A CAF GROUP COMPANY

ENVIRONMENT

Richborough
Land to North of Little Green Lane
Croxley Green
Sustainable Drainage Statement

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Richborough
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Sustainable Drainage Statement

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1. INTRODUCTION

1.1 A Sustainable Drainage Statement (SDS) sets out the principles of drainage design for a development and summarises the reasoning behind the chosen design. This includes consideration of national and local guidance, justification of specific flow rates, volumes of attenuated storage, as well as the appropriate level of treatment to be provided to surface water runoff.

1.2 This SDS has been produced by BWB Consulting on behalf of Richborough in respect of a planning application for a proposed residential-led, mixed use development on Land to North of Little Green Lane, Croxley Green. A Flood Risk Assessment (FRA) has been produced for the site (reference: 233574-BWB-ZZ-XX-T-W-0002_FRA) and this SDS accompanies this overarching document.

1.3 The report is intended to support an outline application for the construction of up to 600 residential dwellings (Use Class C3(a)), a 5-bedroom property for children's social care and supported living (Use Class C3(b)). Two vehicular access points from Little Green Lane and further pedestrian / cycleway accesses. A one form entry primary school (Use Class F1(a)) (plus expansion land for a two form entry primary school). A mixed use local centre including provision for NHS health and social care services (Use Class E(e)), community building (Use Class F2), retail and café provision (Use Class E(a-c)), car parking and associated infrastructure. A country park, areas for play and recreation, allotments, community orchard and landscaping with associated infrastructure including sustainable urban drainage systems. (All matters are reserved except for vehicular access). See **Appendix 1** for the Proposed Illustrative Masterplan (reference: P24-1200_DE_021_01C).

1.4 The site is located on Land to North of Little Green Lane and is greenfield, comprising agricultural land and ancient woodland. The site is bound to the south by Little Green Lane, to the west and north by woodland and agricultural fields and to the east and north by Rousebarn Lane, with the West Herts Golf Course beyond. Key site details are provided within **Table 1.1**, with the location of the site illustrated within **Figure 1.1.**

Table 1.1: Site Details

Site Name	Land to North of Little Green Lane
Location	Croxley Green
NGR (approx.)	TQ 08101 96702
Application Site Area (ha)	40.7 (approx.)
Development Area (ha)	15.7 (approx.)
Development Type	Mixed Use Residential School Local Centre
Lead Local Flood Authority	Hertfordshire County Council
Local Planning Authority	Three Rivers District Councils
Sewerage Undertaker	Thames Water

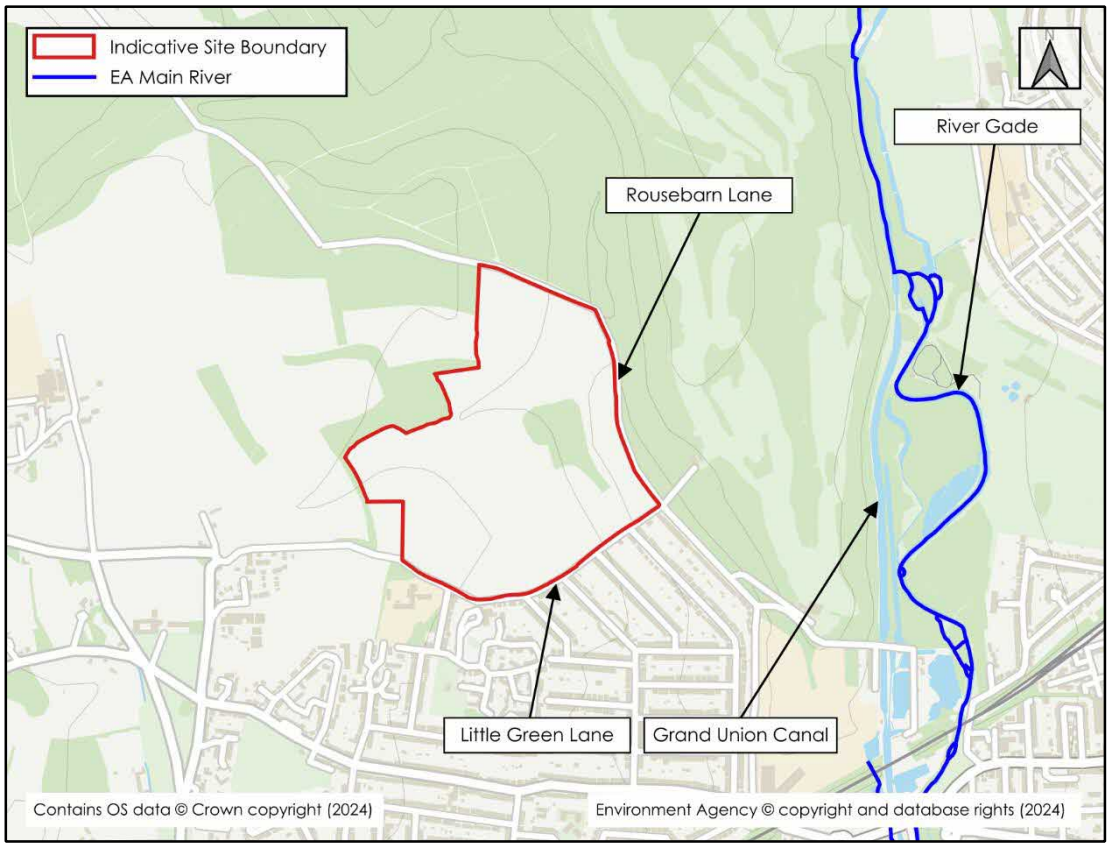

Figure 1.1: Site Location

Sustainable Drainage Guidance

1.5 Sustainable Drainage Systems (SuDS) aim to reduce the impact of development by replicating the natural runoff regime in a sustainable, cost-effective manner, whilst protecting water quality and reducing pollution. The four key objectives of SuDS design are to achieve improvements in water quantity, water quality, amenity provision and biodiversity.

1.6 Hertfordshire County Council, in their role as the Lead Local Flood Authority (LLFA), have published the 'LLFA Summary Guidance for developers'[1] and 'The Local Flood Risk Management Strategy (LFRMS)[2] which provides guidance on surface water management. The guidance notes:

> *LFRMS Policy 15* states that the volume of the attenuation storage should be designed for the 1 in 100 year critical storm with a climate change allowance.
>
> *LFRMS Policy 18* states that SuDS should be provided above ground.
>
> *LLFA Summary Guidance* states that SuDS such as green roofs, attenuation basins, ponds, swales and permeable pavements should be used.

1.7 In accordance with LLFA guidance the 'Surface Water Drainage Statement' proforma has also been completed and included as **Appendix 2.**

1.8 Correspondence with the LLFA has been undertaken and is included as **Appendix 3**. The LLFA have confirmed that infiltration can be permitted within Source Protection Zone 3 (Total Catchment) provided a robust treatment using SuDS is provided, they have confirmed that the Simple Index Approach as set out by the SuDS Manual would be appropriate. The LLFA also recommend that a safety factor of 5 is used within the calculations.

1.9 Predicted future changes in peak rainfall intensity caused by climate change are provided by the Environment Agency (EA). Table 2 from the EA's 'Flood risk assessments: climate change allowances'[3], included as **Table 1.2** shows the anticipated changes in peak rainfall intensity.

[1] LLFA Summary Guidance for developers (Hertfordshire County Council, August 2021)
[2] The Local Flood Risk Management Strategy (Hertfordshire County Council, February 2019)
[3] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Table 1.2: Peak Rainfall Climate Change Allowances for the Colne Management Catchment

Tame Anker and Me Management Catchment Allowance	Total Potential Change Anticipated for the '2050s' (Lifetime up to 2060)	Total Potential Change Anticipated for the '2070s' (2061 to 2125)
1 in 30-Year Rainfall Event		
Upper End	35%	35%
Central	20%	25%
1 in 100-Year Rainfall Event		
Upper End	40%	40%
Central	20%	25%

1.10 The EA's guidance on peak rainfall intensity climate change allo residential development should be considered to have a minimum lifetime of 100 years. Therefore, the proposed development is expected to fall into the 2070s epoch and a 40% climate change allowance will be applied to the calculations for the 1 in 100-year event. It should be noted that the 1 in 30-year event plus 35% climate change event will need to be considered at the detailed design stage.

1.11 The 'Non-Statutory Technical Standards for Sustainable Drainage Systems'[4] notes that urban creep occurs as more surfaces like driveways and patios are added over time. This reduces the natural infiltration and increases the surface water runoff. Therefore, a 10% allowance to the assumed impermeable area should be included within th storage calculations to account for urban creep.

1.12 In addition to the LLFA guidance, the Non-Statutory Technical Standards for Sustainable Drainage Systems, as published by DEFRA, and The SuDS Manual[5] have been utilised to inform the strategy.

[4] 2015, DEFRA, Non-statutory technical standards for sustainable drainage systems
[5] The SuDS Manual (CIRIA, 2015)

2. EXISTING CONDITIONS

2.1 A topographical survey of the site has been undertaken and is included as **Appendix 4**. Ground levels within the site typically fall in an easterly direction, with levels ranging from approximately 84.4m Above Ordnance Datum (AOD) in the south-west to approximately 56.9m AOD in the south-east.

2.2 Thames Water sewer records, included as **Appendix 5**, show no public surface water sewers to be present within the site. A 300mm public foul water sewer is located within the east of the site and flows from north to south. The public foul water sewer is shown to terminate within the site and therefore a CCTV survey, included as **Appendix 6**, has been undertaken to determine the onward connectivity of this asset.

2.3 The CCTV survey (**Appendix 6**) confirms the presence of a 300mm foul water sewer within the east of the site. The CCTV identified the onward connectivity of the sewer which flows in a southerly direction towards the south-eastern corner of the site where it continues along Rousebarn Lane. The depth to invert of the sewer ranges between 1.7m and 2.2m below ground level.

2.4 The accompanying FRA shows that the site is generally at a low risk of flooding. The site is located entirely within Flood Zone 1 and is predominantly at a very low risk of surface water flooding. Further information on flood risk can be found within the FRA (reference: 233574-BWB-ZZ-XX-T-W-0002_FRA).

2.5 British Geological Survey (BGS) mapping shows the site to be underlain by Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated) - Chalk. Superficial deposits of Gerrards Cross Gravel (Sand and Gravel) are mapped within the west of the site.

2.6 Site-specific ground investigations were undertaken by PJS Geotechnical Engineers in February 2020 (reference: PJSG20-01-R02, Appendix 7). Two trial pits were excavated in the east of the site for the purpose of identifying the permeability of the underlying ground. The trial pits confirmed the ground generally consisted of reworked topsoil over sand, underlain by chalk.

2.7 No groundwater was encountered in either trial pit to excavated depths of 3.1m below ground level (bgl) and 3.2m bgl respectively. Soakaway tests SA101, SA102 and SA103 were undertaken in the vicinity of the proposed attenuation and the results from these tests are summarised in **Table 2.1** with the full results included within **Appendix 7**.

Table 2.1: Infiltration Test Results

Soakaway Test Reference	Infiltration Rate* (m/s)	Depth of Soakaway Pit (m bgl)	Ground Water Strike
SA101	9.49×10^{-5}	2	None – groundwater not encountered
	7.89×10^{-5}		
	4.90×10^{-5}		
SA102	$>2.33 \times 10^{-4}$ (Unable to raise a head of water)	1.5	None – groundwater not encountered
SA103	2.33×10^{-4}	1	None – groundwater not encountered
	6.57×10^{-5}		
	5.41×10^{-5}		

2.8 The site is located within Source Protection Zone 3 (Total Catchment) which is the area around a supply source within which all the groundwater ends up at the abstraction point.

2.9 Given the underlying ground conditions and infiltration rates recorded at the site, it is expected that surface water runoff currently drains via infiltration into the ground.

Existing Runoff Rates

2.10 An assessment of the existing surface water runoff rates per hectare has been undertaken and is summarised within **Table 2.2.** Calculations are included within **Appendix 8**.

2.11 The runoff rates have been estimated using the IH124 met
prorated adjustments for a site of less than 50ha, as recommended in Interim Code of Practice for Sustainable Drainage[6]. This was undertaken using HR Wallingford Greenfield runoff estimation tool[7], which makes the necessary adjustments for small sites automatically.

[6] The National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage
[7] https://www.uksuds.com/tools/greenfield-runoff-rate-estimation

Table 2.2: Existing Runoff Rate from the Site

Return Period (Yrs.)	Runoff Rate (l/s)
1	1.5
Mean Annual Flow Rate (QBAR)	1.8
30	4.0
100	5.6

Existing Runoff Volume

2.12 An assessment of the existing surface water runoff rates from the area proposed for development (15.7ha) has been made for a 1 in 100-year, 6 hour storm.

2.13 As the existing site is permeable, the runoff volume has been calculated using the Discharge Volume within Causeway 'Flow' to be 3,295m^3, results are included within **Appendix 9**.

3. SURFACE WATER DRAINAGE STRATEGY

3.1 The site has an approximate total area of 40.7ha and an approximate total development area of 15.7ha has been measured from the proposed illustrative masterplan included as **Appendix 1**. The total impermeable area has been esti to be 12.26ha. The following percentages have been taken to assess the impermeable areas across the development:

Residential – 65% + 10% urban creep

School & Local Centre – 70%

Proposed Attenuation SuDS – 100%

3.2 The site has been split into two catchments based upon topography and development aspirations. Details of the catchments are presented in **Table 3.1**.

Table 3.1: Catchment Details

Catchment	Development Area (ha)	Total Impermeable Area (ha)
1	6.78	5.31
2	8.92	6.95
Total	**15.70**	**12.26**

Drainage Hierarchy

3.3 The Planning Policy Guidance[8] and the SuDS Manual identify that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:

i. into the ground (infiltration);
ii. to a surface water body;
iii. to a surface water sewer, highway drain, or another drainage system;
iv. to a combined sewer.

3.4 The aim of this is approach is to manage surface water runoff close to where it falls and mimic natural drainage as closely as possible.

3.5 Infiltration testing has been carried out in several areas across the site, including within the vicinity of the proposed surface water storage areas. The results are included in **Appendix 7** and summarised within **Table 2.1**.

[8] Planning Practice Guidance. http://planningguidance.planningportal.gov.uk/.

3.6 Test location number SA101 and SA103 are considered to be mos conditions at the proposed storage locations with the infiltration rate for SA101 used for Catchment 1 and SA103 used for Catchment 2. The most conservative infiltration rate in the vicinity of the proposed soakaway will be used to inform the drainage strategy. The proposed infiltration rates are summarised in **Table 3.2**.

Table 3.2: Proposed Infiltration Rates

Catchment	Test Location	Proposed Infiltration Rate (m/s)	Proposed Infiltration Rate (m/hr)
1	SA101	4.90×10^{-5}	0.17640
2	SA103	5.41×10^{-5}	0.19476

3.7 It is recommended that additional soakaway tests are undertaken at the depth and location of the proposed SuDS features once detailed design has been progressed and the drainage design has been fixed.

Attenuated Storage

3.8 It will be necessary to provide attenuated storage to balance the excess volume in a safe manner whilst it infiltrates away.

3.9 The surface water storage should be located within the site in a position where it can receive runoff from the development and is in a position where it is hydraulically isolated from any fluvial floodplain.

3.10 Sufficient storage for events up to the 1 in 100-year storm with 40% climate change should be provided. A further allowance of 10% should be applied to the proposed residential impermeable area to allow for urban creep over the lifetime of the development.

3.11 After considering the site constraints and development aspirations it is suggested that the necessary surface water storage volume is found within infiltration basins located at the lowest elevation of each catchment.

3.12 For the purpose of this outline assessment, it has been assumed that the basins will accommodate all of the necessary storage, but it may be possible to redistribute a portion of the storage within other drainage components during the detailed design of the development (e.g.: in the pipe network, swales, filter drains, etc).

3.13 Following consultation with the LLFA, included as **Appendix 3**, a safety factor of 5 has been applied to the calculations.

3.14 A simulation has been run using Causeway 'Flow' to identify the necessary storage provision. Using the infiltration rates, as detailed in **Table 3.2**, the volume of attenuated storage required for the development has been calculated for storm events up to the 100 year + 40% storm. The results are summarised in **Table 3.3** and calculations are included as **Appendix 10**.

Table 3.3: Outline Attenuated Storage Requirements

Catchment	Rainfall Method	Critical Storm	Maximum Volume (m^3)
1	FSR	480 min Winter	3,215
	FEH	480 min winter	3,755
2	FSR	360 min winter	4,100
	FEH	360 min Winter	4,820

3.15 At this outline stage it is expected that a minimum of 8,575m^3 of attenuated storage will be provided to cater for the maximum anticipated runoff volume for all storm durations up to the 1 in 100-year return period storm, including a 40% climate change allowance and future urban creep.

3.16 The FEH Rainfall method has been used to design the infiltration basins as it is the more conservative method and is considered to be the most up to date source of data.

3.17 The half drain down time of the infiltration storage features does not exceed 24 hours (1,440 minutes) as shown in **Appendix 10**.

3.18 It is envisaged that the final required storage volume will be determined during the detailed design stage, once the development layout and drainage areas are fixed.

Sustainable Drainage Systems

3.19 A Illustrative Drainage Strategy is included as **Appendix 11** (drawing reference: 233574-BWB-ZZ-XX-D-W-0001) and demonstrates how the required storage volume can be achieved within the site.

3.20 Surface water runoff will be stored within two infiltration basins located within the east of the site. The basins have been modelled with a total depth of 1.4m inclusive of a 400mm freeboard in the 1 in 100-year + 40% climate change event. The basins should be appropriately planted to provide a primary level of treatment and be landscaped into the public open space to provide an amenity value.

3.21 Further levels of treatment will be provided via swales, tree pits and rain gardens located throughout the proposed development which will provide water quality, amenity and biodiversity value. These features have been proposed in accordance with the proposed site layout, however, their use and location will be subject to detailed design once the scheme layout is fixed.

3.22 Surface water will be conveyed through the site primarily via a piped network and swales.

3.23 In line with best practice, a 3m access easement should be applied to the basin for maintenance purposes. A minimum 10m easement should be provided between the infiltration basins and any structures due to the underlying chalk formation.

3.24 The interception value (the first 5mm of runoff in a rainfall event) should be appropriately treated prior to release into the downstream network to prevent contamination from high pollutant concentrations. As the drainage system has been specifically designed for infiltration, the interception value will be delivered.

Water Quality

3.25 As site is located within Source Protection Zone 3 (Total Catchment), the LLFA have advised (**Appendix 3**) that a robust treatment should be provided.

3.26 The SuDS Manual Mitigation Index will be used to assess the treatment levels proposed in relation to the pollution hazard posed from the proposed land use. This methodology is adopted to ensure that surface water flows receive adequate treatment through all areas of the site prior to being infiltrated into the ground.

3.27 **Table 3.4** shows the pollution hazard indices for the land use classification(s) that are relevant to the proposed development, as described within table 26.2 in the SuDS Manual.

Table 3.4: Pollution Hazard Indices for Different Land Use Classifications.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs	Low	0.3	0.2	0.05
Driveways, residential car parks and low traffic roads	Low	0.5	0.4	0.4

3.28 The SuDS Mitigation Indices that are relevant to the proposed development, described within table 26.3 and table 26.4 of the SuDS Manual, are outlined in **Table 3.5** below.

Table 3.5: SuDS Mitigation Indices

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Bioretention System/Rain Garden	0.8	0.8	0.8
Swale	0.5	0.6	0.6
Infiltration Basin*	0.6	0.5	0.6

*From table 26.4 of the SuDS Manual

3.29 The pollution hazard rating and proposed SuDS Mitigation Index for the s within **Table 3.6**. Where more than one SuDS component is proposed, a factor of 0.5 has been applied to the downstream (i.e., secondary and/or tertiary) treatment stages to account for the reduced performance due to reduced inflow concentrations.

Table 3.6: Comparison of Pollution Hazard Rating against Proposed Mitigation Index

Pollution Type	Pollution Hazard Rating	Proposed Mitigation Index	Sufficient Treatment Provided?
Catchment 1 – Swale, Rain Gardens and Infiltration Basin			
TSS	0.5	1.20	
Metals	0.4	1.25	
Hydrocarbons	0.4	1.30	
Catchment 2 – Swale, Rain Gardens and Infiltration Basin			
TSS	0.5	1.20	
Metals	0.4	1.25	
Hydrocarbons	0.4	1.30	

Residual Risk and Designing for Exceedance

3.30 It is recommended that the final layout uses the proposed road infrastructure to provide drainage exceedance (overland flood flow) routes through the development ar towards positively drained areas.

3.31 A 400mm freeboard has been provided in the 100-year + 40% climate change event and the infiltration basin has been designed using a safety factor of 5, in accordance with LLFA recommendations.

3.32 In addition to the volume of storage provided within the main attenuation, there will be capacity within upstream pipes and manholes which has not been accounted for at this stage and a further level of redundancy to the network will therefore be provided.

4. FOUL WATER DRAINAGE

4.1 It is proposed to drain foul water from the proposed development separately to surface water. As the site is currently undeveloped a new foul water connection will be required. It is therefore proposed that foul water from the proposed development will outfall to the existing Thames Water sewer network at the closest connection point available.

4.2 The nearest gravity sewer is the 300mm foul water sewer located within the east of the site. A Pre-Planning Enquiry was submitted to Thames Water and is included as **Appendix 12**. Thames Water have confirmed that the sewerage network does n
capacity and modelling work to design a solution and build the necessary improvements will be required. This is undertaken by Thames Water, at their cost.

4.3 A review of existing ground levels suggests that a gravity connection to the 300mm foul water sewer is achievable. The suggested connection points are shown on the Illustrative Drainage Strategy included as **Appendix 6**.

4.4 A S106 (Water Industry Act 1991) application should be made to Thames Water for approval prior to a connection being made.

5. MAINTENANCE

5.1 The drainage network should be constructed in accordance with Thames Water Construction Guidance and be offered up for adoption to Thames Water. If any parts of the drainage network remain unadopted, or until the point that they are, an appropriate maintenance company should be appointed. Any drainage features within the private curtilage will be the responsibility of the homeowner.

5.2 Requirements for ongoing maintenance of the drainage network should form part of the Operation and Maintenance Manual for the site, an example of which is included as **Appendix 13** (reference: 233574-BWB-ZZ-XX-T-W-0004_O&M).

6. SUMMARY

6.1 This statement and supporting appendices demonstrate that the
the development will comply with the relevant local and national standards, specifically the hierarchy of discharge, runoff rate and volume criterion.

6.2 This SDS is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Table 6.1: Sustainable Drainage Statement Summary

	Existing Site	Proposed Development
Site Area (ha)	40.7	
Impermeable Area + creep + SuDS (ha)	-	12.26
Outfall Location	Infiltration	Infiltration
Infiltration Rate	$4.9x10^{-5}$m/s $5.41x10^{-5}$m/s	$4.9x10^{-5}$m/s $5.41x10^{-5}$m/s
Proposed Storage Volume	-	8,575m^3
SuDS Features	-	Infiltration Basins Swales Rain Gardens Tree Pits
Maintenance Responsibility	-	Management Company/Sewerage Company/ Home Owners

6.3 It is envisaged that the final drainage strategy will be determined during the detailed design stage, as the development layout is finalised.

APPENDICES

Appendix 1: Proposed Illustrative Masterplan

KEY

- SITE LOCATION
- PUBLIC OPEN SPACE
- EXISTING TREES
- NEW TREE PLANTING
- WILDFLOWER / LONG GRASS
- COMMUNITY ORCHARD
- AREA FOR PLAY
- SUSTAINABLE DRAINAGE

KEY PRINCIPLES

N

0 25 50 m

REV C : UPDATED GRAPHICS TO CL COMMENTS. SB/SE (05.12.24)
REV B : UPDATED TO REV F TESTING LAYOUT. SB/SE (04.12.24)
REV A : UPDATED TO REV E TESTING LAYOUT. SB/SE (02.12.24)

Expertly Done.

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CROXLEY GREEN - ILLUSTRATIVE MASTERPLAN

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Appendix 2: Surface Water Drainage Statement Proforma

Surface Water Drainage Statement

In order to provide the required information on surface water drainage from the proposed development this pro-forma must be completed in full and be submitted with any planning application which seeks permission for 'major' development. This information contained in this form will be used by Hertfordshire County Council in its role as Lead Local Flood Authority and 'statutory consultee' on SuDs for all 'major' planning applications. The pro-forma is supported by the Defra/EA Guidance on Rainfall Runoff Management. The pro-forma should be considered alongside other supporting SuDS Guidance, but focuses on ensuring flood risk is not made worse elsewhere. The SuDS solution must operate effectively for as long as the development exists. This pro-forma is based upon current industry standard practice.

1. Site Details

Site	Land to North of Little Green Lane
Address & post code or LPA reference	Little Green Lane, Croxley Green, WD3 3SR
Grid reference	TQ 07898 96927
Is the existing site developed or Greenfield?	Greenfield
Total Site Area served by drainage system (excluding open space) (Ha)*	15.7
Topographical survey plan showing existing site layout, site levels and drainage system	Yes, Appendix 4 of SDS

***** The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers & Local Authorities
Impermeable area (ha) (catchment areas to be shown on a plan)	0	12.26	12.26	If the proposed amount of impermeable surface is greater, then runoff rates and volumes will increase. Section 6 must be filled in. If proposed permeability is equal or less than existing, then section 6 can be skipped & section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)	infiltration	infiltration	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

PPG Paragraph 080

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers & Local Authorities
Existing and proposed calculations	☐	☐	Infiltration is proposedand the soakawaytest are included as Appendix 7 of the SDS. The proposed calculations of the greenfield runoff volume are included as Appendix 9 and the proposed storage requirements are shown in Appendix10.	Please provide Hydraulic modelling calculations of existing and proposed run-off rates and volumes in accordance with a recognised methodology or the results of a full infiltration test (see line below) if infiltration is proposed.
Infiltration	☐	☐	See Appendix 7 in SDS.	e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse	☐	☐		e.g. Is there a watercourse nearby? Please provide details of any watercourse to which the site drains including cross-sections of any adjacent water courses for appropriate distance upstream and downstream of the discharge point (as agreed with the LLFA and/or EA).
To surface water sewer	☐	☐		Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above	☐	☐		e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.
Has the drainage proposal had regard to the SuDS hierarchy?	☐	☐	See SDS paragraphs 3.3 to 3.8	Evidence must be provided to demonstrate that the proposed Sustainable Drainage proposal has had regard to the SuDS hierarchy.
Layout plan showing where the sustainable drainage infrastructure will be located on site.	☐	☐	See Appendix 11 in SDS.	Please provide plan reference numbers showing the details of the site layout showing where the sustainable drainage infrastructure will be located on the site. If the development is to be constructed in phases this should be shown on a separate plan and confirmation should be provided that the sustainable drainage proposal for each phase can be constructed and can operate independently and is not reliant on any later phase of development.

Technical Standards S2 and S3

4. Peak Discharge Rates – This is the maximum flow rate at which surface water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	Notes for developers & Local Authorities
Greenfield QBAR	1.76	N/A	N/A	Mean annual Greenfield peak flow - QBAR is approx. 1 in 2 storm events. Use that figure in Section 7a.
1 in 1	1.49	N/A - Infiltration to be used	N/A	Proposed discharge rates (with mitigation) should be as close as reasonably practicable to predevelopment greenfield run-off rates with long term storage or Qbar, they must be no greater than existing rates for all corresponding storm events. e.g. discharging all flow from site at the existing 1 in 100 event increases flood risk during smaller events. If discharging to watercourse post development results need to be with and without a surcharged outfall. The critical results need to be provided for both the critical storm by level and critical storm by outflow.
1 in 30	4.04	N/A - Infiltration to be used	N/A	
1in 100	5.6	N/A - Infiltration to be used	N/A	
1 in 100 plus climate change	N/A	N/A	N/A	To mitigate for climate change the proposed 1 in 100 +CC must be no greater than the existing 1 in 100 runoff rate. If not, flood risk increases under climate change should be added to the peak rainfall intensity. EA Guidance - Flood Risk Assessments: Climate Change Allowances https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Technical Standards S4 to S9

5. Calculate discharge volumes –The total volume of water leaving the development site for a particular rainfall event. Introducing new impermeable surfaces increases surface water runoff and may increase flood risk outside the development.

	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers & Local Authorities
1 in 1	N/A	N/A	N/A	Proposed discharge volumes (without mitigation) should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30	N/A	N/A	N/A	
1in 100	3295	0	-3295	
1 in 100 plus climate change	N/A	N/A	N/A	To mitigate for climate change the volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. Calculate attenuation storage – In order to minimise the negative impact on flood risk resulting from increased volumes runoff from the proposed development, storage must be provided.

		Notes for developers & Local Authorities
Storage volume required to retain discharge rates as existing (m^3)	8575	Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing
Where will the storage be provided on site?	Infiltration Basins	

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The intention is to not discharge that volume into the watercourses so as not to increase flood risk elsewhere.

			Notes for developers & Local Authorities
Infiltration	**State the Site's Geology/drift material overlaying)**	Seaford Chalk and Newhaven Chalk	Avoid infiltrating in made ground.
	Does the site have a high ground water table? Yes/No?	No	If yes, please provide details of the site's hydrology.
	Is the site within a known Source Protection Zones (SPZ)? Yes/No?	Yes, SPZ 3	Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?	Yes	Infiltration rates should be no lower than $1x10^{-6}$ m/s.
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	No	Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
	State the distance between a proposed infiltration device base and the ground water (GW) level	> 1	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.
	Were infiltration rates obtained by desk study or infiltration test?	Soak Away Tests	Infiltration rates can be estimated from desk studies for outline planning permission if a back-up attenuation scheme is provided. Site specific BRE 365 tests should be provided for Full planning Permission
Is infiltration feasible?	**Yes/No?**	Yes	If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

7a. Storage requirements

Where infiltration is not possible, then the developer must confirm that either of the two options below will be implemented for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at **QBAR**. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers & Local Authorities
Please confirm what option has been chosen and how much storage is required on site.	N/A All by Infiltration	The developer at this stage should understand the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Additional Consideration to comply with the Technical Standards and PPG

		Notes for developers & Local Authorities
Which Drainage Systems measures have been used?	Tree pits, Rain gardens, Swales and Infiltration Basins.	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C753.
How will exceedance events be catered on site without increasing flood risks (both on site and outside the development)?	400mm Freeboard has been used on Infiltration Basins. Infiltration Basins have been designed with a safety factor of 5.	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths.
How are rates being restricted?	N/A - Surface water is being infiltrated in infiltration basins.	Hydrobrakes to be used where rates are between 2l/s to 5l/s. Orifices not be used below 5l/s as the pipes may block. Pipes with flows < 2l/s are prone to blockage.
Drainage during construction period	N/A - To be confirmed at detailed design stage	Provide details of how drainage will be managed during the construction period including any necessary connections, impacts, diversions and erosion control.
Key Drainage components / Features	Infiltration Basins	Which component if blocked (even partial) will lead to flooding?

Technical Standards S10 to S12

9. Management and Maintenance of SuDs

Details are required to be provided of the management and maintenance plan for the SUD, including for the individual plots in perpetuity.

How is the entire drainage system to be maintained in perpetuity?	An O&M Plan is provided in the SDS as Appendix 13	Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided to show that all parts of SuDs are effective and robust. Provide a management plan to describe the SUDS scheme and set out the management objectives for the site. It should consider how the SuDs will perform and develop over time anticipating any additional maintenance tasks to ensure the system continues to perform as designed. — Specification notes that describe how work is to be undertaken and the materials to be used. — A maintenance schedule describes what work is to be done and when it is to be done using frequency and performance requirements as appropriate. — A site plan showing maintenance areas, control points and outfalls. Responsibility for the management and maintenance of each element of the SUDS scheme will also need to be detailed within the Management Plan. Where open water is involved please provide a health and safety plan within the management plan.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	N/A - To be confirmed at detailed design stage.	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma. Please give details of each feature and how it will be managed in accordance with the details in the management plan.
Please provide details demonstrating that any third party agreements required using land outside the application site have been secured.	N/A	

The above form should be completed using evidence from information which should be appended to this form. The information being submitted should be proportionate to the site conditions, flood risks and magnitude of development. It should serve as a summary of the drainage proposals and should clearly show that the proposed discharge rate and volume as a result of development will not be increasing. Where there is an increase in discharge rate or volume, then the relevant section of this form must be completed with clear evidence demonstrating how the requirements will be met.

This form is completed using factual information and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By Ariya Shademani

Qualification of person responsible for signing off this pro-forma BEng (Hons)

Company BWB Consulting

On behalf of (Client's details) RICHBOROUGH

Date: 11/12/2024

Appendix 3: LLFA Correspondence

From: David Uncle
Sent: 03 July 2024 15:31
To: Ariya Shademani
Cc: Lucy Reeves
Subject: RE: 233574 - Flood Risk and Drainage FOI

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Hi Ariya,

Thank you for your email – we do accept the CIRIA Simple Index Approach. For road areas ideally we would like to see mulꝋple treatment layers – for instance via permeable paving and a basin, etc.

End of pipe proprietary systems such as petrol interceptors could also be used but only as a final residual measure, not “in place” of SuDS features.

Best wishes,

David Uncle
Senior Flood Risk Officer | Lead Local Flood Authority
Growth and Environment
Herɳordshire County Council
Office Address: Farnham House, Six Hills Way, Stevenage, SG1 2ST
Postal Address: County Hall, Pegs Lane, Herɳord, SG13 8DN Postal Point CHN101
[redacted]
Working hours: 08:00 – 16:00 Monday - Friday

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We improve Residents' lives | We work with Integrity | We act Sustainably | We champion Equality & fairness

Leave: 05 July (AM only), 19 (PM only) and 22 – 26 July

From: Ariya Shademani [redacted]
Sent: Tuesday, July 2, 2024 9:12 AM
To: David Uncle [redacted]
Cc: Lucy Reeves [redacted]
Subject: RE: 233574 - Flood Risk and Drainage FOI

Hi David, thank you for getting back to me.

The drainage we are proposing will follow the SuDs Manual Indices approach. Would that be satisfactory in terms of providing treatment or would you be expecting further treatment?

Thank you.

Regards,

Ariya Shademani
Graduate Engineer - Water
5*th* Floor, Waterfront House, Station Street, Nottingham, NG2 3DQ

[redacted]

From: David Uncle [redacted]
Sent: Wednesday, June 26, 2024 4:45 PM
To: Ariya Shademani [redacted]
Cc: Lucy Reeves [redacted]; FRMConsultaɵons <[redacted]>
Subject: RE: 233574 - Flood Risk and Drainage FOI

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Hi Ariya,

Thank you for your email.

In principle discharges via infiltraɵon should be avoided in SPZ1 parɵcularly for road runoff. Infiltraɵon can be permiʃ ed in SPZ2/3 provided robust treatment using SuDS is provided.

We recommend a safety factor of 5.

Beyond that, we will require infiltraɵon tesɵng to be submiʃ ed alongside any applicaɵons. This should be conducted to BRE 365 standards.

Best wishes,

David Uncle
Senior Flood Risk Officer | Lead Local Flood Authority
Growth and Environment
Herɳordshire County Council
Office Address: Farnham House, Six Hills Way, Stevenage, SG1 2ST
Postal Address: County Hall, Pegs Lane, Herɳord, SG13 8DN Postal Point CHN101
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Leave: 01 - 02 July, 05 (AM only), 19 (PM only) and 22 – 26 July

From: Ariya Shademani [redacted]
Sent: Tuesday, June 25, 2024 4:36 PM
To: FRMConsultaɵons [redacted]

Cc: Lucy Reeves [redacted]
Subject: RE: 233574 - Flood Risk and Drainage FOI

You don't often get email from [redacted] Learn why this is important

Hello,

Thank you for the below email.

We are currently progressing the drainage strategy for the site and based on soakaway testing, we a proposing to discharge surface water from the site via infiltration. It is proposed that surface water wi stored within above ground basins whilst water infiltrates away.

We have reviewed the pro-forma and validation list documents, however, please could I confirm v they are any specific requirements/guidance relating to infiltration based solutions (i.e. safety facto used, source protection zones etc).

Kind regards,

Ariya Shademani
Graduate Engineer - Water
5th Floor, Waterfront House, Station Street, Nottingham, NG2 3DQ
[redacted]

From: David Uncle [redacted] On Behalf Of FRMConsultaons
Sent: Wednesday, June 19, 2024 9:55 AM
To: Craig Crowe [redacted]
Cc: FRMConsultaons [redacted]
Subject: RE: 233574 - Flood Risk and Drainage FOI

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Hi Craig

Thanks for your email

- Any local policy and guidance documents that we should be aware of when preparing a surfa wa ter drainage strategy for the site; See link below
- Any hydraulic model data you may hold for the local watercourses area; None held
- Any local guidance documents or requirements that we should be aware of regarding flood risk; See link below
- Any available data on historical flood events. None recorded within site area. We have record of a cluster of flooded properties on Links Way and Ludlow Way to the south east of the site.

hΣ ps://www.hernordshire.gov.uk/services/recycling-waste-and-environment/water/surface-water-drainage/surface-water-drainage.aspx#

Please note the "Guidance for developers" document is superseded by the proforma and validaon list documents.

Best wishes,

David Uncle
Senior Flood Risk Officer | Lead Local Flood Authority
Growth and Environment
Hertfordshire County Council
County Hall, Pegs Lane, Hertford, SG13 8DN Postal Point: CHN101
[redacted]
Working hours: 08:00 – 16:00 Monday - Friday

Our vision is to create a cleaner, greener and healthier Hertfordshire, guided by our RISE values

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Craig Crowe [redacted]
Sent: Tuesday, June 18, 2024 1:36 PM
To: FRMConsultations [redacted]
Subject: 233574 - Flood Risk and Drainage FOI

You don't often get email from [redacted] Learn why this is important

Good afternoon,

We are undertaking a Flood Risk Assessment and Drainage Strategy for a site to the north of Croxley G approximate NGR: TQ 07898 96927. Location plan attached.

To aid in our works please could I request the following information for the area:

- Any local policy and guidance documents that we should be aware of when preparing a surfa wa ter drainage strategy for the site;
- Any hydraulic model data you may hold for the local watercourses area;
- Any local guidance documents or requirements that we should be aware of regarding flood risk;
- Any available data on historical flood events.

Kind regards,

Craig Crowe
Consultant (Water)
5th Floor, Waterfront House, Station Street, Nottingham, NG2 3DQ
[redacted]

BWB Consulting

Registered in England and Wales

Registered Office: 5th Floor, Waterfront House, Station Street, Nottingham, NG2 3DQ
Company No. 5265863
VAT Reg No. 648 1142 45

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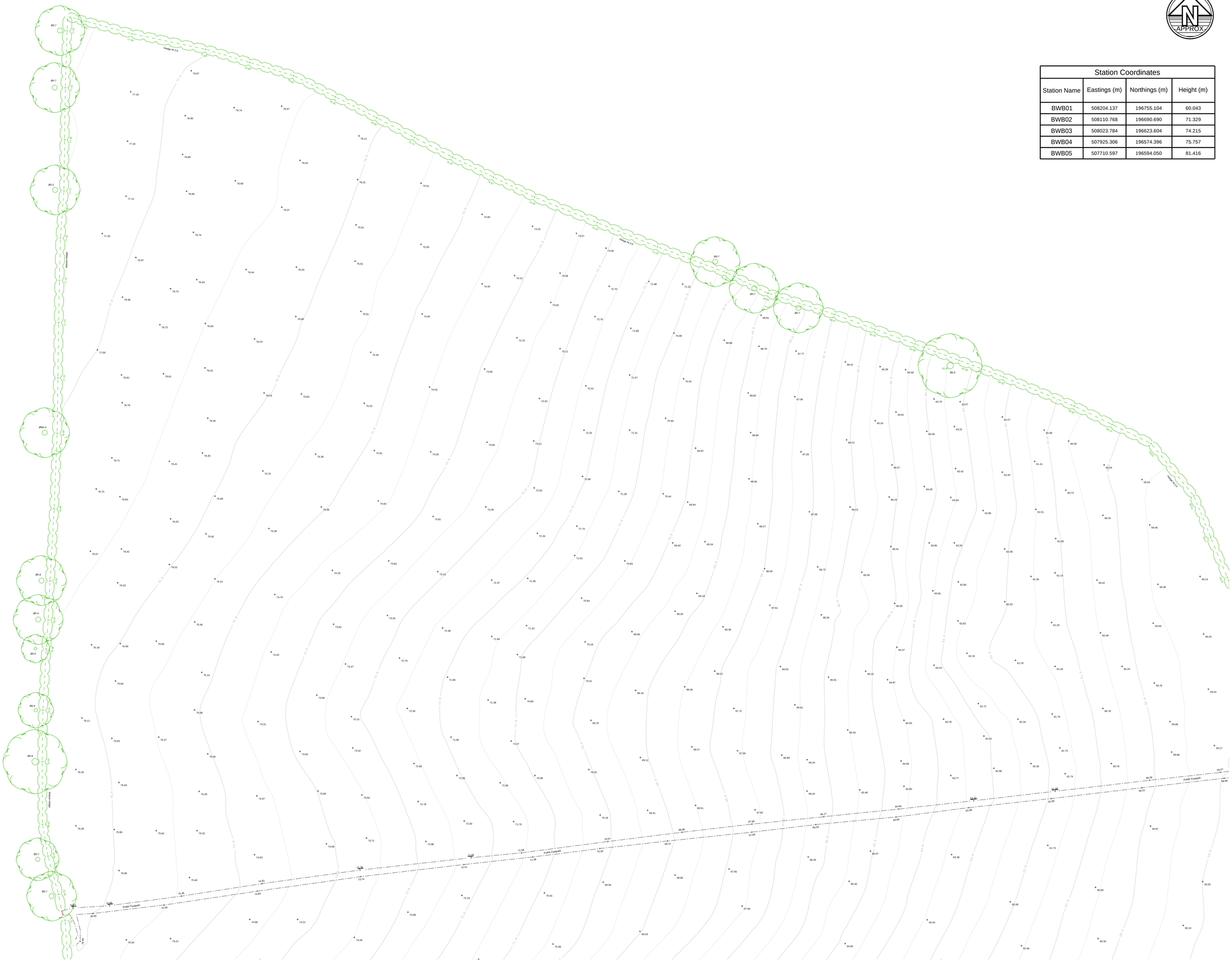
Appendix 4: Topographic Survey


APPROX
Hedge to F.G
Public Footpath
Water Main
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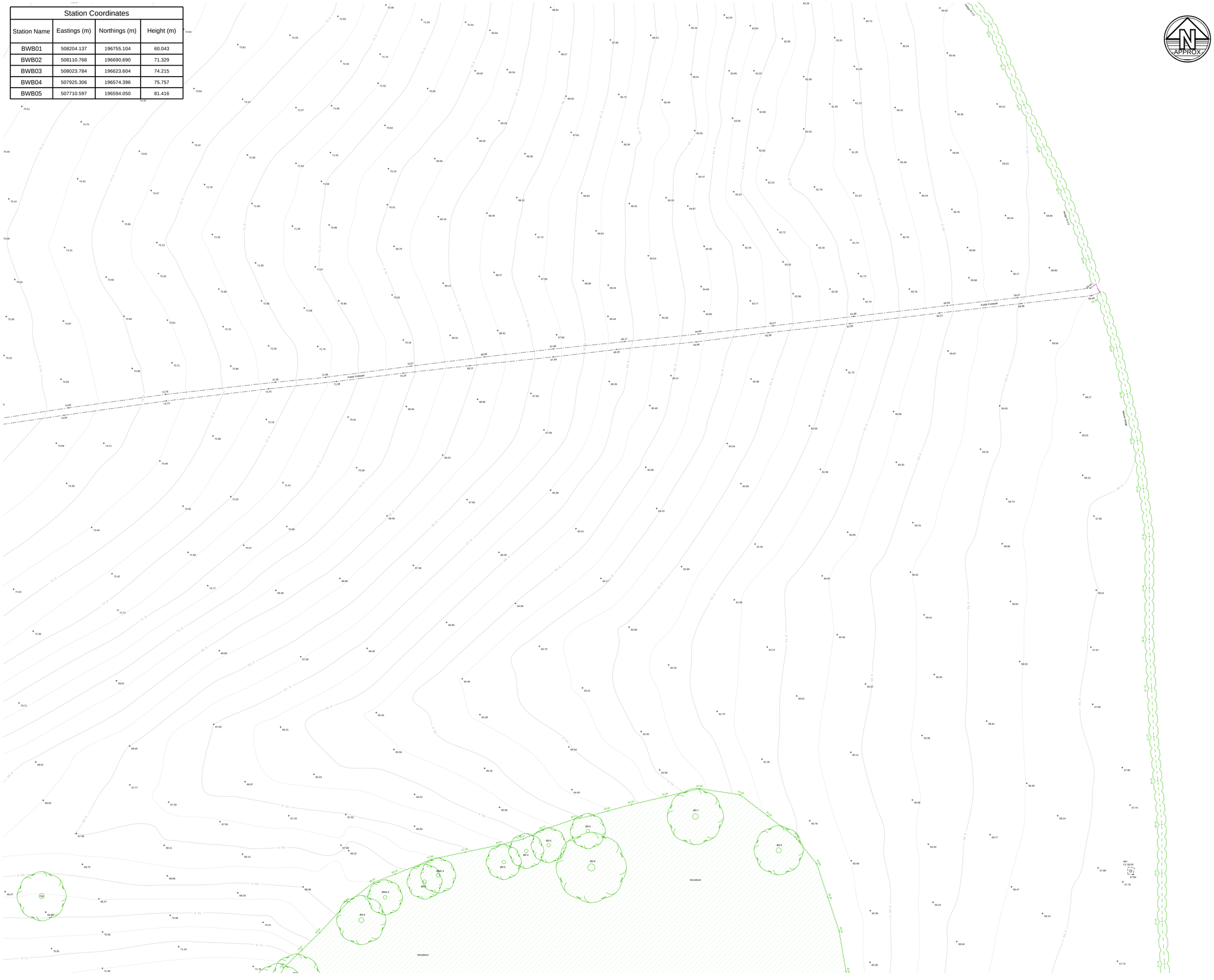
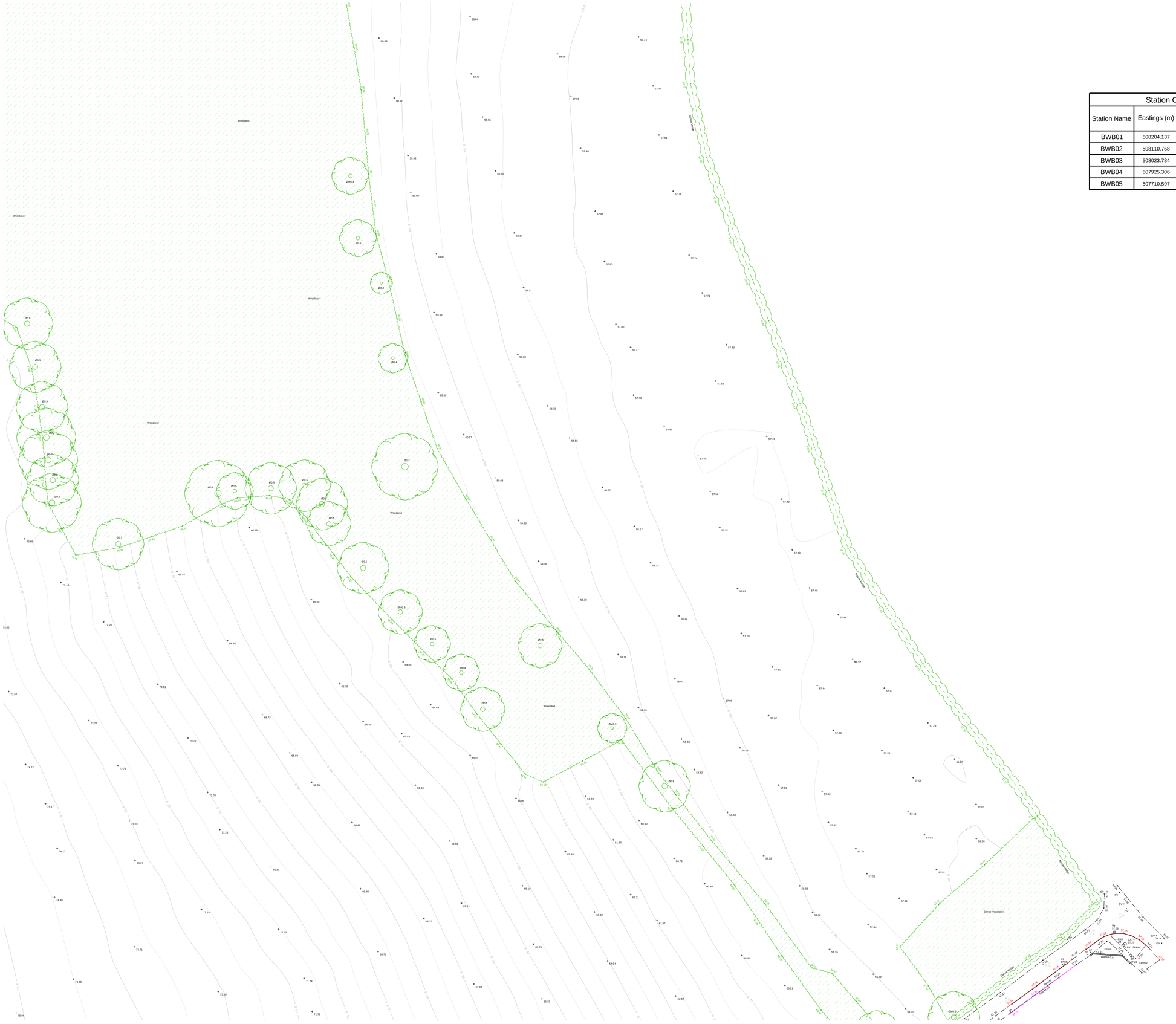
Ø0.7
Ø0.7
Ø0.6
Ø0.7
Ø0.7
Ø0.7

Station Coordinates

Station Name	Eastings (m)	Northings (m)	Height (m)
BWB01	508204.137	196755.104	60.043
BWB02	508110.768	196690.690	71.329
BWB03	508023.784	196623.604	74.215
BWB04	507925.306	196574.396	75.757
BWB05	507710.597	196594.050	81.416


APPROX
Public Footpath
Public Footpath
Woodland
Woodland
Woodland
Ø0.7
Ø0.5
Ø0.5
Ø0.4
Ø0.3
Ø0.4
Ø0.4
Ø0.6
Ø0.3
Ø0.3
Ø0.3


Woodland
Woodland
Woodland
Woodland
Woodland
Woodland
Overhead Powerline
Overhead Powerline
Dense Vegetation
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Ø0.5
Ø0.7
Ø0.4
Ø0.8
Ø0.6
Ø0.3
Ø0.1
Ø0.2
Ø0.9
Ø0.10
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Ø0.45
Ø0.46
Ø0.47
Ø0.48
Ø0.49

Station Coordinates

Station Name	Eastings (m)	Northings (m)	Height (m)
BWB01	508204.137	196755.104	60.043
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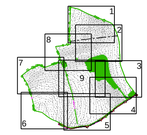
BWB03	508023.784	196623.604	74.215
BWB04	507925.306	196574.396	75.757
BWB05	507710.597	196594.050	81.416

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in metres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. No scale factor has been applied to this survey, therefore the os coordinates are to be treated as arbitrary. Please refer to survey station information below for on site control establishment.
6. All coordinates and height data relate to OSGB36(15). Control stations are coordinated by means of GPS receiving real time corrections via OS smart net.
7. All manhole data is collected from ground level therefore discrepancies may occur. More accurate data is only achievable via confined space entry.
8. OS license number: 100022432

Key Plan



Legend

- OS Buildings
- Surveyed Buildings
- Building
- Wall
- Kerb Channel Line
- Top of Kerb
- Edge of Surface
- Top of Bank
- Bottom of Bank
- Canopy / Overhang
- Line Marking
- Centre Line
- Watercourse Centre Line
- Barrier
- Fence
- Gate
- Overhead Powerline
- Overhead Utilities
- Contour Lines
- Inspection Chamber
- Flow direction and pipe diameter (0.25 / 1)
- Station and Name (BH 1)
- Monitoring Borehole
- Tree / Bush / Sapling
- Area of Vegetation/ Extent of Tree Canopy
- Hedge
- Body of Water
- Body of Water from OS
- Spot Level (+50.00)
- Assumed Surface Water Drainage Line
- Surface Water Drainage Line

AP	Anchor Point	FBW	Fence Barbed Wire	LB	Litter Bin
BG	Back Gully	FCB	Fence Closed Board	LP	Lamp Post
BO	Bollard	FCL	Fence Chain Link	MH	Manhole
BS	Bus Stop	FEL	Fence Electric	Mkr	Service Marker
BT	British Telecom	FMP	Fence Metal Panel	PB	Post Box
C	Crest	FMR	Fence Metal Railing	PT	Post
CL	Cover Level	FOB	Fence Open Board	RE	Rodding Eye
CMP	Cable Marker Post	FPW	Fence Post & Wire	SP	Sign Post
		FSP	Fence Steel Palisade	ST	Stop Tap
CCTV	Security Camera	FWM	Fence Wire Mesh	SV	Stop Valve
CTV	Cable TV	FFL	Finished Floor Level	TCB	Telephone Call Box
DC	Drainage Channel	FP	Flagpole	THL	Threshold Level
		Gas	Gas	TL	Traffic Light
DK	Drop Kerb	GV	Gas Valve	TP	Telegraph Post
DP	Down Pipe	GY	Gully	TS	Traffic Signal
Elec	Electric	Ht	Height	UTS	Unable to Survey
EP	Electricity Post	IC	Inspection Chamber	WL	Water Level
ER	Earth Rod	IFL	Internal Floor Level	WM	Water Meter
FH	Fire Hydrant	IL	Invert Level (as a reduced level)	WO	Wash Out
FL	Floodlight				

Rev	Date	Details of issue / revision	Drw	Rev
P1	20.06.24	First Issue	DS	SS

Issues & Revisions

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Client

Richborough Estates Limited

Project Title

Little Green Lane, Croxley Green

Drawing Title

Existing Site Plan Sheet 4 of 9

Drawn:	D.Smith		Reviewed:	S.Shreeves	
BWB Ref:	233574	Date:	20.06.24	Scale@A1:	1:500

Drawing Status

Information

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
LGL-BWB-00-04-DR-G-0001	**S2**	**P1**

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C:\Users\daniel.smith\Desktop\Ongoing Work Dan\233574 - Croxley Green\LGL-BWB-00-ZZ-M2-G-0001-Existing Site 2D Model.dwg

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
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6. All coordinates and height data relate to OSGB36(15). Control stations are coordinated by means of GPS receiving real time corrections via OS smart net.
7. All manhole data is collected from ground level therefore discrepancies may occur. More accurate data is only achievable via confined space entry.
8. OS license number: 100022432

Key Plan

Legend

- OS Buildings
- Surveyed Buildings
- Building
- Wall
- Kerb Channel Line
- Top of Kerb
- Edge of Surface
- Top of Bank
- Bottom of Bank
- Canopy / Overhang
- Line Marking
- Centre Line
- Watercourse Centre Line
- Barrier
- Fence
- Gate
- Overhead Powerline
- Overhead Utilities
- Contour Lines
- Inspection Chamber
- Flow direction and pipe diameter (0.25 / 1)
- Station and Name (BH 1)
- Monitoring Borehole
- Tree / Bush / Sapling
- Area of Vegetation/ Extent of Tree Canopy
- Hedge
- Body of Water
- Body of Water from OS
- Spot Level (50.00)
- Assumed Surface Water Drainage Line
- Surface Water Drainage Line

AP	Anchor Point	FBW	Fence Barbed Wire	LB	Litter Bin
BG	Back Gully	FCB	Fence Closed Board	LP	Lamp Post
BO	Bollard	FCL	Fence Chain Link	MH	Manhole
BS	Bus Stop	FEL	Fence Electric	Mkr	Service Marker
BT	British Telecom	FMP	Fence Metal Panel	PB	Post Box
C	Crest	FMR	Fence Metal Railing	PT	Post
CL	Cover Level	FOB	Fence Open Board	RE	Rodding Eye
CMP	Cable Marker Post	FPW	Fence Post & Wire	SP	Sign Post
		FSP	Fence Steel Palisade	ST	Stop Tap
CCTV	Security Camera	FWM	Fence Wire Mesh	SV	Stop Valve
CTV	Cable TV	FFL	Finished Floor Level	TCB	Telephone Call Box
DC	Drainage Channel	FP	Flagpole	THL	Threshold Level
DK	Drop Kerb	Gas	Gas	TL	Traffic Light
DP	Down Pipe	GV	Gas Valve	TP	Telegraph Post
Elec	Electric	GY	Gully	TS	Traffic Signal
EP	Electricity Post	Ht	Height	UTS	Unable to Survey
ER	Earth Rod	IC	Inspection Chamber	WL	Water Level
FH	Fire Hydrant	IFL	Internal Floor Level	WM	Water Meter
FL	Floodlight	IL	Invert Level (as a reduced level)	WO	Wash Out

Rev	Date	Details of issue / revision	Drw	Rev
P1	20.06.24	First Issue	DS	SS

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Client

Richborough Estates Limited

Project Title

Little Green Lane, Croxley Green

Drawing Title

Existing Site Plan Sheet 5 of 9

Drawn:	D.Smith		Reviewed:	S.Shreeves	
BWB Ref:	233574	Date:	20.06.24	Scale@A1:	1:500

Drawing Status

Information

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
LGL-BWB-00-05-DR-G-0001	**S2**	**P1**

Station Coordinates

Station Name	Eastings (m)	Northings (m)	Height (m)
BWB01	508204.137	196755.104	60.043
BWB02	508110.768	196690.690	71.329
BWB03	508023.784	196623.604	74.215
BWB04	507925.306	196574.396	75.757
BWB05	507710.597	196594.050	81.416

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Station Coordinates			
Station Name	Eastings (m)	Northings (m)	Height (m)
BWB01	508204.137	196755.104	60.043
BWB02	508110.768	196690.690	71.329
BWB03	508023.784	196623.604	74.215
BWB04	507925.306	196574.396	75.757
BWB05	507710.597	196594.050	81.416

Notes

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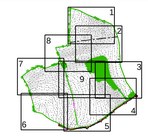
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in metres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. No scale factor has been applied to this survey, therefore the os coordinates are to be treated as arbitrary. Please refer to survey station information below for on site control establishment.
6. All coordinates and height data relate to OSGB36(15). Control stations are coordinated by means of GPS receiving real time corrections via OS smart net.
7. All manhole data is collected from ground level therefore discrepancies may occur. More accurate data is only achievable via confined space entry.
8. OS license number: 100022432

Key Plan



Legend

OS Buildings
Surveyed Buildings
Building
Wall
Kerb Channel Line
Top of Kerb
Edge of Surface
Top of Bank
Bottom of Bank
Canopy / Overhang
Line Marking
Centre Line
Watercourse Centre Line
Barrier
Fence
Gate
Overhead Powerline
Overhead Utilities

Contour Lines
Inspection Chamber
Flow direction and pipe diameter
Station and Name
Monitoring Borehole
Tree / Bush / Sapling
Area of Vegetation/ Extent of Tree Canopy
Hedge
Body of Water
Body of Water from OS
Spot Level
Assumed Surface Water Drainage Line
Surface Water Drainage Line

AP	Anchor Point	FBW	Fence Barbed Wire	LB	Litter Bin
BG	Back Gully	FCB	Fence Closed Board	LP	Lamp Post
BO	Bollard	FCL	Fence Chain Link	MH	Manhole
BS	Bus Stop	FEL	Fence Electric	Mkr	Service Marker
BT	British Telecom	FMP	Fence Metal Panel	PB	Post Box
C	Crest	FMR	Fence Metal Railing	PT	Post
CL	Cover Level	FOB	Fence Open Board	RE	Rodding Eye
CMP	Cable Marker Post	FPW	Fence Post & Wire	SP	Sign Post
CCTV	Security Camera	FSP	Fence Steel Palisade	ST	Stop Tap
CTV	Cable TV	FWM	Fence Wire Mesh	SV	Stop Valve
DC	Drainage Channel	FFL	Finished Floor Level	TCB	Telephone Call Box
DK	Drop Kerb	FP	Flagpole	THL	Threshold Level
DP	Down Pipe	Gas	Gas	TL	Traffic Light
Elec	Electric	GV	Gas Valve	TP	Telegraph Post
EP	Electricity Post	GY	Gully	TS	Traffic Signal
ER	Earth Rod	Ht	Height	UTS	Unable to Survey
FH	Fire Hydrant	IC	Inspection Chamber	WL	Water Level
FL	Floodlight	IFL	Internal Floor Level	WM	Water Meter
		IL	Invert Level (as a reduced level)	WO	Wash Out

Rev	Date	Details of issue / revision	Drw	Rev
P1	20.06.24	First Issue	DS	SS

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Client

Richborough Estates Limited

Project Title

Little Green Lane, Croxley Green

Drawing Title

Existing Site Plan Sheet 6 of 9

Drawn:	D.Smith	Reviewed:	S.Shreeves
BWB Ref:	233574	Date: 20.06.24	Scale@A1: 1:500

Drawing Status

Information

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
LGL-BWB-00-06-DR-G-0001	S2	P1

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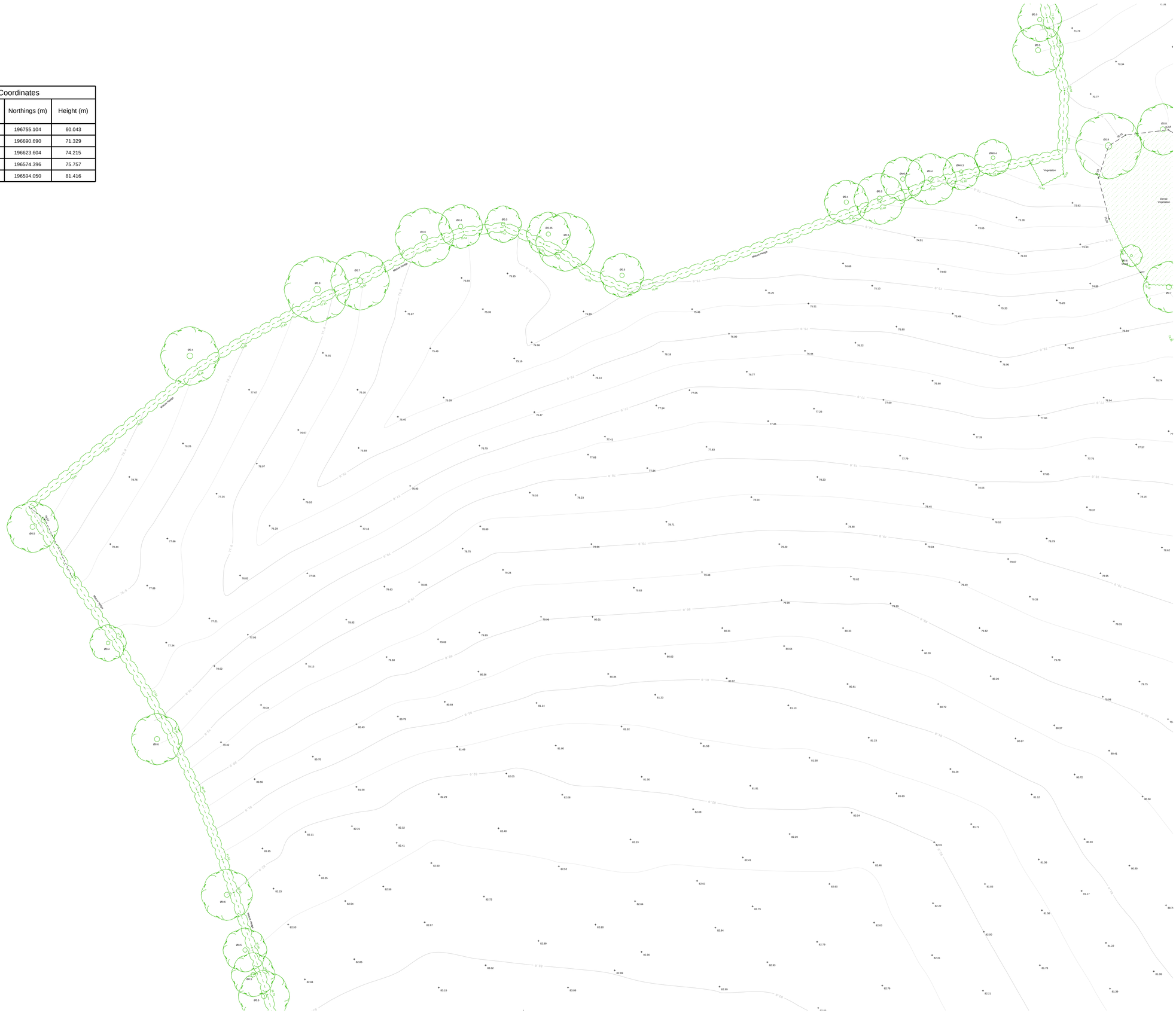
APPROX

Station Coordinates			
Station Name	Eastings (m)	Northings (m)	Height (m)
BWB01	508204.137	196755.104	60.043
BWB02	508110.768	196690.690	71.329
BWB03	508023.784	196623.604	74.215
BWB04	507925.306	196574.396	75.757
BWB05	507710.597	196594.050	81.416


Vegetation
Mature Hedge
Mature Hedge
Mature Hedge

APPROX

Station Coordinates

Station Name	Eastings (m)	Northings (m)	Height (m)
BWB01	508204.137	196755.104	60.043
BWB02	508110.768	196690.690	71.329
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BWB04	507925.306	196574.396	75.757
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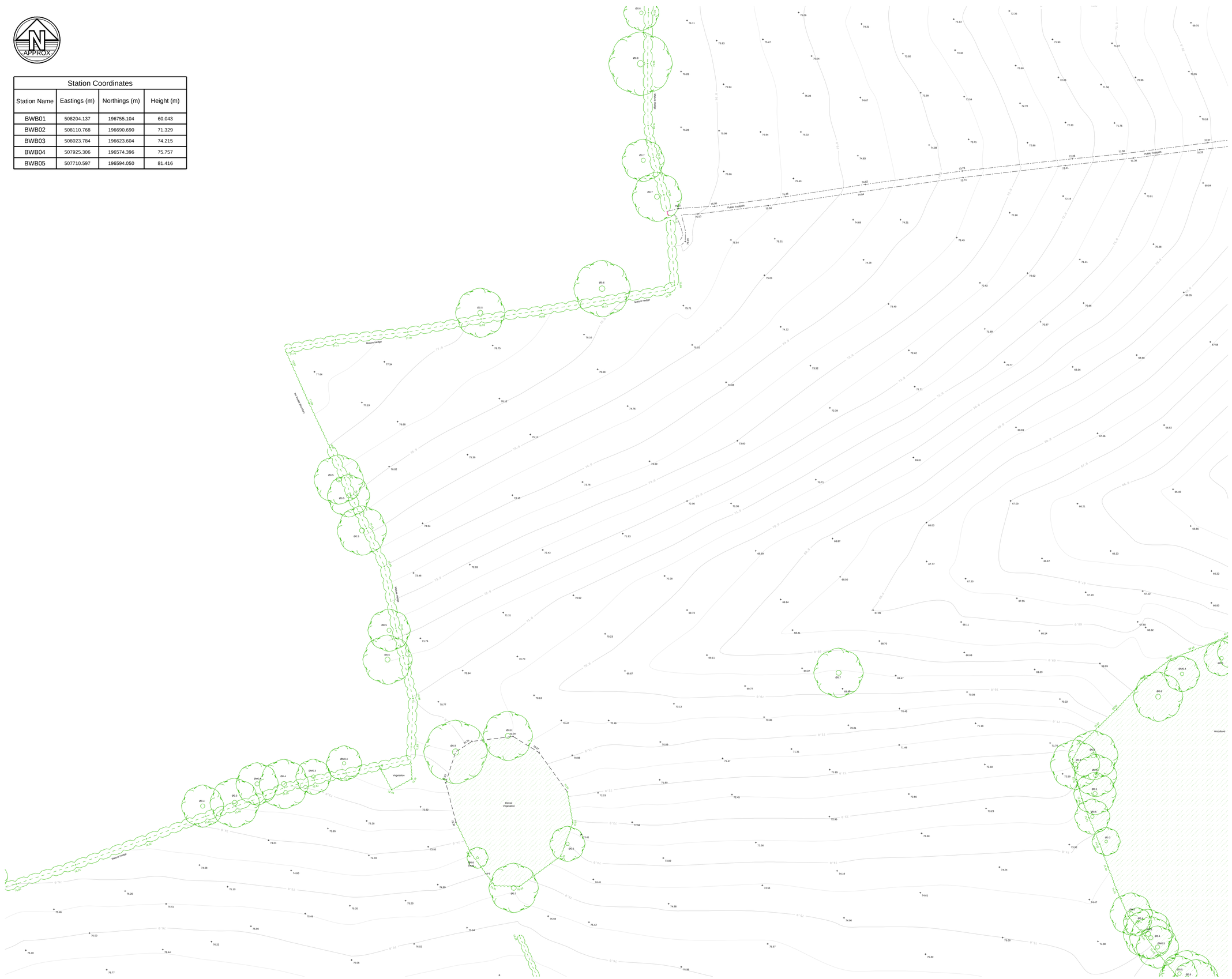
Public Footpath
Public Footpath
Mature Hedge
Mature Hedge
Mature Hedge

Station Coordinates

Station Name	Eastings (m)	Northings (m)	Height (m)
BWB01	508204.137	196755.104	60.043
BWB02	508110.768	196690.690	71.329
BWB03	508023.784	196623.604	74.215
BWB04	507925.306	196574.396	75.757
BWB05	507710.597	196594.050	81.416

Notes

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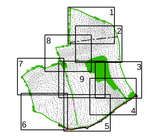
7. All manhole data is collected from ground level therefore discrepancies may occur. More accurate data is only achievable via confined space entry.
8. OS license number: 100022432

Key Plan



Legend

- OS Buildings
- Surveyed Buildings
- Building
- Wall
- Kerb Channel Line
- Top of Kerb
- Edge of Surface
- Top of Bank
- Bottom of Bank
- Canopy / Overhang
- Line Marking
- Centre Line
- Watercourse Centre Line
- Barrier
- Fence
- Gate
- Overhead Powerline
- Overhead Utilities
- Contour Lines
- Inspection Chamber
- Flow direction and pipe diameter (0.25 / 1)
- Station and Name (BH 1)
- Monitoring Borehole
- Tree / Bush / Sapling
- Area of Vegetation/ Extent of Tree Canopy
- Hedge
- Body of Water
- Body of Water from OS
- Spot Level (50.00)
- Assumed Surface Water Drainage Line
- Surface Water Drainage Line

AP	Anchor Point	FBW	Fence Barbed Wire	LB	Litter Bin
BG	Back Gully	FCB	Fence Closed Board	LP	Lamp Post
BO	Bollard	FCL	Fence Chain Link	MH	Manhole
BS	Bus Stop	FEL	Fence Electric	Mkr	Service Marker
BT	British Telecom	FMP	Fence Metal Panel	PB	Post Box
C	Crest	FMR	Fence Metal Railing	PT	Post
CL	Cover Level	FOB	Fence Open Board	RE	Rodding Eye
CMP	Cable Marker Post	FPW	Fence Post & Wire	SP	Sign Post
		FSP	Fence Steel Palisade	ST	Stop Tap
CCTV	Security Camera	FWM	Fence Wire Mesh	SV	Stop Valve
CTV	Cable TV	FFL	Finished Floor Level	TCB	Telephone Call Box
DC	Drainage Channel	FP	Flagpole	THL	Threshold Level
		Gas	Gas	TL	Traffic Light
DK	Drop Kerb	GV	Gas Valve	TP	Telegraph Post
DP	Down Pipe	GY	Gully	TS	Traffic Signal
Elec	Electric	Ht	Height	UTS	Unable to Survey
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FL	Floodlight				

Rev	Date	Details of issue / revision	Drw	Rev
P1	20.06.24	First Issue	DS	SS

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Client

Richborough Estates Limited

Project Title

Little Green Lane, Croxley Green

Drawing Title

Existing Site Plan Sheet 9 of 9

Drawn:	D.Smith		Reviewed:	S.Shreeves	
BWB Ref:	233574	Date:	20.06.24	Scale@A1:	1:500

Drawing Status

Information

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
LGL-BWB-00-09-DR-G-0001	S2	P1

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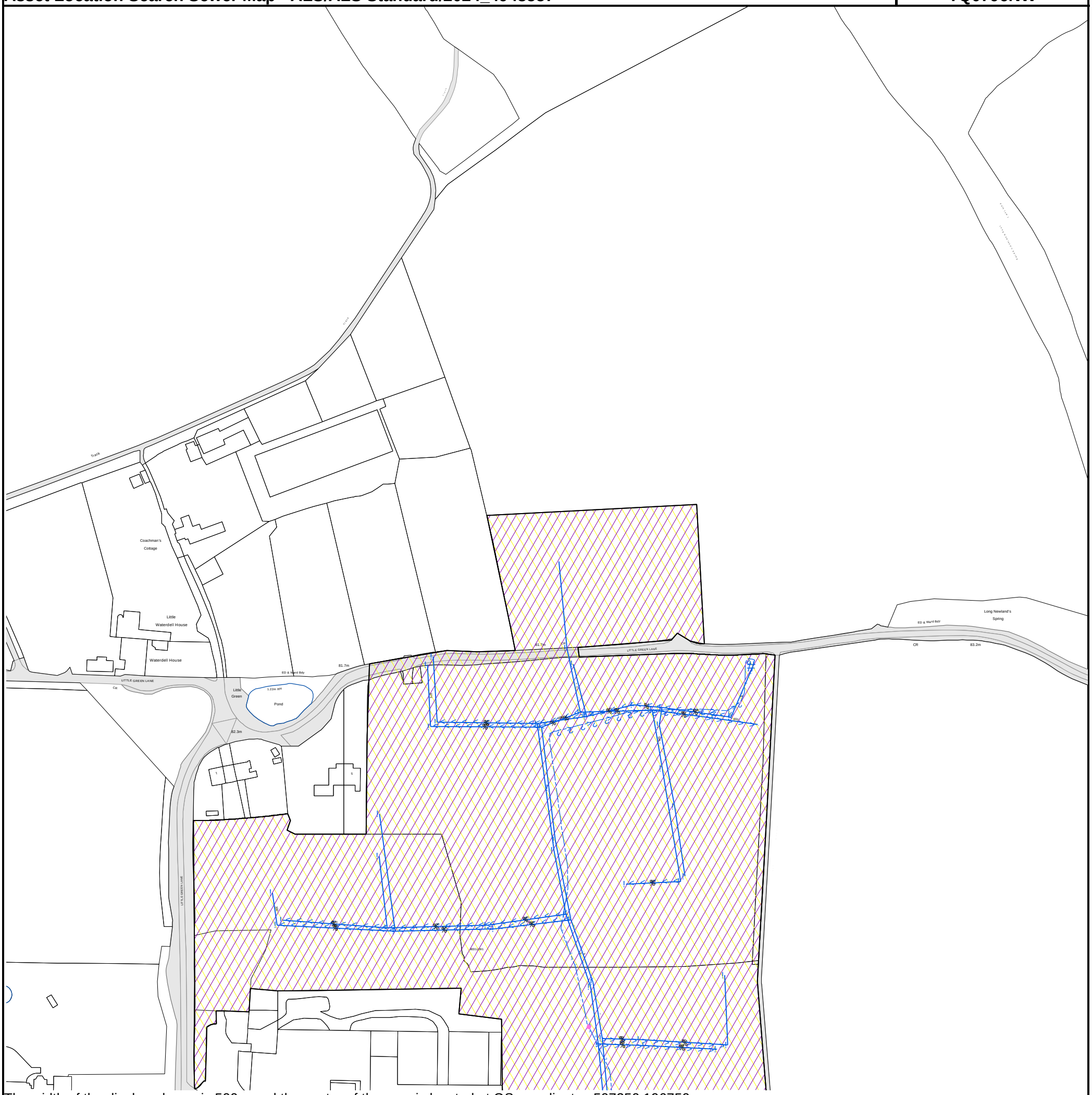
Appendix 5: Thames Water Asset Records

Asset Location Search Sewer Map - ALS/ALS Standard/2024_4948557	TQ0796NW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 507250,196750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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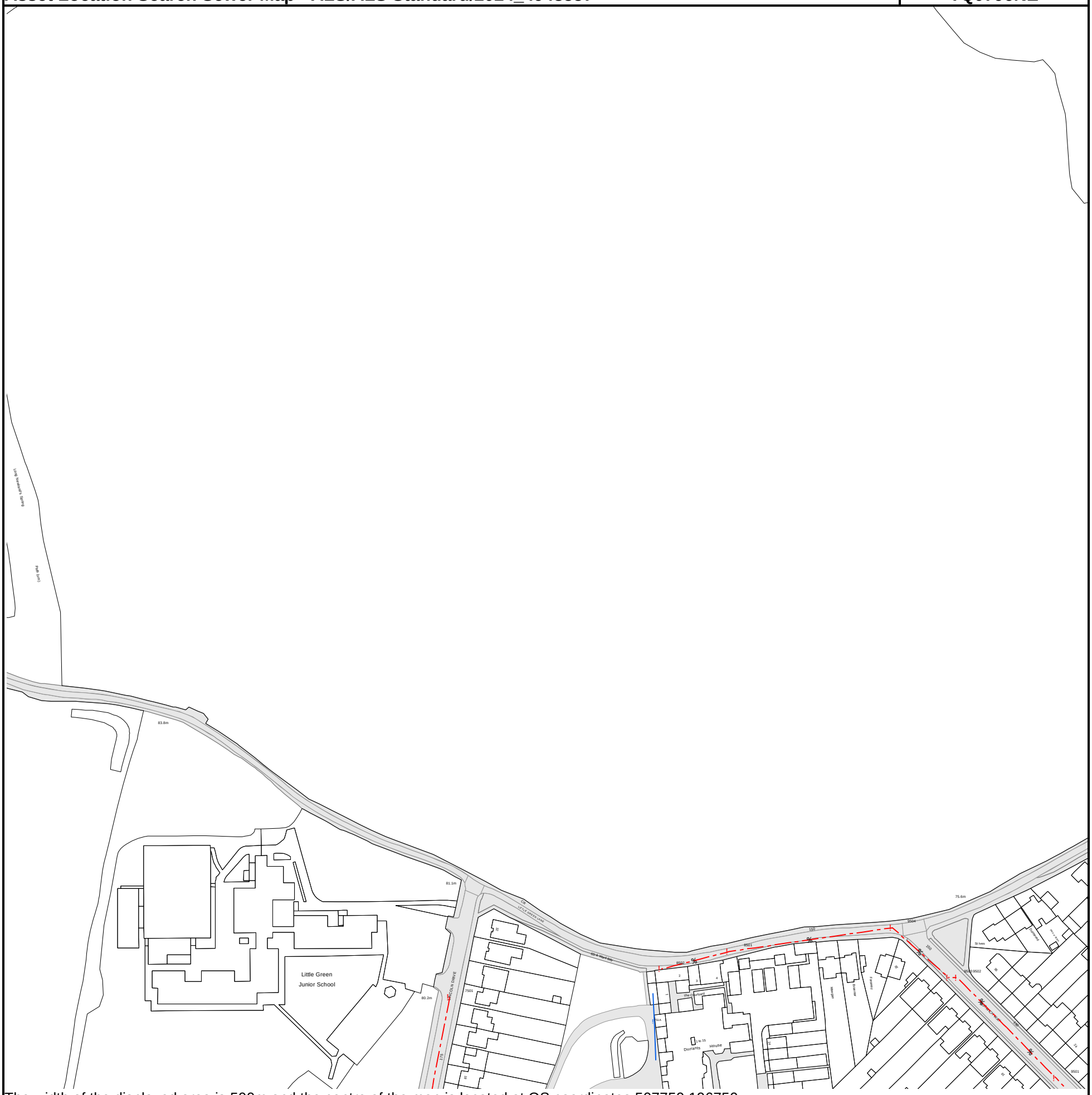
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a

Asset Location Search Sewer Map - ALS/ALS Standard/2024_4948557	TQ0796NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 507750,196750

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 507750,196750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
9501	74.58	72.37
751A	n/a	n/a
7501	80.7	78.89
9503	75.46	73.1
9502	75.4	72.92
8502	n/a	n/a
8501	77.06	74.88
9504	75.73	n/a

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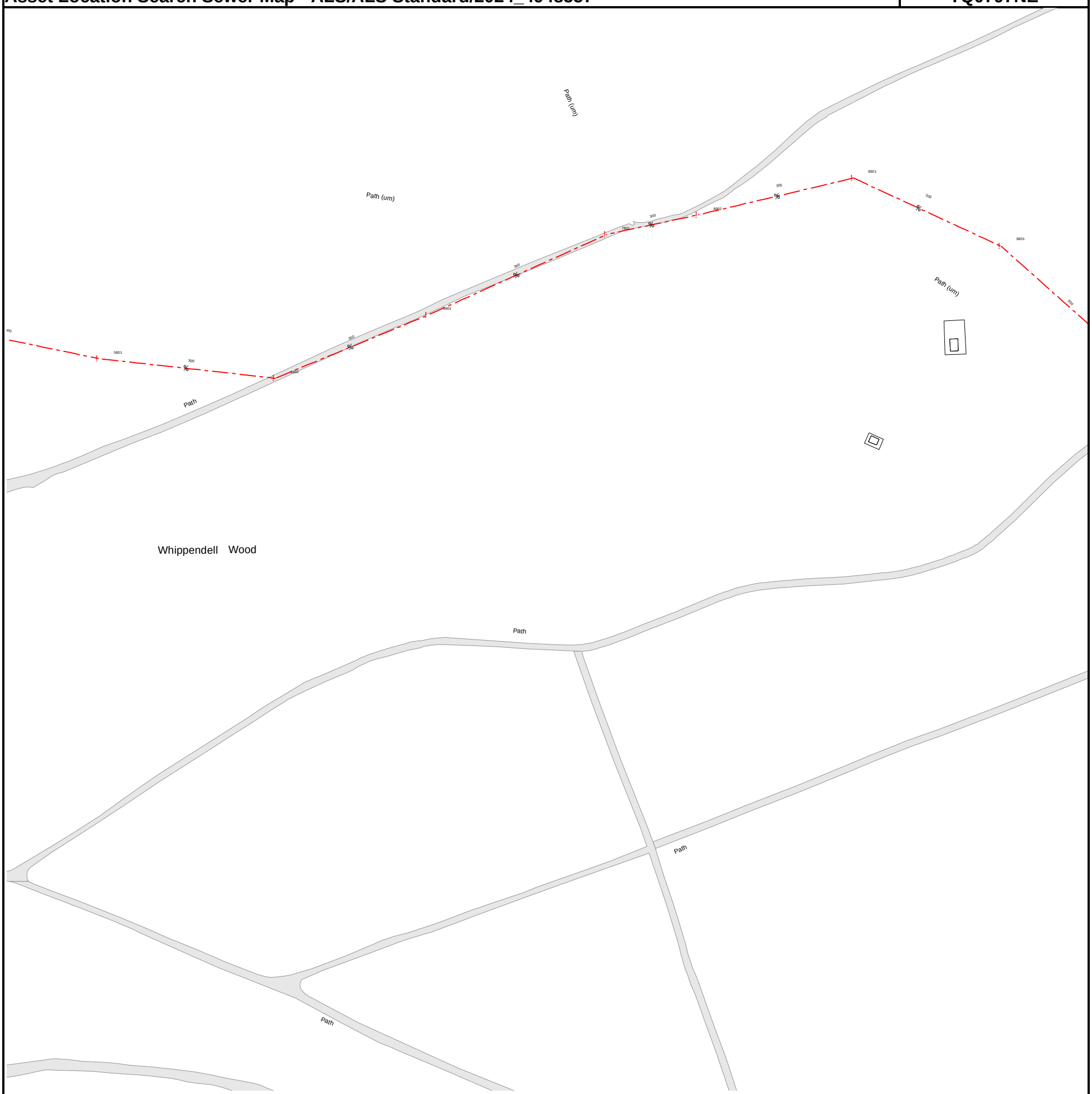
Asset Location Search Sewer Map - ALS/ALS Standard/2024_4948557	TQ0797NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 507750,197750

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Manhole Reference	Manhole Cover Level	Manhole Invert Level
6801	63.17	61.18
7801	63.27	60.92
8902	63.1	60.63
8901	62.3	60.43
9801	61.76	59.9
6802	63.19	61.46
5801	64.08	61.72

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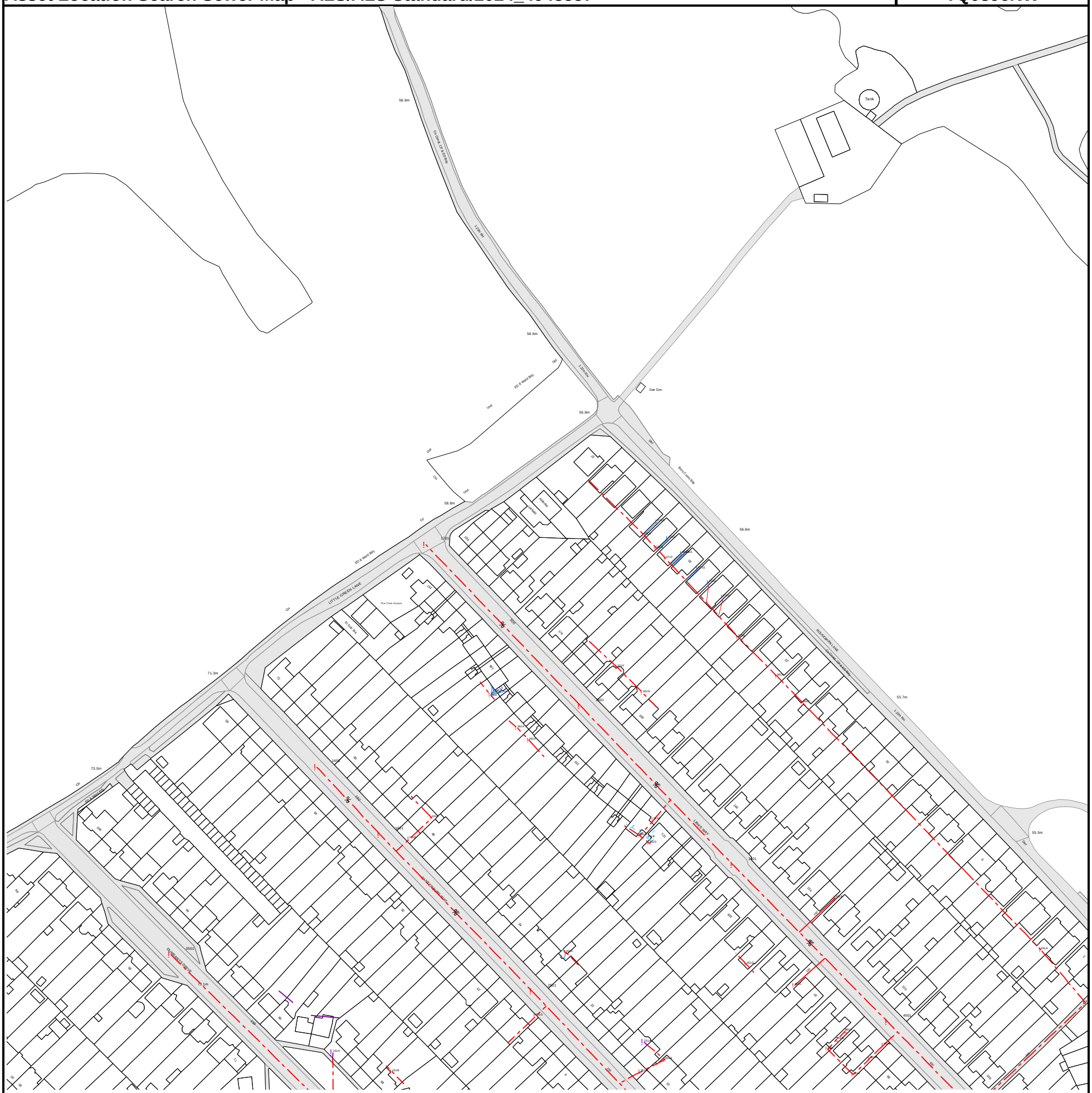
Asset Location Search Sewer Map - ALS/ALS Standard/2024_4948557

TQ0896NW


56.9m
56.6m
56.9m
58.8m
71.3m
73.5m
70.1m
55.7m
55.5m
LITTLE GREEN LANE
Tank
Gas Gov
The Tree House
LAUD WAY
ORCHARD DRIVE
SOUTHERN LANE
Allotments
Path
Track
Ditch
Hedge
Wall
Fence
Building
Conifer
Deciduous
Rough Grass
Scrub
Shrubs
Garden
Unsurfaced
Slope
Cliff
Bank
Top of Bank
Foot of Bank
Top of Cliff
Foot of Cliff
Rail
Rail Over Track
Rail Under Track
Rail Over Path
Rail Under Path
Rail Over Road
Rail Under Road

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
4502	55.7	54.72
451A	n/a	n/a
151B	n/a	n/a
261I	n/a	n/a
261J	n/a	n/a
361C	n/a	n/a
451B	n/a	n/a
4501	57.24	54.27
351C	n/a	n/a
351D	n/a	n/a
251C	n/a	n/a
351B	n/a	n/a
3601	58.32	54.61
261D	n/a	n/a
161B	n/a	n/a
261B	n/a	n/a
261C	n/a	n/a
1601	69.94	67.54
261E	n/a	n/a
161A	n/a	n/a
261H	n/a	n/a
261A	n/a	n/a
2601	59.02	54.75
261G	n/a	n/a
261F	n/a	n/a
371E	n/a	n/a
371F	n/a	n/a
371D	n/a	n/a
371A	n/a	n/a
271B	n/a	n/a
1701	60.78	55.28
371C	n/a	n/a
271A	n/a	n/a
271C	n/a	n/a
351J	n/a	n/a
251B	n/a	n/a
351A	n/a	n/a
351E	n/a	n/a
151A	n/a	n/a
351I	n/a	n/a
251A	n/a	n/a
351G	n/a	n/a
351F	n/a	n/a
251D	n/a	n/a
2501	67.47	65.09
0501	73.43	71.52
1602	70.83	68.28
361A	n/a	n/a
371B	n/a	n/a
371H	n/a	n/a
371G	n/a	n/a

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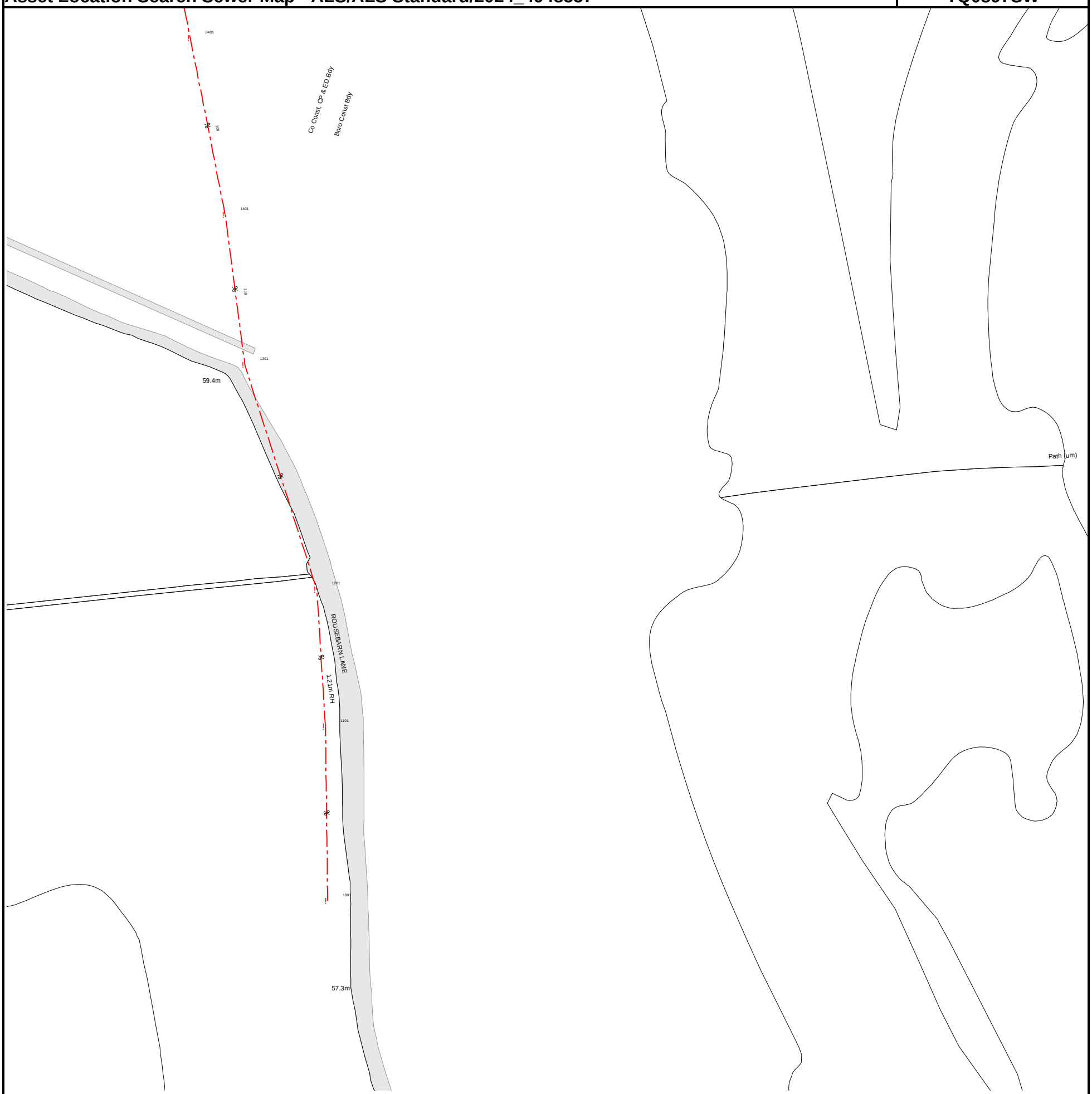
Asset Location Search Sewer Map - ALS/ALS Standard/2024_4948557

TQ0897SW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 508250,197250

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0401	59.69	57.88
1401	58.83	57.3
1301	n/a	n/a
1201	n/a	n/a
1101	n/a	n/a
1001	n/a	n/a

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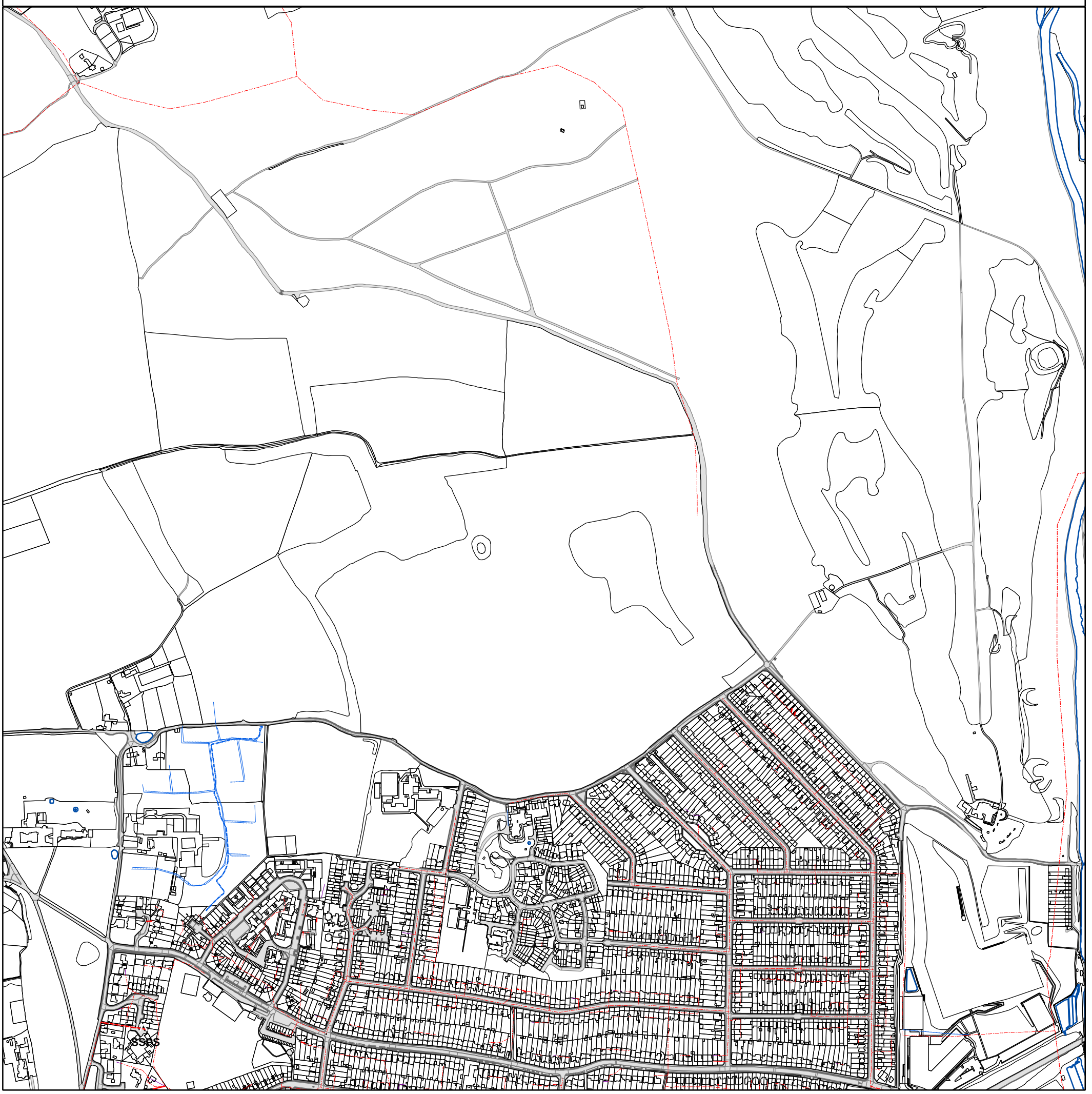
Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2024_4948557



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Scale:	1:7161
Width:	2000m
Printed By:	TSOMASUN
Print Date:	26/02/2024
Map Centre:	507865,197027
Grid Reference:	TQ0797SE

Comments:

ALS/ALS Standard/2024_4948557

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
021D		
241D		
451B		
351G		
351D		
3107		
4011		
8801	58.7	47.76
2001	69.48	67.58
2501	67.47	65.09
3102	62.6	60.76
5101	54.52	52.45
3106		
3104		
3201	58.36	56.54
3302		
5201	54.43	52.87
7101	53.96	48.13
0402	70.55	68.38
9503	75.46	73.1
2203	63.75	61.86
2303	65.16	63.54
9502	75.4	72.92
4201	56.44	53.14
4402	55.63	54.01
4209		
9201		
9202		
0701	62.04	58.85
2301	60.25	58.29
0403	71.78	69.2
0601	63.04	58.48
2009		
4306		
4002	55.7	52.42
6101	55.56	51.66
1106		
3010		
4106		
4108		
4205		
0801	60.79	59.37
3211		
1701	60.78	55.28
3205		
2204		
4104		
2005		
4403	56.31	54.1
4111		
4309		
3402	62.31	60.4
4006		
4117		
4310		
7201	57.77	47.23
0203		
2007		
2209		
2003		
2205		
3007		
1401	71.57	69.54
0205		
0101	70.68	68.73
1401	58.83	57.3
1002		
0401	59.69	57.88
0001	72.32	69.5
0105		
4307		
4007		
1104		
1001		
1102		
1108		
4101	54.64	52.72
3209		
4311		
4118		
4502	55.7	54.72

REFERENCE	COVER LEVEL	INVERT LEVEL
241C		
251D		
351F		
351I		
351J		
3105		
8001	53.1	47.01
8001	58.42	47.99
3202		
3204		
3008		
5102	54.09	52.51
3101	59.83	58.15
3103		
3401	58.77	56.95
5301	54.68	53.03
5401	54.8	53.19
9801	61.76	59.9
8501	58.42	47.52
2202	65.07	62.69
2302	63.23	61.38
2402	67.31	65.72
5103	55.69	52.03
4304	55.66	53.59
4501	57.24	54.27
4116		
9203		
9101	73.1	71.21
0202		
9501	74.58	72.37
0201	70.64	68.74
0102	71.63	69.64
2008		
4305		
4005	55.75	52.47
1101	69.87	68.06
1107		
3208		
4107		
4105		
4204		
1001		
3009		
3203		
3004		
4103		
0104	70.88	
2004		
4112		
4110		
4302	56.32	54.05
4401	55.6	53.83
4114		
4207		
3403	63.2	61.4
0501	73.43	71.52
0204		
2006		
2208		
2206		
2201	62.67	60.48
3301	58.02	56.21
1201		
0501	61.23	58.27
0003		
1003		
1101		
0002	72.5	69.56
0103	71.45	69.28
4308		
4109		
1301		
1301	67.43	65.65
1103		
1109		
4003	55.08	52.56
4102	55.13	52.87
3210		
4312		
4206		
4208		

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ALS/ALS Standard/2024_4948557

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
8701	72.25	69.76
8502		
7202		
3001	82.61	80.53
7801	63.27	60.92
5204		
5301		
7004		
4101	82.44	80.39
4105		
7501	80.7	78.89
3311		
3310		
0001	82.45	81.79
0101	83.56	82.65
5207		
6301	79.78	78.32
6207		
3202		
6801	63.17	61.18
3101		
5302		
0802	69.27	67.4
2304		
4802		
4003		
4202		
9901	711.5	69.8
1103		
8101	74.19	72.31
6206		
5102		
8002		
6202	78.06	76.45
6208		
2801	66.84	65.39
3303	84.12	82.1
5208		
6204	79.04	77.78
6306		
6002		
901C		
2303	84.2	
1101	82.02	81.1
3305	84.3	82.55
3801	65.53	64.27
3306	84.53	83.05
221F		
221H		
421E		
7204		
911E		
911A		
2104		
211A		
751A		
8202		
621C		
711E		
131B		
431D		
431F		
911C		
131A		
4301	55.83	53.49
3201	82.74	
3601	58.32	54.61
6201	78.02	76.44
6802	63.19	61.46
2401	65.37	63.5
0801		
6303		
6450	79.16	78.41
3206		
1107		
011B		
021B		
421A		
231B		
711B		
431A		

REFERENCE	COVER LEVEL	INVERT LEVEL
7101	76.5	74.87
7201		
4001	82.72	79.98
4801	63.45	61.96
5202	80.86	
5303		
8103		
8102	75.09	73.32
4102	82.2	
5205		
3002	82.44	80.69
3304	83.98	
3901	64.06	62.68
0003	83.02	82.14
5201	79.57	77.9
2203		
6005		
3308		
6403	79.24	77.75
7203		
4201	80.51	78.76
3309		
1001	81.12	80.48
2302	84.15	82.13
4103	81.9	
4205		
4301		
5801	64.08	61.72
8901	62.3	60.43
2202		
6305		
5206		
6304		
6308		
6451		
3301	84.17	
5101		
5401	82.9	80.29
6402	81	79.05
6004		
6401	79.37	
6203	78.88	77.27
1102	82.86	81.83
1801	67.79	66.22
3307	84.59	83.31
3312		
6205	78.36	76.87
221G		
8101	57.94	48.09
4104	81.99	80.14
8001	76.73	74.91
911F		
2102		
2103		
011A		
301B		
621B		
501F		
131A		
431C		
431E		
431G		
001A		
6302		
1601	69.94	67.54
221D		
8501	77.06	74.88
1201	66.76	65.27
9504	75.73	
1602	70.83	68.28
6307		
5103		
3207		
2211		
531A		
021A		
021C		
231A		
711A		
441A		
431B		

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ALS/ALS Standard/2024_4948557

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REFERENCE	COVER LEVEL	INVERT LEVEL
331A		
431B		
121A		
221B		
531B		
2301		
351A		
161A		
241E		
8902	63.1	60.63
0401	69.34	67.31
1105		
4115		
7005		
121A		
621A		
621E		
501B		
501D		
121C		
121G		
011A		
021B		
741A		
431G		
151A		
221B		
811A		
811B		
431D		
2207		
221A		
101A		
431H		
4008		
4009		
4113		
261A		
901A		
351E		
441A		
261D		
351C		
101C		
131C		
311B		
5003		
101E		
041C		
321C		
411A		
031A		
931B		
301A		
311B		
521B		
131E		
901B		
341A		
611A		
711C		
341D		
811D		
611C		
411B		
431F		
1002	81.03	80.4
101D	81.46	80.86
101G	82.15	81.2
101K		
4203		
421C		
321B		
131C		
131E		
321E		
911B		
131B		
511A		
531D		
531C		

REFERENCE	COVER LEVEL	INVERT LEVEL
431A		
431C		
221A		
221C		
631A		
251A		
251B		
161B		
9801	71.5	69.15
2601	59.02	54.75
4203		
3302	84.11	
2101	68.25	66.24
4303	56.83	54.75
121B		
621D		
141A		
501C		
121B		
121F		
501A		
021A		
1201	83.57	82.31
641A		
431H		
2201		
221C		
811C		
431E		
351B		
2210		
251C		
101B		
431I		
4010		
4119		-0.88
011B		
231A		
901D		
311A		
261C		
261E		
261B		
101D		
131D		
311C		
501E		
041A		
401A		
321D		
411B		
931A		
301D		
311A		
521A		
101F		
8201		
011C		
341B		
411D		
711D		
7205		
611B		
411A		
101E	81.54	80.77
001C		
101C	81.46	80.96
101F	81.54	80.645
101I	82.15	81.85
101L		
4202		
441B		
321A		
131D		
441C		
421B		
911D		
121H		
411C		
5304		
241F		

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ALS/ALS Standard/2024_4948557

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
241G		
421A		
5203		
021E		
131F		
321C		
221D		
011E		
431I		
301C		
261H		
441B		
341A		
371A		
271C		
271A		
221I		
8004		
8003		
801G		
441E		
221E		
121C		
001B		
6209		
901E		
041B		
261F		
411D		
321G		
371C		
321H		
411F		
621F		
711A	54.12	48.98
031B		
031D		
311C		
711F		
911G		
831A		
371G		
361A		
421D		
521C		
531E		
231E		
231D		
801H		
611D		
311D		
911H		
911J		
911K		
721E		
821A		
511B		
261I		
821C		
151B		

REFERENCE	COVER LEVEL	INVERT LEVEL
421D		
421B		
421C		
101G		
131G		
321E		
2105		
431K		
431J		
451A		
431J		
441C		
341B		
371B		
271B		
211B		
221E		
8005		
801F		
441D		
441F		
121D		
441G		
801A		
101H		
041D		
431L		
261G		
321F		
371E		
371D		
411E		
411G		
371F		
721A	57.6	54.87
031C		
411H		
311D		
721A		
011F		
831B		
371H		
201B		
421E		
621H		
031E		
231C		
231B		
401D		
321I		
311E		
911I		
011G		
721C		
721D		
361C		
261J		
511C		
821B		

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Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

- Inlet
- Outfall
- Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement
- Conduit Bridge
- Subway
- Tunnel

Ducts may contain high voltage cables. Please check with Thames Water.

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement.

If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Payment Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment within 14 days of the date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service or will be held to be invalid.
4. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800.

If you are unhappy with our service, you can speak to your original goods or customer service provider. If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

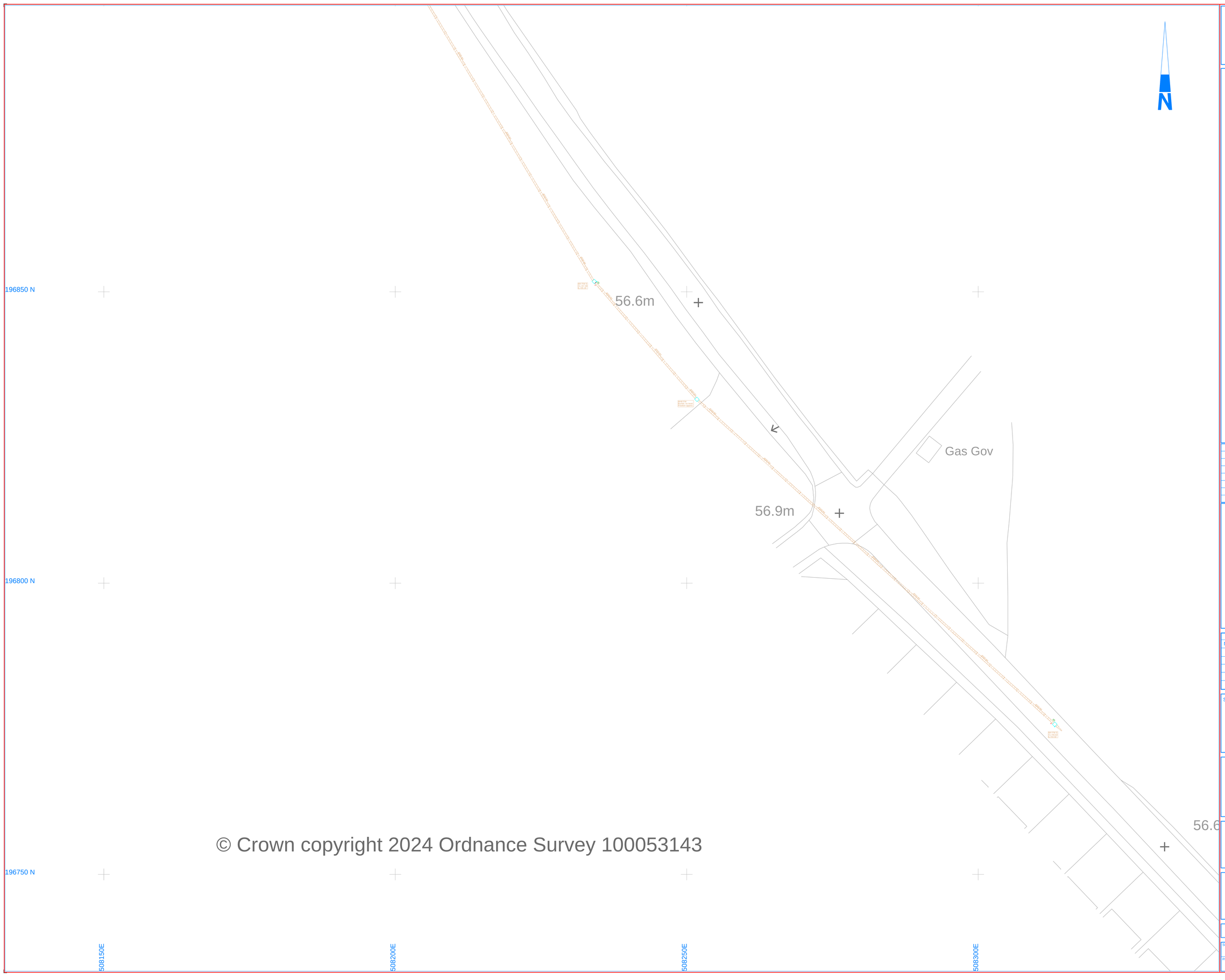
If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0300 034 2222 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**
Please Call **0800 009 4540** quoting your invoice number starting CBA or ADS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number

Appendix 6: CCTV Survey



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Notes :

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- DRAINAGE INFORMATION HAS BEEN DETERMINED WITHOUT MAN ENTRY INTO CHAMBERS AND WHILST EVERY EFFORT HAS BEEN MADE TO CORRECTLY IDENTIFY THIS INFORMATION, IT SHOULD ALWAYS BE CHECKED IN AREAS THAT ARE CRITICAL TO THE FUTURE PROPOSAL.
- ALL SEWERS ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS UNLESS PROVEN THROUGH TRACING TECHNIQUES.
- BASE FILE (OS) SUPPLIED BY THIRD PARTY AND NOT SOLUM VERIFIED.

UTILITY DISCLAIMER:

Electromagnetic techniques have been used in the location of underground services along with the aid of ground penetrating radar. The results are not infallible and trail excavations should be carried out to confirm service identification, position and depths. The completeness of underground services can not be guaranteed.

Solum Surveying will not confirm if a service is alive or dead. This must be undertaken by the service provider. As such all services will be treated as live. This drawing my not include all public services that cross the site. Therefore recommend that a full desktop study is undertaken to provide all service drawings and used in conjunction with this utility survey.

Private service pipes/connections and cables in highways may not be shown, but the presence should be anticipated.

Additional below ground structures or obstructions not shown on this drawing may be present. Review historical records/plans and any as built drawings. Excavations in the vicinity should be treated with extreme caution following the HSE documents on avoiding underground services.

Note that ground conditions, proximity of other utilities, materials and method of construction have an influence on the ability and quality of the data collected on site. Along with areas being accessible at time of survey. Inaccessible areas may contain access/manhole covers that may affect the survey area.

TSA Standards - "Even an appropriate and professionally executed survey may not be able to achieve a 100% detection rate".

UTILITY LINE TYPE KEY

BT B1 (PAS128)	HEATING PIPES B1 (PAS128)
BT B2 (PAS128)	HEATING PIPES B2 (PAS128)
BT B3 (PAS128)	HEATING PIPES B3 (PAS128)
BT B4 (PAS128)	HEATING PIPES B4 (PAS128)
CATV B1 (PAS128)	HV B1 (PAS128)
CATV B2 (PAS128)	HV B2 (PAS128)
CATV B3 (PAS128)	HV B3 (PAS128)
CATV B4 (PAS128)	HV B4 (PAS128)
CCTV B1 (PAS128)	POWER B1 (PAS128)
CCTV B2 (PAS128)	POWER B2 (PAS128)
CCTV B3 (PAS128)	POWER B3 (PAS128)
CCTV B4 (PAS128)	POWER B4 (PAS128)
COMMS B1 (PAS128)	SERVICE DUCT B1 (PAS128)
COMMS B2 (PAS128)	SERVICE DUCT B2 (PAS128)
COMMS B3 (PAS128)	SERVICE DUCT B3 (PAS128)
COMMS B4 (PAS128)	SERVICE DUCT B4 (PAS128)
FUEL/OIL B1 (PAS128)	STORM SEWER
FUEL/OIL B2 (PAS128)	TRAFFIC B1 (PAS128)
FUEL/OIL B3 (PAS128)	TRAFFIC B2 (PAS128)
FUEL/OIL B4 (PAS128)	TRAFFIC B3 (PAS128)
FOUL SEWER	TRAFFIC B4 (PAS128)
GAUGE LINES B1 (PAS128)	UNKNOWN B1 (PAS128)
GAUGE LINES B2 (PAS128)	UNKNOWN B2 (PAS128)
GAUGE LINES B3 (PAS128)	UNKNOWN B3 (PAS128)
GAUGE LINES B4 (PAS128)	UNKNOWN B4 (PAS128)
GAS B1 (PAS128)	VENT PIPE B1 (PAS128)
GAS B2 (PAS128)	VENT PIPE B2 (PAS128)
GAS B3 (PAS128)	VENT PIPE B3 (PAS128)
GAS B4 (PAS128)	VENT PIPE B4 (PAS128)
GENERIC PIPE B1 (PAS128)	WATER B1 (PAS128)
GENERIC PIPE B2 (PAS128)	WATER B2 (PAS128)
GENERIC PIPE B3 (PAS128)	WATER B3 (PAS128)
GENERIC PIPE B4 (PAS128)	WATER B4 (PAS128)
OFFSET FUEL B2 (PAS128)	GPR B1 (PAS128)
OFFSET FUEL B4 (PAS128)	GPR B2 (PAS128)
	GPR B3 (PAS128)
	GPR B4 (PAS128)

DRAINAGE CCTV REFERENCE

(x) Indicates Pipe Reference
(1) CCTV Report Item Number

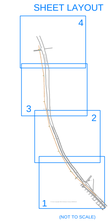
ABBREVIATIONS

Acoustic Connection	AC	Inspection Cover	IC	Stop Valve	SV
Assumed Route	AR	Lamp Post	LP	Soil Vent Pipe	SVP
Backdrop	BD	Manhole	MH	Taken From Records	TFR
Base Level	BL	No Further Information	NFI	Top Of Tank	TOT
Cover Level	CL	Off Survey Area	OSA	Top Of Pipe	TOP
Catchpit	CP	Pipe To Ground	PTG	Traffic Light	TL
Drainage Channel	DCH	Pipe To Surface	PTS	Telegraph Pole	TP
Electricity Pole	EP	Pipe Riser	PR	Unable to Locate	UTL
Earth Rod	ER	Rodding Eye	RE	Unable to Raise	UTR
Fire Hydrant	FH	Rain Water Pipe	RWP	Unable to Survey	UTS
Gas Valve	GV	Silt Level	SL	Unable to Trace	UTT
Gully	GY	Soil Pipe	SP	Unable to Trace Further	UTF
Internal Depth	ID	Soffit Height	SOF	Vent Pipe	VP
Invert Level	IL	Survey Abandoned	SA	Water Level	WL

PAS UTILITY CLASSIFICATION

Quality	Description
BA	Service verified in an open excavation or inside an inspection chamber
B1	Horizontal and vertical location within +-150mm accuracy
B2	Horizontal and vertical location within +-250mm accuracy
B3	Horizontal location only using one geophysical technique. Poor / No Depth response
B4	Service is expected to exist, assumed or taken from records
B1P/B2P	Service verified using post processed GPR Data.

SHEET LAYOUT



Drawing Revision

No	Date	Description
R0	04/09/24	SITE SURVEY COMPLETE
R1		
R2		
R3		
R4		

Site Utility Notes :

- STAT / AS-BUILT PLANS NOT BEEN PROVIDED PRIOR TO SITE SURVEY. WE RECOMMEND DESKTOP STUDY UNDERTAKEN PRIOR TO ANY GROUND WORKS.
- ALL REPORTS TO BE READ IN CONJUNCTION WITH THIS PLAN.
- SURVEY DATA HAS BEEN OVERLAID ONTO AN OS TILE SUPPLIED BY SOLUM SURVEYING.

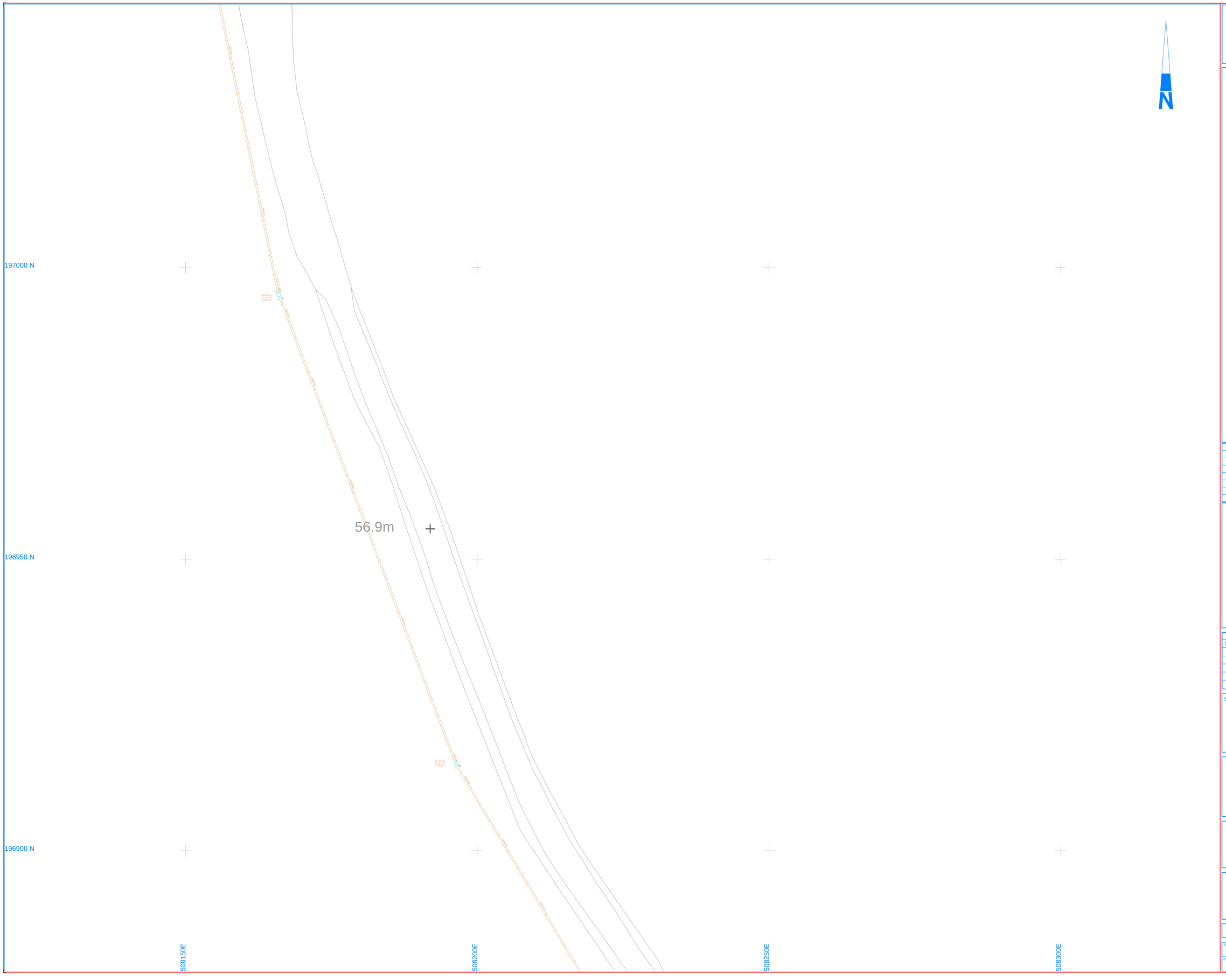
Solum Surveying Ltd
www.solumsurveying.com
tel: 01454 413592
email: info@solumsurveying.com
The Old Stables
Pines Courtyard
Sibbet
Berkeley
GL13 9LE

BWB CONSULTING

LITTLE GREEN LANE
CROXLEY GREEN
WD3 3SR

Drainage CCTV

Scale: 1:200	Sheet Size: A0	1 of 4	ALSO SEE DRAWING:
Project Number: 12862	Rev: R0	Drawing Date: 18/09/24	
		Surveyed By: EM/IO	CHECKED BY:
		Drawn By: RW	MP



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BT B2	BT B2 (PAS128)	HEATING PIPES B2	HEATING PIPES B2 (PAS128)
BT B3	BT B3 (PAS128)	HEATING PIPES B3	HEATING PIPES B3 (PAS128)
BT B4	BT B4 (PAS128)	HEATING PIPES B4	HEATING PIPES B4 (PAS128)
CATV B1	CATV B1 (PAS128)	HV B1	HV B1 (PAS128)
CATV B2	CATV B2 (PAS128)	HV B2	HV B2 (PAS128)
CATV B3	CATV B3 (PAS128)	HV B3	HV B3 (PAS128)
CATV B4	CATV B4 (PAS128)	HV B4	HV B4 (PAS128)
CCTV B1	CCTV B1 (PAS128)	POWER B1	POWER B1 (PAS128)
CCTV B2	CCTV B2 (PAS128)	POWER B2	POWER B2 (PAS128)
CCTV B3	CCTV B3 (PAS128)	POWER B3	POWER B3 (PAS128)
CCTV B4	CCTV B4 (PAS128)	POWER B4	POWER B4 (PAS128)
COMMS B1	COMMS B1 (PAS128)	SERVICE DUCT B1	SERVICE DUCT B1 (PAS128)
COMMS B2	COMMS B2 (PAS128)	SERVICE DUCT B2	SERVICE DUCT B2 (PAS128)
COMMS B3	COMMS B3 (PAS128)	SERVICE DUCT B3	SERVICE DUCT B3 (PAS128)
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GAUGE LINES B2	GAUGE LINES B2 (PAS128)	UNKNOWN B2	UNKNOWN B2 (PAS128)
GAUGE LINES B3	GAUGE LINES B3 (PAS128)	UNKNOWN B3	UNKNOWN B3 (PAS128)
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GAS B1	GAS B1 (PAS128)	VENT PIPE B1	VENT PIPE B1 (PAS128)
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GAS B4	GAS B4 (PAS128)	VENT PIPE B4	VENT PIPE B4 (PAS128)
GENERIC PIPE B1	GENERIC PIPE B1 (PAS128)	WATER B1	WATER B1 (PAS128)
GENERIC PIPE B2	GENERIC PIPE B2 (PAS128)	WATER B2	WATER B2 (PAS128)
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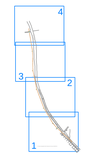

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Drawing Revision

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Drainage CCTV

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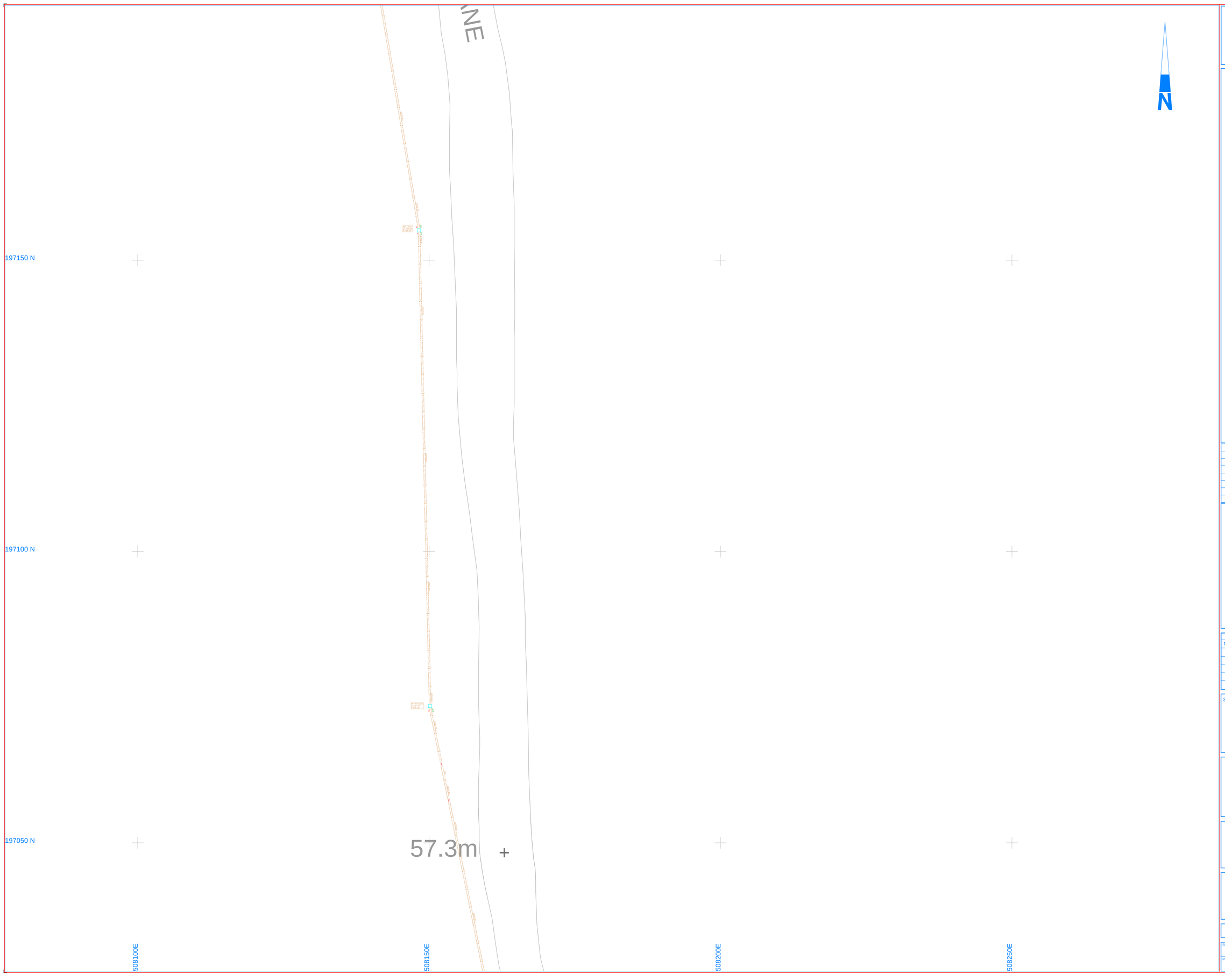

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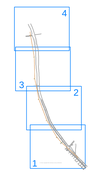

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Drainage CCTV

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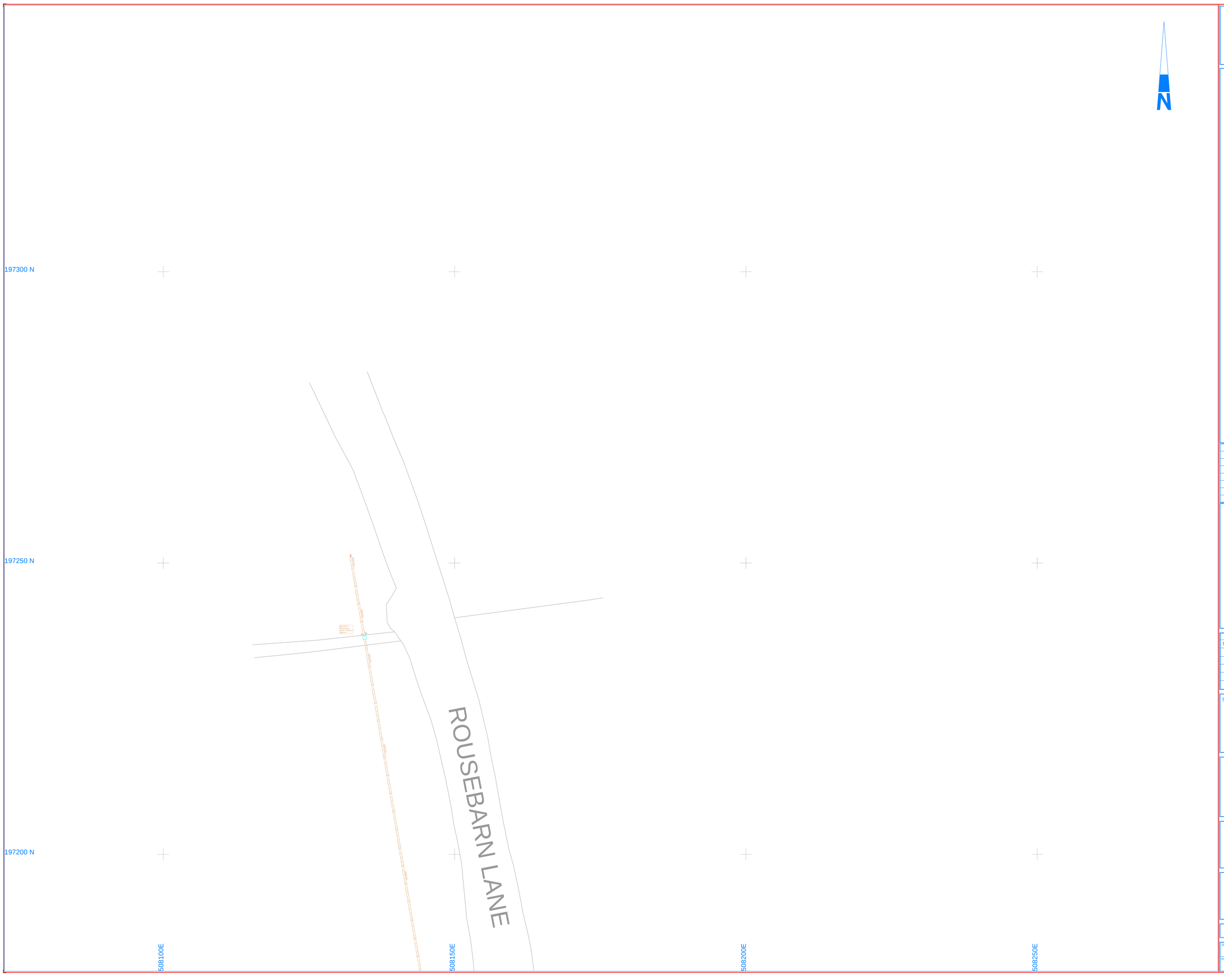

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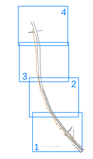

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Drainage CCTV

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		Drawing Date: 18/09/24		
Project Number: 12862	Rev: R0	Surveyed By: EM/IO		CHECKED BY: MP
		Drawn By: RW		

Appendix 7: Soakaway Tests

GEOTECHNICAL ENGINEERS
Delivering Innovative Solutions

Project Reference: Land off Little Green Lane, Croxley Green

Report Title: Preliminary Permeability Assessment

Client: Richborough Estates

Report Reference: PJSG20-01-R02

Report Status: Draft

Date of Issue: 28 February 2020

Revision: Original

Approval Status	**Name & Position**	**Signature**
Prepared by:	Vinny Hallifield BSc (Hons) Senior Project Engineer	[redacted]
Approved by:	David Faux CEng MICE RoGEP Managing Director	

Revision Status	**Date**	**Summary of Revisions**
Original	28.02.20	n/a

EXECUTIVE SUMMARY

Instruction	In January 2020, PJS Geotechnical Engineers Limited (PJSG) were instructed by Richborough Estates (the Client) to undertake a Preliminary Permeability Assessment for a proposed residential development at Land off Little Green Lane, Croxley Green (the site).
Site Investigation Works	Site investigation works commenced on 04 February and completed on 05 February 2020 under the supervision of a Geotechnical Engineer.
Ground Conditions	The ground conditions on-site generally comprised the following: • Reworked agricultural topsoil mixed with natural sands, overlying; • Reddish / brown clayey gravelly fine to medium SAND, overlying; • Structureless CHALK.
Soil Infiltration Testing & Results	Soil infiltration testing was generally carried out in accordance with the methodology set out within BRE Digest 365 'Soakaway Design'. Results of the soil infiltration testing undertaken ranged from 2.33×10^{-4} to 7.78×10^{-6}.
Conclusions	The preliminary rates recorded would indicate that the proposed infiltration basin is likely to provide a suitable solution for the disposal of surface water, subject to detailed design. No groundwater was encountered during the works undertaken to date, as such high groundwater levels are no considered likely to impede the proposed drainage strategy for the site. At this stage no potential contamination issues are anticipated which could impede the proposed drainage strategy for the site. Further site investigation works shall be required to confirm. Following a desk-based study a moderate risk of ground dissolution has been identified within the western portion of the site. Further consideration is required to determine the suitability of infiltration drainage within this area of the site.

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1.0 INTRODUCTION 1

2.0 SITE SETTING 2

3.0 SITE INVESTIGATION WORKS 4

4.0 SOIL INFILTRATION TESTING 6

5.0 CONCLUSIONS 8

DRAWINGS

PJSG20-01-D01 - SITE LOCATION PLAN

LGL-BWB-ZZ-XX-SK-CD-0001 - INDICATIVE SURFACE WATER STORAGE & BASIN SIZES

PJSG20-01-D02 - EXPLORATORY HOLE LOCATION PLAN

LIST OF APPENDICES

APPENDIX A: GROUND LOGS

APPENDIX B: PERMEABILITY TEST DATA

1.0 INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

In January 2020, PJS Geotechnical Engineers Limited (PJSG) were instructed by Richborough Estates (the Client) to undertake a Preliminary Permeability Assessment for a proposed residential development at Land off Little Green Lane, Croxley Green (the site).

The objectives of this assessment were to establish infiltration rates for the near surface ground conditions, and identify any factors within the ground that may influence the decision process for determining the suitability of a soakaway drainage scheme.

1.2 PREVIOUS GROUND REPORTS

The table below provides the details of the previous ground related documents which have been made available to PJSG for review as part of this assessment:

Reference	Date
Desk Study Report (PJSG20-01-R01)	Jan 2020

Pertinent items from these documents are summarised within Section 2 of this report. Reference to the individual documents should be made for further details.

1.3 PROPOSED SITE

It is understood that a residential development is proposed for the site.

1.4 LIMITATIONS AND CONFIDENTIALITY

All comments and proposals contained in this report, including any conclusions, are based on information available to PJSG at the time of assessment. The conclusions drawn by PJSG could therefore differ if the information is found to be inaccurate or misleading. PJSG accepts no liability should this be the case, nor if additional information exists or becomes available with respect to this scheme.

PJSG has undertaken the work in accordance with our understanding of current best practice at the time of undertaking the report. Except as otherwise requested by the client, PJSG is not obliged to and disclaims any obligation to update the report for events taking place after: -

- The date on which this assessment was undertaken, and
- The date on which the final report is delivered.

PJSG makes no representation whatsoever concerning the legal significance of its findings or the legal matters referred to in the following report.

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

2.0 SITE SETTING

2.1 INFORMATION SOURCES

The information contained within this section is based on review of the documents listed within Section 1.2 of this report. Only information considered pertinent to the proposed drainage strategy is included.

2.2 SITE LOCATION & DESCRIPTION

Location	Land off Little Green Lane, Croxley Green, Hertfordshire
National Grid Reference	507883E, 196955N.
Approximate site Area	40 Ha.
Current Land Use	Agricultural land comprising an immature crop divided by field boundaries comprising mature trees and hedgerows.
Notable site Features	A significant number of mature trees and hedgerows present around the site boundaries, and individual field boundaries. A relatively large spinney of irregular shape is present in the eastern portion of the site. A small depression is present in the central portion of the site adjacent to the northern boundary, with sparse trees present. General fall from west to east, with some localised undulations.

A Site Location Plan (PJSG20-01-D01) is provided within the drawings section of this report.

2.3 SITE HISTORY

The land use of the site and surrounding area has remained agricultural since the start of historical records to the present day, with no significant potentially contaminative features noted.

2.4 GEOLOGY & POTENTIAL GEOTECHNICAL HAZARDS

Geological records and potential geotechnical hazards are recorded below:

Feature	Description	Comments
Artificial Ground	A small area of Worked Ground (Void) in the central portion of the site, adjacent to the northern boundary.	-
Superficial Deposits	Gerrards Cross Gravel Deposits are recorded in western portion of the site. No Superficial Deposits are recorded for central and eastern portions of the site.	A very small deposit of Winter Hill Gravel transects the site in the southeast portion of the site.

Feature	Description	Comments
Bedrock	Seaford Chalk & Newhaven Chalk Formation (undifferentiated)	-
Permeability	Superficial –Very High to High Bedrock –Very High	-
Historical Ground Workings	An Unspecified Pit in the central portion of the site, adjacent to the northern boundary.	(c.1878 –1990).
Non-Coal Mining Workings	Localised chalk workings.	Negligible Risk –No further action
Natural Cavities	None recorded	Sinkhole x 6, Solution Pipe x 6 recorded off-site approx. 55m SW of the site.
Ground Dissolution Features	Risk Rating - Moderate to Very Low	Moderate Risk Rating is associated with the Gerrards Cross Gravel Deposits which are recorded in western portion of the site.

2.5 POTENTIAL CONTAMINATION SOURCES

Records of potentially contaminative land uses and incidents are recorded below:

Location	Date	Description
On-site (N)	1878 - 1990	Potentially Infilled Land - Unspecified Pit.
On-site (E)	1920	Unspecified Tank.
On-site (SW)	2002	Pollution Incident –Category 3 (Minor) –Household Waste.

2.6 HYDROGEOLOGY

Hydrogeology records in the vicinity of the site are recorded below:

Feature	Description	Comments
Superficial Deposits	Secondary A Aquifer	Gerrards Cross Gravel Deposits.
Bedrock	Principal Aquifer	Seaford Chalk & Newhaven Chalk Formation.
Source Protection Zone	Zone 2 / 3	-

3.0 SITE INVESTIGATION WORKS

3.1 SITE INVESTIGATION RATIONALE & SUMMARY

PJS Consulting Engineers (PJS CE) who are responsible for the design of the drainage strategy of the site, were consulted prior to undertaking the site investigation works in order to establish the most suitable locations and depths for the tests.

Details of the site investigation works and rationale are detailed below:

Exploratory Hole Ref:	Rationale:
SA101 –SA103	Establish targeted soil infiltration rates in the area of the site currently proposed for the infiltration basin. The primary objective of the works was to gather as much data as possible within this area of the site within the allotted timescales.
SA104 –SA107	Establish general soil infiltration rates across the remainder of the site.
TP01 –TP02	Identify ground conditions and groundwater conditions in the area of the site currently proposed for the infiltration basin.

BWB Drawing (Ref: LGL-BWB-ZZ-XX-SK-CD-0001) is provided in the drawings section of this report which indicates the proposed location of the infiltration basin in the eastern portion of the site.

Site investigation works commenced on 04 February and completed on 05 February 2020 under the full supervision of a Geotechnical Engineer. All exploratory holes were excavated by means of a JCB-3CX mechanical excavator.

The exploratory holes were excavated utilising were logged in accordance with BS 5930 ‘Code of Practice for Site Investigations’ 1999.

The locations of the exploratory holes are indicated on PJSG20-01-D02 –Exploratory Hole Location Plan; provided within the drawings section of this report.

3.2 GROUND CONDITIONS

The following section describes the ground conditions identified during the investigation works:

Strata Encountered:	Depth of strata (m):
Brown gravelly sand / topsoil	0.05 - 0.30
Reddish brown / brown clayey gravelly fine to medium SAND. (Possible Gerrards Cross Gravel Deposits) or Firm to stiff reddish brown sandy gravelly CLAY encountered in SA106 and 107. (Possible Gerrards Cross Gravel Deposits)	0.05 –3.20 0.30 - 1.50
Structureless CHALK composed of cream slightly gravelly SILT recorded in TP01 only. (Possible Seaford Chalk & Newhaven Chalk Formation).	2.70 –3.10

The depths of the exploratory holes ranged from 1000mm –3200mm. No groundwater was encountered within any of the exploratory holes.

Minor instability of the sides of all exploratory holes was noted during excavations.

Full copies of the ground logs are provided within Appendix A.

4.0 SOIL INFILTRATION TESTING

4.1 SOIL INFILTRATION TESTING

Soil infiltration testing was generally carried out in accordance with the methodology set out within BRE Digest 365 'Soakaway Design', however the following deviations were encountered:

- Due to the slower infiltration rates observed within several pits and time constraints of the works, only one water fill was possible within SA104 to SA107.
- No data was recorded within SA102 as water drained through the base of the TP as fast as it was being emptied into the TP, this resulted in it not being possible to raise a head of water to monitor. Two separate unsuccessful attempts to fill this TP with water were undertaken.

All dimensions of the pits were recorded for use in calculation of soil infiltration rates.

Water was added to the SA's and the water level from a known marker positioned at the surface was recorded at the start of the test and at regular intervals throughout.

4.2 SOIL INFILTRATION RATES

The detailed method for calculating the soil infiltration rate (f) from the in-situ test data is set out within BRE Digest 365. The key requirements from this document are summarised below:

- Using the in-situ test data, the time taken for the water within the trial pit to fall from 75 –25% effective depth is recorded to calculate the soil infiltration rate.
- The test pit must at least discharge from full to half-volume within 24 hours to be feasible for soakaway drainage.

Due to time constraints on-site, it was not possible to achieve 75% effective depth drainage in SA107 and therefore, the in-situ test data for SA107 has been extrapolated to calculate an indicative soil infiltration rate for this test location.

All soakaway pits half emptied within 24 hours.

The results of the soil infiltration tests are contained within Appendix B and are summarised below:

Soakaway Test Ref.	Depth of Soakaway Pit (m)	No. of Fills	Soil Infiltration Rate f (m/s)
SA101	2.00	1	9.49×10^{-5}
		2	7.89×10^{-5}
		3	4.90×10^{-5}
SA102	1.50	N/A –unable to raise a head of water.	$> 2.33 \times 10^{-4}$

SA103	1.00	1	2.33×10^{-4}
		2	6.57×10^{-5}
		3	5.41×10^{-5}
SA104	1.50	1	1.19×10^{-5}
SA105	1.50	1	8.04×10^{-6}
SA106	1.50	1	7.78×10^{-6}
SA107	1.50	1	8.65×10^{-6}

5.0 CONCLUSIONS

A total of 7 No. soakaway trial pits were excavated in targeted locations to carry out soil infiltration testing under the guidance of BRE Digest 365 'Soakaway Design'.

SA101 to SA103 were located specifically within the proposed infiltration basin in the east. SA104 to SA107 were located across the remainder of the site to gain a general indication of soil infiltration rates.

Overall, the results reflect relatively consistent soil infiltration rates, however, the greater soil infiltration rates were obtained within the area of the proposed infiltration basin.

The preliminary rates recorded would indicate that the proposed infiltration basin is likely to provide a suitable solution for the disposal of surface water, subject to detailed design.

No groundwater was encountered during the works undertaken to date, as such high groundwater levels are no considered likely to impede the proposed drainage strategy for the site.

At this stage no potential contamination issues are anticipated which could impede the proposed drainage strategy for the site. Further site investigation works shall be required to confirm.

Following a desk-based study a moderate risk of ground dissolution has been identified within the western portion of the site. Further consideration is required to determine the suitability of infiltration drainage within this area of the site.

DRAWINGS

PJSG20-01-D01 - SITE LOCATION PLAN

LGL-BWB-ZZ-XX-SK-CD-0001 - INDICATIVE SURFACE WATER STORAGE & BASIN SIZES

PJSG20-01-D02 - EXPLORATORY HOLE LOCATION PLAN

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Delivering Innovative Solutions

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Kingston on Soar, Nottingham, NG11 0DP.
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Client	RICHBOROUGH ESTATES
Project	CROXLEY GREEN
Drawing Title	SITE LOCATION PLAN

	Drawn	Checked
Initial	MP	DF
Date	30.01.20	30.01.20

Status	Scale
INFORMATION	NTS

Project	Drawing Number	Revision
PJSG20-01	D01	-

TOTAL SITE AREA - 40.63ha
DEVELOPABLE AREA (OUTSIDE OF BUFFER/WOODLAND AREA) - 29.26ha
ASSUMING DEVELOPABLE AREA HAS AN IMPERMEABLE AREA OF 65% OF TOTAL AREA, IMPERMEABLE AREA - 19.02ha

DETENTION BASIN
SIZED TO ACCOMMODATE THE 1 IN 100 YEAR +40% CLIMATE CHANGE STORM EVENT
QBAR RATE BASED UPON IMP AREA OF 19.02ha - 34.7l/s
STORAGE REQUIREMENTS RESTRICTING RUNOFF TO QBAR RATE IS APPROXIMATELY 16,700m³
PLAN AREA - APPROXIMATELY 18,100m²
BANK GRADIENT - 1:4
*DETENTION BASIN DESIGNED ON THE ASSUMPTION OF A CONNECTION TO POSSIBLE SURFACE WATER SEWER WITHIN ROUSEBARN LANE PRESENT IMMIDIATELY OUTSIDE OF EASTERN SITE BOUNDARY, IN ABSENCE OF DETAILED SEWER RECORD INFORMATION.

INFILTRATION BASIN
SIZED TO ACCOMMODATE THE 1 IN 100 YEAR +40% CLIMATE CHANGE STORM EVENT
BASED UPON A CONSERVATIVE RATE OF 1x10 ^-5
STORAGE REQUIREMENTS APPROXIMATELY 13,350m³

PLAN AREA - APPROXIMATELY 15,200m²
BANK GRADIENT - 1:4

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. Do not build from this drawing.

Legend

Indicative Infiltration Basin

Indicative Attenuation Basin

Rev	Date	Details of issue / revision	Drw	Rev
P01	10.07.18	PRELIMINARY ISSUE	JR	BF

Issues & Revisions

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Client
RICHBOROUGH ESTATES

Project Title
LAND OFF LITTLE GREEN LANE, CROXLEY GREEN

Drawing Title
INDICATIVE SURFACE WATER STORAGE ESTIMATE & BASIN SIZES

Drawn:	J. Read		Reviewed:	B. Fleming	
BWB Ref:	BMW	Date:	10.07.18	Scale@A3:	NTS

Drawing Status
PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
LGL-BWB-ZZ-XX-SK-CD-0001	S2	P01

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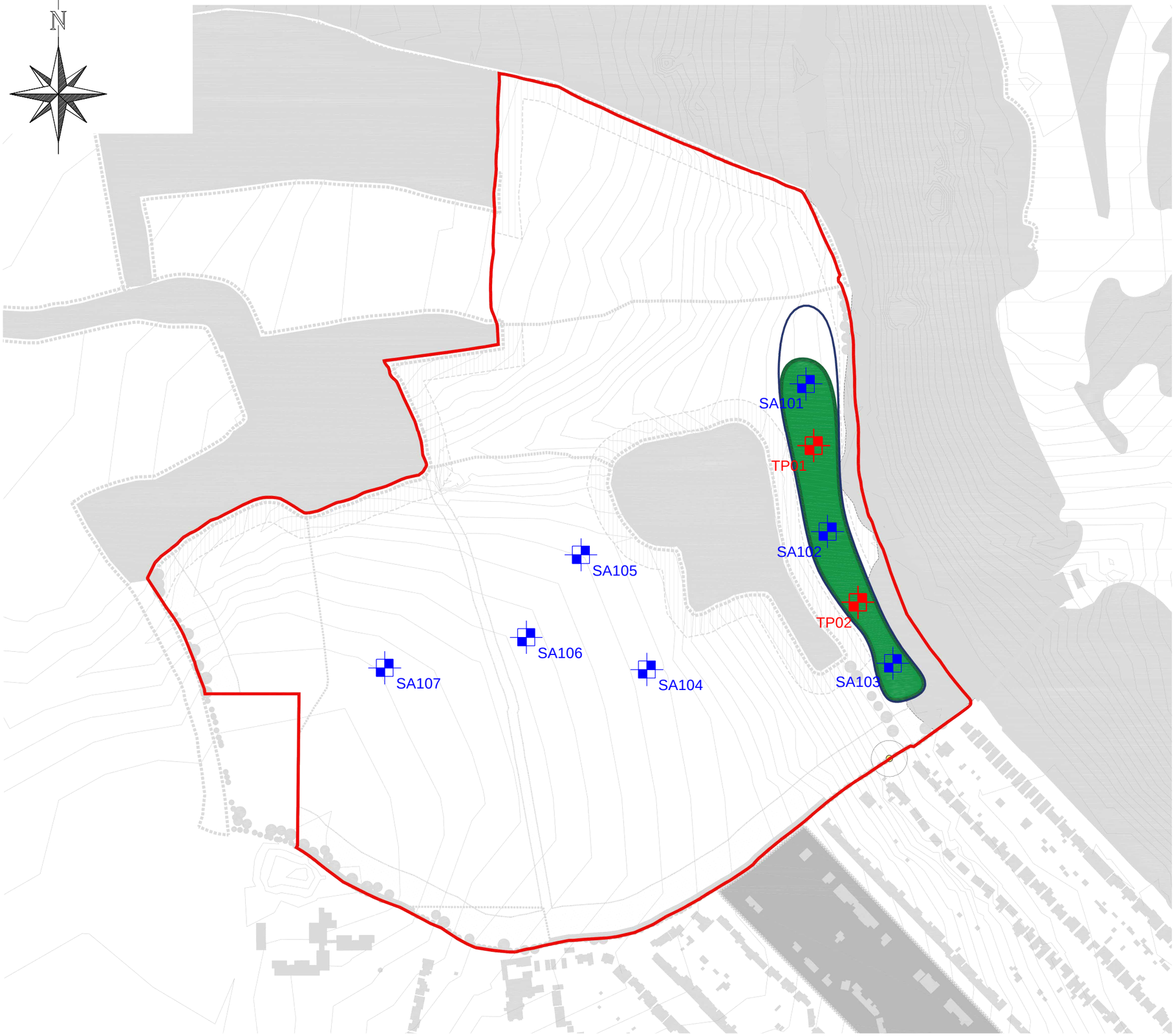
C:\Users\joel.read\Desktop\Croxley Green\Drainage_Strategy.dwg

A3



General Notes

1. Do not scale this drawing. If in doubt, ask.
2. This drawing is to be read in conjunction with all other relevant Engineers, Architects and specialist design drawings and details.
3. All dimensions are in metres unless noted otherwise. All levels are in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the Engineer immediately.

Key

TP01 — Approximate location and reference of machine excavated trial pit undertaken in February 2020.

SA101 — Approximate location and reference of machine excavated trial pit and soakaway test undertaken in February 2020.

Rev	Date	Amendments	By	Chk

PJS GEOTECHNICAL ENGINEERS
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Client

RICHBOROUGH ESTATES

Project

CROXLEY GREEN

Drawing Title

EXPLORATORY HOLE LOCATION PLAN

	Drawn	Checked	Status	Scale
Initial	VH	DWF	INFORMATION	1:1000
Date	27/02/20	28/02/20		

Project Number	Drawing Number	Revision
PJSG20-01	D02	-

APPENDIX A:

GROUND LOGS

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend
		Depth (m)	Type	Results			
					0.60		
					2.00		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend
		Depth (m)	Type	Results			
					1.50		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend
		Depth (m)	Type	Results			
					1.00		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend
		Depth (m)	Type	Results			
					0.60		
					1.50		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend
		Depth (m)	Type	Results			
					0.50		
					1.50		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend
		Depth (m)	Type	Results			
					0.30		
					1.50		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend
		Depth (m)	Type	Results			
					0.50		
					1.30		
					1.50		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend
		Depth (m)	Type	Results			
					0.40		
					2.70		
					3.10		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend
		Depth (m)	Type	Results			
					0.40		
					3.20		

APPENDIX B:

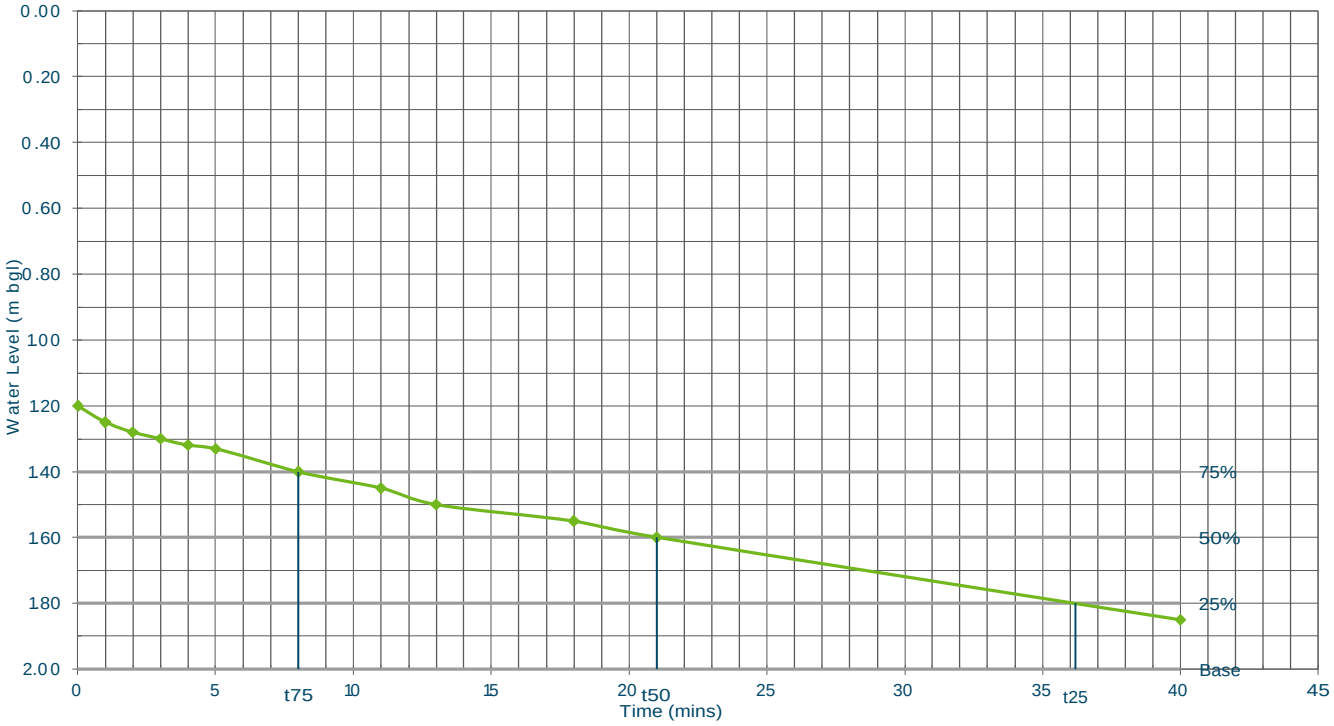
PERMEABILITY TEST DATA

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJS Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA101
Depth (m):	2.00
Width (m):	0.70
Length (m):	2.30
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	1.20
1.0	1.25
2.0	1.28
3.0	1.30
4.0	1.32
5.0	1.33
8.0	1.40
11.0	1.45
13.0	1.50
18.0	1.55
21.0	1.60
40.0	1.85

Test Information and Calculation	
Test Reference/Number:	1
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	2.00
Effective Storage Depth (m)	1.20
Effective Drop (m)	0.80
75% Effective Depth (m)	1.40
50% Effective Depth (m)	1.60
25% Effective Depth (m)	1.80
t_{75} (min)	8.00
t_{50} (min)	21.00
t_{25} (min)	36.20
V_{p75-25}	0.64
Adjusted V_p for Gravel Fill	0.64
a_{s50}	4.01
t_{p75-25}	28.20

Results	
Soil Infiltration Rate (m/s)	9.49E-05
Soil Infiltration Rate (mm	3.42E+02

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

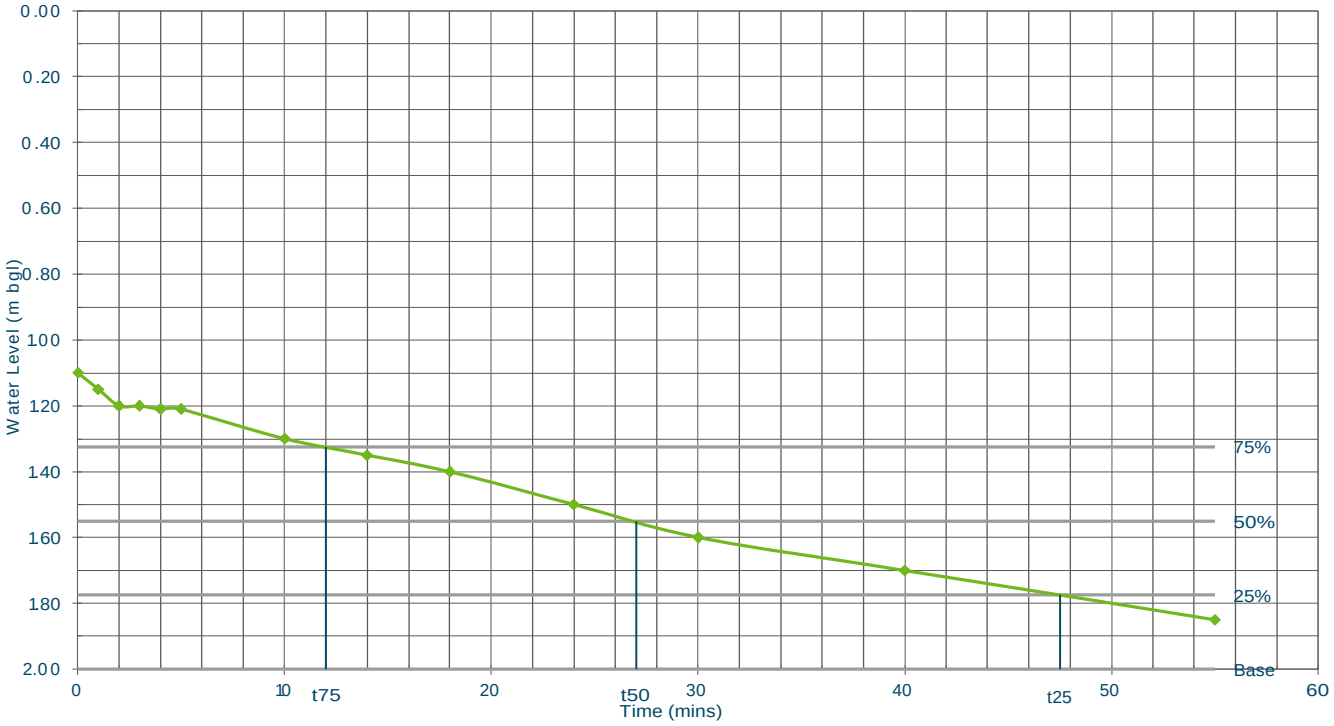
Comments

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJS Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA101
Depth (m):	2.00
Width (m):	0.70
Length (m):	2.30
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	1.10
1.0	1.15
2.0	1.20
3.0	1.20
4.0	1.21
5.0	1.21
10.0	1.30
14.0	1.35
18.0	1.40
24.0	1.50
30.0	1.60
40.0	1.70
55.0	1.85

Test Information and Calculation	
Test Reference/Number:	2
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	2.00
Effective Storage Depth (m)	1.10
Effective Drop (m)	0.90
75% Effective Depth (m)	1.33
50% Effective Depth (m)	1.55
25% Effective Depth (m)	1.78
t_{75} (min)	12.00
t_{50} (min)	27.00
t_{25} (min)	47.50
V_{p75-25}	0.72
Adjusted V_p for Gravel Fill	0.72
a_{s50}	4.31
t_{p75-25}	35.50

Results	
Soil Infiltration Rate (m/s)	7.89E-05
Soil Infiltration Rate (mm	2.84E+02

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

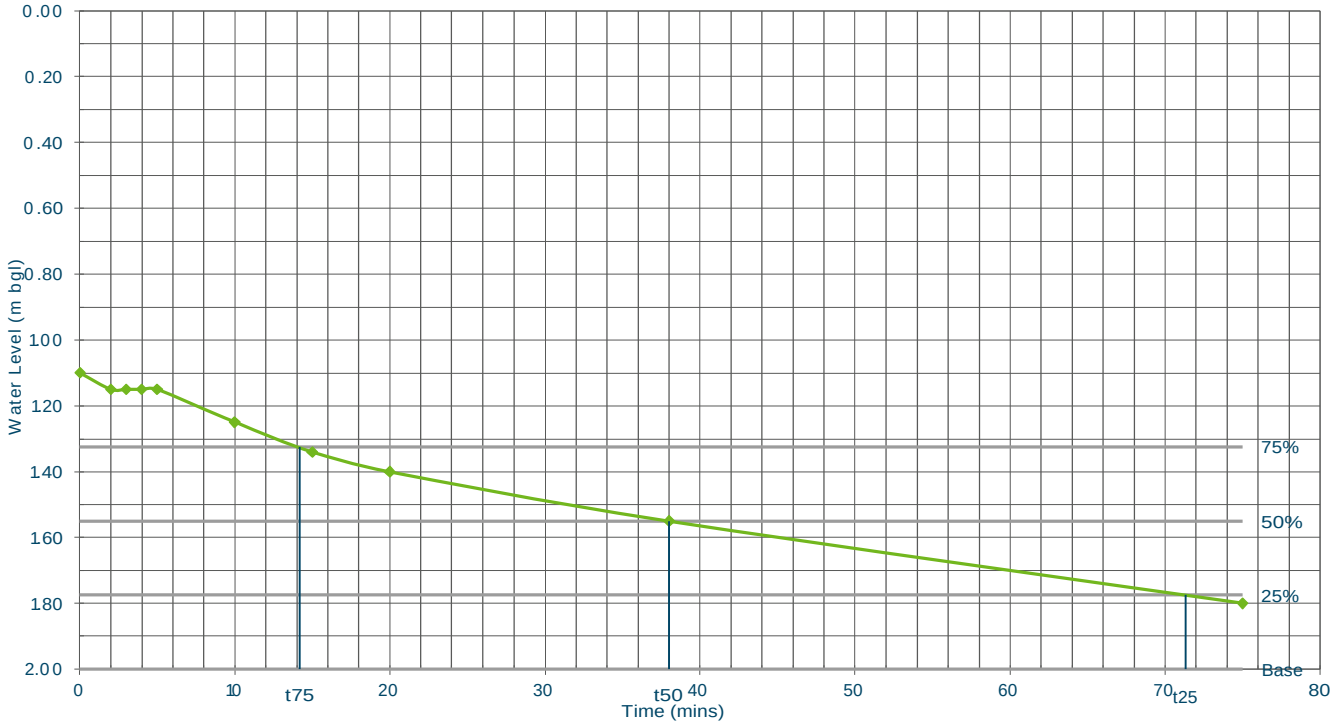
Comments

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJS Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA101
Depth (m):	2.00
Width (m):	0.70
Length (m):	2.30
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	1.10
2.0	1.15
3.0	1.15
4.0	1.15
5.0	1.15
10.0	1.25
15.0	1.34
20.0	1.40
38.0	1.55
75.0	1.80

Test Information and Calculation	
Test Reference/Number:	3
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	2.00
Effective Storage Depth (m)	1.10
Effective Drop (m)	0.90
75% Effective Depth (m)	1.33
50% Effective Depth (m)	1.55
25% Effective Depth (m)	1.78
t_{75} (min)	14.17
t_{50} (min)	38.00
t_{25} (min)	71.30
V_{p75-25}	0.72
Adjusted V_p for Gravel Fill	0.72
a_{s50}	4.31
t_{p75-25}	57.13

Results	
Soil Infiltration Rate (m/s)	4.90E-05
Soil Infiltration Rate (mm	177E+02

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

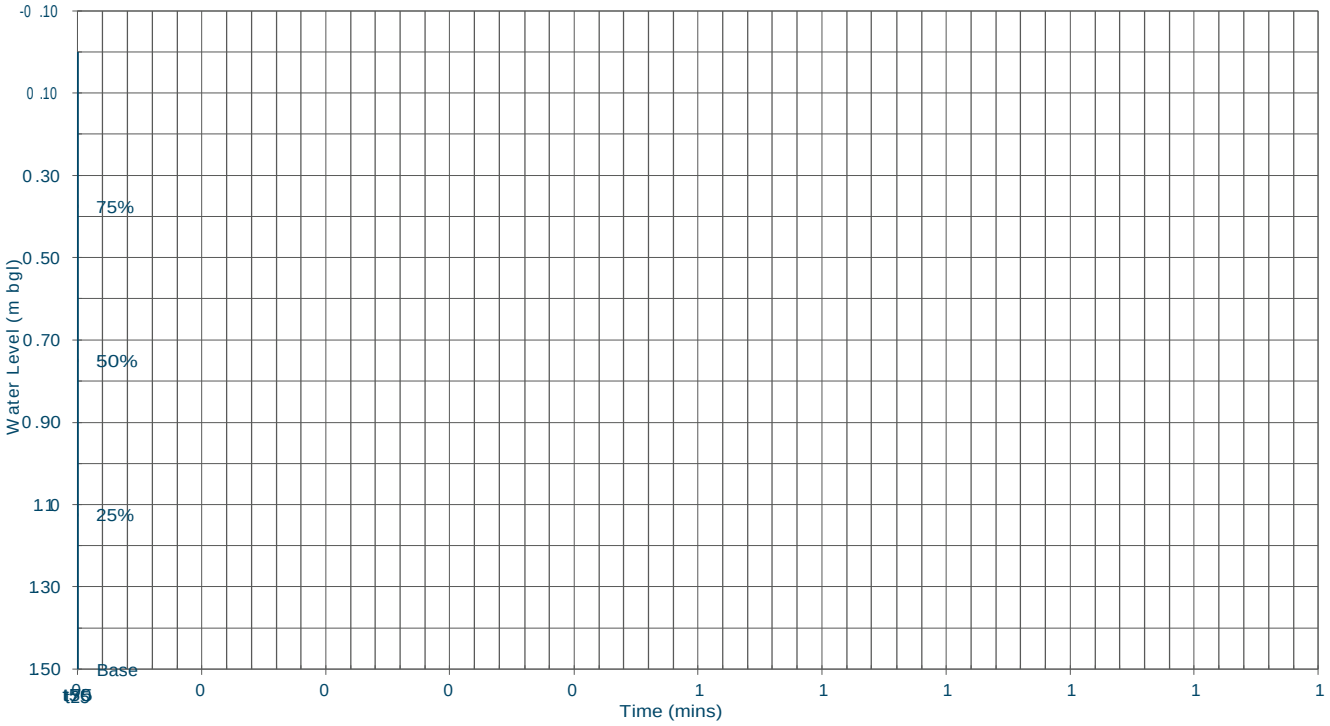
Comments

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJA Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA102
Depth (m):	1.50
Width (m):	0.70
Length (m):	2.20
Depth to Standing Water	Dry



Time (min)	Depth (m)

Test Information and Calculation	
Test Reference/Number:	1
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	1.50
Effective Storage Depth (m)	0.00
Effective Drop (m)	1.50
75% Effective Depth (m)	0.38
50% Effective Depth (m)	0.75
25% Effective Depth (m)	1.13
t_{75} (min)	0.00
t_{50} (min)	0.00
t_{25} (min)	0.00
V_{p75-25}	1.16
Adjusted V_p for Gravel Fill	1.16
a_{s50}	5.89
t_{p75-25}	0.00

Results	
Soil Infiltration Rate (m/s)	#DIV/0!
Soil Infiltration Rate (mm	#DIV/0!

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

Comments

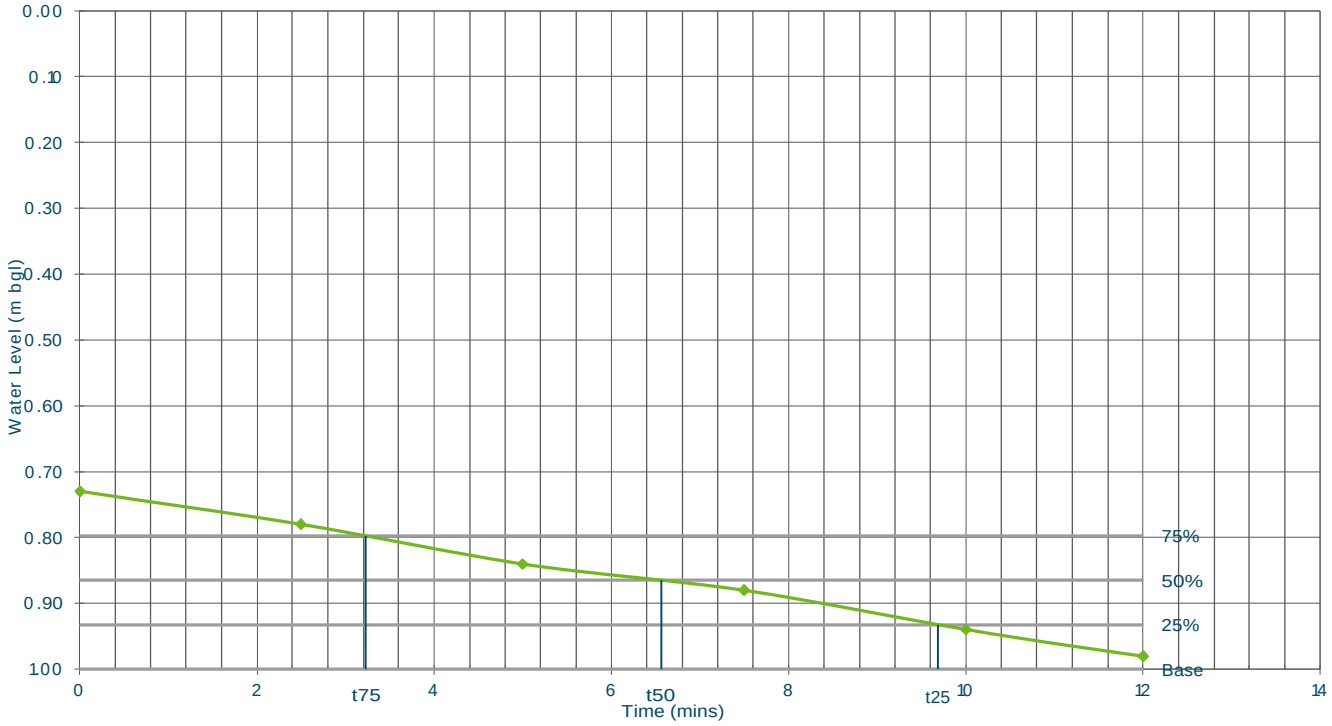
Unable to raise head by >150mm using 600 litres of water. Test abandoned.

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJA Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA103
Depth (m):	1.00
Width (m):	0.70
Length (m):	2.50
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	0.73
2.5	0.78
5.0	0.84
7.5	0.88
10.0	0.94
12.0	0.98

Test Information and Calculation	
Test Reference/Number:	1
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	1.00
Effective Storage Depth (m)	0.73
Effective Drop (m)	0.27
75% Effective Depth (m)	0.80
50% Effective Depth (m)	0.87
25% Effective Depth (m)	0.93
t_{75} (min)	3.23
t_{50} (min)	6.56
t_{25} (min)	9.69
V_{p75-25}	0.24
Adjusted V_p for Gravel Fill	0.24
a_{s50}	2.61
t_{p75-25}	6.46
Results	
Soil Infiltration Rate (m/s)	2.33E-04
Soil Infiltration Rate (mm	8.40E+02

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

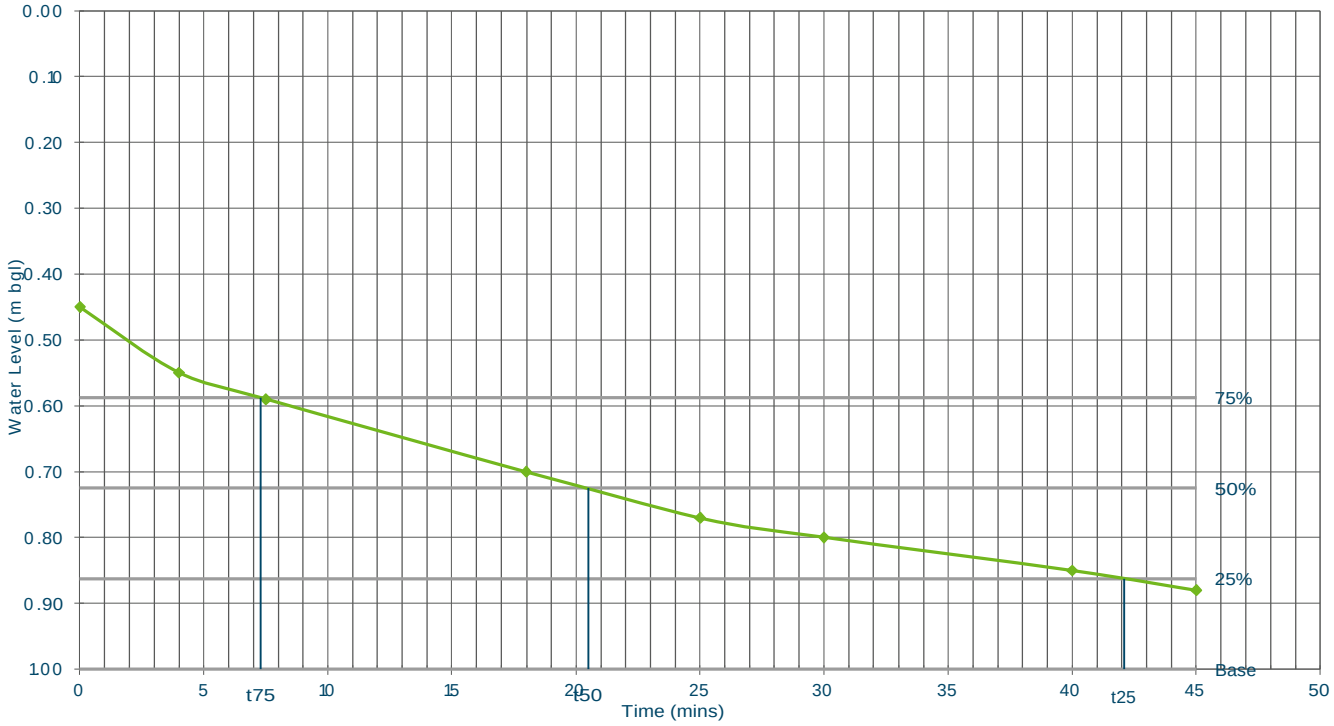
Comments

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJA Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA103
Depth (m):	1.00
Width (m):	0.70
Length (m):	2.50
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	0.45
4.0	0.55
7.5	0.59
18.0	0.70
25.0	0.77
30.0	0.80
40.0	0.85
45.0	0.88

Test Information and Calculation	
Test Reference/Number:	2
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	1.00
Effective Storage Depth (m)	0.45
Effective Drop (m)	0.55
75% Effective Depth (m)	0.59
50% Effective Depth (m)	0.73
25% Effective Depth (m)	0.86
t_{75} (min)	7.28
t_{50} (min)	20.50
t_{25} (min)	42.08
V_{p75-25}	0.48
Adjusted V_p for Gravel Fill	0.48
a_{s50}	3.51
t_{p75-25}	34.80
Results	
Soil Infiltration Rate (m/s)	6.57E-05
Soil Infiltration Rate (mm	2.36E+02

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

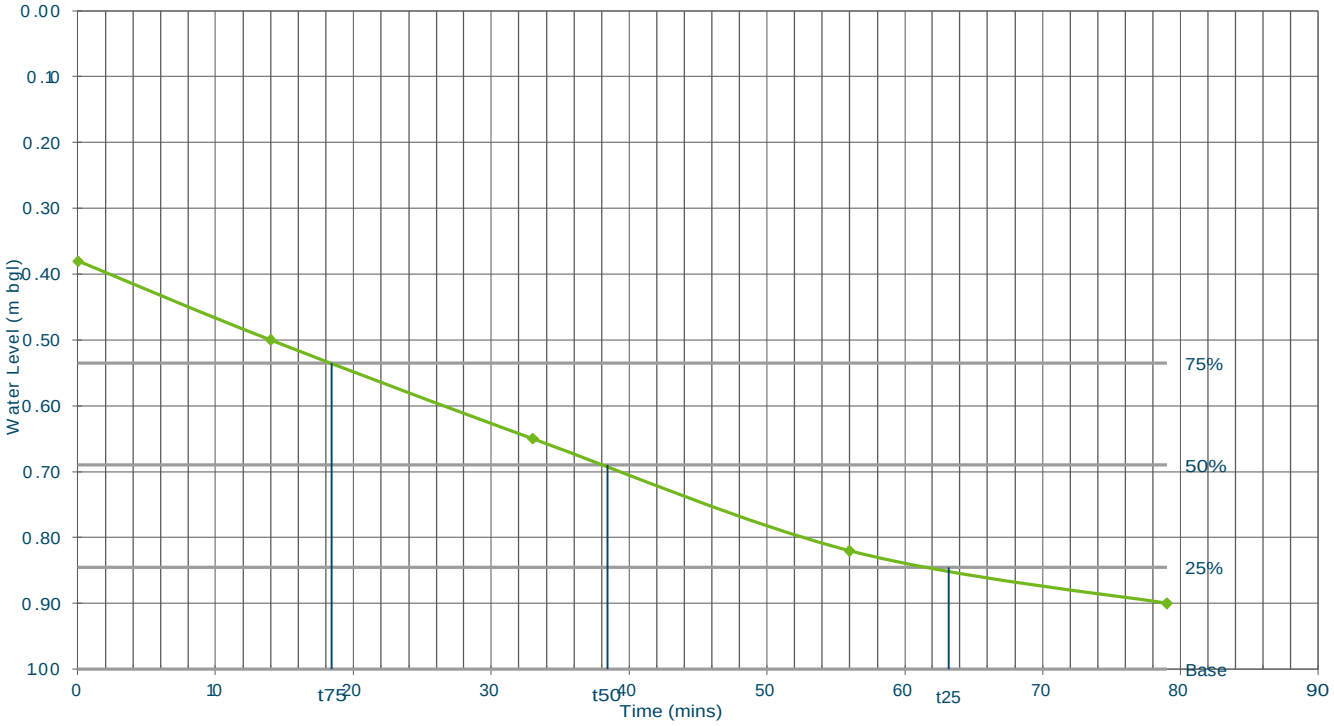
Comments

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJA Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA103
Depth (m):	1.00
Width (m):	0.70
Length (m):	2.50
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	0.38
14.0	0.50
33.0	0.65
56.0	0.82
79.0	0.90

Test Information and Calculation	
Test Reference/Number:	3
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	1.00
Effective Storage Depth (m)	0.38
Effective Drop (m)	0.62
75% Effective Depth (m)	0.54
50% Effective Depth (m)	0.69
25% Effective Depth (m)	0.85
t_{75} (min)	18.43
t_{50} (min)	38.41
t_{25} (min)	63.19
V_{p75-25}	0.54
Adjusted V_p for Gravel Fill	0.54
a_{s50}	3.73
t_{p75-25}	44.75
Results	
Soil Infiltration Rate (m/s)	5.41E-05
Soil Infiltration Rate (mm	195E+02

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

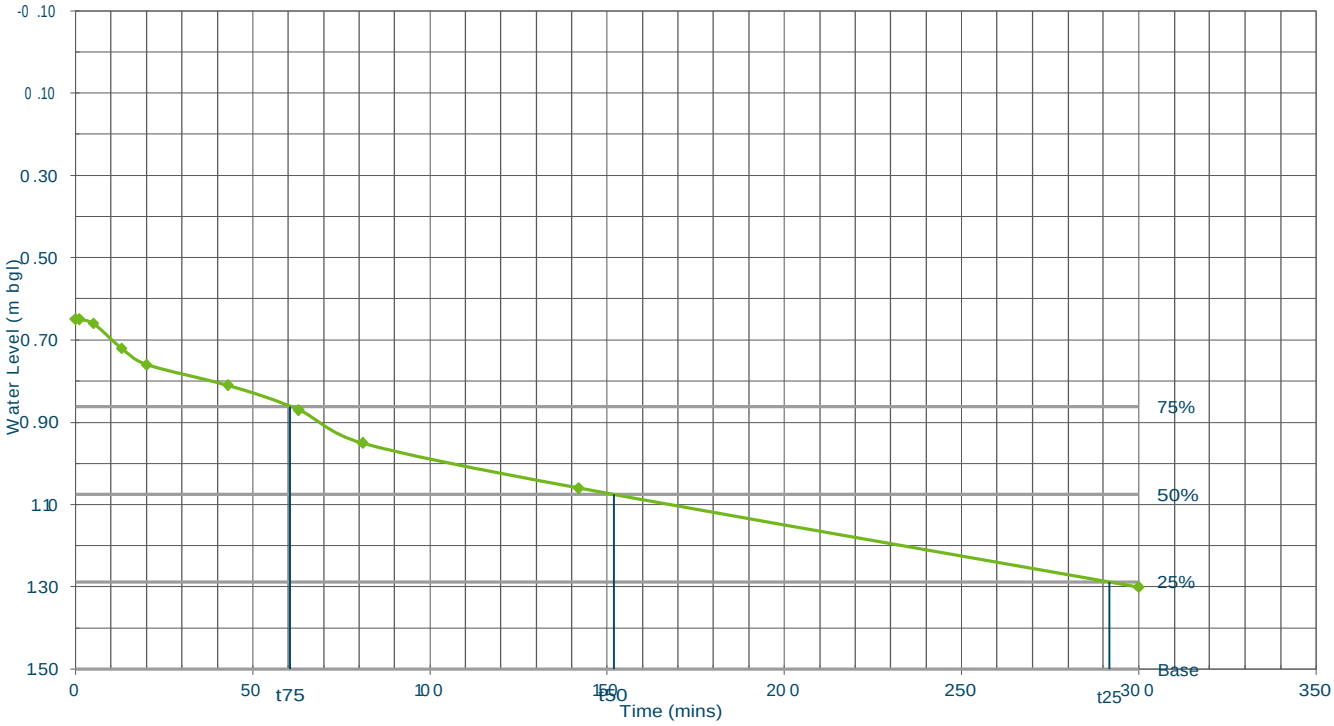
Comments

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJA Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA104
Depth (m):	1.50
Width (m):	0.70
Length (m):	2.30
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	0.65
1.0	0.65
5.0	0.66
13.0	0.72
20.0	0.76
43.0	0.81
63.0	0.87
81.0	0.95
142.0	1.06
300.0	1.30

Test Information and Calculation	
Test Reference/Number:	1
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	1.50
Effective Storage Depth (m)	0.65
Effective Drop (m)	0.85
75% Effective Depth (m)	0.86
50% Effective Depth (m)	1.08
25% Effective Depth (m)	1.29
t_{75} (min)	60 .50
t_{50} (min)	151.88
t_{25} (min)	291.77
$V_{p75\text{-}25}$	0 .68
Adjusted V_p for Gravel Fill	0 .68
a_{s50}	4 .16
$t_{p75\text{-}25}$	2 31.2 7
Results	
Soil Infiltration Rate (m/s)	1.19E-05
Soil Infiltration Rate (mm	4.27E+01

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 19 8 6 .

Comments

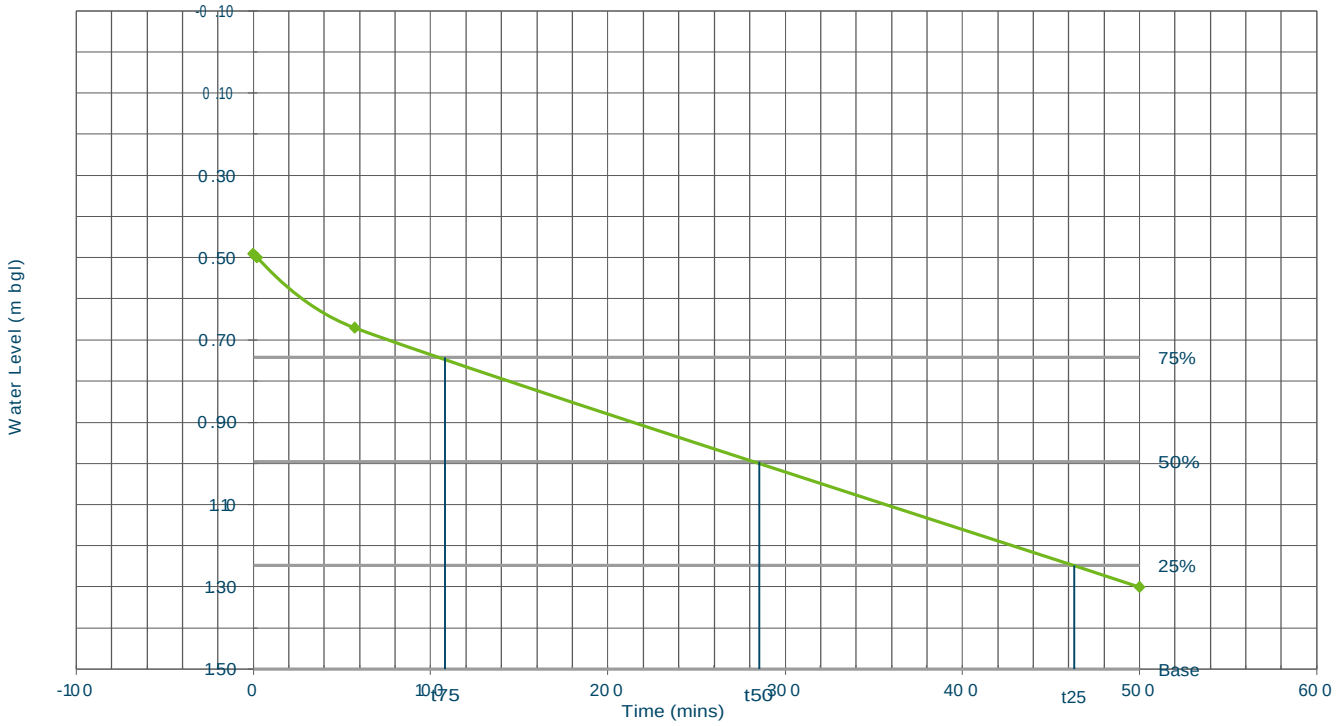
Test left running overnight and location dry by 8am. Extrapolated final result added to enable approximation based on data obtained

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJA Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA105
Depth (m):	1.50
Width (m):	0.70
Length (m):	2.00
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	0.49
2.0	0.50
57.0	0.67
500.0	1.30

Test Information and Calculation	
Test Reference/Number:	1
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	1.50
Effective Storage Depth (m)	0.49
Effective Drop (m)	1.01
75% Effective Depth (m)	0.74
50% Effective Depth (m)	1.00
25% Effective Depth (m)	1.25
t_{75} (min)	107.98
t_{50} (min)	285.53
t_{25} (min)	463.08
V_{p75-25}	0.71
Adjusted V_p for Gravel Fill	0.71
a_{s50}	4.13
t_{p75-25}	355.10
Results	
Soil Infiltration Rate (m/s)	8.04E-06
Soil Infiltration Rate (mm	2.89E+01

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

Comments

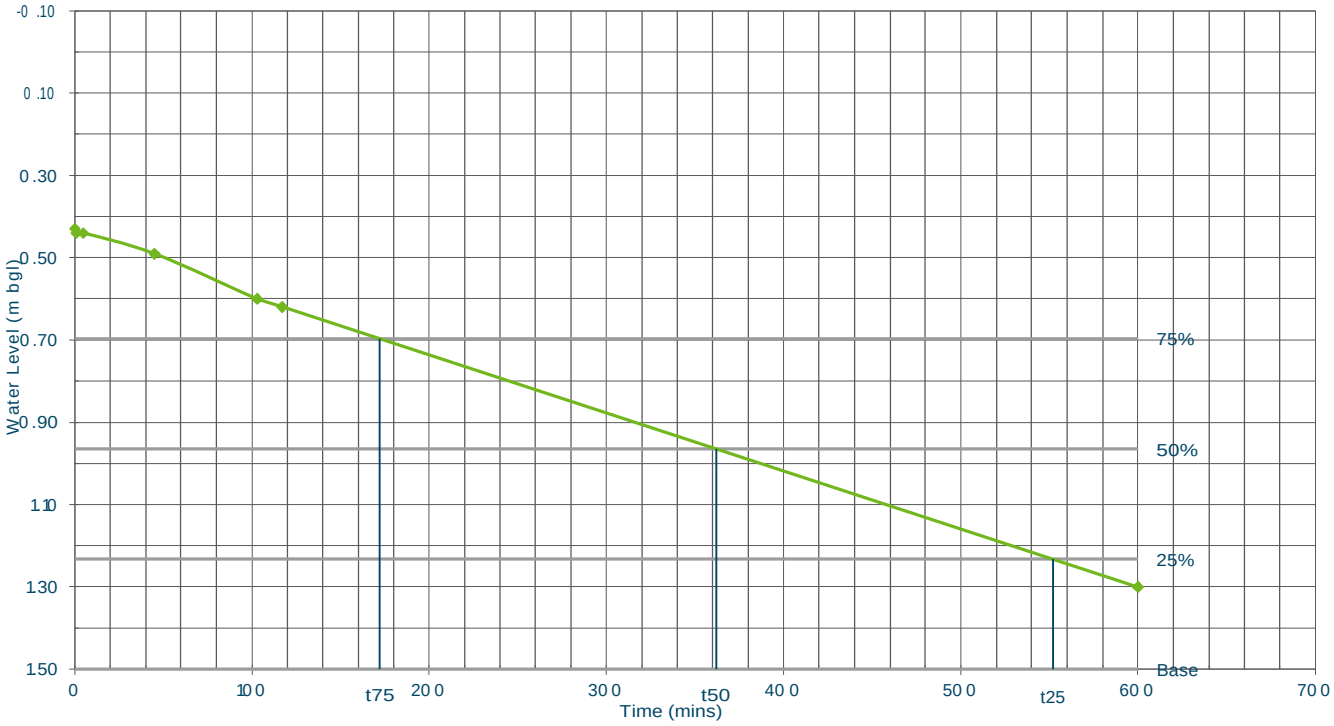
Test left running overnight and location dry by 8am. Extrapolated final result added to enable approximation based on data obtained

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJA Geotechnical Engineers
Date:	04/02/2020

Pit Information	
Location ID:	SA106
Depth (m):	1.50
Width (m):	0.70
Length (m):	2.20
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	0.43
1.0	0.44
5.0	0.44
45.0	0.49
103.0	0.60
117.0	0.62
600.0	1.30

Test Information and Calculation	
Test Reference/Number:	1
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	1.50
Effective Storage Depth (m)	0.43
Effective Drop (m)	1.07
75% Effective Depth (m)	0.70
50% Effective Depth (m)	0.97
25% Effective Depth (m)	1.23
t_{75} (min)	172.05
t_{50} (min)	362.05
t_{25} (min)	552.06
V_{p75-25}	0.82
Adjusted V_p for Gravel Fill	0.82
a_{s50}	4.64
t_{p75-25}	380.01
Results	
Soil Infiltration Rate (m/s)	7.78E-06
Soil Infiltration Rate (mm	2.80E+01

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

Comments

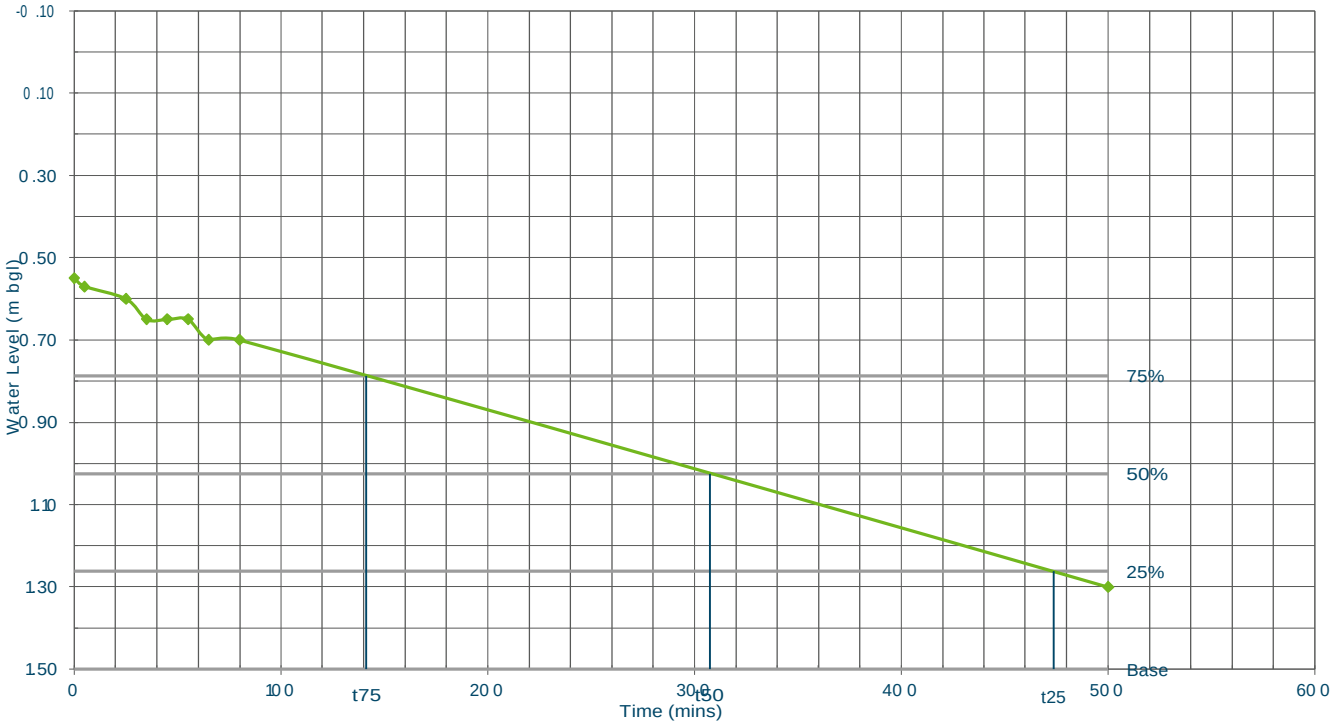
Test left running overnight and location dry by 8am. Extrapolated final result added to enable approximation based on data obtained

SOAKAWAY TESTING

EXPLORATION & TESTING ASSOCIATES

Contract Information	
Contract:	Croxley Green
Contract No:	C10012
Client:	PJA Geotechnical Engineers
Date:	05/02/2020

Pit Information	
Location ID:	SA107
Depth (m):	1.50
Width (m):	0.70
Length (m):	2.40
Depth to Standing Water	Dry



Time (min)	Depth (m)
0.0	0.55
5.0	0.57
25.0	0.60
35.0	0.65
45.0	0.65
55.0	0.65
65.0	0.70
80.0	0.70
500.0	1.30

Test Information and Calculation	
Test Reference/Number:	1
Test Start Time:	
Method of Calculation	BRE365
Pit Gravel Filled?	No
Max. Depth (m)	1.50
Effective Storage Depth (m)	0.55
Effective Drop (m)	0.95
75% Effective Depth (m)	0.79
50% Effective Depth (m)	1.03
25% Effective Depth (m)	1.26
t_{75} (min)	141.25
t_{50} (min)	307.50
t_{25} (min)	473.75
V_{p75-25}	0.80
Adjusted V_p for Gravel Fill	0.80
a_{s50}	4.63
t_{p75-25}	332.50
Results	
Soil Infiltration Rate (m/s)	8.65E-06
Soil Infiltration Rate (mm	3.11E+01

References

BRE 365 *Soakaway design*, 2016, with reference to CIRIA Report 113 *Control of groundwater for temporary works*, 1986.

Comments

Test aborted due to time constraints. Extrapolated final result added to enable approximation based on data obtained

Appendix 8: Greenfield Run-Off Rates

Greenfield runoff ra estimation for sit

www.uksuds.com | Greenfield runoff

Calculated by:	Ariya Shademani
Site name:	Little Green Lane
Site location:	Rickmansworth

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.66103° N
Longitude:	0.44327° W
Reference:	1724820991
Date:	Dec 03 2024 09:06

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	678	678
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	1.76	1.76
1 in 1 year (l/s):	1.49	1.49
1 in 30 years (l/s):	4.04	4.04
1 in 100 year (l/s):	5.6	5.6
1 in 200 years (l/s):	6.57	6.57

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. Use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix 9: Greenfield Run-Off Volume

Appendix 10: Proposed Attenuation Calculations

Appendix 11: Illustrative Drainage Strategy

Appendix 12: Thames Water Pre-Development Enquiry

Mr Ariya Shademani
BWB Consulting
5th Floor Waterfront House
Station Street
Nottingham
NG2 3DQ

Wastewater pre-planning
Our ref DS6125447

15 October 2024

Pre-planning enquiry: Capacity concerns

Site: Little Green Lane, Croxley Green, Rickmansworth, WD3 3NJ

Dear Mr Shademani,

Thank you for providing information on your development to construct 600 residential housing and a primary school with a maximum capacity of 420 pupils with an allowance for 52 nursery students.

Foul Water to discharge via gravity flow into manhole referenced TQ0897**1001** on a 300mm Foul Water Sewer.

Foul Water to discharge via gravity flow into an unchartered Foul Water manhole (grid reference: 508270, 196821) on a 300mm Foul Water Sewer.

We have completed the assessment of the foul water flows based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

We've assessed your **foul water** proposals and concluded that our sewerage network will not have enough capacity and unfortunately, we're unable to meet the needs of your development at this time.

In order to ensure we make the appropriate upgrades – or 'off-site reinforcement' – to serve the remainder of your development, we'll need to carry out modelling work, design a solution and build the necessary improvements. This work is done at our cost.

Once we've begun modelling, we may need to contact you to discuss changing the connection point for capacity reasons. Please note that we'll pay the cost of covering any extra distance if the connection needs to be made at a point further away than the nearest practicable point of at least the same diameter.

How long could modelling and reinforcement take?

Typical timescales for a development of your size are:

Modelling: 8 months

Design: 6 months
Construction: 6 months
Total: 20 months

If the time you're likely to take from planning and construction through to first occupancy is longer than this, we'll be able to carry out the necessary upgrades in time for your development. If it's shorter, please contact me on the number below to discuss the timing of our activities.

What do you need to tell us before we start modelling?

We will only carry out modelling once we're confident that your development will proceed. In order to have this confidence, we'll need to know that you **own the land and have either outline or full planning permission**. Please email this information to us as soon as you have it.

If the modelling shows we need to carry out reinforcement work, then before we start construction we'll need you to supply us with notification that you've confirmed your F10 – Notification of construction project - submission to the Health and Safety Executive.

Surface Water

The site is to follow SuDs therefore no indirect or direct discharge of surface water into a Thames Water sewer/network.

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2) rainwater infiltration to ground at or close to source
3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4) rainwater discharge direct to a watercourse (unless not appropriate)
5) controlled rainwater discharge to a surface water sewer or drain
6) controlled rainwater discharge to a combined sewer.

Where connection to the public sewerage network is required to manage surface water flows we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

Please see our FAQ's leaflet for additional information.

What do I need to do next?

If you've satisfied the points above, then you should compare your own timeline with the typical timescales we've suggested for our activities. If the time you're likely to take from planning and construction through to first occupancy is **more** than the total time we're likely to take, we'll be able to carry out the necessary upgrades in time for your development.

If you've any further questions, please contact us.

Yours sincerely,

Sarah-Jane Lacey on behalf of Steve Knight
Adoption Engineer
Developer Services – Adoptions Engineer, Sewer Adoptions Team

Appendix 13: SuDS Operation and Maintenance Plan

ENVIRONMENT

Richborough
Land to North of Little Green Lane
Croxley Green
SuDS Operation and Maintenance Plan

December 2024

Document Number:	**233574**-BWB-ZZ-XX-T-W-0004_O&M
BWB Reference:	233574-O&M

Revision	Date of Issue	Status	Author:	Checked:	Approved:
P01	11/12/2024	S2	Ariya Shademani BEng	Lucy Reeves BSc (Hons) MCIWEM	Rowan Jobling BEng (Hons)

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(i) The date on which this assessment was undertaken, and
(ii) The date on which the final report is delivered

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The information presented, and conclusions drawn, are based on statistical data and are for guidance purposes only. The study provides no guarantee against flooding of the study site or elsewhere, nor of the absolute accuracy of water levels, flow rates and associated probabilities.

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1. INTRODUCTION

1.1 This Sustainable Drainage Systems (SuDS) Operation and Maintenance been prepared on behalf of Richborough in respect of a planning application for a proposed residential-led, mixed use development on Land to North of Little Green Lane, Croxley Green.

1.2 The report sets out the principles for the maintenance and management of the SuDS proposed at the site. It is important that the drainage system is maintained, to ensure that SuDS operate effectively for their lifetime. All drainage systems require regular maintenance. The maintenance of the drainage systems should be included alongside other regular maintenance tasks.

1.3 The SuDS O&M Plan should be read in conjunction with the Sustainable Drainage Statement (SDS), reference: 233574-BWB-ZZ-XX-T-W-0001. Any specialist or proprietary products that are specified at construction design should have a manufacturer specific maintenance regime which should be included within the O&M document.

1.4 This SuDS O&M plan should be incorporated into the O&M manual for the site which will be developed by the civil contractor appointed to undertake the construction of the proposed development. However, this high-level document is intended as a guide for the typical maintenance requirements to ensure the drainage proposals outlined within the accompanying SDS remain operational and in a suitable condition for the lifetime of the proposed development.

Site Details

1.1 The site is greenfield, comprising agricultural land and ancient woodland. The site is located to the north of Little Green Lane, on the northern fringe of Croxley Green. The site is bound to the south by Little Green Lane, to the west by woodland and agricultural fields and to the east and north by Rousebarn Lane, with the West Herts Golf Course beyond. Key site details are provided within **Table 1.1**, with the location of the site illustrated within **Figure 1.1.**

Table 1.1: Site Details

Site Name	Land to North of Little Green Lane
Location	Croxley Green
NGR (approx.)	TQ 08101 96702
Application Site Area (ha)	40.7 (approx.)
Development Area (ha)	15.70
Development Type	Mixed Use Residential School Local Centre
Lead Local Flood Authority	Hertfordshire County Council

Local Planning Authority	Three Rivers District Councils
Sewerage Undertaker	Thames Water

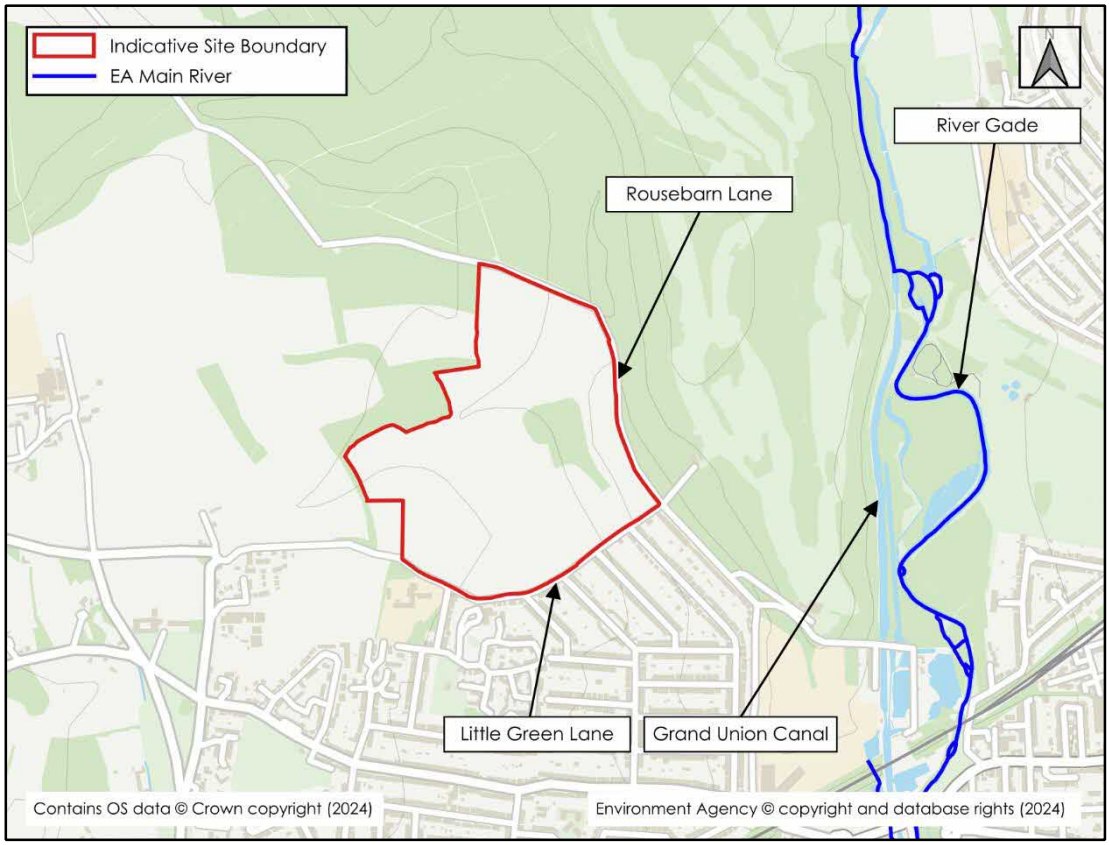

Figure 1.1: Site Location

Proposed Development

1.5 The proposed development comprises an outline application for up to 600 residential dwellings (Use Class C3(a)), a 5-bedroom property for children's social care and supported living (Use Class C3(b)). Two vehicular access points from Little Green Lane and further pedestrian / cycleway accesses. A one form entry primary school (Use Class F1(a)) (plus expansion land for a two form entry primary school). A mixed use local centre including provision for NHS health and social care services (Use Class E(e)), community building (Use Class F2), retail and café provision (Use Class E(a-c)), car parking and associated infrastructure. A country park, areas for play and recreation, allotments, community orchard and landscaping with associated infrastructure including sustainable urban drainage systems. (All matters are reserved except for vehicular access).

Proposed Surface Water Drainage Design

1.6 An Illustrative Drainage Strategy has been produced and included as Appendix 11 within the overarching SDS (drawing reference: 233574-BWB-ZZ-XX-D-W-0001).

1.7 The proposed SuDS aim to reduce the impact of development by repli runoff regime in a sustainable, cost effective manner whilst protecting water quality and reducing pollution. The four key objectives of SuDS design are to achieve improvements in water quantity, water quality, amenity provision and biodiversity.

1.2 Hertfordshire County Council, in their role as the Lead Local Flood Authority (LLFA), have published the 'LLFA Summary Guidance for developers'[1] and 'The Local Flood Risk Management Strategy (LFRMS)[2] which provides guidance on surface water management. The guidance notes:

> *LFRMS Policy 15* states that the volume of the attenuation storage should be designed for the 1 in 100 year critical storm with a climate change allowance.
>
> *LFRMS Policy 18* states that SuDS should be provided above ground.
>
> *LLFA Summary Guidance* states that SuDS such as green roofs, attenuation basins, ponds, swales and permeable pavements should be used.

1.8 Correspondence with the LLFA has been undertaken and is included within **Appendix 3** of the SDS The LLFA have confirmed that infiltration can be permitted within Source Protection Zone (SPZ) 3 (Total Catchment) provided a robust treatment using SuDS is provided using the Simple Index Approach. The LLFA also recommend that a safety factor of 5 is used within the calculations.

1.9 Given the development proposals, a 40% allowance for the potential implications of climate change has been applied, in accordance with Environment Agency's (EA) guidance[3].

1.10 The primary SuDS features proposed on site is infiltration basins. The infiltration basins will be located within the east of the development and will provide all the storage volume for the development. Further levels of treatment will be provided via swales, tree pits and rain gardens located throughout the proposed development. These features will provide water quality, amenity and biodiversity value.

[1] LLFA Summary Guidance for developers (Hertfordshire County Council, August 2021)
[2] The Local Flood Risk Management Strategy (Hertfordshire County Council, February 2019)
[3] Environment Agency, Flood Risk Assessment Climate Change Allowances: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

2. OVERVIEW OF MAINTENANCE

2.1 All drainage systems, whether piped systems or SuDS systems, require regular maintenance. The maintenance of the drainage system should be included alongside other regular maintenance tasks. Table 2.1 below gives an overview of typical maintenance tasks and the frequency with which they need to be undertaken.

Table 2.1: Typical Maintenance Tasks and Frequency

Activity	Indicative Frequency	Typical Tasks
Routine / regular maintenance	Monthly to annually (for normal care of SuDS)	Litter picking Inspections
Occasional maintenance	Annually (dependent on the design	Sediment removal Vegetation managemen
Remedial maintenance	As required (tasks to repair problems due to damag or vandalism)	Inlet/outlet repair Erosion repairs Reinstatement works Reinstatement following pollution Removal of silt build up
Unplanned incidents	As required as reactive measures for unforeseen accidents/spillages	-

2.2 Table 2.2 below lists the drainage features proposed on the site and provides a description of their function and design criteria.

Table 2.2: Proposed Drainage Features

Component	Function
Swales	Swales are linear, flat bottomed grassed c vegetated channels that convey surface water in lieu of below ground pipes.
Headwalls	Headwalls are located at the inlets and outlets to the ponds and swales. They must be always free from obstruction.
Rain Gardens	Shallow, landscaped areas designed to capture and treat stormwater runoff fro nearby surfaces like roofs and driveways. They help reduce runoff and improve wa quality.
Infiltration Basin	Infiltration Basins are proposed to provide attenuation of surface water runoff durin high exceedance storm events. Surface water will then infiltrate into the ground.

Tree Pits	Tree Pits support tree growth and allow water to infiltrate into the ground, reducing the pressure on the drainage systems.

2.3 The required maintenance for each drainage component that mak system is scheduled in **Section 3**.

3. MANAGEMENT AND MAINTENANCE

3.1 The following maintenance guidance for the proposed drainage CIRIA C753 – The SuDS Manual[4]. These O&M requirements are to be continually monitored by the body responsible for the operation and maintenance of below ground drainage and any SuDS features and modified as necessary to suit requirements of the site once operational.

3.2 All inspections should comply with all relevant Health and Safety legislation (Health and Safety at Work Regulations, 1999) including the development of risk assessments for working close to or in water.

3.3 Sediment testing may be required before sediment excavation to determine classification and appropriate disposal methods. In most cases, it will be acceptable to distribute the sediment on site if there is an appropriate safe and acceptable location to do so.

Swales

3.4 Maintenance requirements for swales from the SuDS Manual[4] are given in **Table 3.1** below.

Table 3.1: The SuDS Manual Typical Maintenance Schedule for Swales

Maintenance Activity	Action Required	Frequency
Regular Maintenance	Litter and debris removal.	Monthly, or as required
	Amenity grass cutting 35-50mm	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly, at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear is required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record are where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly

[4] The SuDS Manual (C753F) (CIRIA, 2015)

Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if require	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial action	Repair erosion or other damage by re-turfing or reseeding	As required
	Re-level uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream of gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Headwalls

3.5 Maintenance requirements for headwalls are given in **Table 3.2** below.

Table 3.2: Maintenance Requirements for Headwalls

Maintenance Activity	Action Required	Frequency
Regular Maintenance	Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage	Annually, after major storm event, or as required
	Strim vegetation 1m min. surround to structure and keep hard aprons free from silt and debris	Monthly (during growing season)
	Undertake inspection of grating to ensure it is securely fixed without blockages	Monthly
	Undertake inspection of headwall after leaf fall in autumn	As required
Occasional maintenance	Repair physical damage if necessary	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required
Monitoring	Inspect structures for evidence of poor operation.	Monthly/after large storms
	Inspect silt accumulation rates and establish appropriate removal, frequencies.	Half yearly

Rain Gardens

3.6 Maintenance requirements for rain gardens are given in **Table 3.3** below.

Table 3.3 Maintenance Requirements for Rain Gardens

Maintenance Activity	Action Required	Frequency
Regular Maintenance	Litter and debris removal.	Monthly (or as required)
	Amenity grass cutting 35-50mm	Monthly (during growing season)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
Occasional Maintenance	Checking for poor vegetation growth due lack of sunlight or dropping of leaf litter, an cut back adjacent vegetation where poss	Annually
Remedial action	Repair erosion or other damage by re-turfing or reseeding	As required
	Re-level uneven surfaces and reinstate desig levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt depos and prevent compaction of the soil surfac	As required

Infiltration Basin

3.7 Maintenance requirements for infiltration basins are given in **Table 3.4**. Weather forecast to be checked prior to entering pond areas being entered. Areas should not be entered during storm events or if a storm event is anticipated.

Table 3.4: Maintenance Requirements for Infiltration Basins

Maintenance Activity	Action Required	Frequency
Regular Maintenance	Remove litter, debris and trash	Monthly (or as required)
	Cut grass – for landscaped areas and access routes	Monthly (during growing season) or as required
	Cut grass – meadow grass in and around basin	Half yearly: spring (before nesting season) and autumn
	Manage other vegetation and remove nuisance plans	Monthly at start and then as required
	Reseed areas of poor vegetation growt	Annually, or as required

Occasional Maintenance	Prune and trim trees and remove cutting	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realign the rip-rap	As required
	Repair/rehabilitate inlets, outlets and overflows	As required
	Repair/ rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly/after large storm
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly/after large storm
	Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compactic and ponding	Monthly

Tree Pits

3.8 Maintenance requirements for tree Pit's are given in **Table 3.5**.

Table 3.5: Maintenance Requirements for Tree Pits

Maintenance Activity	Action Required	Frequency
Regular Maintenance	Litter and debris removal.	Monthly (or as required)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
Occasional Maintenance	Trim or redirect roots to prevent structural damage to nearby infrastructure.	Annually
Remedial actions	Replant trees if they die	As required
	Repair or upgrade structural elements if erosi occurs.	As required

	Remove and replace clogged or compac soil if infiltration is impaired.	As required

Operation and Maintenance

3.9 Regular inspections and maintenance are crucial for the effective operation drainage infrastructure. During the development of the site and therea maintenance and management regime will be adopted. The future success of the drainage system is largely dependent on the standard and frequency of the subsequent maintenance and management it receives.

3.10 Maintenance responsibility should always be placed with an appropriate, long-term, accountable organisation. It is envisaged that the proposed drainage system will remain private and therefore a suitably qualified management company should be appointed, or the occupier will be responsible for inspection and all maintenance.

3.11 The maintenance responsibilities of the proposed SuDS features will be confirmed at the construction design phase, prior to the commencement of works within the site.

Maintenance and Access

3.12 For the proposed drainage systems to perform effectively, it is essential that manhole/catchpit structures and attenuation features are monitored to ensure they remain operational. Any specific manufacturer recommendations should be adhered to in the first instance.

3.13 Access for maintenance should be available as necessary for the relevant parties.

Inspection Routine

3.14 In the absence of specific manufacturer's guidance on inspections, the followin section should be used as a guide.

3.15 During operational monitoring, the structures should be assessed against a range of criteria: condition, structural performance, hydraulic performance, environmenta performance and health and safety.

3.16 The maintenance guidance for the surface water systems on-site is recorded in **Section 3**. In line with CIRIA definitions, inspections are separated into two categories, General and Principal, which are defined as follows:

> A general inspection is the examination of all parts of a structure that can b inspected without specialist equipment.
>
> A principal inspection is defined as a close examination of all accessible parts, including adjacent earthworks, with man-entry or CCTV inspection taking place. Note that pressure jetting may be required prior to CCTV inspection.

All inspections carried out should be recorded and retained on file.

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