BETTS HYDRO
CONSULTING ENGINEERS

FORMER GLEN DIMPLEX
STONEY LANE
WHISTON

DRAINAGE MANAGEMENT STRATEGY

For

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DECEMBER 2025

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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 204no. residential dwellings, on land located at the Former Glen Dimplex, Stoney Lane, Whiston site. This assessment has been completed in accordance with 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 (SuDS).

There are three methods that have been reviewed for the management and discharge of surface water, these may be applied individually or collectively and should be applied in the order of priority 1. Discharge via infiltration, 2. Discharge to watercourse and 3. Discharge to public sewer. Based on the online datasets and the cohesive underlying strata of the site, the use of an infiltration-based solution is not likely to offer a suitable surface water management option for the development proposals.

The nearest watercourse to the site is an un-named watercourse which is located beneath the site at present, it is understood that most run-off generated by the site at present would drain toward the existing Ordinary Watercourse located onsite, with the remainder discharging into the public sewer network.

Should infiltration not offer a full practical solution at the site; the proposals are to mimic the existing regime and discharge most of the site post-development via the un-named culverted watercourse crossing the site. It is noted that a small section of the site cannot drain to the culverted watercourse under gravity, and therefore there will be a requirement for this small part of the site to drain directly to the public sewer network.

A below ground pipe network will be used for conveyance, supplemented above by above-ground attenuation within the basin shown on the planning layout. Permeable surfaces are recommended throughout the site where feasible, lined and connected to the main drainage system for the redevelopment. These measures will still manage the first 5mm of rainfall at source, in accordance with the SuDS Manual (CIRIA 753).

In accordance with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015) 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 42.4l/s (based on 7.5l/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 will 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 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 appropriate in accordance with the National Standards for SuDS.

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CONTENTS

Document Tracking Sheet iii
EXECUTIVE SUMMARY v
CONTENTS vii
Figures & Tables vii
Specialist Software viii
Abbreviations & Acronyms ix
1.0 INTRODUCTION 11
1.1 Planning Policy Context 11
1.2 Site Context 11
1.3 Consultation 11
2.0 EXISTING SITE LOCATION 12
2.1 Location 12
2.2 Existing and Historical Land Use 12
2.3 Topography 13
3.0 DEVELOPMENT PROPOSALS 14
3.1 Nature of the Development 14
4.0 SURFACE WATER MANAGEMENT 15
4.1 Pre-Development Surface Water Run-off 15
4.2 Post Development Surface Water Run-Off 15
4.3 Sustainable Drainage Systems (SuDS) 16
4.4 Methods of Surface Water Management 17
4.5 Discharge via Infiltration 18
4.6 Discharge to Watercourse/Waterbody 18
Proposed Discharge Rates 20
4.7 Discharge to the Public Sewer Network 20
4.8 Climate Change 20
5.0 FOUL WATER MANAGEMENT 22
6.0 SUMMARY AND CONCLUSIONS 23
7.0 RECOMMENDATIONS 25
BIBLIOGRAPHY & REFERENCES 26
Web-based References 26

Figures & Tables

Figure 1: Existing Features Plan (Google Maps, 2025) 12
Figure 2: Appraisal Site Layout (Banners Gate, 2025) 14
Table 1: Pre-Development Surface Water Run-Off Rates (Betts Hydro, 2025) 15

Table 2: Post-Development Un-Restricted Run-Off Rates (Betts Hydro, 2025) 16

Figure 3: SuDS Photographs (SusDrain, 2012) 17

Figure 4: Preliminary Drainage Plan – (Betts Associates, 2025) 19

Table 4: Change to Peak Rainfall Compared to Baseline (Environment Agency, 2025) 21

APPENDIX A: NPPF + PPG EXTRACTS .....

APPENDIX B: EA INFORMATION & CORRESPONDENCE .....

APPENDIX C: UU CORRESPONDENCE.....

APPENDIX D: LPA/LLFA CORRESPONDENCE .....

APPENDIX E: LOCATION PLAN .....

APPENDIX F: TOPOGRAPHIC SURVEY .....

APPENDIX G: SKETCH LAYOUT .....

APPENDIX H: CULVERT INVESTIGATIONS.....

APPENDIX I: SURFACE WATER RUN-OFF CALCULATIONS .....

APPENDIX J: PRELIMINARY DRAINAGE STRATEGY .....

APPENDIX K: DRAINAGE NETWORK DETAILS.....

APPENDIX L: SUDS EXAMPLES .....

APPENDIX M: NOTES OF LIMITATIONS .....

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 SuDS.

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.

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.

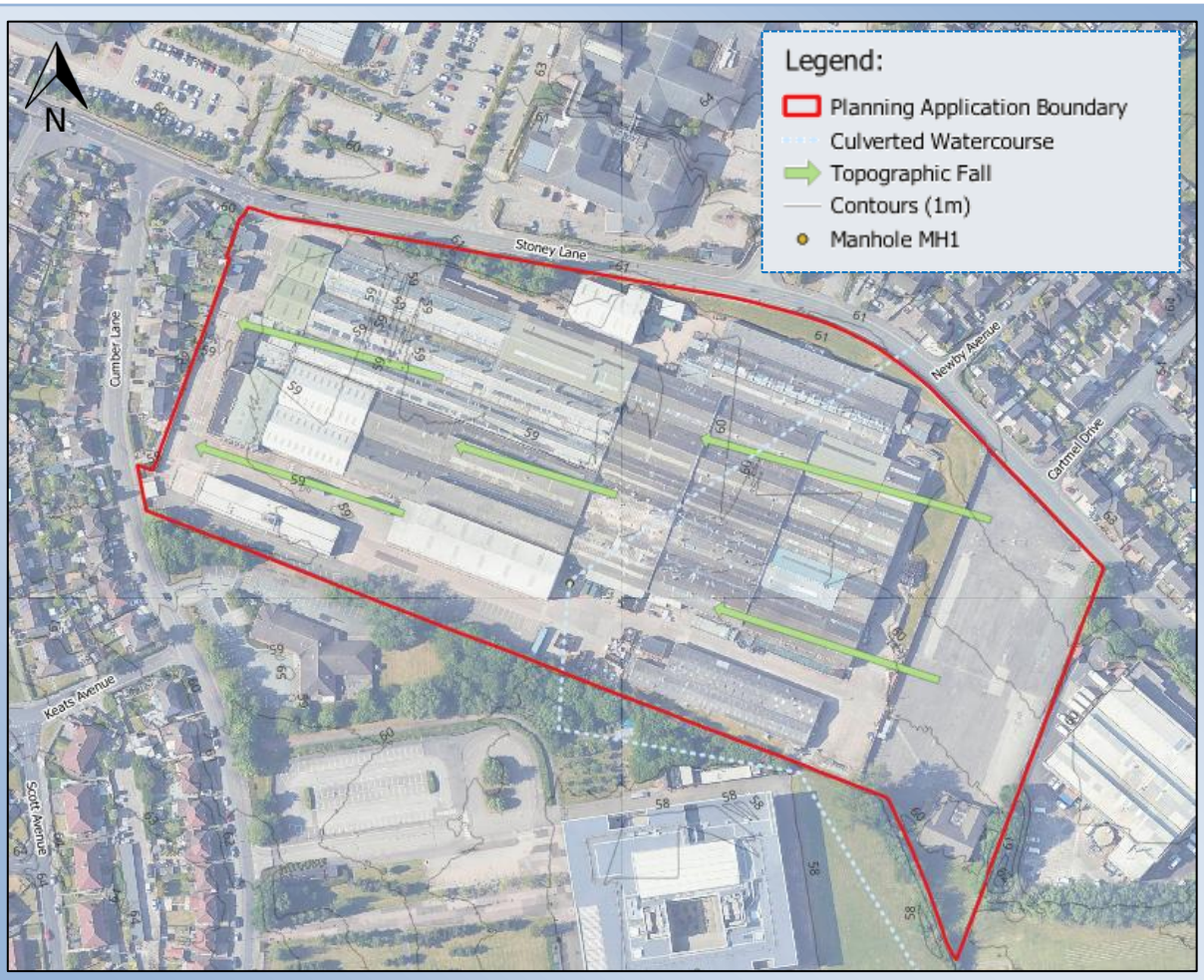

Figure 1: Existing Features Plan (Google Maps, 2025)

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 Appraisal Site Layout is included in **Figure 2** (see full plan in **Appendix H**).

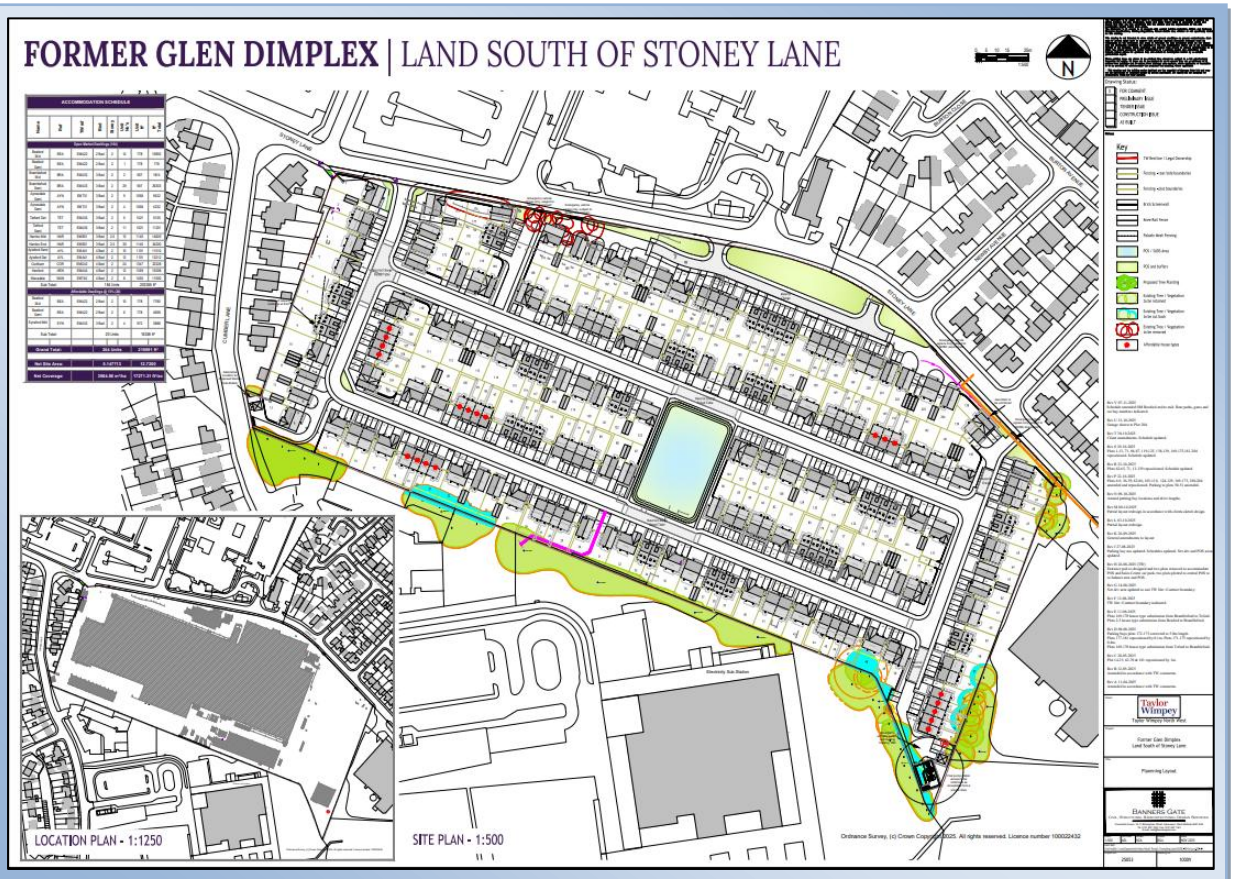

Figure 2: Appraisal Site Layout (Banners Gate, 2025)

3.1.2 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.

3.1.5 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

4.1 Pre-Development Surface Water Run-off

4.1.1 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.

4.1.2 Given the site is already developed for commercial use, it is understood that there is an existing drainage regime currently serving the site. The drainage systems are understood to ultimately discharge into Cumber Lane. In addition, surface water is expected to currently outfall via manholes within the site curtilage into the existing culverted watercourse.

4.1.3 Irrespective of the sites current uses, in accordance with national and local policy, the requirement is therefore to restrict the site to the greenfield run-off rates. Therefore, for the purpose of this assessment we have assumed the site as 100% permeable for the purpose of calculating the pre-development and post-development surface water run-off rates.

4.1.4 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. The full calculations in **Appendix H** are based on an area of 1ha and these rates and volumes are calculated pro-rata for the proposed development area of 5.648ha.

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	88.7/s	42.4l/s	639.6cu.m	1632.7cu.m

Table 1: Pre-Development Surface Water Run-Off Rates (Betts Hydro, 2025)

4.2 Post Development Surface Water Run-Off

4.2.1 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**.

4.2.2 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, 2025)

4.2.3 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.

4.2.4 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 section 4.6 subsequently.

4.3 Sustainable Drainage Systems (SuDS)

4.3.1 In accordance with national and local planning policy, including the National Standards for SuDS (July 2025) and the SuDS Manual (CIRIA 753), peak surface water discharge rates from new development should be appropriately managed and where possible reduced. To manage surface water run-off policy shows that preference should always be given to Sustainable Drainage Systems (SuDS) over the traditional methods wherever possible and practical.

4.3.2 SuDS can (if designed and situated appropriately) address the four key sustainability objectives embedded in planning policy including providing space for water (water quantity), improving water quality and biodiversity, along with providing valuable amenity/recreational space within new development sites. These benefits of SuDS depend on the type of features being proposed; some typical examples relevant to this nature of development are illustrated in **Figure 3**.

Figure 3: SuDS Photographs (SusDrain, 2012)

4.3.3 Opportunities should also be taken to provide soft landscaping where at all possible on site to assist in minimising surface water run-off. It would be recommended that permeable surfacing and bio-filtration (tree pits) be considered where at all feasible (these would need to consider suitable water quality measures where the site coincides with a sensitive underling groundwater source). If infiltration is not feasible then a connection into the main drainage systems is needed, but the presence of the permeable surfaces will allow the first 5mm of rainfall to be dealt with at source as identified in the SuDS Manual (CIRIA 753).

4.3.4 Promoting SuDS to deal with surface water at the source, will limit the required attenuation and in turn reduce the volume of surface water in the nearby watercourse and sewer infrastructure. It is recommended that permeable surfacing and bio-filtration are included where practical, to provide opportunity for natural uptake, but also added benefits to the water quality. There may also be scope to incorporate rainwater collection butts and/or rain garden style raised planters also (as illustrated in **Figure 3**) to provide added water quality, amenity, and biodiversity benefits.

4.3.5 In terms of stormwater storage this will be both above ground within an attenuation basin (detention) and below ground in oversized pipes. In terms of conveyance this will be provided via the below ground pipe network. If designed appropriately, SuDS features such as those proposed can aid with attenuation and provide added benefits in terms of water quality, biodiversity, and amenity value. Detailed design should confirm suitability for incorporation of SuDS following more detailed analysis of levels, ground conditions and attenuation.

4.4 Methods of Surface Water Management

4.4.1 In accordance with PPG – Flood Risk and Coastal Change para.056, surface water runoff should be disposed of according to the following hierarchy. There are three methods that have been reviewed for the management and discharge of surface water. These may be applied individually or collectively to form a complete strategy and should be applied in the order of priority listed below:

- Discharge via infiltration
- Discharge to watercourse
- Discharge to the public sewerage system

4.5 Discharge via Infiltration

4.5.1 Any impermeable areas that can drain to soakaway or an alternative method of infiltration would significantly improve the sustainability of any new surface water systems. The published online datasets have been reviewed to consider how favourable the underlying strata is to support a potential infiltration-based solution at the site.

4.5.2 The Cranfield Soil and AgriFood Institute (CSAI), Soilscapes viewer identifies the soils to be 'slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. The British Geology Survey (BGS) mapping data indicates that the bedrock geology consists of Kinnerton Sandstone Formation – Sandstone for approximately 80% of the site, with the east of the site consisting of Chester Formation - sandstone, pebbly (gravelly). The superficial deposits comprise of Devensian Till (diamicton).

4.5.3 The Standard Percentage Run-off (SPR) of 0.387 suggests medium permeability (0.1 is very high and 0.5 is very low). Based on the ground conditions identified by the published datasets, infiltration is unlikely to offer a fully viable drainage management solution for the wider proposals. This could offer a partial option for the site to provide water quality improvements to the proposed surface water drainage solution. To confirm whether infiltration rates at the site would promote the use of permeable surfacing and other infiltration solutions, it is recommended that Soakaway Testing (to BRE365) is undertaken at an early stage.

4.5.4 It is still recommended that permeable surfaces are utilised in external areas where an engineerable solution can be achieved, even if a full infiltration solution is not viable. The permeable surfaces themselves will be lined with a connection to the proposed main drainage serving the new development. The presence of the permeable surfaces will still allow the first 5mm of rainfall to be dealt with at source as identified in the SuDS Manual (CIRIA 753).

4.6 Discharge to Watercourse/Waterbody

4.6.1 As infiltration is unlikely to provide a full drainage solution, due to the cohesive nature of the underlying ground conditions; this assessment has considered the alternative drainage options in accordance with the sustainable drainage hierarchy. The next method is to discharge surface water run-off to a nearby watercourse/waterbody.

4.6.2 The online mapping shows there to be an unnamed Ordinary Watercourse which runs beneath the site within a culvert, running from north to south. The Ordinary Watercourse leaves via the southern boundary and is diverted around the adjacent St Edmunds Arrowsmith School to the south, before discharging into Whiston Brook.

4.6.3 It is understood that at present the development onsite drains surface water to the culverted Ordinary Watercourse crossing the site. The client has undertaken an investigation of the culverted watercourse across the site and towards the outfall (refer to **Appendix I**), to establish connectivity and capacity.

4.6.4 Should infiltration not offer a full practical solution at the site; the proposals are to mimic the existing regime and discharge the majority of the site post-development to the un-named culverted watercourse. 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) for works to the Ordinary Watercourse and any Riparian Owners for access to do such.

4.6.5 It is recommended to utilise permeable surfaces where practical, despite the poor underlying ground conditions identified thus far. The permeable surfaces themselves will be lined with a connection to the proposed main drainage serving the site redevelopment. These features will still allow the first 5mm of rainfall to be dealt with at source as identified in the SuDS Manual (CIRIA 753).

4.6.6 A Preliminary Drainage Plan has been prepared by Betts Associates to demonstrate the feasibility proposals, as illustrated in **Figures 4** (see **Appendix J**). This has demonstrated that a site wide gravity solution is not fully achievable. It is noted that a small section of the site will not be able to drain to the culverted watercourse under gravity, therefore this small section will form a new connection to the public sewer network (subject to the relevant consents form United Utilities).

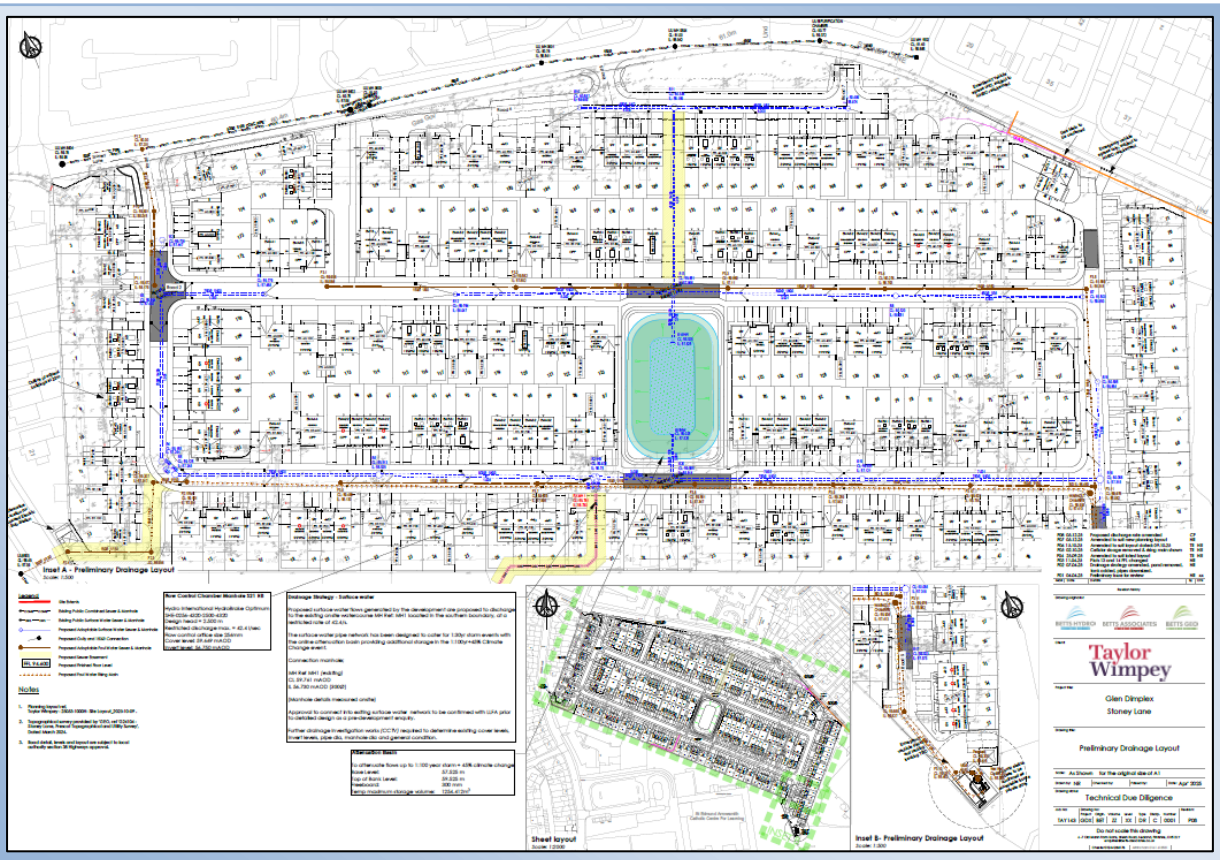

Figure 4: Preliminary Drainage Plan – (Betts Associates, 2025)
** This drawing is not a drainage 'design' it is a preliminary drainage plan."*

Proposed Discharge Rates

4.6.7 In accordance with the SuDS Manual (CIRIA) and the National Standards for SuDS (July 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.

4.6.8 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**).

4.6.9 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. Required onsite attenuation will be provided via an attenuation basin and vias underground oversized pipes. A below ground pipe network (900mm dia.) will be utilised for conveyance. The specific means are to be determined during the detailed design stage.)

4.7 Discharge to the Public Sewer Network

4.7.1 UU sewer records have identified public surface water compatible sewers located adjacent to Cumber Lane. Should infiltration not offer a full practical solution at the site; the proposals are to mimic the existing regime and discharge most of the site post-development via the un-named culverted watercourse.

4.7.2 It is noted that a small section of the site cannot drain to the culverted watercourse under gravity, therefore it is proposed that a new connection to serve this small area of site is made to the adjacent sewer network.

4.8 Climate Change

4.8.1 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.

4.8.2 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.

4.8.3 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.

4.8.4 In accordance with the Lower Mersey Management Catchment peak rainfall allowances, the upper end allowance (**Table 4**) 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 4: Change to Peak Rainfall Compared to Baseline (Environment Agency, 2025)

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 **Figure 3** previously).

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.** It is recommended that further investigation of the existing drainage systems onsite is undertaken in due course, to determine the specific capacity within any existing connections and confirm whether maintenance is required prior to serving the development proposals.

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 Sewers for Adoption.

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. Detailed design will need to confirm this in due course

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 The key focus of this assessment is on the sustainable management of surface water run-off to ensure no increased flood risk results from the development proposals. The surface water run-off management options have been assessed in accordance with the sustainable drainage hierarchy.

6.2 Based on the online datasets and the cohesive underlying strata of the site, the use of an infiltration-based solution is not likely to offer a suitable surface water management option for the development proposals. Given the site is already developed for commercial use, it is understood that there is an existing drainage regime currently serving the site. The drainage systems are understood to ultimately discharge into Cumber Lane. In addition, surface water is expected to currently outfall via manholes within the site curtilage into the existing culverted watercourse.

6.3 UU sewer records have identified public surface water compatible sewers located adjacent to Cumber Lane. Should infiltration not offer a full practical solution at the site; the proposals are to mimic the existing regime and discharge most of the site post-development via the un-named culverted watercourse. It is noted that a small section of the site cannot drain to the culverted watercourse under gravity, therefore it is also pertinent that it is proposed to discharge to the public sewer network.

6.4 The drainage proposed to serve this development will likely be a combination of below ground pipe network for conveyance, an attenuation basin, and underground oversized pipes, catering for the onsite stormwater attenuation requirements. It is recommended to utilise permeable surfaces where practical. These features will still allow the first 5mm of rainfall to be dealt with at source as identified in the SuDS Manual (CIRIA 753). The proposal would be to line these features and have connections from them into the proposed main drainage systems serving the new development if infiltration rates are not suitable.

6.5 In accordance with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015) all sites should endeavour to achieve as close to pre-development greenfield rates as is viable. This is pertinent for areas located within Critical Drainage Area (CDA). 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.

6.6 The surface water scheme for this will 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 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. Detailed design will need to confirm this in due course

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 The LLFA may require a 4-6m offset to be maintained from the top of bank of the onsite Culverted Watercourse. It is recommended that this watercourse is retained where at all possible post-development, and where required maintenance is undertaken to ensure these are suitable for continued use post-development. Based on the planning layout, a 6m offset is not currently maintained post-development.

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 a 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 because of the proposals. Safe avenues directing overland flow away from any existing/proposed buildings is advised.

7.4 To minimise the flood risk to the 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 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 100yr return period storm event with a 45% allowance for climate change being contained onsite.

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.

7.7 If an extreme rainfall event exceeds the design criteria for the drainage system it is likely that there will be some overland flows that are unable to enter the system, it is important that these potential overland flows are catered for within the proposed development site if the capacity of the drainage system is exceeded.

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Cranfield University – http://www.landis.org.uk/soilscapes/
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FloodProBE – http://www.floodprobe.eu/
Flood Forum – http://www.floodforum.org.uk/
Google Maps – http://maps.google.co.uk/
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Streetmap – http://www.streetmap.co.uk/
United Utilities – https://www.unitedutilities.com/

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;

---

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.

APPENDIX B: EA INFORMATION & CORRESPONDENCE

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Liam Davies

From: Liam Davies
Sent: 24 October 2025 10:13
To: inforequests.gmmc@environment-agency.gov.uk
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 BA MSc
Graduate Flood Risk Analyst

BETTS HYDRO
Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

liamdavies@betts-associates.co.uk
www.betts-associates.co.uk

CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

Liam Davies

From: Greater Manchester, Merseyside and Cheshire Enquiries <inforequests.gmmc@environment-agency.gov.uk>
Sent: 31 October 2025 08:05
To: Liam Davies
Subject: Request for information - Ref: EIR2025/37531 [Filed 31 Oct 2025 08:23]
Attachments: MRC2GJC18N48.pdf

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:	Get flood risk information for planning <get.flood.risk.information.for.planning@notifications.service.gov.uk>
Sent:	24 October 2025 10:10
To:	Liam Davies
Subject:	Confirmation of request for flood risk data. Your reference number MRC2GJC18N48 [Filed 24 Oct 2025 10:10]
Categories:	Filed by Mail Manager

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

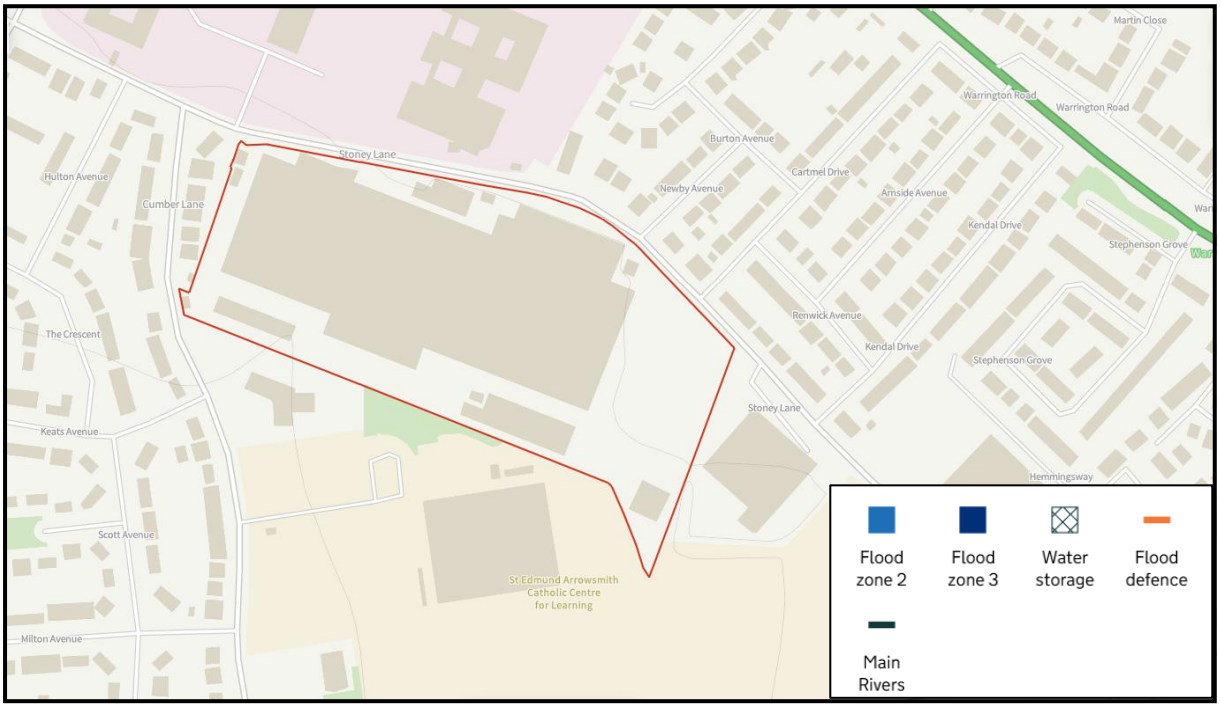
inforequests.gmmc@environment-agency.gov.uk. Make sure you include your reference number.

Regards,

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

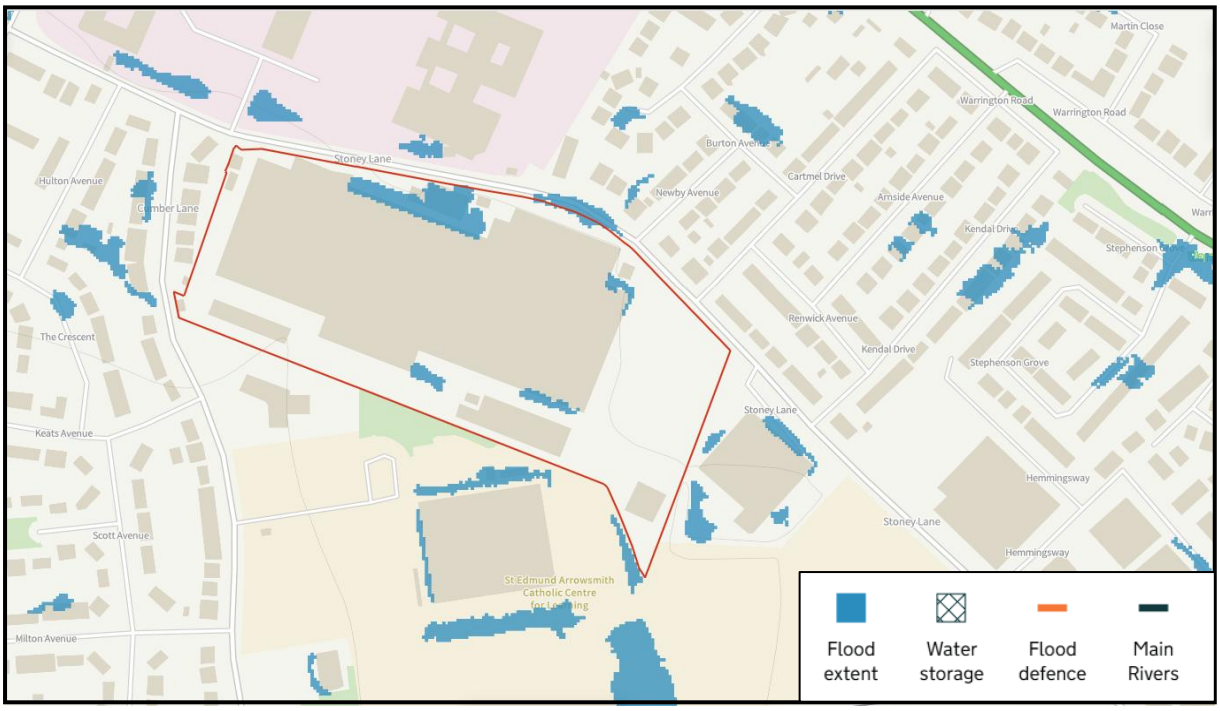
FLOOD MAP FOR PLANNING

Flood Zones – Present Day

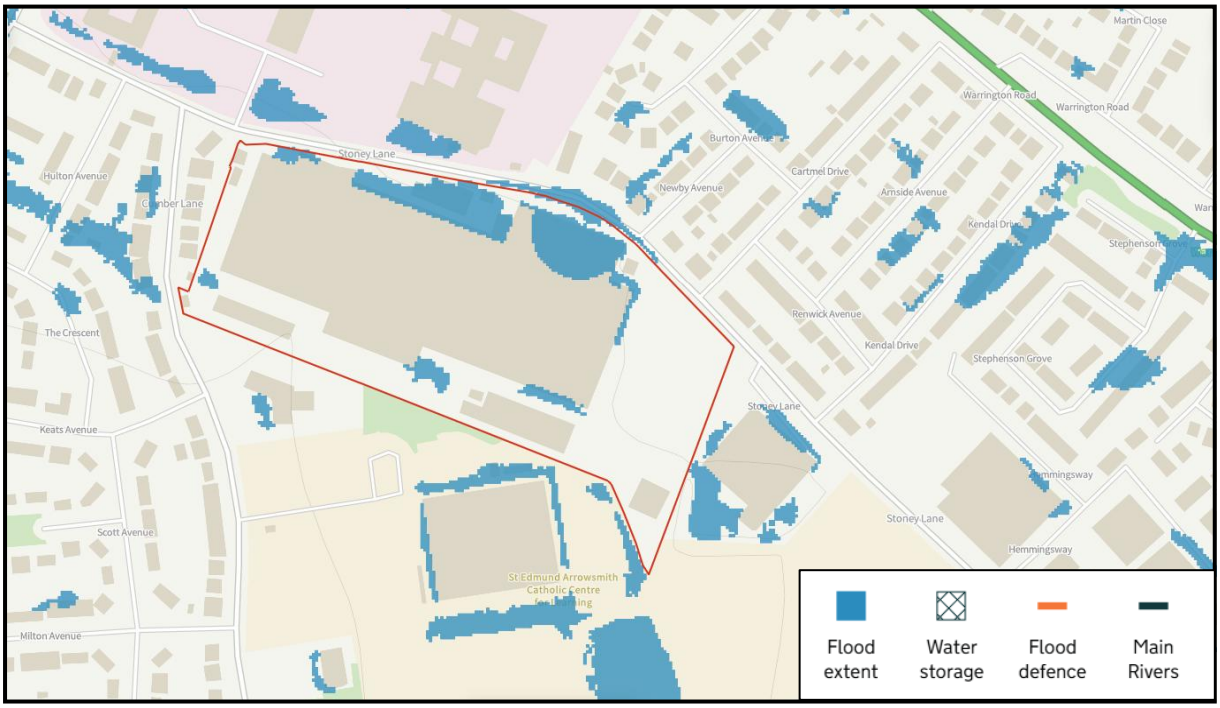


Flood Zones – Future

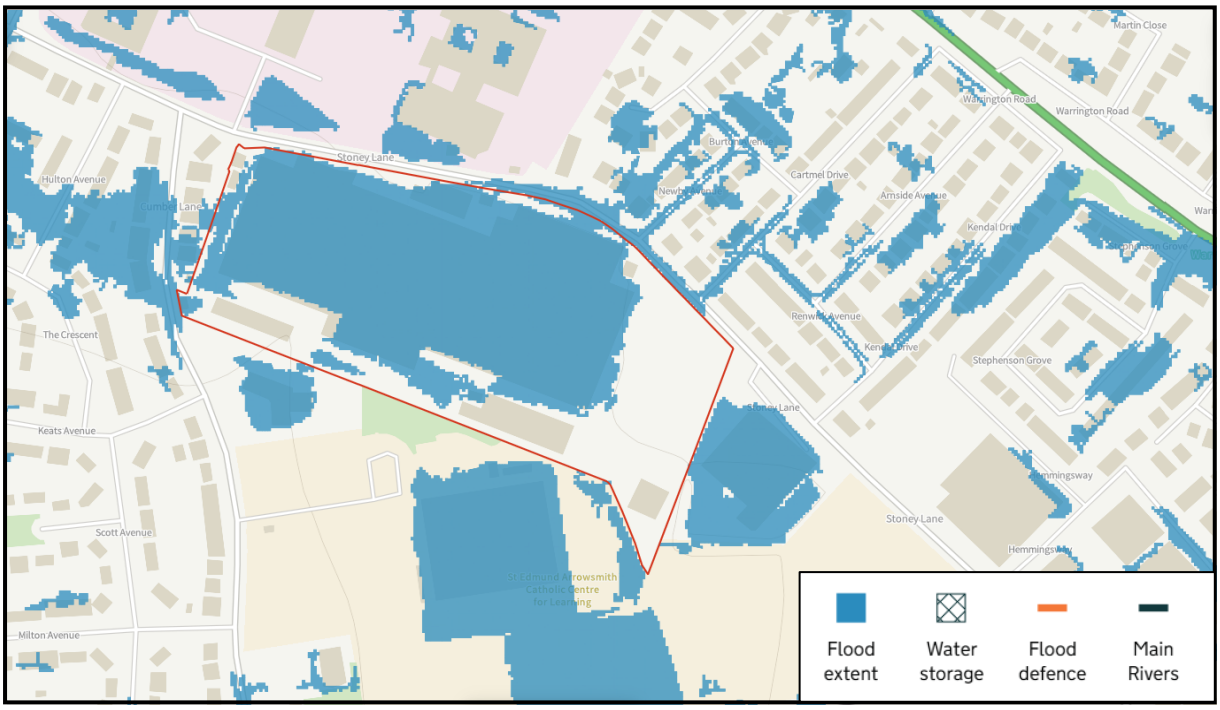
Surface Water Annual Likelihood of Flooding – 1 in 30yr



Surface Water Annual Likelihood of Flooding – 1 in 100yr



Surface Water Annual Likelihood of Flooding – 1 in 1000yr

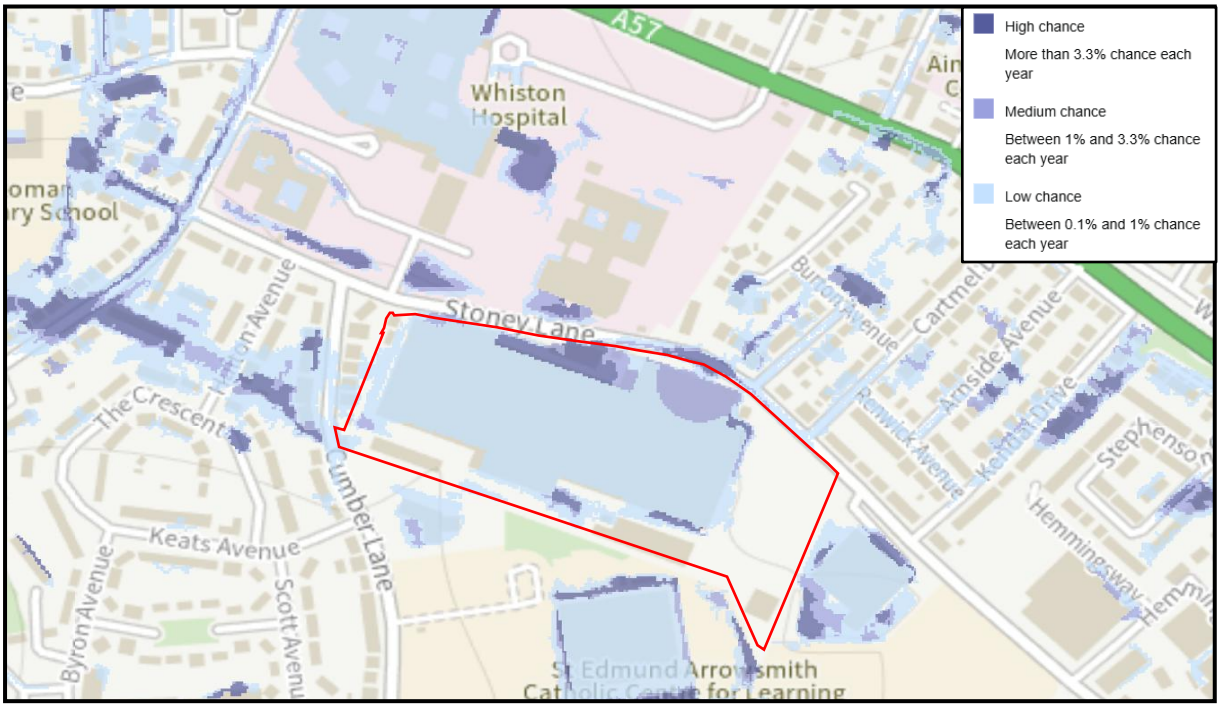


LONG TERM RISK OF FLOODING MAPPING

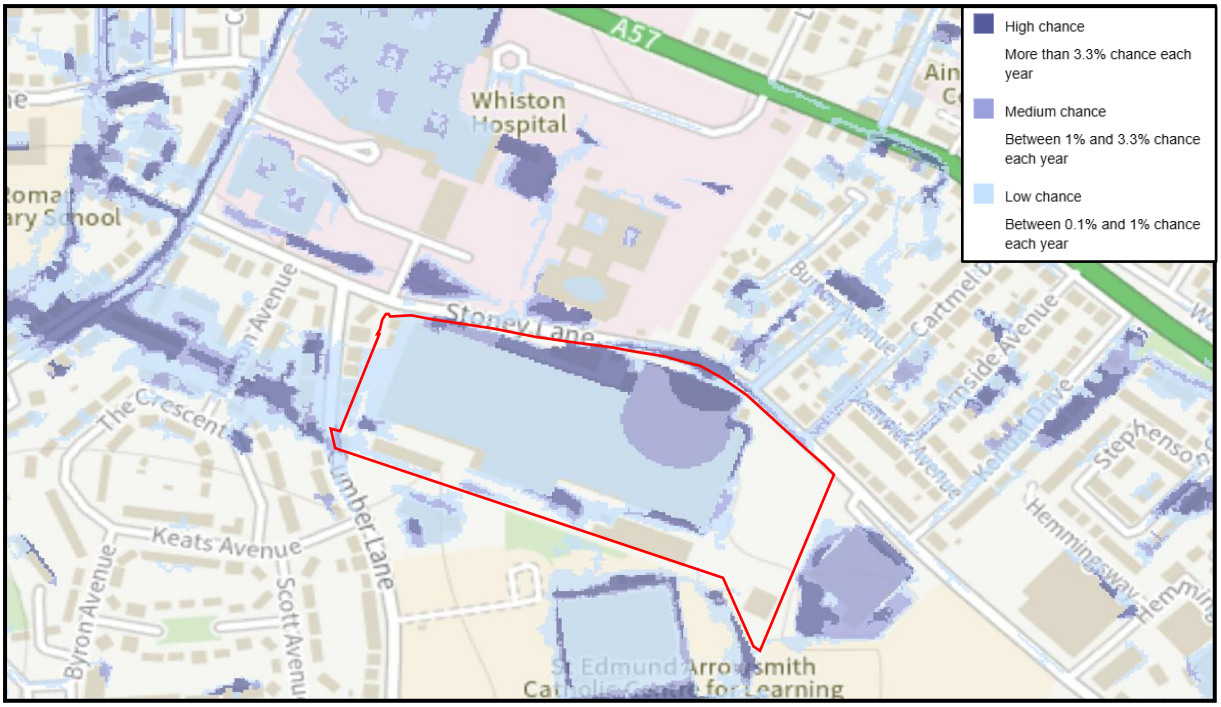
Rivers or Sea – Current

Rivers or Sea – Future (2036-2069)

Surface Water – Current



Future (2040-2060)



Long Term Flood Risk - Reservoirs

APPENDIX C: UU CORRESPONDENCE

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Liam Davies

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 03 November 2025 10:25
To: Liam Davies
Subject: RE: HYD1128 Former Glen Dimplex, Stoney Lane, Whiston - Sewer Flood Risk Information Request [Filed 03 Nov 2025 10:26]

Categories: Filed by Mail Manager

Good Morning Liam,

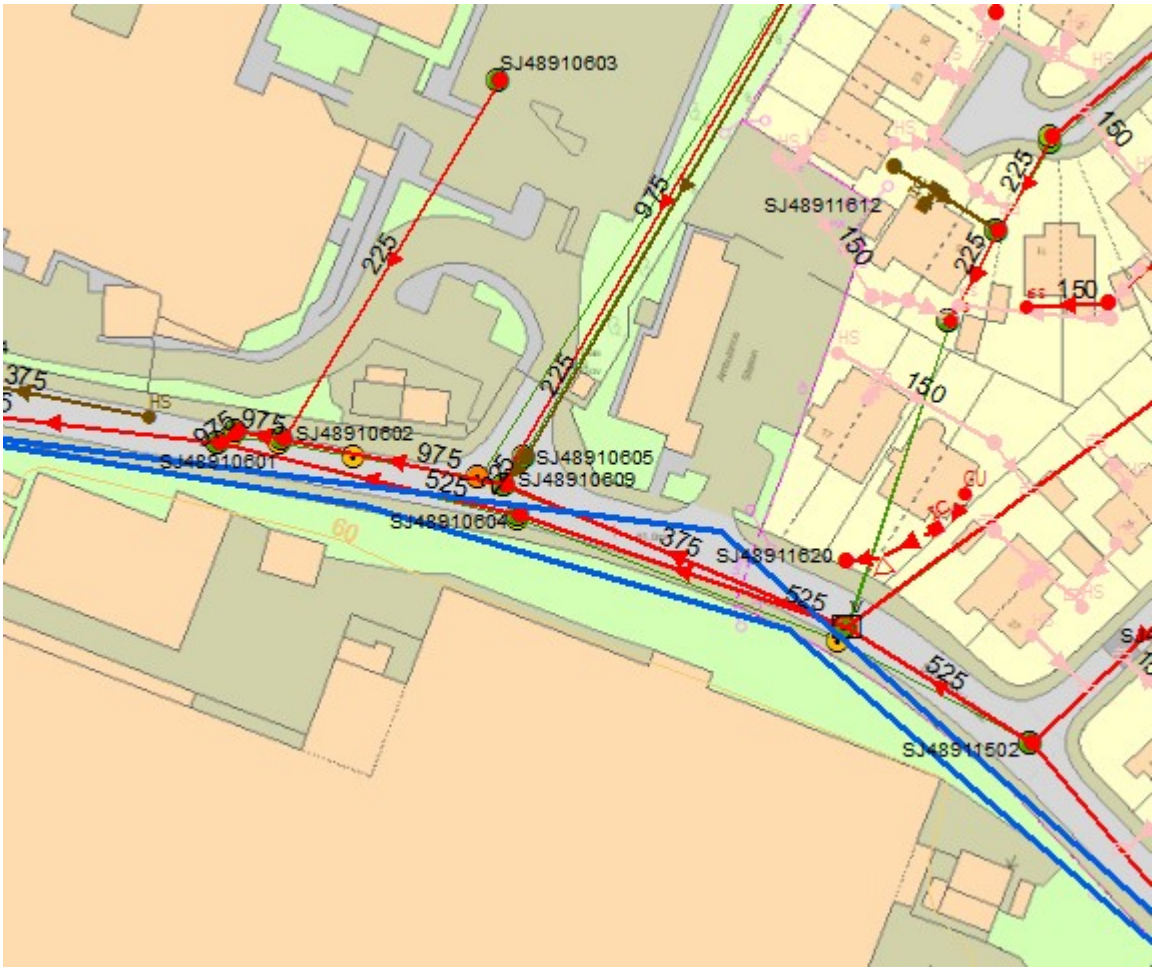
I can confirm that we have modelled flood risk within the vicinity of the proposed development.

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

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

---------- Original Message ----------
From: wastewaterdeveloperservices@uuplc.co.uk [wastewaterdeveloperservices@uuplc.co.uk]
Sent: 24/10/2025 10:22
To: liamdavies@betts-associates.co.uk
Subject: RE: HYD1128 Former Glen Dimplex, Stoney Lane, Whiston - Sewer Flood Risk Information Request

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*

---------- Original Message ----------
From: Liam Davies [liamdavies@betts-associates.co.uk]
Sent: 24/10/2025 10:17
To: wastewaterdeveloperservices@uuplc.co.uk
Subject: HYD1128 Former Glen Dimplex, Stoney Lane, Whiston - Sewer Flood Risk Information Request

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

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

Chester +44 (0)1244 289041

liamdavies@betts-associates.co.uk

www.betts-associates.co.uk

CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT

SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

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Liam Davies

From: Liam Davies
Sent: 24 October 2025 10:18
To: 'wastewaterdeveloperservices@uuplc.co.uk'
Subject: HYD1128 Former Glen Dimplex, Stoney Lane, Whiston - Sewer Flood Risk Information Request [Filed 24 Oct 2025 10:18]
Attachments: Location Plan.pdf

Categories: Filed by Mail Manager

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

BETTS HYDRO
Consulting Engineers

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CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

APPENDIX D: LPA/LLFA CORRESPONDENCE

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Liam Davies

From: Liam Davies
Sent: 17 November 2025 14:51
To: 'LLFA@knowsley.gov.uk'
Subject: RE: HYD1128 Former Glen Dimplex, Stoney Lane, Whiston - Historic Flood Risk and Drainage Information Request [Filed 17 Nov 2025 14:50]

Importance: High

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

Liam Davies BA MSc
Graduate Flood Risk Analyst

BETTS HYDRO
Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

liamdavies@betts-associates.co.uk
www.betts-associates.co.uk

CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

From: Liam Davies
Sent: Friday, October 24, 2025 10:15 AM
To: LLFA@knowsley.gov.uk
Subject: HYD1128 Former Glen Dimplex, Stoney Lane, Whiston - Historic Flood Risk and Drainage Information Request [Filed 24 Oct 2025 10:15]

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 BA MSc
Graduate Flood Risk Analyst

BETTS HYDRO
Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

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CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

Liam Davies

From: Liam Davies
Sent: 24 October 2025 10:16
To: 'LLFA@knowsley.gov.uk'
Subject: HYD1128 Former Glen Dimplex, Stoney Lane, Whiston - Historic Flood Risk and Drainage Information Request [Filed 24 Oct 2025 10:15]
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 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.

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Kind regards

Liam Davies BA MSc
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SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

APPENDIX E: LOCATION PLAN

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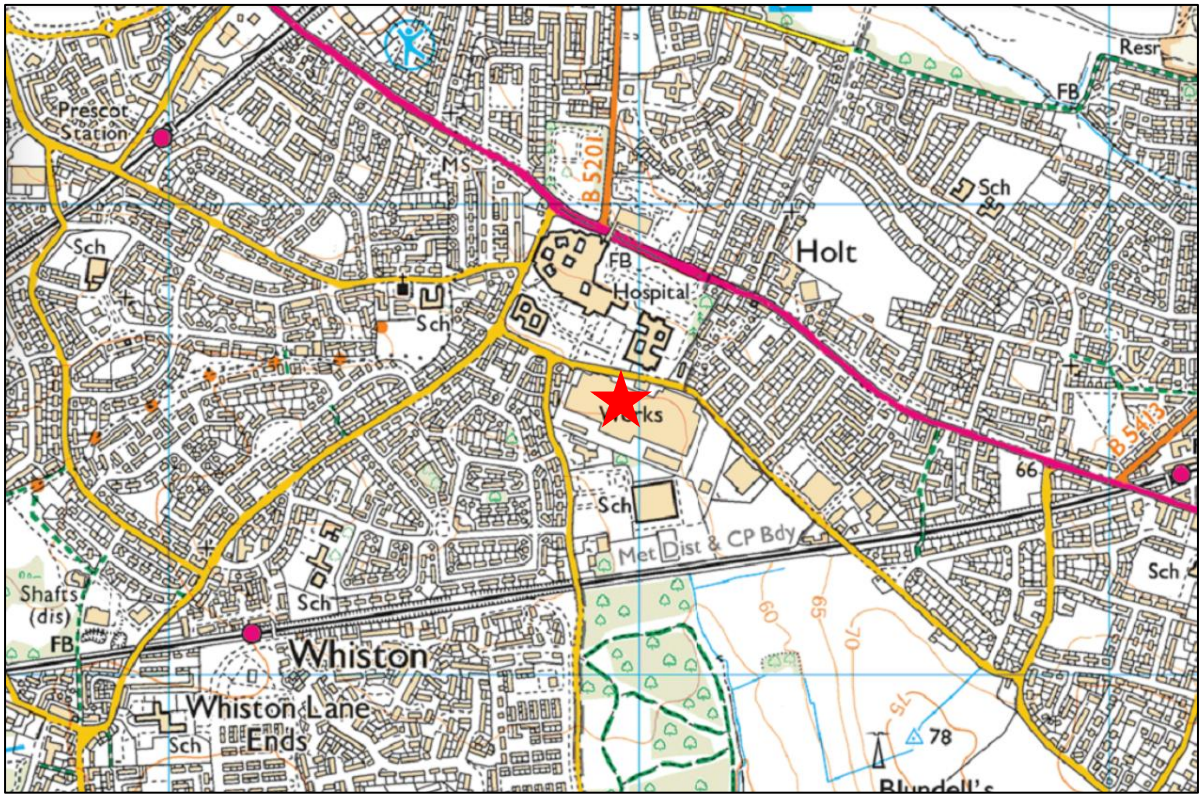
LOCATION PLAN

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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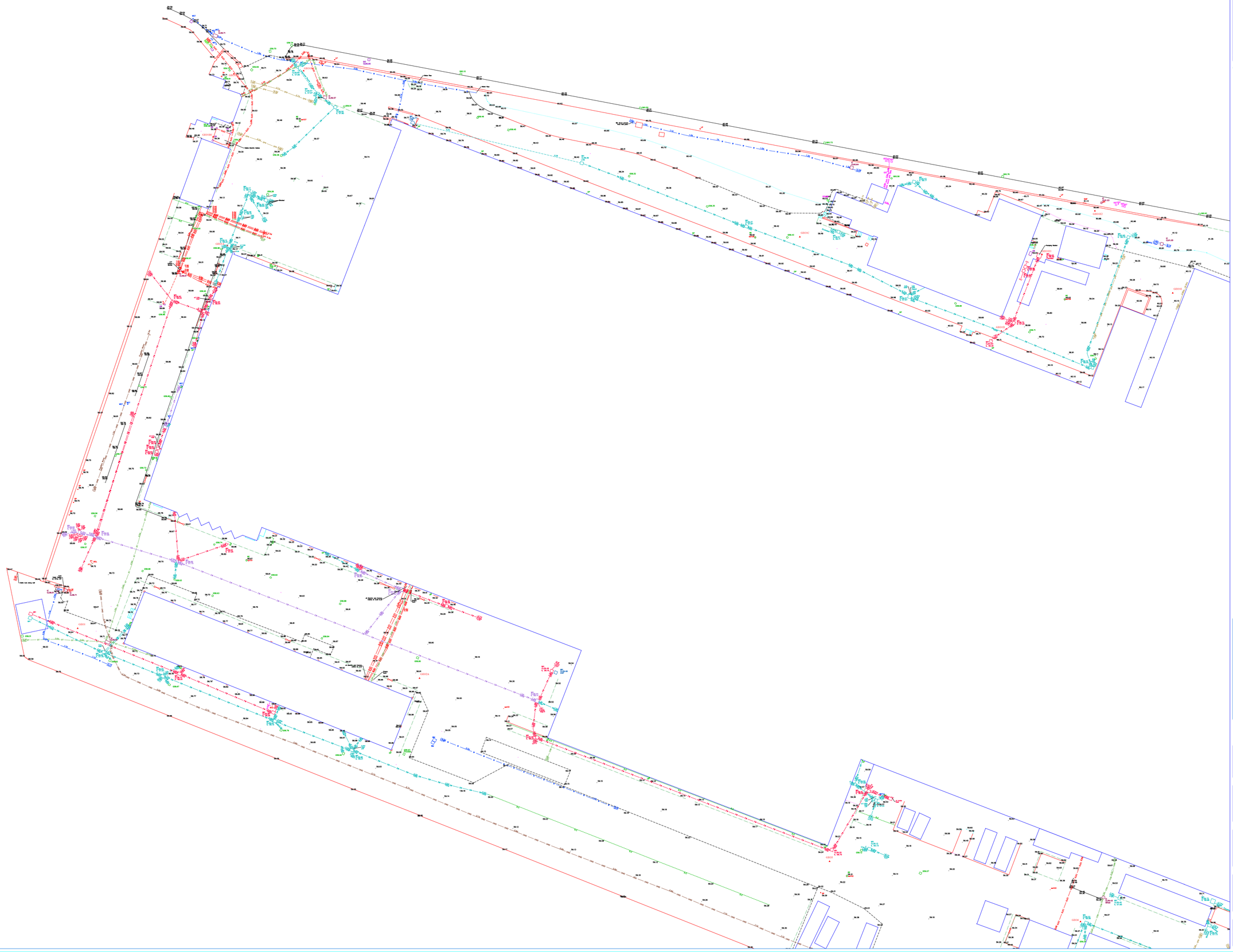

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N

PLAN GRID NORTH

File name: TA7143 - Stoney Lane, Prescot Topographical and Utility Survey.dwg

LEGEND

AV	AIR VALVE
BI	BT INSPECTION COVER
BO	BOLLARD (TYPE)
CCTV	CCTV CAMERA POST
COM	COMMUNICATIONS COVER
CP	CATHODIC PROT.
Cu	CABLE TO CUBICLE
DC	DRAINAGE CHANNEL
DI	DRAIN INLET
DR	DRAIN
EI	ELECTRIC INSPECTION COVER
EB	ELECTRIC BOX
EM	ELECTRIC METER
EP	ELECTRICITY POLE
FFL	FINISHED FLOOR LEVEL
FH	FIRE HYDRANT
G	GULLY
GLT	GROUND LIGHT
GM	GAS METER
GSV	GAS VALVE
IC	INSPECTION COVER
IL	INVERT LEVEL
KO	KERB OUTLET
LP	LIGHT POST
MK	MARKER
MKR	MARKERS
PI	PLASTIC PIPE
PN	PYLON
PP	PETROL PUMP
RP	RAINWATER PIPE
RWP	RAINWATER PIPE
SA	STOP VALVE
SV	STOP VALVE
TB	TRAFFIC SIGNAL BOX
TL	TRAFFIC LIGHT
TLB	TRAFFIC LIGHT BOX
TP	TELEPHONE POLE
WI	WATER INLET
WO	WATER OUTLET
WSC	WATER STOP TAP
WSV	WATER STOP VALVE
EOT	END OF TRACE
UTA	UNABLE TO ACCESS AREA
UTL	UNABLE TO LOCATE
UTS	UNABLE TO SENSE
SL	SIGNAL LOSS
S.L	SIGNAL LOSS
NFN	NO FURTHER NFN CONTACTS
NFP	NO FURTHER PIPE
RW	NO VISIBLE EVE
TJP	TOP OF PIPE
TOP	TOP OF POLE
UTS	UNABLE TO SENSE
LOR	LOSS OF REFLECTION

BT	CABLE DUCT
BT	BT CABLE TV
CCTV	CCTV
TELECOMS	TELECOMS
ELEC	ELECTRIC STRIP
ELEC	ELECTRIC
FL	FUEL LINE
FL	FUEL LINE
GAS	GAS DISTRIBUTION LINE
GAS	MAINS GAS
WATER	MAINS WATER
SEWER	SEWER FW
SEWER	SEWER CW
SEWER	SEWER CW
UNID	UNIDENTIFIED CABLE
UNID	UNIDENTIFIED TRACE
UNID	UNIDENTIFIED CABLE
UNID	UNIDENTIFIED PIPE
VDC	VEHICLE DETECTION CABLE
VDC	VDC
SURVEY	SURVEY AREA
SURVEY	SURVEY BOUNDARY

FROM STATUTORY AUTHORITY PLANS

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

NOTES

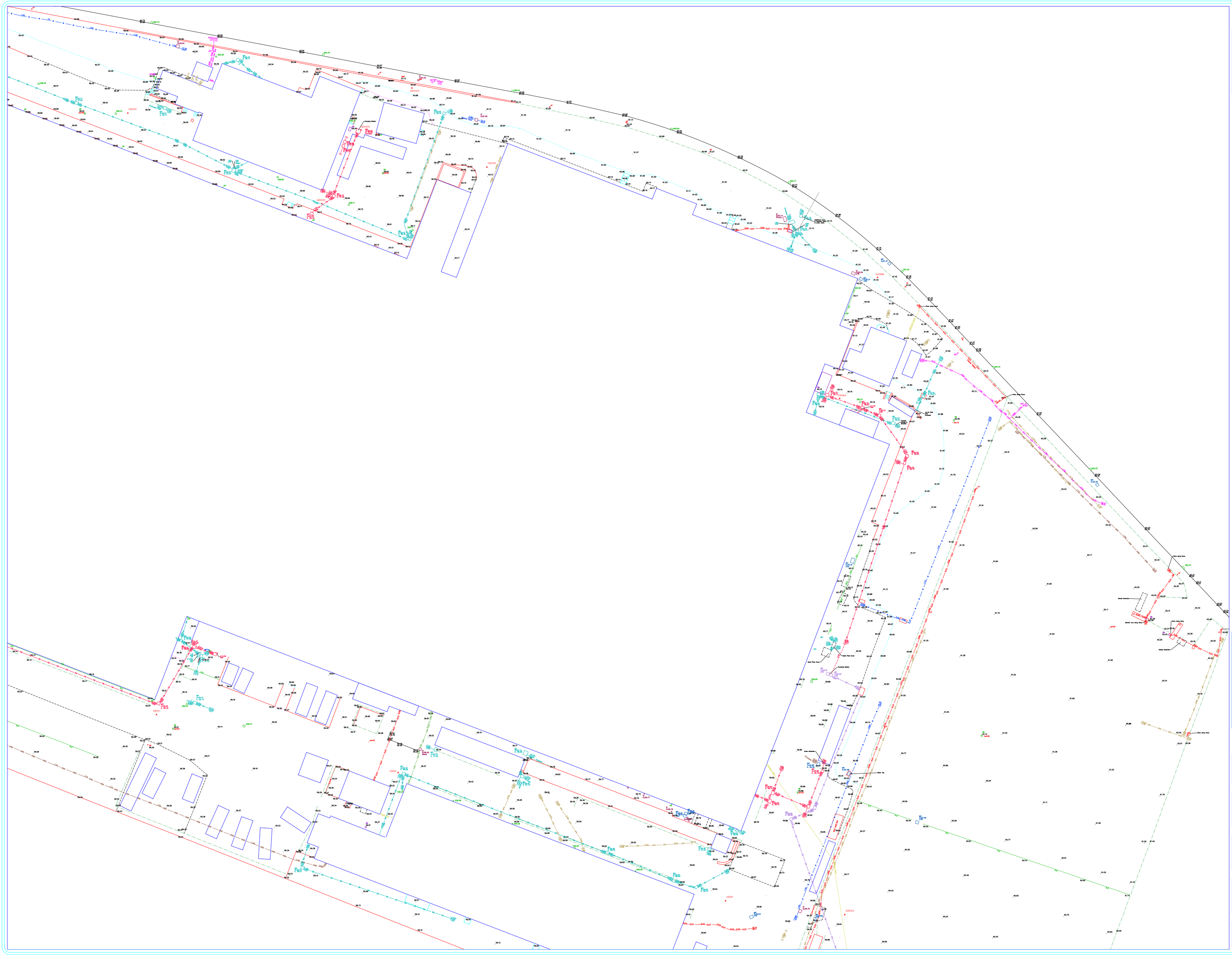
All levels relate to O.S (Newlyn) Datum, Established using network RTK. Survey plotted on a plane local grid, orientated to National Grid.

Services shown as 'From Statutory Authority Plans' line styles are taken from Statutory Records plans supplied by the relevant regional authorities. Such 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.

FINAL PLOTTING STATUS ANNOTATION

ELECTRICAL/MAINS TO DETECTOR	TELECOM/CATV/FIBRE OPTICS	MAINS WATER/MAINS GAS/SEWER/FLOW METERS
CABLE TYPE: 11KV CABLE TYPE: 33KV CABLE TYPE: 132KV CABLE TYPE: 275KV CABLE TYPE: 400KV CABLE TYPE: 132KV CABLE TYPE: 275KV CABLE TYPE: 400KV CABLE TYPE: LV CABLE TYPE: UNIDENTIFIED CABLE TYPE: CATHODIC PROTECTION CABLE TYPE: CATHODIC PROTECTION CABLE TYPE: CATHODIC PROTECTION



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N

PLAN GRID NORTH

File name: TA7143 - Stoney Lane, Prescot Topographical and Utility Survey.dwg

LEGEND

AV	AIR VALVE
BT	BT INSPECTION COVER
CAB	CABLE TV BOX
CCTV	CCTV CAMERA POST
COM	COMMUNICATIONS COVER
CP	CATHODIC PIPE
Cu	CABLE TO CUBICLE
CD	DRAINAGE CHANNEL
DO	DRAIN OUTLET
DR	DRAIN
DI	DRAIN INSPECTION COVER
ELB	ELECTRIC BOX
EP	ELECTRIC POST
LP	ELECTRICITY POLE
FFL	FINISHED FLOOR LEVEL
FH	FIRE HYDRANT
G	GULLY
GLT	GROUND LIGHT
GM	GAS METER
GOV	GAS VALVE
IC	INSPECTION COVER
IL	INVERT LEVEL
KO	KERB OUTLET
LD	LAND DRAIN
MK	MARKER
MKR	MARKERS
PIPE	PIPE/CABLE PIPE
PN	PYLON
PP	PETROL PUMP
RP	RAINWATER PIPE
SWP	SUBWATER PIPE
SP	SIGN POST
SV	STOP VALVE
TB	TELEPHONE WALL BOX
TL	TRAFFIC LIGHT
TLB	TRAFFIC LIGHT BOX
TP	TELEPHONE POLE
WB	WATER METER
WO	WATER OUTLET
WP	WATER POLE TAP
WSV	WATER STOP VALVE
EOT	END OF TRACE
UTA	UNABLE TO ACCESS AREA
UTL	UNABLE TO LOCATE
UTS	UNABLE TO SENCE
S.C.	SIGNAL CABINET
S.L.	SIGNAL LIGHT
S.P.	SIGNAL POST
NFN	NO FURTHER GPR CONTACTS
RVP	RODDING VENT PIPE
RW	RAINWATER PIPE
TUP	TOP OF PIPE
UP	UNDER PIPE
UTS	UNABLE TO SENCE
LOR	LOSS OF REFLECTION

BT	BT
CABLE DUCT	DUCT
CABLE TV	CABLE TV
CCTV	CCTV
TELECOMS	COM
ELECTRIC STRIP	ELEC
ELECTRIC	ELEC
FUEL	FL
FUEL LINE	FL
GAS PIPELINE/GAS LINE	GAS
GAS	GAS
MAINS WATER	W
WATER	W
SEWER FW	FW
SEWER CW	CW
UNIDENTIFIED CABLE	UNID
UNIDENTIFIED PIPE	UNID
UNIDENTIFIED CABLE	UP
UNIDENTIFIED PIPE	UP
VEHICLE DETECTION CABLE	VDC
VEHICLE	VEH
TOP OF BANK	TOB
TOE OF BANK	TOE
SURVEY BOUNDARY	

FROM STATUTORY AUTHORITY PLANS

BT	BT
CABLE DUCT	DUCT
CATV	CATV
CCTV	CCTV
TELECOMS	COM
ELECTRIC	ELEC
MAINS GAS	GAS
MAINS WATER	W
SEWER CW	CW
SEWER FW	FW
SEWER GM	GM
PIPE-OPTICS	FO

NOTES

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

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

TYPICAL FIELD PLANE DEPTH ANNOTATION

ELECTRICAL/GAS/ TELECOMS	TELECOMS/ FIBRE OPTICS	WATER/ FIBRE OPTICS
0.600m CABLE DEPTH	0.600m CABLE DEPTH	0.600m PIPE DEPTH

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.

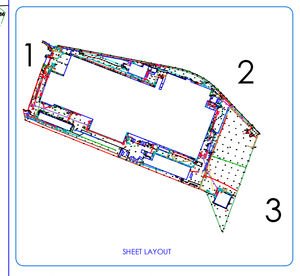
Successful tracing of non-conductive materials may be limited. Drainage gulleys are due tested where possible to prove connectivity but it is not always possible to introduce the sonde due to narrow pipe sizes and/or accumulated silt.

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 this cannot be guaranteed. Depths shown 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 rough/uneven ground.

Existing record information that was made available to GEO UK LTD by the Client or by the statutory utility provider should be regarded only as an indication and cannot be guaranteed.

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

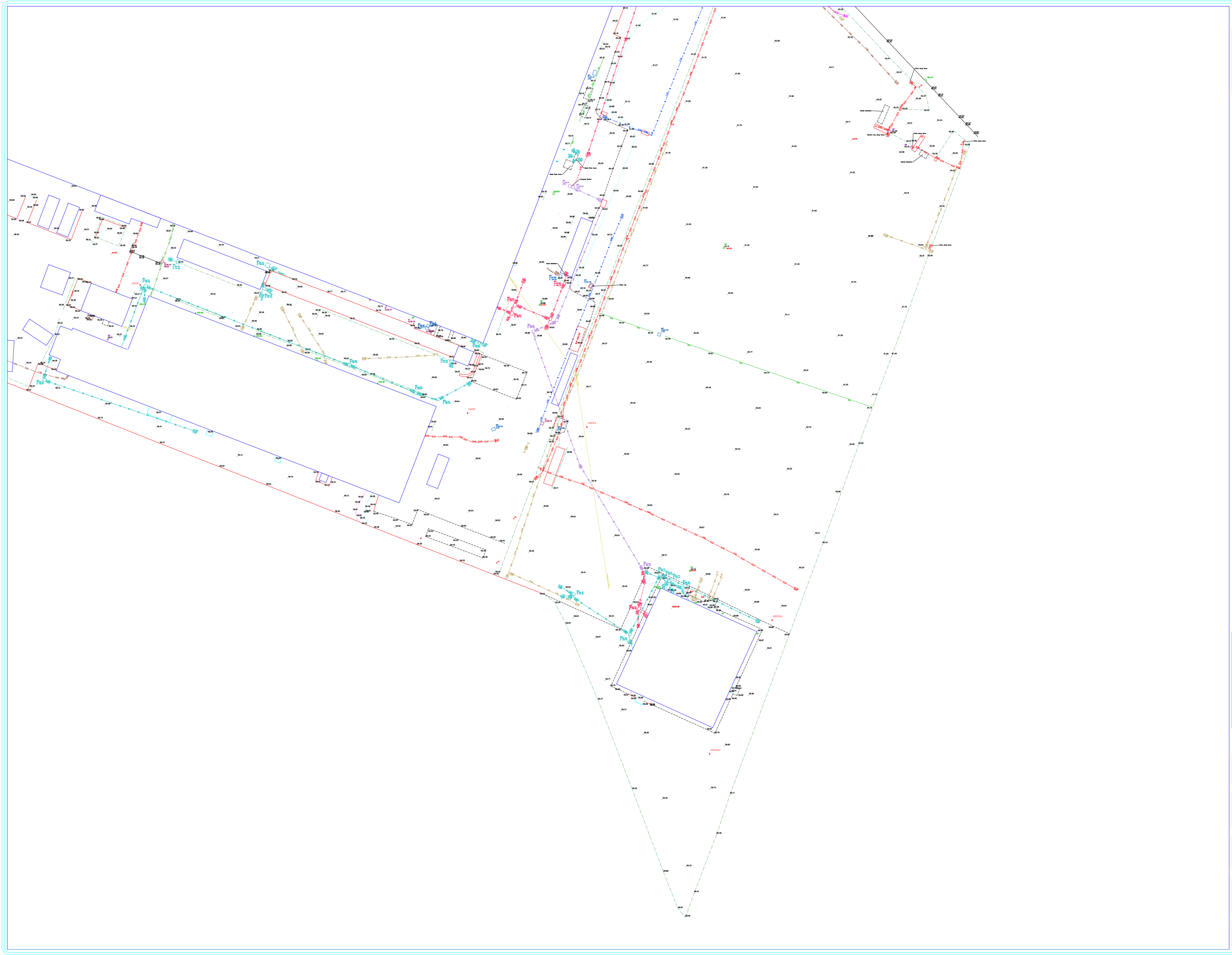
Geographical Engineering Operations

Client
E3P
Taylor Road
Urmston
Manchester
M41 7JQ

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

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: TA7143 - Stoney Lane, Prescot Topographical and Utility Survey.dwg

LEGEND

AV	AIR VALVE	BT	BT
BI	BT INSPECTION COVER	CABLE DUCT	DUCT
BX	BT JOINT BOX	CATV	CATV
CCTV	CCTV CAMERA POST	CCTV	CCTV
COM	COMMUNICATIONS COVER	TELECOMS	COM
CP	CATHODIC PROT.	ELECTRIC STRIP	ELEC
Cu	CABLE TO CLEAR	ELECTRIC	ELEC
DC	DRAINAGE CHANNEL	FIBRE OPTIC	FO
DI	DRAIN INSP.	FUEL LINE	FL
DO	DRAIN	GAS PIPELINE/GAS LINE	GAS
EI	ELECTRIC INSPECTION COVER	GAS	GAS
ELB	ELECTRIC BOX	MAINS WATER	W
EP	ELECTRIC POLE	SEWER FM	FM
GP	GATEPOST/ POLE	SEWER CW	CW
FFL	FINISHED FLOOR LEVEL	SEWER CW	CW
GI	GULLY INSPECT	UNIDENTIFIED CABLE	UNID
GUL	GULLY	UNIDENTIFIED TRACE	UNID
OLT	GROUND LIGHT	UNIDENTIFIED CABLE	UID
GV	GAS VALVE	UNIDENTIFIED TRACE	UID
GOV	GAS VALVE	VEHICLE DETECTION CABLE	VDC
IC	INSPECTION COVER	VDC	VDC
		SURVEY CONTROL	SC
		SURVEY CONTROL	SC
		SURVEY BOUNDARY	

IL	INVERT LEVEL
KO	KERB OUTLET
MO	MAIN OUTLET
MK	MARKER
MKR	MARKER
PIPE	PIPE/ PIPE
PN	PYLON
PP	PETROL PUMP
PT	PETROL TANK
RMP	RUMMETER PIPE
SP	SIGNAL POST
SV	STOP VALVE
TB	TRAFFIC SIGNAL BOX
TL	TRAFFIC LIGHT
TLB	TRAFFIC LIGHT BOX
TP	TELEPHONE POLE
WB	WATER METER
WO	WATER OUTLET
WSP	WATER STOP TAP
WSV	WATER STOP VALVE
EOT	END OF TRACE
UTA	UNABLE TO ACCESS AREA
UTL	UNABLE TO LOCATE
UTS	UNABLE TO SENSE
S.L.	SIGNAL LOSS
S.S.	SIGNAL STRIP
S.W.	SIGNAL WEAK
NFN	NO FURTHER SPR CONTACTS
RPP	RODDING POINT
RIP	INVISIBLE PIPE
TUP	TOP OF PIPE
UNI	UNIDENTIFIED
UTC	UNABLE TO TRACE
LOR	LOSS OF REFLECTION

FROM STATUTORY AUTHORITY PLANS

BT	BT
CABLE DUCT	DUCT
CATV	CATV
CCTV	CCTV
TELECOMS	COM
ELECTRIC	ELEC
FIBRE-OPTICS	FO
FUEL LINE	FL
GAS PIPELINE	GAS
MAINS WATER	W
SEWER FM	FM
SEWER CW	CW
UNIDENTIFIED CABLE	UID
UNIDENTIFIED TRACE	UID
VEHICLE DETECTION CABLE	VDC

NOTES

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

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

TYPICAL FIXTURE DEPTH INDICATORS		
ELECTRICAL/GAS/ TELECOM/ FIBRE OPTIC	TELECOM/ FIBRE OPTIC/ CATV/ CCTV/ ELECTRICAL	WATER/ GAS/ TELECOM/ SEWER
CABLE/FIBRE OPTIC	CABLE/ FIBRE OPTIC/ TELECOM	WATER/ GAS/ TELECOM/ SEWER

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.

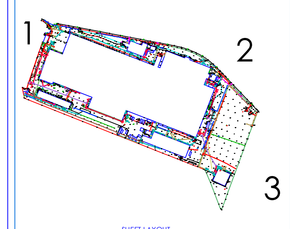
Successful tracing of non-conductive materials may be limited. Drainage gullies are dye tested where possible to prove connectivity but it is not always possible to introduce the sonde due to narrow pipe sizes and/or accumulated silt.

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 this cannot be guaranteed. Depths shown 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 rough/uneven ground.

Existing record information that was made available to GEO UK LTD by the Client or by the statutory utility provider should be regarded only as an indication and cannot be guaranteed.

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	03	A0	--

APPENDIX G: SKETCH 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 all existing dimensions and levels before commencement of any work 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 reported to the Engineer. Unsuitable material encountered in the formation of structural fill 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 root protection zones (RPZ) should be established in accordance with current guidelines 4 metres from buildings and 2 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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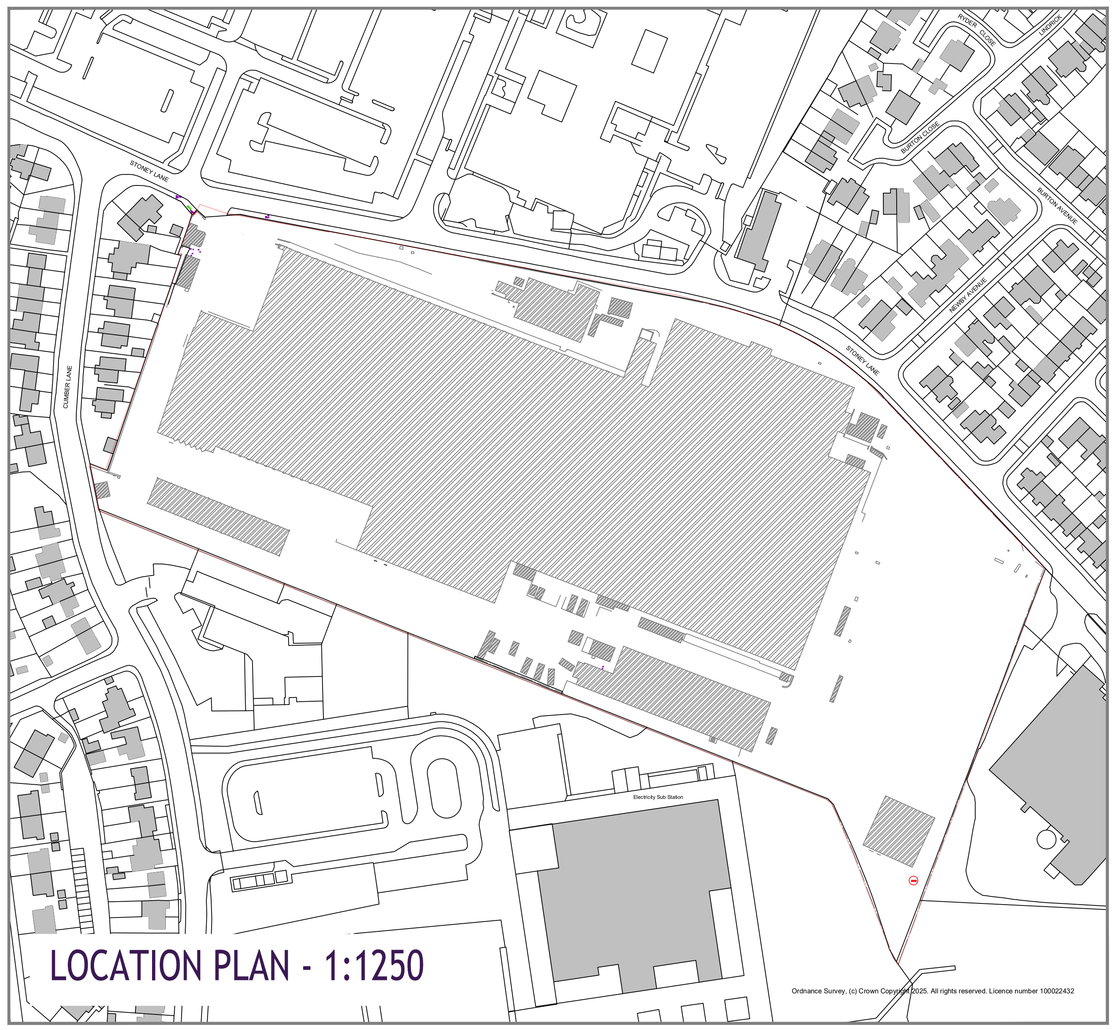
Drawing Status:

- [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**



LOCATION PLAN - 1:1250

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SITE PLAN - 1:500

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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
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.:
U:\Land Yeadon\Jobs\ - Live\Land Opportunities\Glen Dimplex, Whitehall_Planning\2.1 Planning Drawings\Layouts\CAD\25053-1000V Site Layout_2025-10-30

Project no.:	Drawing no.:
25053	1000V

APPENDIX H: CULVERT INVESTIGATIONS

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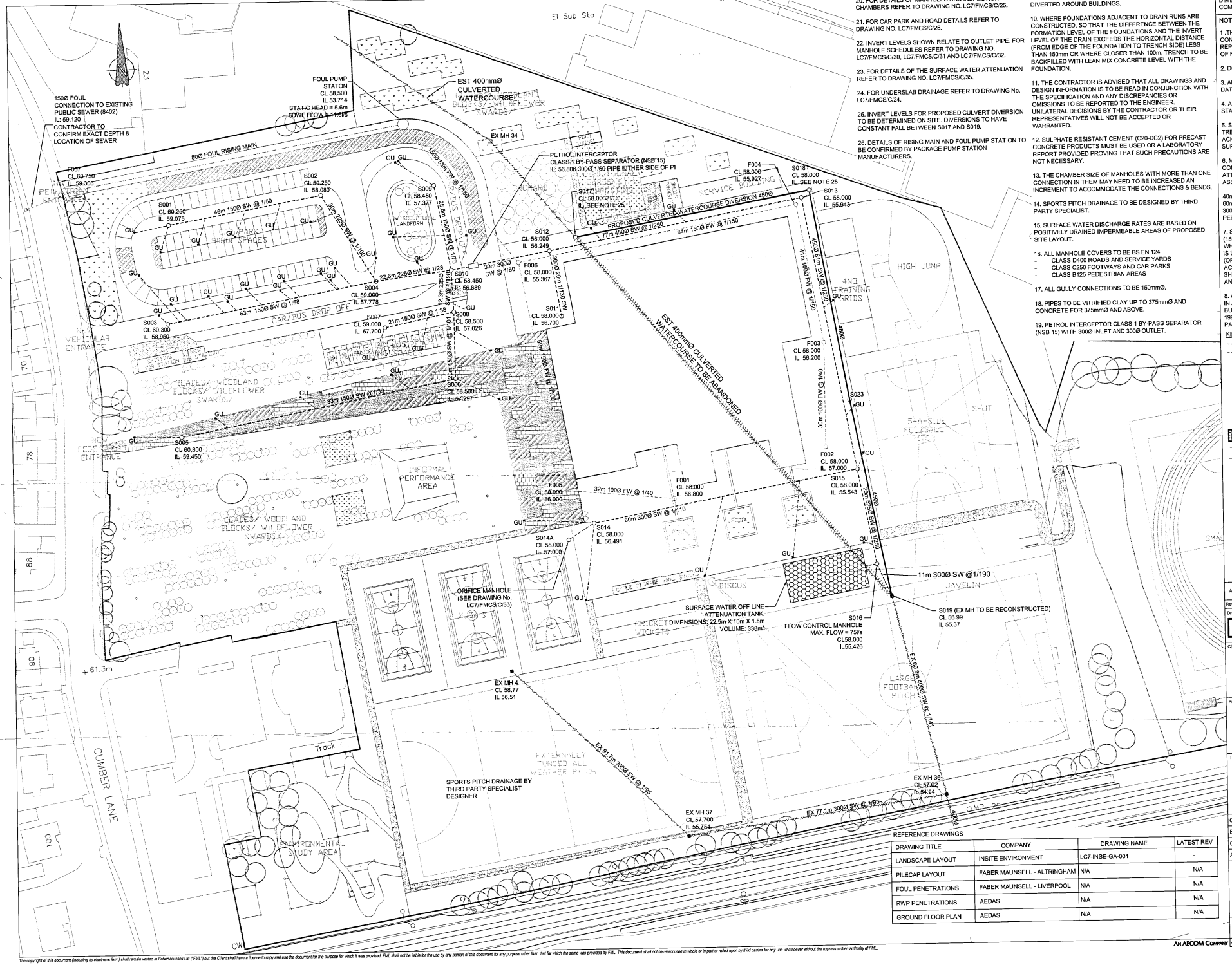

20. FOR DETAILS OF MANHOLES AND INSPECTION CHAMBERS REFER TO DRAWING NO. LC7/FMCS/C/25.

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/30, LC7/FMCS/C/31 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 S019.

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 EDGE OF THE FOUNDATION TO TRENCH SIDE) LESS THAN 150mm OR WHERE CLOSER THAN 100m, 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 (C20-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. MUGA'S TO BE DESIGNED BY SPECIALIST CONTRACTOR. MUGA'S 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 1998 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	App
A	18/02/08	ISSUED FOR COMMENT	JCR	SCL	CJO

Drawing Status:

FOR COMMENT

Client:

BALFOUR BEATTY CONSTRUCTION

Project:

KNOWSLEY BSF
LC7 - KNOWSLEY CENTRAL RC LEARNING CENTRE

Title:

PROPOSED DRAINAGE LAYOUT

CAD Ref:

Engineer	WJ			Made	WJ
C'k'd	M -	E -	PH SJK	STR -	Date 16/01/07
App.	SJK			Scale	1/500 @ A1

REFERENCE DRAWINGS

DRAWING TITLE	COMPANY	DRAWING NAME	LATEST REV
LANDSCAPE LAYOUT	INSITE ENVIRONMENT	LC7-INSE-GA-001	-
PILECAP LAYOUT	FABER MAUNSELL - ALTRINGHAM	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

FABER MAUNSELL AECOM
5th Floor
2 City Walk,
Leeds. LS11 9AR
T +44(0) 113 391 6800
F +44(0) 113 391 6999
www.fabermaunsell.com

No. LC7/FMCS/C/23 Rev A

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A1

Key:

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

Ex MH33

225Ø VC

225Ø Line Require Lining

225Ø VC

375Ø VC

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

450Ø Concrete

450Ø Concrete

SW18
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

450Ø Concrete

SW19
Buried Under Grass

450Ø Concrete

Exposed SW20 buried in grass

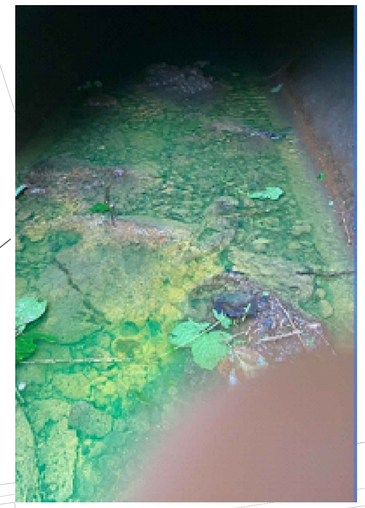
SW20 Buried under grass but exposed

450Ø Concrete

SW21
Buried Under Grass. Line Comes in on T not bend so can not CCTV to outfall.

Pin showing location of buried SW21. Unable to access

Dye in Whiston Brook from MH33 in Glen Dimplex



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

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 'A'

WHISTON INFIRMARY

CUMBER LANE

STONEY LANE

SHED No 2

SHED No 1

1971 LAND DRAIN

BRICK TRANSFORMER HOUSE

9 STRAND B.W. FENCE

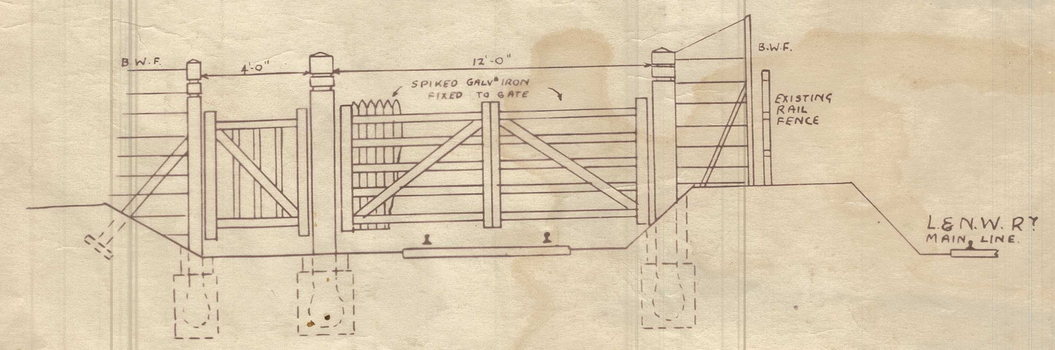
L.&N.W. RY MAIN LINE TO LIVERPOOL TO MANCHESTER

TO LIVERPOOL

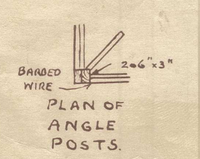
DESCRIPTION

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

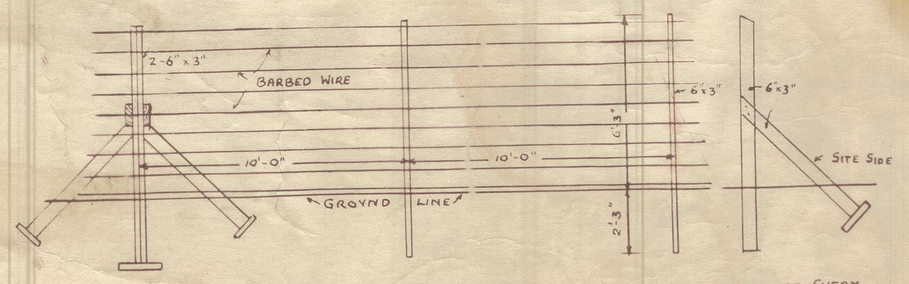
N.B. LEVELS TAKEN AS BEING ABOVE DATUM WHICH IS 40'-0" BELOW THE SIGNAL BOX GROUND LEVEL AT 'A'.



DETAIL OF GATES OVER RAILWAY



PLAN OF ANGLE POSTS.



STRAINING POST

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

DETAIL OF EVERY 5TH POST.

WHISTON RAINHILL : NR. LIVERPOOL.

MUNITION STORE SITE PLAN.

SCALE OF 56 FEET TO AN INCH.

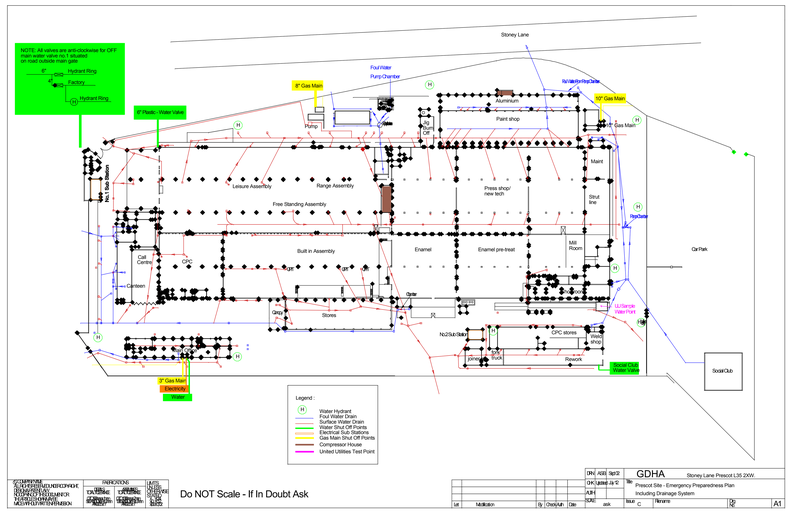
COPIED FROM DRG. No 1 H.M. OFFICE OF WORKS. STORE YS GATE WESTMINSTER S.W.1

STOVES LIMITED RAINHILL

PLAN OF WORKS

TRACED BY W.K.M.

CHECKED W.



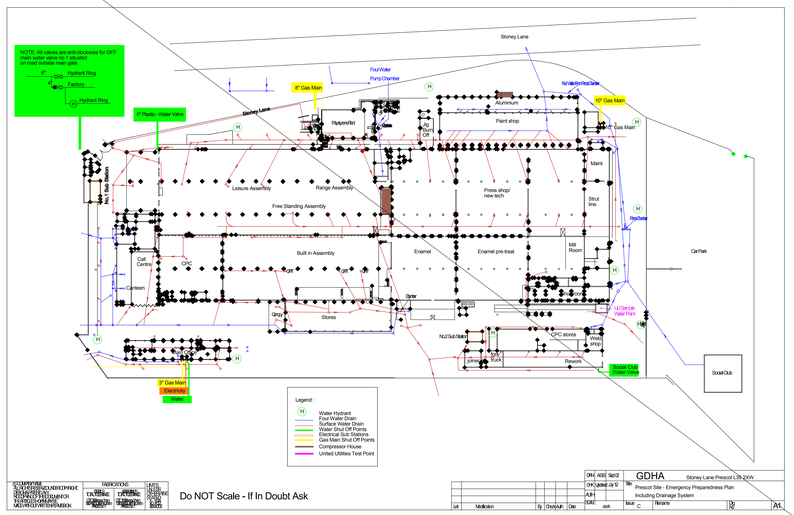
Do NOT Scale - If In Doubt Ask

Lvl	Modification	By	Chkd/App	Date			

DR: A3B Sep'22
CH: Latest Issue G
APP:
SCALE: ask
Issue: C
Filename:
Dr: A1

GDHA
Stoney Lane Prescot L35 2XW.

Title: Prescot Site - Emergency Preparedness Plan
Including Drainage System



Do NOT Scale - If In Doubt Ask

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DR: A3B Sep'22
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GDHA
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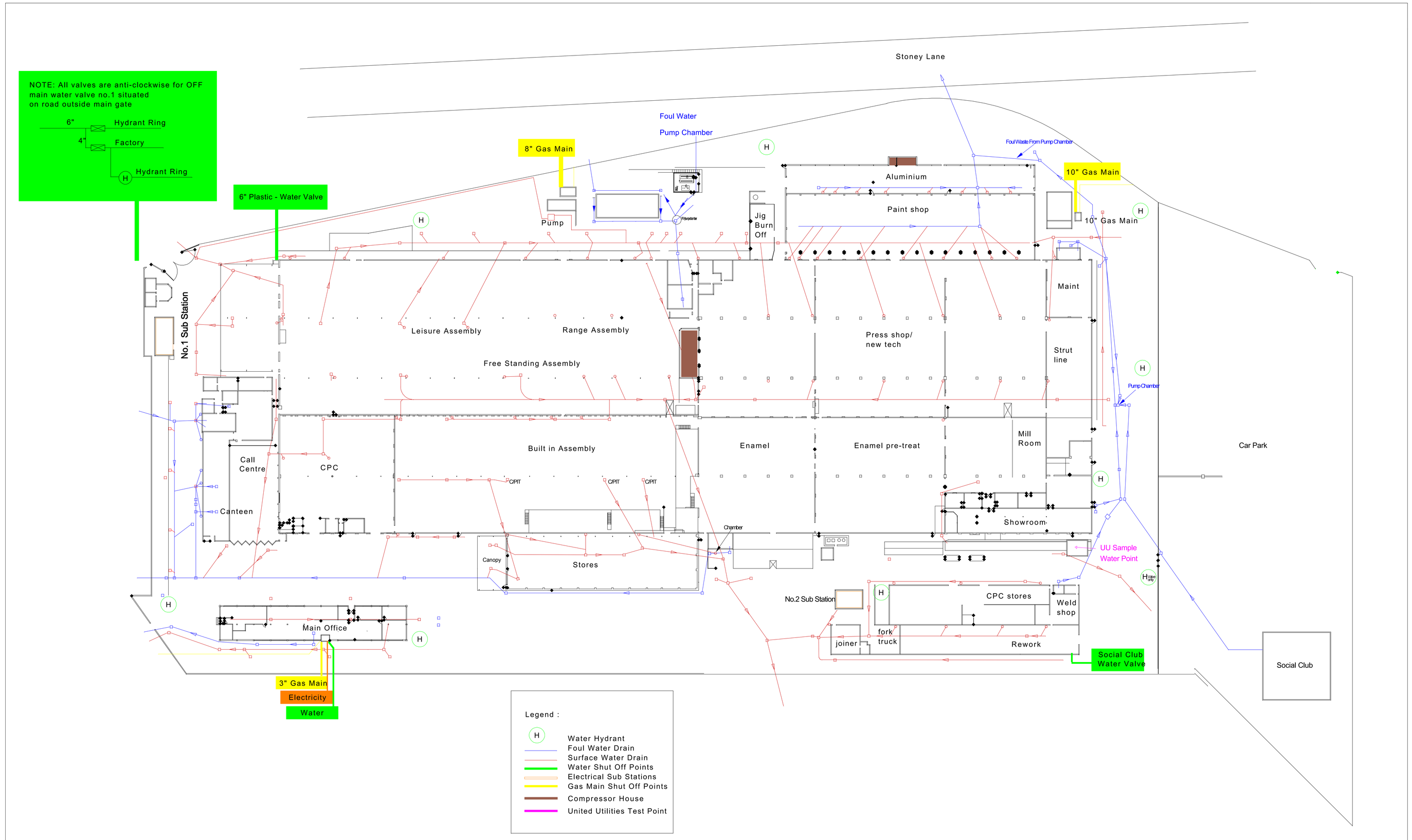

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FABRICATIONS		LIMITS UNLESS OTHERWISE STATED
DETAILS TOTAL TOLERANCE	ASSEMBLIES TOTAL TOLERANCE	
0 TO 500mm ± 1mm 500 AND OVER ± 3mm ANGLES ± 1°	0 TO 1000mm ± 2mm 1000 AND OVER ± 3mm ANGLES ± 1°	x. ± 0.4 x.0 ± 0.2 x.00 ± 0.02

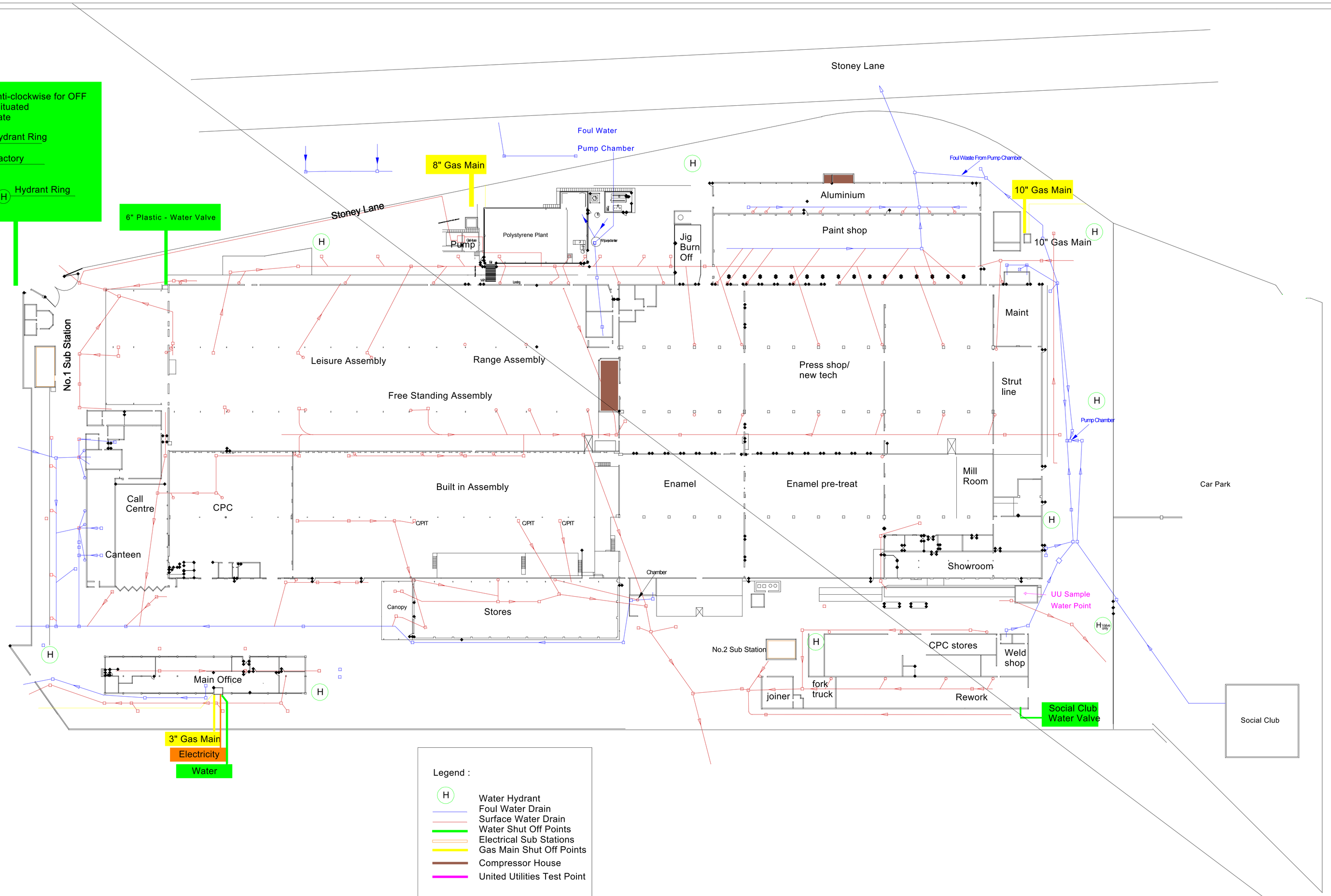
Do NOT Scale - If In Doubt Ask

Let	Modification	By	Check	Auth	Date

DRN	A.S.B.	Sept 02	GDHA Stoney Lane Prescot L35 2XW.
CHK	Updated	July 12	Title: Prescot Site - Emergency Preparedness Plan Including Drainage System
AUTH			
SCALE ask	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
Hydrant Ring



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FABRICATIONS		LIMITS UNLESS OTHERWISE STATED
DETAILS TOTAL TOLERANCE	ASSEMBLIES TOTAL TOLERANCE	
0 TO 500mm ± 1mm	0 TO 1000mm ± 2mm	x ± 0.4
500 AND OVER ± 3mm	1000 AND OVER ± 3mm	x.0 ± 0.2
ANGLES ± 1°	ANGLES ± 1°	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	

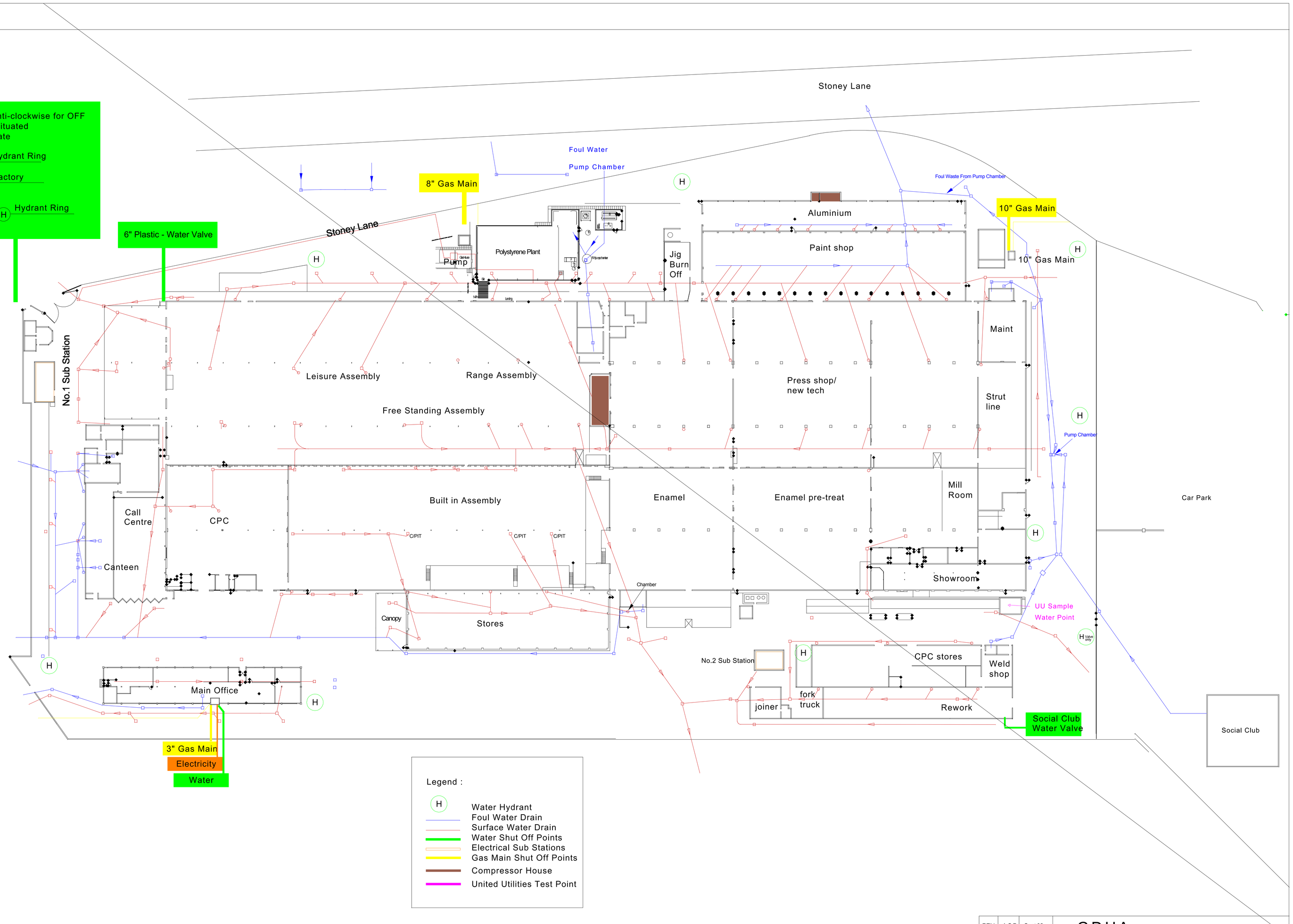
GDHA Stoney Lane Prescot L35 2XW.

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



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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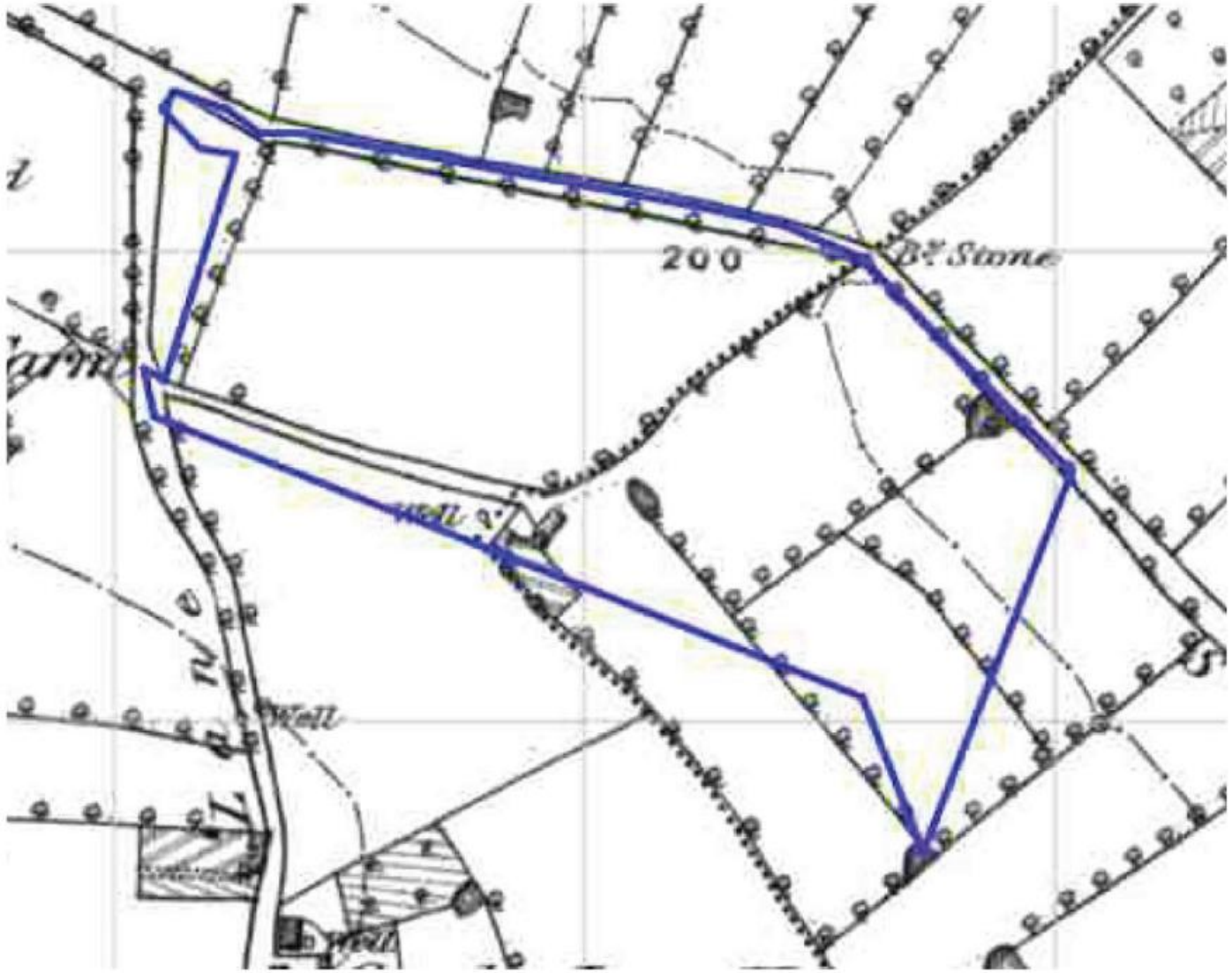
FABRICATIONS		LIMITS UNLESS OTHERWISE STATED
DETAILS TOTAL TOLERANCE	ASSEMBLIES TOTAL TOLERANCE	

Do NOT Scale - If In Doubt Ask

DRN	A.S.B.	Sept 02	GDHA Stoney Lane Prescot L35 2X
CHK	Updated	July 12	Title: Prescot Site - Emergency Preparedness Plan Including Drainage System
AUTH			

On-site historical development of Glen Dimplex

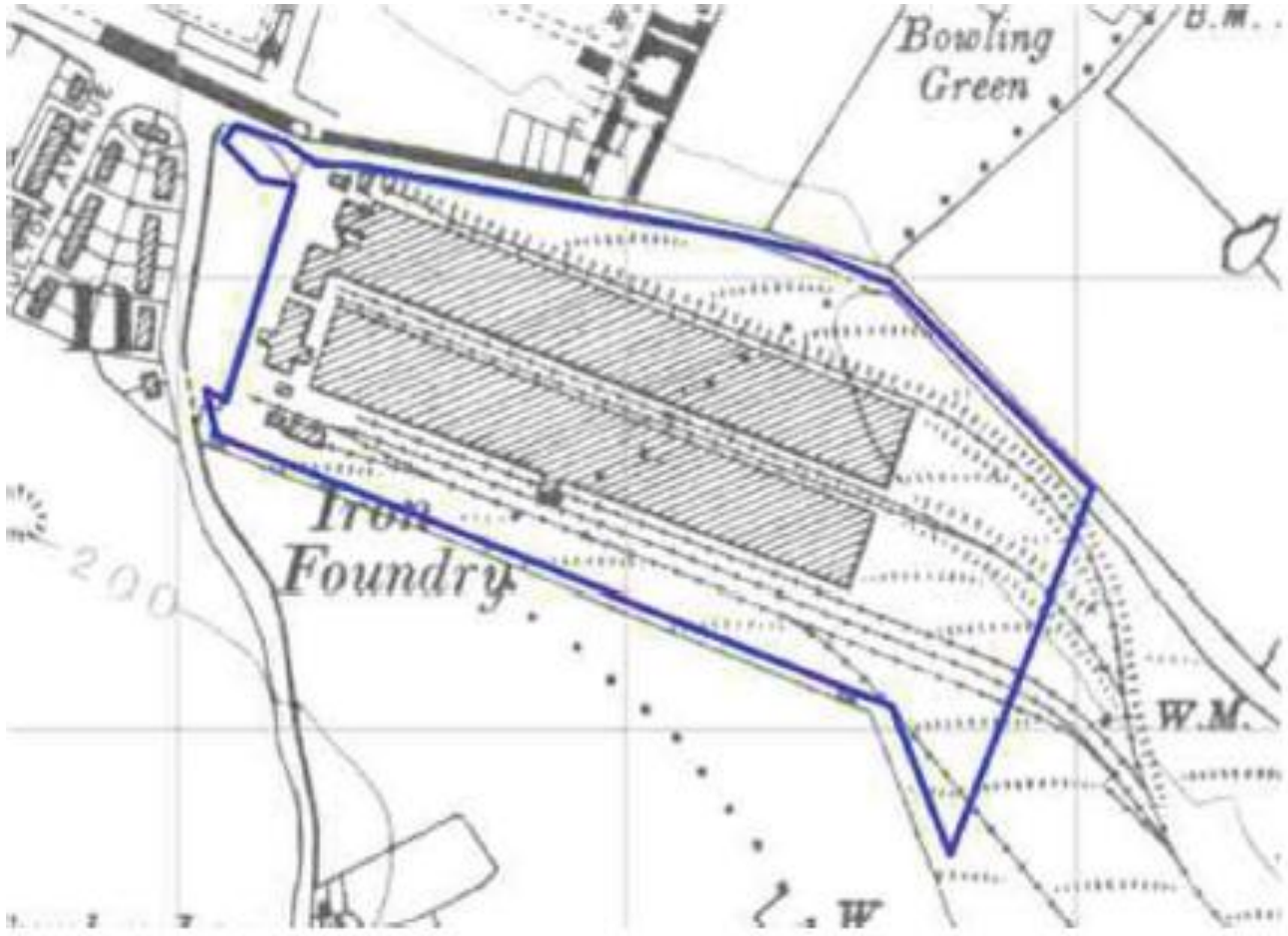
1850 – Several segmenting field boundaries are present, with the site comprising seven smaller fields



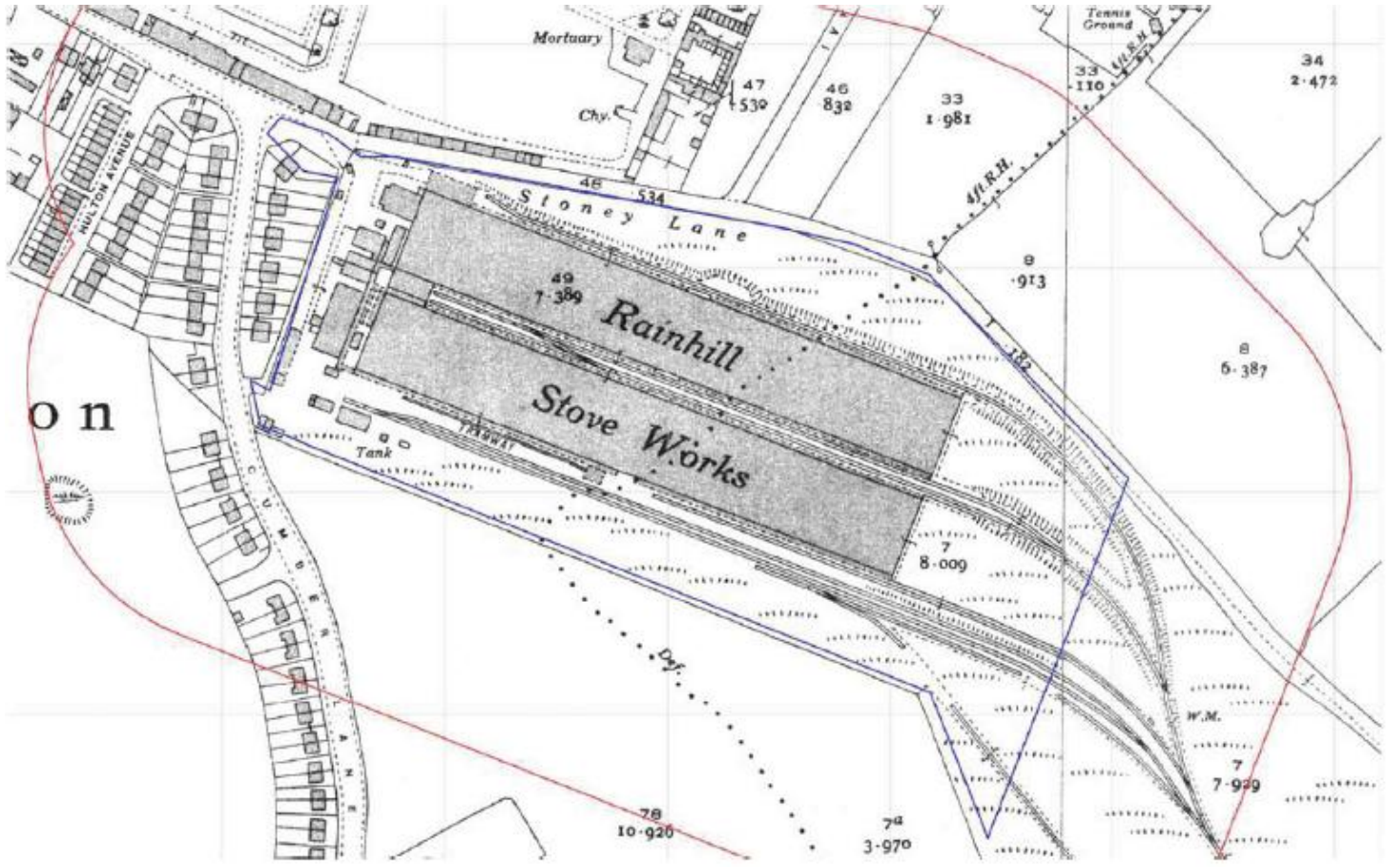
1892 – Majority of field boundaries removed and field boundary traversing through the centre of the site is now noted as a small hedge-lined road traversing from the south towards the northeast, continuing off site.

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

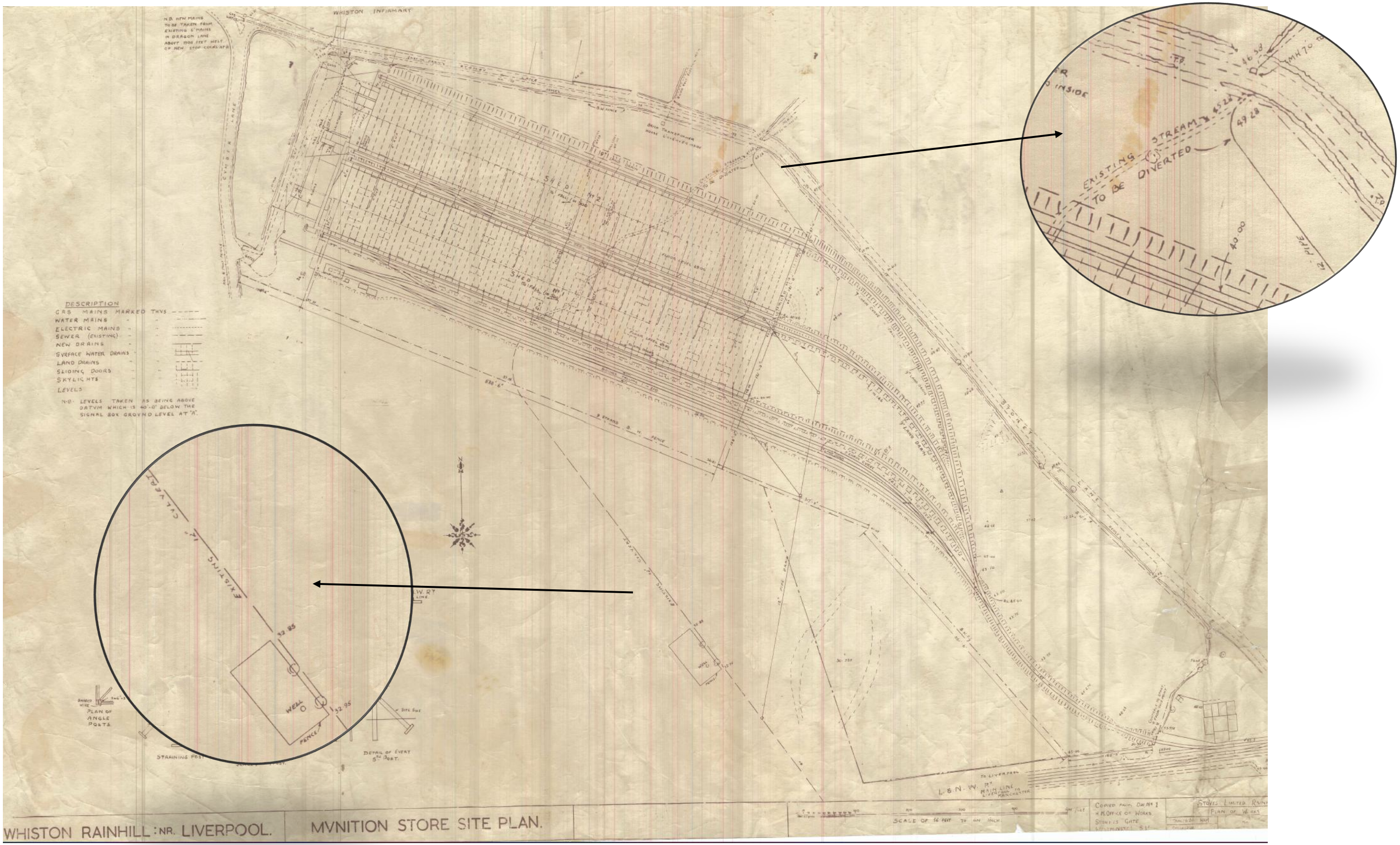
1925 – Site redeveloped and comprises an iron foundry with associated railway sidings



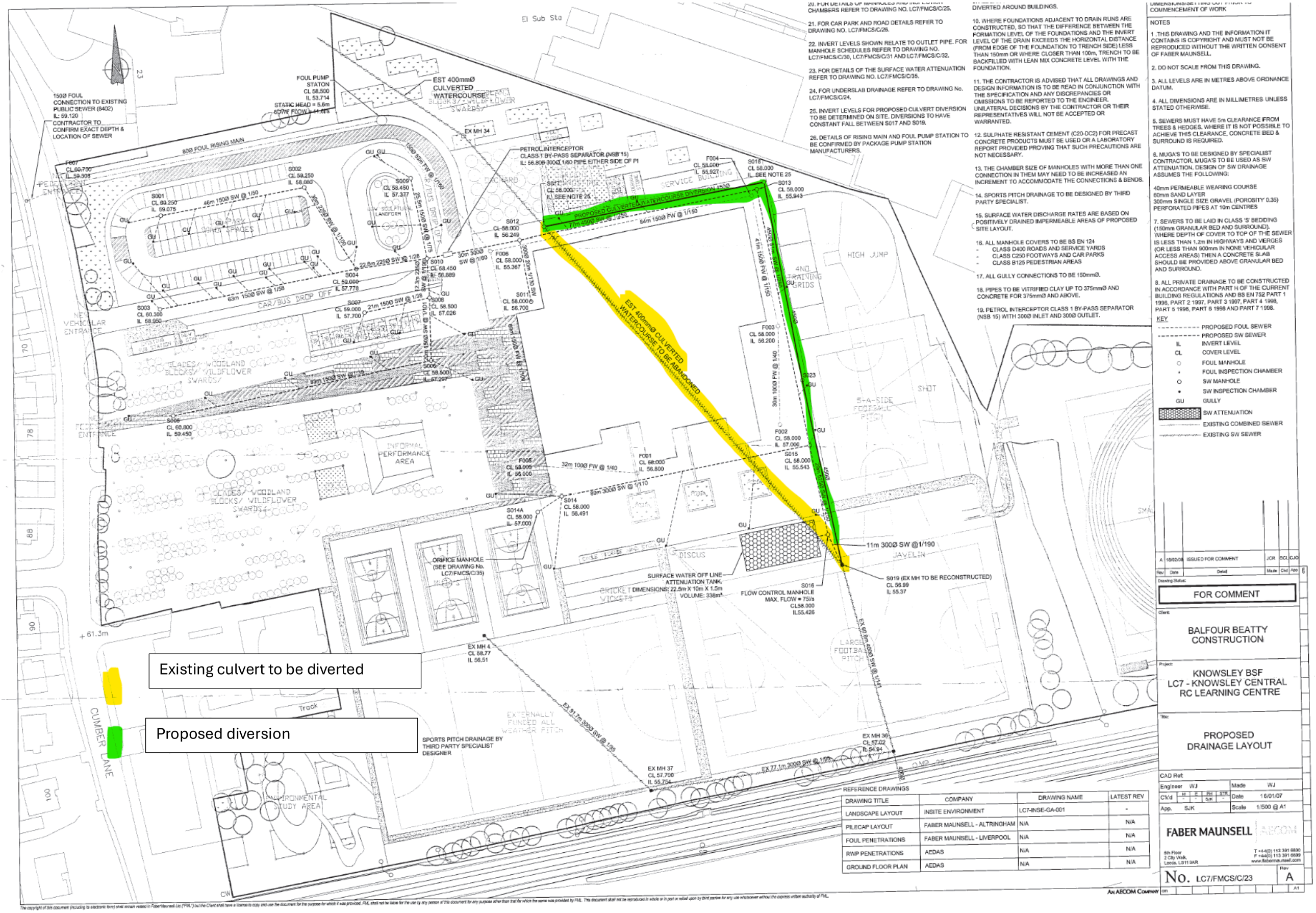
1937 – Site now renamed as Stove Works



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

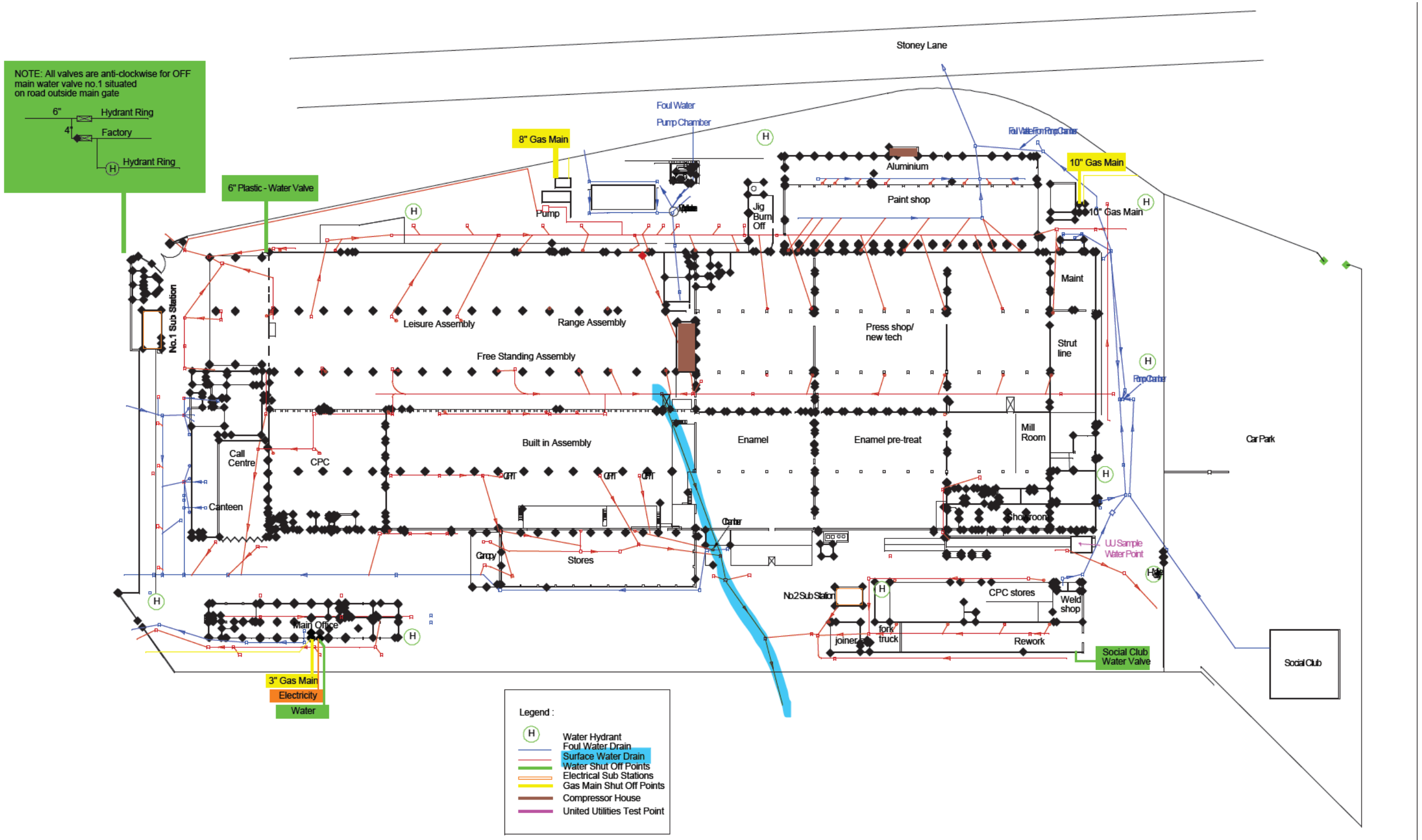


2007 – Revision A Faber Maunsell plans showing existing route of 400mm culverted watercourse to be abandoned downstream from MH34 and diverted as 450mm around new school building downstream to existing manhole S019.



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.



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FABRICATIONS

DEALS TOLERANCE	ASSEMBLIES TOLERANCE	LIMITS UNLESS OTHERWISE STATED
[illegible]	[illegible]	[illegible]

Do NOT Scale - If In Doubt Ask

Let	Modification	By	Check	Auth	Date

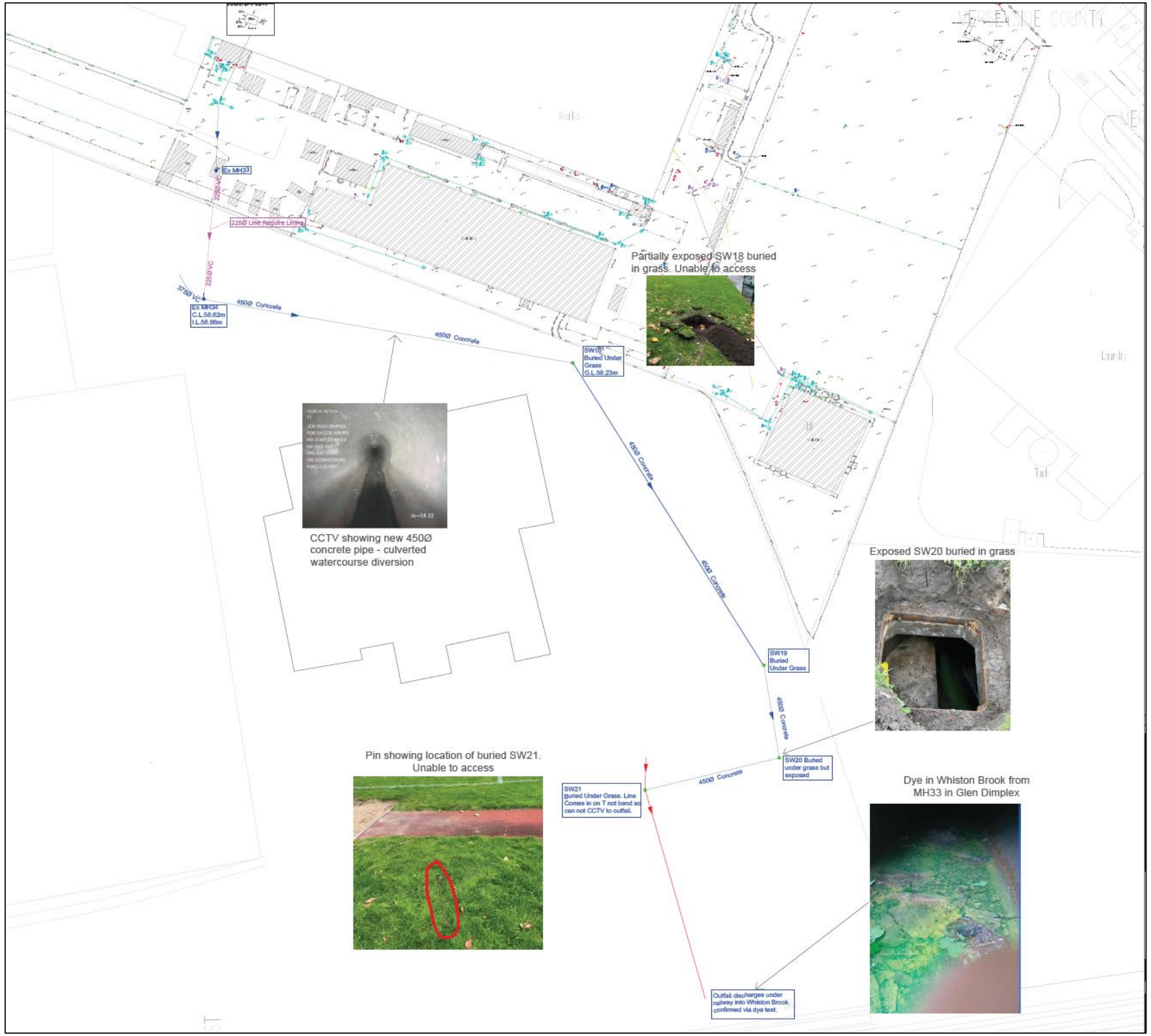
DRN	ASB	Sept 02
CHK	Updated	July 12
AUTH		
SCALE	ask	

GDHA Stoney Lane Prescot L35 2XW.

Title: Prescot Site - Emergency Preparedness Plan Including Drainage System

Issue C | Filename | Dig No. | A1

2025 – CCTV investigation confirms the route of the culverted watercourse through St Edmunds Arrowsmith is in line with the Rev 11 Faber Maunsell plan provided by the school.



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APPENDIX I: SURFACE WATER RUN-OFF CALCULATIONS

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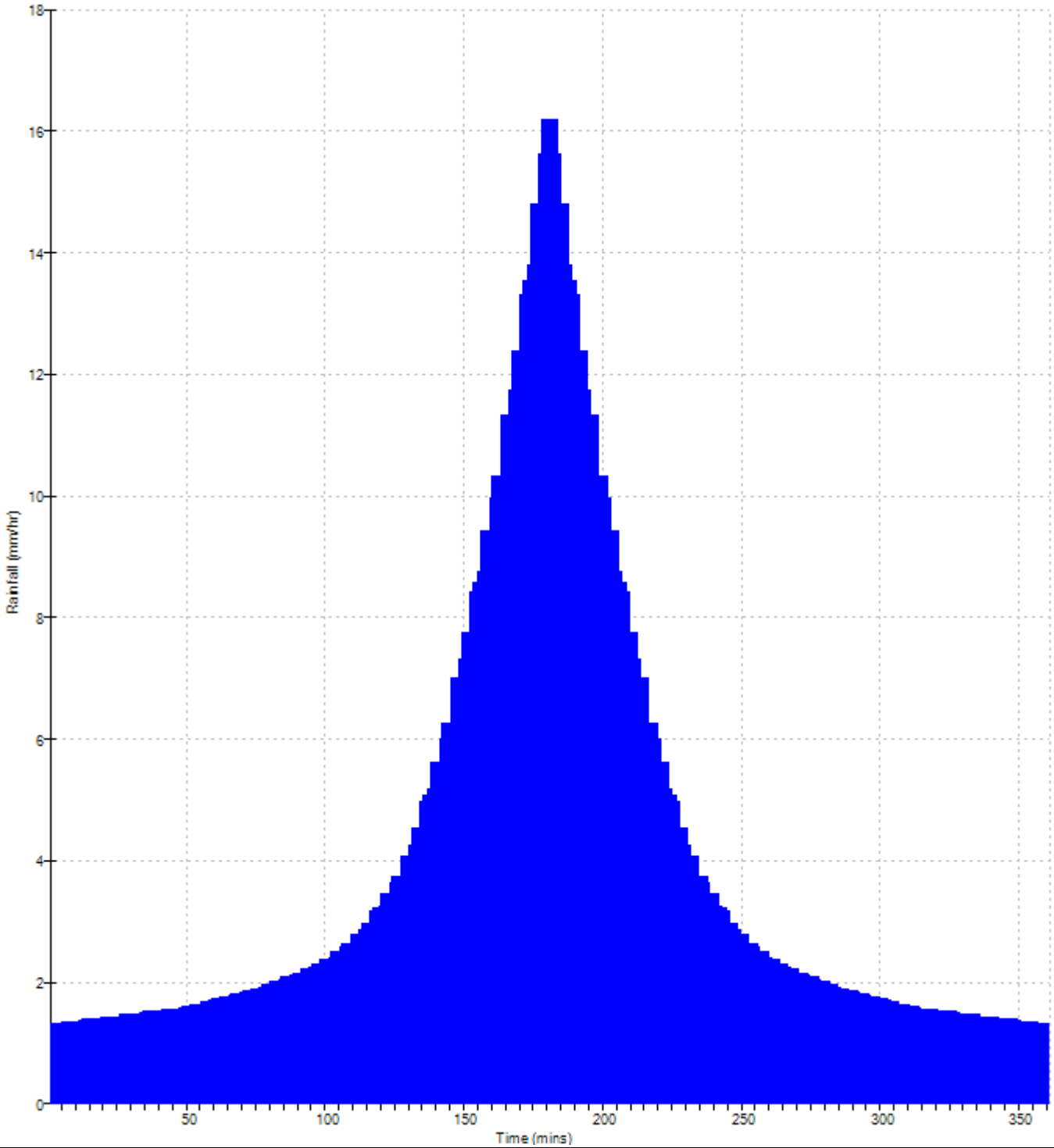
Rainfall profile

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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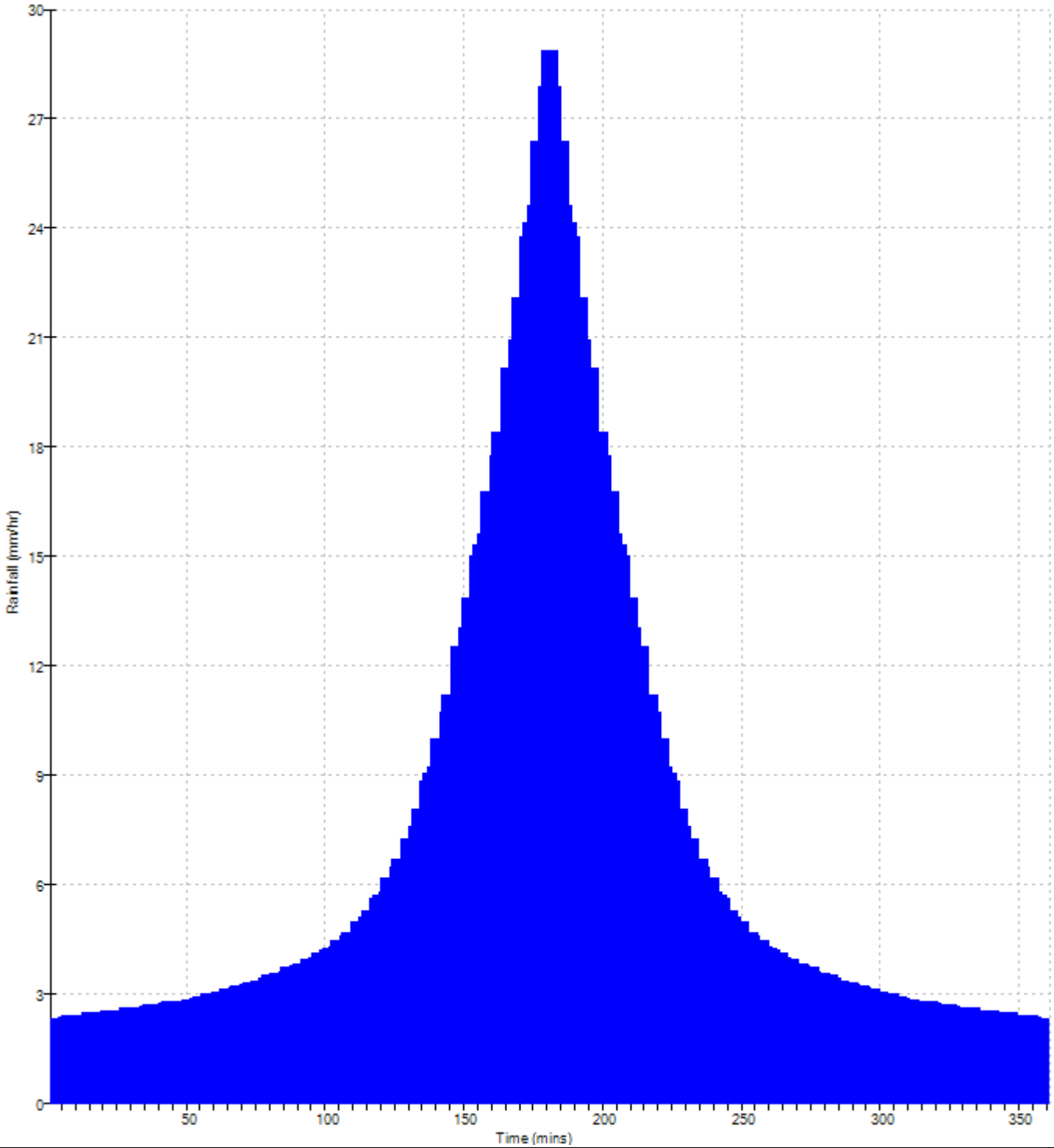
Rainfall profile

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

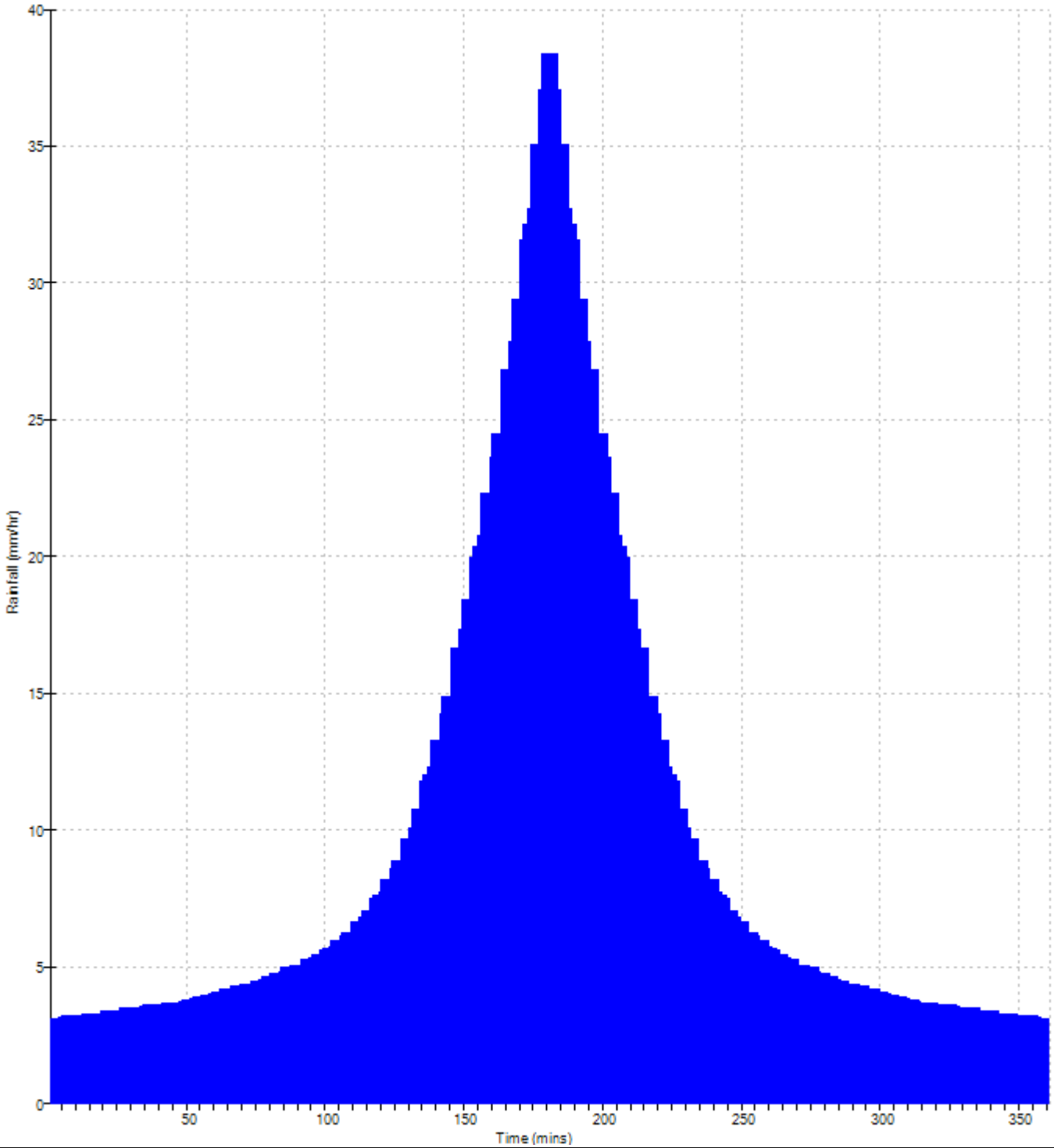


©1982-2020 Innovyze

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 J: PRELIMINARY DRAINAGE STRATEGY

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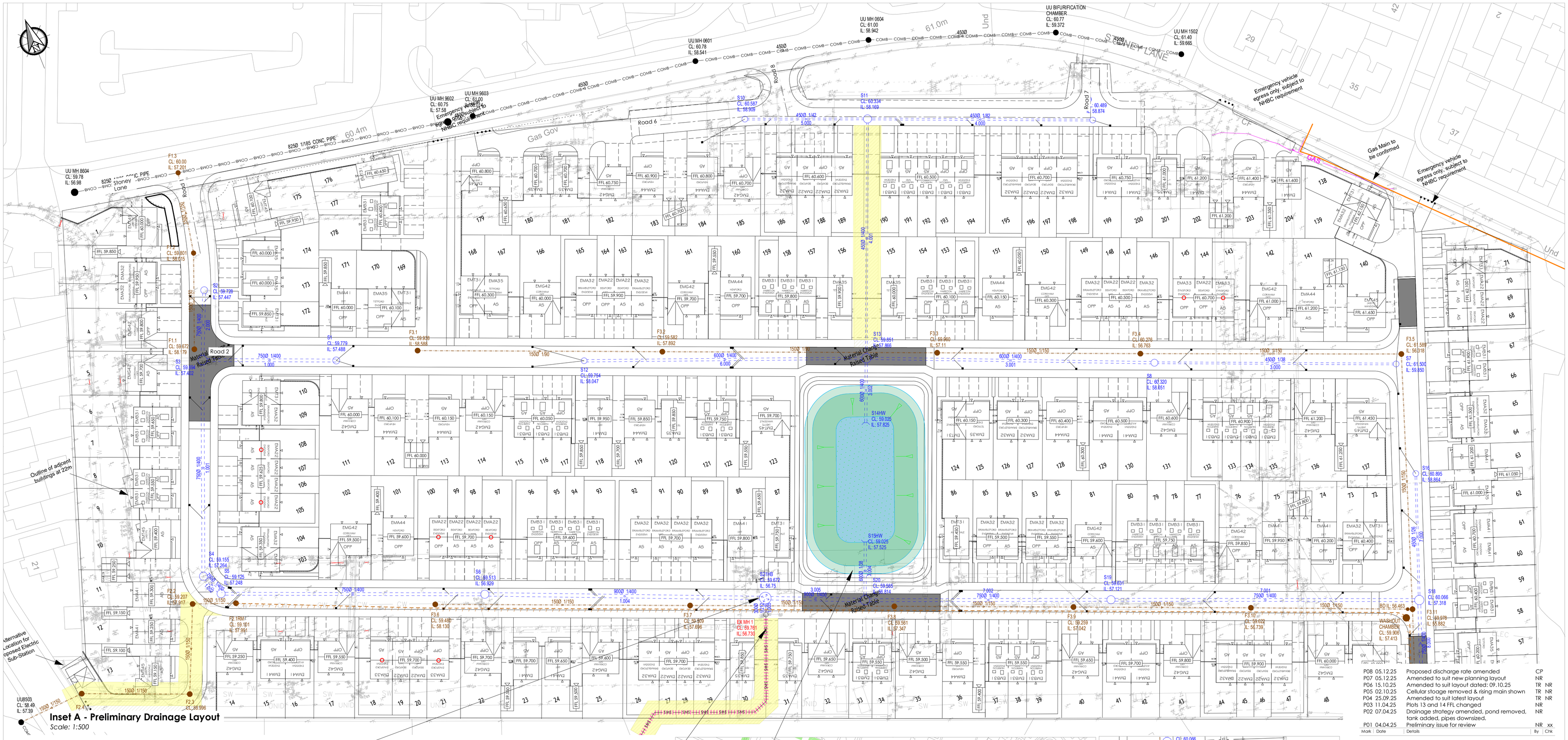


Inset A - Preliminary Drainage Layout

Scale: 1:500

Legend

- Site Extents
- COMB — COMB — Existing Public Combined Sewer & Manhole
- SWS — SWS — Existing Public Surface Water Sewer & Manhole
- Proposed Adoptable Surface Water Sewer & Manhole
- Proposed Gully and 150Ø Connection
- Proposed Adoptable Foul Water Sewer & Manhole
- Proposed Sewer Easement
- FFL 94.600 — Proposed Finished Floor Level
- Proposed Foul Water Rising Main

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.

Flow Control Chamber Manhole S21 HB

Hydro International HydroBrake Optimum
SHE-0256-4320-2500-4320
Design head = 2.500 m
Restricted discharge max. = 42.4 l/sec
Flow control orifice size 256mm
Cover level: 59.669 mAOD
Invert level: 56.750 mAOD

Drainage Strategy - Surface water

Proposed surface water flows generated by the development are proposed to discharge to the existing onsite watercourse MH Ref: MH1 located in the southern boundary, at a restricted rate of 42.4/s.

The surface water pipe network has been designed to cater for 1:30yr storm events with the online attenuation basin providing additional storage in the 1:100yr+45% Climate Change event.

Connection manhole;

MH Ref MH1 *(existing)*
CL 59.761 mAOD
IL 56.730 mAOD (300Ø)

(Manhole details measured onsite)

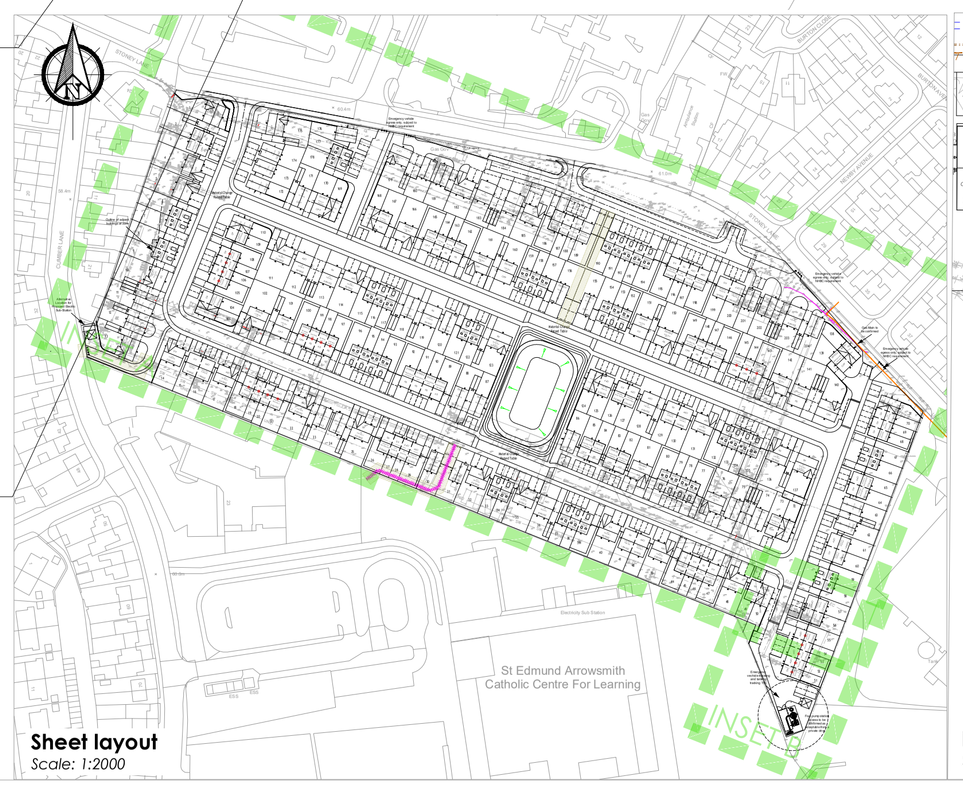
Approval to connect into exiting surface water network to be confirmed with LLFA prior to detailed design as a pre-development enquiry.

Further drainage investigation works *(CCTV)* required to determine existing cover levels, invert levels, pipe dia, manhole dia and general condition.

Attenuation Basin

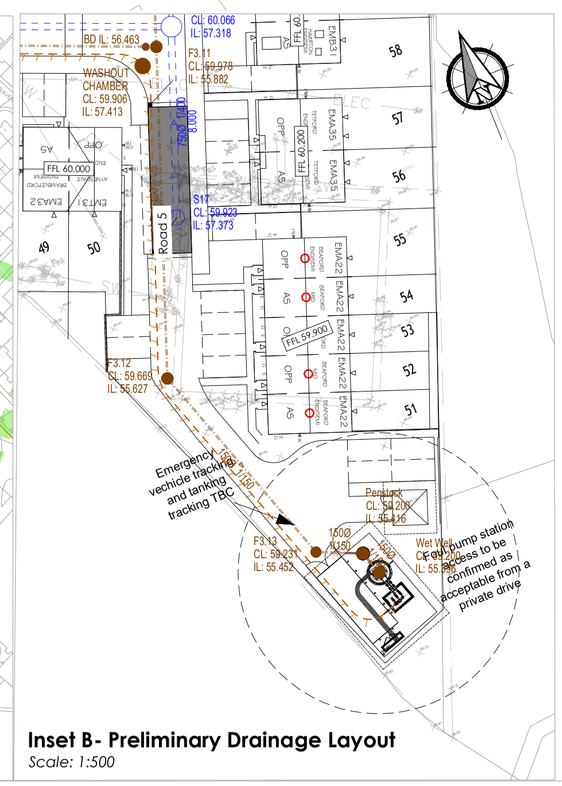
To attenuate flows up to 1:100 year storm + 45% climate change

Base Level:	57.525 m
Top of Bank Level:	59.525 m
Freeboard:	300 mm
Temp maximum storage volume:	1254.412m^3



Sheet layout

Scale: 1:2000



Inset B- Preliminary Drainage Layout

Scale: 1:500

Mark	Date	Details	By	Chk
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 stoage 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

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: As Shown for the original size of A1

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	0001	P08

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 | Altrincham 0161 613531

APPENDIX K: DRAINAGE NETWORK DETAILS

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SURFACE WATER DRAINAGE NETWORK DETAILS

Site at Former Glen Dimplex, Stoney Lane, Whiston

For

Taylor Wimpey

Rev. 1.0

05th December 2025

FORMER GLEN DIMPLEX, STONEY LANE, WHISTON

Drainage Network Details

05th December 2025

Issue no.	Rev. 1.0			
Date:	05th Dec 2025			
Prepared By:	Nicholas Richards			
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

CONTENTS

Surface Water System Details
Plan of proposed Surface Drainage Network
Design Settings
Node & Link Details
Pipeline Schedules
Manhole Schedules
Surcharged Outfall Details
Flow Controls
Storage Structures

Simulation
Simulation Settings
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

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
S1	0.198	5.00	59.779	1800	347909.533	391592.207	2.291	57.488
S2	0.106	5.00	59.728	1800	347884.821	391621.414	2.281	57.447
S3	0.085	5.00	59.669	2400	347877.780	391605.000	2.267	57.402
S4	0.130	5.00	59.155	2100	347857.494	391553.515	1.891	57.264
S5	0.131	5.00	59.125	2100	347860.047	391547.707	1.877	57.248
S6	0.266	5.00	59.513	2100	347922.646	391522.556	2.584	56.929
S7	0.160	5.00	61.500	1500	348161.090	391490.830	1.650	59.850
S8	0.295	5.00	60.320	1800	348103.767	391514.063	2.269	58.051
S9	0.230	5.00	60.524	1500	348112.125	391577.572	1.650	58.874
S10	0.196	5.00	60.559	1500	348029.541	391610.818	1.650	58.909
S11			60.298	2100	348058.703	391599.220	2.129	58.169
S12	0.278	5.00	59.754	1500	347968.418	391568.630	1.707	58.047
S13	0.130	5.00	59.826	2400	348035.729	391542.446	1.960	57.866
S14HW			59.025		348029.483	391527.194	1.500	57.525
S15HW		5.00	59.025		348018.058	391498.916	1.500	57.525
S16	0.078	5.00	60.895	1500	348155.384	391462.925	2.031	58.864
S17	0.097	5.00	59.898	1800	348136.615	391411.850	2.525	57.373
S18	0.102	5.00	60.066	2400	348144.196	391432.533	2.748	57.318
S19	0.351	5.00	59.511	2100	348070.965	391461.848	2.390	57.121
S20	0.090	5.00	59.560	2400	348012.470	391485.085	2.746	56.814
S21HB	0.082	5.00	59.669	3000	347988.960	391495.058	2.919	56.750
EX MH 1			59.761	1200	347987.557	391491.058	3.031	56.730
FALSE			59.399	1200	347978.471	391467.452	2.775	56.624

Links

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	S3	34.233	0.600	57.488	57.402	0.086	398.1	750	5.41	50.0
2.000	S2	S3	17.860	0.600	57.447	57.402	0.045	396.9	750	5.21	50.0
1.001	S3	S4	55.337	0.600	57.402	57.264	0.138	401.0	750	6.07	49.5
1.002	S4	S5	6.345	0.600	57.264	57.248	0.016	396.6	750	6.15	49.2
1.003	S5	S6	67.463	0.600	57.248	57.079	0.169	399.2	750	6.95	46.4
1.004	S6	S21HB	71.790	0.600	56.929	56.750	0.179	401.1	900	7.72	44.0
3.000	S7	S8	61.852	0.600	59.850	58.201	1.649	37.5	450	5.31	50.0
3.001	S8	S13	73.720	0.600	58.051	57.866	0.185	398.5	600	6.32	48.6
4.000	S9	S11	57.641	0.600	58.874	58.169	0.705	81.8	450	5.43	50.0
5.000	S10	S11	31.384	0.600	58.909	58.169	0.740	42.4	450	5.17	50.0
4.001	S11	S13	61.246	0.600	58.169	58.016	0.153	400.3	450	6.44	48.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.396	616.8	26.8	1.541	1.517	0.198	0.0	105	0.716
2.000	1.398	617.7	14.4	1.531	1.517	0.106	0.0	77	0.594
1.001	1.391	614.5	52.1	1.517	1.141	0.389	0.0	145	0.863
1.002	1.399	618.0	69.2	1.141	1.127	0.519	0.0	167	0.939
1.003	1.394	615.9	81.6	1.127	1.684	0.650	0.0	183	0.983
1.004	1.558	991.2	109.1	1.684	2.019	0.915	0.0	199	1.043
3.000	3.327	529.2	21.6	1.200	1.669	0.160	0.0	61	1.665
3.001	1.213	343.1	59.9	1.669	1.360	0.455	0.0	168	0.922
4.000	2.249	357.8	31.1	1.200	1.679	0.230	0.0	88	1.399
5.000	3.128	497.5	26.6	1.200	1.679	0.196	0.0	70	1.697
4.001	1.010	160.6	55.5	1.679	1.360	0.425	0.0	182	0.921

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Links

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)
6.000	S12	S13	72.225	0.600	58.047	57.866	0.181	399.0	600	5.99	49.8
3.002	S13	S14HW	16.481	0.600	57.866	57.825	0.041	402.0	600	6.67	47.3
3.004	S15HW	S20	14.917	0.600	57.525	57.132	0.393	38.0	600	5.06	50.0
7.000	S16	S18	32.386	0.600	58.864	57.618	1.246	26.0	450	5.13	50.0
8.000	S17	S18	22.028	0.600	57.373	57.318	0.055	400.5	750	5.26	50.0
7.001	S18	S19	78.881	0.600	57.318	57.121	0.197	400.4	750	6.21	49.0
7.002	S19	S20	62.941	0.600	57.121	56.964	0.157	400.9	750	6.96	46.3
3.005	S20	S21HB	25.538	0.600	56.814	56.750	0.064	399.0	900	7.23	45.5
1.005	S21HB	EX MH 1	4.239	0.600	56.750	56.730	0.020	212.0	300	7.79	43.8
1.006	EX MH 1	FALSE	25.294	0.600	56.730	56.624	0.106	238.6	300	8.20	42.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
6.000	1.213	342.9	37.5	1.107	1.360	0.278	0.0	133	0.808
3.002	1.208	341.6	165.2	1.360	0.600	1.288	0.0	294	1.199
3.004	3.960	1119.7	0.0	0.900	1.828	0.000	0.0	0	0.000
7.000	4.000	636.1	10.6	1.581	1.998	0.078	0.0	40	1.541
8.000	1.392	614.9	13.2	1.775	1.998	0.097	0.0	74	0.577
7.001	1.392	615.0	36.8	1.998	1.640	0.278	0.0	123	0.782
7.002	1.391	614.6	78.9	1.640	1.846	0.628	0.0	180	0.972
3.005	1.562	993.7	88.5	1.846	2.019	0.718	0.0	179	0.985
1.005	1.076	76.0	203.6	2.619	2.731	1.716	0.0	300	1.090
1.006	1.013	71.6	198.2	2.731	2.475	1.716	0.0	300	1.026

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	34.233	398.1	750	Circular	59.779	57.488	1.541	59.669	57.402	1.517
2.000	17.860	396.9	750	Circular	59.728	57.447	1.531	59.669	57.402	1.517
1.001	55.337	401.0	750	Circular	59.669	57.402	1.517	59.155	57.264	1.141
1.002	6.345	396.6	750	Circular	59.155	57.264	1.141	59.125	57.248	1.127
1.003	67.463	399.2	750	Circular	59.125	57.248	1.127	59.513	57.079	1.684
1.004	71.790	401.1	900	Circular	59.513	56.929	1.684	59.669	56.750	2.019
3.000	61.852	37.5	450	Circular	61.500	59.850	1.200	60.320	58.201	1.669
3.001	73.720	398.5	600	Circular	60.320	58.051	1.669	59.826	57.866	1.360
4.000	57.641	81.8	450	Circular	60.524	58.874	1.200	60.298	58.169	1.679
5.000	31.384	42.4	450	Circular	60.559	58.909	1.200	60.298	58.169	1.679

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1800	Manhole	Adoptable	S3	2400	Manhole	Adoptable
2.000	S2	1800	Manhole	Adoptable	S3	2400	Manhole	Adoptable
1.001	S3	2400	Manhole	Adoptable	S4	2100	Manhole	Adoptable
1.002	S4	2100	Manhole	Adoptable	S5	2100	Manhole	Adoptable
1.003	S5	2100	Manhole	Adoptable	S6	2100	Manhole	Adoptable
1.004	S6	2100	Manhole	Adoptable	S21HB	3000	Manhole	Adoptable
3.000	S7	1500	Manhole	Adoptable	S8	1800	Manhole	Adoptable
3.001	S8	1800	Manhole	Adoptable	S13	2400	Manhole	Adoptable
4.000	S9	1500	Manhole	Adoptable	S11	2100	Manhole	Adoptable
5.000	S10	1500	Manhole	Adoptable	S11	2100	Manhole	Adoptable

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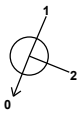
Pipeline Schedule

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)
4.001	61.246	400.3	450	Circular	60.298	58.169	1.679	59.826	58.016	1.360
6.000	72.225	399.0	600	Circular	59.754	58.047	1.107	59.826	57.866	1.360
3.002	16.481	402.0	600	Circular	59.826	57.866	1.360	59.025	57.825	0.600
3.004	14.917	38.0	600	Circular	59.025	57.525	0.900	59.560	57.132	1.828
7.000	32.386	26.0	450	Circular	60.895	58.864	1.581	60.066	57.618	1.998
8.000	22.028	400.5	750	Circular	59.898	57.373	1.775	60.066	57.318	1.998
7.001	78.881	400.4	750	Circular	60.066	57.318	1.998	59.511	57.121	1.640
7.002	62.941	400.9	750	Circular	59.511	57.121	1.640	59.560	56.964	1.846
3.005	25.538	399.0	900	Circular	59.560	56.814	1.846	59.669	56.750	2.019
1.005	4.239	212.0	300	Circular	59.669	56.750	2.619	59.761	56.730	2.731
1.006	25.294	238.6	300	Circular	59.761	56.730	2.731	59.399	56.624	2.475

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
4.001	S11	2100	Manhole	Adoptable	S13	2400	Manhole	Adoptable
6.000	S12	1500	Manhole	Adoptable	S13	2400	Manhole	Adoptable
3.002	S13	2400	Manhole	Adoptable	S14HW		Junction	
3.004	S15HW		Junction		S20	2400	Manhole	Adoptable
7.000	S16	1500	Manhole	Adoptable	S18	2400	Manhole	Adoptable
8.000	S17	1800	Manhole	Adoptable	S18	2400	Manhole	Adoptable
7.001	S18	2400	Manhole	Adoptable	S19	2100	Manhole	Adoptable
7.002	S19	2100	Manhole	Adoptable	S20	2400	Manhole	Adoptable
3.005	S20	2400	Manhole	Adoptable	S21HB	3000	Manhole	Adoptable
1.005	S21HB	3000	Manhole	Adoptable	EX MH 1	1200	Manhole	Adoptable
1.006	EX MH 1	1200	Manhole	Adoptable	FALSE	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	347909.533	391592.207	59.779	2.291	1800				
						0	1.000	57.488	750
S2	347884.821	391621.414	59.728	2.281	1800				
						0	2.000	57.447	750
S3	347877.780	391605.000	59.669	2.267	2400		1	2.000	57.402	750
							2	1.000	57.402	750
						0	1.001	57.402	750
S4	347857.494	391553.515	59.155	1.891	2100		1	1.001	57.264	750
						0	1.002	57.264	750
S5	347860.047	391547.707	59.125	1.877	2100		1	1.002	57.248	750
						0	1.003	57.248	750

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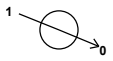
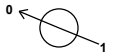
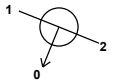
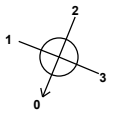
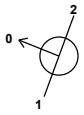
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S6	347922.646	391522.556	59.513	2.584	2100		1	1.003	57.079	750
							0	1.004	56.929	900
S7	348161.090	391490.830	61.500	1.650	1500		0	3.000	59.850	450
S8	348103.767	391514.063	60.320	2.269	1800		1	3.000	58.201	450
							0	3.001	58.051	600
S9	348112.125	391577.572	60.524	1.650	1500		0	4.000	58.874	450
S10	348029.541	391610.818	60.559	1.650	1500		0	5.000	58.909	450
S11	348058.703	391599.220	60.298	2.129	2100		1	5.000	58.169	450
							2	4.000	58.169	450
							0	4.001	58.169	450
S12	347968.418	391568.630	59.754	1.707	1500		0	6.000	58.047	600
S13	348035.729	391542.446	59.826	1.960	2400		1	6.000	57.866	600
							2	4.001	58.016	450
							3	3.001	57.866	600
							0	3.002	57.866	600
S14HW	348029.483	391527.194	59.025	1.500			1	3.002	57.825	600
S15HW	348018.058	391498.916	59.025	1.500			0	3.004	57.525	600
S16	348155.384	391462.925	60.895	2.031	1500		0	7.000	58.864	450
S17	348136.615	391411.850	59.898	2.525	1800		0	8.000	57.373	750
S18	348144.196	391432.533	60.066	2.748	2400		1	8.000	57.318	750
							2	7.000	57.618	450
							0	7.001	57.318	750

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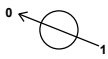
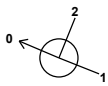
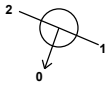
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S19	348070.965	391461.848	59.511	2.390	2100		1	7.001	57.121	750
							0	7.002	57.121	750
S20	348012.470	391485.085	59.560	2.746	2400		1	7.002	56.964	750
							2	3.004	57.132	600
							0	3.005	56.814	900
S21HB	347988.960	391495.058	59.669	2.919	3000		1	3.005	56.750	900
							2	1.004	56.750	900
							0	1.005	56.750	300
EX MH 1	347987.557	391491.058	59.761	3.031	1200		1	1.005	56.730	300
							0	1.006	56.730	300
FALSE	347978.471	391467.452	59.399	2.775	1200		1	1.006	56.624	300

Node S21HB Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	56.750	Product Number	CTL-SHE-0254-4240-2500-4240
Design Depth (m)	2.500	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	42.4	Min Node Diameter (mm)	2700

Node S15HW Pond Storage Structure

Invert Level (m)	57.525	Time to half empty (mins)	124	Analyse flow through structure	x

Inlets

S14HW

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	818.4	0.300	924.6	0.600	1039.9	0.900	1163.8	1.200	1296.2	1.500	1437.1
0.100	852.4	0.400	962.1	0.700	1080.3	1.000	1207.0	1.300	1342.2		
0.200	888.0	0.500	1000.5	0.800	1121.6	1.100	1251.1	1.400	1389.2		

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Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.750	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	0.0		

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

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Results for 1 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 winter	S1	10	57.577	0.089	19.9	0.2266	0.0000	OK
15 minute winter	S2	11	57.526	0.079	10.7	0.2008	0.0000	OK
15 minute winter	S3	11	57.522	0.120	37.7	0.5439	0.0000	OK
120 minute winter	S4	92	57.441	0.177	18.2	0.6114	0.0000	OK
120 minute winter	S5	92	57.440	0.192	22.7	0.6662	0.0000	OK
120 minute winter	S6	92	57.440	0.511	32.0	1.7691	0.0000	OK
15 minute winter	S7	10	59.903	0.053	16.1	0.0935	0.0000	OK
15 minute winter	S8	11	58.193	0.142	45.1	0.3605	0.0000	OK
15 minute winter	S9	10	58.950	0.076	23.1	0.1336	0.0000	OK
15 minute winter	S10	10	58.969	0.060	19.7	0.1063	0.0000	OK
15 minute winter	S11	12	58.320	0.151	42.1	0.5240	0.0000	OK
15 minute winter	S12	11	58.158	0.111	27.9	0.1960	0.0000	OK
15 minute winter	S13	12	58.102	0.236	119.2	1.0670	0.0000	OK
120 minute winter	S14HW	80	57.602	0.077	45.0	0.0000	0.0000	OK
120 minute winter	S15HW	80	57.592	0.067	34.1	60.0875	0.0000	OK
15 minute winter	S16	10	58.899	0.035	7.9	0.0619	0.0000	OK
120 minute winter	S17	94	57.442	0.069	3.4	0.1764	0.0000	OK
120 minute winter	S18	94	57.443	0.125	9.8	0.5655	0.0000	OK
120 minute winter	S19	94	57.440	0.319	22.1	1.1055	0.0000	OK
120 minute winter	S20	92	57.440	0.626	43.6	2.8300	0.0000	OK
120 minute winter	S21HB	92	57.440	0.690	50.5	4.8746	0.0000	SURCHARGED
120 minute winter	EX MH 1	92	56.902	0.172	41.4	0.1945	0.0000	OK
120 minute winter	FALSE	92	56.781	0.157	41.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S3	19.4	0.540	0.031	1.2759	
15 minute winter	S2	2.000	S3	9.8	0.339	0.016	0.6247	
15 minute winter	S3	1.001	S4	36.1	0.648	0.059	3.1327	
120 minute winter	S4	1.002	S5	18.1	0.548	0.029	0.5327	
120 minute winter	S5	1.003	S6	22.7	0.675	0.037	10.0672	
120 minute winter	S6	1.004	S21HB	25.6	0.297	0.026	32.0400	
15 minute winter	S7	3.000	S8	15.5	1.503	0.029	0.6382	
15 minute winter	S8	3.001	S13	44.0	0.636	0.128	5.5489	
15 minute winter	S9	4.000	S11	22.6	0.830	0.063	1.8275	
15 minute winter	S10	5.000	S11	19.5	0.985	0.039	0.9159	
15 minute winter	S11	4.001	S13	37.9	0.884	0.236	2.6262	
15 minute winter	S12	6.000	S13	26.8	0.465	0.078	4.9164	
15 minute winter	S13	3.002	S14HW	114.3	1.178	0.335	1.5996	
120 minute winter	S15HW	3.004	S20	30.8	1.253	0.027	1.2001	
15 minute winter	S16	7.000	S18	7.7	1.376	0.012	0.1815	
120 minute winter	S17	8.000	S18	3.4	0.259	0.006	0.7525	
120 minute winter	S18	7.001	S19	9.7	0.386	0.016	8.9356	
120 minute winter	S19	7.002	S20	20.5	0.568	0.033	14.8572	
120 minute winter	S20	3.005	S21HB	39.0	0.255	0.039	12.6643	
120 minute winter	S21HB	1.005	EX MH 1	41.4	0.931	0.544	0.1883	
120 minute winter	EX MH 1	1.006	FALSE	41.4	1.046	0.578	1.0005	303.5

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S1	92	57.618	0.130	9.0	0.3298	0.0000	OK
120 minute winter	S2	92	57.616	0.169	4.8	0.4295	0.0000	OK
120 minute winter	S3	92	57.614	0.212	17.7	0.9612	0.0000	OK
120 minute winter	S4	94	57.613	0.349	23.5	1.2081	0.0000	OK
120 minute winter	S5	94	57.612	0.364	29.4	1.2615	0.0000	OK
120 minute winter	S6	90	57.607	0.678	41.2	2.3495	0.0000	OK
15 minute winter	S7	10	59.912	0.062	22.1	0.1093	0.0000	OK
15 minute winter	S8	11	58.218	0.167	62.2	0.4241	0.0000	OK
15 minute winter	S9	10	58.963	0.089	31.8	0.1564	0.0000	OK
15 minute winter	S10	10	58.979	0.070	27.1	0.1239	0.0000	OK
15 minute winter	S11	12	58.350	0.181	58.0	0.6263	0.0000	OK
15 minute winter	S12	11	58.177	0.130	38.4	0.2294	0.0000	OK
15 minute winter	S13	12	58.148	0.282	165.8	1.2771	0.0000	OK
60 minute winter	S14HW	44	57.619	0.094	86.9	0.0000	0.0000	OK
60 minute winter	S15HW	45	57.606	0.081	56.6	73.1498	0.0000	OK
15 minute winter	S16	10	58.905	0.041	10.8	0.0720	0.0000	OK
120 minute winter	S17	104	57.611	0.238	4.7	0.6048	0.0000	OK
120 minute winter	S18	92	57.611	0.293	14.4	1.3261	0.0000	OK
120 minute winter	S19	92	57.610	0.489	28.5	1.6955	0.0000	OK
120 minute winter	S20	92	57.607	0.793	55.9	3.5860	0.0000	OK
120 minute winter	S21HB	92	57.606	0.856	56.6	6.0519	0.0000	SURCHARGED
120 minute winter	EX MH 1	90	56.904	0.174	42.3	0.1973	0.0000	OK
120 minute winter	FALSE	90	56.783	0.159	42.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	S1	1.000	S3	9.0	0.407	0.015	2.6192	
120 minute winter	S2	2.000	S3	4.8	0.257	0.008	1.5751	
120 minute winter	S3	1.001	S4	20.8	0.520	0.034	8.3068	
120 minute winter	S4	1.002	S5	23.4	0.587	0.038	1.3085	
120 minute winter	S5	1.003	S6	29.1	0.689	0.047	18.2079	
120 minute winter	S6	1.004	S21HB	33.9	0.317	0.034	40.7317	
15 minute winter	S7	3.000	S8	21.3	1.654	0.040	0.7999	
15 minute winter	S8	3.001	S13	60.7	0.683	0.177	7.0619	
15 minute winter	S9	4.000	S11	31.2	0.883	0.087	2.3364	
15 minute winter	S10	5.000	S11	26.8	1.030	0.054	1.1722	
15 minute winter	S11	4.001	S13	52.9	0.970	0.330	3.3428	
15 minute winter	S12	6.000	S13	36.9	0.484	0.108	6.2332	
15 minute winter	S13	3.002	S14HW	160.2	1.303	0.469	2.0257	
60 minute winter	S15HW	3.004	S20	45.9	1.017	0.041	1.8136	
15 minute winter	S16	7.000	S18	10.6	1.519	0.017	0.2261	
120 minute winter	S17	8.000	S18	4.5	0.280	0.007	3.0573	
120 minute winter	S18	7.001	S19	17.3	0.405	0.028	18.2876	
120 minute winter	S19	7.002	S20	23.6	0.559	0.038	22.2181	
120 minute winter	S20	3.005	S21HB	48.7	0.275	0.049	15.5015	
120 minute winter	S21HB	1.005	EX MH 1	42.3	0.936	0.556	0.1915	
120 minute winter	EX MH 1	1.006	FALSE	42.3	1.052	0.591	1.0164	392.9

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Results for 30 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
60 minute winter	S1	62	57.900	0.412	30.8	1.0486	0.0000	OK
60 minute winter	S2	64	57.893	0.446	16.5	1.1352	0.0000	OK
120 minute winter	S3	118	57.892	0.490	45.2	2.2168	0.0000	OK
60 minute winter	S4	63	57.894	0.630	85.3	2.1839	0.0000	OK
60 minute winter	S5	63	57.894	0.646	94.4	2.2394	0.0000	OK
60 minute winter	S6	65	57.893	0.964	165.7	3.3377	0.0000	SURCHARGED
15 minute winter	S7	10	59.941	0.091	48.9	0.1602	0.0000	OK
15 minute winter	S8	11	58.335	0.284	138.8	0.7223	0.0000	OK
15 minute winter	S9	10	59.006	0.132	70.2	0.2335	0.0000	OK
15 minute winter	S10	10	59.013	0.104	59.9	0.1831	0.0000	OK
15 minute winter	S11	11	58.476	0.307	128.8	1.0628	0.0000	OK
15 minute winter	S12	11	58.321	0.274	84.9	0.4835	0.0000	OK
15 minute winter	S13	12	58.308	0.442	357.3	2.0014	0.0000	OK
60 minute winter	S14HW	62	57.903	0.378	196.1	0.0000	0.0000	OK
60 minute winter	S15HW	61	57.891	0.366	168.5	328.8408	0.0000	OK
15 minute winter	S16	10	58.924	0.060	23.9	0.1059	0.0000	OK
60 minute winter	S17	63	57.896	0.523	15.6	1.3298	0.0000	OK
60 minute winter	S18	63	57.894	0.576	52.2	2.6080	0.0000	OK
60 minute winter	S19	59	57.897	0.776	141.6	2.6866	0.0000	SURCHARGED
120 minute winter	S20	208	57.940	1.126	486.8	5.0954	0.0000	SURCHARGED
60 minute winter	S21HB	65	57.892	1.142	307.2	8.0747	0.0000	SURCHARGED
30 minute summer	EX MH 1	19	56.905	0.175	42.5	0.1974	0.0000	OK
15 minute winter	FALSE	12	56.783	0.159	42.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S1	1.000	S3	45.6	0.583	0.074	9.4290	
60 minute winter	S2	2.000	S3	15.0	0.311	0.024	5.1564	
120 minute winter	S3	1.001	S4	57.7	0.563	0.094	19.2678	
60 minute winter	S4	1.002	S5	78.6	0.745	0.127	2.5339	
60 minute winter	S5	1.003	S6	88.9	0.762	0.144	28.4605	
60 minute winter	S6	1.004	S21HB	-130.2	0.421	-0.131	45.4986	
15 minute winter	S7	3.000	S8	48.3	1.988	0.091	1.9049	
15 minute winter	S8	3.001	S13	125.2	0.806	0.365	13.0039	
15 minute winter	S9	4.000	S11	69.3	1.032	0.194	4.4102	
15 minute winter	S10	5.000	S11	59.5	1.253	0.120	2.2252	
15 minute winter	S11	4.001	S13	122.9	1.107	0.765	6.7982	
15 minute winter	S12	6.000	S13	74.4	0.568	0.217	12.4696	
15 minute winter	S13	3.002	S14HW	351.2	1.687	1.028	3.4255	
60 minute winter	S15HW	3.004	S20	183.4	0.974	0.164	3.4452	
15 minute winter	S16	7.000	S18	23.5	1.920	0.037	1.1559	
60 minute winter	S17	8.000	S18	24.6	0.385	0.040	7.6081	
60 minute winter	S18	7.001	S19	88.0	0.488	0.143	31.6845	
60 minute winter	S19	7.002	S20	100.5	0.666	0.164	27.7016	
120 minute winter	S20	3.005	S21HB	285.2	0.450	0.287	16.1853	
60 minute winter	S21HB	1.005	EX MH 1	42.4	0.942	0.558	0.1917	
30 minute summer	EX MH 1	1.006	FALSE	42.3	1.053	0.591	1.0173	489.4

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S1	118	58.045	0.557	22.5	1.4183	0.0000	OK
120 minute winter	S2	118	58.043	0.596	12.0	1.5175	0.0000	OK
120 minute winter	S3	118	58.043	0.641	50.6	2.9020	0.0000	OK
120 minute winter	S4	116	58.046	0.782	64.0	2.7086	0.0000	SURCHARGED
120 minute winter	S5	116	58.046	0.798	71.3	2.7645	0.0000	SURCHARGED
120 minute winter	S6	116	58.047	1.118	170.6	3.8716	0.0000	SURCHARGED
15 minute winter	S7	10	59.951	0.101	60.4	0.1779	0.0000	OK
15 minute winter	S8	12	58.403	0.352	171.4	0.8957	0.0000	OK
15 minute winter	S9	10	59.022	0.148	86.8	0.2608	0.0000	OK
15 minute winter	S10	10	59.024	0.115	74.1	0.2038	0.0000	OK
15 minute winter	S11	11	58.532	0.363	159.4	1.2566	0.0000	OK
15 minute winter	S12	11	58.383	0.336	105.0	0.5935	0.0000	OK
15 minute winter	S13	12	58.370	0.504	445.9	2.2781	0.0000	OK
120 minute winter	S14HW	118	58.055	0.530	145.2	0.0000	0.0000	OK
120 minute winter	S15HW	118	58.045	0.520	128.6	478.7377	0.0000	OK
15 minute winter	S16	10	58.931	0.067	29.6	0.1177	0.0000	OK
120 minute winter	S17	114	58.044	0.671	11.6	1.7066	0.0000	OK
120 minute winter	S18	118	58.044	0.726	32.3	3.2864	0.0000	OK
120 minute winter	S19	114	58.044	0.923	78.6	3.1987	0.0000	SURCHARGED
120 minute winter	S20	116	58.045	1.231	439.9	5.5671	0.0000	SURCHARGED
120 minute winter	S21HB	116	58.046	1.296	316.7	9.1582	0.0000	SURCHARGED
15 minute summer	EX MH 1	11	56.905	0.175	42.5	0.1974	0.0000	OK
30 minute summer	FALSE	18	56.783	0.159	42.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	S1	1.000	S3	29.0	0.489	0.047	12.8700	
120 minute winter	S2	2.000	S3	12.0	0.283	0.019	6.9335	
120 minute winter	S3	1.001	S4	49.2	0.564	0.080	23.2729	
120 minute winter	S4	1.002	S5	56.8	0.632	0.092	2.7926	
120 minute winter	S5	1.003	S6	78.4	0.660	0.127	29.6919	
120 minute winter	S6	1.004	S21HB	-143.6	0.370	-0.145	45.4986	
15 minute winter	S7	3.000	S8	59.7	1.992	0.113	2.8709	
15 minute winter	S8	3.001	S13	151.9	0.819	0.443	15.6396	
15 minute winter	S9	4.000	S11	85.7	1.063	0.240	5.2171	
15 minute winter	S10	5.000	S11	73.7	1.323	0.148	2.6349	
15 minute winter	S11	4.001	S13	150.7	1.124	0.938	8.2633	
15 minute winter	S12	6.000	S13	97.1	0.583	0.283	14.9498	
15 minute winter	S13	3.002	S14HW	430.9	1.830	1.261	3.8660	
120 minute winter	S15HW	3.004	S20	183.6	1.184	0.164	4.0345	
15 minute winter	S16	7.000	S18	29.2	2.042	0.046	1.6909	
120 minute winter	S17	8.000	S18	16.2	0.321	0.026	9.3771	
120 minute winter	S18	7.001	S19	41.3	0.397	0.067	34.5630	
120 minute winter	S19	7.002	S20	97.2	0.600	0.158	27.7016	
120 minute winter	S20	3.005	S21HB	287.1	0.453	0.289	16.1853	
120 minute winter	S21HB	1.005	EX MH 1	42.5	0.943	0.559	0.1916	
15 minute summer	EX MH 1	1.006	FALSE	42.3	1.054	0.591	1.0173	466.1

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.32%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	S1	176	58.394	0.906	23.6	2.3047	0.0000	SURCHARGED
180 minute winter	S2	176	58.394	0.947	12.6	2.4089	0.0000	SURCHARGED
180 minute winter	S3	176	58.394	0.992	41.4	4.4858	0.0000	SURCHARGED
180 minute winter	S4	176	58.394	1.130	56.5	3.9132	0.0000	SURCHARGED
180 minute winter	S5	176	58.394	1.146	59.7	3.9686	0.0000	SURCHARGED
180 minute winter	S6	176	58.394	1.465	134.8	5.0739	0.0000	SURCHARGED
15 minute winter	S7	10	59.971	0.121	87.6	0.2146	0.0000	OK
15 minute winter	S8	11	58.658	0.607	248.7	1.5436	0.0000	SURCHARGED
15 minute winter	S9	10	59.054	0.180	125.9	0.3182	0.0000	OK
15 minute winter	S10	10	59.048	0.139	107.4	0.2465	0.0000	OK
15 minute winter	S11	11	58.872	0.703	231.4	2.4339	0.0000	SURCHARGED
15 minute winter	S12	11	58.583	0.536	152.3	0.9469	0.0000	OK
15 minute winter	S13	11	58.552	0.686	622.9	3.1014	0.0000	SURCHARGED
180 minute winter	S14HW	180	58.405	0.880	153.3	0.0000	0.0000	OK
180 minute winter	S15HW	176	58.394	0.869	138.6	856.5260	0.0000	SURCHARGED
15 minute winter	S16	10	58.944	0.080	42.9	0.1420	0.0000	OK
180 minute winter	S17	176	58.394	1.021	11.6	2.5979	0.0000	SURCHARGED
180 minute winter	S18	176	58.394	1.076	31.4	4.8673	0.0000	SURCHARGED
180 minute winter	S19	176	58.394	1.273	64.2	4.4094	0.0000	SURCHARGED
180 minute winter	S20	176	58.394	1.580	373.7	7.1480	0.0000	SURCHARGED
180 minute winter	S21HB	176	58.394	1.644	199.2	11.6205	0.0000	SURCHARGED
30 minute summer	EX MH 1	16	56.905	0.175	42.5	0.1974	0.0000	OK
15 minute summer	FALSE	10	56.783	0.159	42.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	S1	1.000	S3	24.5	0.441	0.040	15.0667	
180 minute winter	S2	2.000	S3	10.8	0.269	0.018	7.8606	
180 minute winter	S3	1.001	S4	45.1	0.497	0.073	24.3550	
180 minute winter	S4	1.002	S5	48.3	0.558	0.078	2.7926	
180 minute winter	S5	1.003	S6	56.3	0.624	0.091	29.6919	
180 minute winter	S6	1.004	S21HB	-110.8	0.343	-0.112	45.4986	
15 minute winter	S7	3.000	S8	86.7	1.987	0.164	5.9358	
15 minute winter	S8	3.001	S13	222.2	0.841	0.648	20.7641	
15 minute winter	S9	4.000	S11	124.5	1.121	0.348	6.2727	
15 minute winter	S10	5.000	S11	106.8	1.465	0.215	3.1420	
15 minute winter	S11	4.001	S13	213.1	1.345	1.327	9.7040	
15 minute winter	S12	6.000	S13	133.2	0.622	0.389	19.7647	
15 minute winter	S13	3.002	S14HW	625.4	2.234	1.831	4.4311	
180 minute winter	S15HW	3.004	S20	150.4	1.247	0.134	4.2018	
15 minute winter	S16	7.000	S18	42.3	2.270	0.067	2.8204	
180 minute winter	S17	8.000	S18	9.9	0.288	0.016	9.6950	
180 minute winter	S18	7.001	S19	26.5	0.353	0.043	34.7172	
180 minute winter	S19	7.002	S20	95.1	0.590	0.155	27.7016	
180 minute winter	S20	3.005	S21HB	162.4	0.270	0.163	16.1853	
180 minute winter	S21HB	1.005	EX MH 1	42.3	0.937	0.557	0.1916	
30 minute summer	EX MH 1	1.006	FALSE	42.3	1.053	0.591	1.0173	892.7

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APPENDIX L: SUDS EXAMPLES

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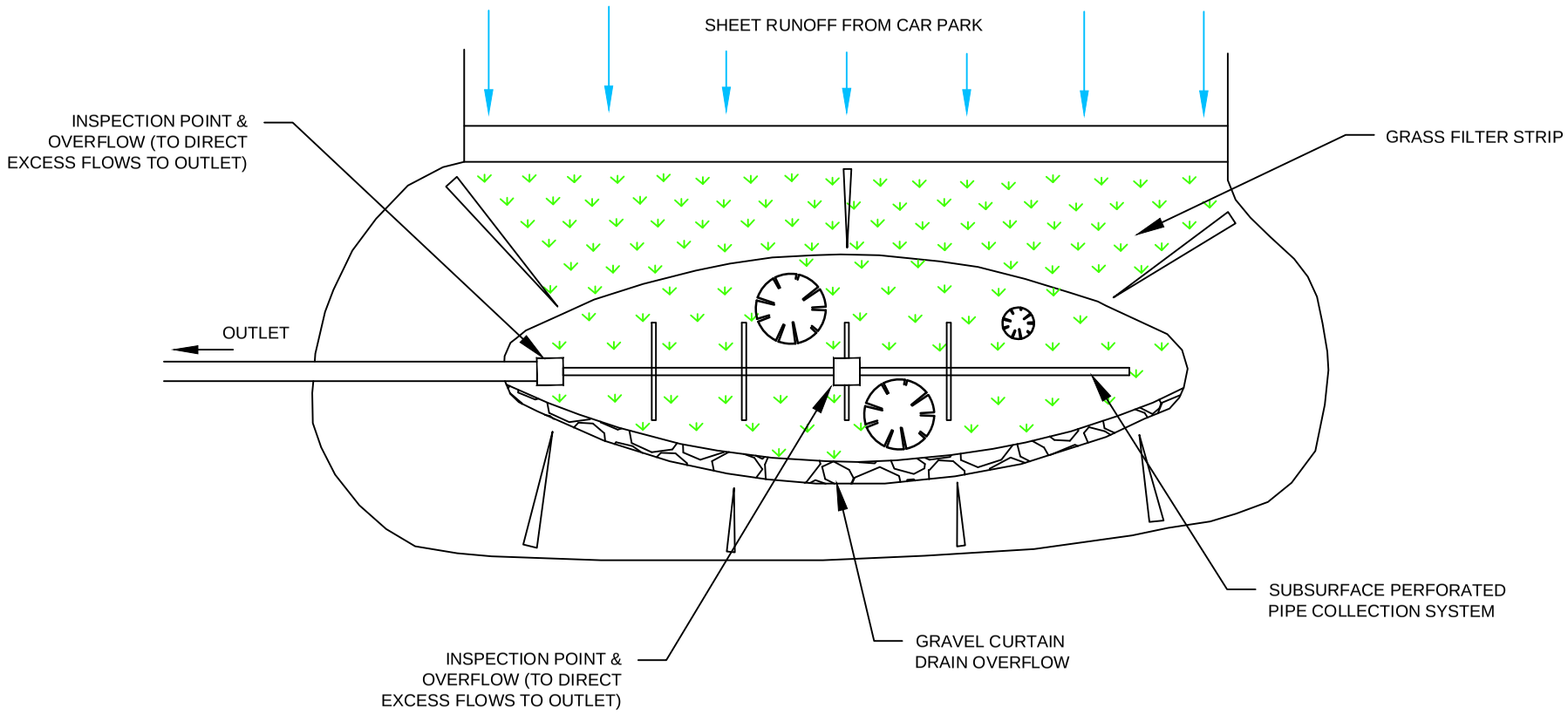

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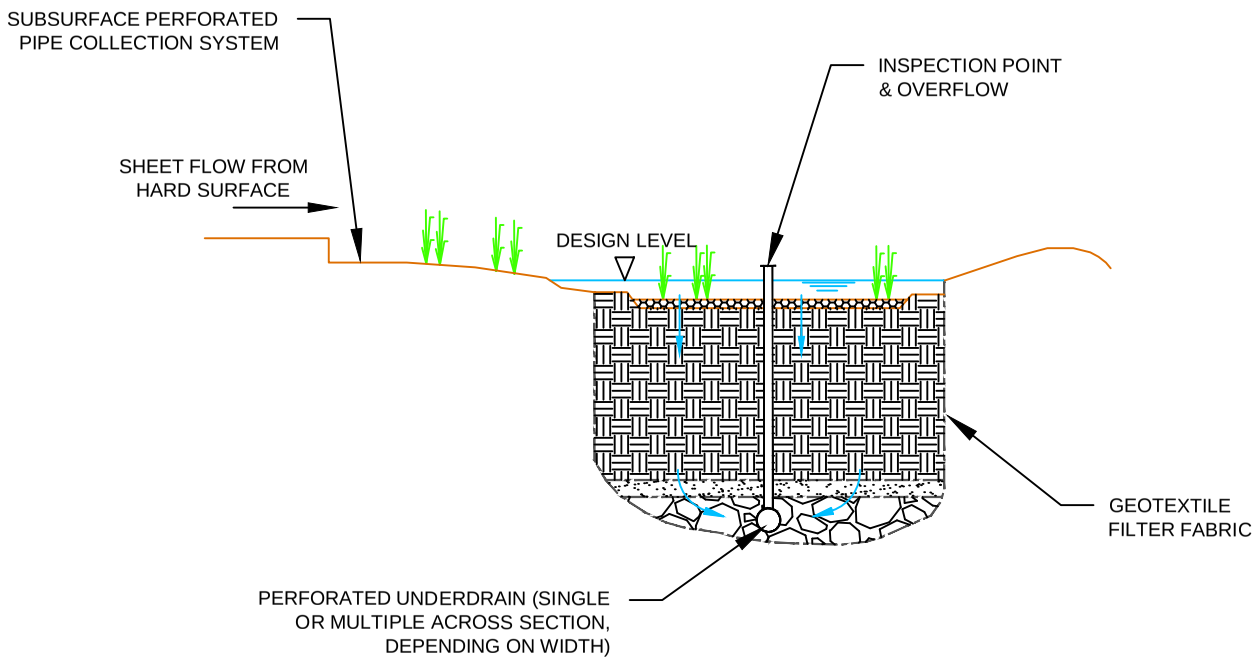

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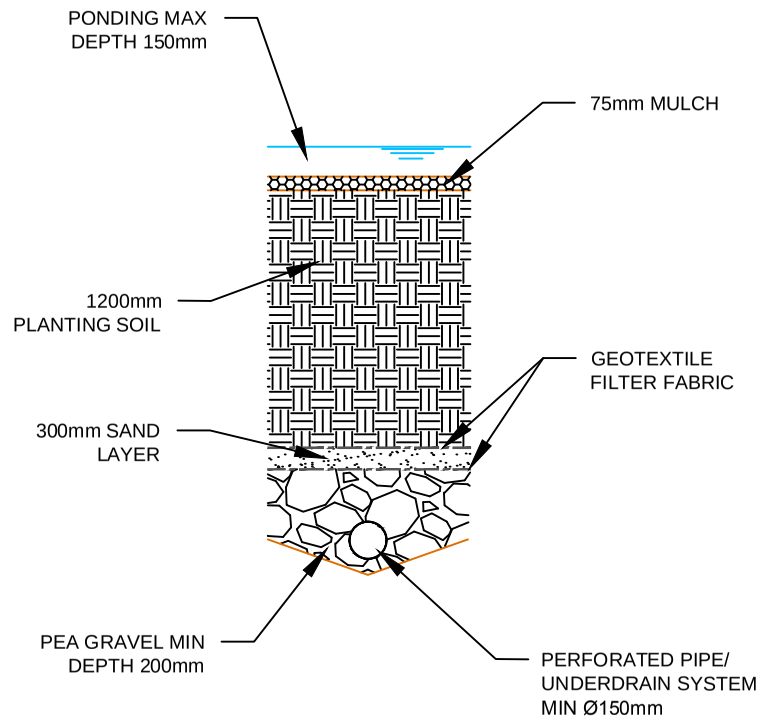

TYPICAL SECTION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT: TYPICAL SUDS DETAIL

TITLE: BIORETENTION APPLICATIONS

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	112	A

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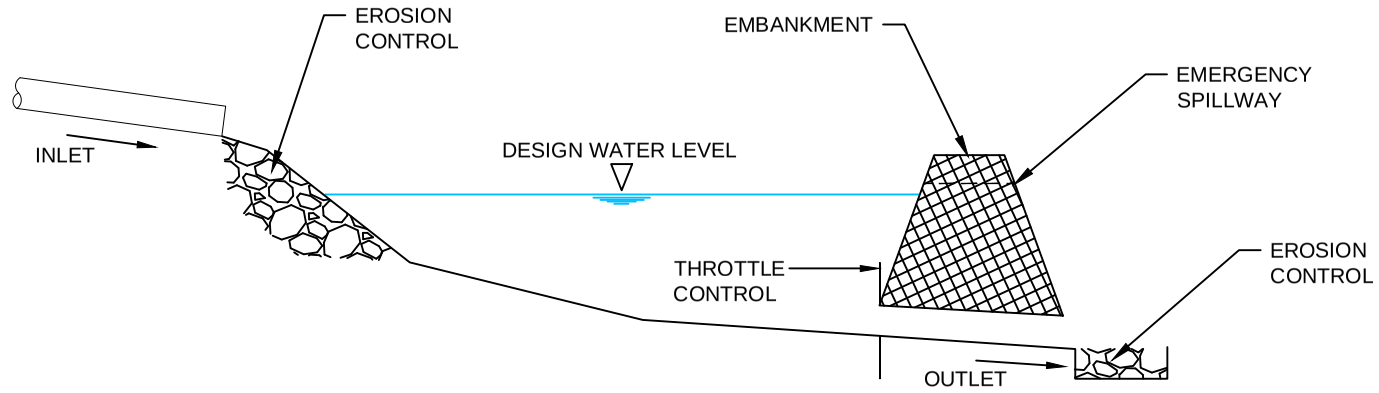
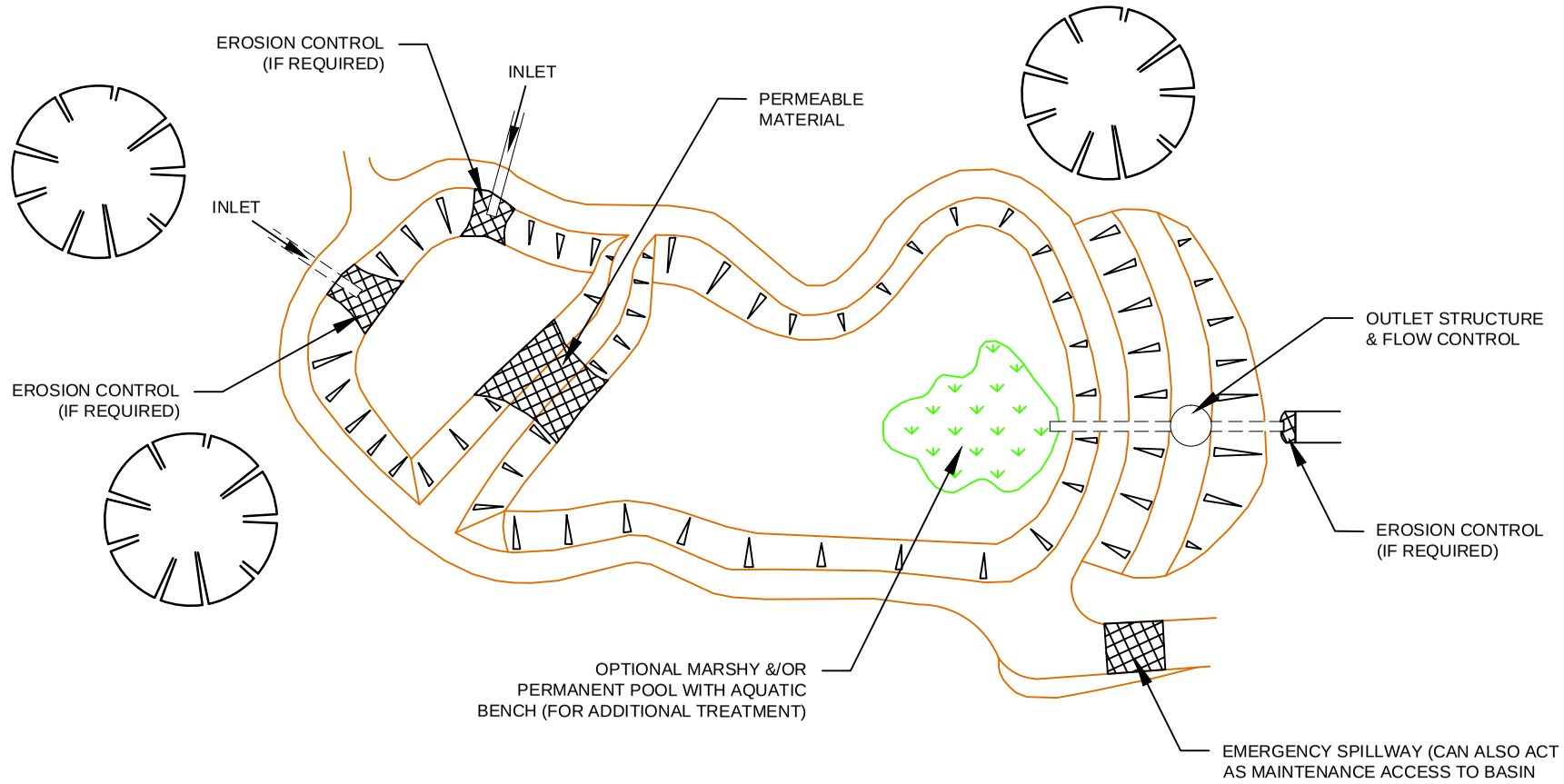


SCHEMATIC OF DETENTION BASIN PROFILE



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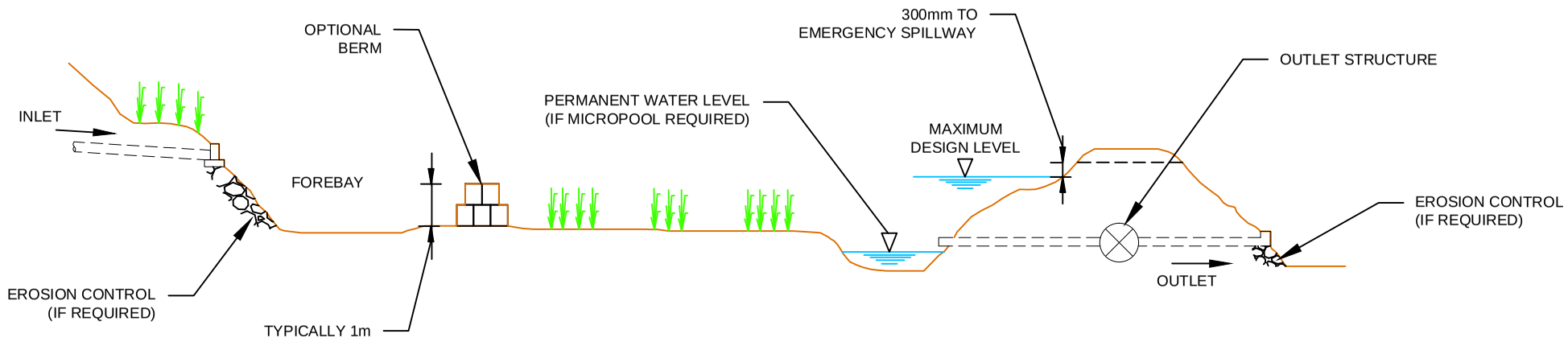

ELEVATION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

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CIVIL AND STRUCTURAL ENGINEERS
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PROJECT: TYPICAL SUDS DETAIL

TITLE: DETENTION BASINS

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	110	A

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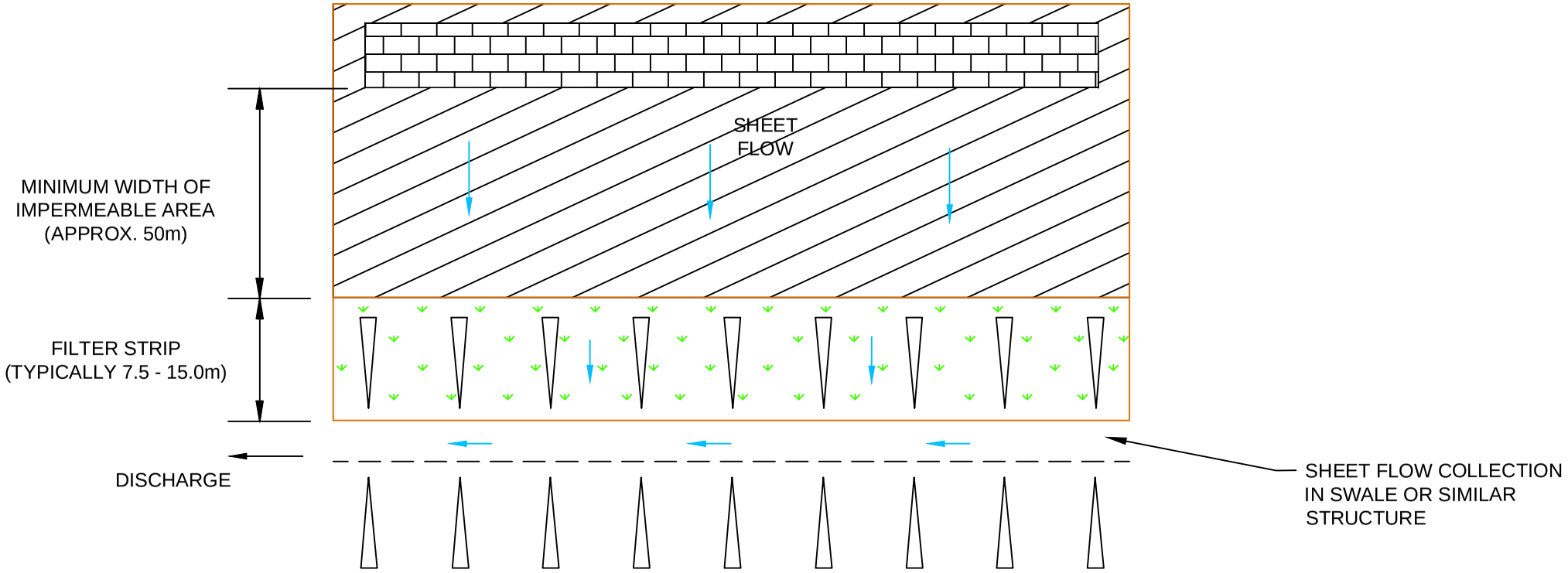
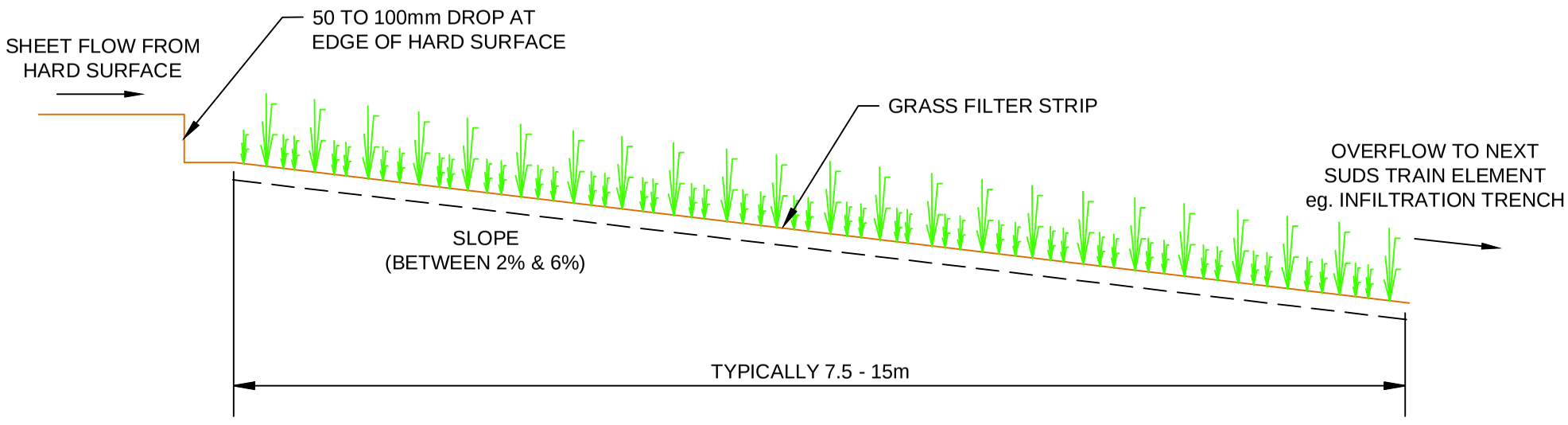


PLAN



ELEVATION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

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PROJECT: TYPICAL SUDS DETAIL

TITLE: FILTER STRIPS

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	107	A

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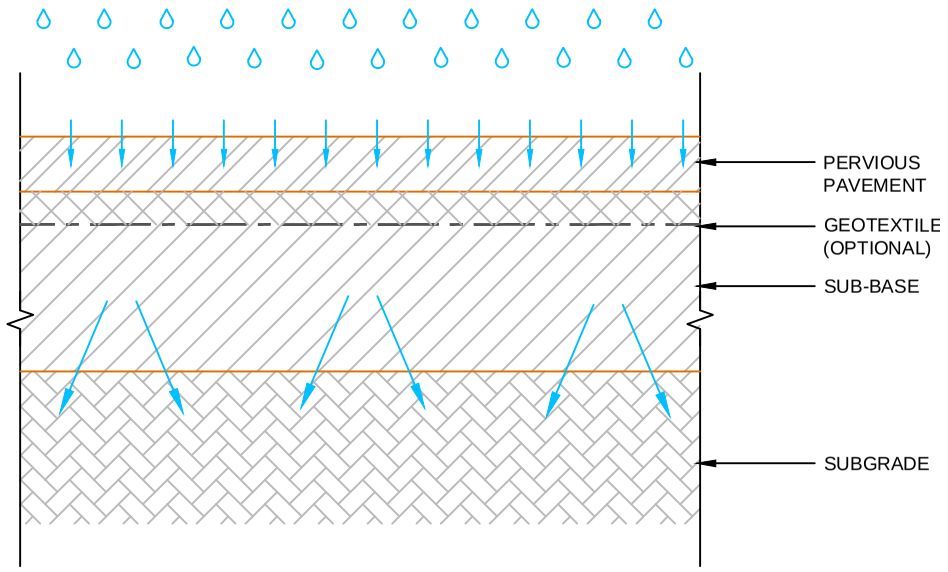

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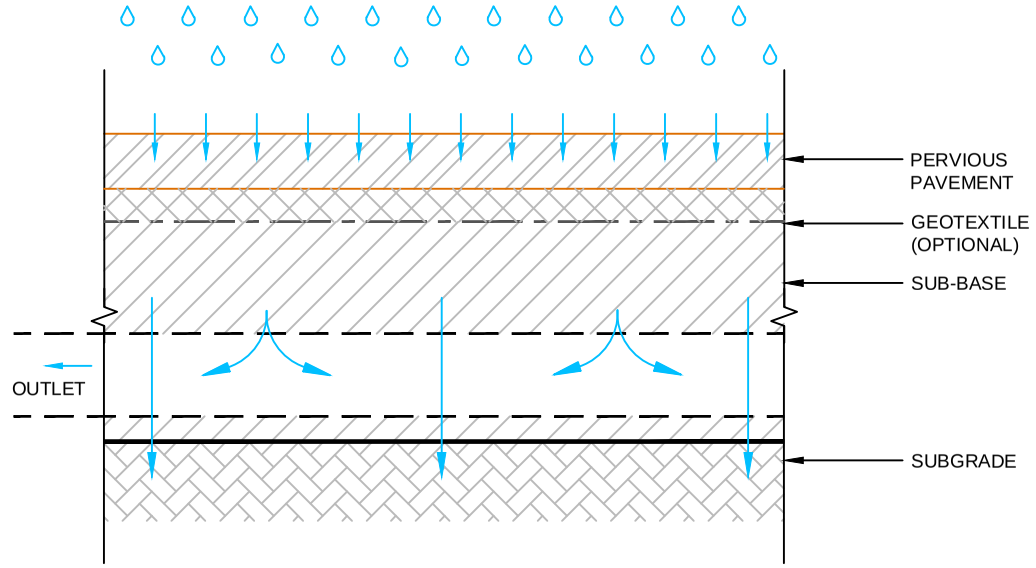

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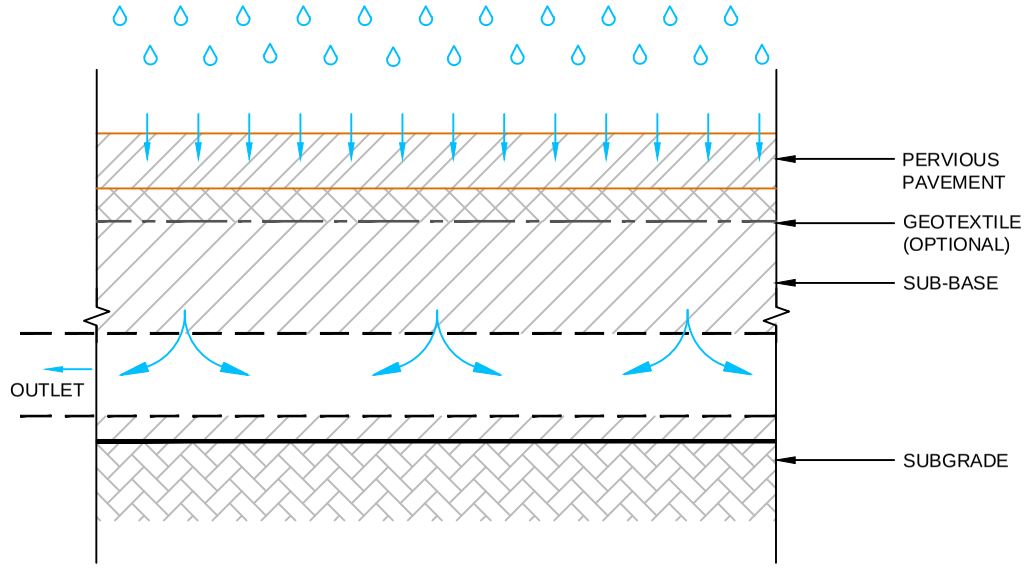
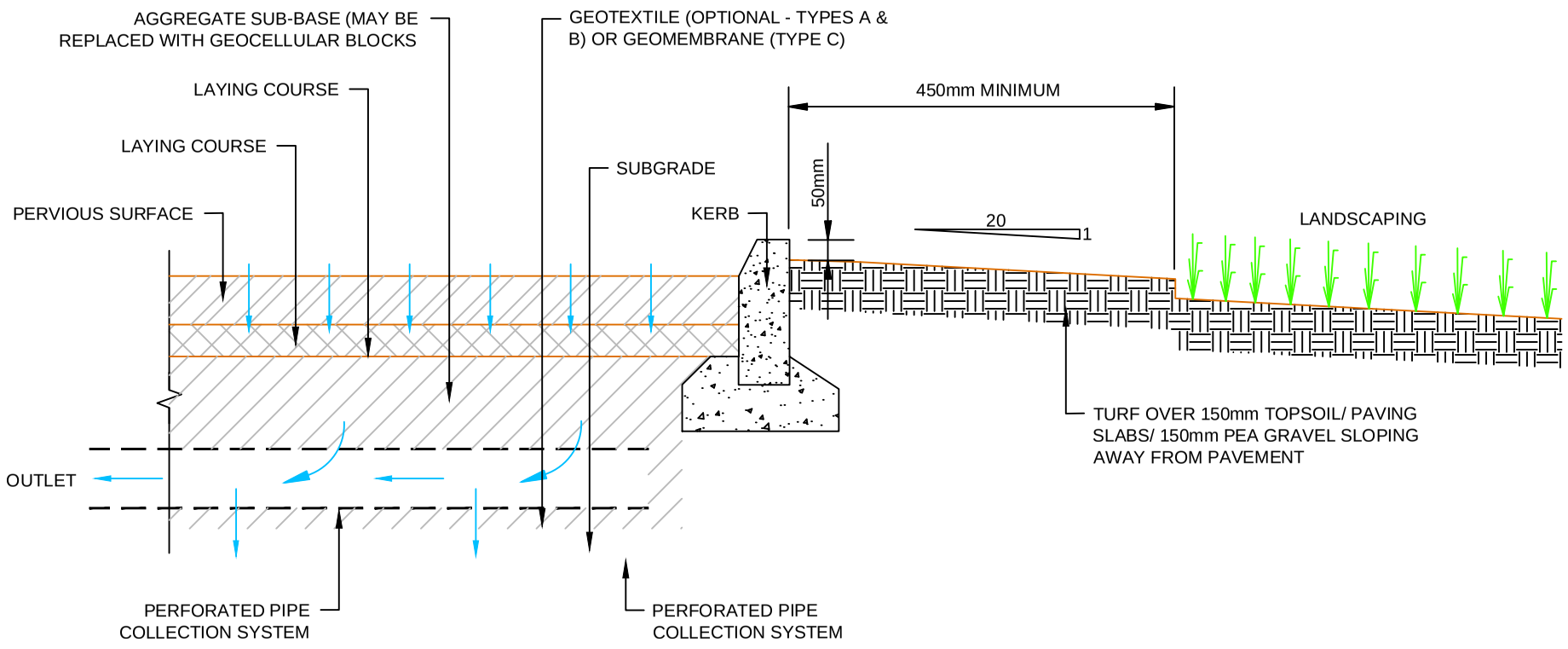


TYPE C: NO INFILTRATION



LANDSCAPING DETAIL

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

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Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT: TYPICAL SUDS DETAIL

TITLE: PERVIOUS PAVEMENTS

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	105	A

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APPENDIX M: 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.

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