BETTS HYDRO
CONSULTING ENGINEERS

FORMER GLEN DIMPLEX
STONEY LANE
WHISTON

DRAINAGE MANAGEMENT STRATEGY



For

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Taylor Wimpey

AUGUST 2026

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WHISTON

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EXECUTIVE SUMMARY

This Drainage Management Strategy was commissioned by Taylor Wimpey, referred to hereafter as 'the client'. This report has been prepared to support a planning application for the construction of 204 no. residential dwellings on land located at the Former Glen Dimplex, Stoney Lane, Whiston site.

This assessment has been completed in accordance with the National Planning Policy Framework and Planning Practice Guidance to consider the most appropriate sustainable drainage options for the proposals, in line with the National Standards for Sustainable Drainage Systems (July 2025). Five methods have been reviewed for the management and discharge of surface water; these may be applied individually or collectively and have been considered in order of priority, as follows.

Rainwater harvesting is not considered viable at plot or estate scale, due to practical and financial constraints. Rainwater butts are, however, proposed to encourage small-scale water reuse.

Infiltration has been discounted as a drainage solution, in part or in full. The site has a documented history of contaminative industrial use, and ground investigation has confirmed contamination within the Made Ground and groundwater, including volatile organic compounds and localised heavy metal contamination. Groundwater has been recorded at shallow depth across parts of the site, and the site lies within Environment Agency Source Protection Zone 3 (SPZ3), overlying a Principal Aquifer. Introducing infiltration-based drainage in these conditions would risk mobilising existing contamination and increasing its migration towards this sensitive aquifer receptor, and infiltration has therefore been excluded on environmental as well as ground condition grounds.

No open or above-ground watercourses exist within proximity of the site suitable to receive a new direct discharge. This option has therefore been discounted.

A former culverted watercourse is located onsite to the east, running through the existing Glen Dimplex car park before heading south. A CCTV survey undertaken by Taylor Wimpey in July 2026 confirmed that this culverted watercourse has been abandoned, with the line obstructed by 100% concrete or other hardened material. The watercourse is therefore confirmed to be redundant, and all culverted sections will be removed from the site as part of the proposals. An onsite culverted watercourse is located within the south of the site and flows south ultimately outfalling to Whiston Brook. As infiltration is not a suitable drainage solution, the proposals are to mimic the existing regime and discharge post-development to the onsite culverted watercourse via new MH32 to the south of the site. A Preliminary Drainage Layout has been prepared by Betts Associates to demonstrate the feasibility of the proposals.

A below-ground pipe network will be used for conveyance, supplemented by above-ground attenuation within the basin shown on the planning layout. The proposals incorporate lined Filter Drains to serve plot-level driveway and roof water run-off, together with an Interception Drain along the southern site boundary, providing source control and treatment ahead of the attenuation basin, in addition to water quality, biodiversity and amenity benefits. A Water Quality Assessment has been prepared, considering the existing (commercial) and proposed (residential) use of the site, and demonstrates more than sufficient treatment site-wide as a result of the proposed SuDS components.

In accordance with the SuDS Manual (CIRIA) and the National Standards for Sustainable Drainage Systems (June 2025), all sites should endeavour to achieve as close to pre-development greenfield rates as is viable. Based on the development area, the pre-development greenfield rate (QBar) is calculated to be 42.4 l/s (based on 7.5 l/s/ha). The LLFA (Knowsley Metropolitan Borough Council) will also need to agree to the proposed rates of discharge as part of their approval.

The surface water scheme for this development will be designed to cater for the surface water run-off generated in events up to and including the 1 in 100-year return period event, with a 45% allowance for climate change. Restricting the overall rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. Detailed design will determine with accuracy the attenuation requirements in due course.

This Drainage Management Strategy has been prepared in consultation with the relevant interested parties. The report is commensurate with the scale and nature of the development, and the development is considered appropriate in accordance with the National Standards for SuDS.

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Specialist Software

- MicroDrainage WinDES (v.2020.1.3) – Calculation of Greenfield run-off volumes, rates of rainfall and stormwater storage estimates.

Abbreviations & Acronyms

AEP	Annual Exceedance Probability
CC	Climate Change
EA	Environment Agency
FRA	Flood Risk Assessment
KMBC	Knowsley Metropolitan Borough Council
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	Metres Above Ordnance Datum
NPPF	National Planning Policy Framework
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
SFRA	Strategic Flood Risk Assessment
TWL	Top Water Level
UU	United Utilities

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1.0 INTRODUCTION

1.1 Planning Policy Context

1.1.1 All forms of flooding and their impact on the natural and built environment are material planning considerations. The National Planning Policy Framework (NPPF) sets out the Government's objectives for the planning system, and how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change.

1.1.2 Government policy with respect to development in flood risk areas is contained within the NPPF and the supporting Planning Practice Guidance (PPG) (refer to extracts in **Appendix A**). This Drainage Management Strategy (DMS) has been completed in accordance with NPPF/PPG to consider the most appropriate sustainable surface water and foul water drainage options for the proposals.

1.1.3 The purpose of this report is to ensure that there is no increased flood risk because of the development in line with the NPPF guidance. The use of Sustainable Drainage Systems (SuDS) to manage surface water run-off has also been considered as part of the assessment in line with the National Standards for Sustainable Drainage Systems (SuDS).

Local Policy

1.1.4 The Knowsley Local Plan Core Strategy was adopted in January 2016. The following policy is relevant in respect of drainage:

Policy CS24: Managing Flood Risk

1.1.5 The drainage of new development shall be designed to reduce surface water run-off rates to those associated with a green-field site by treating it at its source. The chosen method of implementation should take account of site size, ground contamination or conditions, and potential damage to adjacent buildings or sites.

1.1.6 Sustainable Drainage Systems ('SuDS') are now the expected way to manage surface water and can be used on any site. These features include green roofs, soft landscaping, permeable surfaces and/or water storage ponds. Policy CS24 will complement Part H of the Building Regulations 2010 and national legislation by requiring the use of SuDS on all sites. Further guidance on the Council's requirements concerning the use of SuDS will be set out in the 'Design Quality in New Development' or other SPD as appropriate.

1.2 Site Context

1.2.1 This DMS has been prepared to support a planning application the construction of 204 no. residential dwellings on land located at Glen Dimplex, Stoney Lane, Whiston. The proposals will be complete with access, car parking, external works, boundary fencing, external services, and drainage.

1.3 Consultation

1.3.1 The preparation of this report has been undertaken in consultation with the Environment Agency (EA), United Utilities (UU) and Knowsley Metropolitan Borough Council (KMBC). The consultation responses can be seen in **Appendix B, C** and **D** respectively.

1.3.2 An Application Consultation Response was received from the Lead Local Flood Authority (LLFA) at Knowsley Metropolitan Borough Council in July 2026 (**Appendix D**). This report seeks to address the comments provided in the LLFA consultation response.

2.0 EXISTING SITE LOCATION

2.1 Location

2.1.1 The site is located off Stoney Lane in Rainhill, in Prescot. The nearest Ordnance Survey National Grid Reference is E: 347921, N: 391590 and the nearest postcode is L35 2XW (see Location Plan in **Appendix E**). The whole site covers 5.648ha and is edged in red in **Figure 1**.

2.1.2 In terms of the surrounding land-use, the site is bounded to the north by Whiston Hospital and Whiston Ambulance Station, with residential properties located off Stoney Lane, Cartmel Drive, Kendal Drive and Newby Avenue. To the east of the site is Elis (Laundry Centre). To the south lies St Edmund Arrowsmith Catholic Academy with associated playgrounds and grass fields, together with residential development off Cumber Lane. The west of the site is bounded by further residential development. This is illustrated in **Figure 1** below.

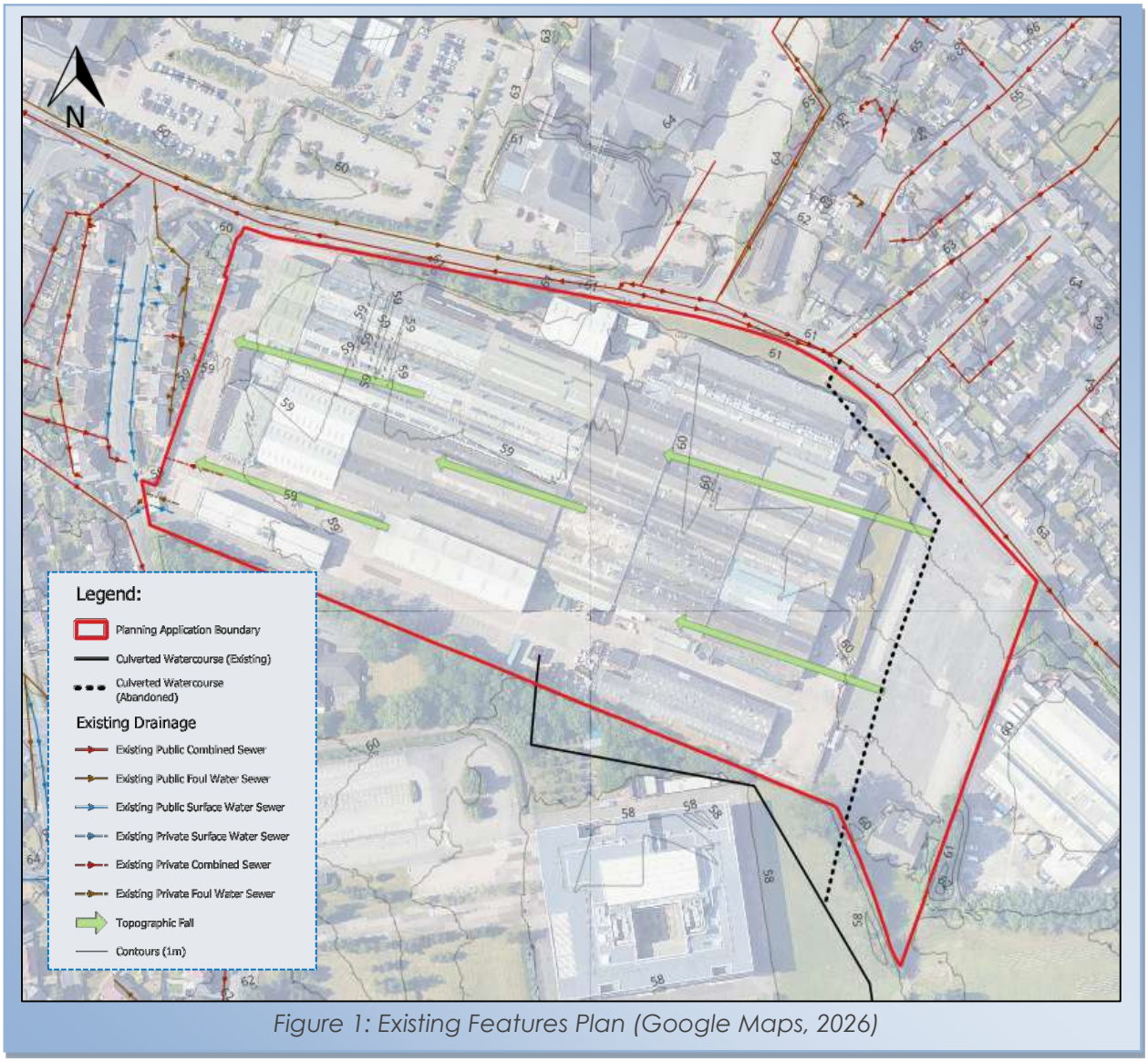


Figure 1: Existing Features Plan (Google Maps, 2026)

2.2 Existing and Historical Land Use

2.2.1 The site currently consists of industrial and manufacturing premises formerly occupied by Glen Dimplex. No other historic uses have been identified during the preparation of this report.

2.3 Topography

2.3.1 A topographic survey has been undertaken and is included in **Appendix F** for completeness. To summarise, the site falls from a high point of 62.82mAOD in the north-eastern corner, located adjacent to Stoney Lane to a low point of 58.40mAOD in the south-western corner. Generally, the levels onsite fall from the east towards the western boundary of the site. The arrows shown in **Figure 1** indicate the general fall across the site.

3.0 DEVELOPMENT PROPOSALS

3.1 Nature of the Development

3.1.1 This planning application is for the construction of 204 no. residential dwellings. The proposals will be complete with access, footpaths, car parking, external works, landscaping, boundary fencing, and drainage. The Proposed Site Layout is included in **Figure 2** (see full plan in **Appendix G**).

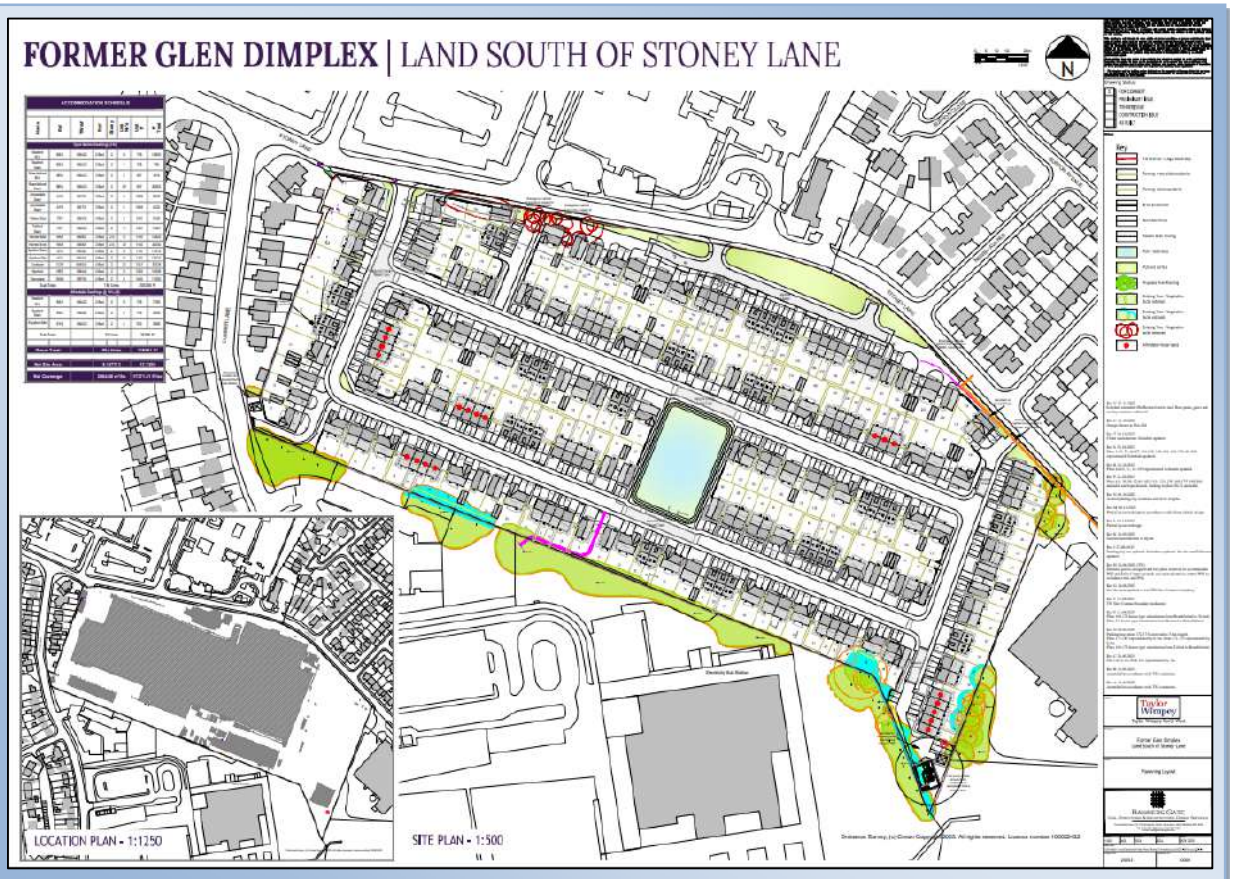


Figure 2: Appraisal Site Layout (Banners Gate, 2026)

3.1.2 Review of the United Utilities sewer records has identified an existing private combined sewer, foul water sewer and surface water sewer located within the south-western corner of the site. There is a requirement to provide maintenance offsets from the public sewers, where they are located onsite. The specific offset needs to be discussed with UU as they vary depending on the size of the infrastructure and the depth at which it is laid. Should diversion be required to facilitate the development proposals, then early discussion with UU will identify where this is considered acceptable.

3.1.3 A culverted watercourse is located onsite to the east, running through the existing Glen Dimplex Car Park before heading south and outfalling into Whiston Brook to the south of the site. A CCTV survey was undertaken by Taylor Wimpey in July 2026 (**Appendix H**), which confirmed that culverted watercourse has been abandoned, with the line obstructed by 100% concrete or other hardened material. The watercourse is therefore confirmed to be redundant and all culverted sections will be removed from the site as part of the proposals.

3.1.4 An onsite culverted watercourse is located within the south of the site and flows south. This then joins a 450mm dia. concrete surface water sewer. A 4-6m offset will be maintained post-development from the centreline of the southern culverted watercourse. Review of the United Utilities sewer records has identified an existing combined sewer, foul water sewer and surface water sewer located within the south-western corner of the site. There is a requirement to provide maintenance offsets from the public sewers, where they are located onsite. The specific offset needs to be discussed with UU as they vary depending on the size of the infrastructure and the depth at which it is laid. Should diversion be required to facilitate the development proposals, then early discussion with UU will identify where this is considered acceptable.

3.1.5 The total site covers 5.648ha and is understood to be 100% impermeable at present. Based on the residential nature of the proposals, we have estimated that the impermeable areas will decrease to post-development to 2.940ha. Betterment in the form of permeable surfaces opposed to external hardstanding should also be considered to reduce the surface water run-off. Opportunities to provide soft landscaping on the site would provide added benefits to water quality and ecology.

3.1.6 National and local policy identifies that SuDS should be incorporated into new development where feasible to manage surface water run-off generated. Betterment in the form of permeable surfaces opposed to external hardstanding should also be considered to reduce the surface water run-off.

4.0 SURFACE WATER MANAGEMENT

4.0.1 In accordance with national and local drainage policies, the principal focus of this assessment is on the effective management of surface water run-off generated by the proposed development. Surface water runoff management options have been assessed in accordance with the sustainable drainage hierarchy, as outlined within the National Standards for SuDS (July 2025).

4.0.2 The aim of the National Standards for SuDS is to provide information to support the design of surface water drainage systems for new infrastructure and development. The standards are noted below and are discussed in turn within this section of the report.

- *Standard 1 - Runoff Destinations*
- *Standard 2 - Management of Everyday Rainfall*
- *Standard 3 - Management of Extreme Rainfall and Flooding*
- *Standard 4 - Water Quality*
- *Standard 5 - Amenity*
- *Standard 6 - Biodiversity*
- *Standard 7 - Design of Drainage for Construction, Operation, Maintenance, Decommissioning, and Structural Integrity*

4.0.3 Standard 1 is a hierarchy standard, and this provides the criteria for determining the final runoff destination. The remaining standards (Standards 2 – 7) detail the minimum design criteria that all surface water drainage systems should meet.

4.1 Standard 1 – Runoff Destinations

4.1.1 Standard 1 as noted, sets out the surface water drainage hierarchy, in order of priority. Surface water runoff generated by the proposed development is to be discharged to the final destinations, to the maximum extent practicable. The five levels, in order of priority, are:

- Priority 1: Collected for Non-Potable Use.
- Priority 2: Infiltrated to Ground.
- Priority 3: Discharged to an Above Ground Surface Water Body.
- Priority 4: Discharged to a Surface Water Sewer, or Another Piped Surface Water Drainage System.
- Priority 5: Discharged to a Combined Sewer.

Priority 1: Collected for Non-Potable Use

4.1.2 The National Standards for Sustainable Drainage Systems (SuDS) require that the potential for rainwater re-use is considered as the first destination for surface water run-off. In accordance with this hierarchy, the feasibility of incorporating rainwater harvesting (RWH) within the proposed residential development has been assessed.

4.1.3 The proposed development comprises a traditional housing estate with standard domestic water demands. Whilst rainwater harvesting can offer benefits in certain circumstances, its use at plot or estate scale is not considered viable for this type of development due to financial and practical constraints.

4.1.4 Rainwater harvesting systems require significant additional capital investment, including storage tanks, pumping equipment, filtration systems, dual pumping networks, and ongoing maintenance. For individual dwellings, these costs are disproportionate to the limited potable water savings typically achievable, while communal systems introduce further cost, operational complexity and long-term management and liability issues.

4.1.5 Industry guidance and experience indicate that rainwater harvesting for low-to-medium density housing is generally not cost-effective when assessed on a whole-life basis and is associated with long payback periods. This is especially the case where alternative SuDS measures can achieve the required surface water management objectives without introducing mechanical systems or maintenance burdens for future occupants.

4.1.6 Whilst traditional rainwater harvesting systems are not practical, it is recommended that rainwater butts are included within the rear garden of the proposed dwellings to encourage collection of non-potable water for re-use. It is however, noted that this will not offer a full drainage solution for the proposed development, and therefore alternative drainage destinations have been assessed.

Priority 2: Discharged to Ground

4.1.7 In accordance with the hierarchy for the management of surface water, discharge to ground through infiltration has been considered as a potential means of managing surface water runoff from the development. Infiltration-based SuDS can provide a sustainable means of surface water management where site-specific ground conditions, groundwater levels and groundwater quality are suitable.

4.1.8 However, the suitability of infiltration cannot be determined solely by establishing whether the underlying ground is hydraulically capable of accepting water. The potential for infiltration to mobilise existing contaminants and adversely affect controlled waters, including the underlying Principal Aquifer, must also be considered. Accordingly, the assessment of infiltration at this site has considered the available geological and hydrogeological online datasets, alongside the findings of the Phase I and II Geoenvironmental Site Assessment prepared by E3P.

Online Datasets

4.1.9 The Cranfield Soil and AgriFood Institute (CSAI) Soilscapes mapping identifies the soils as "slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils". This provides an initial indication that the superficial soils are not inherently favourable to rapid infiltration.

4.1.10 British Geological Survey (BGS) mapping identifies the bedrock geology as predominantly Kinnerton Sandstone Formation – Sandstone, covering approximately 80% of the site, with the eastern part of the site underlain by Chester Formation – sandstone, pebbly (gravelly). The superficial deposits comprise Devensian Till (diamicton). Whilst the mapped bedrock geology may, in isolation, suggest some potential for infiltration, this does not provide sufficient evidence to demonstrate that an infiltration-based drainage system is appropriate

4.1.11 Phase I and II Geoenvironmental Site Assessment prepared by E3P confirms significant variability in the superficial deposits, including cohesive clay and Made Ground, together with variable groundwater conditions. The Standard Percentage Runoff (SPR) value of 0.387 provides a catchment-scale indication of runoff characteristics but cannot be relied upon as evidence that a site-specific soakaway system would be hydraulically or environmentally suitable.

Ground Conditions & Contamination

4.1.12 The Phase I and II Geoenvironmental Site Assessment prepared by E3P provides a detailed consideration of the potential sources of contamination onsite. The site has been subject to extensive historical industrial use, including its former use as a Munitions Works, Iron Foundry and Oven Manufacturing Factory, together with extensive infilling and areas of Made Ground.

4.1.13 The GI investigation identified contamination within both the Made Ground and groundwater. Of particular relevance to infiltration, widespread volatile organic compound (VOC) contamination has been identified, including Trichloroethene (TCE), cis-1,2-Dichloroethene, trans-1,2-Dichloroethene and Vinyl Chloride, together with localised heavy metal contamination.

4.1.14 The introduction of infiltrating surface water would potentially mobilise contaminants within the Made Ground and increase their migration into the underlying groundwater, thereby creating or exacerbating a contaminant pathway. This could present a risk to groundwater quality and, where hydraulic connectivity exists, to downstream receptors and neighbouring land or properties through changes in groundwater flow and contaminant migration.

4.1.15 Importantly, the contamination is not restricted to soil. The E3P investigation identified elevated concentrations of these contaminants within groundwater and identified a groundwater plume extending across the site. The report notes that VOC concentrations are significantly higher within deeper groundwater monitoring wells, which is considered indicative of a DNAPL plume. The GI Report identifies the relevant contamination pathway as leaching of contaminants from the Made Ground through infiltration and percolation of rainwater, with the underlying Principal Aquifer identified as the receptor.

4.1.16 This is particularly significant because the existing extensive hardstanding currently intercepts rainfall and limits infiltration and contaminant mobilisation. E3P specifically concludes that retaining hardstanding as part of the proposed development will reduce infiltration, reduce the production of leachate from contaminated soils and consequently reduce the risk to the underlying aquifer.

4.1.17 The GI Report therefore identifies a clear environmental benefit in reducing rather than increasing infiltration through the contaminated ground.

Groundwater Levels

4.1.18 The E3P ground investigation included groundwater monitoring across the site. The investigation identified groundwater within the superficial deposits and bedrock, with groundwater levels varying across the site. The report states that groundwater is present

within the upper ground profile and that groundwater flows through both Made Ground and natural deposits, particularly within the southern part of the site.

4.1.19 This provides a further potential pathway for the migration and dispersion of contaminants. Groundwater levels recorded during the investigation ranged from approximately 0.60m to 5.47m bgl, demonstrating that groundwater is relatively shallow in parts of the site.

4.1.20 The groundwater monitoring undertaken has been cross-referenced with the Monthly Water Situation Report: North-West England (June 2026) as published by the Environment Agency. The nearest indicator site, which is underlain by the same Principal Aquifer as the proposed development, is Richmond Park. As indicated within **Figure 3** below, the groundwater levels generally peak between November and March.

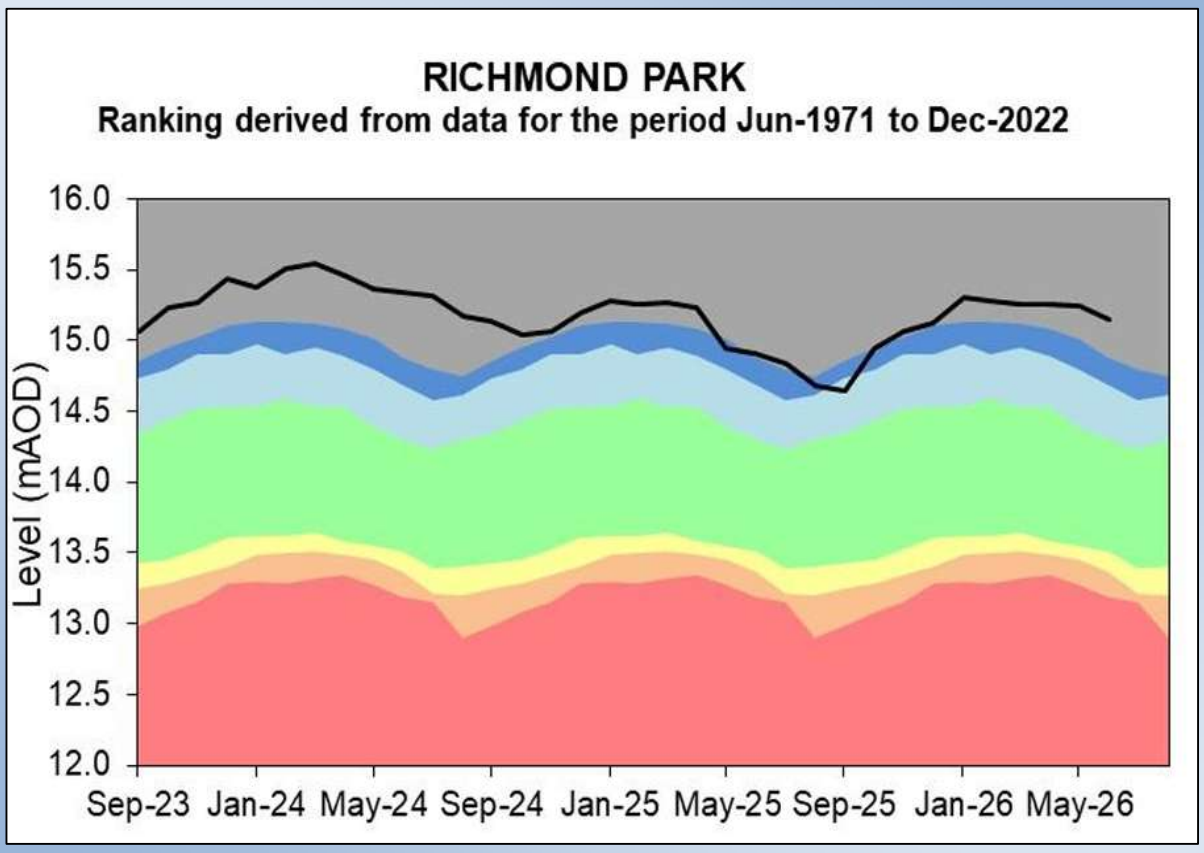


Figure 3: Groundwater Level Chart – Richmond Park (EA, 2026)

4.1.21 It is therefore noted that groundwater monitoring was undertaken in a period whereby levels regionally typically decrease. Irrespective, the presence of shallow groundwater was still identified within the E3P reporting:

"The presence of groundwater appears common to bedrock levels both within the overlying superficial deposits and the bedrock. Groundwater levels indicate a shallow groundwater level, which is significantly lower towards the south of the site."

Source Protection Zones

4.1.22 The site is located within an Environment Agency Source Protection Zone 3 (SPZ3). SPZ3 represents the wider catchment area contributing groundwater to a protected groundwater abstraction and therefore identifies groundwater as a sensitive receptor.

4.1.23 The relevance of SPZ3 is particularly significant in this case because the site-specific GI investigation has already identified actual groundwater contamination and a Principal Aquifer beneath the site. E3P expressly identifies the Principal Bedrock Aquifer and SPZ3 as the receptor within its controlled waters risk assessment and considers the Principal Aquifer to be at high risk.

4.1.24 SPZ3 does not, in isolation, constitute an absolute prohibition on every form of infiltration. However, where infiltration would provide a pathway for pollutants to enter or migrate through groundwater, the presence of the protected groundwater resource materially increases the environmental consequence of that pathway.

4.1.25 At this site, that pathway is already demonstrated by the GI investigation: contaminants are present within Made Ground, groundwater contamination has been confirmed, and infiltration/percolation of rainfall is specifically identified as a mechanism by which contaminants can be leached from the Made Ground.

4.1.26 Introducing additional surface water into this ground would therefore create an avoidable risk of further contaminant mobilisation towards the underlying Principal Aquifer and the wider SPZ3 groundwater resource.

Critical Drainage Area

4.1.27 The site is also located within a Critical Drainage Area (CDA). This designation is relevant to the drainage strategy because it identifies an area where surface water management and the prevention of increased flood risk require particular consideration.

4.1.28 The CDA designation is not relied upon as a standalone reason to prohibit infiltration. Rather, it reinforces the requirement for the proposed drainage system to provide robust and controlled management of surface water without creating additional adverse impacts on the surrounding drainage or groundwater regime.

4.1.29 In this instance, introducing additional water into the ground through infiltration would need to be considered in the context of the existing shallow and seasonally variable groundwater conditions, the known groundwater flow regime and the confirmed groundwater contamination. It would therefore be inappropriate to regard infiltration as inherently preferable simply because it reduces a controlled surface-water discharge.

4.1.30 The drainage strategy must instead consider the whole-system consequences of infiltration, including the potential for increased groundwater levels, contaminant mobilisation and migration, and interaction with the wider drainage catchment.

BRE365 Infiltration Testing

4.1.31 BRE 365 infiltration testing is ordinarily undertaken to establish the infiltration characteristics of the ground and determine whether infiltration drainage can be accommodated hydraulically. However, BRE 365 testing does not, in itself, establish whether infiltration is environmentally acceptable.

4.1.32 For this site, the fundamental constraint is not simply uncertainty regarding the infiltration rate. The GI investigation has identified a confirmed contamination source, an existing groundwater contamination plume, a potential contaminant migration pathway through infiltration and percolation, and a sensitive Principal Aquifer receptor.

4.1.33 Accordingly, even if BRE365 testing were to demonstrate a technically adequate infiltration rate, this would not overcome the established source–pathway–receptor contamination risk. Indeed, the GI Report expressly concludes that the ground conditions and contamination preclude the use of infiltration drainage systems.

4.1.34 Undertaking soakaway testing solely to establish whether water can physically infiltrate would therefore not address the reason infiltration is being excluded. The relevant question is not whether the ground *can* accept water, but whether it is appropriate to deliberately introduce additional water into contaminated ground above a sensitive Principal Aquifer.

4.1.35 Based on the cohesive underlying strata of the site, the presence of potential contamination, the sensitive Principal Aquifer below the site, and shallow groundwater, the use of an infiltration-based solution will not offer a suitable surface water management option for the development proposals.

4.1.36 In this specific instance, it is understood that the potential ground contamination and shallow groundwater, preclude the use of an infiltration-based approach regardless of the infiltration rates. Therefore, alternative priorities in the drainage hierarchy have been considered.

Priority 3: Discharged to an Above Ground Surface Water Body

4.1.38 As infiltration will not provide a full or partial drainage solution, this assessment has considered the alternative options in accordance with the sustainable drainage hierarchy. The next preferred method is to discharge surface water run-off to an above-ground surface water body.

4.1.39 There are no open or above-ground watercourses within proximity of the site. The nearest surface water body is Whiston Brook, located south of the site. Discharge to Whiston Brook (Main River) would require a potential new connection across third-party land, which is neither available nor necessary, given that connectivity from the site to Whiston Brook is already established via the on-site culverted watercourse discussed under Priority 4 below. Discharge to an above-ground surface water body is not, therefore, considered a reasonable or available option for this site.

4.1.40 Discharging surface water run-off to an above-ground surface water body is therefore not feasible as a drainage solution for this site, and the following alternative options have been considered in accordance with the sustainable drainage hierarchy.

Priority 4: Discharged to a Surface Water Sewer, or Another Piped Surface Water Drainage System

4.1.41 As infiltration will not provide a full or partial drainage solution, and no above-ground waterbody is available on site to provide an alternative outfall, this assessment has considered the next option in accordance with the sustainable drainage hierarchy: discharge of surface water run-off to a surface water sewer or other piped drainage system.

4.1.42 An unnamed culverted watercourse previously crossed the site to the east. Historically, this joined offsite to the south within the adjacent St Edmunds Arrowsmith School land before discharging into Whiston Brook, with this connectivity previously confirmed via dye-tracing. A CCTV survey undertaken by Taylor Wimpey on 17/07/2026 has since confirmed that this watercourse is abandoned and redundant, with the line obstructed by 100% concrete or other hardened material. This watercourse will therefore be removed from the site as part of the proposals and is not available to provide a piped drainage outfall.

4.1.43 It is understood that, at present, the development onsite drains surface water via the onsite culverted watercourse. The client has undertaken investigations of the culverted watercourse across the site and towards the outfall (refer to **Appendix H**) to establish connectivity and condition, including as-built drawings showing the drainage arrangement for the former factory.

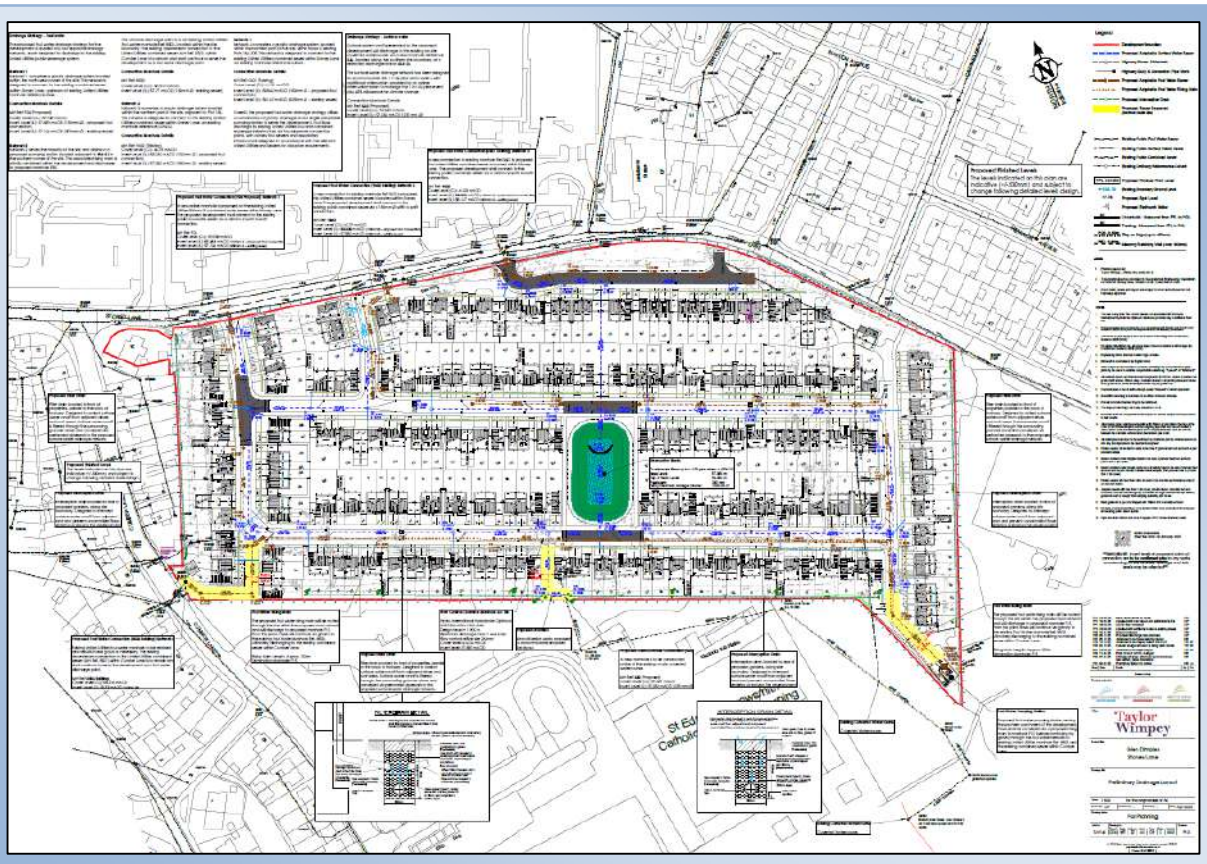


Figure 4: Preliminary Drainage Layout (Betts Associates, 2026)
** This drawing is not a drainage 'design' it is a preliminary drainage plan.*

4.1.44 As infiltration is not a suitable drainage solution, either in part or in full, and as no culverted watercourse remains available on-site following removal of the eastern culvert, the proposals are to mimic the existing regime and discharge post-development to the onsite culverted watercourse to the south of the site. A Preliminary Drainage Layout (TAY143-GDX-BET-ZZ-XX-DR-C-0001- P13-Preliminary Drainage Layout) has been prepared by Betts Associates to demonstrate the feasibility of the proposals, as illustrated in **Figure 4** (see **Appendix I**).

4.1.45 Detailed design will need to be carried out in due course to confirm the proposal. Consent and formal agreement will likely be required in this case from KMBC (who are the Lead Local Flood Authority) and any Riparian Owners for access to do such.

4.1.46 The drainage proposed to serve this development will comprise an attenuation basin and underground oversized pipes, complemented by a source control drainage strategy incorporating filter drains and interception drains. A below-ground pipe network (900mm dia.) will be utilised for conveyance; the specific means of attenuation and conveyance are to be determined during the detailed design stage.

4.1.47 Permeable paving to private driveways and raingarden planters were considered but discounted as the primary means of plot-level source control. Both are difficult to protect and maintain in perpetuity. Raingarden planters in particular have a limited operational lifespan and are unlikely to be reinstated or retained by future residents, while permeable paving has been found to present recurring issues in relation to building control requirements, service corridor coordination, and build sequencing, issues compounded on this scheme by the tight viability margins associated with development of a contaminated brownfield site.

4.1.48 Instead, a lined filter drain is proposed to serve all plot drainage, including both driveway/hardstanding and roof water run-off. Private driveways will discharge via dish channels and yard gullies to small filter chambers, or, where filter chambers are not provided, via gully pots connecting directly to the filter drain. Roof water will, in places, also connect directly into the filter drain.

4.1.49 This provides attenuation and treatment nearer to source, rather than relying solely on attenuation at the downstream basin. Due to the presence of contamination across the site, the filter drain will be fully lined with an impermeable membrane. Surface water will pass through the granular filter media into a Terram-wrapped perforated pipe at the base of the drain, which will convey flow to the drag-out manholes before connecting into the public sewer system that will serve the development.

4.1.50 An interception drain is also proposed along the southern site boundary, to intercept potential exceedance flows entering or leaving the site from adjacent land.

4.1.51 The inclusion of a short length of open-channel swale prior to leaving the site was also explored; however, this was discounted due to the resulting depths having an unacceptable impact on developable area.

4.1.52 The above source control strategy, comprising the site-wide filter drain in place of permeable paving and raingarden planters, together with the southern boundary interception drain, has been reviewed and agreed by Knowsley Metropolitan Borough Council, as LLFA, subject to the filter drain approach being implemented consistently across the entire site (Refer to **Appendix D**).

4.1.53 If designed appropriately, the SuDS features proposed, comprising the attenuation basin, oversized pipe attenuation, filter drains, and the interception drain can provide effective attenuation while delivering additional benefits in terms of water quality, biodiversity, and amenity value. Detailed design should confirm the suitability and sizing of these features following further analysis of levels, ground conditions, and attenuation requirements.

Priority 5: Discharged to a Combined Sewer

4.1.54 United Utilities Sewer Records have identified a private combined sewer within the southwest of the site. Public combined sewers are also located within Cumber Lane to the west and Stoney Lane to the north of site. Irrespective, given that a higher priority destination is achievable, there are no proposals at this time to discharge to a surface water sewer, or any other available piped surface water drainage systems.

4.2 Standard 2: Management of Everyday Rainfall (Interception)

4.2.1 Standard 2 of the National Standards for SuDS identifies that source control measures should be applied, such that at least the first 5mm of rainfall for most rainfall events is intercepted. A SuDS approach should be adopted to ensure this is delivered alongside water quality improvement, amenity value, and biodiversity benefits (Standards 4, 5, and 6).

4.2.2 As infiltration is not viable across the site, the proposals instead utilise a lined Filter Drain at plot level to serve private driveways/hardstanding and roof water run-off. This provides interception and treatment of frequent, everyday rainfall at or near source, ahead of conveyance to the wider drainage network.

4.2.3 An Interception Drain is also proposed along the southern site boundary, providing further interception of surface water at source and preventing uncontrolled flows entering or leaving the development.

4.3 Standard 3: Management of Extreme Rainfall and Flooding

4.3.1 The total site covers 5,648ha and is understood to be 100% impermeable at present. Based on the proposed planning layout, the impermeable area will decrease to 2.940ha.

4.3.2 Given the site is already developed for commercial use, it is understood that there is an existing drainage regime currently serving the site. As noted, two historic drainage features are present, one to the east and one to the south of the site. The eastern feature is a former culverted watercourse that has been abandoned and is now fully concrete-lined. The southern feature is an existing surface-water sewer. The former factory is understood to have discharged into the surface water sewer. Its location, routing and downstream connectivity to Whiston Brook have been confirmed by via CCTV surveys. These are included within **Appendix H** for completeness.

Pre-Development Greenfield Rates

4.3.3 The peak rates and volumes of run-off generated by the site have been calculated for the peak events shown in **Table 1**. The surface water run-off rates have been calculated using the FEH Method (2025). The full calculations in **Appendix J** are based on an area of 1ha and these rates and volumes are calculated pro-rata for the proposed development area of 2.940ha.

Dev. Area	Run-Off Rates				Run-Off Volumes	
	1 In 1yr	1 In 30yr	1 In 100yr	QBar	1 In 1yr	1 In 100yr
2.940ha	36.7l/s	72.3l/s	88.7l/s	42.4l/s	639.6cu.m	1632.7cu.m

Table 1: Pre-Development Surface Water Run-Off Rates (Betts Hydro, 2026)

Post-Development Runoff Rates

4.3.4 As previously discussed, based on the planning layout we have estimated that the impermeable areas post-development will decrease, given the residential nature of the proposals. This equates to 2.940ha. In accordance with the KMBC's guidance, an allowance has been added to the impermeable area to account for the potential for urban creep, totalling 3.059ha. The unrestricted post-development run-off rates are detailed in **Table 2**.

4.3.5 These proposed impermeable areas will however be refined as part of the drainage design work based on the specific contributing areas for the main drainage and plot drainage networks.

Proposed Imp. Area (+10% UC)	Run-Off Rates			Run-Off Volumes	
	1 In 1yr	1 In 30yr	1 In 100yr + 45% CC	1 in 1yr	1 in 100yr
3.059ha	137.7l/s	245.6l/s	489.6l/s	621.0cu.m	1505.3cu.m

Table 2: Post-Development Un-Restricted Run-Off Rates (Betts Hydro, 2026)

4.3.6 In accordance with national and local planning policies, it is necessary to restrict surface water run-off rates, where at all practical, to mimic a pre-development situation. In this instance the existing is developed and therefore brownfield in nature, however as noted within the 2012 Knowsley Metropolitan Council Level 2 Strategic Flood Risk Assessment, the site is also located within the Prescot Critical Drainage Area.

4.3.7 The proposals are to therefore consider this site in terms of drainage as greenfield for the purpose of surface water drainage calculations. The pre-development greenfield equivalent rates are detailed in **Table 1**. Full details on the proposed rates of discharge can be found in **Appendix K**.

Proposed Discharge Rates

4.3.8 In accordance with the SuDS Manual (CIRIA) and the National Standards for SuDS (June 2025) all sites will endeavour to achieve as close to pre-development greenfield equivalent rates as is viable. This is pertinent for sites such as this which is located within Critical Drainage Areas. Based on the development area, the pre-development greenfield rate (QBar) is calculated to be 42.4l/s (based on 7.5l/s/ha). The LLFA (KMBC) will also need to agree to the proposed rates of discharge as part of their consultation.

4.3.9 Restricting the rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. Betts Associates has provided Surface Water Drainage Network Details (**Appendix K**), which present hydraulic simulation results for the 1 in 1 year, 1 in 2 year, 1 in 30 year, 1 in 100 year, 1 in 100 year plus 45% climate change, and 1 in 200 year return periods. For each event, the results report peak water level and depth at every manhole, together with peak flow and pipe velocity for each link, demonstrating the network's hydraulic performance across the full range of design and climate change events.

4.3.10 The surface water scheme for the development will need to be designed to cater for the surface water run-off generated in the events up to and including the 1 in 100yr return period event with 45% allowance for climate change. The drainage proposed to serve this development will comprise an attenuation basin and underground oversized pipes, complemented by a source control drainage strategy incorporating a filter drain and interception drain . A below-ground pipe network (900mm dia.) will be utilised for conveyance; the specific means of attenuation and conveyance are to be determined during the detailed design stage.

Proposed Catchment Areas

4.3.11 An Impermebale Area Plan has been prepared (TAY143-GDX-BET-ZZ-XX-DR-C-0006-P02-Impermeable Areas Plan), included at **Appendix L**. This plan identifies the contributing impermeable and permeable (pervious) areas draining to each manhole within the proposed on-site surface water network, in accordance with the proposed drainage layout.

4.3.12 This catchment breakdown ensures that pipe sizing, gradients, and attenuation volumes have been appropriately calculated based on the actual contributing area to each manhole, rather than a single whole-site value, thereby providing the LLFA with confidence that the proposed network has been sized correctly on a manhole-by-manhole basis.

Exceedance Flood Flow Routing

4.3.13 The proposed drainage network has been designed to accommodate the 1 in 100-year critical storm event, including a 45% allowance for the impact of climate change, in line with current national guidance and the design criterion confirmed by the LLFA. An assessment of exceedance flows and surface water runoff in excess of this design standard has been undertaken, to identify where above ground flooding might occur and where this would be expected to pool and flow.

4.3.14 An Exceedance Flow Plan has been prepared (Refer to **Appendix M**) illustrating the anticipated overland flow routes, ponding locations, and flow direction across the site during rainfall events in excess of the design standard.

4.3.15 The assessment identified the 1 in 800-year event as the point at which the proposed below-ground drainage network is first exceeded. Modelling of this event has identified one location where above ground flooding may occur, at manhole S7, with an associated flood volume of approximately 14m³.

4.3.16 Exceedance flows arising at S7 are contained within the proposed carriageway and are directed away from both the proposed and existing dwellings. No flood water is shown to pool or flow towards site boundaries, buildings, or adjacent third-party land in the simulated event, and there is no flooding of the proposed dwellings even in this extreme storm event.

4.3.17 On this basis, it is considered that the proposed development has appropriately assessed exceedance flows and runoff in excess of the 1 in 100-year plus 45% climate change design standard, and that the resulting overland flow routes and containment within the carriageway provide sufficient resilience to flood risk without the need for additional mitigation measures.

Climate Change

4.3.18 There are indications that the climate in the UK is changing significantly, and it is widely believed that the nature of climate change will vary greatly by region. Opinion indicates the likelihood that future climate change would produce more frequent short duration and high intensity rainfall events with the addition of more frequent periods of long duration rainfall.

4.3.19 It is believed that the impact of climate change means there is likely to be a long-term increase in the average sea levels, with an expectation that sea levels will rise gradually. An increase in flood water levels means that future flooding events will occur more frequently and will have a greater impact.

4.3.20 In light of the future uncertainties Climate Change should be accounted for within the design of all new developments. Climate change factors have been considered and any increase in the level of flood risk (to the site) from climate change is likely to be related to the increase in rainfall intensity and duration and its impact upon the surface water drainage system.

4.3.21 In accordance with the Lower Mersey Management Catchment peak rainfall allowances, the upper end allowance (**Table 3**) for the 2070's has been utilised (based on 100yr design life).

PROJECTIONS	TOTAL POTENTIAL CHANGE ANTICIPATED FOR THE 2070'S
Upper End Allowance	45%
Central Allowance	30%

Table 3: Change to Peak Rainfall Compared to Baseline (Environment Agency, 2026)

4.4 Standard 4: Water Quality

4.4.1 To ensure that surface waters, ground waters, and coastal waters are protected, the National Standards for SuDS (Standard 4) requires appropriate management of the quality of surface water runoff post-development. This should be provided, via a SuDS based approach.

Current Site Conditions

4.4.2 The site has a long industrial history that includes use as an iron foundry and stove works, potential munitions-related activity during both World Wars, and more recent manufacture of home appliances involving enamel and paint processes. The Phase II investigation and earlier work by ECP have identified several contamination sources of relevance to controlled waters and surface-water quality.

4.4.3 The main source of contamination is the enamel slurry tank in the south-east corner of the main factory building. High levels of chlorinated solvents, including trichloroethene (TCE), along with its breakdown products, have been found in both the Made Ground and the natural soils beneath the site.

4.4.4 The highest TCE concentrations were recorded in the natural soils at borehole BH104, around 5.5 m below ground level. The way these chemicals have spread through the ground, both sideways and downwards, suggests they have moved through more permeable layers within the clay. The presence of breakdown products also shows that the contamination is gradually degrading over time.

4.4.5 Across the main factory site, the Made Ground also contains raised levels of heavy metals, including arsenic, lead and nickel, as well as polycyclic aromatic hydrocarbons (PAHs), at concentrations above levels considered suitable for residential use. Hydrocarbon odours were also detected in the central Assembly Area, close to the former railway sidings. Groundwater in the shallow soils contains elevated levels of metals and solvent-related contaminants that exceed environmental and drinking water standards.

4.4.6 Contamination in the underlying sandstone aquifer appears to be limited at present, although elevated levels of trichloromethane have been found in a small number of bedrock samples.

4.4.7 Under the CIRIA Simple Index Approach the current industrial land use generates high pollution hazard indices: approximately 0.8 for total suspended solids, 0.8 for metals and 0.9 for hydrocarbons. These elevated indices reflect the combination of process chemicals, vehicle movements, storage of oils and solvents, and the legacy of Made Ground and process residues.

Proposed Site Conditions

4.4.8 The proposed end-use is residential housing with private gardens, roadways and associated drainage infrastructure. No industrial processes will remain on site. All manufacturing plant, the enamel slurry tank and associated contaminated soils will be removed under a formal Remediation and Enabling Works Strategy, with validation sampling. A clean-cover system will be placed in soft-landscaping and garden areas to break human-health pathways; the same measures will substantially reduce residual soil-leachate potential.

4.4.9 Under the CIRIA Simple Index Approach the residential land-use categories produce markedly lower pollution hazard indices: approximately 0.5 for total suspended solids, 0.4 for metals and 0.4–0.5 for hydrocarbons (the lower end of the hydrocarbon range being appropriate once residual industrial sources have been removed, and only domestic vehicle traffic remains). Land-use change alone therefore produces an immediate and substantial reduction in pollution hazard indices of the order of 40–50% for metals and hydrocarbons. This constitutes clear betterment before any SuDS treatment train is applied.

4.4.10 The Preliminary Drainage Layout incorporates a multi-stage surface-water treatment train. Surface-water runoff from private drives, hardstanding and roofs is collected by lined filter drains located to the rear of the footways. These provide source control and initial treatment as flows pass through the granular filter media into the perforated collector pipes. Flows then continue into the wider surface-water network and the central attenuation basin, which provides further treatment and storage. Treated flows are released under controlled discharge via flow-control chambers into the existing onsite watercourse, and ultimately outfall to Whiston Brook. Interception drains are also provided along the site boundaries to manage potential exceedance flows entering or leaving the development.

4.4.11 The Simple Index Approach requires that the total SuDS mitigation index for each pollutant category equals or exceeds the pollution hazard index of the contributing land use. e. The combination of attenuation storage and source-control features delivers mitigation indices that comfortably exceed the reduced post-development residential hazard indices for total suspended solids, metals and hydrocarbons. Because the post-development hazard indices are already low to moderate, the treatment train shown on the Preliminary Drainage Layout provides a robust margin of safety.

4.4.12 In addition, source removal of the enamel slurry tank and associated TCE-impacted soils will eliminate the principal ongoing source of volatile organic compounds, while the clean-cover system and engineered earthworks will further limit residual leaching of metals and hydrocarbons into surface water and shallow groundwater. The combination of land-use change, source remediation and the multi-stage SuDS treatment train therefore delivers clear and demonstrable betterment in water quality relative to the existing industrial baseline, consistent with the objectives of the Water Framework Directive and national planning policy on sustainable drainage.

4.4.13 Ultimately, the full scope of the SuDS to be provided within the proposed development will be confirmed at the detailed design stage (where a detailed planning layout is available). To demonstrate compliance with the National Standards for SuDS, a Water Quality Assessment has been prepared for both the existing (commercial) and proposed (residential) land use conditions, as included within **Appendix N**. This demonstrates that at this concept stage, sufficient treatment of water quality can be provided post-development, with no net deterioration in water quality relative to the existing commercial use.

4.5 Standard 5: Amenity

4.5.1 Within new development proposals, SuDS features should be implemented to provide benefit to amenity. This is to be achieved through the creation of multi-functional places and landscapes, in accordance with the National Standards for SuDS and CIRIA's SuDS Manual (C753, Chapter 5).

4.5.2 The attenuation basin has been designed to provide multi-functional public open space, alongside its primary attenuation function. The Filter Drain and Interception Drain, whilst predominantly functional source control features, have been integrated discreetly within the plot layout and site boundary so as not to compromise the usability of private gardens, driveways, or the wider public realm.

4.5.3 The amenity value provided by the attenuation basin has been maximised where practical by situating it in proximity to proposed footpaths, allowing it to be experienced as a positive landscape feature rather than a purely functional asset. The basin has been designed with gently sloping, naturalistic side slopes and marginal planting to soften its appearance and reflect a more informal landscape character, in keeping with the residential setting of the wider development. Detailed landscape proposals will have regard to relevant Local Planning Authority landscape guidance and design policy, to ensure the basin and surrounding open space contribute positively to the street scene and public realm.

4.5.4 Soft landscaping associated with the attenuation basin and surrounding open space will incorporate a mix of marginal and terrestrial planting, including trees where appropriate, to provide shade and help mitigate urban heat island effects across the development. Plant species will be selected with regard to biosecurity risk, favouring locally sourced, disease-resistant stock in accordance with the SuDS Manual (C753), BS 3936-1, BS 3936-10, and BS 8545. Soil and aggregate specifications for the basin and Filter Drain will be confirmed at detailed design stage to ensure long-term planting success and drainage performance under a changing climate.

4.5.5 Situating the attenuation basin in proximity to proposed footpaths provides opportunity for informal public appreciation of the feature and supports pedestrian movement and accessibility through the site. The basin and adjacent open space will provide an informal amenity space for residents, contributing to opportunities for walking within the development and supporting general health and wellbeing.

4.5.6 The attenuation basin has been designed with gentle side slopes and shallow water depths during normal operation, reducing risk to public safety while retaining its function as an accessible and visible landscape feature. Marginal planting and, where required, low-level boundary treatment will be used to define the edge of the basin without unnecessarily restricting views into the space.

4.6 Standard 6: Biodiversity

4.6.1 In accordance with Standard 6, the proposed SuDS features have been designed to maximise biodiversity benefit for the intended design lifetime (min. 100yrs), with above-ground, vegetated features preferred over solely below-ground conveyance in line with the SuDS Manual (C753) and the National Standards' preference for green/blue infrastructure. This will primarily be achieved through the proposed attenuation basin, complemented by the vegetated corridors provided by the Filter Drain and Interception Drain.

4.6.2 Attenuation basins can offer a range of biodiversity benefits, providing opportunity for varied habitat creation, such as species-rich grassland, marginal and aquatic planting, and wetland features, which in turn can support invertebrates, amphibians, and foraging/commuting birds and bats. The specific habitat features to be incorporated within the proposed attenuation basin, and their contribution to biodiversity, will be confirmed at detailed design stage, in conjunction with the project ecologist and landscape architect, complementing the basin's function as multi-functional public open space.

4.6.3 The filter drains and interception drain, whilst primarily functional source control features, incorporate vegetated tops and margins along the building frontages and southern site boundary respectively. These linear features provide additional opportunity for habitat connectivity across the site and with the wider green infrastructure network, supplementing the ecological value provided by the attenuation basin.

4.6.4 All associated planting proposed will be native to the area, where practicable, and selected to provide benefit to natural and local ecosystems, including pollinator and invertebrate value; the specific palette and planting design will be confirmed during detailed design, in conjunction with the project ecologist and landscape architect. Additional biodiversity enhancement features, such as bird and bat boxes, will be considered at detailed design stage to further support compliance with Standard 6.

4.7 Standard 7: Design of Drainage for Construction, Operation, Maintenance, Decommissioning and Structure Integrity

4.7.1 To demonstrate compliance with Standard 7, the National Standards for SuDS require that a Maintenance and Management Plan is prepared. This is to ensure that the objectives set out within Standards 1 – 6 are delivered and maintained for lifetime of the development proposals.

4.7.2 A SuDS Maintenance and Management Plan has been prepared to identify the typical maintenance requirements in accordance with CIRIA (2015) for the SuDS features that have been considered at this stage. This has been included within **Appendix O** for completeness.

5.0 FOUL WATER MANAGEMENT

5.1 Given the site is currently developed for commercial use, it is understood there is an existing drainage regime serving the site. The existing drainage network is understood to drain to the combined sewer within Cumber Lane to the west (see existing drainage within **Appendix H**).

5.2 The proposals are to mimic the existing situation and discharge foul flows, from the site post-development, into the public combined surface within Cumber Lane, as illustrated previously within **Figure 4.**

5.3 Based on the proposals for the construction of 204no. residential dwellings, the approximate peak foul water flows generated by the site have been calculated at 9.44l/s, based on 4000 litres per dwelling per 24 hours as per the guidance contained within National Standards for SuDS.

5.4 It is understood that a gravity connection is not anticipated to be feasible at this stage. A foul water pumping station is therefore proposed to be in the south-eastern extent of the site. This will be used to connect via a foul water rising main, which will pump flows westwards, across the site to the combined sewer outfall within Cumber Lane.

5.5 Consent for work to the public sewer network will be required from United Utilities at an early stage, this includes consent for the proposed rates of discharge and the points of connection. It is recommended that a pre-development enquiry is undertaken with UU at an early stage.

6.0 SUMMARY AND CONCLUSIONS

6.1 Based on the cohesive underlying strata of the site, the presence of potential contamination, the sensitive Principal Aquifer below the site, and shallow groundwater, the use of an infiltration-based solution will not offer a suitable surface water management option for the development proposals.

6.2 Given the site is already developed for commercial use, it is understood that there is an existing drainage regime currently serving the site. As noted, two historic drainage features are present, one to the east and one to the south of the site. The eastern feature is a former culverted watercourse that has been abandoned and is now fully concrete-lined. The southern feature is an existing surface water sewer. The former factory is understood to have discharged into this sewer. Its location, routing and downstream connectivity to Whiston Brook have been confirmed via CCTV surveys.

6.3 Rainwater harvesting is not considered viable at plot or estate scale, due to practical and financial constraints. Rainwater butts are, however, proposed to encourage small-scale water reuse.

6.4 Infiltration has been discounted as a drainage solution, in part or in full. The site has a documented history of contaminative industrial use, and ground investigation has confirmed contamination within the Made Ground and groundwater, including volatile organic compounds and localised heavy metal contamination. Groundwater has been recorded at shallow depth across parts of the site, and the site lies within Environment Agency Source Protection Zone 3 (SPZ3), overlying a Principal Aquifer. Introducing infiltration-based drainage in these conditions would risk mobilising existing contamination and increasing its migration towards this sensitive aquifer receptor, and infiltration has therefore been excluded on environmental as well as ground condition grounds.

6.5 As infiltration is not a suitable drainage solution (in part, nor in full); the proposals are to mimic the existing regime and discharge post-development to the onsiteculverted watercourse. A Preliminary Drainage Plan has been prepared by Betts Associates to demonstrate the feasibility proposals

6.6 The drainage proposed to serve this development will comprise a below-ground pipe network for conveyance, an attenuation basin, and underground oversized pipes, catering for the onsite stormwater attenuation requirements. Lined Filter Drains are proposed to serve plot-level driveway and roof water run-off, providing source control and initial treatment nearer to source. An Interception Drain is also proposed along the southern site boundary to manage potential exceedance flows entering or leaving the development. These features will allow the first 5 mm of rainfall to be dealt with at source, as identified in the SuDS Manual (CIRIA 753). Due to the presence of contamination, the Filter Drains will be fully lined.

6.5 In accordance with the SuDS Manual (CIRIA) and the National Standards for SuDS (June 2025) all sites should endeavour to achieve as close to pre-development greenfield rates as is viable. This is pertinent for areas located within a Critical Drainage Area (CDA). Based on the development area, the pre-development greenfield rate (QBar) is calculated to be 42.4 l/s (based on 7.5 l/s/ha). The LLFA (KMBC) will also need to agree to the proposed rates of discharge as part of their consultation.

6.6 The surface water scheme for this development will be designed to cater for the surface water run-off generated in the events up to and including the 1 in 100 year return period event with a 45% allowance for climate change. Restricting the overall rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. Detailed design will determine with accuracy the attenuation requirements in due course.

6.7 The proposals are to discharge foul flows from the site post-development into the public combined sewer within Cumber Lane. It is understood that a gravity connection is not anticipated to be feasible at this stage. A foul water pumping station is proposed to be located in the south-eastern extent of the site. This will be connected via a foul water rising main, which will pump flows from low-lying areas of the site westwards, across the site to the combined sewer outfall within Cumber Lane.

6.8 This Drainage Management Strategy has been prepared in consultation with the relevant interested parties. The report is commensurate with the scale and nature of the development, and the development is appropriate in accordance with the National Standards for SuDS.

7.0 RECOMMENDATIONS

7.1 A 4-6m offset will be maintained post-development from the centreline of the southern culverted watercourse. Review of the United Utilities sewer records has identified an existing combined sewer, foul water sewer and surface water sewer located within the south-western corner of the site. There is a requirement to provide maintenance offsets from the public sewers, where they are located onsite. The specific offset needs to be discussed with UU as they vary depending on the size of the infrastructure and the depth at which it is laid. Should diversion be required to facilitate the development proposals, then early discussion with UU will identify where this is considered acceptable.

7.2 It is advised that external levels fall away from the proposed dwellings, to minimise the flood risk from a variety of sources. By keeping the Finished Floor Levels elevated relative to the externals, this should help create a safe overland flood flow route externally in the event of flooding associated with a variety of sources, including residual groundwater and surface water flooding.

7.3 Any run-off conveying through the site at present should be catered for through continued routing in an appropriate manner; this will ensure no increased run-off elsewhere as a result of the proposals. Safe avenues directing overland flow away from any existing/proposed buildings are advised. A Flood Flow Exceedance Routing Plan has been prepared to demonstrate that this will be achieved post-development. The proposed interception drain along the southern site boundary will further assist in managing potential exceedance flows entering or leaving the development.

7.4 To minimise the flood risk to neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively, with the peak rates of run-off being restricted to the equivalent of the pre-development greenfield situation (with betterment where required).

7.5 The proposed onsite surface water drainage system will need to be sized to contain up to and including the 1 in 100-year return period storm event with a 45% allowance for climate change being contained onsite. The system will comprise lined filter drains serving plot-level driveway and roof water run-off (providing source control and initial treatment), an interception drain, an attenuation basin, and underground oversized pipes.

7.6 As with any drainage system, blockages within either the foul or surface water system have the potential to cause flooding or disruption. It is important that should any drainage systems not be offered for adoption to either the Water Company or the Local Authority then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems. Particular attention should be given to the long-term maintenance of the lined filter drains and an interception drain to ensure their continued performance.

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Cranfield University – http://www.landis.org.uk/soilscapes/
Environment Agency – www.environment-agency.gov.uk/
FloodProBE – http://www.floodprobe.eu/
Flood Forum – http://www.floodforum.org.uk/
Google Maps – http://maps.google.co.uk/
Rainfall Climate Change Allowance - https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall
Streetmap – http://www.streetmap.co.uk/
United Utilities – https://www.unitedutilities.com/

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APPENDIX A: NPPF + PPG EXTRACTS

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14. Meeting the challenge of climate change, flooding and coastal change

161. The planning system should support the transition to net zero by 2050 and take full account of all climate impacts including overheating, water scarcity, storm and flood risks and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Planning for climate change

162. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperatures[61]. Policies should support appropriate measures to ensure the future health and resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

163. The need to mitigate and adapt to climate change should also be considered in preparing and assessing planning applications, taking into account the full range of potential climate change impacts.

164. New development should be planned for in ways that:

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through incorporating green infrastructure and sustainable drainage systems; and

b) help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings in plans should reflect the Government's policy for national technical standards.

165. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);

[61] In line with the objectives and provisions of the Climate Change Act 2008.

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

166. In determining planning applications, local planning authorities should expect new development to:

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

167. Local planning authorities should also give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.

168. When determining planning applications for all forms of renewable and low carbon energy developments and their associated infrastructure, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the proposal's contribution to a net zero future;

b) recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emissions;

c) in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site.

169. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

Planning and flood risk

170. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where

development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

171. Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.

172. All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:

a) applying the sequential test and then, if necessary, the exception test as set out below;

b) safeguarding land from development that is required, or likely to be required, for current or future flood management;

c) using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and

d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.

173. A sequential risk-based approach should also be taken to individual applications in areas known to be at risk now or in future from any form of flooding, by following the steps set out below.

174. Within this context the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test.

175. The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).

176. Applications for some minor development and changes of use[62] should also not be subject to the sequential test, nor the exception test set out below, but should still meet the requirements for site-specific flood risk assessments set out in footnote 63.

[62] This includes householder development, small non-residential extensions (with a footprint of less than 250m^2) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park

177. Having applied the sequential test, if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3.

178. The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

179. Both elements of the exception test should be satisfied for development to be allocated or permitted.

180. Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-making stage, or if more recent information about existing or potential flood risk should be taken into account.

181. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment[63]. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;

c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

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home site, where the sequential and exception tests should be applied as appropriate.

[63] A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

182. Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity. Sustainable drainage systems provided as part of proposals for major development should:

a) take account of advice from the Lead Local Flood Authority;

b) have appropriate proposed minimum operational standards; and

c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.

Coastal change

183. In coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement and marine plans. Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.

184. Plans should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast. They should identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, and:

a) be clear as to what development will be appropriate in such areas and in what circumstances; and

b) make provision for development and infrastructure that needs to be relocated away from Coastal Change Management Areas.

185. Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that:

a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;

b) the character of the coast including designations is not compromised;

c) the development provides wider sustainability benefits; and

d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast[64].

[64] As required by the Marine and Coastal Access Act 2009.

186. Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development.

How can neighbourhood plans and neighbourhood development/community right to build orders take account of coastal change?

In any instance where a Neighbourhood Area is proposed in a Coastal Change Management Area, careful attention should be paid to the guidance on what development would be appropriate in such an area, including whether time-limiting planning permissions are needed. The local planning authority will need to be consulted about existing and anticipated levels of risk, and the types of development that may or may not be appropriate.

See related policy in paragraphs 170 to 173 of the National Planning Policy Framework (https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change).

Paragraph: 076 Reference ID: 7-076-20220825

Revision date: 25 08 2022

Flood Zone and flood risk tables

- Table 1: Flood Zones
- National Planning Policy Framework Annex 3 - Flood risk vulnerability classification (https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification)
- Table 2: Flood risk vulnerability and flood zone 'incompatibility'

Paragraph: 077 Reference ID: 7-077-20220825

Revision date: 25 08 2022

Table 1: Flood Zones

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map)

Flood Zone	Definition
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the Strategic Flood Risk Assessment (https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment) when considering location and potential future flood risks to developments and land uses.

Paragraph: 078 Reference ID: 7-078-20220825

Revision date: 25 08 2022

Table 2: Flood risk vulnerability and flood zone 'incompatibility'

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	**X**	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	**X**	**X**	**X**	✓ *

Key:

✓ Exception test is not required

X Development should not be permitted

Notes to table 2:

- This table does not show the application of the Sequential Test which should be applied first to guide development to the lowest flood risk areas; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to those developments set out in National Planning Policy Framework footnote 56 (https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change). The Sequential and Exception Tests should be applied to 'major' and 'non major' development;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

"†" In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

18. Managing flood risk and coastal change

The objective of the policies in this chapter is to minimise risks to development arising from all sources of flooding and coastal change, taking into account the impacts of climate change, by steering development away from areas of risk, ensuring that development will be safe for its lifetime without increasing flood risk elsewhere, and incorporating sustainable drainage systems where appropriate.

Plan-making policies

F1: **Assessing flood risk for plan-making**

1. In order to manage development in ways which minimise the risk of flooding to people and property, development plans should:

    a. Be informed by an up-to-date strategic flood risk assessment which considers current and future flood risk from all sources, including cumulative impacts in, or affecting, areas susceptible to flooding; and

    b. Take account of advice from the Environment Agency and other relevant flood risk management authorities, such as Lead Local Flood Authorities and internal drainage boards, about levels of risk, options for mitigation, and the implications for development in the plan area.

F2: Planning for effective flood risk management

1. Development plans should take a risk-based approach when identifying suitable locations for development, taking into account all sources of flood risk and the current and future impacts of climate change. They should do this, and manage any residual risk, by:

    a. Applying the sequential test in policy F5 and, where relevant, policy F6;

    b. Safeguarding land that is, or is likely to be, required for current or future flood management;

    c. Using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and

    d. Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.

F3: Managing coastal change

1. Development plans should take into account relevant Shoreline Management Plans, the National Coastal Erosion Risk Map, the UK Marine Policy Statement and relevant marine plans in assessing the risks arising from coastal change and appropriate approaches to coastal management. Integrated Coastal Zone Management should be pursued across

local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.

2. Inappropriate development in vulnerable coastal areas should be avoided when identifying suitable locations for development, so that risks arising from coastal change are not exacerbated. In order to do this development plans should:

    a. Identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, estuaries or tidal rivers, over the next century;

    b. Set out what types of development will be appropriate in the Coastal Change Management Area, and in what circumstances, taking into account the safeguards in policy F9 and local conditions;

    c. Safeguard land that is, or is likely to be, required for current or future coastal change risk management, including managed realignment; and

    d. Reduce risks by making provision for development and infrastructure which needs to be relocated away from Coastal Change Management Areas.

National decision-making policies

F4: **Assessing flood risk for decision-making**

1. To inform the assessment of flood risk and, where relevant, appropriate mitigation, a site-specific flood risk assessment should accompany all development proposals in Flood Zones 2, 3a, and 3b as defined in Annex F, table 1.

2. In Flood Zone 1, a site-specific flood risk assessment should inform and accompany all development proposals involving:

    a. Sites of one hectare or more;

    b. Land which has been identified by the Environment Agency as having critical drainage problems; and

    c. Land identified in a strategic flood risk assessment or the Flood Map for Planning[55] as being at risk of flooding from any source, whether now or in the future.

3. Site-specific flood risk assessments should be appropriate to the scale, nature, and location of development and should, where relevant, support an assessment of whether a development proposal satisfies the sequential and exception tests set out in policies F5 and F6.

F5: **The sequential test**

1. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Where the test applies, development proposals should not be located in areas at risk of flooding where alternative sites, appropriate for the development, are reasonably available in areas with a lower risk of flooding. The area to

[55] Flood Map for Planning published in: https://flood-map-for-planning.service.gov.uk/.

which the test is applied should not be greater than the anticipated catchment of the development in terms of its likely occupiers or users.

2. The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, other than for:

    a. Sites allocated in the development plan which were subject to the sequential test during plan preparation;

    b. Sites where a site-specific flood risk assessment demonstrates clearly that:

        i. No built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk); or

        ii. Where the site would be at risk of surface water flooding only, the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development without increasing flood risk elsewhere in accordance with policy F7.

    c. For the following types of development:

        i. Householder development;

        ii. Small non-residential extensions (with a footprint of less than 250m^2); and

        iii. Changes of use, other than changes of use to a caravan, camping or chalet site, or to a mobile home or park home site.

3. The strategic flood risk assessment covering the area of the proposed development and the Flood Map for Planning should provide the evidential basis for applying the sequential test.

F6: **Development in areas at risk of flooding from rivers or the sea**

1. In areas falling within flood zones 2, 3a, or 3b (as defined in Annex F, table 1):

    a. Development proposals should be refused if the use is incompatible with the risk from river or sea flooding, as set out in Annex F, table 3; and

    b. In certain other circumstances set out in Annex F, table 3, in addition to satisfying the sequential test in policy F5 where applicable, development will only be appropriate where an ‘exception test’ is satisfied. The exception test involves demonstrating that the development would meet all the following criteria:

        i. Provide wider sustainability benefits to the community that outweigh the flood risk;

        ii. Be safe for its anticipated lifetime in accordance with policy F7; and

        iii. Not increase flood risk elsewhere and, where possible, reduce flood risk overall.

2. The application of the exception test should be informed by a site-specific flood risk assessment[56]. The exception test does not need to be applied:

    a. To those forms of development, or in those circumstances, where the sequential test is not required, as set out in policy F5; or

    b. Where development is proposed on a site allocated in the development plan to which the exception test was applied at the plan-making stage, unless there has been a significant increase in the risk of flooding to the site subsequently, or the nature of the development itself has changed significantly from that which was allocated so as to introduce a more vulnerable use (having regard to Annex F, table 2).

F7: **Ensuring development is safe from flooding**

1. Development proposals should not present a risk from flooding to potential occupiers, users, or visitors, and should not increase flood risk elsewhere.

2. Where development is proposed in a location known to be at risk from any form of flooding, now or in the future, it should be refused unless:

    a. Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons which justify a different arrangement;

    b. The development will be safe throughout its lifetime taking account of the vulnerability of its users;

    c. Any residual risk can be safely managed, and safe access and escape routes are included where appropriate, as part of an agreed emergency plan;

    d. The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment; and

    e. It can be demonstrated that flood risk will not be increased elsewhere.

F8: Sustainable drainage systems and watercourses

1. Development proposals which could affect drainage on or around the development site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, in ways which are proportionate to the nature and scale of the proposal. The systems employed should provide multifunctional benefits where possible, facilitating improvements in water quality, biodiversity and amenity.

2. Sustainable Drainage Systems should:

    a. Be designed in accordance with the National Standards for Sustainable Drainage Systems[57];

[56] For the purpose of policy F2, when the exception test is being applied at the plan-making stage, it should be informed instead by an up-to-date strategic flood risk assessment.
[57] National Standards for Sustainable Drainage Systems published in: National standards for sustainable drainage systems (SuDS) - GOV.UK.

b. Have maintenance arrangements in place to ensure an acceptable standard of operation for the anticipated lifetime of the development; and

c. In the case of proposals for major development, take account of advice from the Lead Local Flood Authority.

3. Development proposals should not enclose existing watercourses where this is not already the case, unless there are compelling reasons to do so; and should where possible remove existing culverts and renaturalise existing river channels, unless to do so would increase flood risk, result in other environmental harm or cause harm to heritage assets.

F9: **Development in Coastal Change Management Areas**

1. Development should not take place within a Coastal Change Management Area (or within other areas likely to be subject to coastal erosion or tidal inundation over the next century, accounting for the National Coastal Erosion Risk Map and other up-to-date evidence on coastal change and its management) unless it can be demonstrated that it would:

   a. Be safe over its planned lifetime;

   b. Reflect the provisions of the relevant Shoreline Management Plan and not have an unacceptable impact on coastal change processes; and

   c. Provide wider sustainability benefits which justify the development.

2. Where development proposals meet these requirements, time-limited permissions and site-restoration conditions should be used where appropriate.

3. New residential development (including through changes of use) is inappropriate within an area to which this policy applies, unless it satisfies the tests set out at paragraph 1(a) to 1(c) in this policy.

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APPENDIX B: EA INFORMATION & CORRESPONDENCE

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Liam Davies

From:
Sent: 24 October 2025 10:13
To:
Subject: HYD1128 Former Glen Dimplex, Stoney Lane, Whiston - Flood Risk Information Request – Products 4, 5, 6, & 7 [Filed 24 Oct 2025 10:12]
Attachments: Location Plan.pdf

Categories: Filed by Mail Manager

To whom it may concern,

Former Glen Dimplex, Stoney Lane, Whiston

Please could you confirm whether you have any information (where available, Products 4, 5, 6, & 7) that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and specific drainage requirements; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind regards

Liam Davies

From:

Sent:
To:
Subject:
Attachments:

Categories: Filed by Mail Manager

Dear Liam Davies,

I am writing in response to your request for information, received 24 October 2025, regarding Request for Flood risk assessment data (product 4). Customer request reference MRC2GJC18N48.

We respond to requests for information under the Freedom of Information Act 2000 (FOI) and Environmental Information Regulations 2004 (EIR).

There is no detailed modelling for this site, we have provided a detailed flood map.

We hold no record of flooding in this area.

However, this does not mean flooding has not occurred in the past or that it will not flood in future.

There are no flood defences in the vicinity of the site.

There are no 2D levels available for this site.

We recommend that you also contact United Utilities and Lead Local Flood Authority Knowsley Council,

who may hold additional information (the former especially in relation to sewer flooding.

Lead Local Flood Authority Knowsley Council is responsible for issues relating to surface water and hold information on surface water flooding.

For further surface information: Surface water map - Check your long term flood risk - GOV.UK

For further information on your property's flood risk, visit:

Check Your Long Term Flood Risk: Check the long term flood risk for an area in England - GOV.UK

Check for Flooding: Check for flooding in England - GOV.UK

Sign up for flood warnings: Sign up for flood warnings - GOV.UK

Flood Map for Planning: https://flood-map-for-planning.service.gov.uk/

For additional flood risk information, advice and support in your area, please visit: https://thefloodhub.co.uk/

For more information on how the rivers and see dataset is used and its limitations, we recommend you visit How to use rivers and sea data - Flood map for planning - GOV.UK

Please refer to the Open Government Licence which explains the permitted use of this information.

Rights of appeal

If you are not satisfied with our decision, you can contact us within two calendar months to ask for the decision to be reviewed. We will then conduct an internal review of our response to your request and give you our decision in writing within 40 working days.

If you are not satisfied with the outcome of the internal review, you can then make an appeal to the Information Commissioner Office, the statutory regulator for EIR and FOI. The address is: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire. SK9 5AF.

Tel: 0303 123 1113 (local rate) or 01625 545 745 (national rate) | Fax: 01625 524 510 Email: casework@ico.org.uk | Website: www.ico.org.uk

Yours sincerely,

Lauren Blackley

GMMC Area Customers and Engagement Team

Environment Agency

Please tell us how we did

To help improve your experience as a customer we are currently gathering feedback. If you would like to take part in a short customer satisfaction survey, please click the link below:

Environment Agency FOI Customer Satisfaction Survey

Liam Davies

From:

Sent:
To:
Subject:

Categories:

GOV·UK

Dear Liam Davies,

Thank you for ordering flood risk data.

Location data requested for: 348024,391523 easting and northing coordinates.

Your reference number is: MRC2GJC18N48.

You should receive your flood risk data by email within 20 working days.

You should not submit another request for data for the same location after you have placed an order. We will not action a request for the same location if the email address is the same. If you request the same data twice, it will not speed up your order. If you have any questions about your order, please use the contact details below.

Contact us

Do not reply to this email. This inbox is not checked regularly.

If you have any questions about your order, or no longer need the data, contact the Greater Manchester Merseyside and Cheshire Environment Agency team at

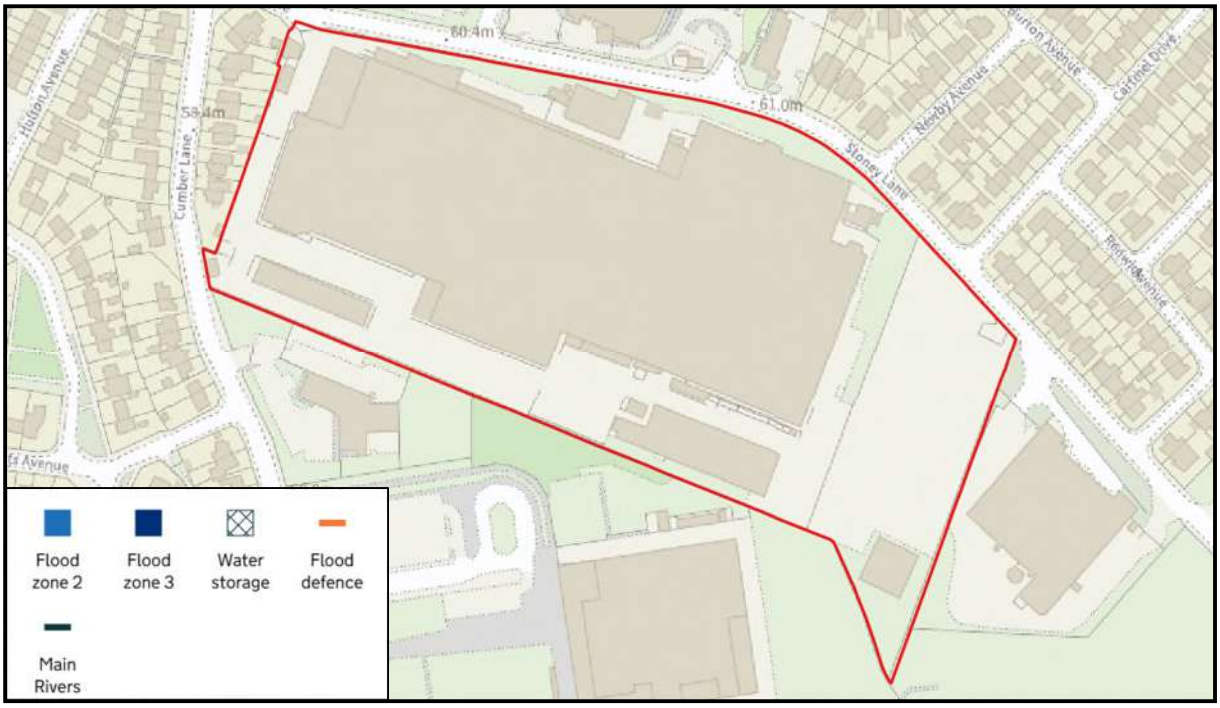
inforequests.gmmc@environment-agency.gov.uk. Make sure you include your reference number.

Regards,

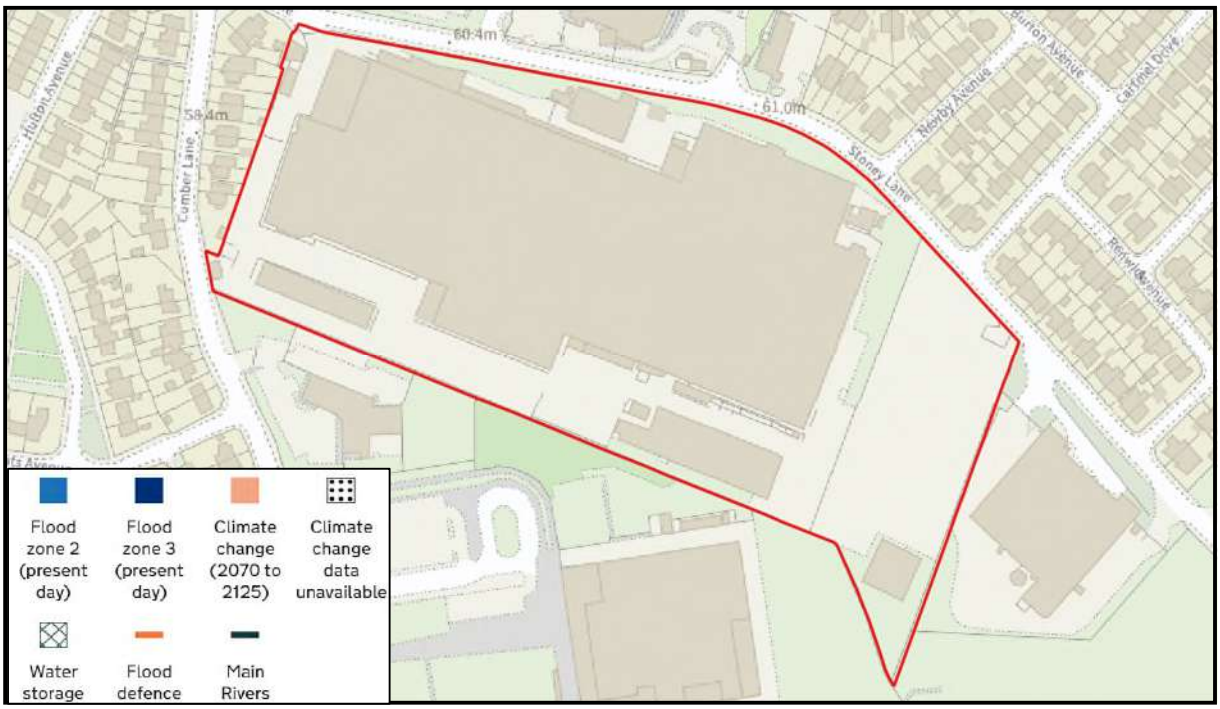
Flood map for planning service
Environment Agency
https://flood-map-for-planning.service.gov.uk/

FLOOD MAP FOR PLANNING

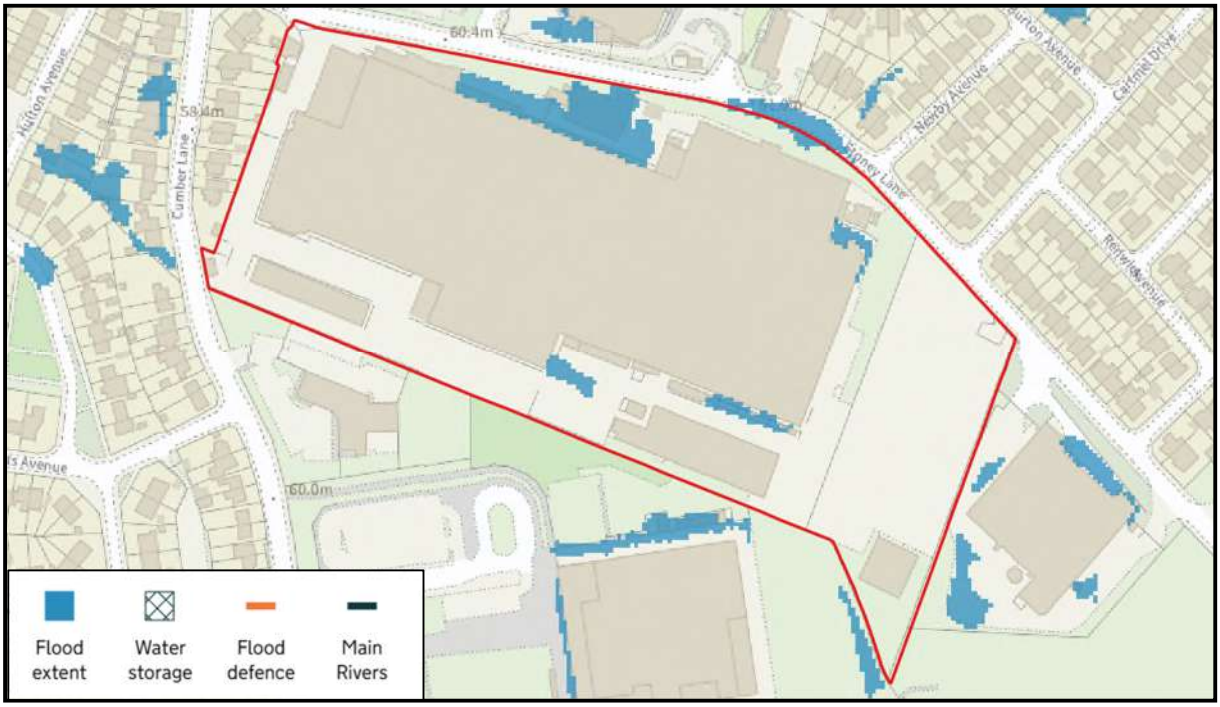
Flood Zones – Present Day



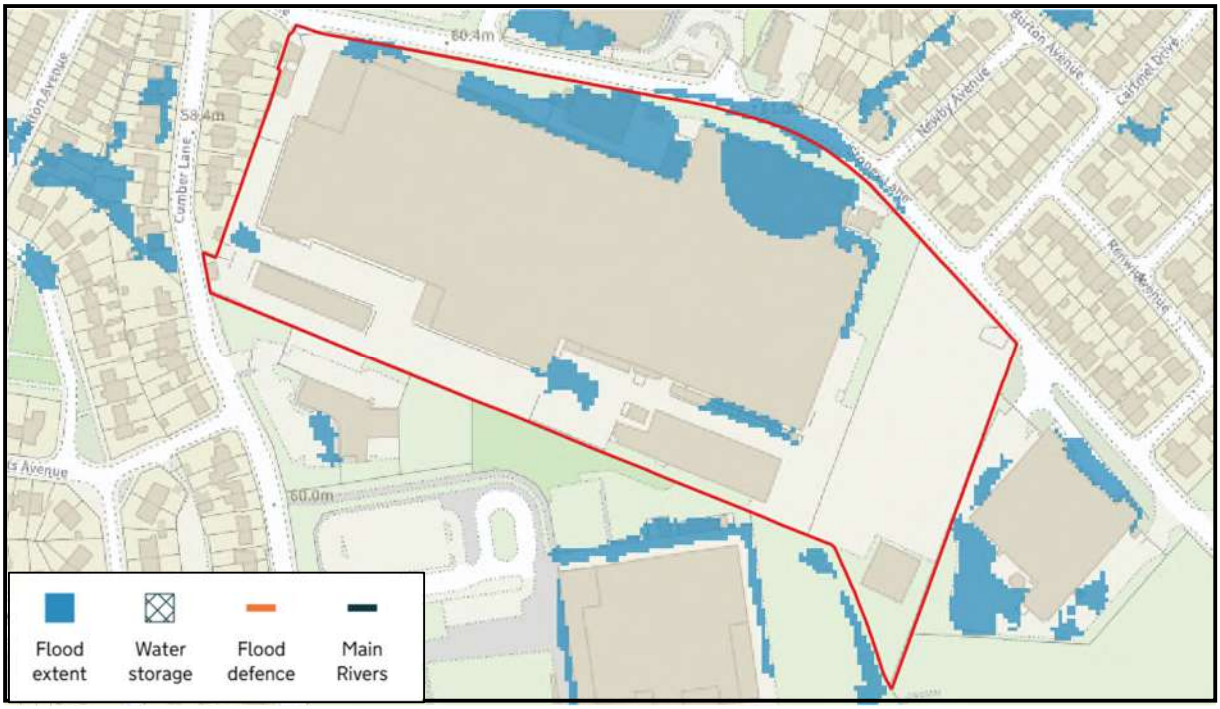
Flood Zones – Future



Surface Water Annual Likelihood of Flooding (Present Day) – 1 in 30yr



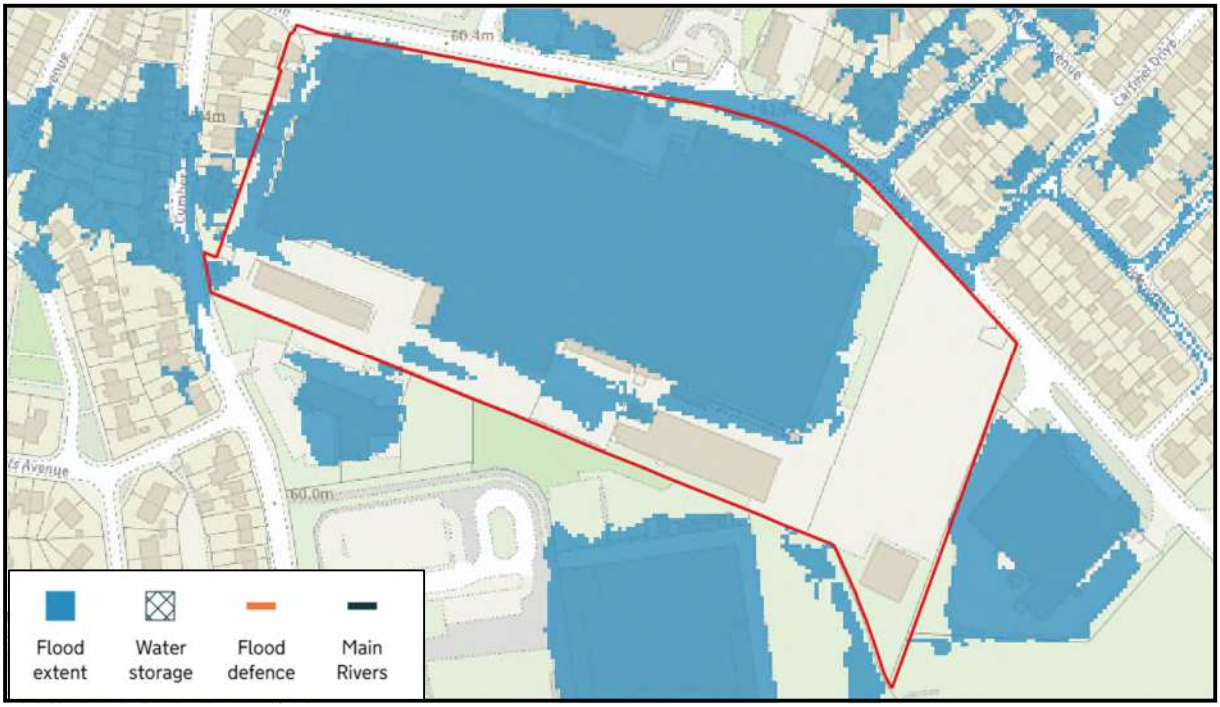
Surface Water Annual Likelihood of Flooding (Present Day) – 1 in 100yr



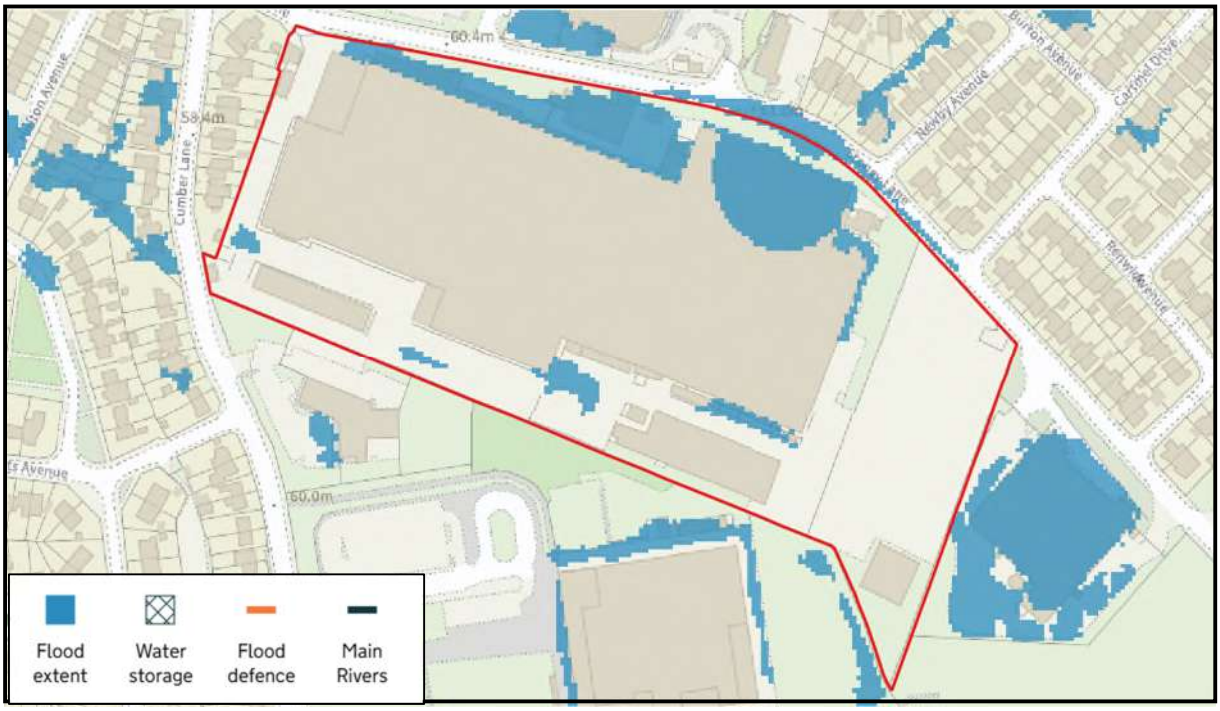
NATIONAL FLOOD MAPPING

BETTS HYDRO
CONSULTING ENGINEERS

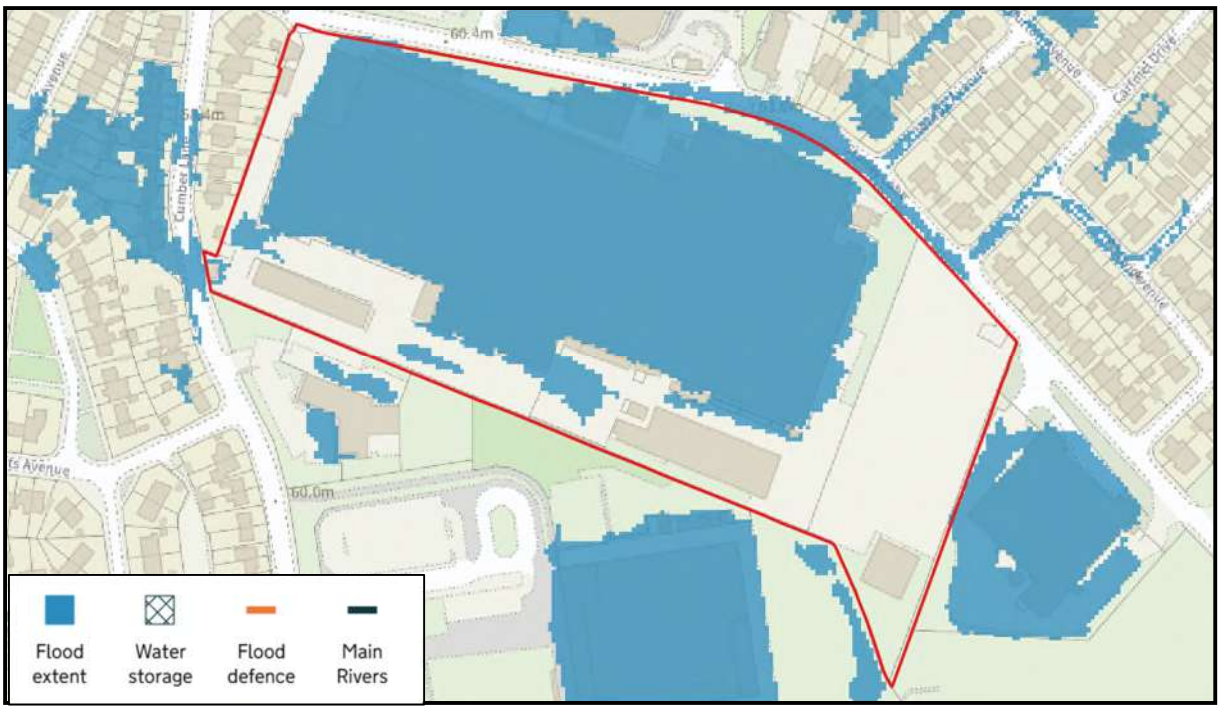
Surface Water Annual Likelihood of Flooding (Present Day)– 1 in 1000yr



Surface Water Annual Likelihood of Flooding (Climate Change) – 1 in 30yr



Surface Water Annual Likelihood of Flooding (Present Day) – 1 in 100yr



Surface Water Annual Likelihood of Flooding (Present Day)– 1 in 1000yr



LONG TERM RISK OF FLOODING MAPPING

Rivers or Sea – Current

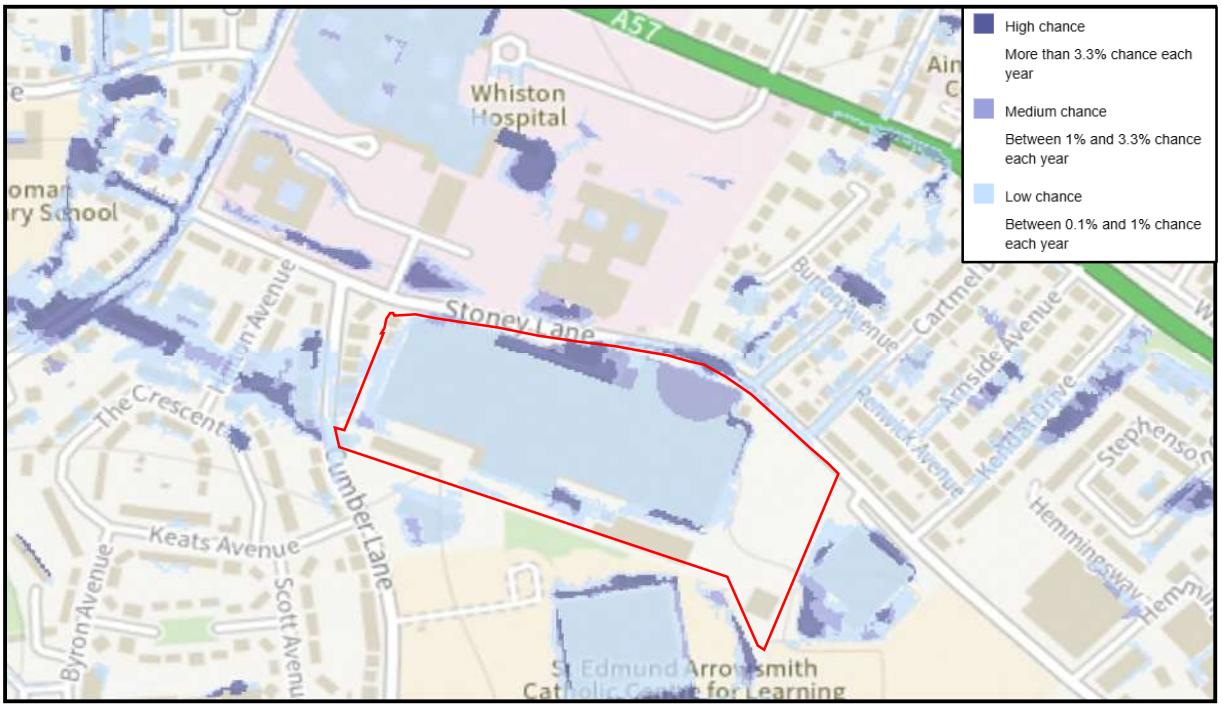


Rivers or Sea – Future (2036-2069)



NATIONAL FLOOD MAPPING

Surface Water – Current



Future (2040-2060)



Long Term Flood Risk - Reservoirs



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APPENDIX C: UU CORRESPONDENCE

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Liam Davies

From:
Sent:
To:
Subject:

Categories:

Good Morning Liam,

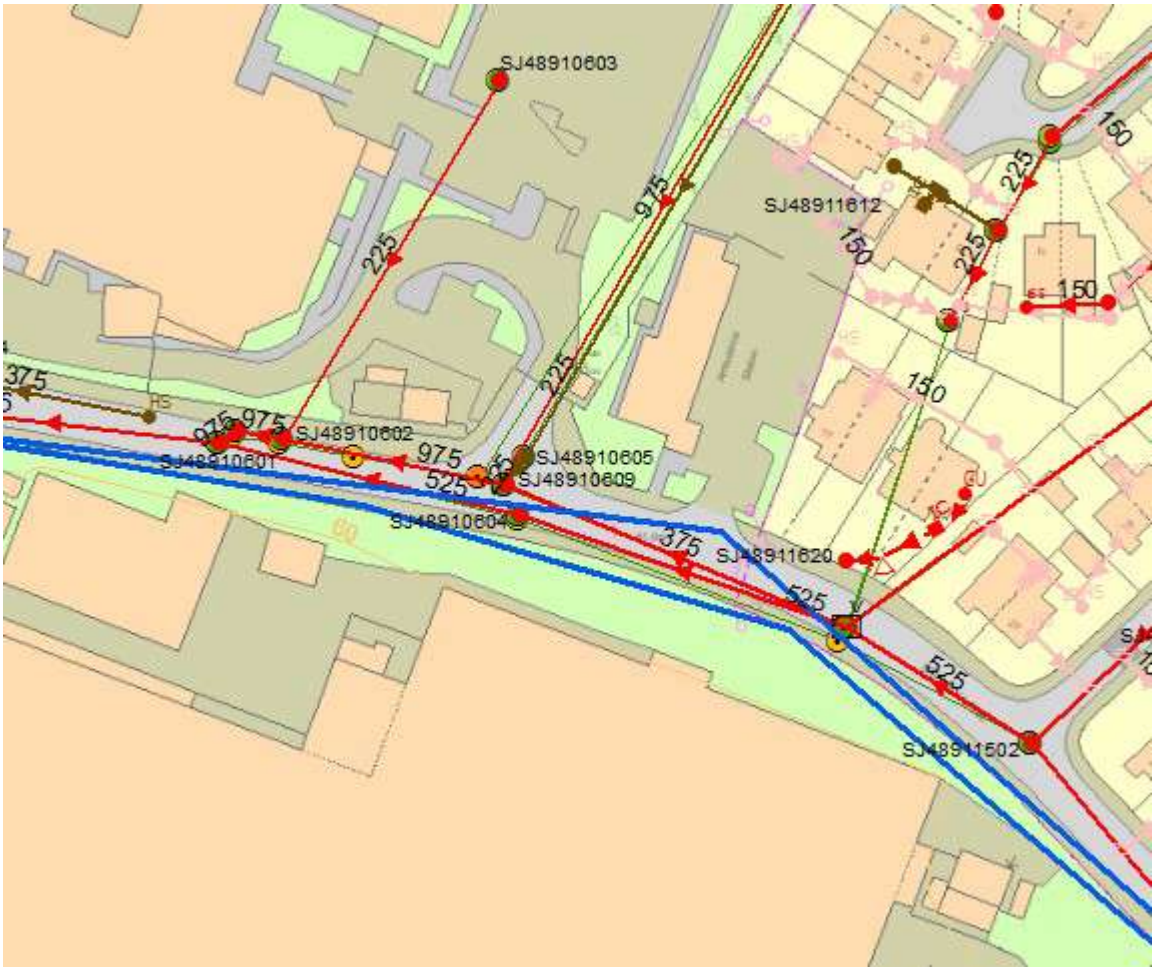
I can confirm that we have modelled flood risk within the vicinity of the proposed development.

Please note that our modelling data is indicative, and only representative of the 1:100year storm event.

United Utilities Water Limited (UUW) can only record and check flooding events which are reported to us, and we must comply with our Regulators instructions on the qualification of flooding events.

Our response does not include:

- any sewer flooding events caused by blockages or collapses which are the result of third-party actions, natural events, or other actions over which UUW has no control and not a facet of sewer capacity; or
- any historical sewer flooding events that have been resolved from investment in our infrastructure.



Thanks

United Utilities
Water for the North West

Shoaib Tauqeer
Developer Engineer
Developer Services & Metering
M: 01925 429087
unitedutilities.com

If you have received a great service today why not tell us?
Visit: unitedutilities.com/wow

Good Morning,

Your enquiry has been logged and sent to our engineer Shoaib Tauqeer and his contact number is 01925 429087. Our service Level agreement is to respond to you within 5 working days.

Many thanks

Laura Owens
Customer Advisor Advanced
Developer Services & Metering
Customer Services
T: 0345 026 8989 option 4
unitedutilities.com

If you feel you have received a good service from myself, please can you take two minutes to fill in the survey below. This will be much appreciated

Visit: *https://unitedutilities.thewowawards.co.uk/nominate*

To whom it may concern,

Former Glen Dimplex, Stoney Lane, Whiston

We have recently been instructed to prepare a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached). Please could you confirm whether you have any record of sewer flooding impacting on or within proximity of the site?

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind regards



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Liam Davies

From:
Sent:
To:
Subject:

Attachments:

Categories:

To whom it may concern,

Former Glen Dimplex, Stoney Lane, Whiston

We have recently been instructed to prepare a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached). Please could you confirm whether you have any record of sewer flooding impacting on or within proximity of the site?

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind regards

Liam Davies BA MSc
Graduate Flood Risk Analyst

APPENDIX D: LPA/LLFA CORRESPONDENCE

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Liam Davies

From:
Sent:
To:
Subject:

Importance:

Categories: Filed by Mail Manager

Good Afternoon,

Apologies if I am mistaken, but I believe I am still awaiting a response to my request for Flood Risk and Drainage Information Request submitted on 24th October 2025 for the above-named site.

Please can you inform me when I can expect to receive a response, and I hope to hear from you in due course!

Kind regards

To whom it may concern,

Former Glen Dimplex, Stoney Lane, Whiston

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and specific drainage requirements; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind regards

Liam Davies

To whom it may concern,

Former Glen Dimplex, Stoney Lane, Whiston

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and specific drainage requirements; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind regards

Knowsley Council

Regeneration & Environment

Date: 4 March 2026

APPLICATION CONSULTATION RESPONSE

APPLICATION No:	**25/00672/FUL**
LOCATION:	**RESIDENTIAL DEVELOPMENT COMPRISING THE ERECTION OF UP TO 204 DWELLINGS WITH ASSOCIATED PARKING, CONSTRUCTION OF VEHICULAR AND PEDESTRIAN ACCESSES FROM STONEY LANE, PEDESTRIAN ACCESS FROM CUMBER LANE, SUBSTATIONS, SUDS BALANCING POND, PUBLIC OPEN SPACE, LANDSCAPING, AND ASSOCIATED INFRASTRUCTURE**
GRID REF:	
PROPOSAL:	**Glen Dimplex Site Stoney Lane Whiston**

Thank you for inviting the Lead Local Flood Authority (LLFA) to comment on the above application. Knowsley Council as Lead Local Flood Authority (LLFA) provides comments on planning applications as our statutory consultee role in relation to surface water drainage and works in relation to ordinary watercourse.

The LLFA has reviewed the submitted information/documents concerning the above application including Flood Risk Assessment report dated December 2025, Proposed Drainage Layout Ref GDXBETZZXXDRC0001 P09 dated April 2025 and Phase I & II Geoenvironmental Site Assessment dated June 2024. The current LLFA comments are based on these documents/information and other databases available to the Council.

The review of the submitted Flood Risk Assessment and accompanying Drainage Strategy layout indicates that the proposed drainage design and SuDS approach do not meet the minimum requirements of the LLFA at Knowsley Council and are not fully aligned with the principles and standards set out in the SuDS Manual (June 2025).
Accordingly, the LLFA raises an objection to the planning application at this stage in respect of the surface water drainage proposals. The principal reasons for this objection are summarised below.

- No explanation of surface water management at the exiting site has been provided in terms of where surface water discharges to and how.

- No details of an investigation of the hierarchy of drainage options in the National Standards for Sustainable Drainage Systems (SuDS Manual - June 2025) have been provided. In absence of such an investigation, the LLFA cannot accept any proposed discharge destination. This investigation shall include evidence of an assessment of ground conditions and the potential for infiltration of surface water utilising the BRE 365 method. 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. Given parts of the site is located within Environment Agency-designated Zone III (Total Catchment) Source Protection Zone, the infiltration-based SuDS (if feasible) should only be proposed at locations only receiving roof waters. Where there is risk of contamination, shallow inlined infiltration might be considered.

- Aside from the proposed attenuation basin, the submitted drainage layout does not demonstrate an integrated SuDS strategy incorporating source control measures and linked green/blue infrastructure features or corridors. In accordance with the 2025 update to the SuDS Manual, SuDS design should seek to minimise impacts on water quantity and quality while maximising amenity and biodiversity benefits. In developing an appropriate SuDS strategy, the LLFA would ordinarily expect, where feasible, the integration of source control features within a wider green/blue infrastructure network, with a preference for above-ground, vegetated attenuation features to enhance water quality treatment, visual amenity and ecological value. The current submission does not set out such a SuDS hierarchy, nor does it provide any justification for the omission of source control and green infrastructure components. Given the apparent availability of space and feasibility for their inclusion, the absence of these features is not considered consistent with the objectives of promoting water quality, amenity and biodiversity.

- It appears that a culverted ordinary watercourse crosses the site in a north–south direction. The precise alignment of the culvert should be confirmed and verified by a CCTV survey. The current proposed building layout appears to encroach over the line of the culverted watercourse. However, Planning Practice Guidance (PPG) advises that planning authorities should avoid permitting development that would compromise the operational effectiveness of flood defences or drainage infrastructure. In practice, this means that the LLFA do not support the erection of buildings or structures (other than minor works such as paving) directly over a culverted watercourse. Accordingly, a revised site layout will be required to accommodate and safeguard the watercourse corridor, providing a minimum easement of 4–6 metres from the top of each bank to allow for future access, maintenance and potential restoration.

- It is stated the culverted watercourse has been surveyed beyond the site boundary along its length to Whiston Brook. The findings of the survey shall be required.

- The FRA report indicates that at manhole MH1 (cover level 59.120m AOD, invert level 56.730m AOD, providing 2.39m of available depth), there is adequate freeboard between the incoming pipe soffit and the cover level. It concludes that, in the event of a complete

blockage of the culvert, water levels at the inlet would remain significantly below the manhole cover, and therefore there would be no material risk of surcharge or surface water flooding at MH1. However, further clarification is required regarding the exceedance routing - specifically, where surface water runoff from the site and flows arriving via the culverted watercourse would discharge under such blockage conditions.

- The FRA report states that any residual exceedance flows at MH1 would, based on the surrounding ground levels, flow southwards and ultimately re-enter the open channel section of Whiston Brook. However, the site topographical survey does not appear to support this conclusion, as the land generally falls towards the south-west. There is therefore potential for exceedance flows to migrate towards properties along Cumber Lane. Furthermore, if residual exceedance flows are predicted to reach Whiston Brook, a clear assessment of the associated flood risk implications for any premises or assets located between the site and Whiston Brook would be required.

- No information on the correct number of treatment stages in the surface water management train shall be required. It must be demonstrated 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 development.

There are a number of additional elements that are routinely considered in the review of a proposed drainage strategy. These include: confirmation of the appropriate number of treatment stages within the surface water management train; modelling criteria and a summary of network performance results for the critical 1 in 2 year, 1 in 30 year, and 1 in 100 year plus 45% climate change storm events; detailed drainage layout plans; assessment of exceedance flows and runoff events exceeding the design standard; and a comprehensive management and maintenance plan. However, as the proposed drainage strategy is subject to a objection, the LLFA is unable to provide detailed comments on these aspects at this stage. Further review will only be undertaken once the applicant has addressed the above concerns and submitted a revised drainage proposal.

Should you require any clarification regarding the above comments, please do not hesitate to contact me at Knowsley Council LLFA.

Yours faithfully,
Dr Vahid Tayefi

Knowsley Borough Council LLFA

Knowsley Council

Regeneration & Environment

Phone:

Email:

Website:

Date: 23 July 2026

APPLICATION CONSULTATION RESPONSE

APPLICATION No:	**25/00672/FUL**
LOCATION:	**RESIDENTIAL DEVELOPMENT COMPRISING THE ERECTION OF UP TO 204 DWELLINGS WITH ASSOCIATED PARKING, CONSTRUCTION OF VEHICULAR AND PEDESTRIAN ACCESSES FROM STONEY LANE, PEDESTRIAN ACCESS FROM CUMBER LANE, SUBSTATIONS, SUDS BALANCING POND, PUBLIC OPEN SPACE, LANDSCAPING, AND ASSOCIATED INFRASTRUCTURE**
GRID REF:	
PROPOSAL:	**Glen Dimplex Site Stoney Lane Whiston**

Thank you for inviting the Lead Local Flood Authority (LLFA) to comment on the above application. Knowsley Council as Lead Local Flood Authority (LLFA) provides comments on planning applications as our statutory consultee role in relation to surface water drainage and works in relation to ordinary watercourse.

The LLFA has revisited the submitted information/documents concerning the above application including Flood Risk Assessment report dated March 20256, Drainage Management Strategy report dated March 2026, Preliminary Drainage Layout Ref GDX BET ZZ XX DR C 0001 P11 dated April 2025, Phase I & II Geoenvironmental Site Assessment dated June 2024, and Exceedance Route drawing Ref GDX BET ZZ XX DR C 0008 P02. The current LLFA comments are based on these documents/information and other databases available to the Council.

The review of the recently submitted Flood Risk Assessment and accompanying Drainage Strategy report/layout indicates that the proposed drainage design and SuDS approach do not still meet the minimum requirements of the LLFA at Knowsley Council and are not fully aligned with the principles and standards set out in the SuDS Manual (June 2025). Accordingly, the LLFA retains its objection to the planning application at this stage in respect of the surface water drainage proposals. The principal reasons for this objection are summarised below.

- The site is at risk of surface water flooding from north where Stoney Lane is located. As stated in the Flood Risk Assessment, the site is bounded by a boundary wall which protects the site from entering the site at some locations. Despite this, it appears that there are still gaps along the boundary wall allowing the surface water to enter the site. No mechanism has been proposed to protect the site. To the south of the site where St Edmund's Arrowsmith Catholic Academy is laid, ground levels are generally lower than the development site and there is a chance that the surface water may enter the neighbouring site; for which no interception mechanism is proposed.

- As recommended by the drainage strategy report, an assessment of ground conditions and the potential for infiltration of surface water utilising the BRE 365 method shall be required. 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. Justifications provided in Paragraph 4.5.3 of the Surface Water Strategy report are not sufficient to preclude the use of infiltrating-based SuDS features as part of the drainage design. The exclusion of infiltrating-based SuDS features would require solid evidence of groundwater contamination risk. Parts of the site that is located within Environment Agency-designated Zone III (Total Catchment) Source Protection Zone, the infiltrating-based SuDS, as a minimum, should be proposed at locations only receiving roof waters. Should the groundwater contamination risk is established, shallow inlined infiltration can be considered.

- The revised drainage strategy submitted, aside from the proposed attenuation basin, does not still demonstrate an integrated SuDS strategy incorporating source control measures and linked green/blue infrastructure features or corridors. In accordance with the 2025 update to the SuDS Manual, SuDS design should seek to minimise impacts on water quantity and quality while maximising amenity and biodiversity benefits. The proposed planters at the rear gardens would not solely be considered as source control features given their size and its potential impact. In developing an appropriate SuDS strategy, the LLFA would ordinarily expect the integration of source control features (i.e. deep infiltrating or shallow inlined infiltrating surfaces, and raingardens along highways/footpaths) within a wider green/blue infrastructure network, with a preference for above-ground, vegetated attenuation features to enhance water quality treatment, visual amenity and ecological value. The current submission does not set out such a SuDS hierarchy, nor does it provide any justification for the omission of source control and green infrastructure components. Given the apparent availability of space and feasibility for their inclusion, the absence of these features is not considered consistent with the objectives of promoting water quality, amenity and biodiversity. A revised Drainage Strategy shall then be required.

- Despite the provision of CCTV survey information for sections of the culverted watercourses to the east and south of the site, the submitted documentation does not provide a clear understanding of the watercourses' alignment, connectivity, route, or condition between their points of entry and exit from the site. The available information indicates that certain sections of the existing culverted watercourses may require repair or replacement.
  The proposed diversion of the culverted watercourses is not considered acceptable in its

current form due to the incorporation of sharp bends within the design. Where practicable, the LLFA would strongly support the de-culverting of these watercourses and their integration into the site landscape as open green corridors. Accordingly, a revised site layout will be required to accommodate and safeguard the watercourse corridors. This should include a minimum easement of 4 to 6 metres from the top of each bank to facilitate future access, maintenance, and any potential restoration or enhancement works.

- The FRA report indicates that at manhole MH1 (cover level 59.120m AOD, invert level 56.730m AOD, providing 2.39m of available depth), there is adequate freeboard between the incoming pipe soffit and the cover level. It concludes that, in the event of a complete blockage of the culvert, water levels at the inlet would remain significantly below the manhole cover, and therefore there would be no material risk of surcharge or surface water flooding at MH1. However, further clarification is required regarding the exceedance routing - specifically, where surface water runoff from the site and flows arriving via the culverted watercourse would discharge under such blockage conditions.

- Upon the provision of a revised drainage strategy, catchment area to each of the proposed manholes shall be required.

- Upon the provision of a revised drainage strategy, results showing all the modelling criteria and summary network results for critical 1 in 2 years, 1 in 30 years and 1 in 100 years plus 45% CC storm events showing maximum water level, flow and velocity and details of any surface flooding anticipated shall be required.

- Upon the provision of a revised drainage strategy a Detailed Drainage Scheme Plan showing the layout of the proposed drainage network, post development impermeable area, Suds features, the location of the attenuation storage within the proposed development and how these relate to the submitted calculations, including any chamber, pipe numbers, direction of low, invert and cover levels, gradients diameters and dimensions. The methods of flow control must be detailed as should non-conventional elements such as pond and permeable paving.

- Upon the provision of a revised drainage strategy, Technical and design details of all SuDS features, hydraulic devices and outfalls and attenuation storage (including longitudinal and cross-sectional profiles if applicable) shall be required.

- Upon the provision of a revised drainage strategy, exceedance flows and runoff in excess of design criteria shall be required. Calculations and plans shall be provided to show where above ground flooding might occur and where this would pool and flow. Where there is possibility of water ponding, the maximum extent and depth of flooded water shall be required to ensure that there would be sufficient resilience flood mitigation measures in place. If the design criterion is an event with the 1 in 100 years likelihood including 45% as the impact of climate change, then exceedance flows and runoff in excess of such an event must be considered.

- Upon the provision of a revised drainage strategy, the mechanism for securing long-term maintenance will need to be considered and agreed between the applicant and the Local Planning Authority. This may involve discussions with those adopting and/or maintaining the proposed systems, which could include the Highway Authority, Planning Authority, Parish Councils, Water Companies and

private management companies.

- Upon the provision of a revised drainage strategy, a revised management and maintenance plan for the proposed drainage system, arrangements for adoption and means of access for inspection and maintenance purposes shall be considered.

Should you require any clarification regarding the above comments, please do not hesitate to contact me at Knowsley Council LLFA.

Yours faithfully,
Dr Vahid Tayefi

Knowsley Borough Council LLFA

Liam Davies

From:
Sent:
To:
Cc:
Subject:

Hi Chole,

I have reviewed the proposed option. While it is not the ideal solution, we believe that, given the site constraints, it represents an improvement from a source control SuDS perspective. Provided that the proposed option is implemented across the entire site, we would accept it as the source control SuDS solution.

The proposed interception drain is also considered acceptable.

Regards
Vahid

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Secured by Check Point

Hi Vahid

Please could you look at the below today if possible?

We would welcome an early teams call this week to present the proposal ahead of resubmitting our planning pack the end of this week.

Kind regards
Chloe

Warning: This email is from an external sender, please be cautious when opening attachments or links.

Good afternoon Vahid,

We have been having some extensive discussion around how we deal with the matter of source control / SuDS / water quality improvement in view of the issues both site-specific and in relation to recent problems encountered by Taylor Wimpey in relation to permeable paving and I'm pleased to say we now have what I consider to be a better approach than we have previously proposed. I've attached a sketch / concept for Plot no.s17-24 for your review and comment prior to us applying a site-wide design update.

In summary: -

TW have been having issues with block paving driveways relating to building control issues, service corridors and build sequence (also viability issues on this specific scheme where margins are very tight on a contaminated brownfield development).

The proposal is that rather than use permeable paving for the private driveways and raingarden plants – both of which are difficult to protect in perpetuity (particularly raingarden planters that have a limited lifespan and will undoubtably not be replaced by residents or removed for space). Instead, we propose a Filter Drain (FD) that serves all of the plot drainage, both driveways/hardstanding and roof water runoff, this will slow the flow nearer to source that just being reliant on the 'end of pipe basin' (as proposed at present).

The FD will obviously still need to be lined due to the contam. issue, but all runoff will be through the granular filter media into the terram wrapped perforated base pipe that will convey flow to the drag-out manholes before connecting into the public sewer system that will serve the development – still with further water quality improvement for most of the site runoff within the detention basin. Notwithstanding that, even without the detention basin the Pollution Index (PI) of the driveways 0.5/0.4/0.4 (TSS/Met/HC) are met when the Treatment Index (TI) of both the Filter Drain and Catchpits are combined (FD TI 0.4/0.4/0.4 – CP to remove residual TSS).

We have also introduced an Interception Drain on a portion of the southern boundary (also shown on the attached sketch/concept plan) that can intercept potential exceedance from offsite and visa-versa.

N.b. we explored the addition of a short length of swale /open-channel before leaving site, however depths resulted in an impact on developable area that could not be accommodated.

I'd be very grateful if you could scan the attached and let me know if you can support this approach – at which point we will update the Drainage Strategy to confirm such.

Please do not hesitate to call in the interim should you have any queries, if you feel a Teams call is required to discuss, please let me know.

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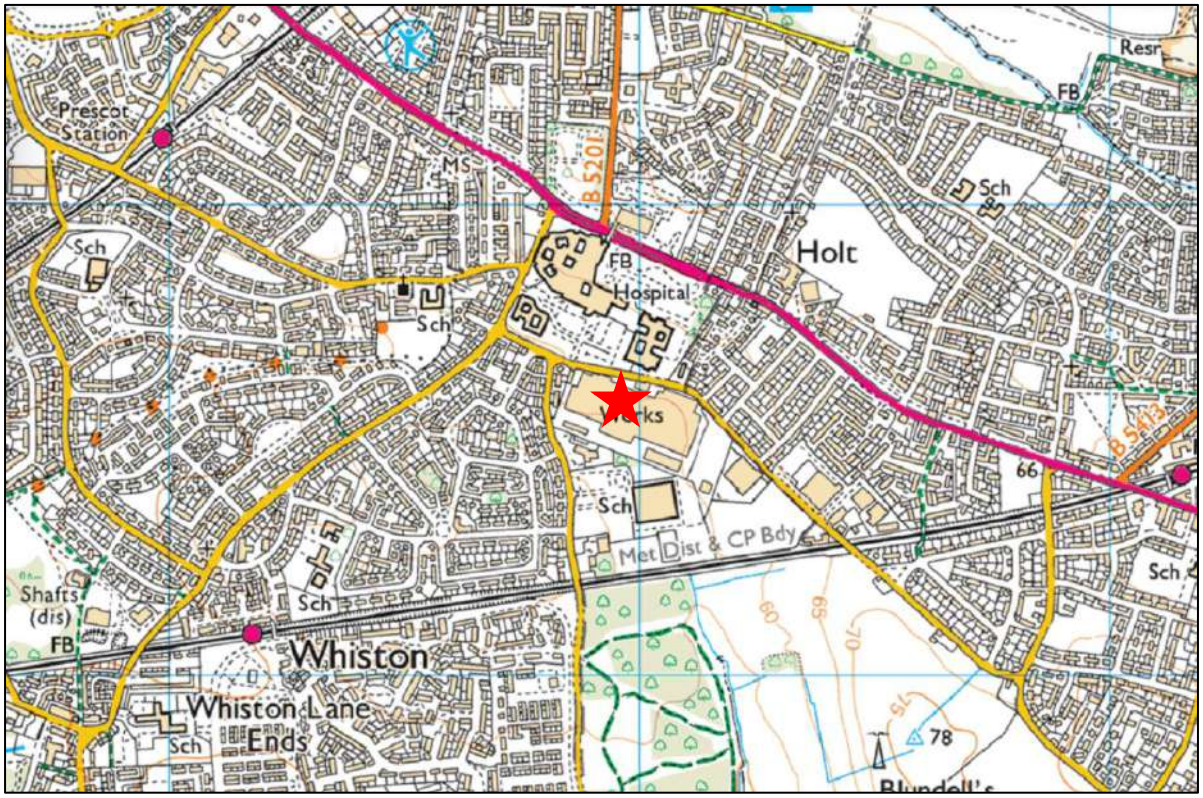
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APPENDIX E: LOCATION PLAN

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LOCATION PLAN

Former Glen Dimplex, Stoney Lane, Whiston



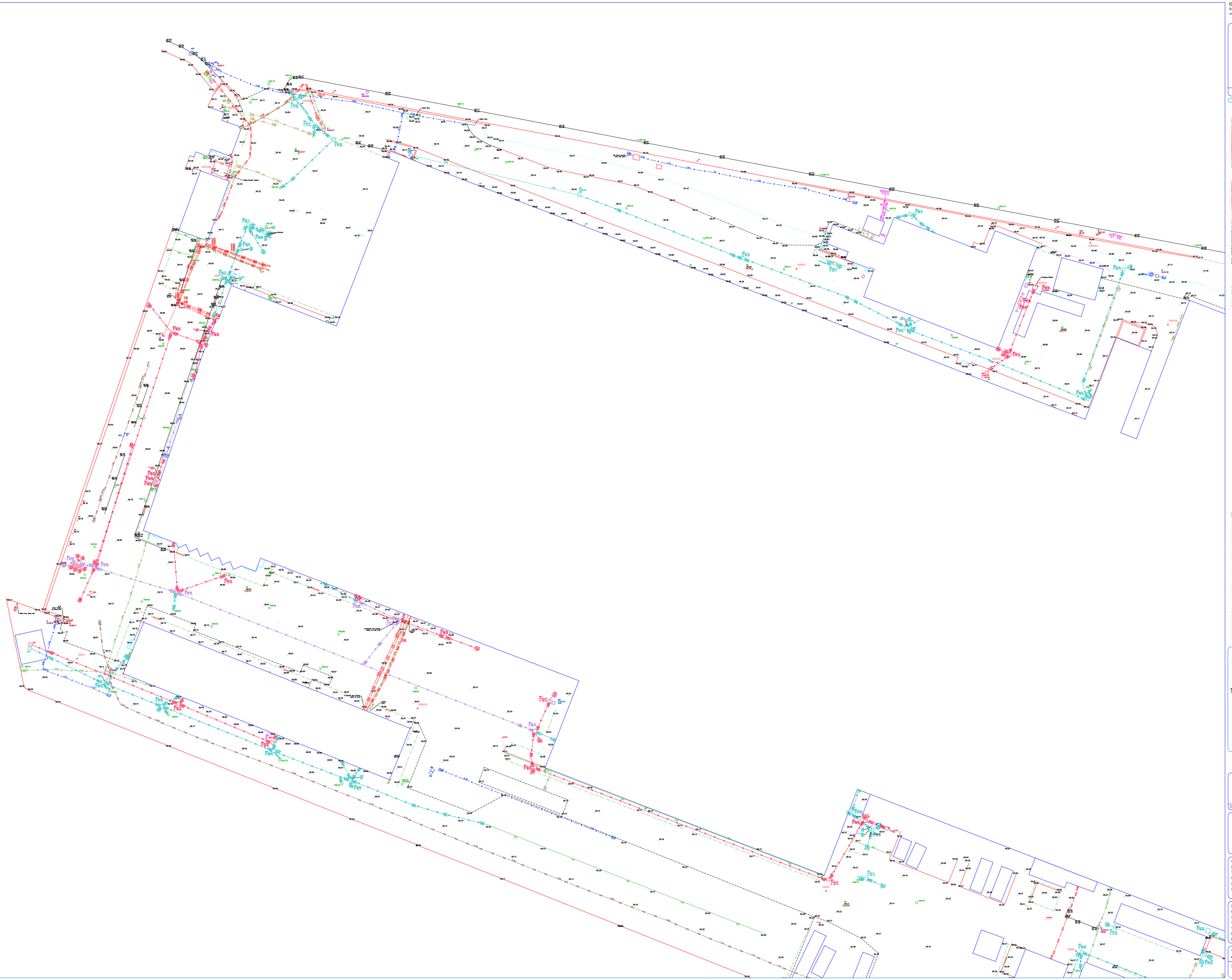
OS X (Eastings) 347921
OS Y (Northings) 391590
Nat Grid SJ479915 / SJ4792191590
Nearest Post Code L35 2XW
Lat (WGS84) N53:25:07 (53.41852684321607)
Long (WGS84) W2:47:06 (-2.785068353974353)
Lat,Long (WGS84) 53.41852684321607,-2.785068353974353
Lat (OSGB36) N53:25:06 (53.41827891888551)
Long (OSGB36) W2:47:01 (-2.783696832357844)
Lat,Long (OSGB36) 53.41827891888551,-2.783696832357844



APPENDIX F: TOPOGRAPHIC SURVEY

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N

PLAN GRID NORTH

File Name: TAY143 - Stoney Lane, Prescot Topographical and Utility Survey.dwg

LEGEND

AV	AIR VALVE	BT	BT
BT	BT INSPECTION COVER	DUCT	DUCT
CCTV	CCTV CAMERA	CABLE TV	CABLE TV
CCTV	CCTV CAMERA POST	CCTV	CCTV
COM	COMMUNICATIONS COVER	TELECOMS	TELECOMS
C	CABLE TV COVER	TELECOMS STRIP	TELECOMS STRIP
CTV	CABLE TV COVER	ELECTRIC	ELEC
DC	DRAINAGE CHANNEL	ELECTRIC	ELEC
DP	DOWN PIPE	FUEL LINE	FL
DP	DRAIN	FUEL/TELECOM LINE	FL/T
EIC	ELECTRIC INSPECTION COVER	GAS	GAS
EJB	ELECTRIC BOX	MAINS WATER	W
EP	ELECTRIC POST	SEWER	S
EP	ELECTRICITY POLE	SEWER F/M	SF
FFL	FINISHED FLOOR LEVEL	SEWER C/W	SW
FH	FIRE HYDRANT	UNIDENTIFIED CABLE	UNID
G	GULLY	UNIDENTIFIED TRACE	UNID
GLT	GROUND LIGHT	UNIDENTIFIED CABLE	UC
GP	GAS POST	UNIDENTIFIED TRACE	UC
GSV	GAS VALVE	VEHICLE DETECTION CABLE	VDC
IC	INSPECTION COVER	VDC	VDC
		SURVEY STATION	
		SURVEY BOUNDARY	

IL	INVERT LEVEL
KO	KERB OUTLET
LP	LAMP POST
MH	MANHOLE
MKR	MARKER
OP	OVERFLOW PIPE
PN	PYLON
PT	PICTORIAL MARK
RP	RODDING EYE
SVP	RUNWATER PIPE
SP	SOIL VENT PIPE
ST	STOP VALVE
TB	TELEPHONE JUNCTION BOX
TL	TRAFFIC LIGHT
TLB	TRAFFIC LIGHT BOX
TP	TELEPHONE POST
WB	WATER METER
WO	WATER OUTLET
WT	WATER TANK TAP
WSV	WATER STOP VALVE
EOT	END OF TRACE
UTA	UNABLE TO ENTER AREA
UTL	UNABLE TO LOCATE
UTS	UNABLE TO TRACE
SL	SIGNAL LIGHT
SJ	SIGNAL JUNCTION
MFN	NO FURTHER MARKS
NFC	NO FURTHER SPR CONTACTS
NFP	NO FURTHER PIPES
NVP	NO VISIBLE EXIT
TUP	TOP OF PIPE
TOP	TOP OF KERB
UTE	UNABLE TO TRACE
LOR	LOSS OF REFLECTION

FROM STATUTORY AUTHORITY PLANS

BT	
CABLE DUCT	
CABLE TV	
CCTV	
TELECOMS	
ELECTRIC	
MAINS GAS	
MAINS WATER	
SEWER C/W	
SEWER F/W	
SEWER S/W	
FIBRE-OPTICS	

NOTES

All levels relate to O.S (Newlyn) Datum, Established using network RTK.
Survey plotted on a plane local grid, orientated to National Grid.

Services shown as 'From Statutory Authority Plans' line styles are taken from Statutory Records plans supplied by the relevant regional authorities. These services were not located and are shown for indicative purposes only.

Survey Control Markers established for Mapping purposes only and should not be used for Construction without the written approval of GEO UK Ltd.

TYPICAL FEATURE USED ON SURVEY (SCALE)		
ELECTRICITY PYLON/TOWER	TELECOMMUNICATIONS MANHOLE	WATER TANK/RESERVOIR
20m	1m	10m

DISCLAIMER:

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Where similar services run in close proximity it may be impossible to separately trace individual services as the trace signal can experience interference. In such cases, services will be shown as a single, annotated line. The displayed depth will refer to the shallowest detected utility.

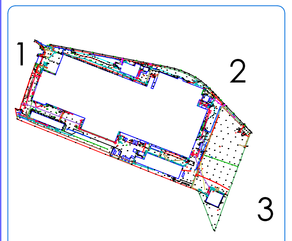
Successful tracing of non-conductive materials may be limited. Drainage gullies are duly tested where possible to prove connectivity but it is not always possible to introduce the sonde due to narrow pipe sizes and/or accumulated silt.

Depth information of underground services/features are generally accurate to within +/- 10% (i.e. a pipe at 2m deep may be accurate to +/-200mm) but should not be relied upon for excavation. Depths usually refer to the top of the service. Gravity sewer and drain depths are usually to invert (base of drainage channel) unless otherwise stated.

Some above ground features may have been obscured at time of survey. It is not always possible to operate the Ground Penetrating Radar in areas including, but not limited to, dense vegetation, rubble, debris and/or roughly-uneven ground.

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Excavation in the vicinity of services shown should be carried out with due diligence (Ref. HSG47).



SHEET LAYOUT

0 2.5m 5m 10m 15m 20m

SCALE BAR

REV	DATE	DESCRIPTION

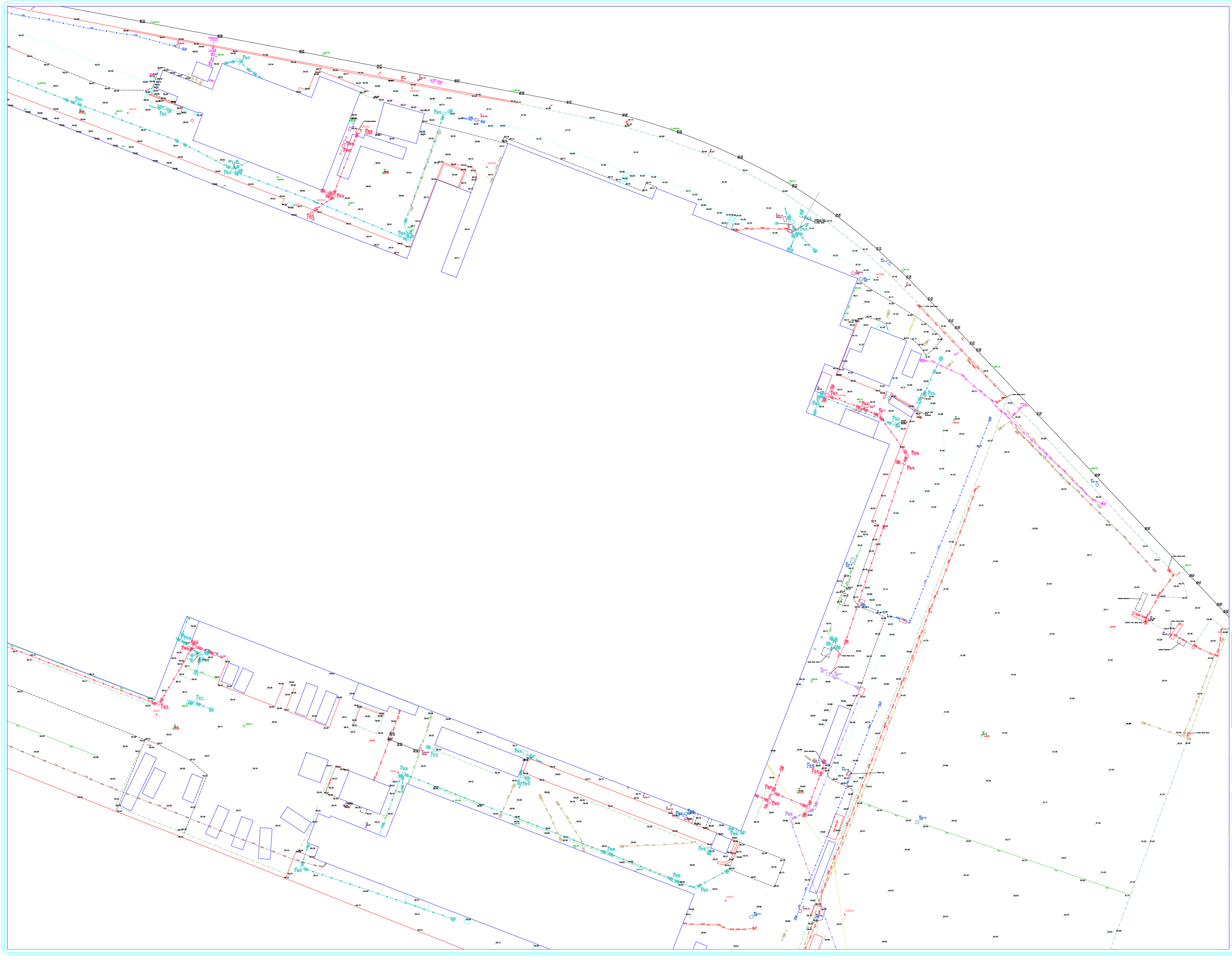
Geographical Engineering Operations

Client
E3P
Taylor Road
Urmston
Manchester
M41 7JQ

Project Title
Utility Survey of Land at:
Stoney Lane
Whiston Cross
Whiston
Knowsley
L35 9JU

Surveyed	Drawn	Checked
CT	JAS	GEO UK LTD

Scale	Date	Drawing Ref.	No.	Size	Rev
1:250	MAR 24	G24104	01	A0	--



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N

PLAN GRID NORTH

File Name: TAY143 - Stoney Lane, Prescot Topographical and Utility Survey.dwg

LEGEND

AV	AIR VALVE
BT	BT INSPECTION COVER
CCTV	CCTV CAMERA
CCTV	CCTV CAMERA POST
COM	COMMUNICATIONS COVER
CP	CONTROL POST
CTV	CABLE TV COVER
DC	DRAINAGE CHANNEL
DP	DOWN PIPE
DR	DRAIN
EIC	ELEC INSPECTION COVER
EJB	ELECTRIC BOX
EP	ELECTRIC POST
EP	ELECTRICITY POLE
FFL	FINISHED FLOOR LEVEL
FH	FIRE HYDRANT
G	GULLY
GLT	GROUND LIGHT
GP	GUARD POST
GV	GAS VALVE
IC	INSPECTION COVER

IL	INVERT LEVEL
KO	KERB OUTLET
MH	MANHOLE
MK	MARKER
MKR	MARKER
OP	OVERFLOW PIPE
PN	PYLON
PP	PICNIC POST
PT	PETROL TANK
SVP	SOIL VENT PIPE
TP	TRANSFORMER PIPE
TV	TELEVISION POST
VA	STOP VALVE
TL	TRAFFIC LIGHT BOX
TL	TRAFFIC LIGHT
TLB	TRAFFIC LIGHT BOX
WB	WATER BOX
WM	WATER METER
WO	WATER OUTLET
WP	WATER STAND PIPE
WV	WATER STOP VALVE
EOT	END OF TRACE
UTA	UNABLE TO ACCESS AREA
UTL	UNABLE TO LOCATE
UTS	UNABLE TO SPACE
SCP	SURVEY CONTROL
S.V.	SIGNAL VDS
MH	MANHOLE
NFN	NO FURTHER SPR CONTACTS
NVP	NO VISIBLE PIPE
NW	NO VISIBLE WIRE
TUP	TOP OF RSPC
TW	TOP OF WALL
UTR	UNABLE TO RAISE
LOR	LOSS OF REFLECTION

BT	BT
CABLE DUCT	DUCT
CABLE TV	CABLE TV
CCTV	CCTV
TELECOMS	TELECOMS
ELECTRIC STRIP	ELEC
ELECTRIC	ELEC
FUEL	FUEL
FUEL LINE	FL
GAS PROTECTION LINE	GPL
MAINS GAS	GAS
MAINS WATER	W
SEWER	S
SEWER FW	FW
SEWER SW	SW
UNDERGROUND CABLE	UNID
UNIDENTIFIED TRACE	UNID
UNIDENTIFIED CABLE	UC
UNIDENTIFIED PIPE	UP
VEHICLE DETECTION CABLE	VDC
VDS	VDS
SURVEY BOUNDARY	

FROM STATUTORY AUTHORITY PLANS

BT	
CABLE DUCT	
CATV	
CCTV	
TELECOMS	
ELECTRIC	
MAINS GAS	
MAINS WATER	
SEWER SW	
SEWER FW	
FIBRE-OPTICS	

NOTES

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TYPICAL FEATURE DETAILS AND SYMBOLOGY		
ELECTRICAL/MANHOLE PROTECTION	TELECOMS MANHOLE / CHAMBER	WATER / FOUL / SURFACE WATER
CABLE/FIBRE OPTIC		

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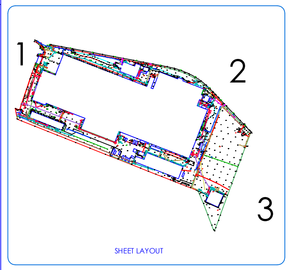
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SHEET LAYOUT

0 2.5m 5m 10m 15m 20m

SCALE BAR

REV	DATE	DESCRIPTION

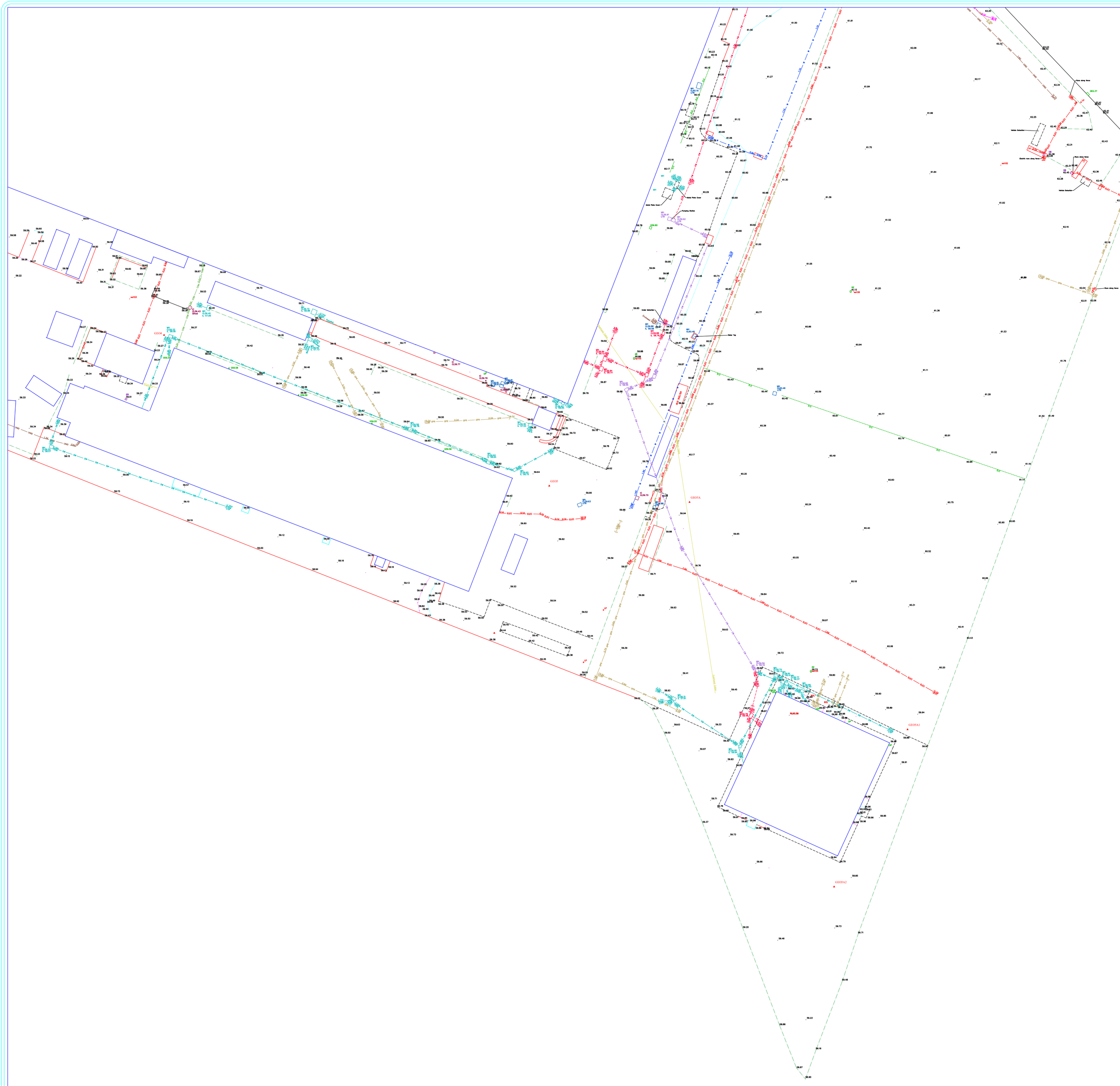
Geographical Engineering Operations

Client
E3P
Taylor Road
Urmston
Manchester
M41 7JQ

Project Title
Utility Survey of Land at:
Stoney Lane
Whiston Cross
Whiston
Knowsley
L35 9JU

Surveyed	Drawn	Checked
CT	JAS	GEO UK LTD

Scale	Date	Drawing Ref.	No.	Size	Rev
1:250	MAR 24	G24104	02	A0	--



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PLAN GRID NORTH

File Name: TAY143 - Stoney Lane, Prescot Topographical and Utility Survey.dwg

LEGEND

AV	AIR VALVE
BT	BT INSPECTION COVER
CCTV	CCTV CAMERA
CCTV	CCTV CAMERA POST
COM	COMMUNICATIONS COVER
CP	CONTROL POST
CTY	CABLE TV COVER
DC	DRAINAGE CHANNEL
DP	DOWN PIPE
DW	DRAIN
EIC	ELECTRIC INSPECTION COVER
EJB	ELECTRIC BOX
EP	ELECTRIC POST
EP	ELECTRICITY POLE
FFL	FINISHED FLOOR LEVEL
FH	FIRE HYDRANT
G	GULLY
GLT	GROUND LIGHT
GV	GAS VALVE
GVV	GAS VALVE
IC	INSPECTION COVER

BT	BT
CABLE DUCT	CABLE DUCT
CABLE TV	CABLE TV
CCTV	CCTV
TELECOMS	TELECOMS
ELECTRIC STRIP	ELEC STRIP
ELECTRIC	ELEC
FIBRE	FIBRE
FUEL LINE	FL
GAS/TELECOM LINE	GAS/TELECOM
GAS MAIN	GAS
MAINS WATER	W
SEWER	SEWER
SEWER FW	SEWER FW
SEWER SW	SEWER SW
TRAFFIC CABLE	TRAFFIC
UNIDENTIFIED TRACE	UNID
UNIDENTIFIED CABLE	UC
UNIDENTIFIED PIPE	UP
VEHICLE DETECTION CABLE	VDC
VOLTAGE	V
SURVEY BOUNDARY	

IL	INVERT LEVEL
KO	KERB OUTLET
LP	LAMP POST
MK	MARKER
MKR	MARKER
MP	MANHOLE PIPE
PN	PYLON
PT	PICTORIAL POST
RP	RAINWATER PIPE
SHP	SHARPS BOX
SP	SOIL PIPE
ST	STOP VALVE
TB	TELEPHONE JUNCTION BOX
TL	TRAFFIC LIGHT
TLB	TRAFFIC LIGHT BOX
TP	TELEPHONE POST
WB	WATER METER
WO	WATER OUTLET
WP	WATER PIPE TAP
WSV	WATER STOP VALVE
EOT	END OF TRACE
UTA	UNABLE TO ACCESS AREA
UTL	UNABLE TO LOCATE
UTS	UNABLE TO SPACE
SCP	SURVEY CONTROL
S.C.	SIGNAL COVER
MFN	NO FURTHER NOTES
NFC	NO FURTHER DPR CONTACTS
NFP	NO FURTHER PIPES
NVP	NO VISIBLE PIPE
TUP	TOP OF PIPE
TVP	TOP OF VALVE
UTR	UNABLE TO RAISE
LOR	LOSS OF REFLECTION

FROM STATUTORY AUTHORITY PLANS

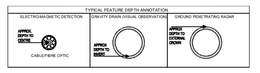
BT	BT
CABLE DUCT	CABLE DUCT
CABLE TV	CABLE TV
CCTV	CCTV
TELECOMS	TELECOMS
ELECTRIC	ELEC
MAINS GAS	GAS
MAINS WATER	W
SEWER CW	SEWER CW
SEWER FW	SEWER FW
SEWER SW	SEWER SW
FIBRE-OPTICS	FIBRE

NOTES

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SHEET LAYOUT

0 2.5m 5m 10m 15m 20m

SCALE BAR

REV	DATE	DESCRIPTION

Geographical Engineering Operations

Client
E3P
Taylor Road
Urmston
Manchester
M41 7JQ

Project Title
Utility Survey of Land at:
Stoney Lane
Whiston Cross
Whiston
Knowsley
L35 9JU

Surveyed	Drawn	Checked
CT	JAS	GEO UK LTD

Scale	Date	Drawing Ref.	No.	Size	Rev
1:250	MAR 24	G24104	03	A0	--

APPENDIX G: PROPOSED LAYOUT

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FORMER GLEN DIMPLEX | LAND SOUTH OF STONEY LANE

0 5 10 15 25m
1:500

N

The Contractor is to check and verify in conjunction with the Architects details all setting out dimensions, levels and boundary positions before commencing any work on site and ensure that they are fully conversant with the content and the requirements of the Site Investigation Report before work starts.
The Contractor is to comply in all respects with current building legislation, British and European Standard specifications, Building Regulations, Robust Details etc., whether or not specifically stated on this drawing.

This drawing is not intended to show details of ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. Any areas of formation for said structures which do not accord with the anticipated conditions as described in the Site Investigation Report are to be immediately brought to the attention of the Contractor's engineer. Any areas of made ground encountered on or within the ground should be further investigated by a suitable expert. Any earthworks shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert.

Where existing trees are shown to be retained they should be subject to a full arboricultural survey and report and any trees to be felled should be replaced with new trees planted at least 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

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Drawing Status:

- [X] FOR COMMENT
- [ ] PRELIMINARY ISSUE
- [ ] TENDER ISSUE
- [ ] CONSTRUCTION ISSUE
- [ ] AS BUILT

Notes:

ACCOMMODATION SCHEDULE

Name	Ref	TW ref	Bed	Storey	Unit No's	Unit ft²	ft² Total
Open Market Dwellings (184)							
Beaford Mid	BEA	EMA22	2 Bed	2	14	778	10892
Beaford Semi	BEA	EMA22	2 Bed	2	1	778	778
Brambleford Mid	BRA	EMA32	3 Bed	2	2	907	1814
Brambleford Semi	BRA	EMA33	3 Bed	2	29	907	26303
Aynesdale Semi	AYN	EMT31	3 Bed	2	9	1058	9522
Aynesdale Semi	AYN	EMT31	3 Bed	2	4	1058	4232
Tetford Det	TET	EMA35	3 Bed	2	5	1021	5105
Tetford Semi	TET	EMA35	3 Bed	2	11	1021	11231
Harrton Mid	HAR	EMB31	3 Bed	2.5	13	1140	14820
Harrton End	HAR	EMB31	3 Bed	2.5	30	1140	34200
Ayleford Semi	AYL	EMA41	4 Bed	2	10	1101	11010
Ayleford Det	AYL	EMA41	4 Bed	2	12	1101	13212
Corkham	COR	EMG42	4 Bed	2	24	1347	32328
Henford	HEN	EMA44	4 Bed	2	12	1359	16308
Wansdale	WAN	EMT45	4 Bed	2	8	1450	11600
Sub Total:			184 Units				203355 ft²
Affordable Dwellings @ 10% (20)							
Beaford Mid	BEA	EMA22	2 Bed	2	10	778	7780
Beaford Semi	BEA	EMA22	2 Bed	2	6	778	4668
Eynsford Mid	EYN	EMA33	3 Bed	2	4	972	3888
Sub Total:			20 Units				16336 ft²
Grand Total:			**204 Units**				**219691 ft²**
Net Site Area:			**5.147713**				**12.7200**
Net Coverage:			**3964.86 m²/ha**				**17271.31 ft²/ac**

Key

- TW Red line / Legal Ownership
- Fencing - rear/side boundaries
- Fencing - plot boundaries
- Brick Screenwall
- Knee Rail Fence
- Paladin Mesh Fencing
- POS / SUDS Area
- POS and buffers
- Proposed Tree Planting
- Existing Tree / Vegetation to be retained
- Existing Tree / Vegetation to be cut back
- Existing Tree / Vegetation to be removed
- Affordable house types

Rev V 07-11-2025
Schedule amended OM Beaford end to mid. Rear paths, gates and car bay numbers indicated.

Rev U 31-10-2025
Garage shown to Plot 204.

Rev T 30-10-2025
Client amendments. Schedule updated.

Rev S 29-10-2025
Plots 1-13, 71, 86-87, 119-125, 138-139, 169-175,181-204 repositioned. Schedule updated.

Rev R 23-10-2025
Plots 62-65, 71, 13-139 repositioned. Schedule updated.

Rev P 22-10-2025
Plots 6-9, 36-39, 82-86, 103-110, 124-129, 169-175, 180-204 amended and repositioned. Parking to plots 50-51 amended.

Rev N 09-10-2025
Amend parking bay locations and drive lengths.

Rev M 08-10-2025
Partial layout redesign in accordance with clients sketch design.

Rev L 03-10-2025
Partial layout redesign.

Rev K 26-09-2025
General amendments to layout

Rev J 27-08-2025
Parking bay nos updated. Schedules updated. Net dev and POS areas updated.

Rev H 26-08-2025 (TW)
Entrance pod re-designed and two plots removed to accommodate POS and Sales Centre car park, two plots plotted to central POS to re-balance mix and POS.

Rev G 14-08-2025
Net dev area updated to suit TW Site /Contract boundary.

Rev F 13-08-2025
TW Site /Contract boundary indicated.

Rev E 11-08-2025
Plots 169-170 house type substitution from Brambleford to Teford. Plots 2-3 house type substitution from Beaford to Brambleford.

Rev D 08-08-2025
Parking bays plots 172-175 corrected to 5.0m length.
Plots 177-181 repositioned by 0.1m. Plots 171-175 repositioned by 0.4m.
Plots 169-170 house type substitution from Teford to Brambleford.

Rev C 28-05-2025
Plot 14-33, 62-70 & 181 repositioned by 1m.

Rev B 12-05-2025
Amended in accordance with TW comments.

Rev A 11-04-2025
Amended in accordance with TW comments.

Client:
Taylor Wimpey North West

Project:
Former Glen Dimplex
Land South of Stoney Lane

Title:
Plannning Layout

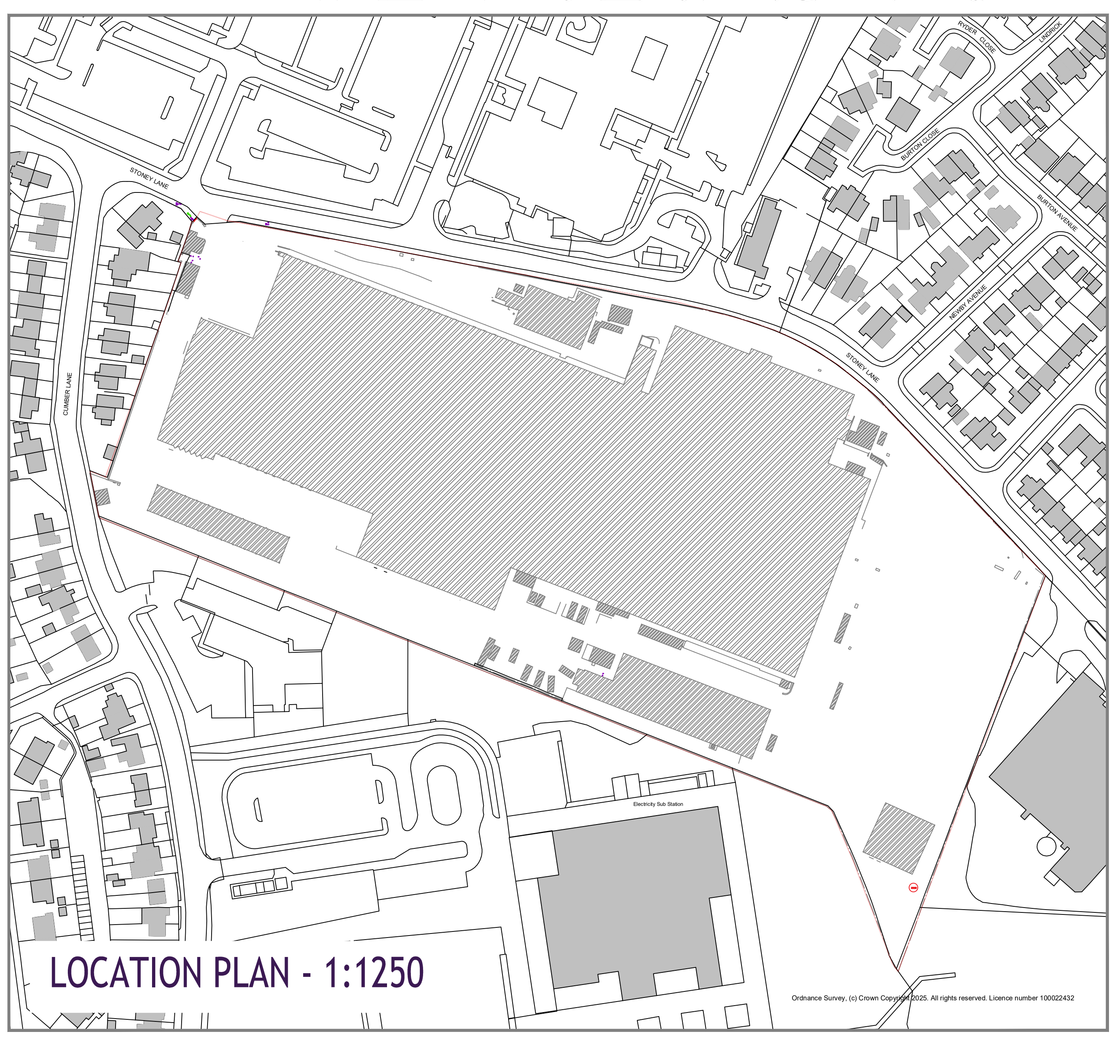
BANNERS GATE
CIVIL, STRUCTURAL & ARCHITECTURAL DESIGN SERVICES
Cavendish House, 10-11 Birmingham Street, Halesowen, West Midlands B63 3HN
Tel: 0121 687 1500 Fax: 0121 687 1501
E-mail: mail@bannersgate.com

Scale:	Plot size:	Drawn:	Check:	Date:
1:500	A0L	BGA	BGA	NOV 2025

CAD Ref:
J:\Land Yeadon\Jy1 - Live Land Opportunities\Glen Dimplex, Whitkirk\2. Planning\2.2 Planning Design Layout\GA\2025-1009 SH layout_2025.dwg

Project no.:	Drawing no.:
25053	1000V

LOCATION PLAN - 1:1250



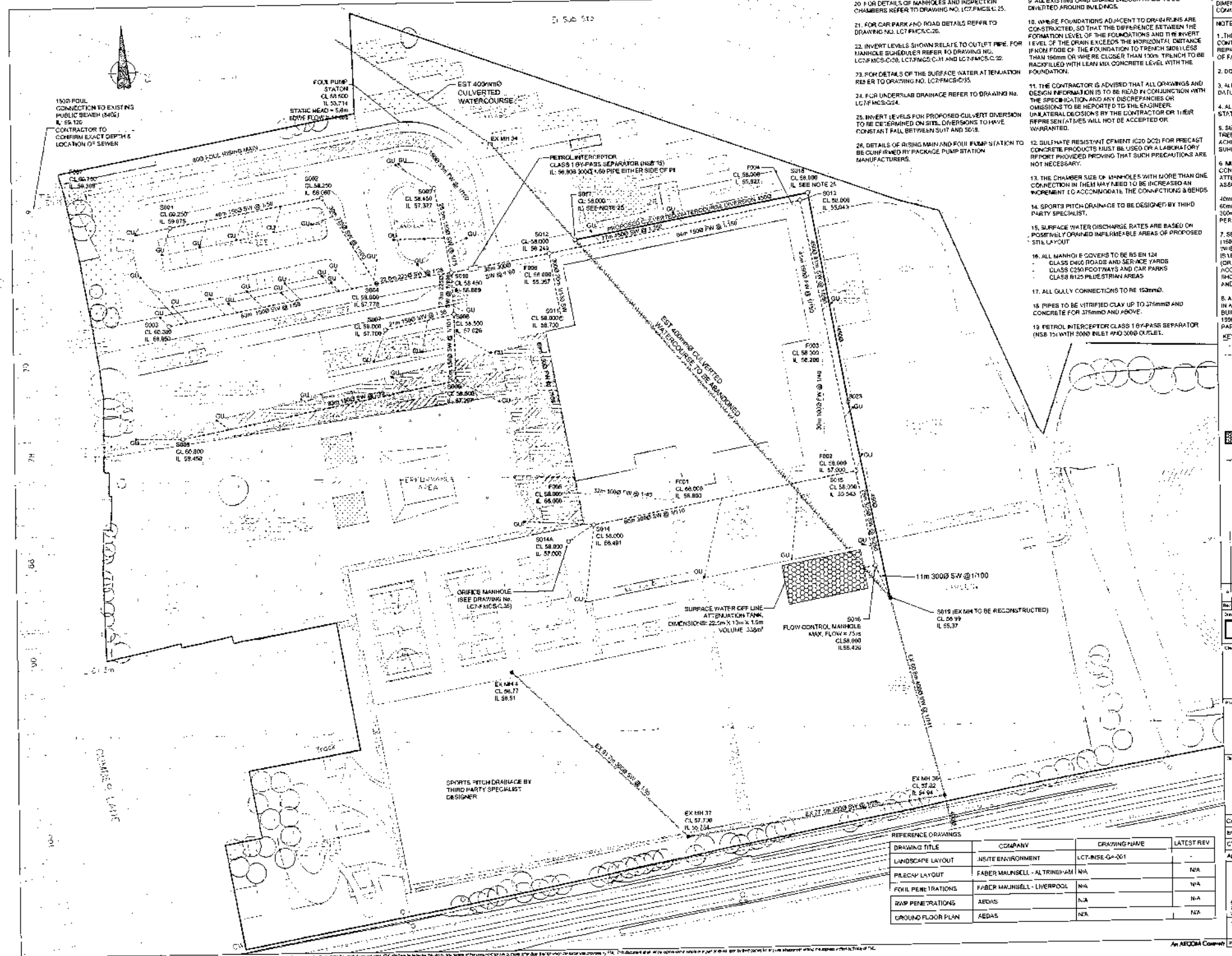
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SITE PLAN - 1:500

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APPENDIX H: CULVERT INVESTIGATIONS

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20. FOR DETAILS OF MANHOLES AND INSPECTION CHAMBERS REFER TO DRAWING NO. LC7-FMCS-C-25.

21. FOR CAR PARK AND ROAD DETAILS REFER TO DRAWING NO. LC7-FMCS-C-26.

22. INVERT LEVELS SHOWN RELATE TO OUTLET PIPE. FOR MANHOLE SCHEDULES REFER TO DRAWING NO. LC7-FMCS-C-36, LC7-FMCS-C-34 AND LC7-FMCS-C-32.

23. FOR DETAILS OF THE SURFACE WATER ATTENUATION REFER TO DRAWING NO. LC7-FMCS-C-35.

24. FOR UNDERSLAB DRAINAGE REFER TO DRAWING No. LC7-FMCS-C-24.

25. INVERT LEVELS FOR PROPOSED CULVERT DIVERSION TO BE DETERMINED ON SITE. DIVERSIONS TO HAVE CONSTANT FALL BETWEEN S017 AND S018.

26. DETAILS OF RISING MAIN AND FOUL PUMP STATION TO BE CONFIRMED BY PACKAGE PUMP STATION MANUFACTURERS.

9. ALL EXISTING LAND DRAINS ENCOUNTERED TO BE DIVERTED AROUND BUILDINGS.

10. WHERE FOUNDATIONS ADJACENT TO DRAIN RUNS ARE CONSTRUCTED, SO THAT THE DIFFERENCE BETWEEN THE FORMATION LEVEL OF THE FOUNDATIONS AND THE INVERT LEVEL OF THE DRAIN EXCEEDS THE HORIZONTAL DISTANCE FROM FACE OF THE FOUNDATION TO TRENCH SIDE LESS THAN 150mm OR WHERE CLOSER THAN 150m TRENCH TO BE BACKFILLED WITH LEAN MIX CONCRETE LEVEL WITH THE FOUNDATION.

11. THE CONTRACTOR IS ADVISED THAT ALL DRAWINGS AND DESIGN INFORMATION IS TO BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ANY DISCREPANCIES OR OMISSIONS TO BE REPORTED TO THE ENGINEER. UNILATERAL DECISIONS BY THE CONTRACTOR OR THEIR REPRESENTATIVES WILL NOT BE ACCEPTED OR WARRANTED.

12. SULPHATE RESISTANT CEMENT (CSS DC2) FOR PRECAST CONCRETE PRODUCTS MUST BE USED OR A LABORATORY REPORT PROVIDED PROVING THAT SUCH PRECAUTIONS ARE NOT NECESSARY.

13. THE CHAMBER SIZE OF MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS & BENDS

14. SPORTS PITCH DRAINAGE TO BE DESIGNED BY THIRD PARTY SPECIALIST.

15. SURFACE WATER DISCHARGE RATES ARE BASED ON POSITIVELY DRAINED IMPERMEABLE AREAS OF PROPOSED SITE LAYOUT

16. ALL MANHOLE COVERS TO BE BS EN 124
- CLASS D400 ROADS AND SERVICE YARDS
- CLASS C250 FOOTWAYS AND CAR PARKS
- CLASS B125 PEDESTRIAN AREAS

17. ALL GULLY CONNECTIONS TO BE 150mmØ.

18. PIPES TO BE VITRIFIED CLAY UP TO 375mmØ AND CONCRETE FOR 375mmØ AND ABOVE.

19. PETROL INTERCEPTOR CLASS 1 BY-PASS SEPARATOR (NSB 15) WITH 300Ø INLET AND 300Ø OUTLET.

NOTE:- CONTRACTOR TO CONFIRM ALL SITE DIMENSIONS/SETTING OUT PRIOR TO COMMENCEMENT OF WORK

NOTES

1. THIS DRAWING AND THE INFORMATION IT CONTAINS IS COPYRIGHT AND MUST NOT BE REPRODUCED WITHOUT THE WRITTEN CONSENT OF FABER MAUNSELL.

2. DO NOT SCALE FROM THIS DRAWING.

3. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM.

4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

5. SEWERS MUST HAVE 5m CLEARANCE FROM TREES & HEDGES, WHERE IT IS NOT POSSIBLE TO ACHIEVE THIS CLEARANCE, CONCRETE BED & SURROUND IS REQUIRED.

6. MUGAYS TO BE DESIGNED BY SPECIALIST CONTRACTOR, MUGAS TO BE USED AS SW ATTENUATION. DESIGN OF SW DRAINAGE ASSUMES THE FOLLOWING:

40mm PERMEABLE WEARING COURSE
60mm SAND LAYER
300mm SINGLE SIZE GRAVEL (POROSITY 0.35)
PERFORATED PIPES AT 10m CENTRES

7. SEWERS TO BE LAID IN CLASS 'S' BEDDING 150mm GRANULAR BED AND SURROUND. WHERE DEPTH OF COVER TO TOP OF THE SEWER IS LESS THAN 1.2m IN HIGHWAYS AND VERGES (OR LESS THAN 900mm IN NONE VEHICULAR ACCESS AREAS) THEN A CONCRETE SLAB SHOULD BE PROVIDED ABOVE GRANULAR BED AND SURROUND.

8. ALL PRIVATE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH PART H OF THE CURRENT BUILDING REGULATIONS AND BS EN 752 PART 1 1996, PART 2 1997 PART 3 1997, PART 4 1998, PART 5 1998 PART 6 1999 AND PART 7 1998

KEY

- PROPOSED FOUL SEWER
- PROPOSED SW SEWER
- IL INVERT LEVEL
- CL COVER LEVEL
- FOUL MANHOLE
- FOUL INSPECTION CHAMBER
- SW MANHOLE
- SW INSPECTION CHAMBER
- GU GULLY
- SW ATTENUATION
- EXISTING COMBINED SEWER
- EXISTING SW SEWER

Rev	Date	Detail	Made	Ckd	Appd
A	18/10/07	ISSUED FOR COMMENT	ASR	SCG	CJC

Drawing Status: FOR COMMENT

Client: BALFOUR BEATTY CONSTRUCTION

Project: KNOWSLEY BSF LC7 - KNOWSLEY CENTRAL RC LEARNING CENTRE

Title: PROPOSED DRAINAGE LAYOUT

REFERENCE DRAWINGS

DRAWING TITLE	COMPANY	DRAWING NAME	LATEST REV
LANDSCAPE LAYOUT	INSITE ENVIRONMENT	LC7-INSE-GA-001	-
PILECAP LAYOUT	FABER MAUNSELL - ALTRINCHAM	N/A	N/A
FOUL PENETRATIONS	FABER MAUNSELL - LIVERPOOL	N/A	N/A
RWP PENETRATIONS	AEDAS	N/A	N/A
GROUND FLOOR PLAN	AEDAS	N/A	N/A

CAD Ref:

Engineer	WJ	Made	WJ
Chkd	-	Date	18.10.07
App.	SJK	Scale	1:500 @ A1

FABER MAUNSELL
5th Floor, 21 City Walk, Leeds LS11 9AR
T +44 (0) 113 391 6800
F +44 (0) 113 391 6808
www.fabermaunsell.com

No. LC7/FMCS/C/23 Rev A

An AECOM Company

A1

Ex MH33

2250 VC

2250 VC

375Ø VC

Ex MH34
C.L.58.62m
I.L.56.96m

450Ø Concrete

450Ø Concrete

SW01
Buried Under Grass
G.L.58.23m

Partially exposed SW18 buried in grass. Unable to access





CCTV showing new 450Ø concrete pipe - culverted watercourse diversion

450Ø Concrete

SW02
Buried Under Grass

450Ø Concrete

SW03 Buried under grass but exposed

450Ø Concrete

SW04
Buried Under Grass. Line Comes in on T not bend so can not CCTV to outfall.

Outfall discharges under railway into Whiston Brook, confirmed via dye test.

Exposed SW20 buried in grass



Pin showing location of buried SW21. Unable to access



Dye in Whiston Brook from MH33 in Glen Dimplex



Key:

- Culverted watercourse diversion within St Edmunds Arrowsmith (CCTV completed)
- Existing culverted watercourse within St Edmunds Arrowsmith (CCTV unavailable)
- Buried Manholes. Locations confirmed by probing.

Rev	Description	Date	Initial

Revisions

Taylor Wimpey

Taylor Wimpey North West
Washington House, Birchwood Park,
Warrington, Cheshire WA3 6GR
Tel 01925 849 500 Fax 01925 849 501
www.taylorwimpey.com

DRAWING TITLE:

GLEN DIMPLEX

RAINHILL
CULVERTED WATERCOURSE DIVERSION INVESTIGATION

DRAWING STATUS: PRELIMINARY

DWG SCALE	DATE	DRAWN	CHECKED BY
NTS @ A1	03/09/25	CP	-

DRAWING NUMBER

SITE CODE	DRAWING CODE	DRAWING NO	REVISION
GLEN DIM	100	01	-

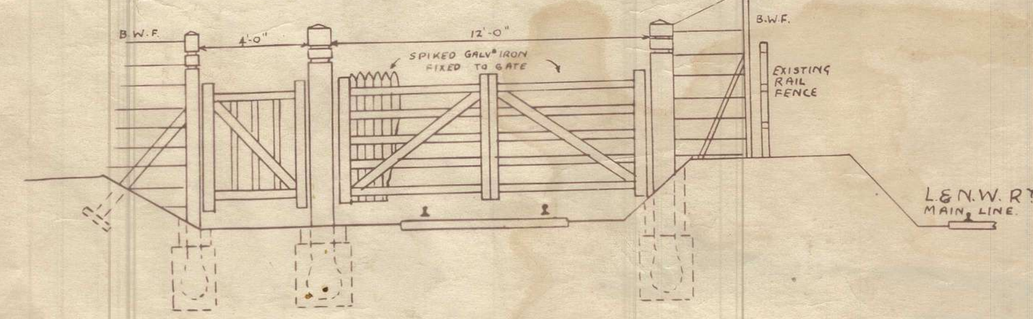
N.B. NEW MAINS TO BE TAKEN FROM EXISTING 6" MAINS IN DRAGON LANE ABOUT 1900 FEET WEST OF NEW STOP-COCKS AT K

WHISTON INFIRMARY

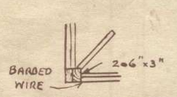
DESCRIPTION

GAS MAINS MARKED THUS ------
WATER MAINS " " ----------
ELECTRIC MAINS " " ----------
SEWER (EXISTING) " " ----------
NEW DRAINS " " ----------
SURFACE WATER DRAINS " " ----------
LAND DRAINS " " ----------
SLIDING DOORS " " ----------
SKYLIGHTS " " ----------
LEVELS " " ----------

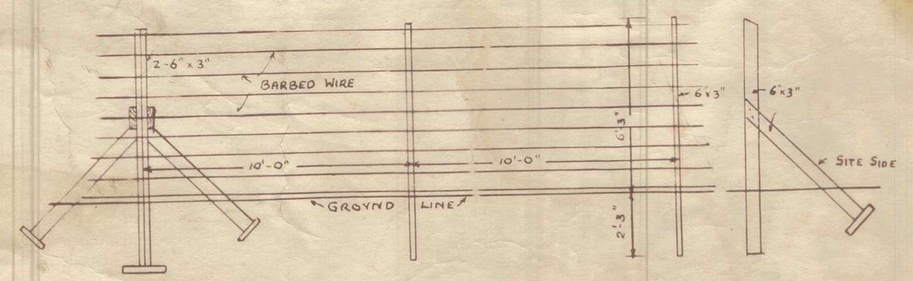
N.B. LEVELS TAKEN AS BEING ABOVE DATUM WHICH IS 40'-0" BELOW THE SIGNAL BOX GROUND LEVEL AT 'A'.



DETAIL OF GATES OVER RAILWAY



PLAN OF ANGLE POSTS.



STRAINING POST

DETAILS OF FENCING
SCALE 1/4" = 1 FOOT.

DETAIL OF EVERY 5TH POST.

N

DRAGON LANE

STONEY LANE

SHED No 2 TO FALL 1in 200

SHED No 1 TO FALL 1in 200

FLOOR LEVEL 49.00

FLOOR LEVEL 48.50

1971 LAND DRAIN

BRICK TRANSFORMER HOUSE 6'-0"x6'-0"x8'-0" INSIDE

EXISTING STREAMS TO BE DIVERTED

EXISTING 12" PIPE DRAIN

9" LAND DRAIN

1977

9" LAND DRAIN

SLIDING DOORS

SLIDING DOORS

9 STRAND B.W. FENCE

838'-6"

361'-6"

317'-6"

160'-0"

EXISTING 12" PIPE DRAIN

WELL

TO LIVERPOOL

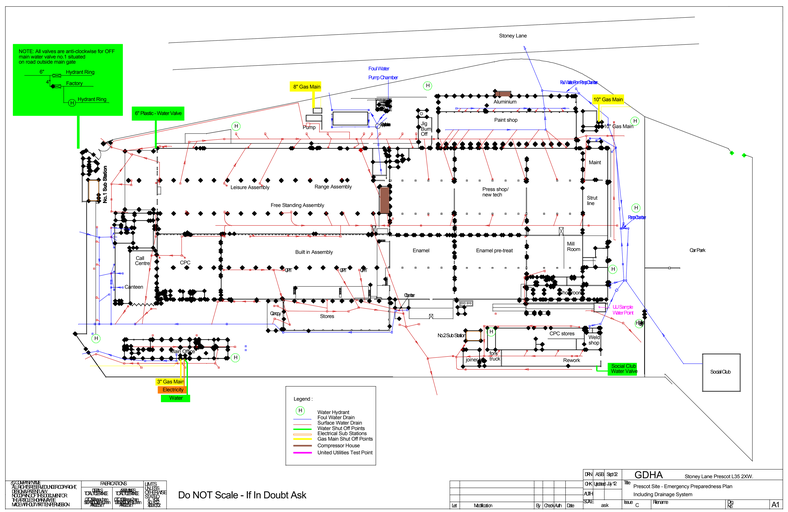
L. & N. W. RY. MAIN LINE TO LIVERPOOL MANCHESTER

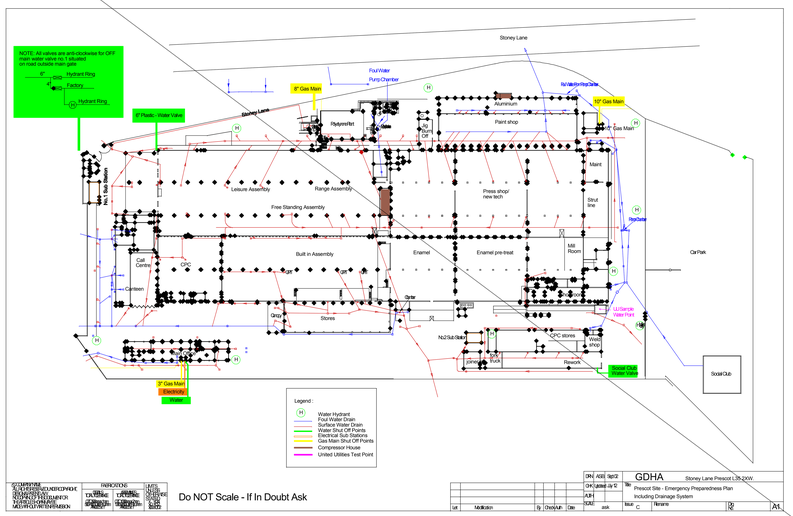
SCALE OF 56 FEET TO AN INCH.

COPIED FROM DRG No 1 H.M. OFFICE OF WORKS. STORE YS GATE WESTMINSTER S.W.

STOVES LIMITED RAINHI
PLAN OF WORKS
TRACED BY WAM
CHECKED BY

WHISTON RAINHILL: NR. LIVERPOOL. MVNITION STORE SITE PLAN.


NOTE: All valves are anti-clockwise for OFF
main water valve no 1 situated
on road outside main gate
8" Hydrant Ring
Factory
Hydrant Ring
8" Plastic - Water Valve
8" Gas Main
Foul Water
Pump Chamber
Stoney Lane
Hydrant Ring Circle
10" Gas Main
Pump
Aluminium
Paint shop
Maint
No.1 Sub Station
Leisure Assembly
Range Assembly
Free Standing Assembly
Press shop/
new tech
Strut
line
Ring Circle
Built in Assembly
Enamel
Enamel pre-treat
Mill
Room
Car Park
Call
Centre
Canteen
Qmpy
Stores
Qstor
CPC stores
Work
shop
Joinery
Rework
Social Club
Water Valve
Social Club
3" Gas Main
Electricity
Water
Legend :
Water Hydrant
Foul Water Drain
Surface Water Drain
Water Shut Off Points
Electrical Sub Stations
Gas Main Shut Off Points
Compressor House
United Utilities Test Point
Do NOT Scale - If In Doubt Ask
GDHA
Stoney Lane Prescot L35 2XW.
Prescot Site - Emergency Preparedness Plan
Including Drainage System
A1


NOTE: All valves are anti-clockwise for OFF
main water valve no 1 situated
on road outside main gate
8" Hydrant Ring
Factory
Hydrant Ring
8" Plastic - Water Valve
8" Gas Main
Foul Water
Pump Chamber
Stoney Lane
Hydrant Ring Circle
10" Gas Main
Aluminium
Paint shop
Maint
No.1 Sub Station
Leisure Assembly
Range Assembly
Free Standing Assembly
Press shop/
new tech
Strut
line
Ring Circle
Built in Assembly
Enamel
Enamel pre-treat
Mill
Room
Car Park
Call
Centre
Canteen
Qmpy
Stores
Qstor
CPC stores
Work
shop
Joinery
Rework
Social Club
Water Valve
Social Club
3" Gas Main
Electricity
Water
Legend :
Water Hydrant
Foul Water Drain
Surface Water Drain
Water Shut Off Points
Electrical Sub Stations
Gas Main Shut Off Points
Compressor House
United Utilities Test Point
Do NOT Scale - If In Doubt Ask
GDHA
Stoney Lane Prescot L35 2XW.
Prescot Site - Emergency Preparedness Plan
Including Drainage System
A1

NOTE: All valves are anti-clockwise for OFF
main water valve no.1 situated
on road outside main gate

6" Hydrant Ring
4" Factory
H Hydrant Ring

6" Plastic - Water Valve

Stoney Lane

Foul Water
Pump Chamber

8" Gas Main

Pump

Jig
Burn
Off

Foul Waste From Pump Chamber

10" Gas Main

Aluminium

Paint shop

10" Gas Main

Maint

No.1 Sub Station

Leisure Assembly

Range Assembly

Press shop/
new tech

Strut
line

Free Standing Assembly

Pump Chamber

Call
Centre

CPC

Built in Assembly

Enamel

Enamel pre-treat

Mill
Room

Car Park

Canteen

CPRT

CPRT

CPRT

Chamber

Showroom

UU Sample
Water Point

Canopy

Stores

No.2 Sub Station

CPC stores

Weld
shop

fork
truck

joiner

Rework

Social Club
Water Valve

Social Club

Main Office

3" Gas Main
Electricity
Water

Legend :

- H — Water Hydrant
- Foul Water Drain
- Surface Water Drain
- Water Shut Off Points
- Electrical Sub Stations
- Gas Main Shut Off Points
- Compressor House
- United Utilities Test Point

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FABRICATIONS

DETAILS TOTAL TOLERANCE	ASSEMBLIES TOTAL TOLERANCE
0 TO 500mm ± 1mm 500 AND OVER ± 3mm ANGLES ± 1°	0 TO 1000mm ± 2mm 1000 AND OVER ± 3mm ANGLES ± 1°

LIMITS UNLESS OTHERWISE STATED
x ± 0.4
x.0 ± 0.2
x.00 ± 0.02

Do NOT Scale - If In Doubt Ask

Let	Modification	By	Check/Auth	Date

DRN	A.S.B.	Sept 02
CHK	Updated	July 12
AUTH		
SCALE	ask	

GDHA Stoney Lane Prescot L35 2XW.

Title: Prescot Site - Emergency Preparedness Plan
Including Drainage System

Issue	Filename	Drg No.	
C			A1

NOTE: All valves are anti-clockwise for OFF
main water valve no.1 situated
on road outside main gate

6" Hydrant Ring
4" Factory
H Hydrant Ring

6" Plastic - Water Valve

Stoney Lane

8" Gas Main

Foul Water
Pump Chamber

Foul Waste From Pump Chamber

10" Gas Main

Pump

Polystyrene Plant

Polyesterlar

Jig
Burn
Off

Aluminium

Paint shop

10" Gas Main

Maint

No.1 Sub Station

Leisure Assembly

Range Assembly

Free Standing Assembly

Press shop/
new tech

Strut
line

Pump Chamber

Mill
Room

Built in Assembly

Enamel

Enamel pre-treat

Car Park

Call
Centre

CPC

CPIT

Canteen

Chamber

Showroom

UU Sample
Water Point

Canopy

Stores

No.2 Sub Station

CPC stores

Weld
shop

Main Office

joiner

fork
truck

Rework

Social Club
Water Valve

Social Club

3" Gas Main
Electricity
Water

Legend :

- H Water Hydrant
- Foul Water Drain
- Surface Water Drain
- Water Shut Off Points
- Electrical Sub Stations
- Gas Main Shut Off Points
- Compressor House
- United Utilities Test Point

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FABRICATIONS		LIMITS
DETAILS TOTAL TOLERANCE	ASSEMBLIES TOTAL TOLERANCE	UNLESS OTHERWISE STATED
0 TO 300mm ± 1mm 600 AND OVER ± 3mm ANGLES ± 1°	0 TO 1000mm ± 2mm 1000 AND OVER ± 3mm ANGLES ± 1°	x ± 0.4 x.0 ± 0.2 x.00 ± 0.02

Do NOT Scale - If In Doubt Ask

Let	Modification	By	Check	Auth	Date

DRN	A.S.B.	Sept 02
CHK	Updated	July 12
AUTH		
SCALE	ask	

GDHA Stoney Lane Prescot L35 2XW.

Title: Prescot Site - Emergency Preparedness Plan
Including Drainage System

Issue C | Filename | Drg No. | A1

NOTE: All valves are anti-clockwise for OFF
main water valve no.1 situated
on road outside main gate

6" Hydrant Ring
4" Factory
H Hydrant Ring

Stoney Lane

6" Plastic - Water Valve

8" Gas Main

Foul Water
Pump Chamber

Foul Waste From Pump Chamber

10" Gas Main

Stoney Lane

Polystyrene Plant

Pump

Hydrastar

Jig
Burn
Off

Aluminium

Paint shop

10" Gas Main

Maint

No.1 Sub Station

Leisure Assembly

Range Assembly

Free Standing Assembly

Press shop/
new tech

Strut
line

Pump Chamber

Call
Centre

CPC

Canteen

Built in Assembly

C/PIT

C/PIT

C/PIT

Enamel

Enamel pre-treat

Mill
Room

Car Park

Chamber

Showroom

UU Sample
Water Point

Canopy

Stores

No.2 Sub Station

CPC stores

Weld
shop

fork
truck

joiner

Rework

Social Club
Water Valve

Social Club

Main Office

3" Gas Main
Electricity
Water

Legend :

- Water Hydrant
- Foul Water Drain
- Surface Water Drain
- Water Shut Off Points
- Electrical Sub Stations
- Gas Main Shut Off Points
- Compressor House
- United Utilities Test Point

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FABRICATIONS		LIMITS
DETAILS TOTAL TOLERANCE	ASSEMBLIES TOTAL TOLERANCE	UNLESS OTHERWISE STATED

Do NOT Scale - If In Doubt Ask

DRN	A.S.B.	Sept 02
CHK	Updated	July 12
AUTH		

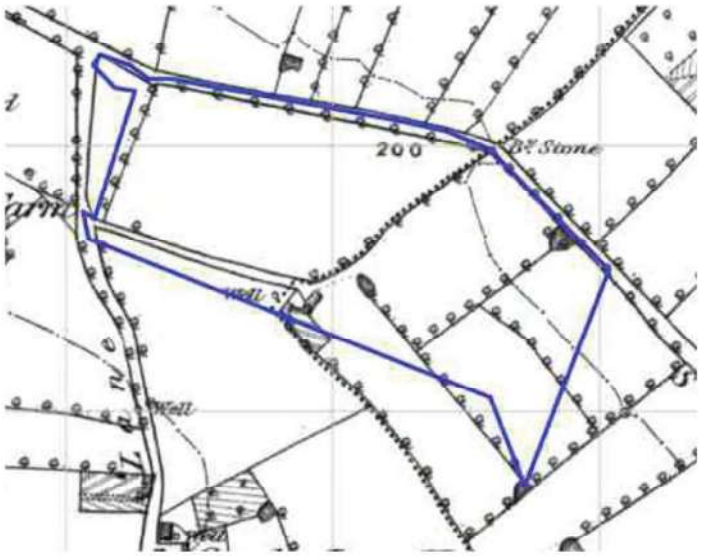
GDHA

Stoney Lane Prescot L35 2X

Title: Prescot Site - Emergency Preparedness Plan
Including Drainage System

On-site historical development of Glen Dimplex

1850 – Several segmenting field boundaries are present, with the site comprising seven smaller fields

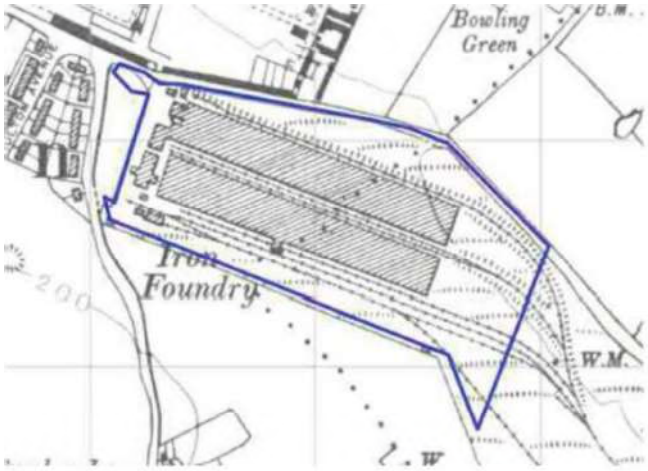


1892 – Majority of field boundaries removed and field boundary traversing through the centre of the site is now noted as a small hedge-lined road traversing from the south towards the northeast, continuing off site.

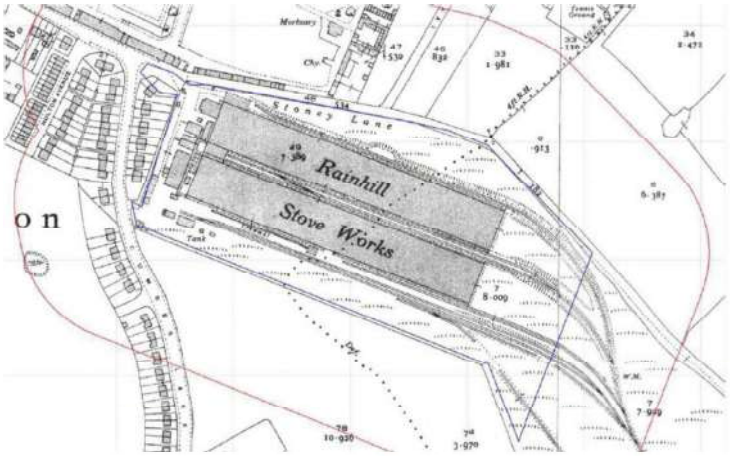


1907-1925 – Historical mapping unavailable but records held by Heritage Gateway indicates a factory had been developed used as munitions works.

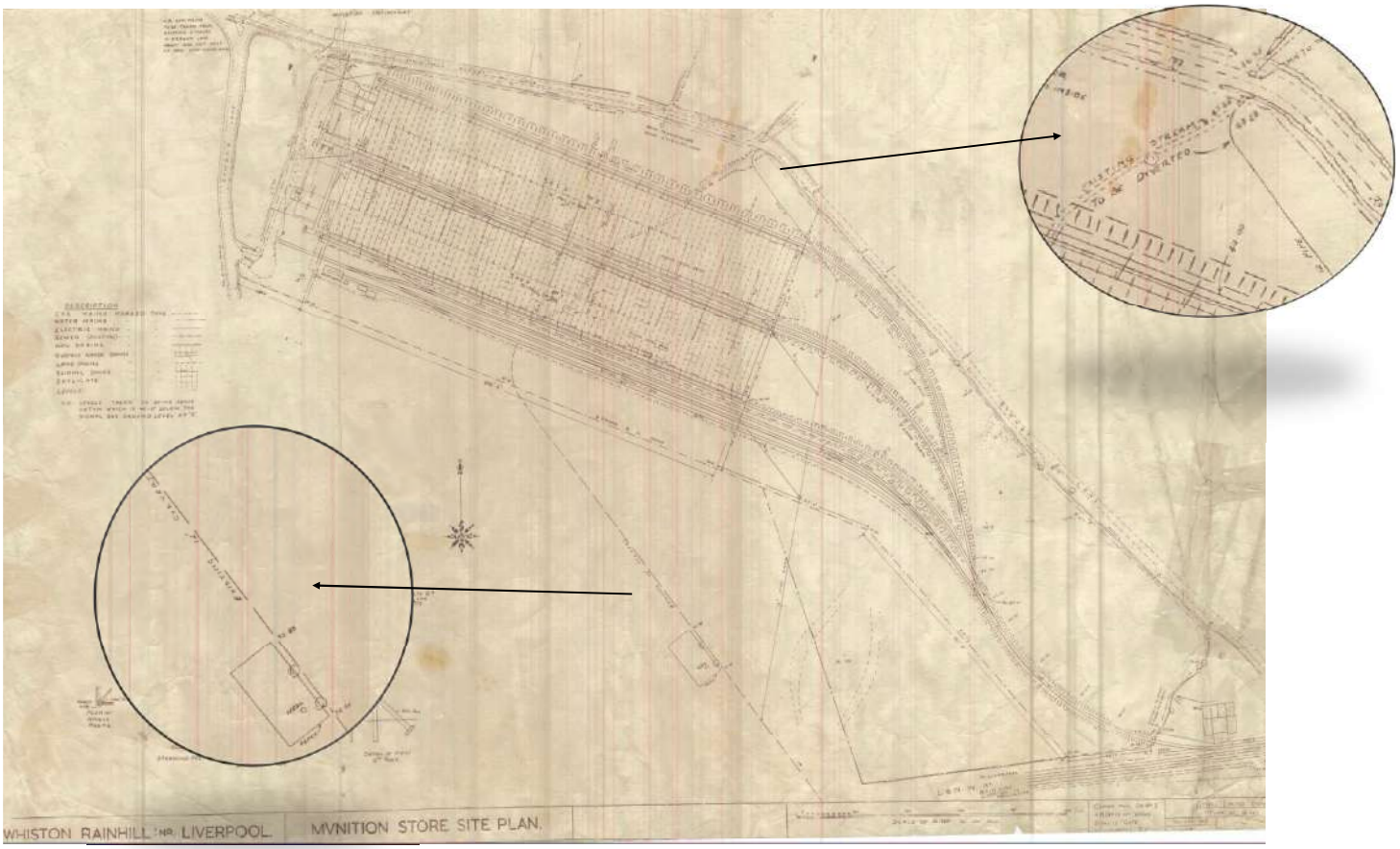
1925 – Site redeveloped and comprises an iron foundry with associated railway sidings



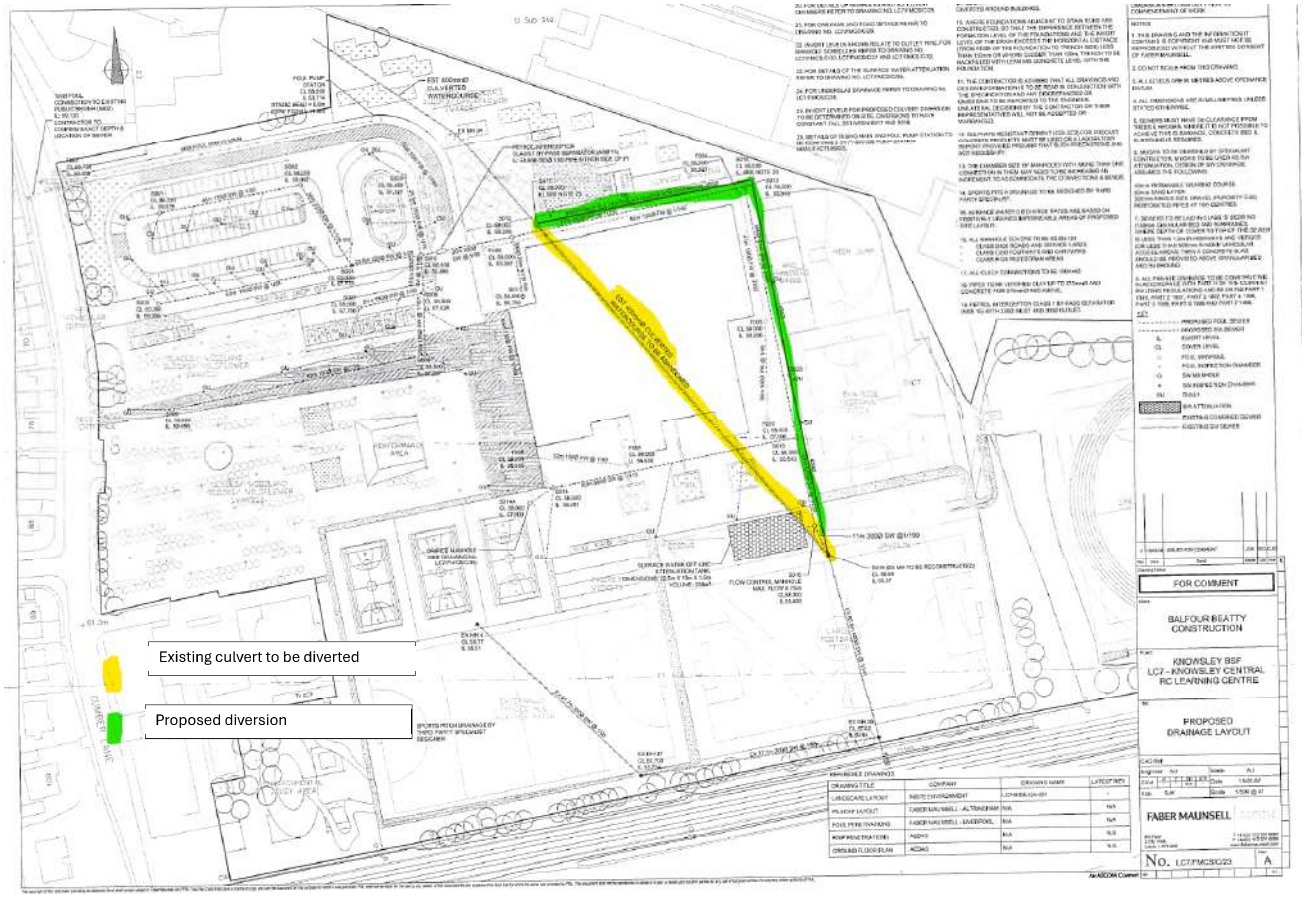
1937 – Site now renamed as Stove Works



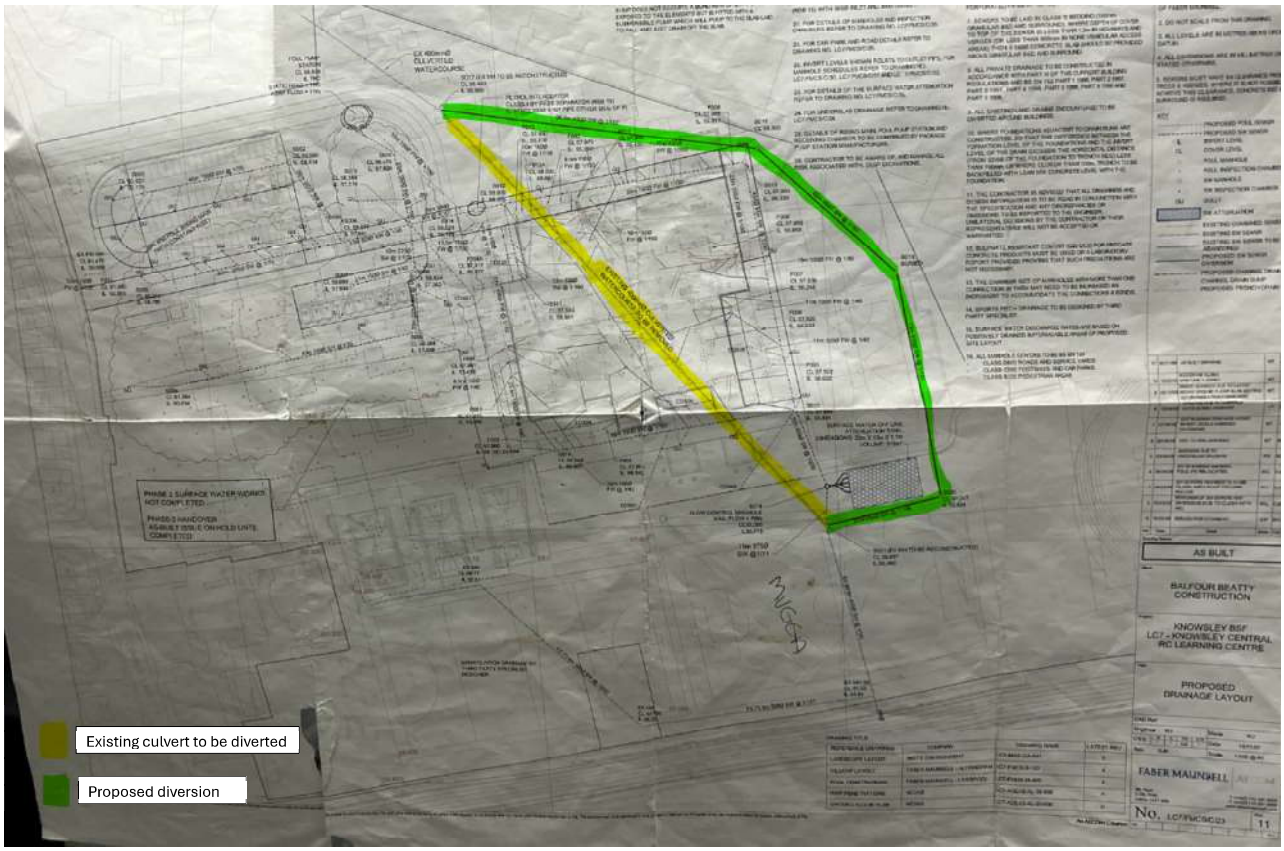
1955 – Historical map shows existing stream traversing along route of field boundary to be diverted to east of development into 12'' pipe (location and condition of eastern culverted watercourse still to be confirmed). Plan also references existing 12'' culvert to south of site



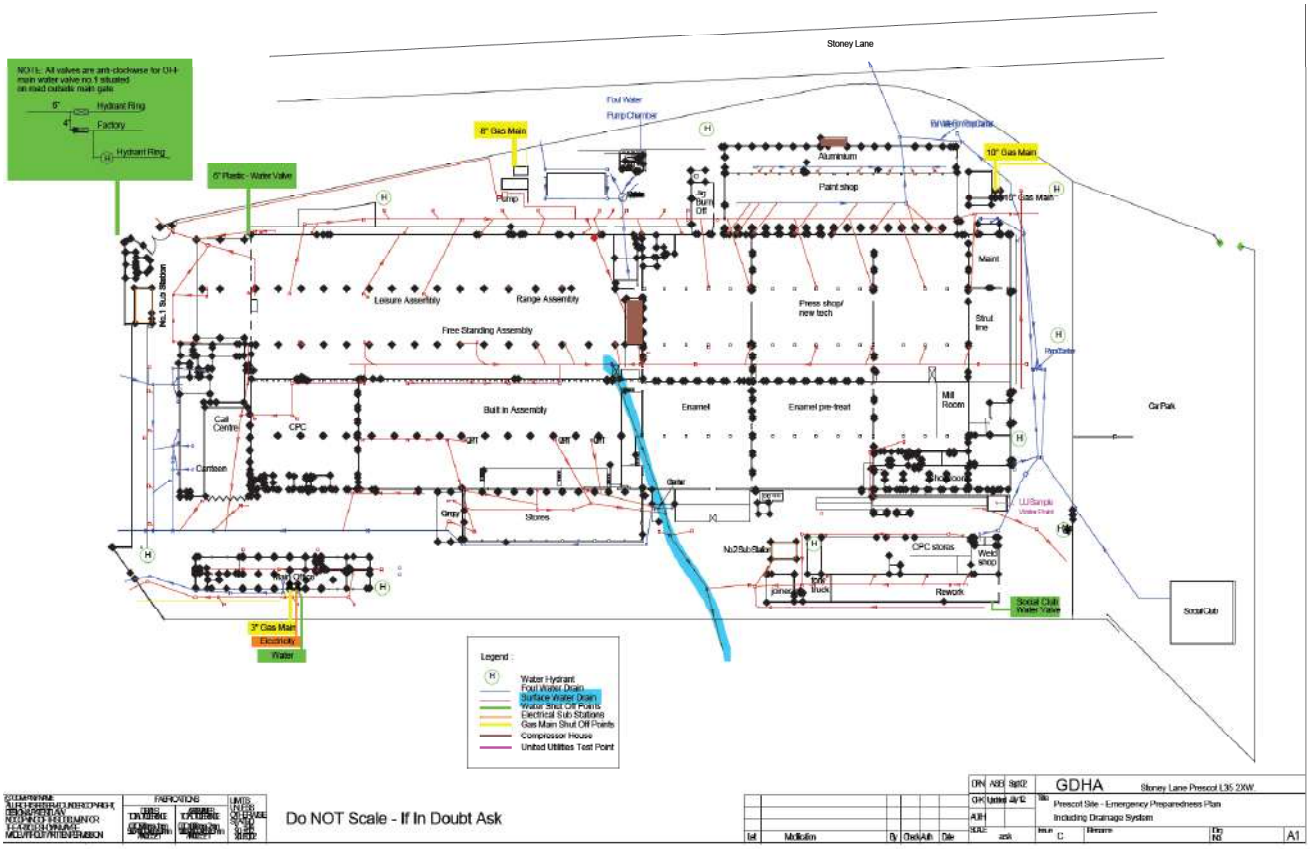
2007 – Revision A Faber Maunsell plans showing existing route of 400mm culverted watercourse to be abandoned downstream from MH34 and diverted as 450mm around new school building downstream to existing manhole S019.



2009 – Revision 11 of the Faber Maunsell proposed drainage diversion plan provided by St Edmunds Arrowsmith showing diversion directly from MH34.



2012 – Glen Dimplex emergency preparedness plan including drainage system showing surface water factory drains connecting into culverted watercourse to south.



Quinn Utilities
30 Lees Road, Knowsley

ryan.davies@quinnutilities.com

Project

Project Name:	M3382 Taylor Wimpey Glen Dimplex Stoney Lane Whiston 17 07 26
Project Date:	17/07/2026
Inspection Standard:	MSCC5 Sewers & Drainage GB (SRM5 Scoring)

Quinn Utilities
30 Lees Road, Knowsley

ryan.davies@quinnutilities.com

Table of Contents

Project Name	Project Number	Project Date
M3382 Taylor Wimpey Glen Dimplex Stoney Lane Whiston 17 07 26		17/07/2026

Project Information P-1

Section Item 1: MH2 > MH1 (MH2X) 1

Section Item 2: MH3 > 3A (MH3X) 3

Section Item 3: MH1 > MH0 (MH1X) 5

Section Item 4: MH0 > OOB (MH0X) 8

Quinn Utilities
30 Lees Road, Knowsley

ryan.davies@quinnutilities.com

Project Information

Project Name	Project Number	Project Date
M3382 Taylor Wimpey Glen Dimplex Stoney Lane Whiston 17 07 26		17/07/2026

Client

Company: Taylor Wimpey
Description: Taylor Wimpey North West
Contact: Chloe Powell
Department: Washington House
Street: Birchwood Park Avenue
Town or City: Birchwood
County: Warrington
Post Code: WA3 6GR

Site

Company: Taylor Wimpey
Department: Glen Dimplex
Street: Stoney Lane
Town or City: Whiston
County: Prescot
Post Code: L35 2XW

Contractor

Company: Quinn Utilities
Contact: Ryan Davies
Department: Business Development Mangaer
Street: 30 Lees Road
Town or City: Knowsley
County: Merseyside
Post Code: L33 7SE
Email: ryan.davies@quinnutilities.com

Quinn Utilities
30 Lees Road, Knowsley
ryan.davies@quinnutilities.com

Section Inspection - 17/07/2026 - MH2X

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
1	1	17/07/26	9:08	Not Specified	No Rain Or Snow	Yes	MH2X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
K Heron	OY25 ZGO	Crawler	Not Specified	Watercourse	Not Specified

Town or Village:	Whiston	**Inspection Direction:**	Upstream	**Upstream Node:**	MH2
Road:	Stoney Lane	**Inspected Length:**	24.29 m	**Upstream Pipe Depth:**	
Location:	Other location	**Total Length:**	24.29 m	**Downstream Node:**	MH1
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	2.750 m

Use:	Surface water	**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	375 mm
Flow Control:	No flow control	**Material:**	Vitrified clay
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:211

Depth: 2.75 m
MH1



Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: MH1	00:00:00		
0.00	WL	Water level, 5% of the vertical dimension	00:00:01		
10.53	JDM	Joint displaced, medium	00:01:39	MH2X_70b96853-f2dd-454a-9	1 / 3
12.85	JDM	Joint displaced, medium	00:02:02	MH2X_51476cb6-0e7a-4a51-a	1 / 3
15.93	JDM	Joint displaced, medium	00:02:27	MH2X_d78f335c-0e2b-4e60-9	1 / 3
23.47	FL	Fracture, longitudinal at 12 o'clock	00:03:17	MH2X_2b820b75-7151-4426-a	3 / 2
24.29	MHF	Finish node, manhole, reference: MH2	00:03:53		

MH2
Depth: m

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
4	40.0	1.8	43.0	3.0	4	2.0	0.3	7.0	3.0

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Section Pictures - 17/07/2026 - MH2X

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
1	Upstream	MH2X		



MH2X_70b96853-f2dd-454a-9ce1-c7ffbd0943df_20260717_091002_028.jpg, 00:01:39, 10.53 m
Joint displaced, medium



MH2X_51476cb6-0e7a-4a51-a76a-bdbbae8c9da7_20260717_091025_919.jpg, 00:02:02, 12.85 m
Joint displaced, medium



MH2X_d78f335c-0e2b-4e60-97e7-b1cd699de009_20260717_091052_749.jpg, 00:02:27, 15.93 m
Joint displaced, medium



MH2X_2b820b75-7151-4426-a22a-f04f192eac9f_20260717_091149_533.jpg, 00:03:17, 23.47 m
Fracture, longitudinal at 12 o'clock

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Section Inspection - 17/07/2026 - MH3X

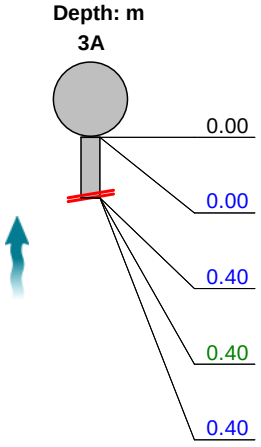
Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
2	1	17/07/26	11:14	Not Specified	No Rain Or Snow	Yes	MH3X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
K Heron	OY25 ZGO	Crawler	Not Specified	Watercourse	Not Specified

Town or Village:	Whiston	**Inspection Direction:**	Unknown	**Upstream Node:**	MH3
Road:	Stoney Lane	**Inspected Length:**	0.40 m	**Upstream Pipe Depth:**	
Location:	Other location	**Total Length:**	0.40 m	**Downstream Node:**	3A
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	300 mm
Flow Control:	No flow control	**Material:**	Vitrified clay
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining

Comments:
Recommendations:



Scale: 1:50 Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: MH3	00:00:00		
0.00	WL	Water level, 0% of the vertical dimension	00:00:01		
0.40	REM	General remark: Potential reduction in pipe size	00:00:34	MH3X_6ec5eae9-f7f7-4b36-bc9	
0.40	OBZ	Other obstacles from 12 o'clock to 12 o'clock, 100% cross-sectional area loss: Concrete or other hardened material	00:00:54	MH3X_039bc8c8-8b32-404e-8	5
0.40	SA	Survey abandoned: Due to obstruction	00:01:00		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	1	10.0	25.0	10.0	5.0

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Section Pictures - 17/07/2026 - MH3X

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
2	Unknown	MH3X		



MH3X_6ec5eae9-f7f7-4b36-bc9b-21bc69e7c60b_20260717_111558_946.jpg, 00:00:34, 0.40 m
General remark, Potential reduction in pipe size



MH3X_039bc8c8-8b32-404e-85ed-5f8493afefc0_20260717_111628_907.jpg, 00:00:54, 0.40 m
Other obstacles from 12 o'clock to 12 o'clock, 100% cross-sectional area loss, Concrete or other hardened material

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Section Inspection - 17/07/2026 - MH1X

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
3	2	17/07/26	14:54	Not Specified	No Rain Or Snow	Yes	MH1X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
K Heron	OY25 ZGO	Crawler	Not Specified	Watercourse	Not Specified

Town or Village:	Whiston	**Inspection Direction:**	Downstream	**Upstream Node:**	MH1
Road:	Stoney Lane	**Inspected Length:**	54.57 m	**Upstream Pipe Depth:**	
Location:	Other location	**Total Length:**	54.57 m	**Downstream Node:**	MH0
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	375 mm
Flow Control:	No flow control	**Material:**	Vitrified clay
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:473



Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: MH1	00:00:00		
0.00	WL	Water level, 5% of the vertical dimension	00:00:00		
3.94	JDM	Joint displaced, medium	00:00:39	MH1X_d1d000ce-2e63-47f9-9a	1 / 3
19.73	JDL	Joint displaced, large	00:01:49	MH1X_9d1ff4eb-c813-48e7-8c	1 / 4
19.73	FL	Fracture, longitudinal at 10 o'clock	00:01:53		3 / 2
19.73	FCJ	Fracture, circumferential at joint from 10 o'clock to 12 o'clock	00:01:53	MH1X_cd4f427d-3721-4f2e-915	3 / 2
21.12	WL	Water level, 35% of the vertical dimension	00:02:12		
22.83	IR	Infiltration, running at 1 o'clock	00:02:31	MH1X_3c2783cd-9cf6-4daf-ac6	
22.83	CL	Crack, longitudinal at 11 o'clock	00:02:38	MH1X_24b1b9f7-e9a1-409c-b	2 / 2
25.67	WL	Water level, 10% of the vertical dimension	00:03:00		
30.67	DES	Settled deposits, fine, 15% cross-sectional area loss	00:03:37		3
54.57	MHF	Finish node, manhole, reference: MH0	00:05:29		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
5	82.0	1.7	93.0	3.0	6	7.0	0.2	12.0	4.0

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Section Pictures - 17/07/2026 - MH1X

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
3	Downstream	MH1X		



MH1X_d1d000ce-2e63-47f9-9aac-6a08f6949ada_20260717_145455_273.jpg, 00:00:39, 3.94 m
Joint displaced, medium



MH1X_9d1ff4eb-c813-48e7-8c01-65a6ef8fe5cb_20260717_145607_787.jpg, 00:01:49, 19.73 m
Joint displaced, large



MH1X_cd4f427d-3721-4f2e-9150-2226468e5617_20260717_145633_810.jpg, 00:01:53, 19.73 m
Fracture, circumferential at joint from 10 o'clock to 12 o'clock



MH1X_3c2783cd-9cf6-4daf-ac69-b8213db6fc7d_20260717_145712_139.jpg, 00:02:31, 22.83 m
Infiltration, running at 1 o'clock

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Section Pictures - 17/07/2026 - MH1X

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
3	Downstream	MH1X		



MH1X_24b1b9f7-e9a1-409c-b5cc-b43551ab275d_20260717_145725_127.jpg, 00:02:38, 22.83 m
Crack, longitudinal at 11 o'clock

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Section Inspection - 17/07/2026 - MH0X

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
4	1	17/07/26	15:18	Not Specified	No Rain Or Snow	Yes	MH0X

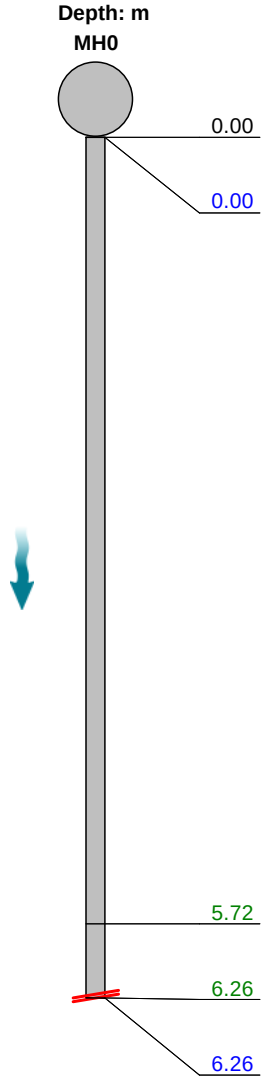
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
K Heron	OY25 ZGO	Crawler	Not Specified	Watercourse	Not Specified

Town or Village:	Whiston	**Inspection Direction:**	Downstream	**Upstream Node:**	MH0
Road:	Stoney Lane	**Inspected Length:**	6.26 m	**Upstream Pipe Depth:**	
Location:	Other location	**Total Length:**	6.26 m	**Downstream Node:**	OOB
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	375 mm
Flow Control:	No flow control	**Material:**	Vitrified clay
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:55



Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: MH0	00:00:00		
0.00	WL	Water level, 5% of the vertical dimension	00:00:00		
5.72	RMJ	Roots, mass at joint, 15% cross-sectional area loss	00:00:39	MH0X_16 19bb27-03 6f-4894-82	3
6.26	RMJ	Roots, mass at joint, 40% cross-sectional area loss	00:01:01	MH0X_27 0af548-64 4a-4df9-8c	5
6.26	SA	Survey abandoned: Due to roots	00:01:03		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	2	10.0	2.2	14.0	5.0

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Section Pictures - 17/07/2026 - MH0X

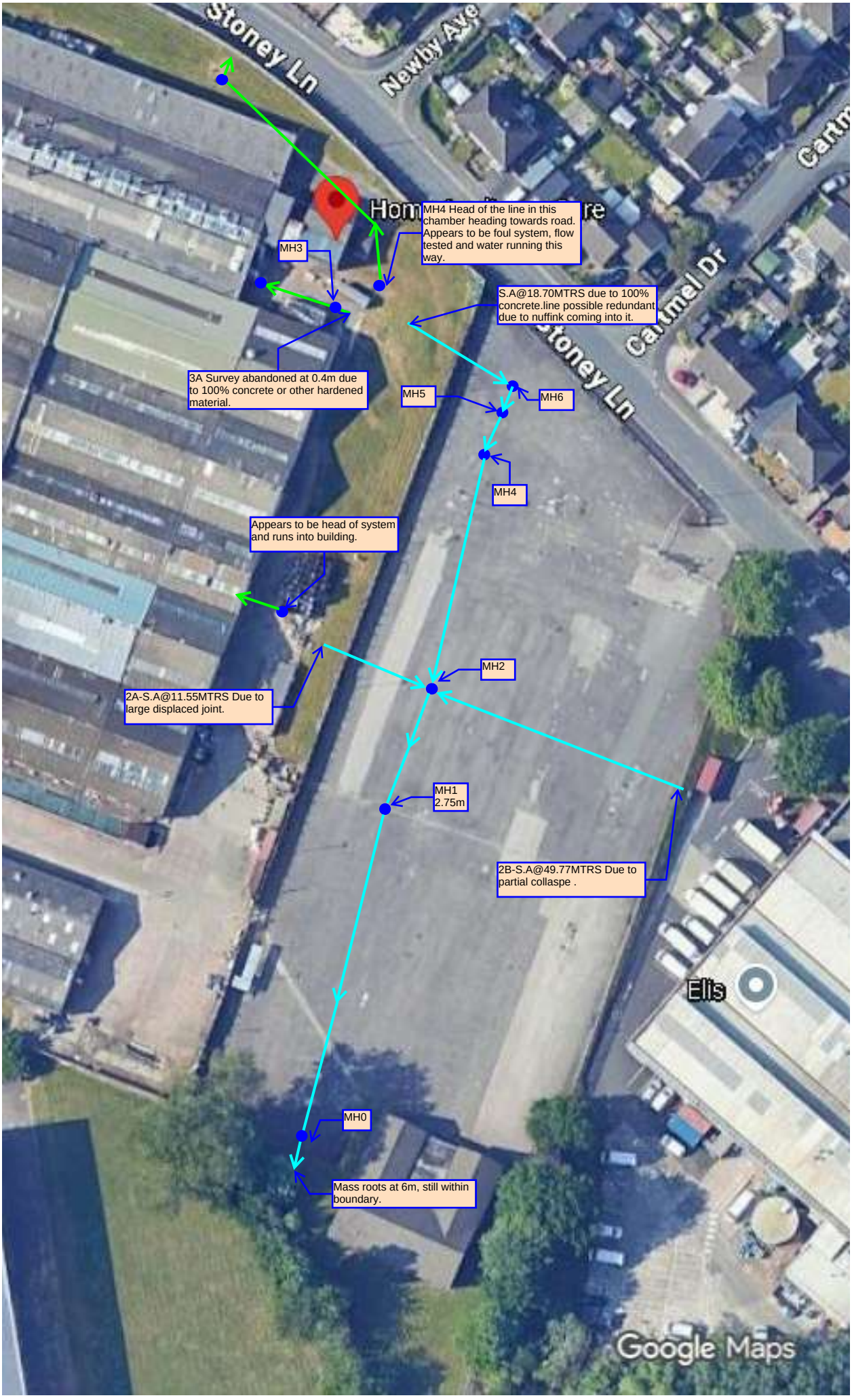
Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
4	Downstream	MH0X		



MH0X_1619bb27-036f-4894-822f-efa32403b63a_20260717_151943_329.jpg, 00:00:39, 5.72 m
Roots, mass at joint, 15% cross-sectional area loss



MH0X_270af548-644a-4df9-8cdf-657b3aa446a6_20260717_152005_522.jpg, 00:01:01, 6.26 m
Roots, mass at joint, 40% cross-sectional area loss


Stoney Ln
Newby Ave
Carmel Dr
Stoney Ln
Elis
Google Maps
MH4 Head of the line in this chamber heading towards road. Appears to be foul system, flow tested and water running this way.
MH3
S.A@18.70MTRS due to 100% concrete.line possible redundant due to nuffink coming into it.
3A Survey abandoned at 0.4m due to 100% concrete or other hardened material.
MH5
MH6
MH4
Appears to be head of system and runs into building.
MH2
2A-S.A@11.55MTRS Due to large displaced joint.
MH1
2.75m
2B-S.A@49.77MTRS Due to partial collaspe .
MH0
Mass roots at 6m, still within boundary.

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APPENDIX I: PRELIMINARY DRAINAGE STRATEGY (BETTS ASSOCIATES)

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Drainage Strategy - Foul water

The proposed foul water drainage strategy for the development is divided into four separate drainage networks, each designed to discharge to the existing United Utilities public sewerage system.

Network 1
Network 1 comprises a gravity drainage system located within the north-west corner of the site. This network is designed to connect to the existing combined sewer within Stoney Lane, upstream of existing United Utilities manhole reference 8604.

Connection Manhole Details:

MH Ref: F24 (Proposed)
Cover Level (CL): 59.938 mAOD
Invert Level (IL): 57.853 mAOD (150mm Ø – proposed foul connection)
Invert Level (IL): 57.104 mAOD (900mm Ø – existing sewer)

Network 2
Network 2 serves the majority of the site and drains to a proposed pumping station located adjacent to **Plot 51** in the southern corner of the site. The associated rising main is wholly contained within the development and discharges to proposed manhole **F15**.

The ultimate discharge point is to an Existing United Utilities foul water manhole Ref. 8503, located within the site boundary. The existing downstream connection to the United Utilities combined sewer (MH Ref. 8501) within Cumber Lane is to remain and shall continue to serve the development as a foul water discharge point.

Connection Manhole Details:

MH Ref: 8503
Cover Level (CL): 58.518 mAOD
Invert Level (IL): 57.77 mAOD (150mm Ø - existing sewer)

Network 3
Network 3 comprises a gravity drainage system located within the northern part of the site, adjacent to Plot 180. This network is designed to connect to the existing United Utilities combined sewer within Stoney Lane via existing manhole reference UU9602.

Connection Manhole Details:

MH Ref: 9602 (Existing)
Cover Level (CL): 60.75 mAOD
Invert Level (IL): 58.330 mAOD (150mm Ø – proposed foul connection)
Invert Level (IL): 57.580 mAOD (900mm Ø – existing sewer)

Network 4
Network 4 comprises a gravity drainage system located within the northern part of the site, within Road 3, serving Plots 184–205. This network is designed to connect to the existing United Utilities combined sewer within Stoney Lane via existing manhole reference UU0601.

Connection Manhole Details:

MH Ref: 0601 (Existing)
Cover Level (CL): 61.03 mAOD
Invert Level (IL): 58.842 mAOD (150mm Ø – proposed foul connection)
Invert Level (IL): 58.167 mAOD (825mm Ø – existing sewer)

Overall, the proposed foul water drainage strategy utilises a combination of gravity drainage and a single adoptable pumping station to serve the development. Foul flows discharge to existing United Utilities foul and combined sewerage infrastructure via four separate connection points, with all new foul sewers and associated infrastructure designed in accordance with the relevant United Utilities and Sewers for Adoption requirements.

Drainage Strategy - Surface water

Surface water runoff generated by the proposed development will discharge to the existing on-site culverted watercourse via a new manhole reference **S33**, located along the southern site boundary, at a restricted discharge rate of **42.4 l/s**.

The surface water drainage network has been designed to accommodate the 1 in 30 year storm event, with additional attenuation provided by an online attenuation basin to manage the 1 in 100 year event plus 45% allowance for climate change.

Connection Manhole Details:
MH Ref: **S33** (Proposed)
Cover Level (CL): 59.549 mAOD
Invert Level (IL): 57.056 mAOD (225 mm Ø)

Proposed Foul Water Connection (F24 Proposed) Network 1

A new online manhole is proposed on the existing United Utilities 900mm Ø combined water sewer within Stoney Lane. The proposed development shall connect to the existing public foul water sewer via a 150mm Ø soffit to soffit connection.

MH Ref: F24
Cover Level (CL): 59.938 mAOD
Invert Level (IL): **57.853** mAOD *(150mm Ø – proposed foul connection)*
Invert Level (IL): 57.104 mAOD *(900mm Ø – existing sewer)*

Proposed Foul Water Connection (9602 Existing) Network 3

A new connection to existing manhole Ref 9602 is proposed, this United Utilities combined sewer is located within Stoney Lane. The proposed development shall connect to the existing public combined sewer via a 150mm Ø soffit to soffit connection.

MH Ref: **9602**
Cover Level (CL): 60.75 mAOD
Invert Level (IL): **58.330** mAOD *(150mm Ø – proposed foul connection)*
Invert Level (IL): 57.580 mAOD *(900mm Ø – existing sewer)*

Proposed Foul Water Connection (0601 Existing) Network 4

A new connection to existing manhole Ref 0601 is proposed, this United Utilities combined sewer is located within Stoney Lane. The proposed development shall connect to the existing public combined sewer via a 150mm Ø soffit to soffit connection.

MH Ref: **9602**
Cover Level (CL): 61.03 mAOD
Invert Level (IL): **58.842** mAOD *(150mm Ø – proposed foul connection)*
Invert Level (IL): 58.167 mAOD *(825mm Ø – existing sewer)*

Proposed Finished Levels
The levels indicated on this plan are indicative (+/-500mm) and subject to change following detailed levels design.

Proposed Filter Drain
Filter drain located to front of properties, parallel to the back of footway. Designed to collect surface water runoff from adjacent drives and roof areas. Surface water runoff is filtered through the surrounding granular stone and conveyed via perforated pipework to the proposed surface water drainage network.

Proposed Interception Drain
Interception drain located to rear of proposed gardens, along site boundary. Designed to intercept surface water runoff from adjacent land and prevent uncontrolled flows entering or leaving the development.

Proposed Foul Water Connection (8503 Existing) Network 2

Existing United Utilities foul water manhole to be retained and rebuilt/made good as necessary. The existing downstream connection to the United Utilities combined sewer (MH Ref. 8501) within Cumber Lane is to remain and shall continue to serve the development as a foul water discharge point.

MH Ref: **8503 Existing**
Cover Level (CL): 58.518 mAOD
Invert Level (IL): **57.77** mAOD *(150mm Ø)*

Foul Water Rising Main
The proposed foul water rising main will be routed through the site within the proposed road network and will discharge to proposed manhole F15. From this point, flows will continue via gravity to the existing Foul Water Manhole Ref. 8503, ultimately discharging to the existing combined sewer within Cumber Lane.

Rising Main Length: Approx. 320m
Termination Manhole: F15

Flow Control Chamber Manhole S31 HB
Hydro International HydroBrake Optimum
SHE-0263-4240-1900-4240
Design head = 1.900 m
Restricted discharge max. = 42.4 l/sec
Flow control orifice size 263mm
Cover level: 60.074 mAOD
Invert level: 57.585 mAOD

Proposed Diversion
Minor diversion works proposed to accommodate proposed site layout.

Proposed Surface Water Connection (S33)
A New manhole is to be constructed online of the existing on site culverted watercourse.

MH Ref: **S32** (Proposed)
Cover Level (CL): 59.549 mAOD
Invert Level (IL): 57.056 mAOD (225 mm Ø)

Attenuation Basin
To attenuate flows up to 1:100 year storm + 45% CC

Base Level:	57.383 m
Top of Bank Level:	59.383 m
Freeboard:	300 mm
Temp maximum storage volume:	1003.09 m³

Proposed Finished Levels
The levels indicated on this plan are indicative (+/-500mm) and subject to change following detailed levels design.

Proposed Interception Drain
Interception drain located to rear of proposed gardens, along site boundary. Designed to intercept surface water runoff from adjacent land and prevent uncontrolled flows entering or leaving the development.

Proposed Filter Drain
Filter drain located to front of properties, parallel to the back of footway. Designed to collect surface water runoff from adjacent drives and roof areas. Surface water runoff is filtered through the surrounding granular stone and conveyed via perforated pipework to the proposed surface water drainage network.

Proposed Interception Drain
Interception drain located to rear of proposed gardens, along site boundary. Designed to intercept surface water runoff from adjacent land and prevent uncontrolled flows entering or leaving the development.

Foul Water Rising Main
The proposed foul water rising main will be routed through the site within the proposed road network and will discharge to proposed manhole F15. From this point, flows will continue via gravity to the existing Foul Water Manhole Ref. 8503, ultimately discharging to the existing combined sewer within Cumber Lane.

Rising Main Length: Approx. 320m
Termination Manhole: F15

Foul Water Pumping Station
Proposed foul water pumping station serving the southern catchment of the development. Flows shall be conveyed via a proposed rising main to manhole F15, before continuing by gravity through the foul water network to existing United Utilities manhole Ref. 8503 and the existing combined sewer within Cumber Lane.

Existing Culverted Watercourse
Culverted Watercourse.

Existing Culverted Watercourse
Culverted Watercourse.

SW02 Buried Under Grass

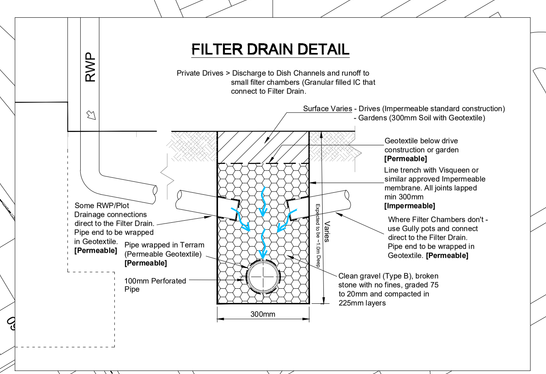
SW03 Buried under grass but exposed

SW04 Buried Under Grass. Line Comes in on T not bend so can not CCTV to outfall.

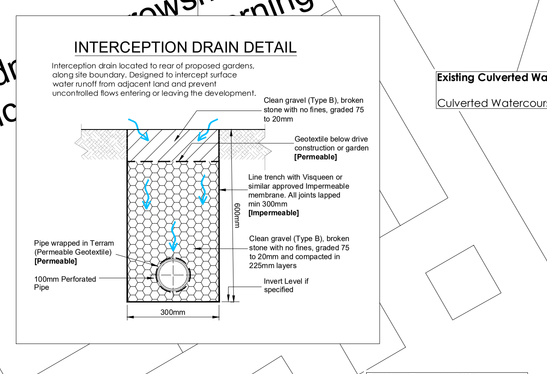
SW00 Buried Under Grass
CL:58.23m

Proposed Finished Levels
The levels indicated on this plan are indicative (+/-500mm) and subject to change following detailed levels design.

FILTER DRAIN DETAIL



INTERCEPTION DRAIN DETAIL



Legend

- Development boundary
- Proposed Adoptable Surface Water Sewer
- Highway Sewer & Manhole
- Highway Gully & Connection Pipe Work
- Proposed Adoptable Foul Water Sewer
- Proposed Adoptable Foul Water Rising Main
- Proposed Interception Drain
- Proposed Sewer Easement *(3m from Centre line)*
- Existing Public Foul Water Sewer
- Existing Public Surface Water Sewer
- Existing Public Combined Sewer
- Existing Ordinary Watercourse Culvert
- FFL 134.65 — Proposed Finished Floor Level
- +133.70 — Existing Boundary Ground Level
- +17.100 — Proposed Spot Level
- Proposed Earthwork Batter
- 4C — Underbuild - Measured from FFL to PGL
- 3C — Tanking - Measured from FFL to PGL
- FOE - 0.150m — Flag on Edge (up to 450mm)
- RET - 0.500m — Masonry Retaining Wall (over 450mm)

Notes

1. Planning layout ref.
Taylor Wimpey - 25053-VIM_2026-07-29
2. Topographical survey provided by 'Geographical Engineering Operations', ref 'G24104 Stoney Lane, Whiston Cross', Dated March 2024.
3. Road detail, levels and layout are subject to local authority section 38 Highways approval.

Notes

1. The use of any other flow control devices not associated with the Hydro International HydroBrake Optimum references provided may constitute a flood risk.
2. Drainage design and construction is in accordance with Design and Construction Guidance 2020 (DCG) and the requirements of the statutory undertaker.
3. Tolerances in pipe laying to be in accordance with Design and Construction Guidance 2020 (DCG).
4. For pipes 150-450mm dia. all rocker pipes to be in accordance with Design and Construction Guidance 2020 (DCG).
5. Engineering bricks shall not contain frogs or holes.
6. Brickwork to manholes to be English bond.
7. Where pipes are surrounded in concrete, flexibility is to be maintained at pipe joints by the use of a suitable compressible material eg. "FLexcell" or "Fibreboard".
8. All manhole covers and frames must comply with BS EN124, covers in roads to be grade D400 and be 150mm deep. manhole covers in car parking areas and drives to be grade B125, whilst landscaped areas may be grade A15.
9. Clayware pipes to be 65 extra strength quality "Hepseal" or similar approved.
10. Granolithic benching to manholes to be 40mm minimum thickness.
11. Precast concrete chamber rings to be reinforced.
12. The slope of benching in all cases should be 1 in 30.
13. Manholes shall not incorporate double square or double oblique channel junctions in their inverts.
14. All incoming pipes shall be surrounded with 150mm of concrete to the face of the collar of the first flexible joint and the outgoing pipe shall also be surrounded to within 50mm of the first flexible joint and a compressible filler used as a former between the concrete surround and downstream pipe collar.
15. All underground services to be confirmed by contractor prior to commencement on site, any discrepancies to be reported to engineer.
16. Private sewers not located in roads to be class F granular bed and surround as per standard details.
17. Sewers located under adopted roads to be class s granular bed and surround (more than 1.2m cover.)
18. Sewers located under private roads and car parking bays to be class f granular bed and surround as per standard details unless adopted, then provide class s (if more than 1.2m cover).
19. Private sewers with less than 0.6m of cover to be concrete surrounded as class Z on standard details.
20. Adopted sewers with less than 1.2m cover, provide class Z concrete bed and surround. concrete haunching may be suitable for large diameter storage sewers, guidance must be sought from adopting authority prior to use.
21. Road gullies to be pcc and trapped with 150mm ST4 concrete surround.
22. No deep or wide rooted trees to be planted within close proximity of the proposed and existing public sewer system.
23. Pipes less than 300mm dia. to be Polypipe UPVC unless otherwise stated.

NHBC Standards
Effective from 1st January 2025

IMPORTANT** - Invert levels at proposed points of connection are **to be confirmed prior** to any works commencing on site as onsite drainage and slab levels may be affected

P13 24.08.26	Minor amendment to notes	CP
P12 19.08.26	Updated with new layout and additional SUDs	CP
P11 26.03.26	Up-Fix filter indicated	CP
P10 23.03.26	Updated with additional notes & existing assets	CP
P09 19.01.26	Scale bar shown	TR
P08 05.12.25	Proposed discharge rate amended	CP
P07 05.12.25	Amended to suit new planning layout	NR
P06 15.10.25	Amended to suit layout dated: 09.10.25	TR NR
P05 02.10.25	Cellular storage removed & rising main shown	TR NR
P04 25.09.25	Amended to suit latest layout	TR NR
P03 11.04.25	Plots 13 and 14 FFL changed	NR
P02 07.04.25	Drainage strategy amended, pond removed, tank added, pipes downsized.	NR
P01 04.04.25	Preliminary issue for review	NR xx
Mark | Date	Details	By | Chk

Revision history

Drawing originator:

BETTS HYDRO CONSULTING ENGINEERS · BETTS ASSOCIATES CONSULTING ENGINEERS · BETTS GEO CONSULTING ENGINEERS

Client: Taylor Wimpey

Project title:

Glen Dimplex
Stoney Lane

Drawing title:

Preliminary Drainage Layout

Scale: 1:500 for the original size of A0

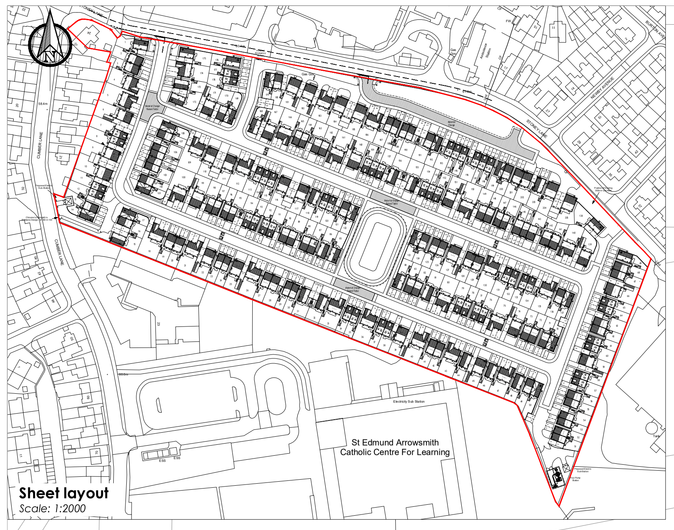
Drawn by: CP | Checked by: - | Passed by: - | Date: Apr 2025

Drawing status:

For Planning

Job No:	Drawing No: Project	Origin	Volume	Level	Type	Discip	Number	Revision:
TAY143	GDX	BET	ZZ	XX	DR	C	0001	P13

6-7 Old Hoarh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
enquiries@betts-associates.co.uk
Chester 01244 288178



Sheet layout
Scale: 1:2000

LEGEND

- Site Boundary
- FFL 134.65 — Proposed Finished Floor Level
- +(133.70) — Existing Boundary Ground Level
- 16.500 — Proposed Road / Driveway Contour - Major (0.50m interval)
- 16.450 — Proposed Road / Driveway Contour - Minor (0.05m interval)
- ACO — Private Drainage (ACO Channel & Gully)
- 1 in 13 — Proposed Drive / Path Gradient & Direction
- 1 in 10 — Proposed Garden Gradient & Direction
- +17.100 — Proposed Spot Level
- Proposed Earthwork Batter
- S — Proposed Steps *(300mm going, 150mm rising)*
- STEP+450 — Stepped Foundation
- AC — Underbuild - Measured from FFL -150mm to PGL
- TC — Tanking - Measured from FFL -150mm to PGL
- SC — Stepped DPC - Measured from FFL -150mm to PGL

Retaining construction details to be provided by developer.

- FOE - 0.150m — Flag on Edge (up to 450mm) - *Retained height shown*
- RET - 0.500m — Masonry Retaining Wall (over 450mm) - *Retained height shown*

Notes

1. Planning layout ref. Taylor Wimpey - 25053-VIM_2026-07-29
2. Topographical survey provided by 'Geographical Engineering Operations', ref 'G24104 Stoney Lane, Whiston Cross', Dated March 2024.
3. Road detail, levels and layout are subject to local authority section 38 Highways approval.

Proposed Finished Levels
The levels indicated on this plan are indicative (*+/-500mm*) and subject to change following detailed levels design.

60.4m Adopted Emergency Access

61.0m

Road 2

Road 3

Road 5

Material Change Raised Table

Gas Gov

Proposed Electric Sub-Station

Chicane to Footpath to Eddisons Design, ref: SD-4-100

Mark	Date	Details	By	Chk
P08	24.08.26	Minor note amendments	CP	
P07	19.08.26	Updated with new layout & revised external levels	CP	
P06	19.01.26	Scale bar shown	TR	
P05	05.12.25	Amended to suit new layout	NR	
P04	15.10.25	Amended to suit layout dated: 09.10.25	TR	NR
P03	02.10.25	Road 4 levels changed	TR	NR
P02	25.09.25	Amended to suit latest layout	TR	NR
P01	11.04.25	Preliminary issue for review	NR	xx

Revision History

Drawing originator:

BETTS HYDRO CONSULTING ENGINEERS · BETTS ASSOCIATES CONSULTING ENGINEERS · BETTS GEO CONSULTING ENGINEERS

Client: Taylor Wimpey

Project title:
Glen Dimplex
Stoney Lane

Drawing title:
Preliminary Retaining Layout

Scale: for the original size of A0

Drawn by: NR | Checked by: | Passed by: | Date: Apr' 2025

Drawing status:
Technical Due Diligence

Job No:	Drawing No: Project	Origin	Volume	Level	Type	Discip.	Number	Revision:
TAY143	GDX	BET	ZZ	XX	DR	C	0002	P08

6-7 Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
enquiries@betts-associates.co.uk
Chester 01244 288178

STONEY LANE

RENWICK AVENUE

Road 5TH

Road 4

Road 2

Road 1

Material Change

Material Change Raised Table

Position of Existing 355mm Gas Main

CF

Und

EP

29

35

37

47

53

59

12

20

138

139

LEGEND

- Site Boundary
- FFL 134.65 — Proposed Finished Floor Level
- +(133.70) — Existing Boundary Ground Level
- 16.500 — Proposed Road / Driveway Contour - Major (0.50m interval)
- 16.450 — Proposed Road / Driveway Contour - Minor (0.05m interval)
- ACO — Private Drainage (ACO Channel & Gully)
- 1 in 13 — Proposed Drive / Path Gradient & Direction
- 1 in 10 — Proposed Garden Gradient & Direction
- +17.100 — Proposed Spot Level
- Proposed Earthwork Batter
- (S) — Proposed Steps *(300mm going, 150mm rising)*
- STEP+450 — Stepped Foundation
- AC — Underbuild - Measured from FFL -150mm to PGL
- 3C — Tanking - Measured from FFL -150mm to PGL
- 3C — Stepped DPC - Measured from FFL -150mm to PGL

Retaining construction details to be provided by developer.

- FOE - 0.150m — Flag on Edge (up to 450mm) - *Retained height shown*
- RET - 0.500m — Masonry Retaining Wall (over 450mm) - *Retained height shown*

Notes

1. Planning layout ref. Taylor Wimpey - 25053-VIM_2026-07-29
2. Topographical survey provided by 'Geographical Engineering Operations', ref 'G24104 Stoney Lane, Whiston Cross', Dated March 2024.
3. Road detail, levels and layout are subject to local authority section 38 Highways approval.

Proposed Finished Levels
The levels indicated on this plan are indicative (*+/-500mm*) and subject to change following detailed levels design.

NORTH Indicative

Sheet layout
Scale: 1:2000

St Edmund Arrowsmith Catholic Centre For Learning

Proposed Electric Sub-Station

Foul Pump Station

Mark	Date	Details	By	Chk
P08	24.08.26	Minor amendment to Notes	CP	
P07	19.08.26	Updated with new layout & revised external levels	CP	
P06	19.01.26	Scale bar shown	TR	
P05	05.12.25	Amended to suit new layout	NR	
P04	15.10.25	Amended to suit layout dated: 09.10.25	TR	NR
P03	02.10.25	Road 4 levels changed	TR	NR
P02	25.09.25	Amended to suit latest layout	TR	NR
P01	11.04.25	Preliminary issue for review	TR	xx

Revision History

Drawing originator:

BETTS HYDRO CONSULTING ENGINEERS · BETTS ASSOCIATES CONSULTING ENGINEERS · BETTS GEO CONSULTING GEOLOGISTS

Client: Taylor Wimpey

Project title:
Glen Dimplex
Stoney Lane

Drawing title:
Preliminary Retaining Layout

Scale: for the original size of A0

Drawn by: NR | Checked by: | Passed by: | Date: Apr' 2025

Drawing status:
Technical Due Diligence

Job No:	Drawing No: Project	Origin	Volume	Level	Type	Discip.	Number	Revision:
TAY143	GDX	BET	ZZ	XX	DR	C	0003	P08

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enquiries@betts-associates.co.uk
Chester 01244 288178

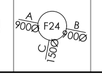
Surface Water

MH No.	DIAGRAM	MANHOLE DIMENSION (mm)	MANHOLE TYPE	COVER TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
S1		1350Ø	Type C	B125	60.797	59.213	1.434	347945.194	391628.292
S2		1350Ø	Type C	B125	60.635	59.089	1.396	347941.921	391610.063
S3		1800Ø	Type C	D400	60.389	58.748	1.341	347931.180	391583.485
S4		1500Ø	Type C	D400	60.203	58.558	1.270	347905.708	391593.748
S5		1350Ø	Type C	D400	59.955	58.702	0.952	347887.069	391642.825
S6		2400Ø	Type C	D400	60.130	58.088	1.292	347878.280	391604.799
S7		2100Ø	Type C	D400	59.628	57.950	0.928	347857.494	391553.515
S8		2100Ø	Type C	D400	59.584	57.934	0.900	347860.046	391547.707
S9		2100Ø	Type C	D400	59.679	57.873	1.056	347882.811	391538.561
S10		2100Ø	Type C	D400	59.777	57.697	1.330	347947.445	391512.593
S11		1500Ø	Type B	D400	61.146	58.414	2.282	348118.621	391574.685
S12		1500Ø	Type C	D400	60.824	59.149	1.224	348017.411	391615.435
S13		1500Ø	Type C	D400	60.776	58.975	1.351	348023.976	391609.685
S14		1500Ø	Type B	D400	60.649	58.637	1.562	348040.478	391606.148
S15		1800Ø	Type B	D400	60.490	58.252	1.789	348058.369	391598.944
S16		2100Ø	Type B	D400	61.791	58.133	2.908	348160.138	391490.862
S17		2100Ø	Type B	D400	60.742	57.984	2.008	348104.767	391513.234
S18		2100Ø	Type B	D400	60.323	57.853	1.720	348056.250	391532.836
S19		2100Ø	Type C	D400	60.208	58.000	1.458	347959.786	391571.810
S20		2100Ø	Type C	D400	59.972	57.849	1.373	348015.516	391549.294
S21		2700Ø	Type B	D400	60.242	57.796	1.695	348035.180	391541.349
S22		---	HEADWALL		59.683	57.760	1.173	348029.837	391528.020
S23		---	HEADWALL		59.683	57.683	1.250	348018.331	391499.471
S24		1200Ø	Unknown	D400	60.271	58.672	1.373	348135.710	391410.594
S25		1200Ø	Unknown	D400	61.506	60.081	1.200	348158.094	391472.702
S26		1500Ø	Type B	D400	60.587	58.301	1.836	348144.008	391433.619
S27		2100Ø	Type B	D400	60.472	57.990	1.732	348140.169	391435.162

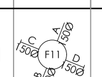
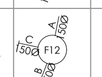
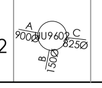
Surface Water

MH No.	DIAGRAM	MANHOLE DIMENSION (mm)	MANHOLE TYPE	COVER TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
S28		2100Ø	Type C	D400	60.033	57.865	1.417	348093.698	391453.833
S29		2100Ø	Type C	D400	59.787	57.711	1.326	348036.303	391476.892
S30		2700Ø	Type B	D400	60.089	57.648	1.691	348012.998	391486.256
S31		2700Ø	Type B	D400	60.074	57.585	2.190	347989.644	391495.638
S32		1350Ø	Type B	D400	59.529	57.106	2.198	347978.493	391468.039
S33		1350Ø	Type B	D400	59.549	57.056	2.268	347986.213	391464.920

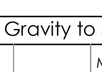
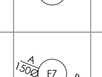
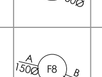
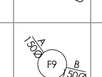
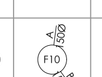
Foul Gravity to Stoney Road (**FW Network 1**)

MH No.	DIAGRAM	MANHOLE DIMENSION (mm)	MANHOLE TYPE	COVER TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
F20		1350Ø	Type C	D400	59.633	58.596	0.888	347856.362	391557.193
F21		1350Ø	Type C	D400	59.894	58.347	1.397	347868.609	391587.926
F22		1350Ø	Type B	D400	60.167	58.181	1.836	347875.557	391608.835
F23		1200Ø	Type B	D400	60.025	57.972	1.904	347882.660	391635.779
F24		1800Ø	Type B	D400	59.938	57.104	1.934	347885.699	391651.144

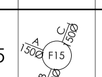
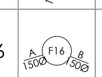
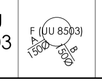
Foul Gravity to Stoney Road (**FW Network 3**)

MH No.	DIAGRAM	MANHOLE DIMENSION (mm)	MANHOLE TYPE	COVER TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
F11		1350Ø	Type C	D400	60.368	58.786	1.432	347935.954	391588.988
F12		1200Ø	Type B	B125	60.616	58.635	1.832	347943.186	391607.781
F13		1200Ø	Type B	B125	60.781	58.464	2.166	347947.736	391630.019
F14		1200Ø	Type B	B125	60.989	58.364	2.475	347960.958	391631.644
UU 9602		1800Ø	Type B	D400	60.750	57.580	2.270	347961.836	391636.086

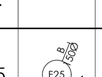
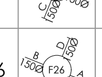
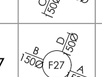
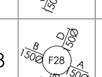
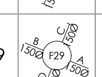
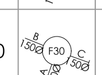
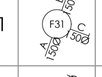
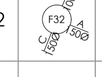
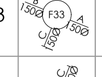
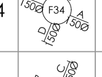
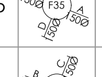
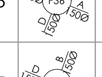
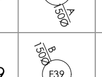
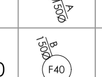
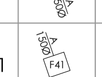
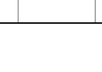
Foul Gravity to Stoney Road (**FW Network 4**)

MH No.	DIAGRAM	MANHOLE DIMENSION (mm)	MANHOLE TYPE	COVER TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
F6		1350Ø	Type C	D400	61.242	59.699	1.392	348126.950	391574.366
F7		1350Ø	Type C	D400	60.680	59.399	1.131	348085.154	391591.202
F8		1350Ø	Type C	D400	60.624	59.099	1.376	348043.358	391608.039
F9		1200Ø	Type B	D400	60.803	58.962	1.691	348023.407	391612.539
F10		1200Ø	Type B	D400	60.892	58.907	1.836	348018.563	391619.334
UU 0601		1800Ø	Type B	D400	61.030	58.167	2.038	348019.759	391628.983

Foul Gravity to Cumber Lane (**FW Network 2**)

MH No.	DIAGRAM	MANHOLE DIMENSION (mm)	MANHOLE TYPE	COVER TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
F15		1350Ø	Type C	D400	59.943	58.685	1.108	347915.703	391522.531
F16		1350Ø	Type C	D400	59.551	58.245	1.156	347861.434	391544.469
F17		1200Ø	Unknown	B125	59.684	58.195	1.339	347855.109	391542.585
F18		1200Ø	Unknown	B125	59.250	58.024	1.076	347846.582	391521.479
F19		1350Ø	Type C	B125	58.885	57.837	0.898	347823.490	391530.809
UU 8503		1350Ø	Type C	D400	58.563	57.770	0.643	347818.840	391538.396

Foul to Pumping Station - Rising Main to Foul Gravity to Cumber Lane (**FW Network 2**)

MH No.	DIAGRAM	MANHOLE DIMENSION (mm)	MANHOLE TYPE	COVER TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
F25		1350Ø	Type C	D400	60.044	58.786	1.108	347979.040	391566.997
F26		1200Ø	Type B	D400	59.988	57.589	2.248	348019.082	391550.819
F27		1200Ø	Type B	D400	60.286	57.309	2.827	348053.689	391536.837
F28		1200Ø	Type A	D400	60.760	56.863	3.747	348108.605	391514.649
F29		1200Ø	Type A	D400	61.151	56.628	4.373	348137.639	391502.919
F30		1200Ø	Type A	D400	61.921	56.417	5.353	348163.608	391492.427
F31		1200Ø	Type A	D400	61.196	56.171	4.874	348152.504	391461.619
F32		1350Ø	Type C	D400	59.866	58.761	0.955	347964.497	391502.806
F33		1350Ø	Type C	D400	60.090	58.524	1.415	347993.663	391491.015
F34		1350Ø	Type C	D400	59.805	58.207	1.449	348032.831	391475.182
F35		1350Ø	Type B	D400	59.983	57.770	2.063	348086.723	391453.395
F36		1350Ø	Type B	D400	60.227	57.540	2.536	348114.981	391441.972
F37		1200Ø	Type A	D400	60.488	55.928	4.409	348141.553	391431.230
F38		1200Ø	Type A	B125	60.209	55.657	4.403	348129.519	391397.209
F39		1500Ø	Pen-Stock	D400	59.600	55.417	4.033	348142.199	391367.939
F40		TBC	Wet Well	D400	59.600	55.395	4.055	348143.133	391365.193
F41		1650 x1850	Valve Chamber	D400	59.600	55.368	4.082	348144.289	391361.797

NOTES

a. These Manhole Schedules are for guidance purposes only and NOT to be used for pricing and ordering. The 1:20 Manhole Construction Details are to be used ONLY when approval has been obtained from the Statutory Undertaker.

b. These Manhole Schedules only indicate main drainage runs; refer to the approved 1:20 Manhole Construction Details for locations of incoming connections from gullies and domestic drainage for construction purposes.

c. The co-ordinates indicated on these Manhole Schedules relate to the intersection of the main drainage runs and not the centre of the manhole. Please refer to the 1:20 Manhole Construction Details for this information.

d. Should any discrepancies be identified between the 1:20 Manhole Construction Details and the Manhole Schedules these should be reported to both the Developer's Engineer and Betts Associates prior to any construction taking place.

e. Should any discrepancies be identified between the Main Drainage Layout and the Domestic Drainage Layout these should be reported to both the Developer's Engineer and Betts Associates prior to any construction taking place.

f. The contractor shall check all existing drainage levels and points of connection to existing public sewers before site start and the design engineer notified immediately of any discrepancy against levels provided to inform the design.

Notes

1. Planning layout ref, Taylor Wimpey - 25053-VIM_2026-07-29
2. Topographical survey provided by 'Geographical Engineering Operations', ref 'G24104 Stoney Lane, Whiston Cross', Dated March 2024.
3. Road detail, levels and layout are subject to local authority section 38 Highways approval.

Mark	Date	Details	By	Chk
P04	19.08.26	Updated with new layout	CP	
P03	05.12.25	Amended to suit new planning layout	NR	
P02	15.10.25	Amended to suit layout dated: 09.10.25	TR	NR
P01	02.10.25	Preliminary issue for review	TR	NR

Revision history

Drawing originator:

BETTS HYDRO CONSULTING ENGINEERS · BETTS ASSOCIATES CONSULTING ENGINEERS · BETTS GEO CONSULTING ENGINEERS

Client: Taylor Wimpey

Project title:

Glen Dimplex
Stoney Lane

Drawing title:

Manhole Schedules

Scale: NTS for the original size of A1

Drawn by: TR | Checked by: NR | Passed by: | Date: Oct' 2025

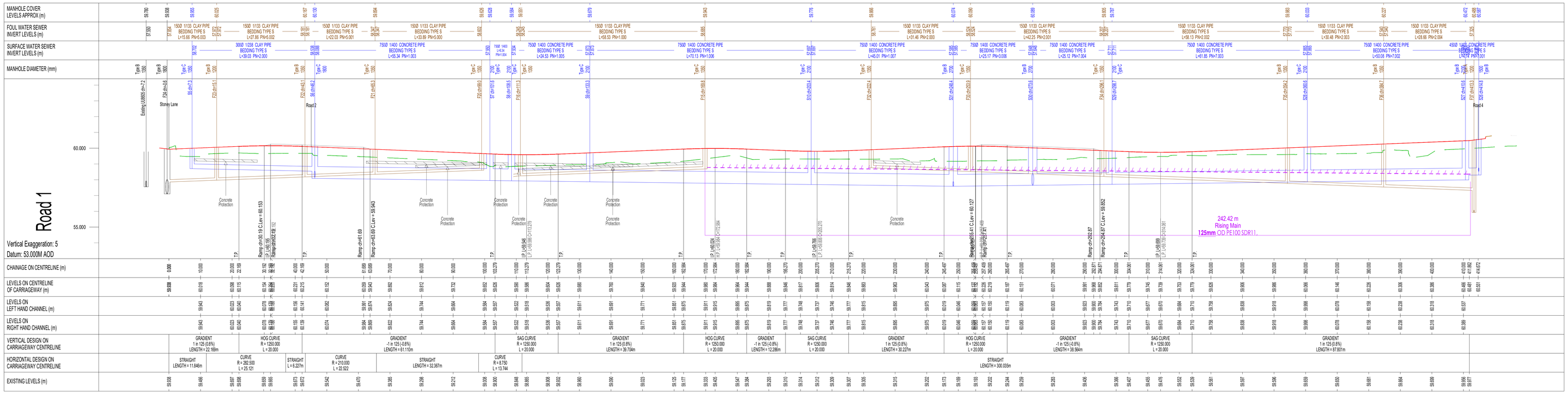
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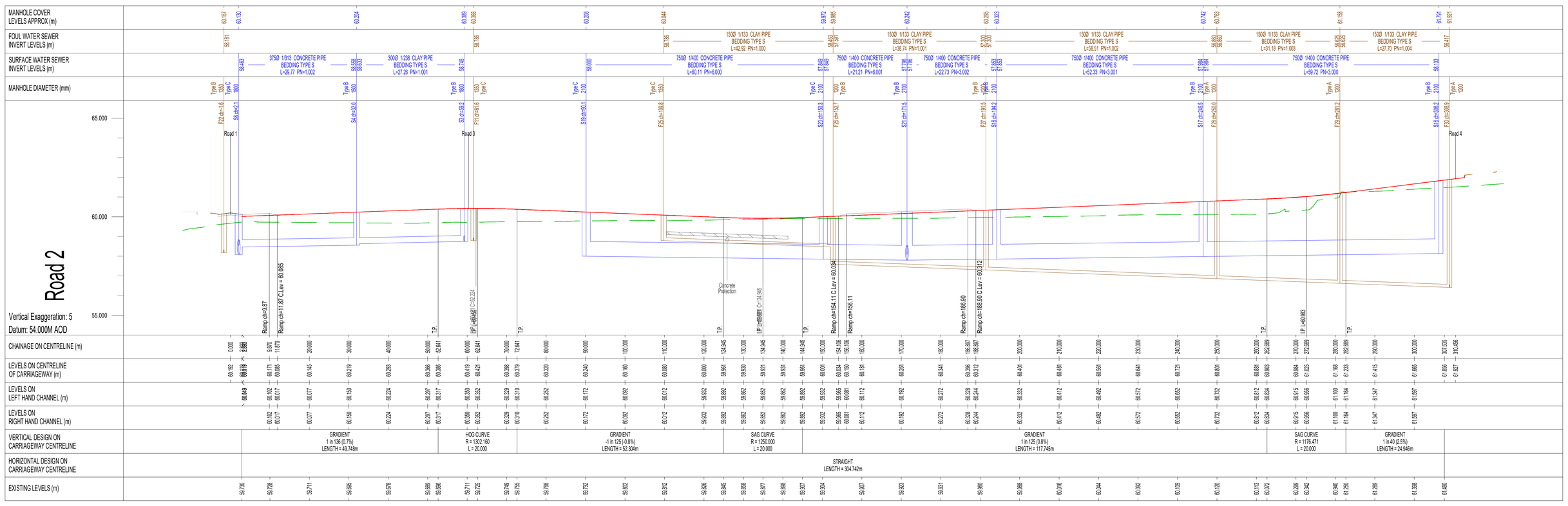
Technical Due Diligence

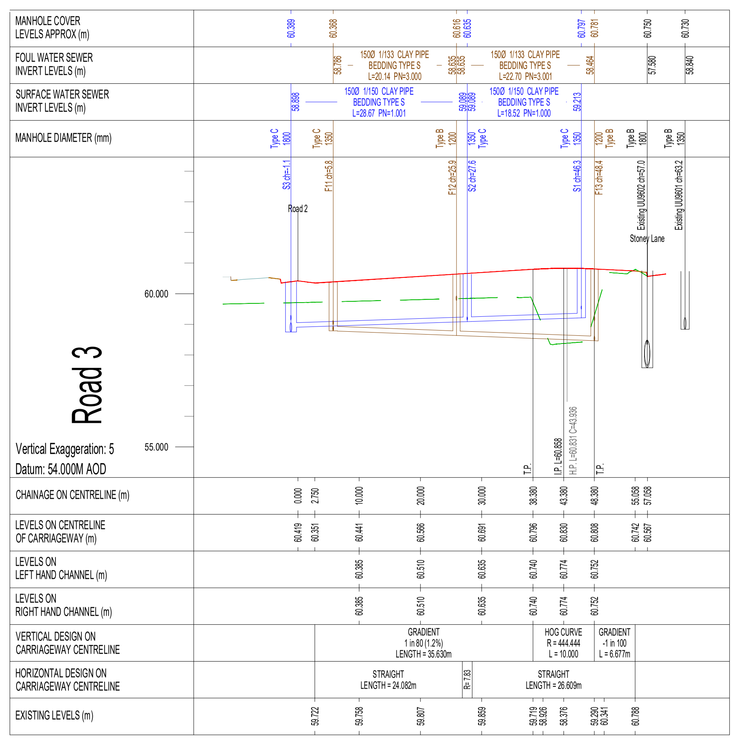
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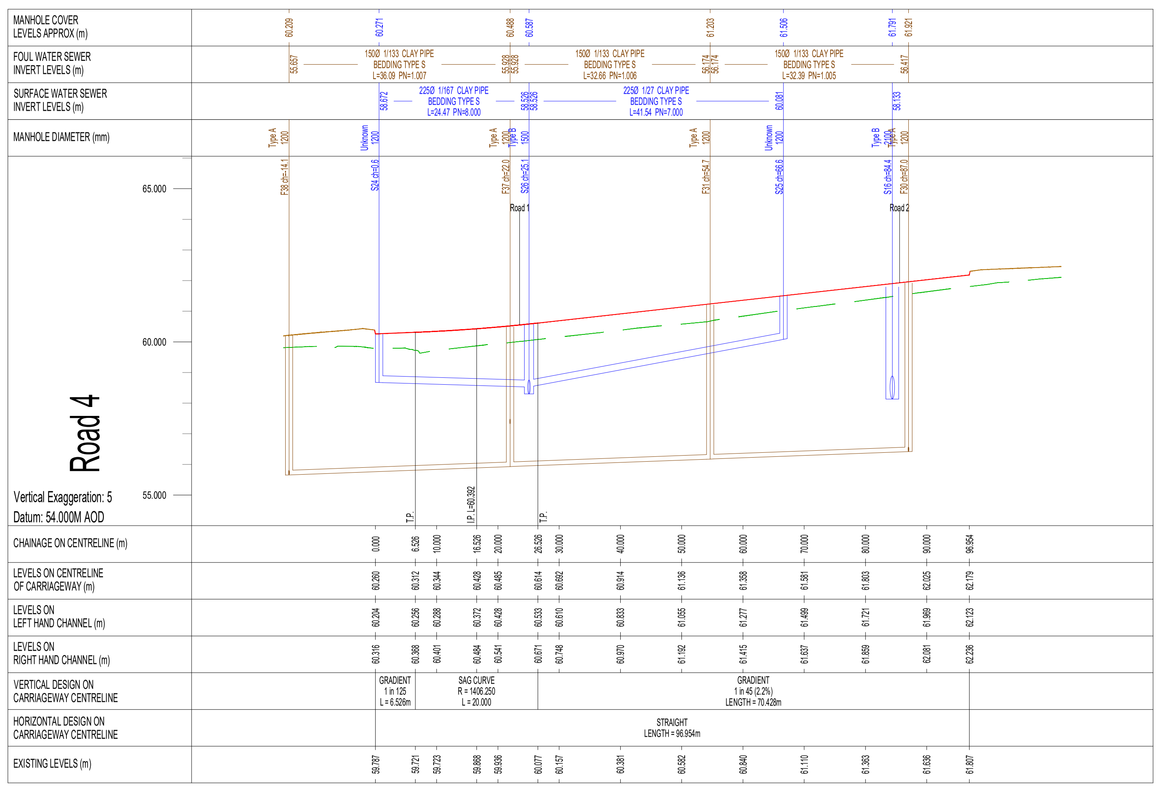
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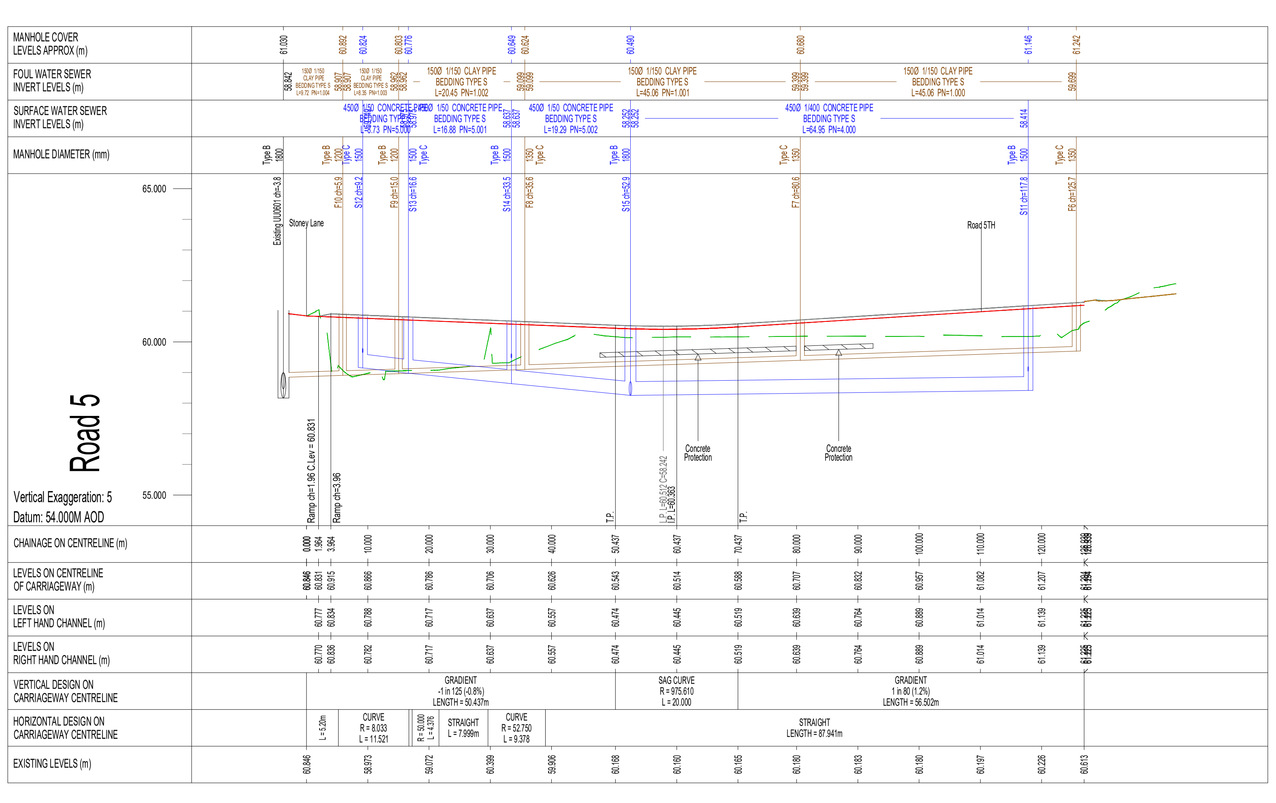
6 -7 Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
enquiries@betts-associates.co.uk
Chester 01244 288178

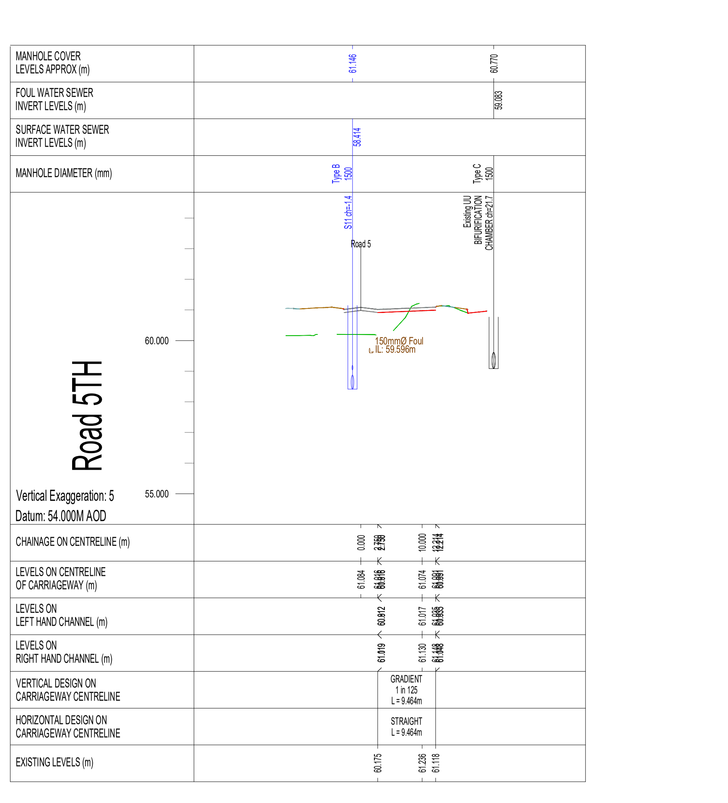












Legend

- Existing Ground Level
- Proposed Ground Level
- Proposed Foul Water Sewer
- Proposed Surface Water Sewer
- Proposed Ordinary Watercourse Culvert
- Existing Ordinary Watercourse Culvert
- Existing Combined Sewer
- Existing Highways Sewer

Notes

1. This drawing is to be read in conjunction with the standard details, the layouts, schedules and specifications for the development.
2. A +1% gradient represents a rise of 1m in 100m.
3. Left and right hand channels are on the left and right hand side respectively, when standing at zero chainage and looking along the road.
4. A level at any point 'x' m from the start of a vertical curve is given by the formula:-

   $$\text{level@'x'=level@ start of curve} + \frac{ax}{100} - \frac{(a-b)x^2}{200}$$

   where 'a' and 'b' are the gradients at the start and end of the curve respectively and having the algebraic signs +/-.
5. Pipe sizes are stated in millimetres and levels are shown in metres A.O.D.
6. All pipes to have flexible joints with granular bedding (class s) unless stated otherwise. where 150mm concrete bed and surround is specified the concrete must be broken at the joint positions by the insertion of a 'flexcell' collar.
7. Connections to existing sewers are to be soffit to soffit unless noted otherwise.
8. All vitrified CLAYs to be extra strength to B.S. 65. 1991.
9. 'MV' is equal to the rate of change of gradient and is calculated from the formula:-

   $$MV = 100 * \frac{(A-B)}{L}$$

   Where A and B are as in note 4 above.
10. Existing levels to be confirmed on site prior to commencement of works.
11. All CONC.s to be class 'M'.
12. Refer to Betts Associates drainage layout drawing **TAY143-101** for further drainage notes.

Notes

1. Planning layout ref, Taylor Wimpey - 25053-VIM_2026-07-29
2. Topographical survey provided by "Geographical Engineering Operations", ref 'G24104 Stoney Lane, Whiston Cross', Dated March 2024.
3. Road detail, levels and layout are subject to local authority section 38 Highways approval.

Mark	Date	Details	By	Chk
P05	19.08.26	Updated with new layout		CP
P04	19.01.26	Scale bar shown		TR
P03	05.12.25	Amended to suit new planning layout		NR
P02	15.10.25	Amended to suit layout dated: 09.10.25		TR NR
P01	02.10.25	Preliminary issue for review		TR NR

Revision history

Drawing originator:

BETTS HYDRO CONSULTING ENGINEERS
BETTS ASSOCIATES CONSULTING ENGINEERS
BETTS GEO CONSULTING ENGINEERS

Client:

Taylor Wimpey

Project title:

Glen Dimplex
Stoney Lane

Drawing title:

Longsections

Scale: 1:500H 1:100V for the original size of A0

Drawn by: TR | Checked by: NR | Passed by: | Date: Oct' 2025

Drawing status:

Technical Due Diligence

Job No:	Drawing No: Project	Originator	Volume	Level	Type	Discipline	Number	Revision
TAY143	GDX	BET	XX	ZZ	DR	C	0005	P05

Do not scale this drawing

6 -7 Old Model Farm Barns, Wrexham Road, Saltney, Flintshire, CH5 2LY
enquiries@betts-associates.co.uk
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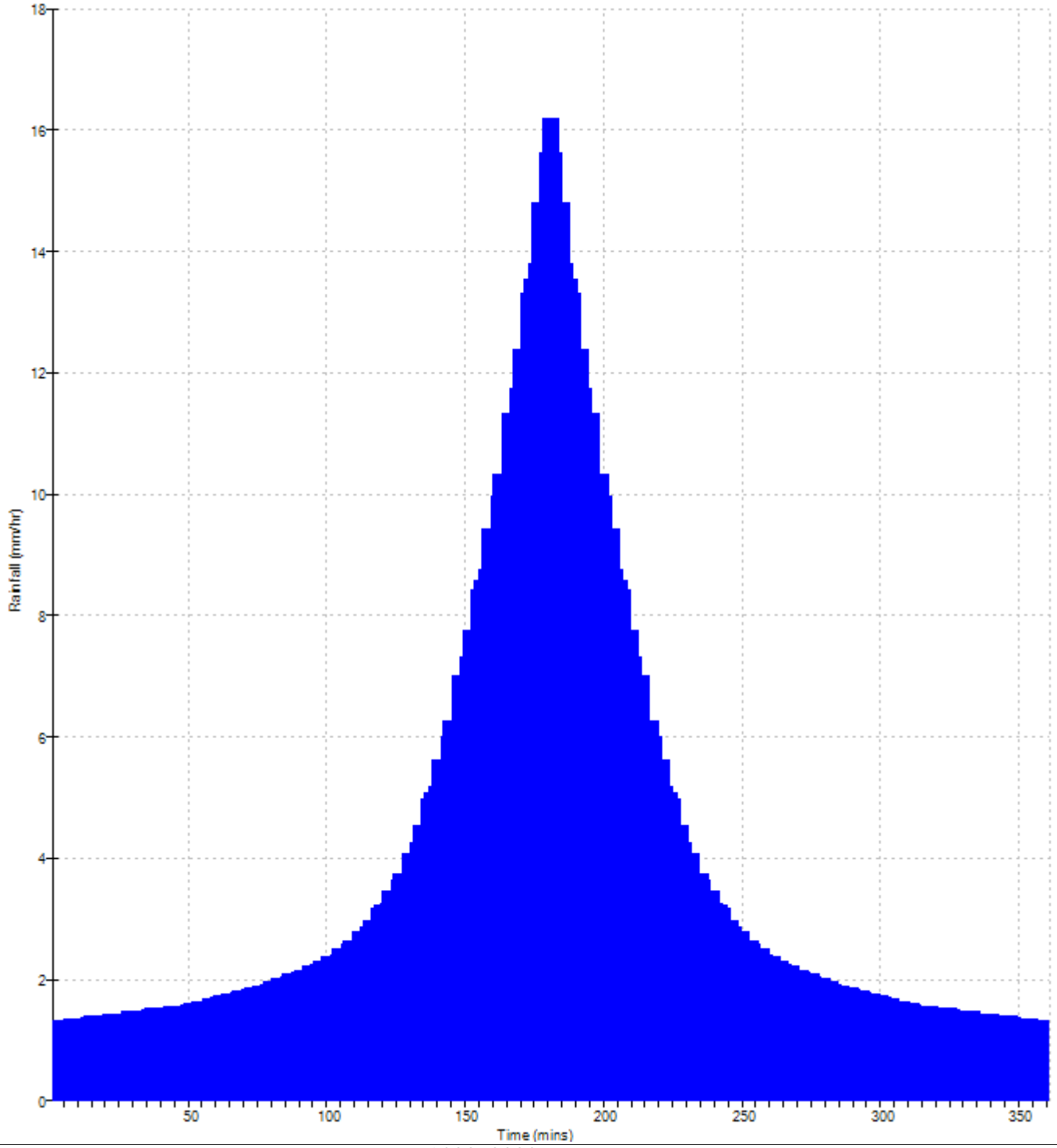
APPENDIX J: SURFACE WATER RUN-OFF CALCULATIONS

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Rainfall profile

Storm duration (mins) 360

FEH Data	
FEH Rainfall Version	2013
Site Location	GB 347970 391576 SJ 47970 91576
Data Type	Point
Peak Intensity (mm/hr)	16.204
Ave. Intensity (mm/hr)	4.134
Return Period (years)	2.0

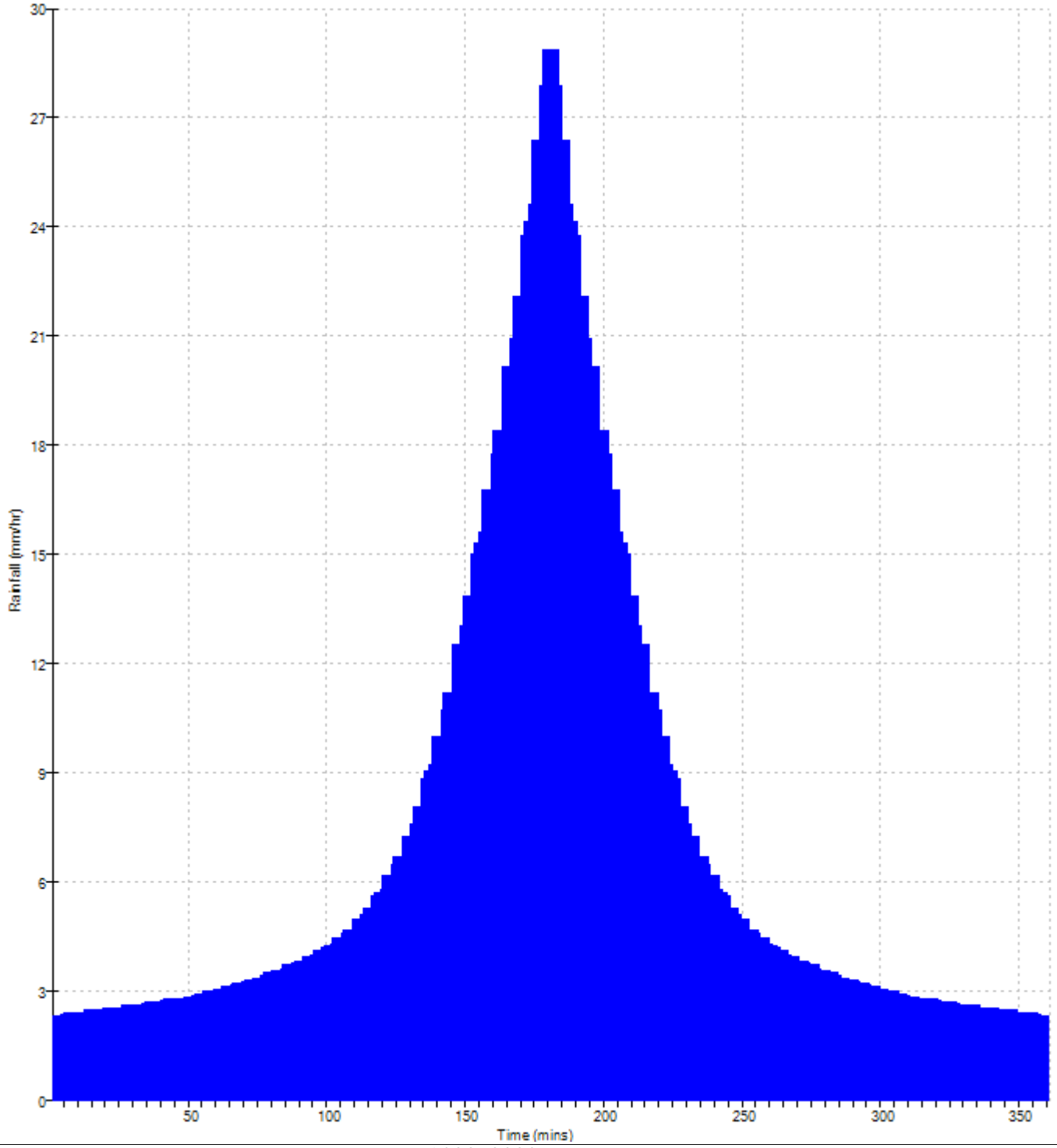


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Rainfall profile

Storm duration (mins) 360

FEH Data	
FEH Rainfall Version	2013
Site Location	GB 347970 391576 SJ 47970 91576
Data Type	Point
Peak Intensity (mm/hr)	28.902
Ave. Intensity (mm/hr)	7.373
Return Period (years)	30.0

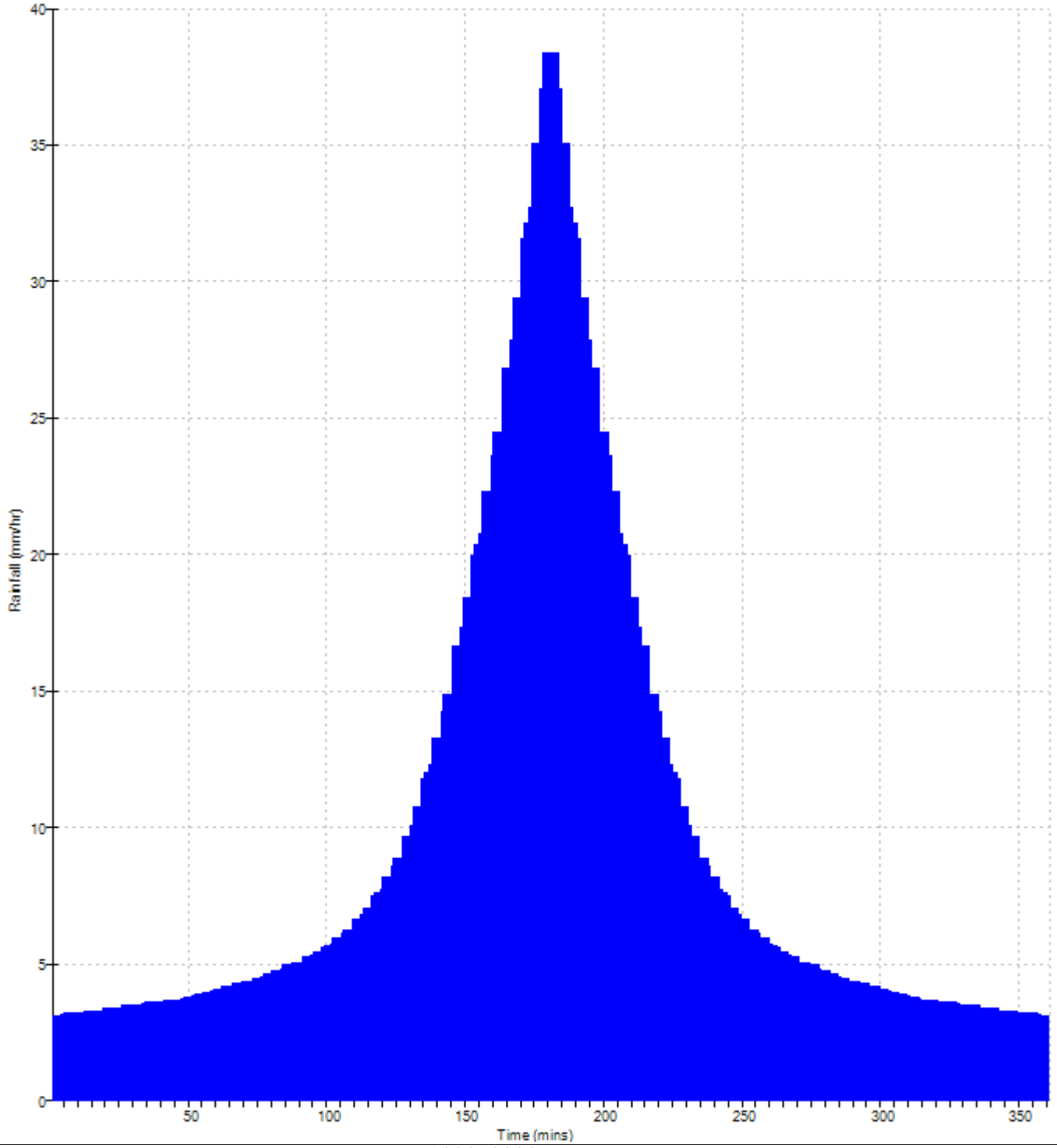


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Rainfall profile

Storm duration (mins) 360

FEH Data	
FEH Rainfall Version	2013
Site Location	GB 347970 391576 SJ 47970 91576
Data Type	Point
Peak Intensity (mm/hr)	38.413
Ave. Intensity (mm/hr)	9.799
Return Period (years)	100.0



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Greenfield Runoff Volume

FEH Data

Return Period (years)	2
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 347970 391576 SJ 47970 91576
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	5.648
SAAR (mm)	925
CWI	122.427
SPR Host	46.300
URBEXT (1990)	0.0000

Results

Percentage Runoff (%)	45.66
Greenfield Runoff Volume (m^3)	639.567

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Greenfield Runoff Volume

FEH Data

Return Period (years)	30
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 347970 391576 SJ 47970 91576
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	5.648
SAAR (mm)	925
CWI	122.427
SPR Host	46.300
URBEXT (1990)	0.0000

Results

Percentage Runoff (%)	46.89
Greenfield Runoff Volume (m^3)	1171.664

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Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 347970 391576 SJ 47970 91576
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	5.648
SAAR (mm)	925
CWI	122.427
SPR Host	46.300
URBEXT (1990)	0.0000

Results

Percentage Runoff (%)	49.16
Greenfield Runoff Volume (m^3)	1632.666

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APPENDIX K: HYDAULIC CALCULATIONS & DRAINAGE NETWORK DETAILS

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PRELIMINARY SURFACE WATER DRAINAGE NETWORK DETAILS

Site at Former Glen Dimplex, Stoney Lane, Whiston

For

Taylor Wimpey



Rev. 1.0

20th August 2026

FORMER GLEN DIMPLEX, STONEY LANE, WHISTON

Drainage Network Details

20th August 2026

Issue no.	Rev. 1.0			
Date:	20th Aug 2026			
Prepared By:	Chris Pickles			
Checked By:	Richard Nicholas			
Authorised By:	Robert Ankers			

Betts Associates Ltd
Old Marsh Farm Barns
Welsh Road
Sealand
Flintshire
CH5 2LY

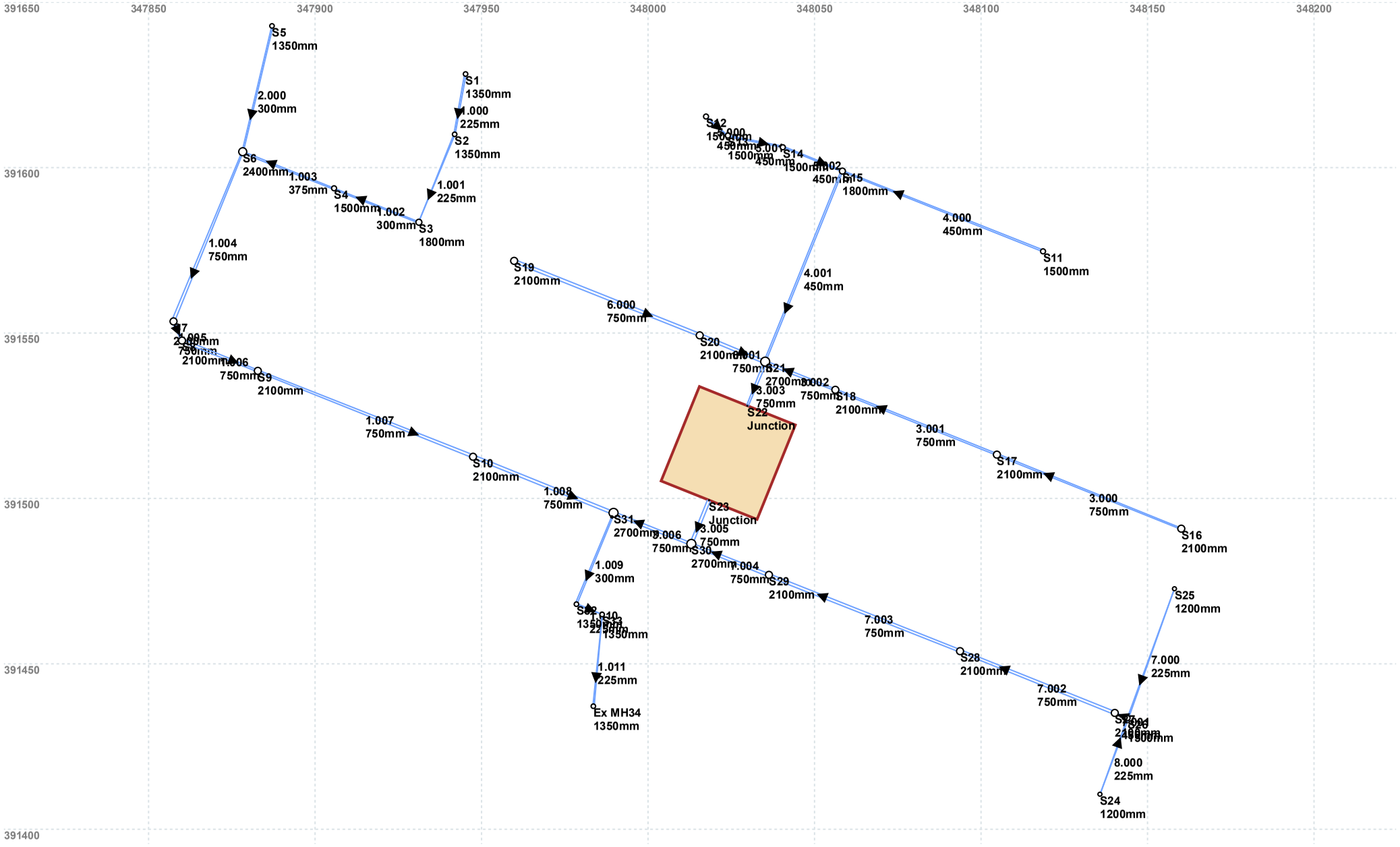
Tel no. 01244 288178
Project no. CAS02

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Surface Water System Details
Plan of proposed Surface Drainage Network
Simulation Settings
Node Details
Link Details
Pipeline Schedules
Manhole Schedules
Flow Controls
Storage Structures

Simulation
Simulation Results for the 1yr Return Period
Simulation Results for the 2yr Return Period
Simulation Results for the 30yr Return Period
Simulation Results for the 100yr Return Period
Simulation Results for the 100yr Return Period + 45% Climate Change
Simulation Results for the 200yr Return Period

BETTS ASSOCIATES CONSULTING ENGINEERS	Betts Associates Ltd Unit 6, Old Marsh Farm Barns, Sealand, Deeside CH5 2LY	File: TAY143 - Preliminary Drainage Details - P01 - Augu Network: Chris Pickles Aug 2026	Page 1 Preliminary Surface Water Drainage Network



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Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	1 year (l/s)	42.2
Rainfall Events	Singular	Drain Down Time (mins)	1440	2 year (l/s)	42.4
Summer CV	1.000	Additional Storage (m³/ha)	0.0	30 year (l/s)	42.4
Winter CV	1.000	Starting Level (m)		100 year (l/s)	42.4
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0
200	0	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	SPR	0.10	Betterment (%)	0
Greenfield Method	IH124	Region	1	QBar	
Positively Drained Area (ha)		Growth Factor 1 year	0.85	Q 1 year (l/s)	
SAAR (mm)		Growth Factor 30 year	1.95	Q 30 year (l/s)	
Soil Index	1	Growth Factor 100 year	2.48	Q 100 year (l/s)	

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Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
S1	0.010	5.00	60.797	1350	347945.194	391628.292	1.659	59.138
S2	0.092	5.00	60.635	1350	347941.921	391610.063	1.621	59.014
S3	0.088	5.00	60.389	1800	347931.180	391583.485	1.641	58.748
S4	0.062	5.00	60.203	1500	347905.708	391593.748	1.645	58.558
S5	0.090	5.00	59.955	1350	347887.069	391642.825	1.253	58.702
S6	0.205	5.00	60.130	2400	347878.280	391604.799	2.042	58.088
S7	0.062	5.00	59.628	2100	347857.494	391553.515	1.678	57.950
S8	0.053	5.00	59.584	2100	347860.047	391547.707	1.650	57.934
S9	0.195	5.00	59.679	2100	347882.811	391538.561	1.806	57.873
S10	0.198	5.00	59.777	2100	347947.445	391512.593	2.080	57.697
S16	0.145	5.00	61.791	2100	348160.138	391490.862	3.658	58.133
S17	0.200	5.00	60.742	2100	348104.767	391513.234	2.758	57.984
S18	0.158	5.00	60.323	2100	348056.250	391532.836	2.470	57.853
S11	0.251	5.00	61.146	1500	348118.621	391574.685	2.732	58.414
S12	0.105	5.00	60.824	1500	348017.411	391615.435	1.675	59.149
S13	0.022	5.00	60.776	1500	348023.976	391609.685	1.801	58.975
S14	0.049	5.00	60.649	1500	348040.478	391606.148	2.012	58.637
S15			60.490	1800	348058.369	391598.944	2.238	58.252
S19	0.209	5.00	60.208	2100	347959.786	391571.810	2.208	58.000
S20	0.129	5.00	59.972	2100	348015.516	391549.294	2.123	57.849
S21			60.242	2700	348035.180	391541.349	2.446	57.796
S22			59.683		348029.837	391528.020	1.924	57.759
S23		5.00	59.683		348018.331	391499.471	2.000	57.683
S25	0.101	5.00	61.506	1200	348158.094	391472.702	1.425	60.081
S24	0.128	5.00	60.271	1200	348135.710	391410.594	1.599	58.672
S26			60.587	1500	348144.008	391433.619	2.286	58.301
S27	0.037	5.00	60.472	2100	348140.169	391435.162	2.482	57.990
S28	0.262	5.00	60.033	2100	348093.698	391453.833	2.168	57.865
S29	0.131	5.00	59.787	2100	348036.303	391476.892	2.076	57.711
S30	0.082	5.00	60.089	2700	348012.998	391486.256	2.441	57.648
S31			60.074	2700	347989.644	391495.638	2.489	57.585
S32			59.529	1350	347978.493	391468.039	2.423	57.106
S33			59.549	1350	347986.213	391464.920	2.493	57.056
Ex MH34			58.500	1350	347983.573	391437.196	1.540	56.960

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	18.520	0.600	59.138	59.014	0.124	149.4	225	5.29	38.8
1.001	S2	S3	28.667	0.600	59.014	58.823	0.191	150.1	225	5.74	37.4
1.002	S3	S4	27.462	0.600	58.748	58.633	0.115	238.8	300	6.19	36.2
1.003	S4	S6	29.571	0.600	58.558	58.463	0.095	311.3	375	6.67	34.9
2.000	S5	S6	39.028	0.600	58.702	58.538	0.164	238.0	300	5.64	37.7
1.004	S6	S7	55.336	0.600	58.088	57.950	0.138	401.0	750	7.34	33.3
1.005	S7	S8	6.345	0.600	57.950	57.934	0.016	396.6	750	7.41	33.1
1.006	S8	S9	24.533	0.600	57.934	57.873	0.061	402.2	750	7.71	32.4
1.007	S9	S10	69.656	0.600	57.873	57.697	0.176	395.8	750	8.53	30.7
1.008	S10	S31	45.477	0.600	57.697	57.585	0.112	406.0	750	9.08	29.7
3.000	S16	S17	59.720	0.600	58.133	57.984	0.149	400.8	750	5.72	37.5
3.001	S17	S18	52.327	0.600	57.984	57.853	0.131	399.4	750	6.34	35.8
3.002	S18	S21	22.725	0.600	57.853	57.796	0.057	398.7	750	6.61	35.1
4.000	S11	S15	64.952	0.600	58.414	58.252	0.162	400.9	450	6.07	36.5
5.000	S12	S13	8.727	0.600	59.149	58.975	0.174	50.2	450	5.05	39.5

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Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
5.001	S13	S14	16.877	0.600	58.975	58.637	0.338	49.9	450	5.15	39.2
5.002	S14	S15	19.286	0.600	58.637	58.252	0.385	50.1	450	5.26	38.8
4.001	S15	S21	62.089	0.600	58.252	58.096	0.156	398.0	450	7.09	33.8
6.000	S19	S20	60.106	0.600	58.000	57.849	0.151	398.1	750	5.72	37.5
6.001	S20	S21	21.208	0.600	57.849	57.796	0.053	400.2	750	5.97	36.8
3.003	S21	S22	14.360	0.600	57.796	57.760	0.036	398.9	750	7.27	33.4
3.005	S23	S30	14.251	0.600	57.683	57.648	0.035	407.2	750	5.17	39.1
7.000	S25	S26	41.544	0.600	60.081	58.526	1.555	26.7	225	5.27	38.8
8.000	S24	S26	24.475	0.600	58.672	58.526	0.146	167.6	225	5.41	38.4
7.001	S26	S27	4.138	0.600	58.301	58.290	0.011	376.2	450	5.47	38.2
7.002	S27	S28	50.081	0.600	57.990	57.865	0.125	400.6	750	6.07	36.5
7.003	S28	S29	61.853	0.600	57.865	57.711	0.154	401.6	750	6.81	34.5
7.004	S29	S30	25.117	0.600	57.711	57.648	0.063	398.7	750	7.11	33.8
3.006	S30	S31	25.168	0.600	57.648	57.585	0.063	399.5	750	7.41	33.1
1.009	S31	S32	29.766	0.600	57.585	57.106	0.479	62.1	300	9.33	29.3
1.010	S32	S33	8.326	0.600	57.106	57.056	0.050	166.5	225	9.47	29.0
1.011	S33	Ex MH34	27.850	0.600	57.056	56.960	0.096	290.1	225	10.08	28.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	18.520	149.4	225	Circular	60.797	59.138	1.434	60.635	59.014	1.396
1.001	28.667	150.1	225	Circular	60.635	59.014	1.396	60.389	58.823	1.341
1.002	27.462	238.8	300	Circular	60.389	58.748	1.341	60.203	58.633	1.270
1.003	29.571	311.3	375	Circular	60.203	58.558	1.270	60.130	58.463	1.292
2.000	39.028	238.0	300	Circular	59.955	58.702	0.953	60.130	58.538	1.292
1.004	55.336	401.0	750	Circular	60.130	58.088	1.292	59.628	57.950	0.928
1.005	6.345	396.6	750	Circular	59.628	57.950	0.928	59.584	57.934	0.900
1.006	24.533	402.2	750	Circular	59.584	57.934	0.900	59.679	57.873	1.056
1.007	69.656	395.8	750	Circular	59.679	57.873	1.056	59.777	57.697	1.330
1.008	45.477	406.0	750	Circular	59.777	57.697	1.330	60.074	57.585	1.739
3.000	59.720	400.8	750	Circular	61.791	58.133	2.908	60.742	57.984	2.008
3.001	52.327	399.4	750	Circular	60.742	57.984	2.008	60.323	57.853	1.720
3.002	22.725	398.7	750	Circular	60.323	57.853	1.720	60.242	57.796	1.696
4.000	64.952	400.9	450	Circular	61.146	58.414	2.282	60.490	58.252	1.788

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1350	Manhole	Adoptable	S2	1350	Manhole	Adoptable
1.001	S2	1350	Manhole	Adoptable	S3	1800	Manhole	Adoptable
1.002	S3	1800	Manhole	Adoptable	S4	1500	Manhole	Adoptable
1.003	S4	1500	Manhole	Adoptable	S6	2400	Manhole	Adoptable
2.000	S5	1350	Manhole	Adoptable	S6	2400	Manhole	Adoptable
1.004	S6	2400	Manhole	Adoptable	S7	2100	Manhole	Adoptable
1.005	S7	2100	Manhole	Adoptable	S8	2100	Manhole	Adoptable
1.006	S8	2100	Manhole	Adoptable	S9	2100	Manhole	Adoptable
1.007	S9	2100	Manhole	Adoptable	S10	2100	Manhole	Adoptable
1.008	S10	2100	Manhole	Adoptable	S31	2700	Manhole	Adoptable
3.000	S16	2100	Manhole	Adoptable	S17	2100	Manhole	Adoptable
3.001	S17	2100	Manhole	Adoptable	S18	2100	Manhole	Adoptable
3.002	S18	2100	Manhole	Adoptable	S21	2700	Manhole	Adoptable
4.000	S11	1500	Manhole	Adoptable	S15	1800	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
5.000	8.727	50.2	450	Circular	60.824	59.149	1.225	60.776	58.975	1.351
5.001	16.877	49.9	450	Circular	60.776	58.975	1.351	60.649	58.637	1.562
5.002	19.286	50.1	450	Circular	60.649	58.637	1.562	60.490	58.252	1.788
4.001	62.089	398.0	450	Circular	60.490	58.252	1.788	60.242	58.096	1.696
6.000	60.106	398.1	750	Circular	60.208	58.000	1.458	59.972	57.849	1.373
6.001	21.208	400.2	750	Circular	59.972	57.849	1.373	60.242	57.796	1.696
3.003	14.360	398.9	750	Circular	60.242	57.796	1.696	59.683	57.760	1.173
3.005	14.251	407.2	750	Circular	59.683	57.683	1.250	60.089	57.648	1.691
7.000	41.544	26.7	225	Circular	61.506	60.081	1.200	60.587	58.526	1.836
8.000	24.475	167.6	225	Circular	60.271	58.672	1.374	60.587	58.526	1.836
7.001	4.138	376.2	450	Circular	60.587	58.301	1.836	60.472	58.290	1.732
7.002	50.081	400.6	750	Circular	60.472	57.990	1.732	60.033	57.865	1.418
7.003	61.853	401.6	750	Circular	60.033	57.865	1.418	59.787	57.711	1.326
7.004	25.117	398.7	750	Circular	59.787	57.711	1.326	60.089	57.648	1.691
3.006	25.168	399.5	750	Circular	60.089	57.648	1.691	60.074	57.585	1.739
1.009	29.766	62.1	300	Circular	60.074	57.585	2.189	59.529	57.106	2.123
1.010	8.326	166.5	225	Circular	59.529	57.106	2.198	59.549	57.056	2.268
1.011	27.850	290.1	225	Circular	59.549	57.056	2.268	58.500	56.960	1.315

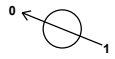
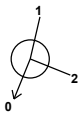
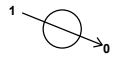
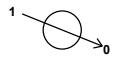
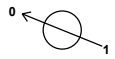
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
5.000	S12	1500	Manhole	Adoptable	S13	1500	Manhole	Adoptable
5.001	S13	1500	Manhole	Adoptable	S14	1500	Manhole	Adoptable
5.002	S14	1500	Manhole	Adoptable	S15	1800	Manhole	Adoptable
4.001	S15	1800	Manhole	Adoptable	S21	2700	Manhole	Adoptable
6.000	S19	2100	Manhole	Adoptable	S20	2100	Manhole	Adoptable
6.001	S20	2100	Manhole	Adoptable	S21	2700	Manhole	Adoptable
3.003	S21	2700	Manhole	Adoptable	S22		Junction	
3.005	S23		Junction		S30	2700	Manhole	Adoptable
7.000	S25	1200	Manhole	Adoptable	S26	1500	Manhole	Adoptable
8.000	S24	1200	Manhole	Adoptable	S26	1500	Manhole	Adoptable
7.001	S26	1500	Manhole	Adoptable	S27	2100	Manhole	Adoptable
7.002	S27	2100	Manhole	Adoptable	S28	2100	Manhole	Adoptable
7.003	S28	2100	Manhole	Adoptable	S29	2100	Manhole	Adoptable
7.004	S29	2100	Manhole	Adoptable	S30	2700	Manhole	Adoptable
3.006	S30	2700	Manhole	Adoptable	S31	2700	Manhole	Adoptable
1.009	S31	2700	Manhole	Adoptable	S32	1350	Manhole	Adoptable
1.010	S32	1350	Manhole	Adoptable	S33	1350	Manhole	Adoptable
1.011	S33	1350	Manhole	Adoptable	Ex MH34	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S1	347945.194	391628.292	60.797	1.659	1350		0	1.000	59.138	225
S2	347941.921	391610.063	60.635	1.621	1350		1	1.000	59.014	225
							0	1.001	59.014	225

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S3	347931.180	391583.485	60.389	1.641	1800	 1	1.001	58.823	225
						0	1.002	58.748	300
S4	347905.708	391593.748	60.203	1.645	1500	 1	1.002	58.633	300
						0	1.003	58.558	375
S5	347887.069	391642.825	59.955	1.253	1350	 0	2.000	58.702	300
S6	347878.280	391604.799	60.130	2.042	2400	 1	2.000	58.538	300
						2	1.003	58.463	375
						0	1.004	58.088	750
S7	347857.494	391553.515	59.628	1.678	2100	 1	1.004	57.950	750
						0	1.005	57.950	750
S8	347860.047	391547.707	59.584	1.650	2100	 1	1.005	57.934	750
						0	1.006	57.934	750
S9	347882.811	391538.561	59.679	1.806	2100	 1	1.006	57.873	750
						0	1.007	57.873	750
S10	347947.445	391512.593	59.777	2.080	2100	 1	1.007	57.697	750
						0	1.008	57.697	750
S16	348160.138	391490.862	61.791	3.658	2100	 0	3.000	58.133	750
S17	348104.767	391513.234	60.742	2.758	2100	 1	3.000	57.984	750
						0	3.001	57.984	750
S18	348056.250	391532.836	60.323	2.470	2100	 1	3.001	57.853	750
						0	3.002	57.853	750
S11	348118.621	391574.685	61.146	2.732	1500	 0	4.000	58.414	450
S12	348017.411	391615.435	60.824	1.675	1500	 0	5.000	59.149	450

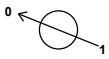
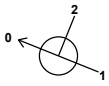
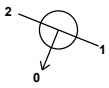
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S13	348023.976	391609.685	60.776	1.801	1500	1	5.000	58.975	450
						0	5.001	58.975	450
S14	348040.478	391606.148	60.649	2.012	1500	1	5.001	58.637	450
						0	5.002	58.637	450
S15	348058.369	391598.944	60.490	2.238	1800	1	5.002	58.252	450
						2	4.000	58.252	450
						0	4.001	58.252	450
S19	347959.786	391571.810	60.208	2.208	2100	0	6.000	58.000	750
S20	348015.516	391549.294	59.972	2.123	2100	1	6.000	57.849	750
						0	6.001	57.849	750
S21	348035.180	391541.349	60.242	2.446	2700	1	6.001	57.796	750
						2	4.001	58.096	450
						3	3.002	57.796	750
						0	3.003	57.796	750
S22	348029.837	391528.020	59.683	1.924		1	3.003	57.760	750
S23	348018.331	391499.471	59.683	2.000		0	3.005	57.683	750
S25	348158.094	391472.702	61.506	1.425	1200	0	7.000	60.081	225
S24	348135.710	391410.594	60.271	1.599	1200	0	8.000	58.672	225
S26	348144.008	391433.619	60.587	2.286	1500	1	8.000	58.526	225
						2	7.000	58.526	225
						0	7.001	58.301	450
S27	348140.169	391435.162	60.472	2.482	2100	1	7.001	58.290	450
						0	7.002	57.990	750
S28	348093.698	391453.833	60.033	2.168	2100	1	7.002	57.865	750
						0	7.003	57.865	750

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S29	348036.303	391476.892	59.787	2.076	2100	1	7.003	57.711	750
									
						0	7.004	57.711	750
S30	348012.998	391486.256	60.089	2.441	2700	1	7.004	57.648	750
							2	3.005	57.648	750
						0	3.006	57.648	750
S31	347989.644	391495.638	60.074	2.489	2700	1	3.006	57.585	750
							2	1.008	57.585	750
						0	1.009	57.585	300
S32	347978.493	391468.039	59.529	2.423	1350	1	1.009	57.106	300
									
						0	1.010	57.106	225
S33	347986.213	391464.920	59.549	2.493	1350	1	1.010	57.056	225
									
						0	1.011	57.056	225
Ex MH34	347983.573	391437.196	58.500	1.540	1350	1	1.011	56.960	225
									

Node S31 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	57.585	Product Number	CTL-SHE-0263-4240-1900-4240
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	42.4	Min Node Diameter (mm)	2400

Node S23 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	30.425
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	57.683	Main Channel Slope (1:X)	400.0
Safety Factor	2.0	Time to half empty (mins)	300	Main Channel n	0.035

Inlets

S22

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	355.7	0.0	0.600	511.8	0.0	1.200	688.8	0.0	1.800	886.1	0.0
0.100	379.9	0.0	0.700	539.9	0.0	1.300	720.3	0.0	1.900	921.0	0.0
0.200	405.2	0.0	0.800	568.6	0.0	1.400	752.3	0.0	2.000	956.4	0.0
0.300	431.0	0.0	0.900	597.8	0.0	1.500	784.9	0.0			
0.400	457.4	0.0	1.000	627.6	0.0	1.600	818.1	0.0			
0.500	484.3	0.0	1.100	657.9	0.0	1.700	851.8	0.0			

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	11	59.164	0.026	1.2	0.0371	0.0000	OK
15 minute summer	S2	11	59.100	0.086	12.9	0.1233	0.0000	OK
15 minute summer	S3	11	58.870	0.122	23.5	0.3115	0.0000	OK
15 minute summer	S4	11	58.697	0.139	31.1	0.2453	0.0000	OK
15 minute summer	S5	11	58.783	0.081	11.4	0.1155	0.0000	OK
15 minute summer	S6	11	58.254	0.166	67.1	0.7515	0.0000	OK
15 minute summer	S7	12	58.155	0.205	74.9	0.7110	0.0000	OK
15 minute summer	S8	12	58.130	0.196	78.0	0.6779	0.0000	OK
180 minute summer	S9	120	58.073	0.200	40.9	0.6919	0.0000	OK
180 minute summer	S10	120	58.073	0.376	50.1	1.3024	0.0000	OK
15 minute summer	S16	11	58.219	0.086	18.5	0.2970	0.0000	OK
15 minute summer	S17	11	58.112	0.128	42.8	0.4421	0.0000	OK
180 minute summer	S18	120	58.074	0.221	24.0	0.7641	0.0000	OK
15 minute summer	S11	10	58.548	0.134	32.0	0.2366	0.0000	OK
15 minute summer	S12	10	59.204	0.055	13.4	0.0972	0.0000	OK
15 minute summer	S13	10	59.033	0.058	16.1	0.1021	0.0000	OK
15 minute summer	S14	10	58.703	0.066	22.2	0.1172	0.0000	OK
15 minute summer	S15	12	58.426	0.174	54.1	0.4424	0.0000	OK
15 minute summer	S19	11	58.102	0.102	26.7	0.3534	0.0000	OK
180 minute summer	S20	120	58.074	0.225	16.2	0.7782	0.0000	OK
180 minute summer	S21	120	58.074	0.278	54.3	1.5902	0.0000	OK
180 minute summer	S22	120	58.074	0.315	50.9	0.0000	0.0000	OK
180 minute summer	S23	120	58.074	0.391	36.3	0.0000	0.0000	OK
15 minute summer	S25	10	60.135	0.054	12.8	0.0614	0.0000	OK
15 minute summer	S24	10	58.775	0.103	16.3	0.1162	0.0000	OK
15 minute summer	S26	10	58.433	0.132	28.6	0.2336	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	1.2	0.156	0.028	0.1527	
15 minute summer	S2	1.001	S3	12.6	0.922	0.298	0.3919	
15 minute summer	S3	1.002	S4	23.5	0.898	0.328	0.7190	
15 minute summer	S4	1.003	S6	31.0	0.891	0.275	1.0289	
15 minute summer	S5	2.000	S6	11.1	0.740	0.155	0.5854	
15 minute summer	S6	1.004	S7	67.4	0.806	0.110	4.6382	
15 minute summer	S7	1.005	S8	72.7	0.770	0.118	0.5991	
15 minute summer	S8	1.006	S9	78.8	0.852	0.128	2.2704	
15 minute summer	S9	1.007	S10	100.2	0.892	0.162	7.9088	
15 minute summer	S10	1.008	S31	110.4	0.669	0.181	8.4516	
15 minute summer	S16	3.000	S17	17.8	0.474	0.029	2.3066	
15 minute summer	S17	3.001	S18	40.9	0.647	0.066	3.5926	
15 minute summer	S18	3.002	S21	53.9	0.568	0.087	2.3827	
15 minute summer	S11	4.000	S15	32.1	0.736	0.200	3.0402	
15 minute summer	S12	5.000	S13	13.3	1.166	0.029	0.0998	
15 minute summer	S13	5.001	S14	16.0	1.218	0.035	0.2221	
15 minute summer	S14	5.002	S15	22.0	0.869	0.048	0.6711	
15 minute summer	S15	4.001	S21	49.0	0.949	0.304	3.2093	
15 minute summer	S19	6.000	S20	25.8	0.568	0.042	3.6225	
15 minute summer	S20	6.001	S21	35.0	0.442	0.057	2.2054	
15 minute summer	S21	3.003	S22	135.8	1.190	0.220	1.6454	
15 minute summer	S22	Flow through Pond	S23	99.3	0.158	0.002	93.9126	
15 minute summer	S23	3.005	S30	-134.7	-1.471	-0.221	2.3826	
15 minute summer	S25	7.000	S26	12.6	1.727	0.124	0.3024	
15 minute summer	S24	8.000	S26	16.0	0.938	0.400	0.4187	
15 minute summer	S26	7.001	S27	28.5	0.808	0.172	0.1459	

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S27	11	58.105	0.115	33.0	0.3983	0.0000	OK
180 minute summer	S28	124	58.073	0.208	25.3	0.7221	0.0000	OK
180 minute summer	S29	124	58.073	0.362	29.9	1.2544	0.0000	OK
180 minute summer	S30	120	58.073	0.425	30.2	2.4358	0.0000	OK
180 minute summer	S31	120	58.073	0.488	44.5	2.7944	0.0000	SURCHARGED
180 minute summer	S32	124	57.413	0.307	41.1	0.4400	0.0000	SURCHARGED
180 minute summer	S33	124	57.332	0.276	41.1	0.3945	0.0000	SURCHARGED
180 minute summer	Ex MH34	124	57.130	0.170	41.1	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S27	7.002	S28	33.0	0.593	0.054	2.8030	
15 minute summer	S28	7.003	S29	65.0	0.801	0.106	5.2960	
15 minute summer	S29	7.004	S30	73.2	0.711	0.119	3.9529	
15 minute summer	S30	3.006	S31	-77.2	-0.443	-0.125	5.1031	
180 minute summer	S31	1.009	S32	41.1	0.979	0.291	1.3954	
180 minute summer	S32	1.010	S33	41.1	1.034	1.023	0.3311	
180 minute summer	S33	1.011	Ex MH34	41.1	1.068	1.356	1.0020	436.9

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	59.168	0.030	1.7	0.0431	0.0000	OK
15 minute summer	S2	11	59.117	0.103	17.7	0.1478	0.0000	OK
15 minute summer	S3	11	58.895	0.147	32.5	0.3753	0.0000	OK
15 minute summer	S4	11	58.724	0.166	42.8	0.2936	0.0000	OK
15 minute summer	S5	11	58.798	0.096	15.7	0.1367	0.0000	OK
15 minute summer	S6	11	58.286	0.198	92.5	0.8961	0.0000	OK
15 minute summer	S7	12	58.197	0.247	103.3	0.8539	0.0000	OK
15 minute summer	S8	12	58.169	0.235	107.5	0.8134	0.0000	OK
180 minute summer	S9	124	58.161	0.288	51.1	0.9980	0.0000	OK
180 minute summer	S10	124	58.161	0.464	58.5	1.6064	0.0000	OK
15 minute summer	S16	11	58.233	0.100	25.4	0.3457	0.0000	OK
180 minute summer	S17	128	58.162	0.178	20.7	0.6165	0.0000	OK
180 minute summer	S18	128	58.162	0.309	30.2	1.0687	0.0000	OK
15 minute summer	S11	10	58.572	0.158	44.0	0.2795	0.0000	OK
15 minute summer	S12	10	59.214	0.065	18.4	0.1146	0.0000	OK
15 minute summer	S13	10	59.043	0.068	22.1	0.1198	0.0000	OK
15 minute summer	S14	10	58.715	0.078	30.6	0.1370	0.0000	OK
15 minute summer	S15	12	58.461	0.209	74.5	0.5322	0.0000	OK
180 minute summer	S19	124	58.162	0.162	12.6	0.5608	0.0000	OK
180 minute summer	S20	124	58.161	0.312	20.3	1.0823	0.0000	OK
180 minute summer	S21	128	58.161	0.365	65.5	2.0912	0.0000	OK
180 minute summer	S22	124	58.161	0.402	60.7	0.0000	0.0000	OK
180 minute summer	S23	124	58.161	0.478	43.2	0.0000	0.0000	OK
15 minute summer	S25	10	60.145	0.064	17.6	0.0725	0.0000	OK
15 minute summer	S24	10	58.797	0.125	22.4	0.1409	0.0000	OK
15 minute summer	S26	10	58.458	0.157	39.3	0.2765	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	1.6	0.167	0.039	0.1936	
15 minute summer	S2	1.001	S3	17.4	1.002	0.410	0.4971	
15 minute summer	S3	1.002	S4	32.4	0.981	0.453	0.9083	
15 minute summer	S4	1.003	S6	42.8	0.974	0.380	1.3015	
15 minute summer	S5	2.000	S6	15.3	0.810	0.214	0.7393	
15 minute summer	S6	1.004	S7	92.9	0.860	0.151	6.0154	
15 minute summer	S7	1.005	S8	100.1	0.822	0.162	0.7727	
15 minute summer	S8	1.006	S9	108.6	0.910	0.177	2.9307	
15 minute summer	S9	1.007	S10	138.2	0.937	0.223	10.3887	
15 minute summer	S10	1.008	S31	153.9	0.735	0.252	11.1295	
15 minute summer	S16	3.000	S17	24.5	0.519	0.040	2.9033	
15 minute summer	S17	3.001	S18	57.1	0.685	0.093	4.7673	
15 minute summer	S18	3.002	S21	75.9	0.595	0.123	3.1413	
15 minute summer	S11	4.000	S15	44.1	0.788	0.275	3.8901	
15 minute summer	S12	5.000	S13	18.3	1.264	0.040	0.1264	
15 minute summer	S13	5.001	S14	22.0	1.328	0.048	0.2793	
15 minute summer	S14	5.002	S15	30.3	0.910	0.066	0.8595	
15 minute summer	S15	4.001	S21	68.5	1.042	0.426	4.0849	
15 minute summer	S19	6.000	S20	35.5	0.591	0.058	4.8397	
15 minute summer	S20	6.001	S21	48.5	0.455	0.079	2.9091	
15 minute summer	S21	3.003	S22	192.0	1.308	0.312	2.1094	
15 minute winter	S22	Flow through Pond	S23	107.2	0.159	0.002	128.8610	
15 minute summer	S23	3.005	S30	-203.8	-1.574	-0.334	3.1603	
15 minute summer	S25	7.000	S26	17.3	1.891	0.172	0.3808	
15 minute summer	S24	8.000	S26	22.0	1.013	0.549	0.5331	
15 minute summer	S26	7.001	S27	39.1	0.881	0.236	0.1840	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	S27	124	58.162	0.172	16.0	0.5950	0.0000	OK
180 minute summer	S28	124	58.161	0.296	31.8	1.0264	0.0000	OK
180 minute summer	S29	124	58.161	0.450	33.5	1.5584	0.0000	OK
180 minute summer	S30	124	58.161	0.513	32.5	2.9366	0.0000	OK
180 minute summer	S31	124	58.161	0.576	50.3	3.2964	0.0000	SURCHARGED
180 minute summer	S32	128	57.427	0.321	42.0	0.4590	0.0000	SURCHARGED
180 minute summer	S33	128	57.341	0.285	42.0	0.4082	0.0000	SURCHARGED
180 minute summer	Ex MH34	128	57.132	0.172	42.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S27	7.002	S28	45.5	0.647	0.074	3.5505	
15 minute summer	S28	7.003	S29	90.1	0.850	0.147	8.9565	
15 minute summer	S29	7.004	S30	101.0	0.719	0.164	5.3418	
15 minute summer	S30	3.006	S31	-106.2	-0.509	-0.172	6.5299	
180 minute summer	S31	1.009	S32	42.0	0.976	0.298	1.4009	
180 minute summer	S32	1.010	S33	42.0	1.057	1.046	0.3311	
180 minute summer	S33	1.011	Ex MH34	42.0	1.089	1.386	1.0066	548.2

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	59.194	0.056	3.8	0.0795	0.0000	OK
15 minute summer	S2	11	59.194	0.180	38.4	0.2575	0.0000	OK
15 minute summer	S3	11	59.004	0.256	71.7	0.6511	0.0000	OK
15 minute summer	S4	11	58.829	0.271	94.3	0.4783	0.0000	OK
15 minute summer	S5	10	58.852	0.150	34.8	0.2149	0.0000	OK
120 minute winter	S6	118	58.604	0.516	59.7	2.3324	0.0000	OK
120 minute winter	S7	118	58.604	0.654	63.5	2.2644	0.0000	OK
120 minute winter	S8	118	58.604	0.670	62.4	2.3197	0.0000	OK
120 minute winter	S9	118	58.603	0.730	79.8	2.5303	0.0000	OK
120 minute winter	S10	118	58.604	0.907	90.4	3.1406	0.0000	SURCHARGED
120 minute winter	S16	118	58.605	0.472	15.8	1.6365	0.0000	OK
120 minute winter	S17	120	58.604	0.620	36.6	2.1487	0.0000	OK
120 minute winter	S18	118	58.604	0.751	43.3	2.6019	0.0000	SURCHARGED
15 minute summer	S11	11	58.670	0.256	97.3	0.4532	0.0000	OK
15 minute summer	S12	10	59.249	0.100	40.8	0.1762	0.0000	OK
15 minute summer	S13	10	59.079	0.104	49.1	0.1829	0.0000	OK
15 minute summer	S14	10	58.752	0.115	67.8	0.2032	0.0000	OK
120 minute winter	S15	118	58.604	0.352	46.6	0.8963	0.0000	OK
120 minute winter	S19	118	58.605	0.605	22.8	2.0951	0.0000	OK
120 minute winter	S20	118	58.604	0.755	30.1	2.6166	0.0000	SURCHARGED
120 minute winter	S21	118	58.604	0.808	100.3	4.6283	0.0000	SURCHARGED
120 minute winter	S22	118	58.605	0.845	88.2	0.0000	0.0000	OK
120 minute winter	S23	118	58.604	0.921	79.8	0.0000	0.0000	SURCHARGED
15 minute summer	S25	10	60.180	0.099	39.0	0.1120	0.0000	OK
15 minute summer	S24	10	58.957	0.285	49.7	0.3226	0.0000	SURCHARGED
120 minute winter	S26	118	58.604	0.303	25.0	0.5360	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	3.9	0.207	0.091	0.3855	
15 minute summer	S2	1.001	S3	38.5	1.136	0.908	0.9783	
15 minute summer	S3	1.002	S4	71.1	1.217	0.994	1.5951	
15 minute summer	S4	1.003	S6	94.3	1.219	0.836	2.2826	
15 minute summer	S5	2.000	S6	34.1	1.004	0.475	1.3239	
15 minute summer	S6	1.004	S7	202.6	0.986	0.330	11.7219	
15 minute summer	S7	1.005	S8	217.9	0.936	0.353	1.6177	
15 minute summer	S8	1.006	S9	232.3	1.001	0.379	6.9080	
15 minute summer	S9	1.007	S10	285.3	1.036	0.461	24.7266	
15 minute summer	S10	1.008	S31	318.9	0.924	0.522	19.2694	
15 minute summer	S16	3.000	S17	54.6	0.624	0.089	10.6349	
15 minute summer	S17	3.001	S18	114.9	0.745	0.187	13.9024	
15 minute summer	S18	3.002	S21	160.5	0.661	0.260	7.4244	
15 minute summer	S11	4.000	S15	95.1	0.922	0.593	7.3373	
15 minute summer	S12	5.000	S13	40.6	1.518	0.089	0.2336	
15 minute summer	S13	5.001	S14	48.8	1.646	0.106	0.5012	
15 minute summer	S14	5.002	S15	67.4	1.144	0.147	1.5819	
15 minute summer	S15	4.001	S21	152.6	1.302	0.947	7.2386	
15 minute summer	S19	6.000	S20	70.1	0.634	0.114	15.9958	
15 minute summer	S20	6.001	S21	107.7	0.509	0.175	6.9076	
15 minute summer	S21	3.003	S22	418.3	1.660	0.679	5.0445	
15 minute summer	S22	Flow through Pond	S23	197.8	0.153	0.004	266.5284	
15 minute summer	S23	3.005	S30	-456.0	-2.057	-0.748	5.9251	
15 minute summer	S25	7.000	S26	38.5	2.341	0.381	0.6836	
15 minute summer	S24	8.000	S26	48.5	1.239	1.212	0.9111	
15 minute summer	S26	7.001	S27	86.6	1.111	0.522	0.3227	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S27	118	58.604	0.614	29.0	2.1278	0.0000	OK
120 minute winter	S28	118	58.604	0.739	52.0	2.5606	0.0000	OK
120 minute winter	S29	118	58.604	0.893	53.9	3.0938	0.0000	SURCHARGED
120 minute winter	S30	118	58.604	0.956	77.7	5.4748	0.0000	SURCHARGED
120 minute winter	S31	118	58.604	1.019	77.4	5.8341	0.0000	SURCHARGED
15 minute winter	S32	48	57.431	0.325	42.3	0.4658	0.0000	SURCHARGED
60 minute summer	S33	185	57.345	0.289	42.3	0.4131	0.0000	SURCHARGED
60 minute summer	Ex MH34	185	57.132	0.172	42.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S27	7.002	S28	100.3	0.736	0.163	13.1905	
15 minute summer	S28	7.003	S29	191.3	0.953	0.312	21.7733	
15 minute summer	S29	7.004	S30	207.1	0.845	0.336	10.3068	
15 minute summer	S30	3.006	S31	-259.4	-0.748	-0.421	10.8750	
120 minute winter	S31	1.009	S32	42.3	0.980	0.300	1.4029	
15 minute winter	S32	1.010	S33	42.3	1.065	1.054	0.3311	
60 minute summer	S33	1.011	Ex MH34	42.3	1.097	1.397	1.0083	830.3

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	11	59.317	0.179	5.3	0.2563	0.0000	OK
15 minute summer	S2	11	59.314	0.300	44.1	0.4298	0.0000	SURCHARGED
15 minute summer	S3	11	59.068	0.320	84.6	0.8133	0.0000	SURCHARGED
120 minute winter	S4	118	58.881	0.323	33.9	0.5709	0.0000	OK
120 minute winter	S5	118	58.881	0.179	12.1	0.2559	0.0000	OK
120 minute winter	S6	120	58.881	0.793	73.7	3.5858	0.0000	SURCHARGED
120 minute winter	S7	118	58.881	0.931	72.2	3.2250	0.0000	SURCHARGED
120 minute winter	S8	118	58.881	0.947	69.9	3.2806	0.0000	SURCHARGED
120 minute winter	S9	118	58.881	1.008	90.9	3.4925	0.0000	SURCHARGED
120 minute winter	S10	118	58.882	1.185	104.2	4.1036	0.0000	SURCHARGED
120 minute winter	S16	120	58.884	0.751	19.6	2.5999	0.0000	SURCHARGED
120 minute winter	S17	120	58.883	0.899	40.9	3.1134	0.0000	SURCHARGED
120 minute winter	S18	120	58.883	1.030	47.5	3.5663	0.0000	SURCHARGED
120 minute winter	S11	120	58.881	0.467	33.9	0.8251	0.0000	SURCHARGED
15 minute summer	S12	10	59.261	0.112	50.4	0.1986	0.0000	OK
15 minute summer	S13	10	59.091	0.116	60.7	0.2055	0.0000	OK
120 minute winter	S14	120	58.882	0.245	23.8	0.4324	0.0000	OK
120 minute winter	S15	118	58.883	0.631	57.7	1.6055	0.0000	SURCHARGED
120 minute winter	S19	120	58.882	0.882	28.2	3.0562	0.0000	SURCHARGED
120 minute winter	S20	120	58.882	1.033	36.3	3.5800	0.0000	SURCHARGED
120 minute winter	S21	120	58.882	1.086	115.6	6.2212	0.0000	SURCHARGED
120 minute winter	S22	120	58.883	1.124	107.7	0.0000	0.0000	OK
120 minute winter	S23	120	58.883	1.200	120.4	0.0000	0.0000	SURCHARGED
15 minute summer	S25	10	60.193	0.112	48.3	0.1271	0.0000	OK
15 minute summer	S24	10	59.101	0.429	61.4	0.4848	0.0000	SURCHARGED
120 minute winter	S26	120	58.882	0.581	30.9	1.0270	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	7.6	0.312	0.179	0.6821	
15 minute summer	S2	1.001	S3	44.4	1.179	1.049	1.1401	
15 minute summer	S3	1.002	S4	84.2	1.240	1.176	1.7740	
15 minute summer	S4	1.003	S6	111.9	1.280	0.992	2.5701	
15 minute summer	S5	2.000	S6	42.1	1.064	0.587	1.5452	
15 minute summer	S6	1.004	S7	243.8	1.012	0.397	15.7238	
15 minute summer	S7	1.005	S8	261.2	0.959	0.423	2.1422	
15 minute summer	S8	1.006	S9	277.3	1.017	0.452	8.8852	
15 minute summer	S9	1.007	S10	336.6	1.052	0.544	28.6114	
15 minute summer	S10	1.008	S31	388.2	0.979	0.636	20.0154	
15 minute summer	S16	3.000	S17	67.5	0.649	0.110	15.8198	
15 minute summer	S17	3.001	S18	138.5	0.741	0.225	18.2402	
15 minute summer	S18	3.002	S21	196.0	0.693	0.318	9.1029	
15 minute summer	S11	4.000	S15	114.9	0.954	0.716	8.8988	
15 minute summer	S12	5.000	S13	50.2	1.586	0.110	0.2763	
15 minute summer	S13	5.001	S14	60.3	1.736	0.132	0.5868	
15 minute summer	S14	5.002	S15	83.3	1.185	0.182	1.8299	
15 minute summer	S15	4.001	S21	184.5	1.361	1.146	8.2670	
15 minute summer	S19	6.000	S20	85.1	0.649	0.138	20.5758	
15 minute summer	S20	6.001	S21	135.5	0.533	0.220	8.4863	
15 minute summer	S21	3.003	S22	486.5	1.741	0.790	6.0207	
15 minute summer	S22	Flow through Pond	S23	-248.9	0.164	-0.005	332.2716	
15 minute summer	S23	3.005	S30	-518.5	-2.034	-0.850	6.2722	
15 minute summer	S25	7.000	S26	47.7	2.468	0.472	0.8033	
15 minute summer	S24	8.000	S26	60.1	1.514	1.502	0.9436	
15 minute summer	S26	7.001	S27	107.4	1.189	0.648	0.3736	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S27	120	58.882	0.892	35.9	3.0905	0.0000	SURCHARGED
120 minute winter	S28	120	58.882	1.017	62.9	3.5215	0.0000	SURCHARGED
120 minute winter	S29	118	58.882	1.171	66.2	4.0555	0.0000	SURCHARGED
120 minute winter	S30	120	58.882	1.234	122.2	7.0651	0.0000	SURCHARGED
120 minute winter	S31	118	58.882	1.297	97.2	7.4254	0.0000	SURCHARGED
30 minute summer	S32	180	57.431	0.325	42.3	0.4658	0.0000	SURCHARGED
30 minute summer	S33	180	57.345	0.289	42.3	0.4131	0.0000	SURCHARGED
30 minute summer	Ex MH34	180	57.132	0.172	42.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S27	7.002	S28	121.1	0.747	0.197	17.0813	
15 minute summer	S28	7.003	S29	224.3	0.972	0.365	25.4732	
15 minute summer	S29	7.004	S30	242.2	0.880	0.393	11.0536	
15 minute summer	S30	3.006	S31	-306.3	-0.790	-0.497	11.0770	
720 minute summer	S31	1.009	S32	42.3	0.964	0.300	1.4029	
30 minute winter	S32	1.010	S33	42.3	1.065	1.054	0.3311	
30 minute summer	S33	1.011	Ex MH34	42.3	1.097	1.397	1.0083	834.4

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	11	59.962	0.824	7.3	1.1790	0.0000	SURCHARGED
15 minute summer	S2	11	59.961	0.947	65.6	1.3550	0.0000	SURCHARGED
30 minute summer	S3	20	59.515	0.767	112.6	1.9512	0.0000	SURCHARGED
180 minute winter	S4	176	59.507	0.949	35.6	1.6776	0.0000	SURCHARGED
180 minute winter	S5	176	59.507	0.805	12.7	1.1524	0.0000	SURCHARGED
180 minute winter	S6	176	59.507	1.419	76.8	6.4209	0.0000	SURCHARGED
180 minute winter	S7	176	59.507	1.557	73.2	5.3943	0.0000	FLOOD RISK
180 minute winter	S8	176	59.507	1.573	73.2	5.4497	0.0000	FLOOD RISK
180 minute winter	S9	176	59.507	1.634	98.4	5.6610	0.0000	FLOOD RISK
180 minute winter	S10	176	59.507	1.810	124.8	6.2706	0.0000	FLOOD RISK
180 minute winter	S16	180	59.507	1.374	20.5	4.7608	0.0000	SURCHARGED
180 minute winter	S17	180	59.507	1.523	43.2	5.2767	0.0000	SURCHARGED
180 minute winter	S18	180	59.508	1.655	62.4	5.7313	0.0000	SURCHARGED
180 minute winter	S11	176	59.507	1.093	35.6	1.9321	0.0000	SURCHARGED
180 minute winter	S12	176	59.507	0.358	14.9	0.6331	0.0000	OK
180 minute winter	S13	176	59.507	0.532	18.0	0.9407	0.0000	SURCHARGED
180 minute winter	S14	176	59.507	0.870	25.2	1.5380	0.0000	SURCHARGED
180 minute winter	S15	176	59.507	1.255	57.5	3.1947	0.0000	SURCHARGED
180 minute winter	S19	180	59.508	1.508	29.6	5.2221	0.0000	SURCHARGED
180 minute winter	S20	180	59.508	1.659	45.0	5.7456	0.0000	SURCHARGED
180 minute winter	S21	180	59.508	1.712	152.9	9.8010	0.0000	SURCHARGED
180 minute winter	S22	180	59.508	1.749	161.9	0.0000	0.0000	OK
180 minute winter	S23	180	59.508	1.825	172.3	0.0000	0.0000	FLOOD RISK
15 minute summer	S25	10	60.224	0.143	69.9	0.1616	0.0000	OK
15 minute summer	S24	10	59.562	0.890	89.0	1.0064	0.0000	SURCHARGED
180 minute winter	S26	180	59.507	1.206	32.4	2.1317	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	15.7	0.465	0.371	0.7366	
15 minute summer	S2	1.001	S3	64.1	1.611	1.513	1.1401	
15 minute summer	S3	1.002	S4	121.1	1.720	1.692	1.9339	
15 minute summer	S4	1.003	S6	162.1	1.501	1.437	3.2616	
15 minute summer	S5	2.000	S6	61.0	1.177	0.850	2.7483	
15 minute summer	S6	1.004	S7	327.3	1.061	0.533	24.3545	
15 minute summer	S7	1.005	S8	330.1	0.987	0.534	2.7926	
15 minute summer	S8	1.006	S9	340.8	1.029	0.555	10.7975	
15 minute summer	S9	1.007	S10	453.0	1.070	0.732	30.6570	
15 minute summer	S10	1.008	S31	548.6	1.247	0.898	20.0154	
30 minute summer	S16	3.000	S17	88.8	0.632	0.144	26.2840	
15 minute summer	S17	3.001	S18	170.5	0.741	0.277	23.0302	
15 minute summer	S18	3.002	S21	252.3	0.738	0.409	10.0017	
15 minute summer	S11	4.000	S15	176.9	1.117	1.103	10.2912	
15 minute summer	S12	5.000	S13	72.8	1.802	0.159	0.3707	
15 minute summer	S13	5.001	S14	87.8	1.865	0.191	1.4177	
15 minute summer	S14	5.002	S15	117.1	1.253	0.256	2.7857	
15 minute summer	S15	4.001	S21	272.1	1.744	1.689	9.8376	
15 minute summer	S19	6.000	S20	131.0	0.637	0.212	26.4539	
15 minute summer	S20	6.001	S21	202.8	0.585	0.330	9.3341	
15 minute summer	S21	3.003	S22	707.1	1.941	1.148	6.3201	
15 minute summer	S22	Flow through Pond	S23	-497.1	0.159	-0.011	526.4492	
30 minute summer	S23	3.005	S30	-829.3	-1.884	-1.360	6.2722	
15 minute summer	S25	7.000	S26	69.2	2.681	0.685	1.0754	
15 minute summer	S24	8.000	S26	87.5	2.201	2.187	0.9636	
15 minute summer	S26	7.001	S27	156.1	1.353	0.942	0.6556	

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	S27	180	59.507	1.517	35.0	5.2563	0.0000	SURCHARGED
180 minute winter	S28	180	59.507	1.642	67.9	5.6894	0.0000	SURCHARGED
180 minute winter	S29	180	59.508	1.797	85.1	6.2232	0.0000	FLOOD RISK
180 minute winter	S30	180	59.508	1.860	175.2	10.6480	0.0000	SURCHARGED
180 minute winter	S31	180	59.507	1.922	123.0	11.0067	0.0000	SURCHARGED
180 minute summer	S32	648	57.431	0.325	42.3	0.4658	0.0000	SURCHARGED
30 minute winter	S33	348	57.345	0.289	42.3	0.4131	0.0000	SURCHARGED
30 minute winter	Ex MH34	348	57.132	0.172	42.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S27	7.002	S28	164.1	0.758	0.267	22.0417	
15 minute summer	S28	7.003	S29	298.6	1.008	0.486	27.2228	
15 minute summer	S29	7.004	S30	333.3	0.945	0.541	11.0545	
30 minute summer	S30	3.006	S31	-497.3	-1.130	-0.808	11.0770	
60 minute summer	S31	1.009	S32	42.3	1.004	0.300	1.4029	
480 minute summer	S32	1.010	S33	42.3	1.065	1.054	0.3311	
30 minute winter	S33	1.011	Ex MH34	42.3	1.097	1.397	1.0083	1211.5

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Results for 200 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	11	59.477	0.339	5.3	0.4858	0.0000	SURCHARGED
15 minute summer	S2	11	59.467	0.453	51.9	0.6488	0.0000	SURCHARGED
15 minute summer	S3	11	59.142	0.394	95.5	1.0037	0.0000	SURCHARGED
180 minute winter	S4	176	59.077	0.519	27.8	0.9167	0.0000	SURCHARGED
180 minute winter	S5	176	59.077	0.375	9.9	0.5362	0.0000	SURCHARGED
180 minute winter	S6	176	59.077	0.989	60.3	4.4731	0.0000	SURCHARGED
180 minute winter	S7	176	59.077	1.127	59.8	3.9033	0.0000	SURCHARGED
180 minute winter	S8	176	59.077	1.143	58.4	3.9587	0.0000	SURCHARGED
180 minute winter	S9	176	59.077	1.204	76.1	4.1701	0.0000	SURCHARGED
180 minute winter	S10	176	59.077	1.380	89.3	4.7802	0.0000	SURCHARGED
180 minute winter	S16	176	59.077	0.944	16.0	3.2711	0.0000	SURCHARGED
180 minute winter	S17	176	59.077	1.093	30.9	3.7871	0.0000	SURCHARGED
180 minute winter	S18	176	59.077	1.224	36.3	4.2410	0.0000	SURCHARGED
180 minute winter	S11	176	59.078	0.664	27.7	1.1725	0.0000	SURCHARGED
15 minute summer	S12	10	59.269	0.120	56.5	0.2121	0.0000	OK
15 minute summer	S13	10	59.099	0.124	68.1	0.2192	0.0000	OK
180 minute winter	S14	176	59.077	0.440	19.4	0.7778	0.0000	OK
180 minute winter	S15	176	59.077	0.825	47.1	2.1004	0.0000	SURCHARGED
180 minute winter	S19	176	59.077	1.077	23.1	3.7320	0.0000	SURCHARGED
180 minute winter	S20	176	59.077	1.228	30.0	4.2550	0.0000	SURCHARGED
180 minute winter	S21	176	59.077	1.281	92.5	7.3369	0.0000	SURCHARGED
180 minute winter	S22	176	59.077	1.318	93.8	0.0000	0.0000	OK
180 minute winter	S23	176	59.077	1.394	103.2	0.0000	0.0000	SURCHARGED
15 minute summer	S25	10	60.202	0.120	54.1	0.1363	0.0000	OK
15 minute summer	S24	10	59.224	0.552	68.8	0.6239	0.0000	SURCHARGED
180 minute winter	S26	176	59.077	0.776	25.2	1.3718	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	11.3	0.361	0.265	0.7366	
15 minute summer	S2	1.001	S3	50.5	1.269	1.192	1.1401	
15 minute summer	S3	1.002	S4	94.9	1.350	1.326	1.8784	
15 minute summer	S4	1.003	S6	125.7	1.321	1.115	2.7763	
15 minute summer	S5	2.000	S6	47.2	1.098	0.658	1.6777	
15 minute summer	S6	1.004	S7	269.5	1.030	0.438	18.7699	
15 minute summer	S7	1.005	S8	283.2	0.965	0.458	2.4665	
15 minute summer	S8	1.006	S9	297.7	1.015	0.485	10.0085	
15 minute summer	S9	1.007	S10	361.2	1.054	0.584	30.0519	
15 minute summer	S10	1.008	S31	419.8	0.993	0.688	20.0154	
15 minute summer	S16	3.000	S17	74.4	0.658	0.121	19.4429	
15 minute summer	S17	3.001	S18	150.2	0.745	0.244	20.6900	
15 minute summer	S18	3.002	S21	217.0	0.711	0.352	9.8074	
15 minute summer	S11	4.000	S15	124.6	0.968	0.776	9.9076	
15 minute summer	S12	5.000	S13	56.3	1.623	0.123	0.3027	
15 minute summer	S13	5.001	S14	67.7	1.788	0.148	0.6394	
15 minute summer	S14	5.002	S15	93.4	1.214	0.204	1.9099	
15 minute summer	S15	4.001	S21	204.7	1.390	1.271	8.6526	
15 minute summer	S19	6.000	S20	99.2	0.657	0.161	23.4871	
15 minute summer	S20	6.001	S21	146.0	0.543	0.237	9.1567	
15 minute summer	S21	3.003	S22	549.5	1.818	0.892	6.3201	
15 minute summer	S22	Flow through Pond	S23	-289.0	0.177	-0.006	377.0437	
15 minute summer	S23	3.005	S30	-583.6	-2.170	-0.957	6.2722	
15 minute summer	S25	7.000	S26	53.4	2.535	0.529	0.8760	
15 minute summer	S24	8.000	S26	67.6	1.699	1.688	0.9556	
15 minute summer	S26	7.001	S27	120.5	1.235	0.727	0.4033	

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Results for 200 year Critical Storm Duration. Lowest mass balance: 99.81%

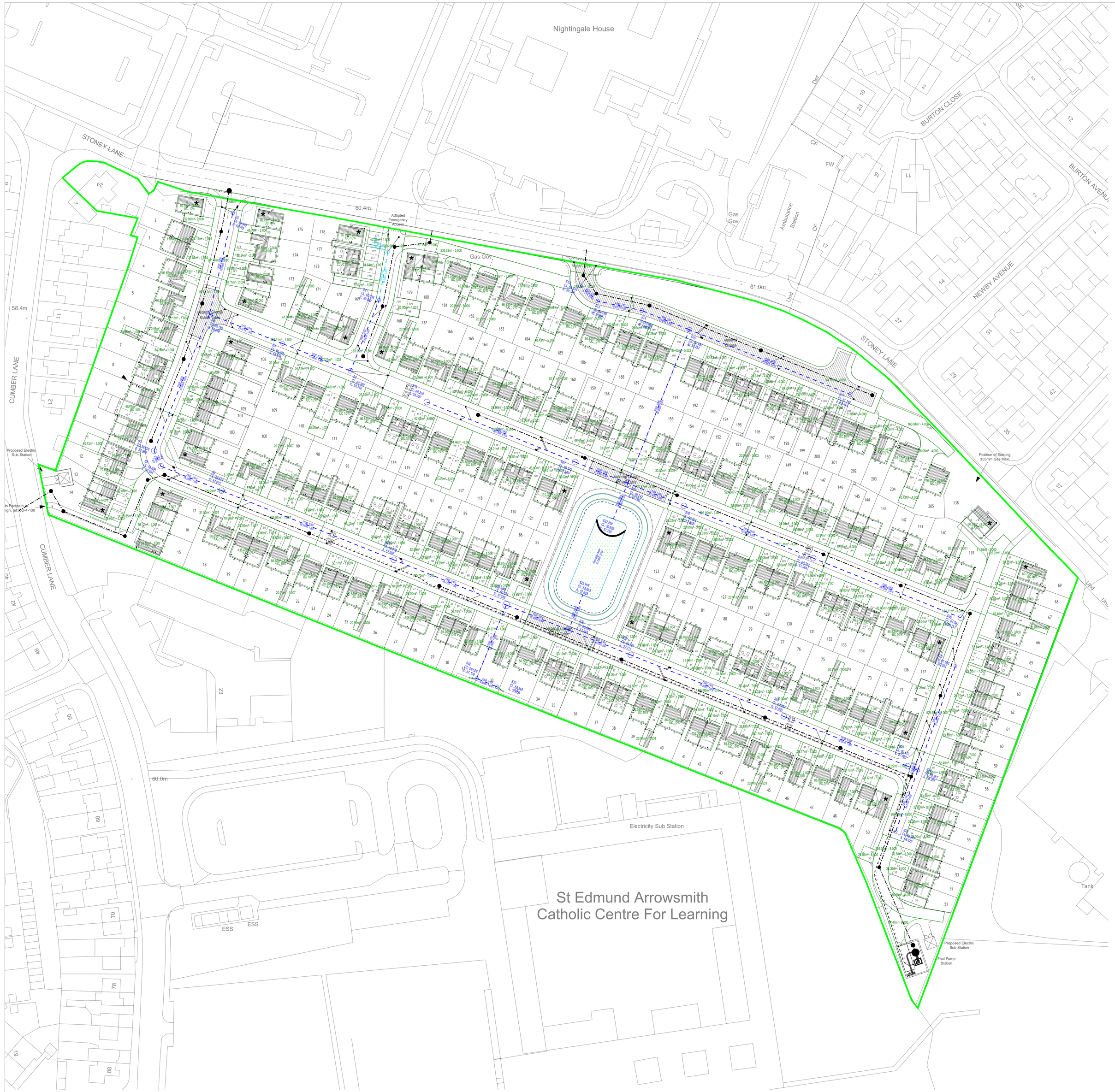
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	S27	176	59.077	1.087	29.0	3.7664	0.0000	SURCHARGED
180 minute winter	S28	176	59.077	1.212	50.4	4.1992	0.0000	SURCHARGED
180 minute winter	S29	176	59.077	1.366	55.6	4.7327	0.0000	SURCHARGED
180 minute winter	S30	176	59.077	1.429	104.8	8.1839	0.0000	SURCHARGED
180 minute winter	S31	176	59.077	1.492	85.8	8.5434	0.0000	SURCHARGED
30 minute summer	S32	223	57.431	0.325	42.3	0.4658	0.0000	SURCHARGED
60 minute winter	S33	337	57.345	0.289	42.3	0.4131	0.0000	SURCHARGED
60 minute summer	Ex MH34	337	57.132	0.172	42.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S27	7.002	S28	132.5	0.750	0.216	19.4166	
15 minute summer	S28	7.003	S29	245.2	0.985	0.399	26.7074	
15 minute summer	S29	7.004	S30	266.0	0.892	0.432	11.0545	
15 minute summer	S30	3.006	S31	-343.5	-0.805	-0.558	11.0770	
30 minute winter	S31	1.009	S32	42.3	1.075	0.300	1.4029	
30 minute summer	S32	1.010	S33	42.3	1.065	1.054	0.3311	
60 minute summer	S33	1.011	Ex MH34	42.3	1.097	1.397	1.0083	1178.2

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APPENDIX L: IMPERMEABLE AREAS PLAN (BETTS ASSOCIATES)

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Manhole No.	Pipe No.	Private IMP	Private UC	Total IMP + UC
S2	1.000	97.532	0.000	97.532
S3	1.001	890.736	26.658	917.394
S4	1.002	845.165	31.481	876.646
S6	1.003	605.690	18.060	623.750
S7	1.004	1955.398	94.698	2050.096
S8	1.005	593.923	25.663	619.586
S8	1.006	525.990	0.000	525.990
S10	1.007	1857.340	96.118	1953.458
S31	1.008	1912.228	70.919	1983.147
S6	2.000	863.347	32.890	896.237
S17	3.000	1408.667	39.572	1448.239
S18	3.001	1910.056	90.068	2000.124
S21	3.002	1479.638	95.541	1575.179
S31	3.006	764.422	55.196	819.618
S15	4.000	2425.172	81.648	2506.819
S13	5.000	1011.083	39.089	1050.172
S13	5.001	218.548	0.000	218.548
S15	5.002	462.366	26.543	488.909
S20	6.000	2019.071	69.279	2088.350
S21	6.001	1224.078	62.979	1287.057
S25	7.000	978.413	26.871	1005.284
S27	7.002	368.126	0.000	368.126
S29	7.003	2515.374	109.466	2624.840
S30	7.004	1246.323	66.519	1312.841
S26	8.000	1241.675	37.673	1279.348
Totals:		29420.360	1196.929	30617.289

Notes

1. Planning layout ref.
   Taylor Wimpey - 25053-VIM_2026-07-29
2. Topographical survey provided by 'Geographical Engineering Operations', ref 'G24104 Stoney Lane, Whiston Cross', Dated March 2024.
3. Road detail, levels and layout are subject to local authority section 38 Highways approval.

Mark	Date	Details	By	Chk
P02	20.08.26	Updated with current site Layout	CP	
P01	23.12.25	Preliminary issue for review	NR	

Revision history

Drawing originator:

BETTS HYDRO CONSULTING ENGINEERS
BETTS ASSOCIATES CONSULTING ENGINEERS
BETTS GEO CONSULTING ENGINEERS

Client:

Taylor Wimpey

Project title:

Glen Dimplex
Stoney Lane

Drawing title:

Impermeable Areas Plan

Scale: As Shown for the original size of A1

Drawn by: NR | Checked by: | Passed by: | Date: Dec' 2025

Drawing status:

Technical Due Diligence

Job No:	Drawing No: Project	Origin.	Volume	Level	Type	Discip.	Number	Revision:
TAY143	GDX	BET	ZZ	XX	DR	C	0006	P02

Do not scale this drawing

6 -7 Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
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APPENDIX M: EXCEEDANCE FLOW ROUTING PLAN (BETTS ASSOCIATES

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LEGEND

- Site Boundary
- FFL 134.65 — Proposed Finished Floor Level
- Proposed Surface Water Sewer
- Proposed Gully Connection
- Proposed Foul Water Sewer
- Flood Flow Exceedance Low Points

Flood Exceedance Event (1 in 800 Year)

This plan illustrates flood exceedance routing and ponding based on the proposed ground levels under the simulated 1 in 800 year storm event, as detailed in Doc: TAY143-GDX-BET-ZZ-XX-RP-C-0013- P01-Exceedance Event Network Details.

The simulation results show manhole cover exceedance and flooding at the following location: S7 (~14m³). This plan provides a visual representation of the associated flood volumes for exceedance.

The simulation includes the operation of the proposed below-ground drainage system and identifies the point at which it is first exceeded. Exceedance flows are contained within the proposed carriageway, directed away from both proposed and existing dwellings. There is no flooding of the proposed dwellings in this extreme storm event.

Notes

1. Planning layout ref. Taylor Wimpey - 25053-1000H- Site Layout_2025-10-09 .
2. Topographical survey provided by 'GEO_ref 'G24104 - Stoney Lane, Prescot Topographical and Utility Survey', Dated March 2024.
3. Road detail, levels and layout are subject to local authority section 38 Highways approval.

0 5 10 20 30 40 50m

SCALE 1:500

Mark	Date	Details	By	Che
P03	20.08.26	Updated with current Site Layout	CP	
P02	26.03.26	Up-Flo filter indicated	CP	
P01	23.03.26	Preliminary issue for review	CP	

Revision history

Drawing originator:

BETTS HYDRO CONSULTING ENGINEERS · BETTS ASSOCIATES CONSULTING ENGINEERS · BETTS GEO CONSULTING ENGINEERS

Client: Taylor Wimpey

Project title: Glen Dimplex, Stoney Lane

Drawing title: Flood Exceedance Routing

Scale: 1:500 for the original size of A0

Drawn by: CP | Checked by: - | Passed by: - | Date: Apr' 2025

Drawing status:

Job No:	Drawing No: Project	Origin	Volume	Level	Type	Discip	Number	Revision:
TAY143	GDX	BET	ZZ	XX	DR	C	0008	P03

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Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	1 year (l/s)	42.2
Rainfall Events	Singular	Drain Down Time (mins)	1440	2 year (l/s)	42.4
Summer CV	1.000	Additional Storage (m³/ha)	0.0	30 year (l/s)	42.4
Winter CV	1.000	Starting Level (m)		100 year (l/s)	42.4
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
800	0	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	SPR	0.10	Betterment (%)	0
Greenfield Method	IH124	Region	1	QBar	
Positively Drained Area (ha)		Growth Factor 1 year	0.85	Q 1 year (l/s)	
SAAR (mm)		Growth Factor 30 year	1.95	Q 30 year (l/s)	
Soil Index	1	Growth Factor 100 year	2.48	Q 100 year (l/s)	

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Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
S1	0.010	5.00	60.797	1350	347945.194	391628.292	1.659	59.138
S2	0.092	5.00	60.635	1350	347941.921	391610.063	1.621	59.014
S3	0.088	5.00	60.389	1800	347931.180	391583.485	1.641	58.748
S4	0.062	5.00	60.203	1500	347905.708	391593.748	1.645	58.558
S5	0.090	5.00	59.955	1350	347887.069	391642.825	1.253	58.702
S6	0.205	5.00	60.130	2400	347878.280	391604.799	2.042	58.088
S7	0.062	5.00	59.628	2100	347857.494	391553.515	1.678	57.950
S8	0.053	5.00	59.584	2100	347860.047	391547.707	1.650	57.934
S9	0.195	5.00	59.679	2100	347882.811	391538.561	1.806	57.873
S10	0.198	5.00	59.777	2100	347947.445	391512.593	2.080	57.697
S16	0.145	5.00	61.791	2100	348160.138	391490.862	3.658	58.133
S17	0.200	5.00	60.742	2100	348104.767	391513.234	2.758	57.984
S18	0.158	5.00	60.323	2100	348056.250	391532.836	2.470	57.853
S11	0.251	5.00	61.146	1500	348118.621	391574.685	2.732	58.414
S12	0.105	5.00	60.824	1500	348017.411	391615.435	1.675	59.149
S13	0.022	5.00	60.776	1500	348023.976	391609.685	1.801	58.975
S14	0.049	5.00	60.649	1500	348040.478	391606.148	2.012	58.637
S15			60.490	1800	348058.369	391598.944	2.238	58.252
S19	0.209	5.00	60.208	2100	347959.786	391571.810	2.208	58.000
S20	0.129	5.00	59.972	2100	348015.516	391549.294	2.123	57.849
S21			60.242	2700	348035.180	391541.349	2.446	57.796
S22			59.683		348029.837	391528.020	1.924	57.759
S23		5.00	59.683		348018.331	391499.471	2.000	57.683
S25	0.101	5.00	61.506	1200	348158.094	391472.702	1.425	60.081
S24	0.128	5.00	60.271	1200	348135.710	391410.594	1.599	58.672
S26			60.587	1500	348144.008	391433.619	2.286	58.301
S27	0.037	5.00	60.472	2100	348140.169	391435.162	2.482	57.990
S28	0.262	5.00	60.033	2100	348093.698	391453.833	2.168	57.865
S29	0.131	5.00	59.787	2100	348036.303	391476.892	2.076	57.711
S30	0.082	5.00	60.089	2700	348012.998	391486.256	2.441	57.648
S31			60.074	2700	347989.644	391495.638	2.489	57.585
S32			59.529	1350	347978.493	391468.039	2.423	57.106
S33			59.549	1350	347986.213	391464.920	2.493	57.056
Ex MH34			58.500	1350	347983.573	391437.196	1.540	56.960

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	18.520	0.600	59.138	59.014	0.124	149.4	225	5.29	38.8
1.001	S2	S3	28.667	0.600	59.014	58.823	0.191	150.1	225	5.74	37.4
1.002	S3	S4	27.462	0.600	58.748	58.633	0.115	238.8	300	6.19	36.2
1.003	S4	S6	29.571	0.600	58.558	58.463	0.095	311.3	375	6.67	34.9
2.000	S5	S6	39.028	0.600	58.702	58.538	0.164	238.0	300	5.64	37.7
1.004	S6	S7	55.336	0.600	58.088	57.950	0.138	401.0	750	7.34	33.3
1.005	S7	S8	6.345	0.600	57.950	57.934	0.016	396.6	750	7.41	33.1
1.006	S8	S9	24.533	0.600	57.934	57.873	0.061	402.2	750	7.71	32.4
1.007	S9	S10	69.656	0.600	57.873	57.697	0.176	395.8	750	8.53	30.7
1.008	S10	S31	45.477	0.600	57.697	57.585	0.112	406.0	750	9.08	29.7
3.000	S16	S17	59.720	0.600	58.133	57.984	0.149	400.8	750	5.72	37.5
3.001	S17	S18	52.327	0.600	57.984	57.853	0.131	399.4	750	6.34	35.8
3.002	S18	S21	22.725	0.600	57.853	57.796	0.057	398.7	750	6.61	35.1
4.000	S11	S15	64.952	0.600	58.414	58.252	0.162	400.9	450	6.07	36.5
5.000	S12	S13	8.727	0.600	59.149	58.975	0.174	50.2	450	5.05	39.5

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Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
5.001	S13	S14	16.877	0.600	58.975	58.637	0.338	49.9	450	5.15	39.2
5.002	S14	S15	19.286	0.600	58.637	58.252	0.385	50.1	450	5.26	38.8
4.001	S15	S21	62.089	0.600	58.252	58.096	0.156	398.0	450	7.09	33.8
6.000	S19	S20	60.106	0.600	58.000	57.849	0.151	398.1	750	5.72	37.5
6.001	S20	S21	21.208	0.600	57.849	57.796	0.053	400.2	750	5.97	36.8
3.003	S21	S22	14.360	0.600	57.796	57.760	0.036	398.9	750	7.27	33.4
3.005	S23	S30	14.251	0.600	57.683	57.648	0.035	407.2	750	5.17	39.1
7.000	S25	S26	41.544	0.600	60.081	58.526	1.555	26.7	225	5.27	38.8
8.000	S24	S26	24.475	0.600	58.672	58.526	0.146	167.6	225	5.41	38.4
7.001	S26	S27	4.138	0.600	58.301	58.290	0.011	376.2	450	5.47	38.2
7.002	S27	S28	50.081	0.600	57.990	57.865	0.125	400.6	750	6.07	36.5
7.003	S28	S29	61.853	0.600	57.865	57.711	0.154	401.6	750	6.81	34.5
7.004	S29	S30	25.117	0.600	57.711	57.648	0.063	398.7	750	7.11	33.8
3.006	S30	S31	25.168	0.600	57.648	57.585	0.063	399.5	750	7.41	33.1
1.009	S31	S32	29.766	0.600	57.585	57.106	0.479	62.1	300	9.33	29.3
1.010	S32	S33	8.326	0.600	57.106	57.056	0.050	166.5	225	9.47	29.0
1.011	S33	Ex MH34	27.850	0.600	57.056	56.960	0.096	290.1	225	10.08	28.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	18.520	149.4	225	Circular	60.797	59.138	1.434	60.635	59.014	1.396
1.001	28.667	150.1	225	Circular	60.635	59.014	1.396	60.389	58.823	1.341
1.002	27.462	238.8	300	Circular	60.389	58.748	1.341	60.203	58.633	1.270
1.003	29.571	311.3	375	Circular	60.203	58.558	1.270	60.130	58.463	1.292
2.000	39.028	238.0	300	Circular	59.955	58.702	0.953	60.130	58.538	1.292
1.004	55.336	401.0	750	Circular	60.130	58.088	1.292	59.628	57.950	0.928
1.005	6.345	396.6	750	Circular	59.628	57.950	0.928	59.584	57.934	0.900
1.006	24.533	402.2	750	Circular	59.584	57.934	0.900	59.679	57.873	1.056
1.007	69.656	395.8	750	Circular	59.679	57.873	1.056	59.777	57.697	1.330
1.008	45.477	406.0	750	Circular	59.777	57.697	1.330	60.074	57.585	1.739
3.000	59.720	400.8	750	Circular	61.791	58.133	2.908	60.742	57.984	2.008
3.001	52.327	399.4	750	Circular	60.742	57.984	2.008	60.323	57.853	1.720
3.002	22.725	398.7	750	Circular	60.323	57.853	1.720	60.242	57.796	1.696
4.000	64.952	400.9	450	Circular	61.146	58.414	2.282	60.490	58.252	1.788

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1350	Manhole	Adoptable	S2	1350	Manhole	Adoptable
1.001	S2	1350	Manhole	Adoptable	S3	1800	Manhole	Adoptable
1.002	S3	1800	Manhole	Adoptable	S4	1500	Manhole	Adoptable
1.003	S4	1500	Manhole	Adoptable	S6	2400	Manhole	Adoptable
2.000	S5	1350	Manhole	Adoptable	S6	2400	Manhole	Adoptable
1.004	S6	2400	Manhole	Adoptable	S7	2100	Manhole	Adoptable
1.005	S7	2100	Manhole	Adoptable	S8	2100	Manhole	Adoptable
1.006	S8	2100	Manhole	Adoptable	S9	2100	Manhole	Adoptable
1.007	S9	2100	Manhole	Adoptable	S10	2100	Manhole	Adoptable
1.008	S10	2100	Manhole	Adoptable	S31	2700	Manhole	Adoptable
3.000	S16	2100	Manhole	Adoptable	S17	2100	Manhole	Adoptable
3.001	S17	2100	Manhole	Adoptable	S18	2100	Manhole	Adoptable
3.002	S18	2100	Manhole	Adoptable	S21	2700	Manhole	Adoptable
4.000	S11	1500	Manhole	Adoptable	S15	1800	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
5.000	8.727	50.2	450	Circular	60.824	59.149	1.225	60.776	58.975	1.351
5.001	16.877	49.9	450	Circular	60.776	58.975	1.351	60.649	58.637	1.562
5.002	19.286	50.1	450	Circular	60.649	58.637	1.562	60.490	58.252	1.788
4.001	62.089	398.0	450	Circular	60.490	58.252	1.788	60.242	58.096	1.696
6.000	60.106	398.1	750	Circular	60.208	58.000	1.458	59.972	57.849	1.373
6.001	21.208	400.2	750	Circular	59.972	57.849	1.373	60.242	57.796	1.696
3.003	14.360	398.9	750	Circular	60.242	57.796	1.696	59.683	57.760	1.173
3.005	14.251	407.2	750	Circular	59.683	57.683	1.250	60.089	57.648	1.691
7.000	41.544	26.7	225	Circular	61.506	60.081	1.200	60.587	58.526	1.836
8.000	24.475	167.6	225	Circular	60.271	58.672	1.374	60.587	58.526	1.836
7.001	4.138	376.2	450	Circular	60.587	58.301	1.836	60.472	58.290	1.732
7.002	50.081	400.6	750	Circular	60.472	57.990	1.732	60.033	57.865	1.418
7.003	61.853	401.6	750	Circular	60.033	57.865	1.418	59.787	57.711	1.326
7.004	25.117	398.7	750	Circular	59.787	57.711	1.326	60.089	57.648	1.691
3.006	25.168	399.5	750	Circular	60.089	57.648	1.691	60.074	57.585	1.739
1.009	29.766	62.1	300	Circular	60.074	57.585	2.189	59.529	57.106	2.123
1.010	8.326	166.5	225	Circular	59.529	57.106	2.198	59.549	57.056	2.268
1.011	27.850	290.1	225	Circular	59.549	57.056	2.268	58.500	56.960	1.315

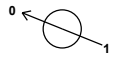
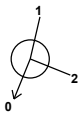
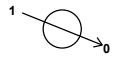
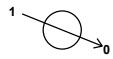
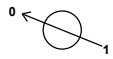
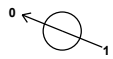
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
5.000	S12	1500	Manhole	Adoptable	S13	1500	Manhole	Adoptable
5.001	S13	1500	Manhole	Adoptable	S14	1500	Manhole	Adoptable
5.002	S14	1500	Manhole	Adoptable	S15	1800	Manhole	Adoptable
4.001	S15	1800	Manhole	Adoptable	S21	2700	Manhole	Adoptable
6.000	S19	2100	Manhole	Adoptable	S20	2100	Manhole	Adoptable
6.001	S20	2100	Manhole	Adoptable	S21	2700	Manhole	Adoptable
3.003	S21	2700	Manhole	Adoptable	S22		Junction	
3.005	S23		Junction		S30	2700	Manhole	Adoptable
7.000	S25	1200	Manhole	Adoptable	S26	1500	Manhole	Adoptable
8.000	S24	1200	Manhole	Adoptable	S26	1500	Manhole	Adoptable
7.001	S26	1500	Manhole	Adoptable	S27	2100	Manhole	Adoptable
7.002	S27	2100	Manhole	Adoptable	S28	2100	Manhole	Adoptable
7.003	S28	2100	Manhole	Adoptable	S29	2100	Manhole	Adoptable
7.004	S29	2100	Manhole	Adoptable	S30	2700	Manhole	Adoptable
3.006	S30	2700	Manhole	Adoptable	S31	2700	Manhole	Adoptable
1.009	S31	2700	Manhole	Adoptable	S32	1350	Manhole	Adoptable
1.010	S32	1350	Manhole	Adoptable	S33	1350	Manhole	Adoptable
1.011	S33	1350	Manhole	Adoptable	Ex MH34	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S1	347945.194	391628.292	60.797	1.659	1350		0	1.000	59.138	225
S2	347941.921	391610.063	60.635	1.621	1350		1 0	1.000 1.001	59.014 59.014	225 225

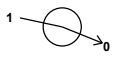
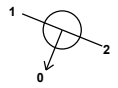
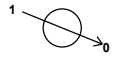
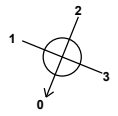
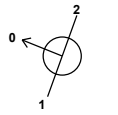
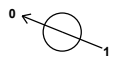
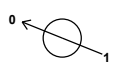
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S3	347931.180	391583.485	60.389	1.641	1800		1	1.001	58.823	225
							0	1.002	58.748	300
S4	347905.708	391593.748	60.203	1.645	1500		1	1.002	58.633	300
							0	1.003	58.558	375
S5	347887.069	391642.825	59.955	1.253	1350		0	2.000	58.702	300
S6	347878.280	391604.799	60.130	2.042	2400		1	2.000	58.538	300
							2	1.003	58.463	375
							0	1.004	58.088	750
S7	347857.494	391553.515	59.628	1.678	2100		1	1.004	57.950	750
							0	1.005	57.950	750
S8	347860.047	391547.707	59.584	1.650	2100		1	1.005	57.934	750
							0	1.006	57.934	750
S9	347882.811	391538.561	59.679	1.806	2100		1	1.006	57.873	750
							0	1.007	57.873	750
S10	347947.445	391512.593	59.777	2.080	2100		1	1.007	57.697	750
							0	1.008	57.697	750
S16	348160.138	391490.862	61.791	3.658	2100		0	3.000	58.133	750
S17	348104.767	391513.234	60.742	2.758	2100		1	3.000	57.984	750
							0	3.001	57.984	750
S18	348056.250	391532.836	60.323	2.470	2100		1	3.001	57.853	750
							0	3.002	57.853	750
S11	348118.621	391574.685	61.146	2.732	1500		0	4.000	58.414	450
S12	348017.411	391615.435	60.824	1.675	1500		0	5.000	59.149	450

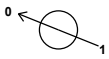
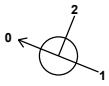
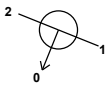
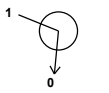
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S13	348023.976	391609.685	60.776	1.801	1500	 1	5.000	58.975	450
						0	5.001	58.975	450
S14	348040.478	391606.148	60.649	2.012	1500	 1	5.001	58.637	450
						0	5.002	58.637	450
S15	348058.369	391598.944	60.490	2.238	1800	1	5.002	58.252	450
						 2	4.000	58.252	450
						0	4.001	58.252	450
S19	347959.786	391571.810	60.208	2.208	2100				
						0	6.000	58.000	750
S20	348015.516	391549.294	59.972	2.123	2100	 1	6.000	57.849	750
						0	6.001	57.849	750
S21	348035.180	391541.349	60.242	2.446	2700	 1	6.001	57.796	750
						2	4.001	58.096	450
						3	3.002	57.796	750
						0	3.003	57.796	750
S22	348029.837	391528.020	59.683	1.924		 1	3.003	57.760	750
S23	348018.331	391499.471	59.683	2.000					
						0	3.005	57.683	750
S25	348158.094	391472.702	61.506	1.425	1200				
						0	7.000	60.081	225
S24	348135.710	391410.594	60.271	1.599	1200				
						0	8.000	58.672	225
S26	348144.008	391433.619	60.587	2.286	1500	 1	8.000	58.526	225
						2	7.000	58.526	225
						0	7.001	58.301	450
S27	348140.169	391435.162	60.472	2.482	2100	 1	7.001	58.290	450
						0	7.002	57.990	750
S28	348093.698	391453.833	60.033	2.168	2100	 1	7.002	57.865	750
						0	7.003	57.865	750

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S29	348036.303	391476.892	59.787	2.076	2100		1	7.003	57.711	750
							0	7.004	57.711	750
S30	348012.998	391486.256	60.089	2.441	2700		1	7.004	57.648	750
							2	3.005	57.648	750
							0	3.006	57.648	750
S31	347989.644	391495.638	60.074	2.489	2700		1	3.006	57.585	750
							2	1.008	57.585	750
							0	1.009	57.585	300
S32	347978.493	391468.039	59.529	2.423	1350		1	1.009	57.106	300
							0	1.010	57.106	225
S33	347986.213	391464.920	59.549	2.493	1350		1	1.010	57.056	225
							0	1.011	57.056	225
Ex MH34	347983.573	391437.196	58.500	1.540	1350		1	1.011	56.960	225

Node S31 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	57.585	Product Number	CTL-SHE-0263-4240-1900-4240
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	42.4	Min Node Diameter (mm)	2400

Node S23 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	30.425
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	57.683	Main Channel Slope (1:X)	400.0
Safety Factor	2.0	Time to half empty (mins)	340	Main Channel n	0.035

Inlets

S22

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	355.7	0.0	0.600	511.8	0.0	1.200	688.8	0.0	1.800	886.1	0.0
0.100	379.9	0.0	0.700	539.9	0.0	1.300	720.3	0.0	1.900	921.0	0.0
0.200	405.2	0.0	0.800	568.6	0.0	1.400	752.3	0.0	2.000	956.4	0.0
0.300	431.0	0.0	0.900	597.8	0.0	1.500	784.9	0.0			
0.400	457.4	0.0	1.000	627.6	0.0	1.600	818.1	0.0			
0.500	484.3	0.0	1.100	657.9	0.0	1.700	851.8	0.0			

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Results for 800 year Critical Storm Duration. Lowest mass balance: 99.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	11	59.912	0.774	8.3	1.1074	0.0000	SURCHARGED
15 minute summer	S2	11	59.911	0.897	64.5	1.2836	0.0000	SURCHARGED
240 minute winter	S3	224	59.585	0.837	22.6	2.1303	0.0000	SURCHARGED
240 minute winter	S4	224	59.584	1.026	30.0	1.8138	0.0000	SURCHARGED
240 minute winter	S5	232	59.584	0.882	10.7	1.2623	0.0000	SURCHARGED
240 minute winter	S6	224	59.584	1.496	64.4	6.7684	0.0000	SURCHARGED
240 minute winter	S7	232	59.584	1.634	60.9	5.6602	0.0000	FLOOD RISK
240 minute winter	S8	224	59.584	1.650	65.2	5.7156	11.3135	FLOOD
240 minute winter	S9	228	59.584	1.711	84.9	5.9282	0.0000	FLOOD RISK
240 minute winter	S10	228	59.585	1.888	105.7	6.5417	0.0000	FLOOD RISK
240 minute winter	S16	228	59.588	1.455	17.3	5.0388	0.0000	SURCHARGED
240 minute winter	S17	228	59.587	1.603	38.7	5.5542	0.0000	SURCHARGED
240 minute winter	S18	228	59.587	1.734	55.7	6.0082	0.0000	SURCHARGED
240 minute winter	S11	228	59.588	1.174	29.9	2.0746	0.0000	SURCHARGED
240 minute winter	S12	228	59.588	0.439	12.5	0.7757	0.0000	OK
240 minute winter	S13	228	59.588	0.613	15.1	1.0831	0.0000	SURCHARGED
240 minute winter	S14	228	59.588	0.951	20.9	1.6803	0.0000	SURCHARGED
240 minute winter	S15	228	59.588	1.336	46.9	3.3998	0.0000	SURCHARGED
240 minute winter	S19	228	59.588	1.588	24.9	5.4992	0.0000	SURCHARGED
240 minute winter	S20	228	59.588	1.739	38.8	6.0224	0.0000	SURCHARGED
240 minute winter	S21	228	59.588	1.792	133.4	10.2583	0.0000	SURCHARGED
240 minute winter	S22	228	59.588	1.828	132.5	0.0000	0.0000	OK
240 minute winter	S23	228	59.587	1.904	141.1	0.0000	0.0000	FLOOD RISK
15 minute summer	S25	10	60.222	0.141	68.3	0.1590	0.0000	OK
240 minute winter	S24	228	59.588	0.916	15.3	1.0359	0.0000	SURCHARGED
240 minute winter	S26	228	59.587	1.286	27.3	2.2730	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	14.1	0.477	0.331	0.7366	
15 minute summer	S2	1.001	S3	62.7	1.577	1.481	1.1401	
15 minute summer	S3	1.002	S4	118.6	1.684	1.656	1.9339	
15 minute summer	S4	1.003	S6	158.7	1.474	1.407	3.2616	
15 minute summer	S5	2.000	S6	59.7	1.171	0.832	2.4624	
15 minute summer	S6	1.004	S7	321.1	1.059	0.523	24.3545	
15 minute summer	S7	1.005	S8	325.3	0.984	0.526	2.7926	
15 minute summer	S8	1.006	S9	336.7	1.028	0.549	10.7975	
30 minute summer	S9	1.007	S10	419.2	0.953	0.678	30.6570	
30 minute summer	S10	1.008	S31	532.3	1.210	0.872	20.0154	
15 minute summer	S16	3.000	S17	85.4	0.677	0.139	26.0587	
15 minute summer	S17	3.001	S18	168.4	0.743	0.274	23.0302	
15 minute summer	S18	3.002	S21	248.5	0.738	0.403	10.0017	
15 minute summer	S11	4.000	S15	175.7	1.109	1.095	10.2912	
15 minute summer	S12	5.000	S13	71.2	1.792	0.156	0.3649	
15 minute summer	S13	5.001	S14	86.2	1.855	0.188	1.2923	
15 minute summer	S14	5.002	S15	113.5	1.250	0.248	2.6482	
15 minute summer	S15	4.001	S21	267.1	1.715	1.658	9.8376	
15 minute summer	S19	6.000	S20	127.5	0.643	0.207	26.4539	
15 minute summer	S20	6.001	S21	198.1	0.584	0.322	9.3341	
15 minute summer	S21	3.003	S22	700.9	1.967	1.138	6.3201	
15 minute summer	S22	Flow through Pond	S23	-464.8	0.160	-0.010	509.6441	
30 minute summer	S23	3.005	S30	-831.1	-1.889	-1.363	6.2722	
15 minute summer	S25	7.000	S26	67.6	2.669	0.669	1.0522	
15 minute summer	S24	8.000	S26	85.6	2.153	2.139	0.9636	
15 minute summer	S26	7.001	S27	152.7	1.342	0.921	0.6556	

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Results for 800 year Critical Storm Duration. Lowest mass balance: 99.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	S27	228	59.587	1.597	29.1	5.5331	0.0000	SURCHARGED
240 minute winter	S28	228	59.587	1.722	58.3	5.9658	0.0000	SURCHARGED
240 minute winter	S29	228	59.587	1.876	72.4	6.4992	0.0000	FLOOD RISK
240 minute winter	S30	228	59.587	1.939	143.6	11.1037	0.0000	SURCHARGED
240 minute winter	S31	228	59.586	2.001	104.1	11.4598	0.0000	SURCHARGED
600 minute summer	S32	1035	57.431	0.325	42.3	0.4658	0.0000	SURCHARGED
600 minute summer	S33	1035	57.345	0.289	42.3	0.4131	0.0000	SURCHARGED
60 minute summer	Ex MH34	481	57.132	0.172	42.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S27	7.002	S28	161.2	0.759	0.262	22.0417	
15 minute summer	S28	7.003	S29	294.3	1.006	0.479	27.2228	
15 minute summer	S29	7.004	S30	328.9	0.940	0.534	11.0545	
30 minute summer	S30	3.006	S31	-477.2	-1.084	-0.775	11.0770	
120 minute summer	S31	1.009	S32	42.3	0.982	0.300	1.4029	
60 minute winter	S32	1.010	S33	42.3	1.065	1.054	0.3311	
60 minute summer	S33	1.011	Ex MH34	42.3	1.097	1.397	1.0083	1512.7

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APPENDIX N: WATER QUALITY ASSESSMENT (SIA)

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Water quality management assessment - CIRIA SuDS Manual 'Simplified Index Approach' - Existing

Pollution hazard indices from Table 26.2 'Pollution hazard indices for different land use classifications'

Mitigation indices from Table 26.3 'Indicative SuDS mitigation indices for discharges to surfae waters'

Former Glen Dimplex
Whiston
v1.0 HYD1128

BETTS HYDRO CONSULTING ENGINEERS

Description of area being served	Ref. no.	Category	Pollution type	Hazard index	Treatment Stage and Component: Primary	Secondary	Tertiary	Total SuDS mitigation index	Assessment criteria	Acceptable (y/n)
Main Factory/ Manufacturing Areas , Delivery Yards & Chemical Hadling Zones	001	Sites with heavy pollution... industrial sites; sites where chemicals and fuels are delivered, handled, stored, used or manufactured (CIRIA Table 26.2 - High)	Pollution hazard level	High						
			Total suspended solids (TSS)	0.8				0.00	0.80	n
			Metals	0.8				0.00	0.20	n
			Hydrocarbons	0.9				0.00	0.05	n
Internal Service Roads, Hardstanding & Delivery Approaches	002	Commercial yard and delivery areas, non-residential car parking with frequent change... all roads except low traffic roads (CIRIA Table 26.2 - Medium)	Pollution hazard level	Medium						
			Total suspended solids (TSS)	0.7				0.00	0.70	n
			Metals	0.6				0.00	0.60	n
			Hydrocarbons	0.7				0.00	0.70	n
Staff / Visitor Car Parking Areas	003	Non-residential car parking with infrequent change (eg offices) ie < 300 traffic movements/day (CIRIA Table 26.2 - Low)	Pollution hazard level	Low						
			Total suspended solids (TSS)	0.5				0.00	0.50	n
			Metals	0.4				0.00	0.40	n
			Hydrocarbons	0.4				0.00	0.40	n
Factory / Building Roofs	004	Other roofs (typically commercial/industrial roofs) (CIRIA Table 26.2 - Low). Note: potential for metal leaching from	Pollution hazard level	Low						
			Total suspended solids (TSS)	0.3				0.00	0.30	n
			Metals	0.2				0.00	0.20	n
			Hydrocarbons	0.05				0.00	0.05	n

Water quality management assessment - CIRIA SuDS Manual 'Simplified Index Approach' - Proposed

Pollution hazard indices from Table 26.2 'Pollution hazard indices for different land use classifications'

Mitigation indices from Table 26.3 'Indicative SuDS mitigation indices for discharges to surfae waters'

Former Glen Dimplex
Whiston
v1.0 HYD1128

BETTS HYDRO
CONSULTING ENGINEERS

Description of area being served	Ref. no.	Category	Pollution type	Hazard index	Treatment Stage and Component: Primary	Secondary		Tertiary		Total SuDS mitigation index	Assessment criteria	Acceptable (y/n)
Roof area	001	Residential roofs	Pollution hazard level	Very low	Filter Drain	Detention Basin	(factored by 0.5)					
			Total suspended solids (TSS)	0.2	0.40	0.50	0.25			0.65	0.20	y
			Metals	0.2	0.40	0.50	0.25			0.65	0.20	y
			Hydrocarbons	0.05	0.40	0.60	0.30			0.70	0.05	y
Domestic Driveways	002	Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Pollution hazard level	Low	Filter Drain	Detention Basin	(factored by 0.5)					
			Total suspended solids (TSS)	0.5	0.40	0.50	0.25			0.65	0.50	y
			Metals	0.4	0.40	0.50	0.25			0.65	0.40	y
			Hydrocarbons	0.4	0.40	0.60	0.30			0.70	0.40	y
Private/Adoptable Estate Roads	003	Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Pollution hazard level	Low	Detention Basin							
			Total suspended solids (TSS)	0.5	0.50					0.50	0.50	y
			Metals	0.4	0.50					0.50	0.40	y
			Hydrocarbons	0.4	0.50					0.50	0.40	y

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APPENDIX O: SUDS MAINTENANCE & MANAGEMENT PLAN

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24th August 2026

BETTS HYDRO
CONSULTING ENGINEERS

SUDS MAINTENANCE AND MANAGEMENT PLAN

SITE: FORMER GLEN DIMPLEX, STONEY LANE, WHISTON

We have been asked to prepare an outline Sustainable Drainage Systems Maintenance and Management Plan to support the proposed development at the site above. The purpose of this statement is to identify the typical requirements in accordance with CIRIA (2015) for maintenance and management of the drainage infrastructure that has been proposed (see *Appendix A*). The Preliminary Drainage Layout, prepared by Betts Associates, has been appended to this statement for completeness (see *Appendix A* for further details).

In terms of the proposed surface water management infrastructure, source control will be provided via a filter drain and an interception drain. Conveyance will be provided by a below ground pipe network, utilising oversized pipework (900mm diameter) to assist with attenuation. Stormwater storage generated in the events up to and including the 1 in 100yr plus 45% climate change allowance event will be catered for by an attenuation basin. An interception drain is also proposed along the southern site boundary, to intercept potential exceedance flows entering or leaving the site from adjacent land. The specific means of attenuation and conveyance are to be confirmed at the detailed design stage.

The proposed drainage infrastructure will be offered to United Utilities or a NAV for adoption. The adoptee should be inspecting any assets regularly, preferably during and after heavy rainfall to check effective operation.

The following section will consider the typical maintenance and management techniques recommended for the types of drainage infrastructure included within the Preliminary Drainage Layout. Regular inspection and maintenance is required to ensure the effective long-term operation of all proposed components. Maintenance responsibility for systems should be placed with a responsible organisation.

Regular inspection and maintenance of drainage systems are important for their effective and continued operation. Maintenance activities can be broadly defined as regular, occasional, and remedial maintenance. The proposed maintenance regime for the surface water drainage infrastructure should follow typical guidance for management and maintenance, guidance can also be sought from the CIRIA 753 SuDS Manual where appropriate. Guidance on the operation and maintenance requirements that may be appropriate are outlined subsequently; this is not exhaustive, and some actions may not always be required.

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Welsh Road, Sealand
Flintshire CH5 2LY
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Head Office Betts Associates Ltd

www.betts-associates.co.uk

BETTS HYDRO
CONSULTING ENGINEERS

PIPEWORK AND MANHOLES

Below ground pipework and manholes should be routinely monitored to ensure they are operating safely and sustainably. The pipework should be inspected routinely, and any defects repaired as and when required.

FILTER DRAIN

As shown on the Preliminary Drainage Layout (Appendix A), the Filter Drain is located to the front of properties, parallel to the back of footway, and is designed to collect surface water run-off from adjacent drives and roof areas. Owing to the presence of ground contamination across the site, the Filter Drain is fully lined with an impermeable membrane; run-off passes through the surrounding granular filter media into a Terram-wrapped perforated pipe at the base of the drain before conveyance to the proposed surface water network. Maintenance activities should take care not to damage the impermeable lining. Regular and ongoing maintenance is required for the filter drain to ensure that it continues to operate to the design performance standards. Detailed specifications and frequencies should be provided for the required maintenance, along with annual costs and any potential machinery necessary to undertake maintenance. Different designs will have different operational and maintenance requirements (to be confirmed at the detailed design stage). The typical requirements set out in **Table 1** below are as recommended within The SuDS Manual.

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Table 1: Recommended Maintenance Routines for Filter Drains (CIRIA, 2015)

Regular Maintenance	***Frequency***
Remove litter and debris	Monthly
Cut grass/vegetation on top of the filter drain and side slopes	Monthly (during growing season), or as required
Inspect inlets, outlets, control structures and pipework for blockages and physical damage, clear/repair as required	Monthly
Occasional Maintenance	***Frequency***
Remove sediment and debris from the surface of the filter media	As required, following inspection
Rehabilitate surface and upper filter media where clogging is identified	As required
Remedial Actions	***Frequency***
Repair erosion or damage to side slopes	As required
Reconstruct/replace filter media where infiltration performance has significantly reduced	As required (likely to be infrequent)
Monitoring	***Frequency***
Initial inspection	Monthly (for three months post-installation)
Inspect for evidence of poor operation, ponding, or weed growth – if required, take remedial action	Every 3 months (48hr following large storms for first 6 months)
Monitor silt accumulation rates and establish appropriate maintenance frequencies	Annually

INTERCEPTION DRAIN

As shown on the Preliminary Drainage Layout (Appendix A), the Interception Drain is located to the rear of proposed gardens, along the southern site boundary, and comprises a series of catch pits connected by perforated pipework laid within granular fill and wrapped in a permeable geotextile, with an impermeable membrane lining the trench. The interception drain, proposed along the southern site boundary to manage potential exceedance flows entering or leaving the site from adjacent land, will require regular and ongoing maintenance to ensure it continues to operate to the design performance standards. Detailed specifications and frequencies should be provided for the required maintenance, along with annual costs and any potential machinery necessary to undertake maintenance. Different designs will have different operational and maintenance requirements (to be confirmed at the detailed design stage). The typical requirements set out in **Table 2** below are as recommended within The SuDS Manual.

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Table 2: Recommended Maintenance Routines for Interception Drain (CIRIA, 2015)

Regular Maintenance	***Frequency***
Remove litter and debris	Monthly
Inspect inlets, outlets and overflows for blockages, clear as required	Monthly
Inspect for evidence of physical damage along the drain alignment	Monthly
Manage vegetation along the drain corridor	Monthly (during growing season), or as required
Occasional Maintenance	***Frequency***
Inspect silt accumulation rates and establish appropriate removal frequencies	Every 3 months, or as required
Remove sediment from inlets and outlets	Annually, or as required
Remedial Actions	***Frequency***
Repair erosion or other damage along the drain	As required
Repair/rehabilitate inlets, outlets and overflows	As required
Relevel uneven sections and reinstate design levels/falls	As required

ATTENUATION BASIN

As shown on the Preliminary Drainage Layout (Appendix A), the attenuation basin is designed with a base level of 57.383 mAOD and a top of bank level of 59.383 mAOD, providing a 300mm freeboard and a temporary maximum storage volume of 1,003.09 m^3. Outflow from the basin is controlled via a Hydro International HydroBrake® Optimum flow control device (Ref. S30), restricting discharge to 42.4 l/s to the private surface water sewer. Regular and ongoing maintenance is required for the attenuation basin to ensure that it continues to operate to the design performance standards. Detailed specifications and frequencies should be provided for the required maintenance, along with annual costs and any potential machinery necessary to undertake maintenance. Different designs will have different operational and maintenance requirements (to be confirmed at the detailed design stage). This will need to be designed to cater for the extreme storm event volumes up to and including the 100yr return period event with 45% allowance for climate change. The requirements set out in **Table 3** below refer to the recommendations in The SuDS Manual for maintenance of attenuation basins.

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Table 3: Recommended Maintenance Routines for Attenuation Basins (CIRIA, 2015)

Regular Maintenance	***Frequency***
Remove litter and debris	Monthly
Manage vegetation and remove nuisance plans (inc. cutting grass for spillways/access routes)	Monthly (during growing season), or as required
Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
Inspect inlets, outlets and overflows for blockages, and clear as required	Monthly
Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
Inspect inlets and facility surface for silt accumulation: establish appropriate silt removal frequencies	Monthly (for first year), then annually/as required
Check any penstocks and other mechanical devices	Annually
Tidy all dead growth before start of growing season	Annually
Remove sediment from inlets, outlets and forebay	Annually (or as required)
Manage wetland plants in outlet pool – where provided	Annually
Occasional Maintenance	***Frequency***
Reseed areas of poor vegetation growth	As required
Prune and trim any trees and remove cuttings	Every 2 years, or as required
Remove sediment from inlets, outlets, forebay and main basin where required	Every 5 years, or as required (likely to be minimal where effective upstream source control is provided)
Remedial Actions	***Frequency***
Repair erosion or other damage by reseeding or re-turfing	As required

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Realignment of rip-rap	As required
Repair/rehabilitation of inlets, outlets, and overflows	As required
Relevel uneven surfaces and reinstate design levels	As required

HYDROBRAKE FLOW CONTROL DEVICES

As shown on the Preliminary Drainage Layout (Appendix A), a Hydro International HydroBrake® Optimum (Ref. S30, cover level 60.074 mAOD, invert level 57.585 mAOD) is proposed to control outflow from the attenuation basin, restricting discharge to 42.4 l/s. Generally, Hydrobrake devices require little maintenance and have a design life greater than that of the upstream drainage infrastructure. Should the device get blocked, then the main chamber would flood and depending on the specific Hydrobrake product being installed, most come equipped with by-pass doors (or similar) to allow the device to be accessed and drained manually to provide appropriate access for maintenance to be undertaken. In terms of management, the typical routines for maintenance are for inlets, outlets, and overflows to be inspected regularly to prevent blockages and be cleared where needed. Sediment can be removed from inlets and outlets when required and any inlets and outlets can be repaired if damage is picked up in the regular inspections.

I trust you will find the above and attached are of assistance. If you however have any queries or require further information, please do not hesitate to contact me.

Yours sincerely,

APPENDED

Appendix A – Preliminary Drainage Layout (Betts Associates)

Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041

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APPENDIX A – PRELIMINARY DRAINAGE LAYOUT (BETTS ASSOCIATES)

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Drainage Strategy - Foul water

The proposed foul water drainage strategy for the development is divided into four separate drainage networks, each designed to discharge to the existing United Utilities public sewerage system.

Network 1
Network 1 comprises a gravity drainage system located within the north-west corner of the site. This network is designed to connect to the existing combined sewer within Stoney Lane, upstream of existing United Utilities manhole reference 8604.

Connection Manhole Details:

MH Ref: F24 (Proposed)
Cover Level (CL): 59.938 mAOD
Invert Level (IL): 57.853 mAOD (150mm Ø – proposed foul connection)
Invert Level (IL): 57.104 mAOD (900mm Ø – existing sewer)

Network 2
Network 2 serves the majority of the site and drains to a proposed pumping station located adjacent to **Plot 51** in the southern corner of the site. The associated rising main is wholly contained within the development and discharges to proposed manhole **F15**.

The ultimate discharge point is to an Existing United Utilities foul water manhole Ref. 8503, located within the site boundary. The existing downstream connection to the United Utilities combined sewer (MH Ref. 8501) within Cumber Lane is to remain and shall continue to serve the development as a foul water discharge point.

Connection Manhole Details:

MH Ref: 8503
Cover Level (CL): 58.518 mAOD
Invert Level (IL): 57.77 mAOD (150mm Ø - existing sewer)

Network 3
Network 3 comprises a gravity drainage system located within the northern part of the site, adjacent to Plot 180. This network is designed to connect to the existing United Utilities combined sewer within Stoney Lane via existing manhole reference UU9602.

Connection Manhole Details:

MH Ref: 9602 (Existing)
Cover Level (CL): 60.75 mAOD
Invert Level (IL): 58.330 mAOD (150mm Ø – proposed foul connection)
Invert Level (IL): 57.580 mAOD (900mm Ø – existing sewer)

Network 4
Network 4 comprises a gravity drainage system located within the northern part of the site, within Road 3, serving Plots 184–205. This network is designed to connect to the existing United Utilities combined sewer within Stoney Lane via existing manhole reference UU0601.

Connection Manhole Details:

MH Ref: 0601 (Existing)
Cover Level (CL): 61.03 mAOD
Invert Level (IL): 58.842 mAOD (150mm Ø – proposed foul connection)
Invert Level (IL): 58.167 mAOD (825mm Ø – existing sewer)

Overall, the proposed foul water drainage strategy utilises a combination of gravity drainage and a single adoptable pumping station to serve the development. Foul flows discharge to existing United Utilities foul and combined sewerage infrastructure via four separate connection points, with all new foul sewers and associated infrastructure designed in accordance with the relevant United Utilities and Sewers for Adoption requirements.

Drainage Strategy - Surface water

Surface water runoff generated by the proposed development will discharge to the existing on-site culverted watercourse via a new manhole reference **S33**, located along the southern site boundary, at a restricted discharge rate of **42.4 l/s**.

The surface water drainage network has been designed to accommodate the 1 in 30 year storm event, with additional attenuation provided by an online attenuation basin to manage the 1 in 100 year event plus 45% allowance for climate change.

Connection Manhole Details:
MH Ref: **S33** (Proposed)
Cover Level (CL): 59.549 mAOD
Invert Level (IL): 57.056 mAOD (225 mm Ø)

Proposed Foul Water Connection (F24 Proposed) Network 1

A new online manhole is proposed on the existing United Utilities 900mm Ø combined water sewer within Stoney Lane. The proposed development shall connect to the existing public foul water sewer via a 150mm Ø soffit to soffit connection.

MH Ref: F24
Cover Level (CL): 59.938 mAOD
Invert Level (IL): **57.853** mAOD *(150mm Ø – proposed foul connection)*
Invert Level (IL): 57.104 mAOD *(900mm Ø – existing sewer)*

Proposed Foul Water Connection (9602 Existing) Network 3

A new connection to existing manhole Ref 9602 is proposed, this United Utilities combined sewer is located within Stoney Lane. The proposed development shall connect to the existing public combined sewer via a 150mm Ø soffit to soffit connection.

MH Ref: **9602**
Cover Level (CL): 60.75 mAOD
Invert Level (IL): **58.330** mAOD *(150mm Ø – proposed foul connection)*
Invert Level (IL): 57.580 mAOD *(900mm Ø – existing sewer)*

Proposed Foul Water Connection (0601 Existing) Network 4

A new connection to existing manhole Ref 0601 is proposed, this United Utilities combined sewer is located within Stoney Lane. The proposed development shall connect to the existing public combined sewer via a 150mm Ø soffit to soffit connection.

MH Ref: **9602**
Cover Level (CL): 61.03 mAOD
Invert Level (IL): **58.842** mAOD *(150mm Ø – proposed foul connection)*
Invert Level (IL): 58.167 mAOD *(825mm Ø – existing sewer)*

Proposed Finished Levels
The levels indicated on this plan are indicative (+/-500mm) and subject to change following detailed levels design.

Proposed Filter Drain
Filter drain located to front of properties, parallel to the back of footway. Designed to collect surface water runoff from adjacent drives and roof areas. Surface water runoff is filtered through the surrounding granular stone and conveyed via perforated pipework to the proposed surface water drainage network.

Proposed Interception Drain
Interception drain located to rear of proposed gardens, along site boundary. Designed to intercept surface water runoff from adjacent land and prevent uncontrolled flows entering or leaving the development.

Proposed Foul Water Connection (8503 Existing) Network 2

Existing United Utilities foul water manhole to be retained and rebuilt/made good as necessary. The existing downstream connection to the United Utilities combined sewer (MH Ref. 8501) within Cumber Lane is to remain and shall continue to serve the development as a foul water discharge point.

MH Ref: **8503 Existing**
Cover Level (CL): 58.518 mAOD
Invert Level (IL): **57.77** mAOD *(150mm Ø)*

Foul Water Rising Main
The proposed foul water rising main will be routed through the site within the proposed road network and will discharge to proposed manhole F15. From this point, flows will continue via gravity to the existing Foul Water Manhole Ref. 8503, ultimately discharging to the existing combined sewer within Cumber Lane.

Rising Main Length: Approx. 320m
Termination Manhole: F15

Flow Control Chamber Manhole S31 HB
Hydro International HydroBrake Optimum
SHE-0263-4240-1900-4240
Design head = 1.900 m
Restricted discharge max. = 42.4 l/sec
Flow control orifice size 263mm
Cover level: 60.074 mAOD
Invert level: 57.585 mAOD

Proposed Diversion
Minor diversion works proposed to accommodate proposed site layout.

Proposed Surface Water Connection (S33)
A New manhole is to be constructed online of the existing on site culverted watercourse.

MH Ref: **S32** (Proposed)
Cover Level (CL): 59.549 mAOD
Invert Level (IL): 57.056 mAOD (225 mm Ø)

Attenuation Basin
To attenuate flows up to 1:100 year storm + 45% CC

Base Level:	57.383 m
Top of Bank Level:	59.383 m
Freeboard:	300 mm
Temp maximum storage volume:	1003.09 m³

Proposed Finished Levels
The levels indicated on this plan are indicative (+/-500mm) and subject to change following detailed levels design.

Proposed Interception Drain
Interception drain located to rear of proposed gardens, along site boundary. Designed to intercept surface water runoff from adjacent land and prevent uncontrolled flows entering or leaving the development.

Proposed Filter Drain
Filter drain located to front of properties, parallel to the back of footway. Designed to collect surface water runoff from adjacent drives and roof areas. Surface water runoff is filtered through the surrounding granular stone and conveyed via perforated pipework to the proposed surface water drainage network.

Proposed Interception Drain
Interception drain located to rear of proposed gardens, along site boundary. Designed to intercept surface water runoff from adjacent land and prevent uncontrolled flows entering or leaving the development.

Foul Water Rising Main
The proposed foul water rising main will be routed through the site within the proposed road network and will discharge to proposed manhole F15. From this point, flows will continue via gravity to the existing Foul Water Manhole Ref. 8503, ultimately discharging to the existing combined sewer within Cumber Lane.

Rising Main Length: Approx. 320m
Termination Manhole: F15

Foul Water Pumping Station
Proposed foul water pumping station serving the southern catchment of the development. Flows shall be conveyed via a proposed rising main to manhole F15, before continuing by gravity through the foul water network to existing United Utilities manhole Ref. 8503 and the existing combined sewer within Cumber Lane.

Existing Culverted Watercourse
Culverted Watercourse.

Existing Culverted Watercourse
Culverted Watercourse.

SW02 Buried Under Grass

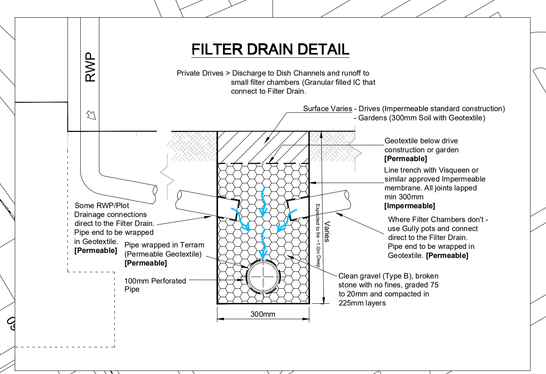
SW03 Buried under grass but exposed

SW04 Buried Under Grass. Line Comes in on T not bend so can not CCTV to outfall.

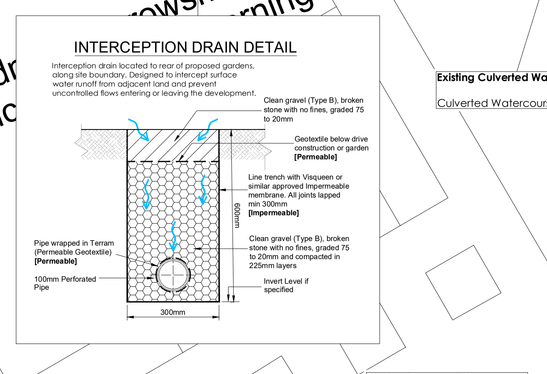
SW00 Buried Under Grass
CL:58.23m

Proposed Finished Levels
The levels indicated on this plan are indicative (+/-500mm) and subject to change following detailed levels design.

FILTER DRAIN DETAIL



INTERCEPTION DRAIN DETAIL



Legend

- Development boundary
- Proposed Adoptable Surface Water Sewer
- Highway Sewer & Manhole
- Highway Gully & Connection Pipe Work
- Proposed Adoptable Foul Water Sewer
- Proposed Adoptable Foul Water Rising Main
- Proposed Interception Drain
- Proposed Sewer Easement *(3m from Centre line)*
- Existing Public Foul Water Sewer
- Existing Public Surface Water Sewer
- Existing Public Combined Sewer
- Existing Ordinary Watercourse Culvert
- FFL 134.65 — Proposed Finished Floor Level
- +133.70 — Existing Boundary Ground Level
- +17.100 — Proposed Spot Level
- Proposed Earthwork Batter
- 4C — Underbuild - Measured from FFL to PGL
- 3C — Tanking - Measured from FFL to PGL
- FOE - 0.150m — Flag on Edge (up to 450mm)
- RET - 0.500m — Masonry Retaining Wall (over 450mm)

Notes

1. Planning layout ref.
Taylor Wimpey - 25053-VIM_2026-07-29
2. Topographical survey provided by 'Geographical Engineering Operations', ref 'G24104 Stoney Lane, Whiston Cross', Dated March 2024.
3. Road detail, levels and layout are subject to local authority section 38 Highways approval.

Notes

1. The use of any other flow control devices not associated with the Hydro International HydroBrake Optimum references provided may constitute a flood risk.
2. Drainage design and construction is in accordance with Design and Construction Guidance 2020 (DCG) and the requirements of the statutory undertaker.
3. Tolerances in pipe laying to be in accordance with Design and Construction Guidance 2020 (DCG).
4. For pipes 150-450mm dia. all rocker pipes to be in accordance with Design and Construction Guidance 2020 (DCG).
5. Engineering bricks shall not contain frogs or holes.
6. Brickwork to manholes to be English bond.
7. Where pipes are surrounded in concrete, flexibility is to be maintained at pipe joints by the use of a suitable compressible material eg. "FLexcell" or "Fibreboard".
8. All manhole covers and frames must comply with BS EN124, covers in roads to be grade D400 and be 150mm deep. manhole covers in car parking areas and drives to be grade B125, whilst landscaped areas may be grade A15.
9. Clayware pipes to be 65 extra strength quality "Hepseal" or similar approved.
10. Granolithic benching to manholes to be 40mm minimum thickness.
11. Precast concrete chamber rings to be reinforced.
12. The slope of benching in all cases should be 1 in 30.
13. Manholes shall not incorporate double square or double oblique channel junctions in their inverts.
14. All incoming pipes shall be surrounded with 150mm of concrete to the face of the collar of the first flexible joint and the outgoing pipe shall also be surrounded to within 50mm of the first flexible joint and a compressible filler used as a former between the concrete surround and downstream pipe collar.
15. All underground services to be confirmed by contractor prior to commencement on site, any discrepancies to be reported to engineer.
16. Private sewers not located in roads to be class F granular bed and surround as per standard details.
17. Sewers located under adopted roads to be class s granular bed and surround (more than 1.2m cover.)
18. Sewers located under private roads and car parking bays to be class f granular bed and surround as per standard details unless adopted, then provide class s (if more than 1.2m cover).
19. Private sewers with less than 0.6m of cover to be concrete surrounded as class Z on standard details.
20. Adopted sewers with less than 1.2m cover, provide class Z concrete bed and surround. concrete haunching may be suitable for large diameter storage sewers, guidance must be sought from adopting authority prior to use.
21. Road gullies to be pcc and trapped with 150mm ST4 concrete surround.
22. No deep or wide rooted trees to be planted within close proximity of the proposed and existing public sewer system.
23. Pipes less than 300mm dia. to be Polypipe UPVC unless otherwise stated.

NHBC Standards
Effective from 1st January 2025

IMPORTANT** - Invert levels at proposed points of connection are **to be confirmed prior** to any works commencing on site as onsite drainage and slab levels may be affected

P13 24.08.26	Minor amendment to notes	CP
P12 19.08.26	Updated with new layout and additional SUDs	CP
P11 26.03.26	Up-Fix filter indicated	CP
P10 23.03.26	Updated with additional notes & existing assets	CP
P09 19.01.26	Scale bar shown	TR
P08 05.12.25	Proposed discharge rate amended	CP
P07 05.12.25	Amended to suit new planning layout	NR
P06 15.10.25	Amended to suit layout dated: 09.10.25	TR NR
P05 02.10.25	Cellular storage removed & rising main shown	TR NR
P04 25.09.25	Amended to suit latest layout	TR NR
P03 11.04.25	Plots 13 and 14 FFL changed	NR
P02 07.04.25	Drainage strategy amended, pond removed, tank added, pipes downsized.	NR
P01 04.04.25	Preliminary issue for review	NR xx
Mark | Date	Details	By | Chk

Revision history

Drawing originator:

BETTS HYDRO CONSULTING ENGINEERS · BETTS ASSOCIATES CONSULTING ENGINEERS · BETTS GEO CONSULTING ENGINEERS

Client: Taylor Wimpey

Project title:

Glen Dimplex
Stoney Lane

Drawing title:

Preliminary Drainage Layout

Scale: 1:500 for the original size of A0

Drawn by: CP | Checked by: - | Passed by: - | Date: Apr 2025

Drawing status:

For Planning

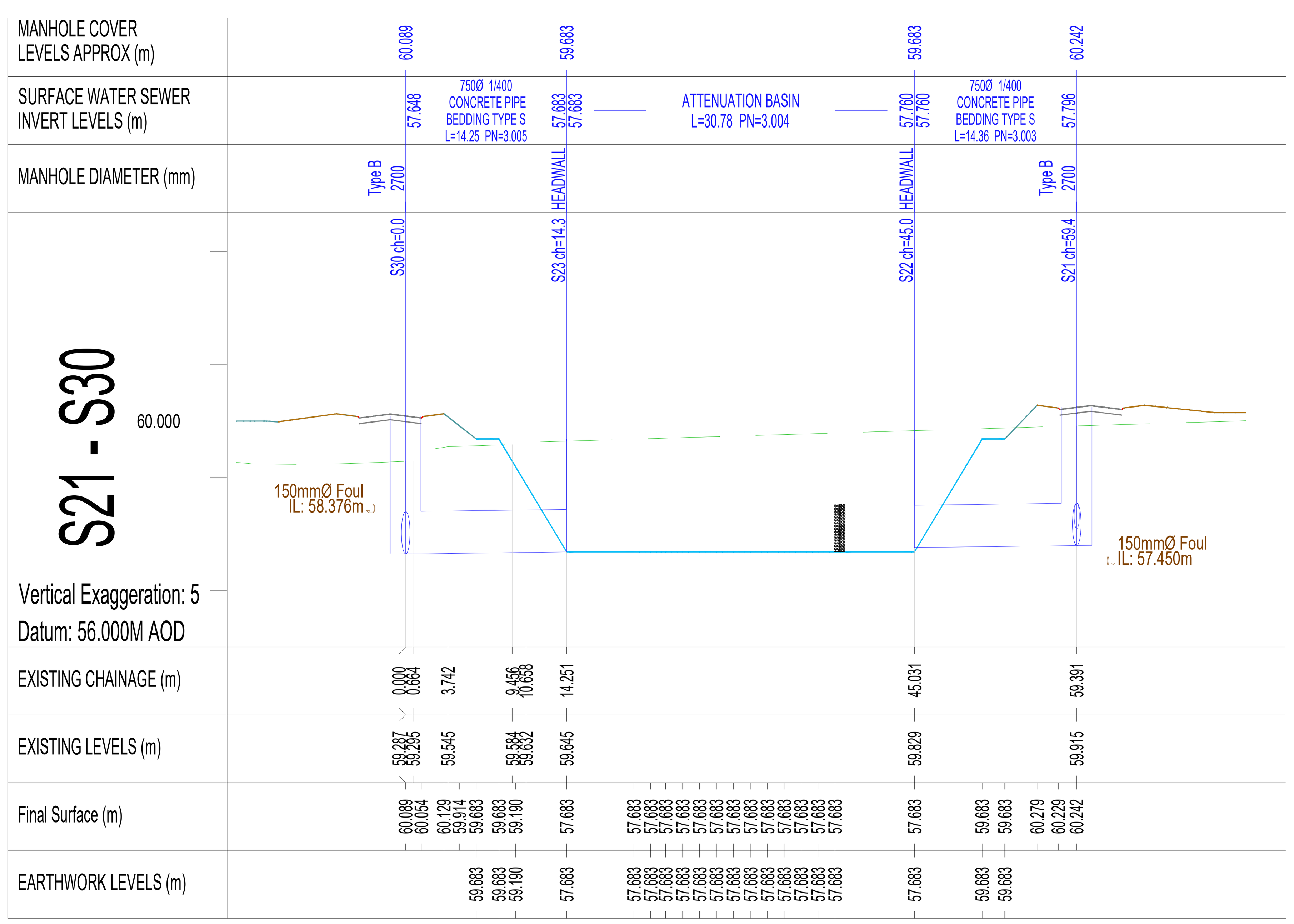
Job No:	Drawing No: Project	Origin	Volume	Level	Type	Discip	Number	Revision:
TAY143	GDX	BET	ZZ	XX	DR	C	0001	P13

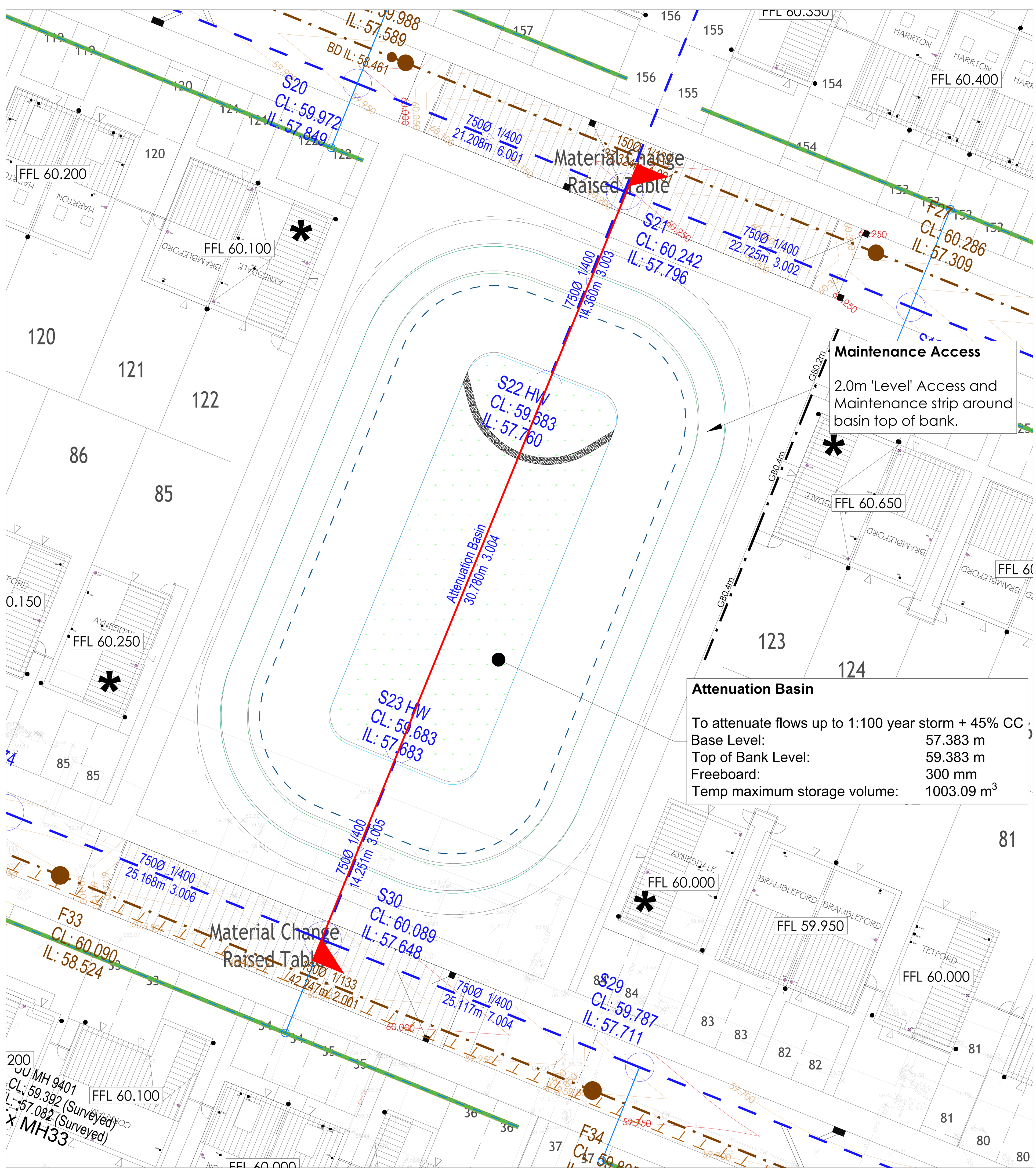
6-7 Old Hoarh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
enquiries@betts-associates.co.uk
Chester 01244 288178

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APPENDIX P: SUDS EXAMPLES

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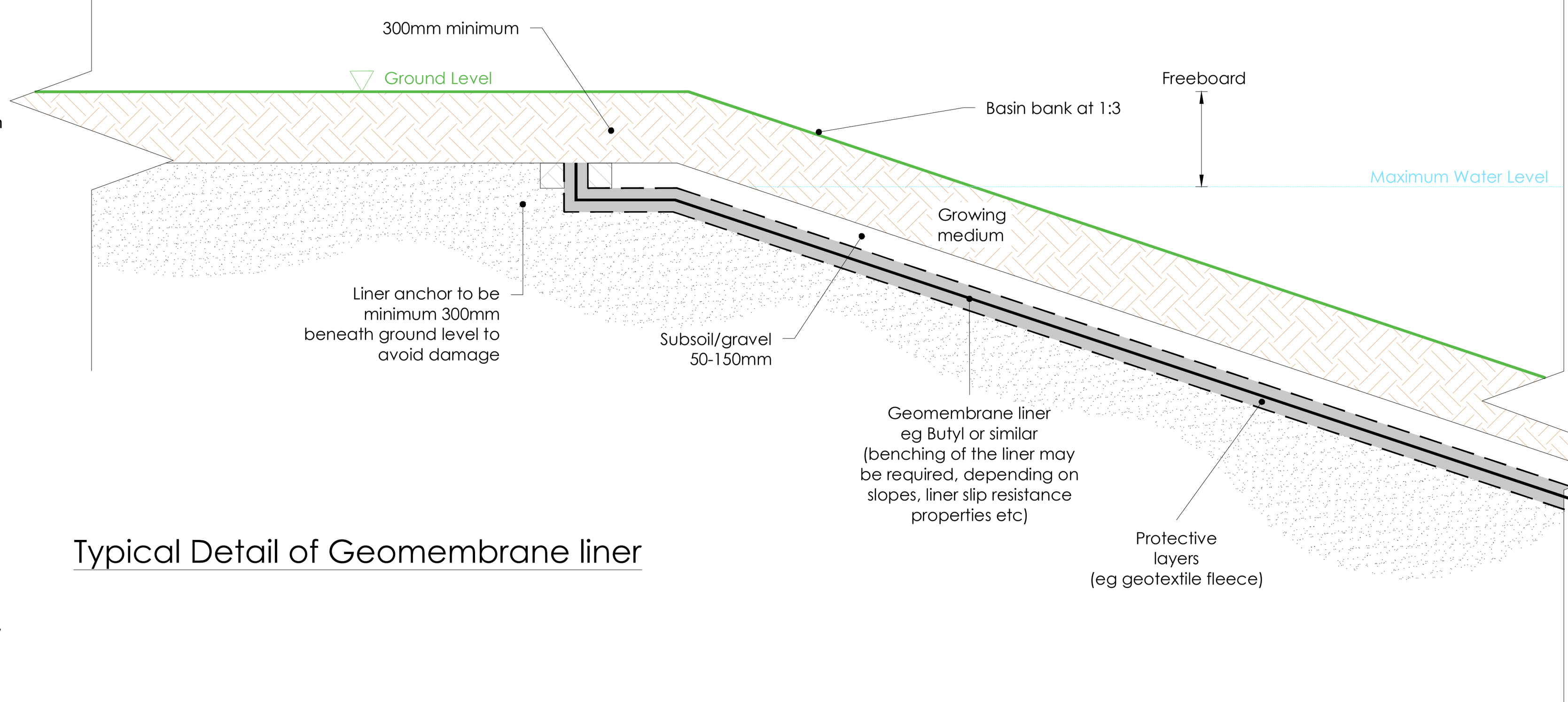
Notes:-

Specification for site won and site imported clay to be used as a pond liner:

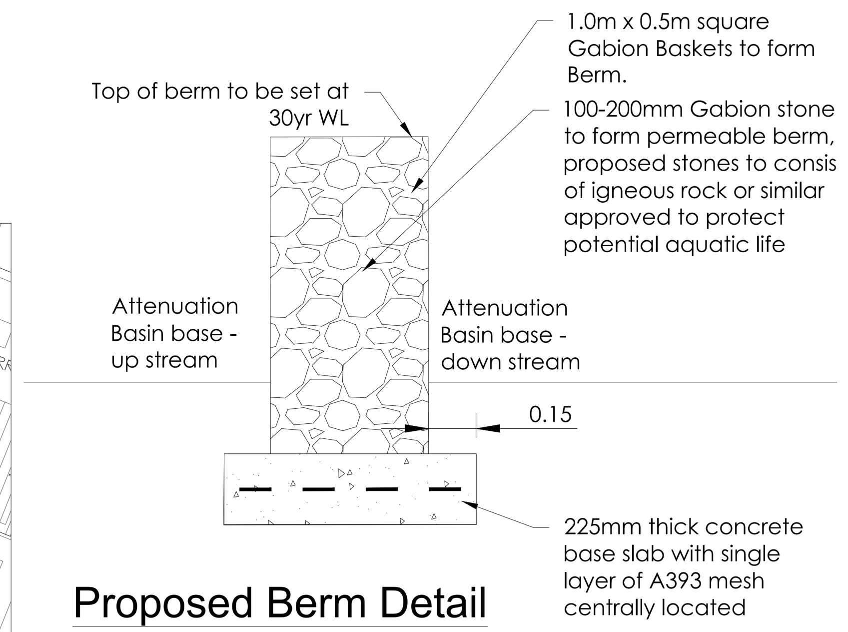
1. General
Material to be used as puddle clay shall be naturally occurring homogeneous plastic material. It shall be free from deleterious matter such as sand, stones and organic material. The use of lime-stabilised clays shall not be allowed.

2. Properties
a. More than 65% of the natural material shall be finer than 0.06mm and more than 40% shall be finer than 0.002mm.
b. The natural material shall be defined as firm clay in accordance with bs5930:1981 table 8 (cu 40-75 kpa).
c. The natural material shall be defined as clay of intermediate to extremely high plasticity in accordance with bs5930:1981, figure 31 and the liquid limit shall not be less than 35%.
d. The coefficient of permeability (k) of the remoulded material shall not be greater than 10 -9 m/s.
e. The remoulded material shall be defined as non-dispersible (nd1) in accordance with bs1377:part 5:1990, table 2.

3. Identification
An indication of a material's suitability may be obtained from the following empirical tests, at the moisture content agreed for placement.
a. Tenacity test
A 300mm long, 25mm diameter cylinder of clay is held vertically for 15 seconds so that at least 200mm is unsupported and in tension under its weight. If the cylinder breaks the Clay will be rejected as unsuitable.
b. Pinch test
A 75mm diameter ball of remoulded clay is squeezed into a 25mm thick flat disc. If any cracks appear the clay may be rejected as unsuitable.
c. Slaking test
A 50mm diameter ball of remoulded clay is placed in a 600ml beaker and covered with water if the ball disintegrates within 24 hours the clay may be rejected as unsuitable.
d. Permeability test
A sample of remoulded clay shall be formed into a tray to hold 20 litres of water and the loss measured after 24 hours. This shall be compared with the water loss from a metal tray of the same surface area holding the same quantity of water. If the difference is Greater than 1% the clay may be rejected.

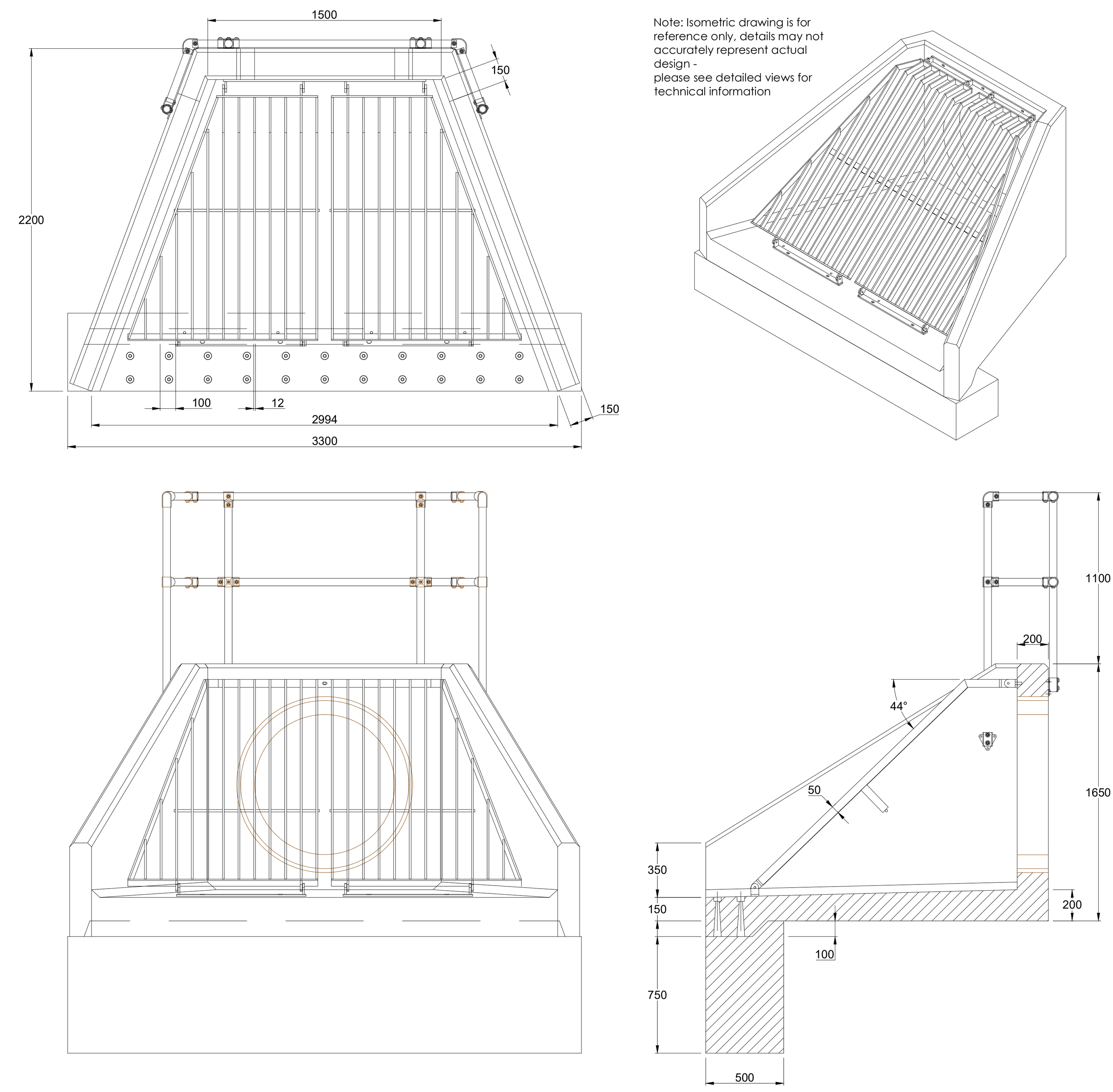


Typical Detail of Geomembrane liner

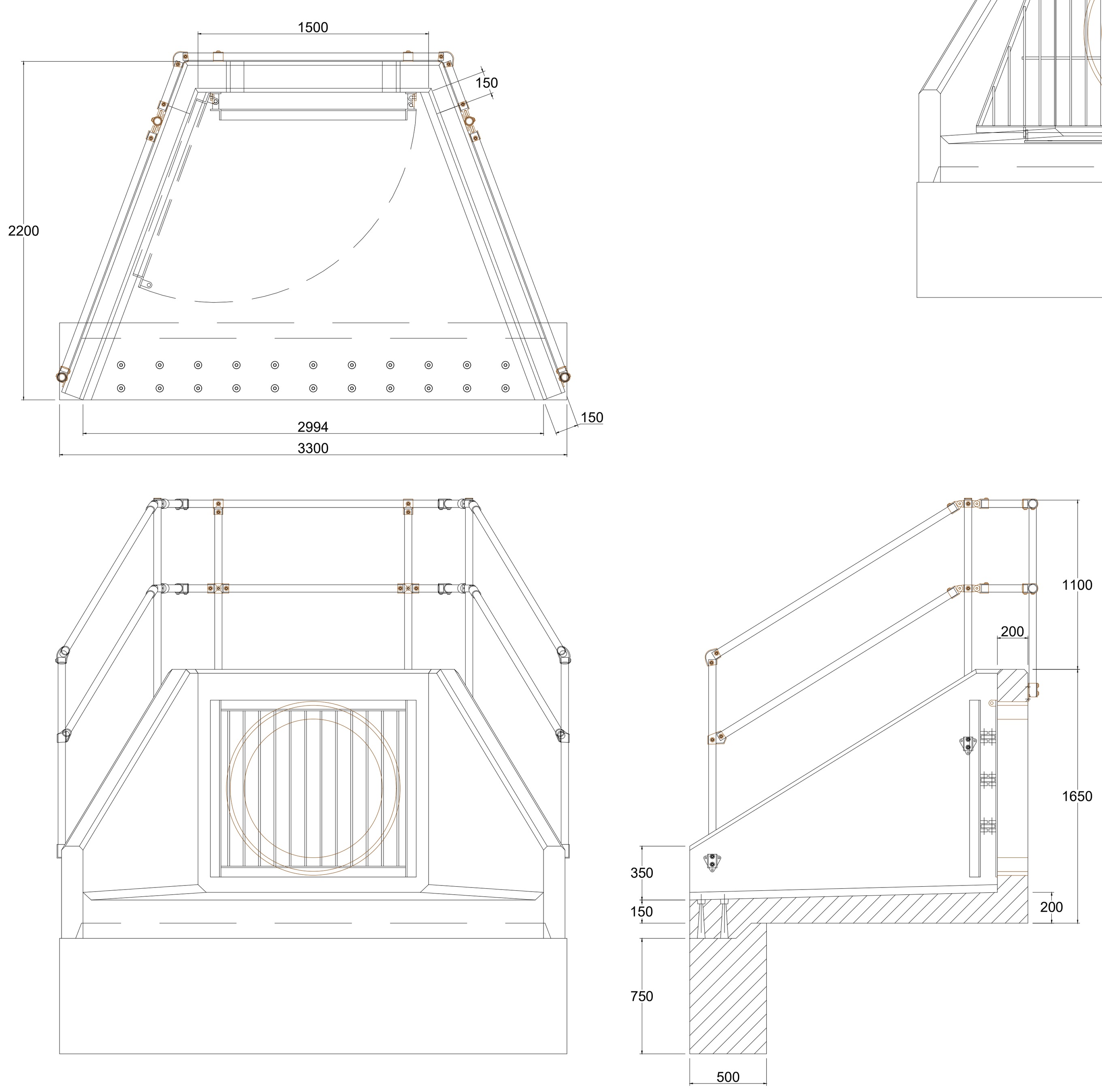


Proposed Berm Detail

SCALE N.T.S



SFA15B Headwall
750 x 500mm Toe
Backwall Kee Klamp
Cranked Grating



SFA15B Headwall
750 x 500mm Toe
3 Sided Kee Klamp
SFA1 900 Outfall Safety Grille

NOTE
DETAILS ON THIS DRAWING ARE SUBJECT TECHNICAL APPROVALS

NOTES

a. These 1:20 Manhole Construction Details are for construction purposes ONLY when approval has been obtained from the Statutory Undertaker.

b. The co-ordinates indicated on these 1:20 Manhole Construction Details relate to the proposed centre of the manhole and not to the pipe intersection; please refer to the Manhole Schedules should this information be required. Please note that the Manhole Schedules are for guidance and information purposes only and NOT to be used for pricing, ordering or construction.

c. Should any discrepancies be identified between the 1:20 Manholes Construction Details and the Manhole Schedules these should be reported to both the Developer's Engineer and Betts Associates prior to any construction taking place.

d. Should any discrepancies be identified between the Main Drainage Layout and the Domestic Drainage Layout these should be reported to both the Developer's Engineer and Betts Associates prior to any construction taking place.

e. All manholes and main drainage to be constructed in accordance with the Standard 'Design and Construction Guidance - Appendix C' details

f. All 1350mm Ø chamber rings to be 'Kitemarked'

g. Concrete surround is required to manhole chamber rings unless otherwise proved

h. All manhole lateral connections are to be made at soffit level to the main channel

i. All adoptable manholes to have a class D400 cover.

j. Ladders are to comply with Design and Construction Guide Clause E2.37.

k. Rocker pipes are required at all inlet and outlet pipes to adoptable manholes, for rocker pipe length's refer to DCG Table E13

Notes

1. Planning layout ref, Taylor Wimpey - 25053-VIM_2026-07-29

2. Topographical survey provided by 'Geographical Engineering Operations', ref 'G24104 Stoney Lane, Whiston Cross', Dated March 2024.

3. Road detail, levels and layout are subject to local authority section 38 Highways approval.

Mark	Date	Details	By	Chk
P01	20.08.26	First Issue to client		CP

Revision history

Drawing originator: BETTS HYDRO CONSULTING ENGINEERS / BETTS ASSOCIATES CONSULTING ENGINEERS / BETTS GEO CONSULTING ENGINEERS

Client: Taylor Wimpey

Project title: Former Glen Dimplex, Stoney Lane, Whiston

Drawing title: Attenuation Basin Detail

Scale: As Shown for the original size of A1

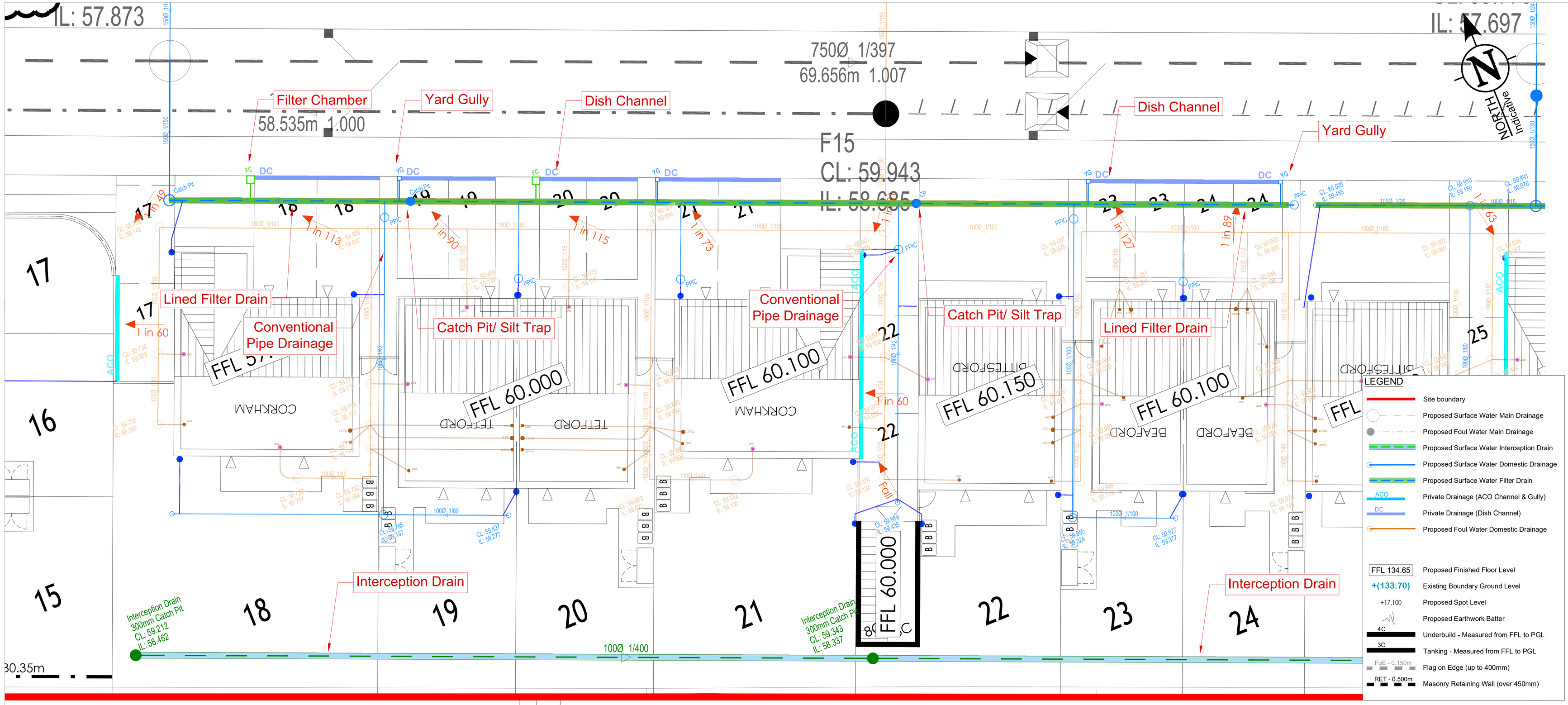
Drawn by: CP | Checked by: - | Passed by: RA | Date: June 26

Drawing status: For Planning

Job No:	Project	Origin.	Volume	Level	Type	Discip.	Number	Revision:
TAY143	XX	BET	XX	XX	XX	C	0010	P01

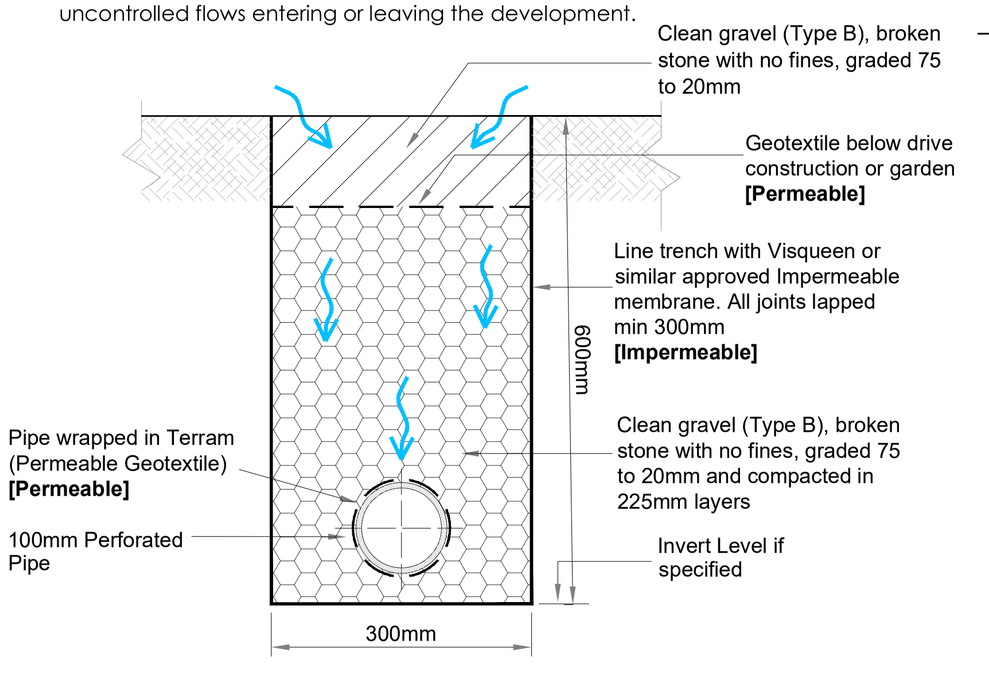
Do not scale this drawing

6 -7 Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
enquiries@betts-associates.co.uk
Chester 01244 288178



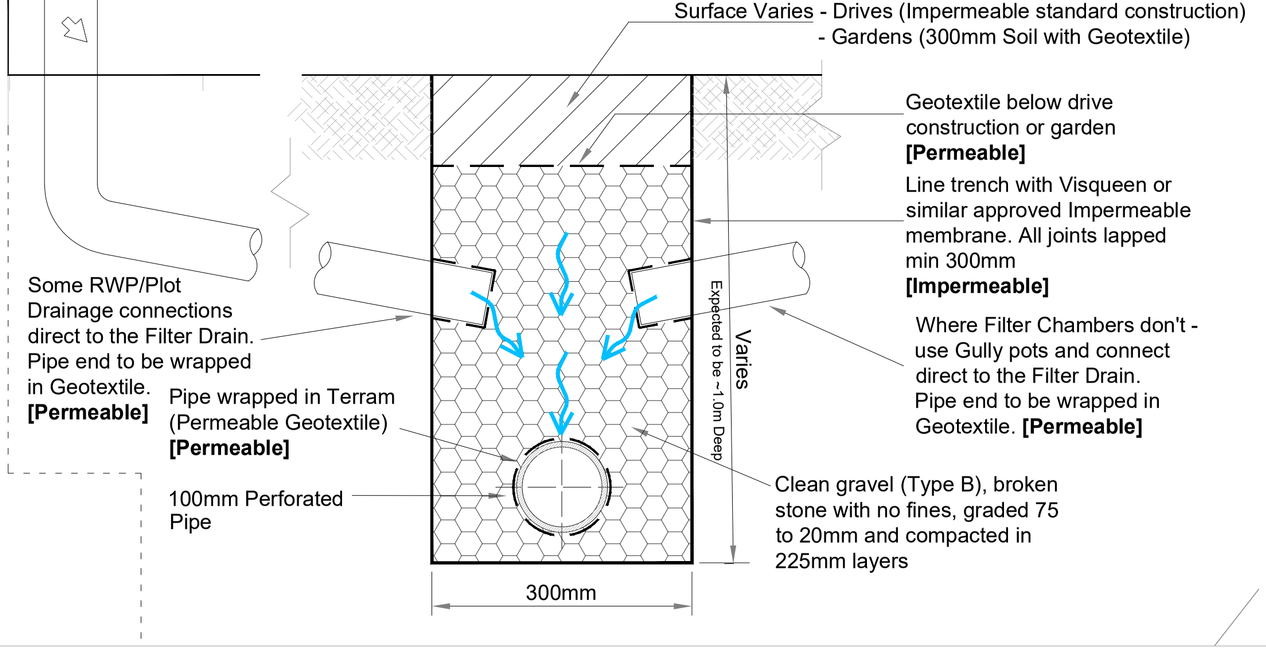
INTERCEPTION DRAIN DETAIL

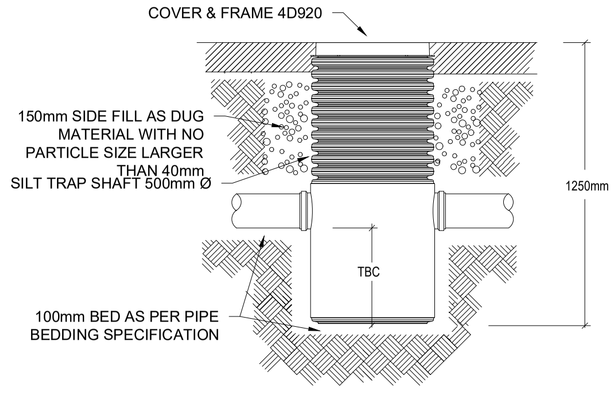
Interception drain located to rear of proposed gardens, along site boundary. Designed to intercept surface water runoff from adjacent land and prevent uncontrolled flows entering or leaving the development.



RWP

Private Drives > Discharge to Dish Channels and runoff to small filter chambers (Granular filled IC that connect to Filter Drain.





PPIC SILT TRP CHAMBER (NON TRAFFICKED AREAS)
Scale 1:20

Mark	Date	Details	By	Chk
P01	20.08.26	Preliminary issue for review	CP	RDN

Revision history

Drawing originator:

BETTS HYDRO CONSULTING ENGINEERS
BETTS ASSOCIATES CONSULTING ENGINEERS
BETTS GEO CONSULTING ENGINEERS

Client: Taylor Wimpey

Project title:

Former Glen Dimplex,
Stoney Lane, Whiston

Drawing title:

Proposed Lined Filter Drain Detail

Scale: for the original size of A1

Drawn by: CP | Checked by: - | Passed by: | Date: Aug 26

Drawing status:

For Information

Job No:	Drawing No: Project	Origin.	Volume	Level	Type	Discip.	Number	Revision:
TAY143	xx	BET	xx	xx	xx	C	0011	P01

Do not scale this drawing

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APPENDIX Q: NOTES OF LIMITATIONS

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns, and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information.

This report was prepared by Betts Hydro Ltd for the sole and exclusive use of the titled client in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

This document has been prepared for the titled project only and should any third party wish to use or rely upon the contents of the report, written approval from Betts Hydro Ltd must be sought.

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