SUPPLEMENTARY GROUND INVESTIGATION REPORT SYMMETRY PARK, MERSEYSIDE - UNITS 03 & 04

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EXECUTIVE SUMMARY

Introduction	Tier Environmental was commissioned by Tritax Symmetry Ltd to undertake a Supplementary Ground Investigation of Symmetry Park, Merseyside – Units 03 and Units 04. The purpose of the investigation was to determine the nature and extent of soil, bedrock and groundwater beneath the site for the purposes of environmental and geotechnical assessment.
Site location	The site is located at the Former Cronton Colliery Site, Fox's Bank Lane, Cronton, L35 3SU.
Site history	The earliest available OS maps indicate that the site was occupied with agricultural land with pockets of woodland and hedgerows. OS maps from 1925 show that the southern and central areas of the Site were occupied by buildings, railway lines and spoil heals associated with Cronton Colliery. It is understood that Cronton Colliery was operational between 1913 and 1984. The 2002 OS map indicates the presence of spoil heaps across the southern and eastern areas of the Site indicating regrading works were undertaken in the southern area of the Site. It is understood that in 1995, the site was partially restored by removing the colliery infrastructure and major earthworks, and then mixing colliery spoil with paper mill crumb and sewage cake to create soils to support woodland planting.
Mining and quarrying	The risk from Coal Mining at the site has been assessed in a Coal Mining Risk Assessment (CMRA) Report (Report Ref: TE1163-TE-00-XX-RP-GE-003-V01). This report just be read in conjunction with the CMRA.
Fieldwork	The investigation, which was supervised by a Tier Environmental Geoenvironmental Engineer, took place in two phases. The first phase was undertaken between 21st April and 14th November 2023 and comprised: • The excavation of 16 No. machine excavated trial pits; and, • Advancement of 7 No. open hole rotary boreholes. The second phase of investigation was undertaken on 25th September 2025 and comprised: • The advancement of 4 No. window sample boreholes. Historic site investigation data undertaken by tier has also been reviewed an included within the report.
Laboratory testing	Samples of soil and soil leachate were submitted for analysis of a range of metal, other inorganic and organic components including asbestos. Geotechnical testing was scheduled on selected samples. All testing was undertaken at accredited laboratories.
Ground conditions	Made Ground was generally composed of reworked topsoil material consisting of sandy silty loam. Some areas within the north contained no Made Ground. Localised areas of reworked material and demolition rubble were observed within the eastern section of the site. Materials representative of Till Deposits were encountered across the Site. This stratum was encountered as dark brown and light brown slightly sandy gravelly clay or as a gravelly sand. The base of the Till deposits was proven at 13.40m bgl at its deepest extent across the site or at elevations between 32.20m AOD and 33.95m AOD. Bedrock across the majority of the site was observed to be strata from the Pennine Middle Coal Measures Formation with the Kinnerton Sandstone Formation encountered within the east of the site. A north-south trending normal fault is shown to separate the two units on BGS geological maps. The weathered Pennine Middle Coal Measures was encountered as a sandy gravelly clay, whilst the weathered Kinnerton Sandstone Formation was encountered as a slightly gravelly silty sand. Both increased in strength or density with depth. The competent rockhead was encountered between 33.95m AOD and 20.82m AOD, the base of these stratums was not encountered.
Ground stability	It is considered that there should be no particular difficulties in excavating the strata indicated in the boreholes utilising an appropriate and suitably sized mechanical excavator. Excavations into existing Made Ground and the natural strata should be assumed to be unstable given the nature of the ground conditions encountered beneath the site. Slope Stability assessment included within Appendix R.
National Highways	Tier Environmental have updated this report in accordance with guidance document CD622. A slope stability assessment is included within Appendix R and a Geotechnical risk register is included within Section 9.
Foundations and floor slabs	Both proposed units will require a cut and fill exercise to create a suitable development platform. There will be up to 5.5m fill in the west of unit 04 and 2.70m of fill in the west of unit 03. These materials could be installed under a stringent earthworks specification or placed and then improved with a ground improvement solution. Foundations should be pads into the bedrock, Till and re-engineered fill, assuming a safe bearing capacity of 100kPa-150kPa at this stage. Floor slabs would be ground bearing on firm and stiff clay, bedrock or re-engineered materials. A transition zone will be required at the cut/fill boundary.
Sulphate class	Based on the reported results a Design Sulphate Class of DS-4 and an ACEC Class of AC-4 should be applied for below ground concrete.
Contamination – Human Health	Localised low level asbestos impacts have been reported that are considered to present a potentially unacceptable risk to human health receptors for a commercial/industrial. The dust inhalation pathways associated with asbestos impacted soils may be realised in areas where Made Ground soils remain at the surface (i.e. soft landscaped areas). It is considered that these pathways will be broken in areas of proposed hardstanding and building footprints such that no remediation will be required in those areas. Additional analysis and detailed qualitative risk assessments have

	undertaken to determine the suitability of the asbestos impacted soils being retained at surface/shallow depth. An asbestos risk assessment report has been conducted alongside this report. In summary, for the proposed end uses it has determined that the asbestos concentrations encountered present a minimal/tolerable risk to future site users.
Contamination – Controlled Waters	From a conceptual site model perspective, the superficial stratum beneath the majority of the site (Till) is designated as a Secondary (undifferentiated) Aquifer and bedrock of the Pennine Middle Coal Measures Formation beneath the majority of the Site is designated as a Secondary (A) Aquifer and the Kinnerton Formation beneath the eastern area of the Site is designated as a Principal Aquifer (not considered present beneath Units 3 and 4). The eastern area of the wider Site lies within a Source Protection Zone (Total Catchment – Zone 3). Groundwater flow is likely to be in a southerly direction. There are no licensed groundwater abstractions within 1km of the Site. Watercourses, including Fox's Bank Brook are present within the site that are within the catchment for Ditton Brook. On this basis, the controlled waters sensitivity is considered by Tier Environmental to be moderate The conclusion of an assessment carried out on leachate and groundwater results has determined that the site does not present a significant risk to the controlled water environment.
Gas protection	Tier Environmental consider that a Characteristic Situation 2 – Low Risk scenario should be implemented to adequately protect future site users from the presence of hazardous ground gases.
Radon Requirements	Basic radon protection measures are not currently required for the proposed development on this site.
Further works	To aid the development of the Site it is considered that the following works will be required: • A series of drilling and grouting proof stabilisation works within the areas of shallow mineworking's; • Settlement Analysis; • Further Slope Stability Analysis;
Waste Soils Classification	Basic waste characterisation has determined that Made Ground soils are non-hazardous with the following exceptions: • TP210 at 1.90m bgl. It is anticipated that natural soils will be suitable for disposal to an inert landfill.
Materials re-use	Subject to volumetric cut and fill requirements the majority of Made Ground materials and all of natural soil materials and may be considered chemically suitable for potential re-use subject to careful management and placement of materials and in line with an appropriate end-of-waste protocol such as WRAP Quality Protocol for Aggregates from Inert Waste, U1 Exemption or a Materials Management Plan in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP). Suitability for re-use would also be subject to confirmation of the geotechnical suitability depending on whether the materials are to be re-used in load bearing areas. This would need to be detailed in a supporting document. Please note that any previously landfilled or mining waste materials may not be appropriately subject to consideration under DoWCoP and may not be re-used under DoWCoP unless sufficient lines of evidence and agreement with the local Environment Agency Waste Team can be sought beforehand. In addition, Section 14.3 of this report includes statements with respect to re-use of excavated and stockpiled clean naturally occurring soils within the site and re-use on other sites. These statements are designed to provide a clear intention to reuse any clean, naturally occurring soils derived from future excavations at this site (which may also include temporary future stockpiling these materials).
Outline Remediation Strategy	Based upon the findings of this ground investigation, the following measures are recommended in order to make the Site safe and suitable for redevelopment: • General site clearance including hardstanding, vegetation and Topsoil; • Segregation of Topsoil from the different source areas, i.e. agricultural land and paddock, the imported Topsoil within the motocross track and the manufactured Topsoil; • Chipping of trees and incorporation into site won Topsoil; • Removal of any below ground relict structures associated with former foundations/basements, notably in the eastern area of the site; • Bulk earthworks to achieve the proposed development levels, with fill materials compacted in accordance with a recognised specification, such as Specification for Highways Works Series 600; • Removal and verification of any previously unidentified areas of contamination, where required; • Drilling and grouting within areas of supposed mineworking's • Backfill of resultant excavations with suitable material; • Installation of hazardous ground gas protection measures in accordance with BS8485; • Laboratory chemical testing and risk assessment of all imported materials; and, • Installation of a minimum of 150mm Topsoil to provide a suitable growing medium in any soft landscaping areas.

1. INTRODUCTION

Tier Environmental was commissioned by Tritax Symmetry Ltd to undertake a Land Contamination Risk Management (LCRM) Supplementary Ground Investigation for Units 3 & 4 of Symmetry Park Merseyside, located off Fox's Bank Lane, Cronton, L3 5SU (the "Site"). The Site is generally bounded to the north by the M62 motorway, to the south by Cronton Road and to the east by Fox's Bank Lane.

The title of this report is in accordance with that described in the Land Contamination Risk Management guidance (available at https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm) which has superseded CLR 11:

Stage 1:

- LCRM Tier 1 Preliminary Risk Assessment Report
- LCRM Tier 2 Generic Quantitative Risk Assessment Report

This report was written as an addendum to the Ground Investigation Report conducted for the wider site area and comprises a plot specific report for Units 03 & 04. This report should be read in conjunction with the full site GIR (Report Ref TE1163GIR1.4).

1.1. Proposed Development

This report has been written to aid planning application No. 20/00494/HYB - application for the approval of reserved matters (scale, access, appearance, layout and partial landscaping) comprising of the development of 272,091 (gia) of storage space and distribution floorspace (use class b8) and ancillary offices (use class e(g)), provision of infrastructure submitted pursuant to planning permission 20/00494/hyb. It has been assumed in the production of this report that the redevelopment is to comprise 2 No. industrial warehouses each with associated car parking areas, surface water attenuation ponds and areas of soft landscaping. The units currently proposed are:

- Unit 03 – 266,970 sq ft (24,802m^2)
- Unit 04- 193,195 sq ft (17,948m^2)

1.2. Previous Reports

In producing this report, a number of site investigation reports pertaining to the site itself been made available to Tier Environmental:

- Site Investigation Interpretive Report by Parkman (Ref 19399/OR/02 B dated August 1999);
- Factual Report on Ground Investigation by Soil Mechanics (Ref: F3605 dated October 2003);
- Environmental interpretive Report by Mouchel Parkman(Ref: 1002574/R/02B dated March 2004)
- Desk Study Assessment and Gap Analysis Report by Mouchel (Ref: 797035/R.01A dated July 2008);
- Coal Mining Risk Assessment by Baker Barnett Ltd (Ref: -15/NSB/SB dated 12th June 2015);
- Preliminary Risk Assessment for the Former Cronton Colliery Site by Tier Environmental Ltd (Ref: TE1163PRA1 dated 4th April 2019); and,
- Preliminary Ground Investigation Report for the Former Cronton Colliery by Tier Environmental Ltd (Ref: TE1163PGIR1.2 dated 13th August 2020).

- A Ground Investigation Report for Symmetry Park Merseyside, Huyton by Tier Environmental Ltd (Ref: TE1163GIR1.5 dated 29th March 2023).

1.3. Objectives

Taking into account the proposed development of the site, the objectives of this appraisal were:

- To determine the historical and current land use.
- To establish the environmental setting of the site.
- To evaluate whether past mining or other extractive industries could have an influence on the site.
- To review previous pertinent third party reports;
- To determine current ground and groundwater conditions.
- To determine the potential risks to human health and the wider environment.
- To provide a preliminary waste soils classification.
- To determine potential risks posed to the site from hazardous ground gases and / or vapours.
- Provide preliminary outline remedial measures to manage any identified risks.
- To provide preliminary geotechnical parameters to inform floor slab and foundation recommendations.

1.4. Assumptions

The following assumptions are made in this report:

- It is assumed that ground levels will not change significantly from those described in this report or a shown on proposed development drawings. If this is not the case, then amendments to the recommendations made in this report may be required.
- The ground investigation has been designed with due consideration of known or suspected constraints (including underground services and access constraints).
- Any references to observations of suspected asbestos-containing materials are for information only and should be verified by a suitably qualified asbestos specialist and/or confirmed by laboratory analysis.
- The use of the term 'Topsoil' within this report is based on a visual identification only and that these materials have not been classified in accordance with BS3882:2015.
- The use of the terms ‘shallow’ and ‘deep’ within this report (from a geotechnical perspective) assume *typically* between ground level to circa 3.00m below ground level (bgl) for ‘shallow’ and greater than 3.00m bgl regarded as ‘deep’;
- The comments and opinions presented in this report are based on the findings of the desk study, review of third party information, ground conditions encountered during intrusive investigation works performed by Tier Environmental and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the site which have not been revealed by this investigation and which have not been taken into account by this report.
- Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of intermediate ground conditions should be undertaken if deemed necessary.

This report has been prepared for the sole use of Tritax Symmetry Ltd. No other third party may rely upon or reproduce the contents of this report without the written approval of Tier Environmental. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk and the authors do not owe them any Duty of Care or Skill.

2. SITE DETAILS AND DESCRIPTION

Table 2.1 Current Site Overview.

Site name	Former Cronton Colliery
Site address	South of Halsnead Farm Livery Stables, Fox's Bank Lane, Cronton, L353SU. A site location plan is included as Drawing No. TE1163GIR1 within Appendix A.
National Grid Reference (NGR)	SJ 47493 89537
Approximate site area	The site is located south of the M62 in a predominantly agricultural area. The closest town is Whiston which is 2.3 km North of the Site.
Site shape	20.84ha
Current land use on the site	The site is currently unoccupied with no above ground structures. The site is currently occupied by grazing and agricultural land. There a 3 No. mine gas vent pipes located just southeast of the site (outside of the development area) overlying the 3 No. old mine shafts used by the former colliery. High voltage overhead electricity pylons transect the site east to west. Additional unrecorded services should be anticipated.
Surrounding land uses	The site is set within a mixed commercial, agricultural and residential area. The southern and western areas next to the site are currently occupied by immature woodland. The area just east of the site comprises Unit 01 of the Symmetry Park development. The area south of the site also contains the access road is and an area covered with concrete hardstanding with bridge/embankment structure associated with the former colliery.
General topography and ground levels	The site is slopes gradually to the west with ground levels in the northeast of the site from 38m AOD falling to 24m AOD in the west.

3. PREVIOUS INVESTIGATION FINDINGS

In producing this report, a number of site investigation reports pertaining to the site itself been made available to Tier Environmental:

- Site Investigation Interpretive Report by Parkman (Ref 19399/OR/02 B dated August 1999);
- Factual Report on Ground Investigation by Soil Mechanics (Ref: F3605 dated October 2003);
- Environmental interpretive Report by Mouchel Parkman(Ref: 1002574/R/02B dated March 2004)
- Desk Study Assessment and Gap Analysis Report by Mouchel (Ref: 797035/R.01A dated July 2008);
- Coal Mining Risk Assessment by Baker Barnett Ltd (Ref: -15/NSB/SB dated 12th June 2015);
- Preliminary Risk Assessment for the Former Cronton Colliery Site by Tier Environmental Ltd (Ref: TE1163PRA1 dated 4th April 2019); and,
- Preliminary Ground Investigation Report for the Former Cronton Colliery by Tier Environmental Ltd (Ref: TE1163PGIR1.2 dated 13th August 2020).
- A Ground Investigation Report for Symmetry Park Merseyside, Huyton by Tier Environmental Ltd (Ref: TE1163GIR1.5 dated 29th March 2023).

Whilst it is not the intention of this report to repeat the information contained within the above reports in full, the salient points are summarised below.

3.1. Site Investigation Interpretive Report by Parkman (Ref 19399/OR/02 B dated August 1999)

Introduction	Parkman Environment was appointed by English Partnerships to carry out an Environmental Risk Assessment Study covering the former colliery site at Cronton. This appointment transferred to the North West Development Agency in 1999 with the creation of the body. The objectives of the report were to establish any short term liabilities associated with the site and to determine whether any actions from EP/NWDA were required to make the area safe.
Fieldworks	This investigation was undertaken between April and May 1999 and comprised 24 No. trial pits excavated to between 0.9m and 4.0m bgl, 23 cable percussion boreholes sunk to depths of between 0.9m and 13.45m bgl with 19 No. boreholes installed with standpipes. A further 17 No. boreholes were sunk using rotary methods to locate the 3 ft Coal Seam and whether or not it had been worked. A further 10 No. boreholes were sunk in the vicinity of the shafts in order to monitor soil gas.
Ground conditions	Ground conditions encountered colliery spoil overlying glacial Till underlain by either sandstone or mudstone. Groundwater was encountered between 19.30m AOD and 42m AOD.
Contamination	A total of 97 No. soil samples were submitted for chemical analysis comprising a standard metals and non-metals suite, including ammoniacal nitrogen, mineral oil and screening for Polyaromatic Hydrocarbons (PAH). In addition, selected samples were tested for faecal coliform, as sewage sludge had been imported to site to facilitate growth of vegetation within landscaped areas. Leachate and water samples were tested for the same basic suite. A total of 27 No. results recorded exceedances against the corresponding ICRCL GACs used in the assessment. The exceedances were recorded for arsenic, boron and copper, generally the results did not appear to be leachable. Groundwater analysis indicated that iron was elevated in some samples especially from within the mine workings.
Controlled Waters	At the time of the investigation two foul water treatment tanks were identified; the northern tank was classified as acceptable, but the southern tank was stated as needing replacement. Surface water analysis indicated that waters were not impacted by the underlying ferruginous water. It was therefore considered that the existing liabilities associated with the mine waters was low. Further monitoring was recommended.
Recomendations	• It was recommended to avoid the potential risk to human health from the contaminants identified within the soils, that the public should be excluded from the Site or a 200mm inert soil cover layer could be implemented to isolate the impacted material. • Elevated concentrations of methane and carbon dioxide were detected. It was recommended that gas protection measures should be incorporated into any future developments. • Shallow mine workings associated with the 3 ft Coal Seam were located in the north-west of the Site. It was identified that there was the potential for void migration up to rockhead. Subsidence and settlement

	at the surface was reported for an area 160m by 90m directly west of the shafts. It was recommended that future development was avoided within this high risk area. • It was considered that a 100m length of the western bank of Fox's Bank Brook should be regraded in order to prevent the potential for slope failure which could have led to blocking of the stream and hence flooding upstream.

3.2. Factual Report on Ground Investigation by Soil Mechanics (Ref F3605 dated October 2003) & Environmental Interpretative Report, by Mouchel Parkman (Ref 1002574/R/02B dated March 2004)

Introduction	During July 2003 Soil Mechanics were commissioned by Parkman on behalf of Maro Developments to carry out a ground investigation at Cronton Colliery. The objectives were to obtain geotechnical and Geoenvironmental information to aid the proposed development of a business park.
Fieldworks	This phase of works (later identified as Phase II (2003)) comprised 49 No. machine excavated trial pits, 30 No. cable percussion boreholes, and 16 No. rotary holes.
Ground conditions	In the area of the former colliery, colliery spoil was encountered between 38.82m AOD and 16.99m AOD with the greatest thickness of spoil recorded as 12m. Glacial Till was found to extend across the majority of the site, but in some places it was not encountered. Where absent, colliery spoil was directly underlain by rock or sand layers. The thickness of the Till below the spoil was generally less than 3m apart from the south-east of the site where it was 6m thick. Rock-head comprised either Permo-Triassic Sandstone or Coal Measures. The Coal Measures were generally encountered to the west of the mine shafts and comprised mudstone with some interbedded coal and sandstone. In the agricultural area of the Site ground conditions comprised T opsoil over Glacial Till, underlain by Coal Measures or Sherwood Sandstone. Up to 3.5m depth of Made Ground was recorded in the western section of the site. Glacial Till extended across the site and was approximately 2-3m thick, thin 1m bands of sand and gravel were encountered within the Till. The underlying rock comprised sandstone or mudstone. Three different groundwater regimes were identified on the site these included: • Perched water in the Made Ground and at the Made Ground/ Glacial Till interface; • Within sand bands and lenses in the Glacial Till; and, • Groundwater within the bedrock, possibly in continuity with the water within the sand lenses within the Glacial Till.
Coal Mining	No evidence of coal seams or old workings were identified in the east of the Site. Coal seams and workings were encountered within the central sections of the site, and thin seams recorded in the west. An area of approximately 300m x 300m was considered potentially at risk from old workings.
Contamination	Soil samples were analysed for a standard metals and non metals suite. Testing included speciated PAHs, TPHs (to give either total TPH or divided by carbon banding), asbestos, sulphates and total sulphur (to allow assessment to BRE SD1) and Loss on Ignition (LOI). Some soil samples were also subjected to leachability testing with both these and water samples tested for the same basic suite as for soils (apart from asbestos and LOI). For a human health risk assessment, all results from the previous phase of work were compared against applicable 'generic guidelines' (including CLEA SGV's), assuming that the site would be developed for the business/warehousing development with extensive hard cover combined with landscaping. A total of 128 No. samples from various depths across the site were screened and the 95% UCL for all determinants were below the relevant screening value. Concentrations of faecal coliforms were not considered to present a significant risk to human health. The zinc 95% UCL exceeded the phytotoxic relevant screening value in the Made Ground strata.
Controlled Waters	For the groundwater screening, exceedances of some heavy metals, sulphide, TPH (Total Petroleum Hydrocarbons) GRO (Gasoline Range Organics) BaP (Benzo[a]pyrene) and PAHs (Polyaromatic Hydrocarbons) were observed. For the leachate screening assessment, the laboratory analytical limits of detection for a number of determinants were greater than the screening values. Exceedences of cyanide, sulphate, TPH and PAH were recorded across the former colliery area.
Ground Gas	Carbon dioxide concentrations >5% were recorded in a number of boreholes and an maximum methane concentration of 32.5% was recorded. No significant gas emission rates were reported. Ground gas results were compared against recommendations in CIRIA 149, this indicated conditions on site would be classified as Characteristic Situations (CS) in the range of CS2 – CS4 which would require a degree of protection measures.

Recomendations	• In the former colliery area a final Design Sulphate class of DS-4 and ACEC class of AC-5 was allocated. Further testing involving the presence / absence of pyrites by XRD was advised to establish the potential to reduce the Design Sulphate and ACEC classes accordingly. An assessment of the agricultural land revealed that a Design Sulphate class of DS-1 and ACEC class of AC-1 would be suitable, although it was considered to be appropriate to consider a higher classification at localised sulphate hotspots • For preliminary design purposes a slope of 1:2 (V:H) was proposed in colliery fill and Bedrock and 1:2.5 (V:H) in Glacial Till although detailed analysis would have to be performed on each location. • The risk of swelling from pyrite degradation or swelling spoil was considered low.

3.3. Desk Study Assessment and Gap Analysis Report by Mouchel (Ref 797035/R.01A dated July 2008)

Introduction	A desk study was produced by Mouchel who were instructed by The Land Restoration Trust. The study was an assessment/gap analysis to include; review of previous data, risk assessments for the proposed public open space end use at the former Cronton Colliery site to ascertain works required to fulfil the relevant planning conditions.
Contamination	There were no site wide risks to human health considered to exist within the soils. Hotspots of benzo(a)pyrene, chrysene, lead, arsenic, nickel, pH, dibenzo(ah)anthracene and naphthalene were identified as potentially posing risk to human health if they are in areas that are to be accessed regularly by site users.
Controlled Waters	The historic soil leachate data pointed to a significant risk to controlled waters. It was identified that the historic groundwater data contained determinants in concentrations which exceeded UK DWS and EQS. The report identified that the EA stated that the water quality in Fox's Bank Brook was poor. For inorganics, the site was not impacting upon water quality in the Brook (apart from sulphate) the organic assessment was inconclusive as the limits of detection were greater than the screening values.
Recomendations	The report concluded to address human health issues, further soil sampling should be undertaken with testing focused on the top 300mm from the plateau area to assess the impact of the silts placed there from the former lagoons. Further soil sampling was also identified for the proposed picnic area once the final design is agreed. It was highlighted that some mitigation may be required if exposure was to become prolonged due to changes in layout or use. Limited speciated petroleum and polyaromatic hydrocarbons analysis had been undertaken to date therefore further shallow soil sampling from the top 1m across the site was also proposed. It was also proposed to undertake further sampling from the brook with risk assessment to assess the impact of the site on the brook. Other issues highlighted included further slope stability assessments and possible remedial works.

3.4. Coal Mining Risk Assessment by Baker Barnett Ltd (Ref -15/NSB/SB dated 12th June 2015)

Introduction	A Coal Mining Risk Assessment Report (CMRA) was produced by Baker Barnett Ltd (Ref. 15/NSB/SB/2572 dated 12th June 2015) on behalf of the Land Trust for the area of the former Cronton Colliery, i.e. the southern area of the proposed development area.
Coal Mining Summary	Due to the depth and date of the recorded workings that have taken place under the site [Cronton Colliery], it was considered that there is no significant risk of coal mining subsidence, from known coal mine workings, affecting the proposed development [as a country park]; There is a possibility of shallow un-charted coal mine workings being present, from close to the surface of the 3FT seam outcrop, extending some 140m to the southwest of the outcrop; There are no mine shafts or adits recorded on the site other than the 3 no. shafts of the former Cronton Colliery; There may be unrecorded mine shafts (bell pits) or adits near the outcrop of the 3FT Seam; Provided the vents remain in place over the 3 No. Coal Authority mine shafts, there should be little or no risk to the proposed development due to methane or carbon dioxide.
Recomendations	It was recommended that the ground should be checked visually for anomalies and signs of bell pits, old mine shafts or adits during the topsoil strip and excavations;

	Probe drilling was recommended if it is proposed to construct any buildings or structures in the area where shallow workings may be present. The probe drilling should be to a depth of 30m to prove the coal seam and also check for any voids;

3.5. Preliminary Risk Assessment for the Former Cronton Colliery Site by Tier Environmental Ltd (Ref: TE1163PRA1 dated 4th April 2019)

Introduction	Tier Environmental was commissioned by db symmetry to undertake a geo-environmental appraisal of the former Cronton Colliery. The purpose of the investigation was to undertake a desk study and Phase I Preliminary Risk Assessment to support the planning application for the proposed commercial/industrial development.
Site location	The site is located at Former Cronton Colliery Site, Fox's Bank Lane, Cronton, L35 3SU.
Site history	The earliest available OS maps indicate that the site was occupied with agricultural land with pockets of woodland and hedgerows. OS maps from 1925 show that the southern and central areas of the Site were occupied by buildings, railway lines and spoil heals associated with Cronton Colliery. It is understood that Cronton Colliery was operational between 1913 and 1984. The 2002 OS map indicates the presence of spoil heaps across the southern and eastern areas of the Site indicating regrading works were undertaken in the southern area of the Site. It is understood that in 1995, the site was partially restored by removing the colliery infrastructure and major earthworks, and then mixing colliery spoil with paper mill crumb and sewage cake to create soils to support woodland planting.
Probable Ground conditions	The southern area of the Site is understood to underlain in part by Made Ground comprising manufactured topsoil (blend of colliery spoil, paper mill crumb and sewage cake). Superficial Deposits beneath the majority of the site are anticipated to comprise Till, with Alluvium locally within the eastern area of the site and in the vicinity of the proposed southern access road. The superficial deposits are underlain by the Pennine Middle Coal Measures Formation in the western half of the Site comprising mudstone, siltstone and sandstones and the Kinnerton Sandstone Formation in the eastern half of the Site comprising sandstones. The nature and thickness of the Made Ground and superficial deposits is likely to be significant in determining the final foundation design. The superficial stratum beneath the majority of the site (Till) is designated as a Secondary (undifferentiated) Aquifer, with the Alluvium along the eastern and south-eastern areas of the site designated as Secondary (A) Aquifer. The bedrock of the Pennine Middle Coal Measures Formation beneath the majority of the Site is designated as a Secondary (A) Aquifer and the Kinnerton Formation beneath the eastern area of the Site is designated as a Principal Aquifer.
Possible Foundations and floor slabs	Based on the published geological information and the proposed regrading works, there is the potential for poor ground to be present beneath the Site, notably Made Ground. These deposits are unlikely to provide a suitable foundation platform and, as such, the geotechnical investigation should determine the depth of these units. There is the potential that piled, raft or ground improvement foundation solutions may be required at the site, depending on the finalised design and anticipated loads of the properties. An earthworks exercise is also currently planned so it is likely material will need to be reengineered sufficiently, such as in accordance with Specification for Highways Work Series 600, to ensure economic floor slab and foundation design. In the event that contamination is identified at the Site, care must be taken to avoid creating vertical preferential pathways, although it is noted that the deeper aquifer systems are of low sensitivity.
Sulphate Risk	It is considered that, due to the presence of colliery spoil and Pennine Middle Coal Measures Formation at possible shallow depth, there is potential for upgraded concrete to be required for all surface and below ground structures. The ground conditions should be classified in accordance with BRE SD1.
Potential Soil and Groundwater Contamination	Tier Environmental has reviewed the historic information and there is evidence of potential contamination at the site within the shallow soils associated with the Site's former use as a colliery, brick works and sewage works; however, further site investigation would be required to assess this. In addition, it is considered that Made Ground may contain metals, PAHs, phenol, asbestos, sulphate and VOCs / SVOCs associated with the site's historic land uses and inherent concentrations within the Made Ground soils. There may be a requirement for further Detailed Quantitative Risk Assessment to fully establish potential risks to human health or controlled waters. In the event that potentially significant risks to future site users are identified from the risks assessment, then there is a potential for abnormal development costs associated with the implementation of a suitable cover system in soft landscaped areas or excavation and disposal of impacted soils to break potential direct contact, vapour and ingestion pathways.

Potential for gas protection	There is a potential for hazardous ground gases associated with the historic mine workings, shallow coal seam(s), mine entries, colliery spoil, Made Ground and former infilled ponds/reservoir. Upon completion of ground gas monitoring and assessment at the Site, it is considered likely that measured concentrations of potentially hazardous ground gases may be reported at concentrations and flow rates that present a potentially significant risk to the future site users. In this case, it may be that gas protection measures may be required as specified in BS8485:2015+A1:2019. These protection measures may include passive or active systems such as venting or membrane systems dependant on the outcome of the ground gas assessment which may present an abnormal development cost.
Regrading works	It is understood that significant regrading works will be required to provide a suitable platform for the proposed development. It is understood that the regrading works will generally comprise the cut of materials from the eastern area of the site likely to be colliery spoil and placement of these materials across the rest of the site. The proposed intrusive ground investigation will need to determine whether the proposed cut materials will be suitable for reuse and compaction as general fill (with or without material conditioning).
Slope stability	The regrading works are likely to result in slopes integrated into the development layout. It is recommended that slope stability analyses are undertaken during the design phase; the results of the analyses may affect the unit dimensions, foundation solutions and floor slab designs for the proposed units. Retaining structures may also be required locally, notably to the west of unit DBS1 to maximise the floor area of this unit and minimise potential impact on the adjacent 'ancient woodland'.
Surface water drainage	Surface water runoff within historic coal mining areas are often acidic and can contain elevated concentrations of metals, notably iron that can result in ochrous discharges into watercourses if not treated. The site is currently drained through a network of ditches/open watercourses flowing in a general southwest direction, following the local gradient. It is understood that surface water attenuation ponds are to be incorporated into the proposed development. It is considered at this stage that soakaways are unlikely to be suitable across the majority of the Site due to the likely presence of low permeability strata and the potential risk of causing unacceptable settlements within the colliery spoil and fill materials.
Historic mineworkings	The Coal Authority Mining Report states that the south-western area of the Site is located in an area that could be affected by historic shallow mineworkings. The stabilisation of shallow coal mineworkings may be required beneath the proposed structures, highways and infrastructure to minimise the risk of potential settlements affecting the proposed development. It is considered at this stage that there is a low risk of the recorded mine workings affecting the proposed development across the majority of the site.
Mine entries	There are 3 No. recorded mine entries recorded within the site boundary. It is understood that these mine entries will not be disturbed during the proposed development and that their management will be remain the responsibility of the Coal Authority. It is recommended that the land ownership of the fenced-off areas around these shafts be retained by the current owner/Coal Authority. Additional unrecorded mine entries should be anticipated, notably in the south-western area of the site. The areas around all mine entries should be assumed to have a high risk of collapse until the treatment status can be proven.
Further works	It is recommended that intrusive ground investigation works be undertaken to determine the following: • Determine the ground conditions beneath the site, notably the depth of Made Ground, potential obstructions and potential contaminated soils/groundwater; • Determine the geotechnical suitability of the soil materials that are proposed to be reused in the proposed regrading works; • Determine the most economic foundation and floor slab solution for the proposed units; • Probe drilling to investigate potential mineworkings, notably within the south-western area of the site; • Trial trenching/probe drilling to investigate potential unrecorded mine entries, notably within the south-western area of the site; and, • Slope stability assessments for the proposed slopes within the development area.

3.6. Preliminary Ground Investigation Report for the Former Cronton Colliery Site by Tier Environmental Ltd (Ref: TE1163PGIR1.2 dated 13th August 2020)

Introduction	**Tier Environmental was commissioned by db symmetry Ltd to undertake a Preliminary Ground Investigation Report for an area of land referred to as Former Cronton Colliery, located off Fox's Bank Lane, Cronton, L3 5SU (the "Site"). The purpose of the investigation was to undertake ground investigation works to assess the risks to human health and controlled waters from potential contamination on Site, undertake a ground gas risk assessment, determine the preliminary soil waste classification and provide data to assist with foundation and floor slab design.**
Site location	The site is located at Former Cronton Colliery Site, Fox's Bank Lane, Cronton, L35 3SU.
Site history	The earliest available OS maps indicate that the site was occupied with agricultural land with pockets of woodland and hedgerows. OS maps from 1925 show that the southern and central areas of the Site were occupied by buildings, railway lines and spoil heals associated with Cronton Colliery. It is understood that Cronton Colliery was operational between 1913 and 1984. The 2002 OS map indicates the presence of spoil heaps across the southern and eastern areas of the Site indicating regrading works were undertaken in the southern area of the Site. It is understood that in 1995, the site was partially restored by removing the colliery infrastructure and major earthworks, and then mixing colliery spoil with paper mill crumb and sewage cake to create soils to support woodland planting.
Fieldwork	The investigation, which was supervised by a Tier Environmental Geoenvironmental Engineer, took place between 24th July 2019 and 30th July 2019 and comprised: • The excavation of 17 No. hand excavated pits (WS01 to WS17) to a depth of 1.20m bgl; • The advancement of 17 No. window sample borehole (WS01 to WS17) to depths between 1.83m (WS12) and 6.45m bgl (WS7, WS8); and, • The excavation of 26 No. machine excavated pits (TP01 to TP26) to a maximum depth of 4.5m bgl (TP26). Combined gas and groundwater monitoring wells were installed in exploratory holes WS3 to WS5, WS7 to WS12, WS15 and WS16.
Laboratory testing	Samples of soil, soil leachate and groundwater were submitted for analysis of a range of metal, other inorganic and organic components. Geotechnical testing was scheduled on selected samples. All testing was undertaken at accredited laboratories.
Ground conditions	Made Ground was encountered at all exploratory hole locations from depths between ground level to depths greater than 4.50m bgl. Total Made Ground thickness was highly variable, but it was generally observed to be thinner towards the north of the site. Made Ground generally consisted of colliery spoil amalgamated with some anthropogenic constituents which included brick and coal in the south of the Site. In the northern sections of the Site Made Ground was generally composed of reworked topsoil material consisting of sandy silty loam. Localised areas of demolition rubble were observed within the former footprints of infrastructure related to the colliery. Materials representative of Till Deposits were encountered across the Site. This strata was encountered as dark brown and light brown slightly sandy gravelly clay or as a gravelly sand. SPT N values achieved within this unit ranged from 4 to 78, indicative of low to very high strength soils. The base of the Till deposits was proven at 4.40m bgl at its deepest extent across the site or at elevations between 32.20m AOD and 37.95mAOD. Bedrock across the majority of the site was observed to be strata from the Pennine Middle Coal Measures Formation with the Kinnerton Sandstone Formation encountered within the east of the site. A north-south trending normal fault is shown to separate the two units on BGS geological maps. The weathered Pennine Middle Coal Measures was encountered as a sandy gravelly clay, whilst the weathered Kinnerton Sandstone Formation was encountered as a slightly gravelly silty sand. Both increased in strength or density with depth. The competent rockhead was encountered between 37.94m AOD and 28.82m AOD, the base of these stratums was not encountered. Groundwater observations indicate that there is a perched groundwater body present locally across the site, within the colliery spoil and locally within the Till Deposits. The minimum groundwater level during monitoring to date is 0.26m bgl (21.80m AOD). Seasonal variations in the groundwater level should be anticipated.
Ground stability	It is considered that there should be no particular difficulties in excavating the strata indicated in the boreholes utilising an appropriate and suitably sized mechanical excavator. Excavations into existing Made Ground and the underlying natural strata should be assumed to be unstable given the nature of the ground conditions encountered beneath the Site
Foundations and floor slabs	Due to expected varied ground conditions which will be present post earthworks the foundations appraisals have been conducted separately for each proposed unit (this assessment was based on a 4 No. unit scheme): • Unit 03 – Within the proposed footprint of Unit 03, it is anticipated that approximately 3m of cut in the east and 7m of fill in the western sections of the unit will be required in order to provide adequate development platforms. This unit will therefore require a bespoke foundation solution composing of pad foundations in the east and either a ground improvement solution or piles in the western section of the unit.

	• Unit 04 - It is considered that the optimum foundation solution for this unit will be reinforced pads (column loads) and strip footings (line loads) placed on vibro stone columns. If vibro stone columns are to be chosen as a foundation solution, this method could involve employing a ground bearing floor slab • Unit 02 - It is considered that pad foundations founded onto the weathered bedrock strata represent the most economic foundation solution for Unit 03. A ground bearing floor laid on the bedrock strata could be implemented within this unit. • Unit 01 - At the time of writing the founding strata under the proposed footprint of Unit 04 is not certain due to a proposed 9m of cut anticipated in this area. If the bedrock strata is found to be at a uniform level across this section of the site it may be possible for found in the bedrock strata utilising a pad foundation solution with a ground bearing slab. If deeper colliery spoil remains following the cut, VSCs could be locally used.
Sulphate class	Based on the samples tested, a Design Sulphate Class of DS-4 and an ACEC Class of AC-4 should be used for buried concrete structures.
Contamination	Asbestos fibre bundles were identified below the screening level (<0.1%) at 5 No. of the 10 No. samples screened for asbestos. It is therefore considered that colliery spoil, demolition rubble and localised areas of Topsoil at the Site should be regarded as presenting a potential risk to human health with respect to asbestos. Measured concentrations of chromium, nickel and zinc were reported in soil leachate samples taken from within the colliery spoil in excess of EQS Freshwater Values by between the same and 1 No. order of magnitude. Given the presence of colliery spoil to the south of the proposed development site, the absence of a persistent shallow groundwater body, the significant potential for dilution within groundwater at depth, the distance to the closest significant surface water body, Ditton Brook 450m southwest, the low order of magnitude of the exceedances and the fact that leachable concentrations in excess of the respective WQS appear not to be widespread, it is considered that the measured leachate concentrations do not present a significant risk to controlled waters. Marginal EQS exceedances of nickel, zinc and fluoranthene were reported in groundwater samples taken from within the colliery spoil at the Site. These concentrations are considered representative of assumed background groundwater contamination associated with the surrounding areas historical industrial land uses, rather than any former on Site process or ongoing contamination source. As such, the measured groundwater concentrations on Site are not considered to represent a risk to controlled waters.
Gas protection	In accordance with CIRIA C665, the assessment of these results obtained to date produced a maximum Gas Screening Value of 1.4196 /hr, derived using the maximum recorded carbon dioxide concentration of 15.6%v/v and the maximum peak flow rate of 9.1l/hr. Assessment of this gas screening value alone places the Site in a Characteristic Situation 3 – A moderate risk scenario in accordance with CIRIA C665 for which ground gas protection measures **will** be required in areas where colliery spoil is to be retained/relocated to or areas in the vicinity of the shallow coal seam.
Radon Requirements	Radon protection measures are not currently required for the proposed development on this site.
Further works	The scope of this report was a preliminary investigation; as such it is recommended that further site investigations are undertaken with a more intensive sampling regime when proposed development levels have been finalised and the relocation of the different cut materials have been confirmed. Some areas of the site were also inaccessible during the site works; these areas of the site should be revisited to avoid any data gaps. It is then likely that some findings of this report may be amended. Investigation of any potential shallow mine working will also be required before any development works in accordance with CIRIA C578. It is likely that to discharge the relevant planning conditions, a remediation strategy and ground gas verification plan report will be required. It may be beneficial to undertake a more detailed fault influence investigation to determine if the fault zone may have any adverse affects on the proposed development. A materials management plan and earthworks specification documents will be required in order to facilitate the large earthworks exercise planned on site.
Waste Soils Classification	Basic waste characterisation has demonstrated that the colliery spoil, demolition rubble and reworked topsoil should be classified as **non-hazardous**. Further WAC testing will be required to determine if this material can be disposed of to an inert waste landfill. It should be noted that to maximise the sustainability of the proposed redevelopment, it is intended to retain all excavation arisings and cut materials within the site.
Remediation Strategy	Based upon the findings of this preliminary site investigation, the following remediation measures are considered to be required in order to make the Site safe and suitable for the proposed redevelopment: • General site clearance, including hardstanding, vegetation and Topsoil; • Chipping of trees and incorporation into site won Topsoil; • Removal of any below ground relict structures associated with former foundations/basements, notably in the eastern area of the site; • Bulk earthworks to achieve the proposed development levels, with fill materials compacted in accordance with a recognised specification, such as Specification for Highways Works Series 600; • Removal and verification of any previously unidentified areas of contamination, where required; • Backfill of resultant excavations with suitable material; • Installation of hazardous ground gas protection measures in accordance with BS8485: 2015 within affected units;

	• Laboratory chemical testing and risk assessment of **all** imported materials; and, • Installation of a 300mm clean cover system in any soft landscaping areas where contaminated Made Ground remains at the surface.

3.7. A Ground Investigation Report for Symmetry Park Merseyside, Huyton by Tier Environmental Ltd (Ref: TE1163GIR1.5 dated 29th March 2023).

Introduction	Tier Environmental was commissioned by Tritax Symmetry Ltd to undertake a Ground Investigation Report for the Symmetry Park development, located off Fox's Bank Lane, Cronton, L3 5SU (the "Site"). The purpose of the investigation was to undertake further ground investigation works to assess the risks to human health and controlled waters from potential contamination on Site, undertake a ground gas risk assessment and provide data to assist with foundation and floor slab design.
Site location	The site is located at the Former Cronton Colliery Site, Fox's Bank Lane, Cronton, L35 3SU.
Site history	The earliest available OS maps indicate that the site was occupied with agricultural land with pockets of woodland and hedgerows. OS maps from 1925 show that the southern and central areas of the Site were occupied by buildings, railway lines and spoil heals associated with Cronton Colliery. It is understood that Cronton Colliery was operational between 1913 and 1984. The 2002 OS map indicates the presence of spoil heaps across the southern and eastern areas of the Site indicating regrading works were undertaken in the southern area of the Site. It is understood that in 1995, the site was partially restored by removing the colliery infrastructure and major earthworks, and then mixing colliery spoil with paper mill crumb and sewage cake to create soils to support woodland planting.
Fieldwork	The investigation, which was supervised by a Tier Environmental Geoenvironmental Engineer, took place between 17th August 2020 and 28th August 2020 and comprised: • The excavation of 36 No. hand excavated pits; • Advancement of 17 No. window sample boreholes; • Advancement of 8 No. cable percussive boreholes; • Advancement of 9 No. open hole rotary boreholes; and, • The excavation of 58 No. machine excavated trial pits.
Laboratory testing	Samples of soil, soil leachate, surface water and groundwater were analysed for a range of metal, other inorganic and organic components. Geotechnical testing was scheduled on selected samples. All testing was undertaken at accredited laboratories.
Ground conditions	Made Ground was encountered at all exploratory hole locations from depths between ground level to depths greater than 14.50m bgl. Total Made Ground thickness was highly variable, but it was observed to be thinner in the north of the site. Made Ground generally consisted of colliery spoil amalgamated with some anthropogenic constituents which included brick, rubber, glass, concrete, slag and coal in the south of the Site. In the northern sections of the Site Made Ground was generally composed of reworked topsoil material consisting of sandy silty loam. Some areas within the north contained no Made Ground. Localised areas of demolition rubble were observed within the former footprints of infrastructure related to the colliery. Within the colliery spoil heaps, in the east of the Site very soft grey clayey silt was encountered from between approximately 4.00m bgl and 14.20m bgl. This material is believed to have been excavated from the old colliery settlement ponds and lagoons around the Site and deposited here in 1995. SPT N values within this material ranged from 1 to 7. Materials representative of Till Deposits were encountered across the Site. This stratum was encountered as dark brown and light brown slightly sandy gravelly clay or as a gravelly sand. SPT N values achieved within this unit ranged from 4 to 78, indicative of low to very high strength soils. The base of the Till deposits was proven at 13.40m bgl at its deepest extent across the site or at elevations between 32.20m AOD and 37.95m AOD. Bedrock across the majority of the site was observed to be strata from the Pennine Middle Coal Measures Formation with the Kinnerton Sandstone Formation encountered within the east of the site. A north-south trending normal fault is shown to separate the two units on BGS geological maps. The weathered Pennine Middle Coal Measures was encountered as a sandy gravelly clay, whilst the weathered Kinnerton Sandstone Formation was encountered as a slightly gravelly silty sand. Both increased in strength or density with depth. The competent rockhead was encountered between 37.94m AOD and 20.82m AOD, the base of these stratums was not encountered. Groundwater observations indicate that there are perched groundwater bodies present locally across the site, within the colliery spoil and locally within the Till Deposits. The minimum groundwater level during monitoring to date is 0.26m bgl (21.80m AOD). Seasonal variations in the groundwater level should be anticipated.
Ground stability	The western area of the site is considered to be at risk from unrecorded shallow mining. Evidence of unrecorded workings was encountered within 10 No. out of 42 No. deep boreholes undertaken throughout all historic investigations taken place at the Site. In the central and western areas of the Site multiple boreholes

	encountered either broken ground, voids, no core return, a change in flush, a loss of flush or extremely weak strata. All are highly indicative of unrecorded mineworkings. **Drilling and grouting proof stabilisation works will be required underlying the proposed Units 02 and 03.** It is considered that there should be no particular difficulties in excavating the strata indicated in the boreholes utilising an appropriate and suitably sized mechanical excavator. Excavations into existing Made Ground and the underlying natural strata should be assumed to be unstable given the nature of the ground conditions encountered beneath the Site
Foundations and floor slabs	Due to expected varied ground conditions which will be present post earthworks the foundations appraisals have been conducted separately for each proposed unit. The optimum foundations solutions for each proposed unit are as follows: • Unit 01 – Excavate all Made Ground to down to bedrock level, lime and/or cement stabilise and re-engineer suitable material to create development platform designing foundations using reinforced perimeter strips or pads and floor slab on a modified raft. • Unit 02- Excavate all Made Ground and Till in the north of the unit to formation level, re-engineer alongside a suitable ground improvement solution such as rigid inclusions. Traditional foundations could then be implemented on the improved soils.
Sulphate class	Based on the samples tested, a Design Sulphate Class of DS-4 and an ACEC Class of AC-4 should be used for buried concrete structures where colliery spoil is to be retained or reused within the site. If concrete is only to come into contact with Till strata a Design Sulphate Class of DS-2 and an ACEC Class of AC-2 may be implemented. If concrete is to come into contact with bedrock strata a Design Sulphate Class of DS-3 and an ACEC Class of AC-3 may be implemented.
Contamination	Localised low level asbestos impacts have been reported that are considered to present a potentially unacceptable risk to human health receptors for a commercial/industrial and public open space / park land use. The dust inhalation pathways associated with asbestos impacted soils may be realised in areas where Made Ground soils remain at the surface (i.e. soft landscaped areas). It is considered that these pathways will be broken in areas of proposed hardstanding and building footprints such that no remediation will be required in those areas. Additional analysis and detailed qualitative risk assessments have been undertaken to determine the suitability of the asbestos impacted soils being retained at surface/shallow depth. An asbestos risk assessment report has been conducted alongside this report and is included within Appendix O. In summary, for the proposed end uses it has determined that the asbestos concentrations encountered present a minimal/tolerable risk to future site users. Measured concentrations of chromium, copper, nickel, zinc, anthracene, fluoranthene and benzo(g,h,i)perylene were reported in soil leachate samples in excess of EQS Freshwater Values by between the same and 1 No. order of magnitude. Given the presence of colliery spoil to the north and south of the site, the absence of a persistent shallow groundwater body, the significant potential for dilution within groundwater at depth, the low order of magnitude of the exceedances and the fact that leachable concentrations in excess of the respective WQS appear not to be widespread, it is considered that the measured leachate concentrations do not present a significant risk to controlled waters. Marginal EQS exceedances of cadmium, copper, lead, nickel, zinc, benzo(a)pyrene and fluoranthene were reported in groundwater samples taken at the Site. These concentrations are considered representative of assumed background groundwater quality associated with the surrounding areas historical industrial land uses. As such, the measured groundwater concentrations on Site are not considered to represent a risk to controlled waters.
Gas protection	In accordance with CIRIA C665, the assessment of these results obtained to date produced a maximum Gas Screening Value of 0.3276l/hr, derived using the maximum recorded carbon dioxide concentration of 15.6%v/v and the maximum steady flow rate of 2.1l/hr. Assessment of this gas screening value alone places the Site in a Characteristic Situation 2. A low risk scenario in accordance with CIRIA C665 for **which ground gas protection measures will be required.** At the time of writing the final development layout for the site (Units 02 and 03) is still not established in detail, as such the final locations, post earthworks, of differing material types cannot be confidently discerned. Under each of the current proposed units is an area where ground levels need to be increased. To do this may use any material type found across the Site. It is therefore considered prudent, at this stage, to utilise a worst case scenario from across the entire Site, as undertaken above to adequately protect future end users. Tier Environmental have also considered the risk from the outcropping coal seam and faulting system that underlies the Site, targeting multiple boreholes above these features. After a thorough review of the conceptual site model, gas data to date and development plans Tier Environmental are satisfied that a CS2 scenario across the Site, will adequately protect the proposed development from hazardous ground gases.
Radon Requirements	Radon protection measures are not required at the Site.
Waste Soils Classification	To maximise the sustainability of the development it is envisaged that all materials will be retained and reused at the Site under a Materials Management Plan. If material does have to be removed from Site, a basic waste characterisation has demonstrated that all material has been classified as non-hazardous. Further WAC testing would be required.
Enabling Works	Based upon the findings of this ground investigation, the following enabling works are recommended in order to make the Site safe and suitable for the proposed redevelopment: • General site clearance including hardstanding, vegetation and Topsoil;

	• Segregation of Topsoil from the different source areas, i.e. agricultural land and paddock, the imported Topsoil within the motocross track and the manufactured Topsoil above the colliery spoil (where it is present); • Chipping of trees and incorporation into site won Topsoil; • Removal of any below ground relict structures associated with former foundations/basements, notably in the eastern area of the site; • Bulk earthworks to achieve the proposed development levels, with fill materials compacted in accordance with a recognised specification, such as Specification for Highways Works Series 600. It would be beneficial for the fill materials beneath Unit 01 (and possibly Units 02 and 03 depending on fill and prevailing weather conditions) to be lime stabilised to minimise the risk of unacceptable total and differential settlements and improve the potential bearing capacity; • Removal and verification of any previously unidentified areas of contamination, where required; • Backfill of resultant excavations with suitable material; • Installation of hazardous ground gas protection measures in accordance with BS8485: 2015 within affected units; • Laboratory chemical testing and risk assessment of all imported materials; and, • Installation of a minimum of 150mm Topsoil to provide a suitable growing medium in any soft landscaping areas. A Materials Management Plan and Ground Gas Verification Plan will be required to set out in detail how the above works are to be carried out and verified. These documents are likely to be required in order to discharge the relevant planning conditions.
Further Works	To aid the development of the Site it is considered that the following works will be required: • A series of drilling and grouting proof stabilisation works within the areas of shallow mineworkings; • Bench trials to identify if lime stabilisation would be suitable, including leachate analysis of the stabilised material; • Settlement Analysis; • Slope Stability Analysis; • Ground Gas Verification Plan; • Materials Management Plan; and, • Drilling and Grouting Specification. It is also possible that the ground levels within the shaft compound may need to be reduced by approximately 3m. These works, including the lowering of the vent stacks and construction of new shaft caps, will be agreed with the Coal Authority.

4. PRELIMINARY CONCEPTUAL SITE MODEL

Based on the information provided in the previous sections of this report a combined preliminary conceptual site model and conceptual exposure model has been developed for the proposed future land use. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors. In assessing the likely contaminants of concern present at the site, reference has also been made to Defra and Environment Agency supporting documentation. A preliminary qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance in accordance with CIRIA C552.

The potential pollutant linkages identified and the qualitative risk assessment for these are presented in Table 4.1 below. The terms used in the preliminary qualitative risk assessment are defined in Appendix K.

4.1. Uncertainties

The following uncertainties exist in the preliminary conceptual model:

- The presence of any features unrecorded by the historic maps.
- Any unrecorded geological features.
- Any unrecorded pollution events during the site's history.

Table 4.1 Preliminary Assessment of Potential Pollutant Linkages (Continued on Next Page).

Justification / Comments
• The site is currently unoccupied with no above ground structures (excluding the 3No. shaft vents). The northern area of the Site is currently occupied by agricultural land. The southern are of the Site is currently occupied by immature woodland over regraded colliery spoil. • The earliest available OS maps indicate that the site was occupied with agricultural land with pockets of woodland and hedgerows. OS maps from 1925 show that the southern and central areas of the Site were occupied by buildings, railway lines and spoil heals associated with Cronton Colliery. It is understood that Cronton Colliery was operational between 1913 and 1984. The 2002 OS map indicates the presence of spoil heaps across the southern and eastern areas of the Site indicating regrading works were undertaken in the southern area of the Site. It is understood that in 1995, the site was partially restored by removing the colliery infrastructure and major earthworks, and then mixing colliery spoil with paper mill crumb and sewage cake to create soils to support woodland planting. • Pertinent surrounding current and historic land uses include brick works, sewage works, a colliery and associated infrastructure, a pumping house, multiple unspecified pits, a potentially in-filled reservoir, electric substations and multiple potentially in-filled ponds. • The southern area of the Site is understood to underlain in part by Made Ground comprising manufactured topsoil (blend of colliery spoil, paper mill crumb and sewage cake). Superficial Deposits beneath the majority of the site are anticipated to comprise Till, with Alluvium locally within the eastern area of the site and in the vicinity of the proposed southern access road. The superficial deposits are underlain by the Pennine Middle Coal Measures Formation in the western half of the Site comprising mudstone, siltstone and sandstones and the Kinnerton Sandstone Formation in the eastern half of the Site comprising sandstones. The nature and thickness of the Made Ground and superficial deposits is likely to be significant in determining the final foundation design. • The superficial stratum beneath the majority of the site (Till) is designated as a Secondary (undifferentiated) Aquifer, with the Alluvium along the eastern and south-eastern areas of the site designated as Secondary (A) Aquifer. The bedrock of the Pennine Middle Coal Measures Formation beneath the majority of the Site is designated as a Secondary (A) Aquifer and the Kinnerton Formation beneath the eastern area of the Site is designated as a Principal Aquifer (not considered present beneath Units 3 and 4) • The eastern area of the Site lies within a Source Protection Zone (Total Catchment – Zone 3). Groundwater flow is likely to be in a southerly direction. There are no licensed groundwater abstractions within 1km of the Site. Watercourses are present within the site that are within the catchment for Ditton Brook. On this basis, the controlled waters sensitivity is considered by Tier Environmental to be moderate. • Multiple discharge consents are recorded up to 250m south and east of the Site. Effluent type is recorded as sewage. • The flood risk on the Site is considered to be locally moderate. The probability of flooding is considered to be 1% or greater from rivers and 0.5% or greater from the sea. It is understood a separate flood risk assessment is being undertaken. • The Old Wood located adjacent to the western site boundary is designated as ancient woodland; changing ground levels in the vicinity of The Old Wood is likely to require agreement from Natural England through the planning process. • A landfill is located 226m south of the Site recorded as accepting inert waste. • Numerous potential sources of hazardous ground gases include potential shallow mine workings, deeper mine workings and upward gas migration along geological faults, colliery spoil, the 3 No. recorded mine shafts associated with the former Cronton Colliery, any potential hydrocarbon impacted soils and/or groundwater and potentially infilled ponds and/or drainage ditches • The Site is not located in an area where radon protection measures are required.

Source	Potential Contaminants of Concern	Pathway	Receptor	Consequence	Probability	Qualitative Risk Assessment
Made Ground from previous on- and off-site uses.	Metals PAHs pH Hexavalent chromium	Direct contact, dust inhalation and ingestion	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial/public open space/residential)	Medium	Low Likelihood	Moderate / Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Low Likelihood	Moderate / Low Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits	Adjacent site users (commercial/public open space/residential)	Medium	Low Likelihood	Moderate / Low Risk
		Migration via water pipes	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
		Lateral and/or vertical migration of mobile contaminants.	Aquifer 1 - Secondary (Undifferentiated) Aquifer associated with Till	Medium	Low Likelihood	Moderate / Low Risk
			Aquifer 2 - Secondary A Aquifer associated with Pennine Middle Coal Measures Formation	Medium	Likely	Moderate Risk
			Fox's Bank Brook located on southern/eastern boundary of Unit 3 & 4.	Medium	Low Likelihood	Moderate / Low Risk
	Naphthalene (a semi-volatile PAH) TPH / BTEX / MTBE VOCs / SVOCs Phenols PolyChlorinated Biphenyls (PCBs) Cyanides	Vapour inhalation, direct contact, dust inhalation and ingestion	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial/public open space/residential)	Medium	Low Likelihood	Moderate / Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Low Likelihood	Moderate / Low Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits	Adjacent site users (commercial/public open space/residential)	Medium	Low Likelihood	Moderate / Low Risk
		Migration via water pipes	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
		Lateral and/or vertical migration of mobile contaminants.	Aquifer 1 - Secondary (Undifferentiated) Aquifer associated with Till	Medium	Low Likelihood	Moderate / Low Risk
			Aquifer 2 - Secondary A Aquifer associated with Pennine Middle Coal Measures Formation	Medium	Likely	Moderate Risk
			Fox's Bank Brook located on southern/eastern boundary of Unit 3 & 4.	Medium	Low Likelihood	Moderate / Low Risk
	Asbestos	(Dust migration and) dust inhalation	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial/public open space/residential)	Medium	Low Likelihood	Moderate / Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Low Likelihood	Moderate / Low Risk
Potential hazardous soil and gas generation.	Hazardous ground gasses (methane, carbon dioxide, hydrogen sulphide, carbon monoxide and depleted oxygen)	Inhalation (indoor and outdoor)	Future site users (commercial)	Medium	Likely	Moderate Risk
			Adjacent site users (commercial/public open space/residential)	Medium	Low Likelihood	Moderate / Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Low Likelihood	Moderate / Low Risk
		Migration of hazardous ground gases from beneath the site to adjacent sites along services or other preferential conduits	Adjacent site users (commercial/public open space/residential)	Medium	Low Likelihood	Moderate / Low Risk
		Migration of ground gas / explosion	Buildings and services	Severe	Low Likelihood	Moderate Risk

For definition of the terms used in the qualitative risk assessment, please see Appendix K.

5. FIELDWORK

The information contained in this report is limited to areas of land accessible during the ground investigation within the site boundary, as indicated on the site plan, presented in Appendix A as Drawing No. TE1163-TE-00-XX-DR-GE-027-V02.

Tier Environmental scoped the intrusive ground investigation using guidance presented in:

- BS 10175:2011+A2:2017;
- Land Contamination Risk Management (LCRM) - https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm;
- BS 5930:2015+A1:2020;
- BS EN 1997:2004 and 2007.

Tier Environmental's standard strata description criteria are compliant with the above guidance.

5.1. Scope of Ground Investigation

Supplementary ground investigation within the proposed Unit 03 and 04 site area was undertaken, previous ground investigation works are discussed in detail within the wider site GIR (Report ref TE1163GIR1.4). The supplementary works comprised rotary boreholes conducted between 21st to 25th April 2023 followed by trial pitting undertaken between 13th and 14th November 2023. These works were supervised by a suitably qualified Tier Environmental engineer. Table 5.1 below provides a summary of the exploratory holes completed and rationale. Exploratory hole locations are presented on Drawing No. TE1163-TE-00-XX-DR-GE-027-V05. A second phase of site investigation was undertaken on 25th September 2024.

Table 5.1 Scope of Ground Investigation and Rationale

Exploratory Hole Type	Exploratory Hole Reference	Exploratory Hole Depths (m bgl)	Rationale
Trial pits	TP201 to TP216	1.50m to 3.50m bgl	To confirm the shallow ground conditions across the site, relatively shallow groundwater presence and rate of inflow, stability of excavations, and to enable shallow soil sampling for geotechnical and geoenvironmental parameters.
Rotary boreholes	RB401 to RB406, RB413	30.00m bgl	To confirm the deeper ground conditions across the site, conduct *in situ* geotechnical tests, facilitate soil sampling for geotechnical and geoenvironmental parameters and installation of gas/groundwater monitoring wells.
Window Sample boreholes	WS501 to WS504	2.78 to 3.26m bgl	To confirm the shallow ground conditions across the site and to enable shallow soil sampling for geotechnical parameters.

No constraints were encountered during the ground investigation.

Table 5.2 summarises the monitoring installations that fall within the unit 3 and Unit 4 area. No new wells were installed during the 2023 works.

Table 5.2 Scope of Monitoring Installations

Investigation	Exploratory Hole Location	Strata Targeted	Slotted Response Zone (m bgl)	Rationale
2019	WS03	Pennine Middle Coal Measures	0.50 to 2.00m	Targeting shallow ground gas and any perched groundwater body.
	WS11	Till	1.00 to 3.00m	
	WS12	Till	0.50 to 1.00m	
2020	WS101	Made Ground	0.50 to 1.50m	Targeting shallow ground gas Made Ground source.
	WS102	Till	1.00 to 2.00m	Targeting shallow ground gas and any perched groundwater body.
	WS104	Till	1.00 to 2.00m	
	WS105	Till	1.00 to 2.00m	
	WS107	Till	1.00 to 3.00m	
	WS108	Till	1.00 to 3.00m	
	CP101	Till	1.00 to 3.00m	

Depths and accurate descriptions of strata and groundwater observations made during investigation works, together with details of the samples recovered, are presented on the Engineer's exploratory hole records in Appendix B.

5.2. Geoenvironmental Testing

Sampling and QA/QC protocols are presented in Appendix O. Tier Environmental's schedule of chemical laboratory testing is presented in Table 5.3.and Table 5.4. The testing was carried out by Element Materials Technology, a UKAS and MCerts (where appropriate for soils analysis) accredited laboratory.

Human Health and Preliminary Waste Classification Laboratory Testing

Based upon the conclusions of the preliminary risk assessment, Tier Environmental scheduled chemical laboratory testing on selected soil samples. The purpose of the testing was to:

- Determine the concentration and spatial distribution of potential contaminants of concern in the Made Ground;
- Determine the chemical composition and properties of the shallow natural soils;
- Undertake a *preliminary* soils waste classification and waste disposal route determination.

Table 5.3 Schedule of Chemical Testing for Human Health Risk Assessment and Preliminary Waste Soils Assessment.

Laboratory analysis	Mae Ground (Topsoil)	Made Ground 1	Made Ground 2	Natural Soils (Till)	Natural (Bedrock)
Tier Environmental soil suite*	2	2	1	1	0
Asbestos screen	0	4	2	0	0
Speciated TPH / BTEX / MTBE	0	2	1	0	0

Laboratory analysis	Mae Ground (Topsoil)	Made Ground 1	Made Ground 2	Natural Soils (Till)	Natural (Bedrock)
Total, free and complex cyanides	2	4	2	1	0
BRE SD1	0	4	2	2	1
Calorific Value	0	0	0	1	1
Total Organic Carbon	0	0	0	1	1

*For definition of Tier Environmental analytical suites, please see Appendix O. NA - not applicable.

Controlled Waters Laboratory Testing

Based upon the conclusions of the preliminary risk assessment, Tier Environmental scheduled chemical laboratory testing on selected soil leachate samples. The purpose of the testing was to:

- Determine the concentration and spatial distribution of potential leachable contaminants of concern in the Made Ground;

Table 5.4 Schedule of Chemical Testing for Controlled Waters Risk Assessment.

Laboratory analysis	Made Ground 1	Made Ground 2
Tier Environmental leachate suite*	3	2
Leachable Vanadium	2	0
Leachable iron	2	0
Leachable Manganese	2	0
Leachable Phosphorus	2	0

*For definition of Tier Environmental analytical suites, please see Appendix O. NA - not applicable.

5.3. Geotechnical Testing

Geotechnical laboratory testing was scheduled by Tier Environmental on selected samples as presented in Table 5.5. The testing was performed by Murray Rix Laboratories, a UKAS (where appropriate) accredited laboratory. Test certificates including details of appropriate testing standards are presented in Appendix E and discussed in Section 7, below.

Table 5.5 Geotechnical Laboratory Testing Schedule.

Test	Stratum type	Number of tests	Rationale
1. Classification			
Atterberg limit	Till	11	a) Volume change potential. b) Plasticity assessment (comply with Eurocode 7 description) c) Consistency Index. d) Determine soil type (e.g., clay/silt). e) Use as an empirical guide to soil shear strength
2. Chemical tests			
Loss on Ignition	Made Ground	3	To determine organic contents of materials.
	Bedrock	1	
Calorific Value	Bedrock	1	

Test	Stratum type	Number of tests	Rationale
3. Compaction			
2.5 kg rammer dry density/moisture content relationship test	Made Ground	1	Establish maximum dry density and optimum moisture content of materials to assess suitability for reuse within earthworks
	Till	1	
Particle density	Made Ground	1	Used to calculate 0%, 5% and 10% air voids lines on dry density moisture content relationship plots.
	Till	2	
	Bedrock	1	

6. GROUND CONDITIONS

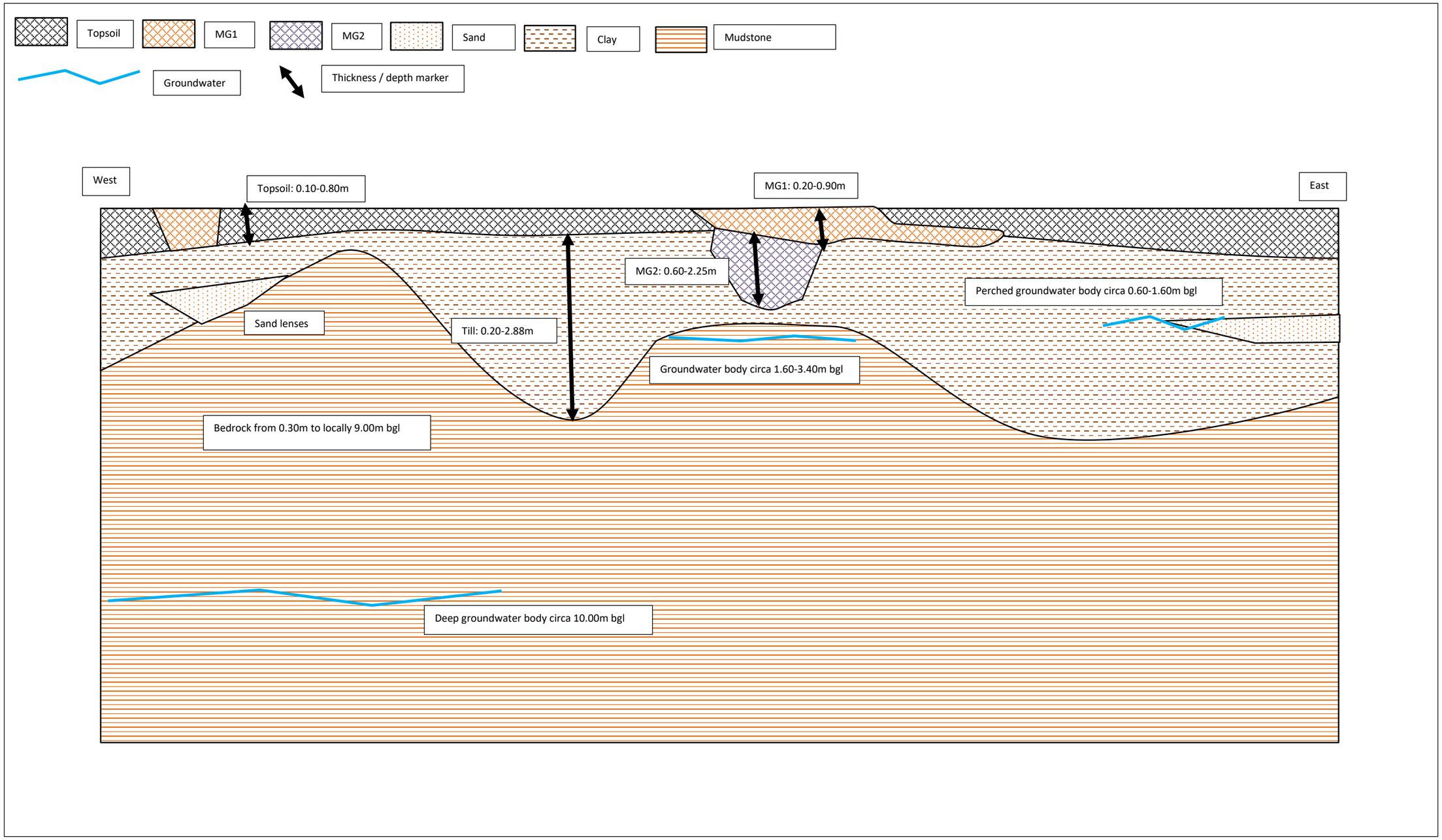
The following section provides a summary of the ground conditions encountered during both supplementary and historic investigations, including strata profile, obstructions and visual / olfactory evidence of contamination. Exploratory hole logs are provided in Appendix B.

Photographs of ground investigation works are provided in Appendix G.

6.1. Strata Profile

Figure 6.1presented below provide a schematic summary of the ground conditions beneath the site. The distinct populations of strata identified have been numbered and correspond with the more detailed descriptions below.

Figure 6.1 Schematic Drawing of Ground Conditions



6.2. Strata Descriptions

Made Ground – Topsoil

Locations encountered	TP201-208, TP211, TP120-127, TP146-148, TP153, WS102-104, WS107-109, CP101, RB108, TP07, TP08, TP15, TP18, TP19, TP25, TP26, WS01-03, WS11, WS12-14
Depths encountered from top of stratum (range)	Ground level
Depths encountered to base of stratum (range)	0.15m to 0.80m bgl
Thickness (range)	0.15m to 0.80m (typically 0.30-0.40m)
Spatial location on site	Widespread across site
General description	Light brown, dark brown, grey, black, clayey, silty, sandy LOAM. Rootlets present.

Made Ground (Granular) – MG1

Locations encountered	RB401, RB402, RB404-406, RB413, TP209, TP210, TP212, TP214-216, TP145, RB102, RB105, WS101, WS112, TP08, TP15, TP17, WS13
Depths encountered from top of stratum (range)	Ground level to 0.60m bgl
Depths encountered to base of stratum (range)	0.20m to 0.90m bgl
Thickness (range)	0.20m to 0.90m
Spatial location on site	Located predominantly across the north of the site
General description	Sandy, clayey fine to coarser Gravel of brick, concrete, mudstone, sandstone, limestone and occasional glass and ceramic. Also recorded as dark brown to black sandy silty Gravel of sandstone, coal, mudstone and brick described as colliery spoil.

Made Ground (Cohesive) – MG2 (Found in northeast within former moto cross track)

Locations encountered	TP213-215, RB105, WS13
Depths encountered from top of stratum (range)	Ground level to 2.30m bgl
Depths encountered to base of stratum (range)	0.60m to 4.84m bgl
Thickness (range)	0.60m to 2.25m
Spatial location on site	Located locally in the east and west of the site
General description	Soft orange brown slightly sandy to sandy, variably gravelly Clay with gravel of brick, concrete, mudstone and sandstone. Occasional metal fragments. Also recorded as a black very gravelly Clay with mudstone, coal and other natural lithologies described as colliery spoil.

Drift Deposits – DD1

Till (Clay)	
Locations encountered	All locations (except: TP204, TP205, TP210, TP215, TP216, TP125, TP145, WS112, RB102, TP15, TP25, WS03, WS13)
Depths encountered from top of stratum (range)	Ground level to 2.60m bgl
Depths encountered to base of stratum (range)	0.70m to 3.55m bgl
Thickness (range)	0.20m to 2.88m
Spatial location on site	Widespread across site
General description	Firm to stiff, low strength to high strength. Fissured and friable. Dark, light, orangish, reddish brown – mottled grey sandy CLAY.

Drift Deposits – DD2

Till (Sand)	
Locations encountered	TP204, TP205, TP208, TP148, TP26, TP19, WS02
Depths encountered from top of stratum (range)	0.30m to 0.45m bgl
Depths encountered to base of stratum (range)	0.95m to 1.90m bgl
Thickness (range)	0.50m to 1.52m
Spatial location on site	Located locally in the east, centre and far west of the site
General description	Slightly clayey, silty, gravelly fine to medium SAND. Gravel is typically of subangular to rounded natural lithologies and coal, low cobbles and boulders content.

Weathered Bedrock – WBR1

Locations encountered	TP201, TP202, TP205-209, TP211-TP214, TP120-123, TP127, TP07, TP15, TP17, TP25, WS03, WS11, WS12, WS14
Depths encountered from top of stratum (range)	0.30m to 3.35m bgl
Depths encountered to base of stratum (range)	1.83m to 4.00m bgl
Thickness (range)	0.10m to 2.23m (not proven in all locations)
Spatial location on site	Generally encountered site wide where depths achieved
General description	Weathered weak to very dense. Light, reddish brown to light grey/mottled grey fine to coarse sand with gravel of siltstone, sandstone and clay. Gravel is subangular to rounded. Also locally encountered as firm to stiff, friable, fissured dark brown sandy gravelly clay. Gravel is angular to rounded, fine to coarse of mudstone.

Bedrock – BR1

Locations encountered	RB401-406, RB413, TP203, RB102, RB105-108, WS101-105, WS107-109, WS112, TP120-127, TP145-148, TP153, TP18, TP19, TP25, TP26, WS01, WS02
Depths encountered from top of stratum (range)	0.70m to 9.00m bgl
Depths encountered to base of stratum (range)	40.00m bgl (where depth achieved in rotary boreholes)
Thickness (range)	Not proven
Spatial location on site	Anticipated to underly the entire site
General description	Extremely weak to very weak thinly laminated to thinly bedded, light grey to grey, sandy, silty MUDSTONE. Extremely weak to very weak, thinly bedded, slightly clayey, slightly gravelly SANDSTONE

6.3. Obstructions

The following potential obstructions were encountered during the ground investigation works.

Table 6.1 Obstructions Summary Table

Exploratory Hole Location	Location on Site	Depths recorded from (m bgl)	Depth of Base of Feature (m bgl)	General description and comments
TP145	East	1.50		Concrete at base of pit

6.4. Visual and Olfactory Evidence of Contamination

A summary of visual and/or olfactory evidence of contamination noted during previous and Tier Environmental investigations is summarised in Table 6.2 below:

Table 6.2 Visual and/or Olfactory Evidence of Contamination Summary

Exploratory Hole Location	Depth Range (m bgl) Encountered From	Depth Range (m bgl) Encountered To	Location on Site	Description
TP124	1.00	1.50	Central	High organic odour (natural)
TP125	1.80	2.50	Central	High organic odour (natural)
TP208	1.30		East	Slight organic odour (natural)

6.5. Groundwater Observations During Fieldwork

Table 6.3 below provides a summary of the groundwater observations during the fieldworks. Further information of groundwater observed is presented in the exploratory hole logs in Appendix B.

Table 6.3 Field Observations of Groundwater.

Exploratory hole	Strike (m bgl)	Rise in groundwater after 20 mins. (m bgl)	Formation	Observations
TP25	2.30	2.10	Bedrock	NR
WS01	2.70	NR	Bedrock	NR
TP127	1.65	NR	Bedrock	Seepage
RB102	10.00	NR	Bedrock	NR
RB105	2.60	NR	Bedrock	NR
RB106	31.00	NR	Bedrock	NR
RB08	20.04	NR	Bedrock	NR
TP201	2.20	NR	Bedrock	NR
TP202	1.45	NR	Bedrock	NR
TP204	1.40	NR	Till	NR
TP205	1.60	NR	Till	NR
TP206	2.20	NR	Bedrock	NR
TP207	3.00	NR	Bedrock	From western pit wall only
TP208	0.80	NR	Till	NR
TP209	0.60	NR	Till	NR
TP210	1.30	NR	Made Ground	NR
TP211	3.48	NR	Bedrock	NR
TP212	0.90	NR	Till	NR
TP213	0.80	NR	Till	NR
TP214	1.10	NR	Made Ground	NR
TP215	2.85	NR	Made Ground	NR

7. PRELIMINARY GEOTECHNICAL ASSESSMENT

7.1. Determination of pH and Water-Soluble Sulphate

Representative samples of the soils encountered during the Tier Environmental ground investigations, were tested to determine their pH and concentrations of water-soluble sulphate (SO_4^{2-}). The results are presented in Appendix C and Appendix D and summarised in Table 7.1 below. It is assumed that the site is a 'brownfield' site, and the groundwater is 'mobile' in accordance with BRE SD1.

Based on the reported results a Design Sulphate Class of DS-4 and an ACEC Class of AC-4 should be applied for below ground concrete. As the site is underlain by material that contains pyrite, it is essential to take account of the total potential sulphate content which might result from oxidation following ground disturbance. The mean of the highest 2 No. of values of Total Potential Sulphate give a Design Sulphate Class of DS-5 and an ACEC Class of AC-3, however, following BRE SD1 guidance, a limitation of DS-4 and AC-4 can be applied. The reason for this limitation is that not all the pyrite in soil will be oxidised and only a part will be taken into solution by groundwater.

Whilst no evidence of gross hydrocarbon contamination has been observed at the site, it is a concrete specialist should review the TPH results and ground conditions summary within this report to ensure appropriate concrete design against retardation / degradation due to hydrocarbons.

Table 7.1 Results of Soil pH Testing and Water-Soluble Sulphate Determination.

Exploratory Hole Location	Depth (m bgl)	pH	Water-soluble sulphate (mg/l)	Total Potential Sulphate	Design sulphate class	ACEC sulphate class
TOPSOIL						
TP08	0.25	7.86	30.9	Na	5 No. samples so mean of the highest 2 No. results used as the characteristic value: **180mg/l -DS-1**	5 No. samples so lowest result is used as the characteristic value: **7.67 -AC-1**
TP18	0.10	8.13	5.8	Na		
TP121	0.05	8.51	328.6	Na		
TP202	0.20	7.67	16.2	Na		
TP205	0.30	7.92	1.9	Na		
MADE GROUND						
TP210	0.60	8.4	37.2	0.15	>5 No. samples so mean of the highest 2 No. results used as the characteristic value: **2.74 -DS-5**	>5 No. samples so lowest result is used as the characteristic value: **7.3 -AC-3**
TP210	1.90	8.03	65.3	0.15		
TP213	0.50	7.9	24.8	0.06		
TP214	1.65	7.54	151.9	0.12		
TP215	1.20	7.81	1963.1	2.64		
TP216	2.60	7.3	1895.2	2.79		
DRIFT DEPOSITS						
TP120	0.75	8.18	85.2	Na	>10 No. samples so mean of the highest 20% of results used as the characteristic value: **130mg/l DS-1**	>10 No. samples so mean of the lowest 20% of results used as the characteristic value: **5.54**
TP122	0.50	8.75	9.7	Na		
TP146	2.00	4.88	247.9	Na		
TP148	1.30	7.55	30	Na		
TP201	1.00	9.09	16.9	0.03		
TP202	1.50	5.33	67.1	0.06		
TP205	1.10	7.24	7	Na		
TP206	0.80	7.99	4.4	Na		

Exploratory Hole Location	Depth (m bgl)	pH	Water-soluble sulphate (mg/l)	Total Potential Sulphate	Design sulphate class	ACEC sulphate class
TP206	1.85	8.35	3.1	Na		**AC2z**
TP207	1.00	7.67	1.5	0.09		
TP209	1.30	6.43	54.9	Na		
TP211	1.50	7.78	16	0.03		
BEDROCK						
TP207	3.00	7.54	7.4	0.09	<5 No. samples so highest result used as the characteristic value: **2058mg/l -DS-3**	<5 No. samples so lowest result is used as the characteristic value: **5.46 -AC-5**
TP120	2.80	5.46	2058.3	Na		
TP126	1.65	5.68	25.5	Na		
Groundwater						
WS104	0.74	7.42	11.5	Na	<5 No. samples so highest result used as the characteristic value: **19.9mg/l -DS-1**	<5 No. samples so lowest result is used as the characteristic value: **7.42 -AC-1**
WS105	1.51	7.48	19.9	Na		

ACEC - Aggressive Chemical Environment for Concrete (see BRE, 2005).

7.2. Geotechnical Parameters

The data obtained during the Ground Investigation has been assessed for the recorded soil and rock either types in order to provide characteristic values in order to aid the final foundation design.

Table 7.2 Soil Classification Test Results for Till

Exploratory hole	Depth (m bgl)	Stratum	MC (%)	LL (%)	PL (%)	PI (%) (Modified)	Class	Volume Change Potential
CP101	1.2	Till	31	55	24	37	Medium	Medium
WS107	1.2	Till	15	15	11	19	Low	Low
WS108	1.5	Till	22	28	11	17	Low	Low
TP211	1.4	Till	23.3	43	21	23	Medium	Medium
WS501	1.2	Till	11.8	39	13	26	Medium	Medium
WS502	2.0	Till	20.9	41	16	25	Medium	Medium
WS503	3.0	Till	18.8	38	18	20	Medium	Medium
WS504	2.0	Till	15.2	42	17	25	Medium	Medium

ND - Not determined; MC - Moisture content, LL - Liquid limit, PL - Plastic limit, PI - Plasticity index.

Consistency index (CI) is obtained from Atterberg limits and is allowed by Eurocode 7 as a scientific means of determining consistency of clays over and above an engineer merely sticking a thumb in (CI = 1-(mc-(PL/PI)) using unmodified PI).

Soil Classification

The results of Standard Penetration Tests undertaken within the granular Till Deposits are considered to be very variable, ranging from N = 4 to an extrapolated value of N = 65 with most N values falling in the loose and medium dense categories. It should be noted all of the low N values were recorded at shallow depth and could be representative of reworked strata. The values show slight increase with depth. Based on these results a conservative SPT N value of N = 10 and an angle of shearing resistance of 30° is tentatively proposed for the granular Till strata; however, this value should be used with caution.

A total of 3 No. samples of Till were submitted for one dimensional consolidation testing. The test results indicated moderate variability in the coefficient of volume compressibility (m_v) and coefficient of consolidation (C_v).

Table 7-3 Oedometer Results

Location	Depth (m bgl)	Pressure Range From (kPa)	Pressure Range to (kPa)	m_V (m^2/MN)	C_v (m^2/yr)
WS107	1.5	30	240	0.18	6.90
WS108	1.5	30	240	0.50	1.52
CP101	1.2	25	200	0.47	17.73

The results of the one dimensional consolidation testing indicate that the Till Deposits have a low to medium compressibility (Carter et al 1991) as would be expected from natural Till strata.

Shear Strength Parameters

A total of 40 No. hand shear vane tests were undertaken within the Till strata with results ranging from 32 kPa to 118 kPa indicating the material is predominantly firm to stiff which confirms field tests undertaken during the works. Most of the results lie in the 60 kPa to 90 kPa range (firm to stiff strata) with an average of 75kPa being assessed for the Till deposits from hand shear vane analysis.

A total of 3 No. total stress undrained triaxial tests were performed on the natural clay strata encountered within the exploratory holes. Single stage tests were performed and these yielded value of undrained shear strength (Cu). A summary of the test results obtained for the natural clay strata is given in the table below. These shear strengths are shown in **Figure 11.4** in which they are plotted against depth.

Table 7.3. Summary of Undrained Shear Strength Values for Natural Clay Strata

Borehole	Depth (m bgl)	Shear Strength Cu (kPa)
WS107	1.5	111
WS108	1.5	39
CP101	1.2	46

The results range from 39kPa to 125kPa in the firm to stiff consistency range. The differences are likely due to differing moisture contents and localised periglacial conditions occurring during the deposition of the material. The test results show a reasonable variation with no clear increase with depth. An average value of 79kPa is assessed for the Till strata from the triaxial test method indicating the material is generally a firm clay.

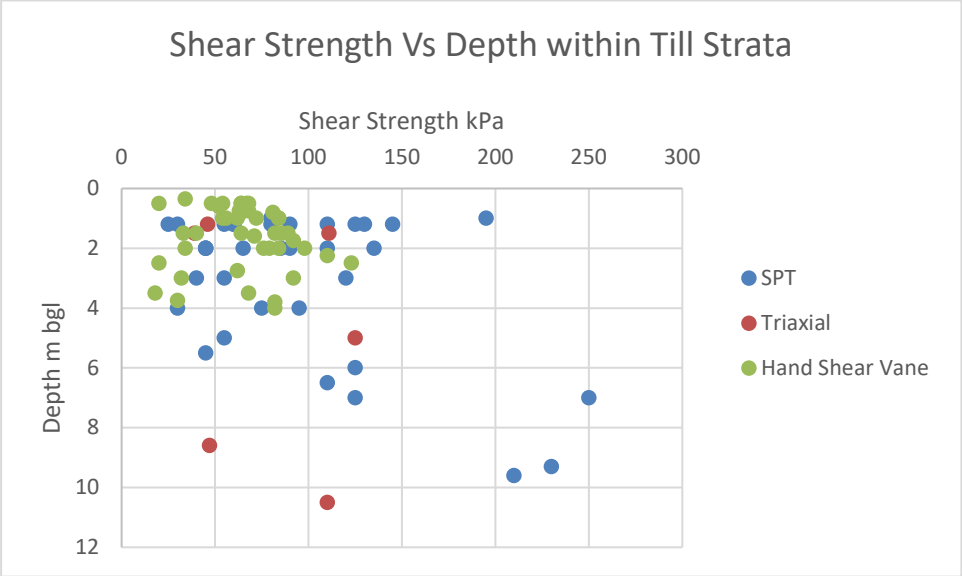
Standard Penetration Tests (SPT) were carried out in all of the boreholes. The undrained shear strength of the natural cohesive strata tested has been estimated using the relationship developed by Stroud, where:

Cu = f1 x SPT N60 value

The value of f1 is dependent on the Plasticity Index (Ip). By using the moderately conservative Plasticity Index of 20%, a characteristic value of f1 = 5 has been derived.

The results of shear strength values derived from *in situ* standard penetration tests, hand shear vanes and triaxial tests for the natural clay unit are plotted in Figure 7.4 below.

Figure 7-1 Shear Strength Vs Depth in Till Strata



All methods of analysis show some variation but also an increase with depth and this broadly agrees with the variation in moisture content for this stratum. Based on these results, a moderately conservative design undrained shear strength of 35kPa at 1m bgl, increasing to 75kPa at 4m bgl is assessed for the natural clay strata.

Weathered Bedrock Strata

Strength Classification of Weathered Rock Strata using SPT N Value Results

A total of 2 No. samples of weathered bedrock strata were submitted for Particle Size Distribution tests. The test results indicate this material is classified as clayey to very clayey, silty to very silty gravelly to very gravelly sand.

Standard Penetration Tests (SPT) were carried out in 9 No. boreholes within the weathered Kinnerton Sandstone Formation and the weathered Pennine Middle Coal Measures Formation. The results of 24 No. Standard Penetration Tests undertaken within the weathered bedrocks range from 27 blows/300mm to 50 blows/95mm with all N values exceeding N=27.

The results plotted show notable variation over the depth range of the tests with extrapolated N values ranging between N = 27 and N = 234.

The approximate unconfined compressive strength of the rock strata tested has been estimated using the relationship developed by Stroud, where:

UCS (MN/m^2) = 10 x SPT N60 extrapolated value

The results indicate that this stratum is extremely weak to very weak. Based on these results a conservative design extrapolated SPT N60 value of N60 = 27 has been selected for the weathered bedrock and applying the relationship detailed above this would yield a design unconfined compressive strength of 250kPa although it is noted that stronger strata are likely to be encountered.

Foundation Recommendations & Floor Slabs

The founding strata on each unit will comprise bedrock, till or re-engineered material, engineered to a specification. Consideration should be given to settlements within the underlying Till due to the additional surcharge (although the Till is over consolidated). If the settlement criteria for the floor slab are very strict, band drains may be required to accelerate the settlement within the Till during the construction phase. An alternative to band drains (that may be difficult to install in the Till) would be to install a granular blanket on top of the Till prior to the placement of the fill to ensure there is a drainage path for any excess porewater pressure. A post-earthworks CPT investigation and settlement monitoring may be required to verify the earthworks unless the works are supervised full time by Tier with adequate verification testing by the contractor.

With regards to slope stability, the distance between the site boundaries for these two units is approx. 8m with a 7.45m difference in height, therefore a retaining wall or reinforced soil slope is anticipated to be required between Unit 3 (FFL – 38.25m AOD) and Unit 4(FFL – 30.80m AOD. Proposed slopes including cut within the bedrock and or till and slopes formed from engineered till will need to be assessed.

Unit 03

The floor slab in the eastern area would be ground bearing on firm and stiff clay (Till). Potential issues with slight heave should be low risk as the depth of remaining clay should be between 0.50m and 2.00m following the proposed cut.

In the western area, levels are to be raised by approx. 2.70m, with cut in the eastern section A transition zone at the cut/fill boundary will be required to reduce the risk of unacceptable total and differential settlements. Foundations should be pads into the bedrock, Till and re-engineered fill, assuming a safe bearing capacity of 100kPa-150kPa at this stage.

Stabilisation of shallow mineworkings are unlikely to be required (subject to confirmation by additional probe holes). There is a geological fault located beneath the unit so the design of the floor slab and superstructure should take this into account.

Unit 04

Assuming a FFL of 30.80m AOD, a ground bearing slab would be founded on bedrock in the east transitioning to Till in the central area then engineering fill in the west.

In the western area, levels are to be raised by up to 5.5m, wither cut in the east of the unit, therefore a transition zone at the cut/fill boundary to reduce the risk of unacceptable total and differential settlements will be required. The majority of the fill should be suitable for use, especially if the weathered bedrock is segregated and utilised. Foundations should be pads into the bedrock, Till and re-engineered fill, assuming a safe bearing capacity of 100kPa-150kPa at this stage.

Additional trial pits with a 22T excavator are recommended to determine whether the bedrock (especially the sandstone) can be excavated without the use of a breaker, screener and crusher otherwise an allowance will be required to process these materials if they are to be reused as engineered fill within the development area.

Stabilisation of shallow mineworkings are likely to be required beneath the majority of Unit 04 (subject to confirmation by additional probe holes). A coal seam was encountered in TP126 between 1.5m and 2.5m bgl. There is approx. 3.9m cut in this area therefore some of the seam will be removed during the regrading works. A dialogue with the Coal Authority is required to determine if they would class it as ‘incidental coal’ if reused in the site.

Reuse on site will need consideration regarding geotechnical suitability and potential risk of spontaneous combustion; preferred option would be to blend with the general fill and compact in layers within the Land Trust/Country Park area if no economic value.

The construction of foundations is a specialist job and the advice of a reputable local contractor familiar with the type of ground and groundwater conditions encountered on this site should be sought prior to finalising the design.

Precautionary Considerations

As mining related subsidence is expected at the Site, superstructures should be designed with a degree of flexibility to accommodate a degree of movement in the foundations. Examples of some measures that may be taken include:

- Modified cross bracing;
- Detailing connections between the frame and cladding;
- Articulation or independent breaks; and
- Jacking points between the foundation and building.

Fault Zone

The site is traversed by two recorded geological faults. One normal fault enters the site approximately midway along the southern boundary and runs north south through the centre of the site and exhibits left-lateral or sinstral strike-slip movement. The second fault enters the site close to the south-eastern corner of the site and runs northwest to southeast through the centre of the site. Both faults intersect in the central northern portion of the site. No further information on the local faulting is available from BGS maps.

Within the fault zone, the rock mass will be more highly fractured than the surrounding undisturbed strata. Historic faults are unlikely to be reactivated (unless affected by mining activities) and therefore should not preclude the development on the site. The area will however be weaker and consequently more susceptible to settlement than adjacent undisturbed strata. Whilst construction may extend over the published fault position, foundation design should be based on appropriate engineering parameters for solid and disturbed strata around fault zones. The structural engineer should take this into account whilst designing the superstructure and foundations.

7.3. Earthworks

The compaction data has been assessed by comparing the results against criteria commonly used in earthworks to achieve an adequate density for engineered fills. The criteria indicate whether the samples could achieve in excess of 95% of Maximum Dry Density (MDD – a requirement often included in highways specifications) and whether they could be compacted to less than 5% air voids ratio (a requirement applied where raft foundations are to be adopted).

Sample	Stratum	Natural Moisture Content %	Maximum Dry Density (Mg/m^3)	Optimum Moisture Content %	95% Maximum Dry Density (Mg/m^3)	Moisture Content at 95% Maximum Dry Density %	Conditioning Required
TP26 at 1.50m bgl	Till Deposits	16	1.87	13	1.78	18	No
TP26 at 3.50m bgl	Weathered Kinnerton Sandstone Formation	13	1.89	13	1.8	17	No

Sample	Stratum	Natural Moisture Content %	Maximum Dry Density (Mg/m³)	Optimum Moisture Content %	95% Maximum Dry Density (Mg/m³)	Moisture Content at 95% Maximum Dry Density %	Conditioning Required
TP123 at 2.00m bgl	Weathered Pennine Middle Coal Measures	12	1.95	12	1.85	13.5	No
TP148 at 1.00m bgl	Till	21	1.79	17	1.70	20	No
TP146 at 4.40m bgl	Till	25	1.80	16	1.71	14	Yes – reduce moisture content
TP120 at 1.00m bgl	Till	16	1.80	16	1.71	14.5	No
TP122 at 3.00m bgl	Weathered Pennine Middle Coal Measures	12	1.82	16	1.72	14.5	Yes- increase moisture content
TP126 at 2.00m bgl	Pennine Middle Coal Measures	15	1.41	15	1.34	12	No
TP147 at 2.00m bgl	Till	15	1.79	17	1.70	15	Yes- increase moisture content
TP211 at 1.40m bgl*	Till	23	1.56	25	1.48	28.5	Yes- increase moisture content
TP214 at 2.10m bgl	Till	24	1.80	15	1.71	17.2	Yes- reduce moisture content

- Caution should be used when these results as there seems to be discrepancies between moisture content, hand shear vane results, field descriptions and natural moisture contents.

The results of compaction testing undertaken indicate that the soils could be recompacted to achieve >95% of MDD and <5% air voids. Based upon the results obtained, materials could be used as an engineered fill, subject to other suitability considerations. It should be noted that suitability for compaction is highly dependent on the initial moisture content of the material to be compacted. Some processing of the material (including screening and crushing of unsuitable elements) may be required during the enabling works phase to remove over-sized or unsuitable material, such as metal, plastic, fabric and timber. Where Made Ground is to be reused as an engineered fill, it would be sensible to select granular fills only and subject them to a confirmatory testing regime where they were required to achieve a compaction specification as a structural fill.

Construction plant should be provided with an adequate working platform in line with the requirements of BRE report, “BR 470: Working Platforms for Tracked Plant”. Again, further advice should be sought from the temporary works designer. However, the following factors should be considered.

It is understood that the existing Made Ground at the site is to be excavated and re-engineered to remove buried obstructions. Excavated materials will be processed and re-engineered as an Engineered Fill. The new Design CBR should be assumed to be equivalent to 2.5%, however values of between 10% and 20% should be achievable given the material present at the site. During construction, the in situ CBR value must be checked against the Design CBR value, to confirm design requirements are being met.

7.4. Groundworks, Excavation Stability and Groundwater Dewatering

In our opinion, there should be no particular difficulties in excavating the strata indicated in the boreholes utilising an appropriate and suitably sized mechanical excavator. Excavations into existing Made Ground and the underlying natural soils should be assumed to be unstable. No man entry into unsupported excavations should be allowed without an appropriate risk assessment. Reference to CIRIA report 097 (1983) should be made to establish suitable means of support or battering of excavation sides.

It is recommended that all excavations to greater than 1.20 metres depth, or for shallower excavations where groundwater is encountered above this level are closely supported, especially where man entry is required. Alternatively, where space permits, the excavations might be battered back to an appropriate angle. Should groundwater seepages occur, and water accumulate in shallow excavations it should be able to be removed by pumping from a filtered sump. However, groundwater control by more robust means, such as well pointing, may be required locally.

It should be noted that should deep {specify depth} basements be constructed as part of the development then we would recommend that the standpipes are monitored for groundwater levels for an extended period of time and take into consideration seasonal variations and periods of very wet weather to measure the fluctuation of the standing water levels. It should be noted that groundwater inflows and levels are likely to be subject to seasonal and climatic variations.

Great care will need to be taken if reducing groundwater levels to ensure that adjoining nearby buildings, structures and services are not affected.

8. NATIONAL HIGHWAYS

Following the planning submission for this area of the site the following conditions were provided by National Highways:

"Condition 1 - No development shall commence unless and until technical reports required by the Design Manual for Roads and Bridges CD 622 – Managing Geotechnical Risk have been submitted and approved in writing by the Local Planning Authority, in consultation with the Highway Authority for the M62 motorway. "

Tier Environmental have updated this report in accordance with guidance document CD622. A slope stability assessment is included within Appendix R and a Geotechnical risk register is included within Section 9.

9. GEOTECHNICAL RISK REGISTER

A geotechnical risk register for the scheme has been produced and is provided below.

Table 9-1 Geotechnical Risk Register

Activity / Hazard	Consequence	Probability	Impact	Risk Rating	Mitigation	Probability	Impact	Risk Rating
Settlement from unrecorded and recorded mine workings within influencing distance of proposed new structures.	Failure of design and damage to proposed new structures	Probable	High	Medium	Undertake stabilisation of unrecorded and recorded mine workings in accordance with specification.	Unlikely	High	Low
Creation of slopes / loading of existing slopes	Potential for excessive settlements or failures	Probable	Medium	Medium	Undertake slope stability assessment and only design all slopes within parameters discussed within.	Unlikely	Medium	Low
Excessive settlements of Made Ground	Potential for excessive settlement and deformation of Made Ground resulting in need for repair of structures.	Unlikely	Medium	Low	Undertake construction in accordance with design.	Negligible	Low	Negligible
Collapse of excavations during construction	Ground movements resulting in: - Damage to buried utilities or drainage resulting in the need for repairs. - Potential Health and Safety risk to site workers.	Probable	Medium	Medium	Design and support of all excavations to take account of and be suitable for ground and groundwater conditions presented within this report.	Negligible	Medium	Low
Unidentified services identified during construction	Potential delays to construction or damage to services	Probable	High	Medium	Carry out detailed surveys prior to construction.	Unlikely	High	Low
Sulphate attack on concrete structures	Degradation of concrete	Probable	Medium	Medium	Install new concrete in accordance with concrete sulphate recommendations provided within this report.	Unlikely	Medium	Low

10.HUMAN HEALTH RISK ASSESSMENT

Results of chemical analysis are presented in full in Appendix C.

10.1. Data Interpretation Approach

The analytical data obtained were reviewed for completeness and consistency. The data for each sample type was then compiled, screened against the Generic Assessment Criteria (GACs) for a commercial/industrial land use and those potential contaminants of concern which were found to exceed the GACs were then subjected to detailed analysis as described below.

Previously, it was possible for results from soil (and leachate) samples to be subject to statistical assessment in accordance with a 2008 guidance document (CL:AIRE / CIEH Guidance on Comparing Soil Contamination Data with a Critical Concentration). This guidance has now been withdrawn and replaced with the following document:

- Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration (CL:AIRE 2020)

The purpose behind statistical assessment is ultimately to determine whether concentrations of contaminants are at levels that present potential risk to the future site users (and the wider environment if the statistical assessment is conducted on leachate test results).

The new guidance places even greater emphasis and reliance on the desk study being carried out first, appropriately detailed sampling strategies, collection and testing of samples for contamination and use of appropriate screening criteria.

The guidance requires an increased number of criteria to be met before a robust statistical assessment can be conducted and introduces the principle of the Central Limit Theorem (CLT); a key tool of statistics that is used in the comparison of confidence intervals with the critical concentration. A common ‘rule of thumb’ is that the CLT will apply provided your sample size is between 20 and 50.

On this basis, Tier Environmental considers that statistical assessment in accordance with the CL:AIRE 2020 guidance may not be applied in this instance given that the number of samples obtained is below 20 No. for any given identified soil population.

Due consideration of the ground conditions, distinct identifiable populations of soil and has been undertaken and, where appropriate, laboratory results associated with discrete populations or ‘hotspots’ have been assessed separately.

10.2. Selection of Generic Assessment Criteria (GAC)

In short, for the majority of the contaminants of concern, LQM/CIEH Suitable 4 Use Levels (S4ULs) published in 2015 have been adopted as GACs for a commercial/industrial land use; however, further details on the hierarchal approach for the selection of the GACs used as screening criteria for this assessment is provided in Appendix L.

These values are considered as appropriate screening criteria as they incorporate updated assumption exposures derived for the production of C4SLs but within the context of deriving screening criteria above which assessment of the risks or remedial action may be needed (i.e. within the context of the planning regime rather than Part 2A context for which C4SLs were derived).

For those potential contaminants of concern where the selected GAC is dependent on Soil Organic Matter content (SOM), an assumed SOM of 1% has been selected based on the reported Total Organic Carbon (TOC) concentrations (which have been converted to SOM by dividing by a conversion

factor of 0.58). It should be noted; however, that for any soil samples where the TOC may be artificially driven by the presence of petroleum hydrocarbons, that these TOC results have been removed from the data set when determining an appropriate characteristic SOM. For this purpose, Tier Environmental have notionally considered that any TOC results from soil samples where the measured total TPH concentration exceeds 500mg/kg should be removed.

10.3. Human Health Risk Assessment

No measured concentrations of potential contaminants of concern have been reported in excess of the respective GACs protective of human health for a commercial/industrial land use.

Furthermore, the conclusions of previous investigations did not recorded any measured concentrations of potential contaminants of concern in excess of the respective GACs.

Measured Potential Contaminant of Concern Concentrations without Publicly Available GACs

No measured concentrations of potential contaminants of concern have been reported in excess of the laboratory method detection limit for which there are no current publicly available GACs.

Asbestos

Asbestos can be present in soil as fragments of bulk Asbestos Containing Materials (ACMs) (e.g. asbestos cement sheeting) and also as discrete asbestos fibres within the soil matrix. This investigation has carried out assessments to determine whether both bulk fragments and / or fibres are present in the soil at the site. The asbestos assessment commenced on site with inspection of the Made Ground by our suitably qualified supervising engineer for the presence of bulk ACMs.

During the fieldwork no suspected ACMs were identified.

Of the 13 No. of Made Ground samples submitted for asbestos screening, 3 No were reported to contain asbestos. Those positive identifications are summarised in Table 10.1, below.

Table 10.1 Summary of Asbestos Assessment

Exploratory Hole Location	Depth (m bgl)	Location on Site Description	Soil Population	Asbestos Type	Quantification (% w/w)
Asbestos in Soil Samples					
TP08	0.25	North east	Made Ground	Chrysotile fibre bundles	<0.1% w/w (not quantified)
TP210	1.20	North east	Made Ground	Chrysotile ACM debris	0.003
TP215	1.20	South	Made Ground	Chrysotile fibre bundles	<0.001

Any visible ACMs will need to be segregated during excavation works.

Tier Environmental have undertaken an asbestos DQRA, which has shown that the reported concentrations of chrysotile asbestos within the Made Ground materials will present a minimal / tolerable risk for the proposed commercial / industrial land use and are therefore suitable for use.

Groundwater

Measured groundwater concentrations have been compared against Generic Assessment Criteria derived for assessing vapour risks to human health from volatile contaminants by the Society of Brownfield Risk Assessment (SoBRA) (report reference; Groundwater Vapour GAC v1.0, dated February 2017). The assessment has been made via comparison of reported groundwater concentrations with available SoBRA GACs for a commercial use.

This assessment has determined that no measured concentrations of volatile compounds are present in excess of the SoBRA GACs protective of future site users, as such, the measured groundwater contaminant concentrations are not considered to pose a vapour risk to human health for the intended land use.

10.4. Utilities

It is recommended that the results of the chemical testing and details of the proposed remedial works are provided to the appropriate utility companies to determine the necessity for service protection.

10.5. Construction and Maintenance Workers

Contamination may pose a short-term (acute) or long-term (chronic) risk to workers during construction and maintenance. The potential risks must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation. Site practices must conform to the specific legislative requirements and follow appropriate guidance (e.g., HSE, 1991; CIRIA, 1996).

On the basis of the results obtained, the following potential exposure risks to construction and maintenance workers have been highlighted:

- Asbestos in Made Ground soils.

As asbestos has been reported at concentrations potentially above 0.001% w/w (i.e. above ‘trace’ levels), the Control of Asbestos Regulations 2012 should be adhered to. A summary of complying with CAR: risk assessments, licensing and training is provided in Appendix Q.

11.CONTROLLED WATERS RISK ASSESSMENT

11.1. Introduction

In order to assess whether there is a potentially unacceptable risk of pollution of controlled waters, samples of soil leachate and groundwater have been submitted for laboratory chemical analysis as per the summary presented in Table 5.4 within this report. Analytical data from soil leachate and groundwater sample testing undertaken by previous and the most recent Tier Environmental investigations have been evaluated against Water Quality Standard (WQS) values appropriate to the Conceptual Site Model.

In accordance with Part 2A of the Environmental Protection Act 1990, Tier Environmental has made regard to all of the WQS values that are relevant to the site and a judgment has been made against the most stringent of those relevant standards. Further details are provided, along with the approach for selection of TPH / BTEX WQS values, in Appendix M.

In some instances, the laboratory method detection limit is greater than the appropriate WQS value. In these instances, only measured concentrations in excess of the laboratory method detection limit have been considered likely to potentially represent a possible significant risk to controlled waters.

For those potential contaminants of concern for which the WQS values are dependent on hardness (e.g. cadmium EQS values), a hardness of <40mg CaCO3/l has been selected based on the reported values in the groundwater beneath the site.

11.2. Controlled Waters Environment Conceptual Site Model Summary

From a conceptual site model perspective, the superficial stratum beneath the majority of the site (Till) is designated as a Secondary (undifferentiated) Aquifer and bedrock of the Pennine Middle Coal Measures Formation beneath the majority of the Site is designated as a Secondary (A) Aquifer and the Kinnerton Formation beneath the eastern area of the Site is designated as a Principal Aquifer (not considered present beneath Units 3 and 4). The eastern area of the wider Site lies within a Source Protection Zone (Total Catchment – Zone 3). Groundwater flow is likely to be in a southerly direction. There are no licensed groundwater abstractions within 1km of the Site. Watercourses, including Fox's Bank Brook are present within the site that are within the catchment for Ditton Brook. On this basis, the controlled waters sensitivity is considered by Tier Environmental to be moderate.

11.3. Soil Leachate Testing

Table 11.1 below summarises the measured concentrations of contaminants of concern from soil leachate samples at the site that have been reported in excess of the respective WQS values.

Table 11.1 Summary of Measured Concentrations of Soil Leachate Potential Contaminants of Concern in Excess of WQS Values

Potential Contaminant of Concern	Units	LoD*	WQS	Maximum concentration	No. samples >WQS	Exploratory Hole Location	Depth (m bgl)	Soil Population
Manganese	µg/l	<2	123	924	1 of 2	TP216	2.60	Made Ground
Nickel	µg/l	<2	4	13	2 of 5	TP216	2.60	Made Ground
Zinc	µg/l	<3	10.9	41	1 of 5	TP210	1.90	Made Ground
Fluoranthene	µg/l	<0.005	0.0063	0.045	3 of 5	TP214	1.65	Made Ground

* LOD= Laboratory Method Limit of Detection

Measured leachable concentrations of manganese, nickel, zinc and fluoranthene have been reported only *marginally* in excess of the WQS protective of the controlled waters environment by up to one order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution within the groundwater beneath the site, the localised nature of those soil leachate concentrations in excess of the WQS and the absence of any reported widespread leachable concentrations, the fact that the site will incorporate buildings / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the absence of any potable or non-potable groundwater abstractions within close proximity to the site, the protection offered to the underlying Secondary A aquifer by the low permeability Till (although it is acknowledged this is not laterally consistent across site), measured leachable concentrations of manganese, nickel, zinc and fluoranthene are not considered to present a risk to the controlled waters environment,

Further specific consideration of the reported soil leachate concentrations of fluoranthene concentrations have been made. The EQS values for fluoranthene is derived assuming bioaccumulation in fish and ultimately consumption of the fish by humans which is an exposure scenario that is not viable for this site given the absence of a nearby viable surface water body where this will scenario be realised. Subsequent sensitivity analysis has demonstrated that no measured soil leachate concentrations of fluoranthene have been reported in excess of the respective Maximum Allowable Concentrations (MAC) EQS values for Inland Surface Waters. As such, and in the absence of viable 'bioaccumulation in fish and consumption of fish by humans' scenario, it is therefore considered that the reported soil leachate concentrations of fluoranthene do not present a potential risk to the controlled waters environment.

11.1. Groundwater Testing

No measured dissolved phase groundwater concentrations of potential contaminants of concern have been reported in excess of the respective WQS values considered protective of the controlled waters environment. As such, it is not considered that that the site presents a potential risk to the controlled waters environment.

12.GROUND GAS RISK ASSESSMENT

12.1. Introduction

The ground gas risk assessment has been undertaken in accordance with the following guidance:

- BS 8485:2015+A1:2019;
- CIRIA C665, 2007;
- Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide Are Present, NHBC, 2007;
- A Pragmatic Approach to Ground Gas Risk Assessment RB17. CL:AIRE, 2012; and,
- Ground Gas Monitoring and 'Worst-Case' Conditions TB17, CL:AIRE, 2018

The ground gas risk assessment has been conducted with full consideration of the viable sources, pathways and receptors included within the Preliminary Conceptual Site Model presented in Section 4.

Ground gas monitoring was conducted in conjunction with groundwater monitoring (and sampling); however, it should be noted during the gas monitoring was conducted first, prior to any groundwater monitoring / sampling works. The monitoring well locations and construction were designed with due consideration of the proposed development layout and preliminary conceptual site model. Further information pertaining to monitoring wells is provided in Table 5.2.

12.2. Ground Gas Monitoring Results

The full ground gas monitoring results from the installations are presented in Appendix F and summarised below:

Table 12.1 Ground Gas Monitoring Results Summary –6 No. Visits of Proposed Monitoring Programme of 6 No. Visits

Strata targeted by response zone	Monitoring well reference	Maximum peak CH_4 (%v/v)	Maximum steady state CH_4 (%v/v)	Maximum peak CO_2 (%v/v)	Maximum steady state CO_2 (%v/v)	Lowest O_2 recorded (%v/v)	Maximum peak gas flow rate (l/h)	Maximum steady state gas flow (l/h)
Made Ground, Till & Pennine Coal Measures	CP101	**0.1**	**0.1**	1.9	1.8	11.3	**12.4**	0.1
Made Ground	WS101	0.1	0.1	**10.0**	**9.9**	6.4	0.1	0.1
Made Ground	WS103	0.1	0.1	0.9	0.9	10.8	-0.1	0.1
Made Ground	WS104	0.1	0.1	1.6	1.4	19.5	0.4	**0.2**
Made Ground	WS105	0.1	0.1	2.9	2.9	**17.6**	0.3	0.1
Till & Pennine Coal Measures	WS107	0.1	0.1	6.7	6.7	11.4	6.8	0.1
Till & Pennine Coal Measures	WS108	0.1	0.1	8.9	8.9	11.5	0.1	-1.4

Bold = maximum value reported across all visits.

12.3. Ground Gas Risk Assessment

Table 12.2 and Table 12.3 demonstrate how, in accordance with CIRIA C665, the periods and frequency of monitoring have been selected for the site.

Table 12.2 From Table 5.5a CIRIA C665 - Typical/idealised periods of monitoring (after Wilson et al, 2005)

	2	Generation Potential of the Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of development	Low (commercial)	1 month	2 months	3 months	6 months	12 months
	Moderate (flats)	2 months	3 months	6 months	12 months	24 months
	High (residential with gardens)	3 months[1]	6 months	6 months	12 months[1]	24 months

Notes:

1 NHBC guidance also recommends this period of monitoring (Boyle and Witherington, 2007).

2 There is no industry consent over "high", "medium" or "low" generation potential of source.

Table 12.3 From Table 5.5b CIRIA C665 - Typical/idealised frequency of monitoring (after Wilson et al, 2005)

	2	Generation Potential of the Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of development	Low (commercial)	4	6	6	12	12
	Moderate (flats)	6	6	9	12	24
	High (residential with gardens)	6[1]	9	12	24[1]	24

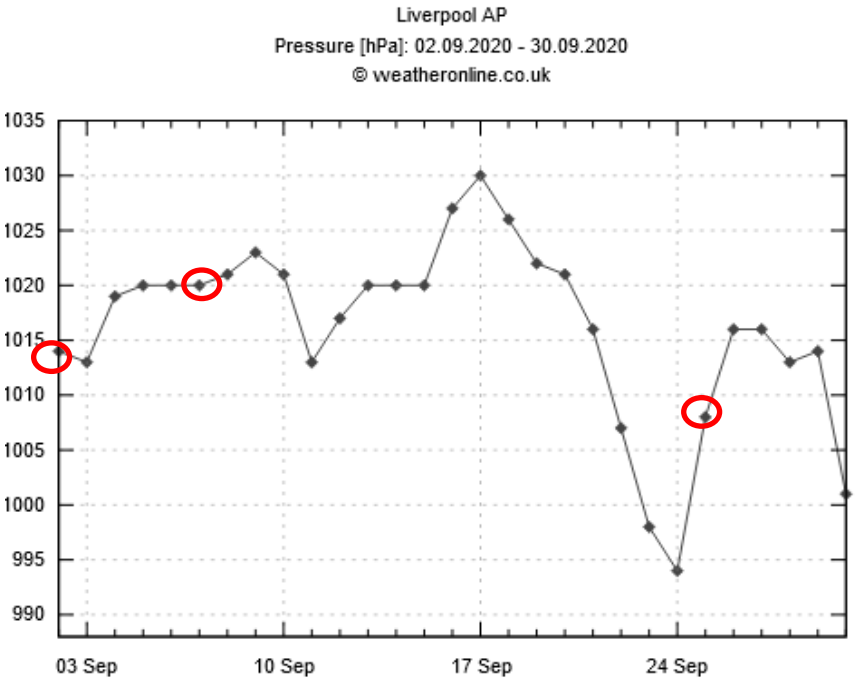
Notes:

1 NHBC guidance also recommends this period of monitoring (Boyle and Witherington, 2007).

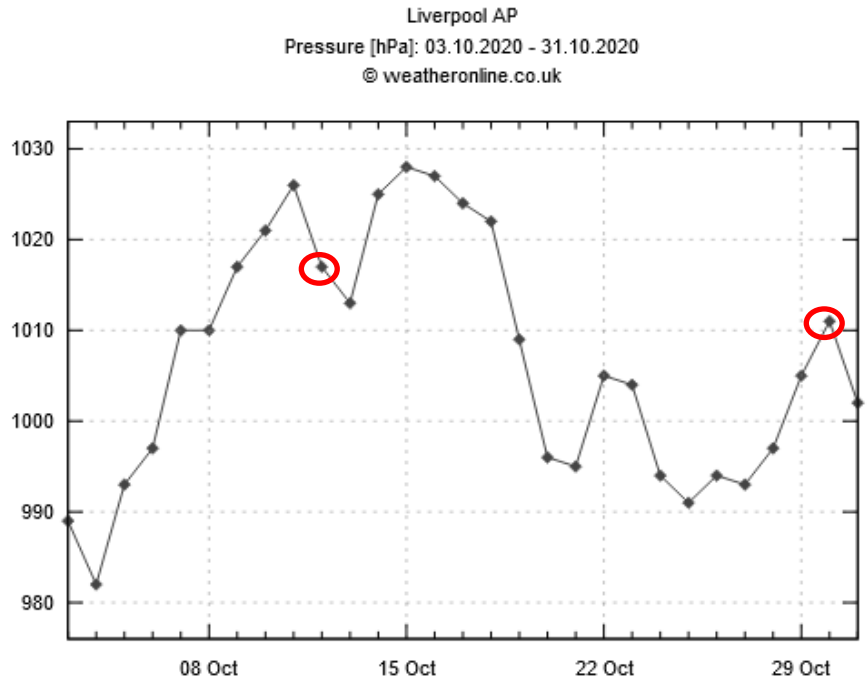
2 There is no industry consent over "high", "medium" or "low" generation potential of source.

The total atmospheric pressure range of the ground gas monitoring data included in this report was between 1001mbar and 1019mbar. This range covers moderate to high atmospheric pressures. Monitoring events included periods of stable, steady and falling pressure trends.

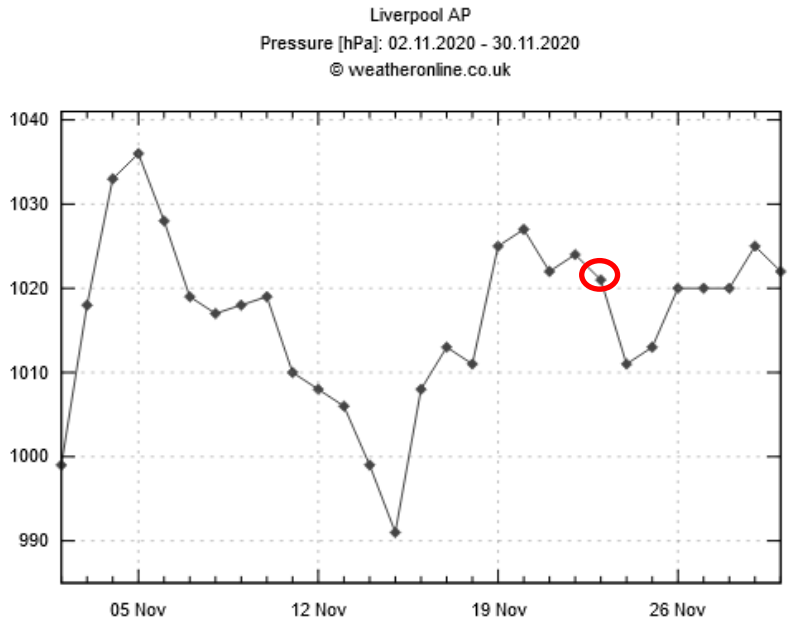
Visit 1 02.09.2020, Visit 2 07.09.2020 & Visit 3 25.09.2020



Visit 4 12.10.2020 & Visit 5 30.10.2020



Visit 6 23.11.2020



Consideration of Groundwater Effects

An assessment has been made to determine whether groundwater levels beneath the site lie at a shallow depth at, or above, the plain section of the monitoring well or within cohesive strata. In those instances where shallow groundwater is located within the plain section of the monitoring well pipe or within cohesive strata this can result in 'groundwater pumping' or a 'piston effect' where the measured peak (and in some cases steady) flow rates reported at these monitoring well locations are significantly (and artificially) influenced by the pressures formed in the void above the groundwater in the plain section of the pipe or within the pipework installed within cohesive strata, as opposed to being truly representative of the ground gas flow rates. In such instances, this scenario can create 'artificial' negative and /or relatively high peak positive readings depending on whether the groundwater levels have increased or decreased in between monitoring events or since installation of the monitoring wells.

The results of gas monitoring have indicated the following instances where groundwater pumping is likely to have influenced the measured ground gas flow rates such that they may be reasonably discounted from the Gas Screening Value (GSV) calculation:

The results of the ground gas monitoring have been assessed in accordance with the criteria specified for this site, which were derived as described in Appendix N.

Initial 'Worst-Case' GSV Calculation – Carbon Dioxide and Methane

An initial conservative assessment has been made by calculating a 'worst-case' Gas Screening Value (GSV) for the site by using:

- the maximum reported methane or carbon dioxide concentration (whichever is highest) from any monitoring well and during any ground gas monitoring visit; and,

- the remaining maximum peak positive flow rate (after any negative flow rates or 'artificially' high flow rates have been discounted as described above) from any monitoring well and during any ground gas monitoring visit.

Table 12.4 Initial Worst-Case GSV Calculation

Ground Gas	Maximum Reported Peak Concentration (% v/v)		Selected Concentration used in GSV Calculation (% v/v)		Maximum Appropriately Selected Gas Flow Rate (l/hr)		'Worst case' GSV (l/hr)
Methane (CH_4)	0.1		9.9	X	0.2	=	0.0198
Carbon dioxide (CO_2)	9.9						

CIRIA C665 provides two separate methods to 'characterise' a site that firstly requires the assessor to distinguish between two fundamental development 'situations':

- **Situation A** - Any development other than Situation B (e.g. factories, shops, commercial, warehouses, schools, cinemas, sports centres, stadiums, high rise housing, housing with basements, etc) for which the **Modified Wilson and Card 'Characteristic Situation' classification system** is applied; and,
- **Situation B** - Low rise building with minimum ventilated under floor void (min 150 mm) for which the **NHBC Traffic light classification system** is applied.

In this instance, as the site is due to be developed as commercial units, it shall be regarded as a 'situation A' scenario for the purposes of the ground gas risk assessment.

Table 12.4 demonstrates that the site is placed in a Characteristic Situation 1 – very low scenario on the basis of the 'worst case' GSV alone.

CIRIA C665 indicates that in the event that the reported methane concentrations are *'typically'* >1% v/v and/or the reported carbon dioxide concentrations are *'typically'* >5% then consideration should be made to increase the determination of the site to a Characteristic Situation 2 – Low Risk scenario.

As the maximum reported carbon dioxide concentrations exceed these thresholds, Tier Environmental has conducted further consideration of whether the site should be classified as a Characteristic Situation 2 – Low Risk scenario below.

- The previous Tier Environmental investigation for Units 1 & 2 produced a maximum Gas Screening Value of 0.3276l/hr, derived using the maximum recorded carbon dioxide concentration of 15.6%v/v and the maximum steady flow rate of 2.1l/hr. Assessment of this gas screening value alone placed the Site in a Characteristic Situation 2. A low risk scenario in accordance with CIRIA C665 for which ground gas protection measures will be required. At the time of writing the final development layout for the site (Units 02 and 03) was not established in detail, as such the final locations, post earthworks, of differing material types cannot be confidently discerned. Under each of the current proposed units is an area where ground levels need to be increased. To do this may use any material type found across the Site. It was therefore considered prudent, at this stage, to utilise a worst case scenario from across the entire Site, as undertaken above to adequately protect future end users.

- Tier Environmental have also considered the risk from the outcropping coal seam and faulting system that underlies the Site, targeting multiple boreholes above these features. After a thorough review of the conceptual site model, gas data to date and development plans Tier Environmental are satisfied that a CS2 scenario across the Site, will adequately protect the proposed development from hazardous ground gases.
- It is understood the development may be subject to emplacement of colliery spoil materials from earthworks carried out in the adjacent plots. This would be considered a potential ground gas source and therefore precautionary ground gas protection measures commiserate with a Characteristic Situation 2 – Low Risk scenario should be implemented if colliery spoil is ultimately used under proposed footprints for Units 3 & 4.

Carbon Monoxide and Hydrogen Sulphide

There is no current UK risk assessment guidance available for carbon monoxide and hydrogen sulphide derived from ground gases.

No measured concentrations of hydrogen sulphide have been reported in excess of the instrument's detection limit. As such, there is no evidence to suggest that the site presents a potential risk to future land users from hydrogen sulphide.

A maximum peak carbon monoxide concentration of 16 ppm has been reported which is below the workplace long term exposure limit (30ppm) and the workplace short term exposure limit (200ppm) published by the Health and Safety Executive (EH40/2005 Workplace Exposure Limits) and above the WHO long term (24 hours) indoor exposure guideline value (5.68 ppm).

Considerations for Construction and Maintenance Workers

During engineering and construction activities, the ground gas data indicate that the following aspects are to be considered during the preparation of relevant site H&S plans, method statements and related documents, and appropriate working methods adopted:

- **Carbon dioxide concentrations in ground gas:** The measured CO2 concentrations in ground gas reported are elevated relative to background levels and could present an asphyxiation risk in excavations and other confined spaces. The Health & Safety Executive has published information defining safe occupational exposure levels for CO2 and the latest guidance must be consulted to determine whether the ground gas regime necessitates specific precautions during site works.

12.4. Radon Gas

The site is not located within an area that requires radon protection measures.

12.5. Ground Gas Protection Measure Requirements

The due process to select ground gas protection measures is summarised in Table 12.5, below.

Table 12.5 Ground Gas Protection Measure Requirements

<table>
<tr><th>Ground Gas Characteristic Situation</th><th>Vapour Membrane Required?</th><th>Building Type (in accordance with BS8485)</th><th>Gas Protection Score by Characteristic Situation and Type of Building</th><th>Proposed Ground Gas Protection Measures</th></tr>
<tr>
<td>Characteristic Situation 2 – Low Risk Scenario</td>
<td></td>
<td>The proposed building type is considered to be Type C & Type D in accordance with the BS8485 description:
Type C building: commercial building with central building management control of any alterations to the building or its uses and central building management control of the maintenance of the building, including the gas protection measures. Single occupancy of ground floor and basement areas. Small to large size rooms with active ventilation or good passive ventilation of all rooms and other internal spaces throughout ground floor and basement areas. Probably civil engineering construction. Examples include offices, some retail premises, and parts of some public buildings (such as schools, hospitals, leisure centres and parts of hotels).
Type D building: industrial style building having large volume internal space(s) that are well ventilated. Corporate ownership with building management controls on alterations to the ground floor and basement areas of the building and on maintenance of ground gas protective measures. Probably civil engineering construction. Examples are retail park sales buildings, factory shop floor areas, warehouses. (Small rooms within these style buildings should be separately categorized as Type B or Type C).</td>
<td>The red ellipse below has been added to show the appropriate point score, based on the Characteristic Situation that has been determined for the site and Building type in accordance with BS8485.

From Table 4 in BS 8485:2015+A1:2019 – Gas Protection Score by CS and Type of Building
<table>
<tr><th rowspan="3">CS</th><th colspan="4">Minimum gas protection score (points)</th></tr>
<tr><th colspan="2">High risk</th><th>Medium risk</th><th>Low risk</th></tr>
<tr><th>Type A Building</th><th>Type B Building</th><th>Type C Building</th><th>Type D Building</th></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>3.5</td><td>3.5</td><td>2.5</td><td>1.5</td></tr>
<tr><td>3</td><td>4.5</td><td>4</td><td>3</td><td>2.5</td></tr>
<tr><td>4</td><td>6.5[A)]</td><td>5.5[A)]</td><td>4.5</td><td>3.5</td></tr>
<tr><td>5</td><td>-[B)]</td><td>6[A)]</td><td>5.5</td><td>4.5</td></tr>
<tr><td>6</td><td>-[B)]</td><td>-[B)]</td><td>-[B)]</td><td>6</td></tr>
</table>
A) Residential buildings should not be built on CS4 or higher sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.
B) The gas hazard is too high for this empirical method to be used to define the gas protection measures.</td>
<td>Selection of appropriate ground gas protection measures has been conducted in accordance with Section 7.2 of BS8485 that states that the gas protection measures should form at least two separate elements.
All office areas and ancillary rooms (toilets etc) would be classified as Building Type C for which 2.5 points are needed which may be obtained thusly:
• Gas resistant membrane which satisfies specification of Table 7 of BS8485, lapped and sealed – 2 points and;
• Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement)– 0.5 points.
The remainder of the building would be classified as Building Type D (large warehouse areas) only 1.5 points required:
• Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement)– 0.5 points;
• Good performance passive sub floor dispersal layer (formed by a geocomposite void former blanket or strips terminating in a gravel trench external to the building) – 1.5 points.</td>
</tr>
</table>

13.REVISED CONCEPTUAL SITE MODEL AND GENERIC QUANTITATIVE RISK ASSESSMENT OF POLLUTANT LINKAGES

The preliminary combined conceptual site model and conceptual exposure model, developed from the desk study information and presented in Section 4, has been revised in light of the ground investigation and the chemical analysis results presented above in Table 13.1, below.

A revised qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance in accordance with CIRIA C552.

Table 13.1 Revised Assessment of Potential Pollutant Linkages (Continued on Next Page).

Justification / Comments
• Localised low level asbestos impacts have been reported that are considered to present a potentially unacceptable risk to human health receptors for a commercial/industrial land use. The dust inhalation pathways associated with asbestos impacted soils may be realised in areas where Made Ground soils remain at the surface (i.e. soft landscaped areas). It is considered that these pathways will be broken in areas of proposed hardstanding and building footprints such that no remediation will be required in those areas. Additional analysis and detailed qualitative risk assessments have undertaken to determine the suitability of the asbestos impacted soils being retained at surface/shallow depth. An asbestos risk assessment report has been conducted alongside this report. In summary, for the proposed end uses it has determined that the asbestos concentrations encountered present a minimal/tolerable risk to future site users. • From a conceptual site model perspective, the superficial stratum beneath the majority of the site (Till) is designated as a Secondary (undifferentiated) Aquifer and bedrock of the Pennine Middle Coal Measures Formation beneath the majority of the Site is designated as a Secondary (A) Aquifer and the Kinnerton Formation beneath the eastern area of the Site is designated as a Principal Aquifer (not considered present beneath Units 3 and 4). The eastern area of the wider Site lies within a Source Protection Zone (Total Catchment – Zone 3). Groundwater flow is likely to be in a southerly direction. There are no licensed groundwater abstractions within 1km of the Site. Watercourses, including Fox's Bank Brook are present within the site that are within the catchment for Ditton Brook. On this basis, the controlled waters sensitivity is considered by Tier Environmental to be moderate. • Measured leachable concentrations of manganese, nickel, zinc and fluoranthene have been reported only marginally in excess of the WQS protective of the controlled waters environment by up to one order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution within the groundwater beneath the site, the localised nature of those soil leachate concentrations in excess of the WQS and the absence of any reported widespread leachable concentrations, the fact that the site will incorporate buildings / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the absence of any potable or non-potable groundwater abstractions within close proximity to the site, the protection offered to the underlying Secondary A aquifer by the low permeability Till (although it is acknowledged this is not laterally consistent across site), measured leachable concentrations of manganese, nickel, zinc and fluoranthene are not considered to present a risk to the controlled waters environment. • Tier Environmental consider that a Characteristic Situation 2 – Low Risk scenario should be implemented to adequately protect future site users from the presence of hazardous ground gases.

Source	Potential Contaminants of Concern	Pathway	Receptor	Consequence	Probability	Qualitative Risk Assessment
Asbestos in Made Ground soils at TP210 and TP216	Asbestos	(Dust migration and) dust inhalation	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial)	Medium	Unlikely	Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Low Likelihood	Moderate / Low Risk
Potential for ground gases if colliery spoil is used under building footprints as part of earthworks.	Hazardous ground gasses (methane, carbon dioxide, hydrogen sulphide, carbon monoxide and depleted oxygen)	Inhalation (indoor and outdoor)	Future site users (commercial)	Severe	Low Likelihood	Moderate Risk
			Adjacent site users (commercial)	Severe	Unlikely	Moderate / Low Risk
			Construction, site investigation, demolition and future maintenance workers	Severe	Low Likelihood	Moderate Risk
		Migration of hazardous ground gases from beneath the site to adjacent sites along services or other preferential conduits	Adjacent site users (commercial)	Severe	Unlikely	Moderate / Low Risk
		Migration of ground gas / explosion	Buildings and services	Severe	Low Likelihood	Moderate Risk

For definition of the terms used in the qualitative risk assessment, please see Appendix K.

14.PRELIMINARY WASTE MATERIALS CLASSIFICATION

14.1. Introduction

If the site is to be redeveloped and materials are disposed off site, the material exported from the site to Landfill should be hauled by a register waste carrier in accordance with Duty of Care Regulations 1991 and the Hazardous Waste Regulations 2005.

There will be requirement for the waste producer to provide appropriate Waste Acceptance Criteria (WAC) testing of the Soils for disposal to ensure that the soils are appropriately classified and that the landfill is licensed to receive such soils. Mixing of hazardous and non-hazardous waste is not permitted. For any hazardous wastes, a consignment note shall be completed, signed, and retained by all parties involved. The consignment note shall state the volume of waste, a physical description of the material and statement of its chemical composition. The waste consignment notes shall be kept by the contractor for a period of at least two years. For non-hazardous wastes, a Waste Transfer Note (WTN) shall be completed. The WTN should be signed and a copies should be kept by the contractor for a period of at least two years. Finally, consignment notes and WTNs shall be shown to an enforcement officer from the local council or the Environment Agency, if asked.

Approach to Assessing Hazard Properties

Flammability and Oxidisability

For any samples flagged as possessing hazardous properties flammability and oxidisability, for which there are no thresholds, Tier Environmental has used professional judgment and on-site observations to decide whether the waste soil, as a whole, is likely to be flammable or oxidising. It should be noted that flammability/oxidisability alone are unlikely to result in a hazardous classification for waste soil.

Worst Case Metal Compounds

The choice of an appropriate worst case metal compound in soil has been made on the basis of the available lines of evidence. For example, if laboratory chemical analysis has demonstrated that no measured concentrations of hexavalent chromium have been reported in excess of the laboratory method detection limit, there it would be regarded as evidence of an absence of a soil source of hexavalent chromium. In such an instance, the worst case metal chromates may be replaced in favour of the next worst case metal compound.

pH

For samples that have been determined as hazardous based on pH alone and cement/concrete has been identified in the sample, Tier Environmental may assume that the high pH was due to the crushing process in the laboratory and is not representative of the waste as a whole. If further detailed determination of this is required then Tier Environmental recommend that such assessment is carried out on these results in a manner described in the AGS Waste Classification for Soils – A Practitioners' Guide (dated 2019):

- Consideration of the acid/alkali reserve to be conducted (as described in WM3 Appendix C4 and C8).
- If large enough, the cement/concrete fraction may be separated manually before testing. Waste concrete from construction and demolition which doesn't contain hazardous substances is non-hazardous (LoW code 17-01-01).
- If cement/concrete has been identified in the sample, a second analysis may be conducted on an 'as received' sample, avoiding the need for crushing before testing. The high pH is typically associated with the finer fractions of cement. If the 'as received' sample has an acceptable pH, this provides additional confidence that the high pH was due to the crushing process and is not representative of the waste as a whole.

Asbestos

With respect to asbestos, If the waste contains fibres that are free and dispersed then the waste will be hazardous if the waste as a whole contains 0.1% w/w or more asbestos in accordance with WM3. If the waste contains any identifiable pieces of suspected asbestos containing material (i.e. any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye), then these pieces must be assessed separately. The waste is hazardous if the concentration of asbestos in the piece of asbestos containing material is 0.1% w/w or more. The waste shall then be regarded as a mixed waste and classified accordingly.

The following codes will then be assigned to the asbestos waste as appropriate:

- 17 06 05* Construction material containing asbestos.
- 17 06 01* Insulation material containing asbestos.

17 06 05* would normally be used in preference to 17 06 01* for the asbestos in asbestos contaminated soil and stones in accordance with WM3.

Tier Environmental Geoenvironmental engineers hold up to date UKATA Asbestos Awareness training certificates in order to demonstrate 'competence' that is required as described in WM3.

Flammable Liquid Waste

Tier Environmental consider that such a hazard property would apply if free phase product has been reported in the sample. As such, in those instances where materials are classified as hazardous based on this alone and no free phase product is encountered, it is considered that the materials may be regarded as being non-hazardous. Please note that the table below includes a column to show whether free phase product has been encountered within the sample location.

14.2. Preliminary Waste Materials Classification

Tier Environmental have assessed the chemical results in terms of basic waste characterisation of materials on site. This provides a preliminary assessment of whether a material is potentially non-hazardous or hazardous waste.

The results of this preliminary assessment are summarised in the following table.

Natural Soils / Bedrock

Representative samples of natural soils have been obtained during the investigation.

The results of basic waste characterisation are summarised in the table below. It is likely that any natural soils (that are not impacted by any known contamination from shallow Made Ground, or unexpected contamination) would be suitable for disposal to an inert waste landfill. It is recommended that the landfill is approached to confirm this position prior to off-site disposal. Otherwise, additional testing will be required to confirm the waste disposal route for natural soils beneath the site.

Table 14.1 Preliminary Materials Waste Classification

Exploratory Hole Location	Sample Depth (m bgl)	Simplified Description of the Sample	Basic Waste Characterisation Result	If 'Potentially Hazardous': Is it Possible to Demonstrate the Material is Non-Hazardous?	If the material is Hazardous – What is the Driver for Hazardous Waste Classification?	Asbestos Presence, Type and Quantification	WAC Sample Available?
TP201	1.00	Till: Firm yellowish brown sandy gravelly Clay.	Non-Hazardous	N/A	N/A	Not analysed for asbestos	No
TP202	0.20	Made Ground: Dark brown sandy silty clayey Loam.	Non-Hazardous	N/A	N/A	Not analysed for asbestos	No
TP205	0.30	Made Ground: Dark brown sandy silty clayey Loam.	Non-Hazardous	N/A	N/A	Not analysed for asbestos	No
TP210	0.60	Made Ground: Sandy clayey Gravel of brick, concrete, mudstone and fragments of glass and ceramic.	Non-Hazardous	N/A	N/A	Chrysotile ACM debris at 0.003% w/w	No
TP210	1.90	Made Ground: Soft orangish brown sandy gravelly Clay with brick and concrete.	Hazardous	N/A	Zinc sulphate	None detected	No
TP214	1.65	Made Ground: Soft orangish brown sandy gravelly Clay with brick and concrete.	Non-Hazardous	N/A	N/A	None detected	No
TP215	1.20	Made Ground: Sandy clayey Gravel of brick, concrete, mudstone and fragments of glass and ceramic.	Non-Hazardous	N/A	N/A	Chrysotile fibre bundles at <0.001% w/w	No
TP120	0.75	Till: Firm yellowish brown sandy gravelly Clay.	Non-Hazardous	N/A	N/A	None detected	No
TP120	2.80	Till: Firm yellowish brown sandy gravelly Clay.	Non-Hazardous	N/A	N/A	None detected	No
TP121	0.05	Made Ground: Dark brown sandy silty clayey Loam.	Non-Hazardous	N/A	N/A	None detected	No
TP121	0.05	Made Ground: Dark brown sandy silty clayey Loam.	Non-Hazardous	N/A	N/A	None detected	No
TP122	0.50	Till: Firm yellowish brown sandy gravelly Clay.	Non-Hazardous	N/A	N/A	None detected	No
TP126	1.65	Extremely weak friable black bituminous Coal.	Non-Hazardous	N/A	N/A	None detected	No
TP146	2.00	Till: Firm yellowish brown sandy gravelly Clay.	Non-Hazardous	N/A	N/A	None detected	No
TP148	1.30	Till: Firm yellowish brown sandy gravelly Clay.	Non-Hazardous	N/A	N/A	None detected	No
TP08	0.25	Made Ground: Dark brown sandy silty clayey Loam.	Non-Hazardous	N/A	N/A	Chrysotile fibre bundles at <0.1% w/w (not quantified)	No
TP18	0.10	Made Ground: Dark brown sandy silty clayey Loam.	Non-Hazardous	N/A	N/A	None detected	No

14.3. Materials Re-Use

Subject to volumetric fill requirements and a future assessment of suitability of re-use (both chemically and geotechnically), some materials may be considered for potential re-use in line with an appropriate end-of-waste protocol such as WRAP Quality Protocol for Aggregates from Inert Waste, U1 Exemption or a Materials Management Plan in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP). Please note that any previously landfilled or mining waste materials may not be appropriately subject to consideration under DoWCoP and may not be re-used under DoWCoP unless sufficient lines of evidence and agreement with the local Environment Agency Waste Team can be sought beforehand.

Re-Use of Excavated and Stockpiled Clean Naturally Occurring Soils on Other Sites

In addition, Tier Environmental are aware that CL:AIRE is classing stockpiled clean, naturally occurring soils as waste, unless their final destination is identified in a Materials Management Plan, before they are excavated. However, Tier Environmental consider that any clean naturally occurring soils arising from enabling works, earthworks or construction activities would be regarded as an asset and the default assumption for this site (prior to excavation and stockpiling) is not the intention to discard these materials where they may be reasonably re-used on this, or another, development site. Stockpiling is a recognised, recommended means of safely storing soils. Whilst there may be advantages to leaving soils in-situ, stripping topsoil and subsoil prior to earthworks is a routine construction activity. Tier Environmental consider that it is not unreasonable to state that in the event that the developer owns another site where the construction phase is ongoing, soils can be transferred between their sites as an owned product and never become waste.

The above paragraph above is therefore considered a clear intention to reuse any clean, naturally occurring soils derived from excavations at this site (which may also include temporary stockpiling these materials). It is considered; however, that in addition to this the following must be adhered to:

- Reuse does need to occur within a ‘reasonable’ timeframe (12 No. months); and,
- If soils are transferred to a third party (another developer), there needs to be some contractual agreement in place, as in this situation it is important to have something in place confirming that surplus soils are required by the third party.

Re-Use of Excavated and Stockpiled Clean Naturally Occurring Soils Within The Site They Are Excavated From

Further to the above, where soils are naturally occurring, uncontaminated and re-used on the site they are excavated from, they fall outside of the Waste Framework Directive (WFD) i.e. they will not be classified as a waste Currently the CL:AIRE Definition of Waste Code of Practice states the following which appears to support this position: *“If the material is waste an Environmental Permit will be required to lawfully deposit or re-use it unless the material is “uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated”, which is excluded from waste regulation by the Waste Framework Directive (2008).”*

15.CONCLUSIONS AND RECOMMENDATIONS

15.1. Conclusions

Localised low level asbestos impacts have been reported that are considered to present a potentially unacceptable risk to human health receptors for a commercial/industrial. The dust inhalation pathways associated with asbestos impacted soils may be realised in areas where Made Ground soils remain at the surface (i.e. soft landscaped areas). It is considered that these pathways will be broken in areas of proposed hardstanding and building footprints such that no remediation will be required in those areas. Additional analysis and detailed qualitative risk assessments have undertaken to determine the suitability of the asbestos impacted soils being retained at surface/shallow depth. An asbestos risk assessment report has been conducted alongside this report. In summary, for the proposed end uses it has determined that the asbestos concentrations encountered present a minimal/tolerable risk to future site users.

Tier Environmental consider that a Characteristic Situation 2 – Low Risk scenario should be implemented to adequately protect future site users from the presence of hazardous ground gases

15.2. Recommendations

Based upon the findings of this ground investigation, the following measures are recommended in order to make the Site safe and suitable for redevelopment:

- General site clearance including hardstanding, vegetation and Topsoil;
- Segregation of Topsoil from the different source areas, i.e. agricultural land and paddock, the imported Topsoil within the motocross track and the manufactured Topsoil;
- Chipping of trees and incorporation into site won Topsoil;
- Removal of any below ground relict structures associated with former foundations/basements, notably in the eastern area of the site;
- Bulk earthworks to achieve the proposed development levels, with fill materials compacted in accordance with a recognised specification, such as Specification for Highways Works Series 600;
- Removal and verification of any previously unidentified areas of contamination, where required;
- Drilling and grouting within areas of supposed mineworking's
- Backfill of resultant excavations with suitable material;
- Installation of hazardous ground gas protection measures in accordance with BS8485;
- Laboratory chemical testing and risk assessment of all imported materials; and,
- Installation of a minimum of 150mm Topsoil to provide a suitable growing medium in any soft landscaping areas.

A Materials Management Plan and ground gas verification plan will be required to set out in detail how the above works are to be carried out and verified. These documents are likely to be required in order to discharge the relevant planning conditions.

15.3. Further Works

To aid the development of the Site it is considered that the following works will be required:

- A series of drilling and grouting proof stabilisation works within the areas of shallow mineworking's;
- Bench trials to identify if lime stabilisation would be suitable;
- Settlement Analysis;
- Slope Stability Analysis;
- Detailed Quantitative Risk Assessment to assess risk of Asbestos in the Made Ground;
- Ground Gas Verification Plan;
- Materials Management Plan; and,
- Drilling and Grouting Specification.

16.REGULATORY APPROVALS

The conclusions and recommendations presented above are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other organisations for their comment and approval prior to undertaking any works on site.

It is recommended that conditions placed on any planning permission are discharged prior to commencement of site works.

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18.GLOSSARY OF TERMS

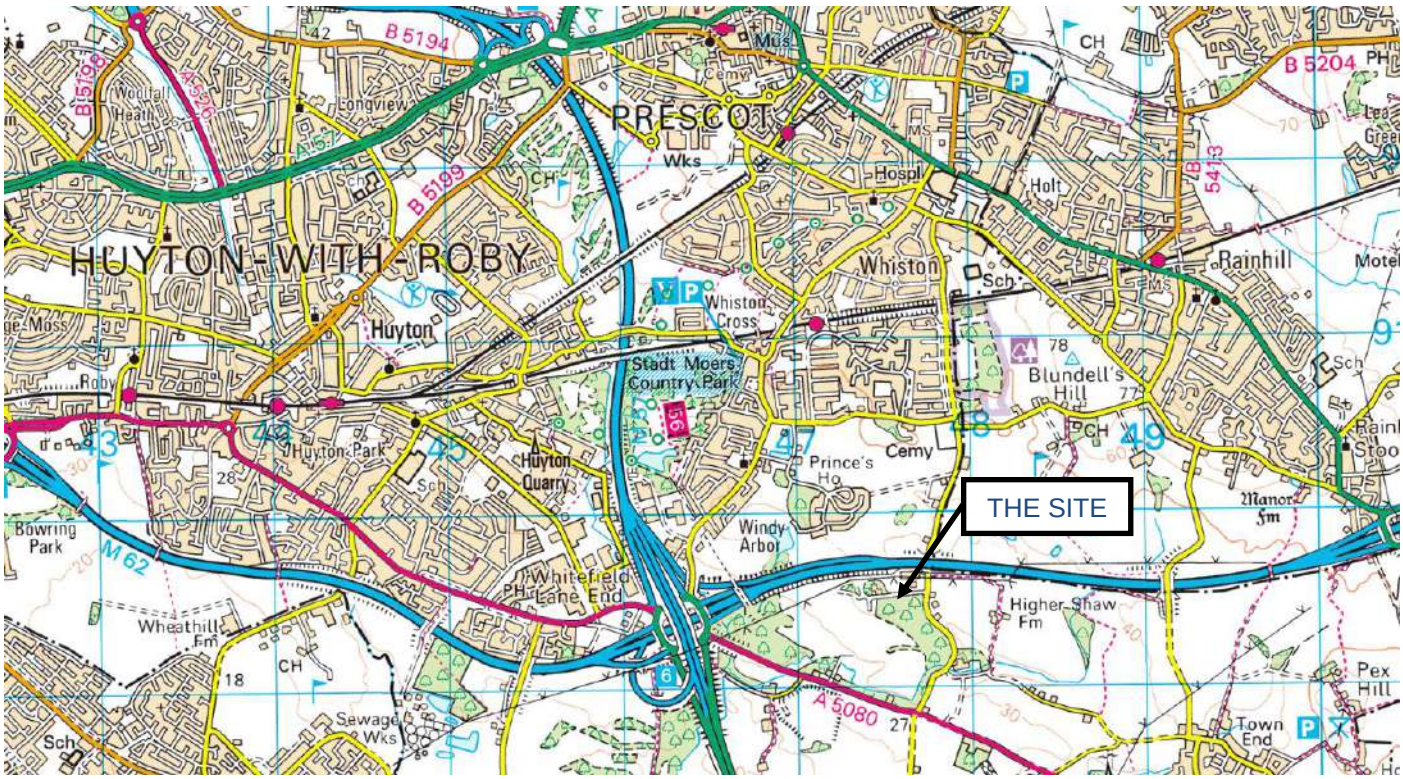
ACEC	Aggressive Chemical Environment for Concrete (classification)
aOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BRE	Building Research Establishment
CBR	California Bearing Ratio (test)
COMAH	Control of Major Accident Hazards (regulations)
Designated location	Site (and the ecosystem on that site) protected under national of international legislation. A potential ecological receptor to be considered as part of the assessment of land contamination. Example designated locations include SSSIs (q.v.), SACs (q.v.), national nature reserves, Ramsar sites and bird special protection areas.
DQA	Data Quality Assessment
DQO	Data Quality Objective
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EQS	Environmental Quality Standard
GAC	Generic Assessment Criterion
GQA	General Quality Assessment (Environment Agency)
GSV	Gas Screening Value
HCV	Health Criteria Value
IPPC	Integrated Pollution Prevention and Control (regulations)
K_{ow}	Octanol-water partition coefficient
LEL	Lower Explosive Limit
LL	Liquid Limit
LoD	Limit of Detection (analytical)
LoQ	Limit of Quantification (analytical)
Mean Value Test	Statistical test (described in the CIEH Guidance) to estimate the mean value of a normally distributed population of data at a given level of confidence. Normally for contaminated land assessment, the 95th percentile (referred to as the 95%UCL or US95) is applied as a reasonable but conservative estimate of the mean concentration for comparison with the relevant assessment criteria.
Maximum Value Test	Statistical test (described in the CIEH Guidance) to identify whether an elevated concentration within a normally distributed data set forms part of the underlying population from which it has been sampled or whether it is an outlier (such as a localised area of contamination) that merits further consideration.
MC	Moisture Content
NGR	National Grid Reference
NIHHS	Notification of Installations Handling Hazardous Substances (regulations)
OS	Ordnance Survey
PI	Plasticity Index
PID	Photoionisation Detector
PL	Plastic Limit
ppm	Parts per million
ppmv	Parts per million by volume
QA	Quality Assurance
QC	Quality Control
SAC	Special Area of Conservation
SOM	Soil Organic Matter

SPT	Standard Penetration Test
SPZ	Source Protection Zone (see Appendix M)
SSAC	Site-Specific Assessment Criterion
SSSI	Site of Special Scientific Interest
SVOC	Semi-Volatile Organic Compound
TEF	Toxicity Equivalent Factor
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
US95	95th percentile estimate of the true mean value of a data population (also known as 95%UCL).
VOC	Volatile Organic Compound

APPENDIX A - DRAWINGS

Contract Number	**TE1163**
Contract	Former Cronton Colliery Site
Client	DB Symmetry

Site Location Plan



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Scale	**NTS**		
Drawn by	JC	**Approved**	SL
Drawing Number	**TE1163GIR1**		



DO NOT SCALE

NOTES

1999 LOCATIONS:
- PARKMAN ROTARY CORE LOCATIONS

2003 LOCATIONS:
- SOIL MECHANICS ROTARY CORE LOCATIONS

2019 LOCATIONS
- WINDOW SAMPLE LOCATON
- TRIAL PIT LOCATION

2020 LOCATIONS:
- TRIAL PIT LOCATION
- ROTARY BOREHOLE LOCATION
- WINDOW SAMPLE LOCATION
- CABLE PERCUSSIVE LOCATION
- SAMPLE LOCATION
- DCP LOCATIONS

2022 LOCATIONS:
- CABLE BOREHOLE LOCATION
- DP LOCATION
- WINDOW SAMPLE LOCATION
- ROTARY OPENHOLE LOCATION
- SOAKAWAY LOCATION

2023 LOCATIONS:
- DP LOCATION
- WINDOW SAMPLE LOCATION
- CABLE PERCUSSIVE LOCATION
- ARUP LOCATION
- ROTARY BOREHOLE LOCATION
- TRIAL PIT LOCATION

2024 LOCATIONS:

- HISTORIC COLLIERY SETTLEMENT LAGOON
- SILT REMOVED
- SILT REMOVED
- APPROXIMATE AREA THAT REQUIRES DRILL AND GROUTING
- REQUIRED CONFIRMATORY BOREHOLES TO ESTABLISH ADEQUATE COVER IS PRESENT
- DRAINAGE RUN
- FAULT - APPROXIMATE LOCATION
- WORSLEY FOUR FEET COAL SEAM
- UNNAMED INFERRED COAL SEAM
- MINESHAFT LOCATION PLOTTED BASED ON INFORMATION PROVIDED BY ZTL

REV	DATE	BY	DESCRIPTION	CHK	APD
P5	26/09/2024	CS	2024 WINDOW SAMPLE LOCATIONS ADDED	AP	AP
P4	25/09/2024	CS	MINESHAFT PLOTTED	AP	AP
P3	08/12/2023	CS	UPDATE OF NEW DEVELOPMENT LAYOUT	AP	AP
P2	14/11/2023	CS	2023 TRIAL PITS INCLUDED	AP	AP
P1	23/03/2023	CS	ISSUED FOR INFORMATION	AP	AP

DRAWING STATUS: INFORMATION

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CLIENT: TRITAX SYMMETRY

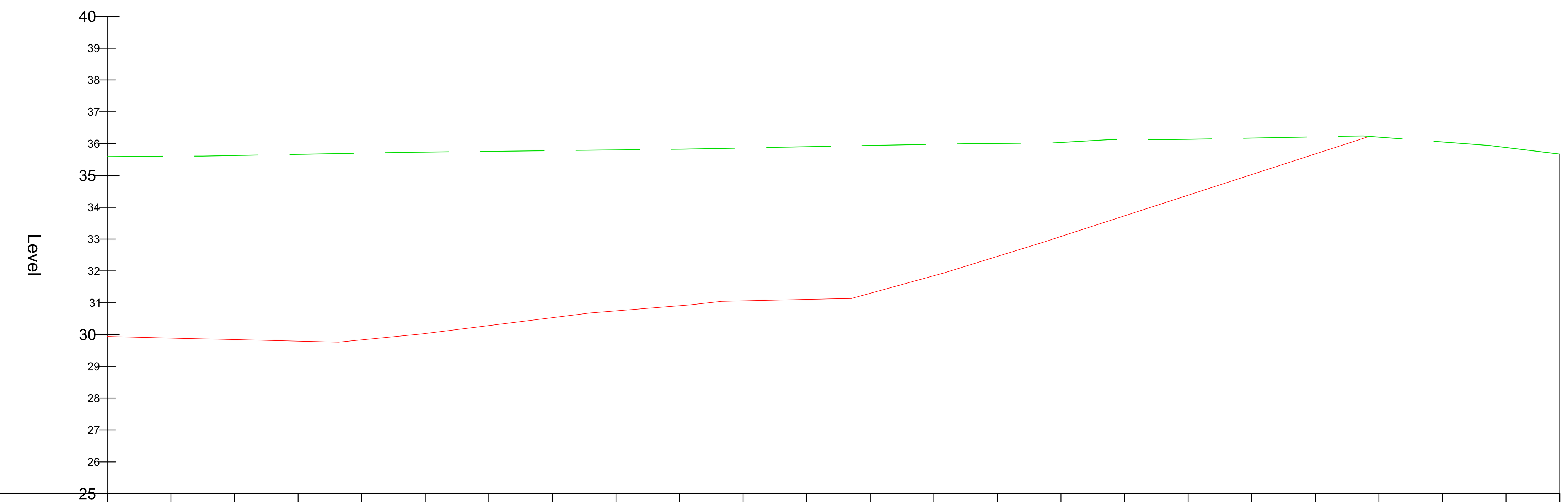
PROJECT: FORMER CRONTON COLLIERY

TITLE: SITE WIDE PLAN

SCALE @ SIZE:	CHECKED:	APPROVED:
NTS	AP	AP
CAD FILE: –	DESIGN/DRAWN: CS	DATE: 08.12.2023
PROJECT No: TE1163	DRAWING No: TE1163-TE-00-XX-DR-GE-027-V05	REV: P5

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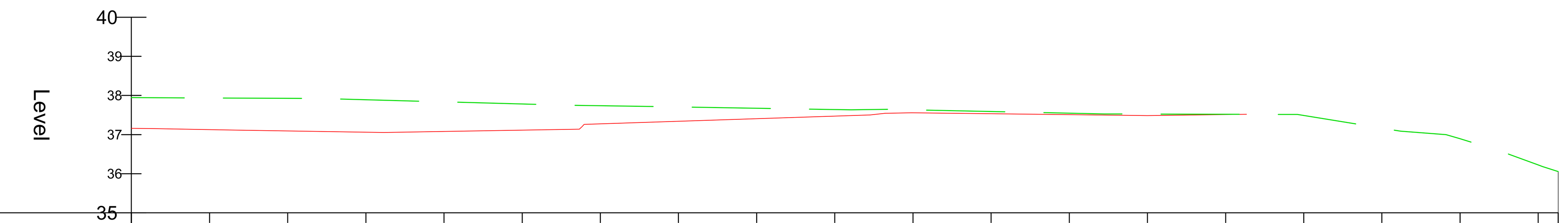
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6.000	35.665	29.794
8.000	35.701	29.834
10.000	35.734	30.032
12.000	35.757	30.282
14.000	35.781	30.531
16.000	35.804	30.746
18.000	35.828	30.908
20.000	35.864	31.059
22.000	35.903	31.104
24.000	35.942	31.299
26.000	35.981	31.849
28.000	36.008	32.456
30.000	36.037	33.083
32.000	36.124	33.731
34.000	36.138	34.380
36.000	36.177	35.028
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F-F - LONGSECTION

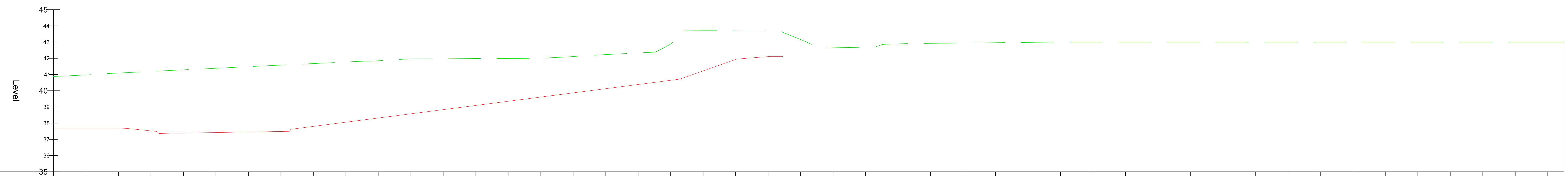
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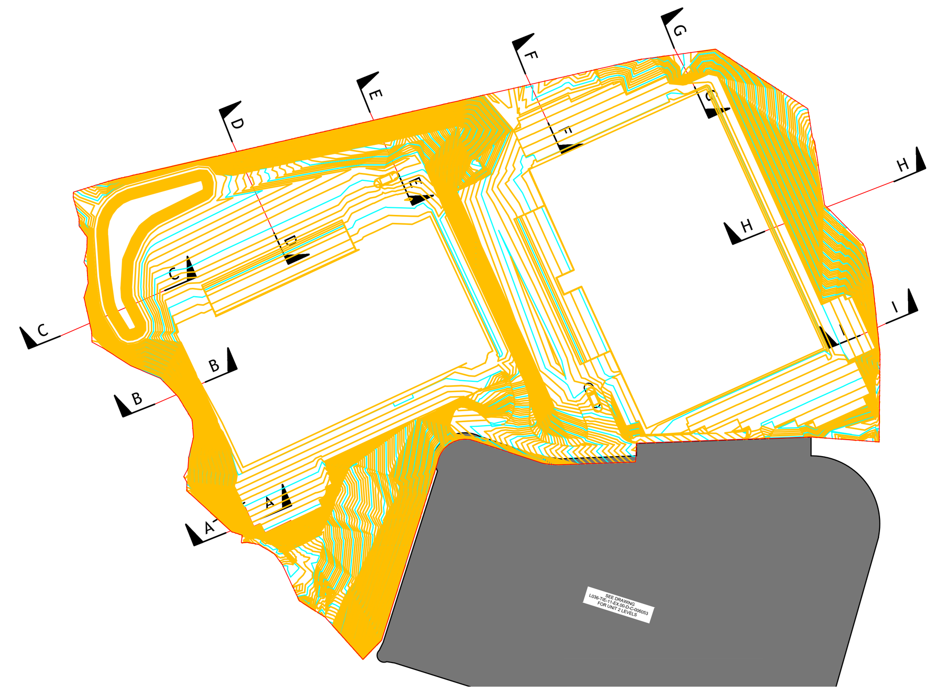
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10.000	37.782	37.112
12.000	37.738	37.275
14.000	37.705	37.340
16.000	37.673	37.406
18.000	37.640	37.471
20.000	37.633	37.558
22.000	37.591	37.533
24.000	37.548	37.509
26.000	37.526	37.484
28.000	37.519	37.510
30.000	37.487	
32.000	37.165	
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36.511	36.054	

H-H - LONGSECTION

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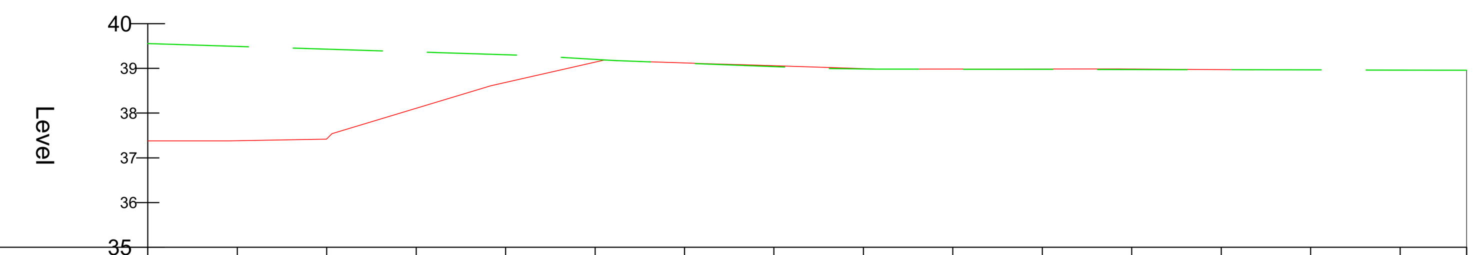


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8.000	41.288	37.387
10.000	41.385	37.420
12.000	41.483	37.453
14.000	41.580	37.487
16.000	41.676	37.799
18.000	41.771	38.058
20.000	41.850	38.316
22.000	41.965	38.575
24.000	41.974	38.834
26.000	41.983	39.092
28.000	41.992	39.351
30.000	42.005	39.610
32.000	42.111	39.868
34.000	42.230	40.127
36.000	42.331	40.386
38.000	42.875	40.644
40.000	43.702	41.223
42.000	43.694	41.929
44.000	43.685	42.108
46.000	43.156	
48.000	42.648	
50.000	42.681	
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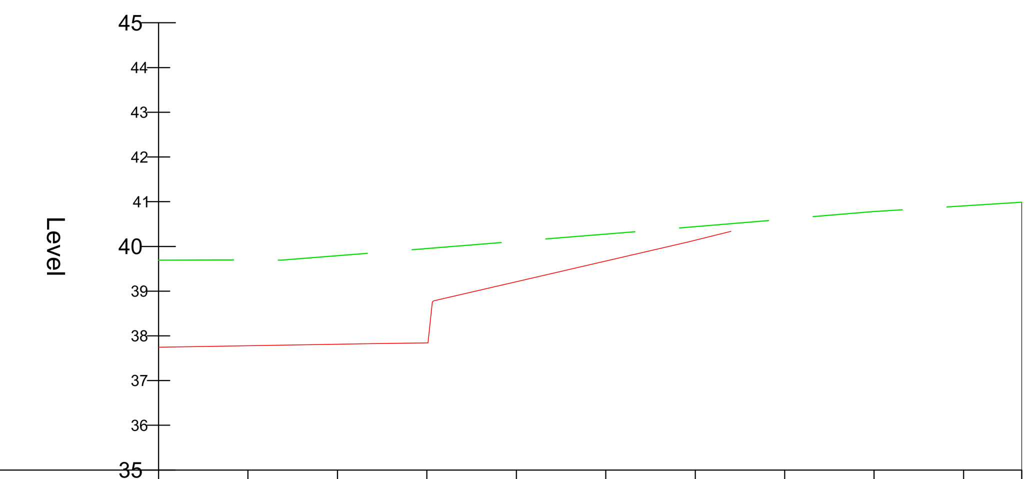
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8.000	39.304	38.688
10.000	39.201	39.140
12.000	39.116	39.123
14.000	39.040	39.060
16.000	38.989	38.995
18.000	38.982	38.986
20.000	38.978	38.987
22.000	38.974	38.987
24.000	38.970	38.974
26.000	38.966	
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I-I - LONGSECTION

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8.000	40.115	39.212
10.000	40.276	39.674
12.000	40.441	40.140
14.000	40.610	
16.000	40.782	
18.000	40.908	
19.301	40.990	

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Legend

Rev	Date	By	Description	Appd
P1	08.08.24	JCB	Issued for Information	WNL

Revisions

Status: PRELIMINARY

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Client: TRITAX SYMMETRY HUYTON LIMITED

Project: SYMMETRY PARK CRONTON

Title: UNIT 3 AND 4 - TIE IN SECTIONS SHEET 2

Scale: 1:100@A0 | Drawn: JCB | Revision: P1
Date: Jan'21 | Checked: WNL

TIER Project No: T_18_2126

Drawing Ref : L005-TIE-ZZ-XX-DR-C-6071

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Legend

RETAINING WALL MAX HEIGHT 1.5M

RETAINING WALL MAX HEIGHT 1.8M

RETAINING WALL MAX HEIGHT 0.8M

RETAINING WALL MAX HEIGHT 4.0M

RETAINING WALL MAX HEIGHT 2.3M

RETAINING WALL MAX HEIGHT 1.3M

RETAINING WALL MAX HEIGHT 1.9M

RETAINING WALL MAX HEIGHT 1.1M

SEE DRAWING L036-TIE11-EX-00-D-C-006053 FOR UNIT 2 LEVELS

Rev	Date	By	Description	Appd
P13	09.08.24	JCB	Retaining walls updated	WNL
P12	29.07.24	JCB	Updated with changes to architect layout	WNL
P11	15.02.23	JCB	Updated with changes to architect layout	WNL
P10	29.01.24	JCB	Yard Entrances and dock levellers updated	WNL
P9	27.11.23	JCB	Attenuation pond Added	WNL
P8	17.11.23	JCB	Levels updated with new site plan	WNL
P7	07.11.23	JCB	Levels updated with new site plan	WNL
P6	08.08.23	JCB	Site Plan Updated	WNL
P5	22.06.23	JCB	Site Plan Updated	WNL
P4	23.03.23	JCB	Unit 2 FFL Raised	WNL
P3	12.01.23	JCB	Issued for Information	WNL
P2	09.01.23	JCB	Issued for Information	WNL
P1	06.01.23	JCB	Issued for Information	WNL

Revisions

Status

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TRITAX SYMMETRY HUYTON LIMITED

Project

SYMMETRY PARK
CRONTON

Title

XL UNIT 3 AND 4 - Proposed Levels

Scale	Drawn	Revision
1:750@A0	JCB	P13
Date	Checked	
Jan'21	WNL	

TIER Project No: T_18_2126

Drawing Ref.: L005-TIE-ZZ-XX-DR-C-6034

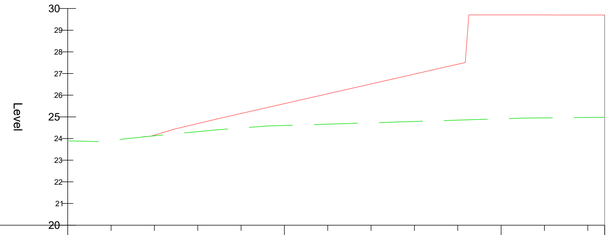
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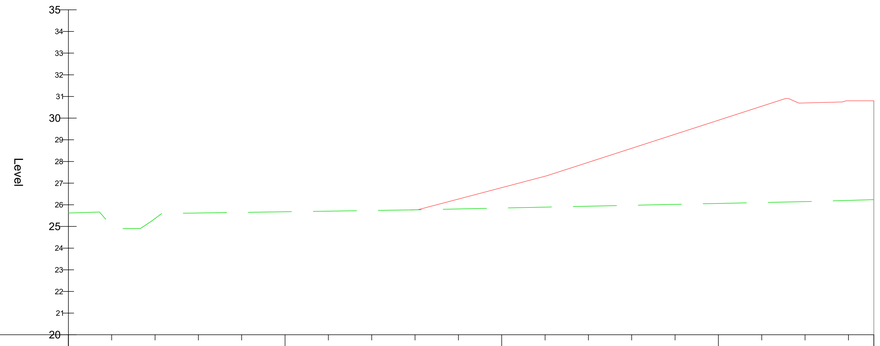
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A-A - LONGSECTION
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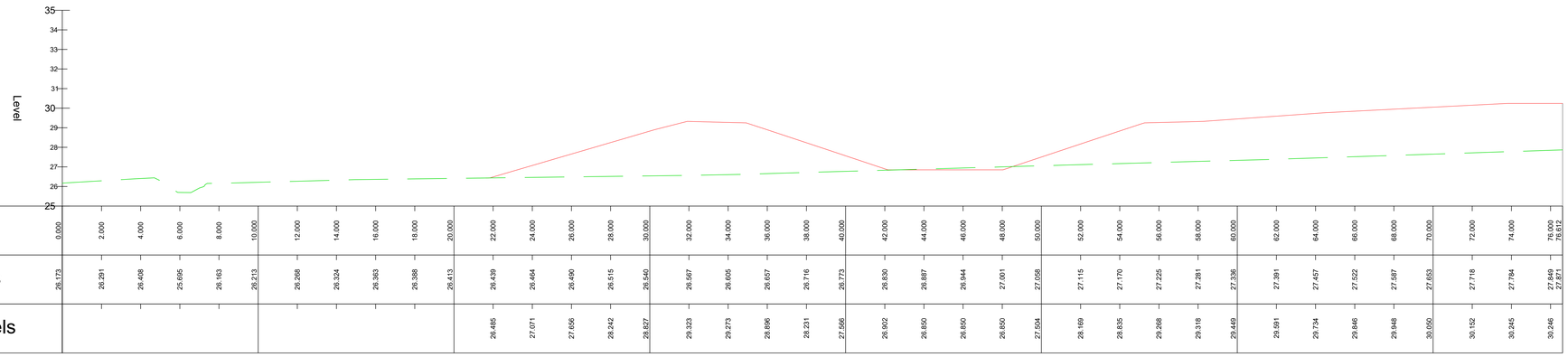
Chainage	0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000	16.000	18.000	20.000	22.000	24.000	24.781
Existing Levels	23.891	23.861	24.127	24.318	24.485	24.601	24.663	24.726	24.788	24.850	24.912	24.953	24.973	24.980
Proposed Levels			24.157	24.691	25.157	25.611	26.066	26.520	26.974	27.429	29.706	29.703	29.701	

B-B - LONGSECTION
SCALE: H 1:100,V 1:100. DATUM: 20.000



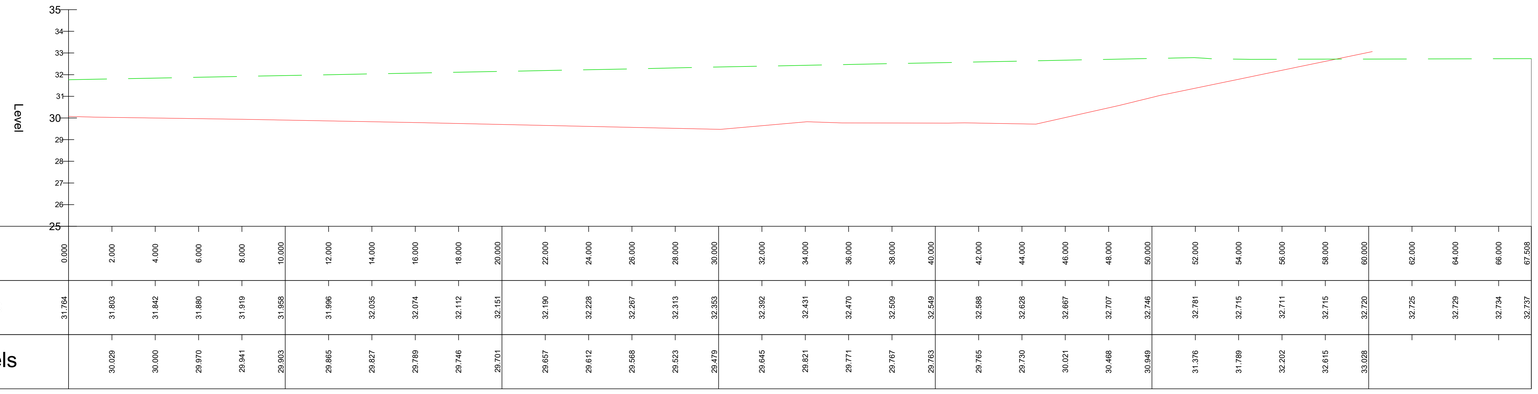
Chainage	0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000	16.000	18.000	20.000	22.000	24.000	26.000	28.000	30.000	32.000	34.000	36.000	37.173
Existing Levels	25.619	25.002	25.367	25.621	25.649	25.678	25.707	25.737	25.766	25.806	25.848	25.891	25.934	25.976	26.019	26.061	26.104	26.147	26.203	26.238
Proposed Levels		25.002	25.367	25.621	25.649	25.678	25.707	25.737	25.766	25.806	25.848	25.891	25.934	25.976	26.019	26.061	26.104	26.147	26.203	

C-C - LONGSECTION
SCALE: H 1:100,V 1:100. DATUM: 25.000

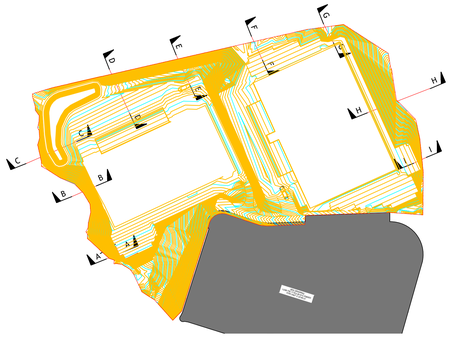


Chainage	0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000	16.000	18.000	20.000	22.000	24.000	26.000	28.000	30.000	32.000	34.000	36.000	38.000	40.000	42.000	44.000	46.000	48.000	50.000	52.000	54.000	56.000	58.000	60.000	62.000	64.000	66.000	68.000	70.000	72.000	74.000	76.000	76.612
Existing Levels	26.173	26.291	26.408	25.695	26.163	26.213	26.268	26.324	26.363	26.388	26.413	26.439	26.464	26.490	26.515	26.540	26.567	26.605	26.657	26.716	26.773	26.830	26.887	26.944	27.001	27.058	27.115	27.170	27.225	27.281	27.336	27.391	27.457	27.522	27.587	27.653	27.718	27.784	27.849	27.871
Proposed Levels												26.485	27.071	27.656	28.242	28.827	29.323	29.273	28.696	28.231	27.596	26.902	26.850	26.850	26.850	27.504	28.169	28.835	29.268	29.318	29.449	29.591	29.734	29.846	29.948	30.050	30.152	30.245	30.246	

D-D - LONGSECTION
SCALE: H 1:100,V 1:100. DATUM: 25.000



Chainage	0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000	16.000	18.000	20.000	22.000	24.000	26.000	28.000	30.000	32.000	34.000	36.000	38.000	40.000	42.000	44.000	46.000	48.000	50.000	52.000	54.000	56.000	58.000	60.000	62.000	64.000	66.000	67.508
Existing Levels	31.764	31.803	31.842	31.880	31.919	31.958	31.996	32.035	32.074	32.112	32.151	32.190	32.228	32.267	32.313	32.353	32.392	32.431	32.470	32.509	32.549	32.588	32.628	32.667	32.707	32.746	32.781	32.715	32.711	32.715	32.720	32.725	32.729	32.734	32.737
Proposed Levels		30.029	30.000	29.970	29.941	29.903	29.865	29.827	29.789	29.746	29.701	29.657	29.612	29.568	29.523	29.479	29.645	29.821	29.771	29.767	29.763	29.765	29.730	30.021	30.468	30.949	31.376	31.789	32.202	32.615	33.028				



0 18 36 Meters

P1 08.08.24 JCB Issued for Information WNL

Rev	Date	By	Description	Appd

Revisions

Status

PRELIMINARY

Tier Consult Ltd.
Richmond House
Sandpiper Court
Chester Business Park
Chester | CH4 9QZ
t: 01244 684900

Client

TRITAX SYMMETRY HUYTON LIMITED

Project

SYMMETRY PARK
CRONTON

Title

UNIT 3 AND 4 - TIE IN SECTIONS
SHEET 1

Scale	Drawn	Revision
1:100@A0	JCB	P1
Date	Checked	
Jan'21	WNL	

TIER Project No: T_18_2126

Drawing Ref: L005-TIE-ZZ-XX-DR-C-6070

APPENDIX B - EXPLORATORY HOLE LOGS

Borehole Log

Borehole No. **WS501**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347440.00 - 389653.00	Hole Type WS
Location:	Cronton		Level:	34.47	Scale 1:25
Client:	Tritax Symmetry		Dates:	25/09/2024 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	34.27		MADE GROUND: Dark brown, sandy to slightly sandy, slightly gravelly, slightly clayey SILT. Gravel is angular to subrounded, fine to medium of brick and mixed natura lithologies, with a medium organic content. (TOPSOIL) MADE GROUND
					0.80	33.67		Dark, reddish brown, slightly silty, clayey to very clayey, fine SAND TILL
		1.20 1.20 1.20	D SPTL S	N=8 (1,2/2,2,2,2)				Firm, dark brown and mottled yellowish brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to subrounded, fine to medium of mixed natural lithologies. TILL
		2.00 2.00	SPTL S	N=21 (3,3/5,5,5,6)				
					2.30	32.17		Weathered bedrock recovered as dark reddish brown, fine SAND. KINNERTON SANDSTONE FORMATION
		2.70 2.70	SPTL S	N=50 (8,9/11,12,13,14)				
					3.15	31.32		End of borehole at 3.15 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) Terminated on SPT refusal 3) Backfilled with arisings. 4) No groundwater encountered

Borehole Log

Borehole No. **WS502**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347337.50 - 389643.00	Hole Type WS
Location:	Cronton		Level:	37.40	Scale 1:25
Client:	Tritax Symmetry		Dates:	25/09/2024 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	37.20		MADE GROUND: Dark brown, sandy to slightly sandy, slightly gravelly, slightly clayey SILT. Gravel is angular to subrounded, fine to medium of brick and mixed natura lithologies, with a medium organic content. (TOPSOIL) MADE GROUND
					0.90	36.50		Light brown, slightly clayey to clayey, silty, fine SAND. TILL
		1.20 1.20	SPTL S	N=11 (3,3/3,2,3,3)				Firm, dark brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to subrounded, fine to medium of mixed natural lithologies. TILL
		2.00 2.00 2.00	D SPTL S	N=19 (4,4/4,4,5,6)				
		2.50 2.50	SPTL S	50 (27 for 135mm/50 for 145mm)	2.40	35.00		Weathered bedrock recovered as stiff, dark brown and greyish brown CLAY PENNINE UPPER COAL MEASURES
					2.78	34.62		End of borehole at 2.78 m

Remarks

1) Hand dug pit to 1.20m bgl 2) Terminated on SPT refusal 3) Backfilled with arisings 4) No groundwater encountered.

Borehole Log

Borehole No. **WS503**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347250.50 - 389626.50	Hole Type WS
Location:	Cronton		Level:	37.94	Scale 1:25
Client:	Tritax Symmetry		Dates:	25/09/2024 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	37.79		MADE GROUND: Dark brown, slightly sandy, angular SILT with a high organic content and occasional rootlets (TOPSOIL) MADE GROUND
								MADE GROUND: Firm dark brown, slightly sandy, gravelly CLAY. Gravel is angular to subrounded, fine to coarse of brick and mixed natural lithologies. MADE GROUND
		1.20 1.20	SPTL S	N=13 (2,3/4,3,3,3)				
					1.35	36.59		Firm, dark brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to subrounded, fine to medium of mixed natural lithologies. TILL
		2.00 2.00	SPTL S	N=12 (3,3/3,3,3,3)				
					2.60	35.34		Weathered bedrock recovered as stiff, dark brown and greyish brown CLAY. PENNINE MIDDLE COAL MEASURES
		3.00 3.00 3.00	D SPTL S	50 (25 for 125mm/50 for 135mm)				
					3.26	34.68		End of borehole at 3.26 m

Remarks

1) Hand dug pit to 1.20m bgl 2) Terminated on SPT refusal 3) Backfilled with arisings 4) No groundwater encountered.

Borehole Log

Borehole No. **WS504**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347184.00 - 389612.00	Hole Type WS
Location:	Cronton		Level:	39.42	Scale 1:25
Client:	Tritax Symmetry		Dates:	25/09/2024 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	39.22		MADE GROUND: Dark brown, slightly sandy, angular SILT with a high organic content and occasional rootlets (TOPSOIL) MADE GROUND
								MADE GROUND: Dark brown and reddish brown and grey, slightly sandy to sandy, slightly clayey to clayey, angular to subrounded, fine to medium GRAVEL of brick, concrete and mixed natural lithologies. MADE GROUND
		1.20 1.20	SPTL S	N=15 (3,3/3,5,5,2)				
					1.50	37.92		Firm ,dark brown, slightly sandy CLAY TILL
		2.00 2.00 2.00	D SPTL S	N=25 (1,3/4,7,7,7)				
					2.20	37.22		Weathered bedrock recovered as stiff, dark brown and greyish brown CLAY. PENNINE MIDDLE COAL MEASURES
		2.80 2.80	SPTL S	50 (25 for 135mm/50 for 145mm)				
					3.08	36.34		End of borehole at 3.08 m

Remarks

1) Hand dug pit to 1.20m bgl 2) Terminated at SPT refusal 3) Backfilled with arisings 4) No groundwater encountered.

Trial Pit Log

Trialpit No **TP07**

Sheet 1 of 1

Project Name:	Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347318.39 - 389589.30 Level: 40.16
Location:	Cronton	Dimensions (m): Depth 4.00	Scale 1:25
Client:	DB symmetry		Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.40	ES		0.50	39.66		MADE GROUND: Dark brown, sandy silty, slightly gravelly LOAM. Gravel is angular to sub-rounded, fine to coarse of coal, brick and mixed natural lithologies. MADE GROUND
	1.50	B		3.35	36.80		Firm consistency, dark reddish brown and mottled grey, sandy CLAY. TILL
				4.00	36.16		Weathered bedrock recovered as light grey, brownish, gravelly, fine to medium SAND. Gravel is angular to sub-rounded, fine to coarse of sandstone. KINNERTON SANDSTONE FORMATION End of pit at 4.00 m

Remarks: 1) Trial pit dry. 2) Terminated in natural ground.

Stability: Stable

Trial Pit Log

Trialpit No **TP08**

Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347365.80 - 389578.67 Level: 41.69	Date
Location: Cronton		Dimensions (m): Depth 3.00	Scale 1:25
Client: DB symmetry			Logged MM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.25	ES		0.30	41.39		MADE GROUND: Dark brown, sandy, silty, clayey LOAM, with frequent rootlets. (Topsoil). MADE GROUND
				0.60	41.09		POSSIBLE MADE GROUND: Dark brown, silty, clayey, fine to medium SAND. MADE GROUND
				3.00	38.69		Firm consistency, orange to orangish brown sandy, slightly gravelly CLAY, with a low boulder content. Gravel is sub-angular to sub-rounded, fine to coarse of mixed natural lithologies. Boulder is sub-angular, large of sandstone. TILL End of pit at 3.00 m

1 2 3 4 5

Remarks: 1) Groundwater strike at 1.30m bgl. 2) Terminated in natural ground.

Stability: Stable

Trial Pit Log

Trialpit No **TP15** Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347190.33 - 389427.81 Level: 34.07	Date
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: DB symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	33.87		MADE GROUND: Light brown, silty, sandy LOAM. (Topsoil). MADE GROUND
	0.40	ES		0.50	33.57		MADE GROUND: Dark black to grey, sandy, angular to rounded, fine to coarse GRAVEL of concrete, brick and sandstone. (Demolition rubble). MADE GROUND
	1.00	B					MADE GROUND: Dark brown and black, sandy, silty, sub-angular to rounded, fine to coarse GRAVEL of sandstone, coal, mudstone and brick. (Colliery Spoil). MADE GROUND
				1.70	32.37		Weathered bedrock recovered as: Light brown, sandy, subangular to rounded, fine to coarse GRAVEL of sandstone and siltstone. PENNINE MIDDLE COAL MEASURES
				4.00	30.07		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) Trial pit collapsing throughout. 2) Slight groundwater seepage throughout. 3) Terminated in natural ground.

Stability: Unstable

Trial Pit Log

Trialpit No **TP17** Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347389.87 - 389560.49 Level: 42.78	Date
Location: Cronton		Dimensions (m): Depth 3.00	Scale 1:25
Client: DB symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	ES		0.45	42.33		MADE GROUND: Dark brown, slightly clayey, slightly graveley, fine SAND. Gravel is sub-angular to sub-rounded, fine to medium of brick, concrete and mixed natural lithologies. MADE GROUND
				1.80	40.98		Frim, light brown, mottled grey, sandy CLAY. TILL
				3.00	39.78		Weathered bedrock, recovered as very clayey, fine SAND. KINNERTON SANDSTONE FORMATION
							End of pit at 3.00 m

1 2 3 4 5

Remarks: 1) No groundwater encountered. 2) Terminated at 3.0m bgl in natural ground.

Stability: Stable

Trial Pit Log

Trialpit No **TP18** Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 346921.04 - 389504.89 Level: 27.60	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 3.15	Scale 1:25
Client: DB symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES					MADE GROUND: Dark brown, sandy, silty, clayey LOAM with frequent rootlets. (Topsoil). MADE GROUND
				0.30	27.30		Firm becoming stiff, fissured, sandy to very sandy, slightly graveley to graveley CLAY. Gravel is sub-angular to rounded, fine to coarse of mixed natural lithologies. Sand is fine to coarse with a low cobble content of sub-rounded mixed natural lithologies. TILL *Occasional sand horizons*
				3.10 3.15	24.50 24.45		Weak, light grey, fine SANDSTONE PENNINE MIDDLE COAL MEASURES End of pit at 3.15 m

Remarks: 1) No groundwater encountered. 2) Terminated at 3.15 in natural ground.

Stability: Stable

Trial Pit Log

Trialpit No **TP19**

Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 346984.72 - 389368.87 Level: 25.15	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 3.10	Scale 1:25
Client: DB symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.25	ES					MADE GROUND: Dark brown, sandy, silty LOAM. (Topsoil). MADE GROUND
				0.40	24.74		
	1.00	B					Light orangish brown, slightly clayey, silty, fine to medium SAND TILL
				1.50	23.64		
							Firm, dark brown, sandy to very sandy CLAY with frequent sand pockets and lenses. TILL
				2.95	22.20		
							Weak, light grey, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES
				3.10	22.04		End of pit at 3.10 m

1 2 3 4 5

Remarks: 1) No groundwater encountered. 2) Terminated at 3.10m bgl.

Stability: Stable

AGS

Trial Pit Log

Trialpit No **TP25** Sheet 1 of 1

Project Name:	Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347142.18 - 389417.51 Level: 29.38
Location:	Cronton	Dimensions (m): Depth 2.60	Date 30/07/2019
Client:	DB symmetry		Scale 1:25 Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Dark browm, sandy, silty LOAM with frequent rootlets. MADE GROUND
				0.50	28.88		Weathered Bedrock recovered as: Light orangish brown to reddish brownish, gravelly to very gravelly, fine to medium SAND. Gravel is angular to rounded, fine to coarse of mudstone and sandstone. PENNINE MIDDLE COAL MEASURES
▼				2.50	26.88		Very weak fine SANDSTONE. PENNINE MIDDLE COAL MEASURES
				2.60	26.78		End of pit at 2.60 m

1 2 3 4 5

Remarks: 1) Groundwater encountered at 2.30m bgl rising to 2.10m bgl after 20 minutes. 2) Terminated at 2.60m bgl on rockhead.

Stability: Stable

Trial Pit Log

Tier Environmental

Trialpit No **TP26** Sheet 1 of 1

Project Name:	Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347382.89 - 389602.27 Level: 41.47
Location:	Cronton	Dimensions (m): Depth 4.70	Scale 1:25
Client:	DB symmetry		Logged TM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	41.17		MADE GROUND: Dark brown, sandy, silty, clayey LOAM with frequent rootlets. (Topsoil). MADE GROUND
				1.00	40.47		Light reddish brown, sandy, silty fine SAND. (Subsoil). SAND
	1.50 1.50	B ES		2.90	38.57		Firm becoming stiff, dark reddish brown and mottled grey, sandy to very sandy, slightly gravelly CLAY. Gravel is sub-angular to rounded, fine to coarse of mixed natural lithologies with a low cobble content of sub-rounded mixed natural lithologies. TILL
	3.50 3.50	B ES		4.70	36.77		Weatherd bedrock recovered as reddish/brownish, slightly gravelley, silty, fine to coarse SAND. Gravel is angular to sub-rounded, fine to coarse of fine to medium sandstone. KINNERTON SANDSTONE FORMATION *Increasing gravel content with depth* End of pit at 4.70 m

Remarks: 1) Trial pit dry. 2) Terminated in natural ground at 4.70m bgl.

Stability: Stable

AGS

Borehole Log

Borehole No. **WS01**

Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347363.41 - 389620.64	Hole Type WLS
Location: Cronton		Level: 40.15	Scale 1:50
Client: DB symmetry		Dates: 24/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.30	39.85		MADE GROUND: Dark brown, sandy, silty, clayey LOAM. TOPSOIL
		0.60	ES		0.65	39.50		Dark brown, mottled grey, slightly clayey, silty SAND. Sand is fine. SUBSOIL
		1.20 1.20 1.20 - 1.65	ES SPTLS	N=9 (1,2/2,2,2,3)				Medium strength, firm, friable, dark brown and mottled grey, slightly sandy, slightly gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to medium of mixed natural lithologies with fragments of coal. TILL
		2.00 2.00 2.00 - 2.45	ES SPTLS	N=14 (2,2/2,3,4,5)	2.20	37.95		Weather Bedrock recovered as: Medium dense to very dense, dark brown and mottled grey, sandy, clayey, angular to subrounded, fine to coarse GRAVEL of fine to medium sandstone and coal. PENNINE MIDDLE COAL MEASURES
	▼	2.70 2.70 - 3.10	 SPTLS	55 (8,8/55 for 220mm)	3.07	37.08		End of borehole at 3.07 m

Remarks

1) Groundwater encountered at 2.70m bgl. 2) Terminated at 3.70m bgl. 3) Hand dug pit to 1.2m bgl.

Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 346908.86 - 389540.02	Hole Type WLS
Location: Cronton		Level: 29.30	Scale 1:50
Client: DB symmetry		Dates: 26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.25	ES		0.35	28.95		Dark brown, slightly sandy, very clayey LOAM with frequent rootlets. TOPSOIL
		0.60	ES					Loose, light brown and orangey, very clayey, fine to medium SAND TILL
		1.20 1.20	SPTL S	N=8 (2,2/2,2,2,2)	1.60	27.70		Firm, dark brown, orangey, mottled grey, slightly gravely, slightly sandy, CLAY. Gravel is sub-angular, medium of siltstone. TILL
		2.00 2.00	SPTL S	N=50 (2,3/50 for 275mm)	2.25 2.43	27.05 26.88		Extremely weak, light yellowish-brown, fine to medium SANDSTONE PENNINE MIDDLE COAL MEASURES End of borehole at 2.43 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at 2.35m bgl due to refusal.

Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347169.02 - 389460.33	Hole Type WLS
Location: Cronton		Level: 34.33	Scale 1:50
Client: DB symmetry		Dates: 26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.30	34.03		Dark brown sandy, silty, gravelley LOAM. Gravel is angular, medium of siltstone. TOPSOIL
		0.75	ES					Weathered Bedrock recovered as stiff-very stiff, light brown, dark brown-black, thinly laminated fissile slightly sandy CLAY. PENNINE MIDDLE COAL MEASURES
		1.00 - 1.45	SPTLS	N=26 (6,6/6,6,6,8)	1.00	33.33		Weathered Bedrock recovered as very stiff, dark brown-black, friable slightly sandy CLAY. PENNINE MIDDLE COAL MEASURES
		1.20			1.45	32.88		Weathered Bedrock recovered as dark brown - black clayey, sandy, angular to sub-rounded, fine to course GRAVEL of siltstone mudstone and coal with a high organic content. PENNINE MIDDLE COAL MEASURES
		1.80	ES					
		2.00		50 (9,10/50 for 190mm)				
		2.00 - 2.45	SPTLS		2.41	31.92		End of borehole at 2.41 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated on refusal at 2.45m bgl.

Borehole Log

Borehole No. **WS11**

Sheet 1 of 1

Project Name:	Former Cronton Colliery Site	Project No. TE1163	Co-ords:	347150.61 - 389605.07	Hole Type WLS
Location:	Cronton		Level:	37.05	Scale 1:50
Client:	DB symmetry		Dates:	26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40	ES					Dark brown, sandy, silty, gravely LOAM. Gravel is angular to sub-rounded, fine to coarse. of mixed natural lithologies. TOPSOIL
		0.90	ES		0.80	36.25		Medium strength becoming high strength, firm becoming stiff, dark brown mottled light grey, slightly sandy, gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to coarse of mixed natural lithologies. TILL
		1.20 1.20	SPTL S	N=15 (2,2/3,3,4,5)				
		2.00 2.00	SPTL S	N=16 (3,3/3,4,4,5)				
		3.00 3.00	SPTL S	50 (8,10/50 for 200mm)	3.00 3.35	34.05 33.70		Weathered Bedrock recovered as very high strength, stiff dark grey, sandy CLAY. PENNINE MIDDLE COAL MEASURES End of borehole at 3.35 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at 3.10m bgl due to refusal.

Borehole Log

Borehole No. **WS12**

Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347284.13 - 389409.11	Hole Type WLS
Location: Cronton		Level: 35.71	Scale 1:50
Client: DB symmetry		Dates: 26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.40	35.30		Dark brown-black clayey, sandy, LOAM. Sand is fine. (Topsoil) TOPSOIL
		1.00	ES		1.00	34.70		Firm, light brown, sandy, gravely CLAY. Sand is fine, Gravel is angular to rounded, fine to medium of coal and natural lithics. TILL
		1.20 1.20 - 1.65	SPTL S	N=29 (2,2/5,6,7,11)				Weathered Bedrock recovered as high to very high strength, firm becoming very stiff, light grey, sandy, silty, laminated/fissile CLAY. Sand is fine PENNINE MIDDLE COAL MEASURES
		1.50 1.50 - 1.83	SPTL S	38 (8,15/38 for 105mm)	1.83	33.88		End of borehole at 1.83 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated on refusal in natural ground.

Borehole Log

Borehole No. **WS13**

Sheet 1 of 1

Project Name: Former Cronton Colliery Site	Project No. TE1163	Co-ords: 347481.52 - 389403.40	Hole Type WLS
Location: Cronton		Level: 42.45	Scale 1:50
Client: DB symmetry		Dates: 25/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES					MADE GROUND: Dark grey to black, sandy, slightly clayey GRAVEL angular to sub-angular, fine to coarse of coal, brick, burnt shale and other natural lithologies (Colliery Spoil). MADE GROUND
		1.20		N=12 (4,3/3,3,3,3)				
		1.20 - 1.65	SPTLS		1.50	40.95		
		1.50	ES					MADE GROUND: Medium to high strength, firm consistency, black, very gravelly CLAY. Gravel is angular to sub-angular, fine to coarse of brick, burnt shale and other natural lithologies. (Colliery Spoil) MADE GROUND
		2.00		N=9 (2,2/2,2,2,3)				
		2.00 - 2.45	SPTLS					
		3.00		N=24 (3,4/6,6,6,6)				
		3.00 - 3.45	SPTLS		3.60	38.85		
		4.00		N=19 (3,4/4,5,5,5)				MADE GROUND: High to very high strength, Stiff consistency, black, very gravelly CLAY, Gravel is angular to sub-angular, fine to coarse of mudstone, coal and other natural lithologies. (Colliery Spoil) MADE GROUND
		4.00 - 4.45	SPTLS					
		4.80	SPTLS	50 (25 for 20mm/50 for 20mm)	4.84	37.61		End of borehole at 4.84 m
		4.80						

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at 4.80m bgl.

Borehole Log

Borehole No. **WS14**

Sheet 1 of 1

Project Name:	Former Cronton Colliery Site	Project No. TE1163	Co-ords:	347072.63 - 389315.32	Hole Type WLS
Location:	Cronton		Level:	24.96	Scale 1:50
Client:	DB symmetry		Dates:	26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.25	24.71		Dark brown to black, sandy, silty, clayey LOAM. Sand is fine. (MADE GROUND
		0.50	ES					Low strength, firm, brown mottled light grey, slightly gravelly, slightly sandy CLAY. Gravel is subangular to subrounded, fine to coarse of mixed natural lithologies. TILL
		1.20 1.20	SPTL S	N=6 (1,1/1,1,2,2)				
		2.00 2.00	SPTL S	N=27 (2,3/4,5,8,10)	2.00	22.96		Weathered Bedrock Recovered as high to very high strength, very stiff, greyish brown, gravelly, very sandy CLAY. Gravel is subangular to subrounded, fine to medium of mudstone and sandstone. PENNINE MIDDLE COAL MEASURES
		2.60 2.60	SPTL S	50 (8,12/50 for 220mm)	2.97	21.99		End of borehole at 2.97 m

Remarks

1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) No groundwater encountered. 3) Terminated at 3.00m bgl in natural ground.

Borehole Log

Borehole No.
WS101
Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347187.68 - 389420.84	Hole Type WLS
Location:	Cronton		Level: 34.14	Scale 1:50
Client:	Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00 1.00 - 1.45	SPTL S	N=7 (2,3/2,1,2,2)				MADE GROUND: Black, slightly sandy, clay, silty angular to subrounded, fine to coarse GRAVEL of mudstone, siltstone and brick with a high proportion of ash. MADE GROUND
					1.50	32.64		Firm consistency, dark brown and orangish brown, slightly silty, sandy CLAY. TILL
					1.80	32.34		Extremely weak strength, light brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
		2.00 2.00 - 2.26	SPTL S	N=50 (25 for 115mm/50 for 145mm)	2.26	31.88		End of borehole at 2.26 m

Remarks
1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347299.23 - 389503.36	Hole Type WLS
Location:	Cronton		Level: 37.29	Scale 1:50
Client:	Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	37.14		Dark brown, sandy, clayey, silty LOAM. TS
		1.00 1.00 - 1.45	SPTL S	N=16 (2,3/4,4,4,4,4)				Firm to stiff consistency, dark orangish brown and grey CLAY. TILL
					1.55	35.74		Extremely weak strength, laminated, dark brown and black SHALE.
		2.00 2.00 - 2.45	SPTL S	N=40 (6,10/40 for 200mm)	2.45	34.84		End of borehole at 2.45 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347137.30 - 389530.31	Hole Type WLS
Location: Cronton		Level: 35.22	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	35.07		Dark brown, sandy LOAM. TS Firm consistency, dark brown, sandy CLAY. TILL
		1.00 1.00 - 1.45	SPTL S	N=22 (4,4/4,4,4,10)	0.90	34.32		Extremely weak, friable, thinly laminated, dark brown and dark grey SANDSTONE and interbedded SHALE. PENNINE MIDDLE COAL MEASURES
		1.80 1.80 - 1.93	SPTL S	N=50 (25 for 60mm/50 for 70mm)	1.93	33.29		End of borehole at 1.93 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347072.24 - 389435.31	Hole Type WLS
Location:	Cronton		Level:	29.58	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	29.38		Dark brown, sandy, silty, clayey LOAM. TS
								Stiff consistency, dark brown and mottled grey, sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
					1.95	27.63		Extremely weak strength, reddish brown, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES
					2.20	27.38		End of borehole at 2.20 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347056.91 - 389369.11	Hole Type WLS
Location: Cronton		Level: 26.34	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	26.14		Dark brown, sandy, silty, clayey LOAM. TS
		1.20 1.20 - 1.65	SPTL S	N=16 (3,3/4,4,4,4)				High strength, stiff consistency, dark brown and mottled grey, sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
		2.00 2.00 - 2.20	SPTL S	N=70 (3 for 75mm/70 for 160mm)	1.95 2.20	24.39 24.14		Extremely weak strength, reddish brown, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES End of borehole at 2.20 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS107**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347255.68 - 389602.38	Hole Type WLS
Location: Cronton		Level: 38.55	Scale 1:50
Client: Tritax Symmetry		Dates: 26/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	38.40		Dark brown, slightly sandy to sandy, slightly clayey to clayey LOAM. TS
		1.20		N=18 (2,3/4,4,5,5)				High strength, firm consistency, dark brown, slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of mudstone with pockets of sand. TILL
		1.20 - 1.65	SPTLS					
		1.50	U	Ublow=20				
		2.00		N=18 (2,2/3,4,5,6)				
		2.00 - 2.45	SPTLS					
					2.50	36.05		Extremely weak strength, light grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
		3.00		N=56 (19 for 75mm/56 for 145mm)				
		3.00 - 3.18	SPTLS		3.18	35.37		End of borehole at 3.18 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS108**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347337.98 - 389619.32	Hole Type WLS
Location: Cronton		Level: 40.77	Scale 1:50
Client: Tritax Symmetry		Dates: 28/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	40.57		Dark brown, sandy LOAM. TS
		1.20		N=9 (1,1/1,2,3,3)				Medium stregnth, firm consistency, dark brown and mottled grey, slightly sandy to sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine of coal, sandstone and mudstone with occasional pockets and lenses of sand. TILL
		1.20 - 1.65	SPTLS					
		1.50	U	Ublow=8				
		2.00		N=11 (1,2/2,3,3,3)				
		2.00 - 2.45	SPTLS					
		3.00		N=50 (25 for 70mm/50 for 85mm)	3.08	37.69		Extremely weak strength, light brown and black, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES
		3.00 - 3.15	SPTLS		3.15	37.62		End of borehole at 3.15 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS109**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347411.39 - 389448.71	Hole Type WLS
Location: Cronton		Level: 39.33	Scale 1:50
Client: Tritax Symmetry		Dates: 28/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	39.13		Dark brown, sandy, slightly gravelly LOAM. Grave is subangular, fine of sandstone. TS
		1.20 1.20 - 1.65	SPTL S	N=22 (4,5/6,5,6,5)				High strength, firm consistency, dark brown, slightly sandy CLAY. TILL
		2.00		N=50 (10,12/50 for 210mm)	2.05	37.28		Extremely weak strength, light brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
		2.00 - 2.31	SPTL S		2.31	37.02		End of borehole at 2.31 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS112**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347312.58 - 389377.34	Hole Type WLS
Location:	Cronton		Level:	34.62	Scale 1:50
Client:	Tritax Symmetry		Dates:	28/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.20		N=9 (2,2/3,2,2,2)				MADE GROUND: Black, sandy, clayey, angular to rounded, fine to coarse GRAVEL of mudstone and coal. MADE GROUND
		2.00		N=14 (3,3/3,4,3,4)				
					2.50	32.12		Extremely weak strength brown, sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES
		3.00		N=50 (8,9/50 for 200mm)				
					3.35	31.27		End of borehole at 3.35 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Trial Pit Log

Trialpit No **TP145**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347388.88 - 389427.79 Level: 38.23	Date 25/08/2020
Location: Cronton		Dimensions (m): 2.4 × 0.8, Depth 1.60	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.80	ES					MADE GROUND: Dark brown, clayey, sandy GRAVEL of angular to subangular brick, shale, coal and mixed natural lithologies. MADE GROUND
	1.00	B					
				1.50	36.73		CONCRETE
				1.60	36.63		MADE GROUND
							End of pit at 1.60 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at concrete slab at base of pit.

Stability: Stable.

Trial Pit Log

Trialpit No **TP146**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347330.60 - 389454.87 Level: 38.43	Date 26/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 2.90	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	38.13		TOPSOIL: Dark brown, sandy, clayey, gravelly LOAM. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of mixed natural lithologies. TOP
			HVR=81				Firm consistency, yellowish brown, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of coal, sandstone and mudstone. TILL
	1.40	B					
	2.00	ES	HVR=110				
				2.60	35.83		Yellowish brown SANDSTONE. Extremely weak, thinly bedded. PENNINE MIDDLE COAL MEASURES
				2.90	35.53		End of pit at 2.90 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) TErminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP147**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347359.41 - 389497.47 Level: 39.98	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 2.95 — 4 × 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.39	39.59		TOPSOIL: Dark brown, slightly sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded of sandstone, coal and mudstone. TOP
			HVR=64				Medium strength, yellowish brown, slightly sandy to sandy, slightly gravelly CLAY. Gravel is fine to coarse, subangular to rounded of mudstone, sandstone, coal and quartz. TILL
	1.00	D					
			HVR=71				
	2.00	B					
				2.83	37.15		Extremely weak, grey, thinly laminated, friable, slightly sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES
				2.95	37.03		End of pit at 2.95 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP148**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347303.11 - 389545.71 Level: 38.90	Date 26/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 2.75	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.45	38.45		TOPSOIL: Dark brown, slightly sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded of sandstone, coal and mudstone. TOP
				0.95	37.95		Dark brown, clayey, gravelly SAND. Gravel is subrounded to rounded, fine to coarse of coal, sandstone and mudstone. TILL
	1.00	B					Medium strength, yellowish brown, slightly sandy to sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of coal, mudstone and sandstone. TILL
	1.30	ES					*Occasional sand lenses between 1.20m bgl to 2.50m bgl.*
			HVR=82				
			HVR=79				
				2.50	36.40		Extremely weak, dark yellowish brown, clayey SANDSTONE. PENNINE MIDDLE COAL MEASURES
				2.75	36.15		End of pit at 2.75 m

Remarks: 1) Slight groundwater ingress encountered at 1.05m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP153**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347053.16 - 389537.50 Level: 33.17	Date 26/08/2020
Location: Cronton		Dimensions (m): 3.5 × 1, Depth 2.65	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	32.86		TOPSOIL: Dark brown, sandy, clayey, silty LOAM. TOP
			HVR=64				Firm consistency, dark brown, sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine to medium of sandstone and mudstone. TILL
			HVR=84				
			HVR=86				
	1.60	D					
			HVR=92				
				2.10	31.06		Extremely weak strength, dark yellowish brown, clayey, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES
	2.50	B					
				2.65	30.52		End of pit at 2.65 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP120**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347060.37 - 389320.19 Level: 25.11	Date 25/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 3.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	24.96		TOPSOIL: Dark brown, sandy, clayey LOAM. TOP
	0.75	ES					Firm becoming stiff consistency, dark brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
▼	1.00	B	HVR=62				
			HVR=84				
				2.60	22.51		Weathered bedrock recovered as: Firm consistency, dark grey, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. PENNINE LOWER COAL MEASURES
	2.80	ES	HVR=92				
				3.15	21.96		Extremely weak, light grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
				3.50	21.61		End of pit at 3.50 m

Remarks: 1) Moderate groundwater seepage at 1.35m bgl. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP121**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347004.83 - 389383.61 Level: 25.34	Date 25/08/2020
Location: Cronton		Dimensions (m): 2.8 × 0.75, Depth 3.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.05	ES		0.20	25.14		TOPSOIL: Dark brown, slightly sandy, clayey to very clayey LOAM. TOP
			HVR=54				Firm to stiff consistency, dark brown, slightly gravelly, slightly sandy to very sandy CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
▼	1.75	D	HVR=76				
			HVR=123	2.75	22.59		Weathered bedrock recovered as: Very dense, light brown SAND. PENNINE MIDDLE COAL MEASURES
				2.85	22.49		Extremely weak strength, light brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
				3.00	22.34		End of pit at 3.00 m

1 2 3 4 5

Remarks: 1) Slight groundwater seepage at 2.35m bgl. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP122**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347013.59 - 389448.21 Level: 28.02	Date 25/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	27.87		TOPSOIL: Dark grey, sandy, clayey LOAM. TOP
	0.50	ES	HVR=67				Firm becoming stiff consistency, dark orangish brown, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of mixed natural lithologies. TILL
			HVR=84				
	2.00	D	HVR=98				
				2.80	25.22		Weathered bedrock recovered as: Firm consistency, gravelly CLAY. Gravel is angular, medium to coarse of mudstone. PENNINE LOWER COAL MEASURES
	3.00	B					
				3.60	24.42		Extremely weak strength, laminated, light grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
				4.00	24.02		End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP123**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347100.75 - 389515.57 Level: 34.03	Date 25/08/2020
Location: Cronton		Dimensions (m): 3.75 x 1 Depth 2.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20	33.83		TOPSOIL: Dark brown, sandy, clayey LOAM. TOP
			HVR=34				Firm becoming stiff consistency, dark orangish brown, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of mixed natural lithologies. TILL
			HVR=63				
	1.25	D					
				1.65	32.38		Weathered bedrock recovered as: light brown, sandy to very sandy, angular to rounded, fine to coarse GRAVEL of sandstone. PENNINE MIDDLE COAL MEASURES
	1.75	ES					
	2.00	B					
				2.25	31.78		Extremely weak strength, light brown, thinly bedded SANDSTONE. PENNINE MIDDLE COAL MEASURES
				2.50	31.53		End of pit at 2.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP124**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347180.59 - 389498.20 Level: 35.14	Date 25/08/2020
Location: Cronton		Dimensions (m): 4 × 1, Depth 1.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	34.98		TOPSOIL: Dark brown, sandy LOAM. TOP
			HVR=64				Dark orangish brown, slightly sandy to sandy CLAY. TILL
	0.75	D	HVR=68				
				1.00	34.14		Extremely weak strength, thinly bedded, black and dark grey MUDSTONE and interbedded SILTSTONE with a high organic odour. PENNINE MIDDLE COAL MEASURES
	1.25	B					
				1.50	33.64		End of pit at 1.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP125**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347257.50 - 389492.18 Level: 35.87	Date 25/08/2020
Location: Cronton		Dimensions (m): 3 × 0.8, Depth 2.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	35.72		TOPSOIL: Dark brown, sandy LOAM.
							TOP Dark orangish brown, slightly sandy to sandy CLAY.
			HVR=48				TILL
	1.00	B	HVR=56				
			HVR=64				
				1.80	34.07		Extremely weak strength, thinly bedded, black and dark grey MUDSTONE and SILTSTONE with a high organic odour. PENNINE MIDDLE COAL MEASURES
	2.00	D					
				2.50	33.37		End of pit at 2.50 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP126**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347173.32 - 389480.10 Level: 34.73	Date 25/08/2020
Location: Cronton		Dimensions (m): 4 × 1, Depth 2.75	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	34.53		TOPSOIL: Dark brown, sandy, silty, clayey LOAM. TOP
	0.40	ES	HVR=52				Dark orangish brown and mottled grey CLAY. TILL
				0.75	33.98		Extremely weak, thinly laminated, dark brown and grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
				1.50	33.23		Extremely weak, friable, thinly bedded, black, bituminous COAL. PENNINE MIDDLE COAL MEASURES
	1.65	ES					
	2.00	B					
				2.50	32.23		Extremely weak, thinly laminated, dark brown and grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
				2.75	31.98		End of pit at 2.75 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP127**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347114.09 - 389418.12 Level: 30.02	Date 25/08/2020
Location: Cronton		Dimensions (m): 2.7 × 0.8, Depth 2.25	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	29.82		TOPSOIL: Dark brown, sandy LOAM. TOP
			HVR=54				Firm consistency, dark brown, sandy CLAY. TILL
	1.00	D	HVR=72				
▼			HVR=89	1.65	28.37		Weathered bedrock recovered as: Light brown, gravelly, fine SAND. Gravel is angular, fine to coarse of sandstone. PENNINE MIDDLE COAL MEASURES
	2.00	B		2.10	27.92		Extremely weak strength, light brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
				2.25	27.77		End of pit at 2.25 m

Remarks: 1) Slight groundwater seepage at 1.65m bgl. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Rotary Core Log

Borehole No. **RB105**

Sheet 1 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347357.25 - 389532.54	Hole Type RC
Location: Cronton		Level: 40.83	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										MADE GROUND: Reddish brown CLAY. MADE GROUND
							0.60	40.23		MADE GROUND: Colliery spoil. MADE GROUND
							2.00	38.83		Reddish brown CLAY. TILL
	▼						2.40	38.43		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 2.60m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB105**

Sheet 2 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347357.25 - 389532.54	Hole Type RC
Location: Cronton		Level: 40.83	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							12.20	28.63		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							15.40	25.43		Grey MUDSTONE with sandstone bands. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 2.60m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB105
Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347357.25 - 389532.54	Hole Type RC
Location:	Cronton		Level:	40.83	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

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Continued on next sheet

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 2.60m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB105**

Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347357.25 - 389532.54	Hole Type RC
Location:	Cronton		Level:	40.83	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							35.80	5.03		COAL. PENNINE MIDDLE COAL MEASURES
							36.00	4.83		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	0.83		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 2.60m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB106**

Sheet 1 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347291.27 - 389553.93	Hole Type RC
Location:	Cronton		Level:	38.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	27/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										Reddish brown CLAY. TILL
							1.30	37.35		Yellowish brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							3.10	35.55		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 31.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB106
Sheet 2 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347291.27 - 389553.93	Hole Type RC
Location:	Cronton		Level:	38.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	27/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							12.00	26.65		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							16.20	22.45		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 31.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB106
Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347291.27 - 389553.93	Hole Type RC
Location:	Cronton		Level:	38.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	27/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

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Continued on next sheet

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 31.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB106**

Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347291.27 - 389553.93	Hole Type RC
Location:	Cronton		Level:	38.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	27/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
	▼						36.80	1.85		COAL.
							37.00	1.65		PENNINE MIDDLE COAL MEASURES Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	-1.35		End of borehole at 31.00 m

31 32 33 34 35 36 37 38 39 40

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 31.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB107**

Sheet 1 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347092.37 - 389438.12	Hole Type RC
Location: Cronton		Level: 30.28	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										Reddish brown CLAY. TILL
							1.80	28.48		Yellowish brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							2.60	27.68		Yellowish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							3.00	27.28		Reddish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							4.60	25.68		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							4.90	25.38		Reddish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							5.70	24.58		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							9.10	21.18		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							10.00	20.28		Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl 2) No groundwater ingress encountered. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB107
Sheet 2 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347092.37 - 389438.12	Hole Type RC
Location:	Cronton		Level:	30.28	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
										Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

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Remarks
1) Hand dug pit to 1.2m bgl 2) No groundwater ingress encountered. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB107**

Sheet 3 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347092.37 - 389438.12	Hole Type RC
Location: Cronton		Level: 30.28	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							22.20	8.08		Brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							29.90	0.38		Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks

1) Hand dug pit to 1.2m bgl 2) No groundwater ingress encountered. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB107
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347092.37 - 389438.12	Hole Type RC
Location:	Cronton		Level:	30.28	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	-9.72		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
1) Hand dug pit to 1.2m bgl 2) No groundwater ingress encountered. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB108
Sheet 1 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347062.97 - 389345.31	Hole Type RC
Location:	Cronton		Level:	25.97	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.30	25.67		TOP SOIL. TOPSOIL
										Reddish brown CLAY. TILL
							2.10	23.87		Yellowish brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							3.00	22.97		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 20.04m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB108**

Sheet 2 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347062.97 - 389345.31	Hole Type RC
Location:	Cronton		Level:	25.97	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							10.50	15.47		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							17.60	8.37		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 20.04m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB108
Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347062.97 - 389345.31	Hole Type RC
Location:	Cronton		Level:	25.97	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							23.80	2.17		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							26.50	-0.53		Brown SHALE. PENNINE MIDDLE COAL MEASURES

Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 20.04m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB108
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347062.97 - 389345.31	Hole Type RC
Location:	Cronton		Level:	25.97	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							36.20	-10.23		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	-14.03		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 20.04m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB102
Sheet 1 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347168.70 - 389384.45	Hole Type RC
Location:	Cronton		Level:	33.93	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										MADE GROUND: Colliery spoil. MADE GROUND
							9.00	24.93		Yellowish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

Remarks
1) Groundwater ingress encountered at 10.00m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Rotary Core Log

Borehole No. **RB102**

Sheet 2 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347168.70 - 389384.45	Hole Type RC
Location: Cronton		Level: 33.93	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							10.80	23.13		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							14.20	19.73		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							18.00	15.93		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1) Groundwater ingress encountered at 10.00m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Rotary Core Log

Borehole No. **RB102**

Sheet 3 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347168.70 - 389384.45	Hole Type RC
Location: Cronton		Level: 33.93	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							21.60	12.33		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							26.00	7.93		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks

1) Groundwater ingress encountered at 10.00m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Rotary Core Log

Borehole No.
RB102
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347168.70 - 389384.45	Hole Type RC
Location:	Cronton		Level:	33.93	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							30.70	3.23		Brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							35.90	-1.97		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	-6.07		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
1) Groundwater ingress encountered at 10.00m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Borehole Log

Borehole No.
CP101
Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347340.86 - 389486.48	Hole Type CP
Location: Cronton		Level: 39.48	Scale 1:50
Client: Tritax Symmetry		Dates: 17/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.35	39.13		MADE GROUND: Dark brown, sandy, slightly clayey LOAM.
		0.70	D					MADE GROUND
		1.20 - 1.65	U	Ublow=25				High strength, firm to stiff consistency, dark brown, slightly sandy, silty, slightly gravelly CLAY. Gravel is subrounded, fine of sandstone, mudstone and coal. TILL
		1.70	D					
		2.00		N=50 (8,10/50 for 285mm)	2.00	37.48		
		2.00 - 2.40	SPTL S					Extremely weak strength, thinly bedded, grey and dark brown, sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES
		3.00		N=50 (10,14/50 for 160mm)				
		3.00 - 3.30	SPTL S		3.31	36.17		End of borehole at 3.31 m

Remarks
1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Trial Pit Log

Trialpit No **TP201**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347341.93 - 389424.40 Level:	Date 13/11/2023
Location: Cronton		Dimensions (m): Depth 3.00 — 3 × 0.6	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			Vegetation over dark brown, soft, slightly sandy, slightly gravelly CLAY. Sand is fine to medium, gravel is fine to medium, angular to subrounded of mixed natural lithologies. Frequent rootlets throughout. TOPSOIL
			HVR=86				Firm, yellowish brown, mottled grey, slightly gravelly, slightly sandy CLAY. Gravel is fine to medium, angular to subangular of mudstone. CLay id friable throughout. TILL
	1.00	ES	HVR=90				
			HVR=88				
▼				2.20			Dark grey, extremely weathered, very weak MUDSTONE
	3.00	D		3.00			End of pit at 3.00 m

Remarks: 1) Trial pit for geoenvironmental purposes. 2) Terminated at 3.00m bgl 3) Groundwater encountered at 2.20m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP202**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347313.13 - 389488.59 Level:	Date 14/11/2023
Location: Cronton		Dimensions (m): Depth 2.80; 3 × 0.6	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES		0.30			Vegetation over dark brown, soft, slightly sandy, slightly gravelly CLAY. Sand is fine to medium, gravel is fine to medium, angular to subrounded of mixed natural lithologies. Frequent rootlets throughout. TOPSOIL
			HVR=81				Firm, yellowish brown, mottled grey, slightly silty, slightly gravelly, slightly sandy CLAY. Sand is fine to medium, gravel is fine to coarse, angular to subangular of mudstone and siltstone. Occasional lenses of light grey, silty, fine sand. TILL
	0.80	B					
			HVR=103				
	1.50	ES					
			HVR=94				
			HVR=100				
▼	2.50	D		2.25			Extremely weathered, very weak to weak, dark grey MUDSTONE PENNINE MIDDLE COAL MEASURES *pockets of black carbonaceous mudstone at 2.50m bgl to 2.70m bgl in western pit wall.*
				2.80			End of pit at 2.80 m

Remarks: 1) Trial pit for geoenvironmental purposes 2) Terminated at 2.80m bgl 3) Groundwater encountered at 2.45m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP203**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347249.67 - 389545.57 Level:	Date 13/11/2023
Location: Cronton		Dimensions (m): 3 × 0.6, Depth 3.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			Vegetation over dark brown, soft, slightly sandy, slightly gravelly CLAY. Sand is fine to medium, gravel is fine to medium, angular to subrounded of mixed natural lithologies. Frequent rootlets throughout. TOPSOIL
							Firm, yellowish brown, mottled grey, slightly silty, slightly gravelly, slightly sandy CLAY. Sand is fine to medium, gravel is fine to coarse, angular to subangular of mudstone and siltstone. Occasional lenses of light grey, silty, fine sand. TILL
	1.20	ES					
				2.30			Grey, friable, silty, gravelly CLAY. Gravel is fine to coarse, angular to subangular of mudstone and siltstone. PENNINE MIDDLE COAL MEASURES
	2.40	ES					
	2.70	D					
				3.20			End of pit at 3.20 m

Remarks: 1) Trial pit for geoenvironmental purposes 2) No groundwater encountered 3) Terminated at 3.20m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP204**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347014.48 - 389465.82 Level:	Date 13/11/2023
Location: Cronton		Dimensions (m): Depth 1.50; 3 × 0.6	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			Dark brown, slightly gravelly, clayey, fine to medium SAND. Gravel is fine to medium, angular of mixed natural lithologies. Frequent rootlets throughout. TOPSOIL
▼	0.70	B		1.50			Orangish brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is fine to coarse, angular to subangular of mudstone and siltstone. TILL
							End of pit at 1.50 m

1 2 3 4 5

Remarks: 1) Trial pit for geoenvironmental purposes 2) Terminated at 1.50m bgl 3) Groundwater encountered at 1.40m bgl

Stability: Stable

Trial Pit Log

Trialpit No **TP205**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347104.16 - 389450.11 Level:	Date 13/11/2023
Location:	Cronton		Dimensions (m): Depth 2.45, 3, 0.6	Scale 1:25
Client:	Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.30	ES		0.38			Dark brown, slightly gravelly, clayey, fine to medium SAND. Gravel is fine to medium, angular of mixed natural lithologies. Frequent rootlets throughout. TOPSOIL
▼	1.10	ES					Orangish brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is fine to coarse, angular to subangular of mudstone and siltstone. TILL
	2.00	D		1.90			Greyish brown, very weathered, weak MUDSTONE PENNINE MIDDLE COAL MEASURES
	2.30	ES		2.45			End of pit at 2.45 m

Remarks: 1) Trial pit for geoenvironmental purpose. 2) Terminated at 2.45m bgl 3) Groundwater encountered at 1.60m bgl

Stability: Stable

Trial Pit Log

Trialpit No **TP206**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347095.02 - 389487.64 Level:	Date 13/11/2023
Location: Cronton		Dimensions (m): Depth 2.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.42			Dark brown, slightly gravelly, clayey, fine to medium SAND. Gravel is fine to medium, angular of mixed natural lithologies. Frequent rootlets throughout.
			HVR=101				Firm to stiff, orangish brown, slightly gravelly, sandy CLAY. Frequent pockets of medium to coarse SAND. Sand is fine to coarse, Gravel is fine to coarse, angular to subangular of mudstone, sandstone and coal.
	0.80	ES					
			HVR=89				
	1.85	ES		1.90			Greyish brown, weathered, weak, medium to coarse SANDSTONE.
▼	2.10	D		2.20			End of pit at 2.20 m

1
2
3
4
5

Remarks: 1) Trial pit for geoenvironmental purposes 2) Terminated at 2.20m bgl 3) Groundwater encountered at 2.20m bgl

Stability: Stable.

Trial Pit Log

Trialpit No **TP207**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347128.94 - 389521.38 Level:	Date 13/11/2023
Location: Cronton		Dimensions (m): Depth 3.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Dark brown, slightly gravelly, clayey, fine to medium SAND. Gravel is fine to medium, angular of mixed natural lithologies. Frequent rootlets throughout.
				0.40			Firm to stiff, orangish brown, slightly gravelly, sandy CLAY. Frequent pockets of medium to coarse SAND. Sand is fine to coarse, Gravel is fine to coarse, angular to subangular of mudstone, sandstone and coal.
			HVR=89				
	1.00	ES					
			HVR=94				
				1.25			Blackish and yellowish grey, extremely weathered, extremely weak SANDSTONE. Recovered as firm, gravelly clay. Gravel is medium to coarse, angular of sandstone and rare coal, (PCM).
				1.60			Blackish grey and yellowish brown, very weathered, very weak, thinly laminated SANDSTONE. Frequently interlaminated with coal (2mm-8mm).
	2.50	B					
▼	3.00	ES					
				3.20			End of pit at 3.20 m

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2
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4
5

Remarks: 1) Trial pit for geoenvironmental purposes 2) Terminated at 3.20m bgl 3) Groundwater encountered at 3.00m bgl in Western pit wall. 5) Hard digging from 2.80m bgl.

Stability: Stable.

AGS

Trial Pit Log

Trialpit No **TP208**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347350.57 - 389509.41 Level:
Location:	Cronton	Dimensions (m): Depth 2.80	3 × 0.6
Client:	Tritax Symmetry		Date 13/11/2023 Scale 1:25 Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.31			Vegetation over dark brown, soft, slightly sandy, slightly gravelly CLAY. Sand is fine to medium, gravel is fine to medium, angular to subrounded of mixed natural lithologies. Frequent rootlets throughout. TOPSOIL Orange, slightly clayey, fine to coarse SAND.
▼	1.30	ES		1.20			Very soft, grey. slightly gravelly, silty CLAY. Gravel is fine to medium, angular to subangular of mudstone and coal. *Pockets of spongy, fibrous, black peat at 1.30m bgl to 1.50m bgl*
	1.60 1.60	D ES					
	2.40	D		2.30			Extremely weathered, very weak to weak, dark grey MUDSTONE PENNINE MIDDLE COAL MEASURES
				2.80			End of pit at 2.80 m

1 2 3 4 5

Remarks: 1) Trial pit for geoenvironmental purposes. 2) Terminated at 2.80m bgl due to pit collapse 3) Groundwater encountered at 0.80m bgl. 4) Slight organic odour at 1.30m bgl

Stability: Unstable

AGS

Trial Pit Log

Trialpit No **TP209**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347287.54 - 389600.48 Level:
Location:	Cronton	Dimensions (m): Depth 3.50	3 × 0.6
Client:	Tritax Symmetry		

Date 14/11/2023

Scale 1:25

Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.40	ES	HVR=63	0.50			MADE GROUND: Grass and vegetation over dark brown, clayey, gravelly, fine to coarse SAND. Gravel is fine to coarse, angular to subangular of brick, coal and mudstone. Frequent rootlets throughout. MADE GROUND
▼			HVR=79				Firm, locally stiff, dark orangish brown, mottled grey, slightly gravelly, slightly sandy CLAY. Sand is fine to medium, gravel is fine to coarse, angular to subangular of coal, mudstone, siltstone and occasional sandstone. Mottled areas comprise of grey, fine sand. TILL
	1.30	ES	HVR=93				
			HVR=67				
	2.20	D	HVR=81				
			HVR=90				
	3.10	ES		3.05			Greenish brown to greenish grey, extremely weathered, extremely weak MUDSTONE PENNINE MIDDLE COAL MEASURES
				3.50			End of pit at 3.50 m

Remarks: 1) Trial pit for geoenvironmental purposes 2) Terminated at 3.50m bgl 3) Groundwater encountered at 0.60m bgl

Stability: Stable

Trial Pit Log

Trialpit No **TP210**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347237.50 - 389572.99 Level:	Date 14/11/2023
Location: Cronton		Dimensions (m): 4 × 2, Depth 2.10	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Vegetation over sandy, clayey, fine to coarse, angular to subangular GRAVEL of brick, concrete, mudstone, sandstone, limestone and clods of clay. Occasional fragments of glass and ceramic. Frequent rootlets throughout MADE GROUND
	0.60	ES	HVR=28	0.62			MADE GROUND: Soft, orangish brown, slightly sandy to sandy, gravelly CLAY. Gravel is fine to coarse, angular to subangular of brick, concrete, mudstone and sandstone. Frequent large metal fragments and objected from 1.10m bgl MADE GROUND
▼	1.00	ES	HVR=31				
			HVR=19				
	1.90	ES	HVR=17				
			HVR=20	2.10			End of pit at 2.10 m

Remarks: 1) Trial pit for geoenvironmental purposes. 2) Terminated at 2.10m bgl due to full pit wall collapse 3) Groundwater encountered at 1.30m bgl

Stability: Unstable

Trial Pit Log

Trialpit No **TP211**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347164.10 - 389515.43 Level:	Date 14/11/2023
Location: Cronton		Dimensions (m): 3 × 0.6, Depth 3.50	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.30	ES		0.40			Vegetation over dark brown, soft, slightly sandy, slightly gravelly CLAY. Sand is fine to medium, gravel is fine to medium, angular to subrounded of mixed natural lithologies. Frequent rootlets throughout. TOPSOIL
			HVR=67				Firm , yellowish brown, mottled grey, slightly gravelly, slightly sandy CLAY. Sand is fine to medium, gravel is fine to coarse, angular of mudstone and siltstone.
			HVR=90				
	1.40	B					
	1.50	ES	HVR=88				*Very friable from 1.60m bgl*
				2.70			Light grey, very weathered, very weak, occasionally thinly laminated MUDSTONE
	2.80	B					
	3.20	ES					
▼				3.50			End of pit at 3.50 m

1 2 3 4 5

Remarks: 1) Trial pit for geoenvironmental purposes. 2) Terminated at 3.50m bgL 3) Groundwater encountered at 3.48m bgl

Stability: Stable

AGS

Trial Pit Log

Trialpit No **TP212**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347309.06 - 389568.99 Level:	Date 14/11/2023
Location: Cronton		Dimensions (m): 3 × 0.6, Depth 2.90	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.40	ES		0.52			MADE GROUND: Grass and vegetation over dark brown, clayey, gravelly, fine to coarse SAND. Gravel is fine to coarse, angular to subangular of brick, coal and mudstone. Frequent rootlets throughout. MADE GROUND
			HVR=79				
▼	0.80	ES					Firm, locally stiff, dark orangish brown, mottled grey, slightly gravelly, slightly sandy CLAY. Sand is fine to medium, gravel is fine to coarse, angular to subangular of coal, mudstone, siltstone and occasional sandstone. Mottled areas comprise of grey, fine sand. TILL
	1.00	B					
			HVR=85				
			HVR=84				
	1.90	ES		1.80			Greenish brown to greenish grey, extremely weathered, extremely weak MUDSTONE *Extremely weathered, recovered as clayey gravel*
	2.90	D		2.90			End of pit at 2.90 m

Remarks: 1) Trial pit for geoenvironmental purposes. 2) Terminated at 2.90m bgl 3) Groundwater encountered at 0.90m bgl

Stability: Stable

Trial Pit Log

Trialpit No **TP213**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347393.29 - 389593.60 Level:	Date 14/11/2023
Location: Cronton		Dimensions (m): 3 × 0.6, Depth 3.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVR=38				MADE GROUND: Vegetation over soft, dark brown, gravelly CLAY. Gravel is fine to coarse, angular to subangular of brick, terracotta, coal, mudstone and sandstone. Frequent rootlets throughout MADE GROUND
	0.40	B					
	0.50	ES		0.60			
▼			HVR=73				Firm to stiff, orangish brown, slightly gravelly CLAY. Gravel is fine to coarse, angular to subrounded of mudstone, sandstone and coal. Low cobble content of subrounded mudstone.
	1.20	ES					
			HVR=69				
			HVR=80				
			HVR=84				
			HVR=89				
				2.60			Orange to orangish brown, very weathered, very weak, medium to coarse SANDSTONE
	2.70	ES					
	3.00	B					
				3.20			End of pit at 3.20 m

1 2 3 4 5

Remarks: 1) Trial pit for geoenvironmental purposes. 2) Terminated at 3.20Mm bgl 3) Groundwater encountered at 0.80m bgl

Stability: Stable

Trial Pit Log

Trialpit No **TP214**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347240.25 - 389566.78 Level:	Date 14/11/2023
Location: Cronton		Dimensions (m): 3 × 0.6, Depth 3.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			MADE GROUND: Vegetation over sandy, clayey, fine to coarse, angular to subangular GRAVEL of brick, concrete, mudstone, sandstone, limestone and clods of clay. Occasional fragments of glass and ceramic. Frequent rootlets throughout MADE GROUND
			HVR=33				MADE GROUND: Very soft, dark grey, sandy, gravelly CLAY. Sand is fine to coarse, gravel is fine to coarse, angular to subangular of brick, mudstone, concrete and sandstone. Frequent fragments of glass and metal MADE GROUND
	0.80	ES					
			HVR=24				
▼	1.10	B					
				1.40			MADE GROUND: Soft to firm, orangish brown, mottled grey, gravelly, sandy CLAY. Gravel is fine to coarse, angular to subangular of mudstone and sandstone, brick and coal. Sand is fine to coarse. MADE GROUND
			HVR=43				
	1.65	ES					
			HVR=89				
	2.10	B					
			HVR=70				
				2.60			Firm to stiff, orangish brown, slightly gravelly CLAY. Gravel is fine to coarse, angular to subrounded of mudstone, sandstone and coal. Low cobble content of subrounded mudstone.
			HVR=79				
				2.85			Greenish brown to greenish grey, extremely weathered, extremely weak MUDSTONE PENNINE MIDDLE COAL MEASURES
	2.90	D					
	3.10	ES					
				3.20			End of pit at 3.20 m

1 2 3 4 5

Remarks: 1) Trial pit for geoenvironmental purposes. 2) Terminated at 3.20m bgl 3) Groundwater encountered at 1.10m bgl

Stability: Semi Stable

Trial Pit Log

Trialpit No **TP215**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347170.51 - 389394.62 Level:	Date 14/11/2023
Location: Cronton		Dimensions (m): Depth 3.00	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Vegetation over blackish grey, sandy, clayey GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick, red shale, coal, concrete and mudstone. A high cobble content of frequent fragments of metal. MADE GROUND
	1.20	ES					*200mm diameter bent and corroded pipe encountered at 1.20m bgl.*
	1.60	B					
				2.30			MADE GROUND: Firm, grey, gravelly CLAY. Gravel is fine to coarse, angular to subangular of mudstone, brick, shale, concrete and coal. MADE GROUND
▼	2.90	ES		2.85			MADE GROUND: Orangish red, fine to coarse, angular GRAVEL of brick, shale and coal. MADE GROUND
				3.00			End of pit at 3.00 m

1 2 3 4 5

Remarks: 1) Trial pit for geoenvironmental purposes. 2) Terminated at 3.00m bgl 3) Groundwater encountered at 2.85m bgl

Stability: Stable

AGS

Trial Pit Log

Trialpit No **TP216**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347152.71 - 389346.05 Level:	Date 14/11/2023
Location: Cronton		Dimensions (m): Depth 2.60	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	1.10	ES					MADE GROUND: Vegetation over blackish grey, sandy, clayey GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick, red shale, coal, concrete and mudstone. A high cobble content of frequent fragments of metal. MADE GROUND
	1.50	B					
	2.60	ES		2.60			End of pit at 2.60 m

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2
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4
5

Remarks: 1) Trial pit for geoenvironmental purposes. 2) Terminated at 2.60m bgl 3) No groundwater encountered.

Stability: Stable.

Rotary Core Log

Borehole No.
RB401
Sheet 1 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347125.30 - 389502.60	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 25/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.40			MADE GROUND: FILL MADE GROUND
							0.80			Reddish brown CLAY
										Reddish brown SANDSTONE
							4.50			Grey SANDSTONE
							5.60			Black SHALE
							6.70			Grey MUDSTONE
							6.80			COAL
							7.80			Grey MUDSTONE
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

Rotary Core Log

Borehole No.
RB401
Sheet 2 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347125.30 - 389502.60	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 25/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

11
12
13
14
15
16
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18
19
20

Continued on next sheet

Remarks

Rotary Core Log

Borehole No.
RB401
Sheet 3 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347125.30 - 389502.60	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 25/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							26.00			Black SHALE
							28.30			Grey MUDSTONE
							30.00			End of borehole at 30.00 m

21 22 23 24 25 26 27 28 29 30

Remarks

AGS

Rotary Core Log

Borehole No.
RB402
Sheet 1 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347043.50 - 389467.50	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.40			MADE GROUND: FILL MADE GROUND
							2.40			Reddish brown CLAY
							4.80			Reddish brown, SANDSTONE
							6.80			Grey SANDSTONE
							8.10			Reddish brown SANDSTONE
										Grey SANDSTONE
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

Rotary Core Log

Borehole No.
RB402
Sheet 2 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347043.50 - 389467.50	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

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Continued on next sheet

Remarks

Rotary Core Log

Borehole No.
RB402
Sheet 3 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347043.50 - 389467.50	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							22.40			Black SHALE
							24.20			Grey SANDSTONE
							28.70			Grey MUDSTONE
							30.00			End of borehole at 30.00 m

21 22 23 24 25 26 27 28 29 30

Remarks

AGS

Rotary Core Log

Borehole No.
RB403
Sheet 1 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347131.50 - 389455.20	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										Reddish brown CLAY
							1.40			Reddish brown and yellow SANDSTONE
							6.60			Grey SANDSTONE
							9.80			Black SHALE
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

Rotary Core Log

Borehole No.
RB403
Sheet 2 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347131.50 - 389455.20	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							13.00			COAL
							13.90			Grey MUDSTONE
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

AGS

Rotary Core Log

Borehole No.
RB403
Sheet 3 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347131.50 - 389455.20	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
							30.00			End of borehole at 30.00 m

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Remarks

AGS

Rotary Core Log

Borehole No.
RB404
Sheet 1 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347172.80 - 389460.90	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 21/04/2023 -	Logged By ER

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.20			MADE GROUND: Fill MADE GROUND Reddish brown CLAY
							1.30			Black Shale
							4.00			Grey MUDSTONE
							5.10			Black COAL
							5.90			Grey and Brown MUDSTONE
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks
1) No groundwater encountered 2) Cased to 1.5m with 6" casing 3) Descriptions from drillers logs. 4) Terminated at target depth.

Rotary Core Log

Borehole No.
RB404
Sheet 2 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347172.80 - 389460.90	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 21/04/2023 -	Logged By ER

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

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Continued on next sheet

Remarks
1) No groundwater encountered 2) Cased to 1.5m with 6" casing 3) Descriptions from drillers logs. 4) Terminated at target depth.

Rotary Core Log

Borehole No.
RB404
Sheet 3 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347172.80 - 389460.90	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 21/04/2023 -	Logged By ER

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
							30.00			End of borehole at 30.00 m

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Remarks
1) No groundwater encountered 2) Cased to 1.5m with 6" casing 3) Descriptions from drillers logs. 4) Terminated at target depth.

Rotary Core Log

Borehole No.
RB405
Sheet 1 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347119.70 - 389422.30	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.30			MADE GROUND: FILL MADE GROUND
							1.00			Reddish brown CLAY
										Reddish brown SANDSTONE
							5.80			Grey SANDSTONE
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

AGS

Rotary Core Log

Borehole No.
RB405
Sheet 2 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347119.70 - 389422.30	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							14.80			Black SHALE
										Continued on next sheet

Remarks

Rotary Core Log

Borehole No.
RB405
Sheet 3 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347119.70 - 389422.30	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							22.50			Grey MUDSTONE
							30.00			End of borehole at 30.00 m

21 22 23 24 25 26 27 28 29 30

Remarks

AGS

Rotary Core Log

Borehole No.
RB406
Sheet 1 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347062.50 - 389393.10	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.50			MADE GROUND: FILL MADE GROUND
							1.90			Reddish brown CLAY
							3.10			Reddish brown SANDSTONE
										Grey MUDSTONE
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

Rotary Core Log

Borehole No.
RB406
Sheet 2 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347062.50 - 389393.10	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							17.60			Grey SANDSTONE
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

Rotary Core Log

Borehole No.
RB406
Sheet 3 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347062.50 - 389393.10	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 24/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							24.30			Black SHALE
							25.30			Grey MUDSTONE
							25.80			Black SHALE
							30.00			End of borehole at 30.00 m

21 22 23 24 25 26 27 28 29 30

Remarks

AGS

Rotary Core Log

Borehole No.
RB413
Sheet 1 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347143.78 - 389482.91	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 25/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										MADE GROUND: FILL MADE GROUND
							0.50			Reddish brown CLAY
							0.70			Reddish brown SANDSTONE
							6.80			Grey SANDSTONE
							7.30			Black SHALE
										Continued on next sheet

Remarks

Rotary Core Log

Borehole No.
RB413
Sheet 2 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347143.78 - 389482.91	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 25/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							10.10			COAL
							11.00			Grey MUDSTONE

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Continued on next sheet

Remarks

Rotary Core Log

Borehole No.
RB413
Sheet 3 of 3

Project Name: Symmetry Park, Huyton	Project No. TE 1163	Co-ords: 347143.78 - 389482.91	Hole Type RO
Location: Former Cronton Colliery		Level:	Scale 1:50
Client: Tritax Symmetry		Dates: 25/04/2023 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
							30.00			End of borehole at 30.00 m

21 22 23 24 25 26 27 28 29 30

Remarks

AGS

APPENDIX C - GEOENVIRONMENTAL SOIL LABORATORY RESULTS

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

41ZA2-IS4QG-3A02U

Job name

EMT-23-19120-Batch-1-Sched-G-202312071506

Description/Comments

Project

TE1163

Site

Former Cronton Colliery Site (Huyton) - db symmetry

Classified by

Name:
Adrian Read
Date:
12 Dec 2023 10:29 GMT
Telephone:
01925 818388

Company:
Tier Environmental
Suite 414
Chadwick House
Warrington
WA3 6AE

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: **CERTIFIED**

Course	Date
Hazardous Waste Classification	03 Dec 2020
Most recent 3 year Refresher	05 Dec 2023

Next 3 year Refresher due by Dec 2026

Purpose of classification

2 - Material Characterisation

Address of the waste

Former Cronton Colliery, off Cronton Road (A5080) **Post Code** L35 1QR

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Proposed redevelopment of land

Description of the specific process, sub-process and/or activity that created the waste

Waste created during excavation of soils during development

Description of the waste

Made ground and/or natural soils

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	TP202-13/11/2023-1.50m		Non Hazardous		3
2	TP205-13/11/2023-1.10m		Non Hazardous		4
3	TP206-13/11/2023-0.80m		Non Hazardous		5
4	TP207-13/11/2023-1.00m		Non Hazardous		6
5	TP209-13/11/2023-1.30m		Non Hazardous		7
6	TP211-13/11/2023-1.50m		Non Hazardous		8

Related documents

#	Name	Description
1	EMT-23-19120-Batch-1-Sched-G-202312071506.HWOL	Element .hwol file used to populate the Job
2	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Adrian Read

Created date: 12 Dec 2023 10:29 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	9
Appendix B: Rationale for selection of metal species	9
Appendix C: Version	9

Classification of sample: TP202-13/11/2023-1.50m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP202-13/11/2023-1.50m

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
		EU CLP index number	EC Number	CAS Number									
1		pH				5.33	pH		5.33	pH	5.33 pH		
				PH									
2		sulfur { sulfur }				200	mg/kg		200	mg/kg	0.02 %		
		016-094-00-1	231-722-6	7704-34-9									
										Total:	0.02 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: TP205-13/11/2023-1.10m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP205-13/11/2023-1.10m

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
		EU CLP index number	EC Number	CAS Number							
1		pH				7.24 pH		7.24 pH	7.24 pH		
				PH							
2		sulfur { sulfur }				<100 mg/kg		<100 mg/kg	<0.01 %		<**LOD**
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.01 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Classification of sample: TP206-13/11/2023-0.80m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP206-13/11/2023-0.80m

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
		EU CLP index number	EC Number	CAS Number									
1		pH				7.99	pH		7.99	pH	7.99 pH		
				PH									
2		sulfur { sulfur }				<100	mg/kg		<100	mg/kg	<0.01 %		<**LOD**
		016-094-00-1	231-722-6	7704-34-9									
										Total:	0.01 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Classification of sample: TP207-13/11/2023-1.00m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP207-13/11/2023-1.00m

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
		EU CLP index number	EC Number	CAS Number							
1		pH				7.67 pH		7.67 pH	7.67 pH		
				PH							
2		sulfur { sulfur }				100 mg/kg		100 mg/kg	0.01 %		
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.01 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: TP209-13/11/2023-1.30m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP209-13/11/2023-1.30m

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	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		pH			PH		6.43 pH		6.43 pH	6.43 pH		
2		sulfur { sulfur }	016-094-00-1	231-722-6	7704-34-9		<100 mg/kg		<100 mg/kg	<0.01 %		**<LOD**
									Total:	0.01 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Classification of sample: TP211-13/11/2023-1.50m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP211-13/11/2023-1.50m

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
		EU CLP index number	EC Number	CAS Number							
1		pH				7.78 pH		7.78 pH	7.78 pH		
				PH							
2		sulfur { sulfur }				100 mg/kg		100 mg/kg	0.01 %		
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.01 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Appendix A: Classifier defined and non GB MCL determinands

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

Appendix B: Rationale for selection of metal species

sulfur {sulfur}

Worse case compound.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2023.341.5847.10836 (07 Dec 2023)
HazWasteOnline Database: 2023.341.5847.10836 (07 Dec 2023)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
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
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021
GB MCL List v2.0 - version 2.0 of 20th October 2023

HazWasteOnline™

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

AXBDQ-518J6-5QRDF

Job name

EMT-23-19120-Batch-1-Sched-BD-202312061108

Description/Comments

Project

TE1163

Site

Former Cronton Colliery Site (Huyton) - db symmetry

Classified by

Name:
Adrian Read
Date:
12 Dec 2023 09:23 GMT
Telephone:
01925 818388

Company:
Tier Environmental
Suite 414
Chadwick House
Warrington
WA3 6AE

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: **CERTIFIED**

Course	Date
Hazardous Waste Classification	03 Dec 2020
Most recent 3 year Refresher	05 Dec 2023

Next 3 year Refresher due by Dec 2026

Purpose of classification

2 - Material Characterisation

Address of the waste

Former Cronton Colliery, off Cronton Road (A5080) **Post Code** L35 1QR

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Proposed redevelopment of land

Description of the specific process, sub-process and/or activity that created the waste

Waste created during excavation of soils during development

Description of the waste

Made ground and/or natural soils

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	TP210-13/11/2023-1.90m		Hazardous	HP 14	3
2	TP214-14/11/2023-1.65m		Non Hazardous		5
3	TP215-14/11/2023-1.20m		Non Hazardous		7
4	TP216-14/11/2023-2.60m		Non Hazardous		8

Related documents

#	Name	Description
1	EMT-23-19120-Batch-1-Sched-BD-202312061108.HWOL	Element .hwol file used to populate the Job
2	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Adrian Read

Created date: 12 Dec 2023 09:23 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	9
Appendix B: Rationale for selection of metal species	10
Appendix C: Version	10

Classification of sample: TP210-13/11/2023-1.90m

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample name:
TP210-13/11/2023-1.90m
Moisture content:
31.4%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 14: Ecotoxic "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

Aquatic Chronic 1; H410 "Very toxic to aquatic life with long lasting effects."

Because of determinand:

zinc sulphate: (compound conc.: 0.462%)

Determinands

Moisture content: 31.4% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12.4 mg/kg	1.32	12.46 mg/kg	0.00125 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		8.9 mg/kg	1.142	7.737 mg/kg	0.000774 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				56.2 mg/kg	2.27	97.088 mg/kg	0.00971 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		54 mg/kg	1.126	46.269 mg/kg	0.00463 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	89 mg/kg	1.56	105.65 mg/kg	0.00677 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.2 mg/kg	1.353	0.206 mg/kg	0.0000206 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		37.6 mg/kg	2.976	85.166 mg/kg	0.00852 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		1 mg/kg	2.554	1.944 mg/kg	0.000194 %	✓	
9	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		2458 mg/kg	2.469	4619.125 mg/kg	0.462 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
14		ethylbenzene				<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<**LOD**
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<0.5	mg/kg	1.884	<0.942	mg/kg	<0.0000942 %		<**LOD**
		006-007-00-5											
17		pH				8.03	pH		8.03	pH	8.03 pH		
				PH									
18		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
19		acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
20		acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
21		fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
22		phenanthrene				0.07	mg/kg		0.0533	mg/kg	0.00000533 %	✓	
			201-581-5	85-01-8									
23		anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
24		fluoranthene				0.11	mg/kg		0.0837	mg/kg	0.00000837 %	✓	
			205-912-4	206-44-0									
25		pyrene				0.11	mg/kg		0.0837	mg/kg	0.00000837 %	✓	
			204-927-3	129-00-0									
26		benzo[a]anthracene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
27		chrysene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
28		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
29		benzo[k]fluoranthene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
30		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
31		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
32		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
33		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
34		sulfur { sulfur }				500	mg/kg		380.518	mg/kg	0.0381 %	✓	
		016-094-00-1	231-722-6	7704-34-9									
										Total:	0.537 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP214-14/11/2023-1.65m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP214-14/11/2023-1.65m
Moisture content:
14.5%
(dry weight correction)

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: 14.5% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9.1 mg/kg	1.32	10.493 mg/kg	0.00105 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<LOD
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				80 mg/kg	2.27	158.603 mg/kg	0.0159 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		26 mg/kg	1.126	25.566 mg/kg	0.00256 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	14 mg/kg	1.56	19.072 mg/kg	0.00122 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		41 mg/kg	2.976	106.574 mg/kg	0.0107 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		64 mg/kg	2.469	138.022 mg/kg	0.0138 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
16		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5	mg/kg	1.884	<0.942	mg/kg	<0.0000942 %		<**LOD**
17		pH			PH		7.54	pH		7.54	pH	7.54 pH		
18		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
19		acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
20		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
21		fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
22		phenanthrene		201-581-5	85-01-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
23		anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
24		fluoranthene		205-912-4	206-44-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
25		pyrene		204-927-3	129-00-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
26		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
27		chrysene	601-048-00-0	205-923-4	218-01-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
28		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
29		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
30		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
31		indeno[123-cd]pyrene		205-893-2	193-39-5		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
32		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
33		benzo[ghi]perylene		205-883-8	191-24-2		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
34		sulfur { sulfur }	016-094-00-1	231-722-6	7704-34-9		400	mg/kg		349.345	mg/kg	0.0349 %	✓	
											Total:	0.0857 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP215-14/11/2023-1.20m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP215-14/11/2023-1.20m
Moisture content:
14.2%
(dry weight correction)

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: 14.2% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<**LOD**
2		pH			PH		7.81 pH		7.81 pH	7.81 pH		
3		sulfur { sulfur }	016-094-00-1	231-722-6	7704-34-9		8800 mg/kg		7705.779 mg/kg	0.771 %	✓	
									Total:	0.771 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Classification of sample: TP216-14/11/2023-2.60m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP216-14/11/2023-2.60m
Moisture content:
9.7%
(dry weight correction)

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: 9.7% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<**LOD**
2		pH			PH		7.3 pH		7.3 pH	7.3 pH		
3		sulfur { sulfur }	016-094-00-1	231-722-6	7704-34-9		9300 mg/kg		8477.666 mg/kg	0.848 %	✓	
									Total:	0.848 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Appendix A: Classifier defined and non GB MCL determinands

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

- **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

- **pH** (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc sulphate}

Measured concentrations of hexavalent chromium reported below the limit of detection.

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide] (edit as required)

sulfur {sulfur}

Worse case compound.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2023.341.5847.10836 (07 Dec 2023)
HazWasteOnline Database: 2023.341.5847.10836 (07 Dec 2023)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
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
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021
GB MCL List v2.0 - version 2.0 of 20th October 2023

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

UZE4R-JDES1-BCWQI

Job name

EMT-23-19120-Batch-1-Sched-ACEF-202312011057

Description/Comments

Project

TE1163

Site

Former Cronton Colliery Site (Huyton) - db symmetry

Classified by

Name:
Adrian Read
Date:
12 Dec 2023 09:09 GMT
Telephone:
01925 818388

Company:
Tier Environmental
Suite 414
Chadwick House
Warrington
WA3 6AE

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: **CERTIFIED**

Course	Date
Hazardous Waste Classification	03 Dec 2020
Most recent 3 year Refresher	05 Dec 2023

Next 3 year Refresher due by Dec 2026

Purpose of classification

2 - Material Characterisation

Address of the waste

Former Cronton Colliery, off Cronton Road (A5080) **Post Code** L35 1QR

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Proposed redevelopment of land

Description of the specific process, sub-process and/or activity that created the waste

Waste created during excavation of soils during development

Description of the waste

Made ground and/or natural soils

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	TP202-13/11/2023-0.20m		Non Hazardous		3
2	TP205-13/11/2023-0.30m		Non Hazardous		5
3	TP206-13/11/2023-1.85m		Non Hazardous		7
4	TP207-13/11/2023-3.00m		Non Hazardous		8
5	TP210-13/11/2023-0.60m		Non Hazardous		9
6	TP213-14/11/2023-0.50m		Non Hazardous		11
7	TP201-14/11/2023-1.00m		Non Hazardous		12

Related documents

#	Name	Description
1	EMT-23-19120-Batch-1-Sched-ACEF-202312011057.HWOL	Element .hwol file used to populate the Job
2	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Adrian Read

Created date: 12 Dec 2023 09:09 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	14
Appendix B: Rationale for selection of metal species	15
Appendix C: Version	15

Classification of sample: TP202-13/11/2023-0.20m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP202-13/11/2023-0.20m
Moisture content:
25.8%
(dry weight correction)

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: 25.8% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		19.9 mg/kg	1.32	20.886 mg/kg	0.00209 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2 mg/kg	1.142	0.182 mg/kg	0.0000182 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				46 mg/kg	2.27	83.005 mg/kg	0.0083 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		57 mg/kg	1.126	51.014 mg/kg	0.0051 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	297 mg/kg	1.56	368.255 mg/kg	0.0236 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.1 mg/kg	1.353	0.108 mg/kg	0.0000108 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		25.3 mg/kg	2.976	59.857 mg/kg	0.00599 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		101 mg/kg	2.774	222.726 mg/kg	0.0223 %	✓	
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
11	pH			PH		7.67 pH		7.67 pH	7.67 pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		0.06 mg/kg		0.0477 mg/kg	0.00000477 %	✓	
13	acenaphthylene		205-917-1	208-96-8		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
14	acenaphthene		201-469-6	83-32-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
15	fluorene		201-695-5	86-73-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		phenanthrene				0.16	mg/kg		0.127	mg/kg	0.0000127 %	✓	
			201-581-5	85-01-8									
17		anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
18		fluoranthene				0.21	mg/kg		0.167	mg/kg	0.0000167 %	✓	
			205-912-4	206-44-0									
19		pyrene				0.19	mg/kg		0.151	mg/kg	0.0000151 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				0.11	mg/kg		0.0874	mg/kg	0.00000874 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				0.13	mg/kg		0.103	mg/kg	0.0000103 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				0.12	mg/kg		0.0954	mg/kg	0.00000954 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				0.04	mg/kg		0.0318	mg/kg	0.00000318 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				0.1	mg/kg		0.0795	mg/kg	0.00000795 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
										Total:	0.0679 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP205-13/11/2023-0.30m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP205-13/11/2023-0.30m
Moisture content:
19.4%
(dry weight correction)

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: 19.4% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13.5 mg/kg	1.32	14.928 mg/kg	0.00149 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.5 mg/kg	1.142	0.478 mg/kg	0.0000478 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				40.1 mg/kg	2.27	76.237 mg/kg	0.00762 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		43 mg/kg	1.126	40.547 mg/kg	0.00405 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	59 mg/kg	1.56	77.076 mg/kg	0.00494 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.2 mg/kg	1.353	0.227 mg/kg	0.0000227 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		20.4 mg/kg	2.976	50.851 mg/kg	0.00509 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		84 mg/kg	2.774	195.166 mg/kg	0.0195 %	✓	
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<**LOD**
11	pH			PH		7.92 pH		7.92 pH	7.92 pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		0.06 mg/kg		0.0503 mg/kg	0.00000503 %	✓	
13	acenaphthylene		205-917-1	208-96-8		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<**LOD**
14	acenaphthene		201-469-6	83-32-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<**LOD**
15	fluorene		201-695-5	86-73-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		phenanthrene				0.16	mg/kg		0.134	mg/kg	0.0000134 %	✓	
			201-581-5	85-01-8									
17		anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
18		fluoranthene				0.13	mg/kg		0.109	mg/kg	0.0000109 %	✓	
			205-912-4	206-44-0									
19		pyrene				0.11	mg/kg		0.0921	mg/kg	0.00000921 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				0.08	mg/kg		0.067	mg/kg	0.0000067 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				0.1	mg/kg		0.0838	mg/kg	0.00000838 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				0.09	mg/kg		0.0754	mg/kg	0.00000754 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				0.03	mg/kg		0.0251	mg/kg	0.00000251 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				0.07	mg/kg		0.0586	mg/kg	0.00000586 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
										Total:	0.0432 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP206-13/11/2023-1.85m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP206-13/11/2023-1.85m
Moisture content:
12%
(dry weight correction)

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: 12% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		pH				8.35 pH		8.35 pH	8.35 pH		
				PH							
2		sulfur { sulfur }				<100 mg/kg		<100 mg/kg	<0.01 %		<**LOD**
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.01 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Classification of sample: TP207-13/11/2023-3.00m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP207-13/11/2023-3.00m
Moisture content:
18.9%
(dry weight correction)

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: 18.9% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		pH				7.54 pH		7.54 pH	7.54 pH		
				PH							
2		sulfur { sulfur }				300 mg/kg		252.313 mg/kg	0.0252 %	✓	
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.0252 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: TP210-13/11/2023-0.60m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP210-13/11/2023-0.60m
Moisture content:
19.5%
(dry weight correction)

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: 19.5% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13.6 mg/kg	1.32	15.026 mg/kg	0.0015 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.3 mg/kg	1.142	0.287 mg/kg	0.0000287 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				52.2 mg/kg	2.27	99.158 mg/kg	0.00992 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		60 mg/kg	1.126	56.53 mg/kg	0.00565 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	870 mg/kg	1.56	1135.598 mg/kg	0.0728 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3 mg/kg	1.353	0.34 mg/kg	0.000034 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		31.1 mg/kg	2.976	77.458 mg/kg	0.00775 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		139 mg/kg	2.774	322.683 mg/kg	0.0323 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<0.5	mg/kg	1.884	<0.942	mg/kg	<0.0000942 %		<**LOD**
		006-007-00-5											
17		pH				8.4	pH		8.4	pH	8.4 pH		
				PH									
18		naphthalene				0.06	mg/kg		0.0502	mg/kg	0.00000502 %	✓	
		601-052-00-2	202-049-5	91-20-3									
19		acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
20		acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
21		fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
22		phenanthrene				0.29	mg/kg		0.243	mg/kg	0.0000243 %	✓	
			201-581-5	85-01-8									
23		anthracene				0.06	mg/kg		0.0502	mg/kg	0.00000502 %	✓	
			204-371-1	120-12-7									
24		fluoranthene				0.49	mg/kg		0.41	mg/kg	0.000041 %	✓	
			205-912-4	206-44-0									
25		pyrene				0.47	mg/kg		0.393	mg/kg	0.0000393 %	✓	
			204-927-3	129-00-0									
26		benzo[a]anthracene				0.26	mg/kg		0.218	mg/kg	0.0000218 %	✓	
		601-033-00-9	200-280-6	56-55-3									
27		chrysene				0.32	mg/kg		0.268	mg/kg	0.0000268 %	✓	
		601-048-00-0	205-923-4	218-01-9									
28		benzo[b]fluoranthene				0.36	mg/kg		0.301	mg/kg	0.0000301 %	✓	
		601-034-00-4	205-911-9	205-99-2									
29		benzo[k]fluoranthene				0.14	mg/kg		0.117	mg/kg	0.0000117 %	✓	
		601-036-00-5	205-916-6	207-08-9									
30		benzo[a]pyrene; benzo[def]chrysene				0.31	mg/kg		0.259	mg/kg	0.0000259 %	✓	
		601-032-00-3	200-028-5	50-32-8									
31		indeno[123-cd]pyrene				0.18	mg/kg		0.151	mg/kg	0.0000151 %	✓	
			205-893-2	193-39-5									
32		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
33		benzo[ghi]perylene				0.2	mg/kg		0.167	mg/kg	0.0000167 %	✓	
			205-883-8	191-24-2									
34		sulfur { sulfur }				500	mg/kg		418.41	mg/kg	0.0418 %	✓	
		016-094-00-1	231-722-6	7704-34-9									
35		asbestos				20	mg/kg		16.736	mg/kg	0.00167 %	✓	
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.179 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP213-14/11/2023-0.50m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP213-14/11/2023-0.50m
Moisture content:
14.3%
(dry weight correction)

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: 14.3% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<**LOD**
2		pH			PH		7.9 pH		7.9 pH	7.9 pH		
3		sulfur { sulfur }	016-094-00-1	231-722-6	7704-34-9		200 mg/kg		174.978 mg/kg	0.0175 %	✓	
										Total:	0.0176 %	

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Classification of sample: TP201-14/11/2023-1.00m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP201-14/11/2023-1.00m
Moisture content:
15.6%
(dry weight correction)

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: 15.6% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		15.4 mg/kg	1.32	17.589 mg/kg	0.00176 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<**LOD**
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				45.2 mg/kg	2.27	88.758 mg/kg	0.00888 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		33 mg/kg	1.126	32.14 mg/kg	0.00321 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	16 mg/kg	1.56	21.589 mg/kg	0.00138 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.2 mg/kg	1.353	0.234 mg/kg	0.0000234 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		43.7 mg/kg	2.976	112.511 mg/kg	0.0113 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		1 mg/kg	2.554	2.209 mg/kg	0.000221 %	✓	
9	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		128 mg/kg	2.774	307.172 mg/kg	0.0307 %	✓	
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<**LOD**
11	pH			PH		9.09 pH		9.09 pH	9.09 pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<**LOD**
13	acenaphthylene		205-917-1	208-96-8		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<**LOD**
14	acenaphthene		201-469-6	83-32-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<**LOD**
15	fluorene		201-695-5	86-73-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			201-581-5	85-01-8									
17		anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
18		fluoranthene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-912-4	206-44-0									
19		pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			204-927-3	129-00-0									
20		benzo[a]anthracene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
28		sulfur { sulfur }				100	mg/kg		86.505	mg/kg	0.00865 %	✓	
		016-094-00-1	231-722-6	7704-34-9									
										Total:	0.0663 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

- **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

- **pH** (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide] (edit as required)

sulfur {sulfur}

Worse case compound.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2023.341.5847.10836 (07 Dec 2023)
HazWasteOnline Database: 2023.341.5847.10836 (07 Dec 2023)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
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
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021
GB MCL List v2.0 - version 2.0 of 20th October 2023

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Attention :	Eve Rowland
Date :	7th December, 2023
Your reference :	TE1163
Our reference :	Test Report 23/19120 Batch 1 Schedule G
Location :	Former Cronton Colliery
Date samples received :	15th November, 2023
Status :	Final Report
Issue :	202312071506

Forty samples were received for analysis on 15th November, 2023 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 9.122 kg of CO2

Scope 1&2&3 emissions - 21.559 kg of CO2

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Eve Rowland
EMT Job No: 23/19120

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	4-6	16-18	22-24	28-30	40-42	58-60					LOD/LOR	Units	Method No.
Sample ID	TP202	TP205	TP206	TP207	TP209	TP211							
Depth	1.50	1.10	0.80	1.00	1.30	1.50							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023							
Sulphur as S	0.02	<0.01	<0.01	0.01	<0.01	0.01					<0.01	%	TM30/PM15
Total Potential Sulphate as SO4	0.06	<0.01	<0.01	0.03	<0.01	0.03					<0.01	%	TM30/PM15
Total Sulphate as SO4 BRE	0.05	<0.01	<0.01	0.02	0.02	<0.01					<0.01	%	TM50/PM29
Oxidisable Sulphides as SO4	0.01	<0.01	<0.01	0.01	<0.01	0.03					<0.01	%	TM30/TM50/PM15/PM29
Sulphate as SO4 (2:1 Ext) #	0.0671	0.0070	0.0044	<0.0015	0.0549	0.0160					<0.0015	g/l	TM38/PM20
Organic Matter	0.4	0.4	0.4	1.1	0.3	0.4					<0.2	%	TM21/PM24
pH #	5.33	7.24	7.99	7.67	6.43	7.78					<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Notification of Deviating Samples

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Eve Rowland

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/19120						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/19120

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/19120

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30/TM50	TM30 : Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 Rev 4.4,1994 and 6010B Rev 2, Dec 1996 TM50 : Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM15/PM29	PM15 : Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. PM29 : Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

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Tier Environmental
Suite 414, Chadwick House
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Birchwood
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WA3 6AE

Attention :	Eve Rowland
Date :	6th December, 2023
Your reference :	TE1163
Our reference :	Test Report 23/19120 Batch 1 Schedule B
Location :	Former Cronton Colliery
Date samples received :	15th November, 2023
Status :	Final Report
Issue :	202312061108

Forty samples were received for analysis on 15th November, 2023 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 21.648 kg of CO2

Scope 1&2&3 emissions - 51.159 kg of CO2

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Eve Rowland
EMT Job No: 23/19120

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	52-54	86-88	92-94	101-103							LOD/LOR	Units	Method No.
Sample ID	TP210	TP214	TP215	TP216									
Depth	1.90	1.65	1.20	2.60									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	13/11/2023	14/11/2023	14/11/2023	14/11/2023									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	15/11/2023	15/11/2023	15/11/2023	15/11/2023									
Arsenic #	12.4	9.1	-	-							<0.5	mg/kg	TM30/PM15
Cadmium #	8.9	<0.1	-	-							<0.1	mg/kg	TM30/PM15
Chromium #	56.2	80.0	-	-							<0.5	mg/kg	TM30/PM15
Copper #	54	26	-	-							<1	mg/kg	TM30/PM15
Lead #	89	14	-	-							<5	mg/kg	TM30/PM15
Mercury #	0.2	<0.1	-	-							<0.1	mg/kg	TM30/PM15
Nickel #	37.6	41.0	-	-							<0.7	mg/kg	TM30/PM15
Selenium #	1	<1	-	-							<1	mg/kg	TM30/PM15
Sulphur as S	0.05	0.04	0.88	0.93							<0.01	%	TM30/PM15
Total Sulphate as SO4 #	359	401	-	-							<50	mg/kg	TM50/PM29
Total Sulphate as SO4 BRE	0.04	0.04	0.82	0.55							<0.01	%	TM50/PM29
Zinc #	2458	64	-	-							<5	mg/kg	TM30/PM15
Magnesium	0.0080	0.0162	0.1952 AA	0.2104 AA							<0.0001	g/l	TM30/PM20
PAH MS													
Naphthalene #	<0.04	<0.04	-	-							<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	-	-							<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	-	-							<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	-	-							<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.07	<0.03	-	-							<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	-	-							<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.11	<0.03	-	-							<0.03	mg/kg	TM4/PM8
Pyrene #	0.11	<0.03	-	-							<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	-	-							<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	-	-							<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	-	-							<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	-	-							<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	<0.04	-	-							<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	-	-							<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	-	-							<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	<0.6	-	-							<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	-	-							<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	-	-							<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	96	100	-	-							<0	%	TM4/PM8

Please see attached notes for all abbreviations and acronyms

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Eve Rowland
EMT Job No: 23/19120

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	52-54	86-88	92-94	101-103							LOD/LOR	Units	Method No.
Sample ID	TP210	TP214	TP215	TP216									
Depth	1.90	1.65	1.20	2.60									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	13/11/2023	14/11/2023	14/11/2023	14/11/2023									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	15/11/2023	15/11/2023	15/11/2023	15/11/2023									
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) #	<0.1	<0.1	-	-							<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) #	<0.1	<0.1	-	-							<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	-	-							<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) #	<0.2	<0.2	-	-							<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) #	<4	<4	-	-							<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) #	<7	<7	-	-							<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) #	<7	<7	-	-							<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	<7	<7	-	-							<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH+HS_CU_1D_AL)	<26	<26	-	-							<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR) #	<0.1	<0.1	-	-							<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) #	<0.1	<0.1	-	-							<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) #	<0.1	<0.1	-	-							<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) #	<0.2	<0.2	-	-							<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) #	<4	<4	-	-							<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) #	<7	<7	-	-							<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) #	<7	<7	-	-							<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	<7	<7	-	-							<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH+HS_CU_1D_AR)	<26	<26	-	-							<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	<52	<52	-	-							<52	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	<5	<5	-	-							<5	ug/kg	TM36/PM12
Benzene #	<5	<5	-	-							<5	ug/kg	TM36/PM12
Toluene #	<5	<5	-	-							<5	ug/kg	TM36/PM12
Ethylbenzene #	<5	<5	-	-							<5	ug/kg	TM36/PM12
m/p-Xylene #	<5	<5	-	-							<5	ug/kg	TM36/PM12
o-Xylene #	<5	<5	-	-							<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15	-	-							<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	31.4	14.5	14.2	9.7							<0.1	%	PM4/PM0
Ammoniacal Nitrogen as NH4	<0.6	<0.6	<0.6	3.7							<0.6	mg/kg	TM38/PM20
Chloride (2:1 Ext BRE) #	0.010	0.005	0.008	0.020							<0.002	g/l	TM38/PM20
Hexavalent Chromium #	<0.3	<0.3	-	-							<0.3	mg/kg	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	<0.0025	<0.0025	<0.0025	<0.0025							<0.0025	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0653	0.1519	1.9631	1.8952							<0.0015	g/l	TM38/PM20
Free Cyanide	<0.5	<0.5	<0.5	<0.5							<0.5	mg/kg	TM89/PM45
Total Cyanide #	<0.5	<0.5	<0.5	<0.5							<0.5	mg/kg	TM89/PM45
Complex Cyanide	<0.5	<0.5	<0.5	<0.5							<0.5	mg/kg	TM89/PM45

Please see attached notes for all abbreviations and acronyms

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Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Eve Rowland
EMT Job No: 23/19120

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	52-54	86-88	92-94	101-103							LOD/LOR	Units	Method No.
Sample ID	TP210	TP214	TP215	TP216									
Depth	1.90	1.65	1.20	2.60									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	13/11/2023	14/11/2023	14/11/2023	14/11/2023									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	15/11/2023	15/11/2023	15/11/2023	15/11/2023									
Total Organic Carbon #	3.23	0.98	-	-							<0.02	%	TM21/PM24
pH #	8.03	7.54	7.81	7.30							<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

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Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Eve Rowland
EMT Job No: 23/19120

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	52-54	74-76	86-88	92-94	101-103						LOD/LOR	Units	Method No.
Sample ID	TP210	TP213	TP214	TP215	TP216								
Depth	1.90	0.50	1.65	1.20	2.60								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	13/11/2023	14/11/2023	14/11/2023	14/11/2023	14/11/2023								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023								
Dissolved Arsenic #	4.0	<2.5	<2.5	<2.5	<2.5						<2.5	ug/l	TM30/PM14
Dissolved Boron #	37	15	18	45	29						<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM30/PM14
Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7						<7	ug/l	TM30/PM14
Dissolved Iron #	-	-	-	<20	<20						<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5						<5	ug/l	TM30/PM14
Dissolved Manganese #	-	-	-	<2	924						<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1						<1	ug/l	TM30/PM14
Dissolved Nickel #	6	<2	<2	3	13						<2	ug/l	TM30/PM14
Dissolved Phosphorus #	-	-	-	<5	<5						<5	ug/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3	<3	<3						<3	ug/l	TM30/PM14
Dissolved Vanadium #	-	-	-	<1.5	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Zinc #	41	9	6	<3	<3						<3	ug/l	TM30/PM14
PAH MS													
Naphthalene	<0.1	<0.1	0.7	<0.1	<0.1						<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Acenaphthene	<0.005	<0.005	0.324	<0.005	0.005						<0.005	ug/l	TM4/PM30
Fluorene	<0.005	<0.005	0.105	<0.005	0.006						<0.005	ug/l	TM4/PM30
Phenanthrene	<0.005	<0.005	0.185	<0.005	0.025						<0.005	ug/l	TM4/PM30
Anthracene	<0.005	<0.005	0.020	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Fluoranthene	<0.005	0.006	0.045	0.007	0.008						<0.005	ug/l	TM4/PM30
Pyrene	<0.005	0.006	0.038	0.008	0.009						<0.005	ug/l	TM4/PM30
Benzo(a)anthracene	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Chrysene	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.008	0.010	<0.008	<0.008	<0.008						<0.008	ug/l	TM4/PM30
Benzo(a)pyrene	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	ug/l	TM4/PM30
PAH 16 Total	<0.173	<0.173	1.417	<0.173	<0.173						<0.173	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.008	<0.008	<0.008	<0.008	<0.008						<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008	<0.008	<0.008	<0.008	<0.008						<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	77	76	77	86	91						<0	%	TM4/PM30
Total Phenols HPLC	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/l	TM26/PM0
Mass of raw test portion	0.1151	0.1066	0.102	0.1034	0.104							kg	NONE/PM17
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09							kg	NONE/PM17
pH	8.30	8.01	7.80	7.90	7.83						<0.01	pH units	TM73/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Eve Rowland

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
23/19120	1	TP210	1.90	53	Charlotte Taylor	05/12/2023	**General Description (Bulk Analysis)**	brown soil/stones
					Charlotte Taylor	05/12/2023	**Asbestos Fibres**	NAD
					Charlotte Taylor	05/12/2023	**Asbestos ACM**	NAD
					Charlotte Taylor	05/12/2023	**Asbestos Type**	NAD
23/19120	1	TP213	0.50	75	Catherine Coles	06/12/2023	**General Description (Bulk Analysis)**	brown soil,stone
					Catherine Coles	06/12/2023	**Asbestos Fibres**	NAD
					Catherine Coles	06/12/2023	**Asbestos ACM**	NAD
					Catherine Coles	06/12/2023	**Asbestos Type**	NAD
23/19120	1	TP214	1.65	87	Emily Anderton	05/12/2023	**General Description (Bulk Analysis)**	Brown soil with stones
					Emily Anderton	05/12/2023	**Asbestos Fibres**	NAD
					Emily Anderton	05/12/2023	**Asbestos ACM**	NAD
					Emily Anderton	05/12/2023	**Asbestos Type**	NAD
23/19120	1	TP215	1.20	93	Catherine Coles	05/12/2023	**General Description (Bulk Analysis)**	brown soil,stone
					Catherine Coles	05/12/2023	**Asbestos Fibres**	Fibre Bundles
					Catherine Coles	05/12/2023	**Asbestos ACM**	NAD
					Catherine Coles	05/12/2023	**Asbestos Type**	Chrysotile
23/19120	1	TP216	2.60	102	Catherine Coles	06/12/2023	**General Description (Bulk Analysis)**	brown soil,stone
					Catherine Coles	06/12/2023	**Asbestos Fibres**	NAD
					Catherine Coles	06/12/2023	**Asbestos ACM**	NAD
					Catherine Coles	06/12/2023	**Asbestos Type**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Eve Rowland

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/19120						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/19120

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/19120

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes

EMT Job No: 23/19120

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes		AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes

EMT Job No: 23/19120

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	

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Attention :	Eve Rowland
Date :	1st December, 2023
Your reference :	TE1163
Our reference :	Test Report 23/19120 Batch 1 Schedule A 23/19120 Batch 1 Schedule C 23/19120 Bat
Location :	Former Cronton Colliery
Date samples received :	15th November, 2023
Status :	Final Report
Issue :	1

Forty samples were received for analysis on 15th November, 2023 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 23.675 kg of CO2

Scope 1&2&3 emissions - 55.95 kg of CO2

Authorised By:

Bruce Leslie
Project Manager

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Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Eve Rowland
EMT Job No: 23/19120

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	13-15	25-27	31-33	46-48	74-76	104-106				LOD/LOR	Units	Method No.
Sample ID	TP202	TP205	TP206	TP207	TP210	TP213	TP201						
Depth	0.20	0.30	1.85	3.00	0.60	0.50	1.00						
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T						
Sample Date	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023	14/11/2023	14/11/2023						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023						
Arsenic #	19.9	13.5	-	-	13.6	-	15.4				<0.5	mg/kg	TM30/PM15
Cadmium #	0.2	0.5	-	-	0.3	-	<0.1				<0.1	mg/kg	TM30/PM15
Chromium #	46.0	40.1	-	-	52.2	-	45.2				<0.5	mg/kg	TM30/PM15
Copper #	57	43	-	-	60	-	33				<1	mg/kg	TM30/PM15
Lead #	297	59	-	-	870	-	16				<5	mg/kg	TM30/PM15
Mercury #	0.1	0.2	-	-	0.3	-	0.2				<0.1	mg/kg	TM30/PM15
Nickel #	25.3	20.4	-	-	31.1	-	43.7				<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1	-	-	<1	-	1				<1	mg/kg	TM30/PM15
Sulphur as S	-	-	<0.01	0.03	0.05	0.02	0.01				<0.01	%	TM30/PM15
Total Sulphate as SO4 #	462	410	-	-	611	-	122				<50	mg/kg	TM50/PM29
Total Sulphate as SO4 BRE	-	-	<0.01	0.03	0.06	0.01	0.01				<0.01	%	TM50/PM29
Zinc #	101	84	-	-	139	-	128				<5	mg/kg	TM30/PM15
Magnesium	-	-	0.0009	0.0004	0.0045	0.0028	0.0006				<0.0001	g/l	TM30/PM20
PAH MS													
Naphthalene #	0.06	0.06	-	-	0.06	-	<0.04				<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	-	-	<0.03	-	<0.03				<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	-	-	<0.05	-	<0.05				<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	-	-	<0.04	-	<0.04				<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.16	0.16	-	-	0.29	-	<0.03				<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	-	-	0.06	-	<0.04				<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.21	0.13	-	-	0.49	-	<0.03				<0.03	mg/kg	TM4/PM8
Pyrene #	0.19	0.11	-	-	0.47	-	<0.03				<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.11	0.08	-	-	0.26	-	<0.06				<0.06	mg/kg	TM4/PM8
Chrysene #	0.13	0.10	-	-	0.32	-	<0.02				<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.16	0.12	-	-	0.50	-	<0.07				<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.10	0.07	-	-	0.31	-	<0.04				<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	<0.04	-	-	0.18	-	<0.04				<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	-	-	<0.04	-	<0.04				<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	-	-	0.20	-	<0.04				<0.04	mg/kg	TM4/PM8
PAH 16 Total	1.1	0.8	-	-	3.1	-	<0.6				<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.12	0.09	-	-	0.36	-	<0.05				<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.04	0.03	-	-	0.14	-	<0.02				<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	99	100	-	-	99	-	97				<0	%	TM4/PM8

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COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T						
Sample Date	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023	14/11/2023	14/11/2023						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023						
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	-	-	-	-	<0.1	-	-				<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	-	-	-	-	<0.1	-	-				<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	-	-	-	-	<0.1	-	-				<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	-	-	-	-	<0.2	-	-				<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	-	-	-	-	<4	-	-				<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	-	-	-	-	<7	-	-				<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	-	-	-	-	<7	-	-				<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	-	-	-	-	<7	-	-				<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH+HS_CU_1D_AL)	-	-	-	-	<26	-	-				<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	-	-	-	-	<0.1	-	-				<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	-	-	-	-	<0.1	-	-				<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	-	-	-	-	<0.1	-	-				<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	-	-	-	-	<0.2	-	-				<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	-	-	-	-	<4	-	-				<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	-	-	-	-	<7	-	-				<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	-	-	-	-	36	-	-				<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	-	-	-	-	<7	-	-				<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH+HS_CU_1D_AR)	-	-	-	-	36	-	-				<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH+HS_CU_1D_Total)	-	-	-	-	<52	-	-				<52	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE#	-	-	-	-	<5	-	-				<5	ug/kg	TM36/PM12
Benzene#	-	-	-	-	<5	-	-				<5	ug/kg	TM36/PM12
Toluene#	-	-	-	-	<5	-	-				<5	ug/kg	TM36/PM12
Ethylbenzene#	-	-	-	-	<5	-	-				<5	ug/kg	TM36/PM12
m/p-Xylene#	-	-	-	-	<5	-	-				<5	ug/kg	TM36/PM12
o-Xylene#	-	-	-	-	<5	-	-				<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15	-	-	<0.15	-	<0.15				<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	25.8	19.4	12.0	18.9	19.5	14.3	15.6				<0.1	%	PM4/PM0
Ammoniacal Nitrogen as NH4	-	-	<0.6	<0.6	<0.6	<0.6	<0.6				<0.6	mg/kg	TM38/PM20
Chloride (2:1 Ext BRE)#	-	-	0.008	0.005	0.008	0.005	0.002				<0.002	g/l	TM38/PM20
Hexavalent Chromium#	<0.3	<0.3	-	-	<0.3	-	<0.3				<0.3	mg/kg	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	-	-	<0.0025	<0.0025	0.0057	<0.0025	<0.0025				<0.0025	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)#	0.0162	0.0019	0.0031	0.0074	0.0372	0.0248	0.0169				<0.0015	g/l	TM38/PM20
Free Cyanide	<0.5	<0.5	-	-	<0.5	<0.5	<0.5				<0.5	mg/kg	TM89/PM45
Total Cyanide#	<0.5	<0.5	-	-	<0.5	<0.5	<0.5				<0.5	mg/kg	TM89/PM45
Complex Cyanide	<0.5	<0.5	-	-	<0.5	<0.5	<0.5				<0.5	mg/kg	TM89/PM45

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

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COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T						
Sample Date	13/11/2023	13/11/2023	13/11/2023	13/11/2023	13/11/2023	14/11/2023	14/11/2023						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023	15/11/2023						
Total Organic Carbon #	4.36	2.67	0.06	3.21	3.32	-	0.36				<0.02	%	TM21/PM24
Calorific Value	-	-	<1	1	-	-	-				<1	MJ/kg	TM21/PM24
pH #	7.67	7.92	8.35	7.54	8.40	7.90	9.09				<0.01	pH units	TM73/PM11

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All solid results are expressed on a dry weight basis unless stated otherwise.

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Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
23/19120	1	TP210	0.60	48	Catherine Coles	24/11/2023	**General Description (Bulk Analysis)**	brown soil,stone
					Catherine Coles	24/11/2023	**Asbestos Fibres**	NAD
					Catherine Coles	24/11/2023	**Asbestos ACM**	ACM Debris
					Catherine Coles	24/11/2023	**Asbestos Type**	Chrysotile
					Catherine Coles	30/11/2023	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					Catherine Coles	30/11/2023	**Total Detailed Gravimetric Quantification (% Asb)**	0.002 (mass %)
					Catherine Coles	30/11/2023	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	0.002 (mass %)
					Remigiusz Blichowski	30/11/2023	**Asbestos PCOM Quantification (Fibres)**	0.001 (mass %)
					Remigiusz Blichowski	30/11/2023	**Asbestos Gravimetric & PCOM Total**	0.003 (mass %)

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EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/19120						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/19120

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/19120

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.			AD	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes

EMT Job No: 23/19120

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes

EMT Job No: 23/19120

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
TM131	Quantification of Asbestos Fibres and ACM based on HSG 248 Second edition:2021, HSG 264 Second edition:2012, HSE Contract Research Report No.83/1996, MDHS 87:1998, WM3 1st Edition v1.1:2018	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes

APPENDIX D - GEOENVIRONMENTAL GROUNDWATER LABORATORY RESULTS

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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F: +44 (0) 1244 833781
W: www.element.com

Tier Environmental
Suite 414, Chadwick House
Warrington Rd
Birchwood
Warrington
United Kingdom
WA3 6AE

Attention :	Alex Preston
Date :	20th December, 2023
Your reference :	TE1163
Our reference :	Test Report 23/21463 Batch 1
Location :	Former Cronton Colliery
Date samples received :	18th December, 2023
Status :	Final Report
Issue :	202312201613

Two samples were received for analysis on 18th December, 2023 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 3.765 kg of CO2

Scope 1&2&3 emissions - 8.897 kg of CO2

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 23/21463

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-5	6-10											
Sample ID	WS105	WS14											
Depth	1.51	0.74											
COC No / misc													
Containers	V P G	V P G											
Sample Date	18/12/2023	18/12/2023											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	18/12/2023	18/12/2023											

Please see attached notes for all abbreviations and acronyms

			LOD/LOR	Units	Method No.
Dissolved Arsenic #	<0.9	<0.9	<0.9	ug/l	TM170/PM14
Dissolved Cadmium #	<0.03	<0.03	<0.03	ug/l	TM170/PM14
Total Dissolved Chromium #	0.4	0.2	<0.2	ug/l	TM170/PM14
Dissolved Copper #	2	3	<1	ug/l	TM170/PM14
Total Dissolved Iron #	<4.7	21.6	<4.7	ug/l	TM170/PM14
Dissolved Lead #	<0.4	<0.4	<0.4	ug/l	TM170/PM14
Dissolved Mercury #	<0.5	<0.5	<0.5	ug/l	TM170/PM14
Dissolved Nickel #	0.6	0.6	<0.2	ug/l	TM170/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	ug/l	TM170/PM14
Dissolved Zinc #	2.7	2.5	<1.5	ug/l	TM170/PM14
Dissolved Magnesium #	11.3	7.9	<0.1	mg/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	288	198	<1	mg/l	TM30/PM14
PAH MS					
Naphthalene #	<0.1	<0.1	<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Acenaphthene #	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Fluorene #	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Phenanthrene #	0.007	<0.005	<0.005	ug/l	TM4/PM30
Anthracene #	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Fluoranthene #	0.014	<0.005	<0.005	ug/l	TM4/PM30
Pyrene #	0.015	<0.005	<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	0.009	<0.005	<0.005	ug/l	TM4/PM30
Chrysene #	0.008	<0.005	<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	0.013	<0.008	<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	0.007	<0.005	<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.005	<0.005	<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	0.005	<0.005	<0.005	ug/l	TM4/PM30
PAH 16 Total #	<0.173	<0.173	<0.173	ug/l	TM4/PM30
Benzo(b)fluoranthene	0.009	<0.008	<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008	<0.008	<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	96	90	<0	%	TM4/PM30
MTBE #	<5	<5	<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5	<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5	ug/l	TM36/PM12

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 23/21463

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-5	6-10											
Sample ID	WS105	WS14											
Depth	1.51	0.74									Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V P G	V P G											
Sample Date	18/12/2023	18/12/2023											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	18/12/2023	18/12/2023											
											LOD/LOR	Units	Method No.
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<10	<10									<10	ug/l	TM36/PM12
>C6-C8 (HS_1D_AL)#	<10	<10									<10	ug/l	TM36/PM12
>C8-C10 (HS_1D_AL)#	<10	<10									<10	ug/l	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<5	<5									<5	ug/l	TM5/PM16/PM30
>C12-C16 (EH_CU_1D_AL)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>C16-C21 (EH_CU_1D_AL)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>C21-C35 (EH_CU_1D_AL)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>C35-C40 (EH_CU_1D_AL)	<10	<10									<10	ug/l	TM5/PM16/PM30
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Aromatics													
>C5-EC7 (HS_1D_AR)#	<10	<10									<10	ug/l	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<10	<10									<10	ug/l	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<10	<10									<10	ug/l	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<5	<5									<5	ug/l	TM5/PM16/PM30
>EC12-EC16 (EH_CU_1D_AR)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC16-EC21 (EH_CU_1D_AR)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC21-EC35 (EH_CU_1D_AR)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC35-EC40 (EH_CU_1D_AR)	<10	<10									<10	ug/l	TM5/PM16/PM30
Total aromatics C5-40 (EH_CU+HS_1D_AR)	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/l	TM26/PM0
Sulphate as SO4#	11.5	19.9									<0.5	mg/l	TM38/PM0
Total Ammonia as N#	<0.03	0.03									<0.03	mg/l	TM38/PM0
Electrical Conductivity @25C#	571	423									<2	uS/cm	TM76/PM0
pH#	7.42	7.48									<0.01	pH units	TM73/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/21463						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
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1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
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#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/21463

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes			

EMT Job No: 23/21463

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM170	Determination of Trace Metals by ICP-MS (Inductively Coupled Plasma – Mass Spectrometry): Modified USEPA Method 200.8, Rev. 5.4, 1994; Modified EPA Method 6020A, Rev.1, Feb 2007; Modified BS EN ISO 17294-2:2016	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			

EMT Job No: 23/21463

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
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TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes			

EMT Job No: 23/21463

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
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TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM170	Determination of Trace Metals by ICP-MS (Inductively Coupled Plasma – Mass Spectrometry): Modified USEPA Method 200.8, Rev. 5.4, 1994; Modified EPA Method 6020A, Rev.1, Feb 2007; Modified BS EN ISO 17294-2:2016	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			

APPENDIX E - GEOTECHNICAL IN SITU FIELDWORK AND LABORATORY RESULTS

Steve Hutchings
Murray Rix (Northern Ltd).☐
Andrew House
Hadfield Street
Dukinfield
SK16 4QX

e: MURRAYRIX Group

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 23-72176

Project / Site name:	TE1163 Former Cronton Colliery	**Samples received on:**	28/11/2023
Your job number:		**Samples instructed on/ Analysis started on:**	30/11/2023
Your order number:	23-469	**Analysis completed by:**	06/12/2023
Report Issue Number:	1	**Report issued on:**	07/12/2023
Samples Analysed:	1 soil sample		

Signed: A. Czerwińska

Agnieszka Czerwińska
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 23-72176
Project / Site name: TE1163 Former Cronton Colliery
Your Order No: 23-469

Lab Sample Number				2895773
Sample Reference				134163
Sample Number				TP207
Depth (m)				2.50
Date Sampled				Deviating
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	69
Moisture Content	%	0.01	NONE	13
Total mass of sample received	kg	0.001	NONE	0.4

General Inorganics

Calorific Value	MJ/Kg	0.12	ISO 17025	< 0.120

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 23-72176
Project / Site name: TE1163 Former Cronton Colliery

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2895773	134163	TP207	2.5	Brown clay and sand with gravel and stones.

Analytical Report Number : 23-72176
Project / Site name: TE1163 Former Cronton Colliery

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Calorific Value of soil	Determination of the calorific value of soil by combustion in a controlled environment.	Calorific Value of Soil by Bomb Calorimeter	L013-PL	D	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Sample Deviation Report

Analytical Report Number : 23-72176
Project / Site name: TE1163 Former Cronton Colliery

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
134163	TP207	S	2895773	a	None Supplied	None Supplied	None Supplied

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client Tier Environmental Ltd

Address Suite 513
Chadwick House
Warrington Road
Birchwood
WA3 6AE

Contract TE1163 -
Former Cronton Colliery

Job Number MRN 4625/57
Date of Issue 14 December 2023

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

5 The results included within the report are representative of the samples submitted for analysis.

6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

M U R R A Y R I X

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE DENSITY DETERMINATION
BS 1377-2:2022 Cl. 9.2
GAS JAR METHOD

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery
JOB NUMBER	MRN 4625/57

METHOD OF PREPARATION	Oven Dry	VARIATIONS FROM PROCEDURE	None
DATE OF TEST	08-Dec-23	DATE SAMPLED	Not advised

Laboratory Sample Number	Sample Label	Sample Location	Material	Particle Density (Mg/m^3)
134164	TP210 2.0 B	S.I. Sample	Grey brown silty slightly sandy slightly CLAY	2.35
134163	TP207 2.5 B	S.I. Sample	Grey brown silty slightly sandy slightly gravelly CLAY	2.62
134162	TP204 0.7 B	S.I. Sample	Grey brown silty slightly sandy slightly gravelly CLAY	2.60
134175	TP208 1.6 D	S.I. Sample	Grey brown silty slightly sandy slightly gravelly CLAY	2.31

Comment / Anomalies
Particle density reported is the average of two determinations

NAME O.P. Davies BA (Hons) (Laboratory Manager) SIGNED DATE 14-Dec-23

M U R R A Y R I X
ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

DETERMINATION OF THE LOSS ON IGNITION
BS 1377-3:2018+A1:2021, Cl. 6

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery
JOB NUMBER	MRN 4625/57

DATE TESTED	08-Dec-23	DATE SAMPLED	Not advised
SAMPLED BY	Client	DATE RECEIVED	17-Nov-23
PRE-TREATMENT	Air Dried	ADVISED SOURCE	Site Investigation Samples

Sample Number	Sample Label	Material	% Passing 2mm	Loss on Ignition (%)
134169	TP215 1.6 B	Grey brown silty slightly sandy slightly gravelly CLAY	76	4.0
134170	TP216 1.5 B	Grey brown silty slightly sandy slightly gravelly CLAY	55	15
134164	TP210 2.0 B	Grey brown silty slightly sandy gravelly CLAY	79	1.8
134163	TP207 2.5 B	Grey brown silty slightly sandy slightly gravelly CLAY	88	2.8

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 14-Dec-23

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 2.5kg RAMMER
BS 1377-2:2022 Cl.11
PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

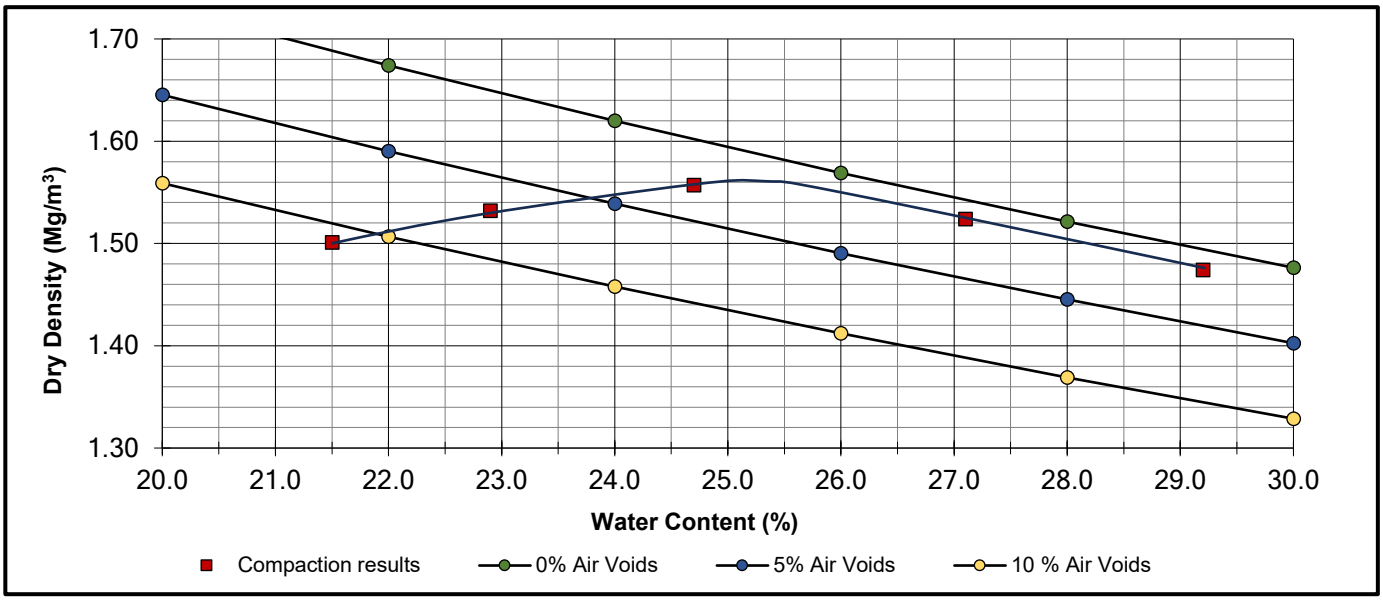
CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery
JOB NUMBER	MRN 4625/57

SAMPLE LABEL	TP211 1.4 B	DATE SAMPLED	Not advised
SAMPLE NUMBER	134165	DATE RECEIVED	17-Nov-23
DATE TESTED	29-Nov-23	SAMPLED BY	Client

MATERIAL	Grey brown silty slightly sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	0 %	GRADING ZONE	Zone 1
RETAINED 20mm	0 %	PARTICLE DENSITY	2.65 Mg/m3 (Assumed)

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m^3)
1	21.5	1.501
2	22.9	1.532
3	24.7	1.557
4	27.1	1.524
5	29.2	1.474



OPTIMUM WATER CONTENT	**25**	(%)
MAXIMUM DRY DENSITY	**1.56**	(Mg/m^3)

REMARKS
As received water content = 23.3%

NAME O.P. Davies BA (Hons) (Laboratory Manager) SIGNED DATE 14-Dec-23

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 2.5kg RAMMER
BS 1377-2:2022 Cl.11
PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

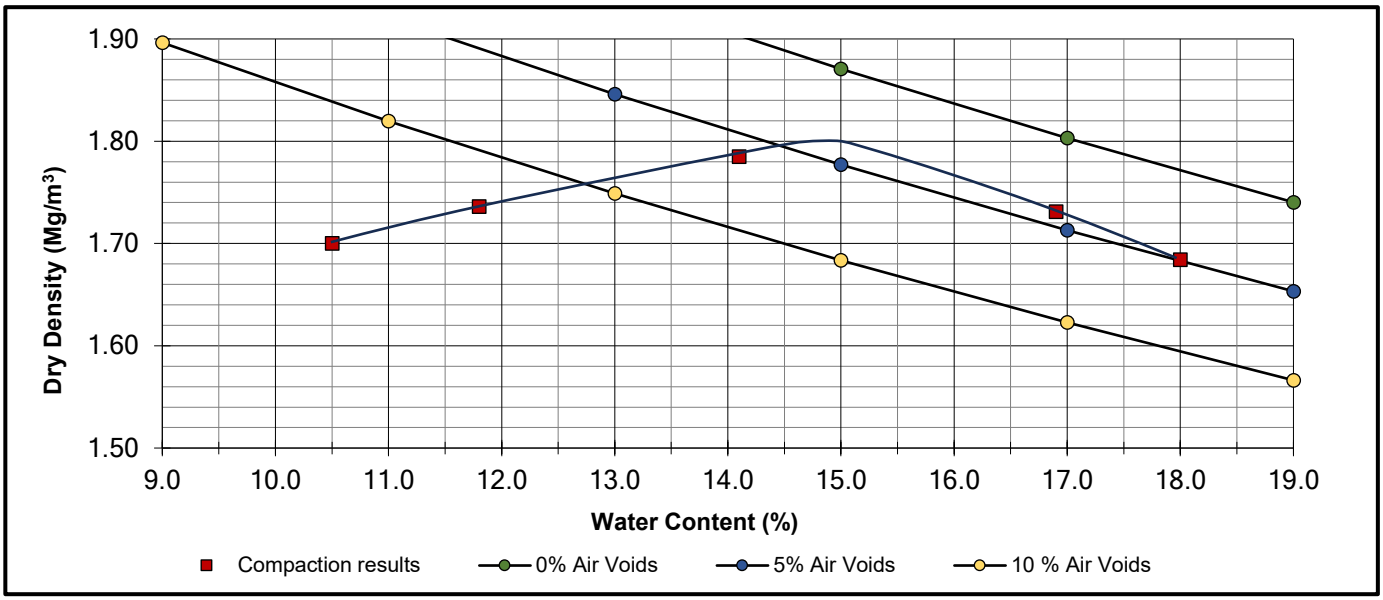
CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery
JOB NUMBER	MRN 4625/57

SAMPLE LABEL	TP214 2.1 B	DATE SAMPLED	Not advised
SAMPLE NUMBER	134168	DATE RECEIVED	17-Nov-23
DATE TESTED	29-Nov-23	SAMPLED BY	Client

MATERIAL	Grey brown silty slightly sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	0 %	GRADING ZONE	Zone 1
RETAINED 20mm	0 %	PARTICLE DENSITY	2.60 Mg/m3 (Assumed)

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m^3)
1	10.5	1.700
2	11.8	1.736
3	14.1	1.785
4	16.9	1.731
5	18.0	1.684



OPTIMUM WATER CONTENT	**15**	(%)
MAXIMUM DRY DENSITY	**1.80**	(Mg/m^3)

REMARKS
As received water content = 24.2%

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

SIGNED

DATE 14-Dec-23

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

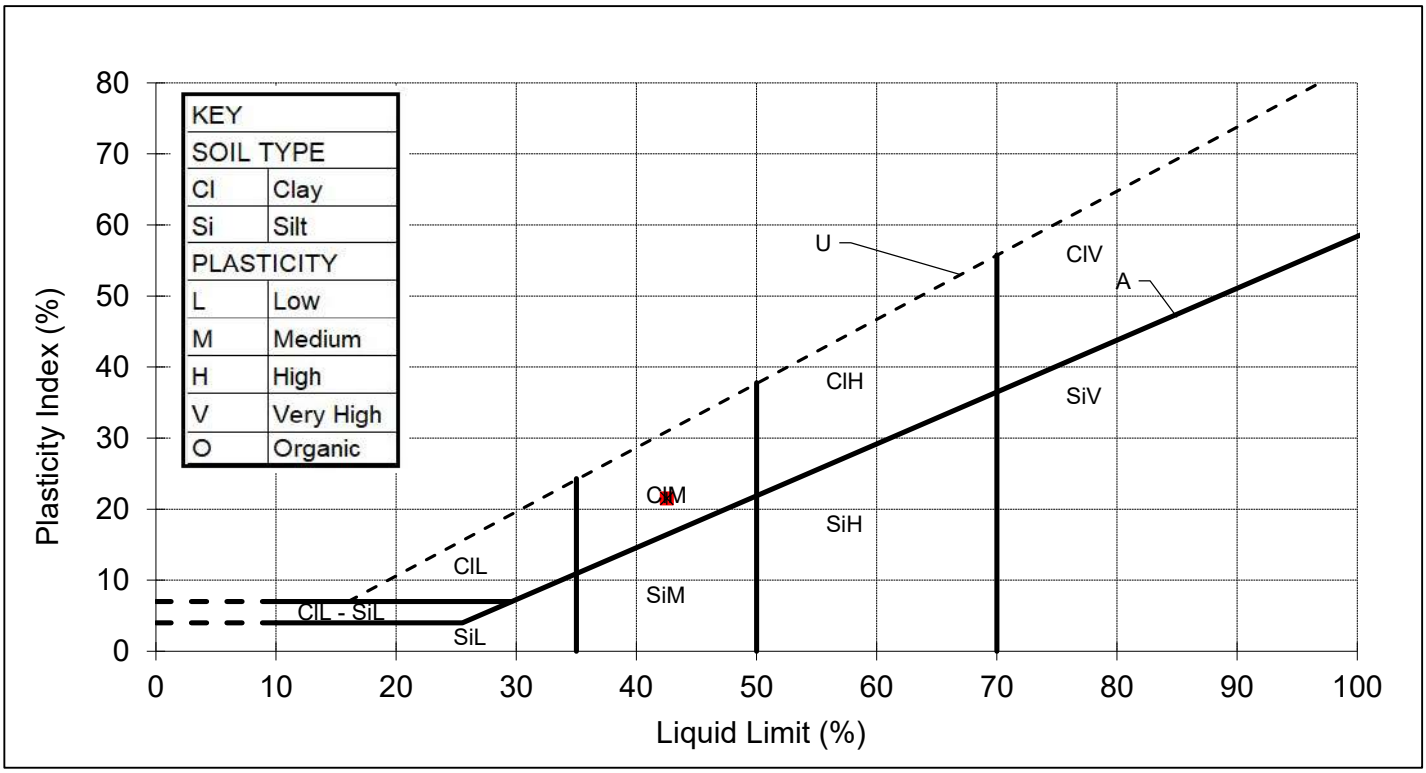
CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery
JOB NUMBER	MRN 4625/57

SAMPLE LABEL	TP211 1.4 B	DATE SAMPLED	Not advised
SAMPLE No.	134165	DATE RECEIVED	17-Nov-23
DATE TESTED	29-Nov-23	SAMPLED BY	Client

MATERIAL	Grey brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	21.3	43.7	0.980	
Determination 2 (avg)	21.3	43.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
23.3	43	21	22	98



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 14-Dec-23

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client Tier Environmental Ltd

Address Suite 513
Chadwick House
Warrington Road
Birchwood
WA3 6AE

Contract TE1816

Job Number MRN 24051/44
Date of Issue 18 October 2024
Pages 1 of 5

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

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4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

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MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

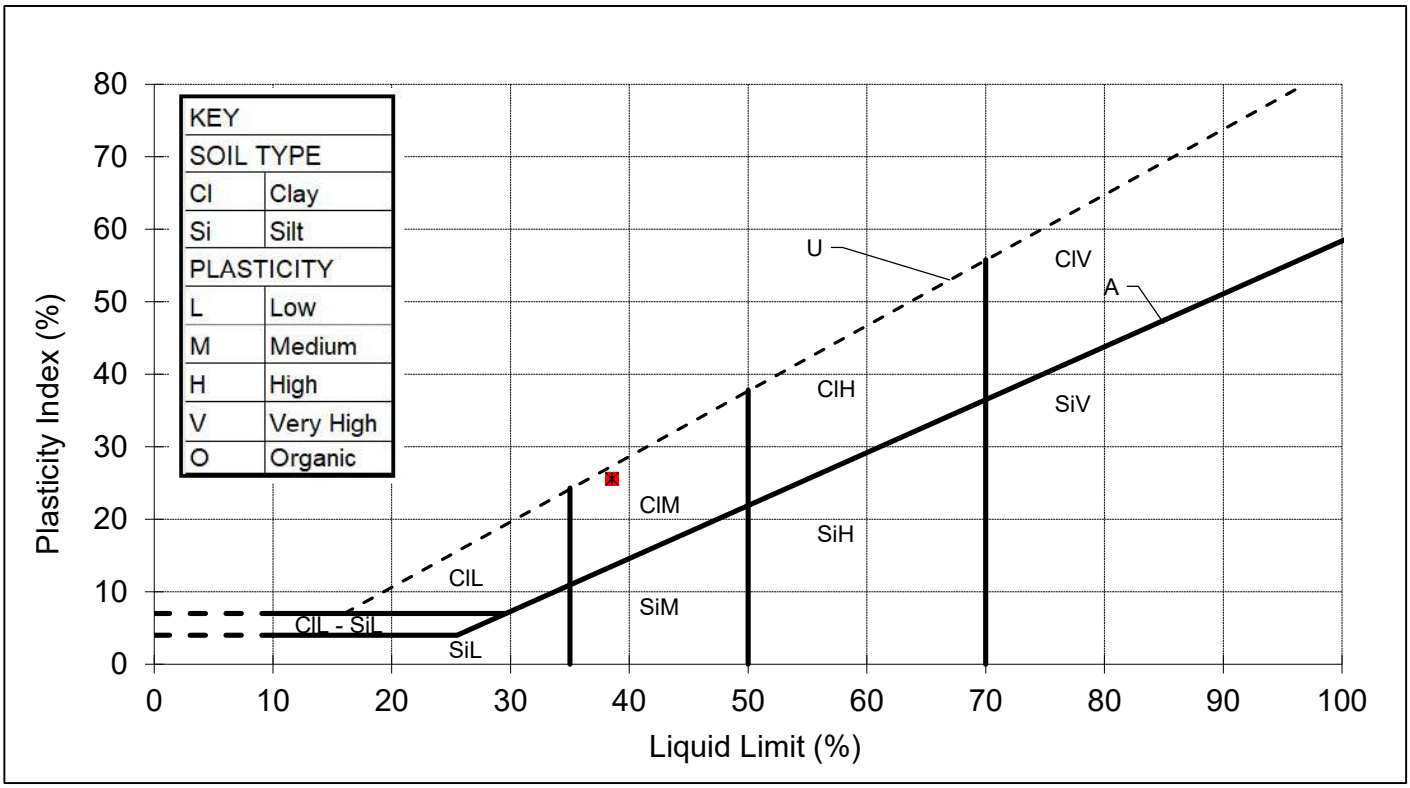
CLIENT	Tier Environmental Ltd
SITE	TE1816
JOB NUMBER	MRN 24051/44

SAMPLE LABEL	WS501 1.2	DATE SAMPLED	25-Sep-24
SAMPLE No.	564901	DATE RECEIVED	26-Sep-24
DATE TESTED	07-Oct-24	SAMPLED BY	Client

MATERIAL	Dark brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.0	38.6	1.004	
Determination 2 (avg)	19.6	38.2		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
11.8	39	13	26	92



REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 18-Oct-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

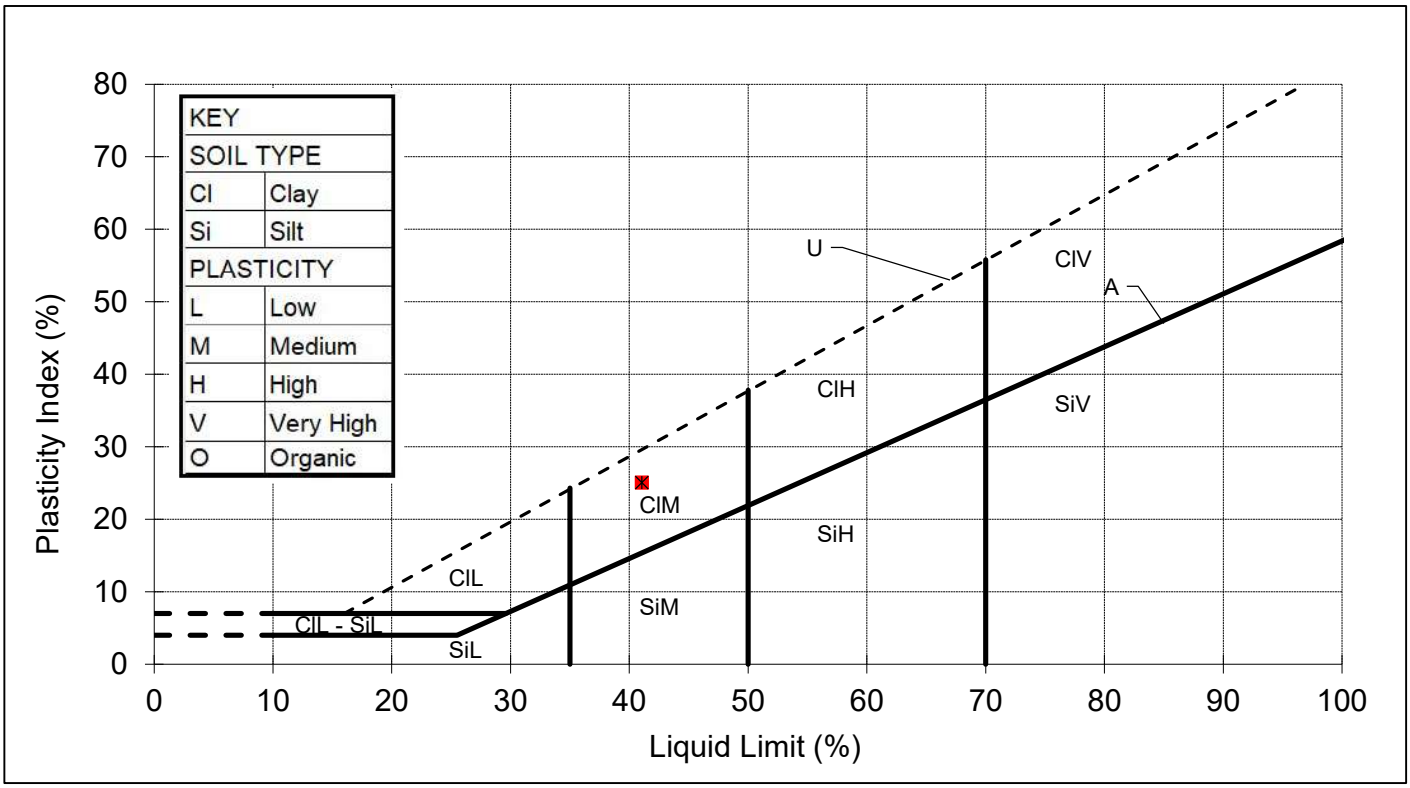
CLIENT	Tier Environmental Ltd
SITE	TE1816
JOB NUMBER	MRN 24051/44

SAMPLE LABEL	WS502 2.0	DATE SAMPLED	25-Sep-24
SAMPLE No.	564902	DATE RECEIVED	26-Sep-24
DATE TESTED	07-Oct-24	SAMPLED BY	Client

MATERIAL	Dark brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.0	41.0	1.000	
Determination 2 (avg)	20.0	41.1		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
20.9	41	16	25	97



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 18-Oct-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

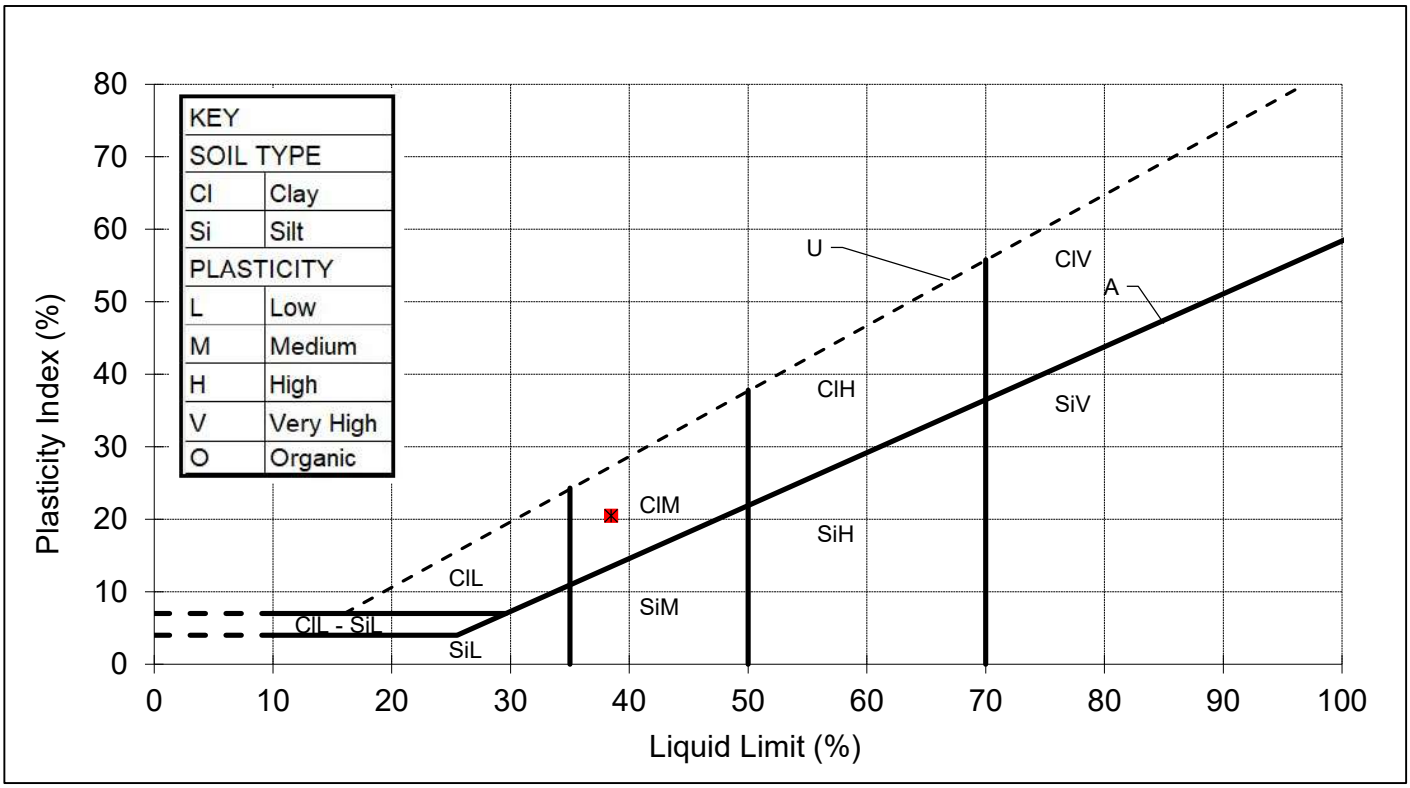
CLIENT	Tier Environmental Ltd
SITE	TE1816
JOB NUMBER	MRN 24051/44

SAMPLE LABEL	WS503 3.0	DATE SAMPLED	25-Sep-24
SAMPLE No.	564903	DATE RECEIVED	26-Sep-24
DATE TESTED	07-Oct-24	SAMPLED BY	Client

MATERIAL	Grey silty slightly sandy CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	18.9	37.8	1.017	
Determination 2 (avg)	18.9	37.8		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
18.8	38	18	20	99



REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 18-Oct-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

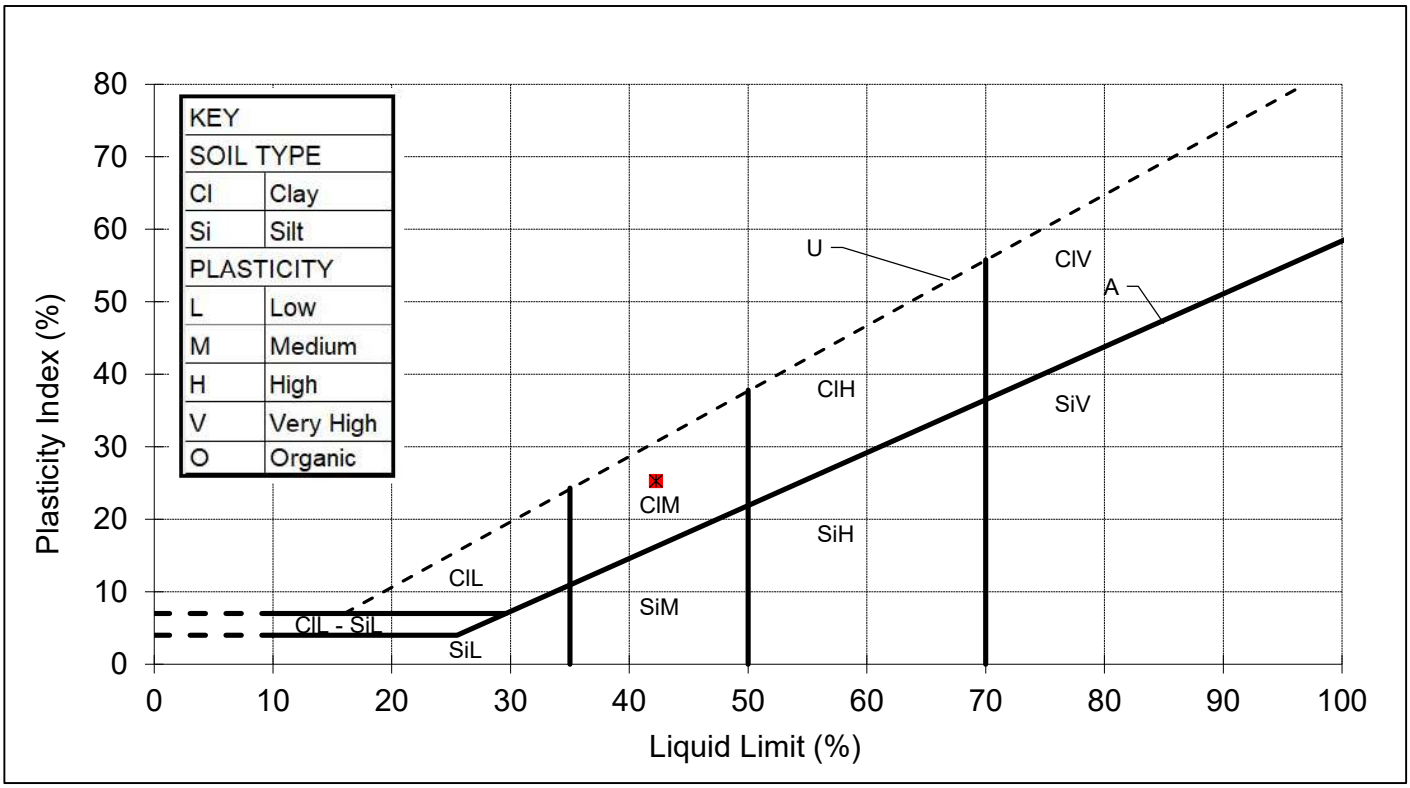
CLIENT	Tier Environmental Ltd
SITE	TE1816
JOB NUMBER	MRN 24051/44

SAMPLE LABEL	WS504 2.0	DATE SAMPLED	25-Sep-24
SAMPLE No.	564904	DATE RECEIVED	26-Sep-24
DATE TESTED	07-Oct-24	SAMPLED BY	Client

MATERIAL	Dark brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.0	42.2	1.001	
Determination 2 (avg)	19.9	42.2		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
15.2	42	17	25	99



REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE 18-Oct-24

APPENDIX F - GROUNDWATER AND GAS MONITORING RESULTS

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:	TE1163	**Job No:**	TE1163		
Client:	Tritax Symmetry	**Visit No:**	1	of	6
Site:	Symmetry Park, Huyton	**Operator:**	ER		
Date:	25/09/2020	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																	34.33	34.33	Pennine Coal Measures	
WS04	ND	ND	ND	ND	9.5	9.5	ND	ND	ND	ND	10.9	10.9	ND	ND	0.30	2.61	40.64	40.34	Till & Kinnerton Sandstone	
WS05																	38.16	38.16	Made Ground & Till	
WS07	0.1	0.1	2.0	2.0	1.4	1.4	ND	ND	ND	ND	0.2	0.2	0.1	0.1	1.28	3.66		-1.28		
WS09																	36.70	36.70	Made Ground & Till	
WS10	ND	ND	ND	ND	9.5	9.5	ND	ND	ND	ND	0.3	0.3	ND	ND	0.20	3.89	33.82	33.62	Made Ground	
WS11																	44.15	44.15	Made Ground	
WS12																	37.05	37.05	Till	
WS15	ND	ND	ND	ND	0.3	0.1	ND	ND	ND	ND	20.7	21.1	ND	ND	1.08	1.66	35.71	34.63	Till	
WS16	ND	ND	ND	ND	0.7	0.7	ND	ND	ND	ND	20.0	20.0	ND	ND	1.04	5.02	23.46	22.42	Made Ground, Till & Pennine Coal Measures	
CP101	ND	ND	ND	ND	0.6	0.6	ND	ND	ND	ND	19.8	19.8	ND	ND	1.79	2.94	24.99	23.20	Made Ground	
CP102	ND	ND	ND	ND	3.0	3.0	3	3	ND	ND	13.8	13.8	0.1	0.1	8.19	8.82		-8.19		
CP103	ND	ND	ND	ND	4.8	4.8	2	1	ND	ND	12.7	12.7	ND	ND	2.57	3.68	39.48	36.91	Till & Pennine Coal Measures	
CP104	ND	ND	ND	ND	7.1	7.1	ND	ND	ND	ND	10.6	10.6	ND	ND	2.42	5.97	34.22	31.80	Till & Pennine Coal Measures	
CP105D	0.1	0.1	2.0	2.0	10.1	5.8	ND	ND	ND	ND	9.2	14.1	ND	ND	0.20	10.56	34.13	33.93	Till & Pennine Coal Measures	
CP105S	0.1	0.1	2.0	2.0	0.2	0.2	ND	ND	ND	ND	20.8	20.8	ND	ND	DRY	2.00	25.46	#VALUE!	Till & Pennine Coal Measures	
CP106D	0.1	0.1	2.0	2.0	0.7	0.7	ND	ND	ND	ND	19.5	19.5	-0.1	-0.1	9.69	10.55	48.34	38.65	Till & Kinnerton Sandstone	
CP106S	0.1	0.1	2.0	2.0	3.9	3.9	ND	ND	ND	ND	16.2	16.2	ND	ND	DRY	2.00	48.34	#VALUE!	Made Ground	
CP107D	0.1	0.1	2.0	2.0	0.7	0.7	ND	ND	ND	ND	19.8	19.8	-0.1	-0.1	5.87	13.87	46.66	40.79	Till & Kinnerton Sandstone	
CP107S	0.1	0.1	2.0	2.0	8.8	8.8	ND	ND	ND	ND	4.3	4.3	ND	ND	DRY	2.00	46.66	#VALUE!	Made Ground	
CP108	ND	ND	ND	ND	1.5	1.5	13	13	ND	ND	16.5	16.5	ND	ND	0.40	8.10	46.71	46.31	Made Ground	
WS101	ND	ND	ND	ND	6.6	6.6	ND	ND	ND	ND	11.2	11.6	ND	ND	0.50	3.54	46.71	46.21	Made Ground	
WS103	ND	ND	ND	ND	0.2	0.2	ND	ND	ND	ND	21.4	21.4	-0.1	ND	1.79	1.79	44.17	42.38	Made Ground	
WS104	ND	ND	ND	ND	0.5	0.4	ND	ND	ND	ND	21.3	21.3	-0.1	ND	1.35	2.84	34.14	32.79	Till & Pennine Coal Measures	
WS105	ND	ND	ND	ND	1.3	1.3	ND	ND	ND	ND	19.3	19.3	ND	ND	1.03	2.06	35.22	34.19	Till & Pennine Coal Measures	
WS106	0.1	0.1	2.0	2.0	5.4	5.4	ND	ND	ND	ND	6.0	6.0	ND	ND	4.80	5.02	29.58	24.78	Till	
WS107	ND	ND	ND	ND	4.7	4.7	16	ND	ND	ND	20.5	20.5	6.8	ND	1.09	3.03	26.34	25.25	Till	
WS108	ND	ND	ND	ND	2.7	2.7	ND	ND	ND	ND	17.6	17.6	ND	ND	DRY	2.78	34.18	#VALUE!	Till & Pennine Coal Measures	
WS110	ND	ND	ND	ND	2.1	2.1	ND	ND	ND	ND	18.4	18.4	ND	ND	DRY	4.06	38.55	#VALUE!	Till	
WS111																	40.77	40.77	Till	
TPBH1	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.9	20.9	ND	ND	1.28	3.66	33.93	32.65	Made Ground	
RB102	ND	ND	ND	ND	0.2	0.1	ND	ND	ND	ND	21.1	21.1	ND	ND	1.40	3.02	32.31	30.91	Made Ground	
Max	**0.1**	**0.1**	**2.0**	**2.0**	**10.1**	**9.5**	**16.0**	**13.0**	**0.1**	**0.1**	**21.4**	**21.4**	**6.8**	**0.1**	**9.7**	**13.9**	34.11	24.42		
Min	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.1**	**0.1**	**0.2**	**1.7**	**33.93**	33.73	Made Ground	

METEOROLOGICAL AND SITE INFORMATION:																				
State of ground:		Dry		Moist	x	Wet		Snow		Frozen										
Wind:		Calm	x	Light		Moderate		Strong												
Cloud cover:		None		Slight		Cloudy	x	Overcast												
Preciptation:		None		Slight		Moderate	x	Heavy												
Barometric pressure (mbar):			1008	Before			1008	After												
Pressure trend:			x	Falling		Steady		Rising												
Ground gas meter:	GA2000																			
Ambient Gas concentration:		CH_4	ND		CO_2	ND		O_2	20.8%											

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1163		
Client:	Tritax Symmetry	**Visit No:**	2	of	6
Site:	Symmetry Park, Huyton	**Operator:**	ER		
Date:	07/09/2020	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																	34.33		Pennine Coal Measures	
WS04	ND	ND	ND	ND	9.2	9.2	ND	ND	ND	ND	10.1	10.6	ND	ND	DRY	2.65	40.64	DRY	Till & Kinnerton Sandstone	
WS05	ND	ND	ND	ND	3.3	3.3	ND	ND	ND	ND	8.0	8.8	ND	ND	1.12	2.41	38.16	37.04	Made Ground & Till	
WS07	0.1	ND	2.0	ND	0.9	0.9	ND	ND	ND	ND	0.6	0.7	0.1	0.1	1.75	3.81				2 LITRES OF WATER PURGED
WS09	ND	ND	ND	ND	6.1	5.9	ND	ND	ND	ND	12.6	12.7	0.2	ND	4.30	4.80	36.7	32.40	Made Ground & Till	
WS10	ND	ND	ND	ND	5.1	5.1	ND	ND	ND	ND	4.1	4.4	ND	ND	DRY	0.86	33.82	DRY	Made Ground	
WS11																	44.15		Made Ground	
WS12																	37.05		Till	
WS15	ND	ND	ND	ND	0.9	0.2	18	ND	ND	ND	19.7	20.5	ND	ND	1.08	1.88	35.71	34.63	Till	
WS16	ND	ND	ND	ND	0.4	0.2	1	ND	ND	ND	19.3	20.3	-0.6	ND	2.66	4.94	23.46	20.80	Made Ground, Till & Pennine Coal Measures	
CP101	ND	ND	ND	ND	0.8	0.8	ND	ND	ND	ND	18.9	18.9	ND	ND	1.37	2.92	24.99	23.62	Made Ground	2 LITRES OF WATER PURGED
CP102	ND	ND	ND	ND	5.5	5.5	1	ND	ND	ND	10.1	10.3	-0.2	ND	8.29	9.08				2 LITRES OF WATER PURGED
CP103	ND	ND	ND	ND	3.1	3.1	2	1	ND	ND	14.0	14.2	ND	ND	8.45	8.62	39.48	31.03	Till & Pennine Coal Measures	
CP104	ND	ND	ND	ND	7.5	7.3	1	ND	ND	ND	9.3	10.0	ND	ND	2.42	5.97	34.22	31.80	Till & Pennine Coal Measures	
CP105D	ND	ND	ND	ND	0.6	0.6	ND	ND	ND	ND	20.0	20.0	0.2	0.2	10.01	10.62	34.13	24.12	Till & Pennine Coal Measures	
CP105S	ND	ND	ND	ND	1.6	1.5	ND	ND	ND	ND	19.1	19.2	0.1	0.1	DRY	2.00	25.46	DRY	Till & Pennine Coal Measures	
CP106D	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.6	20.6	0.2	0.2	9.49	10.60	48.34	38.85	Till & Kinnerton Sandstone	
CP106S	ND	ND	ND	ND	2.3	2.3	ND	ND	ND	ND	18.3	18.4	ND	ND	DRY	2.00	48.34	DRY	Made Ground	
CP107D	ND	ND	ND	ND	0.6	0.5	ND	ND	ND	ND	19.8	19.9	0.2	0.2	6.77	13.70	46.66	39.89	Till & Kinnerton Sandstone	
CP107S																	46.66		Made Ground	
CP108	ND	ND	ND	ND	2.7	2.7	3	2	ND	ND	12.0	12.6	-0.1	-0.2	0.60	7.89	46.71	46.11	Made Ground	
WS101	ND	ND	ND	ND	6.6	6.4	ND	ND	ND	ND	11.5	11.6	ND	ND	DRY	3.50	46.71	DRY	Made Ground	
WS103	ND	ND	ND	ND	0.3	0.3	ND	ND	ND	ND	20.4	20.5	ND	ND	ND	1.80	44.17	DRY	Made Ground	
WS104	ND	ND	ND	ND	0.3	0.3	2	1	ND	ND	20.7	20.7	0.0	0.0	ND	0.72	34.14	DRY	Till & Pennine Coal Measures	
WS105	ND	ND	ND	ND	1.1	1.1	ND	ND	ND	ND	20.0	20.0	ND	ND	1.07	2.00	35.22	34.15	Till & Pennine Coal Measures	
WS106	ND	ND	ND	ND	3.1	3.1	ND	ND	ND	ND	12.6	12.6	ND	ND	4.76	5.04	29.58	24.82	Till	
WS107																	26.34		Till	
WS108																	34.18		Till & Pennine Coal Measures	
WS110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.6	20.7	ND	ND	1.33	3.71	38.55	37.22	Till	
WS111																	40.77		Till	
TPBH1																	33.93		Made Ground	
RB102	ND	ND	ND	ND	0.2	0.2	ND	ND	ND	ND	20.9	20.9	ND	ND	1.49	3.03	32.31	30.82	Made Ground	2 LITRES OF WATER PURGED
Max	**0.1**	**0.1**	**2.0**	**0.1**	**9.2**	**9.2**	**18.0**	**2.0**	**0.1**	**0.1**	**20.9**	**20.9**	**0.2**	**0.2**	**10.0**	**13.7**	34.11	24.10		
Min	**0.1**	**0.0**	**2.0**	**0.0**	**0.1**	**0.1**	**1.0**	**1.0**	**0.0**	**0.0**	**0.6**	**0.7**	**-0.6**	**-0.2**	**0.6**	**0.7**	**33.93**	33.33	Made Ground	

METEOROLOGICAL AND SITE INFORMATION:											
State of ground:		Dry	X	Moist	X	Wet		Snow		Frozen	
Wind:		Calm	X	Light		Moderate		Strong			
Cloud cover:		None	X	Slight	X	Cloudy		Overcast			
Preciptation:		None	X	Slight		Moderate		Heavy			

Barometric pressure (mbar):			1019	Before				1019	After	
Pressure trend:				Falling		X	Steady	X	Rising	
Ground gas meter:	**GA2000**									
Ambient Gas concentration:		**CH_4**	ND		**CO_2**	ND		**O_2**	20.9%	

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1163		
Client:	Tritax Symmetry	**Visit No:**	3	of	6
Site:	Symmetry Park, Huyton	**Operator:**	ER		
Date:	25/09/2020	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																	34.33		Pennine Coal Measures	
WS04	0.1	0.1	2.0	2.0	12.4	12.6	ND	ND	ND	ND	8.2	8.4	-0.1	-0.1	ND	2.60	40.64	DRY	Till & Kinnerton Sandstone	
WS05	0.1	0.1	2.0	2.0	3.5	3.5	ND	ND	ND	ND	13.0	14.2	ND	ND	1.26	2.35	38.16	36.90	Made Ground & Till	
WS07	0.1	0.1	2.0	2.0	0.1	0.1	ND	ND	ND	ND	21.0	21.0	ND	ND	1.72	3.66				
WS09	0.1	0.1	2.0	2.0	0.9	0.9	ND	ND	ND	ND	2.2	2.2	-2.1	-0.1	2.00	2.92	36.7	34.70	Made Ground & Till	
WS10	0.1	0.1	2.0	2.0	12.2	10.7	ND	ND	ND	ND	0.2	0.2	-1.3	-0.2	ND	3.90	33.82	DRY	Made Ground	
WS11																	44.15		Made Ground	
WS12																	37.05		Till	
WS15	0.1	0.1	2.0	2.0	0.2	0.2	3	ND	ND	ND	20.1	20.1	0.3	0.3	1.75	1.09	35.71	33.96	Till	
WS16	0.1	0.1	2.0	2.0	2.5	2.3	ND	ND	ND	ND	16.1	16.1	-0.1	ND	2.60	4.94	23.46	20.86	Made Ground, Till & Pennine Coal Measures	
CP101	0.1	0.1	2.0	2.0	1.5	1.5	ND	ND	ND	ND	16.1	16.1	ND	ND	1.10	2.75	24.99	23.89	Made Ground	
CP102	0.1	0.1	2.0	2.0	4.8	4.8	ND	ND	ND	ND	12.2	12.2	ND	ND	4.26	9.83				
CP103	0.1	0.1	2.0	2.0	ND	ND	ND	ND	ND	ND	20.7	20.7	ND	ND	2.80	3.81	39.48	36.68	Till & Pennine Coal Measures	
CP104	0.1	0.1	2.0	2.0	8.5	8.5	ND	ND	ND	ND	12.0	12.1	-0.1	ND	2.42	5.97	34.22	31.80	Till & Pennine Coal Measures	
CP105D	0.1	0.1	2.0	2.0	1.6	1.4	ND	ND	ND	ND	20.0	20.0	-1.3	-0.3	3.58	10.54	34.13	30.55	Till & Pennine Coal Measures	
CP105S	0.1	0.1	2.0	2.0	1.9	1.9	ND	ND	ND	ND	19.6	19.6	-3.0	ND	1.04	1.95	25.46	24.42	Till & Pennine Coal Measures	
CP106D	0.1	0.1	2.0	2.0	0.6	0.6	ND	ND	ND	ND	20.0	20.0	-0.4	-0.2	3.58	9.05	48.34	44.76	Till & Kinnerton Sandstone	
CP106S	0.1	0.1	2.0	2.0	2.4	2.2	ND	ND	ND	ND	19.2	19.2	-0.3	-0.3	1.81	4.04	48.34	46.53	Made Ground	
CP107D	0.1	0.1	2.0	2.0	3.0	2.9	ND	ND	ND	ND	18.6	18.6	-0.3	-0.1	2.13	13.90	46.66	44.53	Till & Kinnerton Sandstone	
CP107S	0.1	0.1	2.0	2.0	2.6	2.6	ND	ND	ND	ND	18.9	18.9	-0.5	-0.5	2.77	2.89	46.66	43.89	Made Ground	
CP108	0.1	0.1	2.0	2.0	5.5	5.5	ND	ND	ND	ND	6.2	6.2	ND	ND	ND	7.78	46.71	DRY	Made Ground	
WS101	0.1	0.1	2.0	2.0	9.4	9.4	ND	ND	ND	ND	6.4	6.4	ND	ND	2.40	2.40	46.71	44.31	Made Ground	
WS103	0.1	0.1	2.0	2.0	0.2	0.2	ND	ND	ND	ND	20.6	20.6	ND	ND	ND	1.05	44.17	DRY	Made Ground	
WS104	0.1	0.1	2.0	2.0	0.5	0.5	ND	ND	ND	ND	20.6	20.6	0.2	0.2	ND	0.71	34.14	DRY	Till & Pennine Coal Measures	
WS105	0.1	0.1	2.0	2.0	2.7	2.7	ND	ND	ND	ND	18.2	18.4	0.1	ND	1.98	2.88	35.22	33.24	Till & Pennine Coal Measures	
WS106	0.1	0.1	2.0	2.0	3.6	3.6	ND	ND	ND	ND	10.1	10.1	ND	ND	4.78	5.05	29.58	24.80	Till	
WS107	0.1	0.1	2.0	2.0	1.2	0..7	ND	ND	ND	ND	20.0	20.3	ND	ND	ND	2.91	26.34	DRY	Till	
WS108	0.1	0.1	2.0	2.0	8.7	8.7	ND	ND	ND	ND	11.5	11.5	ND	ND	1.91	2.00	34.18	32.27	Till & Pennine Coal Measures	
WS110	0.1	0.1	2.0	2.0	2.5	2.5	1	ND	ND	ND	14.9	14.9	ND	ND	ND	2.18	38.55	DRY	Till	
WS111	0.1	0.1	2.0	2.0	1.7	1.7	ND	ND	ND	ND	18.9	18.9	ND	ND	ND	4.05	40.77	DRY	Till	
TPBH1	0.1	0.1	2.0	2.0	1.6	1.6	ND	ND	ND	ND	19.0	19.0	0.2	0.1	1.80	3.00	33.93	32.13	Made Ground	
RB102	0.1	0.1	2.0	2.0	5.6	5.6	ND	ND	ND	ND	14.7	14.7	ND	ND	2.35	2.73	32.31	29.96	Made Ground	
Max	**0.1**	**0.1**	**2.0**	**2.0**	**12.4**	**12.6**	**3.0**	ND	ND	ND	**21.0**	**21.0**	**0.3**	**0.3**	**4.8**	**13.9**	34.11	29.33		
Min	**0.1**	**0.1**	**2.0**	**2.0**	**0.1**	**0.1**	ND	ND	ND	ND	**0.2**	**0.2**	ND	ND	ND	**0.7**	**33.93**	DRY	Made Ground	

METEOROLOGICAL AND SITE INFORMATION:											
State of ground:	x	Dry		Moist		Wet		Snow		Frozen	
Wind:		Calm	x	Light		Moderate		Strong			
Cloud cover:		None	x	Slight		Cloudy		Overcast			
Preciptation:	x	None		Slight		Moderate		Heavy			
Barometric pressure (mbar):			1001	Before			1004	After			
Pressure trend:				Falling		Steady	X	Rising			
Ground gas meter:	**GA2000**										
Ambient Gas concentration:	**CH_4**	0.1%	**CO_2**	0.1%	**O_2**	20.6%					

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1163		
Client:	Tritax Symmetry	**Visit No:**	4	of	6
Site:	Symmetry Park, Huyton	**Operator:**	ER		
Date:	12/10/2020	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																	34.33		Pennine Coal Measures	
WS04	0.1	0.1	2.0	2.0	11.1	11.1	ND	ND	ND	ND	9.0	9.2	ND	ND	ND	2.60	40.64	DRY	Till & Kinnerton Sandstone	
WS05	0.2	0.2	4.0	4.0	3.8	3.8	ND	ND	ND	ND	14.9	14.9	0.1	0.1	1.11	2.34	38.16	37.05	Made Ground & Till	
WS07	0.1	0.1	2.0	2.0	1.2	1.2	ND	ND	ND	ND	1.5	1.6	0.1	0.1	1.15	3.56	36.7	35.55	Made Ground & Till	
WS09	0.1	0.1	2.0	2.0	0.8	0.8	ND	ND	ND	ND	2.8	2.8	-1.9	-1.9	1.89	2.90	33.82	31.93	Made Ground	
WS10	0.1	0.1	2.0	2.0	10.5	10.5	ND	ND	ND	ND	0.3	0.3	-1.8	ND	3.27	3.90	44.15	40.88	Made Ground	
WS11																	37.05		Till	
WS12																	35.71		Till	
WS15															0.65	1.75	23.46	22.81	Made Ground, Till	Well flooded
WS16	0.1	0.1	2.0	2.0	1.1	0.8	ND	ND	ND	ND	18.8	19.4	ND	ND	2.02	3.94	24.99	22.97	Made Ground	
CP101	0.1	0.1	2.0	2.0	1.9	1.7	ND	ND	ND	ND	17.0	17.0	0.4	ND	0.74	0.75	39.48	38.74	Till & Pennine Coal Measures	
CP102	0.2	0.2	4.0	4.0	0.6	0.6	ND	ND	ND	ND	19.6	19.6	0.3	ND	2.42	5.97	34.22	31.80	Till & Pennine Coal Measures	
CP103	0.1	0.1	2.0	2.0	0.1	0.1	ND	ND	ND	ND	20.6	20.6	ND	ND	2.52	5.99	34.13	31.61	Till & Pennine Coal Measures	
CP104	0.1	0.1	2.0	2.0	7.6	7.6	ND	ND	ND	ND	10.8	10.8	-0.1	ND	1.16	5.95	25.46	24.30	Till & Pennine Coal Measures	
CP105D	0.1	0.1	2.0	2.0	1.3	1.3	ND	ND	ND	ND	20.5	20.6	-0.2	-0.2	3.50	3.50	48.34	44.84	Till & Kinnerton Sandstone	
CP105S	0.1	0.1	2.0	2.0	2.1	2.3	ND	ND	ND	ND	18.7	18.7	-1.1	ND	0.99	1.93	48.34	47.35	Made Ground	
CP106D	0.1	0.1	2.0	2.0	0.8	0.8	ND	ND	ND	ND	20.4	20.3	0.9	ND	3.47	9.05	46.66	43.19	Till & Kinnerton Sandstone	
CP106S	0.1	0.1	2.0	2.0	2.2	2.1	ND	ND	ND	ND	18.8	18.5	ND	-0.2	1.76	4.04	46.66	44.90	Made Ground	
CP107D	0.1	0.1	2.0	2.0	4.9	4.9	ND	ND	ND	ND	14.6	14.6	-0.4	ND	8.14	13.51	46.71	38.57	Made Ground	
CP107S	0.1	0.1	2.0	2.0	7.8	7.8	ND	ND	ND	ND	8.6	8.6	ND	ND	2.22	2.69	46.71	44.49	Made Ground	
CP108	0.2	0.2	4.0	4.0	4.7	4.7	ND	ND	ND	ND	6.9	6.9	ND	ND	7.10	7.49	44.17	37.07	Made Ground	
WS101	0.1	0.1	2.0	2.0	9.3	9.2	ND	ND	ND	ND	7.0	7.0	ND	ND	1.22	2.50	34.14	32.92	Till & Pennine Coal Measures	
WS103	0.1	0.1	2.0	2.0	0.3	0.3	ND	ND	ND	ND	10.8	10.7	ND	ND	0.50	0.77	35.22	34.72	Till & Pennine Coal Measures	
WS104	0.1	0.1	2.0	2.0	1.4	1.4	ND	ND	ND	ND	19.5	19.3	0.2	ND	0.19	1.96	29.58	29.39	Till	
WS105	0.1	0.1	2.0	2.0	2.9	2.9	ND	ND	ND	ND	18.6	17.9	ND	ND	0.77	1.92	26.34	25.57	Till	
WS106													-0.1	-0.1	0.42	5.03	34.18	33.76	Till & Pennine Coal Measures	
WS107	0.1	0.1	2.0	2.0	0.9	0.8	ND	ND	ND	ND	20.0	20.0	ND	ND	ND	2.90	38.55	DRY	Till	
WS108	0.1	0.1	2.0	2.0	8.9	8.9	ND	ND	ND	ND	12.3	12.3	0.1	ND	1.86	2.01	40.77	38.91	Till	
WS110	0.1	0.1	2.0	2.0	2.9	2.9	ND	ND	ND	ND	12.5	12.5	ND	ND	ND	2.08	33.93	DRY	Made Ground	
WS111	0.1	0.1	2.0	2.0	1.9	1.9	ND	ND	ND	ND	19.1	19.1	ND	ND	ND	4.05	32.31	DRY	Made Ground	
TPBH1	0.1	0.1	2.0	2.0	4.9	4.9	ND	ND	ND	ND	14.6	14.6	6.2	0.2	1.07	3.64	34.11	33.04		
RB102	0.1	0.1	2.0	2.0	5.1	5.1		ND	ND	ND	18.2	18.3	ND	ND	1.33	2.42	33.93	32.60	Made Ground	
Max	**0.2**	**0.2**	**4.0**	**4.0**	**11.1**	**11.1**	ND	ND	ND	ND	**20.6**	**20.6**	**0.9**	**0.1**	**8.14**	**13.51**	**48.34**	**47.35**		
Min	**0.1**	**0.1**	**2.0**	**2.0**	**0.1**	**0.1**	ND	ND	ND	ND	**0.3**	**0.3**	**0.1**	**0.1**	**0.19**	**0.75**	**23.46**	**22.81**		

METEOROLOGICAL AND SITE INFORMATION:									
State of ground:		Dry		Moist	X	Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong	
Cloud cover:		None		Slight	X	Cloudy		Overcast	
Preciptation:	X	None		Slight		Moderate		Heavy	
Barometric pressure (mbar):			1003	Before			1007	After	
Pressure trend:				Falling		Steady	X	Rising	
Ground gas meter:	GA2000								
Ambient Gas concentration:	CH_4	0.0%	CO_2	0.0%	O_2	20.8%			

APPENDIX G - PHOTOGRAPHS

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP201
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		14.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP202
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		13.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP203
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Spoil



Spoil

Photographed By		**Date**	
ER		13.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP204
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		13.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP205
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		13.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP206
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		13.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP207
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		13.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP208
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		13.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP209
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		14.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP210
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		14.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP211
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		14.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP212
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		14.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP213
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		14.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP214
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		14.11.2025	

Project Name	Cronton	**Photographic Record**	**Location ID**
Project No.	TE1163		TP215
Engineer	Eve Rowland		
Client	Tritax Bigbox Developments		



Pit



Spoil

Photographed By		**Date**	
ER		14.11.2025	

APPENDIX H - GROUNDSURE REPORT (AVAILABLE AS A SEPERATE DOCUMENT ON REQUEST)

APPENDIX I - REGULATOR PROVIDED INFORMATION

Knowsley Council

REGENERATION AND ECONOMIC DEVELOPMENT DEPARTMENT

TOWN AND COUNTRY PLANNING ACT 1990

APPROVAL OF RESERVED MATTERS

Application No: 24/00145/REM

Name and address of applicant
Tritax Symmetry Merseyside 1 Limited
C/O Gerald Eve LLP
1 Marsden Street
M2 1HW

Name and address of agent
Gerald Eve
1 Marsden Street
Manchester
M2 1HW

Date of Receipt: 21 March 2024

Date Valid: 9 April 2024

Address/Location Of Development

Former Site Of Cronton Colliery
Cronton Road
Halsnead Garden Village
Knowsley
L35 1QR

Description of Development

APPLICATION FOR THE APPROVAL OF RESERVED MATTERS (SCALE, ACCESS, APPEARANCE, LAYOUT AND PARTIAL LANDSCAPING) PURSUANT TO HYBRID PLANNING PERMISSION 20/00494/HYB, COMPRISING THE DEVELOPMENT OF 495,720 SQ FT (GIA) OF STORAGE AND DISTRIBUTION FLOORSPACE (USE CLASS B8) AND ANCILLARY OFFICES (USE CLASS E(G)) ACROSS TWO WAREHOUSE UNITS, TOGETHER WITH LANDSCAPING AND THE PROVISION OF INFRASTRUCTURE

The Council of the Metropolitan Borough of Knowsley hereby give notice in pursuance of the above Act(s) that Reserved Matters Approval has been **granted** for the carrying out of the development referred to above in accordance with the application and plans submitted subject to the following condition(s):

1. The development hereby permitted shall be carried out in accordance with the following approved plans and documents listed below:

    - Site Location Plan - Reference: 22605-UMC-XXXX-SI-DR-A-0502_P02
    - Illustrative Masterplan - Reference: 22605-UMC-XXXX-SI-DR-A-0671_P18
    - Unit 03 Site Plan - Reference: 22605-UMC-XXXX-SI-DR-A-0672_P11
    - Unit 03 Building Plan - Reference: 22605-UMC-XXXX-00-DR-A-1001_P08

- Unit 03 Office Plan - Reference: 22605-UMC-XXXX-ZZ-DR-A-1002_P06
- Unit 03 Roof Plan - Reference: 22605-UMC-XXXX-RF-DR-A-1003_P06
- Unit 03 Elevations - Reference: 22605-UMC-XXXX-ZZ-DR-A-1301_P08
- Unit 03 Proposed Architectural Feature Elevations - Reference: 22605-UMC-XXXX-ZZ-DR-A-1302_P04
- Unit 03 External Finishes - Reference: 22605-UMC-XXXX-SI-DR-A-0701_P10
- Unit 03 Fencing Details - Reference: 22605-UMC-XXXX-SI-DR-A-0702_P13
- Unit 03 Gatehouse Details - Reference: 22605-UMC-XXXX-ZZ-DR-A-0801_P01
- Unit 03 Cycle Shelter - Reference: 22605-UMC-XXXX-SI-DR-A-0703_P10
- Unit 03 Sprinkler Tank and Pump House - Reference: 22605-UMC-XXXX-SI-DR-A-0705_P10
- Unit 03 Sub Station Details - Reference: 22605-UMC-XXXX-SI-DR-A-0706_P09
- Unit 03 Bin Store - Reference: 22605-UMC-XXXX-SI-DR-A-0704_P10
- Unit 03 Building Sections - Reference: 22605-UMC-XXXX-ZZ-DR-A-1101_P05
- Unit 03 Site Cross Section - Reference: 22605-UMC-XXXX-SI-DR-A-0707_P05
- Unit 04 Site Plan - Reference: 22606-UMC-XXXX-SI-DR-A-0673_P10
- Unit 04 Building Plan - Reference: 22606-UMC-XXXX-00-DR-A-1001_P04
- Unit 04 Office Plan - Reference: 22606-UMC-XXXX-ZZ-DR-A-1002_P05
- Unit 04 Roof Plan - Reference: 22606-UMC-XXXX-RF-DR-A-1003_P06
- Unit 04 Elevations - Reference: 22606-UMC-XXXX-ZZ-DR-A-1301_P05
- Unit 04 Proposed Architectural Feature Elevations - Reference: 22606-UMC-XXXX-ZZ-DR-A-1302_P04
- Unit 04 External Finishes - Reference: 22606-UMC-XXXX-SI-DR-A-0701_P10
- Unit 04 Fencing Details- Reference: 22606-UMC-XXXX-SI-DR-A-0702_P11
- Unit 04 Gatehouse Details - Reference: 22606-UMC-XXXX-ZZ-DR-A-0801_P01
- Unit 04 Cycle Shelter - Reference: 22606-UMC-XXXX-SI-DR-A-0703_P10
- Unit 04 Sprinkler Tank and Pump House - Reference: 22606-UMC-XXXX-SI-DR-A-0705_P10
- Unit 04 Bin Store - Reference: 22606-UMC-XXXX-SI-DR-A-0704_P10
- Unit 04 Building Sections - Reference: 22606-UMC-XXXX-ZZ-DR-A-1101_Unit 04_P05
- Unit 04 Sub Station Details - Reference: 22606-UMC-XXXX-SI-DR-A-0706_P09
- Soft Landscape Plan (page 1 of 3) Reference: MAN.1453.008.ENZ.XX.00.DR.L.45.101_PL12
- Soft Landscape Plan (page 2 of 3) Reference: MAN.1453.008.ENZ.XX.00.DR.L.45.102_PL12
- Soft Landscape Plan (page 3 of 3) Reference: MAN.1453.008.ENZ.XX.00.DR.L.45.103_PL12
- Planting Schedule Reference: 1453.008_ENZ.00.XX.SH.L.45.001 REV PL12
- Landscape Technical Note Reference: 12267_R09b
- Landscape Technical Note Reference: 12267_R09b
- Design and Access Statement Reference: 22605-UMC-XXXX-XX-DN-A-2001_P07
- Noise Impact Assessment Reference 50-756-R2-2

- Transport Statement Reference: VN232867-Rev03 (excluding the plans included within the document except for the following: including:
- Proposed Access Junction Arrangement and Visibility Splays (Unit 3 HGV Yard) - Ref: VN232867D100 Rev. B
- Proposed Internal Link Road Geometry and Swept Path Analysis - Ref VN232867-D104 Rev C
- Mainline HGV Tracking - Ref: VN232867-TR104
- Unit 4 Turning Head - Ref: VN232867-TR105-C

Reason: For the avoidance of doubt.

2. No part of the development hereby permitted shall be commenced until an addendum Construction Management Plan has been submitted to and agreed in writing by the Local Planning Authority that details the means of mitigation of construction effects in relation to the impacts of the development on the adjacent listed building. The addendum CMP shall include (but not be limited to) the following actions to be carried out throughout the construction process:

- Pre-commencement survey of the listed building which includes assessment/recording of cosmetic damage as well as structural surveys which will establish a baseline of the current condition of the listed building and any other permanent structures within the listed building's curtilage;
- A system for monitoring the vibration level at the boundary of the application site nearest to Old Halsnead and details of who will undertake the monitoring. These details shall include the vibration monitor type, monitoring positions, frequency of checks, the period of monitoring, settings and thresholds for ceasing works and how the listed building will be monitored in relation to structural movements and stresses and strains including who will carry out this monitoring.
- Procedure for the owner of the listed building to report damage which occurs during construction;
- A schedule to demonstrate what steps will be taken should damage occur during construction, details of how the damage will be assessed and timescales for repairing the damage. The schedule will include details of how working methods will be reviewed;
- A Post construction survey/assessment of the listed building to be submitted within four months of the construction works being completed and subject to the co-operation of the owner/permission to access the site being granted;
- A record demonstrating that reasonable steps have been taken to communicate with the owner of Old Halsnead including notification of the proposed vibration and monitoring methods, opportunities to take into account any reasonable comments made by the owner in relation to monitoring methods only and to gain access to the listed building to undertake the surveys. Where the record demonstrates that access to the listed building has been denied or the owner does not respond within four weeks of first being contacted, the applicant will not be responsible for any survey or monitoring work or rectifying any damage to the listed building thereafter for the purposes of this condition only.
- Details of construction working methods relating to construction, foundations, floorplates, piling and earthworks and details of any specific machinery likely to result in vibration impacts. Such details shall also include: days / hours of work; duration of any pile driving operations, operations likely to cause low level vibration, and earthworks (expected start date and completion date); and vibration monitoring details, including the number of monitors and the monitoring locations;

- Details of how survey, consultation and monitoring information will be reported to the Local Planning Authority;

  All site works shall then proceed only in accordance with the approved addendum Construction Management Plan (and any timescales therein) and any Construction Environmental Management Plan approved under condition 37 of the hybrid consent reference 20/00494/HYB, unless otherwise agreed in writing beforehand with the Local Planning Authority.

  Reason: To seek to preserve the listed building and minimise the impacts during construction on the listed building and in the interests of residential amenity. This condition is a pre-commencement condition to ensure the construction methods do not cause undue harm to residential amenity and to seek to preserve the listed building.

3. At least five working days written notice, prior to the commencement of development, shall be given to the Local Planning Authority of the intention to commence development.

   Reason: To ensure that the proper protection of trees has been carried out and to ensure that the tree protection fencing is in place prior to works commencing. This condition is a pre-commencement condition to secure the protection of the retained trees at the earliest possible stage of development.

4. The development including tree protection works/fencing shall be undertaken in accordance with the Tyler Grange Arboricultural Impact Assessment and Method Statement (report no. 12267_R10f_JJ). All tree protection shall be erected prior to the commencement of the development. Tree Retention shall be in accordance with the Tree Retention and Removal Plan reference 12267/P21f by Tyler Grange. Any fence posts within the root protection areas of the fence adjacent to the boundary with Old Halsnead shall be hand dug to protect the trees in accordance with a method statement that has been submitted to and approved in writing by the Local Planning Authority prior to commencement of any works within the buffer zone adjacent to the east elevation of unit 3 hereby permitted. The fence post Method Statement shall be implemented in accordance with the approved details.

   Reason: To ensure that the proper protection of trees has been carried out, to ensure that the tree protection fencing is in place prior to works commencing, in the interests of visual amenity and to promote biodiversity. This condition is a pre-commencement condition to secure the protection of the retained trees at the earliest possible stage of development.

5. No development shall commence unless and until technical reports required by the Design Manual for Roads and Bridges CD622 - Managing Geotechnical Risk have been submitted and approved in writing by the Local Planning Authority, in consultation with the Highway Authority for the M62 motorway.

   Reason: In the interests of highway safety and to ensure the safety and integrity of the M62 motorway is not compromised. This condition is a pre-commencement condition to ensure the safe operation and integrity of the M62 at the earliest possible stage of development.

6. No development shall take place until :

   a. a plan showing the alignment and elevational treatment of a close-boarded fence of not less than two metres in height to be erected along the Northern boundary of the development site alongside the M62 (or at least one metre from any part of the existing motorway fence where the boundary lies within one metre of this) has been submitted to and agreed in writing by the local planning authority in consultation with National Highways; and

   b. the fence approved by part (a) of this condition has been erected in accordance with the agreed details.

   Thereafter the fence shall remain in situ and only be repaired or replaced in accordance with the requirements of the condition.

   Reason: In the interests of highway safety and to ensure the safety and integrity of the M62 motorway is not compromised. This condition is a pre-commencement condition to ensure the safe operation and integrity of the M62 at the earliest possible stage of development.

7. No development pursuant to this application shall commence until a detailed construction plan working method statement (including Risk Assessment Method Statement) relating to site development earthworks and drainage alongside the M62 has been submitted to and approved by National Highways and the Local Planning Authority.

   Reason: In the interests of highway safety and to ensure the safety and integrity of the M62 motorway is not compromised. This condition is a pre-commencement condition to ensure the safe operation and integrity of the M62 at the earliest possible stage of development.

8. No drainage from the proposed development shall connect into the motorway drainage system, nor shall any drainage from the site run-off onto the M62 motorway.

   Reason: In the interests of highway safety and to ensure the safety and integrity of the M62 motorway is not compromised.

9. There shall be no closure to traffic of the M62 motorway in connection with the construction, maintenance, occupation or decommissioning of the development.

   Reason: In the interests of highway safety and to ensure the safety and integrity of the M62 motorway is not compromised.

10. Development shall be carried out in accordance with the Bat Mitigation Strategy Report entitled 'Reserved Matters 3 - Bat Favourable Conservation Status Mitigation Strategy TEP (document ref 7367.043A v2). The Strategy shall have been implemented prior to first occupation or within an approved timetable for implementation that has been submitted to and approved in writing by the Local Planning Authority prior to first occupation.

    Reason: To promote biodiversity.

11. The rating level of external plant should not exceed 32 dB at the closest existing receptor, or Old Halsnead, during night-time periods. Allowance should be given to acoustic characteristics, such as tonality, when measuring or calculating plant noise levels.

    Where plant items may operate at a higher level during the day or switch off at night, a daytime limit of 40 dB should be applied at the closest receptor.

    Prior to first occupation, a scheme shall be submitted to and approved in writing by the local planning authority which specifies the provisions to be made for the control of noise emanating from the site which shall include the submission of an Operational Noise Management and Mitigation Plan. The scheme shall be based on the results of a noise assessment which suitably characterises the noise climate at nearby residential dwellings both prior to and following the operation of the development permitted. The unit shall then only operate in accordance with the approved Operational Noise Management and Mitigation Plan and any mitigation shall be implemented or constructed in accordance with the approved details prior to each unit hereby permitted being brought into first use. Documentary evidence of the works shall be submitted to and approved in writing by the Local Planning Authority prior to first use of the development.

    Reason: In the interests of protecting residential amenity.

12. Prior to first occupation, a road management scheme shall be submitted to and approved in writing by the local planning authority for the eastern access road that lies adjacent to the boundary with Old Halsnead. The scheme shall include chicanes to prevent HGV access and a speed limit. The road management scheme shall then be implemented in accordance with the approved details prior to any vehicles using the eastern access road.

    Reason: In the interests of residential amenity.

13. Prior to first occupation (and notwithstanding the approved plans) full details of the outside shelter/area including siting, design and materials shall be submitted to and approved in writing by the Local Planning Authority. The outside shelter/area shall then only be constructed in accordance with the approved details.

    Reason: In the interests of residential and visual amenity.

14. The landscaping across the site and the fencing adjacent to Old Halsnead shall be carried out in accordance with the following approved landscape plans:

    - Soft Landscape Plan (REM Application 3) page 1 of 3 dwg no. 1453.008.ENZ.XX.00.DR.L.45.101 Rev PL12
    - Soft Landscape Plan (REM Application 3) page 2 of 3 dwg no. 1453.008.enz.xx.dr.l.45.102 Rev PL12
    - Soft Landscape Plan (REM Application 3) page 3 of 3 dwg no. 1453.008.ENZ.XX.00.DR.L.45.103 Rev PL12
    - Soft Landscape Schedule ENZ.00.XX.SH.L.45.001 Rev PL12

    For the avoidance of doubt, climbing planters shall be included on the fencing facing Old Halsnead. Prior to any above ground works, a timetable for implementation for the fencing and landscaping shall be submitted to and approved

in writing by the Local Planning Authority. The landscaping and fence shall then be erected in accordance with the approved timetable for implementation.

Prior to any above ground works, a Planting Specification shall be submitted to and approved in writing by the Local Planning Authority. The planting specification shall also include how the trees will be planted around the retained trees in the buffer zone area adjacent to Old Halsnead. The landscaping and planting specification shall then be undertaken in accordance with the approved details.

Any tree or other planting which is lost, felled, removed, becomes diseased, or is substantially damaged within a period of five years thereafter shall be replaced in kind during the first available planting season following the date of loss or damage.

Reason: To promote biodiversity, to protect existing trees, to encourage tree planting in the interests of visual amenity and to protect the setting of Old Halsnead.

15. Prior to any above ground works, details of the retaining walls (to include materials and heights) shall be submitted to and approved in writing by the Local Planning Authority. The retaining walls shall then be constructed in accordance with the approved details.

    Reason: In the interests of visual amenity.

16. The development shall be constructed in accordance with the details shown in cross section 22605-UMC-XXXX-SI-DR-A-0709 which relates to the slope adjacent to the Old Wood at the west of the site.

    Reason: In the interests of protecting the ancient woodland.

17. Prior to any above ground works for unit 3, full details of the materials to be used for the east facing elevation of unit 3 (facing Old Halsnead) shall be submitted to and approved in writing by the Local Planning Authority. These details shall include the colour of the proposed cladding and, where requested, samples. Notwithstanding unit 3's east facing elevation, the materials for the development hereby permitted shall be constructed in accordance with the details shown on plan references 22605-UMC-XXXX-ZZ-DR-A-1301 Rev P08 (Unit 03 Elevations) and 22606-UMC-XXXX-ZZ-DR-A-1302 Rev P04 (Unit 4 Architectural Feature Elevations). Prior to any above ground works for unit 4, full details of the materials to be used in the external construction of unit 4, showing where each approved material is proposed to be used, shall be submitted to and approved in writing by the Local Planning Authority. Unit 4 and the east facing elevation shall then only be constructed in accordance with the approved materials detail.

    Reason: In the interests of visual amenity, to protect residential amenity and to preserve the setting of Old Halsnead.

18. Notwithstanding the fencing details adjacent to the M62 motorway, prior to each unit being brought into first use, the boundary treatments for that unit shall be erected in accordance with the approved details shown on plan references 22605-UMC-XXXX-SI-DR-A 0702 P13 and 22606-UMC-XXXX-SI-DR-A 0702 Rev P11. Prior to the development being brought into first use, full details of the external finish of the boundary treatments/fencing shall be submitted to and approved in writing by the Local Planning Authority. The boundary treatments shall then be erected in

accordance with the approved details prior to the unit to which it relates being brought into first use.

Reason: In the interests of visual amenity and to protect the setting of Old Halsnead.

19. The levels of the development hereby permitted shall be carried out in accordance with the plan reference L005-TIE-ZZ-XX-DR-C-6034 Rev P18 entitled XL Unit 3 and 4 - Proposed Levels.

Reason: To protect residential amenity and in the interests of visual amenity.

20. Prior to first occupation of Unit 3 or 4 (as shown on plan reference 22605-UMC-XXXX-SI-DR-A-0672(P11) and 22606-UMC-XXXX-SI-DR-A-0673 (P10)), whichever is latest, or within a timetable for implementation that has been submitted to and approved in writing by the Local Planning Authority prior to first occupation, full construction standard drawings showing the internal road network being built to the southwestern boundaries of the site, where it adjoins the former mineral railway line, to facilitate a mineral line crossing and continuation of the loop road to allow a full continuous link to the site to the south (as identified within the site location plan of planning reference 22/00587/FUL) shall be submitted to and approved in writing by the Local Planning Authority. For the avoidance of doubt the details shall include the following:

i. The proposed road ground level and levels details of any regrading of the land;
ii. Construction details of the road to an adoptable standard;
iii. Full details of the proposed highway drainage;
iv. Full details of the proposed highway lighting;
v. Indicative details of how the road will cross the former mineral line and connect to the development site to the south;
vi. Forward visibility splays, in accordance with drawing VN232867-D104;
vii. Assessment for, and if identified, inclusion of road restraint systems and/or pedestrian guard railing;
viii. Details of any retaining structures required;
ix. Timetable for implementation.

The approved details shall be implemented in full and in accordance with the approved timetable for implementation. The access road/ loop road link to the southwestern boundary shall then remain open and accessible to vehicles/pedestrians with no obstructions, in perpetuity and shall not be closed off. For the avoidance of doubt, forward visibility splays shall be provided clear of obstructions to visibility above the height of 0.6 metres measured from the carriageway level at both ends of the splay. Once created, the visibility splays shall be maintained clear of any obstruction and shall be retained at all times.

Reason: To ensure the delivery of a comprehensive development and ensure an alternative future access into the site is provided.

21. Prior to first occupation of units 3 or 4 (whichever is sooner), or within a timetable for implementation that has been submitted and approved prior to first occupation of a unit, a turning area shall have been implemented in accordance with Drawing VN232867-TR105, unless otherwise agreed with the Council as Local Planning Authority. The turning area shall remain available for use until such time as the

loop road is completed, or a replacement turning facility is agreed, to the satisfaction of the Council as Local Planning Authority.

Reason : To ensure the provision of safe and adequate means of access to the development in the interests of highway safety and amenity.

22. No part of either unit shall be brought into use until visibility splays of 2.4 metres by 70 metres, have been provided at the respective site access junctions with the loop road. The splays shall be provided clear of obstructions to visibility above the height of 0.6 metres measured from the footway/verge level. Once created, the visibility splays shall be maintained clear of any obstruction and shall be retained at all times.

Reason: To ensure adequate visibility at the junction or site access is made and maintained.

23. No part of unit 3 shall be brought into use until the areas indicated on 22605-UMC-XXXX-SI-DR-A-0672 (P11) have been set aside for parking, servicing, vehicular manoeuvring (including provision for pedestrians/cyclists) have been surfaced, drained and permanently marked out or demarcated in accordance with the details and specifications shown; and cycle parking has been provided in accordance with drawing 22605-UMC-XXXX-SI-DR-A-0703 (P10). These facilities shall be retained as such thereafter. The access road leading to units 3 and 4 (from Cronton Road) shall remain open and accessible to vehicles and pedestrians/cyclists and shall not be closed or gated/fenced off.

Reason: In the interests of highway and pedestrian safety.

24. No part of unit 4 shall be brought into use until the areas indicated on 22606-UMC-XXXX-SI-DR-A-0673 (P10) have been set aside for parking, servicing, vehicular manoeuvring (including provision for pedestrians/cyclists) have been surfaced, drained and permanently marked out or demarcated in accordance with the details and specifications shown; and cycle parking has been provided in accordance with drawing 22606-UMC-XXXX-SI-DR-A-0703 (P10). These facilities shall be retained as such thereafter.

Reason: In the interests of highway and pedestrian safety.

25. Prior to first occupation, a Hard Landscape Management Plan shall be submitted to and approved in writing by the Local Planning Authority. This shall exclude the buffer zone planting area and eastern fence adjacent to Old Halsnead. The development shall then be managed in accordance with the Hard Landscape Management Plan for the lifetime of the development. For the avoidance of doubt this shall include all other boundary treatments including the M62 fence.

Reason: In the interests of visual amenity.

26. Prior to first occupation of unit 3, a Buffer Zone Management Plan for the area of land adjacent to Old Halsnead and to the east of unit 3 shall be submitted to and approved in writing by the Local Planning Authority. This management plan shall include provisions to manage the fence, climbing planters, the strip of land immediately in front of the fence facing Old Halsnead, the landscaping to the east of unit 3 and a management and maintenance schedule for this buffer zone. Details shall include who will manage the buffer zone and what will happen in the event of

planting failures for a period of five years after planting of each tree/shrub including five years after re-planting of a failed and replaced shrub/tree.

The Buffer Zone Management Plan shall then be managed in accordance with the approved details for the lifetime of the development.

Reason: To preserve the setting of the listed building, to protect the landscape setting, in the interests of visual amenity and to promote biodiversity.

27. There shall be no open storage of materials, goods, equipment or machinery within the site.

Reason: In the interests of visual amenity.

REASON(S) FOR THE GRANTING OF PLANNING PERMISSION

The decision to grant Reserved Matters has also been taken having regard to the policies and proposals as set out below, and to all relevant material considerations including supplementary planning guidance:-

Knowsley Replacement Unitary Development Plan (Saved Policies, 2006)

T5 - Location of Major Traffic Generating New Development
T7 - New Development and Walking & Cycling Routes
T8 - Transport Assessments
T9 - Travel Plans
DQ2 - Security in the Built Environment
DQ4 - Trees and Development
ENV2 - Noise and Vibration
ENV3 - Light and Pollution
ENV5 - Contaminated Land

Knowsley Local Plan Core Strategy (2016)

SD1- Sustainable development
CS1 - Spatial Strategy for Knowsley
CS2 - Development Principles
CS4 - Economy and Employment
CS7 - Transport Networks
CS8 - Green Infrastructure
SUE1 - Sustainable Urban Extensions and Safeguarded Land
SUE2 - Sustainable Urban Extensions - Development Principles
SUE2c - Sustainable Urban Extensions - South of Whiston and Land South of M62

CS19 - Design Quality and Accessibility in New Development
CS20 - Managing the Borough's Historic Environment
CS21 - Greenspaces and Trees
CS24 - Managing Flood Risk
CS26 - Waste Management
CS27 - Planning for and Paying for New Infrastructure

Supplementary Planning Documents

Ensuring a Choice of Travel SPD (2010)

Design Quality in New Development SPD (2016)
Trees and Development SPD (2016)
Halsnead Garden Village Masterplan SPD
Merseyside Waste Local Plan (2013)

WM8 - Waste Prevention and Resource Management
WM9 - Sustainable Waste Management Design and Layout for New Development

This informative is only intended as a summary of the reason(s) for the granting of Reserved Matters. Should you require any further details relating to the decision please contact the relevant case officer (Clare Appleyard on 0151 443 2848)

ARTICLE 35 STATEMENT

The Local Planning Authority has acted positively and proactively in determining this application by identifying matters of concern within the application (as originally submitted) and negotiating with the applicant, acceptable amendments to the proposal to address those concerns. As a result, the Local Planning Authority has been able to grant planning permission for an acceptable proposal, in accordance with the presumption in favour of sustainable development, as set out within the National Planning Policy Framework.

IMPORTANT - PLEASE READ CAREFULLY THE NOTES BELOW AS FAILURE TO COMPLY COULD MAKE THE DEVELOPMENT HEREBY PERMITTED UNAUTHORISED

1) This planning permission is granted in strict accordance with the approved plans. It should be noted however that:

   a) Any variation from the approved plans following commencement of the development, irrespective of the degree of variation, will constitute unauthorised development and may be liable to enforcement action.

   b) You or your agent or any other person responsible for implementing this permission should inform Planning Services immediately of any proposed variation from the approved plans and ask to be advised as to the best method to resolve the matter. Most proposals for variation to the approved plans will require the submission of a new planning application.

2) This permission is granted subject to conditions and it is the owner of the property and the person responsible for the implementation of the development who will be fully responsible for their compliance throughout the development and beyond.

3) If there is a condition that requires work to be carried out or details to be approved prior to the commencement of the development this is called a "condition precedent". The following should be noted with regards to conditions precedent.

   a) If a condition precedent is not complied with prior to the start of development, the whole of the development will be unauthorised and you may be liable to enforcement action.

   b) In addition, if the requirements of a condition precedent are subsequently not complied with, the development is unauthorised and the only way to rectify the development is the submission of a new application.

If any other type of condition is breached then you will be liable to a breach of condition notice.

Informatives

1. The applicant's attention is drawn to comments from the Environment Agency (in particular note the possible need for a permit), United Utilities, the Fire Authority, National Highways and SPEN.

2. A copy of a licence issued by Natural England pursuant to Regulation 55 of The Conservation of Habitats and Species Regulations 2017 authorising the specified development to go ahead will be required in respect of the bat roost and the proposed tree removal.



Executive Director - Regeneration and Economic Development

Date: 20 August 2025

IMPORTANT NOTES FOR YOUR ATTENTION:

1. **This permission refers only to that required under the Town and Country Planning Acts and does not include any consent or approval under any other enactment, bylaw, order or regulation.**

2. **This permission refers only to those plans submitted as part of the Planning Application a copy of which is retained by the Local Planning Authority. The Local Planning Authority should be contacted in writing if it is proposed to amend these plans in any way as a further permission, may be required.**

3. **If a Building Regulations Consent is required for these works it is your responsibility to ensure that the plans submitted for both the Building Regulations Consent and Planning Permission are the same in all respects. Should the plans relating to one consent vary from the other, it will be necessary for you to submit amended plans to this Department and obtain the relevant approval(s) prior to commencing any works.**

Appeals to the Secretary of State

- If you are aggrieved by the decision of your local planning authority to refuse permission for the proposed development or to grant it subject to conditions, then you can appeal to the Secretary of State under section 78 of the Town and Country Planning Act 1990.

- If you want to appeal against your local planning authority's decision then you must do so within 6 months of the date of this notice.

- Appeals can be made online at: https://www.gov.uk/planning-inspectorate.
  If you are unable to access the online appeal form, please contact the Planning Inspectorate to obtain a paper copy of the appeal form on tel: 0303 444 5000.

- The Secretary of State can allow a longer period for giving notice of an appeal but will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.

- The Secretary of State need not consider an appeal if it seems to the Secretary of State that the local planning authority could not have granted planning permission for the proposed development or could not have granted it without the conditions they imposed, having regard to the statutory requirements, to the provisions of any development order and to any directions given under a development order.

Knowsley Council

REGENERATION AND ECONOMIC DEVELOPMENT DEPARTMENT

TOWN AND COUNTRY PLANNING ACT 1990

This application is subject to a Section 106 Agreement and needs to be read in conjunction with that Agreement.

OUTLINE AND FULL PLANNING PERMISSION

Application No: 20/00494/HYB

Name and address of applicant
Tritax Symmetry Huyton Limited
C/o Gerald Eve LLP
No.1 Marsden Street
Manchester
M2 1HW

Name and address of agent
Gerald Eve LLP
No.1 Marsden Street
Manchester
M2 1HW

Date of Receipt: 28 August 2020

Date Valid: 7 September 2020

Address/Location Of Development:

Former Site Of Cronton Colliery
Cronton Road
Halsnead Garden Village
Knowsley
L35 1QR

Description of Development:

HYBRID PLANNING APPLICATION COMPRISING: FULL APPLICATION FOR THE DEVELOPMENT OF 161,900 SQ FT (15,041 SQ M) (GIA) OF STORAGE AND DISTRIBUTION FLOORSPACE (USE CLASS B8), INCLUDING ANCILLARY OFFICES (USE CLASS B1), SECURITY GATEHOUSE, SITE ACCESS ROAD, ENGINEERING EARTHWORKS TO FORM A PART COUNTRY PARK, PUBLIC CAR PARK TO SERVE COUNTRY PARK, AND ASSOCIATED WORKS; AND OUTLINE APPLICATION WITH DETAILS OF POINT OF ACCESS (DETAILS OF PART-ACCESS, LANDSCAPING, APPEARANCE, SCALE AND LAYOUT ARE RESERVED) FOR THE DEVELOPMENT OF UP TO 838,100 SQ FT (77,862 SQ M) (GIA) OF STORAGE AND DISTRIBUTION FLOORSPACE (USE CLASS B8), WITH ANCILLARY OFFICES AND LIGHT INDUSTRIAL (USE CLASS B1); ENGINEERING EARTHWORKS TO FORM COUNTRY PARK AND DRAINAGE ATTENUATION PONDS; PEDESTRIAN/CYCLE/EQUESTRIAN ROUTE CONNECTING EXISTING M62 FOOTBRIDGE WITH PROPOSED COUNTRY PARK; AND ASSOCIATED WORKS

The Council of the Metropolitan Borough of Knowsley hereby give notice in pursuance of the above Act(s) that permission has been **granted** for the carrying out of the development referred to above in accordance with the application and plans submitted subject to the following condition(s):

1. The development granted full planning permission must be begun not later than the expiration of three years beginning with the date of this permission. Reason: In order to comply with the requirements of Section 91 of the Town and Country Planning Act 1990 (as amended).

   Reason: In order to comply with the requirements of Section 91 of the Town and Country Planning Act 1990 (as amended).

2. The development hereby permitted shall be carried out in accordance with the approved plans and documents listed in Schedule 1.

   Reason: For the avoidance of doubt.

3. No part of the development hereby permitted shall commence until an updated Construction Environmental Management Plan has been submitted to and approved in writing by the Local Planning Authority that details the means of mitigation of construction effects. The Plan shall include timing/implementation details of each phase and shall include, but not be limited to the following:
   a) Methods for the mitigation of noise and vibration from building works, including piling works, and also for the operation of any temporary power generation or plant which will operate overnight.
   b) Control of transfer of mud out of the site - details of wheel washing facilities including location and type.
   c) Methods for the control of dust.
   d) Location and layout of any site compound(s) including identification of areas for the storage of plant and materials, loading/unloading and turning areas for delivery vehicles (for each phase as necessary);
   e) and the methods of loading and unloading of plant and materials.
   f) Management of deliveries including prevention of waiting/layover of construction related traffic on the highway; measures for the control of traffic to and from the site; and consideration of any temporary traffic management arrangements which may be necessary during periods of construction. Note reversing on the highway is not permitted without a Banksman.
   g) Identification of permanent on-site contact and/or traffic manager as main point of enquiries or issues arising from construction activities.
   h) An implementation programme of works including phasing if applicable.
   i) The parking of vehicles of site operatives and visitors.
   j) Scheme for recycling/disposal of waste resulting from construction works.
   k) The details of the design, siting and maintenance of any security hoardings.
   l) Details of ecological mitigation measures

   There shall be no burning of materials on-site during construction work without the prior written approval of the Local Planning Authority.

   Development shall thereafter be carried out in accordance with the measures described within the submitted Construction Environmental Management Plan.

   Reason: To ensure a satisfactory development of the site and that appropriate measures are put in place in the interests of the amenity of neighbouring occupiers/areas and in the interest of highway safety and to comply with the National Planning Policy Framework (2019), Policies CS2, CS8 and CS19 of the

Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policies ENV2 and ENV3 of the Knowsley Replacement Unitary Development Plan, adopted June 2006, Policy WM8 the Merseyside and Halton Joint Waste Local Plan, adopted 2013.

4. Prior to the commencement of any above ground works, a Stage II Road Safety Audit for the approved site access on Cronton Road shall be submitted to all approved in writing by the Local Planning Authority. Any identified mitigation shall subsequently be implemented before the approved building is first occupied and maintained thereafter.

   Reason: To ensure the proposed access points are safe and do not give rise to any highway safety issues.

5. Prior to the commencement of any part of the approved development a Highway Construction Management Plan will have to be submitted to and agreed in writing by the Local Planning Authority that details the means of mitigation of construction effects upon the public highway. This shall detail the following:

   a. Layout of the site compound including identification of areas for the storage of plant and materials, loading/unloading and turning areas for delivery vehicles [for each phase as necessary.
   b. Management of deliveries including prevention of waiting/layover of construction related traffic on the highway, measures for the control of traffic to and from the site and consideration of any temporary traffic management arrangements which may be necessary during periods of construction. Note reversing on the highway is not permitted without a Banksman.
   c. Construction staff parking arrangements
   d. Control of transfer of mud out of the site - details of wheel washing facilities including location and type.
   e. Methods for dust control and suppression.
   f. A programme of works including phasing, if applicable.
   g. Adequate provision for addressing any abnormal wear and tear to the highway, if applicable.

   All site works shall then be carried out in accordance with the approved Plan unless otherwise agreed in writing beforehand with the Local Planning Authority.

   Reason: To ensure the satisfactory development of the site and in the interests of protecting the amenity of neighbouring occupiers and to comply with saved Policies H5, and ENV2 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and Policy CS2 of the Core Strategy, adopted January 2016.

6. Before any works commence to create the approved access, details of the relocation of the two existing bus stops on Cronton Road, including associated bus stop infrastructure, shall be submitted to and approved in writing by the Local Planning Authority. The submitted details shall include provision of a footpath from the approved junction on Cronton Road to the relocated bus stop. The development shall be implemented in full accordance with the approved scheme details prior to first occupation of the development.

   Reason: To ensure provision of the replacement bus stops along Cronton Road and safe access is provided.

7. Before the approved development is first occupied details of a temporary turning head on the site access road, including swept path analysis of a 16.5m length Heavy Goods Vehicle shall be submitted to and approved in writing by the Council as Local Planning Authority. The development shall be implemented in full accordance with the approved scheme details prior to first occupation of the

development unless otherwise agreed in writing by the Council as Local Planning Authority.

Reason: To enable full size HGVs to turn around prior to the construction of the rest of the proposed loop road through the site ensuring the provision of safe and adequate means of access to/from the development in the interests of highway safety and amenity and to comply with Policy CS19 of the Core Strategy, adopted January 2016.

8. Before the approved development is first occupied details of measures to prevent vehicular traffic (except maintenance vehicles) from accessing the emergency access to the north of the approved building shall be submitted to and approved in writing by the Local Planning Authority. The measures shall be implemented as approved before any part of the development is brought into use and shall be retained as such thereafter unless otherwise agreed in writing by the Council as Local Planning Authority.

   Reason: To prevent unauthorised vehicles from using an inappropriate access ensuring the provision of safe access in and around the development.

9. The parking provision shown for Unit 1 of the development on the approved plans shall be provided prior to first occupation of the building to which it relates. The parking provision shall not be used for any other purpose other than the parking of vehicles and shall be hard surfaced.

   Reason: In the interests of highway and pedestrian safety and to comply with Policy CS7 of the Core Strategy, adopted January 2016.

10. No part of the development (excluding site set up, earthworks and remediation) shall be commenced until the Traffic Regulation Order process has commenced, to be confirmed by the local planning authority, to provide a 50mph speed limit on Cronton Road.

    Reason: To preserve the safety and function of the highway network and to comply with Policy CS19 of the Core Strategy, adopted January 2016.

11. Prior to first occupation of the development details of a Travel Plan shall have been submitted to and approved in writing by the Local Planning Authority. The Plan shall include details of how measures to promote and encourage alternative modes of transport to the single-occupancy car would be communicated to employees. For the avoidance of doubt, the Travel Plan shall include, but not be limited to, the following:
    a) Production and distribution of an information pack for employees detailing travel
    b) options and information on all modes of transport.
    c) Information on existing transport policies, services and facilities, travel behaviour and attitudes.
    d) Access for all modes of transport.
    e) Advice on appropriate measures and actions to reduce car dependency and encourage sustainable travel.

    The approved Travel Plan shall be issued to employees on initial occupation of the development.

    Reason: To maximise opportunities for travel by modes of transport other than the private car, and to ensure that the development is sustainable, having regard to

Policies T6 and T9 of the Knowsley Replacement Unitary Development Plan, adopted June 2006.

12. The approved development shall not be occupied until the approved junction on Cronton Road and the construction of the access road as shown on approved plan references VN81193-D0104-Rev-C and VN81193-D0111-Rev-C shall be implemented in full to the written satisfaction of the Local Planning Authority.

Reason: To ensure the necessary infrastructure is in place when the approved use commences and to ensure the comprehensive development of the site

13. Submission of Remediation Scheme
Where land affected by contamination is found which poses unacceptable risks, no development shall take place until a detailed remediation scheme has been submitted to and approved in writing by the Local Planning Authority. The scheme must include an appraisal of remediation options, identification of the preferred option(s), the proposed remediation objectives and remediation criteria, and a description and programme of the works to be undertaken including the verification plan. As a minimum, the scheme must ensure that the site will not qualify as contaminated land under Part 2A of the Environmental Protection Act 1990 in relation to its intended use.

Implementation of Approved Remediation Scheme and Verification Report
Should a remediation scheme be required the approved scheme shall be implemented, and a verification report submitted to and approved in writing by the Local Planning Authority, prior to the development (or relevant phase of development) being brought into use.

Reporting of Unexpected Contamination
In the event that contamination is found at any time when carrying out the development that was not previously identified it must be reported immediately to the Local Planning Authority. Development on the part of the site affected must be halted and a risk assessment carried out and submitted to and approved in writing by the Local Planning Authority. Where unacceptable risks are found remediation and verification schemes shall be submitted to and approved in writing by the Local Planning Authority. These shall be implemented prior to the development (or relevant phase of development) being brought into use.

Materials Management Plan
Prior to the reuse of site won materials ('waste' and non-waste) a Materials Management Plan, carried out in line with the CL: AIRE code of practice and signed off by a Qualified Person, shall be submitted to and agreed in writing with the local planning authority. The MMP shall demonstrate that any reuse of contaminated materials does not result in increased risk to the environment or human health.

Importation of Soil/Material

No soil is to be imported to the site until it has been tested for contamination and assessed for its suitability for the proposed development; a suitable methodology for testing this material should be submitted to and agreed by the Local Planning Authority prior to the soils being imported onto site. The methodology should include the sampling frequency, testing schedules, criteria against which the analytical results will be assessed (as determined by the risk assessment) and source material information. The analysis shall then be carried out and evidence submitted to and approved in writing to by the Local Planning Authority.

Reason: To prevent any risk to the public and general pollution of the environment and in accordance with Policy CS2 in the Knowsley Local Plan Core Strategy and saved policy ENV5 of the Knowsley Replacement Unitary Development Plan, adopted June 2006.

14. Before first occupation of any part of the approved development, details of a scheme for the protection of the residential properties at Park Villas from external traffic noise entering habitable rooms has been submitted to and approved in writing by the Local Planning Authority. The agreed mitigation shall be implemented in full accordance with the approved details prior to first occupation of each property and shall be retained thereafter.

    Reason: The submission of details prior to the construction of the residential properties is fundamental to ensure that appropriate measures are incorporated into the development to protect future occupiers from noise and disturbance from nearby industrial and rail uses.

15. No above ground works hereby approved shall be commenced until Social Value Strategy that accords with the Adding Social Value to Development: Employment and Skills Supplementary Planning Document shall be submitted to and approved in writing by the Local Planning Authority. The agreed details shall be implemented in full during the construction process and when the approved uses commence.

    Reason: To ensure local economic benefits in accordance with Core Strategy Policy CS4.

16. Notwithstanding the details shown on the approved drawings, no part of the development shall be occupied until full details of both hard and soft landscaping works have been submitted to and approved in writing by the Local Planning Authority. The details shall relate to all land surfaces not built upon and shall include:
    a) Land-levels and gradients resulting in the formation of any banks, terraces or other earthworks
    b) hard surfaced areas and materials,
    c) planting plans, specifications and schedules, planting size, species and numbers/densities, trees to be retained and a scheme for the timing / phasing of work.
    d) existing plants / trees to be retained
    e) A detailed regime for the ongoing and longer-term maintenance of all soft landscaping is also required to be submitted for approval.

    The approved landscaping works shall be implemented and completed prior to the occupation of the dwelling to which it relates unless otherwise agreed in writing by the Local Planning Authority.

    Any trees or shrubs planted or retained in accordance with this condition which are removed, uprooted, destroyed, die or become severely damaged or become seriously diseased within 5 years of planting shall be replaced within the next planting season by trees or shrubs of similar size and species to those originally required to be planted.

    Reason: To ensure that the site is satisfactorily landscaped having regard to its location and the nature of the proposed development and to comply with Saved Policy H5 of the Knowsley Replacement Unitary Development Plan, adopted June 2006, Policy CS19 of the Knowsley Local Plan Core Strategy, adopted January 2016, and the National Planning Policy Framework.

17. Prior to installation, details of the proposed means of enclosure (including walls, fences and gates) should be submitted to and approved in writing by the Local Planning Authority. The agreed details shall be implemented in full before any of the approved units are first occupied and shall be maintained at all times thereafter.

    Reason: To ensure satisfactory privacy for occupants of the proposed dwellings, in the interests of visual amenity and to comply with Policies CS2, CS19 of the Knowsley Local Plan Core Strategy, adopted January 2016 and Saved Policy H5 of the Knowsley Replacement Unitary Development Plan, adopted June 2006.

18. Prior to the installation of any external plant or machinery, details including the acoustic specification should be submitted to and approved in writing by the local planning authority. The information should also include the results of a noise assessment to confirm that any fixed plant orand machinery associated with the development shall achieve a level that is at least 5dB(A) below the existing LA90 background noise level as measured during the relevant time period. Any tonal, impulsive and/or irregular noise would be addressed by imposing a penalty as per the methodology set out in BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. Noise limits for fixed plant are to apply at the boundary of the closest affected noise sensitive property.

    Reason: To safeguard local residents from noise and disturbance, and to comply with Saved Policy ENV2 of the Knowsley Replacement Unitary Development Plan adopted June 2006.

19. The development shall be carried out in full accordance with the recommendations of the BAT AND BIRD BOX SCHEME - PHASE 1 by TEP referenced 7363.018 and received by the Local Planning Authority on 10 December 2020. All mitigation measures must be implemented

    Reason: To ensure adequate mitigation is provided for the loss of habitat.

20. Prior to the removal of trees T3 and T4, as identified in the Biodiversity Mitigation Strategy (TEP, reference 7367.017) submitted to the Local Planning Authority on 10 December 2020, a method statement to deal with any bats that may be using the trees as a roost shall be submitted to and approved in writing by the Local Planning Authority. The agreed details shall be implemented in full

    Reason: To ensure if bat roosts are found they are adequately dealt with.

21. Development shall not commence until details and a method statement for interim and temporary drainage measures during the demolition and construction phases have been submitted to and approved in writing by the Local Planning Authority. This information shall demonstrate how the site will be drained to ensure there is no increase in the off-site flows, nor any pollution, debris and settlement to any receiving watercourse or sewer system. Where temporary discharges to a sewer are proposed, written confirmation from the sewer owner that these have been accepted, shall be provided. The site works and construction phase shall thereafter be carried out in accordance with approved method statement.

    Reason: To ensure pre and post development flood risk and water quality at the and off site have been taken into account Policies CS2 and CS24 of the Knowsley Local Plan: Core Strategy (January 2016).

22. Development shall not commence until a detailed SUDS based drainage scheme on the principles of The SUDS Manual (C753) and the criteria as set out within Knowsley Strategic Flood Risk Assessment (SFRA, Levels 2), has been submitted

and approved in writing by the Local Planning Authority (LPA). The applicant should provide suitable drainage drawings, summary calculations and results of all investigations detailing the surface water drainage works as set out below. The maximum rate of discharge, off-site, shall not generally exceed a greenfield runoff rate. The works shall be implemented in accordance with the approved scheme before the development is brought into use, or as set out in the approved phasing details.

The surface water and drainage strategy, detailed design drawings, calculations and supporting information shall be expected to consider the following elements:

(i) Evidence and justification that in selecting drainage features for post-development situation the surface water drainage discharge hierarchy has been followed. As requested by National Planning Practice Guidance applications should aim to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

- into the ground (infiltration)
- to a surface water body to a surface water sewer, highway drain, or another drainage system, and
- to a combined sewer.

Any drainage strategy proposal should clearly demonstrate how the movement down the hierarchy has been considered and that the selection of the most appropriate set of SuDS techniques has taken into account the site geological and topographical characteristics. To assess the feasibility of infiltration techniques as part of the proposed drainage strategy, evidence must be provided to show that a suitable number of soakaway tests have been completed across the whole site within different geology and to a suitable depth (i.e. a similar depth to the proposed infiltration devices). The tests should be completed according to the BRE 365 method and their results should be submitted with the full application.

(ii) inclusion of the site land drain map, their connectivity and, where they are compromised by new development, proposals for an alternative land drain.

(iii) Evidence that surface water will not utilise motorway drainage or result in any overland flows to the M62 motorway.

(iv) An assessment of groundwater levels on the site, their likely variations and, in the event that the assessment shows that groundwater levels will be high, details of mitigation measures proposed by the applicant to prevent groundwater flooding to new development.

(v) Model Information (Micro Drainage or similar approved) to include a plan showing pipework model numbering and network details.

(vi) Results showing all the modelling criteria and summary network results attenuation ponds for critical 1 in 2 year, 1 in 30 year and 1 in 100 year plus 40% CC storm events showing maximum water level, flow and velocity and details of any surface flooding anticipated are required.

(vii) A drawing showing the proposed impermeable and permeable areas, suitably annotated.

(viii) Drainage plan showing drainage layout, manholes including cover and invert levels, proposed levels, pipe sizes and gradients, all on -line controls, on and off line storage structures and outfall details.

(ix) Plan showing overland exceedance routes in the event of a failure of the system or storm event in excess of the 1 in 100 + 30% CC storm event.

(x) Summary Drainage Report setting out the Drainage Strategy and results of calculations demonstrating compliance with the above.

(xi) Where third party agreements to construct sewers and to discharge flows are required, then written evidence of these two agreements shall be provided.
(xii) A timetable for implementation of the drainage works including an assessment of any phasing of the development.
(xiii) Demonstrating that adequate water quality of the off-site surface water flows (draining into a sewer, watercourse and ground) in accordance with the Simplified Index Approach as set out within Section 26 of the SUDS Manual (C753) can be achieved during all phases of the development.

Where SUDs are only proposed in part or not at all, then a full justification statement shall be provided to demonstrate why it is not considered appropriate or reasonable.

Reason: To ensure a satisfactory drainage system is provided to serve the site in accordance Policies CS2 and CS24 of the Knowsley Local Plan: Core Strategy (January 2016).

23. Prior to the first occupation of the development, a Management and Maintenance plan for the approved sustainable drainage system shall be submitted to and approved in writing by the Local Planning Authority. This shall include:
- The arrangements for adoption by an appropriate public body or statutory undertaker or details of provision for management and maintenance by a resident's management company.
- A schedule for on-going inspections relating to performance and condition.
- Details for planned maintenance and a mechanism for remedial and urgent repair works.
- Means of access for inspection and maintenance purposes.

The plan shall be implemented in accordance with the timeframes contained within it.

Reason: To ensure effectiveness of the flood risk measures during the lifetime of the development policies CS2 and CS24 of the Knowsley Local Plan: Core Strategy (January 2016).

24. Before the approved building is first brought into use full details of the finished levels across the remaining parts of the site subject to full planning permission shall be submitted to and approved in writing by the Local Planning Authority. The agreed levels shall be implemented in full and maintained thereafter unless amendments are required as a result of the approved details for any reserved matters application pursuant to this application.

Reason: For the avoidance and to ensure the levels proposed do not compromise the delivery of the Country Park.

25. The development hereby permitted shall be implemented in accordance with the submitted Arboricultural Method Statement referenced 12267_R05, produced by Tyler Grange and received 10 December 2020 unless otherwise agreed in writing by the Local Planning Authority.

Reason: To ensure that the proper protection of trees has been carried out in the interests of visual amenity and to comply with Policies CS2 and CS19 of the Knowsley Local Plan Core Strategy, adopted January 2016 and saved Policy DQ4 of the Knowsley Replacement Unitary Development Plan, adopted June 2006.

26. The development hereby permitted shall be implemented in accordance with paragraph 11.8 of the submitted Environment Statement Addendum received 10 December 2020.

Reason: To prevent any risk to the public and general pollution of the environment and in accordance with Policy CS2 in the Knowsley Local Plan Core Strategy and saved policy ENV5 of the Knowsley Replacement Unitary Development Plan, adopted June 2006.

27. The development shall be carried out in full accordance with the submitted flood risk assessment referenced September 2020/T.18.2126.FRA/Tier Consult received by the Local Planning Authority on 10 December 2020. The identified mitigation measures shall be fully implemented prior to first occupation of unit 1 and maintained thereafter.

Reason: To comply with National Planning Policy Framework (NPPF) and reduce risk of flooding to the proposed development and future occupants.

28. No development associated with the diversion of Fox's Bank Brook shall take place until a scheme for the diversion of Fox's Bank brook has been submitted to and approved in writing by the local planning authority. The submitted details shall include;

- Sufficient cross-sections to represent all design proposals associated with the new Fox's Bank Brook channel (i.e. channel meanders, straight sections of channel, where and what type of new revetment is proposed, culverted sections).
- Details of any channel reinforcement/structures proposed and/or bed substrate to be added to the channel.
- Details of proposed planting and channel reinstatement. Bankfull width and height to be marked on cross-sections in m.
- Channel long section.
- Site supervision requirements.
- A pre and post construction monitoring plan for the Fox's Bank Brook channel.

The diversion of Fox's Bank Brook shall be carried out in full accordance with the agreed details.

Reason: To comply with paragraphs 170 and 175 of the National Planning Policy Framework, ensure the natural functioning of the watercourse and meet the objectives of the Water Framework Directive (WFD).

29. No development within 20 metres of Fox's Bank Brook shall take place until a scheme for the provision and management of a minimum 4 metre wide buffer zone alongside Fox's Bank Brook has been submitted to, and approved in writing by, the local planning authority. The buffer zone scheme shall be free from built development including lighting, and formal landscaping. The scheme shall include:

- plans showing the extent and layout of the buffer zone.
- details of any land re-profiling or re-modelling within the riparian corridor.
- details of any new crossings or culverts (clarification required as to whether existing culvert is to be retained.)
- details of any new surface connections to watercourse.
- details of any new soft landscaping in riparian corridor, including landscape schedule predominantly based on native species.

The development shall be carried out in full accordance with the agreed details and shall be maintained thereafter.

Reason: To comply with paragraphs 170 and 175 of the National Planning Policy Framework, ensure the natural functioning of the watercourse and meet the objectives of the Water Framework Directive (WFD).

30. If piling is required as part of the development, prior to the commencement of any piling works the applicant shall submit a method statement, to be approved by the Local Planning Authority. The piling work shall be undertaken in accordance with the approved method statement:

The method statement shall include the following details:

1. Details of the method of piling
2. Days / hours of work
3. Duration of the pile driving operations (expected start date and completion date)

Reason: In the interests of residential amenity and protect against unacceptable levels of water pollution.

31. Before the approved development is first brought into use details of the surfacing and layout of the car park to serve the country park and a maintenance and management plan (inc arrangements for public access) shall be submitted to and approved in writing by the Local Planning Authority. The agreed details shall be implemented in full accordance with a timetable previously agreed in writing.

Reason: To ensure the car park is constructed to an acceptable standard.

32. Prior to the first occupation of Unit 1, a Habitat and Landscape Management Plan shall be submitted to and approved in writing by the local planning authority. The Plan shall include details of a management strategy for a period of 30 years to maximise gains in biodiversity within the wider site and shall be implemented in full accordance with the agree recommendations.

Reason: To ensure the required level of ecological mitigation is provided within the site.

33. Prior to the first occupation of unit 1 details of all external lighting within the curtilage of unit 1 and along the approved access road, shall be submitted to and approved in writing by the Local Planning Authority. The agreed details shall be implemented in full before unit 1 is first occupied and maintained thereafter.

Reason: To ensure the lighting proposed is acceptable and is not detrimental to the amenity of nearby residential properties.

34. Application for approval of all the reserved matters shall be made to the Local Authority before the expiration of seven years from the date of this permission the development shall be begun not later than the expiration of two years from the final approval of the reserved matters, or in the case of approval on different dates, the final approval of the last such matter to be approved.

Reason: To be imposed pursuant to Section 92 of the Town and Country Planning Act 1990 for those parts of the application submitted for outline permission only, and that the period reflects the separated, phased development programme.

35. No development shall commence within the Outline area shown on plan reference OAP 01, unless Reserved Matters in respect of the whole outline area, or any phase within, have been submitted to and approved in writing by the Local Planning Authority. The following matters are reserved for future approval;

i. Appearance;
ii. Landscaping;
iii. Layout; and,
iv. Scale
v. Part access

Reason: The application is submitted in hybrid form and parts of the site have outline permission only and these matters were reserved by the applicant for subsequent approval.

36. Any subsequent reserved matters application in respect of land that adjoins the M62 motorway corridor, pursuant to this approval shall provide details of boundary treatments along the M62 motorway boundary for the written approval of the Local Planning Authority. The boundary treatment shall be a solid structure not less than two metres in height and located at least 1 metre within the site boundary. The agreed details shall be implemented in full and maintained at all times thereafter.

Reason: To ensure a robust boundary to restrict any possible access to the motorway is provided.

37. No part of the development approved by any subsequent reserved matters application shall commence until an updated Construction Environmental Management Plan has been submitted to and approved in writing by the Local Planning Authority that details the means of mitigation of construction effects. The Plan shall include timing/implementation details of each phase and shall include, but not be limited to the following:

a) Methods for the mitigation of noise and vibration from building works, including piling works, and also for the operation of any temporary power generation or plant which will operate overnight.
b) Control of transfer of mud out of the site - details of wheel washing facilities including location and type.
c) Methods for the control of dust.
d) Location and layout of any site compound(s) including identification of areas for the storage of plant and materials, loading/unloading, and turning areas for delivery vehicles (for each phase as necessary);
e) and the methods of loading and unloading of plant and materials.
f) Management of deliveries including prevention of waiting/layover of construction related traffic on the highway; measures for the control of traffic to and from the site; and consideration of any temporary traffic management arrangements which may be necessary during periods of construction. Note reversing on the highway is not permitted without a Banksman.
g) Identification of permanent on-site contact and/or traffic manager as main point of enquiries or issues arising from construction activities.
(h) An implementation programme of works including phasing if applicable.
(i) The parking of vehicles of site operatives and visitors.
(j) Scheme for recycling/disposal of waste resulting from construction works.
(k) The details of the design, siting, and maintenance of any security hoardings.
(l) There shall be no burning of materials on-site during construction work without the prior written approval of the Local Planning Authority.

The development shall thereafter be carried out in accordance with the measures described within the submitted Construction Environmental Management Plan.

Reason: To ensure a satisfactory development of the site and that appropriate measures are put in place in the interests of the amenity of neighbouring occupiers/areas and in the interest of highway safety and to comply with the National Planning Policy Framework (2019), Policies CS2, CS8 and CS19 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policies ENV2 and ENV3 of the Knowsley Replacement Unitary Development Plan, adopted June 2006, Policy WM8 the Merseyside and Halton Joint Waste Local Plan, adopted 2013.

38. Prior to first occupation of each unit approved as part of any subsequent reserved matters application, details of a Travel Plan shall have been submitted to and approved in writing by the Local Planning Authority. The Plan shall include details of how measures to promote and encourage alternative modes of transport to the single-occupancy car would be communicated to [employees] [new residents]. For the avoidance of doubt, the Travel Plan shall include, but not be limited to, the following:

    a) Production and distribution of an information pack for employees detailing travel
    b) options and information on all modes of transport.
    c) Information on existing transport policies, services and facilities, travel behaviour and attitudes.
    d) Access for all modes of transport.
    e) Advice on appropriate measures and actions to reduce car dependency and encourage sustainable travel.

The approved Travel Plan shall be issued to employees on initial occupation of the development.

Reason: To maximise opportunities for travel by modes of transport other than the private car, and to ensure that the development is sustainable, having regard to Policies T6 and T9 of the Knowsley Replacement Unitary Development Plan, adopted June 2006.

39. No more than 17,000 square metres of floorspace subsequently approved as part of any reserved matters application shall be first brought into use until upcoming junction improvements to Tarbock Island have been commenced to the written satisfaction of the Local Planning Authority. The remaining floorspace approved as part of any reserved matters application shall be first brought into use until upcoming junction improvements to Tarbock Island have been implemented to the written satisfaction of the Local Planning Authority.

Reason: To ensure the development has no detrimental impact on the operation of the local highway network.

40. No development approved as part of any subsequent reserved matters application shall commence until details of any remediation works and/or mitigation measures to address land instability / mine gas arising from coal mining legacy, as may be necessary, have been submitted to and approved in writing by the Local Planning Authority. The agreed mitigation shall be implemented in full in order to ensure that the site is made safe and stable for the development proposed.

Reason: To ensure the development takes into account any legacy issue from former land uses on the site.

41. Prior to the occupation of each building approved as part of any subsequent reserved matters application, a signed statement or declaration prepared by a suitably competent person confirming that the site is, or has been made, safe and stable for the approved development shall be submitted to and approved in writing by the Local Planning Authority. The submitted details shall include the methods and findings of the intrusive site investigations and the completion of any remedial works and/or mitigation necessary to address the risks posed by past coal mining activity.

    Reason: To ensure the development takes into account any legacy issue from former land uses on the site.

42. Any subsequent reserved matters application pursuant to this permission shall be accompanied by an Arboricultural Impact Assessment that reflects the proposed development.

    Reason: To ensure that the proper protection of trees has been carried out in the interests of visual amenity and to comply with Policies CS2 and CS19 of the Knowsley Local Plan Core Strategy, adopted January 2016 and saved Policy DQ4 of the Knowsley Replacement Unitary Development Plan, adopted June 2006.

43. None of the buildings proposed as part of any subsequent reserved matters application pursuant to this permission shall be of a height that exceeds 61m AOD (Above Ordnance Datum).

    Reason: To ensure the amenity of neighbouring dwellings is maintained and to ensure an acceptable visual impact of the development.

44. Prior to the occupation of any building approved as part of any subsequent reserved matters approval details of the provision of bus stops within the site and a timetable for their implementation shall be submitted to and approved in writing by the Local Planning Authority. The development shall be carried out in full accordance with the agreed details and timetable and be retained thereafter.

    Reason: To ensure the development is adequately served by sustainable forms of transport.

45. As part of any subsequent reserved matters application details of the finished levels across the site shall be submitted to and approved in writing by the Local Planning Authority. The submitted details shall include cross sections and details of how any excess material will be disposed of. The agreed details shall be implemented in full before first occupation of the development approved under each reserved matters application.

    Reason: To ensure the levels across the site are acceptable and do not have any unacceptable environmental impacts.

46. As part of any subsequent reserved matters application details of how the highways through the site will connect to neighbouring parcels of land, including through to the former mineral line, shall be submitted to and approved in writing by the Local Planning Authority. The submitted details shall include cross sections, details of the highway construction and a full timetable for implementation. The agreed details shall be implemented in full and maintained thereafter.

    Reason: To ensure the development does not compromise the comprehensive development of the entire site.

47. Any subsequent reserved matters application shall allow a 15-metre buffer from the edge of the Ancient Woodland to the west of the site that shall be free of any form of built development or hardstanding.

Reason: To protect the ancient woodland by ensuring development is an appropriate distance from the woodland.

48. Prior to the commencement of site clearance works within the area subject to outline planning permission,, a Biodiversity Mitigation Strategy (BMS) shall be submitted to and approved in writing by the local planning authority. The BMS shall include details of the following:

- Fencing and protection of habitats to be retained
- Strategy for the staged clearance works to avoid harm to amphibians, hedgehogs and enable identification of potential badger setts
- Pre-commencement badger survey
- Pre-commencement surveys of all trees with bat roost potential
- Updated ground-based assessment and nocturnal surveys of tree T15
- Supervision of all trees with bat roost potential being felled
- Nesting bird checks to the end of September
- Pre-commencement check for water vole
- Bluebell translocation strategy
- Bat and bird box scheme
- The development shall be carried out in full accordance with the agreed details in accordance with a previously agreed timetable for implementation.

Reason: To ensure the tree does not have a bat roost within it and ensure no unnecessary harm is caused on local ecology.

49. As part of any subsequent reserved matters applications details shall be provided on the number and type of electric vehicle charging points to be provided for by each unit. The development shall be carried out in full accordance with the agreed details and maintained thereafter.

Reason: To ensure adequate charging points are required and reduce the impact of the development on local air quality.

50. Any subsequent reserved matters application shall be accompanied by an updated Heritage Impact Assessment that considers the impact of the proposed development on the setting of the Grade II listed Building known as Old Halsnead Hall.

Reason: To ensure the development has further unacceptable level of impact on the listed building adjoining the site.

51. Any subsequent reserved matters application shall be accompanied by an updated Overshadowing Assessment that considers the impact of the proposed development on the amenity of the residential properties along the northern boundary of the site.

Reason: To ensure the development has no unacceptable impact on the amenity of neighbouring properties.

52. Prior to the commencement of the reserved matters development details and a method statement for interim and temporary drainage measures during the demolition and construction phases shall be submitted to and approved in writing by

the Local Planning Authority. This information shall demonstrate how the site will be drained to ensure there is no increase in the off-site flows, nor any pollution, debris and settlement to any receiving watercourse or sewer system. Where temporary discharges to a sewer are proposed, written confirmation from the sewer owner that these have been accepted, shall be provided. The site works and construction phase shall thereafter be carried out in accordance with approved method statement.

Reason: To ensure pre and post development flood risk and water quality at the and off site have been taken into account Policies CS2 and CS24 of the Knowsley Local Plan: Core Strategy (January 2016).

53. No development shall commence, with the exception of details approved pursuant to Condition 32, until a detailed SUDS based drainage scheme on the principles of The SUDS Manual (C753) and the criteria as set out within Knowsley Strategic Flood Risk Assessment (SFRA, Levels 2), has been submitted and approved in writing by the Local Planning Authority (LPA) for each phase unless otherwise agreed in writing. The applicant should provide suitable drainage drawings, summary calculations and results of all investigations detailing the surface water drainage works as set out below. The maximum rate of discharge, off-site, shall not generally exceed a greenfield runoff rate. The works shall be implemented in accordance with the approved scheme before the development is brought into use, or as set out in the approved phasing details.

The surface water and drainage strategy, detailed design drawings, calculations and supporting information shall be expected to consider the following elements:

(i) Evidence and justification that in selecting drainage features for post-development situation the surface water drainage discharge hierarchy has been followed. As requested by National Planning Practice Guidance applications should aim to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:
- into the ground (infiltration)
- to a surface water body to a surface water sewer, highway drain, or another drainage system, and
- to a combined sewer.

Any drainage strategy proposal should clearly demonstrate how the movement down the hierarchy has been considered and that the selection of the most appropriate set of SuDS techniques has taken into account the site geological and topographical characteristics. To assess the feasibility of infiltration techniques as part of the proposed drainage strategy, evidence must be provided to show that a suitable number of soakaway tests have been completed for the outline area (or any phase within) within different geology and to a suitable depth (i.e. a similar depth to the proposed infiltration devices). The tests should be completed according to the BRE 365 method and their results should be submitted with the full application.

(ii) inclusion of the site land drain map, their connectivity and, where they are compromised by new development, proposals for an alternative land drain.
(iii) Evidence that surface water will not utilise motorway drainage or result in any overland flows to the M62 motorway.
(iv) An assessment of groundwater levels on the site, their likely variations and, in the event that the assessment shows that groundwater levels will be high, details of mitigation measures proposed by the applicant to prevent groundwater flooding to new development.

(v) Model Information (Micro Drainage or similar approved) to include a plan showing pipework model numbering and network details.
(vi) Results showing all the modelling criteria and summary network results attenuation ponds for critical 1 in 2 year, 1 in 30 year and 1 in 100 year plus 40% CC storm events showing maximum water level, flow and velocity and details of any surface flooding anticipated are required.
(vii) A drawing showing the proposed impermeable and permeable areas, suitably annotated.
(viii) Drainage plan showing drainage layout, manholes including cover and invert levels, proposed levels, pipe sizes and gradients, all on -line controls, on and off line storage structures and outfall details.
(ix) Plan showing overland exceedance routes in the event of a failure of the system or storm event in excess of the 1 in 100 + 30% CC storm event.
(x) Summary Drainage Report setting out the Drainage Strategy and results of calculations demonstrating compliance with the above.
(xi) Where third party agreements to construct sewers and to discharge flows are required, then written evidence of these two agreements shall be provided.
(xii) A timetable for implementation of the drainage works including an assessment of any phasing of the development.
(xiii) Demonstrating that adequate water quality of the off-site surface water flows (draining into a sewer, watercourse and ground) in accordance with the Simplified Index Approach as set out within Section 26 of the SUDS Manual (C753) can be achieved during all phases of the development.

Where SUDs are only proposed in part or not at all, then a full justification statement shall be provided to demonstrate why it is not considered appropriate or reasonable.

Reason: To ensure a satisfactory drainage system is provided to serve the site in accordance Policies CS2 and CS24 of the Knowsley Local Plan: Core Strategy (January 2016).

54. The development shall be carried out in full accordance with the submitted flood referenced September 2020/T.18.2126.FRA/Tier Consult received by the Local Planning Authority on 10 December 2020. The identified mitigation measures shall be fully implemented prior to the first occupation and subsequently in accordance with the scheme's timing/ phasing arrangements and maintained thereafter.

Reason: To comply with National Planning Policy Framework (NPPF) and reduce risk of flooding to the proposed development and future occupants.

55. The total quantum of development submitted as part of the subsequent reserved matters applications shall not exceed a total of 77,629 sq metres.

Reason: The development has been assessed at this level of accommodation and any increase in floorspace will require a reconsideration of the principle issues surrounding this proposal.

56. Prior to the first occupation of each phase within the outline area, a Habitat and Landscape Management Plan shall be submitted to and approved in writing by the local planning authority. The Plan shall include details of a management strategy for a period of 30 years to maximise gains in biodiversity within the wider site and shall be implemented in full accordance with the agree recommendations.

Reason: To ensure the required level of ecological mitigation is provided within the site.

57. No above ground works hereby approved shall be commenced for any development subsequently approved as part of any reserved matters application, until Social Value Strategy that accords with the Adding Social Value to Development: Employment and Skills Supplementary Planning Document shall be submitted to and approved in writing by the Local Planning Authority. The agreed details shall be implemented in full during the construction process and when the approved uses commence.

Reason: To ensure local economic benefits in accordance with Core Strategy Policy CS4.

58. Submission of Remediation Scheme
Where land, as part of any subsequent reserved matter application, affected by contamination is found which poses unacceptable risks, no development shall take place until a detailed remediation scheme has been submitted to and approved in writing by the Local Planning Authority. The scheme must include an appraisal of remediation options, identification of the preferred option(s), the proposed remediation objectives and remediation criteria, and a description and programme of the works to be undertaken including the verification plan. As a minimum, the scheme must ensure that the site will not qualify as contaminated land under Part 2A of the Environmental Protection Act 1990 in relation to its intended use.

Implementation of Approved Remediation Scheme and Verification Report
Should a remediation scheme be required the approved scheme shall be implemented, and a verification report submitted to and approved in writing by the Local Planning Authority, prior to the development (or relevant phase of development) being brought into use.

Reporting of Unexpected Contamination
In the event that contamination is found at any time when carrying out the development that was not previously identified it must be reported immediately to the Local Planning Authority. Development on the part of the site affected must be halted and a risk assessment carried out and submitted to and approved in writing by the Local Planning Authority. Where unacceptable risks are found remediation and verification schemes shall be submitted to and approved in writing by the Local Planning Authority. These shall be implemented prior to the development (or relevant phase of development) being brought into use.

Materials Management Plan
Prior to the reuse of site won materials ('waste' and non-waste) a Materials Management Plan, carried out in line with the CL: AIRE code of practice and signed off by a Qualified Person, shall be submitted to and agreed in writing with the local planning authority. The MMP shall demonstrate that any reuse of contaminated materials does not result in increased risk to the environment or human health.

Importation of Soil/Material
No soil is to be imported to the site until it has been tested for contamination and assessed for its suitability for the proposed development; a suitable methodology for testing this material should be submitted to and agreed by the Local Planning Authority prior to the soils being imported onto site. The methodology should include the sampling frequency, testing schedules, criteria against which the analytical results will be assessed (as determined by the risk assessment) and source material information. The analysis shall then be carried out and evidence submitted to and approved in writing to by the Local Planning Authority.

Reason: To prevent any risk to the public and general pollution of the environment and in accordance with Policy CS2 in the Knowsley Local Plan Core Strategy and

saved policy ENV5 of the Knowsley Replacement Unitary Development Plan, adopted June 2006.

59. Prior to the first occupation of any development approved as part of any subsequent reserved matters application, a Management and Maintenance plan for the approved sustainable drainage system shall be submitted to and approved in writing by the Local Planning Authority. This shall include:

- The arrangements for adoption by an appropriate public body or statutory undertaker or details of provision for management and maintenance by a resident's management company.
- A schedule for on-going inspections relating to performance and condition.
- Details for planned maintenance and a mechanism for remedial and urgent repair works.
- Means of access for inspection and maintenance purposes.

The plan shall be implemented in accordance with the timeframes contained within it.

Reason: To ensure effectiveness of the flood risk measures during the lifetime of the development policies CS2 and CS24 of the Knowsley Local Plan: Core Strategy (January 2016).

60. Prior to the installation of any external plant or machinery on any phase of the development subsequently approved as part of any reserved matters application, details including the acoustic specification should be submitted to and approved in writing by the local planning authority in relation to that specific phase. The information should also include the results of a noise assessment to confirm that any fixed plant or machinery associated with the development achieves a level that is at least 5dB(A) below the existing LA90 background noise level as measured during the relevant time period. Any tonal, impulsive and/or irregular noise would be addressed by imposing a penalty as per the methodology set out in BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. Noise limits for fixed plant are to apply at the boundary of the closest affected noise sensitive property.

Reason: To ensure the noise caused by the development is not detrimental to residential amenity.

61. Prior to the occupation of each phase of development approved as part of any subsequent reserved matters application details of all external lighting within the curtilage of each building shall be submitted to and approved in writing by the Local Planning Authority. The agreed details shall be implemented in full before each building is first occupied and maintained thereafter.

Reason: To ensure the lighting proposed is acceptable and is not detrimental to the amenity of nearby residential properties.

SCHEDULE 1

Date Received	**Reference No. on Plan/Report**	**Version No.**
25 May 2021	P0001	F
25 May 2021	P0002	N
25 May 2021	P0003	D
25 May 2021	P0004	E
25 May 2021	P0005	G
25 May 2021	P0006	T

25 May 2021	P0007	E
25 May 2021	P0008	E
25 May 2021	P0400	F
25 May 2021	P0401	C
25 May 2021	P0402	C
25 May 2021	P0403	G
25 May 2021	P0404	B
25 May 2021	P0405	F
25 May 2021	P0406	D
25 May 2021	P0407	E
25 May 2021	P0408	D
25 May 2021	P0409	B
25 May 2021	P0410	B
26 February 2021	VN81193 - D0104	C
10 December 2021	VN81193 - D0105	B
26 February 2021	VN81193 - D0111	C
15 January 2021	VN81193 - D0112	A

REASON(S) FOR THE GRANTING OF PLANNING PERMISSION

The decision to grant planning permission has also been taken having regard to the policies and proposals in the Knowsley Replacement Unitary Development Plan (adopted June 2006) as set out below, and to all relevant material considerations including supplementary planning guidance:-

Knowsley Replacement Unitary Development Plan (Saved Policies, 2006)

T5 – Location of Major Traffic Generating New Development.
T7 – New Development and Walking & Cycling Routes
T8 – Transport Assessments
T9 – Travel Plans
DQ2 – Security in the Built Environment
DQ4 – Trees and Development
ENV2 – Noise and Vibration
ENV3 – Light and Pollution
ENV4 – Hazardous Substances
ENV5 – Contaminated Land

Knowsley Local Plan Core Strategy (2016)

SD1- Sustainable development
CS1 – Spatial Strategy for Knowsley
CS2 - Development Principles
CS4 – Economy and Employment
CS7 - Transport Networks
CS8 – Green Infrastructure
SUE1 – Sustainable Urban Extensions and Safeguarded Land
SUE2 – Sustainable Urban Extensions – Development Principles
SUE2c – Sustainable Urban Extensions – South of Whiston and Land South of M62
CS19 - Design Quality and Accessibility in New Development
CS20 - Managing the Boroughs Historic Environment
CS21 – Design Quality and Accessing New Development
CS24 - Managing Flood Risk.
CS26 – Waste management
CS27 – Planning for and Paying for New infrastructure

Merseyside Waste Local Plan (2013)

WM8 – Waste Prevention and Resource Management
WM9 – Sustainable Waste Management Design and Layout for New Development

Supplementary Planning Documents

Ensuring a Choice of Travel SPD (2010)
Design Quality in New Development SPD (2016)
Trees and Development SPD (2016)
Developer Contributions SPD (2016)
Adding Social Value to Development: Employment and Skills SPD (2018)
Halsnead Garden Village Masterplan SPD

This informative is only intended as a summary of the reason(s) for the granting of planning permission. Should you require any further details relating to the decision please contact the relevant case officer (Kevin Foster on 0151 443 2893)

NOTE FOR APPLICANT:

IMPORTANT - PLEASE READ CAREFULLY THE NOTES BELOW AS FAILURE TO COMPLY COULD MAKE THE DEVELOPMENT HEREBY PERMITTED UNAUTHORISED

1) This planning permission is granted in strict accordance with the approved plans. It should be noted however that:

   a) Any variation from the approved plans following commencement of the development, irrespective of the degree of variation, will constitute unauthorised development and may be liable to enforcement action.

   b) You or your agent or any other person responsible for implementing this permission should inform Planning Services immediately of any proposed variation from the approved plans and ask to be advised as to the best method to resolve the matter. Most proposals for variation to the approved plans will require the submission of a new planning application.

2) This permission is granted subject to conditions and it is the owner of the property and the person responsible for the implementation of the development who will be fully responsible for their compliance throughout the development and beyond.

3) If there is a condition that requires work to be carried out or details to be approved prior to the commencement of the development this is called a "condition precedent". The following should be noted with regards to conditions precedent.

   a) If a condition precedent is not complied with prior to the start of development, the whole of the development will be unauthorised and you may be liable to enforcement action.

   b) In addition, if the requirements of a condition precedent are subsequently not complied with, the development is unauthorised and the only way to rectify the development is the submission of a new application.

If any other type of condition is breached then you will be liable to a breach of condition notice.

1 The proposed advertisement(s) indicated on the submitted plan(s) require a separate Express Consent to Display Advertisements. Please contact the Council's Development Control Section (Tel: 0151 443 2381) for further advice).

2 Breeding birds are protected under the general provision of Section 1 of the Wildlife and Countryside Act 1981 as amended. Whilst the nest is being built or is in use, the eggs, young and nest are protected against intentional and reckless taking, damage and destruction. No

tree, scrub or hedgerow felling, management and/or cutting operations should take place during the period 1 March to 31 August inclusive to protect breeding birds.

3 Trees on the application site are included within a Tree Preservation Order. A separate consent is required from the Council for the cutting down, topping, lopping, uprooting or other works affecting these trees (other than work specifically included on the plans hereby approved). Please contact the Council's Arboricultural Officer (Tel: 0151 443 2278) for further advice.

4 Merseyside Fire Authority

5 The Local Planning Authority has acted positively and proactively in determining this application by identifying matters of concern within the application (as originally submitted) and negotiating with the applicant, acceptable amendments to the proposal to address those concerns. As a result, the Local Planning Authority has been able to grant planning permission for an acceptable proposal, in accordance with the presumption in favour of sustainable development, as set out within the National Planning Policy Framework.



Executive Director - Regeneration and Economic Development
Date: 4 March 2022

IMPORTANT NOTES FOR YOUR ATTENTION:

1. This permission refers only to that required under the Town and Country Planning Acts and does **not include any consent or approval under any other enactment, bylaw, order or regulation.**

2. **This permission refers only to those plans submitted as part of the Planning Application a copy of which is retained by the Local Planning Authority. The Local Planning Authority should be contacted in writing if it is proposed to amend these plans in any way as a further permission, may be required.**

3. **If a Building Regulations Consent is required for these works it is your responsibility to ensure that the plans submitted for both the Building Regulations Consent and Planning Permission are the same in all respects. Should the plans relating to one consent vary from the other, it will be necessary for you to submit amended plans to this Department and obtain the relevant approval(s) prior to commencing any works.**

4. If the applicant is aggrieved by the decision of the local planning authority to refuse permission or approval for the proposed development, or to grant permission or approval subject to condition, he may appeal to the Secretary of State for the Environment in accordance with section 78 of the Town and Country Planning Act 1990 within six months of the date of this notice. (Appeals must be made on a form, which is obtainable from the Planning Inspectorate). See address below. The Secretary of State has power to allow a longer period for the giving of a notice of appeal but he will not normally be prepared to exercise this power unless there are special circumstances, which excuse the delay in giving notice of appeal. The Secretary of State is not required to entertain an appeal if it appears to him that permission for the proposed development could not have been granted by the local planning authority, or could not have been so granted otherwise than subject to the conditions imposed by them, having regard to the statutory requirements, to the provisions of the development order, and to any directions given under the order. He does not in practice refuse to entertain appeals solely because the decision of the local planning/authority was based on a direction given by him.

5. If permission to develop land is refused or granted subject to conditions, whether by the local planning authority or by the secretary of state for the Environment, and the owner of the land claims that the land has become incapable of reasonably beneficial use in its existing state and cannot be rendered capable of reasonably beneficial use by the carrying out of any development which has been or would be permitted he may serve on the Council of the district in which the land is situated a purchase notice requiring that council to purchase his interest in the land in accordance with the provisions of Part VI of the Town and Country Planning Act 1990.

6. In certain circumstances, a claim may be made against the local planning authority for compensation, where permission is refused or granted subject to conditions by the Secretary of State on appeal or on reference of the application to him. The circumstances in which such compensation is payable are set out in section 114 of the Town and country Planning Act 1990.

Appeal forms and guidance can be downloaded from the web site www.planning-inspectorate.gov.uk
Alternatively they can be obtained from the following address:-

The Planning Inspectorate
Customer Support Unit
Temple Quay House
2 The Square
Temple Quay
BRISTOL
BS1 6PN

Telephone: 0117 372 6372

APPENDIX J - PREVIOUS SITE INVESTIGATION REPORT (AVAILABLE AS A SEPARATE DOCUMENT)

APPENDIX K - DEFINITIONS OF TERMS USED IN QUALITATIVE AND QUANTITATIVE RISK ASSESSMENTS

CIRIA C552 Terminology

For the qualitative and quantitative assessment of risks posed by potential pollutant linkages have been undertaken using the risk matrix adapted from CIRIA C552 and outlined in the table below.

	Category	Definition
Potential severity	Severe	Acute (short term) risk to human health, Major pollution of sensitive controlled waters, ecosystems or habitat. Catastrophic damage to buildings or property or crops.
	Medium	Chronic (Medium / long term) risk to human health Pollution of sensitive controlled waters, ecosystems or species, Significant damage to crops, buildings or structures
	Mild	Easily preventable permanent health effects on humans. Pollution of non-sensitive controlled waters. Minor damage to buildings or structures.
	Minor	Easily preventable non-permanent health effects on humans, or no effects. Minor, low level and localised contamination of on-site soil. Easily repairable damage to buildings or structures.
Probability of risk	High Likelihood	Pollutant linkage may be present, and the risk is almost certain to occur , or there is evidence of harm already occurring.
	Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
	Low Likelihood	Pollutant linkages may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur are improbable.

		Potential Severity			
		Severe	**Medium**	**Mild**	**Minor**
Probability of risk	**High Likelihood**	Very high risk	High risk	Moderate risk	Moderate / 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

APPENDIX L - HUMAN HEALTH ASSESSEMENT CRITERIA

HUMAN HEALTH ASSESSMENT CRITERIA

Context

Contaminated Land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995 and associated guidance ("Part IIA"). These specify that a "suitable for use" approach is to be applied in the assessment of potentially contaminated land, implemented through a phased programme of site investigation and risk assessment appropriate to the site under consideration.

The assessment of potential risks posed by contaminated land is based upon the assessment of plausible contaminant source - pathway - receptor linkages ("pollutant linkages") for the current and/or proposed future use of the site. The process for the assessment of contaminated land adopted in this report is in line with guidance issued by the Environment Agency Land contamination risk management (LCRM) - GOV.UK (www.gov.uk)

Land contamination can harm:

- human health
- drinking water supplies, groundwater and surface water
- soils
- ecosystems including wildlife, animals and wetlands.
- property

It can also affect the current and future land use. Dealing with land contamination helps make the environment clean and safe. Through regeneration it can:

- enhance the health and wellbeing of all.
- add to the economic, ecological and amenity value of the area.

Use land contamination risk management (LCRM) to:

- identify and assess if there is an unacceptable risk.
- assess what remediation options are suitable to manage the risk.
- plan and carry out remediation.
- verify that remediation has worked.

You can use LCRM in a range of regulatory and management contexts. For example, voluntary remediation, planning, assessing liabilities or under the Part 2A contaminated land regime. The Environment Agency expects you to follow LCRM if you are managing the risks from land contamination.

We support the use of the National Quality Mark Scheme (NQMS). You can use it for any type of land contamination report.

Using the NQMS:

- will make sure all legislative requirements and necessary standards related to managing land contamination are met.
- can provide increased confidence by submitting reports of the quality we expect.
- can result in cost and time savings by 'getting it right first time'.

LCRM is made up of 4 guides.

1. LCRM: Before you start.
2. LCRM: Risk assessment.
3. LCRM: Options appraisal.
4. LCRM: Remediation and verification.

We use a staged risk based approach. There are 3 stages, and each stage is broken down into tiers or steps.

Stage 1: Risk assessment

You will use a tiered approach to risk assessment. The 3 tiers are:

1. Preliminary risk assessment.
2. Generic quantitative risk assessment.
3. Detailed quantitative risk assessment.

Stage 1 includes information for intrusive site investigations.

Stage 2: Options appraisal

There are 3 steps to follow.

1. Identify feasible remediation options.
2. Do a detailed evaluation of options.
3. Select the final remediation option.

Stage 3: Remediation and verification

There are 4 steps to follow.

1. Develop a remediation strategy.
2. Remediate.
3. Produce a verification report.
4. Do long term monitoring and maintenance, if required

You must always start with a preliminary risk assessment.

The risk assessment stage is an iterative process. You can do the 3 tiers in order or progress from a preliminary risk assessment to a detailed quantitative risk assessment. As part of a generic or detailed quantitative risk assessment you will need to collect detailed information about the site. This is usually through an intrusive site investigation.

Depending on the level of risk or regulatory requirements, you can proceed from a preliminary risk assessment to the options appraisal stage. If you proceed direct to the options appraisal stage, you still need to collect the detailed site investigation information required by the generic and detailed quantitative risk assessments. This is to confirm that your approach is viable and acceptable.

Following the risk assessment stage, if you conclude that the risks are acceptable, with agreement from the relevant regulator, you can end the process.

If there are unacceptable risks, then remediation or mitigation is required. Follow stages 2 and 3 in order.

In stage 2 options appraisal, you will:

- look at the most feasible options.
- produce a shortlist of options.
- use evaluation criteria to assess them.
- select which ones are the most suitable to take forward to stage 3.

In stage 3 remediation and verification, you will produce a remediation strategy, do the remediation and then produce a verification report.

You will decide at the options appraisal stage if long term monitoring and maintenance is the remediation option. You may need to do post-remediation monitoring for further verification.

The risk assessment and subsequent investigation, remediation and verification must address all potential sources of pollutants that may be present on the site (the “hazards”), all receptors that may be harmed by these (e.g., human health, controlled waters, ecological receptors) and the pathways by which the contamination may be transported from the contaminant source(s) to the receptor(s). This is defined within the conceptual model for the site, which represents the characteristics of the site in a form that shows the possible pollutant linkages. As further information becomes available (for example, through site investigation), so the conceptual model will be refined.

Remedial action can be specified at any phase within this assessment process to break the identified pollutant linkage in determining whether or not to undertake further assessment or to undertake remediation, the potential cost-savings arising from a more thorough assessment of the pollutant linkages and more tightly defined remedial strategy must be considered against the direct costs involved in the work and the time that this will take to execute and gain regulatory approval.

A different approach to the statistical appraisal of data is required depending on whether the assessment is being undertaken to assess land as Contaminated Land in accordance with the regulations or whether the assessment is to assess whether the site is suitable for new development in accordance with the Planning regime. The statistical approach to assessment is discussed further in CL:AIRE:2020 “Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration”.

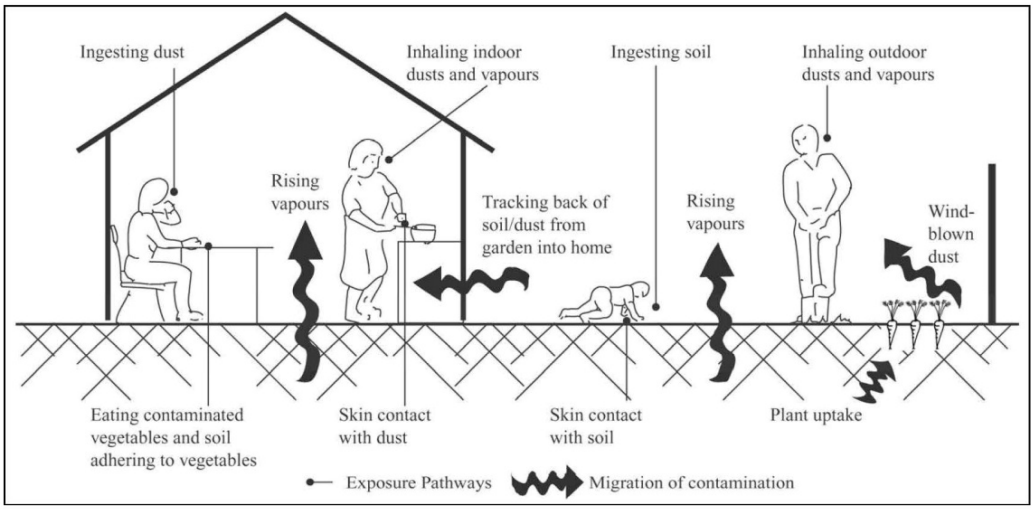
Some form of Detailed Quantitative Risk Assessment (DQRA) will be essential for those cases where appropriate GAC values cannot be established for the contaminant linkages under consideration.

Generic Assessment Criteria for Human Health Risk Assessment

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports and guidance. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. The initial documents (CLR7 – 10) were withdrawn and replaced with revised guidance issued by the Environment Agency including:

- "Using Soil Guideline Values"; EA,2009; Land contamination: using soil guideline values (SGVs) - GOV.UK (www.gov.uk)
- "Human Health toxicology assessment of contaminants in soil" EA;, 2009; https://www.gov.uk/government/publications/human-health-toxicological-assessment-of-contaminants-in-soil
- "Update technical background to the CLEA model" 2009; https://www.gov.uk/government/publications/updated-technical-background-to-the-clea-model
- CLEA Software (Version1.05) Handbook 2015; https://www.gov.uk/government/publications/contaminated-land-exposure-assessment-clea-tool
- Compilation of Data for priority Organic Contaminants for Derivation of Soil Guideline Values; Science Report SC050021/SR7, 2008; and,
- "Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration". CL:AIRE:2020 https://www.claire.co.uk/component/phocadownload/category/9-other-cl-aire-documents?download=745:2020-stats-guidance

The CLEA model and associated guidance was developed to calculate an estimated tolerable daily intake (TDI) of contaminants for site users given a set of 'typical' human health exposure pathways which are detailed in "SR3: Updated technical background to the CLEA model"



(Science Report SC050021/SR3, EA, 2009) and reproduced below.

Ingestion

- Outdoor soil;
- Indoor dust;
- Home grown produce;
- Soil attached to home grown produce.

Dermal Contact

- Outdoor soil;
- Indoor dust.

Inhalation

- Outdoor dust;
- Indoor dust;
- Outdoor vapour;
- Indoor vapour.

It should be noted that the CLEA model does not include an exhaustive list of potential exposure pathways, e.g. certain compounds can pass through plastic water pipes into drinking water supply.

The potential significance of each of the exposure pathways is dependent upon the type of land use and the nature of the contaminant being considered. The CLEA model considers principal 'default' land use scenarios and makes a series of assumptions with regards to building type (where applicable), identification of the critical human receptor group, exposure frequency and duration. The definitions of the principal land use types given in SR3 (EA, 2009) are:

Residential land use;

- A typical residential property consisting of a two-storey terraced house built on a ground-bearing slab of 0.15m thickness with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden. The critical receptor is a 0 – 6-year-old female.
- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and indoor dust and vapour.

Allotments

- A plot of open space commonly made available by the Local Authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than one hectare. The tenants are assumed to be the parents or grandparents and that young children make occasional accompanied visits to the plots. The critical receptor is a 0 – 6-year-old female and there is no building present on site.
- Active exposure pathways are ingestion of outdoor soil, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil; inhalation of outdoor vapour.

Commercial and industrial land use.

- A typical commercial or light industrial property consisting of a three-story office building (pre-1970) with a ground bearing floor slab at which employees spend most time indoors and are involved in office based or related light physical work. The critical receptor is a working female adult aged 16 – 65 years.
- Active exposure pathway is ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and inhalation of indoor dust and vapour.

Soil Guideline Values

Based on the assumption of each land use type, the EA and DEFRA developed and published Soil Guideline Value (SGV) using the CLEA model for a number of principal contaminants and 'default' end-use scenarios of residential, allotments and commercial/industrial use. The primary purpose of the SGVs is as trigger value for the tolerable daily intake (TDI), below which it can be assumed that the soil does not pose an unacceptable risk to the identified receptor. Where soils contamination is present above this level further assessment may be required. SGVs were developed for the following contaminants:

- Heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury, nickel and selenium.
- Benzene, ethylbenzene, toluene and xylenes.
- Phenol.
- Dioxins and dioxin-like polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs) – 11 substances

LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment

In addition, in 2009 CIEH through LQM and EIC published generic assessment criteria (GACs) for 82 substances including metals, petroleum hydrocarbons, PAHs and explosive substances for a variety of soil types and the three 'default' land uses – (residential, allotments and commercial end-uses) as described in SR3 (EA, 2009). These have been superseded as described below.

Category 4 Screening Values

In 2013 "SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination" (CL:AIRE 2013) was issued which detailed findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived for 6 contaminants of concern, Arsenic, Benzene, Benzo(a)pyrene, Cadmium, Chromium VI and Lead.

This was supplemented in 2014 by "SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination – Policy Companion Document" (DEFRA, 2014). SP1010 proposed several updated toxicology information relating to contaminant behaviour updated assumptions relating to the modelling of human exposure to soil contaminants, derivation of separate C4SLs for residential with the consumption of home grown produce, residential without the consumption of home grown produce, and two new land uses: public open spaces near residential housing (POS resi) and public parks (POS park).

Public Open Space: Residential

- For public open space in close proximity to residential housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It is also applicable for smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a generally grassed area up to 0.5ha with up to 50% bare soil. The land use is an important resource

for children and the area is near the homes. The critical receptor is a female child age >3 - <9 years old (CLEA age class 4 – 9) as younger children are unlikely to play outdoors unsupervised.

- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor soil derived dust; inhalation of outdoor and indoor dust and inhalation of outdoor vapour.

Public Open Space: Park

- A public park is defined as an area of open space provided for recreational use and usually owned and maintained by the Local Authority. It is anticipated the park could be used for a wide range of activities, including the following:
    - Family visits and picnics;
    - Children's play area;
    - Sporting activities such as football on an informal basis (i.e. not a dedicated sports pitch); and
    - Dog walking.
- The park is modelled as an area >0.5 ha of predominantly grasses open space with no more than 25% of exposed soil.
- The critical receptor is a female child with CLEA age classes 1 – 6.
- Active exposure pathways are: ingestion of outdoor soil; direct dermal contact with outdoor soil; inhalation of outdoor dust and inhalation of outdoor vapour.

Furthermore, the C4SLs are based on a different toxicological benchmark, the 'low level of toxicological concern' (LLTC). This difference in approach was adopted because the C4SLs were primarily intended for use under Part2A of the EPA 1990 to quickly screen out Category 4 sites where there is "*no risk or that the level of risk posed is low*". SGVs and LQM GACs are based on the more conservative 'minimal or tolerable level of risk' as defined in SR2 (EA, 2009) and were derived for assessment of contamination for the Planning process.

LQM/CIEH Suitable 4 Use Levels (S4ULs)

The publication of the C4SLs resulted in considerable and inconclusive debate about the applicability of the lower level of protection of the C4SL, which are underlain by the LLTC, outside of the Part 2A context for which they were derived. In 2014 LQM/CIEH presented a Suitable 4 Use Levels (S4ULs), which incorporate the updated assumption exposure derived for the production of the C4SLs but within the context of deriving screening criteria above which further assessment of the risks or remedial action may be needed. The S4ULs replace the 82 substances, species and fractions and congeners contained in the previous LQM/CIEH GACs issued in 2009. Additionally, following changes and new land uses proposed in the C4SL research project, S4ULs have also been derived for the majority of substances for which the EA derived SGVs in 2009 with the exception of lead (see below).

Lead

The C4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling than the withdrawn SGV and derived in line with current science of lead toxicology.

EIC/AGS/CL:AIRE Soil Generic Assessment Criteria (2010)

In some instances, EIC/AGC/CL:AIRE GACs for certain VOC / SVOC potential contaminants of concern have been used *in lieu* of available LQM / CIEH S4UL values.

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Metals/metalloids																			
Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			532			LQM (2014)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	180			180			230			980			230			3400			LQM (2014)
Selenium	250			430			88			12000			1100			1800			LQM (2014)
Vanadium	410			1200			91			9000			2000			5000			LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Zinc	3700			40000			620			730000			81000			170000			LQM (2014)
Other																			
Total Sulphate	2,400			2,400			2,400			2,400			2,400			2,400			BRE (2005)
Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)
PAHs																			
Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)

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	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
BTEX and TPH																			
Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)
Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	600000	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	620000	150000 (144)	220000 (322)	320000 (736)	LQM (2014)
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)
Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
VOCs																			
1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)
2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)

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SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
VOCs Continued																			
1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)
Phenol	280	550	1100	750	1300	2300	66	140	280	760 dir (31000)	1500 dir (35000)	3200 dir (37000)	760 dir (31000)	1500 dir (35000)	3200 dir (37000)	760 dir (31000)	1500 dir (35000)	3200 dir (37000)	LQM (2014)
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility.

APPENDIX M - CONTROLLED WATERS RISK ASSESSMENT

CURRENT GUIDANCE FOR CONTROLLED WATERS RISK ASSESSMENT

Regulatory Context

Government policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

> *"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:*
>
> *(a) Significant harm is being caused or there is a significant possibility of such harm being caused; or*
>
> *(b) Pollution of controlled waters is being, or is likely to be, caused."*

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

> *"the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter"*

Controlled Waters are defined Section 104 of the Water Resources Act 1991. In summary, the comprise relevant territorial waters which extend seaward for three miles from the low-tide limit from which the territorial sea adjacent to England and Wales is measured.

The Environment Agency has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land. This is reinforced in The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

Part IIA places contaminated land responsibility as a part of the planning and redevelopment process, rather than Local Authority or Environment Agency directly, except in cases of very high pollution risk or where harm is occurring. In the planning process, guidance is provided by National Planning Policy Framework (NPPF) of March 2012. The NPPF requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant linkages that can then be assessed, and then mitigated using methods that can be agreed with the planners.

Source Protection Zones

Source Protection Zones (SPZs) are defined by the Environment Agency (for England and Wales), SEPA (Scotland) and the Environment and Heritage Service (Northern Ireland) for groundwater sources such as wells, boreholes and springs that are used for public drinking water supply. The zones show the risk of contamination from activities that might cause groundwater pollution in the area. The size and shape of a zone depends upon subsurface conditions, how the groundwater is removed, and other environmental factors.

SPZs are classified into four categories:

- **Zone 1 (Inner protection zone).** Any pollution that can travel to the abstraction point within 50 days from any point within the zone is classified as being inside Zone 1. This applies at and below the groundwater table. This zone also has a minimum 50 m protection radius around the abstraction point. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.
- **Zone 2 (Outer protection zone).** The outer zone covers pollution that takes up to 400 days to travel to the abstraction point, or 25% of the total catchment area, whichever area is the largest. This travel time is the minimum period over which the Environment Agency considers that pollutants need to be diluted, reduced in strength or delayed by the time they reach the abstraction point.
- **Zone 3 (Total catchment).** This is the total area needed to support removal of water from the abstraction point, and to support any discharge from this.
- **Zone of special interest.** This may occasionally be defined as a special case. This is usually where local conditions mean that industrial sites and other potential sources of contamination could affect the groundwater source, even though they are outside the normal catchment area.

Groundwater Vulnerability Assessments

From 1 April 2010 The Environment Agency Groundwater Protection Policy began to use aquifer designations which are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems.

The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different type of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.
- Bedrock -solid permeable formations e.g. sandstone, chalk and limestone.

The maps display the following aquifer designations:

Table 1. Aquifer Classification ("Geological Classification").

Classification	Definition
Principal Aquifers (Highly Permeable)	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A Aquifers	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B Aquifers	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Undifferentiated Aquifers	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Environment Agency Guidance

The Environment Agency's stance on groundwater resources is:

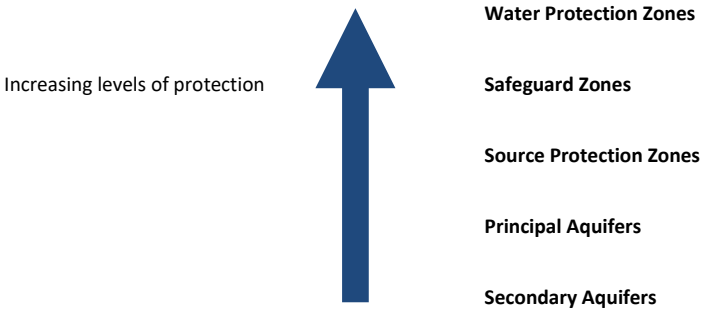
> *"to protect and manage groundwater resources for present and future generations in ways that are appropriate for the risks we identify"* (Groundwater Protection: Policy and Practice GP3, 2012).

At present, the legislation and guidance pertaining to the protection of controlled waters in the UK is complex; however, the core objectives seek to enforce the position given above.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document introduced areas of focus for developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was revised in 1998, since which there have been substantial changes in legislation, driven by key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Gaps in the 1998 PPPG that emerged as the result of further legislative changes were addressed in the Environment Agency Policy document Groundwater Protection: Policy and Practice (GP3), Version 1 of November 2012. The three main parts of GP3 were:

- Groundwater principals;
- Position statements and legislation; and
- Technical information.

The Environment Agency has a tiered risk based approach to drinking water protection as summarised below:



Controlled Waters Risk Assessment

A number of tools are available (as detailed in GP3) in order for a developer of a potentially contaminated site to fulfil their obligations under the legislation. A site assessment would be required in order to identify any potential risks to controlled waters and to derive suitable clean up criteria, if required, to ensure the protection of controlled waters.

There are three main stages to any risk assessment of controlled waters:

1. Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting, controlled waters context etc)
2. Generic Risk Assessment (EA Remedial Targets Methodology Tier 1 / Comparison of groundwater data with relevant standards)
3. Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site specific parameters, EA Remedial Targets Methodology Tiers 2 & 3)

Risk Screening

Here, the Conceptual Site Model (CSM) is a critical tool to assessing any potentially contaminated site. The information from a robust CSM can be used to establish any pathways or receptors that do not require further assessment at an early stage. For example, it may be possible to confirm the absence of a particular sensitive controlled water receptor (such as a surface water feature) within the vicinity of the site thereby breaking the associated source-pathway-receptor pollutant linkage. Information from subsequent tiers of risk assessment, such as following intrusive investigations, are used to update the CSM accordingly.

Generic Risk Assessment - England and Wales

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with those screening criteria.

In accordance with Part 2A of the Environmental Protection Act 1990, Tier Environmental has made regard to all of the Water Quality Standards (WQS) that are relevant to the specific site and a judgment has been made against the most stringent of those relevant standards:

- EQS Directive 2008/105/EC
- Priority Substances Directive 2013/39/EU
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- UK Drinking Water Standards (UK DWS)
- World Health Organisation (WHO Guidelines) for Drinking Water Quality
- Council Directive 98/83/EC on the quality of water intended for human consumption (Drinking water directive)

In some instances, the laboratory method detection limit is greater than the appropriate EQS/UKDWS value. In these instances, only measured concentrations in excess of the laboratory method detection limit have been considered likely to potentially represent a possible significant risk to controlled waters.

Please note that there is no quantitative criterion for total petroleum hydrocarbons (TPH), or speciated TPH fractions. Historically, standards provided for petroleum hydrocarbons ranges from 10µg/l (Private Water Supply Regulations 1991, removed from the 2009 regulations) to 50µg/l-1000µg/l (Surface Waters (Abstraction for Drinking Water) Regulations 1989) which related to the degree of treatment of water prior to use as drinking water. Over time, the legislative standards have been rescinded and no alternative standard provided, although the Environment Agency planned to release speciated TPH criteria (Fretwell et al., 2009).

In order to assess whether there is a potentially unacceptable risk of pollution of controlled waters, the results of the groundwater chemical analysis for TPH and BTEX were evaluated against Water Quality Standards (WQS) appropriate to the conceptual model for the site:

Table 2. Summary of Selected TPH and BTEX Water Quality Standards Selected for Tier 1 Screening

Determinand	Units	WQS Selected	Source of WQS
Aliphatics >C5-C6	µg/l	15000	Table 5.4 of CL:AIRE 2017#
Aliphatics >C6-C8	µg/l	15000	Table 5.4 of CL:AIRE 2017#
Aliphatics >C8-C10	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics >C10-C12	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics >C12-C16	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics >C16-C21	µg/l	-	Table 5.4 of CL:AIRE 2017#
Aliphatics >C21-C35	µg/l	-	Table 5.4 of CL:AIRE 2017#
Aromatics >C5-EC7	µg/l	10	Table 5.4 of CL:AIRE 2017#
Aromatics >EC7-EC8	µg/l	700	Table 5.4 of CL:AIRE 2017#
Aromatics >EC8-EC10	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aromatics >EC10-EC12	µg/l	100	Table 5.4 of CL:AIRE 2017#

Aromatics >EC12-EC16	µg/l	100	Table 5.4 of CL:AIRE 2017#
Aromatics >EC16-EC21	µg/l	90	Table 5.4 of CL:AIRE 2017#
Aromatics >EC21-EC35	µg/l	90	Table 5.4 of CL:AIRE 2017#
Benzene	µg/l	10	Priority Substance Water Framework Directive 2015 and Table 5.3 of CL:AIRE 2017#
Toluene	µg/l	74	Table 1 Water Framework Directive 2015 and Table 5.3 of CL:AIRE 2017#
Ethylbenzene	µg/l	20	R&D Technical Report P2-115/TR4, 2002
Total xylenes	µg/l	30	DoE (1997c) Hedgecott S. and Lewis S, An update on proposed environmental quality standards for xylenes in water, final report to the Department of the Environment. Report No. DoE 4273/1. Medmenham: WRc; and; Table 5.3 of CL:AIRE 2017#

Notes - # = CL:AIRE document 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' (ISBN 978-1-905046-31-7, dated 2017),

Table 5.3 was referenced in the first instance from the CL:AIRE document 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' (ISBN 978-1-905046-31-7, dated 2017), the to select appropriate Freshwater EQS values for benzene, toluene and total xylenes. The selected value for Ethylbenzene was derived from the proposed EQS value of 20µg/l from the Environment Agency R&D Technical Report P2-115/TR4, 2002. This represents a more conservative value than the 300µg/l value in Table 5.3.

With respect to speciated TPH CWG fractions, Table 5.3 states and refers the reader to 'See Table 5.4'. On this basis, Tier Environmental selected the World Health Organization (WHO) guide values for TPHCWG fractions in drinking water that are presented in Table 5.4 which may be considered appropriately protective of the controlled waters environment based on the conceptual site model.

Generic Risk Assessment is generally undertaken via comparison of reported leachate and/or groundwater concentrations against selected assessment criteria for the potential contaminants of concern identified for the site from a preliminary desk based assessment.

The selected Generic Assessment Criteria (GAC) derived from a Water Quality Standard (WQS) for any specific substance may not necessarily be a simple number and can often be found to be expressed as:

- Annual mean concentration;
- Maximum allowable concentration;
- 95th percentile concentration for *n* samples;
- Total concentration;
- Dissolved concentration (applicable to filtered samples)

The values may sometimes be expressed for individual substances (e.g. arsenic or for groups of substances e.g. total xylenes or sums of certain PAHs).

Environmental Quality Standards (EQS) have been used where available for Priority Substances and Priority Hazardous Substances set at a European level:

- Priority Substances Directive 2013/39/EU;
- Amending 2008/105 and 2000/118/EC

In addition, EQS values derived for Specific Pollutants have been used as presented in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

For assessing risks to potable water abstraction supplies, UK Drinking Water Standards presented in the Water Supply (Water Quality) Regulations 2000 (SI/2000/3184) (as amended) have been applied.

In selecting a GAC for a particular site, Tier Environmental considers the following factors:

- Current use/function of the groundwater (e.g. drinking water, irrigation water, industrial use, base-flow to rivers and streams);
- Plausible, proposed or planned future uses of the water and nearby waters;
- Sensitivity of the critical receptor (e.g. human health, aquatic life); and,
- Requirements to trigger action under the legal context.

In accordance with Part 2A:

> *"in deciding whether pollution of controlled waters is occurring, the assessor will have regard to all of the water quality standards that are relevant to the specific site and make a judgment against the most stringent of those relevant standards."*

Should the Level 1 or 2 assessments indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions;
- To carry out more investigation, sampling and analysis;
- To conduct a site-specific Detailed Quantitative Risk Assessment (DQRA) to whether or not the soil materials are suitable for their site-specific intended use or to devise a site-specific clean-up level.

Detailed Quantitative Risk Assessment (DQRA)

The decision to carry out a DQRA will be informed by the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the former two stages. The robust CSM will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment.

Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria derived will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or compliance point. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

Hazardous and Non Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides.

APPENDIX N - ASSESSMENT CRITERIA APPLIED FOR GROUND GAS

Ground Gas Monitoring Methodology

Monitoring for the following is generally performed as part of ground gas assessment:

- Methane (CH_4): an odourless, flammable gas. Mixtures of methane with air containing between 5 and 15% v/v methane are explosive.
- Carbon dioxide (CO_2): an asphyxiant at elevated concentrations. Denser than air, it can accumulate in excavations, and within low points inside buildings.
- Oxygen (O_2): important in the assessment of the potential formation of explosive mixtures with methane. Monitoring normally measures both methane and oxygen concentrations in ground gas to derive an indication of the risk of explosive mixture formation, expressed as a percentage of the Lower Explosive Limit (LEL). Low concentrations of oxygen in ground gas can also exacerbate the risk of CO_2 asphyxiation.
- Hydrogen sulphide (H_2S): odorous and toxic, capable of forming flammable mixtures with air.

In addition, depending on the Conceptual Site Model, monitoring may also include for measurements of Volatile Organic Compounds (VOCs); present as chemical contaminants of soil and sometimes also biologically produced in low concentrations.

Assessment of methane (CH_4) and carbon dioxide (CO_2)

Methane and carbon dioxide can arise from natural geological sources, mine workings, rotting organic matter (peat, landfilled materials, etc.) and/or contaminant biodegradation. Assessment of ground gas composition and flows is therefore an essential part of site assessment. The need to adequately address potential risks from ground gas on development sites is therefore required under the planning regime.

In order to appropriately assess the site risks, the Construction Industry Research and Information Association (CIRIA) and others have issued several guidance documents on landfill and ground gas that are intended to provide advice on how to investigate and deal with gas contaminated ground with respect to development. These are:

- Report 149: 'Protecting Development from Methane' (CIRIA, 1995a)
- Report 150: 'Methane Investigation Strategies' (CIRIA, 1995b)
- Report 151: 'Interpreting Measurement of Gas in the Ground' (CIRIA, 1995c)
- Report 152: 'Risk Assessment for Methane and Other Gases from the Ground' (CIRIA, 1995d)

More recent guidance has been published to update the documents detailed above to collaborate and promote industry 'good practice'. These are:

- CIRIA Report 665: 'Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2008)
- NHBC: 'Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present' (NHBC, 2007)
- BS8485:201+A1:2019: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (BSI Group, 2019)
- BS8576:2013: Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs) (BSI Group, 2013)
- SoBRA Report Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater (Feb 2017)
- CL:AIRE Technical Bulletin TB17 Ground Gas Monitoring and 'Worst Case' Conditions (CL:AIRE Aug 2018)

The earlier CIRIA 149 approach is now considered to be too conservative. A more realistic measure of the risk posed by methane and CO2 in ground gas can be established by determining an appropriate Gas Screening Value (GSV), using the methods described in the NHBC and CIRIA 659 documents. These values are based upon earlier work undertaken by Wilson and Card (1999).

GSVs are calculated by multiplying the borehole flow rate (l/hr) by the percentage (% v/v) concentration in the gas stream of the specific component, i.e.:

GSV = (Concentration / 100) x Flow rate.

A risk-based methodology for deriving GSVs is defined for two situations (designated A and B), which are adequate for the great majority of site cases (as per CIRIA 665 Section 8.3):

- **Situation A**: Any development other than Situation B, e.g. factories, shops, commercial, warehouses, schools, cinemas, sports centres, stadiums, high rise housing, housing with basements, etc
- **Situation B**: Low rise building with minimum ventilated under floor void (min 150 mm)

Under Situation A, classification of the scope of protection required is determined from the site GSV, summarised in Table 1. For Situation B, GSVs derived are used in a 'Traffic Light' classification (summarised in Table 2) which determines the required level and scope of protection measures. Tables 1 and 2 are summaries only: the details provided in the body text, footnotes and appendices of the above-referenced documents should be read in conjunction with the results to determine the appropriate level of protection.

For conservatism, Tier Environmental **initially** uses the maximum concentration and gas flow rate of methane detected in any borehole during all of the monitoring visits in deriving recommendations on appropriate protection measures. This represents the worst-case risk of forming an explosive mixtures. For carbon dioxide, steady state concentrations and flow data are applied, as these determine the development of an asphyxiating mixture. All values are selected whether or not they occurred in the same borehole or during the same monitoring event.

Exceedances of the maximum concentrations used in a Tier 1 Gas Risk Assessment can be tolerated, when the conceptual site model indicates that it is safe to do so. However, appropriately derived GSV values must never be exceeded - where site-specific circumstances permit the derivation of alternative GSVs according to the defined conceptual model, then the appropriate GSV values should be applied.

Table 1. GSV Categories Defined for Situation A (Summarised from CIRIA Report 665).

Risk classification	GSV (CH4 or CO2; l/hr)	Additional factors	Characteristic Situation
Very low	<0.07	Typically methane <=1% and/or CO_2 <=5%, otherwise consider increase to Low Risk.	1
Low	<0.7	Typically borehole ground gas flow rate <=70 l/hr; otherwise consider increase to Moderate Risk.	2
Moderate	<3.5	---	3
Moderate to high	<15	QRA required to evaluate scope of remediation measures.	4
High	<70	---	5
Very high	>70	---	6

Table 2. GSV Categories Defined for Situation B (Summarised from NHBC, 2007).

Methane		CO_2		"Traffic light" classification
Typical max. conc. (% v/v)	GSV (l/hr)	Typical max. conc. (% v/v)	GSV (l/hr)	
				Green
1	0.13	5	0.78	Amber 1
5	0.63	10	1.60	Amber 2
20	1.60	30	3.10	Red

Assessment of hydrogen sulphide (H2S)

H2S is toxic and highly odorous ("rotten eggs") gas. It is often a minor component within mine gases, in ground gas within or overlying strata rich in pyrites or other sulphide-rich ores, and in most natural gas fields.

H2S can be generated biologically in significant concentrations by the decomposition by sulphate-reducing bacteria of natural or anthropogenic organic matter under oxygen-free conditions. Its potential generation will be greater in environments containing elevated sulphate concentrations (including sea water). H2S is therefore common within the gas arising from estuarine and marine sediments, pond sediment, stagnant water bodies, bogs and marshlands and landfilled waste, for example.

It must be noted that H2S normally occurs together with other potentially hazardous ground gases. The measures adopted for protection against these will prove equally protective against H2S.

There are no standards by which H2S concentrations in ground gas can be assessed directly. Therefore, the significance of measured H2S concentrations in ground gas must be evaluated on a case-by-case basis, taking into account the measured concentrations of other components and the specific conceptual site and exposure models. To assist in this process, the following standards and guidance may be applied.

General protection of land users

There are no UK air quality standards for general exposure to H2S. The World Health Organisation has derived ambient air quality standards (WHO, 2000) for this gas, which may be used to inform risk assessment and decision-making:

The 24 hour average exposure guideline value for ambient air: 0.15 mg/m3 (0.1 ppmv, approx.; this was derived by the application of a 100x safety factor to the LOAEL for long-term exposure).

This is significantly above the odour threshold, which is typically around 0.01 mg/m3. To avoid substantial nuisance odour complaints, WHO (2000) recommends that the 30 minute average H2S concentration in ambient air should not exceed: 0.007 mg/m3 (0.005 ppmv, approx.).

Occupational exposures

For occupational exposure, the HSE (2005) limits for H2S are applicable:

- 8 hour time weighted average occupational exposure limit: 5 ppmv (7 mg/m3).
- Short-term exposure limit (15 minute reference period): 10 ppmv (14 mg/m3).

VOC Data Collection, Sampling and Assessment

BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).

Volatile organic compounds (VOCs) include, for example, halogenated hydrocarbons such as trichloroethene, non-halogenated hydrocarbons such as benzene, and organosulfur compounds such as thiols (mercapatans). They can occur as a component of ground gas originating from historically contaminated ground, spills and leaks from industry, commercial or residential properties (e.g. from pipelines, storage facilities, and at the point of use or dispensing), land-filled wastes and from naturally occurring sources.

The migration of VOCs in ground gas can be via three primary mechanisms:

- diffusive flow (movement of constituent along a concentration gradient);
- advective flow (movement of constituent due to motion of a transporting fluid);
- dispersion (transport resulting from local variations in fluid flow, e.g. due to friction effects in the matrix).

The choice of sampling and monitoring techniques should be based upon the conceptual model and be designed to achieve the objectives of the investigation, bearing in mind the requirements of any subsequent analytical procedures and the need to provide relevant data of sufficient quantity and quality. Consideration should also be given to the nature of ground under investigation, as well as the nature and distribution of contamination, the geology and the hydrogeology. Every effort should be made to avoid cross-contamination and at no point should underlying aquifers be put at risk.

Where the response zone extends below the water table, gas present in the groundwater will tend to produce an equilibrium concentration in the well headspace. This applies to both permanent gases and VOCs but can be particularly misleading in the latter case. Testing for dissolved gases in groundwater is useful to help interpret monitoring results in such a situation. Similarly, any VOCs in a floating non-aqueous hydrocarbon layer will produce an equilibrium concentration in the well headspace.

The monitoring period and frequency of monitoring for VOCs in ground gases should be developed on a site-specific basis from the conceptual site model and investigation data quality objectives.

Ground gas samples can be collected from the unsaturated zone adjacent to, or above, the known or suspected source of VOCs in ground gas through installation of a ground gas monitoring point in the unsaturated zone (see 10.2), and from a near-surface location beneath hardstanding or a floor or foundation slab through installation of a near- or sub-slab monitoring point (see 10.3). For monitoring of VOCs in ground gas the monitoring well should be installed into unsaturated ground to allow sampling for VOCs to take place. The borehole should not be progressed below the groundwater table or the surface of any floating non-aqueous layer. The borehole should be progressed to the target sampling depth within the unsaturated zone. Full details can be found in BS8576 Section 10.2 onwards.

Assessment of VOC concentrations have been made for limited number of VOCs by SoBRA with the Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater in Feb 2017.

The assessment of VOC concentrations is not covered by above-referenced reports. These data can be used to inform the human health risk assessment for site occupants but should not be relied upon to assess human health risk due to uncertainties in the ground gas flow regime, variability in the (generally low) contaminant concentrations measured and inaccuracies in the concentrations measured by PID instruments.

Data on the VOC concentration in ground gas can also help inform potential occupational exposure risks to construction and similar workers. For this purpose, the measured values can be compared to the relevant occupational exposure limit (OEL) for the contaminant(s) of concern, as given in HSE (2005). In cases of doubt as to the identity of the organic contaminants within the ground gas or when these are present as a complex mixture, then the 8 hour time-weighted average (TWA) exposure limit for benzene (1 ppmv) will be applied for screening purposes. This is a reasonably conservative approach since the OEL for benzene is lower than that for the great majority of organic contaminants commonly encountered in soil and groundwater at contaminated sites.

APPENDIX O - CHEMICAL AND GEOTECHNICAL TEST SAMPLING

Samples were selected by a representative of Tier Environmental during the site investigation works in accordance with the sampling approach described elsewhere in this report.

Samples for geotechnical and related testing

Bulk samples were placed within robust heavy duty plastic bags and sealed, together with small-disturbed samples, within airtight 1 litre plastic containers.

100 mm diameter 'undisturbed' samples ("U100 samples") were obtained where possible from cable percussive and large diameter window sample boreholes within cohesive materials.

Samples for chemical analysis

All samples for chemical analysis were placed into clean new containers as summarised in Table 1. Unless explicitly stated elsewhere in this report, no preservatives were used to eliminate the risk that preservatives cause contaminant dissolution or analytical interference. Containers for VOC analysis were fully filled to exclude headspace.

Soil samples were dispensed as soon as possible after collection using reusable stainless steel spatulas, trowels or similar implements.

Ground water samples were collected from boreholes using single-use Teflon bailers or dedicated Waterra tubing with foot valves, except as otherwise noted within this report. Caution was taken to avoid excessive agitation during collection.

New disposable gloves were used by the engineer for the collection of each sample.

Reusable equipment was washed down with distilled or deionised water between samples, except where tarry or similarly sticky materials were present. In such cases specific cleaning procedures were adopted as specifically described elsewhere in this report.

All sub-samples taken for chemical analysis were placed into refrigerators or cool boxes containing frozen ice packs immediately after aliquoting. All samples were transferred in cool boxes containing frozen ice packs to the relevant UKAS/MCERTS accredited laboratory as soon as possible. Recommended maximum holding times before analysis are summarised in Table 1.

Table 1. Sample containers and holding times.

Analysis	**Container/special requirements**	**Max. holding time at 4°C before analysis**
Soil and sediment samples		
VOCs	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner. Must be fully filled.	14 days
TPHCWG	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner **PLUS** 250-500 g brown or green glass jar with unwaxed cap liner.[1] The former must be fully filled.	14 days
All other organics	250-500 g brown or green glass jar with unwaxed cap liner.	7 days
Inorganics	Air-tight 0.5-2.0 kg plastic container (250-500 g brown or green glass jar may also be used).	14 days[2]
Water samples		
VOCs	40-50 ml glass vial with VOC resistant screw cap and inert liner. Must be fully filled.	14 days
TPHCWG	40-50 ml glass vial with VOC resistant screw cap and inert liner **PLUS** 500-1000 ml brown or green glass bottle with screw cap and unwaxed liner.[1] The former must be fully filled, the latter should be filled if possible.	14 days
All other organics	500-1000 ml brown or green glass bottle with screw cap. Fill if possible.	7 days
Inorganics	500-1000 ml translucent or opaque screw cap plastic *or* brown or green glass bottles. Fill if possible.	14 days[3]

1 The smaller vessel is used for analysis of the volatile components within the TPH mixture and the larger one is for the non-volatile components.

2 14 days is set as a reasonable limit for all routine analyses of soil for those inorganic components vulnerable to chemical and/or biological breakdown. Samples for sulphate analysis are vulnerable to biological sulphate-reduction but can be held for up to 28 days. For total metals, a holding period of up to 6 months is acceptable.

3 14 days applies for all routine analyses of most inorganic components that may be vulnerable to chemical and/or biological reactions. In the specific cases of sulphide, nitrite, nitrate and phosphate analyses, storage time must not exceed 48 hours. For total metals, a holding time of up to 6 months is acceptable.

Tier Environmental standard analytical suites

The analyses included with Tier Environmental's standard analytical suites for soil, soil leachate and water samples are presented in Table 2. Other individual analyses were specified as described within this report.

Table 2. Tier Environmental Standard Analytical Suites.

Parameter	**Sample type**					
	Soil		**Leachate[1]**		**Water**	
		LoD[2] (mg/kg or as stated)		**LoD (µg/l or as stated)**		**LoD (µg/l or as stated)**
Metals and metalloids						
Arsenic	✓	1	✓	10	✓	10
Cadmium	✓	1	✓	5	✓	5
Chromium	✓	1	✓	5	✓	5
Mercury	✓	1	✓	1	✓	1
Lead	✓	1	✓	4	✓	4
Selenium	✓	2	✓	10	✓	10
Copper	✓	1	✓	1	✓	1
Nickel	✓	1	✓	50	✓	50
Zinc	✓	1	✓	8	✓	8
Other inorganics						
Ammonia (as NH_4-N)					✓	15
Total sulphate	✓	100			✓	50 mg/l
Water-soluble sulphate	✓	0.1 g/l				
Hardness (as $CaCO_3$)					✓	1 mg/l
Organics						
Monohydric phenol	✓	1	✓	0.5	✓	0.5
Speciated PAHs (USEPA 16)	✓	0.1	✓	0.01	✓	0.01
Total Organic Carbon	✓	0.1 wt%				
Others						
Electrical conductivity					✓	NA
pH	✓	NA	✓	NA	✓	NA

NA - Not applicable

1 Leachate preparation according to NRA (1994), 10:1 liquid to solid ratio.

2 The table presents the desired limit of detection for the analysis. Higher LoDs may be reported on analytical data sheets due to interference between analytes within specific samples or if the laboratory needed to dilute samples to achieve results within the calibrated range for that instrument.

Analytical QA procedures

Introduction

Quality Assurance (QA) is a system of review and audit that assesses the effectiveness of that product and assures the producer and user that defined standards of quality have been met. If we consider site investigation and chemical analysis, QA is the management system that ensures these measures are in place and working as intended.

QA within the laboratory form part of relevant certification programmes (such as UKAS and MCERTS) and, indeed, will be undertaken in some form by any reputable analyst, whether for a certified technique or not. Laboratory QA/QC is beyond the control of Tier Environmental and will not be considered further in this document, although the relevant laboratory documentation can be obtained upon request. QA must also form part of the design and execution of a site investigation.

Two parameters often used to assess measurement quality objectives are bias and precision. Bias is a systematic deviation in the data. For example, a positive bias (concentrations higher than in reality) would be introduced if sampling bottles were a source of the analyte and this fact was unknown. Precision is the variation in the measurements around a central 'expected' value. This could be due both to real variability in the environmental medium being measured and random errors in the analytical process. Both precision and bias can be assessed by the use of appropriate blanks and replicates within the site investigation programme.

The objectives of the QA activities undertaken in this present site investigation were to recognise and quantify systematic bias within the analytical dataset and to obtain an indication of precision. In environmental samples, much of the observed variability is likely to result from heterogeneity in the sampled medium, particularly for soil and sediment samples.

Such QA practice within the sampling programme is required by current guidance (e.g., Environment Agency report P5-065/TR (2000); Environment Agency LFTGN02 (2002); BS 10175:2001).

Alternative QA procedures to the generic approach presented in this appendix may be specified for a project, provided case-specific justification is given.

QA checking procedure (data validation)

The responsible Engineer and Project Reviewer are required to undertake data validation and provide comment on data quality within the main body of the report(s) issued, when noteworthy matters arise. This QA checking should involve:

Confirming that data reported by the laboratory have achieved the standards specified by the certification scheme (MCERTS or UKAS). This will be indicated on the analytical certificates issued by the laboratory.

Checking that the limit of detection (LoD) and limit of quantification (LoQ) achieved by the laboratory for an individual analyte is appropriate for the purposes of the report. LoD and LoQ will vary dependent upon analyte concentrations, sample matrix properties and interference from co-contaminants.

A check that the reported range of concentrations are reasonable for the analyte. For example, the dissolved concentration of an analyte in a water sample should not exceed saturation. If it does, then this merits further consideration (e.g., was colloidal organic matter or other solid-phase material present or could there have been unobserved free-phase organic liquid?) and explicit comment. At its simplest, there may be a unit error.

Where analysis involves reporting of Tentatively Identified Compounds (TICs; normally by mass spectrometry), the reviewers should check that these might reasonably be expected at the site under consideration. The uncertainties in identification by MS mean that it is not uncommon that TICs are incorrectly assigned. In cases of doubt, the analytical laboratory can re-check the raw data and confirm.

A review of the analytical precision by comparing data obtained for duplicate samples. There is no absolute threshold - variability is entirely dependent upon the sample matrix and manner in which the contaminant has entered the sample. Variability that cannot reasonably be assigned to such factors (for example a very high apparent variability in data for sediment-free water samples) should be reviewed with the laboratory. Variability that is attributable to the sample matrix can nevertheless provide important pointers to improve understanding of contaminant transport pathways and the risks posed by pollutant linkages (e.g., soil heterogeneity, the association of contamination with particular soil fractions, the presence of residual NAPL within soil pores or the role of suspended sediments in contaminant transport).

Confirmation that no errors have been introduced by data transcription, unit conversion or corrections between preliminary and certificates issued by the laboratory. The reviewer should audit a proportion (typically 5-10%) of all data from the original (final) certificates of analysis through to the equivalent values in the report for those specific samples.

In is important to consult the analytical laboratory if apparent QA issues arise. Many apparent concerns can be adequately resolved on the basis of revisiting the raw analytical data or by obtaining a better understanding of the inherent limitations of the analysis for a particular matrix or sample type.

APPENDIX P - COAL TAR CONTAINING ASPHALT CONSIDERATIONS

Tier Environmental Approach to Coal Tar in Asphalt

This appendix outlines a summary of available guidance and describes the Tier Environmental interpretation of available information to inform, in a robust manner, the approach adopted to consider on, or both of the following objectives:

- If asphalt is present on site, what the waste classification and waste disposal route should be if there is an intention to grub up and dispose of either some, or all, of the asphalt;
- If asphalt is present and there is an intention (subject to suitability for re-use assessment) for re-use, then to determine how that may be achieved.

In order to info the decision making with respect to the above, the following guidance documents and articles have been referenced:

- Waste Classification - Guidance on the classification and assessment of waste (1st Edition v1.2.GB) Technical Guidance WM3. Environment Agency, Scottish Environmental Protection Agency and Natural Resources Wales;
- Managing Reclaimed Asphalt Highways And Pavements - An ADEPT & Construction Demolition Waste Forum Guidance Note (Version 2019 Revision 1, August 2019);
- Environment Agency Regulatory Position Statement 075: 'The movement and use of treated asphalt waste containing coal tar';
- Environment Agency Regulatory Position Statement 157: 'Storing and treating asphalt waste: RPS 157' (Updated 4th February 2020);
- Environment Agency WRAP Quality Protocol - Aggregates from inert waste. End of waste criteria for the production of aggregates from inert waste;
- CIRIA Sustainable management of surplus soil and aggregates from construction, CIRIA, C809, dated 2023;
- Contaminated Land: Applications in Real Environments (CL:AIRE) (2011) Definition of Waste Code of Practice (version 2);
- SEPA Guidance on the Production of fully Recovered Asphalt Road Planings (Scotland);
- AGS magazine – article entitled 'Coal Tar: Analysis and Detection' (March 2023 edition)

COAL TAR CONTAINING ASPHALT

WM3 includes the following text with regards to ascertaining the correct EWC code for waste asphalt:

> ***Waste containing coal tar***
>
> *This example provides guidance on the classification of road asphalt waste containing coal tar (AWCCT) and other construction and demolition wastes containing coal tar and related materials. This does not apply to wastes where coal tar is known not to be present.*
>
> *Coal tar and many coal tar distillates are potentially carcinogenic hazardous substances. If the concentration of such materials is at or above 0.1% the waste would possess the hazardous property HP 7 carcinogenic. Coal tar is complex mix of hydrocarbon compounds which have to be added to together to determine the concentration of coal tar. Therefore the 0.1% concentration must be applied to all fractions of the coal tar. Assessments based on PAH's alone are not consistent with the legislation and cannot be used to classify a waste as non-hazardous. However, if the concentration of coal tar is known, the MCL under the GB CLP uses benzo[a]pyrene (BaP) as a marker compound for carcinogenicity for certain coal tar entries. Where the concentration of BaP is less than 0.005% of the concentration of the coal tar (rather than in the waste as a whole), the coal tar is not carcinogenic and does not need to be considered for HP7.*
>
> *'Black top' (road surface) waste*
>
> *The following applies only to Asphalt material classified in the List of Wastes as*
>
> - *17 03 01* bituminous mixtures containing coal tar*
> - *17 03 02 bituminous mixtures other than those mentioned in 17 03 01*
>
> *Where the concentration of benzo[a]pyrene is at or above 50 ppm (mg/kg) in the black top alone (excluding other material) then the amount of coal tar should be considered to be sufficient (0.1% or more) for the material to be hazardous and thus coded 17 03 01*. Any sampling of black top would need to ensure that layers with different concentrations of benzo[a]pyrene are identified and sampled.*

Tier Environmental have observed third party assessments that have determined 'black top' (road surface) waste as non-hazardous when benzo(a)pyrene is at or below 50mg/kg; however, it is considered that this represents a misunderstanding of WM3 guidance for the following reasons:

1) The first paragraph in the 'Waste containing coal tar' section of WM3 is clear to state that *'This example provides guidance on the classification of road asphalt waste containing coal tar (AWCCT) and other construction and demolition wastes containing coal tar and related materials.';*
2) It also states, explicitly that *"Assessments based on PAH's alone are not consistent with the legislation and cannot be used to classify a waste as non-hazardous"*. Tier Environmental consider this statement is tacit to include road asphalt waste containing coal tar (AWCCT) as it is mentioned in the previous paragraph;
3) The 'Black top' (road surface) waste sub-section states *"Where the concentration of benzo[a]pyrene is at or above 50 ppm (mg/kg) in the black top alone (excluding other material) then the amount of coal tar should be considered to be sufficient (0.1% or more) for the material*

to be hazardous and thus coded 17 03 01"*. However, this does not mean that benzo(a)pyrene concentrations less than 50 mg/kg can be classed as non-hazardous when you take into consideration the text in Item 2), above. This either suggests a contradiction in the guidance, or that benzo(a)pyrene alone can only be used to prove the whether the AWCCT is hazardous but that the opposite does not classify the material as non-hazardous such that to prove non-hazardous you would still require the concentration of the coal tar to be determined.

The AGS article (March 2023) states that for determining whether asphalt waste is hazardous waste that "we *also* have to consider [B(a)P being greater than or equal to 50mg/kg]" suggesting that is consistent with the Tier Environmental interpretation. However, a bit further down the article states that the ADEPT Guidance reiterates and references WM3 and *"the use of the 50 mg/kg level for measuring B(a)P should the total coal tar concentration values not be available for measurement"*. Tier Environmental's interpretation of WM3 is that it does not make reference to the 50mg/kg B(a)P level being used as a threshold *in lieu* of a coal tar concentration value being available.

So if, in order to determine whether asphalt is non-hazardous waste, there is a requirement for the concentration of coal tar to be analysed then a decision needs to be made as to what type of coal tar test is adequate. The AGS article (March 2023) highlights that *"One of the challenges facing laboratories is the lack of standardization in the specification from clients and, also, the analysis itself".* The article explains that a review by the AGS Laboratory Working Group revealed a range of techniques and *"a potentially confusing landscape for the industry to navigate"*.

The ADEPT Guidance states there is data corroborating this assertion that 50mg/kg correlates to around 1000mg/kg road tar, this data is presented in Appendix D4.0. of the ADEPT Guidance document; however, Tier Environmental notes that the ADEPT Guidance states *"This guidance is not intended as a complete guide to managing waste materials and should be read in conjunction with Regulations and guidance issued by the relevant Regulator, these will take precedence over this guidance in all cases"*. As such, with respect to waste classification WM3 takes precedence over the ADEPT Guidance and WM3 does not provide details of any corroboration between B(a)P and road tar.

RE-USE OF ASPHALT

The AGS article (March 2023) summarises the ADEPT Guidance as follows:

> The ADEPT guidance provides more specific focus on the managing of reclaimed asphalt and provides information in to the classification of waste. It reiterates and references WM3 and the 0.1% threshold for coal tar and also the use of the 50mg/kg level for measuring B(a)P should the total coal tar concentration values not be available for measurement [see Tier Environmental comment above regarding this statement].
>
> What the ADEPT guidance then gives, is a clear and defined protocol for sampling, sample preparation, sample volumes and data review with also indication of analytical requirements and basic principles. The document gives details and refences to specific British Standards for the sampling and preparation of road plannings and road cores (BS 932 and BS 12697), and then recommends the following testing:
>
> - PAH analysis in the laboratory by gas chromatography mass spectrometry (GCMS) for the USEPA16 suite of PAHs, though only B(a)P may be necessary. It is worth noting here that labs will test for the full suite in a single process so requesting B(a)P only will usually give no cost or speed benefit. Should further characterisation for landfill disposal be required then the USEPA17 suite inclusive of coronene should be used,
> - Screening methods such as PAK marker sprays or Acrylic White sprays can be used but validated by the use of frequent 'full' analysis,
> - Specifies the use of Monohydric Phenol (Phenol Index) testing, with a potential requirement to speciate the individual compounds (Phenol, Cresols and Xylenols) should the levels be sufficiently high.
>
> In terms of data review the 3 potential outcomes are:
>
> 1) Classed as Inert for the purposes of the Quality Protocol for Aggregates from Inert Waste if:
>   a. The guidance of sample numbers has been observed,
>   b. All the B(Aa)P results are below 25mg/ kg,
>   c. There are ≥3 results.
> 2) Classed as Hazardous and treated accordingly is:
>   a. All the B(a)P results are above 50mg/kg Note: If there are limited results and close to the threshold then further investigation is required.
> 3) Full statistical analysis required to make assessment if:
>   a. Some or all results are above 25mg/kg and below 50mg/kg.

Tier Environmental once again notes that the ADEPT Guidance states *'This guidance is not intended as a complete guide to managing waste materials and should be read in conjunction with Regulations and guidance issued by the relevant Regulator, these will take precedence over this guidance in all cases'*. As such, with respect to *waste classification* WM3 takes precedence over the ADEPT Guidance.

ENVIRONMENT AGENCY REGULATORY POSITION STATEMENTS 075 AND 157

The ADEPT Guidance describes that these documents allow the treatment, movement and use of asphalt waste containing coal tar in construction operations for hard paving structures in England only. They do not enable the producer to demonstrate that end of waste criteria has been met, but they do state that if followed correctly, the EA will not pursue an application for an environmental permit.

CIRIA C809 states the following:

RPS 75 (EA, 2014d) allows the use of treated asphalt waste containing coal tar (AWCCT) (ie classified as hazardous) in specific construction operations for hard paving structures such as roads, pavements, footways, car parks and airfields.

While AWCCT is commonly treated by crushing, grinding, and screening, the treatment of AWCCT is not covered by this RPS. The AWCCT needs to meet the requirements of the Specification for Highways Works and can only be used in bound sub-surface layers, eg sub- base, base and binder layers.

SEPA GUIDANCE ON THE PRODUCTION OF FULLY RECOVERED ASPHALT ROAD PLANINGS (SCOTLAND)

The ADEPT Guidance describes that this document provides approved methodology that allows producers to demonstrate when aggregate produced from asphalt has been fully recovered and has ceased to be a waste. This guidance is only applicable in Scotland. However, it is not applicable to tar bound aggregates, asphalt contaminated with other substances or asphalt removed/processed by any other method than a road planer.

WRAP QUALITY PROTOCOL - AGGREGATES FROM INERT WASTE. END OF WASTE CRITERIA FOR THE PRODUCTION OF AGGREGATES FROM INERT WASTE

The ADEPT Guidance summarises that this document is applicable to England, Northern Ireland and Wales. It identifies that certain specified inert wastes (including uncontaminated asphalt) may achieve end of waste status through treatment and use in compliance with the Quality Protocol for recycled aggregates from inert waste.

RE-USE UNDER DOWCOP

Tier Environmental consider that *in situ* asphalt may be reasonably considered for re-use under DoWCoP, (subject to following DoWCoP fully including conducting site-specific risk assessments to demonstrate suitability for use) as it would constitute "*Source segregated aggregate material arising from demolition activities….*".

If the asphalt materials are coal tar containing then it would be necessary to consider the potential risks to human health and controlled waters carefully and agreement with the Local Authority (via Contaminated Land Officer or equivalent), Environment Agency / Natural Resources Wales local waste team / groundwater team would be necessary.

Due consideration may also need to be given to Series 600 if the materials is to be combined with other materials to form an engineering material.

APPENDIX Q - COMPLYING WITH CONTROL OF ASBESTOS REGULATIONS 2012

Complying with Control of Asbestos Regulations (CAR): Risk Assessments, Licensing and Training

This appendix outlines CAR risk assessments and where they should be applied in relation to assessing and remediating brownfield sites. The information below details the different classifications of work with asbestos under CAR, summarises the legal requirements for asbestos awareness training for all involved in the investigation and management of asbestos containing soil (ACS), and details the potential requirements for suitable proficiency training relating specifically to ACS.

CAR RISK ASSESSMENTS

A CAR Risk Assessment is required for any work which may expose employees to asbestos. It is recommended that a precautionary approach is adopted if there is any doubt about risks associated with asbestos.

There are three main activities for potential asbestos exposure during work on brownfield sites:

- Site reconnaissance visits;
- Site investigation works; and
- Site remediation.

CAR risk assessments are needed at each stage but may be incorporated during the site investigation stage into the overarching health and safety risk assessments.

The CAR risk assessment must:

- Identify the type of asbestos to which employees are liable to be exposed, where possible, or assume it is present in different forms;
- Determine the type and extent of exposures to asbestos that may occur during the work.
- Identify the steps to be taken to prevent exposure or reduce it to the lowest level reasonably practicable; and,
- Consider the effects of control measures that have been or will be taken.

The CAR risk assessment should include any information used to inform the risk assessment such as asbestos reports or desk study information. In the event that this information is not available, the assessor should be assumed that all forms of asbestos may be present on site.

For all investigation and remediation of ACSs, a detailed written work plan should he produced and followed as detailed on the HSE website and in the CAR.

The CAR risk assessments for specific investigations or remediation projects, will determine whether or not work is 'licensable work' (LW)**,** notifiable non-licensable work' (NNLW) or 'non-licensed work' (NLW). In addition, training requirements are also defined by the CAR risk assessment.

Some examples of control measures that apply during site reconnaissance, site investigation works, and site remediation are given below and should be applied depending on the asbestos risks identified for the site at each stage of investigation:

- Avoiding stirring up dust;
- Cleaning footwear after site works;
- Removing and bagging any overalls for disposal/laundering;
- Respirators and hygiene facilities for high risk sites;
- Segregated welfare units;
- Wetting ground
- Minimising soil disturbances;
- Implementation or retention of capping/break layers;
- Implementation of awareness training;
- Air monitoring;
- Managing stockpiles;
- Area segregation;
- Wheel washing
- Road washing/cleaning

It is important to note that during site reconnaissance visits, site investigation works and site remediation that asbestos should not be considered in isolation and control measures are likely to form part of a wider health and safety precautions.

Respiratory protective equipment (RPE)

RPE is the last line of defence and its requirement would be defined by the CAR risk assessment. HSE (2013b) advises that RPE should have an assigned protection factor of 20 or more for all work with asbestos. In certain instances, full face-piece, positive pressure respirators with a protection factor of 40 are necessary (to EN 12942:1998, TM3).

Suitable types of RPE for most ***short*** duration non-licensed asbestos work:

- Disposable respirator to standards EN149 (type FFP3) or EN1827 (type FMP3)
- Half mask respirator (to standard EN140) with P3 filter
- Semi-disposable respirator (to EN405) with P3 filter

These filters are not suitable for people with beards/stubble or for long or continuous use.

LICENSING

CAR defined certain types of activities involving asbestos as 'licensable work' (LW) or as 'notifiable non-licensable work' (NNLW). All other work would be 'non-licensable work' (NLW).

LW is defined as:

- work where exposure is not 'sporadic and low intensity'.
- work where the risk assessment cannot demonstrate that the control limits (four hour and 10 minute limits) will not be exceeded.
- work on asbestos coating
- work on AIB or insulation where risk assessment is either of first two points above or not of short duration (where short duration is defined for any work liable to disturb asbestos as taking less than two hours per week (including ancillary work) and no one person carries out that work for more than one hour').

NNLW includes work with:

- AIB or asbestos insulation of short duration that is not licensable.
- fire-damaged asbestos cement or asbestos cement damaged so as to create significant dust and debris.
- asbestos ropes, yarns, woven cloths in poor condition or handling cutting or breaking up the materials.
- asbestos papers, felts and cardboard in poor condition, unencapsulated or not bound into another material.

Work with weathered asbestos cement, air monitoring and collecting samples of ACM in buildings would not normally be notifiable.

It is impossible to specify definitively what activities will and will not be licensable. This decision should be made as part of the CAR risk assessment. CAR is not primarily aimed at work with ACSs and there is little published information on airborne asbestos concentrations during work with ACSs. Nevertheless, CAR will require some remediation projects, and occasionally site investigations, to be LW. Investigations on other sites may involve NNLW. The decision as to whether work is LW or NNLW should be made during the CAR risk assessment by those in charge of the brownfield site investigations and remediation projects.

TRAINING REQUIREMENTS

Asbestos health and safety courses are offered by a number of providers in the UK. Training courses that include the problem of identifying ACMs in soil should be undertaken at regular intervals by those involved in the investigation, assessment and management of sites where ACs are known or suspected. It is the role of the employer to identify the level of training required for an employee based on their role, experience and duties. Reference to Regulation 10 of CAR should be referred to for more information on training requirements.

Recognising asbestos within soils is challenging due to the heterogeneity of such soils and the discolouration of asbestos by smeared soil. Specific training for ground workers should include understanding fibre release potential, potential control measures in the field, how to take representative ACSs safely, sample labelling and what analytical tests are available and when the y should be implemented.

Health and safety training required under CAR includes asbestos awareness, non-licensable work (including notifiable non-licensable work) and licensable work with asbestos.

In addition to health and safety training, some staff involved in the technical identification on site of ACMs, sampling and analysis may require technical proficiency training (competency training).

Training vs. Competence

HSE (2005) identifies that 'training alone does not make people competent. Training must be consolidated by practical experience so that the person becomes confident, skilful and knowledgeable in practice on the job'. It is critical that ACS surveyors demonstrate competency with details of relevant field experience alongside training and examples of previous works/references.

APPENDIX R – SLOPE STABILITY ASSESSMENT

Tier Consult Limited

Cronton Colliery
M62 Slope Stability Assessment

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Document Control Sheet

Cronton Colliery
M62 Slope Stability Assessment
Project 2701

Rev.	Date	Author	Reviewer	Approver	Status
DRAFT	18/10/2024	SJ			For comment
0	01/11/2024	SJ	WF	WF	Initial Issue

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3 Geotechnical parameters for slope stability analysis
4 Partial factors used in the analysis
5 Slope stability analysis results

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1 Plot of SPT N value against reduced level

Appendix

A Byland Cross Section drawing 2701-004
B Oasys Slope input/output

1 Introduction

Byland Engineering Limited (BEL) has been appointed by Tier Environmental Limited (TEL) to undertake a slope stability assessment for the proposed slopes along the northern boundary of a new industrial development, which is adjacent to the M62. The development scheme is located south of Junction 6 of the M62 on the site of the former Cronton Colliery near Widnes, Merseyside. The centre of the site is located at NGR E347600, N389420 and access is via A5080 which forms the southern boundary to the site or Fox Bank Lane which form the eastern boundary of the site. The wider site will contain Units 1 to the northeast, Unit 2 to the south and Units 3 and 4 to the northwest with a large area to the southeast remaining undeveloped. This report does not consider the slope between the M62 and the attenuation pond, drawing L005-TIE-ZZ-XX-DR-C-6034 - XL UNIT 3 AND 4 - Proposed Levels Rev P13 dated 09.08.2024 indicates a retaining wall at this location.

It is proposed to cut the slopes at a gradient of 1 vertical in 3 horizontal or shallower. The crest of the slope is between 39.2 and 33.0mOD decreasing to the west. The level of the toe is dependent on the unit at the toe of the slope, with the unit in the northeast being at 37.7mOD and the unit in the northwest being at 30.8mOD. The height of the slope varies from less than 1.0m to a maximum of 5.1m.

The M62 is approximately 15m from the boundary of the site. The land between the site and the carriageway forms a slope of approximately 5m in height with a gradient of 1 vertical in 3 horizontal, sloping down to the M62.

The wider site was previously a deep underground mine and associated spoil, the part of the site where the slope stability has been undertaken was previously greenfield. Consideration of mining is outside the scope of this report.

The analysis has been undertaken in accordance with BS EN 1997-1(2004) + A1 (2013) using Design Approach 1.

2 GROUND CONDITIONS

2.1 Geological Mapping

The online British Geological Survey (BGS) Geoindex online mapping at 1:50,000 scale indicates the site to be underlain by the following strata in order of increasing stratigraphic age (and depth):

1. Devensian Till indicted as Diamicton and described as an unsorted to poorly sorted and contains particles ranging in size from clay to boulders. Typically coarse granular material in a fine grained matrix.

2. Bedrock varies either side of a N – S trending fault which bisects the wider site and is mapped as follows:

    - East of the fault is mapped as the Early Triassic Kinnerton Sandstone Formation. It is described as red-brown to yellow, generally pebble-free, fine- to medium-grained Sandstone.

    - West of the fault is mapped as Pennine Middle Coal Measures and described as interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams.

Whilst no Artificial Ground is mapped it is expected to be present due to the sites previous land use.

2.2 Ground Investigation

The site has undergone several phase of site investigation and data from the following site investigations has been provided:

1. Tier Environmental Limited (2003)
2. Tier Environmental Limited (2019)
3. Tier Environmental Limited (2020)
4. Tier Environmental Limited (2023)
5. Tier Environmental Limited ARUP(2023)
6. Lankelma Limited CPT (2023)
7. Tier Environmental Limited (2024)

11 No. exploratory holes are within the vicinity of the slope, the stratigraphy encountered is summarised in the table overleaf.

Site Investigation	Borehole	Ground Level (mOD)	Layer thickness, m (Base Level of Stratum, mOD)		
			Made Ground / Topsoil	Glacial Till	Pennine Middle Coal Measures
Tier Environmental Limited (2024)	WS501	34.47	0.20 (34.27)	2.10 (33.17)	0.95* (NP)
	WS502	37.40	0.20 (37.20)	2.20 (35.00)	0.28* (NP)
	WS503	37.94	1.35 (36.59)	1.25 (35.34)	0.65* (NP)
	WS504	39.42	1.50 (37.92)	0.70 (37.22)	0.88* (NP)
Tier Environmental Limited (2020)	WS103	35.22	0.15 (35.07)	0.75 (34.32)	1.03* (NP)
	WS107	38.55	0.15 (38.40)	2.35 (36.05)	0.68* (NP)
	WS108	40.77	0.20 (40.57)	2.88 (37.69)	0.07* (NP)
	TP153	33.17	0.30 (32.86)	1.80 (31.06)	0.55* (NP)
Tier Environmental Limited (2019)	WS01	40.15	0.65 (39.50)	1.55 (37.95)	0.87* (NP)
	WS02	29.30	0.35 (28.95)	1.90 (27.05)	0.18* (NP)
	WS11	37.05	0.80 (36.25)	2.20 (34.05)	0.35* (NP)

* = thickness penetrated, NP = base not proven

Table 1 – Summary of Relevant Exploratory Holes

2.4 Ground Conditions

The encountered strata are now considered in more detail.

Topsoil

Topsoil was encountered in all relevant exploratory holes to a depth of 0.8mbGL and is described as slightly sandy SILT. It is expected that topsoil will have been removed prior to the slope regrade and is therefore not considered.

Made Ground

Made Ground was encountered in WS503 and WS504 only, it is directly beneath the Topsoil with a thickness of 1.20-1.30m. It is described as a firm slightly sandy gravelly CLAY in WS503 and as a sandy clayey, angular to subrounded, fine to medium GRAVEL. The gravel in both comprises brick, concrete and mixed natural lithologies. A single Standard Penetration Test (SPTs) was undertaken on the granular Made Ground in WS504 which recorded an N value of 15, indicating a medium dense deposit.

Glacial Till

Glacial Till was encountered in all relevant exploratory holes with a thickness of 0.70 - 2.88m, the base of the layer varies between 27.05 – 37.95mOD with the depth of the base increasing to the west. It is described as a firm to stiff slightly sandy, slightly gravelly CLAY. The sand and gravel are fine to medium and the gravel is angular to subrounded, fine to medium of mixed natural lithologies with occasional fragments of coal. WS108 notes the presence of occasional pockets and lenses of sand.

4 No Atterberg tests were undertaken on the Glacial Till revealing a moisture content of 11-22% with a mean of 16%, a liquid limit of 28-33% with a mean of 30%, a plastic limit of 11-16% with a mean of 13% and plasticity index of 16-18% with a mean of 17%, indicating an intermediate plasticity clay. The plasticity index can be used to correlate an effective angle of internal friction (Φ') using the upper bound PI of 18% an effective angle of friction of 28° is deemed appropriate.

15 No SPTs were undertaken within the Glacial Till and returned N values of 8-25, with a mean of 14. Using the correlation between N and undrained shear strength, c_u of c_u=f1 x N and based on the PI and Stroud and Butler (1975) a conservative f1=5 can be taken, the c_u would vary from 40-125kPa with an average of 70kPa, indicating a firm to stiff deposit in agreement with the engineers logs.

Pennine Middle Coal Measures

The Pennine Middle Coal Measures were encountered beneath the Glacial Till, they are not penetrated by any exploratory holes. PMCM are described as weathered bedrock recovered as either a stiff CLAY or a fine SAND and GRAVEL.

10 No. SPTs were undertaken within the PMCM, only a single SPT penetrated 300mm in less than 50 blows returning an N value of 22. For the remining 9 No. SPTs penetrated 70-275mm in 50 blows giving extrapolated N values of 55-214, with a mean N value of 103. Adopting the very approximate relationship of Unconfined Compressive Strength (UCS) = N x 10 indicates the UCS is 0.2 - 2.1MPa with an average of 1.0MPa which indicates the rock varies from extremely weak to a weak.

In addition to these 3 No. Point load tests were undertaken on the PMCM across the site. The tests were conducted on irregular samples and returned $I_{s(50)}$ values of 1.48, 1.82 and 3.16MPa.

2.5 Groundwater

There were no groundwater strikes reported during formation.

Groundwater monitoring was undertaken on a total of 9 No. occasions (3 No. in 2019 and 6 No in 2020). Ground water monitoring was undertaken on 3 No. relevant exploratory holes with the results summarised in the table overleaf.

Exploratory Hole	Max Depth (mBGL) (Level, mOD)	Min Depth (mBGL) (Level, mOD)
WS103	0.43 (34.79)	DRY
WS107	1.09 (37.46)	DRY
WS108	0.81 (39.96)	DRY

Table 2 – Summary of Groundwater Monitoring

These results suggest a high groundwater level. However, within the GIR it is stated that 'The varying water levels recorded across the site, including not encountering any groundwater, indicates that the groundwater observed within the shallow deposits consists of isolated groundwater pockets confined by cohesive strata and not a larger conjoined water body. The groundwater strikes observed at depth within the bedrock strata in the rotary boreholes are considered to be representative of the deeper aquifer conditions.'

Design Groundwater will be taken as the level of the M62 at each section.

2.6 Design Parameters

The following characteristic geotechnical design parameters are proposed, which are based on the descriptions of the soil and in-situ tests taken and correlations to published data. The ground models analysed can be found in Appendix C.

Material	γ_m (kN/m^3)	φ' (deg)	c' (kN/m^2)
Made Ground	18	27	0
Glacial Till	19	28	0
PMCM	21	32	0

Table 3 – Summary of Characteristic Soil Parameters

3 Slope Stability Analysis

3.1 Preamble

The proposed slope runs roughly east-west along the northern boundary of the site where the M62 is adjacent to the boundary. As part of the proposed construction works on the site include a cut and fill operation to create several level plots, along the northern boundary a slope is to be cut with a gradient of 1 vertical in 3 horizontal and shallower.

2 No. design sections have been considered based on drawings L005-TIE-ZZ-XX-DR-C-6070 Rev P1 and L005-TIE-ZZ-XX-DR-C-6071 Rev P1.

Design Section D is at the eastern end of the slope and is between the M62 and the northeast unit. A small increase in level (~0.3m) is indicated at this section, as such 0.7m of Made Ground is considered at the crest of the slope to allow for the removal of topsoil and increase in level. It has the following geometry:

1. Crest of slope = 33.0mOD
2. Toe of Slope = 29.7mOD
3. Maximum slope height = 3.3m
4. Gradient of the slope = 1 vertical in 4.78 horizontal

Design Section E is in the centre of the slope and is between the M62 and the northeast unit. At this location the slope is expected to comprise Glacial Till in the upper parts and PMCM in the lower parts. It has the following geometry:

1. Crest of slope = 36.2mOD
2. Toe of Slope = 31.1mOD
3. Maximum slope height = 5.1m
4. Gradient of the slope = 1 vertical in 3.08 horizontal

The ground models analysed can be found in Appendix A.

Section F from drawing L005-TIE-ZZ-XX-DR-C-6071 Rev P1 is not considered as the gradient is circa 1 vertical in 20 horizontal and therefore by inspection is less critical that the other sections. Section G has also not been considered as the crest of the slope is approximately 20m from the site boundary (~35m from the M62) and therefore by inspection will not impact the M62.

3.2 Limit Equilibrium Analysis

A limit equilibrium analysis using a 2-D limit equilibrium Bishop's method of slices analysis has been undertaken using the Oasys Slope software to assess the slope stability. The calculation considers hypothetical circular failure surfaces of increasing radius based on a grid of centres specified by the user. The analysis automatically calculates the factor of safety for each circle.

The analysis has been undertaken in accordance with BS EN 1997-1(2004) + A1 (2013) using Design Approach 1. 3 No. separate analyses have been undertaken for each line of section as follows:

1. Serviceability Limit State (SLS) using unfactored soil parameters and applied actions with a target factor of safety of 1.3.

2. Ultimate Limit State (ULS) Combination 1 using unfactored soil parameters and factored applied actions with a target factor of safety of 1.0.

3. Ultimate Limit State (ULS) Combination 2 using factored soil parameters and factored applied with a target factor of safety of 1.0.

The following partial factors are applied to actions and soil parameters within the various analyses.

Partial Factors		SLS	DA1 C1	DA1 C2
Actions	**Unfavourable Permanent actions**	1.0	1.3	1.0
	Unfavourable Variable actions	1.0	1.5	1.3
Materials	□	1.0	1.0	1.0
	tan□'	1.0	1.0	1.25
	c'	1.0	1.0	1.25
	c_u	1.0	1.0	1.4

Table 4 – Partial factors used in the analysis

The following assumptions have been made as part of the analysis:

1. The analysis is based on drained soil conditions throughout.

2. It is assumed that groundwater is at the level of the M62, 27.5mOD for Section D and 29.5mOD for Section E.

5.3 Surcharges

Surcharges from the nearby M62 are considered. A variable 20kPA surcharge is considered across the width of the carriageway and a 10kPa variable surcharge between the carriageway and the boundary of the site to consider any future maintenance along the side of the carriageway. A 10Kpa variable surcharge has been applied to 1m from the crest of the slope to model any future maintenance required.

5.4 Slope Stability Analysis Results

The Oasys Slope output is presented in Appendix B.

The results of the analyses, based on drained conditions throughout and indicate the following minimum factors of safety:

Design Section	Slope Height (m)	Gradient	Minimum FoS		
			SLS	ULS C1	ULS C2
D	3.3	1 in 4.78	2.280	2.280	1.824
E	5.1	1 in 3.08	1.638	1.638	1.310

Table 5 – Slope stability analysis results

In all cases the calculated factors of safety for slope stability are above the required values and therefore the stability of the proposed slopes is considered acceptable based on the provided input data.

It is therefore considered that the proposed works are unlikely to impact the M62 motorway.

4 Conclusions & Recommendations

This report presents the finding of a slope stability analysis on the proposed slopes between the northern site boundary adjacent to the M62 and Units 3 and 4 of a new development on the site of the former Cronton Colliery near Widnes, Merseyside. The design contained herein is summarised as follows:

The ground conditions below the site comprise Made Ground, overlying Glacial Till and Coal Measures Bedrock.

A slope stability analysis has been undertaken using the Oasys Slope software for the proposed slope geometries. As part of the analysis a number of assumptions have been made which include the following:

- 2 No. Design Sections based on drawings L005-TIE-ZZ-XX-DR-C-6070 Rev P1 and L005-TIE-ZZ-XX-DR-C-6071 Rev P1 have been analysed.
- Variable surcharges of 20kPa across the live carriageway and 10 kPa between the carriageway and the site boundary have been applied as well as 10kPa to 1.0m from the crest of the slope
- The analysis is based on drained conditions throughout.
- It is assumed that groundwater is at the level of the M62 motorway.

The following are recommended:

1. Slopes should be no steeper than 1 vertical in 3 horizontal.
2. The ground conditions on the site should be validated during the construction works. Any significant changes should be recorded and discussed with the designer.
3. Consideration should be given to additional testing of the soil to confirm that plasticity data is appropriate for this area of the site.
4. It is recommended that the slopes are monitored for movement over a suitable period after completion of the works to ensure no movements are occurring.

5 References

British Geological Survey Geoindex website http://www.bgs.ac.uk/geoindex

BS1377 (1999) British Standard Code of Practice for Tests for Soils for Civil Engineering Purposes, BSI, London

BS5930 (2015) + A1 (2020) British Standard Code of Practice for Site Investigation, BSI, London

BS8002 (2015) British Standard Code of Practice for Earth Retaining Structures, BSI, London

BS6031 (2009) Code of Practice for Earthworks, BSI, London

BS EN 1997-1 (2004) + A1 (2013) – Eurocode 7: Geotechnical design – Part 1 General rules, BSI, London

NA +A1 (2014) to BS EN 1997-1 (2004) + A1 (2013) – UK National Annex to Eurocode 7: Geotechnical design – Part 1: General rules, BSI, London

CIRIA 143 (1995), The standard penetration tests (SPT) : Methods and use, CIRIA, London

CIRIA 504 (1999), Engineering in Glacial Till, CIRIA, London

Oasys Slope 19.1 manual (2015)

Provided information

a) Tier Consult Limited:

   a. TE1163GIR1.3 A Ground Investigation Report dated December 2021

   b. TE1163 Dynamic Probe Results dated August 2022

   c. TE1163 Exploratory Hole Logs dated April 2023

   d. TE1163 WS5 exploratory hole logs dated September 2024

   e. TE1163-TE1163EHLP Exploratory Hole Location Plan Rev. A dated August 2020

   f. TE1163-TE-00-XX-DR-GE-001-V01 Exploratory Hole Site Wide Plan Rev. P1

   g. 01 P-108417-01 CPT Report & Location Plan

   h. 22604-UMC-XXXX-SI-DR-A-0602 Illustrative Masterplan (Site Wide) Rev. P02

   i. L005-TIE-ZZ-XX-DR-C-6034 - XL UNIT 3 AND 4 - Proposed Levels Rev P13 dated 09.08.2024

j. L005-TIE-ZZ-XX-DR-C-6070 - Unit 3 and 4 tie in sections - Sheet 1 Rev P1 dated 08.08.204

k. L005-TIE-ZZ-XX-DR-C-6071 - Unit 3 and 4 tie in sections - Sheet 2 Rev P1 dated 08.08.2024

l. Existing Ground Surface LIDAR drawing received 14.10.2024

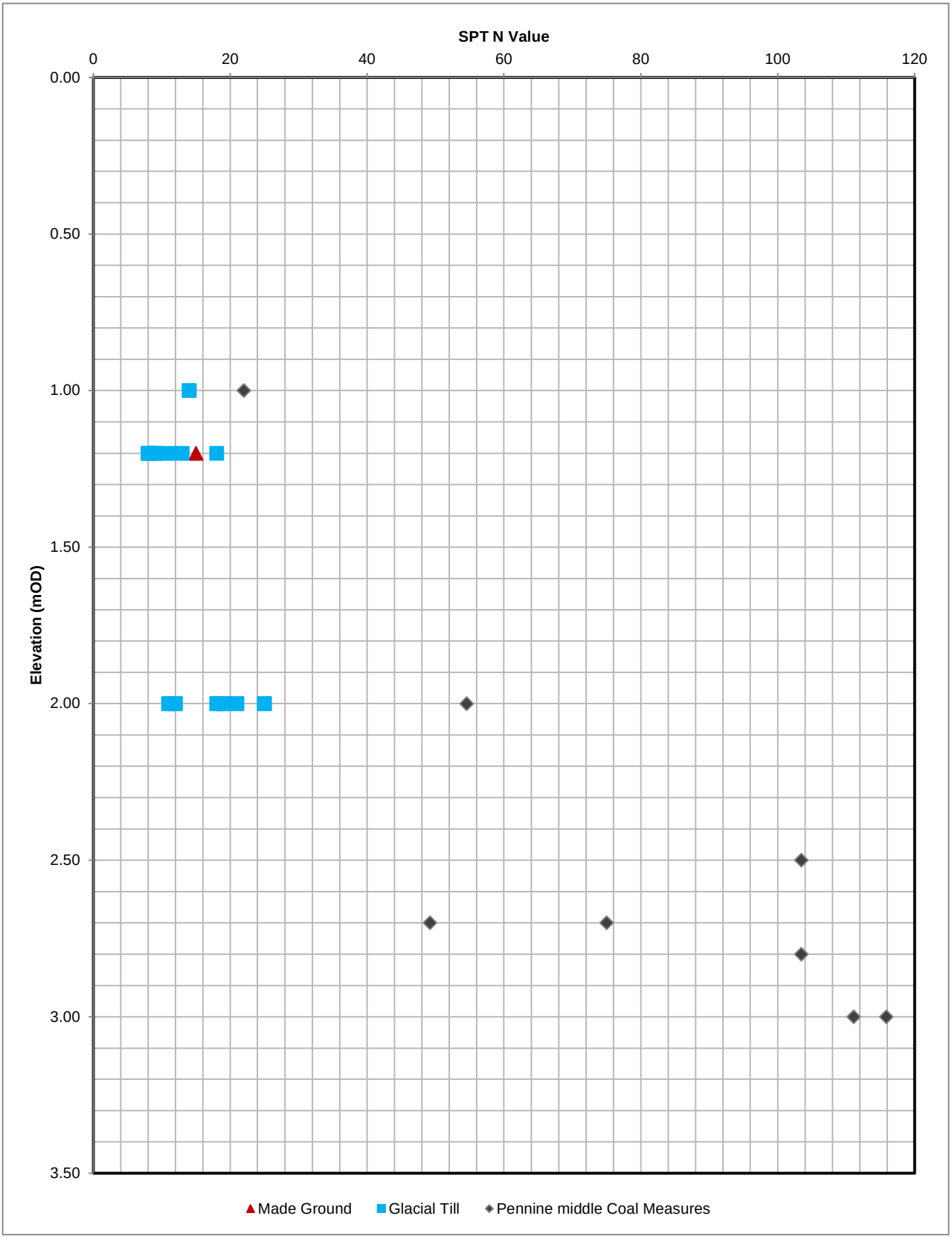
Figures

Byland engineering limited
Geotechnical Design Engineers

BY	SJ	DATE	18/10/2024
CHK		DATE	

PROJECT Wright Street, Renfrew

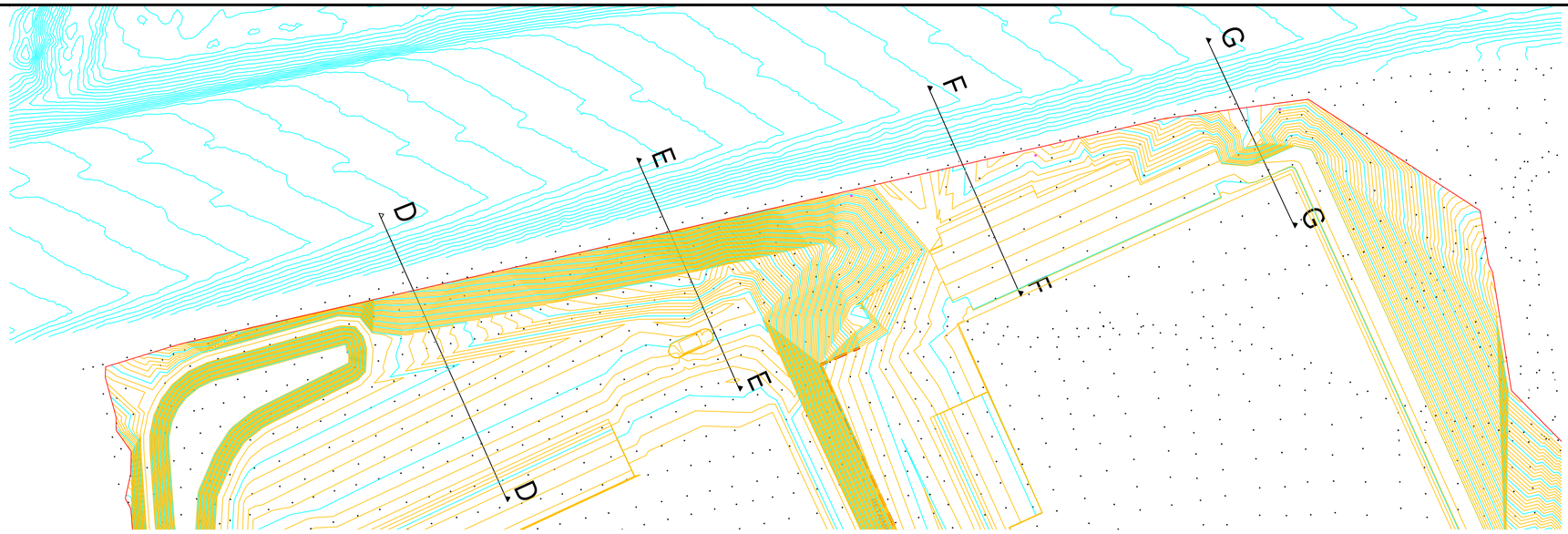
SECTION Profile of SPT N Value versus Depth



Appendices

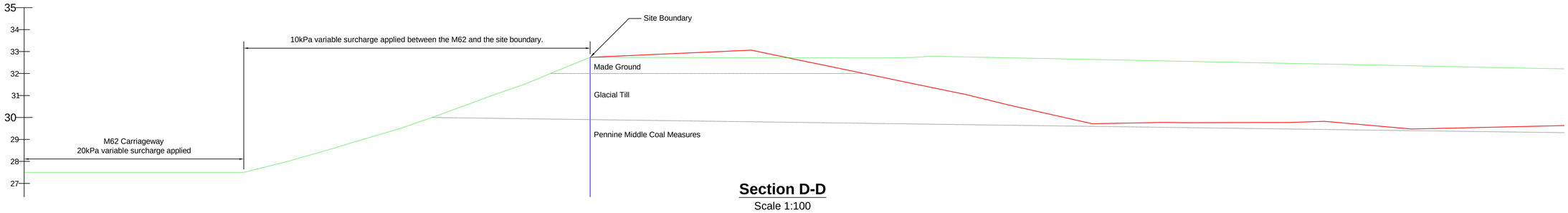
Appendix A

Byland drawing 2701-004



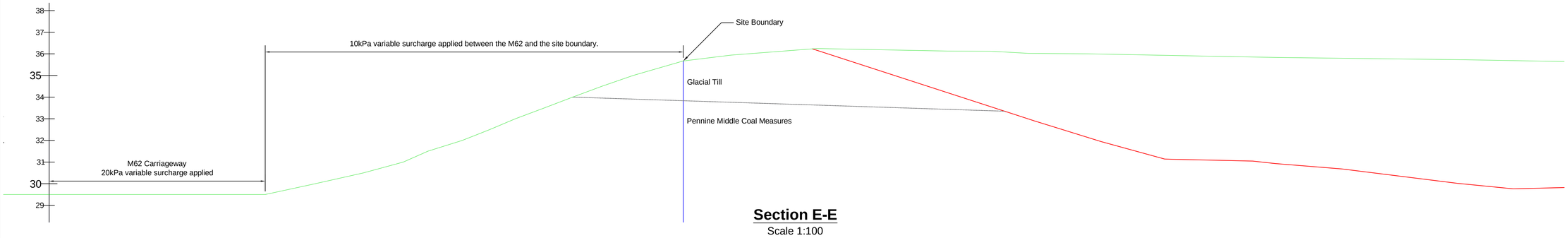
Design Section Location Plan

Scale 1:1000



Section D-D

Scale 1:100



Section E-E

Scale 1:100

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NOTES :

General

All dimensions mm UNO

All elevations mOD UNO

Drawing based on Survey & Engineering Projects drawings:

1. L005-TIE-ZZ-XX-DR-C-6034 - XL UNIT 3 AND 4 - Proposed Levels Rev P13 dated 09.08.2024
2. L005-TIE-ZZ-XX-DR-C-6070 - Unit 3 and 4 tie in sections - Sheet 1 Rev P1 dated 08.08.204
3. L005-TIE-ZZ-XX-DR-C-6071 - Unit 3 and 4 tie in sections - Sheet 2 Rev P1 dated 08.08.2024
4. Existing Ground Surface LIDAR drawing received 14.10.2024

KEY :

Existing Ground Level

Proposed Ground Level

	-	-	-	-
	Removal of Section G	SJ	WF	01/11/24
	AMENDMENTS	DRAWN	CHECK	DATE

Byland engineering limited

Geotechnical Design Engineers

Client:

REV.

Tier Environmental Limited

Project :

Cronton Phase 2

Design Sections

Drawing Status :

FOR INFORMATION

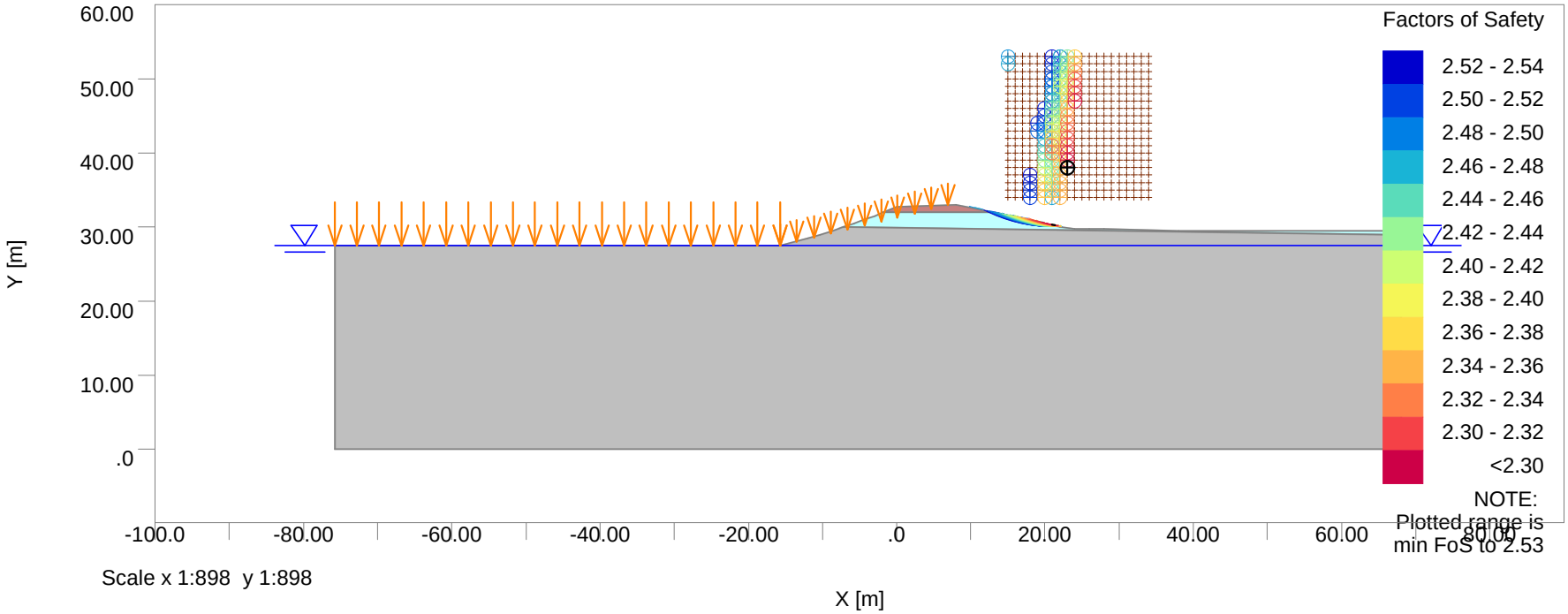
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CHECKED	WF	18/10/24	SCALE	AS SHOWN
APPROVED	WF	18/10/24	October 2024	

PROJECT - ORIG - VOLUME - LEVEL - TYPE - ROLE - NUMBER	REVISION
2701 - BEL - 00 - XX - DR - Y - 0004	A

Appendix B

Oasys Slope input /output

More than one slip surface shown, minimum factor of 2.280



Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Factor of safety on: SHEAR STRENGTH
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Made Ground	18.000	18.000	Drained	27.000	0.0
2	Glacial Till	19.000	19.000	Drained	28.000	0.0
3	PMCM	21.000	21.000	Drained	32.000	0.0

Surface loads

No.	Limits of loaded area X1 [m]	X2 [m]	Distributed load Vert [kN/m²]	Horiz [kN/m²]	Permanent / Variable load	Favourable / Unfavourable load	Use in pull-out calc
1	-75.771	-15.771	20.000	0.0	Variable	N/A	No
2	-15.771	7.0000	10.000	0.0	Variable	N/A	No

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 15.00000 m y = 34.00000 m
Inclination of grid: 0.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 1.00000m spacing
                  20 in y direction at 1.00000m spacing
Initial radius of circle 1.00000 m
Incremented by 0.50000 m until all possible circles considered

WORST CASE

Centre at (23.000m,38.000m)
Iterations: 5
Net vertical force [kN/m]: 25.569E-9
Net horiz force [kN/m]: 109.69E-9
Radius 8.0000m
Horiz acceleration [%g]: 0.0
Slip weight [kN/m] 0.013704
Disturbing moment [kN/m]: 0.024906
Restoring moment [kNm/m]: 0.056797
Reinf.Rest.Moment [kNm/m]: 0.0
Factor of Safety: 2.2804

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
factor of safety. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Point	Slip surface coordinates x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	20.982	30.259	-	-27.590	0.0	0.0	0.0
2	20.997	30.255	-27.550	-27.550	-572.25E-9	14.829E-9	0.0
3	21.013	30.251	-27.510	-27.510	-166.40E-9	3.7822E-6	0.0
4	21.028	30.247	-27.470	-27.470	1.2175E-6	11.302E-6	0.0
5	21.043	30.243	-27.430	-27.430	2.6015E-6	18.822E-6	0.0
6	21.059	30.239	-27.390	-27.390	4.9635E-6	30.094E-6	0.0
7	21.074	30.235	-27.350	-27.350	8.3036E-6	45.119E-6	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
8	21.089	30.231	-27.310	-27.310	12.622E-6	63.896E-6	0.0
9	21.105	30.228	-27.280	-27.280	7.0097E-6	37.428E-6	0.0
10	21.120	30.224	-27.240	-27.240	10.350E-6	52.453E-6	0.0
11	21.135	30.220	-27.200	-27.200	14.668E-6	71.230E-6	0.0
12	21.151	30.217	-27.170	-27.170	9.0560E-6	44.763E-6	0.0
13	21.166	30.213	-27.130	-27.130	13.374E-6	63.540E-6	0.0
14	21.181	30.209	-27.090	-27.090	18.671E-6	86.070E-6	0.0
15	21.197	30.206	-27.060	-27.060	12.024E-6	54.312E-6	0.0
16	21.212	30.202	-27.020	-27.020	17.320E-6	76.841E-6	0.0
17	21.228	30.199	-26.990	-26.990	11.708E-6	50.373E-6	0.0
18	21.243	30.195	-26.950	-26.950	16.027E-6	69.151E-6	0.0
19	21.258	30.192	-26.920	-26.920	10.414E-6	42.683E-6	0.0
20	21.274	30.189	-26.890	-26.890	5.8366E-6	21.506E-6	0.0
21	21.289	30.185	-26.850	-26.850	9.1767E-6	36.530E-6	0.0
22	21.304	30.182	-26.820	-26.820	5.6330E-6	20.643E-6	0.0
23	21.320	30.178	-26.780	-26.780	7.9951E-6	31.916E-6	0.0
24	21.335	30.175	-26.750	-26.750	4.4514E-6	16.029E-6	0.0
25	21.350	30.172	-26.720	-26.720	1.9419E-6	5.4319E-6	0.0
26	21.366	30.169	-26.690	-26.690	466.63E-9	125.58E-9	0.0
27	21.381	30.166	-26.660	-	25.569E-9	109.69E-9	0.0

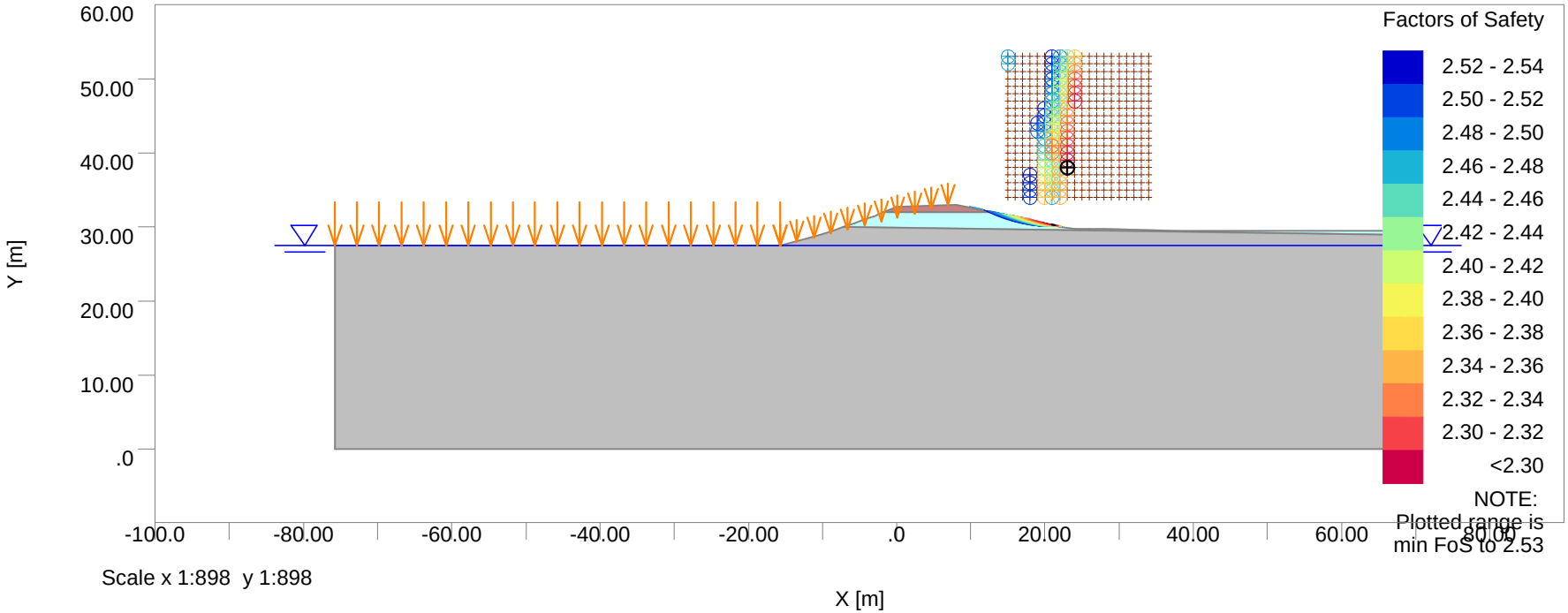
Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	*0.0*	*0.53171*	0.0	*0.0*	557.49E-9	296.42E-9	129.99E-9
2	*0.0*	*0.53171*	0.0	*145.79E-6*	141.63E-6	75.307E-6	33.024E-6
3	*0.0*	*0.53171*	0.0	*291.58E-6*	282.71E-6	150.32E-6	65.917E-6
4	*0.0*	*0.53171*	0.0	*291.58E-6*	282.71E-6	150.32E-6	65.917E-6
5	*0.0*	*0.53171*	0.0	*437.37E-6*	423.78E-6	225.33E-6	98.811E-6
6	*0.0*	*0.53171*	0.0	*583.15E-6*	564.86E-6	300.34E-6	131.70E-6
7	*0.0*	*0.53171*	0.0	*728.94E-6*	705.93E-6	375.35E-6	164.60E-6
8	*0.0*	*0.53171*	0.0	*728.94E-6*	715.83E-6	380.61E-6	166.91E-6
9	*0.0*	*0.53171*	0.0	*583.15E-6*	564.86E-6	300.34E-6	131.70E-6
10	*0.0*	*0.53171*	0.0	*728.94E-6*	705.93E-6	375.35E-6	164.60E-6
11	*0.0*	*0.53171*	0.0	*728.94E-6*	715.83E-6	380.61E-6	166.91E-6
12	*0.0*	*0.53171*	0.0	*728.94E-6*	705.93E-6	375.35E-6	164.60E-6
13	*0.0*	*0.53171*	0.0	*874.73E-6*	847.01E-6	450.36E-6	197.49E-6
14	*0.0*	*0.53171*	0.0	*874.73E-6*	858.91E-6	456.69E-6	200.27E-6
15	*0.0*	*0.53171*	0.0	*874.73E-6*	847.01E-6	450.36E-6	197.49E-6
16	*0.0*	*0.53171*	0.0	*728.94E-6*	715.83E-6	380.61E-6	166.91E-6
17	*0.0*	*0.53171*	0.0	*728.94E-6*	705.93E-6	375.35E-6	164.60E-6
18	*0.0*	*0.53171*	0.0	*728.94E-6*	715.83E-6	380.61E-6	166.91E-6
19	*0.0*	*0.53171*	0.0	*583.15E-6*	572.75E-6	304.54E-6	133.54E-6
20	*0.0*	*0.53171*	0.0	*583.15E-6*	564.86E-6	300.34E-6	131.70E-6
21	*0.0*	*0.53171*	0.0	*437.37E-6*	429.67E-6	228.46E-6	100.18E-6
22	*0.0*	*0.53171*	0.0	*437.37E-6*	423.78E-6	225.33E-6	98.811E-6
23	*0.0*	*0.53171*	0.0	*437.37E-6*	429.67E-6	228.46E-6	100.18E-6
24	*0.0*	*0.53171*	0.0	*291.58E-6*	286.59E-6	152.38E-6	66.822E-6
25	*0.0*	*0.53171*	0.0	*145.79E-6*	143.51E-6	76.306E-6	33.461E-6
26	*0.0*	*0.53171*	0.0	*0.0*	429.81E-9	228.54E-9	100.22E-9

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	*0.0*	*0.0*	0.0	0.0	0.0	0.0
2	*0.0*	*0.0*	0.0	0.0	0.0	0.0
3	*0.0*	*0.0*	0.0	0.0	0.0	0.0
4	*0.0*	*0.0*	0.0	0.0	0.0	0.0
5	*0.0*	*0.0*	0.0	0.0	0.0	0.0
6	*0.0*	*0.0*	0.0	0.0	0.0	0.0
7	*0.0*	*0.0*	0.0	0.0	0.0	0.0
8	*0.0*	*0.0*	0.0	0.0	0.0	0.0
9	*0.0*	*0.0*	0.0	0.0	0.0	0.0
10	*0.0*	*0.0*	0.0	0.0	0.0	0.0
11	*0.0*	*0.0*	0.0	0.0	0.0	0.0
12	*0.0*	*0.0*	0.0	0.0	0.0	0.0
13	*0.0*	*0.0*	0.0	0.0	0.0	0.0
14	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
15	*0.0*	*0.0*	0.0	0.0	0.0	0.0
16	*0.0*	*0.0*	0.0	0.0	0.0	0.0
17	*0.0*	*0.0*	0.0	0.0	0.0	0.0
18	*0.0*	*0.0*	0.0	0.0	0.0	0.0
19	*0.0*	*0.0*	0.0	0.0	0.0	0.0
20	*0.0*	*0.0*	0.0	0.0	0.0	0.0
21	*0.0*	*0.0*	0.0	0.0	0.0	0.0
22	*0.0*	*0.0*	0.0	0.0	0.0	0.0
23	*0.0*	*0.0*	0.0	0.0	0.0	0.0
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys	**BYLAND ENGINEERINGLIMITED**	Job No. **2701**	Sheet No.	Rev.
Chronton Phase 2 M62 Slope Stability Section D - ULS1		Drg. Ref.		
		Made by SJ Date	Checked Date	

More than one slip surface shown, minimum factor of 2.280



Scale x 1:898 y 1:898

Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Made Ground	18.000	18.000	Drained	27.000	0.0
2	Glacial Till	19.000	19.000	Drained	28.000	0.0
3	PMCM	21.000	21.000	Drained	32.000	0.0

Surface loads

No.	Limits of loaded area X1 [m]	X2 [m]	Distributed load Vert [kN/m²]	Horiz [kN/m²]	Permanent / Variable load	Favourable / Unfavourable load	Use in pull-out calc
1	-75.771	-15.771	20.000	0.0	Variable	Unfavourable	No
2	-15.771	7.0000	10.000	0.0	Variable	Unfavourable	No

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 15.00000 m y = 34.00000 m
Inclination of grid: 0.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 1.00000m spacing
                  20 in y direction at 1.00000m spacing
Initial radius of circle 1.00000 m
Incremented by 0.50000 m until all possible circles considered

NOTE on EC7 DA1-1 analyses

The approach used here follows Simpson, B (2011) Concise Eurocodes:
Geotechnical design. BS EN 1997-1: Eurocode 7, Part 1. BSI.
Commenting on EC7 11.5.1(12), this states:
Paragraph (12) makes it clear that no attempt should be made to partition
the sliding mass into favourable and unfavourable ground. Even when
the Design Approach or Combination in use requires different factors on
favourable or unfavourable permanent actions, the weight of the ground
is to be considered as a single source in the terms of 2.4.2(9).

This is at variance with the proposals of Driscoll, R, Scott, P & Powell, J (2008)
EC7 - implications for UK practice. CIRIA Report C641.

WORST CASE

Centre at (23.000m,38.000m) Radius 8.0000m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: 34.315E-9 *Slip weight [kN/m] 0.018501*
Net horiz force [kN/m]: 147.22E-9 Disturbing moment [kN/m]: 0.033623
Restoring moment [kNm/m]: 0.076675
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 2.2804

The system of interslice and base forces are in equilibrium

No.	Limits of loaded area		Distributed load		Permanent / Variable load	Favourable / Unfavourable load	Use in pull-out calc
	X1	X2	Vert	Horiz			

when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	20.982	30.259	-	-27.590	0.0	0.0	0.0
2	20.997	30.255	-27.550	-27.550	-772.54E-9	20.019E-9	0.0
3	21.013	30.251	-27.510	-27.510	-224.65E-9	5.1059E-6	0.0
4	21.028	30.247	-27.470	-27.470	1.6437E-6	15.258E-6	0.0
5	21.043	30.243	-27.430	-27.430	3.5120E-6	25.409E-6	0.0
6	21.059	30.239	-27.390	-27.390	6.7007E-6	40.627E-6	0.0
7	21.074	30.235	-27.350	-27.350	11.210E-6	60.910E-6	0.0
8	21.089	30.231	-27.310	-27.310	17.039E-6	86.260E-6	0.0
9	21.105	30.228	-27.280	-27.280	9.4631E-6	50.528E-6	0.0
10	21.120	30.224	-27.240	-27.240	13.972E-6	70.812E-6	0.0
11	21.135	30.220	-27.200	-27.200	19.802E-6	96.161E-6	0.0
12	21.151	30.217	-27.170	-27.170	12.225E-6	60.429E-6	0.0
13	21.166	30.213	-27.130	-27.130	18.055E-6	85.779E-6	0.0
14	21.181	30.209	-27.090	-27.090	25.205E-6	116.19E-6	0.0
15	21.197	30.206	-27.060	-27.060	16.233E-6	73.320E-6	0.0
16	21.212	30.202	-27.020	-27.020	23.383E-6	103.74E-6	0.0
17	21.228	30.199	-26.990	-26.990	15.806E-6	68.004E-6	0.0
18	21.243	30.195	-26.950	-26.950	21.636E-6	93.353E-6	0.0
19	21.258	30.192	-26.920	-26.920	14.059E-6	57.621E-6	0.0
20	21.274	30.189	-26.890	-26.890	7.8792E-6	29.032E-6	0.0
21	21.289	30.185	-26.850	-26.850	12.388E-6	49.315E-6	0.0
22	21.304	30.182	-26.820	-26.820	7.6044E-6	27.868E-6	0.0
23	21.320	30.178	-26.780	-26.780	10.793E-6	43.085E-6	0.0
24	21.335	30.175	-26.750	-26.750	6.0092E-6	21.638E-6	0.0
25	21.350	30.172	-26.720	-26.720	2.6214E-6	7.3322E-6	0.0
26	21.366	30.169	-26.690	-26.690	629.74E-9	168.67E-9	0.0
27	21.381	30.166	-26.660	-	34.315E-9	147.22E-9	0.0

Slice No.	Strength Parameters c' [kN/m²]	Tan phi	Average Pore Pressure [kN/m²]	Slice Weight [kN/m]	Forces on base [kN/m] Normal	Shear (capacity)	Shear (mobilised)
1	*0.0*	*0.53171*	0.0	*0.0*	752.61E-9	400.17E-9	175.48E-9
2	*0.0*	*0.53171*	0.0	*196.81E-6*	191.20E-6	101.66E-6	44.582E-6
3	*0.0*	*0.53171*	0.0	*393.63E-6*	381.66E-6	202.93E-6	88.988E-6
4	*0.0*	*0.53171*	0.0	*393.63E-6*	381.66E-6	202.93E-6	88.988E-6
5	*0.0*	*0.53171*	0.0	*590.44E-6*	572.11E-6	304.19E-6	133.39E-6
6	*0.0*	*0.53171*	0.0	*787.26E-6*	762.56E-6	405.46E-6	177.80E-6
7	*0.0*	*0.53171*	0.0	*984.07E-6*	953.01E-6	506.72E-6	222.21E-6
8	*0.0*	*0.53171*	0.0	*984.07E-6*	966.37E-6	513.83E-6	225.32E-6
9	*0.0*	*0.53171*	0.0	*787.26E-6*	762.56E-6	405.46E-6	177.80E-6
10	*0.0*	*0.53171*	0.0	*984.07E-6*	953.01E-6	506.72E-6	222.21E-6
11	*0.0*	*0.53171*	0.0	*984.07E-6*	966.37E-6	513.83E-6	225.32E-6
12	*0.0*	*0.53171*	0.0	*984.07E-6*	953.01E-6	506.72E-6	222.21E-6
13	*0.0*	*0.53171*	0.0	*0.0011809*	0.0011435	607.99E-6	266.61E-6
14	*0.0*	*0.53171*	0.0	*0.0011809*	0.0011595	616.53E-6	270.36E-6
15	*0.0*	*0.53171*	0.0	*0.0011809*	0.0011435	607.99E-6	266.61E-6
16	*0.0*	*0.53171*	0.0	*984.07E-6*	966.37E-6	513.83E-6	225.32E-6
17	*0.0*	*0.53171*	0.0	*984.07E-6*	953.01E-6	506.72E-6	222.21E-6
18	*0.0*	*0.53171*	0.0	*984.07E-6*	966.37E-6	513.83E-6	225.32E-6
19	*0.0*	*0.53171*	0.0	*787.26E-6*	773.21E-6	411.12E-6	180.29E-6
20	*0.0*	*0.53171*	0.0	*787.26E-6*	762.56E-6	405.46E-6	177.80E-6
21	*0.0*	*0.53171*	0.0	*590.44E-6*	580.05E-6	308.42E-6	135.25E-6
22	*0.0*	*0.53171*	0.0	*590.44E-6*	572.11E-6	304.19E-6	133.39E-6
23	*0.0*	*0.53171*	0.0	*590.44E-6*	580.05E-6	308.42E-6	135.25E-6
24	*0.0*	*0.53171*	0.0	*393.63E-6*	386.90E-6	205.72E-6	90.210E-6
25	*0.0*	*0.53171*	0.0	*196.81E-6*	193.74E-6	103.01E-6	45.173E-6
26	*0.0*	*0.53171*	0.0	*0.0*	580.25E-9	308.52E-9	135.29E-9

Slice No.	Surface Load [kN/m_hor/m] Vert	Horiz	Point Load [kN/m] Vert	Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Horiz
1	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
2	*0.0*	*0.0*	0.0	0.0	0.0	0.0
3	*0.0*	*0.0*	0.0	0.0	0.0	0.0
4	*0.0*	*0.0*	0.0	0.0	0.0	0.0
5	*0.0*	*0.0*	0.0	0.0	0.0	0.0
6	*0.0*	*0.0*	0.0	0.0	0.0	0.0
7	*0.0*	*0.0*	0.0	0.0	0.0	0.0
8	*0.0*	*0.0*	0.0	0.0	0.0	0.0
9	*0.0*	*0.0*	0.0	0.0	0.0	0.0
10	*0.0*	*0.0*	0.0	0.0	0.0	0.0
11	*0.0*	*0.0*	0.0	0.0	0.0	0.0
12	*0.0*	*0.0*	0.0	0.0	0.0	0.0
13	*0.0*	*0.0*	0.0	0.0	0.0	0.0
14	*0.0*	*0.0*	0.0	0.0	0.0	0.0
15	*0.0*	*0.0*	0.0	0.0	0.0	0.0
16	*0.0*	*0.0*	0.0	0.0	0.0	0.0
17	*0.0*	*0.0*	0.0	0.0	0.0	0.0
18	*0.0*	*0.0*	0.0	0.0	0.0	0.0
19	*0.0*	*0.0*	0.0	0.0	0.0	0.0
20	*0.0*	*0.0*	0.0	0.0	0.0	0.0
21	*0.0*	*0.0*	0.0	0.0	0.0	0.0
22	*0.0*	*0.0*	0.0	0.0	0.0	0.0
23	*0.0*	*0.0*	0.0	0.0	0.0	0.0
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0

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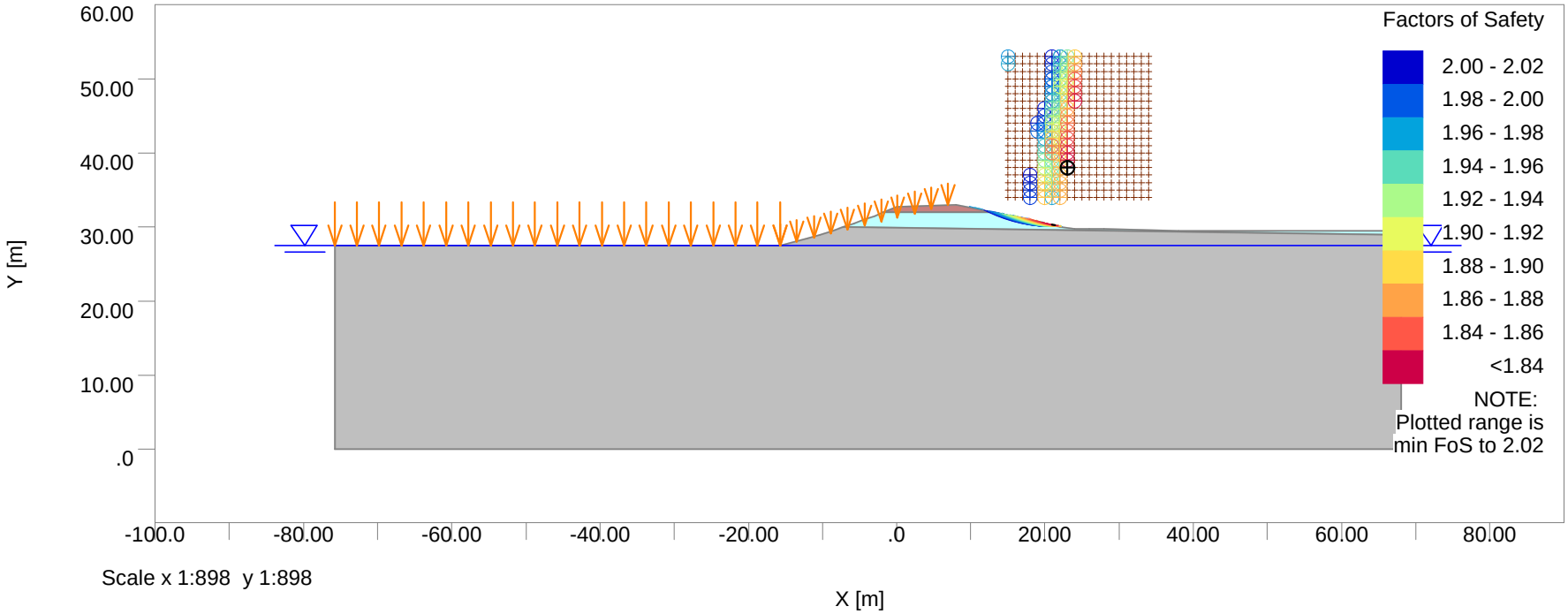
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Drg. Ref.

Made by	Date	Checked	Date
SJ			

Chronton Phase 2
M62 Slope Stability
Section D - ULS2

More than one slip surface shown, minimum factor of 1.824



Scale x 1:898 y 1:898

Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Made Ground	18.000	18.000	Drained	27.000	0.0
2	Glacial Till	19.000	19.000	Drained	28.000	0.0
3	PMCM	21.000	21.000	Drained	32.000	0.0

Surface loads

No.	Limits of loaded area X1 [m]	X2 [m]	Distributed load Vert [kN/m²]	Horiz [kN/m²]	Permanent / Variable load	Favourable / Unfavourable load	Use in pull-out calc
1	-75.771	-15.771	20.000	0.0	Variable	Unfavourable	No
2	-15.771	7.0000	10.000	0.0	Variable	Unfavourable	No

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 15.00000 m y = 34.00000 m
Inclination of grid: 0.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 1.00000m spacing
                  20 in y direction at 1.00000m spacing
Initial radius of circle 1.00000 m
Incremented by 0.50000 m until all possible circles considered

WORST CASE

Centre at (23.000m,38.000m) Radius 8.0000m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: 25.577E-9 *Slip weight [kN/m] 0.013704*
Net horiz force [kN/m]: 109.74E-9 Disturbing moment [kN/m]: 0.024906
Restoring moment [kNm/m]: 0.045437
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 1.8243

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	20.982	30.259	-	-27.590	0.0	0.0	0.0
2	20.997	30.255	-27.550	-27.550	-572.25E-9	14.829E-9	0.0
3	21.013	30.251	-27.510	-27.510	-166.40E-9	3.7822E-6	0.0
4	21.028	30.247	-27.470	-27.470	1.2175E-6	11.302E-6	0.0
5	21.043	30.243	-27.430	-27.430	2.6015E-6	18.822E-6	0.0
6	21.059	30.239	-27.390	-27.390	4.9635E-6	30.094E-6	0.0
7	21.074	30.235	-27.350	-27.350	8.3036E-6	45.119E-6	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
8	21.089	30.231	-27.310	-27.310	12.622E-6	63.896E-6	0.0
9	21.105	30.228	-27.280	-27.280	7.0097E-6	37.428E-6	0.0
10	21.120	30.224	-27.240	-27.240	10.350E-6	52.453E-6	0.0
11	21.135	30.220	-27.200	-27.200	14.668E-6	71.230E-6	0.0
12	21.151	30.217	-27.170	-27.170	9.0560E-6	44.763E-6	0.0
13	21.166	30.213	-27.130	-27.130	13.374E-6	63.540E-6	0.0
14	21.181	30.209	-27.090	-27.090	18.671E-6	86.070E-6	0.0
15	21.197	30.206	-27.060	-27.060	12.024E-6	54.312E-6	0.0
16	21.212	30.202	-27.020	-27.020	17.321E-6	76.841E-6	0.0
17	21.228	30.199	-26.990	-26.990	11.708E-6	50.374E-6	0.0
18	21.243	30.195	-26.950	-26.950	16.027E-6	69.151E-6	0.0
19	21.258	30.192	-26.920	-26.920	10.415E-6	42.683E-6	0.0
20	21.274	30.189	-26.890	-26.890	5.8366E-6	21.506E-6	0.0
21	21.289	30.185	-26.850	-26.850	9.1767E-6	36.530E-6	0.0
22	21.304	30.182	-26.820	-26.820	5.6330E-6	20.643E-6	0.0
23	21.320	30.178	-26.780	-26.780	7.9951E-6	31.916E-6	0.0
24	21.335	30.175	-26.750	-26.750	4.4514E-6	16.029E-6	0.0
25	21.350	30.172	-26.720	-26.720	1.9419E-6	5.4319E-6	0.0
26	21.366	30.169	-26.690	-26.690	466.63E-9	125.63E-9	0.0
27	21.381	30.166	-26.660	-	25.577E-9	109.74E-9	0.0

Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	*0.0*	*0.42537*	0.0	*0.0*	557.49E-9	237.14E-9	129.99E-9
2	*0.0*	*0.42537*	0.0	*145.79E-6*	141.63E-6	60.246E-6	33.024E-6
3	*0.0*	*0.42537*	0.0	*291.58E-6*	282.71E-6	120.25E-6	65.917E-6
4	*0.0*	*0.42537*	0.0	*291.58E-6*	282.71E-6	120.25E-6	65.917E-6
5	*0.0*	*0.42537*	0.0	*437.37E-6*	423.78E-6	180.26E-6	98.811E-6
6	*0.0*	*0.42537*	0.0	*583.15E-6*	564.86E-6	240.27E-6	131.70E-6
7	*0.0*	*0.42537*	0.0	*728.94E-6*	705.93E-6	300.28E-6	164.60E-6
8	*0.0*	*0.42537*	0.0	*728.94E-6*	715.83E-6	304.49E-6	166.91E-6
9	*0.0*	*0.42537*	0.0	*583.15E-6*	564.86E-6	240.27E-6	131.70E-6
10	*0.0*	*0.42537*	0.0	*728.94E-6*	705.93E-6	300.28E-6	164.60E-6
11	*0.0*	*0.42537*	0.0	*728.94E-6*	715.83E-6	304.49E-6	166.91E-6
12	*0.0*	*0.42537*	0.0	*728.94E-6*	705.93E-6	300.28E-6	164.60E-6
13	*0.0*	*0.42537*	0.0	*874.73E-6*	847.01E-6	360.29E-6	197.49E-6
14	*0.0*	*0.42537*	0.0	*874.73E-6*	858.91E-6	365.35E-6	200.27E-6
15	*0.0*	*0.42537*	0.0	*874.73E-6*	847.01E-6	360.29E-6	197.49E-6
16	*0.0*	*0.42537*	0.0	*728.94E-6*	715.83E-6	304.49E-6	166.91E-6
17	*0.0*	*0.42537*	0.0	*728.94E-6*	705.93E-6	300.28E-6	164.60E-6
18	*0.0*	*0.42537*	0.0	*728.94E-6*	715.83E-6	304.49E-6	166.91E-6
19	*0.0*	*0.42537*	0.0	*583.15E-6*	572.75E-6	243.63E-6	133.54E-6
20	*0.0*	*0.42537*	0.0	*583.15E-6*	564.86E-6	240.27E-6	131.70E-6
21	*0.0*	*0.42537*	0.0	*437.37E-6*	429.67E-6	182.77E-6	100.18E-6
22	*0.0*	*0.42537*	0.0	*437.37E-6*	423.78E-6	180.26E-6	98.811E-6
23	*0.0*	*0.42537*	0.0	*437.37E-6*	429.67E-6	182.77E-6	100.18E-6
24	*0.0*	*0.42537*	0.0	*291.58E-6*	286.59E-6	121.91E-6	66.822E-6
25	*0.0*	*0.42537*	0.0	*145.79E-6*	143.51E-6	61.044E-6	33.461E-6
26	*0.0*	*0.42537*	0.0	*0.0*	429.81E-9	182.83E-9	100.22E-9

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	*0.0*	*0.0*	0.0	0.0	0.0	0.0
2	*0.0*	*0.0*	0.0	0.0	0.0	0.0
3	*0.0*	*0.0*	0.0	0.0	0.0	0.0
4	*0.0*	*0.0*	0.0	0.0	0.0	0.0
5	*0.0*	*0.0*	0.0	0.0	0.0	0.0
6	*0.0*	*0.0*	0.0	0.0	0.0	0.0
7	*0.0*	*0.0*	0.0	0.0	0.0	0.0
8	*0.0*	*0.0*	0.0	0.0	0.0	0.0
9	*0.0*	*0.0*	0.0	0.0	0.0	0.0
10	*0.0*	*0.0*	0.0	0.0	0.0	0.0
11	*0.0*	*0.0*	0.0	0.0	0.0	0.0
12	*0.0*	*0.0*	0.0	0.0	0.0	0.0
13	*0.0*	*0.0*	0.0	0.0	0.0	0.0
14	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
15	*0.0*	*0.0*	0.0	0.0	0.0	0.0
16	*0.0*	*0.0*	0.0	0.0	0.0	0.0
17	*0.0*	*0.0*	0.0	0.0	0.0	0.0
18	*0.0*	*0.0*	0.0	0.0	0.0	0.0
19	*0.0*	*0.0*	0.0	0.0	0.0	0.0
20	*0.0*	*0.0*	0.0	0.0	0.0	0.0
21	*0.0*	*0.0*	0.0	0.0	0.0	0.0
22	*0.0*	*0.0*	0.0	0.0	0.0	0.0
23	*0.0*	*0.0*	0.0	0.0	0.0	0.0
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys

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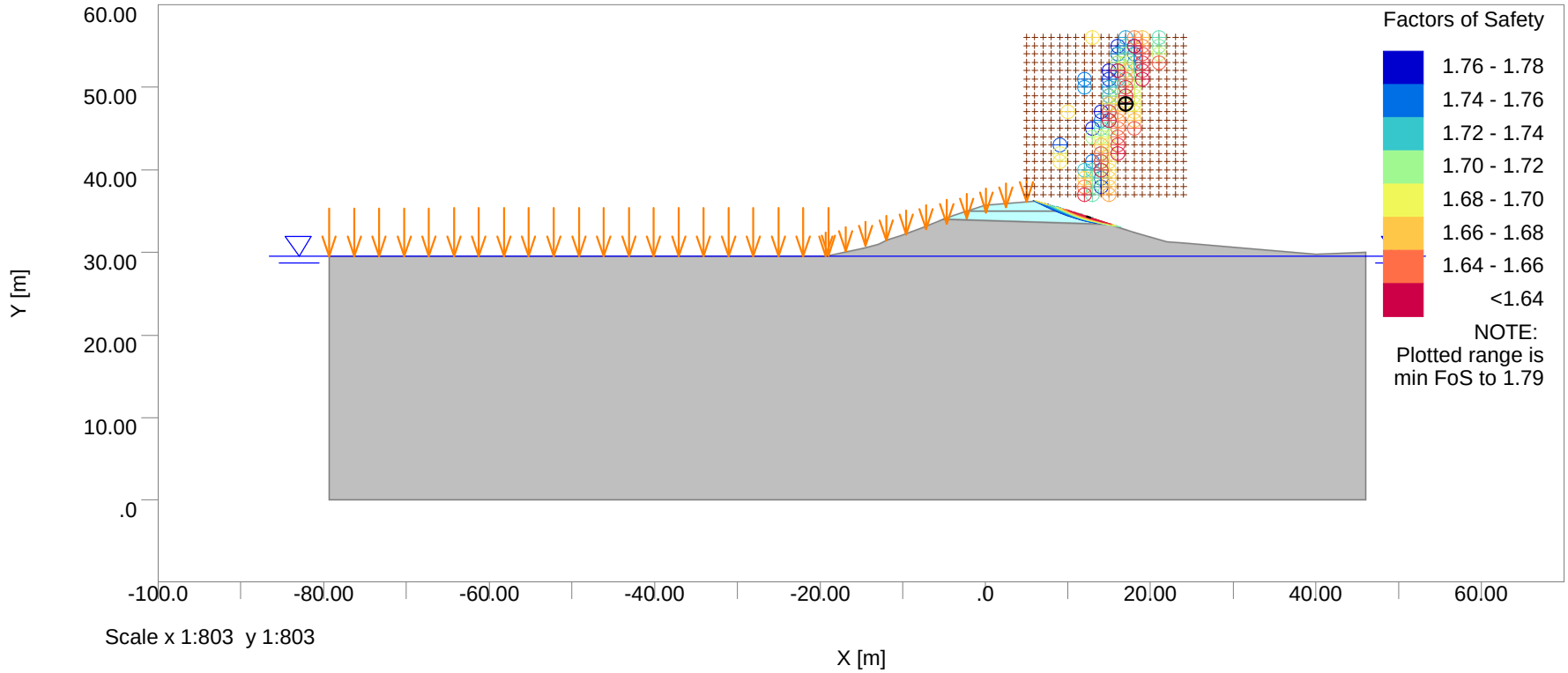
Cronton Phase 2
M62 Slope Stability

Job No.	Sheet No.	Rev.
2701		

Drg. Ref.

Made by	Date	Checked	Date
SJ			

More than one slip surface shown, minimum factor of 1.638



Scale x 1:803 y 1:803

Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Factor of safety on: SHEAR STRENGTH
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Made Ground	18.000	18.000	Drained	27.000	0.0
2	Glacial Till	19.000	19.000	Drained	28.000	0.0
3	PMCM	21.000	21.000	Drained	32.000	0.0

Surface loads

No.	Limits of loaded area X1 [m]	X2 [m]	Distributed load Vert [kN/m²]	Horiz [kN/m²]	Permanent / Variable load	Favourable / Unfavourable load	Use in pull-out calc
1	-79.300	-19.035	20.000	0.0	Variable	N/A	No
2	-19.349	5.0000	10.000	0.0	Variable	N/A	No

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 5.00000 m y = 37.00000 m
Inclination of grid: 0.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 1.00000m spacing
                  20 in y direction at 1.00000m spacing
Initial radius of circle 1.00000 m
Incremented by 0.50000 m until all possible circles considered

WORST CASE

Centre at (17.000m,48.000m) Radius 14.500m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: -12.858E-9 *Slip weight [kN/m] 0.0090279*
Net horiz force [kN/m]: -39.398E-9 Disturbing moment [kN/m]: 0.040437
Restoring moment [kNm/m]: 0.066223
Reinf.Rest.Moment [kNm/m]: 0.0
Factor of Safety: 1.6377

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
factor of safety. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	12.312	34.279	-	-47.790	0.0	0.0	0.0
2	12.328	34.273	-47.730	-47.730	-278.89E-9	10.350E-9	0.0
3	12.345	34.268	-47.680	-47.680	-519.67E-9	6.0759E-9	0.0
4	12.361	34.262	-47.620	-47.620	1.2884E-6	5.7155E-6	0.0
5	12.378	34.257	-47.570	-47.570	-647.86E-9	155.21E-9	0.0
6	12.394	34.251	-47.510	-47.510	3.2472E-6	11.564E-6	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
7	12.410	34.246	-47.460	-47.460	1.3109E-6	6.0034E-6	0.0
8	12.427	34.240	-47.400	-47.400	7.2930E-6	23.111E-6	0.0
9	12.443	34.235	-47.350	-47.350	4.5089E-6	14.773E-6	0.0
10	12.459	34.229	-47.290	-47.290	10.491E-6	31.880E-6	0.0
11	12.476	34.224	-47.240	-47.240	6.8592E-6	20.764E-6	0.0
12	12.492	34.218	-47.180	-47.180	14.928E-6	43.570E-6	0.0
13	12.509	34.213	-47.130	-47.130	11.296E-6	32.454E-6	0.0
14	12.525	34.208	-47.080	-47.080	7.6647E-6	21.338E-6	0.0
15	12.541	34.203	-47.030	-47.030	4.8807E-6	13.000E-6	0.0
16	12.558	34.197	-46.970	-46.970	10.863E-6	30.107E-6	0.0
17	12.574	34.192	-46.920	-46.920	7.2310E-6	18.991E-6	0.0
18	12.591	34.187	-46.870	-46.870	4.4469E-6	10.653E-6	0.0
19	12.607	34.182	-46.820	-46.820	2.5107E-6	5.0924E-6	0.0
20	12.623	34.176	-46.760	-46.760	8.4927E-6	22.200E-6	0.0
21	12.640	34.171	-46.710	-46.710	5.7087E-6	13.862E-6	0.0
22	12.656	34.166	-46.660	-46.660	3.7724E-6	8.3013E-6	0.0
23	12.672	34.161	-46.610	-46.610	1.8361E-6	2.7411E-6	0.0
24	12.689	34.156	-46.560	-46.560	747.60E-9	-41.199E-9	0.0
25	12.705	34.151	-46.510	-46.510	506.82E-9	-45.474E-9	0.0
26	12.722	34.146	-46.460	-46.460	266.03E-9	-49.748E-9	0.0
27	12.738	34.140	-46.400	-	-12.858E-9	-39.398E-9	0.0

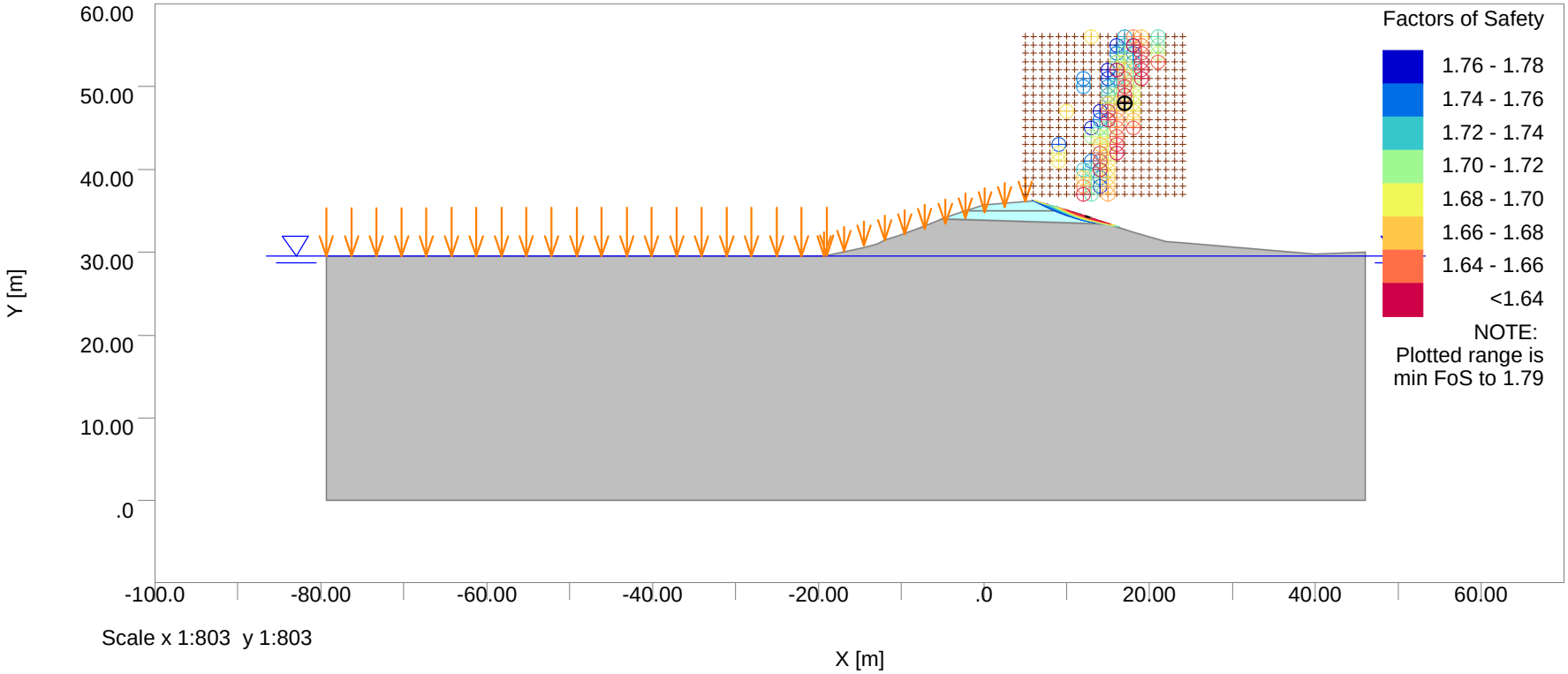
Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	*0.0*	*0.53171*	0.0	*0.0*	265.44E-9	141.14E-9	86.182E-9
2	*0.0*	*0.53171*	0.0	*0.0*	229.05E-9	121.79E-9	74.367E-9
3	*0.0*	*0.53171*	0.0	*155.65E-6*	146.43E-6	77.857E-6	47.541E-6
4	*0.0*	*0.53171*	0.0	*311.31E-6*	297.98E-6	158.44E-6	96.747E-6
5	*0.0*	*0.53171*	0.0	*311.31E-6*	292.59E-6	155.57E-6	94.996E-6
6	*0.0*	*0.53171*	0.0	*311.31E-6*	297.98E-6	158.44E-6	96.747E-6
7	*0.0*	*0.53171*	0.0	*466.96E-6*	438.75E-6	233.29E-6	142.45E-6
8	*0.0*	*0.53171*	0.0	*466.96E-6*	446.86E-6	237.60E-6	145.08E-6
9	*0.0*	*0.53171*	0.0	*466.96E-6*	438.75E-6	233.29E-6	142.45E-6
10	*0.0*	*0.53171*	0.0	*622.62E-6*	595.73E-6	316.76E-6	193.42E-6
11	*0.0*	*0.53171*	0.0	*622.62E-6*	584.91E-6	311.00E-6	189.91E-6
12	*0.0*	*0.53171*	0.0	*622.62E-6*	595.73E-6	316.76E-6	193.42E-6
13	*0.0*	*0.53171*	0.0	*622.62E-6*	595.73E-6	316.76E-6	193.42E-6
14	*0.0*	*0.53171*	0.0	*466.96E-6*	446.86E-6	237.60E-6	145.08E-6
15	*0.0*	*0.53171*	0.0	*466.96E-6*	438.75E-6	233.29E-6	142.45E-6
16	*0.0*	*0.53171*	0.0	*622.62E-6*	595.73E-6	316.76E-6	193.42E-6
17	*0.0*	*0.53171*	0.0	*466.96E-6*	446.86E-6	237.60E-6	145.08E-6
18	*0.0*	*0.53171*	0.0	*311.31E-6*	297.98E-6	158.44E-6	96.747E-6
19	*0.0*	*0.53171*	0.0	*466.96E-6*	438.75E-6	233.29E-6	142.45E-6
20	*0.0*	*0.53171*	0.0	*466.96E-6*	446.86E-6	237.60E-6	145.08E-6
21	*0.0*	*0.53171*	0.0	*311.31E-6*	297.98E-6	158.44E-6	96.747E-6
22	*0.0*	*0.53171*	0.0	*311.31E-6*	297.98E-6	158.44E-6	96.747E-6
23	*0.0*	*0.53171*	0.0	*155.65E-6*	149.11E-6	79.281E-6	48.411E-6
24	*0.0*	*0.53171*	0.0	*0.0*	229.05E-9	121.79E-9	74.367E-9
25	*0.0*	*0.53171*	0.0	*0.0*	229.05E-9	121.79E-9	74.367E-9
26	*0.0*	*0.53171*	0.0	*0.0*	265.44E-9	141.14E-9	86.182E-9

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	*0.0*	*0.0*	0.0	0.0	0.0	0.0
2	*0.0*	*0.0*	0.0	0.0	0.0	0.0
3	*0.0*	*0.0*	0.0	0.0	0.0	0.0
4	*0.0*	*0.0*	0.0	0.0	0.0	0.0
5	*0.0*	*0.0*	0.0	0.0	0.0	0.0
6	*0.0*	*0.0*	0.0	0.0	0.0	0.0
7	*0.0*	*0.0*	0.0	0.0	0.0	0.0
8	*0.0*	*0.0*	0.0	0.0	0.0	0.0
9	*0.0*	*0.0*	0.0	0.0	0.0	0.0
10	*0.0*	*0.0*	0.0	0.0	0.0	0.0
11	*0.0*	*0.0*	0.0	0.0	0.0	0.0
12	*0.0*	*0.0*	0.0	0.0	0.0	0.0
13	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
14	*0.0*	*0.0*	0.0	0.0	0.0	0.0
15	*0.0*	*0.0*	0.0	0.0	0.0	0.0
16	*0.0*	*0.0*	0.0	0.0	0.0	0.0
17	*0.0*	*0.0*	0.0	0.0	0.0	0.0
18	*0.0*	*0.0*	0.0	0.0	0.0	0.0
19	*0.0*	*0.0*	0.0	0.0	0.0	0.0
20	*0.0*	*0.0*	0.0	0.0	0.0	0.0
21	*0.0*	*0.0*	0.0	0.0	0.0	0.0
22	*0.0*	*0.0*	0.0	0.0	0.0	0.0
23	*0.0*	*0.0*	0.0	0.0	0.0	0.0
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys	**BYLAND ENGINEERINGLIMITED**	Job No. **2701**	Sheet No.	Rev.
Cronton Phase 2 M62 Slope Stability Section E - ULS1		Drg. Ref.		
		Made by SJ	Date	Checked	Date

More than one slip surface shown, minimum factor of 1.638



Scale x 1:803 y 1:803

Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Made Ground	18.000	18.000	Drained	27.000	0.0
2	Glacial Till	19.000	19.000	Drained	28.000	0.0
3	PMCM	21.000	21.000	Drained	32.000	0.0

Surface loads

No.	Limits of loaded area X1 [m]	X2 [m]	Distributed load Vert [kN/m²]	Horiz [kN/m²]	Permanent / Variable load	Favourable / Unfavourable load	Use in pull-out calc
1	-79.300	-19.035	20.000	0.0	Variable	Unfavourable	No
2	-19.349	5.0000	10.000	0.0	Variable	Unfavourable	No

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 5.00000 m y = 37.00000 m
Inclination of grid: 0.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 1.00000m spacing
                  20 in y direction at 1.00000m spacing
Initial radius of circle 1.00000 m
Incremented by 0.50000 m until all possible circles considered

NOTE on EC7 DA1-1 analyses

The approach used here follows Simpson, B (2011) Concise Eurocodes:
Geotechnical design. BS EN 1997-1: Eurocode 7, Part 1. BSI.
Commenting on EC7 11.5.1(12), this states:
Paragraph (12) makes it clear that no attempt should be made to partition the sliding mass into favourable and unfavourable ground. Even when the Design Approach or Combination in use requires different factors on favourable or unfavourable permanent actions, the weight of the ground is to be considered as a single source in the terms of 2.4.2(9).

This is at variance with the proposals of Driscoll, R, Scott, P & Powell, J (2008) EC7 - implications for UK practice. CIRIA Report C641.

WORST CASE

Centre at (17.000m,48.000m) Radius 14.500m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: -17.275E-9 *Slip weight [kN/m] 0.012188*
Net horiz force [kN/m]: -52.942E-9 Disturbing moment [kN/m]: 0.054591
Restoring moment [kNm/m]: 0.089402
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 1.6377

No.	Limits of loaded area		Distributed load		Permanent / Variable load	Favourable / Unfavourable load	Use in pull-out calc
	X1	X2	Vert	Horiz			

The system of interslice and base forces are in equilibrium when the strengths available at the bases are divided by the computed over-design factor. The interslice forces shown in the following table are in equilibrium with the factored strengths of the soil at the bases of slices.

Slice Point	Slip surface coordinates x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	12.312	34.279	-	-47.790	0.0	0.0	0.0
2	12.328	34.273	-47.730	-47.730	-376.50E-9	13.972E-9	0.0
3	12.345	34.268	-47.680	-47.680	-701.56E-9	8.2025E-9	0.0
4	12.361	34.262	-47.620	-47.620	1.7394E-6	7.7159E-6	0.0
5	12.378	34.257	-47.570	-47.570	-874.61E-9	209.54E-9	0.0
6	12.394	34.251	-47.510	-47.510	4.3837E-6	15.611E-6	0.0
7	12.410	34.246	-47.460	-47.460	1.7698E-6	8.1046E-6	0.0
8	12.427	34.240	-47.400	-47.400	9.8455E-6	31.200E-6	0.0
9	12.443	34.235	-47.350	-47.350	6.0871E-6	19.943E-6	0.0
10	12.459	34.229	-47.290	-47.290	14.163E-6	43.038E-6	0.0
11	12.476	34.224	-47.240	-47.240	9.2600E-6	28.031E-6	0.0
12	12.492	34.218	-47.180	-47.180	20.153E-6	58.820E-6	0.0
13	12.509	34.213	-47.130	-47.130	15.250E-6	43.813E-6	0.0
14	12.525	34.208	-47.080	-47.080	10.347E-6	28.806E-6	0.0
15	12.541	34.203	-47.030	-47.030	6.5890E-6	17.550E-6	0.0
16	12.558	34.197	-46.970	-46.970	14.665E-6	40.645E-6	0.0
17	12.574	34.192	-46.920	-46.920	9.7619E-6	25.638E-6	0.0
18	12.591	34.187	-46.870	-46.870	6.0034E-6	14.381E-6	0.0
19	12.607	34.182	-46.820	-46.820	3.3895E-6	6.8749E-6	0.0
20	12.623	34.176	-46.760	-46.760	11.465E-6	29.970E-6	0.0
21	12.640	34.171	-46.710	-46.710	7.7068E-6	18.713E-6	0.0
22	12.656	34.166	-46.660	-46.660	5.0928E-6	11.207E-6	0.0
23	12.672	34.161	-46.610	-46.610	2.4789E-6	3.7007E-6	0.0
24	12.689	34.156	-46.560	-46.560	1.0093E-6	-55.374E-9	0.0
25	12.705	34.151	-46.510	-46.510	684.28E-9	-61.144E-9	0.0
26	12.722	34.146	-46.460	-46.460	359.23E-9	-66.914E-9	0.0
27	12.738	34.140	-46.400	-	-17.275E-9	-52.942E-9	0.0

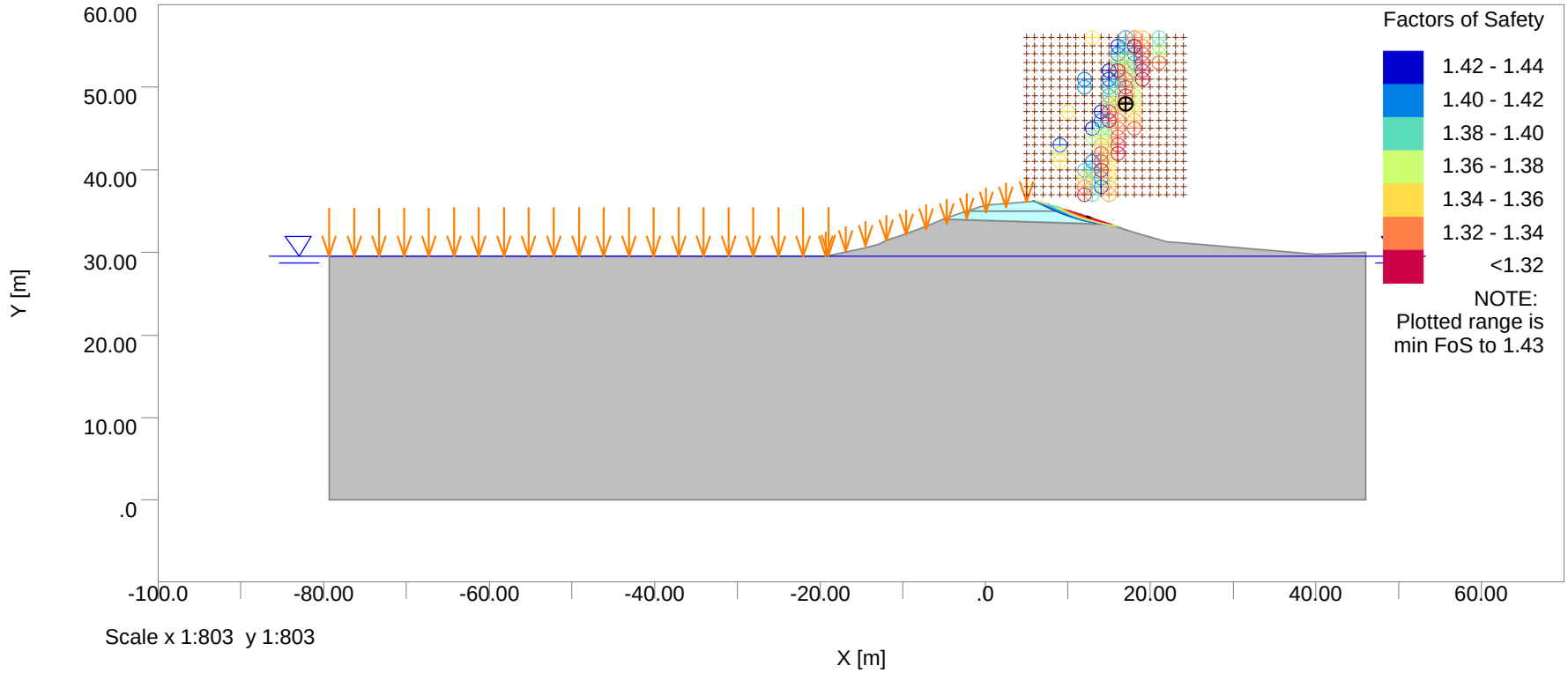
Slice No.	Strength Parameters c' [kN/m²]	Tan phi	Average Pore Pressure [kN/m²]	Slice Weight [kN/m]	Forces on base [kN/m] Normal	Shear (capacity)	Shear (mobilised)
1	*0.0*	*0.53171*	0.0	*0.0*	358.35E-9	190.54E-9	116.35E-9
2	*0.0*	*0.53171*	0.0	*0.0*	309.22E-9	164.42E-9	100.40E-9
3	*0.0*	*0.53171*	0.0	*210.13E-6*	197.68E-6	105.11E-6	64.180E-6
4	*0.0*	*0.53171*	0.0	*420.27E-6*	402.27E-6	213.89E-6	130.61E-6
5	*0.0*	*0.53171*	0.0	*420.27E-6*	395.00E-6	210.02E-6	128.24E-6
6	*0.0*	*0.53171*	0.0	*420.27E-6*	402.27E-6	213.89E-6	130.61E-6
7	*0.0*	*0.53171*	0.0	*630.40E-6*	592.31E-6	314.94E-6	192.31E-6
8	*0.0*	*0.53171*	0.0	*630.40E-6*	603.26E-6	320.76E-6	195.86E-6
9	*0.0*	*0.53171*	0.0	*630.40E-6*	592.31E-6	314.94E-6	192.31E-6
10	*0.0*	*0.53171*	0.0	*840.53E-6*	804.24E-6	427.62E-6	261.12E-6
11	*0.0*	*0.53171*	0.0	*840.53E-6*	789.63E-6	419.86E-6	256.37E-6
12	*0.0*	*0.53171*	0.0	*840.53E-6*	804.24E-6	427.62E-6	261.12E-6
13	*0.0*	*0.53171*	0.0	*840.53E-6*	804.24E-6	427.62E-6	261.12E-6
14	*0.0*	*0.53171*	0.0	*630.40E-6*	603.26E-6	320.76E-6	195.86E-6
15	*0.0*	*0.53171*	0.0	*630.40E-6*	592.31E-6	314.94E-6	192.31E-6
16	*0.0*	*0.53171*	0.0	*840.53E-6*	804.24E-6	427.62E-6	261.12E-6
17	*0.0*	*0.53171*	0.0	*630.40E-6*	603.26E-6	320.76E-6	195.86E-6
18	*0.0*	*0.53171*	0.0	*420.27E-6*	402.27E-6	213.89E-6	130.61E-6
19	*0.0*	*0.53171*	0.0	*630.40E-6*	592.31E-6	314.94E-6	192.31E-6
20	*0.0*	*0.53171*	0.0	*630.40E-6*	603.26E-6	320.76E-6	195.86E-6
21	*0.0*	*0.53171*	0.0	*420.27E-6*	402.27E-6	213.89E-6	130.61E-6
22	*0.0*	*0.53171*	0.0	*420.27E-6*	402.27E-6	213.89E-6	130.61E-6
23	*0.0*	*0.53171*	0.0	*210.13E-6*	201.29E-6	107.03E-6	65.354E-6
24	*0.0*	*0.53171*	0.0	*0.0*	309.22E-9	164.42E-9	100.40E-9
25	*0.0*	*0.53171*	0.0	*0.0*	309.22E-9	164.42E-9	100.40E-9
26	*0.0*	*0.53171*	0.0	*0.0*	358.35E-9	190.54E-9	116.35E-9

Slice No.	Surface Load [kN/m_hor/m] Vert	Horiz	Point Load [kN/m] Vert	Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Horiz

Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
1	*0.0*	*0.0*	0.0	0.0	0.0	0.0
2	*0.0*	*0.0*	0.0	0.0	0.0	0.0
3	*0.0*	*0.0*	0.0	0.0	0.0	0.0
4	*0.0*	*0.0*	0.0	0.0	0.0	0.0
5	*0.0*	*0.0*	0.0	0.0	0.0	0.0
6	*0.0*	*0.0*	0.0	0.0	0.0	0.0
7	*0.0*	*0.0*	0.0	0.0	0.0	0.0
8	*0.0*	*0.0*	0.0	0.0	0.0	0.0
9	*0.0*	*0.0*	0.0	0.0	0.0	0.0
10	*0.0*	*0.0*	0.0	0.0	0.0	0.0
11	*0.0*	*0.0*	0.0	0.0	0.0	0.0
12	*0.0*	*0.0*	0.0	0.0	0.0	0.0
13	*0.0*	*0.0*	0.0	0.0	0.0	0.0
14	*0.0*	*0.0*	0.0	0.0	0.0	0.0
15	*0.0*	*0.0*	0.0	0.0	0.0	0.0
16	*0.0*	*0.0*	0.0	0.0	0.0	0.0
17	*0.0*	*0.0*	0.0	0.0	0.0	0.0
18	*0.0*	*0.0*	0.0	0.0	0.0	0.0
19	*0.0*	*0.0*	0.0	0.0	0.0	0.0
20	*0.0*	*0.0*	0.0	0.0	0.0	0.0
21	*0.0*	*0.0*	0.0	0.0	0.0	0.0
22	*0.0*	*0.0*	0.0	0.0	0.0	0.0
23	*0.0*	*0.0*	0.0	0.0	0.0	0.0
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys	**BYLAND ENGINEERINGLIMITED**	Job No.	Sheet No. / Rev.
Cronton Phase 2 M62 Slope Stability Section E - ULS2		**2701**	
		Drg. Ref.	
		Made by SJ / Date	Checked / Date

More than one slip surface shown, minimum factor of 1.310



Scale x 1:803 y 1:803

Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or c or c0' [°]	Phi0 [kN/m²]
1	Made Ground	18.000	18.000	Drained	27.000	0.0
2	Glacial Till	19.000	19.000	Drained	28.000	0.0
3	PMCM	21.000	21.000	Drained	32.000	0.0

Surface loads

No.	Limits of loaded area X1 [m]	X2 [m]	Distributed load Vert [kN/m²]	Horiz [kN/m²]	Permanent / Variable load	Favourable / Unfavourable load	Use in pull-out calc
1	-79.300	-19.035	20.000	0.0	Variable	Unfavourable	No
2	-19.349	5.0000	10.000	0.0	Variable	Unfavourable	No

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 5.00000 m y = 37.00000 m
Inclination of grid: 0.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 1.00000m spacing
                  20 in y direction at 1.00000m spacing
Initial radius of circle 1.00000 m
Incremented by 0.50000 m until all possible circles considered

WORST CASE

Centre at (17.000m,48.000m) Radius 14.500m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: -12.798E-9 *Slip weight [kN/m] 0.0090279*
Net horiz force [kN/m]: -39.237E-9 Disturbing moment [kN/m]: 0.040437
Restoring moment [kNm/m]: 0.052979
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 1.3101

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	12.312	34.279	-	-47.790	0.0	0.0	0.0
2	12.328	34.273	-47.730	-47.730	-278.89E-9	10.350E-9	0.0
3	12.345	34.268	-47.680	-47.680	-519.67E-9	6.0759E-9	0.0
4	12.361	34.262	-47.620	-47.620	1.2884E-6	5.7155E-6	0.0
5	12.378	34.257	-47.570	-47.570	-647.86E-9	155.22E-9	0.0
6	12.394	34.251	-47.510	-47.510	3.2472E-6	11.564E-6	0.0

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
7	12.410	34.246	-47.460	-47.460	1.3109E-6	6.0034E-6	0.0
8	12.427	34.240	-47.400	-47.400	7.2930E-6	23.111E-6	0.0
9	12.443	34.235	-47.350	-47.350	4.5090E-6	14.773E-6	0.0
10	12.459	34.229	-47.290	-47.290	10.491E-6	31.880E-6	0.0
11	12.476	34.224	-47.240	-47.240	6.8592E-6	20.764E-6	0.0
12	12.492	34.218	-47.180	-47.180	14.928E-6	43.571E-6	0.0
13	12.509	34.213	-47.130	-47.130	11.296E-6	32.454E-6	0.0
14	12.525	34.208	-47.080	-47.080	7.6647E-6	21.338E-6	0.0
15	12.541	34.203	-47.030	-47.030	4.8807E-6	13.000E-6	0.0
16	12.558	34.197	-46.970	-46.970	10.863E-6	30.107E-6	0.0
17	12.574	34.192	-46.920	-46.920	7.2310E-6	18.991E-6	0.0
18	12.591	34.187	-46.870	-46.870	4.4470E-6	10.653E-6	0.0
19	12.607	34.182	-46.820	-46.820	2.5107E-6	5.0925E-6	0.0
20	12.623	34.176	-46.760	-46.760	8.4928E-6	22.200E-6	0.0
21	12.640	34.171	-46.710	-46.710	5.7087E-6	13.862E-6	0.0
22	12.656	34.166	-46.660	-46.660	3.7725E-6	8.3015E-6	0.0
23	12.672	34.161	-46.610	-46.610	1.8362E-6	2.7412E-6	0.0
24	12.689	34.156	-46.560	-46.560	747.66E-9	-41.039E-9	0.0
25	12.705	34.151	-46.510	-46.510	506.88E-9	-45.313E-9	0.0
26	12.722	34.146	-46.460	-46.460	266.09E-9	-49.587E-9	0.0
27	12.738	34.140	-46.400	-	-12.798E-9	-39.237E-9	0.0

Slice No.	Strength Parameters c' [kN/m²]	Tan phi	Average Pore Pressure [kN/m²]	Slice Weight [kN/m]	Forces on base [kN/m] Normal	Shear (capacity)	Shear (mobilised)
1	*0.0*	*0.42537*	0.0	*0.0*	265.44E-9	112.91E-9	86.182E-9
2	*0.0*	*0.42537*	0.0	*0.0*	229.05E-9	97.431E-9	74.367E-9
3	*0.0*	*0.42537*	0.0	*155.65E-6*	146.43E-6	62.285E-6	47.541E-6
4	*0.0*	*0.42537*	0.0	*311.31E-6*	297.98E-6	126.75E-6	96.747E-6
5	*0.0*	*0.42537*	0.0	*311.31E-6*	292.59E-6	124.46E-6	94.996E-6
6	*0.0*	*0.42537*	0.0	*311.31E-6*	297.98E-6	126.75E-6	96.747E-6
7	*0.0*	*0.42537*	0.0	*466.96E-6*	438.75E-6	186.63E-6	142.45E-6
8	*0.0*	*0.42537*	0.0	*466.96E-6*	446.86E-6	190.08E-6	145.08E-6
9	*0.0*	*0.42537*	0.0	*466.96E-6*	438.75E-6	186.63E-6	142.45E-6
10	*0.0*	*0.42537*	0.0	*622.62E-6*	595.73E-6	253.41E-6	193.42E-6
11	*0.0*	*0.42537*	0.0	*622.62E-6*	584.91E-6	248.80E-6	189.91E-6
12	*0.0*	*0.42537*	0.0	*622.62E-6*	595.73E-6	253.41E-6	193.42E-6
13	*0.0*	*0.42537*	0.0	*622.62E-6*	595.73E-6	253.41E-6	193.42E-6
14	*0.0*	*0.42537*	0.0	*466.96E-6*	446.86E-6	190.08E-6	145.08E-6
15	*0.0*	*0.42537*	0.0	*466.96E-6*	438.75E-6	186.63E-6	142.45E-6
16	*0.0*	*0.42537*	0.0	*622.62E-6*	595.73E-6	253.41E-6	193.42E-6
17	*0.0*	*0.42537*	0.0	*466.96E-6*	446.86E-6	190.08E-6	145.08E-6
18	*0.0*	*0.42537*	0.0	*311.31E-6*	297.98E-6	126.75E-6	96.747E-6
19	*0.0*	*0.42537*	0.0	*466.96E-6*	438.75E-6	186.63E-6	142.45E-6
20	*0.0*	*0.42537*	0.0	*466.96E-6*	446.86E-6	190.08E-6	145.08E-6
21	*0.0*	*0.42537*	0.0	*311.31E-6*	297.98E-6	126.75E-6	96.747E-6
22	*0.0*	*0.42537*	0.0	*311.31E-6*	297.98E-6	126.75E-6	96.747E-6
23	*0.0*	*0.42537*	0.0	*155.65E-6*	149.11E-6	63.424E-6	48.410E-6
24	*0.0*	*0.42537*	0.0	*0.0*	229.05E-9	97.431E-9	74.367E-9
25	*0.0*	*0.42537*	0.0	*0.0*	229.05E-9	97.431E-9	74.367E-9
26	*0.0*	*0.42537*	0.0	*0.0*	265.44E-9	112.91E-9	86.182E-9

Slice No.	Surface Load [kN/m_hor/m] Vert	Horiz	Point Load [kN/m] Vert	Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Horiz
1	*0.0*	*0.0*	0.0	0.0	0.0	0.0
2	*0.0*	*0.0*	0.0	0.0	0.0	0.0
3	*0.0*	*0.0*	0.0	0.0	0.0	0.0
4	*0.0*	*0.0*	0.0	0.0	0.0	0.0
5	*0.0*	*0.0*	0.0	0.0	0.0	0.0
6	*0.0*	*0.0*	0.0	0.0	0.0	0.0
7	*0.0*	*0.0*	0.0	0.0	0.0	0.0
8	*0.0*	*0.0*	0.0	0.0	0.0	0.0
9	*0.0*	*0.0*	0.0	0.0	0.0	0.0
10	*0.0*	*0.0*	0.0	0.0	0.0	0.0
11	*0.0*	*0.0*	0.0	0.0	0.0	0.0
12	*0.0*	*0.0*	0.0	0.0	0.0	0.0
13	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
14	*0.0*	*0.0*	0.0	0.0	0.0	0.0
15	*0.0*	*0.0*	0.0	0.0	0.0	0.0
16	*0.0*	*0.0*	0.0	0.0	0.0	0.0
17	*0.0*	*0.0*	0.0	0.0	0.0	0.0
18	*0.0*	*0.0*	0.0	0.0	0.0	0.0
19	*0.0*	*0.0*	0.0	0.0	0.0	0.0
20	*0.0*	*0.0*	0.0	0.0	0.0	0.0
21	*0.0*	*0.0*	0.0	0.0	0.0	0.0
22	*0.0*	*0.0*	0.0	0.0	0.0	0.0
23	*0.0*	*0.0*	0.0	0.0	0.0	0.0
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0