	341630 399665
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	180	2	341695 399710
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	182	2	341615 399655
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	183	2	341685 399695
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	184	2	341705 399715
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	184	2	340970 399625
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	185	2	340965 399630
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	185	2	341675 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	186	2	341670 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	186	2	341635 399660
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	187	2	340970 399620
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (SW)	188	2	340965 399625
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	188	2	341630 399655
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	189	2	341620 399650
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	190	2	341700 399700
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	190	2	341695 399695
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	190	2	341635 399655
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	195	2	340960 399620

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (SW)	195	2	340970 399605
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	197	2	340965 399610
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (SW)	198	2	340960 399615
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	204	2	341705 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	205	2	340955 399610
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	205	2	340965 399595
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	206	2	340960 399600
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	207	2	341730 399710
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	208	2	341700 399675
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	211	2	341710 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	212	2	340950 399605
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	212	2	341705 399675
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	214	2	341735 399705
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	215	2	341715 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	219	2	340945 399600
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	219	2	341730 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	219	2	341725 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (SW)	223	2	340940 399600
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	223	2	340950 399585
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	223	2	341730 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	233	2	341735 399675
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	234	2	340930 399595

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	236	2	341725 399660
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	237	2	341745 399680
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	240	2	341730 399660
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	242	2	341755 399685
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	243	2	341760 399690
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A12SE (SW)	245	2	340920 399590
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	247	2	341740 399655
	JBA 200 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	247	2	341735 399655
	JBA 200 Year Return (undefended) - Coastal None				
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341170 399665
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341160 399680
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341500 399815
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 1.0m	A13NE (E)	0	2	341510 399805
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341165 399675
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341155 399685
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341175 399660
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341145 399695
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341210 399710
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341480 399820
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341485 399815
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341190 399690
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341415 399865

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341405 399865
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	4	2	341525 399805
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	4	2	341520 399795
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	4	2	341455 399780
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	5	2	341470 399785
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341540 399810
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341530 399805
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341495 399790
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341460 399780
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	7	2	341485 399786
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	8	2	341465 399780
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	9	2	341480 399785
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	9	2	341525 399800
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	10	2	341505 399790
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	11	2	341150 399670
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	11	2	341165 399650
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	12	2	341155 399660
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	21	2	341400 399900
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	22	2	341345 399910
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	23	2	341390 399905
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	28	2	341190 399635
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	35	2	341300 399920

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	53	2	341170 399865
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	70	2	341625 399860
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	77	2	341330 399965
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	82	2	341335 399970
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Equal to 0.1m	A13NE (N)	87	2	341340 399975
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	87	2	341545 399935
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	116	2	341585 399960
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (W)	116	2	340990 399725
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	117	2	341595 399715
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	121	2	341620 399725
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	122	2	341625 399715
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	123	2	341590 399695
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	131	2	341590 399700
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (W)	132	2	340970 399740
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	134	2	341580 399690
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	134	2	341620 399710
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	135	2	341175 399975
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	137	2	341525 399985
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (W)	137	2	340965 399745
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	146	2	341685 399910
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	148	2	341360 400035
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	149	2	341380 400035

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	152	2	341690 399915
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	152	2	341525 400000
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	152	2	341560 400000
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	153	2	341370 400040
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	154	2	341580 400000
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	155	2	341615 399685
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	157	2	341355 400045
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	157	2	341175 400000
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	159	2	341695 399920
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	160	2	341705 399760
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	172	2	341530 400020
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	173	2	341370 400060
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	175	2	341185 400025
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	180	2	341590 400025
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	182	2	341130 400000
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	184	2	341120 399995
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	185	2	341610 399650
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	187	2	341560 400035
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	187	2	341550 400035
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	187	2	341565 400035
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	188	2	341605 399645
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	189	2	341620 399650

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (NW)	189	2	341125 400005
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	195	2	341180 400045
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	207	2	341555 400055
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	207	2	341750 399915
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14NW (E)	209	2	341750 399920
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	214	2	341760 399910
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	215	2	341755 399925
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12NE (W)	219	2	340890 399815
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	221	2	341495 399560
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	223	2	341770 399910
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	225	2	341640 399620
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	226	2	341655 399625
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	226	2	341765 399930
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 1.0m	A14NW (E)	227	2	341770 399920
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14NW (E)	231	2	341770 399930
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	232	2	341500 399550
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	233	2	341650 399615
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (SE)	233	2	341680 399630
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (SE)	235	2	341675 399625
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A14NW (E)	236	2	341780 399920
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	240	2	341655 399610
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (SE)	241	2	341670 399615

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (SE)	242	2	341660 399610
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	242	2	341780 399935
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (E)	247	2	341790 399925
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14NW (NE)	249	2	341700 400050
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A8NW (SW)	249	2	341120 399415
	JBA 1000 Year Return (undefended) - Pluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A8NW (SW)	250	2	341145 399410
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341295 399785
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (W)	0	2	341275 399780
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (W)	0	2	341290 399780
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (W)	0	2	341275 399775
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341280 399775
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341285 399775
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (W)	0	2	341290 399775
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341235 399745
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341260 399750
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341245 399740
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341250 399740
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341235 399740
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341215 399735
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341220 399735
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341230 399735
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341245 399735

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341250 399735
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341205 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341210 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341220 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341225 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341230 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341235 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341250 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341305 399790
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NW (W)	0	2	341285 399786
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341290 399786
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (W)	0	2	341300 399786
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341285 399785
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	0	2	341485 399825
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (N)	0	2	341325 399815
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	0	2	341475 399820
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341480 399820
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341500 399820
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341320 399815
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	0	2	341490 399815
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341495 399815
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341500 399815

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (NW)	0	2	341315 399805
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (NW)	0	2	341305 399805
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	0	2	341310 399805
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NW (NW)	0	2	341300 399800
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (NW)	0	2	341310 399800
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NW (W)	0	2	341300 399795
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (NW)	0	2	341305 399795
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (W)	0	2	341300 399790
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (W)	0	2	341275 399770
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (W)	0	2	341280 399770
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (W)	0	2	341260 399760
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (W)	0	2	341270 399765
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (W)	0	2	341250 399755
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341260 399755
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341245 399750
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341350 399845
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341425 399845
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341430 399845
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341440 399845
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341335 399840
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341340 399840
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341345 399840

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341435 399840
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341440 399840
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341445 399835
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341330 399835
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341340 399835
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341450 399835
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	0	2	341460 399835
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341325 399830
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	0	2	341450 399830
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341455 399830
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341465 399830
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341470 399830
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NW (N)	0	2	341325 399825
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341465 399825
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	0	2	341470 399825
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	0	2	341480 399825
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341195 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341210 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341215 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341220 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341180 399720
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341195 399720

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341200 399720
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341215 399720
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341170 399715
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341180 399715
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341185 399715
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341190 399715
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341195 399715
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341150 399700
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341180 399700
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341210 399700
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341215 399715
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341145 399700
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341145 399695
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341195 399695
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341180 399690
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341190 399690
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341195 399690
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341185 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341170 399710
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341370 399870
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341385 399870
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341355 399865

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341385 399865
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341400 399865
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341350 399860
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341370 399860
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (NE)	0	2	341375 399860
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341400 399860
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341415 399860
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341360 399855
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341410 399855
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341415 399855
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341420 399855
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (N)	0	2	341345 399845
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341350 399850
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (NE)	0	2	341355 399850
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (NE)	0	2	341420 399850
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (NE)	0	2	341430 399850
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (N)	0	2	341340 399845
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341175 399710
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341190 399710
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341210 399710
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341145 399705
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	0	2	341155 399705

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341160 399705
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	0	2	341165 399705
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341180 399705
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	0	2	341185 399705
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	0	2	341200 399705
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	0	2	341215 399705
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13NE (E)	2	2	341520 399800
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	4	2	341525 399805
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	5	2	341550 399815
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341540 399810
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	6	2	341530 399805
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	6	2	341135 399700
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	7	2	341555 399815
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	8	2	341545 399805
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	8	2	341530 399795
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13NE (E)	9	2	341525 399800
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	11	2	341520 399795
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	12	2	341555 399810
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	14	2	341550 399805
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	16	2	341560 399805
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	19	2	341535 399790
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	19	2	341550 399800

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	21	2	341120 399695
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	24	2	341545 399786
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	24	2	341120 399690
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	28	2	341115 399690
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	29	2	341540 399786
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	35	2	341545 399785
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	38	2	341540 399780
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	40	2	341545 399780
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13NE (E)	41	2	341570 399786
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	42	2	341105 399680
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	43	2	341575 399786
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	44	2	341555 399780
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	44	2	341545 399775
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	45	2	341570 399785
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	45	2	341535 399770
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	46	2	341540 399765
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	50	2	341095 399680
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	52	2	341565 399775
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13NE (E)	58	2	341590 399780
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	58	2	341085 399680
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	59	2	341535 399755
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	61	2	341540 399755

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	61	2	341085 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	63	2	341590 399775
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	63	2	341545 399755
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13NE (E)	64	2	341600 399780
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	66	2	341075 399680
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	67	2	341580 399765
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	69	2	341595 399770
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	69	2	341075 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	70	2	341070 399680
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	71	2	341555 399750
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	71	2	341565 399755
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	72	2	341600 399770
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	72	2	341580 399760
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	72	2	341075 399670
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	73	2	341070 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	75	2	341605 399770
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	78	2	341560 399745
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	79	2	341600 399760
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	80	2	341065 399670
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SW (SW)	81	2	341060 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	82	2	341610 399765
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	84	2	341575 399745

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	86	2	341570 399740
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	87	2	341060 399665
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	88	2	341055 399670
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	89	2	341600 399750
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	89	2	341575 399740
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	90	2	341590 399745
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	91	2	341580 399740
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	91	2	341570 399735
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	91	2	341055 399665
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	93	2	341585 399740
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	94	2	341605 399745
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	94	2	341600 399745
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (W)	94	2	341045 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	95	2	341590 399740
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	97	2	341615 399750
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	97	2	341045 399670
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	98	2	341575 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	100	2	341580 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	100	2	341570 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	102	2	341585 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	102	2	341045 399660
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	104	2	341040 399665

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	106	2	341595 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A13SW (SW)	106	2	341040 399660
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	107	2	341625 399745
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	108	2	341590 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	109	2	341635 399750
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	110	2	341605 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	110	2	341595 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	112	2	341605 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	114	2	341615 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	119	2	341625 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	119	2	341595 399715
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	121	2	341610 399720
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	124	2	341640 399735
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SE (E)	125	2	341595 399700
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	127	2	341590 399705
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (W)	127	2	341015 399660
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	129	2	341020 399650
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	131	2	341645 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	131	2	341585 399690
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	133	2	341015 399650
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	133	2	341635 399720
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	134	2	341585 399695

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	136	2	341580 399690
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (W)	138	2	341005 399655
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	141	2	341655 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SW (SW)	144	2	341005 399645
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	144	2	341660 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	145	2	341590 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	147	2	341595 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SW (SW)	148	2	341000 399645
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	151	2	341670 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A13SW (SW)	152	2	340995 399645
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (W)	154	2	340985 399655
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (E)	154	2	341615 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	156	2	341605 399680
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	159	2	341685 399730
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	159	2	341590 399670
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (W)	165	2	340975 399650
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	167	2	340980 399640
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	168	2	341700 399735
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	168	2	341635 399680
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	168	2	341625 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (SW)	170	2	340980 399635
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (W)	172	2	340970 399645

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	172	2	341600 399660
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	173	2	341625 399670
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	174	2	340975 399635
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	174	2	341700 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	176	2	341600 399655
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	177	2	341645 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	178	2	341705 399725
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	180	2	340975 399625
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	181	2	341600 399650
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	182	2	341670 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A13SE (SE)	183	2	341605 399650
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	184	2	341705 399715
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	185	2	341675 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (E)	186	2	341635 399660
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	186	2	341670 399680
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (E)	186	2	341655 399670
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	187	2	340970 399620
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	187	2	341705 399710
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A12SE (SW)	188	2	340975 399610
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	188	2	341605 399645
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A13SE (SE)	189	2	341620 399650
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	190	2	341690 399690

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	195	2	340960 399620
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	198	2	340970 399600
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (SW)	198	2	340960 399615
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	199	2	341685 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A13SE (SE)	200	2	341635 399645
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	201	2	341700 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	205	2	340955 399610
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	208	2	340965 399590
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	208	2	341710 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	208	2	341700 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (SW)	209	2	340950 399610
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	209	2	340960 399595
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	212	2	340950 399605
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	212	2	341700 399670
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	214	2	341735 399705
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	216	2	340945 399605
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 1.0m	A12SE (SW)	216	2	340955 399590
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	219	2	340955 399585
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	220	2	340950 399590
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	222	2	341710 399665
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	223	2	340940 399600
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	226	2	341730 399680

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	233	2	341735 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.3m and Less than or equal to 1.0m	A12SE (SW)	234	2	340930 399595
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	234	2	341745 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	236	2	341725 399660
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	237	2	341740 399675
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A12SE (SW)	239	2	340920 399600
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	240	2	341760 399695
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	240	2	341730 399660
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A12SE (SW)	242	2	340920 399595
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	242	2	341755 399685
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A12SE (SW)	243	2	340915 399600
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	244	2	341765 399695
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	244	2	341745 399670
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.01m and Less than or equal to 0.05m	A14SW (E)	247	2	341735 399655
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.1m and Less than or equal to 0.3m	A14SW (E)	247	2	341765 399690
	JBA 1000 Year Return (undefended) - Fluvial Flood Depth: Greater than 0.05m and Less than or equal to 0.1m	A14SW (E)	250	2	341765 399685
	JBA 1000 Year Return (undefended) - Coastal None				
	JBA Canal Failure Coverage Coverage: This area has been mapped for risk of flooding from canal or aqueduct failure or breach. Please note that all canals in this area may not have been mapped for failure or breach.	A13NW (SW)	0	2	341325 399786
	JBA Canal Failure None				
	JBA Dam Break Coverage Coverage: This area has been mapped for flooding from dam or reservoir embankment failure or breach.	A13NW (SW)	0	2	341325 399786
	JBA Dam Break None				

BGS Flood Data

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NW (SW)	0	3	341325 399786
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NW (N)	112	3	341325 400000
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A12SE (SW)	304	3	340950 399450
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A12SE (W)	320	3	340800 399650
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A7SE (SW)	756	3	340800 399000
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A7SE (SW)	782	3	340750 399000
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A19SE (NE)	850	3	342200 400400

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	GeoSmart Information Groundwater Flood Data Risk: Negligible Risk Risk Details: There is a negligible risk of groundwater flooding in this area and any groundwater flooding incidence has a chance of less than 1 in 100 (<1%) probability of occurrence.	A13NW (SW)	0	2	341325 399786
	GeoSmart Information Groundwater Flood Data Risk: Negligible Risk Risk Details: There is a negligible risk of groundwater flooding in this area and any groundwater flooding incidence has a chance of less than 1 in 100 (<1%) probability of occurrence.	A13NW (N)	94	2	341326 399982
	GeoSmart Information Groundwater Flood Data Risk: Negligible Risk Risk Details: There is a negligible risk of groundwater flooding in this area and any groundwater flooding incidence has a chance of less than 1 in 100 (<1%) probability of occurrence.	A13NW (N)	112	2	341325 400000

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	**OS Water Network Lines** Watercourse Name: Kirkby Brook Watercourse Form: Inland river Watercourse Length: 35.4 Watercourse Level: Underground Primacy: 1 Permanent: True Catchment Name: Alt	A13SW (SW)	0	4	341143 399699
2	**OS Water Network Lines** Watercourse Name: Kirkby Brook Watercourse Form: Inland river Watercourse Length: 220.2 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A13NW (NW)	0	4	341309 399805
3	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 161.1 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A13NW (N)	0	4	341317 399815
4	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 5.8 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A13NE (NE)	0	4	341442 399844
5	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 97.2 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A13NE (NE)	0	4	341442 399844
6	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 1101.5 Watercourse Level: Not Supplied Primacy: 1 Permanent: True Catchment Name: Alt	A13NE (E)	15	4	341526 399798
7	**OS Water Network Lines** Watercourse Name: Kirkby Brook Watercourse Form: Inland river Watercourse Length: 232.1 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A13SW (SW)	34	4	341111 399685
8	**OS Water Network Lines** Watercourse Name: Kirkby Brook Watercourse Form: Inland river Watercourse Length: 50.1 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12SE (SW)	250	4	340919 399582
9	**OS Water Network Lines** Watercourse Name: Simonswood Brook Watercourse Form: Inland river Watercourse Length: 598.6 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12SE (SW)	298	4	340874 399561

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
10	**OS Water Network Lines** Watercourse Name: Kirkby Brook Watercourse Form: Inland river Watercourse Length: 97.6 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12SE (SW)	299	4	340874 399561
11	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 50.4 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12SE (SW)	332	4	340886 399487
12	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 2.9 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12SE (SW)	336	4	340893 399470
13	**OS Water Network Lines** Watercourse Name: Kirkby Brook Watercourse Form: Inland river Watercourse Length: 40.3 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12SE (SW)	337	4	340894 399467
14	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 5.8 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A7NE (SW)	351	4	340906 399429
15	**OS Water Network Lines** Watercourse Name: Kirkby Brook Watercourse Form: Inland river Watercourse Length: 1442.2 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A7NE (SW)	356	4	340900 399428
16	**OS Water Network Lines** Watercourse Name: Simonswood Brook Watercourse Form: Inland river Watercourse Length: 839.6 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A17SW (NW)	676	4	340605 400228
17	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 108.0 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12NW (W)	682	4	340425 399844
18	**OS Water Network Lines** Watercourse Name: Simonswood Brook Watercourse Form: Inland river Watercourse Length: 106.4 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12NW (W)	706	4	340419 399937

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
19	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 1.4 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12NW (W)	706	4	340419 399937
20	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 7.8 Watercourse Level: Not Supplied Primacy: 1 Permanent: True Catchment Name: Alt	A12NW (W)	707	4	340417 399937
21	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 525.4 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A12NW (W)	725	4	340434 400041
22	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 39.3 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A17SW (NW)	780	4	340531 400290
23	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 181.1 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A15NW (E)	951	4	342487 400049
24	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 47.6 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A11NE (W)	962	4	340155 399933
25	**OS Water Network Lines** Watercourse Name: Not Supplied Watercourse Form: Inland river Watercourse Length: 41.6 Watercourse Level: On ground surface Primacy: 1 Permanent: True Catchment Name: Alt	A11NE (W)	979	4	340152 399995
26	**OS Water Network Nodes** Hydronode Category: Pseudo	A13SW (SW)	0	4	341143 399699
27	**OS Water Network Nodes** Hydronode Category: Pseudo	A13NW (N)	0	4	341317 399815
28	**OS Water Network Nodes** Hydronode Category: Junction	A13NE (NE)	0	4	341442 399844
29	**OS Water Network Nodes** Hydronode Category: Source	A13NE (NE)	0	4	341447 399846
30	**OS Water Network Nodes** Hydronode Category: Pseudo	A13NE (E)	15	4	341526 399798

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
31	**OS Water Network Nodes** Hydronode Category: Pseudo	A13SW (SW)	34	4	341111 399685
32	**OS Water Network Nodes** Hydronode Category: Pseudo	A12SE (SW)	250	4	340919 399582
33	**OS Water Network Nodes** Hydronode Category: Junction	A12SE (SW)	299	4	340874 399561
34	**OS Water Network Nodes** Hydronode Category: Pseudo	A12SE (SW)	336	4	340893 399470
35	**OS Water Network Nodes** Hydronode Category: Junction	A12SE (SW)	337	4	340894 399467
36	**OS Water Network Nodes** Hydronode Category: Source	A12SE (SW)	341	4	340861 399507
37	**OS Water Network Nodes** Hydronode Category: Source	A7NE (SW)	351	4	340906 399429
38	**OS Water Network Nodes** Hydronode Category: Junction	A7NE (SW)	356	4	340900 399428
39	**OS Water Network Nodes** Hydronode Category: Source	A12NW (W)	682	4	340424 399836
40	**OS Water Network Nodes** Hydronode Category: Junction	A12NW (W)	706	4	340419 399937
41	**OS Water Network Nodes** Hydronode Category: Pseudo	A12NW (W)	707	4	340417 399937
42	**OS Water Network Nodes** Hydronode Category: Pseudo	A12NW (W)	711	4	340412 399931
43	**OS Water Network Nodes** Hydronode Category: Junction	A12NW (W)	725	4	340434 400041
44	**OS Water Network Nodes** Hydronode Category: Outlet	A17SW (NW)	780	4	340531 400290
45	**OS Water Network Nodes** Hydronode Category: Source	A17SW (NW)	812	4	340493 400295
46	**OS Water Network Nodes** Hydronode Category: Source	A15NW (E)	951	4	342487 400049
47	**OS Water Network Nodes** Hydronode Category: Outlet	A11NE (W)	962	4	340154 399926
48	**OS Water Network Nodes** Hydronode Category: Source	A11NE (W)	969	4	340156 399973
49	**OS Water Network Nodes** Hydronode Category: Outlet	A11NE (W)	979	4	340152 399995

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
50	**Historical Flood Liabilities** Use: Area liable to flood Date of Mapping: 1850	A12SE (W)	393	2	340712 399700

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (SW)	258	1	340915 399575
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (SW)	264	1	340900 399585
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (SW)	280	1	340893 399560
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (W)	281	1	340865 399605
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Medium - Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (SW)	284	1	340900 399550
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (SW)	308	1	340863 399561
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Medium - Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (SW)	311	1	340867 399550
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Medium - Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (W)	312	1	340832 399600
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (W)	324	1	340800 399638
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (SW)	326	1	340884 399500
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Medium - Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (W)	340	1	340800 399600
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (SW)	354	1	340850 399500
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (SW)	366	1	340800 399550
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (W)	377	1	340725 399740

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (W)	381	1	340720 399745
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (W)	385	1	340750 399600
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (W)	391	1	340710 399750
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (W)	401	1	340700 399760
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (W)	403	1	340700 399722
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7NE (SW)	406	1	340850 399410
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12SE (W)	414	1	340688 399730
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A12SE (W)	415	1	340700 399650
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	452	1	340650 399792
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	458	1	340645 399800
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7NE (SW)	481	1	340900 399262
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A7NE (SW)	490	1	340895 399254
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7NE (SW)	493	1	340895 399250
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	501	1	340600 399786

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7NE (SW)	532	1	340850 399235
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	534	1	340575 399850
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A7NE (SW)	535	1	340895 399200
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	553	1	340550 399800
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	561	1	340550 399862
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A7NE (SW)	583	1	340885 399151
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7NE (SW)	584	1	340885 399150
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7NE (SW)	599	1	340855 399150
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A7NE (SW)	602	1	340850 399150
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	618	1	340500 399900
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	635	1	340485 399910
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A7SE (SW)	647	1	340850 399098
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	658	1	340450 399855
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	664	1	340610 400205

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	665	1	340600 400195
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	665	1	340605 400200
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	667	1	340615 400215
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	674	1	340625 400235
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	675	1	340555 400155
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7SE (SW)	675	1	340800 399095
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	684	1	340445 399950
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	697	1	340480 400075
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7SE (SW)	698	1	340830 399050
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	700	1	340470 400060
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	702	1	340465 400055
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	704	1	340450 400025
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	707	1	340550 400200
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	708	1	340593 400250

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	716	1	340400 399905
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	718	1	340500 400150
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A7SE (SW)	720	1	340786 399050
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	722	1	340655 400325
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A7SE (SW)	727	1	340800 399033
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	728	1	340459 400100
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A12NW (W)	736	1	340450 400100
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Medium - Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	745	1	340650 400350
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7SE (SW)	767	1	340762 399010
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A7SE (SW)	776	1	340761 399000
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Medium - Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17SW (NW)	776	1	340600 400350
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7SE (SW)	781	1	340760 398995
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7SE (SW)	814	1	340754 398960
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7SE (SW)	833	1	340750 398940

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A7SE (SW)	843	1	340805 398900
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17NW (NW)	868	1	340578 400450
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Medium - Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17NW (NW)	880	1	340600 400482
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17NW (NW)	882	1	340625 400500
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A7SE (SW)	892	1	340750 398872
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Medium - Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A19SE (NE)	899	1	342225 400445
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17NW (NW)	913	1	340550 400485
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A19NE (NE)	915	1	342140 400550
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: High - Greater than or equal to 1 in 30 (3.3%) chance in any given year Suitability Scale: National to County Source: Environment Agency, Head Office	A19NE (NE)	921	1	342250 400450
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A19SE (NE)	938	1	342300 400415
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A19NE (NE)	954	1	342250 400500
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A20SW (NE)	976	1	342375 400375
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17NW (NW)	985	1	340590 400600
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Low - Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A17NW (NW)	994	1	340515 400560

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Risk of Flooding from Rivers and Sea (RoFRS) Flood Risk Assessment: Medium - Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year Suitability Scale: County to Town Source: Environment Agency, Head Office	A20NW (NE)	999	1	342350 400450

Flood Insurance Risk Data

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Postcode Sector Flood Insurance Claim Ratings Insurance Rating: Low Flood Insurance Claim Rating Postcode Sector: L33 1	A13NW (SW)	0	2	341325 399786
	Postcode Sector Flood Insurance Claim Ratings Insurance Rating: Very Low Flood Insurance Claim Rating - No Recorded Claims Postcode Sector: L33 2	A13SW (SW)	0	2	341175 399715
	Postcode Sector Flood Insurance Claim Ratings Insurance Rating: Very Low Flood Insurance Claim Rating - No Recorded Claims Postcode Sector: L33 8	A13SE (SE)	0	2	341342 399748
	Postcode Sector Flood Insurance Claim Ratings Insurance Rating: Very Low Flood Insurance Claim Rating - No Recorded Claims Postcode Sector: L33 9	A13NE (E)	0	2	341521 399826
	Postcode Sector Flood Insurance Claim Ratings Insurance Rating: Very Low Flood Insurance Claim Rating - No Recorded Claims Postcode Sector: L32 1	A13SW (SW)	0	2	341190 399682

EA / NRW / CEH Flood Data	Version	Update Cycle
Extreme Flooding from Rivers or Sea without Defences Environment Agency - Head Office	February 2018	Quarterly
Flooding from Rivers or Sea without Defences Environment Agency - Head Office	February 2018	Quarterly
Areas Benefiting from Flood Defences Environment Agency - Head Office	February 2018	Quarterly
Flood Water Storage Areas Environment Agency - Head Office	February 2018	Quarterly
Flood Defences Environment Agency - Head Office	February 2018	Quarterly
EA / NRW Surface Water Flood Data	**Version**	**Update Cycle**
Surface Water 1 in 30 year Flood Depth Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 100 year Flood Depth Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 1000 year Flood Depth Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 30 year Flood Velocity Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 100 year Flood Velocity Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 1000 year Flood Velocity Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 30 year Flood Flow Direction 25m Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 100 year Flood Flow Direction 25m Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 1000 year Flood Flow Direction 25m Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 30 year Flood Hazard Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 100 year Flood Hazard Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 1000 year Flood Hazard Environment Agency - Head Office	October 2013	As notified
Surface Water Suitability Environment Agency - Head Office	October 2013	As notified

JBA Flood Data	Version	Update Cycle
JBA 75 Year Return (undefended) - Pluvial JBA Risk Management Limited	December 2017	Annually
JBA 75 Year Return (undefended) - Fluvial JBA Risk Management Limited	December 2017	Annually
JBA 75 Year Return (undefended) - Coastal JBA Risk Management Limited	December 2017	Annually
JBA 100 Year Return (undefended) - Fluvial JBA Risk Management Limited	December 2017	Annually
JBA 100 Year Return (undefended) - Coastal JBA Risk Management Limited	December 2017	Annually
JBA 200 Year Return (undefended) - Pluvial JBA Risk Management Limited	December 2017	Annually
JBA 200 Year Return (undefended) - Fluvial JBA Risk Management Limited	December 2017	Annually
JBA 200 Year Return (undefended) - Coastal JBA Risk Management Limited	December 2017	Annually
JBA 1000 Year Return (undefended) - Pluvial JBA Risk Management Limited	December 2017	Annually
JBA 1000 Year Return (undefended) - Fluvial JBA Risk Management Limited	December 2017	Annually
JBA 1000 Year Return (undefended) - Coastal JBA Risk Management Limited	December 2017	Annually
JBA Canal Failure JBA Risk Management Limited	October 2017	Annually
JBA Dam Break JBA Risk Management Limited	October 2017	Annually
BGS Flood Data	**Version**	**Update Cycle**
BGS Geological Indicators of Flooding British Geological Survey - National Geoscience Information Service	February 2011	As notified
BGS Groundwater Flooding Susceptibility British Geological Survey - National Geoscience Information Service	May 2013	As notified
GeoSmart Information Groundwater Flooding Data	**Version**	**Update Cycle**
GeoSmart Information Groundwater Flood Risk GeoSmart Information Ltd	November 2017	Bi-Annually
OS Water Network Data	**Version**	**Update Cycle**
OS Water Network Lines Ordnance Survey	January 2018	Quarterly
OS Water Network Nodes Ordnance Survey	January 2018	Quarterly
EA/NRW Historic Flood Events Data	**Version**	**Update Cycle**
Historic Flood Events Environment Agency - Head Office	February 2018	Quarterly
Historical Flood Liabilities Landmark Information Group Limited	December 1999	Not Applicable

EA/NRW Risk of Flooding from Rivers and Sea (RoFRS)	Version	Update Cycle
RoFRS - Risk of Flooding from Rivers and Sea Environment Agency - Head Office	March 2017	Annually
Flood Insurance Risk Data	**Version**	**Update Cycle**
Postcode Sector Flood Insurance Claim Ratings Crawford and Company	January 2018	Quarterly

Data Suppliers

A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	Map data
Environment Agency	Environment Agency
Natural Resources Wales	Cyfoeth Naturiol Cymru Natural Resources Wales
Centre for Ecology and Hydrology	CEH Centre for Ecology & Hydrology NATURAL ENVIRONMENT RESEARCH COUNCIL
British Geological Survey	BGS 1835 British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL
GeoSmart Information	GeoSmart Information
JBA Risk Management	JBA risk management

Useful Contacts

Contact	Name and Address	Contact Details
1	**Environment Agency - National Customer Contact Centre (NCCC)** PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 03708 506 506 Email: enquiries@environment-agency.gov.uk
2	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9966 Fax: 0844 844 9951 Email: helpdesk@landmark.co.uk Website: www.landmark.co.uk
3	**British Geological Survey - Enquiry Service** British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
4	**Ordnance Survey** Adanac Drive, Southampton, Hampshire, SO16 0AS	Telephone: 03456 05 05 05 Email: customerservices@ordnancesurvey.co.uk Website: www.ordnancesurvey.gov.uk
5	**Environment Agency - Head Office** Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, Avon, BS32 4UD	Telephone: 01454 624400 Fax: 01454 624409

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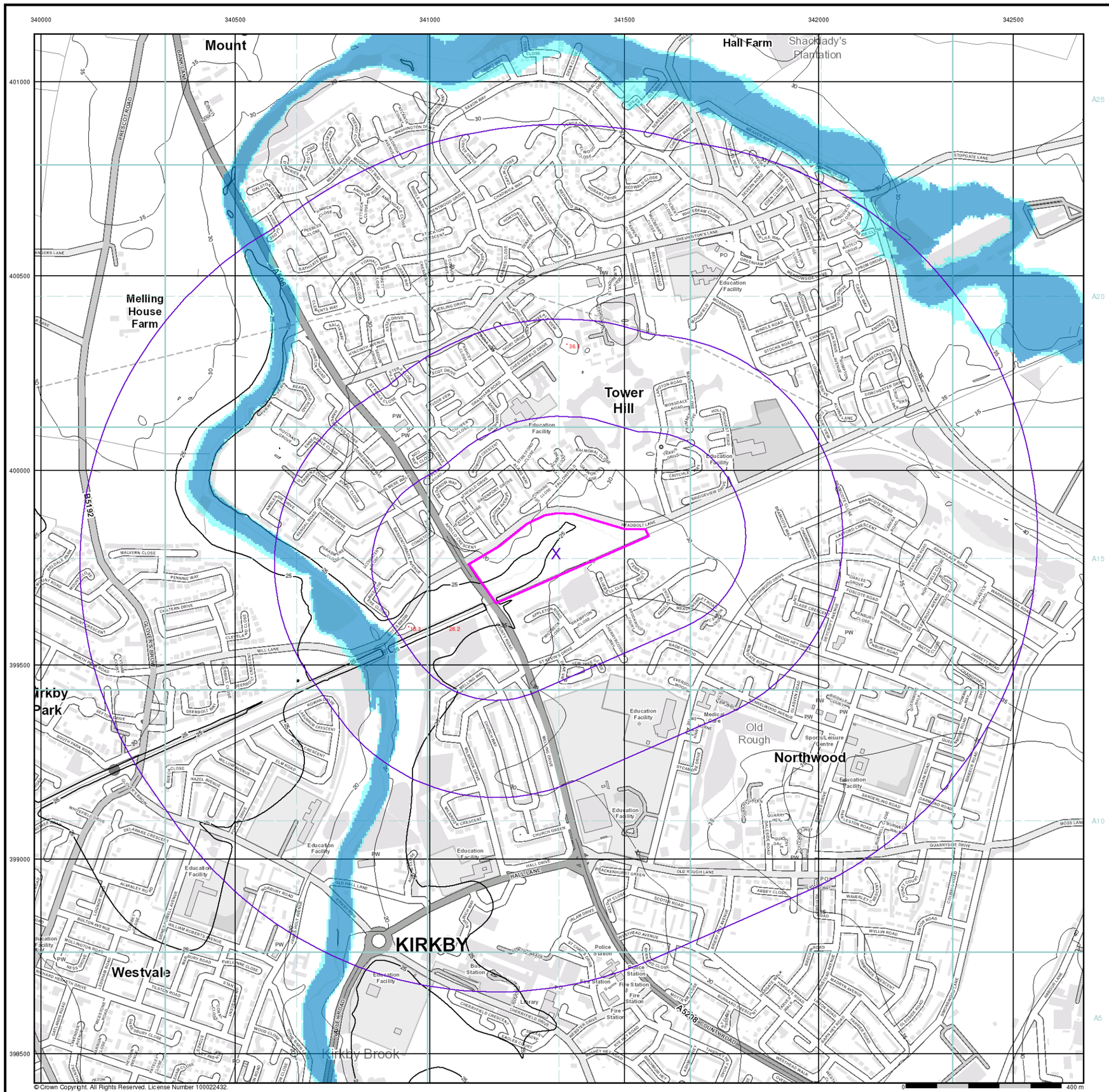

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M M

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EA/NRW Flood Data Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Flood Data

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Contours (height in metres)

Standard Contour — 105 — 100 — 95

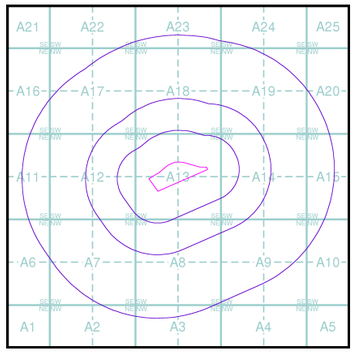
Master Contour

Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

EA/NRW Flood Data Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



M M

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JBA 75 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

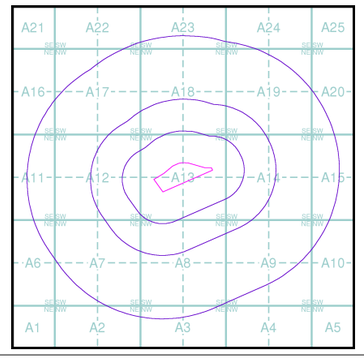
Contours (height in metres)

Standard Contour 105 100 95 — MLW Mean Low Water

Master Contour — MHW Mean High Water

Spot Height 157.8

JBA 75 Year Return Flood Map (Undefended) - Slice A



Order Details

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JBA 100 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Modelled Flood Depth

Fluvial Depth	Coastal Depth
0.01m - 0.05m	0.01m - 0.05m
0.05m - 0.1m	0.05m - 0.1m
0.1m - 0.3m	0.1m - 0.3m
0.3m - 1m	0.3m - 1m
>1m	>1m

Contours (height in metres)

Standard Contour 105 100 95

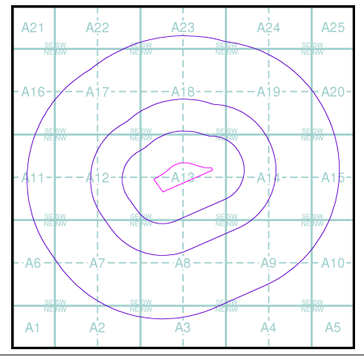
Master Contour

Spot Height 167.8

MLW Mean Low Water

MHW Mean High Water

JBA 100 Year Return Flood Map (Undefended) - Slice A



Order Details

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Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

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0 400 m

M M

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JBA 200 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

Contours (height in metres)

Standard Contour 105 100 95

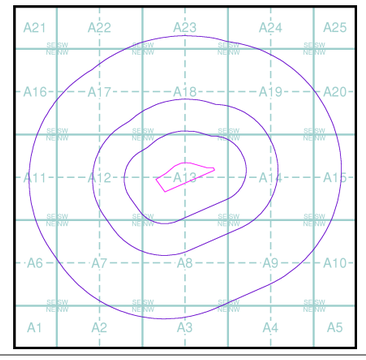
Master Contour

Spot Height 157.8

MLW Mean Low Water

MHW Mean High Water

JBA 200 Year Return Flood Map (Undefended) - Slice A



Order Details

Order Number:	167915730_1_1
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National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

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JBA 1000 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

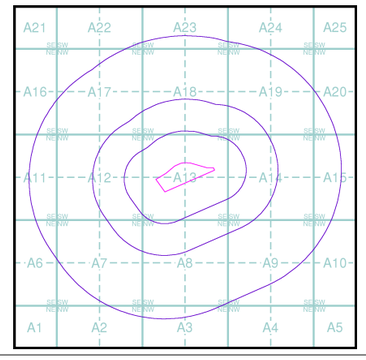
Contours (height in metres)

Standard Contour 105 100 95 — MLW Mean Low Water

Master Contour — MHW Mean High Water

Spot Height 157.8

JBA 1000 Year Return Flood Map (Undefended) - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
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JBA Canal Failure Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

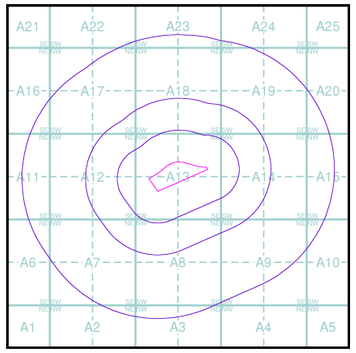
Flood Data

- Canal Failure
- Coverage

Contours (height in metres)

- Standard Contour 105
- Master Contour 100
- Spot Height *167.8
- MLW Mean Low Water
- MHW Mean High Water

JBA Canal Failure Flood Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

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EA/NRW Surface Water 30 Year Return Depth Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

Standard Contour 105 100 95

Master Contour

Spot Height *167.8

MLW Mean Low Water

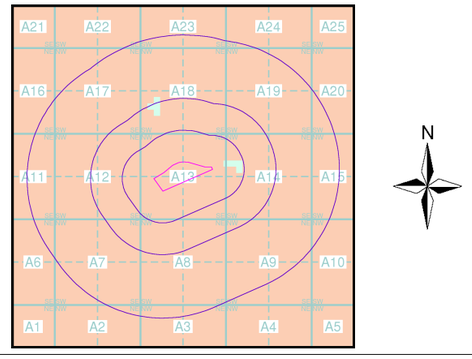
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

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EA/NRW Surface Water 100 Year Return Depth Map

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

Standard Contour 105 | Master Contour 100 95 | Spot Height *167.8

MLW Mean Low Water

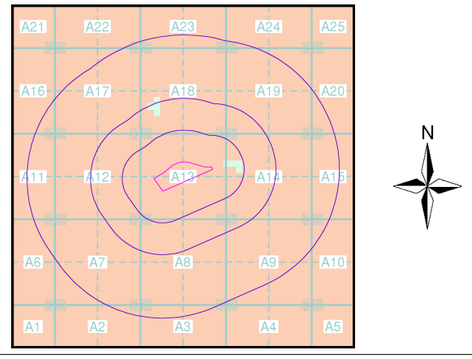
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

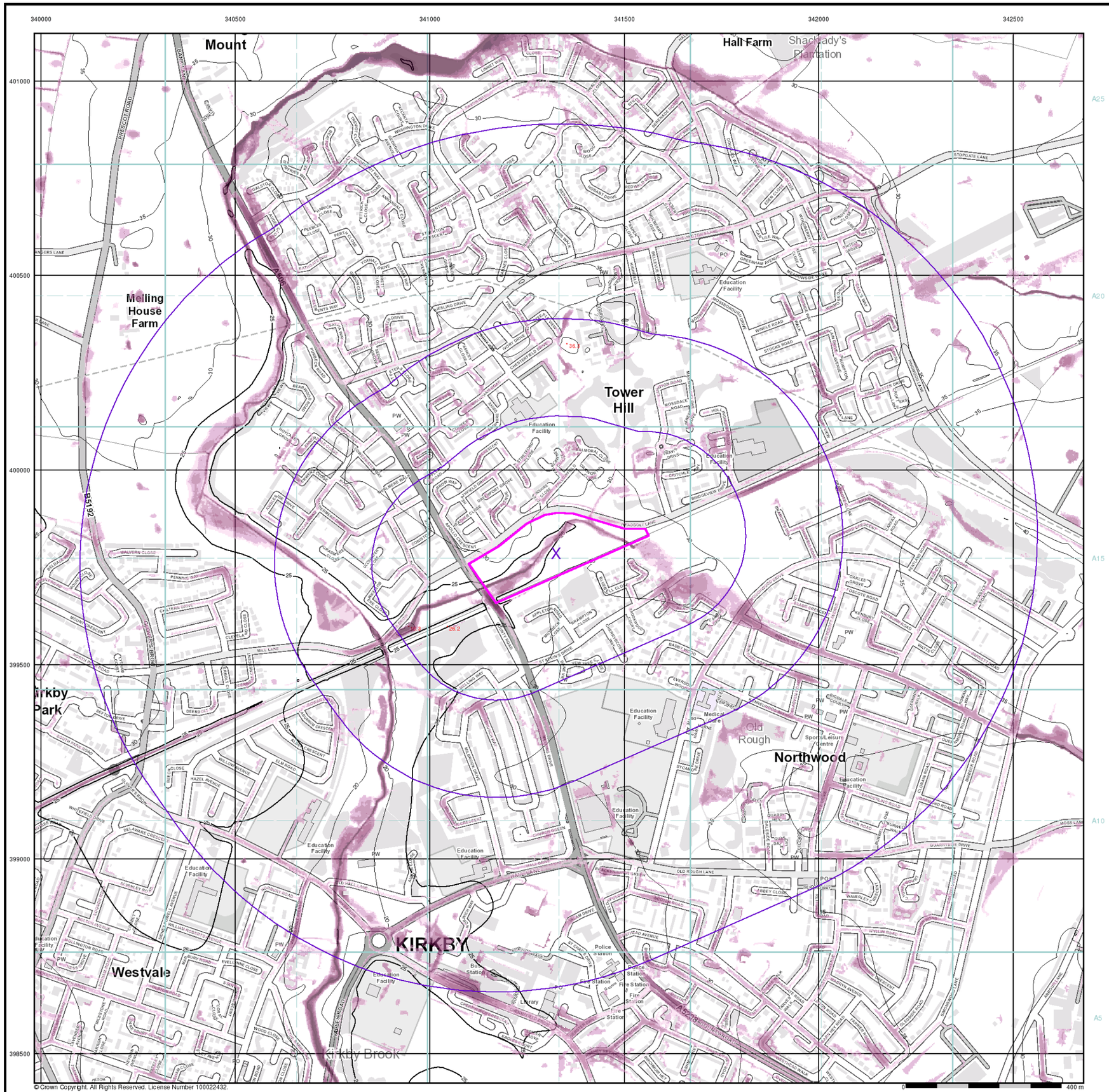
Order Number:	167915730_1_1
Customer Ref:	394359GE05
National Grid Reference:	341330, 399790
Slice:	A
Site Area (Ha):	5.08
Search Buffer (m):	1000

Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



M

M

MOTT MACDONALD

EA/NRW Surface Water 1000 Year Return Depth Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

Standard Contour 105 100 95

Master Contour

Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
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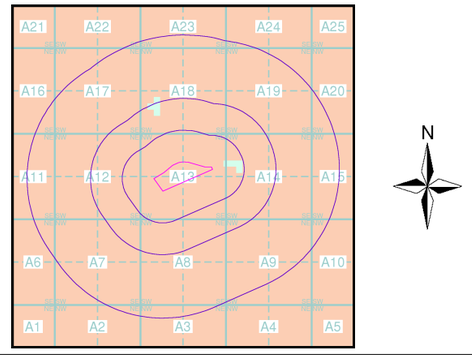
EA/NRW Suitability Map - Slice A



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M M

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EA/NRW Surface Water 30 Year Return Velocity and Flow Direction Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Velocity and Direction

- 0.00 - 0.25m/s
- 0.25 - 0.50m/s
- 0.50 - 1.00m/s
- 1.00 - 2.00m/s
- > 2.00m/s

Flow Direction at maximum velocity

Contours (height in metres)

Standard Contour 105 100 95

Master Contour

Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

Suitability

See the suitability map below

- National to county
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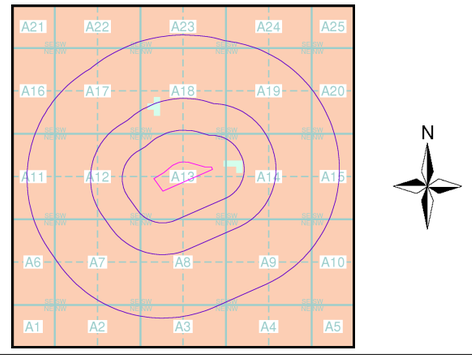
EA/NRW Suitability Map - Slice A



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EA/NRW Surface Water 100 Year Return Velocity and Flow Direction Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Velocity and Direction

- 0.00 - 0.25m/s
- 0.25 - 0.50m/s
- 0.50 - 1.00m/s
- 1.00 - 2.00m/s
- > 2.00m/s

Flow Direction at maximum velocity

Contours (height in metres)

Standard Contour 105 100 95

Master Contour

Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

Suitability

See the suitability map below

- National to county
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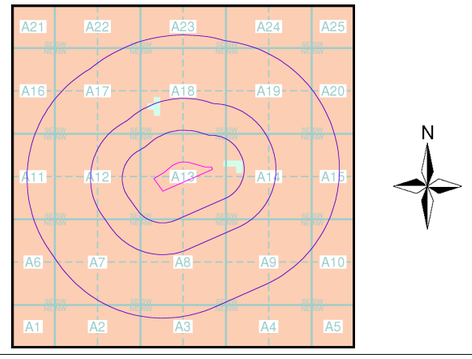
EA/NRW Suitability Map - Slice A



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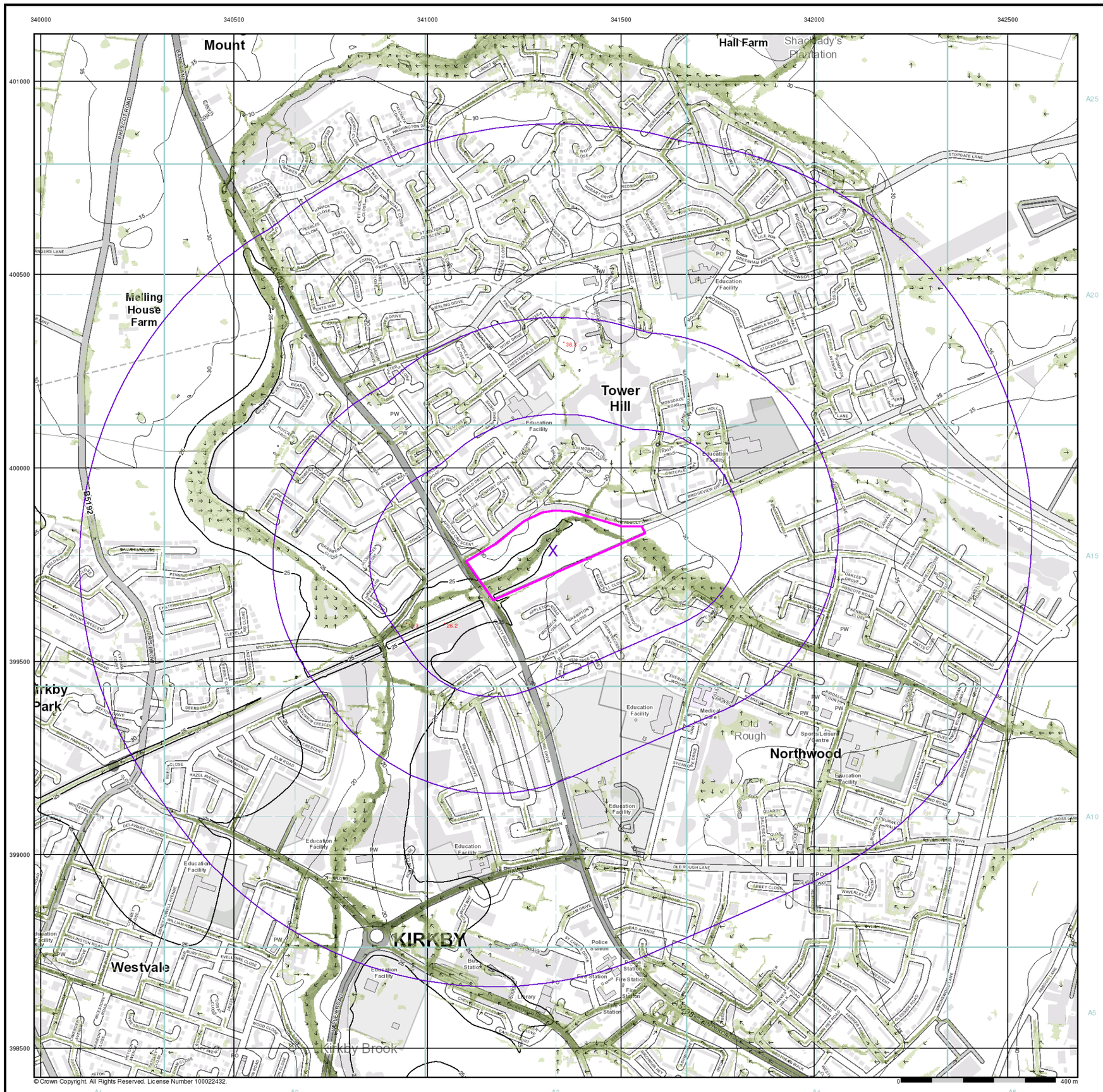

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EA/NRW Surface Water 1000 Year Return Velocity and Flow Direction Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Velocity and Direction

- 0.00 - 0.25m/s
- 0.25 - 0.50m/s
- 0.50 - 1.00m/s
- 1.00 - 2.00m/s
- > 2.00m/s

Flow Direction at maximum velocity

Contours (height in metres)

Standard Contour 105 100 95

Master Contour

Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

Suitability

See the suitability map below

- National to county
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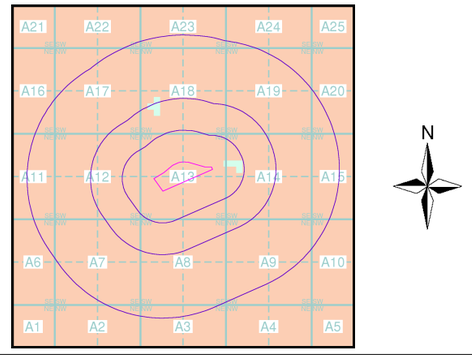
EA/NRW Suitability Map - Slice A



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EA/NRW Surface Water 30 Year Return Hazard Rating Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Hazard Rating

- Low (0.5 – 0.75)
- Moderate (0.75 – 1.25)
- Significant (1.25 – 2.0)
- Extreme (>2.0)

Contours (height in metres)

Standard Contour | Master Contour | Spot Height *167.8

MLW Mean Low Water

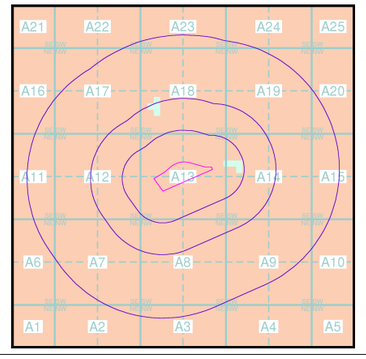
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



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340000
340500
341000
341500
342000
342500
401000
400500
400000
399500
399000
398500
A25
A20
A15
A10
A5
A1
A2
A3
A4
A5
Mount
Hall Farm
Shacklady's Plantation
Melling House Farm
Tower Hill
Education Facility
Old Rough
Northwood
Sports/Leisure Centre
Medical Centre
KIRKBY
Westvale
Kirkby Park
Kirkby Brook
Police Station
Fire Station
Library
Bus Station
PO
PW
B5192
A5208
Prescot Road
Bank Lane
Stonoate Lane
Old Rough Lane
Main Lane
Northwood Avenue
Broadway
Glovers Brook
Malvern Close
Pennine Way
Chatern Drive
Mill Lane
Deerbolt Rd
Delaware Crescent
Alwalley Road
Jubilee Road
Jubilee Way
Cherryfield Drive
Whitefield Drive
Quarryside Drive
Moss Lane
Wyllin Road
Abbey Close
Waverley Crescent
Woodlands Avenue
Woodland Avenue
Windle Road
Stocks Road
Whitefield Road
Mossdale Road
Ashton Road
Dorchester Drive
Lyndhurst Road
Hillfield Drive
Hillcrest Drive
Hillside Drive
Hillsborough Drive
Hillsborough Avenue
Hillsborough Road
Hillsborough Crescent
Hillsborough Close
Hillsborough Way
Hillsborough Gardens
Hillsborough Grove
Hillsborough Mews
Hillsborough Court
Hillsborough Walk
Hillsborough Park
Hillsborough Rise
Hillsborough Terrace
Hillsborough Place
Hillsborough Square
Hillsborough Lane



M

M

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EA/NRW Surface Water 1000 Year Return Hazard Rating Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Hazard Rating

- Low (0.5 – 0.75)
- Moderate (0.75 – 1.25)
- Significant (1.25 – 2.0)
- Extreme (>2.0)

Contours (height in metres)

Standard Contour | Master Contour | Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

Suitability

See the suitability map below

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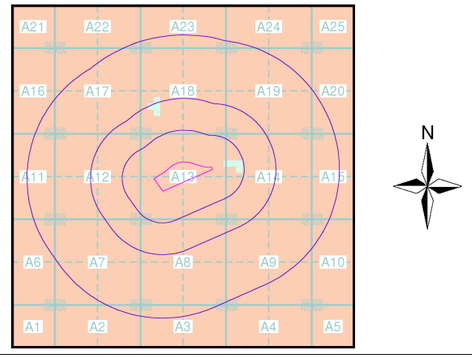
- Property

EA/NRW Suitability Map - Slice A



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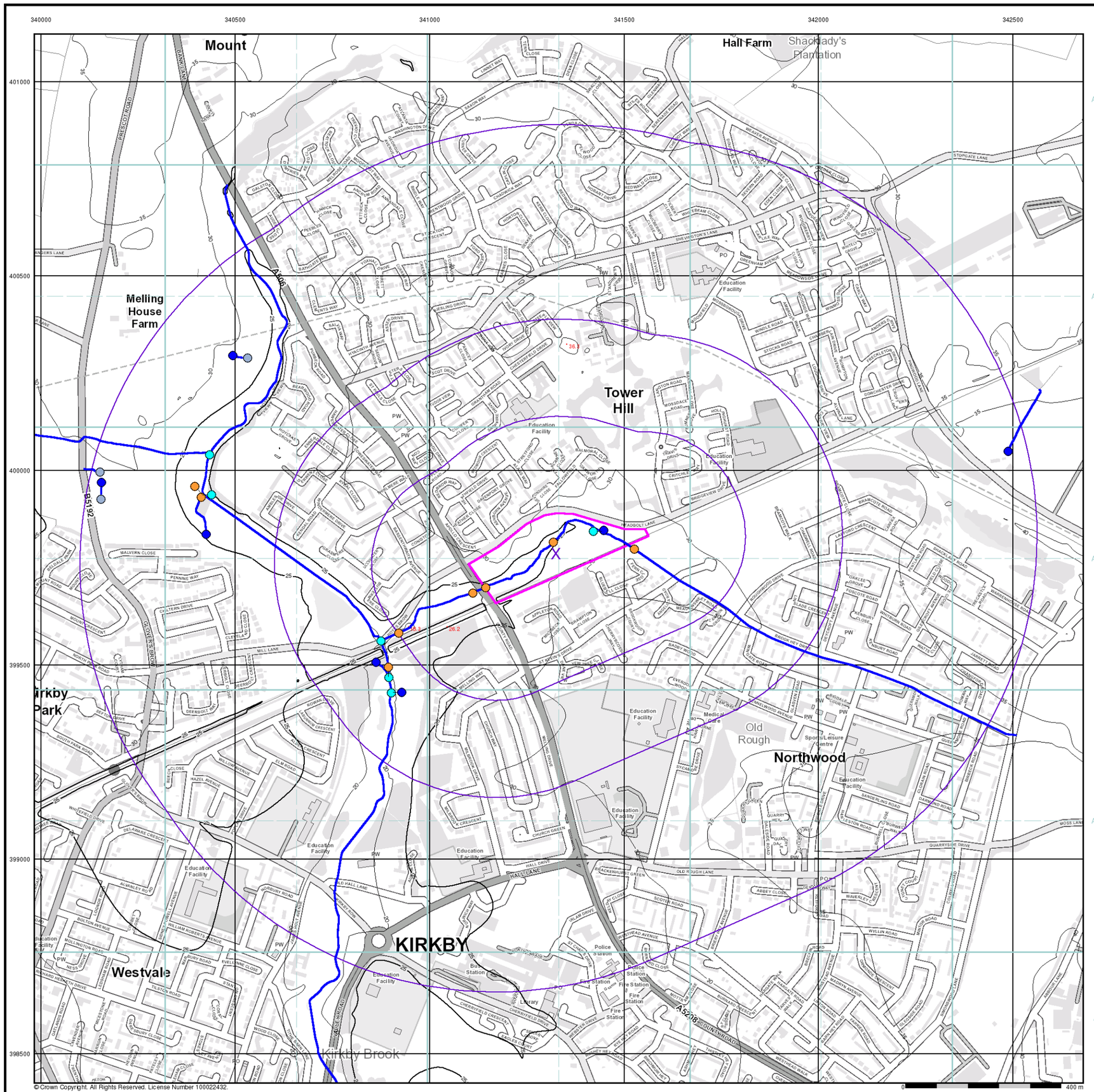

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OS Water Network Lines Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

OS Water Network Data

- Canal
- Reservoir
- Foreshore
- Marsh
- Tidal River
- Inland River
- Drain
- Other
- Lake
- Transfer
- Lock Or Flight Of Locks
- Sea
- Junction
- Outlet
- Pseudo
- Source
- Other

Contours (height in meters)

Standard Contour 105 100 95

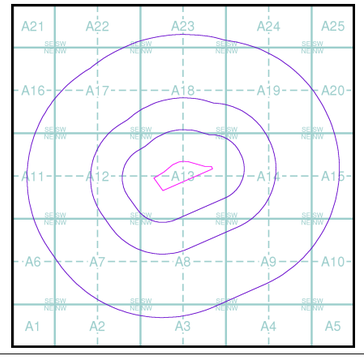
Master Contour

Spot Height *167.3

MLW Mean Low Water

MHW Mean High Water

OS Water Network Map - Slice A



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Slice:	A
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M M

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EA/NRW Historic Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID

Historic Flood Events Data

- Channel Capacity Exceeded (no raised defences)
- Channel Capacity Exceeded /Surface Water
- Groundwater/High Water Table
- Local Drainage/Surface Water
- Mechanical Failure
- Obstruction/Blockage - Bridge
- Obstruction/Blockage - Channel
- Historical Flood Liabilities
- Obstruction/Blockage - Culvert
- Obstruction/Blockage - Debris Screen
- Operational Failure/ Breach of Defence
- Other
- Overtopping of Defences
- Surface Water
- Unknown

Contours (height in metres)

Standard Contour 105 100 95

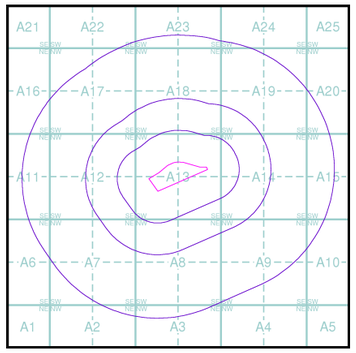
Master Contour

Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

EA/NRW Historic Flood Map - Slice A



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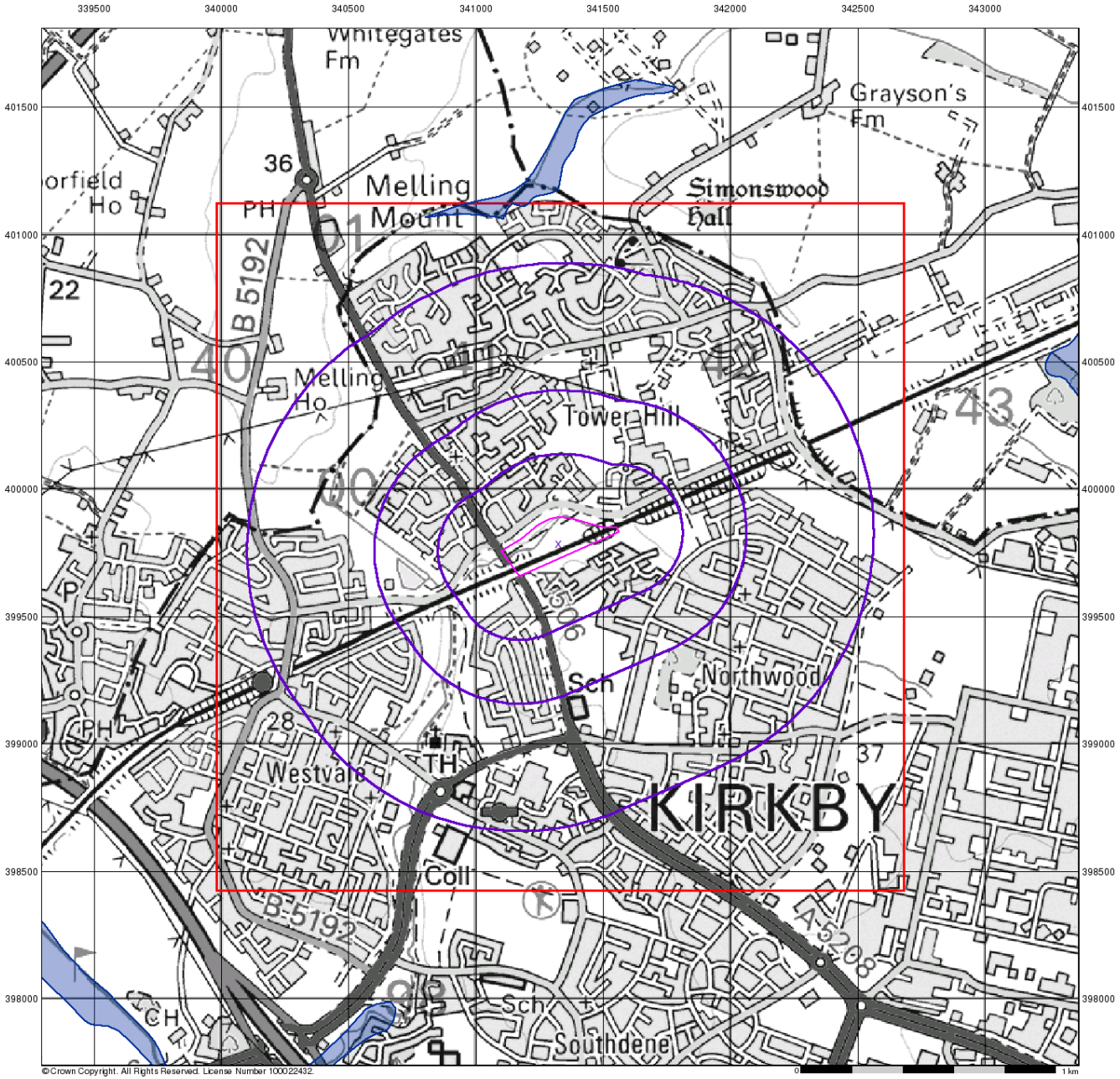


MOTT MACDONALD

BGS Flood Data (1:50,000)

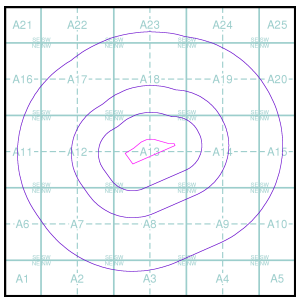
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

BGS Geological Indicators of Flooding

- Coastal
- Inland
- Bodies of Water

BGS Flood Data Map - Slice A



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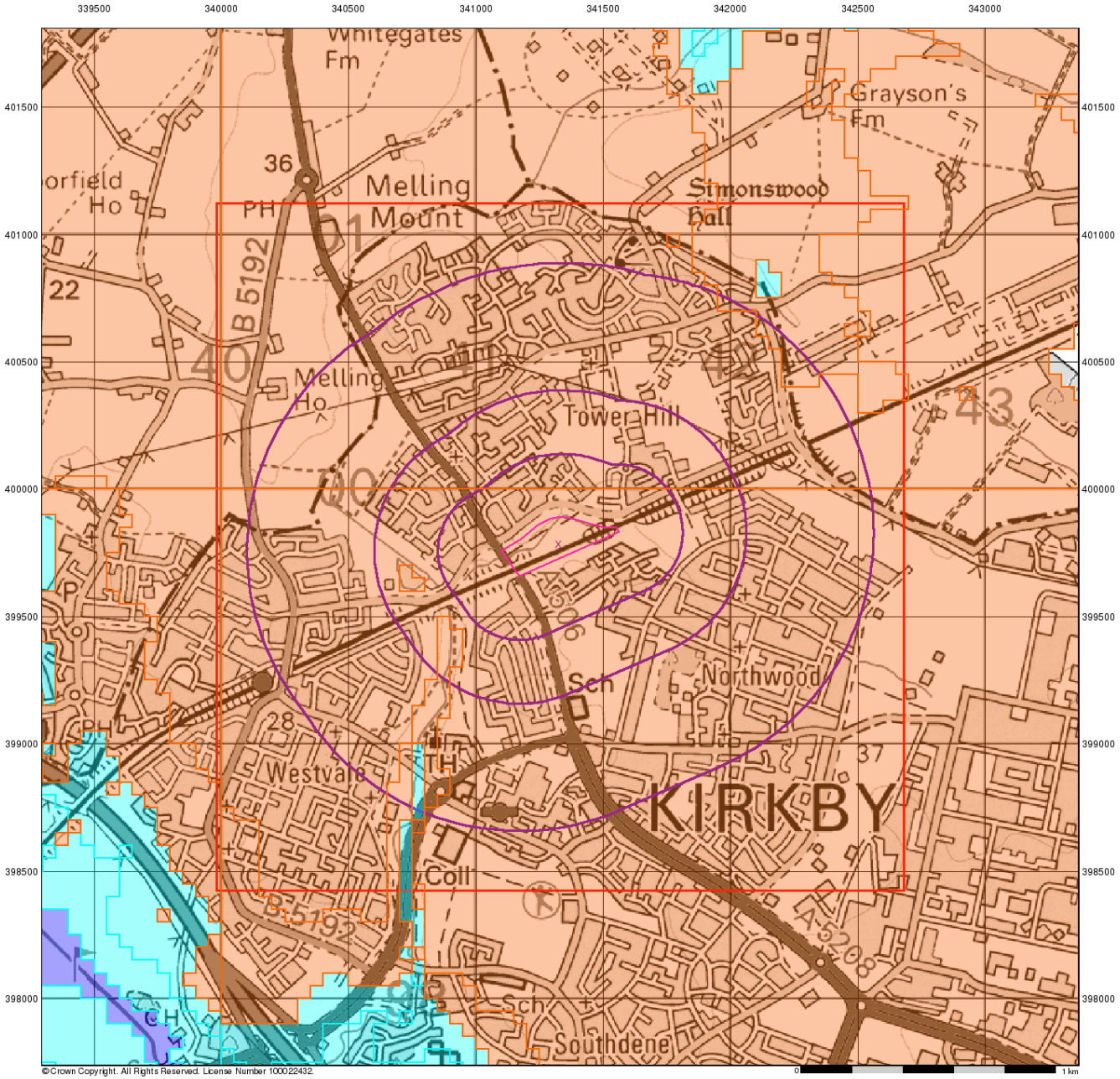
Site Details

Headbolt Lane Station, LIVERPOOL, L33 3AU



MOTT MACDONALD

BGS Flood Data (1:50,000)

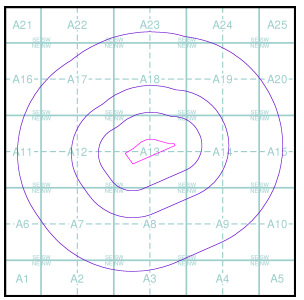
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

BGS Groundwater Flooding Susceptibility

- Potential for Groundwater Flooding to Occur at Surface
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Limited Potential for Groundwater Flooding to Occur

BGS Flood Data Map - Slice A



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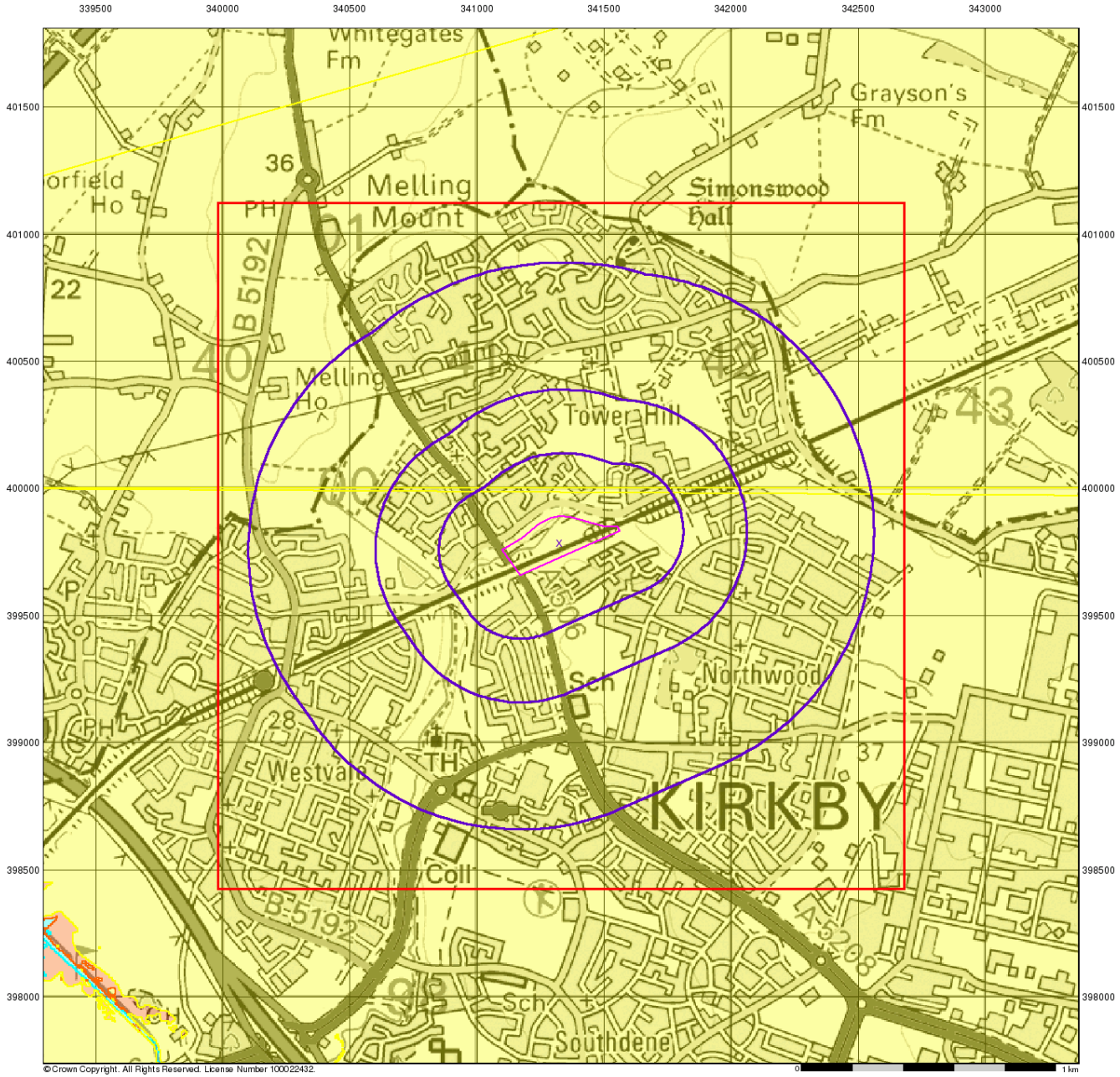

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GeoSmart Information Groundwater Flood Map (1:50,000)

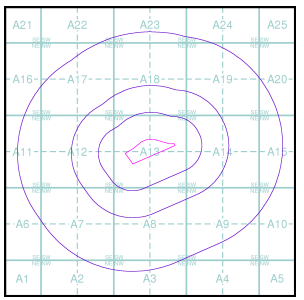
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

GeoSmart Information Groundwater Flooding Risk

- High Risk
- Moderate Risk
- Low Risk
- Negligible Risk

GeoSmart Information Groundwater Flood Map - Slice A



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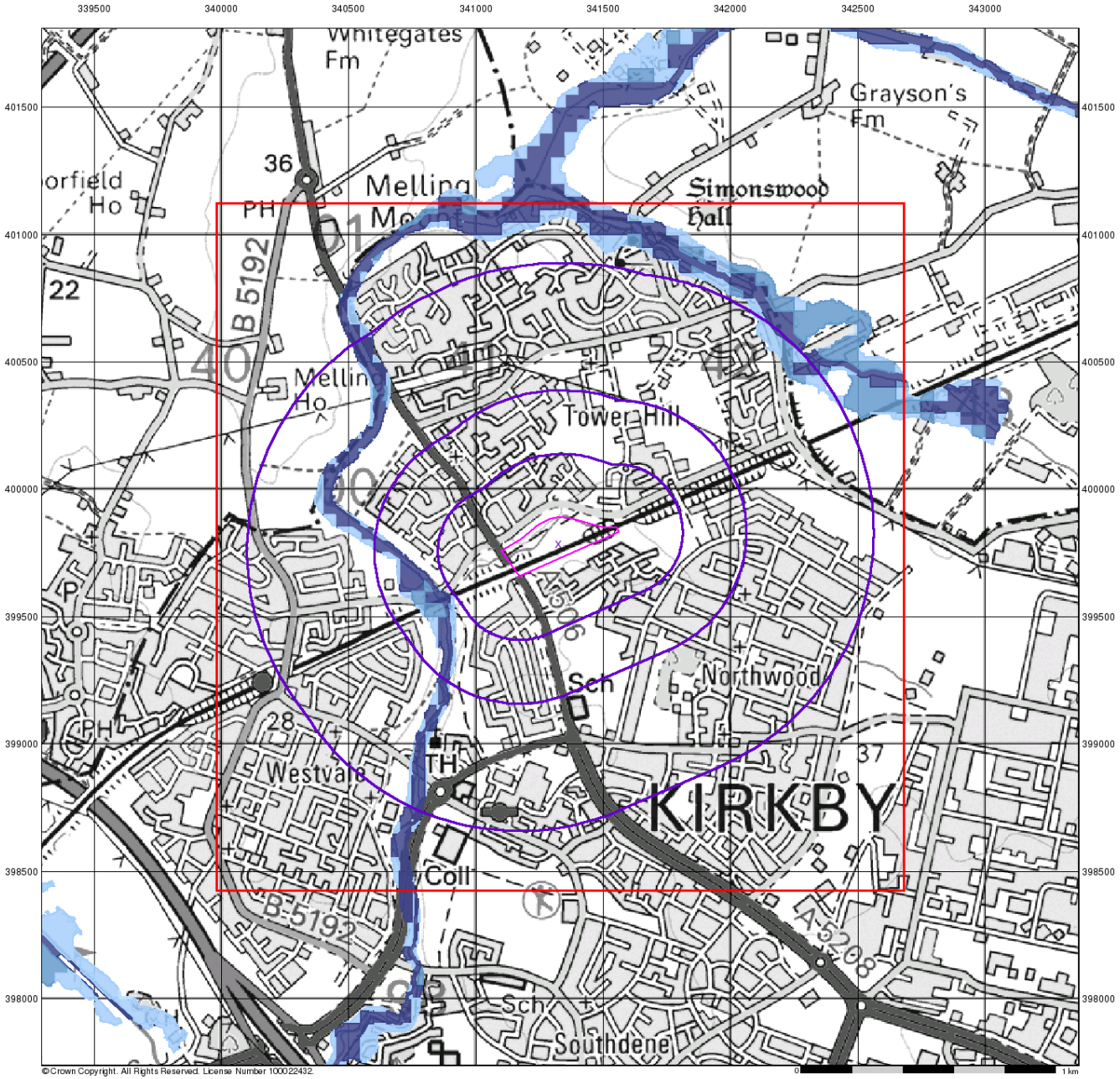

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EA/NRW RoFRS Data (1:50,000)

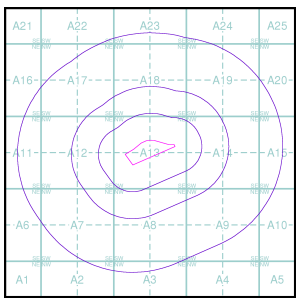
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Risk of Flooding from Rivers and Sea (RoFRS)

- High Risk
- Medium Risk
- Low Risk
- Very Low Risk

EA/NRW RoFRS Data Map - Slice A



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E. Network Rail Earthwork Inspection Records

Report for Embankment WKL2 28.1440 to 28.1539

A

SEHI Soil Embankment

Reference	WKL2_28.1440_U_341224_399704_23_01_2013_12_37_36
EHC	A

Location Information

Inspection 5 Chain Reference	WKL2_28.1430_U_341288_399718_05_03_2012_14_03_42				
ELR	WKL2				
Start Mileage (Miles.Yards)	28.1440	**End Mileage**	28.1539	**Side**	Up
Start Easting	341,267	**Northing**	399,720		
End Easting	341,181	**Northing**	399,688		
Length (Mile.Yards)	0.0099				
Start Connection	-				
End Connection	-				
Approach	False				
Structure Name	-				

Height Ranges

Start Height (m)	1.0	**End Height (m)**	5.0
Min. Height (m)	1.0	**Max. Height (m)**	5.0

Actual Geometry Information

	Slope Angle (deg)	**Slope Hyp (m)**	**Slope Height (m)**
Upper Slope	32.0	9.4	5.0
Middle Slope	0.0	0.0	0.0
Lower Slope	0.0	0.0	0.0

Actual Slope to Track Separation (m)	2.0

LIDAR Derived Geometry

LIDAR Adjacent Natural Slope Angle (deg.)	0
LIDAR Adjacent Natural Slope Direction	Not Inspected
LIDAR Maximum Height (m)	0.00
LIDAR Maximum Angle (deg.)	0

SEHI Soil Embankment

Scored Geometry (A-H) Information

(A) Slope Angle and Height	25 to <35 degrees, 3m to <10m High (A7)
(B) Slope Angle Adjacent to Earthwork	(-)ve falls away from earthwork (B1)
(D) Construction Activity	None (D1)
(E) Min. Slope to Track Separation	Embankment cess width 1-3m (E3)
(F) Historic Geology	Granular Glacial Till / Terrace Deposits / Blown Sand (F7)
(FF) Bedrock Geology	General Competent Rock (FF11)
(FF) Drift Geology	Granular Glacial Till / Terrace Deposits / Blown Sand (FF7)
BGS Superficial Geology	-
BGS Bedrock Geology	-
(G) Slope Composition at Crest	Fine granular / Ash (G2)
(H) Slope Composition at Toe	Fine granular / Ash (H3)
Boulders Present?	None Present
Rock Outcrops \ Faces Present?	None Present

Retaining Walls (C) Information

No Retaining Walls Present

Drainage (I-P) Information

(I) Slope Face Drainage Condition	Face dry (I1)
(J) Slope Toe Drainage Condition	Dry / free draining (J1)
(K) Sub-Drainage	Absent & not required (K1)
(L) Drainage of Adjacent Land	None (L1)
(M) Adjacent Catchment Depth	< 100m (M4)
(N) Adjacent Catchment Gradient	Slopes away from structure (N4)
(O) Catchment Surface	Grazed Pasture (O2)
(P) Catchment Geology	Mixed (P3)

SEHI Soil Embankment

Movement Indicators (Q-DD) Information

(Q) Slope Form of Earthwork	Uniform toe (Q1) And Uniform Crest (Q5)
(R) Geomorphology of Adjacent Land	No Significant Features (R3)
(S) Track Movements	No Significant Features (S4)
(T) Ballast	Maximum 0.5m <1.5m thickness, sleeper ends covered (T3)
(U) Troughing	No Significant Features or Absent (U5)
(V) Leaning Trees / Structures	Random (V2)
(W) Cracking	None (W1)
(X) Mass Movement	None (X1)
(Y) History of Instability	None (Y1)
(Z) Mining / Removal of Support	No Significant Features (Z2)
(AA) Animal Activity	Occasional Rabbit - <10 burrow holes /20sq.m (AA2)
(BB) Tree Cover	Occasional mature trees - <10 trees /20sq.m on slope angles >25degs. (BB4)
(CC) Ground Cover	Sparse grass / bramble cover (CC3) Dense grass / bramble cover (CC4)
(DD) Condition of Opposite Side Embankment	Adjacent ground falls away from toe of embankment or falls towards it at <5 degrees (DD1)

No Line Movement Indicators Present

No Point Movement Indicators Present

Intervention Works

Pre-Intervention SEHI	-115

No Linear Intervention Works Present

No Point Intervention Works Present

SEHI Soil Embankment

Photograph Information

ELR	Start Mileage	Up/Down Side	Photo Date	Photo Time
WKL2	28.1520	Up	09 March 2018	13:43

SEHI Soil Embankment

Examiner

Completed in Current Season	True	
Examined By	Phil McNerney, Amey (LNW)	
Examined Date	09 March 2018	13:46

Comments

Current Season Comments	Phil McNerney, Amey (LNW): 09/03/18: grade increasing to 5m emb, no mi□noted, uniform crest with small conc bag ballast retention, occ burrowing
Historic Comments	2013: EE: Rob Mullen, Amey (LNW): 23/01/13: Up to 5m high embankment; no significant defects noted.

CP4 SSHI

	Rot.	Trans.	Earth.	Wash.	Burrow.
Actual Score	4	4	3	4	24
Potential Score	26	34	45	44	75
SSHI	2.6	3.9	3.9	3.9	6.5

Earthworks Factor	1.3
Overall SSHI Score	6.5
SSHI Category	Marginal
CP5 Category	Marginal

EHC

SEHI	-115
EHC	A
Asset Examination Status	Full

EACB

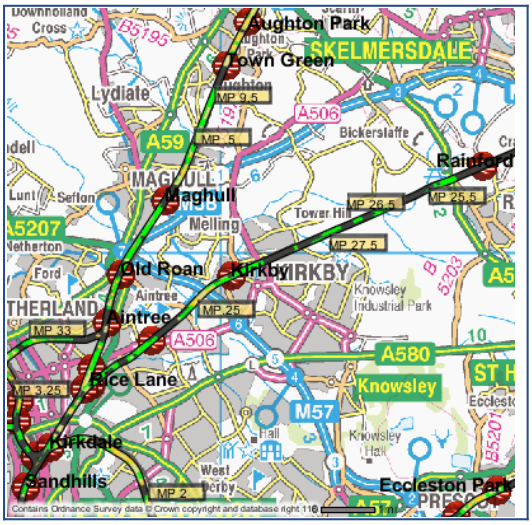
CCT Value	0.00020
EACB	1

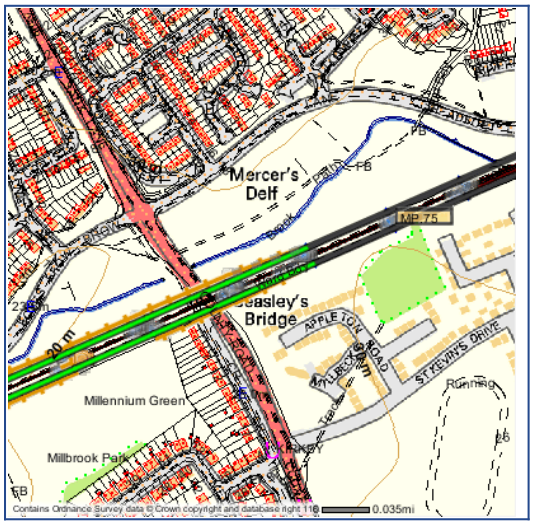
Asset Examination Frequency (Years)

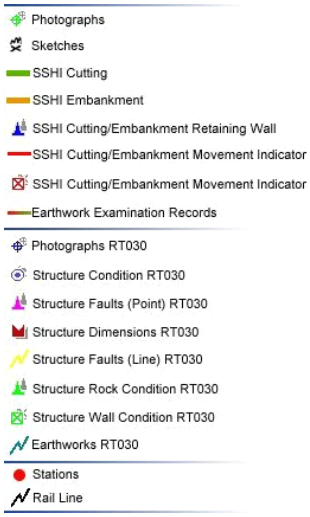
Scored Asset Examination Frequency	10
Reviewed Asset Examination Frequency	0
Overall Asset Examination Frequency	5

SEHI Soil Embankment

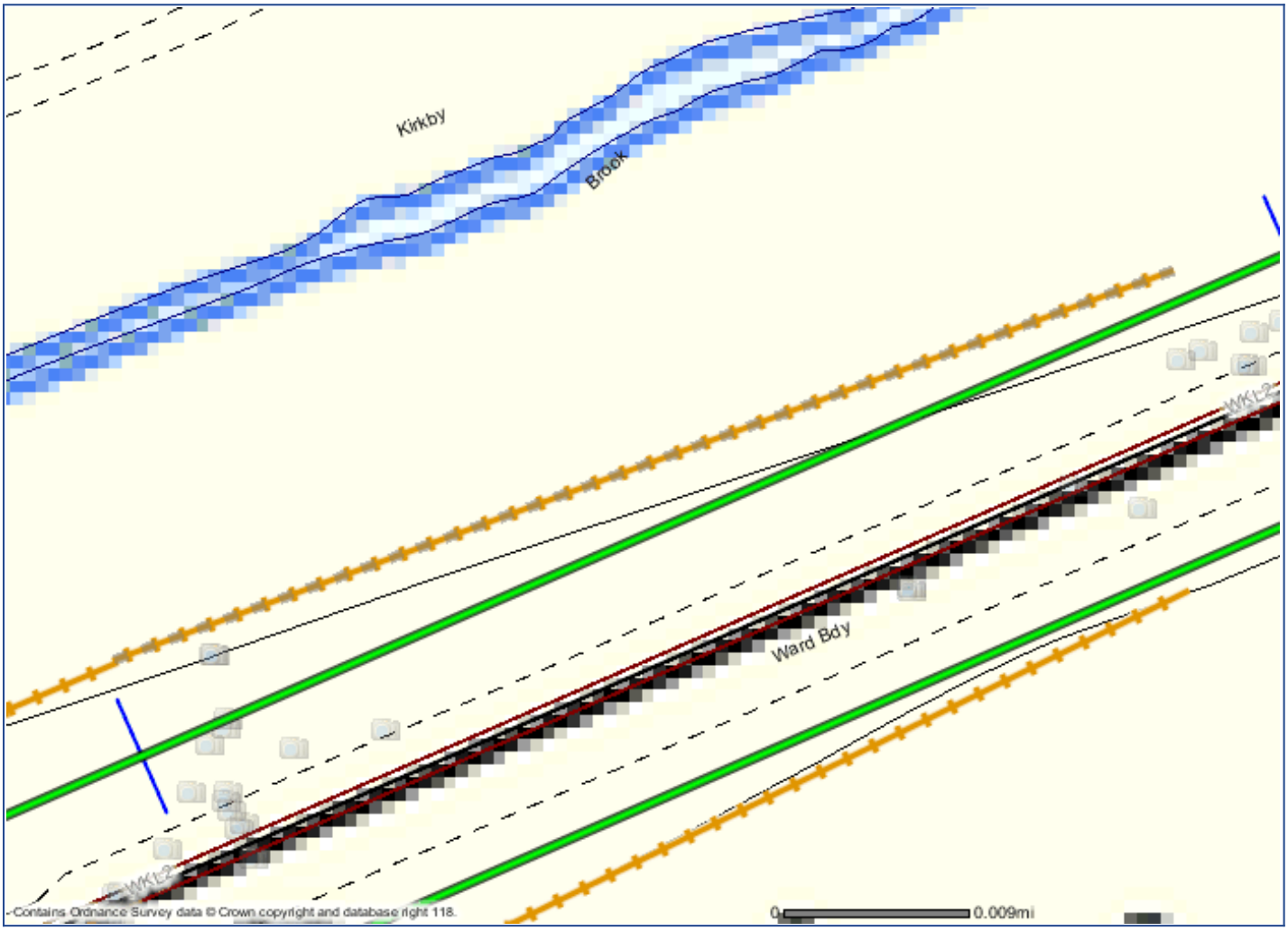
Overview Maps







Location Map



Report for Embankment WKL2 28.1450 to 28.1541

A

SEHI Soil Embankment

Reference	WKL2_28.1450_D_341231_399675_23_01_2013_12_38_14
EHC	A

Location Information

Inspection 5 Chain Reference	WKL2_28.1430_D_341182_399670_05_03_2012_11_43_32				
ELR	WKL2				
Start Mileage (Miles.Yards)	28.1450	**End Mileage**	28.1541	**Side**	Down
Start Easting	341,268	**Northing**	399,694		
End Easting	341,193	**Northing**	399,657		
Length (Mile.Yards)	0.0092				
Start Connection	-				
End Connection	-				
Approach	False				
Structure Name	-				

Height Ranges

Start Height (m)	1.0	**End Height (m)**	4.0
Min. Height (m)	1.0	**Max. Height (m)**	4.0

Actual Geometry Information

	Slope Angle (deg)	**Slope Hyp (m)**	**Slope Height (m)**
Upper Slope	32.0	7.5	4.0
Middle Slope	0.0	0.0	0.0
Lower Slope	0.0	0.0	0.0

Actual Slope to Track Separation (m)	4.0

LIDAR Derived Geometry

LIDAR Adjacent Natural Slope Angle (deg.)	0
LIDAR Adjacent Natural Slope Direction	Not Inspected
LIDAR Maximum Height (m)	0.00
LIDAR Maximum Angle (deg.)	0

SEHI Soil Embankment

Scored Geometry (A-H) Information

(A) Slope Angle and Height	25 to <35 degrees, 3m to <10m High (A7)
(B) Slope Angle Adjacent to Earthwork	(+)ve falls towards e/work 5 to 15 degs (B3)
(D) Construction Activity	None (D1)
(E) Min. Slope to Track Separation	Embankment cess width 3-6m (E2)
(F) Historic Geology	Granular Glacial Till / Terrace Deposits / Blown Sand (F7)
(FF) Bedrock Geology	Not Inspected
(FF) Drift Geology	Granular Glacial Till / Terrace Deposits / Blown Sand (FF7)
BGS Superficial Geology	-
BGS Bedrock Geology	-
(G) Slope Composition at Crest	Fine granular / Ash (G2)
(H) Slope Composition at Toe	Unknown (H8)
Boulders Present?	Not Inspected
Rock Outcrops \ Faces Present?	None Present

Retaining Walls (C) Information

No Retaining Walls Present

Drainage (I-P) Information

(I) Slope Face Drainage Condition	Face dry (I1)
(J) Slope Toe Drainage Condition	Dry / free draining (J1)
(K) Sub-Drainage	Absent & not required (K1)
(L) Drainage of Adjacent Land	None (L1)
(M) Adjacent Catchment Depth	100m to 1km (M3)
(N) Adjacent Catchment Gradient	5-25degs. (N2)
(O) Catchment Surface	Rough Grass (O1) Residential (O6)
(P) Catchment Geology	Mixed (P3)

SEHI Soil Embankment

Movement Indicators (Q-DD) Information

(Q) Slope Form of Earthwork	Uniform toe (Q1) And Uniform Crest (Q5)
(R) Geomorphology of Adjacent Land	No Significant Features (R3)
(S) Track Movements	No Significant Features (S4)
(T) Ballast	Maximum 0.5m <1.5m thickness, sleeper ends covered (T3)
(U) Troughing	No Significant Features or Absent (U5)
(V) Leaning Trees / Structures	Random (V2)
(W) Cracking	None (W1)
(X) Mass Movement	None (X1)
(Y) History of Instability	None (Y1)
(Z) Mining / Removal of Support	No Significant Features (Z2)
(AA) Animal Activity	None observed (AA1)
(BB) Tree Cover	Occasional mature trees - <10 trees /20sq.m on slope angles >25degs. (BB4)
(CC) Ground Cover	Dense grass / bramble cover (CC4)
(DD) Condition of Opposite Side Embankment	Adjacent ground falls away from toe of embankment or falls towards it at <5 degrees (DD1)

No Line Movement Indicators Present
No Point Movement Indicators Present

Intervention Works

Pre-Intervention SEHI	-135

No Linear Intervention Works Present
No Point Intervention Works Present

SEHI Soil Embankment

Photograph Information

No Photograph Information

SEHI Soil Embankment

Examiner

Completed in Current Season	False	
Examined By	Rob Mullen, Amey (LNW)	
Examined Date	23 January 2013	12:41

Comments

Current Season Comments	-
Historic Comments	2013: EE: Rob Mullen, Amey (LNW): 23/01/13: Up to 4m high embankment; no significant defects noted.

CP4 SSHI

	Rot.	Trans.	Earth.	Wash.	Burrow.
Actual Score	4	4	3	4	-21
Potential Score	33	34	40	57	40
SSHI	3.9	3.9	3.9	3.9	3.9

Earthworks Factor	1.3
Overall SSHI Score	3.9
SSHI Category	Serviceable
CP5 Category	Serviceable

EHC

SEHI	-135
EHC	A
Asset Examination Status	Full

EACB

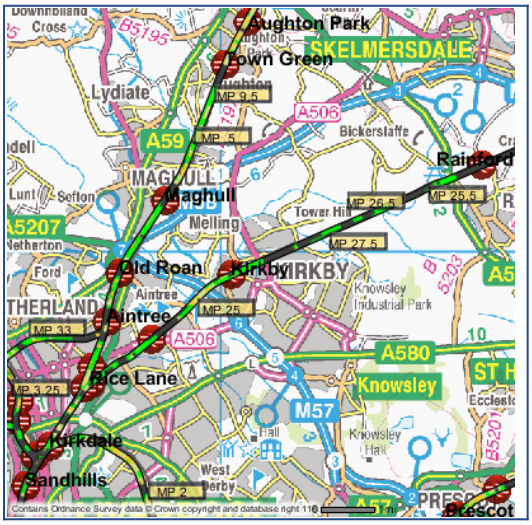
CCT Value	0.00020
EACB	1

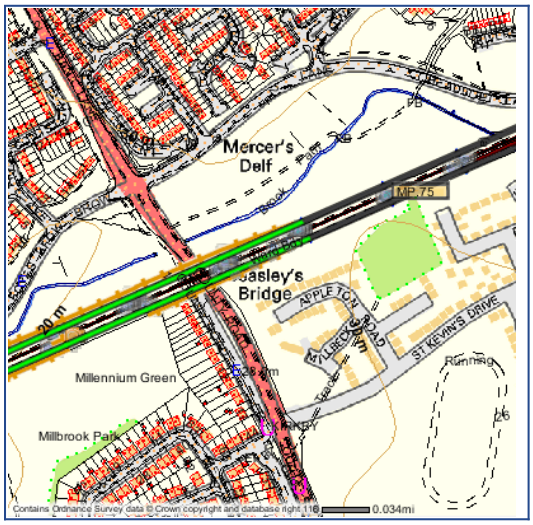
Asset Examination Frequency (Years)

Scored Asset Examination Frequency	10
Reviewed Asset Examination Frequency	0
Overall Asset Examination Frequency	10

SEHI Soil Embankment

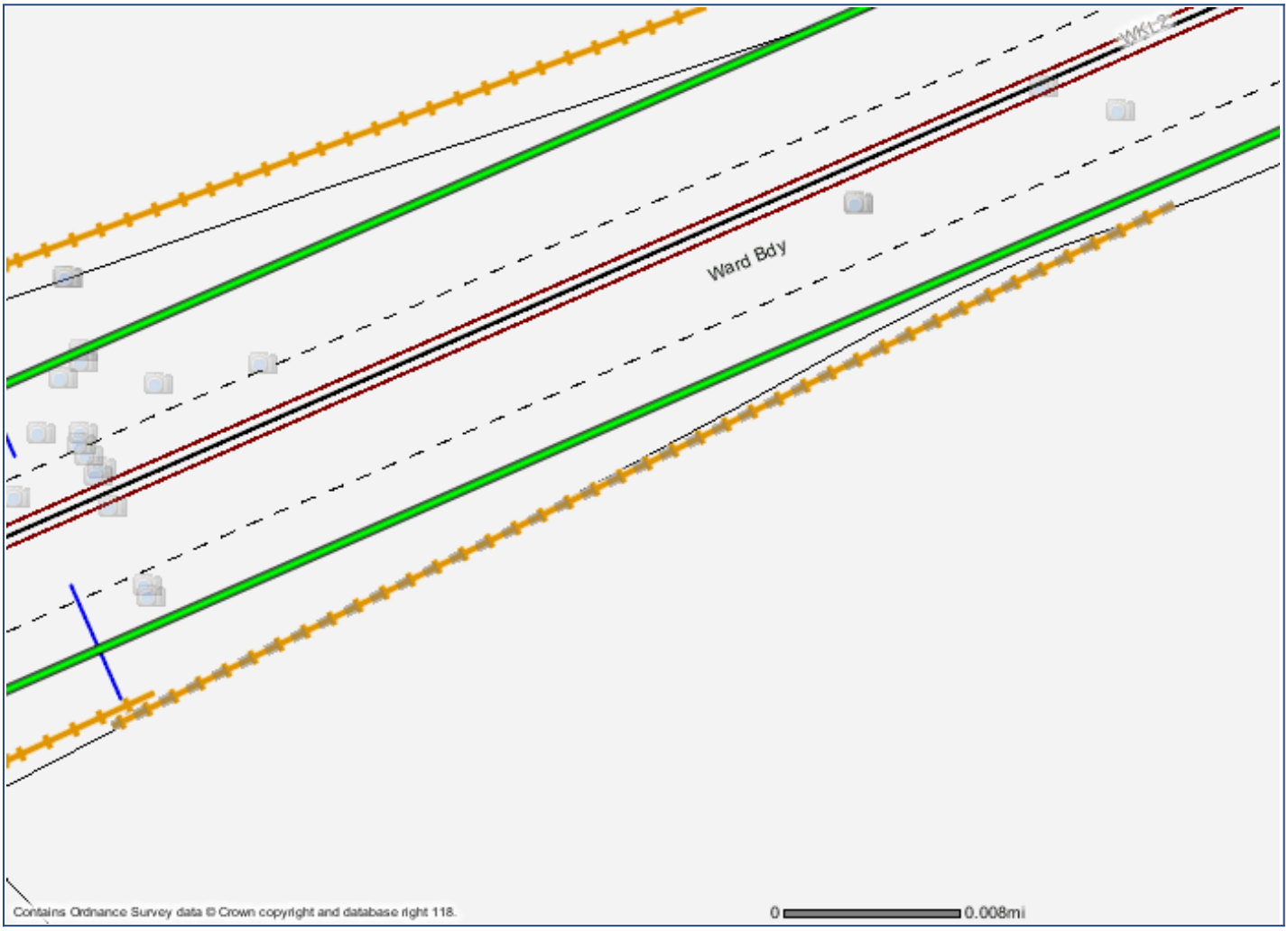
Overview Maps





- Photographs
- Sketches
- SSHI Cutting
- SSHI Embankment
- SSHI Cutting/Embankment Retaining Wall
- SSHI Cutting/Embankment Movement Indicator
- SSHI Cutting/Embankment Movement Indicator
- Earthwork Examination Records
- Photographs RT030
- Structure Condition RT030
- Structure Faults (Point) RT030
- Structure Dimensions RT030
- Structure Faults (Line) RT030
- Structure Rock Condition RT030
- Structure Wall Condition RT030
- Earthworks RT030
- Stations
- Rail Line

Location Map



Report for Embankment WKL2 28.1538 to 28.1651

A

SEHI Soil Embankment

Reference	WKL2_28.1538_D_341149_399637_23_01_2013_12_12_04
EHC	A

Location Information

Inspection 5 Chain Reference	WKL2_28.1540_D_341092_399627_05_03_2012_11_39_46				
ELR	WKL2				
Start Mileage (Miles.Yards)	28.1538	**End Mileage**	28.1651	**Side**	Down
Start Easting	341,196	**Northing**	399,659		
End Easting	341,101	**Northing**	399,616		
Length (Mile.Yards)	0.0113				
Start Connection	-				
End Connection	-				
Approach	False				
Structure Name	-				

Height Ranges

Start Height (m)	4.0	**End Height (m)**	5.0
Min. Height (m)	4.0	**Max. Height (m)**	5.0

Actual Geometry Information

	Slope Angle (deg)	**Slope Hyp (m)**	**Slope Height (m)**
Upper Slope	32.0	9.4	5.0
Middle Slope	0.0	0.0	0.0
Lower Slope	0.0	0.0	0.0

Actual Slope to Track Separation (m)	4.0

LIDAR Derived Geometry

LIDAR Adjacent Natural Slope Angle (deg.)	0
LIDAR Adjacent Natural Slope Direction	Not Inspected
LIDAR Maximum Height (m)	0.00
LIDAR Maximum Angle (deg.)	0

SEHI Soil Embankment

Scored Geometry (A-H) Information

(A) Slope Angle and Height	25 to <35 degrees, 3m to <10m High (A7)
(B) Slope Angle Adjacent to Earthwork	(+)ve falls towards e/work <5 degrees (B2)
(D) Construction Activity	None (D1)
(E) Min. Slope to Track Separation	Embankment cess width 3-6m (E2)
(F) Historic Geology	Granular Glacial Till / Terrace Deposits / Blown Sand (F7)
(FF) Bedrock Geology	Not Inspected
(FF) Drift Geology	Granular Glacial Till / Terrace Deposits / Blown Sand (FF7)
BGS Superficial Geology	-
BGS Bedrock Geology	-
(G) Slope Composition at Crest	Fine granular / Ash (G2)
(H) Slope Composition at Toe	Unknown (H8)
Boulders Present?	Not Inspected
Rock Outcrops \ Faces Present?	None Present

Retaining Walls (C) Information

No Retaining Walls Present

Drainage (I-P) Information

(I) Slope Face Drainage Condition	Face dry (I1)
(J) Slope Toe Drainage Condition	Dry / free draining (J1)
(K) Sub-Drainage	Absent & not required (K1)
(L) Drainage of Adjacent Land	None (L1)
(M) Adjacent Catchment Depth	100m to 1km (M3)
(N) Adjacent Catchment Gradient	< 5degs. (N3)
(O) Catchment Surface	Rough Grass (O1) Industrial/Hardstanding (O7)
(P) Catchment Geology	Mixed (P3)

SEHI Soil Embankment

Movement Indicators (Q-DD) Information

(Q) Slope Form of Earthwork	Uniform toe (Q1) And Uniform Crest (Q5)
(R) Geomorphology of Adjacent Land	No Significant Features (R3)
(S) Track Movements	No Significant Features (S4)
(T) Ballast	Maximum 0.5m <1.5m thickness, sleeper ends covered (T3)
(U) Troughing	No Significant Features or Absent (U5)
(V) Leaning Trees / Structures	Random (V2)
(W) Cracking	None (W1)
(X) Mass Movement	None (X1)
(Y) History of Instability	None (Y1)
(Z) Mining / Removal of Support	No Significant Features (Z2)
(AA) Animal Activity	None observed (AA1)
(BB) Tree Cover	Occasional mature trees - <10 trees /20sq.m on slope angles >25degs. (BB4)
(CC) Ground Cover	Dense grass / bramble cover (CC4)
(DD) Condition of Opposite Side Embankment	Adjacent ground falls away from toe of embankment or falls towards it at <5 degrees (DD1)

No Line Movement Indicators Present
No Point Movement Indicators Present

Intervention Works

Pre-Intervention SEHI	-105

No Linear Intervention Works Present
No Point Intervention Works Present

SEHI Soil Embankment

Photograph Information

No Photograph Information

SEHI Soil Embankment

Examiner

Completed in Current Season	False	
Examined By	Rob Mullen, Amey (LNW)	
Examined Date	23 January 2013	12:25

Comments

Current Season Comments	-
Historic Comments	2013: EE: Rob Mullen, Amey (LNW): 23/01/13: ~5m high embankment; no significant defects noted.

CP4 SSHI

	Rot.	Trans.	Earth.	Wash.	Burrow.
Actual Score	4	4	3	4	-21
Potential Score	30	34	40	54	40
SSHI	2.6	3.9	3.9	3.9	3.9

Earthworks Factor	1.3
Overall SSHI Score	3.9
SSHI Category	Serviceable
CP5 Category	Serviceable

EHC

SEHI	-105
EHC	A
Asset Examination Status	Full

EACB

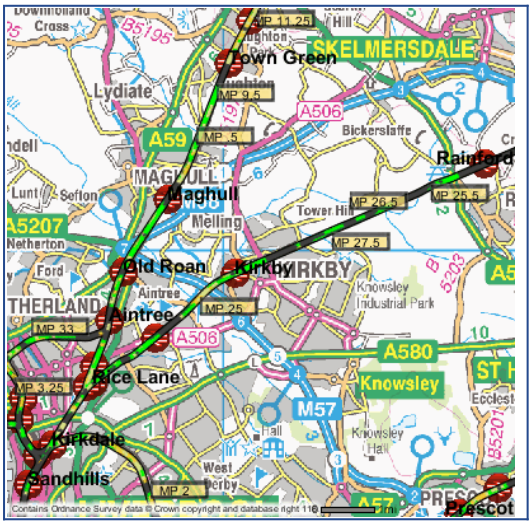
CCT Value	0.00030
EACB	1

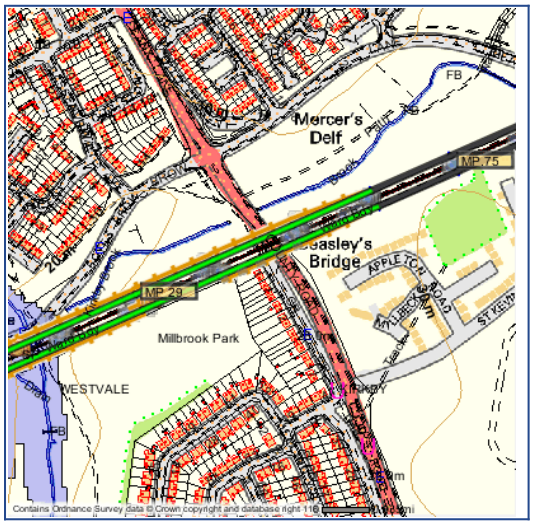
Asset Examination Frequency (Years)

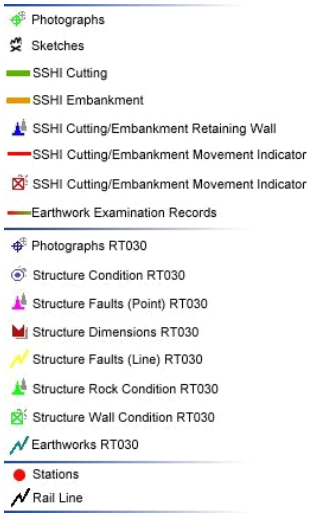
Scored Asset Examination Frequency	10
Reviewed Asset Examination Frequency	0
Overall Asset Examination Frequency	10

SEHI Soil Embankment

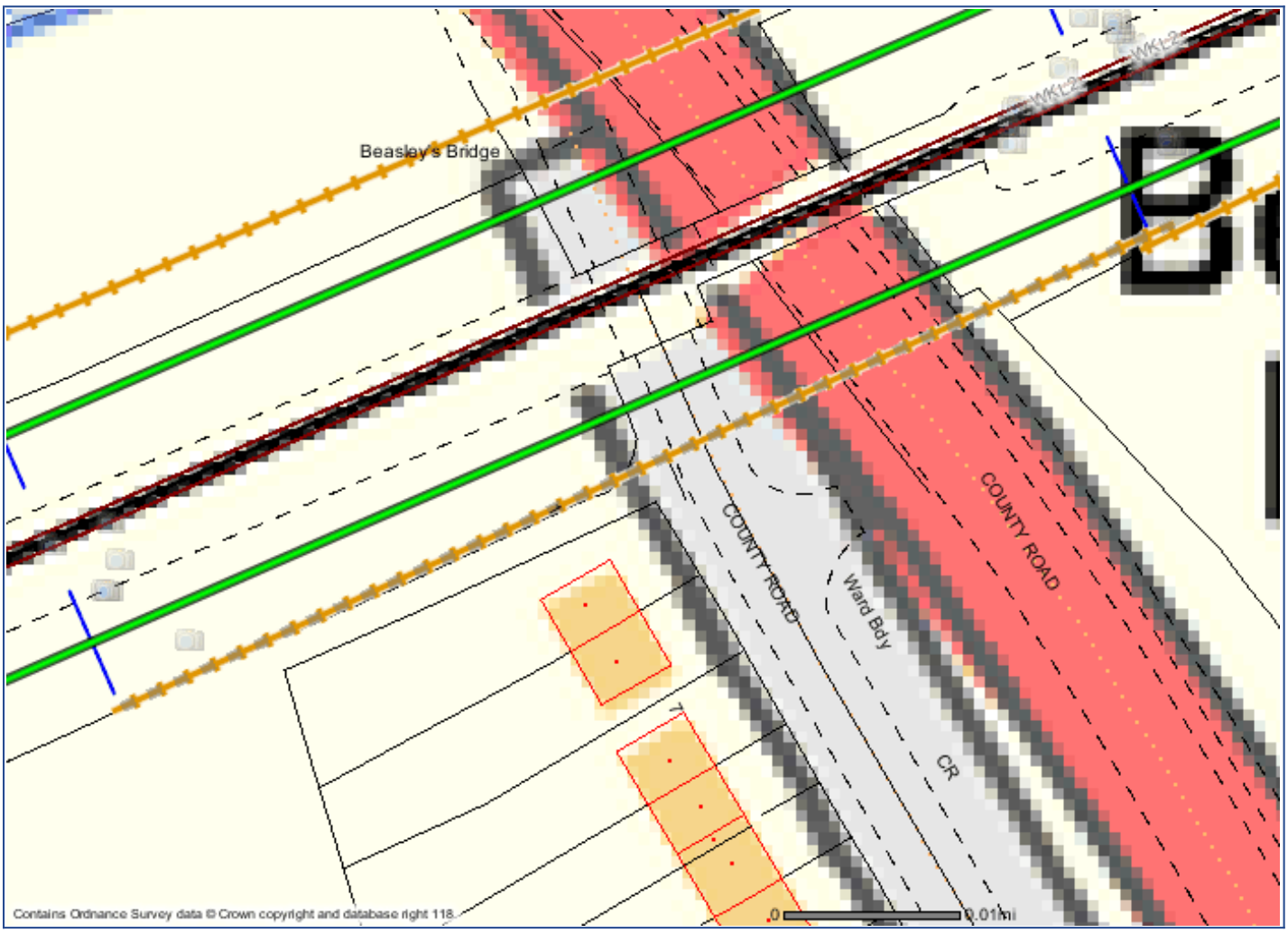
Overview Maps







Location Map



Report for Embankment WKL2 28.1539 to 28.1652

A

SEHI Soil Embankment

Reference	WKL2_28.1539_U_341134_399668_23_01_2013_12_11_18
EHC	A

Location Information

Inspection 5 Chain Reference	WKL2_28.1540_U_341191_399675_05_03_2012_14_08_31				
ELR	WKL2				
Start Mileage (Miles.Yards)	28.1539	**End Mileage**	28.1652	**Side**	Up
Start Easting	341,182	**Northing**	399,688		
End Easting	341,087	**Northing**	399,647		
Length (Mile.Yards)	0.0113				
Start Connection	-				
End Connection	-				
Approach	False				
Structure Name	-				

Height Ranges

Start Height (m)	4.0	**End Height (m)**	5.0
Min. Height (m)	4.0	**Max. Height (m)**	5.0

Actual Geometry Information

	Slope Angle (deg)	**Slope Hyp (m)**	**Slope Height (m)**
Upper Slope	32.0	9.4	5.0
Middle Slope	0.0	0.0	0.0
Lower Slope	0.0	0.0	0.0

Actual Slope to Track Separation (m)	3.0

LIDAR Derived Geometry

LIDAR Adjacent Natural Slope Angle (deg.)	0
LIDAR Adjacent Natural Slope Direction	Not Inspected
LIDAR Maximum Height (m)	0.00
LIDAR Maximum Angle (deg.)	0

SEHI Soil Embankment

Scored Geometry (A-H) Information

(A) Slope Angle and Height	25 to <35 degrees, 3m to <10m High (A7)
(B) Slope Angle Adjacent to Earthwork	(-)ve falls away from earthwork (B1)
(D) Construction Activity	None (D1)
(E) Min. Slope to Track Separation	Embankment cess width 3-6m (E2)
(F) Historic Geology	Granular Glacial Till / Terrace Deposits / Blown Sand (F7)
(FF) Bedrock Geology	General Competent Rock (FF11)
(FF) Drift Geology	Granular Glacial Till / Terrace Deposits / Blown Sand (FF7)
BGS Superficial Geology	-
BGS Bedrock Geology	-
(G) Slope Composition at Crest	Fine granular / Ash (G2)
(H) Slope Composition at Toe	Fine granular / Ash (H3)
Boulders Present?	None Present
Rock Outcrops \ Faces Present?	None Present

Retaining Walls (C) Information

No Retaining Walls Present

Drainage (I-P) Information

(I) Slope Face Drainage Condition	Face dry (I1)
(J) Slope Toe Drainage Condition	Dry / free draining (J1)
(K) Sub-Drainage	Absent & not required (K1)
(L) Drainage of Adjacent Land	None (L1)
(M) Adjacent Catchment Depth	< 100m (M4)
(N) Adjacent Catchment Gradient	Slopes away from structure (N4)
(O) Catchment Surface	Grazed Pasture (O2) Industrial/Hardstanding (O7)
(P) Catchment Geology	Mixed (P3)

SEHI Soil Embankment

Movement Indicators (Q-DD) Information

(Q) Slope Form of Earthwork	Uniform toe (Q1) And Uniform Crest (Q5)
(R) Geomorphology of Adjacent Land	No Significant Features (R3)
(S) Track Movements	No Significant Features (S4)
(T) Ballast	Maximum 0.5m <1.5m thickness, sleeper ends covered (T3)
(U) Troughing	No Significant Features or Absent (U5)
(V) Leaning Trees / Structures	Random (V2)
(W) Cracking	None (W1)
(X) Mass Movement	None (X1)
(Y) History of Instability	None (Y1)
(Z) Mining / Removal of Support	No Significant Features (Z2)
(AA) Animal Activity	Occasional Rabbit - <10 burrow holes /20sq.m (AA2)
(BB) Tree Cover	Occasional mature trees - <10 trees /20sq.m on slope angles >25degs. (BB4)
(CC) Ground Cover	Sparse grass / bramble cover (CC3) Dense grass / bramble cover (CC4)
(DD) Condition of Opposite Side Embankment	Adjacent ground falls away from toe of embankment or falls towards it at <5 degrees (DD1)

No Line Movement Indicators Present

No Point Movement Indicators Present

Intervention Works

Pre-Intervention SEHI	-115

No Linear Intervention Works Present

No Point Intervention Works Present

SEHI Soil Embankment

Photograph Information

No Photograph Information

SEHI Soil Embankment

Examiner

Completed in Current Season	True	
Examined By	Phil McNerney, Amey (LNW)	
Examined Date	09 March 2018	13:38

Comments

Current Season Comments	Phil McNerney, Amey (LNW): 09/03/18: ashy emb, no mi□noted, uniform crest, occ burrowing
Historic Comments	2013: EE: Rob Mullen, Amey (LNW): 23/01/13: ~5m high embankment; no significant defects noted.

CP4 SSHI

	Rot.	Trans.	Earth.	Wash.	Burrow.
Actual Score	4	4	3	4	-1
Potential Score	26	34	45	49	50
SSHI	2.6	3.9	3.9	3.9	3.9

Earthworks Factor	1.3
Overall SSHI Score	3.9
SSHI Category	Serviceable
CP5 Category	Serviceable

EHC

SEHI	-115
EHC	A
Asset Examination Status	Full

EACB

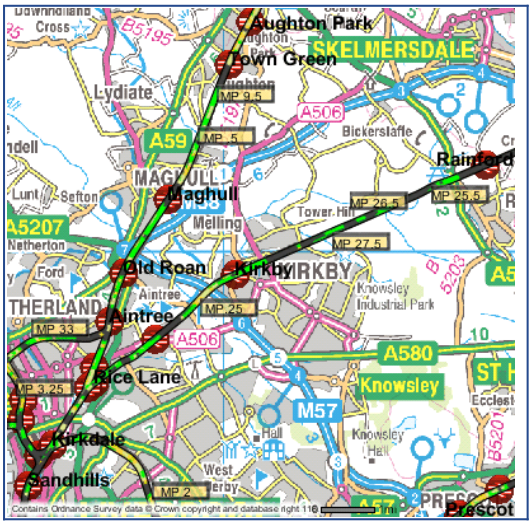
CCT Value	0.00030
EACB	1

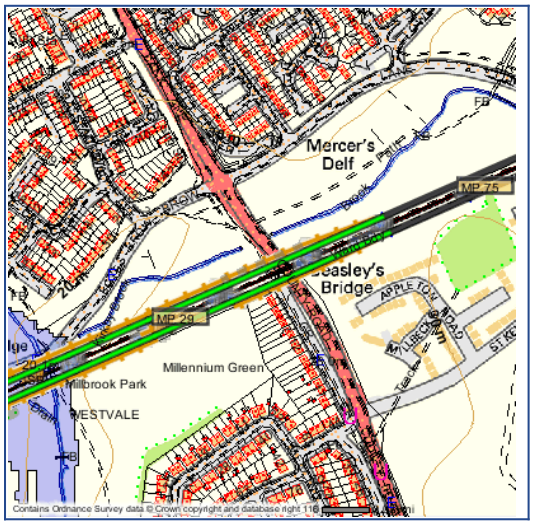
Asset Examination Frequency (Years)

Scored Asset Examination Frequency	10
Reviewed Asset Examination Frequency	0
Overall Asset Examination Frequency	5

SEHI Soil Embankment

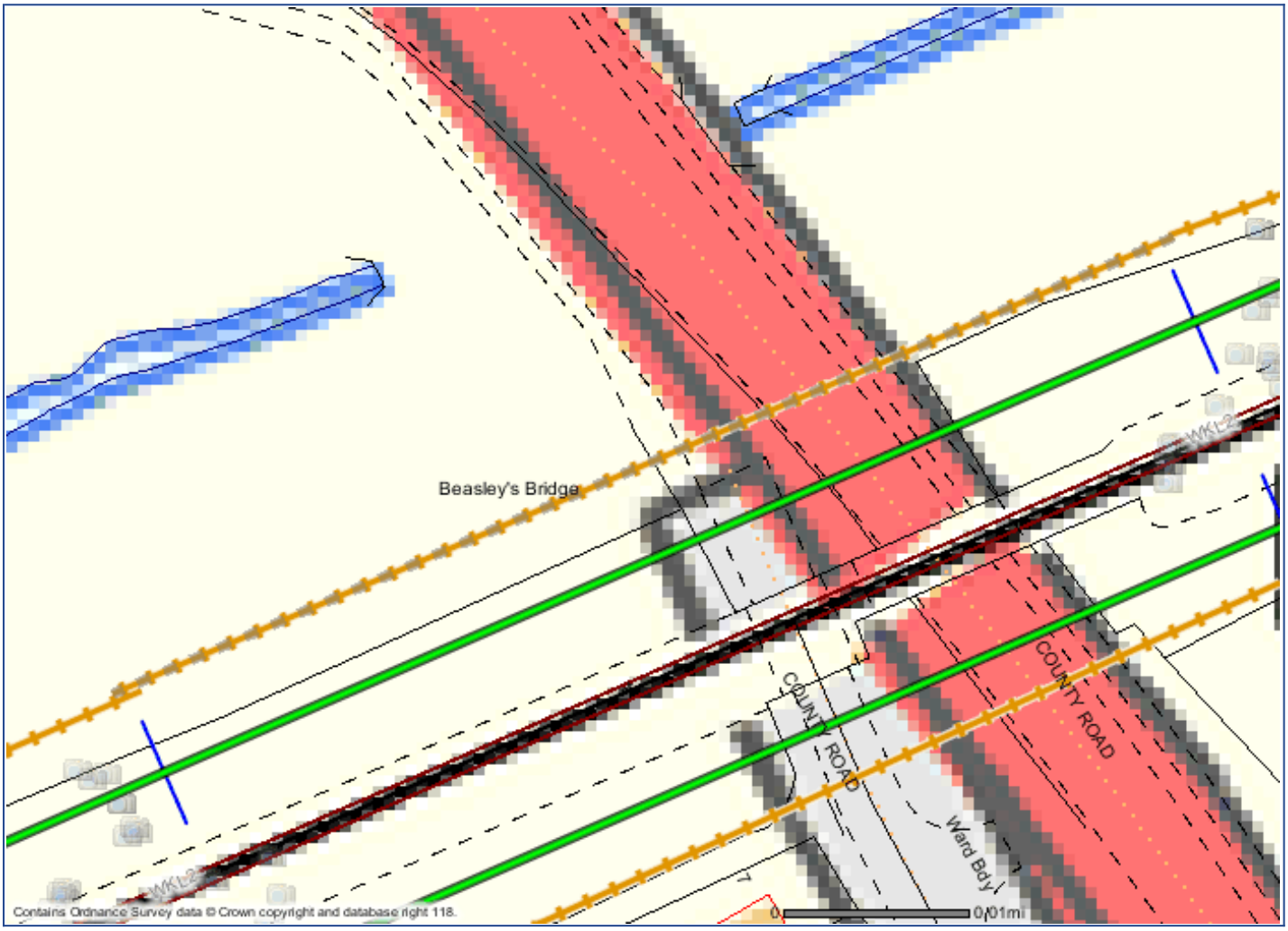
Overview Maps





Photographs
Sketches
SSHI Cutting
SSHI Embankment
SSHI Cutting/Embankment Retaining Wall
SSHI Cutting/Embankment Movement Indicator
SSHI Cutting/Embankment Movement Indicator
Earthwork Examination Records
Photographs RT030
Structure Condition RT030
Structure Faults (Point) RT030
Structure Dimensions RT030
Structure Faults (Line) RT030
Structure Rock Condition RT030
Structure Wall Condition RT030
Earthworks RT030
Stations
Rail Line

Location Map



F. Qualitative Risk Assessment Methodology

The following classification published by the NHBC, EA, and CIEH (2008) has been developed from DOE Guide to Risk Assessment and Risk Management for Environmental Protection and the Statutory Guidance on Contaminated Land (Defra September 2006). The methodology differs from that presented in Contaminated Land Risk Assessment, A Guide to Good Practice (CIRIA C552, 2001), particularly in terms of the definitions of classification of consequence, which include a consideration of immediacy of hazards.

The key to the classification is that the designation of risk is based upon the consideration of both:

- the magnitude of the potential consequence (i.e. severity). [takes into account both the potential severity of the hazard and the sensitivity of the receptor]
- the magnitude of probability (i.e. likelihood). [takes into account both the presence of the hazard and receptor and the integrity of the pathway]

The potential consequences of contamination risks occurring at this Site are classified in accordance with Table 11 below:

Table 11: Classification of Consequence

Classification	Definition of Consequence
Severe	Highly elevated concentrations likely to result in “significant harm” to human health as defined by the EPA 1990, Part 2A, if exposure occurs. Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.
Medium	Elevated concentrations which could result in “significant harm” to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.
Mild	Exposure to human health unlikely to lead to “significant harm”. Equivalent to EA Category 3 pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the longterm maintenance of the population. Minor damage to crops, buildings or property.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.

Classification	Definition of Consequence
	Repairable effects of damage to buildings, structures and services

The probability of contamination risks occurring at this Site is classified in accordance with Table 12 .
Note: A pollution linkage must first be established before probability is classified. If there is no pollution linkage then there is no potential risk. If there is no pollution linkage then there is no need to apply tests for probability and consequence.

Table 12: Classification of Probability

Classification	Definition of Probability
High Likelihood	There is pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is pollutant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low Likelihood	There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.
Unlikely	There is pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

For each possible pollution linkage (source-pathway-receptor) identified, the potential risk can be evaluated based upon the following probability x consequence matrix shown in Table 13.

Table 13: Overall Contamination Risk Matrix

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

R&D 66:2008 presents definitions of the risk categories, together with the investigatory and remedial actions that are likely to be necessary in each case. These definitions are reproduced in Table 14. These risk categories apply to each pollutant linkage, not simply to each hazard or receptor.

Table 14: Risk Category

Risk Category	Definition and Likely Actions Required
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very Low	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.
No Potential Risk	There is no potential risk if no pollution linkage has been established.

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Appendix 10C

Ground Investigation Report

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Appendix B

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1 Introduction

1.1 Context

Headbolt Lane is an infrastructure project that will extend the Merseyrail network from the existing terminating station at Kirkby to a new station to be constructed at Headbolt Lane.

The project extents (based on the GRIP 3 Option Selection Report) are 29m 57ch to 28m 44ch (29m 1254y to 28.0968y). The engineers line reference (ELR) changes from WJK to WKL2 at the existing head shunt to the east of Kirkby station (~29m 0902y).

The existing rail corridor comprises a single line. The Merseyrail network will be extended east from the existing terminating station at Kirkby, a new turnout will provide access to a new twin-track arrangement with provision for new 3rd rail DC electrification and bi-directional signalling. As part of these works the existing earthwork will be widened and strengthening and / or renewal works will be required to the existing Underbridges 55 and 56 (UB55 and UB56). The existing Northern Rail network will be shortened as a result.

The existing Northern Rail station at Kirkby will be decommissioned and a new station interchange provided at Headbolt Lane. This new station will comprise three platforms, with two platform faces serving Merseyrail and a single platform face serving Northern Rail. Buffer stops will be provided to Merseyrail and Northern Rail to delineate between the two Train Operating Companies. The platforms will be connected by a station access arrangement replicating the operational functionality at the existing Kirkby station.

A new 300 space car park, with passive provision to increase to 500 should demand require, with public transport interchange facilities will be provided at Headbolt Lane.

The scheme has been developed to GRIP stage 3 by Network Rail. Buckingham Group Construction Ltd (BGCL) has been appointed to develop the design to GRIP stage 4, and have appointed Ove Arup and Partners Ltd (Arup) to undertake design services.

Drawings to summarise the anticipated scope of works required for the scheme, prepared to support a recent pre-planning application are presented in Appendix A. It should be noted that GRIP stage 4 design is currently ongoing and as such these may be subject to change as the scheme design develops.

Arup has been commissioned by BGCL to prepare a Ground Investigation Report (GIR) and a Geo-environmental Report to support the GRIP stage 4 design and planning application for the scheme. This report covers both these aspects.

1.2 Objectives

A number of ground related uncertainties were identified in an earlier desk study completed by others [1],[2] and an intrusive ground investigation was recommended.

A ground investigation was designed by Arup to inform GRIP stage 4 design activities and preparation of approval in principle (F001) documents for the scheme.

The purpose of this report is to summarise the findings of this intrusive ground investigation and evaluate the potential impact on the future development by:

- Establishing the general ground profile and ground condition across the site;
- Providing an overview on the groundwater levels below the site;
- Characterising the existing geoenvironmental conditions and providing sufficient information to accompany the planning application to enable conditional planning approval;
- Summarising the existing earthworks within the rail corridor.

The report includes preliminary guidance on the ground-related risks which should be considered within subsequent design and construction phases. Key ground-related risks have also been recorded in the Designers Risk Assessment for the project, with relevant entries presented in Appendix G.

This Ground Investigation Report (GIR) has been prepared in accordance with BS EN 1997 (Eurocode 7 [3]) and NR/L3/CIV/071 [4]. Additionally, it contains the results of geoenvironmental investigations and contamination risk assessment.

The factual data from the ground investigation is provided in the Ground Investigation Factual Report [5].

1.3 Geotechnical category

The scheme has currently been identified to be Geotechnical Category 2 in accordance with BS EN 1997-1:2004, which comprise conventional types of structures, foundations and earthworks design with no exceptional risk or difficult ground or loading conditions.

It is anticipated that a number of design elements within the scheme (primarily bases for ancillary lineside civils structures) will be classed as Category 1 and where appropriate standard Network Rail design details will be used for design.

The Geotechnical Category of the various design elements will be identified in the relevant Form 001.

1.4 Use of report and limitations

This report was prepared by Arup on behalf of BGCL. It takes into account our Client's particular instructions and requirements. This report is not intended for,

and should not be relied on by, any third party and no responsibility is undertaken to any third party in relation to it.

All reasonable skill, care and diligence have been exercised within the timescale available and in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in preparing the report, it is possible that other ground contamination or ground conditions, as yet undetected, may exist and consequently reliance on this report must be limited accordingly.

2 The Site

2.1 Existing land use

The site location is shown in Figure 1. The majority of the site is currently occupied by the existing Liverpool-Wigan rail corridor between the existing Merseyrail Kirkby station to the proposed Headbolt Lane station site. The alignment of the rail corridor is roughly south-west to north-east. For the majority of its length the existing rail corridor is bounded by residential properties to the north and south. A number of overline and underline structures are present along the length of the project, these are discussed further in sections 2.9 and 2.10.

Figure 1: Site Location



Existing rail levels range from ~23.4 mOD in the vicinity of Kirkby station rising to ~29.7 mOD in the vicinity of the proposed Headbolt Lane Station site.

On the approach to Kirkby Station the existing rail alignment is situated in cutting, transitioning to embankment to the east of Kirkby Station. The rail alignment remains on embankment for the majority of the remainder of the site. Within the vicinity of the proposed Headbolt Lane Station the rail alignment transitions briefly to at-grade, before entering a section of low-height embankment and cutting to the east. The earthworks within the project extents are discussed further in section 2.8.

The proposed station and car park area is in an area of undulating grassland bounded to the south by the Liverpool-Wigan railway line, to the north and east by Headbolt Lane, and to the west by the A506, Back Lane. The ground levels within the proposed car park area slope from the north and south forming a valley centred on Kirkby Brook.

Kirkby Brook bisects the proposed car park area, entering the east of the site from the south via a culvert beneath the railway. The brook flows north west to the centre of the site before diverting to the south west exiting the site in the west beneath the A506.

2.2 Existing desk-based reports

A series of desk-based assessments have been produced by Mott MacDonald which include detailed description of the site and the site history. The assessments cover the site as a whole and are listed below:

- Geoenvironmental Desk Study – Headbolt Lane Station, dated August 2018, 139606-MMD-REP-EGE-000003 (Rev A) [1]
- Existing Track Geoenvironmental Desk Study – Skelmersdale Rail Link, dated March 2020, 139606-MMD-REP-EGE-000001 (Rev A) [2]

Further to the above, reports have been produced for the housing estate to the south of the site on St Kevins Drive and are referenced in the wider context to understand the ground conditions in the local areas. The reports that have been reviewed are listed below:

- ALM Consult, Geoenvironmental Appraisal of land to the west of Bramcote Walk, Kirkby – Interpretive Report, dated April 2016 [6]
- ESG, Knowsley Northern Primary Support Centre, Kirkby – Factual Report on Ground Investigation, dated September 2015 [7]

2.3 Historical land use

A detailed review of on-site and off-site history, based on publicly available sources and historical mapping, is presented in the following reports:

- Existing Track Geo-environmental Desk Study, Skelmersdale Rail Link, Mott MacDonald, 139606-MMD-REP-EGE-000001, March 2020 (NB the site is within study area 1 of this report) [2]
- Geo-environmental Desk Study, Headbolt Lane Station, Mott MacDonald, 139606-MMD-REP-EGE-000003, August 2018 [1]

A brief summary of the on-site history is described below.

The existing railway line is shown in its present day alignment on the earliest mapping reviewed which dates from 1850. The line was initially constructed as a two track railway as part of the Liverpool to Bury line which opened in 1848. Historical mapping indicates the line reduced from a two to a one track railway between 1962 and 1972.

Overbridge 57, Underbridge 56 and the existing western span of Underbridge 55 were constructed when the original railway line was established.

Record drawings indicate that the western span of Underbridge 55 (over County Road), was constructed in 1847. The original superstructure was replaced with the existing deck in 1930. In 1970 the remaining two spans of Underbridge 55 (over

A506), intermediate pier and eastern abutment were built as part of works associated with the construction of the present day A506. Significant strengthening works were undertaken on the intermediate pier in 1990 due to deterioration, thought to be the result of Alkali-Silica Reaction (ASR).

The earliest mapping reviewed, dating from 1850, shows the proposed car park and station site to be occupied by agricultural land with a sandstone quarry identified as Mercer's Delf located within the centre of the site, to the north of Kirkby Brook which is shown flowing through the centre of the site from east to west. A small building identified as Tanpit House is shown be located in the centre north of the site off Headbolt Lane.

Mapping dating from 1902 shows the quarry to be no longer present and further development of buildings on the northern boundary of the site adjacent to Headbolt Lane. As the quarry is no longer evident it is assumed to have been infilled.

Mapping from 1972 shows the western portion of Kirkby Brook to have been realigned to its present day alignment; presumably as part of works for construction of the A506, and Headbolt Lane which bounds the site in its present day alignment. The footpath which currently crosses the site from east to west is also shown.

Mapping dating from 1990 no longer shows Tanpit House to be present. The crest of the hill on the northern boundary with Headbolt Lane appears to have moved southwards, suggesting a change of ground levels.

2.4 Published geology

Based on the British Geological Survey (BGS) 1:50,000 scale solid geological map [8], the bedrock present beneath the site comprises the Wilmslow Sandstone of the Sherwood Sandstone Group. Immediately to the west of Kirkby Station is a northwest-southeast trending fault with the Chester Formation of the Sherwood Sandstone Group present to the west of the fault line. The Chester Formation is also indicated to subcrop approximately 400m to the south of the proposed Headbolt Lane Station and car park.

Along the rail alignment between Kirkby Station and Underbridge 56 superficial deposits are generally absent in the west with the eastern half of this section underlain by Glacial Till. Alluvium is present in the vicinity of Underbridge 56 associated with Kirkby Brook.

Between Underbridge 56 and the proposed station and car park area superficial deposits are absent, however wind blown sands of the Shirdley Hill Sand Formation are indicated to be present at the eastern site boundary. It is anticipated that the extent of the Shirdley Hill Sand Formation deposits may extend to the west towards Kirkby Brook and may contain some layers of peat.

No made ground is indicated to be present on the site from geological mapping however, given the site's history and current land use, made ground is anticipated to be present along the entire rail alignment associated with the railway

development. Made ground is also anticipated to be present within the following areas of the proposed station and car park site:

- Area of former Tanpit House in the north of the site;
- Area of sandstone quarry (Mercer's Delf);
- Area of railway line and embankment in the west of the site associated with Headbolt Lane; and
- Area of backfilled former stream channel adjacent to the railway line where it crosses the A506.

2.5 Historical ground investigation

Limited historical BGS borehole data [8] is available for the site. There are no records within the site boundary. A BGS borehole record (SD40SW12) is available 270m north of the proposed car park site drilled at land to the east of Ravenscroft Community Primary School. The ground conditions encountered comprised topsoil to 0.46m bgl over sand to 1.86m bgl over clay to 1.83m bgl and weathered sandstone at 3.05m bgl.

A ground investigation comprising fourteen window sample boreholes and thirty four mechanically excavated trial pits was undertaken for the St Kevins Drive housing estate to the south of the proposed station and car park [6]. The reported ground conditions generally comprised made ground over glacial till over sandstone bedrock. The bedrock was encountered at depths ranging from 3.3-5.2m bgl and is at a level of 24.98-27.9mOD. No significant seepages of groundwater were encountered within the exploratory holes

A request for information (HBL-RFI-034) was submitted for any information held by Network Rail RAM teams (Civil Engineering, Earthworks & Track) within the project extents. No geotechnical information was reported to be held (including historical ground investigation, track bed investigation data and earthwork maintenance records).

2.6 Coal mining risk assessment

The site does not lie within a Coal Authority Coal Mining Reporting Area. A mining risk assessment report was completed by Dunelm Limited in July 2020 [9]. This covered the whole site including the existing rail corridor and proposed car park and station areas. The report states that the site is underlain by sandstone with no known mine workings present and no recorded mine entries within 20m of the site. The mining risk assessment report concludes that the site is not considered to be underlain by shallow workings that would pose a risk to the development of the site and no further action in relation to shallow mine workings is required. A copy of the assessment is presented in Appendix B.

2.7 Hydrogeology and hydrology

The closest surface water features to the site are Kirkby Brook which flows beneath the rail corridor in culvert and through the centre of the proposed car park and Simonswood Brook which flows beneath the rail corridor at Underbridge 56.

The site is not indicated to be at risk of flooding from rivers or sea. Localised flooding associated with Kirkby Brook is indicated to be a risk.

The Environment Agency classifies the Shirdley Hill Sand Formation and Alluvium as Secondary A Aquifers, an aquifer supporting water supplies at a local scale. The Glacial Till deposits are classified as unproductive strata.

The Wilmslow Sandstone Formation and Chester Formation are classified as Principal Aquifers, an aquifer which can provide a high level of water storage and may provide water supply and/or base river flow on a strategic scale.

The site is located within a groundwater Source Protection Zone (SPZ) 3, with several abstractions located to the north and south. The nearest groundwater abstractions are located approximately 2km to the north of the rail alignment.

2.8 Earthworks

Earthwork examination records held by Network Rail within the scheme extents have been reviewed. The earthwork examination database was accessed in July 2020, inspection dates range from January 2013 to March 2020. A high level summary of this information is presented in Table 1.

The earthwork examinations have been undertaken in accordance with the procedure described in NR/L3/CIV/065. It should be noted that for the purpose of identifying earthworks for examination the network is divided into 110 yard (100m) lengths and cuttings or embankments less than 3m high are not classified as earthwork assets and as such are not examined. The earthwork hazard category (EHC) and risk category are both assessed using data obtained from earthwork examination. The EHC is a measure of the statistical likelihood of failure (A is least likely and E most likely). The risk category is an evaluation of the risk posed to the operation of the railway from a variety of failure mechanisms.

Table 1: Summary of data from Earthworks examination records

ELR	Start Mileage	End Mileage	Earthwork Type	Side	EHC	Risk Category	Earthwork Geometry	Summary of Earthwork Characteristics	Movement Indicators
WKL2	28.0770	28.1430	No Earthwork	U		Low Risk	(from topo) 28.1430 at grade, 28.1210 embankment ~2m, <28.1210 embankment ~2m		
WKL2	28.0770	28.1430	No Earthwork	D		Low Risk	(from topo) 28.1430 at grade, 28.1210 embankment ~2m, <28.1210 cutting ~2m		
WKL2	28.1430	29.0440	Soil embankment	U	A	Low Risk	5 to 6m high 32 to 35 degrees	slope vegetated (mature trees and grass/brambles) uniform toe & crest slope to track separation 2 to 3m no earthwork drainage, slope face and toe dry occasional rabbit burrows	29.0108 to 29.0220 local slumping noted
WKL2	28.1430	29.0440	Soil embankment	D	A	Low Risk	3 to 6m high 32 degrees	slope vegetated (mature trees and grass/brambles) uniform toe & crest slope to track separation 2 to 3m no earthwork drainage, slope face and toe dry occasional rabbit burrows	28.1758 to 29.0016 translational failure noted. (NB frequent rabbit burrows present)
WKL2	29.0440	29.0550	No Earthwork	U		Low Risk	(from topo) 29.0440 cutting ~2m, 29.0550 cutting ~2m		
WKL2	29.0440	29.0550	No Earthwork	D		Low Risk	(from topo) 29.0440 at grade, 29.0550 cutting ~2m		
WKL2	29.0550	29.0770	Soil Cutting	U	A	Low Risk	4 to 5m high 30 degree slope	slope vegetated (mature trees and grass/brambles) uniform toe & crest	None noted

ELR	Start Mileage	End Mileage	Earthwork Type	Side	EHC	Risk Category	Earthwork Geometry	Summary of Earthwork Characteristics	Movement Indicators
								slope to track separation 3m no animal activity no cess drainage present, slope face dry	
WKL2	29.0550	29.0880	Soil Cutting	D	A to B	Low Risk	3 to 5m high 30 to 34 degree slope	slope vegetated (mature trees and grass/brambles) uniform toe and crest slope to track separation 3 to 4m no animal activity no cess drainage present, slope face dry	None noted
WKL2	29.0660	29.0770	Rock Cutting	D	B	Low Risk	4m high 90 degree slope	noted as sandstone outcrop midslope distant from track	None noted
WKL2	29.0770	29.0880	No Earthwork	U		Low Risk	(from topo) cutting/retaining wall behind Kirkby station platform		
	29.0880	29.0897	NO DATA	U & D					
WJK	29.0897	29.1210	Soil Cutting	D	B to C	Low to Average Risk	4 to 6m high 28 to 32 degree slope	slope vegetated (mature trees and grass/brambles) slope to track separation 2 to 4m dry slope face (typically) cess drainage present in parts (typically impaired/blocked or unknown condition)	29.0915 to 29.0999 surface issues on lower slope
WJK	29.0897	29.1320	Soil Cutting	U	A	Low Risk	3 to 5m 28 to 36 degrees	slope vegetated (mature trees and grass/brambles) slope to track separation 2 to 4m dry slope face cess drainage present in parts (typically impaired/blocked or unknown condition)	29.1010 to 29.1241 movement indicators noted slope washout, soil creep movement & local slumping at slope face
WJK	29.1210	29.1320	No Earthwork	D		Low Risk	assumed low height cutting		

Notes

Earthworks examination data is reported as Up side (U) and Dn side (D). However only a single line is present within the project extent. Based on topography it is assumed that Up = right cess (back to Liverpool) & Down = left cess.

EHC = Earthwork Hazard Category (where A is least likely, E most likely and N not applicable)

2.9 Services/ Utilities

The desk study reports undertaken previously for the project identified a number of active services/utility crossings within the rail corridor, based on a review of 5-mile plans provided by Network Rail. The services/utilities identified within the project extents are summarised in Table 2.

Table 2: Summary of services/utilities within the project extents

ELR	Miles	Yards	Service/ Utility
WKL2	28	1160	4ft 2" stone arch culvert
WKL2	28	1322	NW 18" stone pipe
WKL2	29	0195	3ft 10" stone arch culvert (Millstream)

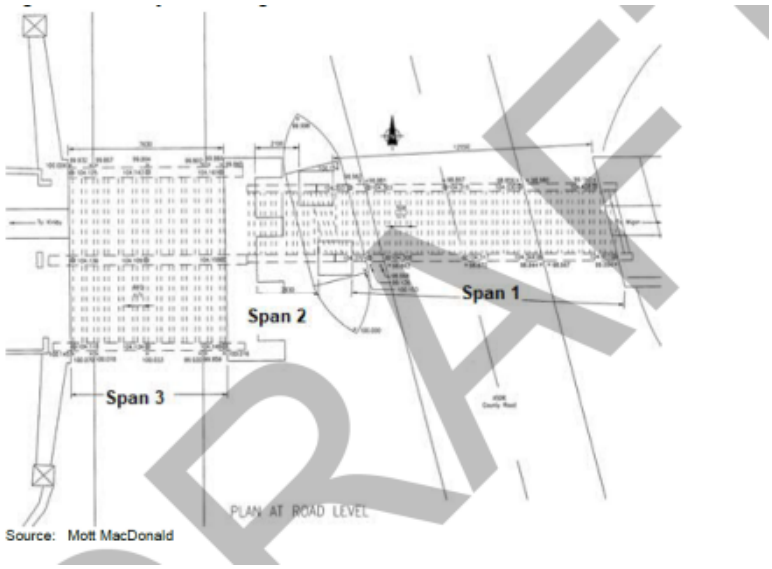
A buried services record search was undertaken by Centara in August 2020 for BGCL to inform the ground investigation works on the site.

2.10 Existing structures

2.10.1 Underbridge 55

Underbridge 55 (located at WKL2, 28m 1590yds) is a three span steel bridge that crosses over the A506 and County Road. Span 3 was constructed in 1847 and spans 1 and 2 added in 1970 to facilitate construction of the A506. The existing pier 2 formed the eastern abutment when the bridge was originally constructed and was modified during the 1970s.

Figure 2: Underbridge 55 layout

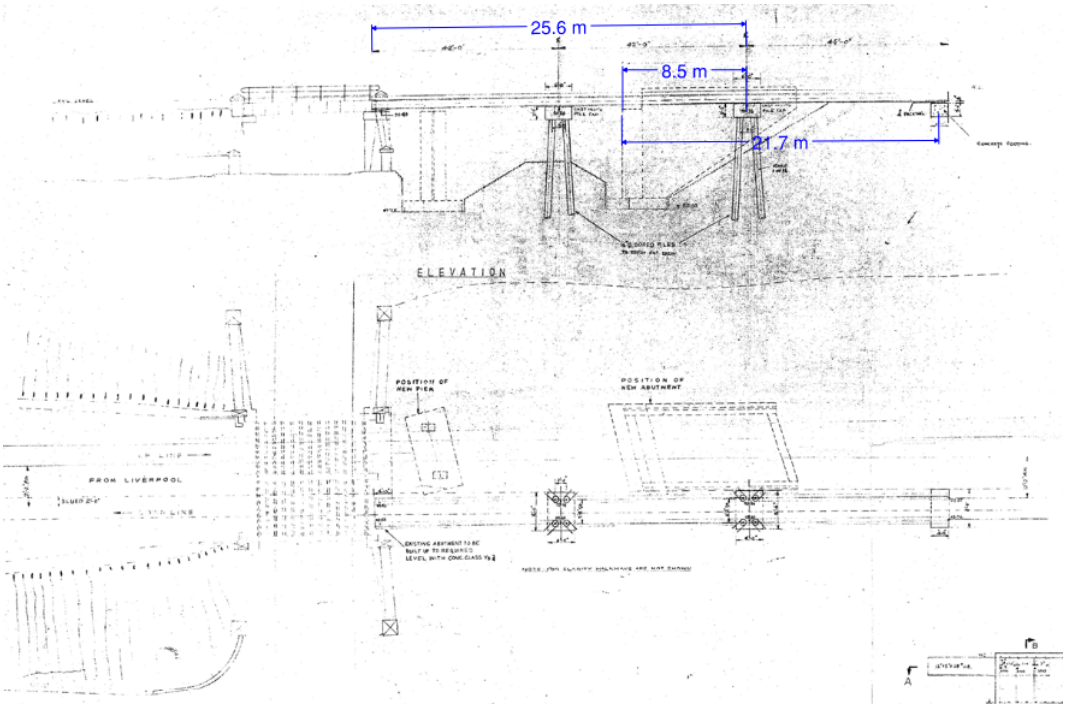


Based on review of published geology, rock is anticipated to be present at shallow depth in the vicinity of UB55. Record drawings held by Network Rail have been reviewed and indicate that all foundations for the existing structure comprise

shallow foundations, which are assumed to bear onto sandstone bedrock. The inferred level of the underside of existing foundations is as follows: pier 2 (21.6mOD), pier 1 (20.3mOD) and east abutment 20.7mOD). Existing road level of A506 is approximately 22mOD.

Record drawings held by Network Rail indicate that temporary works including two groups of four raked bored piles of 16" (~0.4m) diameter were installed as part of the 1970 modification works to UB55 to support a temporary track alignment during construction and are now redundant. The depth of the piles is not clear however it is assumed these extend into underlying rock and that some sub-structure elements remain in place.

Figure 3: Extract from Network Rail drawings showing temporary work (dimensions in m have been added based on scaling from original drawing)



2.10.2 Other structures

Underbridge 56 (located at WKL2, 29m 0145yds) is a two-span masonry arch bridge that crosses over a footpath and the Simonswood Brook.

Overbridge 57 (located at WKL2 29m 0895yds) is a road bridge which carries Glovers Brow over the railway corridor.

A retaining wall (reference WKL2 290820) is located at the back of the Northern platform of Kirkby station, between 29m 0820yrds and overbridge 57 (OB57). The latest Network Rail detailed examination (15th April 2010) notes the wall to be predominantly of stonework construction with a blockwork and brickwork section adjacent to OB57. Retained height vary from 2.1m to 0.5m, reducing in height away from OB57. The wall is noted to be secure but sections are identified to be in poor condition with vegetation clearance and repair works recommended to address defects recorded – which include missing mortar, blocks and bulging .

There are no level crossings within the project boundary.

2.11 Unexploded ordnance

A pre-desk study assessment for unexploded ordnance (UXO) was obtained from Zetica as part of the previous desk study work undertaken. This did not identify any UXO risks on or affecting the site and concluded that a detailed desk study was not necessary. As such the site is considered to be situated in an area with a low risk potential from UXO.

3 Ground investigation

3.1 Overview

A ground investigation scope was designed and specified by Arup and implemented by CC Geotechnical Ltd appointed by BGCL. The works were supervised by CC Geotechnical with occasional site visits from Arup.

The fieldwork was split into two categories as outlined below:

- Rail corridor investigation – to provide geotechnical and geoenvironmental data to input to lineside civil, earthwork widening, structures and track bed designs
- Off track investigation – to provide geotechnical and geoenvironmental data to input to off-track civil works primarily the new station and car park design

The factual findings of the investigations were reported in a factual report produced by CC Geotechnical [5].

The as-constructed ground investigation locations are shown in Appendix C.

In-situ testing was undertaken to gain further understanding of soil strength profile and inform classification and parameter selection for geotechnical design. Standard penetration tests (SPT) were undertaken at regular intervals in cable percussive and windowless sampler holes. Tests undertaken in rock were extended from the standard 50 blows to 100 blows. Pocket penetrometer testing was undertaken at regular intervals in suitable fine-grained soil materials in windowless sampler and automatic ballast sampler holes.

Two soakaway tests were undertaken in trial pits within the proposed car park area.

Selected boreholes were fitted with installations to permit gas and groundwater monitoring. Following completion of the fieldwork, four rounds of monitoring were undertaken between 30th September 2020 and 18th November 2020. Monitoring records are presented in the factual report [5] and assessed in subsequent sections of this report.

A programme of laboratory testing was undertaken to establish the geotechnical and geoenvironmental properties of the ground.

3.2 Rail corridor

As part of the ground investigation, selected intrusive locations were undertaken within the rail corridor. These are summarised below:

- 14 automatic ballast sampler holes (ABS1001 to ABS1013) to depths up to 2m below ground level (bgl) within the 4’ of existing tracks;
- 10 windowless sample holes (WS1201A-B, WS1202, WS1203, WS1205, WS1207, WS1208, WS1210A-D, WS1212, WS1215) to depths up to 6m bgl within the cess of existing tracks;

- 3 windowless sampler holes (WS1204, WS1206, WS1209, WS1211, WS1214) to depth up to 4.6m bgl at the toe/crest of existing embankment/cut slopes;
- 1 cable percussive borehole (BH1301) adjacent to existing UB55 to depths up to 2.8m bgl.

Exploratory holes with letters after hole reference (e.g. WS1201A) denote repeated attempts due to early refusal.

A groundwater sample was obtained from borehole BH1301. The sample was tested for a range of contaminants including metals, inorganics and hydrocarbons.

3.3 Off track

Further to the above, selected exploratory holes were undertaken to provide geotechnical and geoenvironmental data to input to the design of the proposed new station and car park with associated ancillary roadways and crossings. The intrusive locations undertaken in the off track areas at the site are summarised below:

- 10 mechanically excavated trial pits (TP1401 to TP1410) to depths up to 3.5m bgl;
- 4 cable percussive boreholes (BH1302 to BH1305) to depths up to 2.7 m bgl; and
- 2 mechanically excavated pits (SA1 and SA2) to conduct BRE infiltration/ soakaway testing to depths up to 2.2m bgl.

In addition, two surface water samples (SW1601 to SW1602) were obtained from the brook crossing the site. The samples were tested for a range of contaminants including metals, inorganics and hydrocarbons.

4 Ground summary and properties

The ground conditions described in the following sections is predominantly informed by the recent ground investigation, supplemented where appropriate by historical investigation data and desk study sources.

The site has been separated into two main areas, the rail corridor (i.e. within and in close proximity to the Network Rail boundary fence) and the proposed new station and car park. A high level summary of the ground conditions encountered is presented in the following sections, further review and refinement is likely to be required to inform design.

4.1 Rail corridor

4.1.1 Overview

Exploratory holes undertaken within the rail corridor encountered a range of ground conditions influenced by superficial and solid geology and presence of earthworks. As such a series of ground models have been developed, these are detailed in Table 3. It should be noted that the boundaries between the various ground models is indicative and based on a review of both exploratory hole records and topography.

Table 3: Summary of ground models within rail corridor

Project meterage [m]	Network mileage [mm.yyyy]	Earthwork type	Relevant exploratory holes
750 to 1500	29.1283 – 29.463	Cutting	ABS1001 to ABS1007 WS1201B to WS1201A
1500 to 2225	29.463 – 28.1430	Embankment	ABS1008 to ABS1011 WS1202 to WS1209
2225 to 2375	28.1430 – 28.1266	At grade	WS1210
2375 to 2525	28.1266 – 28.1102	Embankment	ABS1012 to ABS1013 WS1211 to WS1212
2525 - 2600	28.1102 – 28.1020	Cutting	ABS1015 WS1215

4.1.2 ~750 to 1500m: existing cutting

Table 4: Ground model 750 to 1500m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0 – 0.2	0.3 - 1	Ballast	

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made ground	0 – 0.8	0.1 – 0.3	Granular track bed material	Not encountered in ABS1001.
Drift Deposits (not encountered in ABS1005, WS1201A and WS1201B)				
Glacial Till deposits	0.85 – 1.2	0.1 – 1.25	Cohesive	Not encountered in ABS1005, ABS1007, WS1201A and WS1201B.
Solid Geology (only encountered between ABS1004 & ABS1007)				
Sandstone	0.25-1.5	0.1 to 0.5 (max proven thickness)	Weathered brown	Not encountered in ABS1001, ABS1002, ABS1003. ABS boreholes report end at shallow depths below ground level. Max thickness proven in WS1201B.

A marked change in ground conditions is evident from the holes in the vicinity of Kirkby Station. To the west of Kirkby Station (ABS1001 to ABS1003) the existing track bed is underlain by Glacial Till whilst rock was encountered at shallow depth in holes within and to the east of the station (including ABS1004 to ABS1006). This is thought to be due to the presence of a fault shown to the west of Kirkby station on published geological mapping.

4.1.3 ~1500 to 2225m: existing embankment

Table 5: Ground model 1500 to 2225m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0 – 0.2	0.2 – 0.6	Ballast	
Made ground	0.3 – 0.8	0.35 – 1.2	Granular track bed material	
Made ground	0.75 – 1.6	0.55 – 4.4	Cohesive embankment fill	
Made ground	0.9	4.6	Granular embankment fill	Only present in WS1208
Drift Deposits				
Glacial Till deposits	1.3 – 5.2	0.2 – 1.1	Cohesive	Not encountered in ABS1008. ABS1009, ABS1010,

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
				ABS1011, WS1208.
Glacial Till deposits	4 – 4.7	0.4 – 0.5	Granular	Not encountered in ABS1008, ABS1009, ABS1010, ABS1011, WS1208.
Solid Geology				
Sandstone	2.4 – 5.5	0.25 to 1.5 (max proven thickness)	Weathered brown	Not encountered in ABS1009, ABS1010, ABS1011, WS1207, WS1208. Max thickness proven in WS1202.

4.1.4 ~2225 to 2375m: existing at-grade

Table 6: Ground model 2225 to 2375m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0	0.4	Topsoil	
Solid Geology				
Sandstone	0.4	0.6 (max proven)	Weathered brown	Max proven thickness in WS1210.

4.1.5 ~2375 to 2525m: existing embankment

Table 7: Ground model 2375 to 2525m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0 – 0.2	0.3 – 0.85	Ballast	
Made ground	0.3 – 1.05	0.3- 1.15	Granular track bed material	
Made ground	1.2	1.5	Cohesive embankment fill	Encountered only in WS1212.
Solid Geology				

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Sandstone	2.7	1 (max proven thickness)	Weathered brown	Encountered only in WS1212, max thickness proven.

4.1.6 ~2525 to 2600m: existing cutting

Table 8: Ground model 2525 to 2600m

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground Deposits				
Made ground	0 – 0.2	0.3 – 0.65	Ballast	
Made ground	0.3 – 0.85	0.1 – 1.2	Granular track bed material	
Drift Deposits				
Glacial Till deposits	0.95 – 1.5	1.25 - 3	Cohesive	
Solid Geology				
Sandstone	4.5	0.1 (max proven thickness)	Weathered brown	Not encountered in ABS1015. Max thickness proven in WS1215.

4.1.7 Made ground

4.1.7.1 Extent and description

Made ground was encountered in the following holes undertaken within the rail corridor and its proximity: ABS1001 to ABS1011, ABS1013, ABS1015 and WS1201 to WS1203, WS1205, WS1207, WS1208 and WS1212. This comprised a layer of ballast in all cases, typically underlain by granular track bed material and for the majority of the project extent embankment fill.

Ballast

Ballast was encountered in all holes undertaken on or adjacent to the existing tracks. This was typically described as dirty or very dirty ballast, although some holes within the existing 4' reported a thin (up to 150mm thick) layer of clean ballast to be present at ground level.

A layer of pitching stones (described as coarse granite cobbles and typically 150mm thick) were encountered underneath the ballast within the Kirby station area west of OB57. The pitching stones were encountered in ABS1002, ABS1003 and ABS1004 located between ~850 to ~1050. The exact limits of the pitching

stones is not known but they were not encountered in ABS1001 or ABS1005 located at ~ 750m and 1150m respectively.

Granular track bed material

All holes undertaken on or adjacent to existing track alignment (i.e. within the 4' and cess of the existing track alignment) encountered a layer of blanketing material below the ballast. The thickness of this layer ranged from 0.1m to 1.2m but was typically ~0.7m.

Generally, this comprised a layer of ashy fill, described as brown silty sandy gravel, where gravel is fine to coarse angular to sub-angular ash and granite, underlain by a layer of light brown silty gravelly sand, described as loose brown silty fine to medium grained sand. This material is thought to represent a combination of the blanketing material and granular embankment fill used to form the original track bed and seal the cohesive fill used to form the core of the existing embankment.

No visible or olfactory evidence of contamination was reported in any of the locations.

Embankment fill

In on-line holes undertaken where the rail corridor is located on embankment the granular blanketing material overlies embankment fill. In all locations (apart from WS1208) this was reported to be cohesive in nature, typically described as brown sandy gravelly silty clay. The thickness of this layer ranged from 0.55m to 4.4m (typically 2.7m) increasing with embankment height.

At WS1208 the embankment fill was reported to be predominantly granular, typically described as a medium dense brown silty gravelly fine to medium sand to 5m depth, with clay bands present (0.4m as maximum thickness).

A possible relict soil surface was encountered in a number of holes, including WS1207 (3.6 to 4.1m depth) and WS1208 (5 to 5.5m depth). This was reported as a soft brown slightly sandy slightly gravelly silty clay with sand lenses and silty organic sand.

4.1.7.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for ballast, blanketing material and for both cohesive and granular embankment fill are presented in

Table 9 to 12.

Table 9: Summary of classification tests in ballast material

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	4	22.44 – 29.76 [0.2 to 0.8]	**Gravel content**: 87 to 100 **Sand content**: 0 to 10 **Clay and silt content**: 0 to 3		Consistent with material descriptions on engineer logs (ABS1004, ABS1008, ABS1011, ABS13).

Table 10: Summary of classification tests in granular track bed material

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	8	23.58 – 29.53 [0.5 to 0.9]	**Gravel content**: 51 to 88 **Sand content**: 9 to 41 **Clay content and silt content**: 3 to 11		Consistent with material descriptions on engineer logs.

Table 11: Summary of classification tests in cohesive embankment fill

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	3	24.34 – 26.72 [1 to 2]	**Gravel content**: 3 to 18 **Sand content**: 20 to 44 **Silt content**: 36 to 57 **Clay content**: 18 to 20		Consistent with material descriptions on engineer logs.
Moisture Content (%)	7	24.09 – 27.35 [1.4 to 2.1]	12 to 20	16.1	
Liquid Limit (%)	6	24.09 – 27.35 [2.1 to 4]	27 to 39	30.8	
Plastic Limit (%)	6	24.09 – 27.35 [2.1 to 4]	13 to 19	15.2	
Plasticity Index (%)	6	24.09 – 27.35 [2.1 to 4]	13 to 20	15.7	

Table 12: Summary of classification tests in granular embankment fill

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	1	25.15 [3]	**Gravel content**: 4 **Sand content**: 82 **Clay and silt content**: 14		Consistent with material descriptions on engineer logs (WS1208).
Moisture Content (%)	2	23.35 – 25.15 [3 to 4.8]	9.6 to 12	10.8	

A summary of SPT N values obtained from made ground materials, specifically in cohesive and granular embankment fill, is presented in Table 13.

Table 13: Summary of SPT N values in made ground

Stratum	No. of SPT N results	Level (mOD)	SPT N range values	SPT N mean value
Cohesive embankment fill	9	22.66 to 28.05	4 to 10	6.7
Granular embankment fill	5	22.85 to 26.85	10 to 18	13.2

Within cohesive materials SPT 'N' values can be used to derive undrained shear strength (c_u). Based on cu = 5.5 x N (Stroud, 1989 for a typical plasticity index of about 20) [10] this indicates an undrained shear strength (c_u) of 22 to 55kPa.

Pocket penetrometer testing was undertaken on soil samples recovered from windowless sample holes. Within cohesive embankment fill materials reported undrained shear strength values ranged from 30 to 90kPa (from sixteen tests).

There is no clear correlation between measured or derived undrained shear strength with depth, but values are generally consistent with descriptions on engineer logs.

Table 14: Summary of SPT hand vane peak values in embankment fill

Stratum	No. of Hand Vane results	Level (mOD)	Hand Vane peak range values
Cohesive embankment fill	16	22.68 to 27.85	30 to 90

4.1.8 Superficial deposits

4.1.8.1 Extent and description

Glacial Till deposits

Glacial Till, comprising cohesive and granular deposits, was encountered in the majority of exploratory holes undertaken within the rail corridor cutting (from 750

to 1500m and from 2525 to 2600m), and in its proximity, at the crest and toe of embankment (from 1500 to 2225m).

Reported depths ranged from 0.6m to 4.7m with the base of the strata proven in all locations. A variation in composition with depth for both the cohesive and granular deposits has been identified. Material descriptions range from soft to stiff clay for the cohesive deposits, typically described as brown slightly sandy silty clay overlying the bedrock. The granular deposits range from loose to medium dense sand, typically described as brown silty sand.

4.1.8.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for Glacial Till deposits are presented in Table 15 respectively.

Table 15: Summary of classification tests in Glacial Till deposits

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	2	21.78 – 23.58 [0.8 to 4.5]	**Gravel content**: 51 **Sand content**: 41 **Clay and silt content**: 8		Consistent with granular material descriptions on engineer log ABS1006.
			Gravel content: 1 **Sand content**: 26 **Silt content**: 40 **Clay content:** 33		Consistent with cohesive material descriptions on engineer log WS1203.
Moisture Content (%)	14	21.52 – 29.22 [1.2 to 4.5]	13 to 32	22.5	Cohesive Glacial Till deposits
Liquid Limit (%)	7	21.52 – 29.22 [1.2 to 4.5]	27 to 41	32.6	Cohesive Glacial Till deposits
Plastic Limit (%)	7	21.52 – 29.22 [1.2 to 4.5]	13 to 20	15.7	Cohesive Glacial Till deposits
Plasticity Index (%)	7	21.52 – 29.22 [1.2 to 4.5]	14 to 21	16.9	Cohesive Glacial Till deposits

SPT testing was conducted in the glacial till at a range of depths, totalling 7 tests. SPT ‘N’ values in the cohesive layer were between 4 and 31, typically increasing with depth. Based on cu = 5.5 x N (Stroud, 1989 for a typical plasticity index of about 20) [10], this indicates an undrained shear strength (cu) of around 22 to 170kPa, indicative of a soft to stiff clay which broadly corresponds to the soil descriptions.

A summary of SPT N values obtained from Glacial Till deposits is presented in Table 16.

Table 16: Summary of SPT N values in Glacial Till deposits

Stratum	No. of SPT N results	Level (mOD)	SPT N range values	SPT N mean value
Cohesive Glacial Till deposits	4	20.98 to 23.84	4 to 31	17.5
Granular Glacial Till deposits	3	21.98 to 22.82	5 to 15	10

Table 17: Summary of Hand Vane peak values in Glacial Till deposits.

Stratum	No. of Hand Vane results	Level (mOD)	Hand Vane peak range values
Cohesive Glacial Till deposits	25	20.81 to 28.52	5 to 110

4.1.9 Bedrock deposits

4.1.9.1 Extent and description

The underlying bedrock was encountered in the all the logs undertaken within the rail corridor and its proximity, at the crest and toe of embankment, apart from ABS1001 to ABS1003, ABS1009 to ABS1015 and WS1207.

Locations which reported sandstone at shallow depth (< 1m) were ABS1005 WS1201 ABS1007 (~1150 to 1400) and WS1210 (~2300).

In most locations there is a layer of completely weathered sandstone which was typically recovered as a silty gravelly sand with gravel of sandstone. Depths to the top of the completely weathered sandstone ranged from 0.4m to 2.7m below ground level. The completely weathered sandstone was between 0.2m and 1.6m thick.

Where encountered, the sandstone beneath the completely weathered layer was described as a weathered reddish brown sandstone, recovered as a slightly silty slightly gravely sand. Depths to the top of sandstone ranged from 0.25m to 4.5m below ground level, typically within the range 0.7m to 2.4m. The base of sandstone was not proven with holes terminating 0.1m to 1.5m below rockhead level.

No visual or olfactory evidence of contamination was reported in any of the locations.

BH1301 was undertaken adjacent to UB55. This reported sandstone bedrock at 2.2m depth (~21.3mOD) with 0.6m penetration achieved. This suggests the original foundations (existing pier 2) are founded at rockhead, potentially within weathered material, and the more recent foundations (existing pier 2) are located ~1m below rockhead, potentially within more competent material.

4.1.9.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for sandstone within the rail corridor is presented in Table 18.

Table 18: Summary of classification tests in weathered sandstone

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	2	23.52 – 25.3 [0.9 to 1]	**Gravel content**: 0 to 58 **Sand content**: 31 to 95 **Clay + silt content**: 5 to 11		Consistent with material descriptions on engineer logs
Moisture Content (%)	1	28.76 [2.2]	13		ABS1013

SPT 'N' values in the Sandstone were 9 to 750 and a mean value of 219. Lower values were recorded in completely weathered sandstone material. Typical SPT 'N' values ranged from 60 to 375 which corresponds to a very weak to weak rock with a UCS of 0.6 to 3.75MPa

A summary of SPT N values obtained from sandstone is presented in Table 19.

Table 19: Summary of SPT N values in sandstone

Stratum	No. of SPT N results	Level (mOD)	SPT N range values	SPT N mean value
Sandstone	21	19.98 – 28.81	9 - 750	219

4.1.10 Summary of derived parameters

A summary of derived soil parameters for stratum encountered within the railway corridor is presented in Table 20. These values are a preliminary assessment only and should be reviewed before being used for design:

Table 20: Summary of parameters within the railway corridor

Geotechnical Parameter	Derived Value	Basis
Made Ground (granular track bed material)		
Bulk Unit Weight, γ [kN/m^3]	19 to 21	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	30 (minimum)	Based on soil description
Made Ground (cohesive embankment fill)		
Bulk Unit Weight, γ [kN/m^3]	17 to 19	Based on soil descriptions & typical values in BS8002

Geotechnical Parameter	Derived Value	Basis
Undrained shear strength, c_u, [kN/m2]	30 to 90	Based on soil descriptions and in-situ testing (SPT & hand shear vane)
Angle of shearing resistance, φ' [°]	28 to 32	Based on soil descriptions and correlation with PI
Made Ground (granular embankment fill)		
Bulk Unit Weight, γ [kN/m^3]	20	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	34 (minimum)	Based on soil descriptions & typical values in BS8002
Glacial Till		
Bulk Unit Weight, γ [kN/m^3]	17 to 19	Based on soil descriptions & typical values in BS8002
Undrained shear strength, c_u, [kN/m2]	20 to 100	Based on soil descriptions and in-situ testing (SPT & hand shear vane)
Angle of shearing resistance, φ' [°]	28 to 34	Based on soil descriptions, correlation with PI and in-situ testing (SPT)
Weathered Sandstone		
Bulk Unit Weight, γ [kN/m^3]	20 to 22	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	38 (minimum)	Based on soil descriptions and in-situ testing (SPT)
Intact Sandstone		
Bulk Unit Weight, γ [kN/m^3]	20 to 22	Based on soil descriptions & typical values in BS8002
Unconfined Compressive Strength [MN/m^2]	0.8 (minimum)	Based on soil descriptions and in-situ testing (SPT)

4.2 Station and car park

The sequence and type of geological strata identified in the ground investigation are summarised in Table 21. This summary is based on the exploratory holes in the recent ground investigation (TP1401 to TP1410 and BH1302 to BH1305).

Table 21: Stratigraphy summary station and car park

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground				
Topsoil	0	0.05 - 0.5		Not encountered in BH1303.
Made Ground	0.05 - 1.4	0.5 – 1.6 (proven) 3.1 (unproven)	Granular	Thickness unproven in TP1405.

Stratum	Depth to top (m BGL)	Thickness (m)	Stratum description	Comments
Made Ground	0 – 0.8	0.25 - 1	Cohesive	Encountered in BH1303 and in TP1408.
Solid Geology				
Sandstone	0.5 - 3.5+	2.4 (max proven)	Weathered brown	Boreholes terminated at shallow depths in bedrock. TP1405 excavated to 3.5m and did not encounter bedrock.

4.2.1 Made ground

4.2.1.1 Extent and description

Made ground was encountered in all off-line holes undertaken within the proximity of the proposed station and car park.

Outside the extent of the former quarry reported depths to underside of made ground ranged from 0.5m to 2m bgl, typically 0.5m to 1.5m bgl, with the base of the strata proven in all locations.

Historical mapping shows a quarry within the car park area (north of Kirkby Brook) and former provides an indication of its extent. BH1303 was undertaken close to the centre of the mapped extent and TP1404 some 5 m to the east. Made ground depths of 2 & 3.1 were encountered in BH1303 and TP1404 respectively. The base of made ground was not proven in TP1404 and whilst sandstone was reported for 0.7m below base of made ground in BH1303 it is possible that this may be a sandstone boulder within quarry infill rather than bedrock.

In the majority of locations, the made ground was reported as a predominantly coarse grained material typically described as dark brown silty gravelly fine to medium sand, (brick, ceramic and inclusions of plastic). In a limited number of locations (BH1303 & TP1408) it was reported as a predominantly fine grained material; typically described as sandy slightly gravelly silty clay, gravel is fine to medium subrounded mudstone and red brick, and sand is fine to coarse. The composition of made ground encountered within the former quarry (TP1404 & BH1303) was not significantly different from that reported elsewhere on the site.

No visual signs of contamination were reported in any of the locations, but a strong fuel smell was reported in BH1303 at a depth of 1.4 to 2m bgl.

No relict substructures where encountered within the made ground, including TP1409 & TP1410 which were located within the vicinity of buildings shown on historical mapping.

4.2.1.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for made ground is presented in Table 22.

Table 22: Summary of classification tests in made ground

Laboratory Test	No. of tests	Sample range (mOD) [m bgl]	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	5	24.09 – 30.01 [0.6 to 1.2]	**Gravel content**: 3 to 37 **Sand content**: 52 to 71 **Clay and silt content**: 8 to 26		Consistent with material descriptions on engineer logs
Moisture Content (%)	14	24.09 – 30.01	24 to 28	26	
Liquid Limit (%)	1	29.24	25		Cohesive made ground in TP1408
Plastic Limit (%)	1	29.24	13		Cohesive made ground in TP1408
Plasticity Index (%)	1	29.24	12		Cohesive made ground in TP1408

A single SPT test was undertaken in the granular made ground at BH1303 at 26.68mOD (1.2 mbgl), returning an SPT 'N' of 4.

Five tests were undertaken on bulk samples obtained from trial pits to establish dry density vs moisture content relationship using light compaction (2.5kg rammer). Sample depths ranged from 0.7 to 2.0m. Reported maximum dry densities ranged from 1.84 to 1.89 with optimum moisture content of 15 to 13% respectively, on average 95% maximum dry density achieved for a moisture content range of 10.7 to 17.7%. Moisture content testing indicates the soils to be wet of optimum, meaning that at natural moisture content achievable compaction will be less than 95% maximum dry density.

4.2.2 Bedrock deposits

4.2.2.1 Extent and description

The underlying bedrock was encountered in all the locations undertaken within the proximity of the proposed station and car park, apart from TP1405 located within the proximity of the former quarry and excavated to a depth of 3.5m.

Depths to top of sandstone ranged from 0.2m to 3.2m below ground level, typically within the range 0.8m to 3m. The base of sandstone was not proven with holes terminating 0.6m to 2.4m below rockhead level.

In most locations, it was typically described as weathered reddish brown sandstone, in BH1302, 1303, 1305 and TP1404 it was recovered as silty gravelly sand.

No visual or olfactory evidence of contamination was reported in any of the locations.

4.2.2.2 Geotechnical in-situ and laboratory testing

A summary of the classification testing for sandstone within car park and station is presented in Table 23.

Table 23: Summary of classification tests in sandstone

Laboratory Test	No. of tests	Sample Level range (mOD)	Typical Range (%)	Mean (%)	Comment
Particle size distribution (wet sieve)	5	24.51 – 29.54	**Sand content**: 21 to 97 **Gravel content**: 12 to 60		
Moisture Content (%)	7	23.29 – 29.54	6 - 18	12.4	

SPT testing was conducted in the sandstone at depths of 0.2-1.3 below the rock surface and vary from 68 to 429. This corresponds to an extremely weak to very weak rock with a UCS of 0.7-4.3MPa.

Table 24: Summary of SPT N values in sandstone

Stratum	No. of SPT N results	Level range (mOD)	SPT N range values	SPT N mean value
Sandstone	10	24.42 – 28.11	68 - 429	160

Two soakaway tests were undertaken in SA1 and SA2 in accordance with the methodology outlined in BRE 365 to assess the infiltration rate within the weathered and competent sandstone strata. The logs and calculation sheets are presented in the CCG Factual Report [5]. The infiltrations rates obtained were $1.41x10^{-05}$ m/s (SA1) and $1.35x10^{-05}$ m/s (SA2).

4.2.3 Summary of derived parameters

A summary of derived soil parameters for stratum encountered within the proposed station and car park area is presented in Table 25. These values are a preliminary assessment only and should be reviewed before being used for design:

Table 25: Summary of parameters within the station and car park

Geotechnical Parameter	Derived Characteristic Value	Basis
Made Ground		
Bulk Unit Weight, γ [kN/m^3]	17 to 19	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	32 (minimum)	Based on soil descriptions and in-situ testing (SPT)
Weathered Sandstone		
Bulk Unit Weight, γ [kN/m3]	20 to 22	Based on soil descriptions & typical values in BS8002
Angle of shearing resistance, φ' [°]	38 (minimum)	Based on soil descriptions and in-situ testing (SPT)
Intact Sandstone		
Bulk Unit Weight, γ [kN/m3]	20 to 22	Based on soil descriptions & typical values in BS8002
Unconfined Compressive Strength [MN/m2]	0.8 (minimum)	Based on soil descriptions and in-situ testing (SPT)

4.3 Groundwater

4.3.1 Groundwater encountered during fieldworks

Groundwater strikes was encountered during the fieldworks as summarised below in Table 26.

Table 26: Summary of groundwater strikes

Location	Strata	Groundwater strike depth (m bgl)	Comments
WS1207	Made ground (embankment – cohesive)	3.0	Described as a slight seepage
WS1214	Superficial deposits (granular)	2.3	Described as groundwater strike
WS1215	Made ground (granular)	0.8	Described as surface water

Groundwater were not encountered at any of the other intrusive locations during the field works.

4.3.2 Groundwater monitoring

Twelve window sample boreholes and five cable percussive boreholes were installed with a single 50mm combined gas and groundwater monitoring standpipe. The standpipes in the window sample boreholes have been monitored on four occasions between 30th September 2020 and 18th November 2020. The standpipes in the cable percussive boreholes have been monitored on three occasions between 7th October 2020 and 18th November 2020.

The installation details and the range of depths to groundwater recorded during monitoring undertaken to date are summarised in Table 27.

Table 27: Summary of groundwater monitoring

Location	Response zone (m bgl)	Response zone stratum	Groundwater depth during monitoring visits (m bgl)	Site area
WS1202	1 – 2.4	Superficial Deposits	1.43 to 1.8	Railway embankment crest
WS1203	1 - 4	Made Ground	Dry	Railway embankment crest
WS1204	0.5 – 2.3	Sandstone	Dry	Railway embankment toe
WS1205	1 - 5	Made Ground	Dry	Railway embankment crest
WS1206	0.5 – 3.1	Sandstone	2.37 to 2.52	Railway embankment toe
WS1207	3 – 6	Made Ground	Dry	Railway embankment crest
WS1208	1 – 4	Made Ground	Dry	Railway embankment crest
WS1209	0.5 – 1.7	Sandstone	0.34 to 1	Railway embankment toe
WS1211	0.5 – 2.2	Sandstone	1.44	Railway embankment toe
WS1212	2.7 – 3.7	Sandstone	Dry	Railway embankment toe
WS1214	0.5 – 4.6	Superficial Deposits	1.31 to 2.4	Railway embankment toe

Location	Response zone (m bgl)	Response zone stratum	Groundwater depth during monitoring visits (m bgl)	Site area
WS1215	0.5 – 1.4	Made Ground	0.27 to 0.6	Railway embankment crest
BH1301	1 – 2.8	Sandstone	1.62 to 2.07	Bridge 55
BH1302	0.5 – 1.8	Sandstone	1.35 to 1.65	Station
BH1303	1.4 – 2.7	Sandstone	Dry	Car park
BH1304	1.0 – 1.3	Sandstone	Dry	Central culvert crossing
BH1305	1.4 – 2	Sandstone	1.57	Eastern culvert crossing

5 Geoenvironmental screening assessment

5.1 Conceptual site model

5.1.1 Introduction

A conceptual model describes the scenario in which the risks to human health and the environment posed by contaminated land are assessed. It describes the ground and surface conditions, the proposed ground works and the final form of the development. In particular, the model identifies and describes the sources of the potential contamination, the behaviour of the contamination in environmental media such as soil and groundwater, surface water and air. It also identifies and characterises potential human health and environmental receptors, and plausible pathways.

The potential risks to human health and the environment have been considered in the context of a conceptual source-pathway-receptor model of the site, identifying:

- The principal pollutant hazards associated with the site (the sources);
- The principal receptors at risk from the identified hazards; and
- The existence, or absence, of plausible pathways which may exist between the identified hazards and receptor.

For risks to be present at the site, all three elements (source-pathway-receptor) of a plausible pollutant linkage must be present. Potential source-pathway-receptor linkages are described below based on the assumption that the site will be redeveloped for commercial use in the form of a new station building and car park with associated works along the existing rail corridor to provide the new twin-track arrangement.

5.1.2 Potential sources

The existing rail alignment has been present since the mid-1800s. The proposed station and car park area was historically agricultural land and later a quarry with associated out houses before its current use as public open space. The site has a history of earthworks in the form of level changes associated with land reprofiling and surface water and utility diversions. The historical activity on site will contribute to the potential sources of contamination that may be present. A summary of potential contaminants that could be associated with historical activity on site are provided in Table 28.

Table 28: Summary of potential contaminants

Potential source	Potentially contaminative materials	Comments
Made ground (demolition material/ infilled quarry/ railway)	Asbestos Heavy metals Petroleum hydrocarbons Polycyclic aromatic hydrocarbons (PAH) Ground gases (methane, carbon dioxide)	Made ground deriving from building demolition of historical buildings on site (Tanpit House) could contain asbestos. Potential contamination also associated with railway line, quarry and infilling The generation of ground gas will depend on the thickness and organic content of made ground.

5.1.3 Potential receptors

Receptors that may be present during construction and after completion of the development include:

- Construction workers, site workers/visitors and site neighbours during construction;
- Site workers/visitors post-construction;
- Groundwater within the Sherwood Sandstone (Principal Aquifer) and Shirdley Hill Sand Formation (Secondary A Aquifer); and
- Kirkby Brook.

5.1.4 Potential pathways

Potential pathways that may be present during redevelopment and operation include:

- Human health - ingestion of soils or dust;
- Human health - inhalation of dust, vapour or ground gas;
- Human health - dermal contact with soils;
- Controlled waters - migration of dissolved phase contamination within groundwater;
- Controlled waters (and human health by vapours) – transport of non-aqueous phase contaminants;
- Ground gas - ingress of ground gas into buildings.

5.1.5 Summary of potential pollutant linkages

A summary of the potential pollutant linkages identified based on the findings of the ground investigation in relation to the site is presented in Table 29. Overall a low risk from site contamination was identified at the site.

Table 29: Summary of potential pollutant linkages

Sources	Pathways	Receptors	Comments
Potentially impacted made ground soils	Dermal contact with soils Inhalation of dust or vapour Ingestion of dust, soil	Construction workers	No significant contamination identified in soils beneath the site which is considered to pose a risk to future site users. Standard good health and safety practices to be applied
Ground gases	Accumulation of gases in confined spaces producing asphyxiation and explosion risk	Future site users of Headbolt Station	No significant sources of ground gas expected on site. Ground gas monitoring undertaken to date indicates that the risk from ground gas to site end users is negligible
Leachable contaminants in the made ground	Vertical infiltration of leachate Lateral movement along service pipe/trenches	Groundwater	No significant contamination identified in soils beneath the site. Limited localised pockets of perched groundwater were recorded during the ground investigation. Hardstanding/ building slab will limit infiltration and leachate production.

5.2 Data screening

The laboratory analytical results and field data collected during the ground investigation have been screened against current published or internal guideline values in order to provide an initial assessment of the potential contamination status of the site. The data for soil, water and ground gas have been assessed separately, as presented in the sections below.

5.3 Soil screening assessment

5.3.1 Methodology

To simplify the assessment of ground contamination risks, the statutory guidance suggests that generic soil quality guideline values may be used for the initial screening of soil contamination testing results. Generic assessment criteria (GAC) and site-specific assessment criteria (SSAC) can be calculated using the software version of the Contaminated Land Exposure Assessment (CLEA) model. The model estimates human exposure (children and adults) to soil contaminants for those potentially living, working and/or playing on contaminated sites over long time periods (chronic exposure). The CLEA model does not consider short-term (acute) risks to humans, such as those which may arise during construction activities, or the risks posed by contaminated groundwater.

Soil guideline values (SGVs) generated using the CLEA software and accompanying toxicological reports have been issued by the Environment Agency

(EA) for eleven contaminants. Arup has produced GAC using risk assessment software (CLEA v1.06) in accordance with the CLEA assessment framework for the four standard CLEA end uses (residential with plant uptake, residential without plant uptake, allotments, and commercial) and for soil organic matter (SOM) values of 1%, 2.5% and 6%.

5.3.2 Soil assessment criteria – commercial end use

The soil results have been compared against screening criteria for a commercial end use. The key input parameters are summarised in Table 30. Full details on the input parameters and background research can be provided upon request. The GACs have been developed using a Soil Organic Matter (SOM) value of 6%, which has been selected based on the average SOM content of the soils sampled on site.ining

Table 30: Summary of key input parameters

Parameter	Unit	Value (commercial end use)
Age Range (critical receptor)	Years	16-65 (Female)
Exposure Frequency	days/yr	230
Exposure duration outdoor	hr/day	1
Soil to skin adherence factor	mg cm^{-2} day^{-1}	0.14
Maximum exposed skin fraction	m^2/m^2	0.08
Soil and dust ingestion rate	mg/day	50
Inhalation rate	m^3/day	13.4

5.3.3 Soil screening results

The results of the human health screening assessment are presented in Appendix E1. A total of 62 soil samples were screened for a variety of contaminants.

All contaminants have been reported below their respective screening criteria for a commercial end use and are considered unlikely to pose a significant risk to future site users.

There is a potential risk to construction workers who may come into direct contact with contaminated soils, particularly during earthworks. However, exposure periods are generally shorter than those experienced by long term site users and can usually be reduced to an acceptable level through adoption of adequate health and safety procedures.

Asbestos was not identified in any of the soil samples tested. However, asbestos may be present (as yet undetected) and it would be prudent to proceed assuming a potential risk during earthworks and construction works where soils are disturbed, as this may allow fibres to be released into ambient air. Appropriate mitigation measures should be applied to protect construction workers and site neighbours and should be designed and implemented by a competent contractor. Mitigation measures should include as a minimum dust suppression and appropriate PPE.

The results indicate that the existing soils within the site are likely to be chemically suitable for reuse as part of the development and that no specific remediation is likely to be required with respect to the protection of human health.

5.4 Controlled waters screening assessment

5.4.1 Controlled waters assessment criteria

Groundwater and surface water test results have been screened against criteria based on the lowest published value of freshwater Environmental Quality Standards (EQS) and UK drinking water standards (DWS) to identify potential contaminants of concern. Where no EQS values are available the results have been compared to EU drinking water standards (EUDWS) or World Health Organisation standards (WHO).

5.4.2 Controlled water screening results

Two surface water samples (SW01 and SW02) from Kirkby Brook upstream and downstream of the station and car park area and one sample of groundwater (BH1301) were obtained during the ground investigation. The contaminants which exceed the screening criteria are summarised in Table 31. This assessment is also presented as Appendix E2.

Table 31: Exceedances of water screening criteria

Determinand	Screening criteria	Exceedances
Manganese	30 µg/l	BH1301 (917 µg/l)
Selenium	10 µg/l	BH1301 (44 µg/l)
Anthracene	0.1 µg/l	BH1301 (0.34 µg/l)
Fluoranthene	0.0063 µg/l	BH1301 (3.69 µg/l) SW01 (0.09 µg/l) SW02 (0.14 µg/l)
Benzo(a)pyrene	0.00017 µg/l	BH1301 (3.37 µg/l) SW01 (0.06 µg/l) SW02 (0.1 µg/l)

In general, the groundwater and surface water testing indicates that the majority of contaminants tested are recorded below the screening criteria.

Elevated concentrations of manganese and selenium were recorded in the groundwater in BH1301. Manganese and selenium are known to be naturally present within groundwater in the Sherwood Sandstone in this region of the UK. Due to the lack of significant contamination identified in the made ground it is considered unlikely that the site is the source of elevated manganese and selenium groundwater concentrations.

Elevated concentrations of PAHs were recorded in the groundwater (anthracene, fluoranthene and benzo(a)pyrene)) and both surface water samples (fluoranthene and benzo(a)pyrene) and it is possible that the made ground may be a contributory

source, however no significant hydrocarbon contamination was recorded within the soils.

Due to the limited of groundwater encountered during the investigation and the lack of significant contamination identified in the made ground any risk posed from soil contamination is considered to be negligible.

5.5 Gas monitoring

Made ground can be a source of ground gases, however at the site significant organic material that could be considered a potential source of ground gases has not been identified. A plausible pollutant linkage between site users and any ground gases accumulating in the station buildings to asphyxiating or explosive concentrations was identified in the conceptual site model. Ground gas monitoring was undertaken upon completion of the recent ground investigation and a generic risk assessment has been undertaken following the guidance outlined in CIRIA C665 [12] the results of which are described below. V low risk

5.5.1 Methodology

The risk posed to buildings by hazardous ground gases has been assessed in accordance with CIRIA C665 [12] and British Standard guidance [13] and follows the source-pathway-receptor model.

5.5.2 Gas monitoring results

To date, a total of four rounds and three rounds of gas monitoring have been completed for twelve standpipes and five standpipes respectively installed within the site as part of the recent ground investigation. The cable percussive borehole installations have only been monitored three times as they were not drilled at the time of the first monitoring round. Atmospheric pressures during the monitoring to date have ranged from 989 to 1006 mb.

The results of the gas monitoring are summarised in Table 32.

Table 32: Summary of gas monitoring data

Monitoring well	No. visits	Methane		Carbon dioxide		Peak gas flow (l/hr)	Site area
		Range % v/v	No. >1%v/v	Range % v/v	No. >5%v/v		
Response zone in made ground							
WS1202	4	<0.1	0	<0.1 – 3.1	0	<0.1	Railway embankment crest
WS1203	4	<0.1	0	1.3 – 11.1	1	<0.1	Railway embankment crest
WS1205	4	<0.1	0	0.2 – 7.1	1	<0.1	Railway embankment crest

Monitoring	No.	Methane		Carbon dioxide		Peak gas flow	Site area
WS1207	4	<0.1	0	2.7 – 9.5	2	<0.1	Railway embankment crest
WS1208	4	<0.1	0	3.7 – 5.5	1	<0.1	Railway embankment crest
WS1214	4	<0.1	0	1.1 – 2.4	0	<0.1	Railway embankment toe
WS1215	4	<0.1	0	<0.1 – 0.4	0	<0.1	Railway embankment crest
BH1303	3	<0.1	0	8.5 – 13.2	3	<0.1	Car park
Response zone in sandstone							
WS1204	4	<0.1	0	1 – 2.2	0	<0.1	Railway embankment toe
WS1206	4	<0.1	0	2.1 – 2.8	0	<0.1	Railway embankment toe
WS1209	4	<0.1	0	0.4 – 1.8	0	<0.1	Railway embankment toe
WS1211	4	<0.1	0	0.6 – 1.0	0	<0.1	Railway embankment toe
WS1212	4	<0.1	0	0.4 – 4.6	0	<0.1	Railway embankment toe
BH1301	3	<0.1	0	1.5 – 1.6	0	<0.1	Bridge 55
BH1302	3	<0.1	0	0.9 – 2.3	0	<0.1	Station
BH1304	3	<0.1	0	1.9 – 2.3	0	<0.1	Central culvert crossing
BH1305	3	<0.1	0	1.7 – 2.3	0	<0.1	Eastern culvert crossing

No methane was recorded in any of the boreholes (<0.1%). Carbon dioxide levels within the made ground recorded elevated concentrations in some wells with a maximum concentration of 13.2% recorded in BH1301.

The gas flow rates recorded were negligible (<0.1 l/hr) in all boreholes suggesting that ground gases are not being generated in significant quantities.

Gas Screening Values (GSV) have been calculated for methane and carbon dioxide, in line with current CIRIA guidance. The GSVs indicate that the gassing regime within the site conforms to Characteristic Situation 1 and presents a very

low risk to the future development. For this situation gas protection measures are not required within new buildings.

5.6 Preliminary waste assessment

An indicative waste classification exercise was undertaken to provide information for the management of materials at the site. Made ground samples were tested for a range of inorganic and organic contaminants during the recent ground investigation and the online waste classification service HazWasteOnline was used to screen the results to identify those samples that may be classified as hazardous if offsite disposal is required. The online service classified material in line with current waste guidance, WM3. Once data is uploaded the service generates detailed reports containing the hazardous properties identified for each sample. These reports are presented in Appendix F.

5.6.1 Automatic Ballast Sampling assessment

Automatic Ballast Sampling (ABS) was carried out to investigate the construction and condition of existing track bed. The procedure for assessing the re-usability of the ballast is defined in NR/L3/ENV/044 [16].

15 ABS samples were analysed for the Network Rail ballast analytical suite which includes a limited metal suite, TPH, asbestos and other analytes that have been identified by risk assessment as potential contaminants – in this case PAH. HazWasteOnline was used to screen the results to identify those samples that may be classified as hazardous waste.

HazWasteOnline classification identified all of the ballast samples tested would be classified as non-hazardous waste.

5.6.2 Car park and station assessment

An indicative waste classification has not been undertaken for samples obtained from the proposed car park and station site as the earthworks strategy is still being developed and the volume of material which may require off-site disposal as waste is currently unknown. On the basis of initial earthworks assessments to inform pre-planning a net deficit of fill materials is anticipated and the volumes of material requiring off-site disposal are likely to be small. Once the earthworks strategy for the site has been developed it is recommended that the requirement for waste classification assessment on materials from the proposed car park and station site be revisited.

5.7 Concrete aggressivity

Contaminants such as sulphate and acidic conditions generally present a low risk to human health but can result in degradation of buried concrete. The chemical environment for concrete has been assessed following the guidance outlined in BRE Special Digest 1 [14].

The design sulphate (DS) and aggressive chemical environment for concrete (ACEC) classes were assessed assuming that the site was classified as non-pyritic brownfield with mobile groundwater. A summary of the assessment results is provided in Table 33.

Table 33: Summary of concrete aggressivity assessment

Strata	Characteristic pH	Characteristic sulphate (mg/l)	Design sulphate class	ACEC class
Made ground	6.3	20	DS-1	AC-1
Superficial Deposits	6.4	20	DS-1	AC-1
Bedrock	6.2	60	DS-1	AC-1

6 Geoenvironmental risk assessment

6.1 Introduction

The screening assessments for the receptors identified in the conceptual site model have identified residual risks at the proposed site. Based on the proposed redevelopment and the plausible pollutant linkages identified in the conceptual site model, these residual risks have been assessed. The risk classifications of Very Low, Low, Moderate or High risk have been based on the CIRIA guidance C552 [17]. A brief description of each is provided below:

- High Risk - There is a high probability that severe harm could arise or is occurring to a designated receptor from an identified hazard. Urgent investigation (if not undertaken already) is required and remedial works may be necessary;
- Moderate Risk - It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm
- were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk. Some remedial works may be required in the longer term;
- Low Risk - It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild;
- Very Low Risk - There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be significant.

In addition to the risk classifications within the CIRIA guidance, a Negligible risk rating has also been used within the assessment where no plausible pollutant linkage exists.

6.2 Human health

6.2.1 Construction phase

There is a potential risk to construction workers who may come into direct contact with contaminated soils, particularly during earthworks. However, exposure periods are generally shorter than those experienced by long term site users and can usually be reduced to an acceptable level through adoption of adequate health and safety procedures.

Asbestos was not identified in any of the soil samples tested. However, asbestos may be present (as yet undetected) and it would be prudent to proceed assuming it still poses a potential risk during earthworks and construction works where soils are disturbed, as this may allow fibres to be released into ambient air. Appropriate good practice measures should be applied to protect construction workers and site neighbours and should be designed and implemented by a competent contractor.

Mitigation measures should include as a minimum dust suppression and appropriate PPE.

If the mitigation procedures described above are implemented during construction it is assessed that the risk of harm to construction workers and neighbours will be **Very Low**.

6.2.2 Operational phase

The concentrations of all contaminants measured during the ground investigation in soil were below values that might be regarded as posing a risk to future users of the proposed station and car park.

The proposed site use means that there is little potential that site users will come into contact with the soils on site. The results indicate that the existing soils within the site are chemically suitable for reuse as part of the development. If soft landscaping areas are proposed then a validated clean topsoil and subsoil will be required, it is possible that some of this material could be site-won.

Consequently, the risks from dermal contact with made ground soils, ingestion of site made ground and inhalation of made ground soil or dust vapour to future site users is **Very Low** and that no specific remediation is likely to be required with respect to the protection of human health.

6.3 Controlled waters

Limited groundwater was encountered during the ground investigation. The lack of superficial deposits between the made ground deposits and sandstone within the proposed station and car park site may permit migration of leachable contaminants into the underlying principal aquifer. However, no significant contamination which could be considered to pose a risk to groundwater was recorded within the made ground soils beneath the site. The proposed station and car park development will predominantly comprise buildings and hardstanding which will minimise infiltration.

Consequently the risks to controlled waters from the proposed development are considered to be **Very Low**.

It is understood that new buildings and structures will be constructed using shallow foundations. If piled foundations into the sandstone are proposed for any new structures a pathway between the made ground and the principal aquifer may be established through piling operations. However, due to the limited presence of significant contamination and absence of a low permeability layer above the principal aquifer, the risk of piling operations creating a pollutant pathway is deemed to be low.

Infiltration drainage may be incorporated into the drainage scheme for the development. This will be confirmed as part of the next design stage where further assessment will be undertaken to confirm the design. The drainage system will incorporate control measures (e.g. petrol interceptor) to prevent migration of any pollutants into the sandstone bedrock which will be assessed as part of the design.

6.4 Ground gas

A potential pollutant linkage exists between ground gas generating soils and future users of the proposed station building, if gas can flow or permeate through building envelopes and accumulate within enclosed spaces. None of the soils encountered have potential to generate significant flows of hazardous gases. Gas monitoring undertaken at the site to date indicates that the gas regime would be classified as Characteristic Situation 1 and therefore ground gas protection measures in new buildings on the site will not be required. The risk from ground gases based on the monitoring results is therefore assessed to be **Very Low**.

6.5 Construction materials

The BRE assessment did not identify any elevated sulphate concentrations within made ground on site which could pose a potential risk to buried concrete. It is considered that all buried concrete at the development site should be designed in accordance with DS-1 and AC-1.

7 Outline remediation strategy

This section presents an outline remediation strategy for the proposed works. Detailed contractor's method statements will need to be prepared prior to commencing works on site. An options appraisal has not been undertaken as the mitigation measures are intrinsic to the development design or relate to site management, as described below.

7.1 Excavated materials management

The scheme includes significant earthworks cut and fill in the car park area. The most sustainable approach is to reuse materials onsite during the development and minimise offsite disposal. This includes materials resulting from the demolition of the existing buildings and excavated soils.

The risk assessments indicate excavated soils are chemically suitable for reuse where needed in the development. A Materials Management Plan (MMP) prepared in accordance with the CL:AIRE Definition of Waste Code of Practice (CL:AIRE DoWCoP) would enable excavated materials to be reused within the development and avoid the material being considered as waste.

The CL:AIRE DoWCoP requires a validation report is produced confirming the location, quantity and suitability of material reused. No visibly contaminated or odorous material should be reused.

If excavated material cannot be reused on site (for example geotechnically unsuitable or surplus to requirements) it may be possible to treat the soil to make it suitable for reuse, reuse the material on another project (with consideration of waste regulatory requirements) or as a least preferred option, offsite disposal to soil treatment facility or landfill.

7.2 Imported material

If any import of soils is proposed the material must be confirmed as geotechnically and chemically suitable. If the imported material is potentially a waste the regulatory mechanism for the material import must be clearly defined (e.g. CL:AIRE DoWCoP).

The testing regime for imported material must be defined. Typically imported materials from brownfield sites should be tested at a frequency of 1 sample in 50m^3. If the source desk study confirms a greenfield source, and no environmental incidents on the site of origin, then it is considered that the testing frequency for imported material can be reduced (e.g. 1 per 500m^3).

7.3 Unforeseen contamination

Grossly contaminated materials are not expected to be encountered at the site. However, on any brownfield site there is the possibility that unforeseen contaminated material may be encountered during excavation works. Care should

be taken during ground works and excavations should be supervised to ensure any previously unforeseen contamination is appropriately managed.

Any material which is identified as potentially contaminated (for example by visual appearance or odour) should be delineated and samples taken for chemical analysis by an Environmental Scientist. The samples should be compared to the soil assessment criteria to determine the suitability of this material for use within the development.

7.4 Buried structural concrete

It is recommended that buried concrete is specified to meet design sulphate class DS-1 and ACEC AC-1.

7.5 Liaison with regulatory authorities

A contaminated land planning condition may be applied to the planning consent, typically requiring investigation, risk assessment and remediation strategy to be approved prior to the commencement of development. This report has been produced in anticipation of such a condition. The planning consent may also include a condition requiring the works be implemented in accordance with the remediation strategy and a validation report be approved prior to occupation of the development.

The need for regulator consultation and decision should be considered in the programme and sufficient time allowed.

7.6 Remediation implementation

Detailed contractor's method statements should be prepared prior to commencing works on site in accordance with this Remediation Strategy and including the following content:

- Environmental protection measures (including water management and dust suppression)
- Health and safety management
- Stockpile management
- Material reuse proposals (if required, with reference to CL:AIRE DoWCoP)
- Confirm material reuse validation criteria and testing frequency (if required)
- Waste management proposals (off site soil disposal, if required)
- Imported soil proposals (if required)
- Proposals for addressing unforeseen contamination
- Buried concrete classification
- Potable water supply pipe requirements
- Validation plan (see below).

7.7 Validation and reporting

Evidence that the works have been undertaken in accordance with this Remediation Strategy and the method statements should be collected by the contractor during the works. A validation report should be prepared including the following, as a minimum:

- Photographic records and details of any below ground infrastructure removed
- Records of environmental protection measures implemented
- Results of validation testing compared to validation criteria
- Records of earthworks including photographs
- Details of any unexpected contamination encountered
- Material reuse records
- Offsite surplus soil disposal records
- Environmental regulator communications

This information should be compiled into a validation report by a suitably qualified environmental scientist at the end of the works.

8 Key development considerations

This section outlines the main areas of geotechnical design associated with the project and provides a description of the relevant geotechnical risk and recommended approach for the management of these. In is intended to assist with the development of specific solutions to address these risks in latter design stages and support the preparation of the Approval in Principle documents at GRIP stage 4.

8.1 Rail corridor

8.1.1 General ground and groundwater conditions

Made ground deposits present along the rail corridor typically comprise a layer of ballast, underlain by granular track bed material and for the majority of the project extent embankment fill.

The ballast encountered was described as dirty or very dirty ballast. The granular track bed material was on average 0.7m thick and comprised a layer of ashy fill (sandy gravel) over a gravelly sand layer. In most locations the embankment fill comprises cohesive material (sandy gravelly silty clay).

Glacial Till, comprising cohesive and granular deposits, was encountered in the majority of exploratory holes undertaken within the rail corridor cutting (from 750 to 1500m and from 2525 to 2600m), and in its proximity, at the crest and toe of embankment (from 1500 to 2225m). Reported depths ranged from 0.6m to 4.7m with the base of the strata proven in all locations.

Sandstone bedrock was encountered at depths ranging from 0.25m to 4.5m below ground level and typically described as weathered reddish brown sandstone. Sandstone was generally encountered at a depth greater than 2m, however in exploratory holes between 1150 to 1400 and 2300m it was reported at shallow depth (<1m).

Pitching stones were encountered at shallow depth underneath the ballast within the Kirby station area west of OB57 (~850 to ~1050). The exact limits of the pitching stones has not been defined but they were not encountered in holes undertaken at ~750m and 1150m.

Very limited perched groundwater was encountered with the exploratory holes undertaken during the ground investigation. Where encountered groundwater monitoring in the sandstone recorded water levels at approximately 1.4 – 2.5m depth. It is anticipated that the main groundwater body lies at a considerable depth below ground level.

8.1.2 Impact on existing earthworks

Some embankment widening to accommodate the proposed track alignment will be required. The extent will be assessed during design development in GRIP stage

4 and will be a function of the rail corridor width required to accommodate access routes, position of safety, cabling in addition to the tracks.

It is anticipated that cess retention will be required to facilitate embankment widening in some areas as widening by earthworks will not be practical for large sections of the site, due to vegetation cover on existing earthwork slopes and/or proximity of the Network Rail boundary to embankment toe.

Network Rail standard details for cess retention, utilising a king post retaining structure, are likely to be suitable for retained heights of up to 1m (subject to design). Retained heights greater than 1m may require anchoring (for example by soil nails) or the use of an alternative retaining structure (for example reinforced concrete stem wall) if widening by earthworks is not practical.

Where the proposed rail corridor is situated in areas of cutting it is anticipated that it will be possible to accommodate this within the existing cutting width without impacting on existing cut slopes. Some local regrading or low height retention may be required to accommodate lineside equipment, this will require further review during design development when lineside equipment locations are confirmed.

8.1.3 UB 55 (Bridge 55)

In order to accommodate the proposed track alignment works to UB55 are required. New foundations will need to be constructed to support the new eastern abutment and intermediate pier. Based on the ground conditions encountered the anticipated foundation solution is shallow pads bearing onto intact sandstone bedrock.

The interface between the new foundations and the existing substructure elements will require careful consideration (in particular for pier 2) to manage issues associated with differential settlement and to develop construction sequencing.

Further ground investigation will be required to inform detailed design. The ground investigation is required to investigate temporary works installed for the construction of UB55 adjacent to the east abutment and prove the depth of the underside of the existing foundation of the abutment. Further investigation is also recommended to provide rotary coring into the intact sandstone to understand rock strength for the bridge widening foundations.

8.1.4 Ancillary civils

Details of the specific locations of individual lineside infrastructure elements of the projects are to be confirmed. It is anticipated that these will include lineside equipment foundations (location cases, REB, etc) within the vicinity of Kirkby station. A limited number of signal structures will be required however the location of these is not currently known.

Based upon ground investigation information it is expected that the majority of locations will be suitable for application of standard detail foundations utilising shallow foundations bearing onto embankment fill or natural ground. However further assessment will be required during design development to confirm this.

For structures with significant lateral loading (for example signal structures) piled foundations may be more efficient particularly if located on areas of existing embankment or in areas where widening to accommodate the existing rail corridor is required to minimise loading on the widening solution.

8.1.5 Track bed and ballast re-use assessment

Automatic Ballast Sampling (ABS) was carried out to investigate the construction and condition of existing track bed. Waste classification identified all ballast samples tested (15No.) would be classified as non-hazardous waste. Which indicates that the ballast should be managed as non-hazardous ballast in accordance with the requirements of NR/L3/ENV/044 [16].

The suitability of existing track bed materials for use in the track bed for the proposed track alignment will be reviewed as part of the track design.

8.1.6 Geoenvironmental issues

The ground investigation did not identify any evidence of significant contamination within the soils in the rail corridor.

There is a potential risk to construction workers who may come into direct contact with contaminated soils, particularly during earthworks. However, these risks can be mitigated to an acceptable level through the adoption of adequate health and safety procedures and appropriate good practice measures including dust suppression and PPE.

The soil assessment indicates that soils are suitable for reuse within the site. A Materials Management Plan (MMP) prepared in accordance with the CL:AIRE Definition of Waste Code of Practice would enable excavated materials to be reused within the development and avoid the material being considered as waste.

It is considered that all buried concrete at the development site should be designed in accordance with DS-1 and AC-1.

8.2 Car park and station

8.2.1 General ground and groundwater conditions

Made ground was encountered in all off-line holes undertaken within the proximity of the proposed station and car park. Outside the extent of the former quarry reported depths to underside of made ground ranged from 0.5m to 2m bgl, typically 0.5m to 1.5m bgl, with the base of the strata proven in all locations.

Historical mapping shows a quarry within the car park area (north of Kirkby Brook). Ground investigation locations within the mapped extent of the former quarry reported made ground depths between 2m and 3.1m bgl, however the base of made ground was not proven in one location.

The underlying bedrock was encountered in all the locations undertaken within the proximity of the proposed station and car park. Depths to top of sandstone

ranged from 0.2m to 3.2m below ground level, typically within the range 0.8m to 3m. The base of sandstone was not proven with holes terminating 0.6m to 2.4m below rockhead level.

Limited perched groundwater was encountered with the exploratory holes undertaken across this area of the site during the ground investigation. Groundwater monitoring in the sandstone shows the water level to be similar to that seen during the fieldwork. It is anticipated that the main groundwater body lies at a considerable depth below ground level. There is a risk of encountering localised perched groundwater during construction activities.

Soakaway testing indicates the sandstone permeability (1.3 to 1.4 x10^{-05} m/s) is likely to be suitable to enable infiltration drainage to be incorporated into the drainage scheme, although further assessment is required to confirm this and size any soakaways. Given the site end usage, control measures (for example a petrol interceptor) will be required to prevent migration of any pollutants into the sandstone bedrock and should be assessed as part of design development.

8.2.2 General earthworks

In order to form the proposed car park levels earthworks will be required. An earthworks volume assessment has not yet been undertaken however it is anticipated that the volume of cut will be greater than the volume of fill and as such there will be an earthworks deficit requiring net import of earthwork fill. It is recommended that any imported earthworks fill is granular in nature.

Based on the ground investigation trial pits (undertaken using a 5T excavator to depths up to 2.5m below rockhead and 0.5m below intact rockhead) it is anticipated that excavations for proposed car park level (up to 2m below existing ground level) should be possible with conventional plant.

Site won made ground and sandstone materials are both considered geotechnically suitable for re-use as general earthworks fill. Based on grading the made ground is anticipated to be suitable as a class 2 materials (general cohesive fill) and sandstone a class material (general granular fill).

Given the nature of site won materials earthwork gradients of 1 in 3 (vertical to horizontal) are considered appropriate. Steeper gradients may be achievable with selected site-won soils or imported granular fill.

Changes in proposed ground levels are proposed to be accommodated through earthwork slopes. As such retaining walls are not currently anticipated to be required, should this change during design development gravity or reinforced concrete stem walls, founded on weathered sandstone or competent made ground are likely to be suitable.

8.2.3 Station building and platforms

Given the anticipated loading of the station building and the relatively shallow bedrock, shallow pad foundations are likely to be the preferred foundation option to support the main structural loads. These would be founded on competent underlying sandstone bedrock.

Due to the variable nature of the made ground it is not recommended that ground bearing floor slabs are founded directly on to this material. However, if the existing made ground is removed to confirm the top of the underlying competent bedrock and replaced with compacted and validated engineered granular fill, the use of a ground bearing slab should be suitable.

The proposed station platforms will be relatively lightly loaded and as such shallow foundations based upon Network Rail standard details are considered to be appropriate. Dependent upon local ground conditions it is anticipated that it will be possible to found the majority of these on weathered sandstone bedrock. In areas where this is not practical bearing onto competent made ground or embankment fill materials should be appropriate.

8.2.4 Brook crossings

The proposed scheme includes a road bridge and two footbridge crossings over Kirkby Brook. The span and structural form for these is subject to design development. It is anticipated that wingwall structures will be required to accommodate the approach earthworks to the road crossing.

Shallow foundations on sandstone bedrock are likely to be the preferred foundation solution for the bridges over the brook. Dependent upon loadings and settlement criteria shallow foundations on competent made ground may be possible for the footbridge crossings. The northern abutment of the road bridge is close to the former quarry extents from historical mapping and as such rockhead may be locally deeper requiring a greater foundation depth.

Shallow foundations, founded on sandstone bedrock, are also considered suitable for the wingwalls associated with the approach earthworks for the road crossing. The form of construction for the wingwalls requires review but reinforced concrete stem walls or reinforced earth structures are considered to be suitable at this stage.

8.2.5 Headbolt Substation

An earthworks platform is proposed to accommodate a substation between the existing railway embankment and Kirkby Brook. In addition to earthworks to form the platform and approach ramp it is anticipated that retaining walls or reinforced soil structures or slopes (~2 to 3m high) will be required to avoid the substation platform encroaching into the maintenance easement associated with Kirkby Brook.

The requirement for structures to form the compound requires review but reinforced concrete stem walls or reinforced soil structures founded on sandstone are considered suitable options for the compound walls. Reinforced soil slopes may also be an option. High quality granular fill will be required for backfill to structures and for reinforced soil structures/slopes and will need to be imported to site.

There is a level difference between the substation platform and track alignment (~2.5m). The horizontal separation between platform and track alignment reduces

towards Headbolt station. In areas where an earthwork slope is not suitable a retaining wall will be required to accommodate the level difference. If a wall is required a reinforced concrete stem wall founded within the earthwork platform or a sheet piled retaining wall are considered the most likely options.

8.2.6 Geoenvironmental issues

The soil assessment identified that the existing made ground is unlikely to pose a risk to human health if reused within the final development. Exposure of construction workers to potentially contaminated soils should be controlled to be as low as reasonably practicable (ALARP). No soil remediation is likely to be necessary to protect the health of future site users.

The soil assessment indicates that soils may be chemically suitable for reuse within the site. A Materials Management Plan (MMP) prepared in accordance with the CL:AIRE Definition of Waste Code of Practice would enable excavated materials to be reused within the development and avoid the material being considered as waste.

If soft landscaping areas are proposed then a validated clean topsoil and subsoil will be required, it is possible that some of this material could be site-won.

Risks to controlled waters are considered to be low and limited perched shallow groundwater was recorded within the made ground beneath the site.

The ground gas risk assessment suggests that the gassing regime within the site conforms to Characteristic Situation 1 and therefore gas protection measures in new station buildings will not be required.

It is considered that all buried concrete at the development site should be designed in accordance with DS-1 and AC-1.

8.3 Further ground investigation

The ground investigation undertaken to date is considered appropriate to inform development of approval in principle designs for the scheme. Further ground investigation will be required to inform detailed design and is summarised below.

- **UB55** - ground investigation is required to provide further information on depth and strength of sandstone rockhead. Additional investigation to provide information on form of construction and founding depth to existing abutment and pier foundations and relict temporary works is recommended to inform design and construction sequencing.
- **Highway brook crossing & associated wingwalls** – additional exploratory holes at proposed abutment and wingwall locations are recommended to inform substructure, approach earthworks and retaining wall design. These should confirm depth and strength of sandstone rockhead and the extent of former quarry
- **Car Park and Station** – additional exploratory holes are recommended to provide further information to inform design of platform foundation and

associated retaining structures, earthworks modelling and substructure design for footbridge brook crossings. Investigation at the highway junction to confirm existing road pavement build-up should also be undertaken

- **Headbolt Substation** – exploratory holes to confirm ground conditions beneath the proposed substation platform and the composition of the adjacent existing embankment should be undertaken to inform design of earthworks and retaining structures associated with the proposed substation platform.
- **Embankment widening** – additional holes at the toe and crest of the embankment are required to provide more detailed information on the embankment composition and underlying natural ground. This will be used to inform design of cess retention/embankment widening, earthworks stability assessment and track bed design.
- **Supplementary track bed investigation** – additional exploratory holes are recommended to inform detailed track bed design. This should include targeted investigation to delineate the extent of pitching stones and shallow rock in the Kirkby station area. A typical hole spacing along the rail corridor of c.50m is recommended (across all phases of investigation).
- **Ancillary Civils** – for most locations it is anticipated that holes scoped for embankment widening and track bed design will provide sufficient information on ground conditions for ancillary civils sub-structure elements. The requirement for targeted investigation locations is anticipated to be limited but will require review during design development.

8.4 Geotechnical Risks

An extract from the CDM Designers Risk Assessment detailing the geotechnical and geo-environmental risks identified and their associated mitigation measures is included in Appendix G.

9 References

[1] Mott MacDonald (2018) Geoenvironmental Desk Study, Headbolt Lane Station, 24 August 2018. 139606-MMD-REP-EGE-000003 A01

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[10] Stroud. M. A and Butler F. G Standard Penetration Tests and Engineering Properties of Glacial Materials, proc. symp Engineering Properties of Glacial Material, Midlands Geotechnical Society, Birmingham 117-28.

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[12] CIRIA 143: The Standard Penetration Test (SPT): Methods and Use, London 1995

[13] CIRIA (2007) Assessing the risks posed by hazardous ground gases to buildings. Report C665

[14] British Standards Institute, 2019. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings, BS8485:2015+A1:2019

[15] BRE (2005) Special Digest 1: Concrete in Aggressive Ground. Third Edition. BRE press

[16] Network Rail (2018) Track Maintenance, Renewal or Alteration – Used Ballast and Excavation Waste Handling, NR/L3/ENV/044

[17] CIRIA (2001) Contaminated land risk assessment – a guide to good practice. Report C552

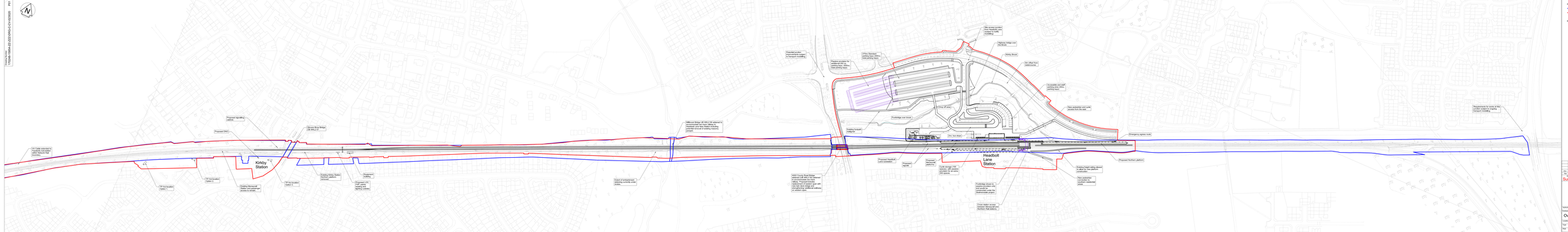
Appendix A

Pre-Planning Application Drawings

Pre Planning Application Proposed Works General Arrangement
170248-15854-ZZ-ZZZ-DRG-C-CV-023020 P01

Pre Planning Application Proposed Elevation
170248-15854-ZZ-ZZZ-DRG-C-CV-029001 P01

Pre Planning Application Cross Sections
170248-15854-ZZ-ZZZ-DRG-C-CV-029002 P01



Legend/Key

Key:

- Network Rail Boundary
- Proposed Red Line Boundary
- Indicative Earthworks

Notes: Indicative Retaining wall

- Passive Provision

Rev	Drawing Amendments	Date	Drawn	Check
P01	Issued for Co-Ordination	08.10.20	DM	TH

Suitable for Co-ordination S1

NetworkRail

Author: Owner: Date:

Designed by:

Ove Arup & Partners

Client: Network Rail

Title: CAD Drawing: Scheme Arrangement

Client Engineer: Scale: 1:1000

Status: S0 Specific Volume or Systems

Project: Preprosal Drawing Size: A1

Headbolt Lane

Project No.

170248

Location

Headbolt Lane

Drawing Title

Pre Planning Application
Proposed Works
General Arrangement

Designed		Verified	Date
Drawn	S.MANLEY	Approved	30/11/20
Checked	ELI CUNTHAY	Authorised	30/11/20
Approved		Date Printed	30/11/20

Scale	Drawing Number	No.	Rev.
1:1000	SPC7km	1	P01

Original Size

Project Number	Originator	Volume	Level	Type	Role	Number	Revision
170248	ARUP	ZZ	ZZ	DRG	C	003020	P01

Original Size

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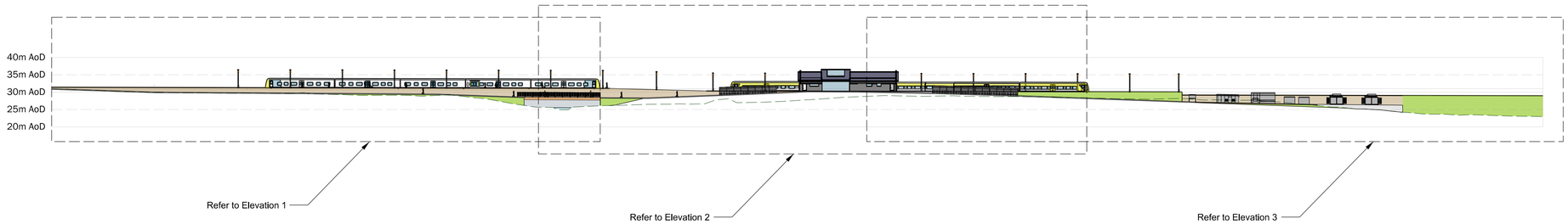
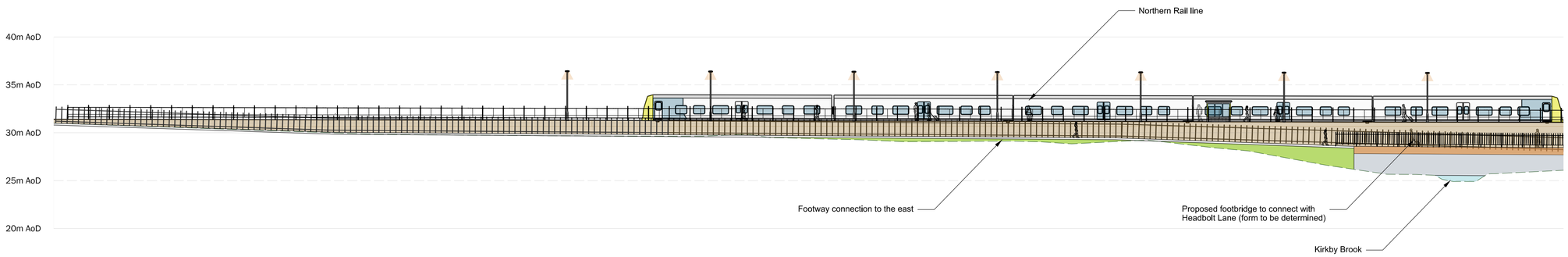
Please Do not Scale Drawing

Drawing Number
170248-15854-ZZ-ZZZ-DRG-C-CV-029001 P01



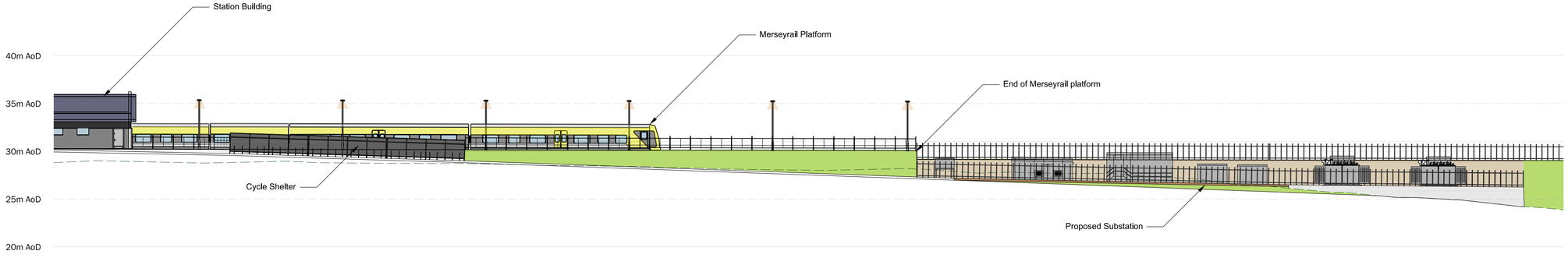
Station Elevation



Station Elevation 1



Station Elevation 2



Station Elevation 3

Legend/Notes

Existing Ground

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01	23/11/20	First Revision	SM	GC	---

Status: Suitable for Co-ordination

Suitability: S1

NetworkRail

Authorised	---	Signed ---	Date

Contractor(s): Ove Arup & Partners Scotland Ltd

Location\Level: No Specific Location

Type: CAD Drawing	Sub-type: Elevation
Role: Civil Engineer	Discipline: Civils
Volume\System: No Specific Volume or System	
Phasing: Proposed	Grip Stage: 4

Project: Headbolt Lane

Contract No.: 170248

Contract Title: Headbolt Lane

Drawing Title: Pre Planning Application
Proposed Elevation

Designed		Signed ---	Date
Drawn	S.MARLEY	Signed SM	Date 23/11/20
Checked	G.COURTNEY	Signed GC	Date 23/11/20
Approved	--	Signed ---	Date

Scale(s): As Shown

ELR & Mileage: SPC1 5m to 7m

Alternative Reference: 170248-ARU-SKE-ECV-000006

Sheet: 1 of 1

Drawing Number: 170248-15854-ZZ-ZZZ-DRG-C-CV-029001

Revision: P01

Sheet Size A1 594 x 841

Drawing Number
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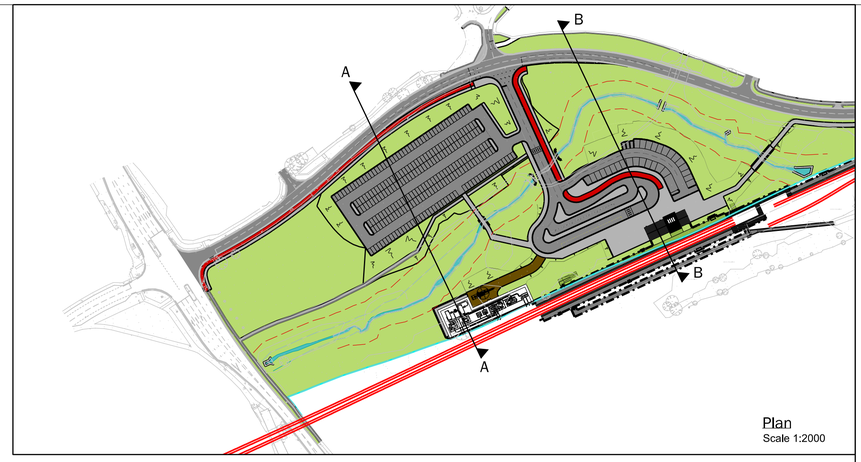

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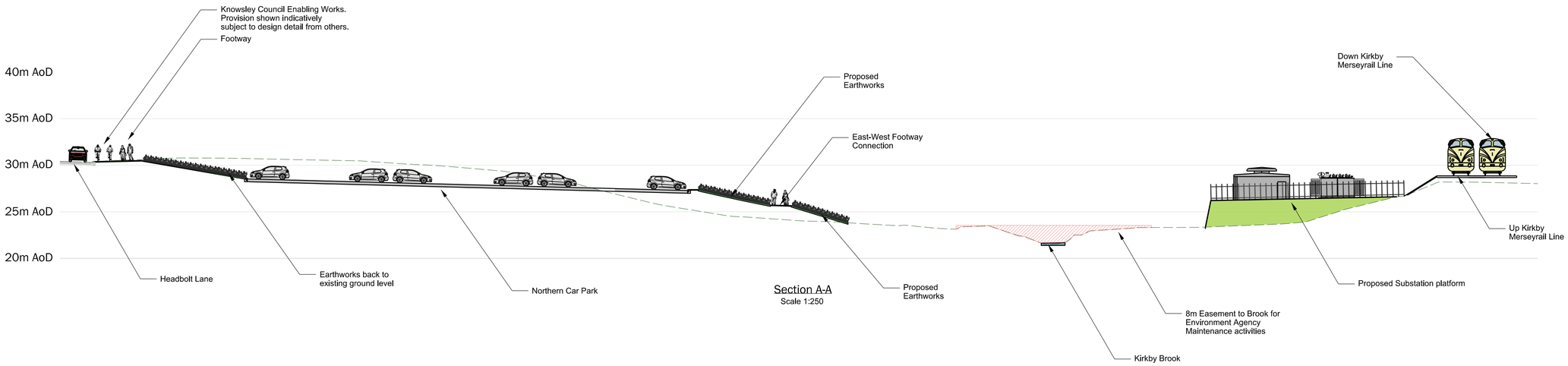

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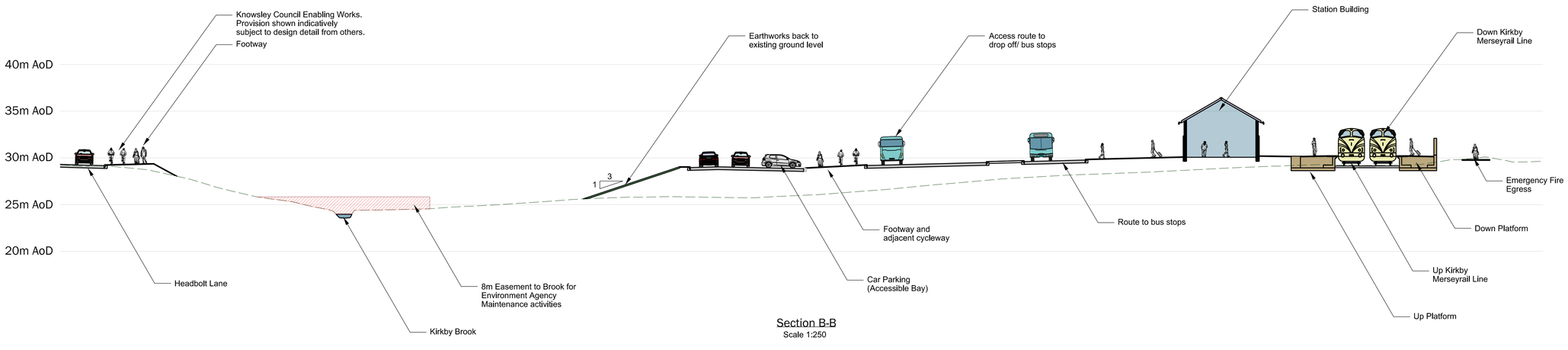

Section B-B
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Legend/Notes

Existing Ground

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01	23/11/20	First Revision	SM	GC	---

Status: Suitable for Co-ordination
Suitability: S1

NetworkRail

Authorised	---	Signed ---	Date
Contractor(s)	Ove Arup & Partners Scotland Ltd		
Location\Level	No Specific Location		
Type	CAD Drawing	Sub-type: Section	
Role	Civil Engineer	Discipline: Civils	
Volume\System	No Specific Volume or System		
Phasing	Proposed	Grip Stage: 4	
Project	Headbolt Lane		
Contract No.	170248		
Contract Title	Headbolt Lane		
Drawing Title	Pre Planning Application Cross Sections		
Designed		Signed ---	Date
Drawn	S.MARLEY	Signed SM	Date 23/11/20
Checked	G.COURTNEY	Signed GC	Date 23/11/20
Approved	--	Signed ---	Date
Scale(s)	As Shown	ELR & Mileage: SPC1 5m to 7m	
Alternative Reference	170248-ARU-SKE-ECV-000007	Sheet: 1 of 1	
Drawing Number	170248-15854-ZZ-ZZZ-DRG-C-CV-029002	Revision: P01	

Sheet Size A1 594 x 841

Appendix B

Mining Risk Assessment

170248-BGC-RSA-EMD-000001 P01

FoundationHouse
St.Johns Road
Meadowfield
Industrial Estate
Durham
DH7 8TZ

Our Ref: D10118

Neil Beaumont
Centara Ltd
Office 1
Woodside Court
Pontefract Road
Normanton
WF6 1SB

Date: 22nd July 2020

Dear Neil

Mining Risk Assessment – Kirby, Nr Liverpool

Further to your recent request, a mining risk assessment has been undertaken for land at Kirby, Near Liverpool. It is understood that the Buckingham Group intend develop the land with rail related infrastructure. The approximate centre of the site is located at National Grid Reference 341276, 399712.

The following sources of information have been examined in the production of this assessment:

- British Geological Survey (BGS) 1: 50,000 scale sheet No 84 Wigan
- BGS historical boreholes
- Coal Mining Report from David Bellis Associates (based on data obtained from the Coal Authority)

Geology

Drift deposits comprise blown sand deposits consisting of sand and gravel with possible glacial clay at the west end of the site. Nearby boreholes indicate that these drift deposits may be <3m deep in the area.

The solid geology underlying the site comprises Triassic Sherwood Sandstone. Nearby boreholes indicate that this stratum is likely to be >100m thick below the site. No coal seams are recorded to outcrop near to the site and are not expected at shallow depth below the site.

Mining

The mining report indicates that the site is underlain by sandstone with no known mine workings.

There are no recorded mine entries within 20m of the site.

Risk Assessment

The risk assessment is based on the potential for shallow mine workings to affect the proposed development based on the desk study information available. The risk for the site may be summarised as following:

Based on the geological plans of the site, historical boreholes and the mining report it is considered that the site is not underlain by shallow workings that would pose a risk to the development of the site.

No mine entries are known to exist on the site.

Action

No significant risk has been identified and as such no further action in relation to shallow mine workings is required.

We trust that the enclosed are sufficient for your present needs, however, please do not hesitate to get in touch should you require any further information.

Yours sincerely,



Katherine Jones

On behalf of Dunelm Geotechnical and Environmental Ltd

David Bellis Consulting Surveyors
Ltd
8, Mornington Terrace
Harrogate
North Yorkshire
HG1 5DH

(DX 720352 Harrogate)

T: 01423 529911 F: 01423 529922
E: contact@coalsearch.plus.com
W: www.coalsearch.plus.com

searchcode

COAL SEARCH PLUS +
Protecting your investment

By

David Bellis
CONSULTING SURVEYORS

Regulated Coal Mining Search Report

Incorporating Cheshire Brine Screening

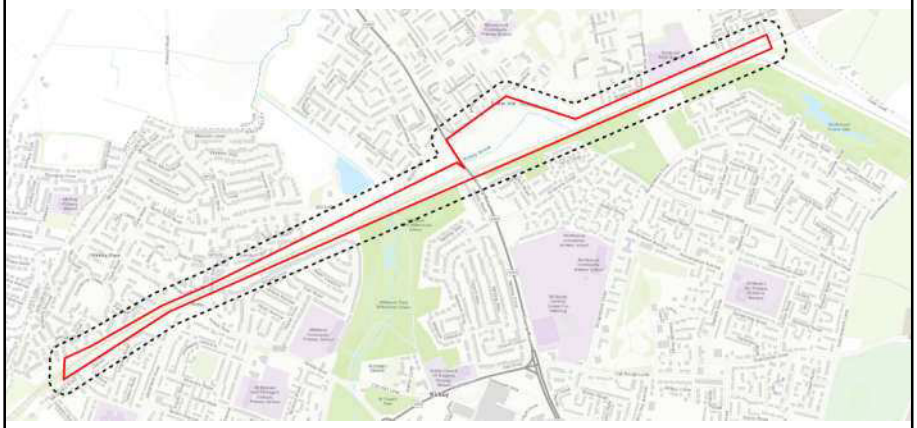
The Property Ombudsman
Consumer Redress

COPSO
ASSOCIATE MEMBER

SITE LOCATION AND COAL MINING FEATURE PLAN

ADDRESS: Site at, Kirkby, Liverpool

SEARCH NUMBER: 424590



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KEY

Property Boundary

50m property boundary buffer

Coal mining subsidence claims within 50m (section 7)

Mine entries within 20m (section 5)

Adits

Shafts

Symbols are indicative only and are not drawn to scale. Do not scale from this plan.

World Topographic Map - Sources: Esri, HERE, Garmin, Intermap, Increment P Corp, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

This plan shows the location of the subject property and where relevant the location of mine entries and subsidence claims referred to in the attached CoalSearchPlus+ regulated coal mining search report. The plan must be viewed in conjunction with the detailed findings in the attached report. A coal mining risk rating, including recommended further action where appropriate, is given at the conclusion of the report. (section 8)

This plan shows reportable features relevant to the property only. Additional relevant coal mining aspects are reported upon within the report. The report and content of this plan are specific to the property under consideration. The report contents should not be used in relation to other property in the area.

Mine entries are reported if they are located within the property boundary or within 20m of it. (see report section 5 for detail)

Coal mining subsidence claims, made since 31 st October 1994 and recorded by The Coal Authority, are reported for the subject property or property located within 50m of its boundary. Records of claims prior to this date are not normally retained by The Coal Authority and will not be reported. (see report section 7 for details)

Property owners have the benefit of the protection of the Coal Mining Subsidence Act 1991* in the event of the occurrence of damage from disused coal mine workings including from disused coal mine entries.

The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency call out facility in coalfield areas to assess the public safety implications of mining features (including disused shafts and adits). The emergency telephone number at all times is (01623) 646333. If you have any questions or queries regarding the content of this coal mining report please contact David Bellis Consulting Surveyors Ltd.

* Note The Coal Mining Subsidence Act 1991 does not apply where coal was worked or gotten by virtue of the grant of a gale in the Forest of Dean, or any other part of the Hundred of St. Briavels in the county of Gloucester

Coal Mining Search Report

Incorporating Cheshire Brine Screening

Serial Number 424590

Client detail :

Dunelm Geotechnical &
Enviromental Ltd
Foundation House
St John's Road
Meadowfield
Co Durham, DH7 8TZ

CoalSearchPlus+ by David Bellis Consulting
Surveyors Ltd
8 Mornington Terrace
Harrogate
North Yorkshire
HG1 5DH
(DX 720352 Harrogate)

Tel 01423 529911
Fax 01423 529922

Search produced by M J Peace

Property details:

Site at
Kirkby
Liverpool

Your ref : 21230KJD10018
Purchaser :
Vendor :

In accordance with your instructions received 20 Jul 2020 we have inspected plans and records of coal mine workings and have made enquiries with respect to Cheshire brine extraction in relation to the above property and can report as follows :

1. **SEAM DETAILS FOR PAST UNDERGROUND COAL MINING :** In relation to the property the undermentioned seam(s) have been worked within the likely zone of physical influence on the surface.

Seam	Depth (m)	Sect (cm)	Date	Remarks
See Remarks				No previous recorded coal workings.

2. **SEAM DETAILS FOR CURRENT AND FUTURE UNDERGROUND COAL MINING :** The undermentioned seam(s) are currently being worked, or licenses to work are being determined, or have been granted to work, within the likely zone of physical influence on the surface in relation to the property.

Seam	Depth (m)	Sect (cm)	Date	Remarks
				No future workings likely.

3. **UNDERLYING GEOLOGY :**

The property is situated in an area of variable drift over sandstones.

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4. OPENCAST COAL MINING :

Past Opencast Workings : The property is not situated within the boundary of a former opencast coal mining site.

Present Opencast Workings : The property is not situated within 200m of the boundary of a currently operating opencast coal mining site.

Future Opencast Workings : The property is not situated within 800m of the boundary of an opencast site for which a license to extract coal by opencast methods has been granted or a license to do so is currently being determined.

5. MINE ENTRIES, MINE GAS, SURFACE HAZARDS AND ADDITIONAL INFORMATION :

The Coal Authority licensed Mine Entry dataset shows no evidence of any shafts or adits within 20 metres of the property or the boundary of the property.

There are no tips or lagoons in the vicinity of the Property.

The Coal Authority licensed Mine Gas dataset shows no record of mine gas emissions within the property or the property boundary requiring action.

The Coal Authority licensed Coal Mining Related Hazards dataset shows that the property has not been subject to remedial works by the Coal Authority, or its representatives, under the Coal Authority Emergency Surface Hazard Call Out Procedures.

6. NOTICES IN RELATION TO FUTURE COAL MINING ACTIVITY :

We have no knowledge of any intention to work coal by underground methods within influencing distance on the surface in the vicinity of the property for which section 46 notices have been issued under the Coal Mining Subsidence Act 1991.

7. PAST COAL MINING RELATED SUBSIDENCE :

A review of the records held by the Coal Authority has shown no evidence of coal mining related subsidence claims in relation to the subject property since 31st October 1994. This is the period for which records are held by the Coal Authority.

8. CONCLUSION (COAL MINING) : In the light of the above facts we conclude that in relation to coal mining :

In our opinion it is unlikely that coal will be worked in the forseeable future.

COAL MINING RISK LEVEL : We recommend that the transaction is treated as :

Where this report is to be used for development purposes particular attention is drawn to the paragraphs below concerning the ownership of in situ coal, coal workings and the risks from mine gases.

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Please note that the overall coal mining risk level above is based upon an assessment of the detailed information contained in the body of the report. The risk assessment must be used in conjunction with the detailed report.

If development of the property is being considered then all necessary enquiries and investigations should be completed prior to the commencement of works to ensure that proposals follow good engineering practice for development in mining areas. The Coal Authority has ownership of in situ coal, coal mines (both current and disused) and coal mine shafts and adits. Activities that intersect, enter or disturb any of the Coal Authority's interests require the written permission of the Authority.

Any development proposals should consider risks to the development, or adjacent property, of generating or displacing underground gases where coal seams or former mining works are disturbed. The need for effective measures to prevent gasses entering public properties should be assessed and properly addressed. These actions are necessary due to the public safety implications of development in these circumstances.

CHESHIRE BRINE EXTRACTION INFORMATION :

The property lies outside the Cheshire Brine Compensation District as prescribed by the Cheshire Brine Pumping (Compensation for Subsidence) Act 1952.

With respect to coal mining there is nothing to prevent a claim being made under the provisions of the Coal Mining Subsidence Act 1991 and subsequent legislation, but it must not be inferred that the Coal Authority or their licensees will necessarily accept that any damage has been caused as a result of mining subsidence.

If you require any further information please contact CoalSearchPlus+ on 01423 529911 or via our website www.coalsearch.plus.com.

This report is prepared in accordance with the CoalSearchPlus+ terms and conditions as published on the CoalSearchPlus+ website (www.coalsearch.plus.com) on the date of issue of this report.

This is a Coal Mining Search Report and is not to be interpreted as being part of an Environmental Assessment of the property.

We cannot be held responsible for the accuracy of the information provided to us by third party organisations.

The information and/or material supplied is composed from data based in many cases on measurements and records of various standards of reliability and age. We cannot be held responsible for the accuracy of such information.

This search report is based upon the privately owned CoalSearchPlus+ mining record database, data supplied to CoalSearchPlus+ under license from the Coal Authority, and plans and records held by the Coal Authority and made publicly available at the time of inspection which may include British Geological Survey and Ordnance Survey data. Organisations reserve the right to vary their proposals and intentions as to their future mining operations without prior notice save as provided in the Coal Mining (Subsidence) Act 1991 and the Coal Industry Act 1994.

This report contains Data provided by the Coal Authority. Any and all analysis and interpretation of the Coal Authority Data in this report is made by David Bellis Consulting Surveyors Ltd trading as CoalSearchPlus+, and is in no way supported, endorsed or authorised by the Coal Authority. The use of the data is restricted to the terms and provisions contained in this report. Data reproduced in this report may be copyright of the Coal Authority and permission should be sought from David Bellis Consulting Surveyors Ltd prior to any re-use.

Coal Authority Address : The Coal Authority, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, HG18 4RG
British Geological Survey Address : British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham NG12 5GG

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Coal Authority data supplied under license may contain Ordnance Survey information Crown Copyright © 100020315 [2020]

The information contained in this report relates to the property address given by the individual or organisation ordering the report. Where a plan indicating the property location and boundary is supplied with the instruction the report is based on that information. Where no plan is supplied the report is based on the property location as defined in publicly available mapping data. At all times it remains the responsibility of the instructing organisation or individual to define the boundary of the property.

Additional notes applicable to Residential Coal Mining Reports only:

David Bellis Consulting Surveyors Ltd is not aware of any personal or business relationship between the person conducting or preparing the search and any person involved in the sale of the property.

This report is a desk study of existing published geological and coal mining records, the CoalSearchPlus+ coal mining data base and data supplied under license by the Coal Authority. In order to compile this report enquiries have been made in relation to the following:

Past Coal Mining – the existence of any previously worked seams of coal within influencing distance on the surface in relation to the property including an indication of the depth and age of the workings,
A statement of shallow depth generally indicates records show that coal has been mined within 30m of the surface. In some circumstances coal classified as shallow may extend up to a depth of 50m.
A statement of moderate depth indicates records show that coal has been mined at between 30m and 500m depth.
A statement of 'at depth' indicates records show that coal has been mined at depths of over 500m.

Present Coal Mining - the existence of any currently worked seams of coal within influencing distance on the surface in relation to the property including an indication of the depth and age of the workings. The existence of coal that could be worked at some time in the future will be enquired into and detail of any relevant licenses disclosed where available.

Underlying Geology - the underlying geology of the property will be reviewed and briefly described in relation to coal mining.

Opencast Coal Mining - the existence of past present and future opencast coal mining, specifically :

- if the property is situated within the boundary of a former opencast site. In the case of old opencast workings it must be understood that the records are often unclear regarding the site boundary and or worked areas. Published records and data supplied under license by the Coal Authority will be reviewed to give our opinion of the existence of relevant former opencast coal workings.
- if the property is situated within 200m of the boundary of a currently operating opencast site.
- if the property is situated within 800m of the boundary of an opencast for which either a license to extract coal by opencast methods has been granted or a license to do so is currently being determined.

Mine Entries, Mine Gas, Surface Hazards and Additional Information – the existence of any mine entries within 20m of the property or the boundary of the property and its associated land and buildings (the definition of the boundary of the property is the responsibility of the individual or organisation ordering this report). Where a mine entry is found to exist the approximate location of the mine entry will be indicated on a plan. The existence of unworked coal will be enquired into and our opinion regarding the likelihood of it being worked at some time in the past will be given where relevant.
It will be reported if mine gas emissions relating to the property are recorded by The Coal Authority.
It will be reported if The Coal Authority has carried out work in relation to the property after a report of an alleged coal mining related hazard under the Coal Authority's Emergency Hazard Call Out procedures.
Any other relevant coal mining related features discovered will be noted.

Notices in relation to future coal mining activity – the existence of notices indicating an intention to work coal by underground methods in the future.

Past coal mining related subsidence – report if The Coal Authority licensed Claim Dataset shows record of a coal mining subsidence claim having been reported on the subject property or any other property within 50m of the boundary of the subject property since 31st October 1994. Where available claim detail information will be given for claims on the subject property only.

Coal Mining Risk Level – the opinion of David Bellis Consulting Surveyors Ltd of the risk posed to the property from coal mining given all the information contained in the report. The risk to the property is given in relation to the majority of the housing stock in the immediate area.

Cheshire Brine – the location of the property in relation to the Cheshire Brine Compensation District.

Additional information, including answers to many frequently asked questions, can be found on the CoalSearchPlus+ website, www.coalsearch.plus.com

Complaints Procedure

David Bellis Consulting Surveyors Ltd is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly.

If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.

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- Liaise, at your request, with anyone acting formally on your behalf.

Complaints should be sent to:

Mr M. Peace, Director, David Bellis Consulting Surveyors Ltd, 8 Mornington Terrace, Harrogate, North Yorkshire, HG1 5DH
Tel : 01423 529911 Fax : 01423 529922 Email : contact@coalsearch.plus.com

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs):
Tel: 01722 333306, Website: www.tpos.co.uk, E-mail: admin@tpos.co.uk

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision.

Date : 21 Jul 2020 Signed : 

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Important Consumer Protection Information

This search has been produced by David Beliis Consutling Surveyors Ltd, 8 Mornington Terrace, Harrogate, HG1 5DH (T: 01423 529911, F: 01423 529922, E: contact@coalsearch.plus.com) which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- Display the Code logo prominently on their search reports.
- Act with integrity and carry out work with due skill, care and diligence.
- At all times maintain adequate and appropriate insurance to protect consumers.
- Conduct business in an honest, fair and professional manner.
- Handle complaints speedily and fairly.
- Ensure that all products and services comply with industry registration rules and standards and relevant laws.
- Monitor their compliance with the Code.

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details:

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Website: www.tpos.co.uk
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

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David Bellis Consulting Surveyors Ltd and CoalSearchPlus+ Terms and Conditions (Available in large print by request)

1. Definitions.
   a) The Service Provider is David Bellis Consulting Surveyors Ltd, trading as CoalSearchPlus+.
   b) The Applicant is the Individual, Organisation, or appointed officer of said Organisation placing a Request with the Service Provider.
   c) The Third Party Provider is any Organisation from which the Service Provider obtains data and/or information on behalf of the Applicant in the normal course of fulfilling the Applicants Request.
   d) The request is a formal Request by the Applicant with CoalSearchPlus+ to retrieve specific data and/or information.
2. CoalSearchPlus+ accept Requests only on the basis that the Applicant is acting as a principal and is directly liable for payment of our invoice or account.
3. It is the policy of CoalSearchPlus+ to observe confidentiality with regard to the identity and affairs of our customers to the extent permitted by law, but, in common with other service providers, we may be required exceptionally to disclose information to governmental and other public authorities.
4. The placing of a Request by the Applicant with CoalSearchPlus+ confirms acceptance of these terms and conditions.
5. Any Order Form produced by CoalSearchPlus+, either printed or published on the CoalSearchPlus+ website, is an invitation to treat. The Applicant makes an offer to buy from CoalSearchPlus+ by the submission of a Request, subject to clause 10. Acceptable modes of transmission for a Request are facsimilie (fax), telephone, electronic mail(e-mail), online transmission via the CoalSearchPlus+ website only, Document Exchange (DX), Royal Mail or courier appointed by the Applicant.
6. Orders will be accepted on order forms other than CoalSearchPlus+ forms however these will be accepted under the standard CoalSearchPlus+ terms and conditions only, subject to Clause 10.
7. CoalSearchPlus+ reserves the right to refuse any Request.
8. CoalSearchPlus+ reserves the right to cancel any Request at any time.
9. Proof of transmission of a Request by the Applicant does not constitute proof of receipt by CoalSearchPlus+.
10. It is the responsibility of the Applicant to ensure the accuracy, legibility, clarity and completeness of all data and/or information provided to CoalSearchPlus+ as part of the Request, including but not limited to, names, numbers, addresses, location plans, and boundary plans. This applies whether the Request is submitted on CoalSearchPlus+ order forms either printed or published on the CoalSearchPlus+ website or on the Applicants own order form.
11. CoalSearchPlus+ may request additional relevant data and/or information from the Applicant in the course of fulfilling a Request, including, but not limited to, names, numbers, addresses, location plans, and boundary plans.
12. CoalSearchPlus+ may request clarification of data and/or information supplied by the Applicant.
13. If, subsequent to Clause 11. and/or Clause 12., requested data and/or information is not provided and/or clarified, CoalSearchPlus+ cannot be held responsible for any resultant loss or delay.
14. If, subsequent to Clause 11. and/or Clause 12., requested data and/or information is not provided and/or clarified within a reasonable period of time, CoalSearchPlus+ reserves the right to cancel the Request in whole or in part. The Applicant remains liable for all fees, Taxes and Disbursements accrued prior to the cancellation.
15. CoalSearchPlus+ reserves the right to subcontract data and/or information retrieval to selected Organisations and/or Individuals. CoalSearchPlus+ is not required to reveal the identity of its Subcontractors.
16. CoalSearchPlus+ will, in the process of fulfilling the request, retrieve data and/or information from publicly and/or commercially available sources and the CoalSearchPlus+ mining database. The sources of data used will primarily be data held by The Coal Authority under an agreement with the Health and Safety Executive, data owned by the British Geological Survey and the CoalSearchPlus+ database.
17. A CoalSearchPlus+ mining report is a report of the interpretation of the data sources in 16. made by CoalSearchPlus+ staff.
18. CoalSearchPlus+ coal mining search reports are based upon the plans and records available from data sources detailed in 16. at the time the report was produced. It should be understood that third party organisations reserve the right to vary their proposals and intentions as to their future mining operations without prior notice save as provided in the Coal Mining Subsidence Act 1994. CoalSearchPlus+ cannot be held responsible for changes to the future proposals and intentions of Third Parties.
19. The information and/or material supplied in a CoalSearchPlus+ coal mining report is composed from data based, in many cases, on measurements and records of various standards of reliability and age. In some instances (usually relating to older records) it is necessary for CoalSearchPlus+ to make assumptions regarding the ‘best plot’ position of mining features. For these reasons users of CoalSearchPlus+ reports should take the position of mining features detailed in reports to be indicative only.
20. The data and/or information that a coal mining search report is based on is constantly being updated. A CoalSearchPlus+ coal mining search report is based on the most up to date information available at the time that the report is produced however it cannot be guaranteed that the information and/or data will not become obsolete at some time in the future. Responsibility for the supply of accurate and up to date information to CoalSearchPlus+ lies with the data supplying organisations listed in 16.
21. A CoalSearchPlus+ coal mining search report relates only to coal mining and minerals worked in relation to coal mining. Other reports may be required in relation to other minerals.
22. A CoalSearchPlus+ coal mining search report is not a substitute for site investigation or a mining survey. Depending on the content of a coal mining search report, or whether development is intended, the Applicant must decide whether a site investigation or mining survey is required.
23. CoalSearchPlus+ coal mining reports comply with the Search Code.

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24. All CoalSearchPlus+ reports are covered by professional indemnity insurance. The content of CoalSearchPlus+ coal mining search reports does not prevent any future claim being made by the Applicant against the Coal Authority in respect of coal mining related subsidence.
25. Any liability in the instance of negligence by CoalSearchPlus+ or its employees in the interpretation of coal mining data and/or the production and provision of coal mining reports will be limited to the extent of the CoalSearchPlus+ Professional Indemnity Insurance or the value of the loss caused by the negligence, whichever is the lower.
26. All CoalSearchPlus+ coal mining search reports give the information detailed in the services section of the CoalSearchPlus+ website and summarised in the report. Further explanation of this information is available in the Glossary and/or the Frequently Asked Questions areas of the CoalSearchPlus+ website. Alternatively contact CoalSearchPlus+ who will be happy to explain the content of a report.
27. The Request is fulfilled when all reports, data and/or information requested by the Applicant have been retrieved and/or compiled by CoalSearchPlus+ and delivered by electronic mail (e-mail) or fax or post or document exchange (DX) or a combination of these methods as required by the Applicant. Alternative delivery arrangements are at the discretion of CoalSearchPlus+.
28. If Requests for multiple reports, data and/or information relating to multiple addresses were made on a single order form these will be fulfilled individually by the delivery of the reports, data and/or information relating to each individual address being treated as an individual Request.
29. CoalSearchPlus+ is not responsible for any loss or misdelivery of retrieved data and/or information caused by failure of Document Exchange (DX), Royal Mail or internet service provider. Most retrieved data and/or information is archived by CoalSearchPlus+ and a copy may be requested by the Applicant. If the data and/or information could not be archived CoalSearchPlus+ reserves the right to treat the request as a new Request.
30. Delivery, by whatever agreed means, will be accompanied by an invoice. Delivery by electronic mail may be followed up with a paper invoice by post or DX. Where Applicants have agreed account facilities with CoalSearchPlus+ invoicing may be on a monthly basis. In all cases the Applicant agrees to provide CoalSearchPlus+ with remuneration for the full amount shown on the invoice, including all Fees, Taxes and Disbursements.
31. The Applicant will be liable for payment of the full invoice amount within 14 days from the date of receipt of the invoice. CoalSearchPlus+ reserve the right to charge for costs and expenses incurred in recovering late payments and to charge interest at the rate of 8% above the Bank of England base rate per annum for the full period that the payments are overdue.
32. Where full payment of the invoice is not made by the Applicant within 14 days from receipt of the invoice CoalsSearchPlus+ reserve the right to withdraw account facilities from the Applicant and cancel any individual agreements concerning fees or other Terms and Conditions that may have been made between the Applicant and CoalSearchPlus+.
33. Where possible the Applicant will receive Advance Notice of the cost of the Request, including all Fees, Taxes and Disbursements, prior to receipt of the invoice. This advance notice will take the form of the price for the service requested as published on the CoalSearchPlus+ website, or the price as individually agreed between CoalSearchPlus+ and the Applicant.
34. Additional Fees, Taxes and Disbursements may arise during the course of data and/or information retrieval, over and above Advance Notice costs as in clause 33. The Applicant is liable for any such additional costs. Where possible, the Applicant is notified of additional costs prior to fulfilment of the Request.
35. If the Applicant shall pay in advance of receipt of the invoice, then the Applicant remains liable for any underpayment.
36. Any overpayment on the part of the Applicant will be refunded. Arrangements for refunds are agreed on a case-by-case basis, through discussion between CoalSearchPlus+ and the Applicant.
37. The Applicant may cancel the Request in whole or in part at any time prior to Clause 27.
38. If the Applicant cancels the Request in whole or in part prior to Clause 27, the Applicant remains liable for all Fees, Taxes and Disbursements already accrued prior to the Cancellation.
39. CoalSearchPlus+ accept no liability for any loss incurred by the Applicant or the Applicants client where the Applicant is acting as an agent for a client, due to late fulfilment and delivery of the Request.
40. CoalSearchPlus+ accept no liability for any loss to the Applicant, or the Applicant's client where the Applicant is acting as an agent for a client, due to any negative outcome of a report provided in the process of the correct and accurate fulfilment of the Request.
41. Any disputes relating to the provision of coal mining search reports should be addressed to the Practice Principal, CoalSearchPlus+ in the first instance. Disputes will be settled according to the CoalSearchPlus+ complaints procedure detailed in each report.
42. Independent Dispute Resolution - If you make a complaint and we are unable to resolve it to your satisfaction you may refer the complaint to The Property Ombudsman scheme (website: www.tpos.co.uk email:admin@tpos.co.uk Tel: 01722 333306). We will cooperate fully with the Ombudsman during an investigation and comply with his final decision.
43. Third Party and subcontractor Terms and Conditions shall apply in addition to these clauses. Should any conflict arise between CoalSearchPlus+ Terms and Conditions and Third Party or Subcontractor Terms and Conditions, then CoalSearchPlus+ Terms and Conditions prevail unless and until CoalSearchPlus+ expressly states otherwise in writing and/or courts of England and Wales establish otherwise.
44. No variation to these Terms and Conditions is effective unless and until CoalSearchPlus+ expressly agrees in writing.
45. CoalsearchPlus+ reserves the right to alter these terms and conditions as appropriate, without notice, at any time. Such amended Terms and Conditions will become effective upon publication on the CoalSearchPlus+ website.
46. These Terms and conditions are subject to English Law and the exclusive jurisdiction of the courts of England and Wales.

Dunelm Conditions of Offer, Notes on Limitations & Basis for Contract

These conditions accompany our tender and supercede any previous conditions issued. The firm will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of the firm. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from the firm. A charge may be levied against such approval, the same to be made at the discretion of the firm.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, soil gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

The firm cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. The firm are not responsible for the action negligent or otherwise of subcontractors or third parties.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as ‘exploratory investigations’ in accordance with the definitions provided in paragraph 5.2.7 of BS 10175:2011 +A2:2017 in order to confirm the conceptual assumptions, and in accordance with BS5930:2015. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, the firm cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by the firm in the course of investigation is the property of the firm, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. The firm reserves the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning the firm, you understand and accept that you/your agent have a contractual relationship with the firm & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Dunelm are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete. Dunelm have not allowed for subsequent reinstatement as a result of settlement. No price has been provided or requested for a return visit to remove pipework and covers. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming the firm agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. We will also apply the right to claim any associated legal costs incurred with recovery of late payments. The firm is exempt from the CIS Scheme. The firm offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. The company are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by the firm, and we give notice that consequential loss as a direct or indirect result of the firm’s activities or omission of the same are excluded.

Appendix C

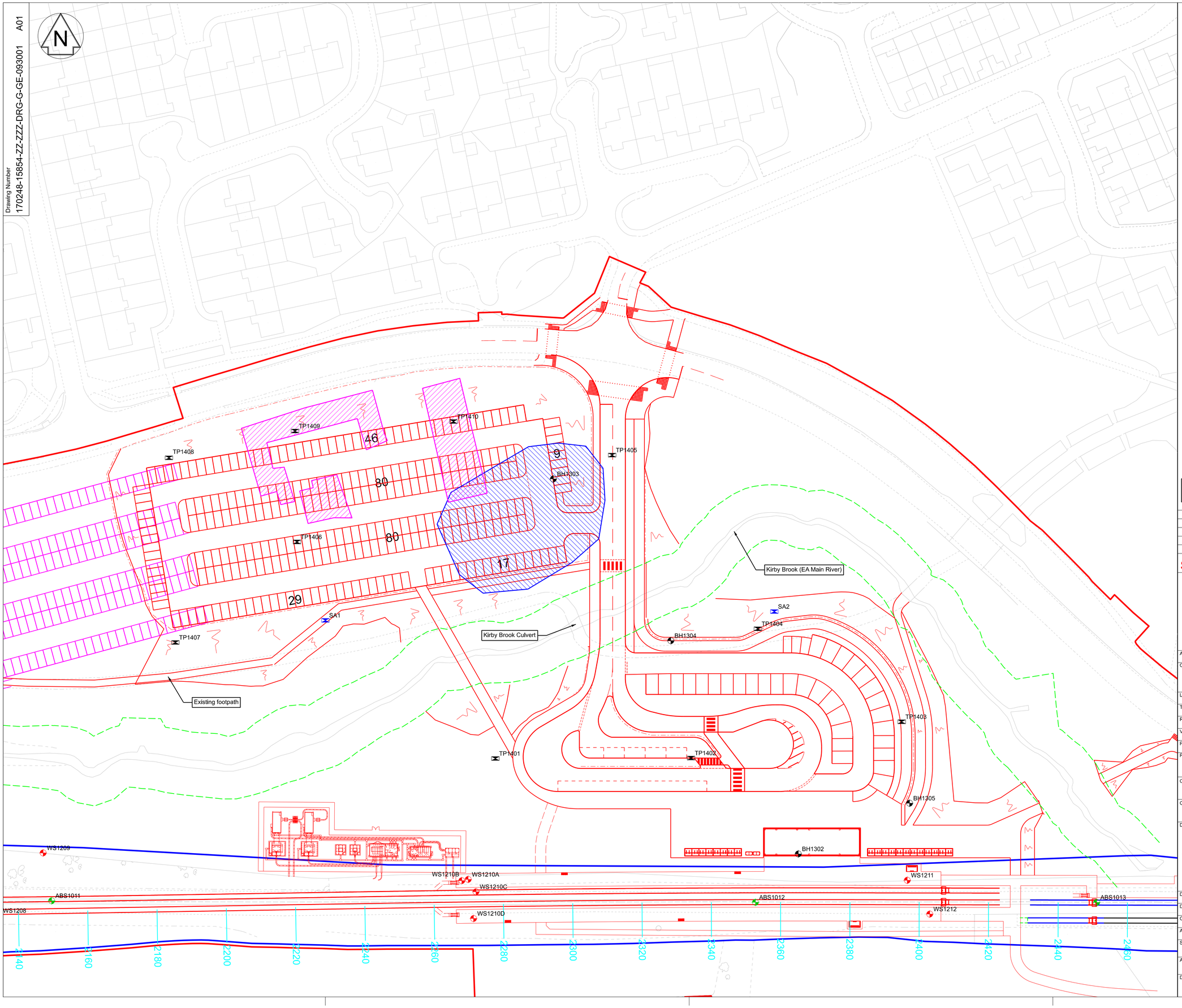
Ground Investigation Plans

As Built Ground Investigation Sheet 1 or 3
Car Park and Station Area
170248-15854-ZZ-ZZZ-DRG-G-GE-093001 P01

As Built Ground Investigation Sheet 2 or 3
170248-15854-ZZ-ZZZ-DRG-G-GE-093002 P01

As Built Ground Investigation Sheet 3 of 3
170248-15854-ZZ-ZZZ-DRG-G-GE-093003 P01

Drawing Number
170248-15854-ZZ-ZZZ-DRG-G-GE-093001 A01



Notes:

1. Contraints taken from Geo-Environmental Constraints drawing 394359-HBL-GEO-01 dated 24/08/2018.
2. All As-Built positions have been surveyed by CC Geotechnical Limited following completion of the ground investigation

Key:

- BH1304 — BH (Borehole)
- ABS1012 — ABS (Automatic Sampling Borehole)
- WS1211 — WS (Windowless Sampling Borehole)
- TP1401 — TP (Trial Pit Excavations)
- SA1 — SA (Soakaway Test)
- Approximate location of former Tanpit House Farm Steading (1908)
- Approximate location of former Mercer's Delf Sandstone Quarry (1850)
- Track Alignment
- NR Boundary
- Red Line Boundary
- 8m Environment Agency access/maintenance easement

0 10 20 30 40 50m

SCALE 1:500

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Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P01	15/09/20	First Revision	AS	SM	---
A01	28/01/21	As Built	TS	SM	SP

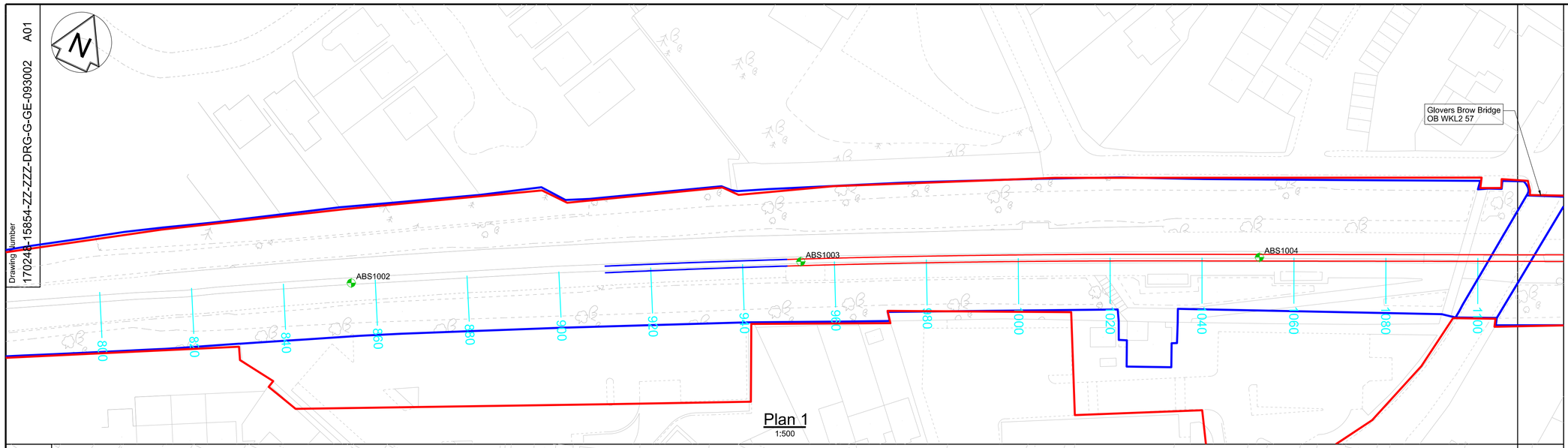
Status: Suitable for Co-ordination
Suitability: S1

NetworkRail

Authorised	---	Signed ---	Date
Contractor(s)	Ove Arup & Partners Scotland Ltd		
Location\Level	No Specific Location		
Type	CAD Drawing	Sub-type Plan	
Role	Geographical and Land Surveyor	Discipline Geotechnical	
Volume\System	No Specific Volume or System		
Phasing	Existing	Grip Stage 4	
Project	Headbolt Lane		
Contract No.	170248		
Contract Title	Headbolt Lane		
Drawing Title	Car Park and Station Area As-Built Ground Investigation Locations Sheet 1 of 3		
Designed		Signed ---	Date
Drawn	P.MCGUCKIAN	Signed PM	Date 28/01/21
Checked	S.MOSS	Signed SM	Date 28/01/21
Approved	S.PALLET	Signed SP	Date 28/01/21
Scale(s)	1:500	ELR & Mileage	WKL2 28.1232 to 29.0913
Alternative Reference	170248-ARU-DRG-EGE-000001	Sheet	1 of 3
Drawing Number	170248-15854-ZZ-ZZZ-DRG-G-GE-093001	Revision	A01

Sheet Size A1 594 x 841

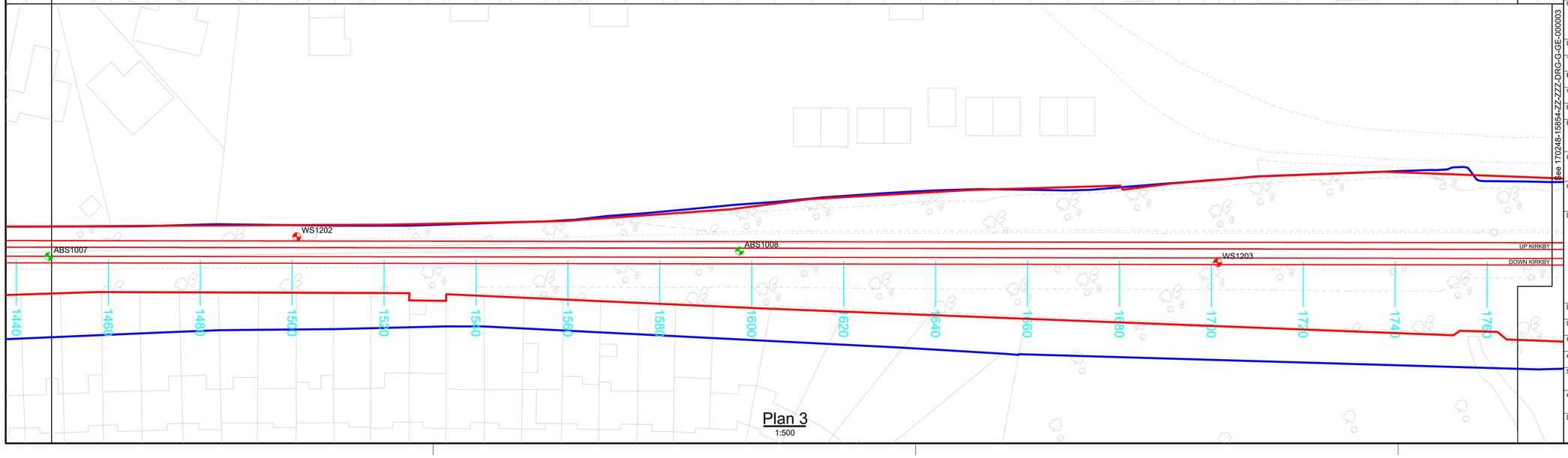
Drawing Number
170248-15854-ZZ-ZZZ-DRG-G-GE-093002 A01



Plan 1
1:500



Plan 2
1:500



Plan 3
1:500

Notes:

1. All As-Built positions have been surveyed by CC Geotechnical Limited following completion of the ground investigation.

Key:

- ABS1012 ABS (Automatic Sampling Borehole)
- WS1211 WS (Windowless Sampling Borehole)
- Track alignment
- Location of railway embankments
- Red Line Boundary
- NR Boundary
- 8m Environment Agency access/maintenance easement

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Rev	Date	Description of Revisions	Drawn	Chkd	Appr
A01	28/01/21	As Built	PM	SM	SP

Status: Suitable for Co-ordination — Suitability: S1

NetworkRail

Authorised	---	Signed ---	Date

Contractor(s): Ove Arup & Partners Scotland Ltd

Location\Level: No Specific Location

Type	CAD Drawing	Sub-type	Plan
Role	Geographical and Land Surveyor	Discipline	Geotechnical

Volume\System: No Specific Volume or System

Phasing	Existing	Grip Stage	4

Project: Headbolt Lane

Contract No.: 170248

Contract Title: Headbolt Lane

Drawing Title: As Built Ground Investigation Sheet 2 of 3

Designed		Signed ---	Date
Drawn	P.MCGUCKIAN	Signed PM	Date 28/01/21
Checked	S.MOSS	Signed SM	Date 28/01/21
Approved	S.PALLET	Signed SP	Date 28/01/21

Scale(s): 1:500

ELR & Mileage: WKL2 28.1232 to 29.0913

Alternative Reference: 170248-ARU-DRG-EGE-000002

Sheet: 2 of 3

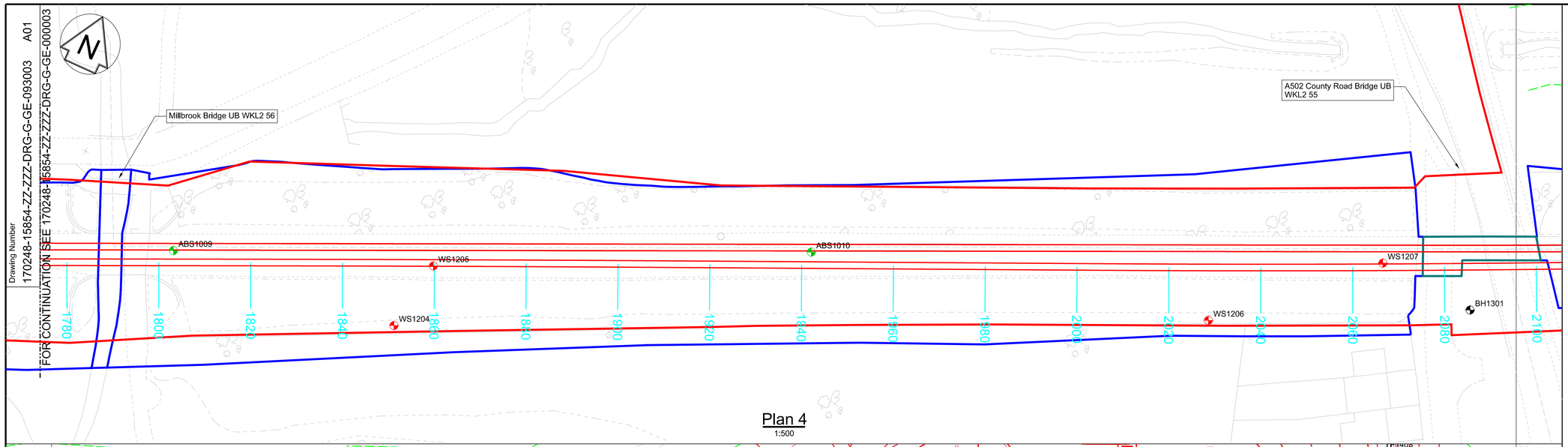
Drawing Number: 170248-15854-ZZ-ZZZ-DRG-G-GE-093002

Revision: A01

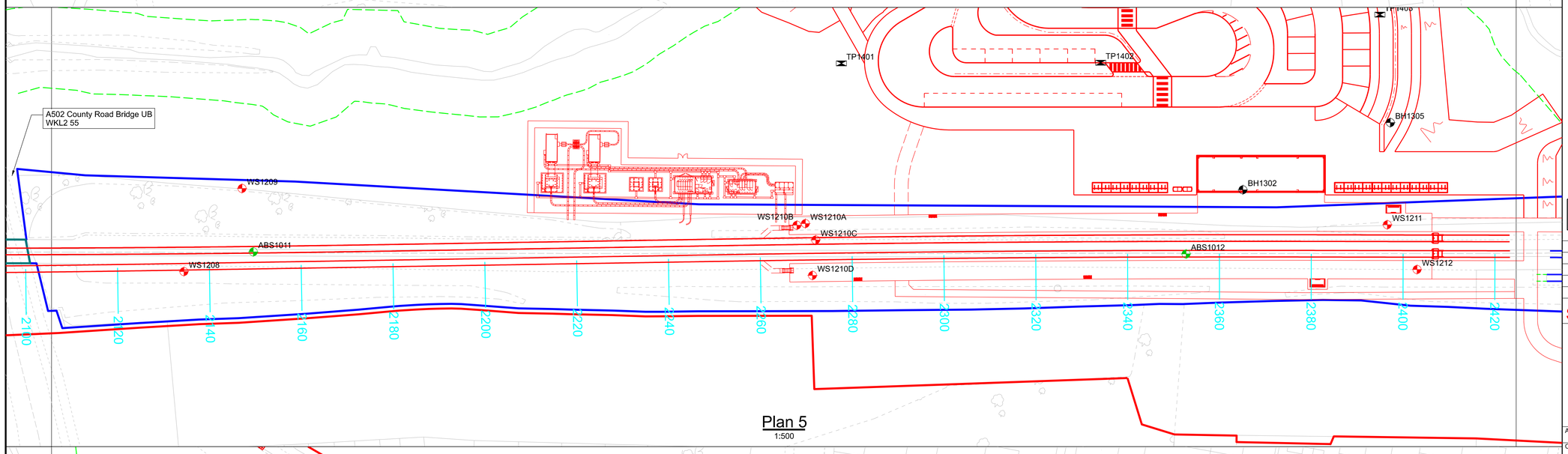
See 170248-15854-ZZ-ZZZ-DRG-G-GE-000003

Sheet Size A1 594 x 841

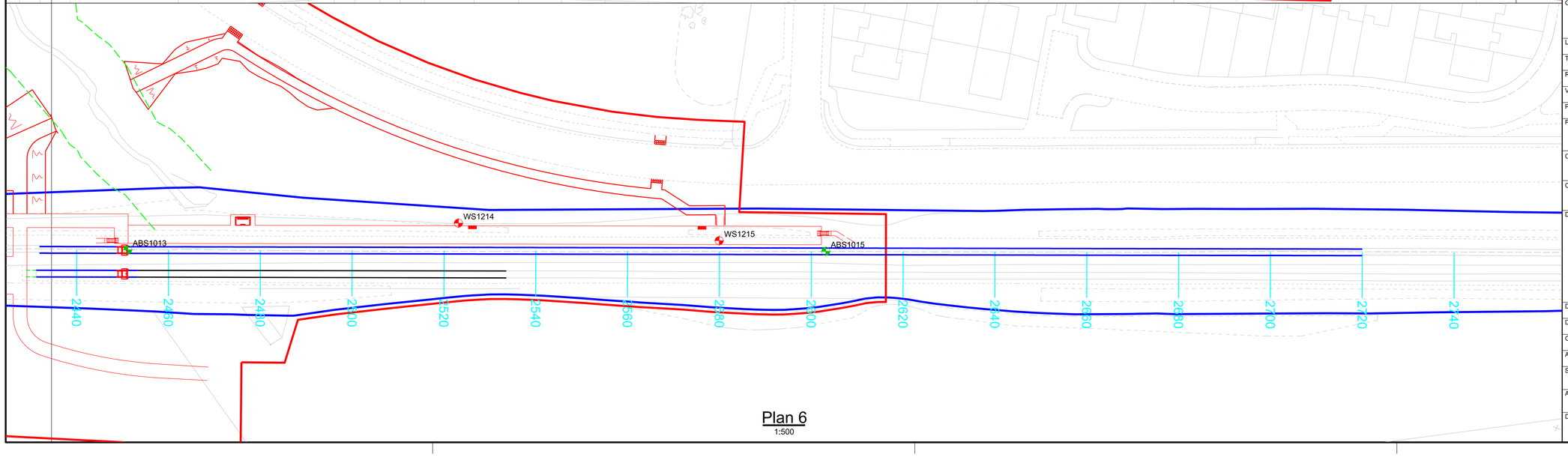
Drawing Number
170248-15854-ZZ-ZZZ-DRG-G-GE-093003 A01
FOR CONTINUATION SEE 170248-15854-ZZ-ZZZ-DRG-G-GE-000003



Plan 4
1:500



Plan 5
1:500



Plan 6
1:500

Notes:

1. All As-Built positions have been surveyed by CC Geotechnical Limited following completion of the ground investigation

Key:

- BH1304 — BH (Borehole)
- ABS1012 — ABS (Automatic Sampling Borehole)
- WS1211 — WS (Windowless Sampling Borehole)
- TP1401 — TP (Trial Pit Excavations)
- Track Alignment
- Red Line Boundary
- NR Boundary
- 8m Environment Agency access/ maintenance easement

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Rev	Date	Description of Revisions	Drawn	Chkd	Appr
A01	28/01/21	As Built	PM	SM	SP

Status: Suitable for Co-ordination
Suitability: S1

NetworkRail

Authorised	---	Signed	---
			Date

Contractor(s): Ove Arup & Partners Scotland Ltd

Location\Level: No Specific Location

Type: CAD Drawing	Sub-type: Plan
Role: Geographical and Land Surveyor	Discipline: Geotechnical
Volume\System: No Specific Volume or System	
Phasing: Existing	Grip Stage: 4

Project: Headbolt Lane

Contract No.: 170248

Contract Title: Headbolt Lane

Drawing Title: As Built Ground Investigation Sheet 3 of 3

Designed		Signed ---	Date
Drawn	P.MCGUCKIAN	Signed PM	Date 28/01/21
Checked	S.MOSS	Signed SM	Date 28/01/21
Approved	S.PALLET	Signed SP	Date 28/01/21

Scale(s): 1:500
ELR & Mileage: WKL2 28.1232 to 29.0913

Alternative Reference: 170248-ARU-DRG-EGE-000003
Sheet: 3 of 3

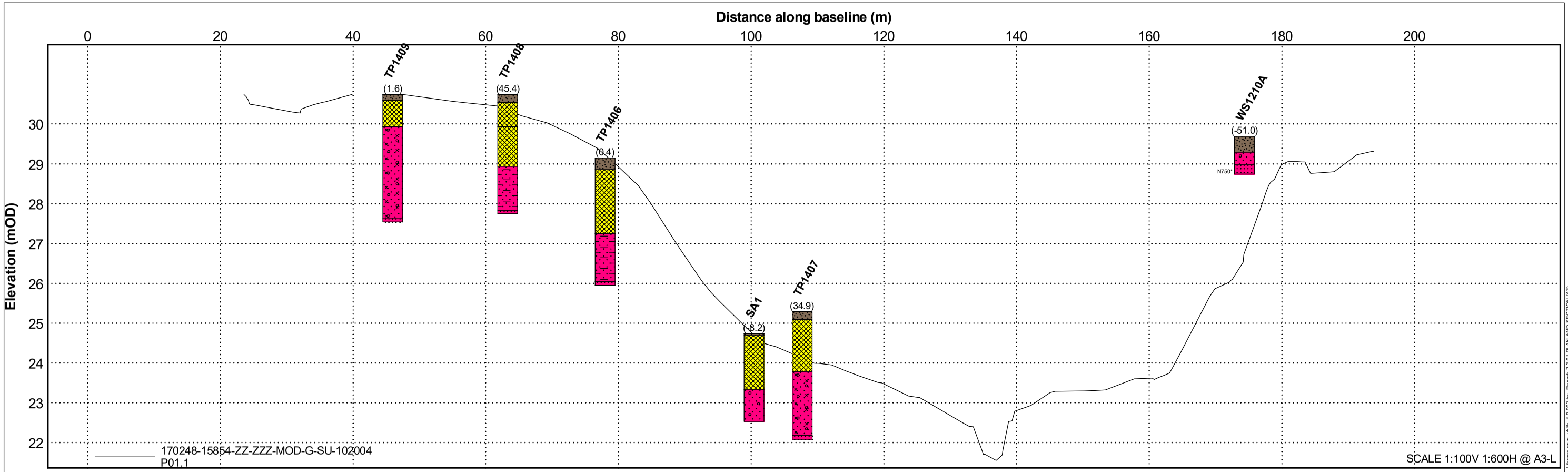
Drawing Number: 170248-15854-ZZ-ZZZ-DRG-G-GE-093003
Revision: A01

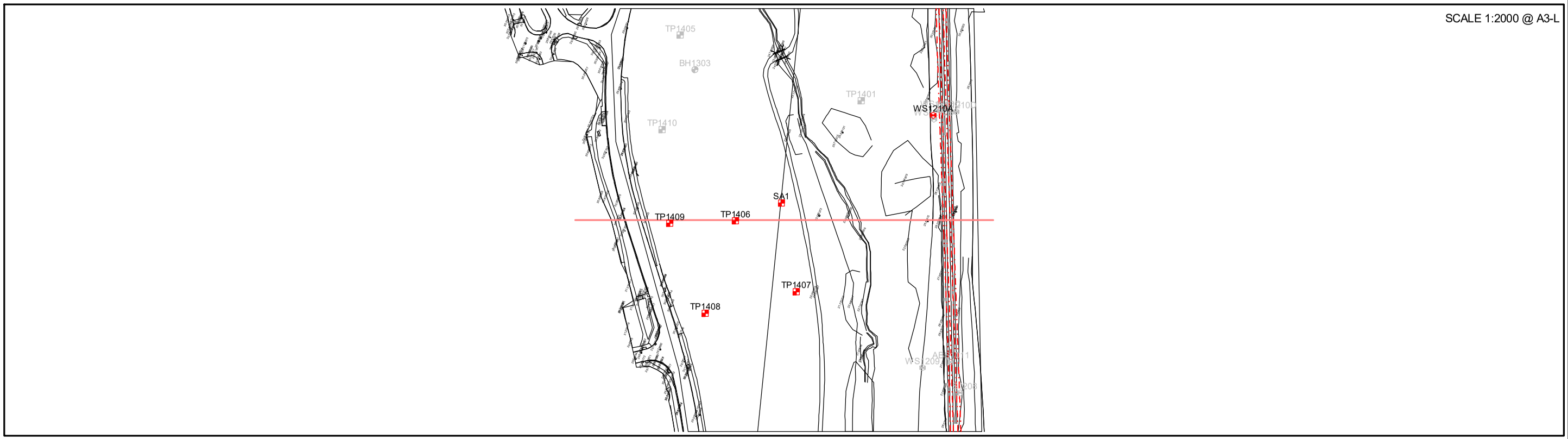
Sheet Size A1 594 x 841

Appendix D

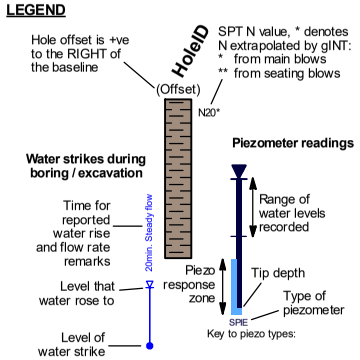
Geotechnical cross sections and plots

170248-ARU-SKE-EGE-000004 P01





LEGEND



COLOUR LEGEND

- Topsoil [TPS]
- Made Ground [MG]
- SANDSTONE [SANDSTONE]

MATERIALS

- TOPSOIL
- Gravelly SAND
- SANDSTONE
- Fill (MADE GROUND)
- Clayey SAND
- Silty gravelly SAND

ARUP

Job Title
Headbolt Lane

Figure Title
Geological cross section
Station and Car Park
Section A-A

Job No
276736-06

Figure No

Library: arup_utils_4-0-002.lbr; Report: 2.3.01 PLAN AND SECTION (A3)
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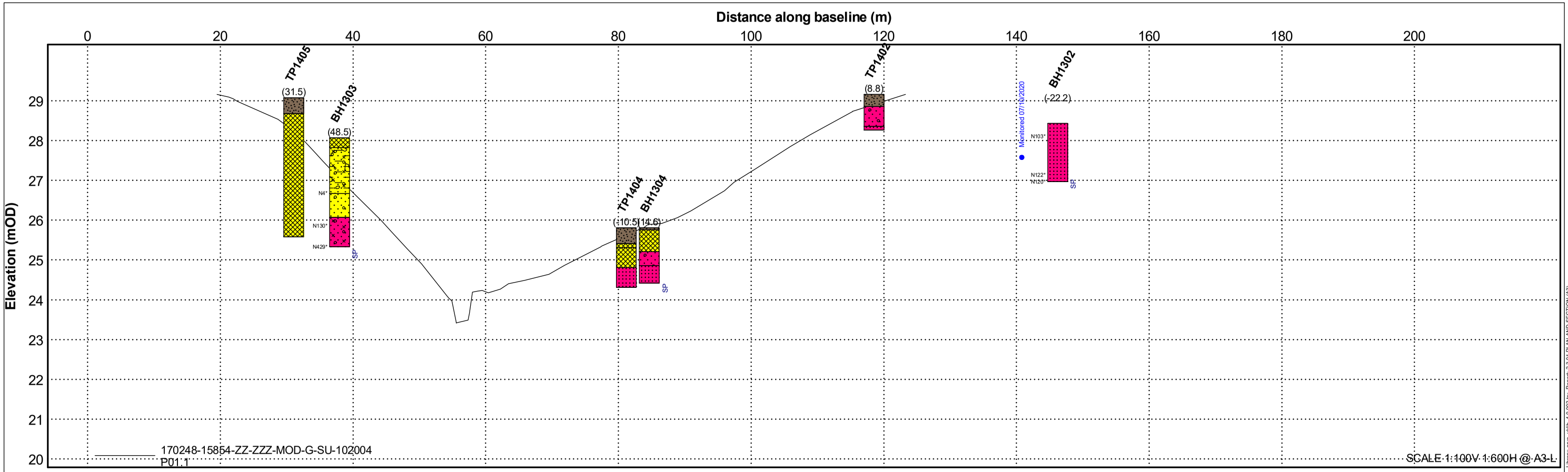
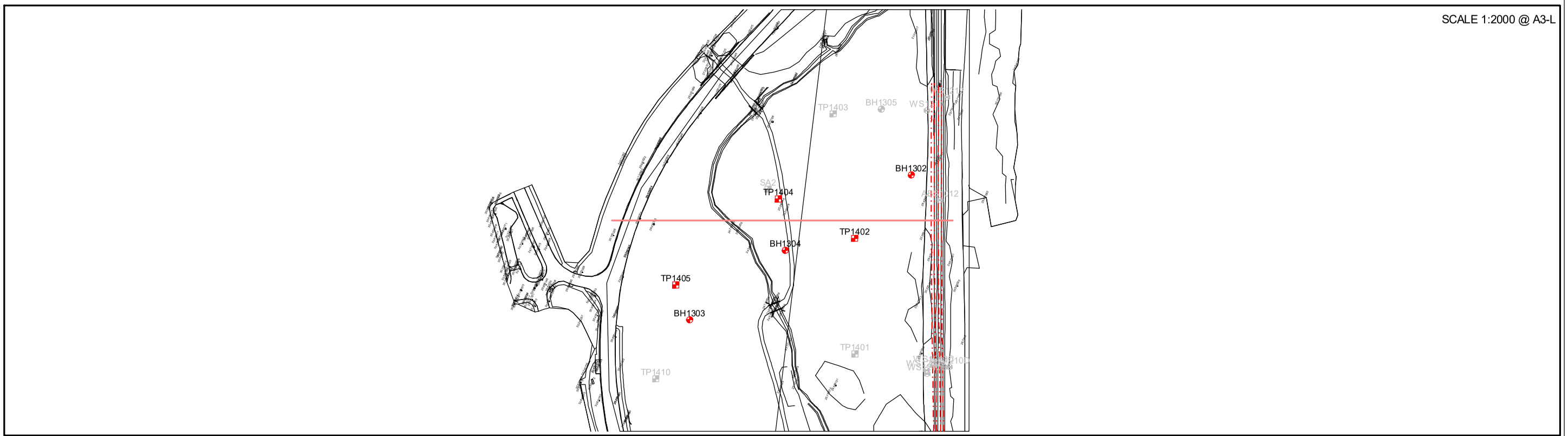
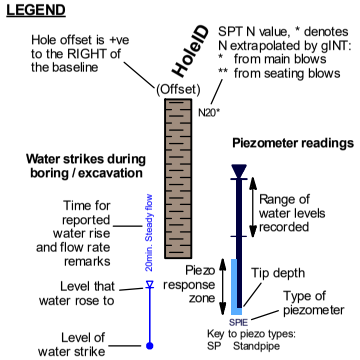
Source data status: of holes
Datablase check status: Full check (A) = 0% Partial/selective check (B) = 0% Minimum check (C) = 0% Unchecked (U) = 0% of holes
Data exclusions: None (dat key/s) = Output Key= (data not currently available)
Filter: None

ARUP, gINT v8.30.004, Made by Sam Moss on 6-Jan-21





LEGEND



COLOUR LEGEND

- Topsoil [TPS]
- Made Ground [MG]
- SANDSTONE [SANDSTONE]

MATERIALS

- SANDSTONE
- Fill (MADE GROUND)
- Clayey silty gravelly cobbly SAND
- Gravelly SAND
- Silty gravelly SAND
- TOPSOIL

ARUP

Job Title
Headbolt Lane

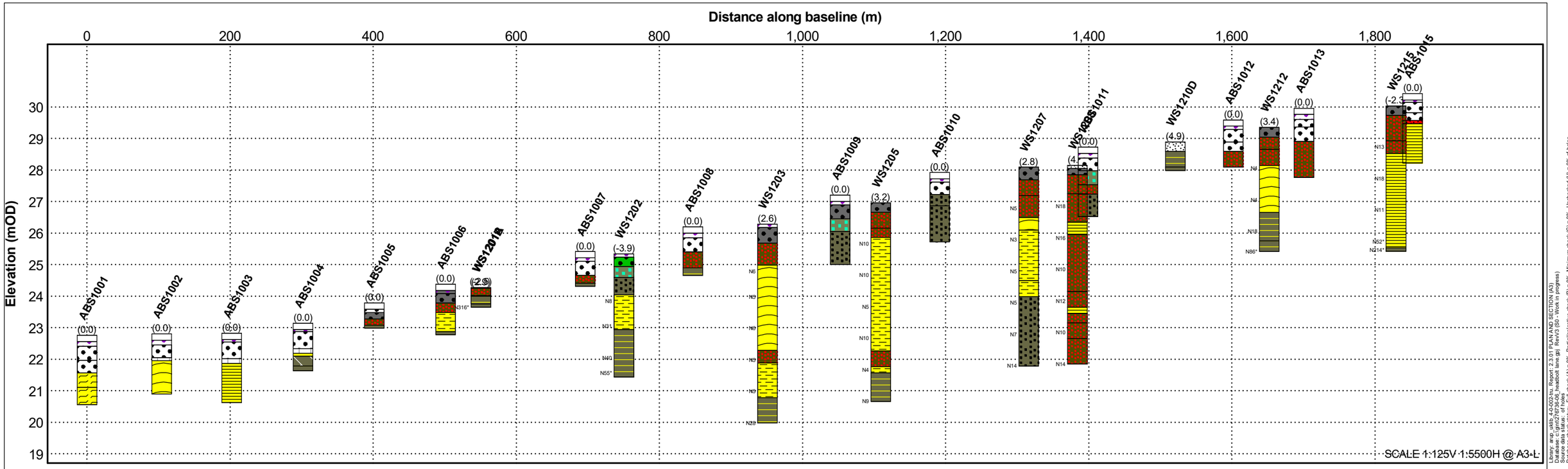
Figure Title
Geological cross section
Station & Car Park
Section B-B

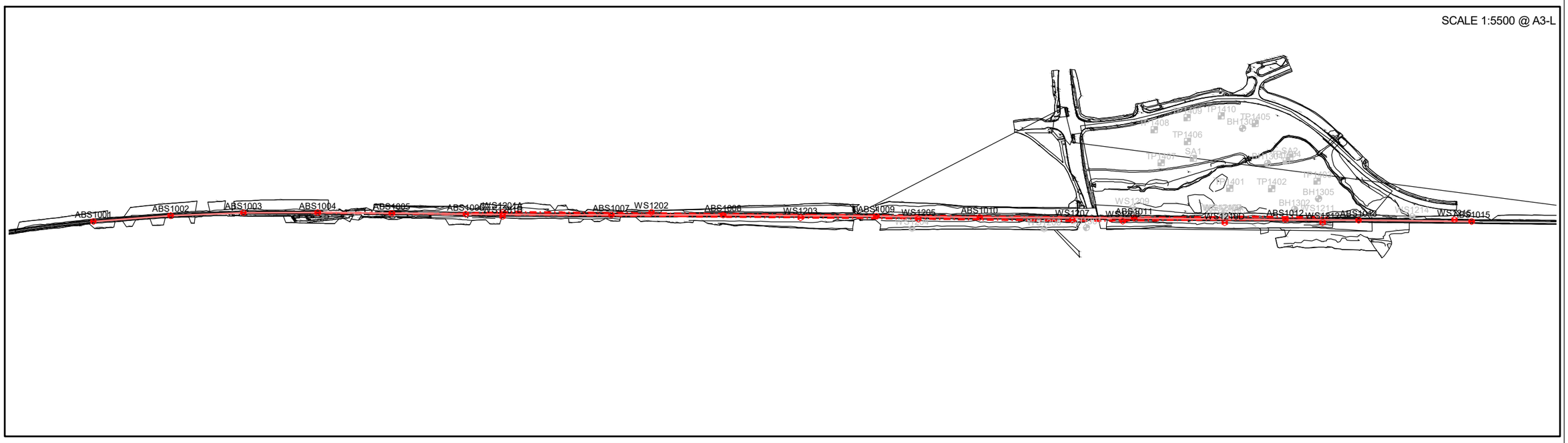
Job No
276736-06

Figure No

Library: arup_uklib_4-0-002-hu, Report: 2.3.01 PLAN AND SECTION (A3)
Data source: 276736-06 Headbolt lane.gpj Rev:V3 (50 - HSA in progress)
Source data status: of holes
Database check status: Full check (A) = 0% Partial/selective check (B) = 0% Minimum check (C) = 0% Unchecked (U) = 0% of holes
Data exported from: (all Keys) + Output Keys: (data not currently available)
Filter: None

ARUP, gINT v8.30.004, Made by Sam Moss on 6-Jan-21





LEGEND

Hole offset is +ve to the RIGHT of the baseline

HoleID (Offset) N20*

SPT N value, * denotes N extrapolated by gINT:
* from main blows
** from seating blows

MATERIALS

- NO RECOVERY
- Clean Ballast
- Dirty Ballast
- Organic/Very Soft
- Clean Pitching
- Soft c_u < 40kN/m²
- Stiff c_u = 75 to 150kN/m²
- Unstratified (clayey/silty Coarse Soil OR sandy or gravely Fine Soil)
- Interbedded or weathered/weakly cemented fine grained rocks
- Very Dirty Ballast (non-cohesive)
- Clayey/silty Sand and/or Gravel (5 to 20%)
- Slightly Dirty Ballast
- Firm c_u = 40 to 75kN/m²
- Clayey/silty ash (<5%)
- Any of 2-a-d in a clay matrix (20 to 50%)
- Fine/Medium Sand (<5%)
- Very Dirty Ballast (cohesive)
- TOPSOIL

ARUP

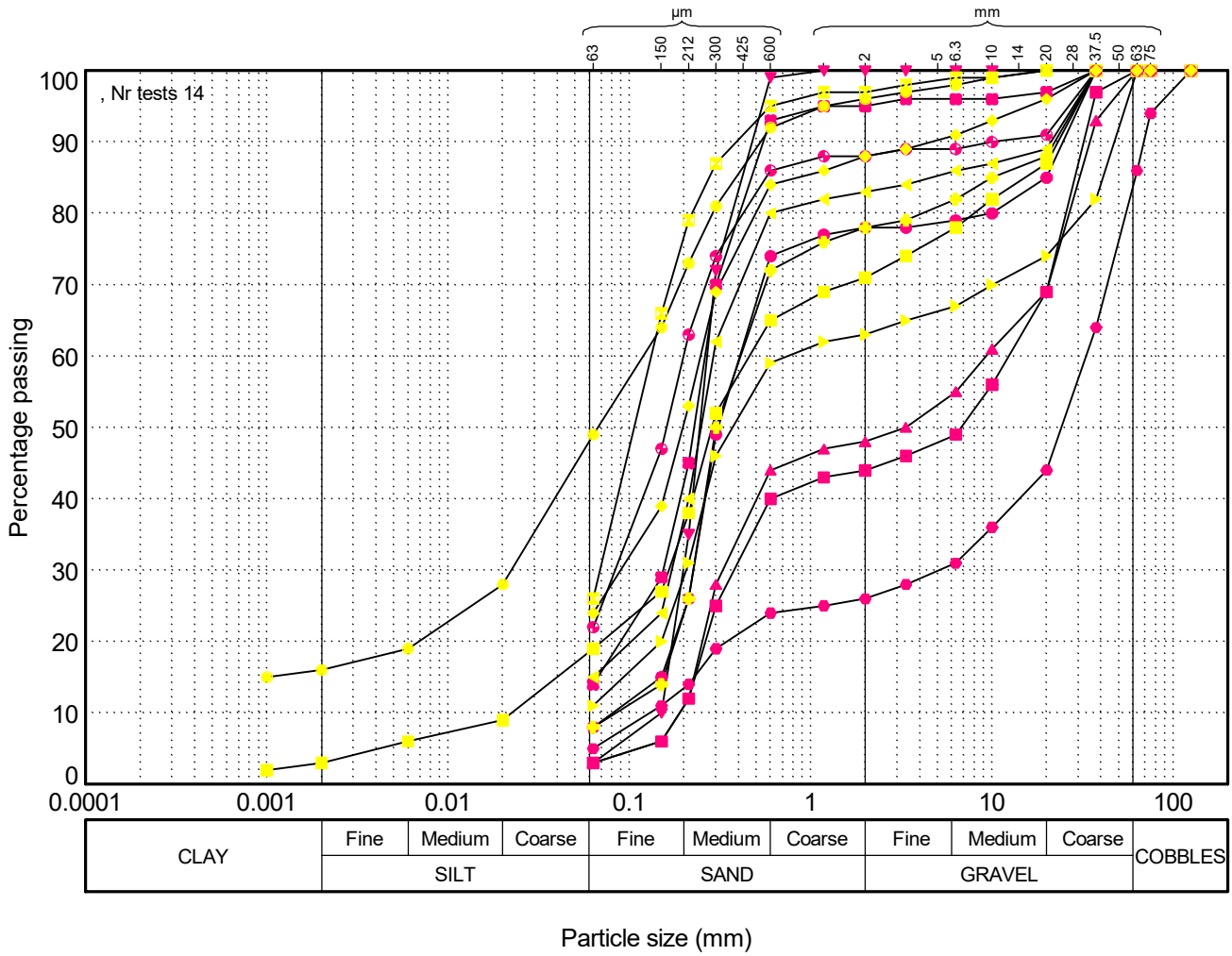
Job Title
Headbolt Lane

Figure Title
Geological cross section
On-track holes

Job No
276736-06

Figure No

ARUP. gINT v8.30.004. Made by Sam Moss on 6-Jan-21



Made Ground (MG)
SANDSTONE
(SANDSTONE)
BH1302, 27.9mOD
BH1303, 27.1mOD
BH1304, 24.5mOD
SA1, 22.6mOD
TP1401, 28.4mOD
TP1403, 26.1mOD
TP1404, 25.1mOD
TP1404, 24.6mOD
TP1405, 28.1mOD
TP1406, 28.5mOD
TP1407, 24.1mOD
TP1408, 29.5mOD
TP1409, 29.5mOD
TP1410, 30.0mOD

ARUP

Job Title
Headbolt Lane

Figure Title
Particle size distribution
Station and Car Park
Made Ground and Sandstone

Job No
276736-06

Figure No

Library : arup_uklib_4-0-002-ru_Report: G10A.00
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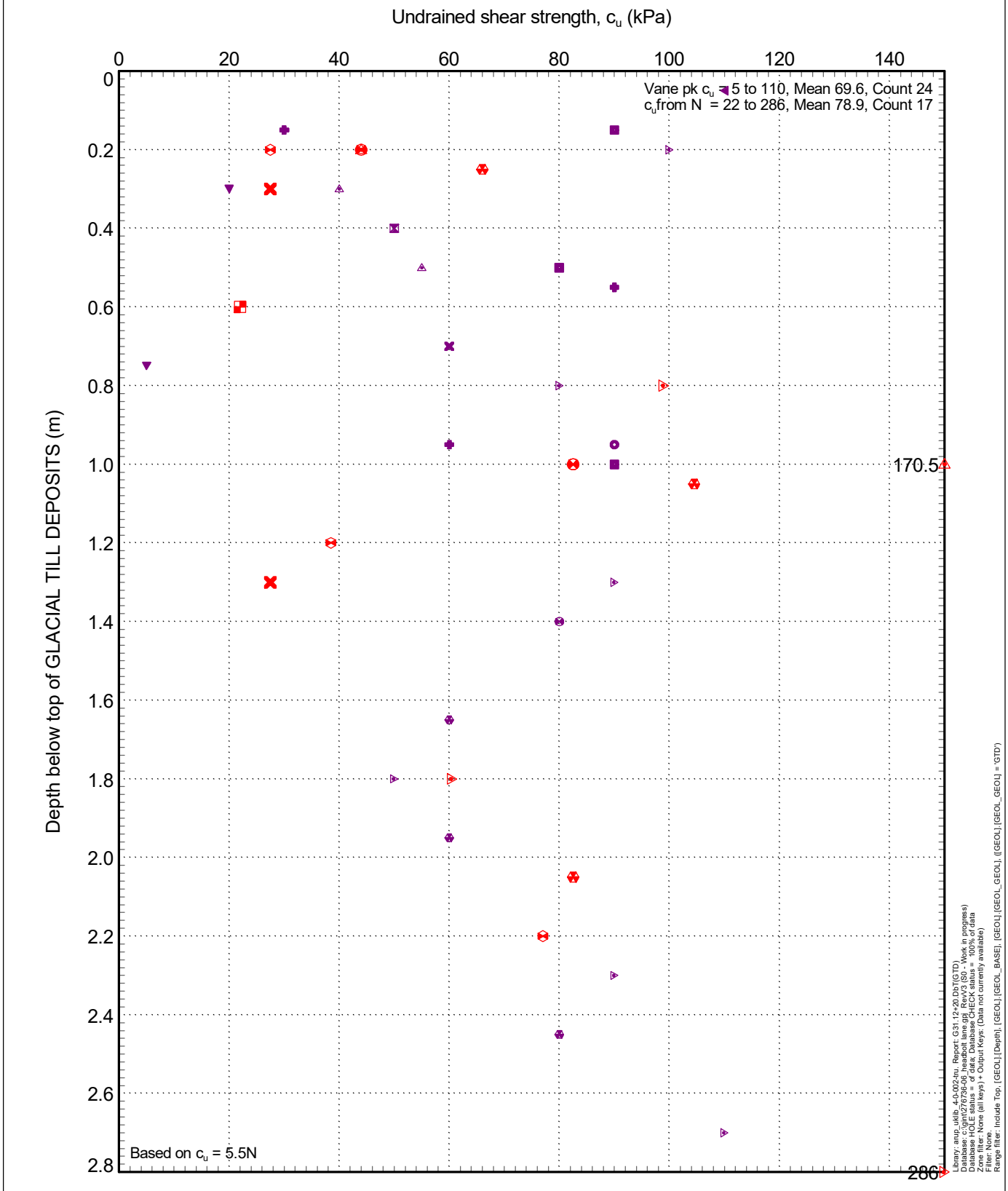
Key filter: None
Range filter: None

ARUP, gINT v8.30.004. Made by Sam Moss on 6-Jan-21



- From hand vane (peak)
- cu from SPT (x5.5)
- ABS1001
- ABS1002
- ABS1003
- ABS1004
- ABS1006
- ABS1015
- WS1202
- WS1203
- WS1205
- WS1206
- WS1207
- WS1214
- WS1215

ARUP

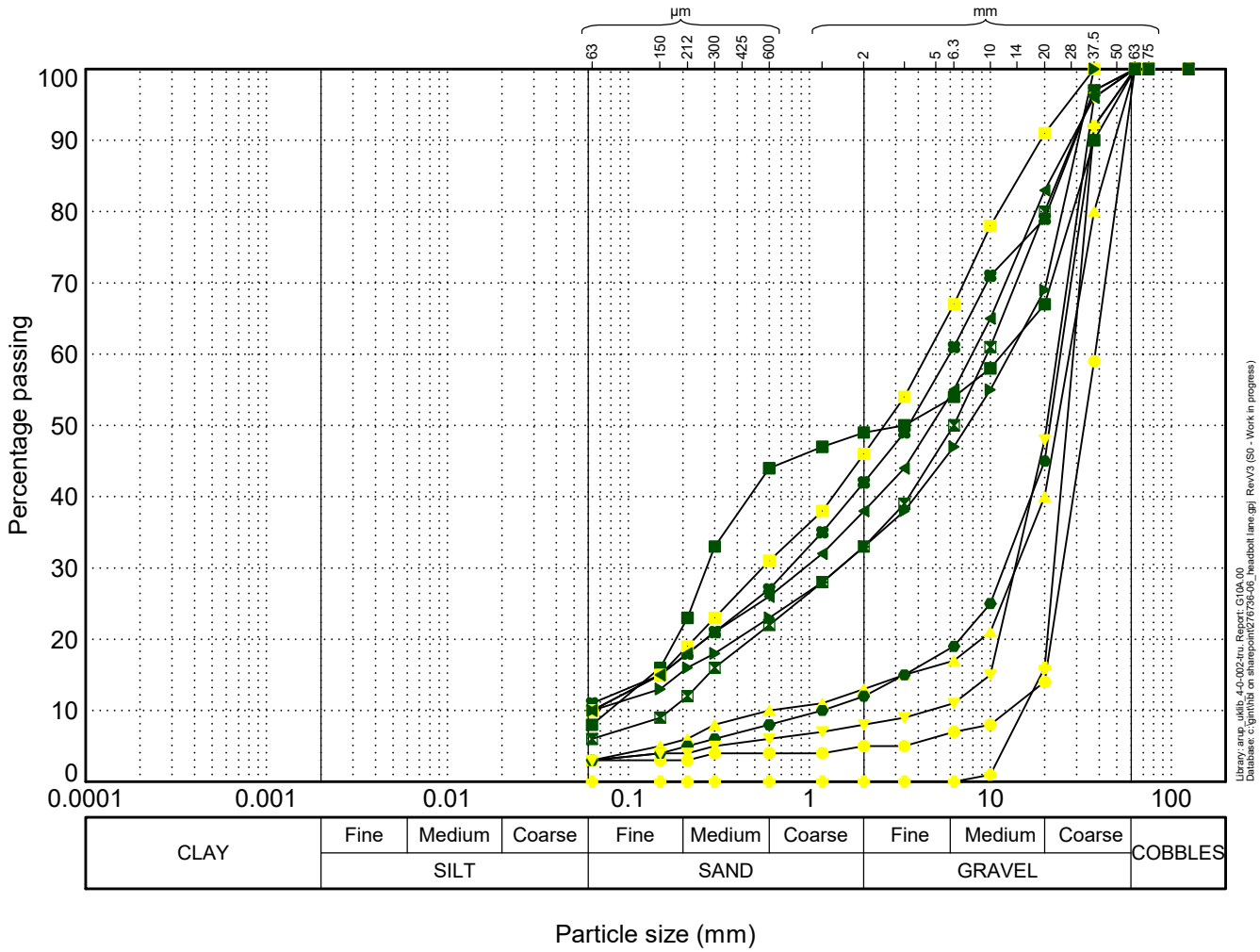
Job Title
Headbolt Lane

Figure Title
Undrained shear strength
Rail Corridor
Glacial Till Deposits

Job No
276736-06

Figure No

ARUP, gINT v8.30.004. Made by Sam Moss on 6-Jan-21



- Blanketing material - GR (MG-TRK-GR)
- Ballast (MG-BA)
- ABS1004, 22.4mOD
- ABS1006, 23.6mOD
- ABS1008, 25.7mOD
- ABS1008, 25.3mOD
- ABS1011, 27.9mOD
- ABS1012, 29.1mOD
- ABS1013, 29.8mOD
- WS1203, 25.8mOD
- WS1205, 26.5mOD
- WS1207, 27.6mOD
- WS1215, 29.5mOD

ARUP

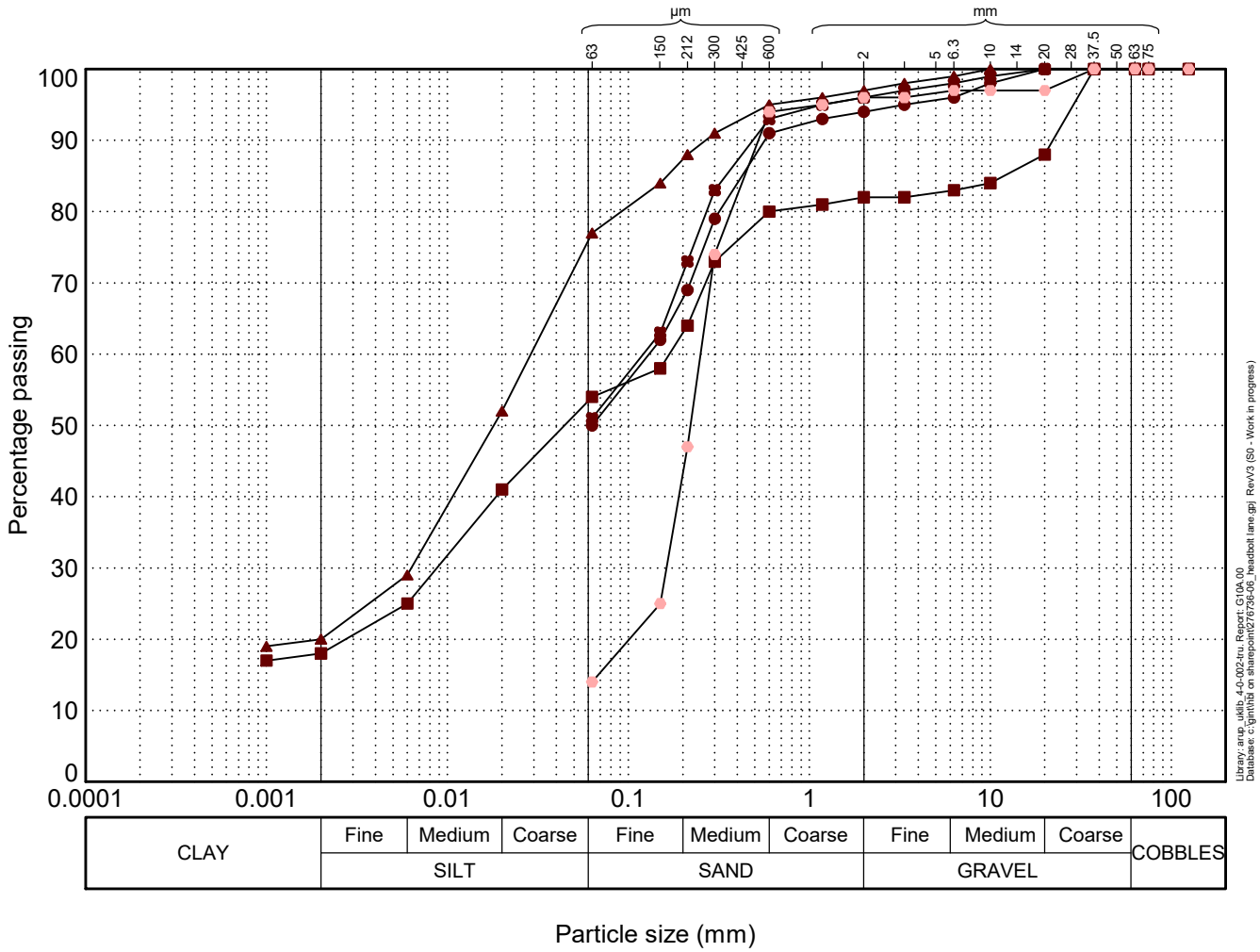
Job Title
Headbolt Lane

Figure Title
Particle size distribution
Rail Corridor
Ballast & granular track bed material

Job No
276736-06

Figure No

ARUP. gINT v8.30.004. Made by Claudia Ventrella on 9-Dec-20



Library: arup_uklib 4-0-002-tru, Report: G10A.00
Database: c:\gint\tbl on sharepoint\276736-06_headbolt lane.gpj RevV3 (S0 - Work in progress)

- Made Ground Embankment Fill - GR (MG-EMB-GR)
- Made Ground Embankment Fill - CO (MG-EMB-CO)
- ABS1010, 26.7mOD
- WS1202, 24.3mOD
- WS1205, 25.0mOD
- WS1207, 26.0mOD
- WS1208, 25.2mOD

ARUP

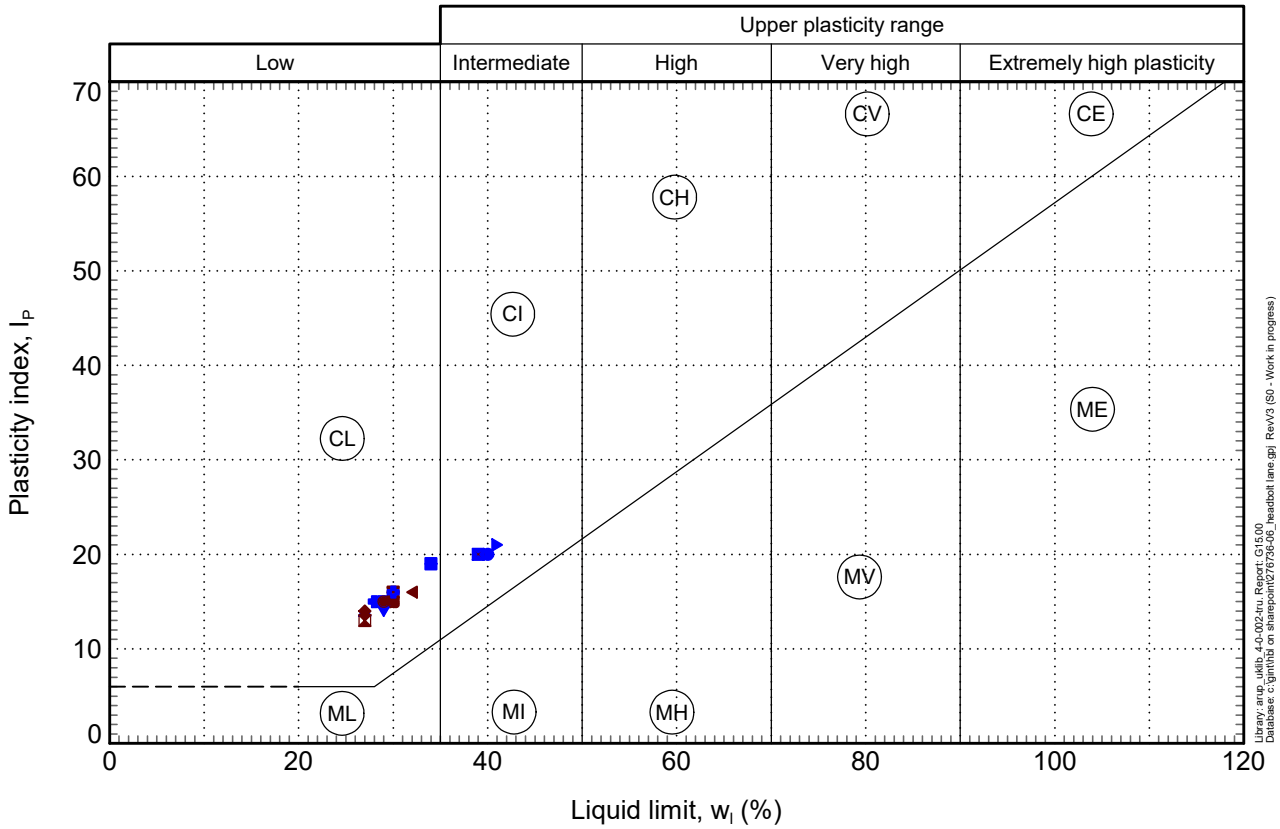
Job Title
Headbolt Lane

Figure Title
Particle size distribution
Rail Corridor
Embankment Fill

Job No
276736-06

Figure No

ARUP. gINT v8.30.004. Made by Claudia Ventrella on 9-Dec-20



- Made Ground
- Embankment Fill - CO (MG-EMB-CO)
- Glacial Till Deposits - CO (GTD-CO)
- ABS1001, 21.6mOD
- ABS1003, 21.5mOD
- ABS1006, 23.2mOD
- ABS1009, 26.0mOD
- ABS1011, 27.2mOD
- ABS1015, 29.2mOD
- WS1202, 23.9mOD
- WS1202, 23.3mOD
- WS1203, 24.3mOD
- WS1203, 21.8mOD
- WS1205, 25.0mOD
- WS1207, 26.0mOD
- WS1207, 24.1mOD
- WS1208, 26.2mOD
- WS1212, 27.4mOD
- WS1214, 26.3mOD
- WS1215, 28.0mOD
- WS1215, 26.0mOD

ARUP

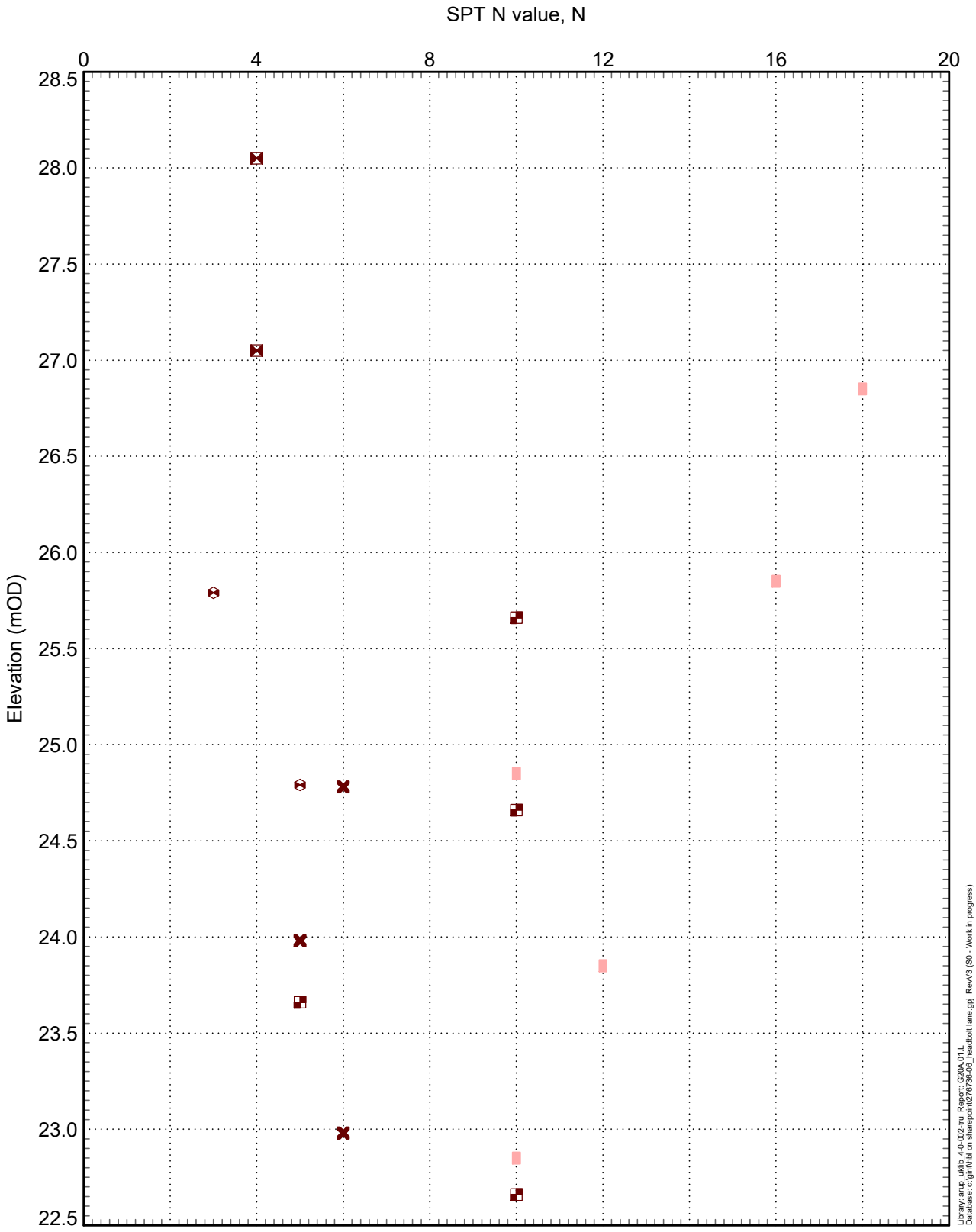
Job Title
Headbolt Lane

Figure Title
Plasticity chart
Rail Corridor

Job No
276736-06

Figure No

ARUP, gINT v8.30.004. Made by Claudia Ventrella on 9-Dec-20



Made Ground Embankment Fill - GR (MG-EMB-GR)
Made Ground Embankment Fill - CO (MG-EMB-CO)
WS1203
WS1205
WS1207
WS1208
WS1212

ARUP

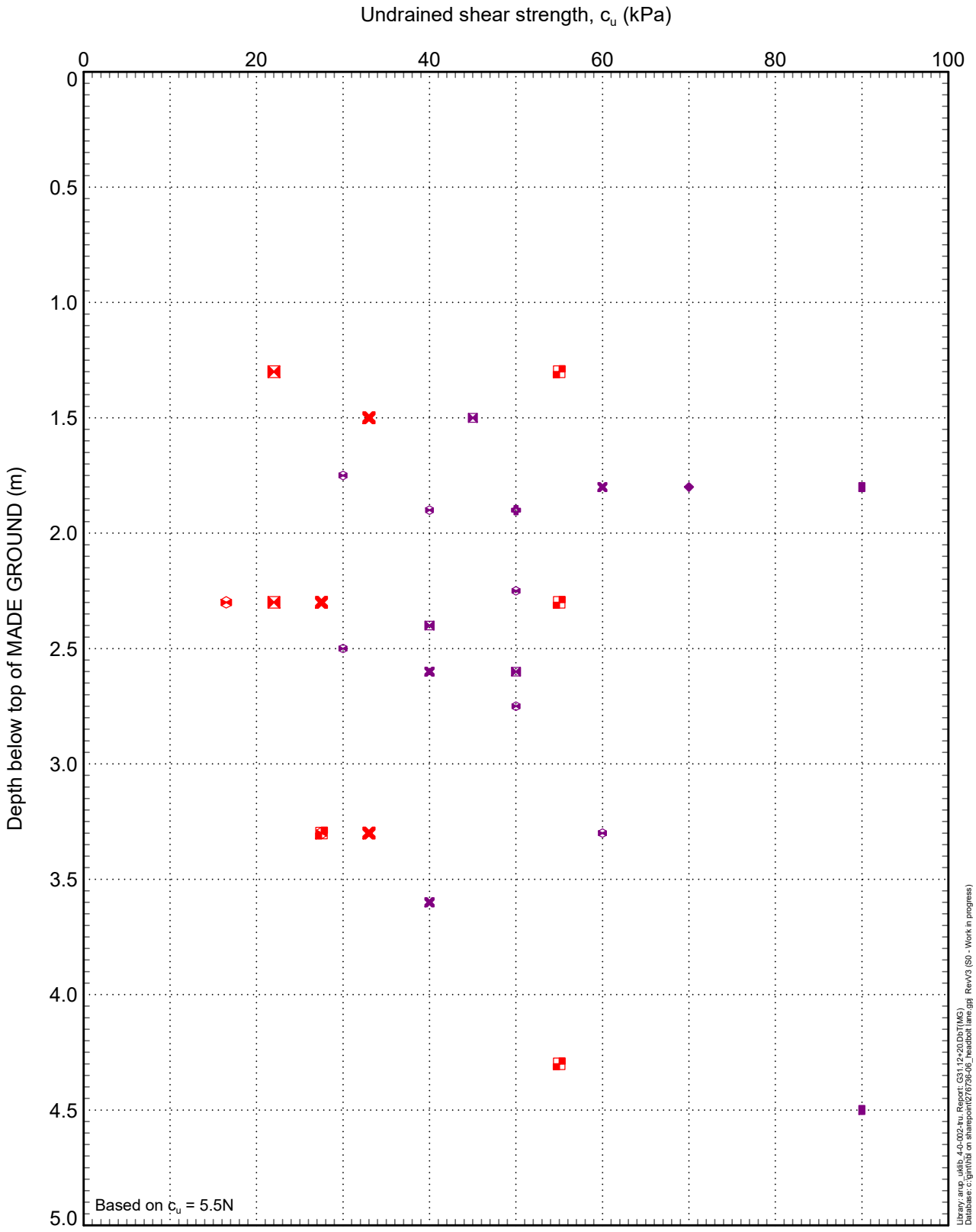
Job Title
Headbolt Lane

Figure Title
Standard penetration tests
Rail Corridor
Embankment Fill

Job No
276736-06

Figure No

ARUP. gINT v8.30.004. Made by Claudia Ventrella on 9-Dec-20



- From hand vane (peak)
- cu from SPT (x5.5)
- ABS1009
- ABS1011
- WS1203
- WS1205
- WS1207
- WS1208
- WS1212

ARUP

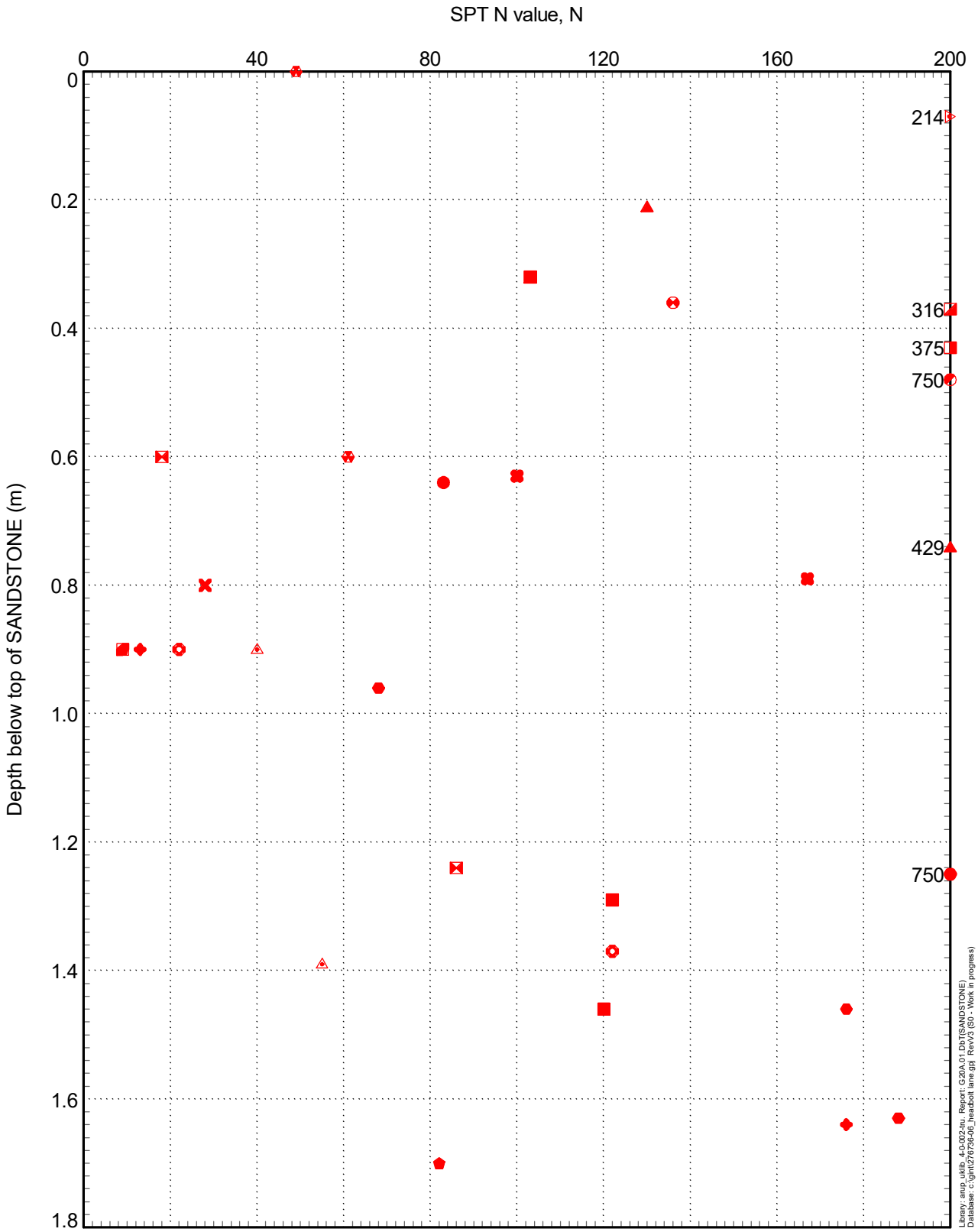
Job Title
Headbolt Lane

Figure Title
Undrained shear strength
Rail Corridor
Embankment Fill

Job No
276736-06

Figure No

ARUP. gINT v8.30.004. Made by Claudia Ventrella on 9-Dec-20



Sandstone (SANDSTONE-Sdst)
BH1301
BH1302
BH1303
BH1304
BH1305
WS1201A
WS1202
WS1203
WS1204
WS1205
WS1206
WS1209
WS1210A
WS1210B
WS1211
WS1212
WS1214
WS1215

ARUP

Job Title
Headbolt Lane

Figure Title
Standard penetration tests
Rail Corridor, Station and Car Park
Sandstone

Job No
276736-06

Figure No

ARUP. gINT v8.30.004. Made by Sam Moss on 5-Jan-21

Appendix E

Geoenvironmental Screening Assessment

170248-ARU-SCH-EGE-000003 P01

E1 Human health screening assessment

Concentration exceeds GAC	100.00
Limit of Detection value exceeds GAC	<0.1
Concentration exceeds saturation value but not GAC	50

Contaminant Name	GAC	Units	Total > LOD	Total > GAC	Min	Max		Hole Ref	WS1201A	WS1205	WS1205	WS1207	WS1207	WS1208	WS1208	WS1212	WS1215
								Easting	340436.16	340948.93	340948.93	341137.83	341137.83	341200.41	341200.41	341445.88	341605.63
								Northing	399340.7	399562.17	399562.17	399646.11	399646.11	399672.38	399672.38	399781.08	399857.35
								Elevation (mOD)	24.27	26.96	26.96	28.09	28.09	28.15	28.15	29.35	30.03
								Sample Top (mbgl)	0.2	0.5	1	0.2	0.5	0.5	1	0.5	0.2
								Sample Elevation (mOD)	24.07	26.46	25.96	27.89	27.59	27.65	27.15	28.85	29.83
								Sample Date									
								Investigation	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB
								Geology	MG-EMB-GR	MG-EMB-GR	MG-EMB-GR	MG-EMB-GR	MG-EMB-GR	MG-EMB-GR	MG-EMB-GR	MG-EMB-GR	MG-EMB-GR
Arsenic	635	mg/kg	36 of 36	0	1.7	143			38.1	54.4	12.8	32.8	63.5	54.5	36.2	51.4	45.1
Beryllium	11.7	mg/kg	17 of 36	0	<1	3.4			3.4	2.2	1.2	1.1	2.7	2.8	2.6	3.2	2.8
Cadmium	190	mg/kg	14 of 36	0	<0.5	1			0.6	0.6	<0.5	1	0.8	<0.5	0.6	0.6	0.7
Chromium	8570	mg/kg	35 of 36	0	<5	54.1			51	25.9	19	51.3	42.2	34.5	22.6	22.5	33.5
Copper	68300	mg/kg	36 of 36	0	6.6	739			233	739	132	144	511	678	608	711	423
Lead	2300	mg/kg	35 of 36	0	<5	359			97.7	251	46.4	126	311	300	163	184	184
Mercury	1100	mg/kg	2 of 36	0	<0.5	2.3			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	983	mg/kg	35 of 36	0	<5	73.3			64.2	70.6	22.2	41.1	72.8	73.3	59.7	67.4	67.7
Selenium	12261	mg/kg	2 of 36	0	<1	1.8			<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Cyanide	168	mg/kg	1 of 36	0	<1	1.4			<1	<1	<1	<1	<1	<1	<1	<1	1.4
Total Organic Carbon		%	36 of 36	0	0.17	54			11	54	4.2	7.2	40	38	22	44	36
Vanadium	9000	mg/kg	35 of 36	0	<5	100			76.8	69.7	25.3	62.3	94	100	53.3	77.7	94.5
Water Soluble Boron	236000	mg/kg	11 of 36	0	<0.5	1			0.9	0.6	<0.5	<0.5	<0.5	0.6	<0.5	0.8	1
Zinc	730000	mg/kg	35 of 36	0	<5	2310			203	263	74.5	295	303	198	207	198	231
pH		pH units	55 of 55	0	5.1	10.7			9.5	7.2	7.9	8.2	7.7	7.5	7.1	6	7.9
Asbestos Identification		-	0 of 31	0					ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene GCMS	97100	mg/kg	13 of 14	0	<0.01	35			0.02	0.03			0.06	0.04	0.03	0.08	0.12
Acenaphthylene GCMS	96800	mg/kg	11 of 14	0	<0.01	0.73			0.02	0.04			0.06	0.07	0.03	0.04	0.11
Anthracene GCMS	536000	mg/kg	14 of 14	0	0.02	18.9			0.15	0.54			0.77	0.53	0.29	0.24	0.79
Benzene	47.4622	mg/kg	0 of 14	0	<0.01	<0.01			<0.01	<0.01			<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene GCMS	174	mg/kg	14 of 14	0	0.07	15.8			0.25	0.38			0.93	0.56	0.38	0.46	1.22
Benzo(a)pyrene GCMS	35.5	mg/kg	14 of 14	0	0.08	11.2			0.36	0.48			1.12	0.52	0.76	0.37	1.09
Benzo(b)fluoranthene GCMS	44.7	mg/kg	14 of 14	0	0.07	11.1			0.28	0.42			0.99	0.79	0.46	0.37	1.07
Benzo(g,h,i)perylene GCMS	3950	mg/kg	14 of 14	0	0.03	5.44			0.16	0.23			0.54	0.25	0.36	0.26	0.72
Benzo(k)fluoranthene GCMS	1180	mg/kg	14 of 14	0	0.08	10.7			0.33	0.41			0.89	0.72	0.55	0.38	1.09
Chrysene GCMS	352	mg/kg	14 of 14	0	0.1	14.7			0.32	0.43			0.99	0.73	0.45	0.56	1.46
Dibenzo(a,h)anthracene GCMS	3.55	mg/kg	13 of 14	0	<0.01	2.33			0.04	0.07			0.18	0.1	0.12	0.08	0.24
Ethylbenzene	12834	mg/kg	0 of 14	0	<0.01	<0.01			<0.01	<0.01			<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene GCMS	22700	mg/kg	14 of 14	0	0.15	47.6			0.68	0.63			1.56	1.32	0.47	0.94	2.82
Fluorene GCMS	68400	mg/kg	13 of 14	0	<0.01	25.5			0.02	0.05			0.08	0.06	0.03	0.06	0.1
Indeno(1,2,3-cd)pyrene GCMS	506	mg/kg	14 of 14	0	0.03	5.93			0.15	0.22			0.57	0.29	0.33	0.2	0.59
Naphthalene GCMS	462	mg/kg	14 of 14	0	0.01	17.1			0.23	0.63			0.98	0.62	0.18	1.24	2.33
Phenanthrene GCMS	22300	mg/kg	14 of 14	0	0.07	62.9			0.65	1.94			2.56	1.99	0.73	1.89	2.85
Pyrene GCMS	54400	mg/kg	14 of 14	0	0.14	36.6			0.53	0.56			1.42	1.27	0.51	0.83	2.51
Toluene	106828	mg/kg	0 of 14	0	<0.01	<0.01			<0.01	<0.01			<0.01	<0.01	<0.01	<0.01	<0.01
Xylenes	13552	mg/kg	0 of 14	0	<0.01	<0.01			<0.01	<0.01			<0.01	<0.01	<0.01	<0.01	<0.01
Hexavalent Chromium	33	mg/kg	0 of 9	0	<0.8	<0.8				<0.8			<0.8	<0.8		<0.8	

Concentration exceeds GAC	100.00
Limit of Detection value exceeds GAC	<0.1
Concentration exceeds saturation value but not GAC	50

Contaminant Name	GAC	Units	Total > LOD	Total > GAC	Min	Max		Hole Ref	WS1202	WS1203	WS1207	WS1215	BH1301	BH1301	BH1301	BH1301	BH1303
								Easting	340618.22	340803.74	341137.83	341605.63	341159.33	341159.33	341159.33	341159.33	341295.86
								Northing	399423.2	399498.83	399646.11	399857.35	399644.44	399644.44	399644.44	399644.44	399852.18
								Elevation (mOD)	25.34	26.28	28.09	30.03	23.46	23.46	23.46	23.46	28.07
								Sample Top (mbgl)	1	2	1	2	0.7	0.8	2	0.2	0.5
								Sample Elevation (mOD)	24.34	24.28	27.09	28.03	22.76	22.66	21.46	23.26	27.57
								Sample Date									
								Investigation	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB
								Geology	MG-EMB-GR	MG-EMB-GR	MG-EMB-GR	MG-EMB-GR	MG-GR	MG-GR	MG-GR	MG-GR	MG-MG-CO
Arsenic	635	mg/kg	36 of 36	0	1.7	143							8.3				16.8
Beryllium	11.7	mg/kg	17 of 36	0	<1	3.4							<1				<1
Cadmium	190	mg/kg	14 of 36	0	<0.5	1							<0.5				0.6
Chromium	8570	mg/kg	35 of 36	0	<5	54.1							15.6				32.4
Copper	68300	mg/kg	36 of 36	0	6.6	739							39.3				64.3
Lead	2300	mg/kg	35 of 36	0	<5	359							31.4				193
Mercury	1100	mg/kg	2 of 36	0	<0.5	2.3							<0.5				<0.5
Nickel	983	mg/kg	35 of 36	0	<5	73.3							13.8				31.3
Selenium	12261	mg/kg	2 of 36	0	<1	1.8							<1				<1
Total Cyanide	168	mg/kg	1 of 36	0	<1	1.4							<1				<1
Total Organic Carbon		%	36 of 36	0	0.17	54							0.58				1.8
Vanadium	9000	mg/kg	35 of 36	0	<5	100							16.5				34.3
Water Soluble Boron	236000	mg/kg	11 of 36	0	<0.5	1							<0.5				<0.5
Zinc	730000	mg/kg	35 of 36	0	<5	2310							45.3				166
pH		pH units	55 of 55	0	5.1	10.7			6.7	7.6	7.3	8.1	8	7.6	7.6		8.1
Asbestos Identification		-	0 of 31	0												ND	ND
Acenaphthene GCMS	97100	mg/kg	13 of 14	0	<0.01	35							<0.01				0.07
Acenaphthylene GCMS	96800	mg/kg	11 of 14	0	<0.01	0.73							<0.01				0.02
Anthracene GCMS	536000	mg/kg	14 of 14	0	0.02	18.9							0.02				0.16
Benzene	47.4622	mg/kg	0 of 14	0	<0.01	<0.01							<0.01				<0.01
Benzo(a)anthracene GCMS	174	mg/kg	14 of 14	0	0.07	15.8							0.07				0.66
Benzo(a)pyrene GCMS	35.5	mg/kg	14 of 14	0	0.08	11.2							0.08				1.12
Benzo(b)fluoranthene GCMS	44.7	mg/kg	14 of 14	0	0.07	11.1							0.07				0.89
Benzo(g,h,i)perylene GCMS	3950	mg/kg	14 of 14	0	0.03	5.44							0.03				0.45
Benzo(k)fluoranthene GCMS	1180	mg/kg	14 of 14	0	0.08	10.7							0.08				0.97
Chrysene GCMS	352	mg/kg	14 of 14	0	0.1	14.7							0.1				0.94
Dibenzo(a,h)anthracene GCMS	3.55	mg/kg	13 of 14	0	<0.01	2.33							<0.01				0.11
Ethylbenzene	12834	mg/kg	0 of 14	0	<0.01	<0.01							<0.01				<0.01
Fluoranthene GCMS	22700	mg/kg	14 of 14	0	0.15	47.6							0.15				1.38
Fluorene GCMS	68400	mg/kg	13 of 14	0	<0.01	25.5							<0.01				0.04
Indeno(1,2,3-cd)pyrene GCMS	506	mg/kg	14 of 14	0	0.03	5.93							0.03				0.38
Naphthalene GCMS	462	mg/kg	14 of 14	0	0.01	17.1							0.01				0.05
Phenanthrene GCMS	22300	mg/kg	14 of 14	0	0.07	62.9							0.07				0.53
Pyrene GCMS	54400	mg/kg	14 of 14	0	0.14	36.6							0.14				1.39
Toluene	106828	mg/kg	0 of 14	0	<0.01	<0.01							<0.01				<0.01
Xylenes	13552	mg/kg	0 of 14	0	<0.01	<0.01							<0.01				<0.01
Hexavalent Chromium	33	mg/kg	0 of 9	0	<0.8	<0.8											

Concentration exceeds GAC	100.00
Limit of Detection value exceeds GAC	<0.1
Concentration exceeds saturation value but not GAC	50

Contaminant Name	GAC	Units	Total > LOD	Total > GAC	Min	Max		Hole Ref	BH1303	BH1303	BH1303	BH1303	BH1304	BH1305	BH1305	TP1407	WS1211
								Easting	341295.86	341295.86	341295.86	341295.86	341345.7	341427.66	341427.66	341215.1	341436.02
								Northing	399852.18	399852.18	399852.18	399852.18	399823.14	399808.01	399808.01	399765	399787.39
								Elevation (mOD)	28.07	28.07	28.07	28.07	25.81	26.63	26.63	25.29	27.33
								Sample Top (mbgl)	1.7	1	1.6	2.3	0.4	0.3	0.6	1	0.1
								Sample Elevation (mOD)	26.37	27.07	26.47	25.77	25.41	26.33	26.03	24.29	27.23
								Sample Date									
								Investigation	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB
								Geology	MG-MG-CO	MG-MG-CO	MG-MG-CO	MG-MG-CO	MG-MG-GR	MG-MG-GR	MG-MG-GR	MG-MG-GR	MG-MG-GR
Arsenic	635	mg/kg	36 of 36	0	1.7	143			23				5.6	4.9	5.1	31	34.3
Beryllium	11.7	mg/kg	17 of 36	0	<1	3.4			1.1				1.7	<1	<1	<1	1.7
Cadmium	190	mg/kg	14 of 36	0	<0.5	1			<0.5				<0.5	<0.5	<0.5	<0.5	0.6
Chromium	8570	mg/kg	35 of 36	0	<5	54.1			24.7				13.6	17.1	16.6	16	31.6
Copper	68300	mg/kg	36 of 36	0	6.6	739			47.6				25.3	22.4	19.8	36.5	165
Lead	2300	mg/kg	35 of 36	0	<5	359			359				44.3	25.8	23.1	15.3	112
Mercury	1100	mg/kg	2 of 36	0	<0.5	2.3			2.3				<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	983	mg/kg	35 of 36	0	<5	73.3			20.7				9.6	12.6	12.4	9.4	35.2
Selenium	12261	mg/kg	2 of 36	0	<1	1.8			1.7				<1	<1	<1	<1	<1
Total Cyanide	168	mg/kg	1 of 36	0	<1	1.4			<1				<1	<1	<1	<1	<1
Total Organic Carbon		%	36 of 36	0	0.17	54			2.2				3.6	0.63	0.92	0.31	10
Vanadium	9000	mg/kg	35 of 36	0	<5	100			31.5				14.9	15.4	16.2	17.4	42
Water Soluble Boron	236000	mg/kg	11 of 36	0	<0.5	1			0.6				<0.5	<0.5	<0.5	<0.5	1
Zinc	730000	mg/kg	35 of 36	0	<5	2310			87				36.5	39.6	36.5	27.7	2310
pH		pH units	55 of 55	0	5.1	10.7			7.9	8.2	8.1	7.9	6.3	6.4	6.4	6.6	7.5
Asbestos Identification		-	0 of 31	0					ND				ND	ND			
Acenaphthene GCMS	97100	mg/kg	13 of 14	0	<0.01	35			35								
Acenaphthylene GCMS	96800	mg/kg	11 of 14	0	<0.01	0.73			0.73								
Anthracene GCMS	536000	mg/kg	14 of 14	0	0.02	18.9			18.9								
Benzene	47.4622	mg/kg	0 of 14	0	<0.01	<0.01			<0.01								
Benzo(a)anthracene GCMS	174	mg/kg	14 of 14	0	0.07	15.8			15.8								
Benzo(a)pyrene GCMS	35.5	mg/kg	14 of 14	0	0.08	11.2			11.2								
Benzo(b)fluoranthene GCMS	44.7	mg/kg	14 of 14	0	0.07	11.1			11.1								
Benzo(g,h,i)perylene GCMS	3950	mg/kg	14 of 14	0	0.03	5.44			5.44								
Benzo(k)fluoranthene GCMS	1180	mg/kg	14 of 14	0	0.08	10.7			10.7								
Chrysene GCMS	352	mg/kg	14 of 14	0	0.1	14.7			14.7								
Dibenzo(a,h)anthracene GCMS	3.55	mg/kg	13 of 14	0	<0.01	2.33			2.33								
Ethylbenzene	12834	mg/kg	0 of 14	0	<0.01	<0.01			<0.01								
Fluoranthene GCMS	22700	mg/kg	14 of 14	0	0.15	47.6			47.6								
Fluorene GCMS	68400	mg/kg	13 of 14	0	<0.01	25.5			25.5								
Indeno(1,2,3-cd)pyrene GCMS	506	mg/kg	14 of 14	0	0.03	5.93			5.93								
Naphthalene GCMS	462	mg/kg	14 of 14	0	0.01	17.1			17.1								
Phenanthrene GCMS	22300	mg/kg	14 of 14	0	0.07	62.9			62.9								
Pyrene GCMS	54400	mg/kg	14 of 14	0	0.14	36.6			36.6								
Toluene	106828	mg/kg	0 of 14	0	<0.01	<0.01			<0.01								
Xylenes	13552	mg/kg	0 of 14	0	<0.01	<0.01			<0.01								
Hexavalent Chromium	33	mg/kg	0 of 9	0	<0.8	<0.8			<0.8								

Concentration exceeds GAC	100.00
Limit of Detection value exceeds GAC	<0.1
Concentration exceeds saturation value but not GAC	50

Contaminant Name	GAC	Units	Total > LOD	Total > GAC	Min	Max		Hole Ref	WS1211	WS1214	BH1304	BH1305	BH1305	BH1305	TP1407	TP1407	WS1211
								Easting	341436.02	341552.14	341345.7	341427.66	341427.66	341427.66	341215.1	341215.1	341436.02
								Northing	399787.39	399837.94	399823.14	399808.01	399808.01	399808.01	399765	399765	399787.39
								Elevation (mOD)	27.33	29.27	25.81	26.63	26.63	26.63	25.29	25.29	27.33
								Sample Top (mbgl)	1.2	0.6	1.3	0.4	0.9	1.7	1.2	0.3	0.55
								Sample Elevation (mOD)	26.13	28.67	24.51	26.23	25.73	24.93	24.09	24.99	26.78
								Sample Date									
								Investigation	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB
								Geology	MG-MG-GR	MG-MG-GR	MG-MG-GR	MG-MG-GR	MG-MG-GR	MG-MG-GR	MG-MG-GR	MG-MG-GR	MG-MG-GR
Arsenic	635	mg/kg	36 of 36	0	1.7	143			7	20.4							
Beryllium	11.7	mg/kg	17 of 36	0	<1	3.4			<1	1.1							
Cadmium	190	mg/kg	14 of 36	0	<0.5	1			<0.5	0.6							
Chromium	8570	mg/kg	35 of 36	0	<5	54.1			7.7	25							
Copper	68300	mg/kg	36 of 36	0	6.6	739			14.2	101							
Lead	2300	mg/kg	35 of 36	0	<5	359			8	107							
Mercury	1100	mg/kg	2 of 36	0	<0.5	2.3			<0.5	<0.5							
Nickel	983	mg/kg	35 of 36	0	<5	73.3			5.8	23.3							
Selenium	12261	mg/kg	2 of 36	0	<1	1.8			<1	<1							
Total Cyanide	168	mg/kg	1 of 36	0	<1	1.4			<1	<1							
Total Organic Carbon		%	36 of 36	0	0.17	54			0.28	3.4							
Vanadium	9000	mg/kg	35 of 36	0	<5	100			5.5	30.7							
Water Soluble Boron	236000	mg/kg	11 of 36	0	<0.5	1			<0.5	<0.5							
Zinc	730000	mg/kg	35 of 36	0	<5	2310			58.9	568							
pH		pH units	55 of 55	0	5.1	10.7			10.7	8.9	6.6	6	8.5	7.5	6.5		
Asbestos Identification		-	0 of 31	0											ND	ND	ND
Acenaphthene GCMS	97100	mg/kg	13 of 14	0	<0.01	35											0.03
Acenaphthylene GCMS	96800	mg/kg	11 of 14	0	<0.01	0.73											<0.01
Anthracene GCMS	536000	mg/kg	14 of 14	0	0.02	18.9											0.06
Benzene	47.4622	mg/kg	0 of 14	0	<0.01	<0.01											<0.01
Benzo(a)anthracene GCMS	174	mg/kg	14 of 14	0	0.07	15.8											0.13
Benzo(a)pyrene GCMS	35.5	mg/kg	14 of 14	0	0.08	11.2											0.13
Benzo(b)fluoranthene GCMS	44.7	mg/kg	14 of 14	0	0.07	11.1											0.12
Benzo(g,h,i)perylene GCMS	3950	mg/kg	14 of 14	0	0.03	5.44											0.08
Benzo(k)fluoranthene GCMS	1180	mg/kg	14 of 14	0	0.08	10.7											0.15
Chrysene GCMS	352	mg/kg	14 of 14	0	0.1	14.7											0.2
Dibenzo(a,h)anthracene GCMS	3.55	mg/kg	13 of 14	0	<0.01	2.33											0.03
Ethylbenzene	12834	mg/kg	0 of 14	0	<0.01	<0.01											<0.01
Fluoranthene GCMS	22700	mg/kg	14 of 14	0	0.15	47.6											0.32
Fluorene GCMS	68400	mg/kg	13 of 14	0	<0.01	25.5											0.02
Indeno(1,2,3-cd)pyrene GCMS	506	mg/kg	14 of 14	0	0.03	5.93											0.07
Naphthalene GCMS	462	mg/kg	14 of 14	0	0.01	17.1											0.06
Phenanthrene GCMS	22300	mg/kg	14 of 14	0	0.07	62.9											0.22
Pyrene GCMS	54400	mg/kg	14 of 14	0	0.14	36.6											0.29
Toluene	106828	mg/kg	0 of 14	0	<0.01	<0.01											<0.01
Xylenes	13552	mg/kg	0 of 14	0	<0.01	<0.01											<0.01
Hexavalent Chromium	33	mg/kg	0 of 9	0	<0.8	<0.8			<0.8	<0.8							

Concentration exceeds GAC	100.00
Limit of Detection value exceeds GAC	<0.1
Concentration exceeds saturation value but not GAC	50

Contaminant Name	GAC	Units	Total > LOD	Total > GAC	Min	Max		Hole Ref	WS1214	WS1212	BH1302	TP1401	TP1402	TP1403	TP1403	TP1403	TP1404
								Easting	341552.14	341445.88	341404.18	341313.1	341364.7	341416.1	341416.1	341416.1	341367.3
								Northing	399837.94	399781.08	399781.67	399771.6	399794.5	399828.6	399828.6	399828.6	399836.4
								Elevation (mOD)	29.27	29.35	28.93	29.14	29.16	26.6	26.6	26.6	25.81
								Sample Top (mbgl)	0.1	1	0.2	0.1	0.1	0.1	0.3	2	0.6
								Sample Elevation (mOD)	29.17	28.35	28.73	29.04	29.06	26.5	26.3	24.6	25.21
								Sample Date									
								Investigation	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB
								Geology	MG-MG-GR	MG-TRK-GR	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS
Arsenic	635	mg/kg	36 of 36	0	1.7	143					17.2	23.5	12.7	24.6	1.7	20.4	21
Beryllium	11.7	mg/kg	17 of 36	0	<1	3.4					<1	<1	<1	<1	<1	<1	<1
Cadmium	190	mg/kg	14 of 36	0	<0.5	1					0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5
Chromium	8570	mg/kg	35 of 36	0	<5	54.1					30.3	26.3	19.1	32.7	<5	12.2	21.4
Copper	68300	mg/kg	36 of 36	0	6.6	739					87	64.6	20.9	78.7	6.6	24.8	50.6
Lead	2300	mg/kg	35 of 36	0	<5	359					102	94.9	15.9	122	<5	16.8	69.1
Mercury	1100	mg/kg	2 of 36	0	<0.5	2.3					<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
Nickel	983	mg/kg	35 of 36	0	<5	73.3					20.7	16.5	8	18.7	<5	8.9	11
Selenium	12261	mg/kg	2 of 36	0	<1	1.8					<1	<1	<1	<1	<1	<1	<1
Total Cyanide	168	mg/kg	1 of 36	0	<1	1.4					<1	<1	<1	<1	<1	<1	<1
Total Organic Carbon		%	36 of 36	0	0.17	54					4.2	2.6	0.46	2.9	0.17	0.24	1.9
Vanadium	9000	mg/kg	35 of 36	0	<5	100					49.5	40.5	25.2	51.9	<5	10.1	26.5
Water Soluble Boron	236000	mg/kg	11 of 36	0	<0.5	1					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	730000	mg/kg	35 of 36	0	<5	2310					77	82.9	26	83.7	<5	24.1	42.9
pH		pH units	55 of 55	0	5.1	10.7				7.5	5.5	5.7	5.1	5.6	6	6.6	7.5
Asbestos Identification		-	0 of 31	0					ND		ND	ND	ND		ND		
Acenaphthene GCMS	97100	mg/kg	13 of 14	0	<0.01	35					0.03						
Acenaphthylene GCMS	96800	mg/kg	11 of 14	0	<0.01	0.73					<0.01						
Anthracene GCMS	536000	mg/kg	14 of 14	0	0.02	18.9					0.03						
Benzene	47.4622	mg/kg	0 of 14	0	<0.01	<0.01					<0.01						
Benzo(a)anthracene GCMS	174	mg/kg	14 of 14	0	0.07	15.8					0.08						
Benzo(a)pyrene GCMS	35.5	mg/kg	14 of 14	0	0.08	11.2					0.1						
Benzo(b)fluoranthene GCMS	44.7	mg/kg	14 of 14	0	0.07	11.1					0.09						
Benzo(g,h,i)perylene GCMS	3950	mg/kg	14 of 14	0	0.03	5.44					0.05						
Benzo(k)fluoranthene GCMS	1180	mg/kg	14 of 14	0	0.08	10.7					0.08						
Chrysene GCMS	352	mg/kg	14 of 14	0	0.1	14.7					0.1						
Dibenzo(a,h)anthracene GCMS	3.55	mg/kg	13 of 14	0	<0.01	2.33					0.01						
Ethylbenzene	12834	mg/kg	0 of 14	0	<0.01	<0.01					<0.01						
Fluoranthene GCMS	22700	mg/kg	14 of 14	0	0.15	47.6					0.17						
Fluorene GCMS	68400	mg/kg	13 of 14	0	<0.01	25.5					0.02						
Indeno(1,2,3-cd)pyrene GCMS	506	mg/kg	14 of 14	0	0.03	5.93					0.05						
Naphthalene GCMS	462	mg/kg	14 of 14	0	0.01	17.1					0.03						
Phenanthrene GCMS	22300	mg/kg	14 of 14	0	0.07	62.9					0.12						
Pyrene GCMS	54400	mg/kg	14 of 14	0	0.14	36.6					0.15						
Toluene	106828	mg/kg	0 of 14	0	<0.01	<0.01					<0.01						
Xylenes	13552	mg/kg	0 of 14	0	<0.01	<0.01					<0.01						
Hexavalent Chromium	33	mg/kg	0 of 9	0	<0.8	<0.8											

Concentration exceeds GAC	100.00
Limit of Detection value exceeds GAC	<0.1
Concentration exceeds saturation value but not GAC	50

Contaminant Name	GAC	Units	Total > LOD	Total > GAC	Min	Max		Hole Ref	TP1405	TP1405	TP1406	TP1408	TP1408	TP1409	TP1410	TP1410	WS1210A
								Easting	341308.6	341308.6	341235.5	341221.8	341221.8	341222.09	341262.8	341262.8	341319.99
								Northing	399865.3	399865.3	399805.7	399835.5	399835.5	399834.75	399855.7	399855.7	399736.52
								Elevation (mOD)	29.08	29.08	29.15	30.74	30.74	30.74	30.61	30.61	29.69
								Sample Top (mbgl)	0.2	0.5	0.5	0.3	1	0.3	0.2	0.5	0.2
								Sample Elevation (mOD)	28.88	28.58	28.65	30.44	29.74	30.44	30.41	30.11	29.49
								Sample Date									
								Investigation	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB
								Geology	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS
Arsenic	635	mg/kg	36 of 36	0	1.7	143			8	7.2	143	17.6	14.2	51.5	11.3	15	6.7
Beryllium	11.7	mg/kg	17 of 36	0	<1	3.4			<1	<1	1.3	<1	1.1	<1	<1	1.2	<1
Cadmium	190	mg/kg	14 of 36	0	<0.5	1			<0.5	<0.5	0.8	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
Chromium	8570	mg/kg	35 of 36	0	<5	54.1			20.4	21.1	26.2	29.5	54.1	26.5	25.1	33	16.6
Copper	68300	mg/kg	36 of 36	0	6.6	739			39.9	35.5	257	57.6	30.7	86.5	38.6	49.7	18.6
Lead	2300	mg/kg	35 of 36	0	<5	359			40.6	48.5	231	207	23	137	55.9	89.2	20.6
Mercury	1100	mg/kg	2 of 36	0	<0.5	2.3			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	983	mg/kg	35 of 36	0	<5	73.3			18.1	18.2	29.3	23.3	39.2	20	27.1	34	9.3
Selenium	12261	mg/kg	2 of 36	0	<1	1.8			<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Cyanide	168	mg/kg	1 of 36	0	<1	1.4			<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Organic Carbon		%	36 of 36	0	0.17	54			2.1	1.1	2.7	1.9	0.32	0.84	1.8	2.6	0.85
Vanadium	9000	mg/kg	35 of 36	0	<5	100			19.5	17.9	34.2	30.6	43.4	28.4	26.6	35.4	24.5
Water Soluble Boron	236000	mg/kg	11 of 36	0	<0.5	1			0.6	<0.5	<0.5	<0.5	<0.5	0.5	0.6	0.6	<0.5
Zinc	730000	mg/kg	35 of 36	0	<5	2310			56.6	42	310	82.8	51.5	145	53	128	27.1
pH		pH units	55 of 55	0	5.1	10.7			6.7	6.9	7.8	7.4	7.6	8.1	7.1	7	7.3
Asbestos Identification		-	0 of 31	0					ND	ND		ND			ND	ND	ND
Acenaphthene GCMS	97100	mg/kg	13 of 14	0	<0.01	35								0.02			
Acenaphthylene GCMS	96800	mg/kg	11 of 14	0	<0.01	0.73								0.03			
Anthracene GCMS	536000	mg/kg	14 of 14	0	0.02	18.9								0.06			
Benzene	47.4622	mg/kg	0 of 14	0	<0.01	<0.01								<0.01			
Benzo(a)anthracene GCMS	174	mg/kg	14 of 14	0	0.07	15.8								0.26			
Benzo(a)pyrene GCMS	35.5	mg/kg	14 of 14	0	0.08	11.2								0.39			
Benzo(b)fluoranthene GCMS	44.7	mg/kg	14 of 14	0	0.07	11.1								0.3			
Benzo(g,h,i)perylene GCMS	3950	mg/kg	14 of 14	0	0.03	5.44								0.38			
Benzo(k)fluoranthene GCMS	1180	mg/kg	14 of 14	0	0.08	10.7								0.33			
Chrysene GCMS	352	mg/kg	14 of 14	0	0.1	14.7								0.29			
Dibenzo(a,h)anthracene GCMS	3.55	mg/kg	13 of 14	0	<0.01	2.33								0.12			
Ethylbenzene	12834	mg/kg	0 of 14	0	<0.01	<0.01								<0.01			
Fluoranthene GCMS	22700	mg/kg	14 of 14	0	0.15	47.6								0.47			
Fluorene GCMS	68400	mg/kg	13 of 14	0	<0.01	25.5								0.04			
Indeno(1,2,3-cd)pyrene GCMS	506	mg/kg	14 of 14	0	0.03	5.93								0.35			
Naphthalene GCMS	462	mg/kg	14 of 14	0	0.01	17.1								0.08			
Phenanthrene GCMS	22300	mg/kg	14 of 14	0	0.07	62.9								0.22			
Pyrene GCMS	54400	mg/kg	14 of 14	0	0.14	36.6								0.46			
Toluene	106828	mg/kg	0 of 14	0	<0.01	<0.01								<0.01			
Xylenes	13552	mg/kg	0 of 14	0	<0.01	<0.01								<0.01			
Hexavalent Chromium	33	mg/kg	0 of 9	0	<0.8	<0.8			<0.8						<0.8		

Concentration exceeds GAC	100.00
Limit of Detection value exceeds GAC	<0.1
Concentration exceeds saturation value but not GAC	50

Hole Ref	WS1210C	BH1302	TP1403	TP1405	TP1408	TP1404	TP1406	TP1409
Easting	341323.49	341404.18	341416.1	341308.6	341221.8	341367.3	341235.5	341222.09
Northing	399734.16	399781.67	399828.6	399865.3	399835.5	399836.4	399805.7	399834.75
Elevation (mOD)	28.87	28.93	26.6	29.08	30.74	25.81	29.15	30.74
Sample Top (mbgl)	0.2	1.6	0.5	1	1.5	0.1	0.1	0.1
Sample Elevation (mOD)	28.67	27.33	26.1	28.08	29.24	25.71	29.05	30.64
Sample Date								
Investigation	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB	20/11799 AB
Geology	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS	TPS-TPS

Contaminant Name	GAC	Units	Total > LOD	Total > GAC	Min	Max								
Arsenic	635	mg/kg	36 of 36	0	1.7	143		55						
Beryllium	11.7	mg/kg	17 of 36	0	<1	3.4		2.5						
Cadmium	190	mg/kg	14 of 36	0	<0.5	1		<0.5						
Chromium	8570	mg/kg	35 of 36	0	<5	54.1		27.1						
Copper	68300	mg/kg	36 of 36	0	6.6	739		495						
Lead	2300	mg/kg	35 of 36	0	<5	359		292						
Mercury	1100	mg/kg	2 of 36	0	<0.5	2.3		<0.5						
Nickel	983	mg/kg	35 of 36	0	<5	73.3		53.8						
Selenium	12261	mg/kg	2 of 36	0	<1	1.8		1.8						
Total Cyanide	168	mg/kg	1 of 36	0	<1	1.4		<1						
Total Organic Carbon		%	36 of 36	0	0.17	54		28						
Vanadium	9000	mg/kg	35 of 36	0	<5	100		75.7						
Water Soluble Boron	236000	mg/kg	11 of 36	0	<0.5	1		<0.5						
Zinc	730000	mg/kg	35 of 36	0	<5	2310		135						
pH		pH units	55 of 55	0	5.1	10.7		7.1	7.3	5.8	6.5	6.4		
Asbestos Identification		-	0 of 31	0				ND					ND	ND
Acenaphthene GCMS	97100	mg/kg	13 of 14	0	<0.01	35								0.07
Acenaphthylene GCMS	96800	mg/kg	11 of 14	0	<0.01	0.73								0.03
Anthracene GCMS	536000	mg/kg	14 of 14	0	0.02	18.9								0.16
Benzene	47.4622	mg/kg	0 of 14	0	<0.01	<0.01								<0.01
Benzo(a)anthracene GCMS	174	mg/kg	14 of 14	0	0.07	15.8								0.98
Benzo(a)pyrene GCMS	35.5	mg/kg	14 of 14	0	0.08	11.2								1.28
Benzo(b)fluoranthene GCMS	44.7	mg/kg	14 of 14	0	0.07	11.1								0.93
Benzo(g,h,i)perylene GCMS	3950	mg/kg	14 of 14	0	0.03	5.44								1.07
Benzo(k)fluoranthene GCMS	1180	mg/kg	14 of 14	0	0.08	10.7								1.11
Chrysene GCMS	352	mg/kg	14 of 14	0	0.1	14.7								1
Dibenzo(a,h)anthracene GCMS	3.55	mg/kg	13 of 14	0	<0.01	2.33								0.37
Ethylbenzene	12834	mg/kg	0 of 14	0	<0.01	<0.01								<0.01
Fluoranthene GCMS	22700	mg/kg	14 of 14	0	0.15	47.6								1.83
Fluorene GCMS	68400	mg/kg	13 of 14	0	<0.01	25.5								0.04
Indeno(1,2,3-cd)pyrene GCMS	506	mg/kg	14 of 14	0	0.03	5.93								1.05
Naphthalene GCMS	462	mg/kg	14 of 14	0	0.01	17.1								0.05
Phenanthrene GCMS	22300	mg/kg	14 of 14	0	0.07	62.9								0.66
Pyrene GCMS	54400	mg/kg	14 of 14	0	0.14	36.6								1.61
Toluene	106828	mg/kg	0 of 14	0	<0.01	<0.01								<0.01
Xylenes	13552	mg/kg	0 of 14	0	<0.01	<0.01								<0.01
Hexavalent Chromium	33	mg/kg	0 of 9	0	<0.8	<0.8								

E2 Controlled waters screening assessment

Sample Identity				SW01	SW02
Sample Date				07/10/2020	07/10/2020
Strata					
	Units	Screening Criteria	Standard		
Dissolved Metals					
Arsenic	ug/l	50	**FEQS**	< 5	< 5
Cadmium	ug/l	0.08	**FEQS**	< 1	< 1
Chromium	ug/l	4.7	**FEQS**	< 5	< 5
Copper	ug/l	6	**FEQS**	5	6
Mercury	ug/l	0.05	**FEQS**	< 0.1	< 0.1
Magnesium	ug/l	-	**-**	6190	5970
Manganese	ug/l	30	**FEQS**	< 5	< 5
Nickel	ug/l	50	**FEQS**	< 5	< 5
Lead	ug/l	1.2	**FEQS**	< 1	< 1
Antimony	ug/l	5	**UK DWS**	< 5	< 5
Selenium	ug/l	10	**UK DWS**	< 5	< 5
Vanadium	ug/l	20	**FEQS**	< 5	< 5
Zinc	ug/l	12.3	**FEQS**	16	8
Anions					
Chloride	mg/l	250	**FEQS**	22.2	22
Inorganics					
Ammoniacal Nitrogen as N	mg/l	0.3	**FEQS**	0.2	< 0.1
Phenols					
Phenol	ug/l	7.7	**FEQS**	< 1	< 1
Polyaromatic hydrocarbons					
Naphthalene	ug/l	2	**FEQS**	0.02	0.02
Acenaphthylene	ug/l	-	**-**	0.01	0.01
Acenaphthene	ug/l	2	**USEPA**	< 0.01	0.01
Fluorene	ug/l	-	**-**	< 0.01	0.01
Phenanthrene	ug/l	-	**-**	0.04	0.07
Anthracene	ug/l	0.1	**FEQS**	0.01	0.02
Fluoranthene	ug/l	0.0063	**FEQS**	0.09	0.14
Pyrene	ug/l	-	**-**	0.12	0.15
Benzo (a) anthracene	ug/l	-	**-**	0.06	0.09
Chrysene	ug/l	-	**-**	0.06	0.08
Benzo (b) fluoranthene	ug/l	-	**-**	0.08	0.08
Benzo (k) fluoranthene	ug/l	-	**-**	0.05	0.08
Benzo (a) pyrene	ug/l	0.00017	**FEQS**	0.06	0.1
Indeno (1,2,3-cd) pyrene	ug/l	-	**-**	0.04	0.05
Dibenzo(a,h)anthracene	ug/l	-	**-**	< 0.01	0.01
Benzo(ghi)perylene	ug/l	-	**-**	0.05	0.06
BTEX					
Benzene	ug/l	1	**FEQS**	< 1.00	< 1.00
Toluene	ug/l	74	**FEQS**	< 1.00	< 1.00
Ethylbenzene	ug/l	20	**FEQS**	< 1.00	< 1.00
Xylenes	ug/l	30	**FEQS**	< 1.00	< 1.00
MTBE	ug/l	15	**WHO**	< 1.00	< 1.00

I/S = Insufficent sample

Sample Identity				BH1301							
Sample Date				07/10/2020							
Strata				Sandstone							
	Units	Screening Criteria	Standard								
Dissolved Metals											
Arsenic	ug/l	50	**FEQS**	< 5							
Cadmium	ug/l	0.08	**FEQS**	< 1							
Chromium	ug/l	4.7	**FEQS**	< 5							
Copper	ug/l	6	**FEQS**	< 5							
Mercury	ug/l	0.05	**FEQS**	< 0.1							
Magnesium	ug/l	-	**-**	15300							
Manganese	ug/l	30	**FEQS**	917							
Nickel	ug/l	50	**FEQS**	9							
Lead	ug/l	1.2	**FEQS**	< 1							
Antimony	ug/l	5	**UK DWS**	< 5							
Selenium	ug/l	10	**UK DWS**	44							
Vanadium	ug/l	20	**FEQS**	< 5							
Zinc	ug/l	12.3	**FEQS**	< 5							
Anions											
Chloride	mg/l	250	**FEQS**	22.4							
Inorganics											
Ammoniacal Nitrogen as N	mg/l	0.3	**FEQS**	0.2							
Phenols											
Phenol	ug/l	7.7	**FEQS**	< 1							
Polyaromatic hydrocarbons											
Naphthalene	ug/l	2	**FEQS**	0.28							
Acenaphthylene	ug/l	-	**-**	0.1							
Acenaphthene	ug/l	2	**USEPA**	0.14							
Fluorene	ug/l	-	**-**	0.14							
Phenanthrene	ug/l	-	**-**	1.67							
Anthracene	ug/l	0.1	**FEQS**	0.34							
Fluoranthene	ug/l	0.0063	**FEQS**	3.69							
Pyrene	ug/l	-	**-**	3.22							
Benzo (a) anthracene	ug/l	-	**-**	2.45							
Chrysene	ug/l	-	**-**	2.01							
Benzo (b) fluoranthene	ug/l	-	**-**	2.55							
Benzo (k) fluoranthene	ug/l	-	**-**	2.27							
Benzo (a) pyrene	ug/l	0.00017	**FEQS**	3.37							
Indeno (1,2,3-cd) pyrene	ug/l	-	**-**	1.88							
Dibenzo(a,h)anthracene	ug/l	-	**-**	0.78							
Benzo(ghi)perylene	ug/l	-	**-**	1.87							
BTEX											
Benzene	ug/l	1	**FEQS**	< 1.00							
Toluene	ug/l	74	**FEQS**	< 1.00							
Ethylbenzene	ug/l	20	**FEQS**	< 1.00							
Xylenes	ug/l	30	**FEQS**	< 1.00							
MTBE	ug/l	15	**WHO**	< 1.00							

I/S = Insufficent sample

Appendix F

Waste Classification

170248-ARU-REP-EGE-000002 P01

ARUP

HazWasteOnline™

Waste Classification Report

8GHSA-WFZ9S-H9LGK

Job name

Headbolt Lane - Ballast

Description/Comments

Project

Headbolt Lane

Site

Related Documents

#	Name	Description
None		

Waste Stream Template

TRU Ballast Screening

Classified by

Name:
Tom Hartley
Date:
19 Nov 2020 11:02 GMT
Telephone:
020 7636 1531

Company:
Ove Arup & Partners International Ltd
13 Fitzroy Street
London
W1T 4BQ

HazWasteOnline™ Training Record:

Course	Date
Hazardous Waste Classification	17 Jun 2019
Advanced Hazardous Waste Classification	18 Jun 2019

Report

Created by: Tom Hartley
Created date: 19 Nov 2020 11:02 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	ABS 1003	0.45	Non Hazardous		3
2	ABS 1004	0.45	Non Hazardous		4
3	ABS 1005	0.45	Non Hazardous		5
4	ABS 1006	0.45	Non Hazardous		6
5	ABS 1007	0.45	Non Hazardous		7
6	ABS 1008	0.45	Non Hazardous		8
7	ABS 1009	0.45	Non Hazardous		9
8	ABS 1010	0.5	Non Hazardous		10
9	ABS 1011	0.5	Non Hazardous		11
10	ABS 1001	0.4	Non Hazardous		12
11	ABS 1002	0.5	Non Hazardous		13
12	ABS 1012	0.5	Non Hazardous		14

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
13	ABS 1013	0.5	Non Hazardous		15
14	ABS 1015	0.45	Non Hazardous		16
15	ABS 1001[2]		Unknown. Chemistry data not provided.		17

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Classification of sample: ABS 1003

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1003	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.45 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1004

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1004	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.45 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1005

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1005	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.45 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10	mg/kg		<10	mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1006

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
ABS 1006
Sample Depth:
0.45 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1007

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1007	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.45 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1008

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
ABS 1008
Sample Depth:
0.45 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1009

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1009	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.45 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1010

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
ABS 1010
Sample Depth:
0.5 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1011

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1011	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.5 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1001

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1001	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.4 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1002

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1002	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.5 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10	mg/kg		<10	mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1012

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
ABS 1012
Sample Depth:
0.5 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10	mg/kg		<10	mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4									
										Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1013

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1013	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.5 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1015

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
ABS 1015	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.45 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
		603-181-00-X	216-653-1	1634-04-4							
								Total:	0.001 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
<LOD	Below limit of detection
ND	Not detected

Classification of sample: ABS 1001[2]

Unknown. Chemistry data not provided.
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample Name:
ABS 1001[2]

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0%		

Key

User supplied data

Appendix A: Classifier defined and non CLP determinands

None used in this classification.

Appendix B: Rationale for selection of metal species

None used in this classification

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2020.315.4525.8798 (10 Nov 2020)
HazWasteOnline Database: 2020.315.4525.8798 (10 Nov 2020)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
POPs Regulation 2019 - Regulation (EU) 2019/1021 of 20 June 2019

Appendix G

Extract from CDM Designers Risk Assessment

170248-ARU-REG-EMF-000002 P01

HAZARD ASSESSMENT										PHASE						EVALUATION (BEFORE MEASURES)				SAFETY MEASURES/REQUIREMENTS	EVALUATION (AFTER MEASURES)				EVIDENCE AND CLOSE OUT			
Hazard ID	**Route Section / Section**	**Location**	**Deliverable (Optional)**	**Source**	**Item Last Edited (Name / Date)**	**Discipline**	**Hazard Cause**	**Hazard -** The unsafe act or condition.	**Hazard Description -** Description of the Hazard Event (the RISK).	**Design**	**Construction**	**Operational**	**Demolition**	**Primary Consequence** - The top level consequence to the railway system (OPERATIONAL RISK ONLY).	**Secondary Consequences or supplementary details**	**Persons at Risk**	**CSM Risk Acceptance Principle** (OPERATIONAL RISK ONLY)	**F**	**C**	**Result**	**Hazard Owner**	**Risk Mitigation and Safety Measure Justification -** Detail the hazard elimination or risk reduction actions. Reference any standards, procedures used to control risks. (Optional) Use ERIC sheets to document options considered or demonstrate that a tolerable risk is ALARP.	**Evidence Required** - evidence that will demonstrate that the risk mitigation has been carried out.	**F**	**C**	**Result**	**Reference to supporting documentation -** References to ACTUAL evidence provided that the safety measures have been implemented.	**Notes -** Provide any additional information that may help with understanding the risk assessment.	**Status**	**Close Out** - (Independent Review)
HBL-G4-DRA-069	SCHEME WIDE	Kirkby Station to Headbolt Lane Station	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Unexpected ground conditions	Contamination within rail corridor	Potential unexpected contamination within the rail corridor may present a risk of harm to sensitive receptors (site staff, environmetnal receptors). Ground investigation undertaken to date has not identifed any significant contamination.	X	X			Harm to site staff/ mobilisation of pollutant into local environmental receptors	*Additional costs for treatment and disposal of excavated material*	Workers, environment		3	3	*6*	Designer / Contractor	Findings of ground investigation to be incorporated into detailed design and construction planning. Construction workers to wear appropriate PPE. Vigilence by site staff during construction. Excavated material to be screened by appropriately trained/competent contractor if the material is being removed and replaced. Material should be disposed to a suitable off-site facility. Suitability of existing track bed materials for reuse in the track bed to be reviewed as part of detailed design.	GIR - for GRIP 4 contamination assessment. F003 documentation - for evaluation of GI to be undertaken during GRIP 5. Contractors method statement - for management of residual risk during construction	2	2	***4***				
HBL-G4-DRA-070	SCHEME WIDE	Headbolt Lane Station and car park	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Made Ground	Localised areas of made ground associated with historical buildings, former quarry, railway line and road embankment may be source of contamination or unsuitable ground conditions for development.	Ground investgtion to date has identifed the presence of made ground within the site. No significant contamination has been identified. The material is considered suitable for reuse within earthworks at the site. Made ground should not be considered suitable as founding strata to to its variable geotechnical properties and high potential for differential settlement.	X	X			Harm to site staff/workers. Mobilisation of pollutant into local environmental receptors. Differential settlement where used as founding strata		Passengers, workers, environment		3	3	*6*	Designer / Contractor	Findings of ground investigation to be incorporated into detailed design and construction planning. Construction workers to wear appropriate PPE. Excavated material to be screened by appropriately trained/competent contractor if the material is being removed and replaced. Materials Management Plan in accordance with CL:AIRE DoWCoP should be prpared to enable site won material to be reused within the development. All soils resued will need to be subject to validation testing. Any excess materials should be disposed off-site to a suitable waste facility.	GIR - for GRIP 4 contamination assessment. F003 documentation - for evaluation of GI to be undertaken during GRIP 5. Contractors method statement - for management of residual risk during construction	2	2	***4***				
HBL-G4-DRA-071	SCHEME WIDE	Kirkby Station to Headbolt Lane Station and car park	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Below ground obstructions	Obstructions encountered during construction as a result of historic sidings, buildings and bridge foundations	Obstruction encountered during construction. Potential obstructions identified during ground investigation include pitching stones beneath the trackbed at Kirkby Station and relic temporary works at UB55	X	X			Delays in construction process. Damage to existing infrastructure		Workers		1	3	*4*	Designer / Contractor	Findings of ground investigation to be incorporated into design and construction planning. Risk mitigation strategy for obstructions to be developed based on proposed construction methodology and technology to be deployed.	GIR - for review of GI & record information F001 design deliverables	1	3	***4***				
HBL-G4-DRA-072	SCHEME WIDE	Headbolt Lane Station and car park	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Peat and other soft/loose desposits	Construction on peat and other soft/loose deposits	Excessive differential settlement leading to damage and instability issues for the track and proposed structures where extensive areas of peat or loose/soft deposits are present. Ground investigation undertaken to date has not identified any extenisve soft ground.	X	X			Damage and instability issues for track and proposed structures				1	3	*4*	Designer / Contractor	Findings of ground investigation to be incorporated into detailed design and construction planning. Appropriate construction methodologies to be adopted if required which may include dig and replace, ground improvement and/or consideration of foundation design		1	3	***4***				
HBL-G4-DRA-073	SCHEME WIDE	Headbolt Lane Station and car park	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Peat and other soft/loose desposits	Instability in excavations	Instability in excavations due to the presence of loose peat and sand in the Shirdley Hill Formation. Ground investigation undertaken to date has not identified any signficant peat of loose sand deposits.	X	X			Potential collapse of excavations		Workers		1	3	*4*	Designer / Contractor	Findings of ground investigation to be incorporated into detailed design and construction planning. Construction control - logging of excavation and pile arisings during works	GIR - for evaluation of GI undertaken during GRIP 4.	1	3	***4***				
HBL-G4-DRA-074	SCHEME WIDE	Kirkby Station to Headbolt Lane Station and car park	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Underground services and culverts	Damage to existing services and culverts which cross the site	Damage to services/culverts during construction. Possible damage to construction equipment though encountering a void. Loss of concrete into drain. Delay in construction programme	X	X			Damage to services/culvert.		Workers		3	4	*7*	Designer / Contractor	All available services information/drawings for the site to be incorporated into buried services file, this includes NR buried culvert records. File to be passed to the construction contracor in pre-construction information. Service/culvert diversions to be designed where required Construction contractor to satisfy themselves as to the adequacy of available information and make additional enquiries as necessary. Appropriate methods to be utilised whilst constructing any diversions and the main proposed works.	Buried services records & model file Design deliverables (F001s at GRIP 4) Contractors Method Statement & Permit to Dig records	1	4	***5***				
HBL-G4-DRA-075	SCHEME WIDE	Kirkby Station to Headbolt Lane Station and car park	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Contamination	Construction process results in contaminants being pushed into groundwater table	During construction contaminants and/or grout/cement could be puched down into the groundwater within the Shirdley Hill Formation. No significant contamiantion was encoutnered beneath the site during the ground investigation which is considered to pose a risk to groundwater. Proposed foundations are not anticipated to extend below goundwater table	X	X			Pollution of Principal Aquifer				1	4	*5*	Designer / Contractor	Findings of ground investigation to be incorporated into design and construction planning. Appropriate construction methodologies to be adopted. Construction contractor to adopt appropriate temporary works design. Consultation with the EA may be required as part of plannign process regarding the proposed construction method and mitigation strategies to be put in place.	GIR - for assessment of risk based on GRIP 4 GI Contractors Method Statement for residual risk during construction	1	4	***5***				
HBL-G4-DRA-076	SCHEME WIDE	Kirkby Station to Headbolt Lane Station	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Excavation	Slope instability	Slope instability associated with track bed excavation and cutting into slopes as part of construction	X	X			Damage to equipment and existing or partially constructed elements of the proposed work. Injury to workers		Workers		3	4	*7*	Designer / Contractor	Findings of ground investigation to be incorporated into design and construction planning. Slope stability analysis to be undertaken to assess the temporary and permanent conditions. Suitable retaining structures to be adopted if required.	F001 design deliverables	2	3	***5***				
HBL-G4-DRA-077	SCHEME WIDE	Kirkby Station to Headbolt Lane Station and car park	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Unexploded Ordnance (UXO)	Encountering UXO during construction	Encountering UXO during construction.		X			Damage to equipment and existing or partially constructed elements of the proposed work. Risk of injury or death to workers		Workers		2	4	*6*	Contractor	UXO desk study assessment for the site has been undertaken. Site considered low risk potential from UXO. Requirement for additional additional mitigation measures to be reviewed by Contractor.	GIR - for summary of UXO desk study assessment Contractors method statement - for management of residual risk	1	4	***5***				
HBL-G4-DRA-084	SCHEME WIDE	Highway Brook crossing and car park	*GIR*	GRIP4 Design	SM - 2021/01/07	Geotechnics	Infilled Quarry	Contamination source or foundation failue	Extent of former quarry is not defined. G4 GI indicates extent of quarry greater than shown on historical mapping but extent not proven. Risk that localised area of deep made ground may impact on highway design and/or foundation solution for northern abutment of highway brook crossing. (Note G4 GI undertaken has not identified any significant contamination within infilled quarry - as such contamination risk antiscipated to be low.	X	X	x		Unaccectable settlement	*increased constuction or maintenance cost*	Passengers, workers, environment		4	3	*6*	Designer / Contractor	Findings of G4 GI to be incorporated into F001 design and preliminary construction planning. Undertake additional GI to confirm depth of made ground below northern abutment of highway crossing. Use this to inform detailed design and construction planning.	GIR - for GRIP 4 contamination assessment. F003 documentation - for evaluation of GI to be undertaken during GRIP 5. Contractors method statement - for management of residual risk during construction	2	2	***4***				