

Surface Water Drainage and SuDS Strategy Report

EX25/331/09

Former Filling Station, Bury Old Road

Prestwich,

Manchester, M25 0EY

REPORT ARRANGED BY*



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Revisions and Additional Material

Document History and Status

Revision	Date	Purpose/Status
-	31.10.2025	First Issue
A	16.02.2026	Exceedance route added as per council's comments

Document Details

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Preamble

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1.0 Introduction

- 1.0.1 JMS Engineers have been appointed to prepare a surface water drainage strategy and SuDS report to support the planning application for the development at Former Filling Station, Bury Old Road, Prestwich, Manchester, M25 OEY.
- 1.0.2 This report will review and aim to meet the requirements set out by Bury Metropolitan Borough Council. The report will include a surface water drainage strategy and will consider the use of SuDS wherever possible.

2.0 Location & Existing Conditions

- 2.0.1 The application site is located in Bury Metropolitan Borough.
- 2.0.2 The site is located on Bury Old Road, Prestwich, with a total boundary area of approximately 0.132 hectares. The site comprises a former filling station and is considered a brownfield site. Access to the site is obtained directly from Bury Old Road. The existing impermeable area within the site boundary is estimated to be approximately 0.13 hectares.
- 2.0.3 The British Geological Survey (BGS) information shows the site is located on the superficial deposits of Glaciofluvial sheet deposits, Devensian of sand and gravel as shown in **Figure 1**. The bedrock shown in **Figure 2** is Chester Formation of Sandstone.

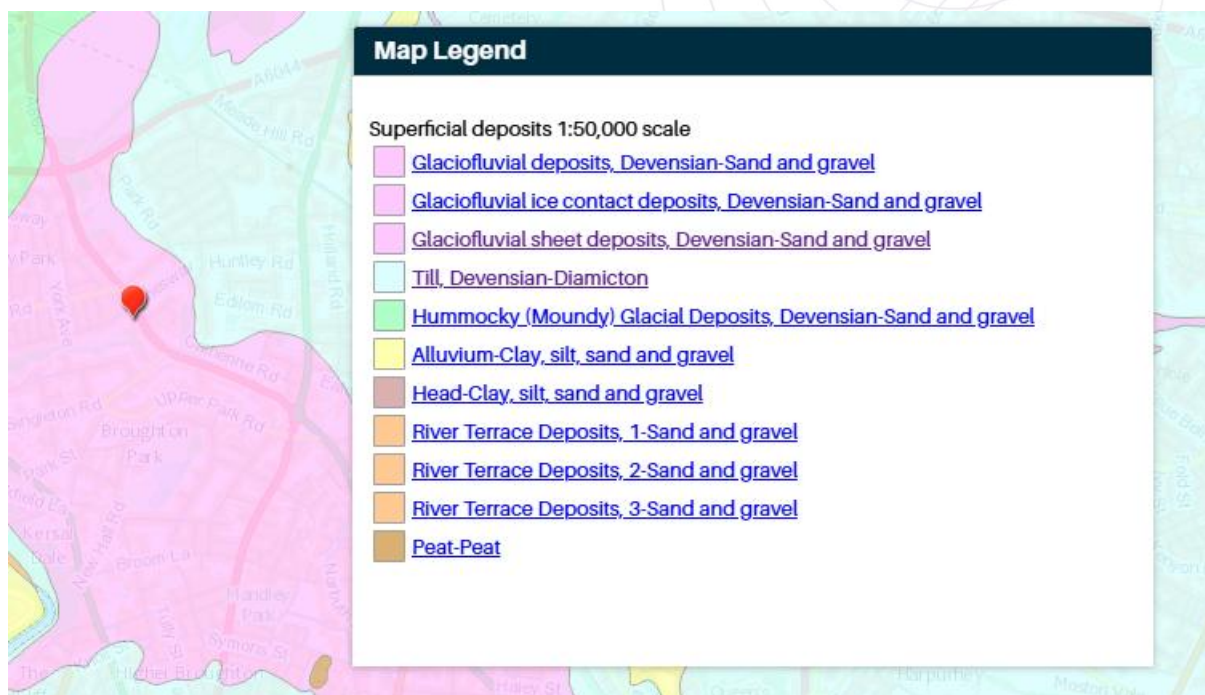


Figure 1 Superficial Deposits

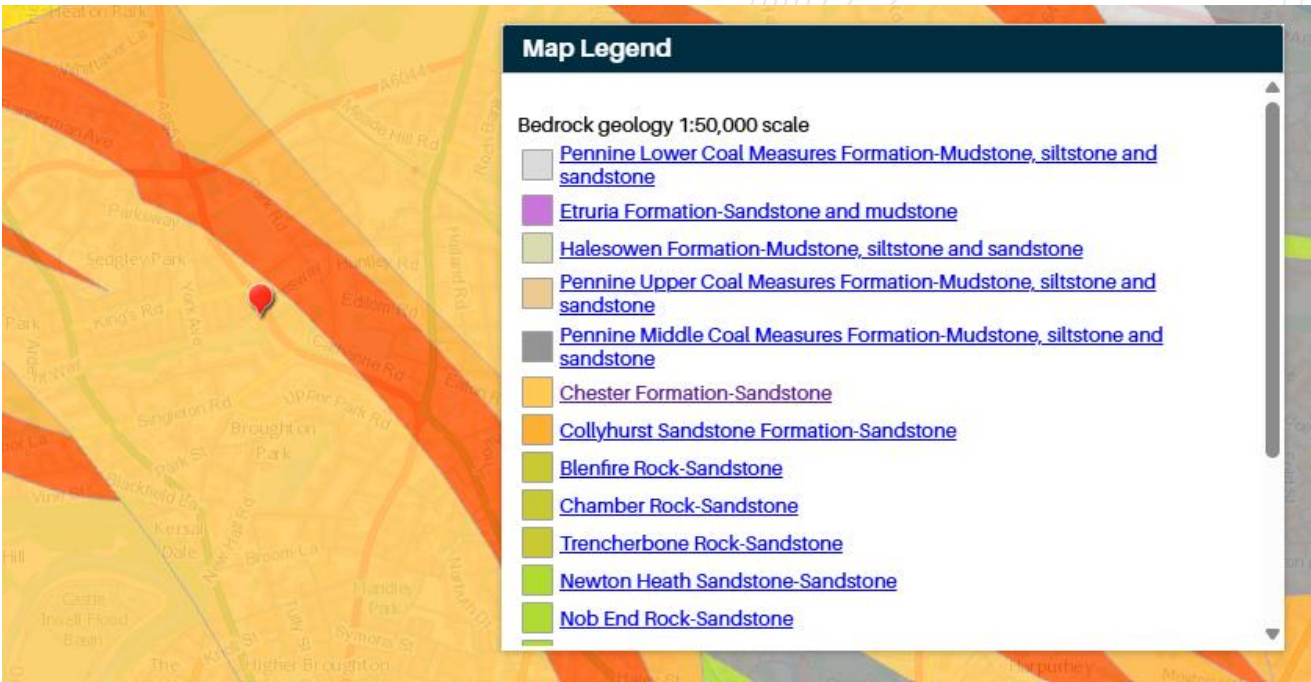


Figure 2 Bedrock Geology

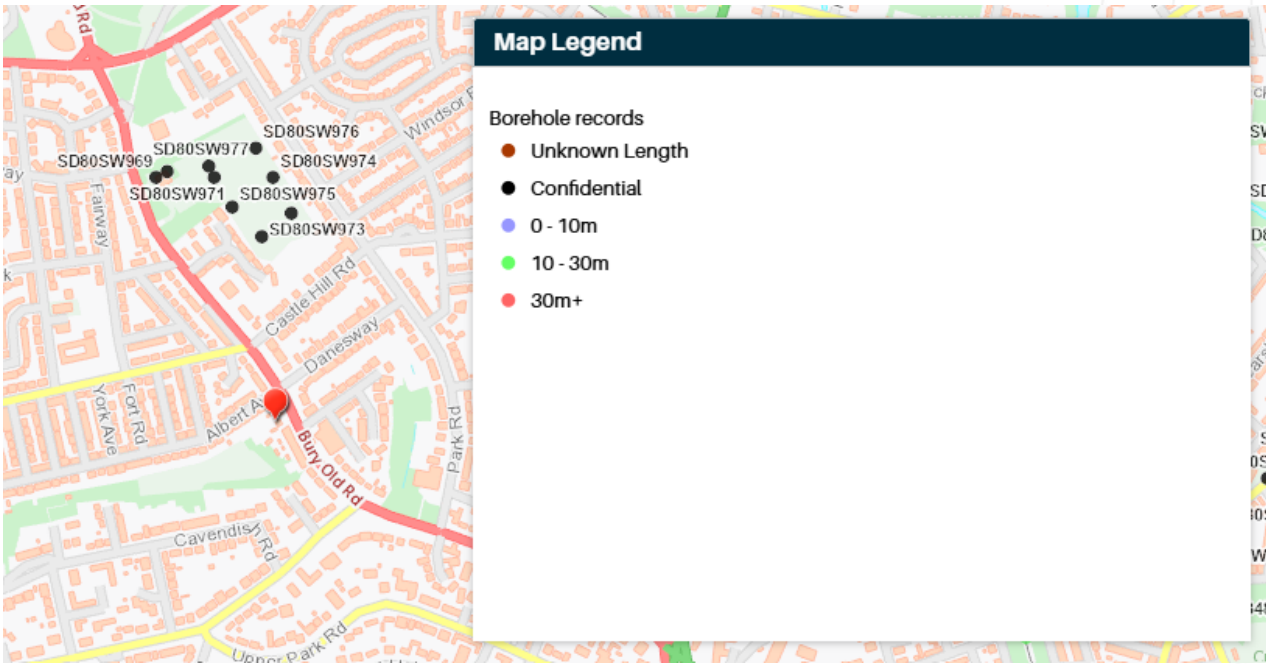


Figure 3 Local Borehole Location Plan

- 2.0.4 Figure 3 illustrates the local borehole plan within the vicinity of the site.
- 2.0.5 A ground investigation was carried out on 1st April 2024 by Unimore Ltd. The investigation comprised borehole sampling at six locations across the site. The findings indicate that groundwater ingress was observed at varying depths, with some boreholes recording higher groundwater levels than others.
- 2.0.6 The deepest borehole, designated MW5, encountered gravelly fine to coarse sand to a depth of approximately 6.0 metres below ground level, where the borehole was terminated. Although no groundwater was recorded in

the MW5 borehole log, other borehole records confirmed the presence of groundwater within the site. Full details of the investigation, including borehole logs, can be seen in **Appendix E**.

2.1 Existing Sewer Assets

- 2.1.1 United utilities sewer map shows foul and surface water sewers in Bury Old Road flowing north. United utilities sewer map can be found in **Appendix A**.

2.2 Site Proposals

- 2.2.1 The proposals are for the demolition of the existing filling station and erection of a commercial building with associated carpark and driveway at the front. The total impermeable area for the proposed site is 0.137ha. The proposals at the time of writing can be seen in **Appendix B**.

2.3 Existing Drainage Regime

- 2.3.1 It is assumed that both foul and surface water flows drain positively to the public sewer network at the front of the site. Therefore, the surface water runoff generated by the existing site is assumed to be picked up by the private drainage network and ultimately to the surface water sewer in Bury Old Road.

- 2.3.2 The average existing runoff rate can be calculated for the existing impermeable area of approximately 0.13ha. The Modified Rational Method is used to consider the existing runoff as set out below:

Section 24.6 of CIRIA 753 states that a value of 35-50mm can be used for rainfall intensity.

$$Q(l/s) = C_v \times C_r \times (2.78 \times I \text{ (mm/hr)} \times A \text{ (ha)})$$

Where:

$$A = 0.13\text{ha}$$

$$C_v = 0.75$$

$$C_r = 1.3$$

Taking $I = 52.531\text{mm}$

$$Q = 18.5\text{l/s}$$

- 2.3.3 The table below shows the greenfield and existing site peak runoff rate for each storm event when considering the 60-minute duration and site-specific rainfall intensity values as follows:

	1:2 Year Storm Event	1:30 Year Storm Event	1:100 Year Storm Event
Greenfield Runoff (l/s)	0.1	0.1	0.2
Rainfall Intensity (l)	52.531	117.380	151.057
Existing Site Peak Runoff Rate (l/s)	18.5	41.36	53.2

Table 1: Existing site peak runoff rate

3.0 SuDS Considerations

- 3.0.1 Consideration of SuDS is a planning requirement for new developments. SuDS are designed to replicate the natural course of drainage as closely as possible with a view to reducing the impact of flooding, removing pollutants at source and combining water management with green space.

Developments should utilise SuDS where possible and ensure that surface water run-off is managed as close to its source as possible in line with the following hierarchy:

1. Into ground (infiltration).
2. To a surface water body.
3. To a surface water sewer.
4. To a combined sewer.

- 3.0.2 Sustainable Drainage Systems should be included in the design in order to manage surface water flood risk. SuDS should be inspired by natural drainage processes and manage water as close to its source as possible whilst offering pollution control and landscape benefits.

3.1 *National and Local Planning Policy*

- 3.1.1 For this development, Bury Metropolitan Borough Council are the Local Planning Authority and set out the requirements in relation to the drainage strategy and SuDS. Those requirements refer to local council guidance documents and national policy guidelines.
- 3.1.2 Bury Metropolitan Local Plan specifically sets out the requirement to Flooding and water management “Policy JP-S4 – Flood Risk and the Water Environment” which addresses the management of flood risk through the planning process, requiring that all new developments appropriately consider flood risk from all potential sources.
- Incorporation of appropriate mitigation measures – including the provision of Sustainable Drainage Systems (SuDS), where practicable, to reduce surface water run-off and manage on-site drainage.
 - Use appropriate SuDS measures to control the rate and volume of surface water runoff.
 - Ensure separation of foul and surface water systems.
 - Make reasonable provision for the safe storage of flood water in excessive events.
 - Demonstrate adequate arrangements for maintenance and management of SuDS features.
- 3.1.3 The policy is designed to ensure that new development is safe, does not increase flood risk elsewhere, and incorporates suitable measures to manage any residual risk.

3.2 SuDS Incorporation

- 3.2.1 The underlying geology of the site indicates that the disposal of surface water through infiltration could be feasible due to the favourable permeability characteristics of the ground. However, evidence of groundwater ingress, identified at depths of less than approximately 3.0 metres below ground level in several borehole investigations across the site suggests that infiltration is unlikely to be a suitable or reliable method for surface water disposal.
- 3.2.2 Therefore, following the hierarchy, the proposals are to discharge to the existing sewer at the front of the site.
- 3.2.3 Table 7.1 below from the SuDS Manual sets out the various components that may be considered in providing SuDS.

Component Type	Description	Collection Mechanism	Design Criteria						Further Information (Chapter Ref)
			Water Quantity (Chapter 3)			Water Quality (Chapter 4)	Amenity (Chapter 5)	Biodiversity (Chapter 6)	
			Peak Runoff Rate	Runoff Volumes					
				Small Events (Interceptions)	Large Events				
Rainwater Harvesting Systems	Systems that collect runoff from the roof of a building or other paved surface for use	P		●	●		●		11
Green roofs	Planted soil layers on the roof of buildings that slow and store runoff	S	○	●		●	●	●	12
Infiltration systems	Systems that collect and store runoff, allowing it to infiltrate into the ground	P	●	●	●	●	●	●	13
Proprietary treatment systems	Subsurface structures design to provide treatment to runoff	P				●			14
Filter strips	Grass strips that promote sedimentation and filtration as runoff is conveyed over the surface	L		●		●	○	○	15
Filter drains	Shallow stone-filled trenches that provide attenuation, conveyance and treatment of runoff	L	●	○		●	○	○	16
Swales	Shallow landscaped depressions that allow runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils	L	●	●	●	●	●	●	17
Bioretention systems	Trees with soil-filled tree pits, tree planters or structural soils used to collect, store and treat runoff	P	●	●	●	●	●	●	18
Trees	Structural paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/or allowed to infiltrate into the ground below	P	●	●		●	●	●	19
Pervious pavements	Structural paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/or allowed to infiltrate into the ground below	S	●	●	●	●	○	○	20
Attenuation storage tanks	Large, below-ground voided spaces used to temporarily store runoff before infiltration-controlled release or use	P	●						21
Detention basins	Vegetated depressions that store and treat runoff	P	●	●		●	●	●	22
Ponds and wetlands	Permanent pools of water used to facilitate treatment of runoff – runoff can also be stored in an attenuation zone above the pool	P	●			●	●	●	23
P-Point L-Lateral S-Surface									
● – likely valuable contribution to delivery of design criterion									
○ - some potential contribution to delivery of design criterion, if specifically included in the design									

Figure 4 CIRIA Table 7.1 SuDS Components

3.2.4 In accordance with the requirements of Bury Metropolitan Borough local plan, all developments will be required to submit a SuDS strategy, considering climate change allowances.

3.2.5 The proposed site layout offers the opportunity to apply SuDS measures in accordance with the table above. Proposals are as follows:

- **Pervious pavement**– Located within the carpark - subsequently allowing runoff to penetrate the paving generated by extreme storm events filtering through the sub-base and perforated pipe.
- **Cellular attenuation** – Large, below-ground voided spaces used to temporarily store runoff before for a controlled release.

Proposals can be seen in **Appendix C**. Proposals are to reduce flows and volumes by use of the SuDS features provided.

3.2.6 By incorporating the above measures, the development proposals aim to manage surface water from all developed areas through Sustainable Drainage Systems (SuDS). The use of permeable paving and cellular storage contributes towards meeting the SuDS objectives by addressing water quantity, water quality, and amenity, as summarised below.

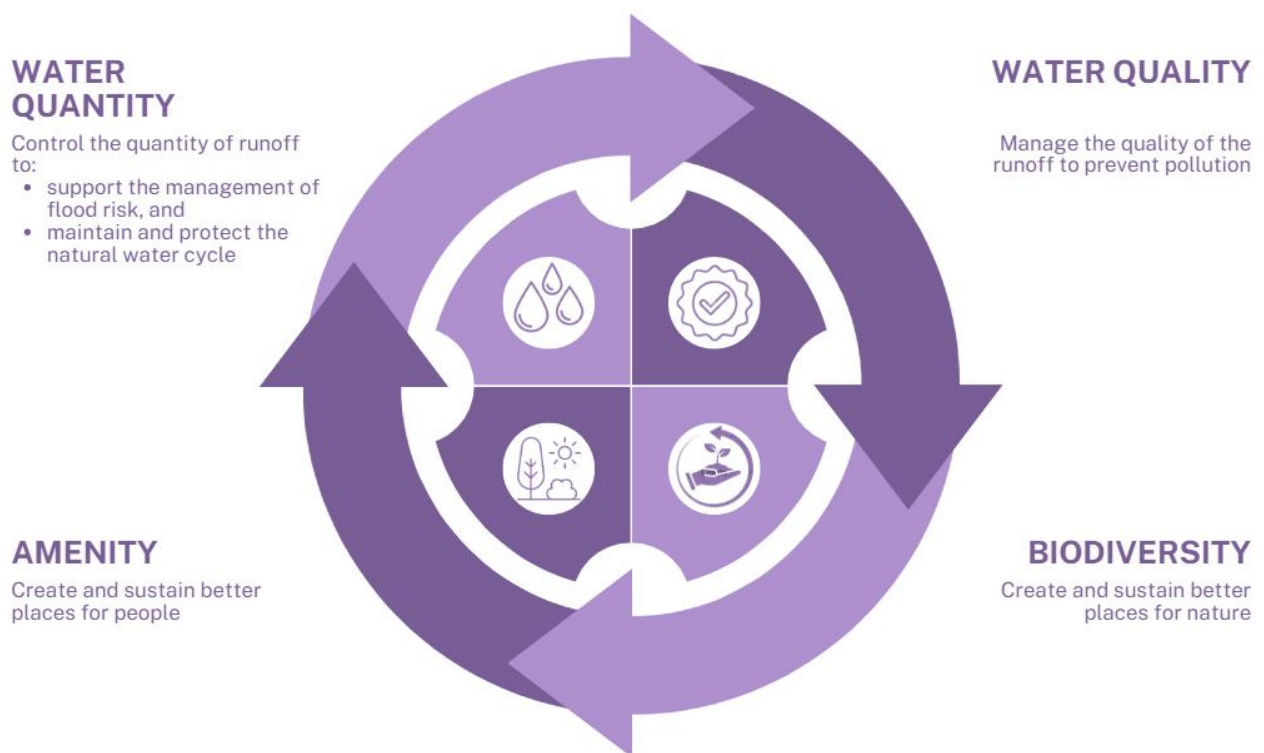


Figure 5 - Reference 4 pillars of SuDS Diagram CIRICA C753 p.6

3.2.7 The above table gives examples of various SuDS components, which may offer SuDS elements in accordance with the requirements. Cellular storage and Permeable paving are proposed. Permeable paving offers an opportunity of managing surface water at source. As per table 7.1 (Figure 5), surface water is slowed at source by soaking through the surfacing. Permeable paving offers the added benefit of filtering the runoff as it drains through, hence improving the quality.

- 3.2.8 In accordance with Table 26.2 of CIRIA Report C753, the pollution hazard level can be classified as ‘very low’ and ‘Low’. Using table 26.3 of the same document, the mitigation indices values for permeable surfacing exceed the pollution hazard values taken from the previous table. This ensures that proposals offer enough pollution risk mitigation.

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 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie <300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

Figure 6 Extract from Table 26.2 CIRIA SuDS Manual Pollution hazard indices for different land use classifications

Mitigation Indices			
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

Figure 7 Extract from Table 26.3 CIRIA SuDS Manual 2015 Indicative SuDS mitigation indices for discharges to surface waters

3.2.9 The above proposals ensure that an ‘at source’ SuDS measure is applied, and betterment is provided in terms of surface water runoff velocity and quality. Pollution indices from different land types can be found per as per table 26.15 CIRIA SuDS Manual 2015, below.

Land use surface type (Lust)	Impermeability (IMP _{REF})	Total suspended solids pollution index (PI _{TSS})	Organic pollution index (PI _{Org})	Hydrocarbon pollution index (PI _{PAD})	Metals Pollution index (PI)
Roofs					
• Industrial / Commercial	1.0	0.3	0.3-0.4	0.2	0.4-0.8
• Residential	0.9	0.4-0.5	0.6-0.7	0.1	0.2-0.5
Highways					
1. Motorways	0.8-0.9	0.9	0.7	0.9	0.8
2. Major arterial highways	0.7-0.8	0.8	0.7	0.8	0.8
3. Urban distributor roads	0.6-0.7	0.7-0.8	0.5	0.8	0.7
4. Residential Street	0.4-0.6	0.4	0.6	0.6	0.6
5. Pavements	0.5-0.6	0.4	0.6	0.3	0.3
Car Parks / Hardstanding					
• Industrial/Commercial	0.6-0.8	0.6-0.7	0.6-0.7	0.7	0.4-0.5
• Driveways (Residential)	0.5	0.5	0.6	0.4	0.3
Open Areas					
• Gardens (All types)	0.1	0.3	0.2-0.3	0	0.01
• Parks/Golf Courses	0.2	0.2-0.3	0.2	0	0.02
• Grassed Areas (including verges, all types)	0.1	0.2-0.3	0.2-0.3	0.05	0.05
Note					
1	Pollution index values are based on reported land use type EMC distributions and impact potential thresholds from House et al (1991), Luker and Montague (1994), Butler and Clark (1995), D'Arcy et al (2000), Mitchell (2005) and Moy et al (2003)				

Figure 8: Impermeability and pollution indices for different land use types

- 3.2.10 The high groundwater ingress shows that infiltration through the sub-base is not possible. Therefore, proposals are to wrap the sub-base in an impermeable membrane, designed to capture surface water runoff.
- 3.2.11 All impermeable area runoff generated by the development will be directed towards the cellular attenuation and to a flow control chamber at the front of the site. From this point all runoff is directed to the existing surface water sewer at an acceptable flow rate.
- 3.2.12 In determining the flow rate, reference is made to the Non-Statutory Technical Standards for SuDS, March 2015. Paragraphs S3 and S5 require the discharge rate and volume from previously developed sites to be as close as reasonably practicable to the greenfield runoff rate for the equivalent rainfall event. The discharge rate and volume of runoff should never exceed the rate of discharge from the development prior to redevelopment for that event.

- 3.2.13 Discharge rates should be managed as close as possible to the required standard by adopting a suitable flow control measure. On the basis that flow controls can manage flow rates as low as 2.0l/s without incurring blockages this has been taken as the allowable flow rate and applied to this site.
- 3.2.14 Pervious pavement is proposed for the at the car park area. The permeable surfacing sub-base is included in the design in order to provide necessary storage attenuation within the voids. The sub-base thickness shall be designed to provide the necessary storage for all storm events.
- 3.2.15 The above proposals ensure that SuDS measures are applied, and betterment is provided in terms of surface water runoff velocity, quantity and quality.

3.3 Climate change

- 3.3.1 The appended drainage calculation allows for a 1:100-year storm plus 45% climate change, this has been sourced from the [DEFRA Hydrology Data Explorer for Climate Change Allowances](https://environment.data.gov.uk/hydrology/climate-change-allowances/), as per figure 9, below.

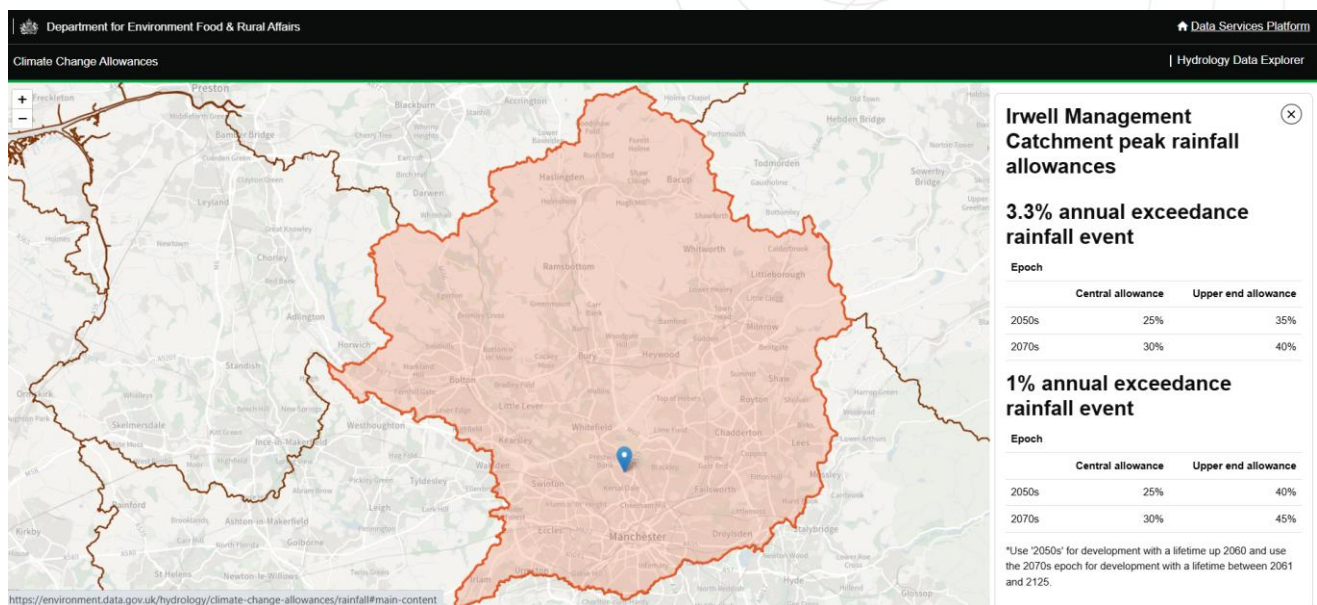


Figure 9 : Climate change allowances for peak rainfall in England by catchment area

3.4 Preliminary Surface Water Drainage Maintenance Schedules

- 3.4.1 This section of the report gives guidance on the maintenance of the drainage system and outlines who will be responsible. The proposed development comprises of site clearance, landscaping, parking, drainage and supporting infrastructure. The SuDS systems will aim to control runoff in terms of velocity and quality.
- 3.4.2 The rainwater from the roofs is collected via rainwater pipes and will be carried to the network. The maintenance of the collection system is the responsibility of the developer, see **Table 2** below.

Table 2: System storage operation and maintenance requirements (rainwater pipes and chambers)

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Inspection of silt trap chamber and removal of debris when necessary	Quarterly or as required following monitoring
Remedial actions	Check for blockages in manholes and pipes. Rodding and jetting of pipes to be carried out. CCTV survey can be carried out to inspect condition of pipework.	Quarterly or as required following monitoring
Monitoring	Inspect collection apparatus for debris and litter. Remove where necessary to prevent blockages in the system	Monthly or after periods of heavy rainfall

3.4.3 Maintenance of the permeable paving and sub-base will be the responsibility of the developer, see **Table 3** below.

Table 3: System storage operation and maintenance requirements (permeable paving)

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Sweeping. [NOTE: Any jointing material between the blocks that is lost or displaced as a result of sweeping must be replaced. New jointing material must be the same type as that removed or a suitable replacement]	3 no. times a year: - - At the end of Winter; - Mid-summer; and - After autumn leaf fall. Also as required based on site specific observations
Occasional Maintenance	Stabilise and mow contributing and adjacent areas to prevent excess sediment being washed into the paving	As required
Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required
	Rehabilitation of surface and underlying sand a geo-textile	As required (if local distortion or settlement occurs as a result of wash out of bedding)
Monitoring	Inspect for evidence for weed growth or deposits affecting run off. If required, take remedial action	Monthly for 3 no. months after installation, then during regular maintenance visits

3.4.4 The maintenance of the flow control is the responsibility of the developer, see **Table 4** below.

Table 4: System Storage operation and maintenance requirements (flow control)

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Remove litter and debris and grass cuttings from upstream to prevent being washed into the flow control. Inspection of the flow control chamber and the removal of any sediment/debris when required.	Quarterly or as required following monitoring
Remedial Actions	Check flow control is functional	Quarterly or as required following monitoring
Monitoring	Inspect flow control and check flows are not impeded	Monthly or after periods of heavy rainfall

3.4.5 The maintenance of the Cellular attenuation is the responsibility of the developer, see **Table 5** below.

Table 5: System Storage operation and maintenance requirements (Cellular attenuation)

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Remove litter, debris and grass cuttings from upstream chamber to prevent being washed into the tank. Inspection of the chamber and the removal of any sediment/debris when required.	Quarterly or as required following monitoring
Monitoring	Inspect for evidence of deposits affecting run off	Monthly for 3 no. months after installation, then during regular maintenance visits.

3.4.6 The design life of the development is likely to exceed the design life of each of the SuDS components listed above. During the routine inspections of any drainage components, it may become apparent that they have reached the end of their functional lifetime. In the interest of sustainability, repairs should be the first-choice solution where practicable. If this is not the case, then it will be necessary for the property owners to undertake complete replacement of the component in question.

4.0 Surface Water Strategy

The surface water strategy is based upon the SuDS implementation as outlined above and Bury Metropolitan Borough Council Local plan hierarchy for surface water disposal as follows:

A. Store rainwater for later use:

Not Applicable.

B. Use infiltration techniques, such as porous surfaces:

The site conditions do not appear to support the use of infiltration techniques due to groundwater ingress. Permeable paving is proposed.

C. Attenuate rainwater in ponds or open water features for gradual release:

The site layout does not offer the opportunity for open water features.

D. Permanent storage structure water features for gradual release:

Surface water will be directed from the roof areas and permeable surfacing into the proposed drainage network. Surface water will be attenuated by use of permeable paving sub-base and cellular storage restricted by a suitable flow control device.

The drainage serving the existing development will provide an outfall for the proposed development, all surface water generated by the proposals will be directed to the existing surface water sewer at a much lesser rate.

Paragraph 2.3.2 shows that the existing site generates an average flow rate of approximately 18.5l/s from roof and hard standing areas for the 1:1 year storm event. The site is a Brownfield Site, with the proposals providing significant betterment in terms of discharge rates. The equivalent greenfield runoff rate for this site was found to be low, generating a 1 in 1 year flow rate of 0.1 l/s. On that basis, the proposed runoff from the development shall be restricted to 2.0l/s for all storm events up to the 1:100-year event including climate change. The current runoff rate is therefore much improved for all storm events up to the 1:100-year event inclusive of climate change.

Table 6: Existing and proposed peak runoff rates

	1:1 Year Storm Event	1:30 Year Storm Event	1:100 Year Storm Event	1:100 Year Storm Event (+45% Climate Change)
Greenfield Runoff Rate (l/s)	0.1	0.1	0.2	-
Existing Site Peak Runoff Rate (l/s)	18.5	41.6	53.2	-
Proposed Peak Runoff Rate (l/s)	1.0	1.4	2.0	2.0
Betterment Provided by Proposals (%)	94.5	96.6	96.2	-

Calculations and drawings supporting the above are in **Appendices C & D**.

E. Direct rainwater to the watercourse:

Not applicable.

F. Discharge rainwater to a surface water sewer/drain:

The surface water runoff is to discharge to the existing surface water sewer along the Bury Old Road at the front of a site with flow controlled to 2.0l/s

G. Discharge rainwater to combined sewer:

Not applicable.

H. Discharge rainwater to foul sewer:

Not applicable.

4.1 Surface Water Management During Construction

- 4.1.1 Consideration for surface water needs to be taken during the construction process, and how it is managed, including flood risk and pollution control.
- 4.1.2 Generally, there are three options for managing surface water during construction
 - 6. Build, use and remediate permanent surface water drainage system
 - 7. Install, use and remove a temporary surface water drainage system
 - 8. Utilise existing drainage system with pollution control measures (brownfield sites only)
- 4.1.3 For this developed site, it is recommended to build, use and remediate the permanent surface water drainage system.
- 4.1.4 Project and Site Managers should sign up for the Met Office weather warning system and take appropriate action. <https://www.metoffice.gov.uk/public/weather/warnings>

- 4.1.5 Consideration for the following legislation and guidance should be made for a construction surface water management plan:

Legislation and Guidance
The Water Environment (England and Wales) Regulation 2009
Land Drainage Act 1991
SEPA Engineering in the Water Environment Good Practice Guide Temporary Construction Methods
Control of Water Pollution from Construction Sites – Guide to Good Practice (SP156)
Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors (C532)
Control of Water Pollution from Linear Construction Projects – Technical Guidance (C648)
Control of Water Pollution from Linear Construction Projects – Site Guide (C649)
Environmental Good Practice – Site Guide (C650)
Site Handbook for the Construction of SuDS (C698)
The SuDS Manual (C753)
BS 8582:2013 Code of Practice for Surface Water Management for Development Sites

Figure 10 Legislation and Guidance for Surface Water Construction Management

4.2 *Designing for Exceedance*

- 4.2.0 Consideration should be given to external levels to ensure they are set above overland flood risk levels, and low points are created to direct water away from the building footprints during exceedance events.
- 4.2.1 CIRIA document C635 *Designing for exceedance in urban drainage – good practice* states that “at present there are no guidelines on the return period of event (extreme event) that should be used for design exceedance”. However, Section 3.4 also states that “it is suggested that return periods of 1 in 30, to 1 in 100-year events would form a suitable framework for most applications”.
- 4.2.2 In accordance with the above, the system has been modelled using a 1 in 100-year event inclusive of climate change.

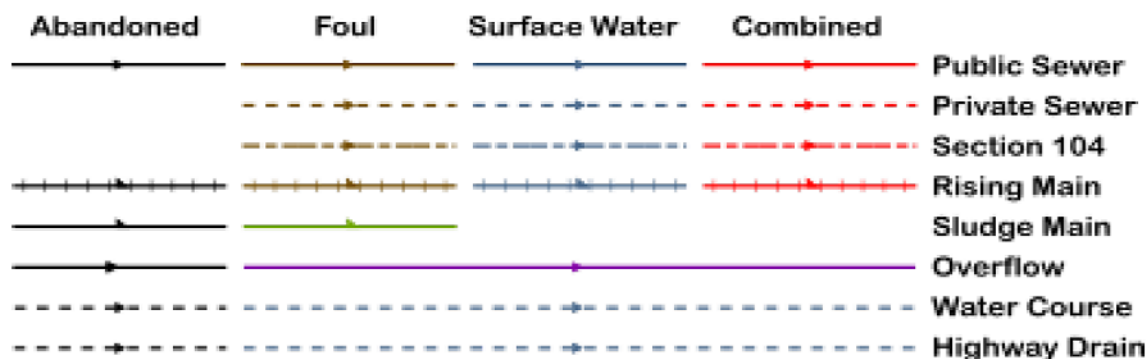
5.0 Conclusions

- 5.1 JMS Engineers have been appointed to prepare a drainage strategy and SuDS Report for the development at Bury Old Road, Prestwich, Manchester, M25 OEY.
- 5.2 Information obtained from the British Geological Survey (BGS) and the site investigation carried out on the site by “Unimore Ltd” indicates that the ground is underlain by silty sand and gravel. However, due to the presence of high groundwater ingress, infiltration methods are not considered a viable option for the disposal of surface water at this site.
- 5.3 The drainage strategy is designed to limit the surface water runoff from the proposed development to an appropriate discharge rate.
- 5.4 Various SuDS components are proposed, namely permeable paving with the sub-base, cellular storage and flow control. The inclusion of such features means that sustainable drainage principles are used to deal with all surface water runoff.
- 5.5 In conclusion, the proposal applies appropriate SuDS features that ensure source control and pollution control are applied.

6.0 Appendices

Appendix A – United Utilities Sewer Map

Wastewater Symbolology



All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

Manhole	Side Entry Manhole
Head of System	Outfall
Extent of Survey	Screen Chamber
Rodding Eye	Inspection Chamber
Inlet	Bifurcation Chamber
Discharge Point	Lamp Hole
Vortex	T Junction / Saddle
Penstock	Catchpit
Washout Chamber	Valve Chamber
Valve	Vent Column
Air Valve	Vortex Chamber
Non Return Valve	Penstock Chamber
Soakaway	Network Storage Tank
Gully	Sewer Overflow
Cascade	Ww Treatment Works
Flow Meter	Ww Pumping Station
Hatch Box	Septic Tank
Oil Interceptor	Control Kiosk
Summit	DNM Network Monitoring Point
Drop Shaft	Change of Characteristic
Orifice Plate	



SEWER RECORDS

Address or Site Reference

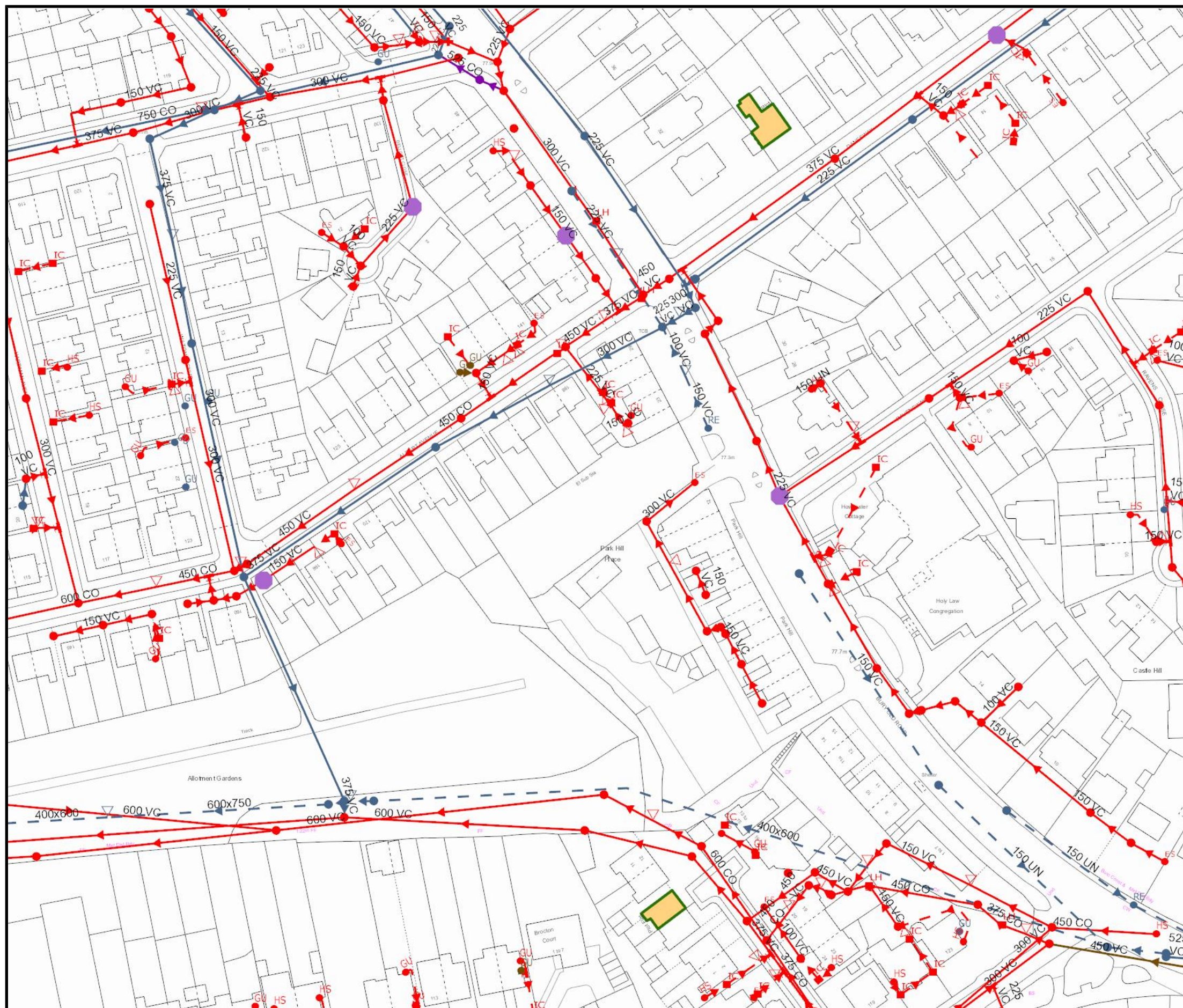
Former Station,

Scale: 1:1250
Date: 30/10/2025

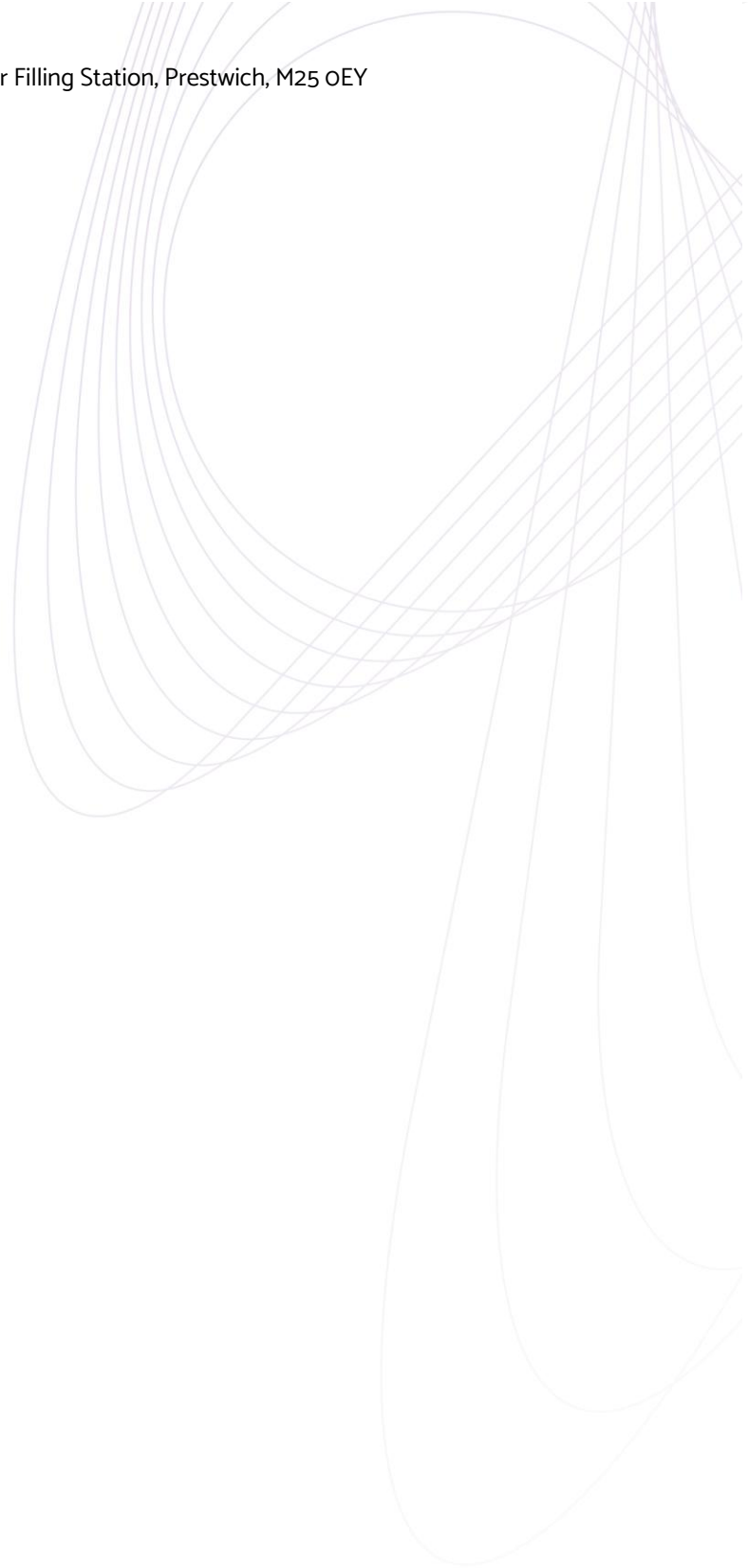
Printed by: Property Searches

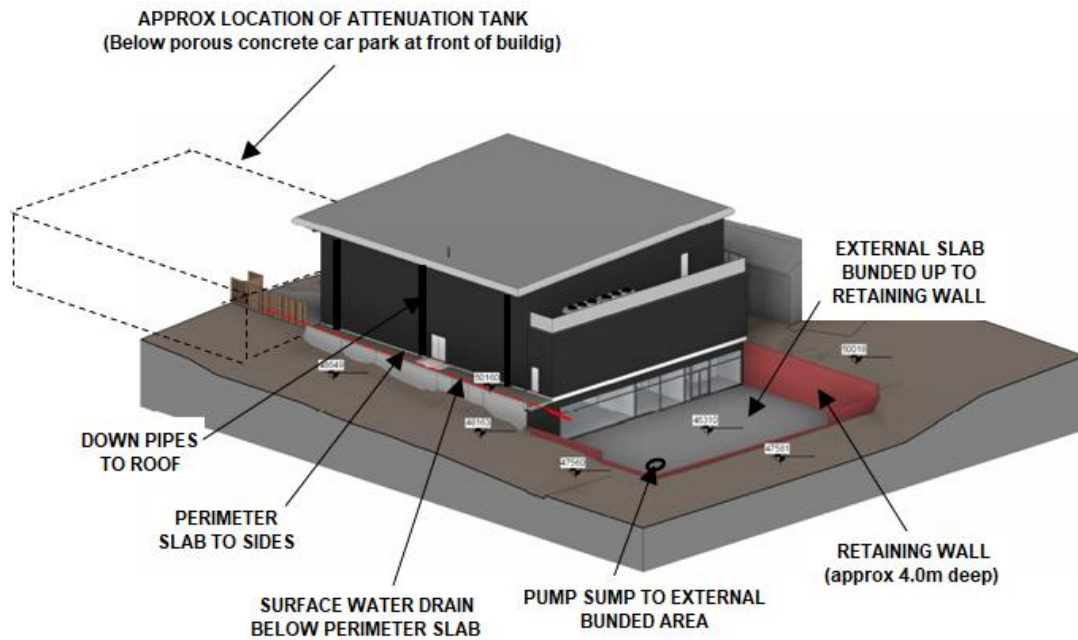
The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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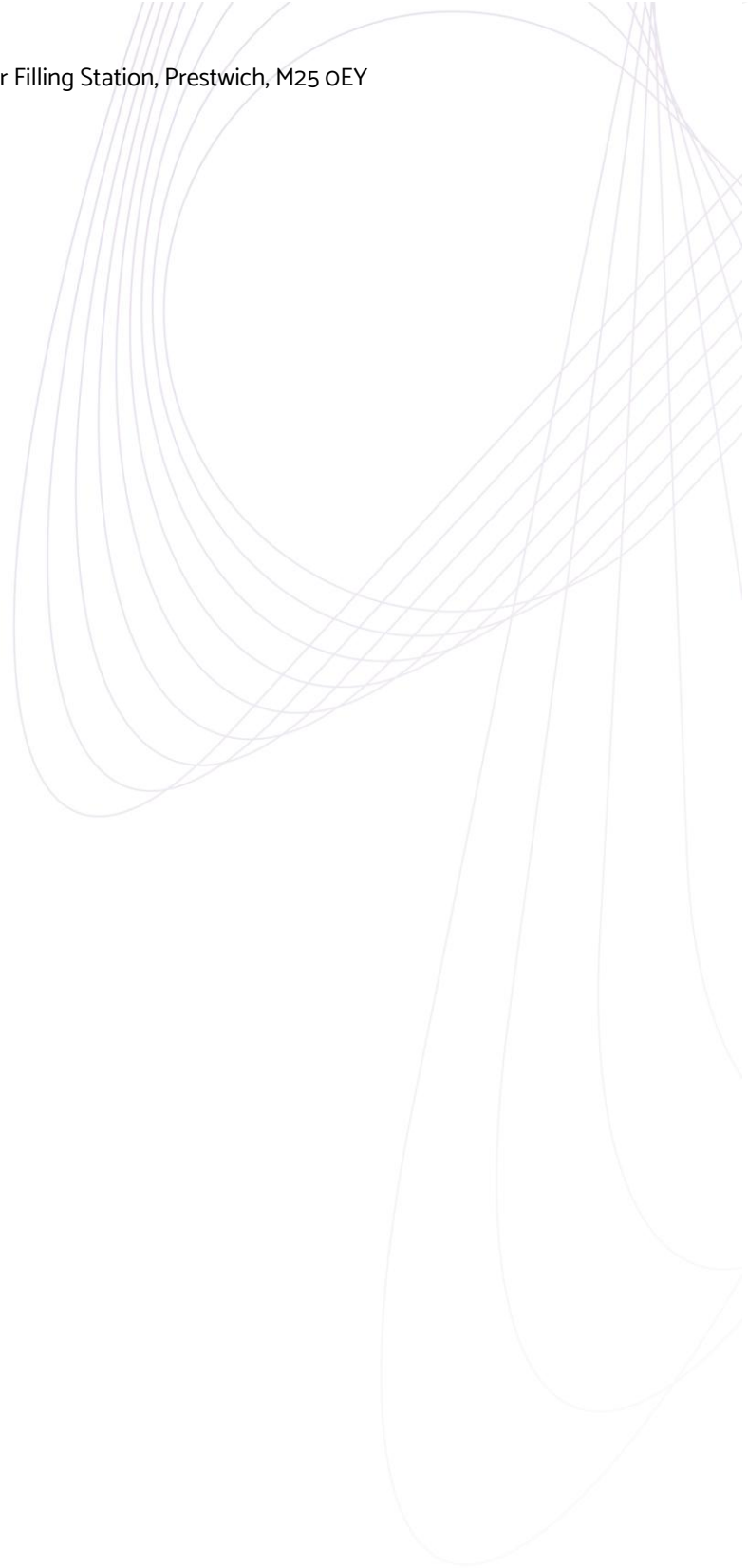


Appendix B – Architectural Plans





Appendix C – Drainage Calculations



JMS Chelmsford Ltd		Page 1
BIC110 - The MedBIC Alan Cherry Drive Chelmsford CM1 1SQ		
Date 30/10/2025 14:52 File	Designed by MathanKumarRenga... Checked by	
XP Solutions		Source Control 2018.1
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.150 Area (ha) 0.130 Urban 0.000 SAAR (mm) 960 Region Number Region 10 Results 1/s QBAR Rural 0.1 QBAR Urban 0.1 Q100 years 0.2 Q1 year 0.1 Q30 years 0.1 Q100 years 0.2		
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JMS Chelmsford Ltd		Page 1
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XP Solutions	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	2013
Site Location GB 382879 402536 SD 82879 02536	
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.102	4-8	0.025

Total Area Contributing (ha) = 0.127

Total Pipe Volume (m³) = 1.587

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	23.900	0.317	75.4	0.025	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	9.400	0.118	79.7	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	14.500	0.182	79.7	0.017	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	-11.23	5.34	48.900	0.025	0.0	0.0	0.0	1.16	20.5	0.0
1.001	-10.94	5.48	48.583	0.045	0.0	0.0	0.0	1.13	19.9	0.0
1.002	-10.53	5.70	48.465	0.062	0.0	0.0	0.0	1.13	19.9	0.0

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BIC110 - The MedBIC Alan Cherry Drive Chelmsford CM1 1SQ		
Date 16/02/2026 13:00 File Revised Calc- 16.02.202...	Designed by MathanKumarRenga... Checked by	
XP Solutions	Network 2018.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	17.100	0.213	80.3	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	8.400	0.105	80.0	0.030	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	5.200	0.065	80.0	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	11.300	0.113	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	-11.42	5.25	48.601	0.020	0.0	0.0	0.0	1.12	19.8	0.0
2.001	-11.16	5.38	48.388	0.050	0.0	0.0	0.0	1.12	19.9	0.0
1.003	-10.39	5.77	48.283	0.127	0.0	0.0	0.0	1.12	19.9	0.0
1.004	-10.06	5.96	48.218	0.127	0.0	0.0	0.0	1.00	17.8	0.0

JMS Chelmsford Ltd		Page 3
BIC110 - The MedBIC Alan Cherry Drive Chelmsford CM1 1SQ		
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XP Solutions		Network 2018.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	49.640	0.740	Open Manhole	480	1.000	48.900	150				
2	50.050	1.467	Open Manhole	480	1.001	48.583	150	1.000	48.583	150	
3	50.340	1.875	Open Manhole	480	1.002	48.465	150	1.001	48.465	150	
4	50.350	1.749	Open Manhole	480	2.000	48.601	150				
5	50.220	1.832	Open Manhole	480	2.001	48.388	150	2.000	48.388	150	
6	50.210	1.927	Open Manhole	480	1.003	48.283	150	1.002	48.283	150	
								2.001	48.283	150	
7	50.100	1.882	Open Manhole	1200	1.004	48.218	150	1.003	48.218	150	
	49.980	1.875	Open Manhole	0		OUTFALL		1.004	48.105	150	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
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1.004	49.980	48.105	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 382879 402536 SD 82879 02536
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	0.840
Storm Duration (mins)	30

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XP Solutions	Network 2018.1	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 7, DS/PN: 1.004, Volume (m³): 2.2

Unit Reference	MD-SHE-0066-2600-1882-2600
Design Head (m)	1.882
Design Flow (l/s)	2.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	66
Invert Level (m)	48.218
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.882	2.6
Flush-Flo™	0.289	1.9
Kick-Flo®	0.591	1.5
Mean Flow over Head Range	-	2.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.1	3.000	3.2	7.000	4.8
0.200	1.9	1.400	2.3	3.500	3.5	7.500	4.9
0.300	1.9	1.600	2.4	4.000	3.7	8.000	5.1
0.400	1.9	1.800	2.5	4.500	3.9	8.500	5.2
0.500	1.8	2.000	2.7	5.000	4.1	9.000	5.4
0.600	1.5	2.200	2.8	5.500	4.3	9.500	5.5
0.800	1.8	2.400	2.9	6.000	4.4		
1.000	1.9	2.600	3.0	6.500	4.6		

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Storage Structures for Storm

Porous Car Park Manhole: 1, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.080	Membrane Depth (mm)	110

Porous Car Park Manhole: 5, DS/PN: 2.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.0
Max Percolation (l/s)	30.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.560	Membrane Depth (mm)	210

Complex Manhole: 6, DS/PN: 1.003

Cellular Storage

Invert Level (m)	48.283	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	77.0	77.0	1.201	0.0	123.8
1.200	77.0	123.8			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	19.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.550	Membrane Depth (mm)	210

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

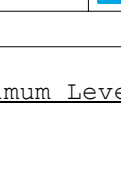
PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Pipe Flow	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Cap.	(l/s)	(l/s)		
2.000	4	-0.104	0.000	0.21		3.8	OK	
2.001	5	-0.065	0.000	0.18		3.1	OK	
1.003	6	0.037	0.000	0.12		1.9	SURCHARGED	
1.004	7	0.098	0.000	0.12		1.9	SURCHARGED	

JMS Chelmsford Ltd								Page 8																																																																																																															
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<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>																																																																																																																							
<u>Simulation Criteria</u>																																																																																																																							
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000																																																																																																																							
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Foul Sewage per hectare (l/s) 0.000																																																																																																																							
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Number of Online Controls 1 Number of Time/Area Diagrams 0																																																																																																																							
Number of Offline Controls 0 Number of Real Time Controls 0																																																																																																																							
<u>Synthetic Rainfall Details</u>																																																																																																																							
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Cv (Summer) 1.000																																																																																																																							
Cv (Winter) 1.000																																																																																																																							
Margin for Flood Risk Warning (mm) 300.0																																																																																																																							
Analysis Timestep 2.5 Second Increment (Extended)																																																																																																																							
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DVD Status ON																																																																																																																							
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Profile(s) Summer and Winter																																																																																																																							
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440																																																																																																																							
Return Period(s) (years) 2, 30, 100																																																																																																																							
Climate Change (%) 0, 0, 45																																																																																																																							
<table><tr><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td>Water</td></tr><tr><td>PN</td><td>US/MH</td><td>Storm</td><td>Return</td><td>Climate</td><td>First (X)</td><td>First (Y)</td><td>First (Z)</td><td>Overflow</td><td>Level</td><td></td></tr><tr><td></td><td>Name</td><td></td><td>Period</td><td>Change</td><td>Surcharge</td><td>Flood</td><td>Overflow</td><td>Act.</td><td>(m)</td><td></td></tr><tr><td>1.000</td><td>1</td><td>15 Summer</td><td>30</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>49.000</td><td></td></tr><tr><td>1.001</td><td>2</td><td>15 Summer</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>48.924</td><td></td></tr><tr><td>1.002</td><td>3</td><td>15 Summer</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>48.796</td><td></td></tr><tr><td>2.000</td><td>4</td><td>120 Winter</td><td>30</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>48.746</td><td></td></tr><tr><td>2.001</td><td>5</td><td>120 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>48.745</td><td></td></tr><tr><td>1.003</td><td>6</td><td>120 Winter</td><td>30</td><td>+0%</td><td>2/60 Summer</td><td></td><td></td><td></td><td>48.742</td><td></td></tr><tr><td>1.004</td><td>7</td><td>120 Winter</td><td>30</td><td>+0%</td><td>2/15 Summer</td><td></td><td></td><td></td><td>48.739</td><td></td></tr></table>																				Water	PN	US/MH	Storm	Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level			Name		Period	Change	Surcharge	Flood	Overflow	Act.	(m)		1.000	1	15 Summer	30	+0%	100/15 Summer				49.000		1.001	2	15 Summer	30	+0%	30/15 Summer				48.924		1.002	3	15 Summer	30	+0%	30/15 Summer				48.796		2.000	4	120 Winter	30	+0%	100/15 Summer				48.746		2.001	5	120 Winter	30	+0%	30/15 Summer				48.745		1.003	6	120 Winter	30	+0%	2/60 Summer				48.742		1.004	7	120 Winter	30	+0%	2/15 Summer				48.739	
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<table><tr><td colspan="2"></td><td colspan="2">Surcharged</td><td colspan="2">Flooded</td><td colspan="2">Pipe</td><td colspan="2"></td></tr><tr><td>PN</td><td>US/MH</td><td>Depth</td><td>Volume</td><td>Flow /</td><td>Overflow</td><td>Flow</td><td></td><td>Level</td><td></td></tr><tr><td></td><td>Name</td><td>(m)</td><td>(m³)</td><td>Cap.</td><td>(l/s)</td><td>(l/s)</td><td>Status</td><td>Exceeded</td><td></td></tr><tr><td>1.000</td><td>1</td><td>-0.050</td><td>0.000</td><td>0.53</td><td></td><td>10.2</td><td>OK</td><td></td><td></td></tr><tr><td>1.001</td><td>2</td><td>0.191</td><td>0.000</td><td>1.04</td><td></td><td>18.4</td><td>SURCHARGED</td><td></td><td></td></tr><tr><td>1.002</td><td>3</td><td>0.181</td><td>0.000</td><td>1.37</td><td></td><td>25.2</td><td>SURCHARGED</td><td></td><td></td></tr></table>												Surcharged		Flooded		Pipe				PN	US/MH	Depth	Volume	Flow /	Overflow	Flow		Level			Name	(m)	(m³)	Cap.	(l/s)	(l/s)	Status	Exceeded		1.000	1	-0.050	0.000	0.53		10.2	OK			1.001	2	0.191	0.000	1.04		18.4	SURCHARGED			1.002	3	0.181	0.000	1.37		25.2	SURCHARGED																																																				
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XP Solutions	Network 2018.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Pipe Flow	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Cap.	(l/s)	(l/s)		
2.000	4	-0.005	0.000	0.14		2.6	OK	
2.001	5	0.207	0.000	0.35		6.1	SURCHARGED	
1.003	6	0.309	0.000	0.13		2.1	SURCHARGED	
1.004	7	0.371	0.000	0.12		1.9	SURCHARGED	

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XP Solutions		
Network 2018.1		

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 382879 402536 SD 82879 02536
Data Type	Point
Cv (Summer)	1.000
Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	100	+45%	100/15 Summer				49.424
1.001	2	15 Summer	100	+45%	30/15 Summer				49.375
1.002	3	240 Winter	100	+45%	30/15 Summer				49.258
2.000	4	240 Winter	100	+45%	100/15 Summer				49.257
2.001	5	240 Winter	100	+45%	30/15 Summer				49.256
1.003	6	240 Winter	100	+45%	2/60 Summer				49.253
1.004	7	240 Winter	100	+45%	2/15 Summer				49.249

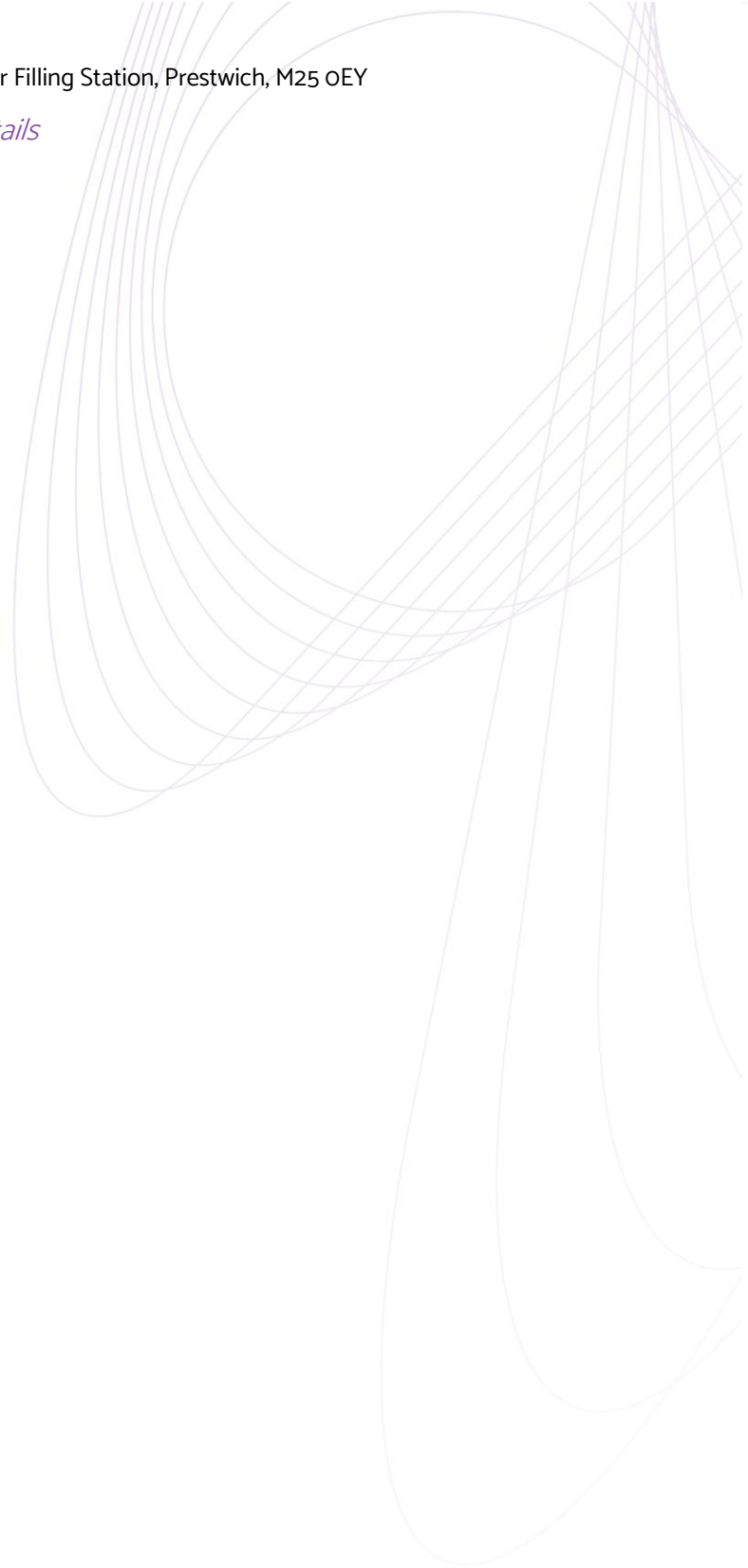
Surcharged Flooded					Pipe			
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.374	0.000	0.81		15.8	FLOOD RISK	
1.001	2	0.642	0.000	1.21		21.4	SURCHARGED	
1.002	3	0.643	0.000	0.45		8.2	SURCHARGED	

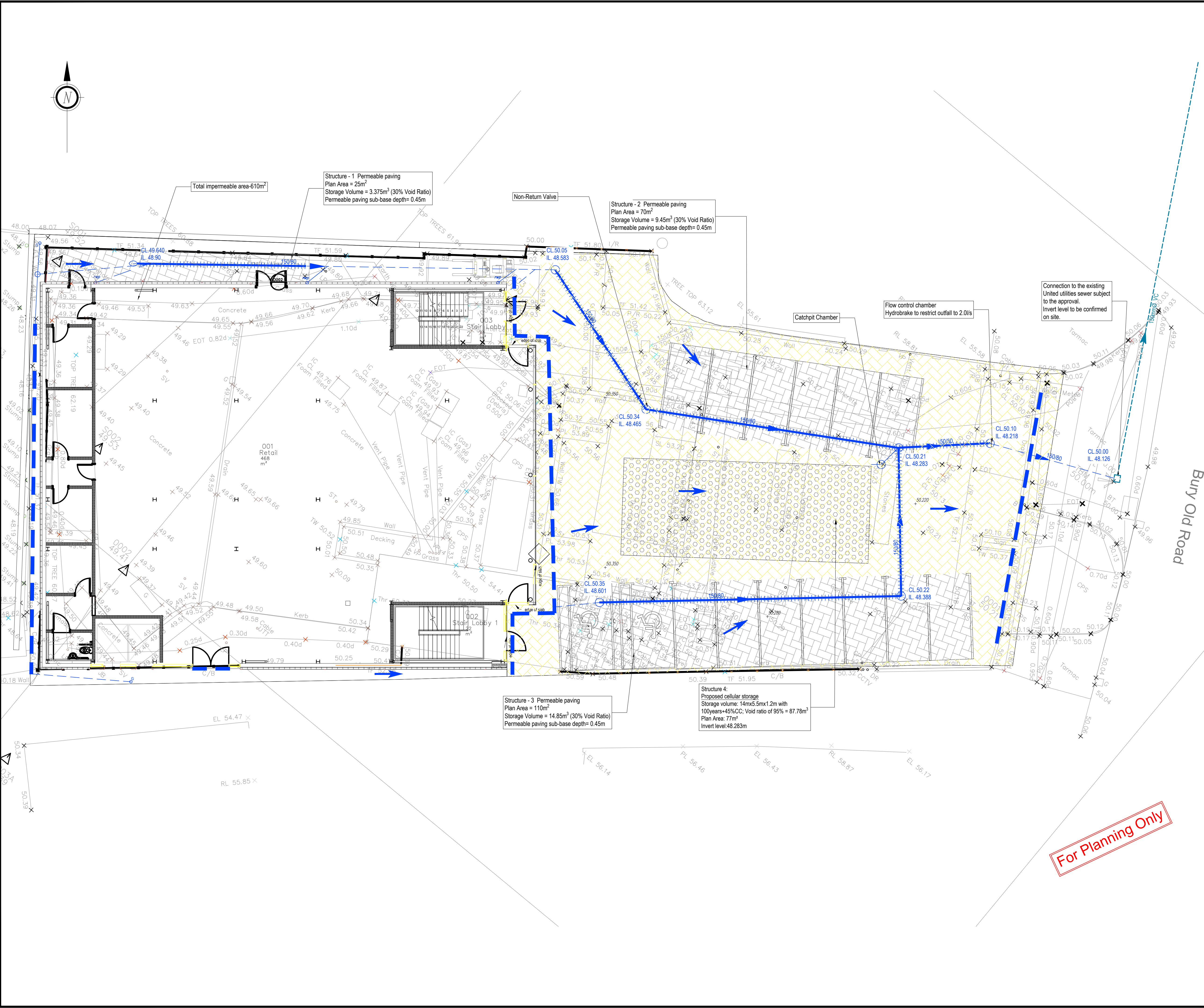
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XP Solutions	Network 2018.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Pipe Flow	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Cap.	(l/s)	(l/s)		
2.000	4	0.506	0.000	0.15		2.7	SURCHARGED	
2.001	5	0.718	0.000	0.39		6.8	SURCHARGED	
1.003	6	0.820	0.000	0.13		2.0	SURCHARGED	
1.004	7	0.881	0.000	0.12		2.0	SURCHARGED	

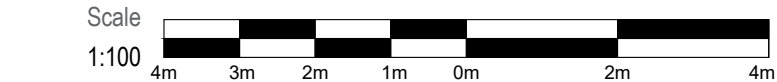
Appendix D – Proposed Drainage Layout and Details





- General Notes:
1. Do not scale this drawing. All dimensions are in metres unless otherwise noted. Any discrepancies are to be recorded and reported to the engineers immediately.
 2. This drawing is to be read in conjunction with all other engineers and architects drawings, and the specification.
 3. All work is to be to the satisfaction of the engineer and local authority building control.
 4. The contractor is responsible for and must take all necessary precautions to ensure the stability of the works at all times during construction.
 5. All workmanship and materials are to be to current British Standards.
 6. All services are to be located and protected as necessary by the contractor prior to the commencement of the works.
 7. Any existing details which are shown on this drawing are for guidance only and are to be checked on site by the contractor. Any variations are to be recorded and reported to the engineer immediately.
 8. All highway works are to be in accordance with the local authorities design guide and specification.
 9. Prior to the occupation of the first dwelling, street nameplates shall be erected in accordance with the highway authority and to the wording agreed with the planning authority.
 10. During construction works on site, all roads and footpaths are to be swept and kept clear of obstructions, this is to include existing highways as appropriate to ensure safe passage of all road users.
 11. Provision shall be made for the installation of all mains services including ducting prior to the laying of the road base-course.
 12. All road markings and signs are to be in accordance with 'The Traffic Signs Regulations and Directions' 2016.
 13. All sewer works are to be in accordance with the Sewerage Sector Guidance.
 14. All private connections to adoptable sewers should be a minimum of 100mm diameter (foul) and 150mm diameter (surface) made in vitrified clay connecting soffit to soffit.

Drainage Key			
Surface Water Manhole	CL 00.00 IL 00.00 BD 00.00	Foul Water Manhole Text	CL 00.00 IL 00.00
Surface Water Pipe	PN 1.000 100/80	Foul Water Pipe Diameter / Gradient	100/80
Existing Inspection chamber	480mm Ø >600mm Depth	Inspection chamber	480mm Ø >600mm Depth
Inspection chamber	225mm Ø <600mm Depth	Existing Surface Water Manhole Text	
Rain Water Pipe	rwp	Existing Foul Sewer	
Rodding Eye	RE IL 00.00	Existing Foul Water Manhole Text	
Permeable Paving (Sub-base depth shown on plan)		Site Boundary	
Permeable Paving (325mm sub-base)		Flow Control Chamber	
Perforated Pipe		Channel Drain	
		Exceedance Flow Route	



P2 Preliminary Issue	MKR BN	16.02.2025
P1 Preliminary Issue	MKR BN	30.10.2025
Issue	Notes	Drawn Approved Date

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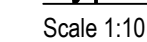
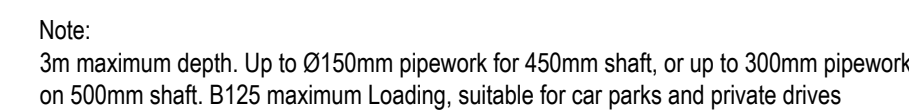
Issuing Office:
JMS East Anglia (Ipswich): Unit 10, Brightwell Barns
Brightwell, Suffolk, United Kingdom, IP10 0BJ, Tel: 01473 487047

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Former Filling Station, Bury Old Road, Prestwich
Manchester, M25 0EY

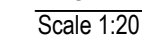
Drawing Title
Proposed Drainage Layout
Layout

Project No.	Drawing No.	Issue
EX25/331/09	201	P2

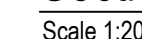
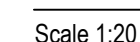
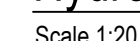
PRELIMINARY



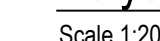
1. Do not scale this drawing. All dimensions are in metres unless otherwise noted. Any discrepancies are to be recorded and reported to the engineers immediately.
2. This drawing is to be read in conjunction with all other engineers and architects drawings, and the specification.
3. All work is to be to the satisfaction of the engineer and local authority building control.
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14. All private connections to adoptable sewers should be a minimum of 100mm diameter (foul) and 150mm diameter (surface) made in vitrified clay connecting soft to soft.



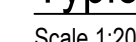
Note:
Pipe protection is required by one of the three methods shown where cover is <600mm in un-trafficked areas and <900mm elsewhere.



Attenuation Tank Schedule						
Tank Ref.	Length(m)	Width(m)	Depth(m)	Cover Level	Invert Level	Top Tank Level
1	14	5.5	1.2	Varies	48.283	49.483



Scale
As Shown



For Planning Only

PRELIMINARY

Appendix E – Ground Investigation Report

4.0 SITE INVESTIGATION

4.1 Site Investigation Rationale

The location of the exploratory holes was decided based on the conceptual ground model and the previous investigations having difficulty penetrating the ground in the eastern end of the site. It should be noted that in 2022 four boreholes (BH3 & BH3A to BH3C) were attempted below the former forecourt of the site. A whole day was spent with a coring team and a cable percussive boring rig and crew. However, the deepest hole was less than 1 m due to multiple layers of concrete/obstructions. Note that no hydrocarbon odours or visual evidence of hydrocarbons were encountered in any of these holes.

The proposed wells were located as follows:

- MW1 to MW3 located in the basement down hydraulic gradient of the former tanks.
- MW4 located in the basement below the former tanks.
- MW5 located to the east of the basement but to the west of the former pumps to be down hydraulic gradient of any minor spillages. First attempt (MW105A) hit an obstruction at 0.70 m). Repositioned to MW105.

The as dug hole locations are shown in Figure 5, together with the holes from previous investigations.

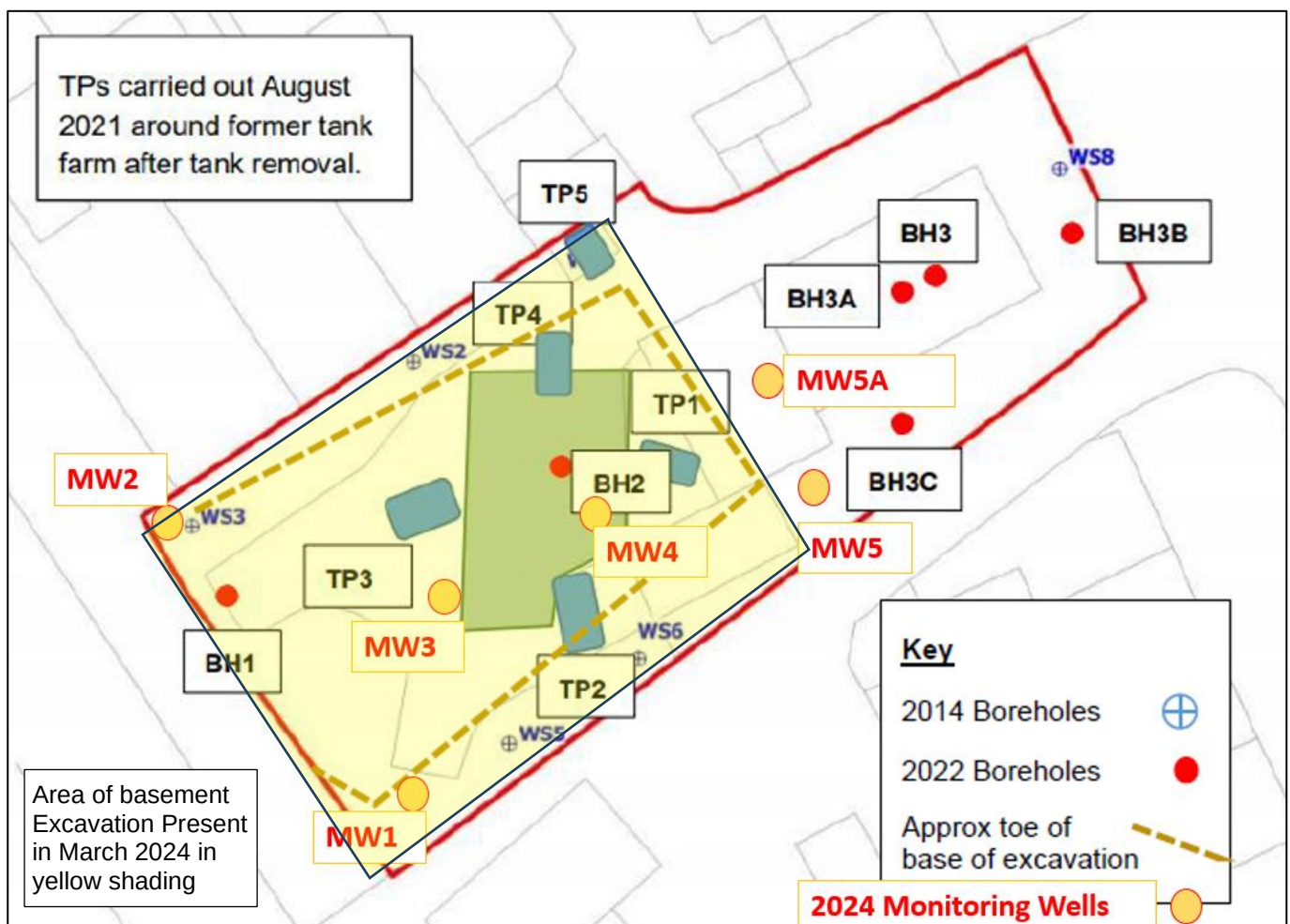


Figure 5: Exploratory Hole Locations

4.2 Fieldwork

Boreholes

The boreholes were conducted on the 14th March 2024. A Chartered Geologist with 25 years experience supervised the works, described the ground encountered, carried out in situ testing and collected the samples for testing.

Fieldwork procedures were undertaken in accordance with the relevant sections of: BS5930:2015 + A1:2020 Code of Practice for Site Investigations and BS10175: 2011+A2:2017: Investigation of potentially contaminated sites.

The investigation comprised holes drilled using a DART window sample rig. 51 mm internal diameter HDPE monitoring wells were installed as deep as possible. Difficulty in sinking the holes was found due to high groundwater conditions. Blowing sands were encountered which infilled the casing, hence the holes could not be cased off.

The hole locations were surveyed using a survey grade GPS system.

The depths of exploratory holes, descriptions of strata encountered and comments on groundwater conditions are given on the records in Appendix III with a list of all of the holes in Table 4 below:

Table 4: Summary of Exploratory Holes					
Exploratory hole ID:	Type:	Date:	Maximum Depth (m bgl) (m OD):	Termination Reason	Monitoring Well Slotted Section, mbgl
MW1	Window Sample	14/03/2024	3.00 (70.04)	Water ingress prevented further progress	1.5 m to 2.0 m*
MW2	Window Sample	14/03/2024	2.00 (70.82)	Water ingress prevented further progress	1.0 m to 2.0 m
MW3	Window Sample	14/03/2024	3.00 (69.97)	Water ingress prevented further progress	1.0 m to 2.0 m*
MW4	Window Sample	14/03/2024	4.00 (69.25)	Water ingress prevented further progress	0.5 m to 1.5 m*
MW5A	Window Sample	14/03/2024	0.70 (76.72)	Obstruction (brickwork)	-
MW5	Window Sample	14/03/2024	6.00 (71.44)	Target depth	1.5 m to 2.5 m *

*Well could not be installed deeper due to collapsing ground

Sampling and Chemical Analysis of Soils

On-site testing was carried out using a PID to test for volatile hydrocarbons (VOCs). The procedures used were in accordance with the CIRIA “VOCs Handbook. Investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination (C682, 2009)” using the headspace method with soils in sealed separate plastic bags. These were separate to the samples taken for laboratory chemical analysis. The results of the PID tests are presented on the logs with all test results being less than the instrument detection limit of 1 ppm.

Disturbed samples of material from beneath the site were collected for laboratory analysis. Samples were taken at regular depths, changes in strata and any discrete horizons. Samples were obtained using a fresh pair of nitrile gloves.

Samples scheduled for analysis of organic contaminants were placed in amber glass jars with a minimum of headspace. The glass jars were immediately sealed with polytetrafluoroethylene (PTFE) lined caps and labelled. The small disturbed samples were placed in polypropylene tubs with a minimum of headspace, sealed with airtight polypropylene 'snap-on' lids and labelled. The labels detailed individual sample number, location, depth and sampler identity.

Collected samples were stored away from sunlight in temperature controlled conditions and transported by courier to the laboratory. Chain of custody forms were completed for all samples sent to the laboratory. The forms detailed individual bottle identification number and sample location..

Sampling and Chemical Analysis of Groundwater

On the 18th March 2024, the wells were developed and purged with three well volumes of water removed from MW1, 3, 4 and 5. Only one well volume was removed from MW2 as it was purged dry and was very slow to recover.

Ground Gas Monitoring

Two rounds of ground gas monitoring were carried out on 20th and 27th March 2024. On 20th March this monitoring was prior to sampling the wells. The monitoring was to determine whether there was any evidence of hydrocarbons in the wells through the presence of methane and PID measurements. The results of this ground gas monitoring is summarised below:

- All methane concentrations were less than the instrument detection limit of 0.1 %.
- All PID measurements were less than the instrument detection limit of 1 ppm.
- Carbon dioxide concentrations varied from 0.1 to 0.5 % in MW1 to MW4 with 0.8% in MW5.
- Oxygen concentrations varied from 13.5 to 18.7 % w/w.
- All H₂S and CO concentrations were less than the instrument detection limit of 1 ppm.
- The atmospheric conditions on 20th March 2024 varied from 997 to 998 mbar but was higher than 1,000 mbar on 27th March 2024.
- Note that in MW1 to MW4 the filter sections were completely flooded so gas monitoring was just from de-gassing of groundwater with only MW105 having a water level lower than the top of the filter section.

The groundwater levels were recorded after the monitoring as presented in Section 5.4.

Sampling of Groundwater

Following the initial round of ground gas monitoring on 20th March 2024 the wells were sampled. The groundwater samples were collected using procedures that ensured the collection and preservation of sample quality. All water samples were taken using separate disposable bailers, to avoid cross contamination, with a bottom pour tap, to minimise the loss of more volatile components. A fresh pair of nitrile gloves were used for sampling each well.

Samples were placed in laboratory prepared amber bottles with a minimum of headspace. The bottles were immediately sealed with polytetrafluoroethylene (PTFE) lined caps and labelled. The labels detailed individual sample number, location, depth and sampler identity. Each sample comprised two amber glass bottles and two amber glass vials.

The dispatched to the laboratory on the same day as they were taken in a cool box with frozen freezer packs and appropriate chain of custody records.

There was no evidence of floating free hydrocarbon product (LNAPL) at the site.

4.3 Laboratory Analysis

The soil samples were sent to The Environmental Laboratory (ELAB) in Hastings for the analysis which comprised just PAH, TPH CWG and VOC analysis. The water samples were sent to i2Analytical Ltd and were tested for pH, heavy metals, sulphate, phenol, PAH, TPH CWG and VOC analysis. The results of the testing are presented in Appendix IV.

5.0 GROUND CONDITIONS

5.1 Anthropogenic Material

A thin layer of capping/6F5 and sub-base materials were encountered in the holes located in the basement level holes (MW1 to MW4) above a geotextile fabric (excavation base). This material was mainly virgin limestone aggregate with limited quantities of a recycled aggregate present (mainly brick).

MW5A found demolition materials and a brick obstruction at 0.70 m bgl.

In MW5 there was 3.00 m (to 74.44 m OD) of fill encountered comprising demolition materials, ash and natural gravels. The bottom 0.25 m of fill was clay with glass, ash, mortar, quartz and a piece of rubber.

5.2 Natural Superficial Material

Glaciofluvial sheet deposits comprising mainly silty sands with varying amounts of silt were encountered in holes MW1 to MW4.

5.3 Bedrock

Bedrock was not encountered in this phase of investigation.

5.4 Groundwater

Groundwater was encountered in all holes except MW5A during drilling and installation. Blowing sands were encountered.

The groundwater level monitoring is presented below:

Table 5: Groundwater Depths and Levels							
Hole ID	Depth to Base of Well (m)	Depth to Groundwater (m bgl)			Reduced Level of Groundwater (m OD)		
		18/03/24	20/03/24	27/03/24	18/03/24	20/03/24	27/03/24
MW1	2.10	0.38	0.37	0.37	72.66	72.67	72.67
MW2	1.80	0.25	0.29	0.30	72.57	72.53	72.52
MW3	1.77	0.30	0.25	0.26	72.67	72.72	72.73
MW4	1.35	0.50	0.48	0.49	72.75	72.77	72.76
MW5	4.00	3.02	2.94	2.95	74.42	74.50	74.49

The groundwater levels on 20th March 2024 are presented in Figure 6. The direction of groundwater flow is towards the southwest.

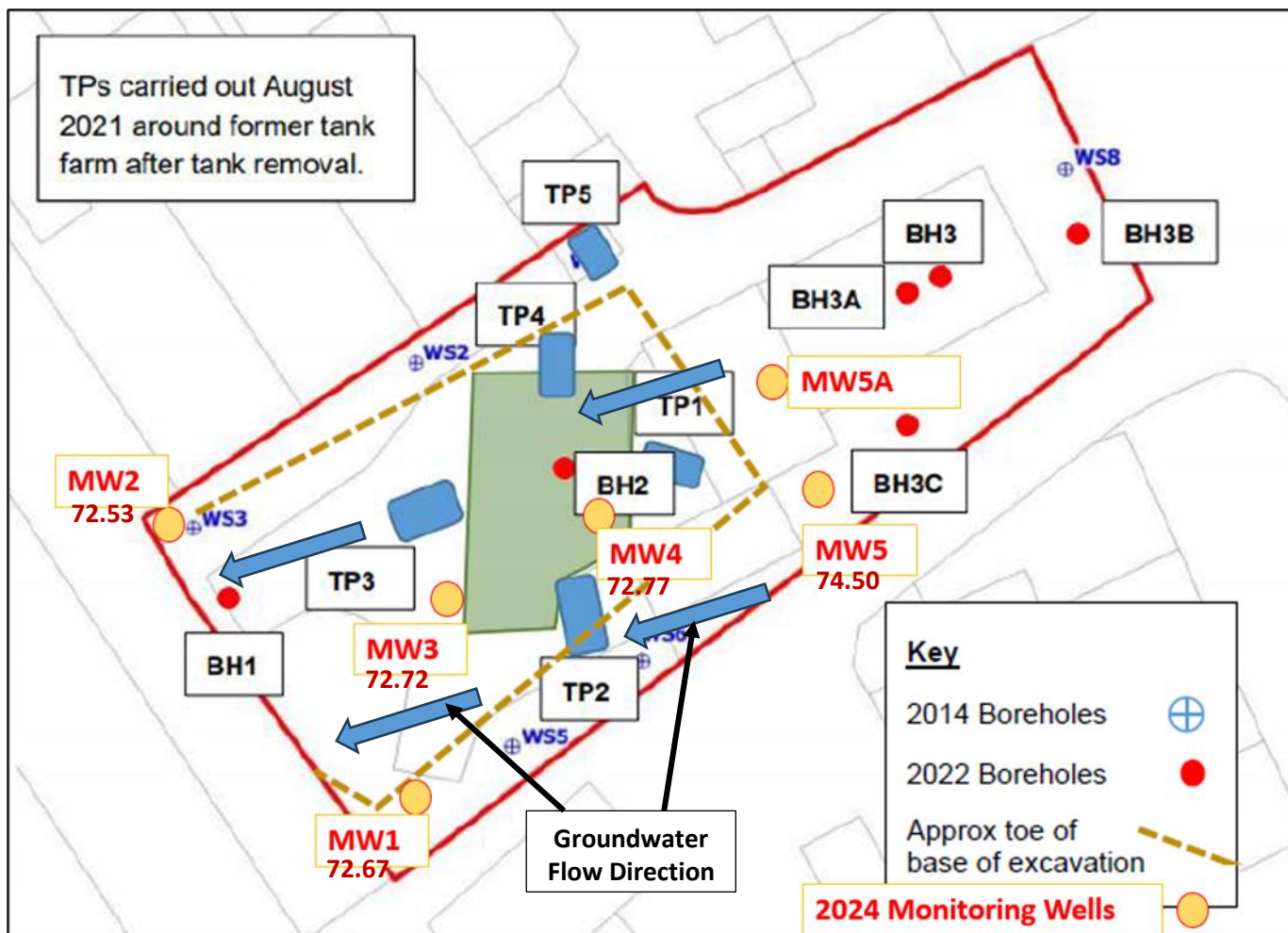


Figure 6: Reduced Level of Groundwater on 20th March 2024 (m OD)

5.5 Contamination

There was no visual or olfactory evidence of contamination noted during the fieldwork other than some ash in MW5 (a potential source of contaminants, particularly PAHs).

All site PID readings were less than the instrument's detection limit.

5.6 Geological Cross Section

A cross section is shown in Figure 7.

6.0 CONTROLLED WATERS RISK ASSESSMENT

6.1 Concentrations in Soils

Testing of the soils was carried out to determine whether there was a source of TPH present in the soil or whether migrating TPH in the groundwater had adhered to the soils.

All site PID readings were less than the instrument detection limit of 1 ppm.

Ten soil samples tested, two per borehole (not including MW105A) for TOC, Speciated PAHS, TPH CWG and BTEX. The samples were at depths from 0.90 m to 6.00 m. Except for the Made Ground in MW5 at 0.30 m, none of the Made Ground/sub-base was sampled and tested as this had been imported as part of the recent construction works. Nine samples of the natural soils were tested to determine whether there had been migration of hydrocarbons from tanks or spillages into the underlying Secondary A drift aquifer. All of the test results on these samples of the natural glacial soils were less than the detection limit.

The Made Ground in MW5 at 0.30 m depth was sampled and this material was described as being ashy. The results are summarised below:

- The TOC was 2.0%.
- PAHs were present, these are summarised below:

Naphthalene	0.09 mg/kg	Residential gardens criteria for human health 2.3 mg/kg
Benzo(a)pyrene	1.28 mg/kg	Residential gardens criteria for human health 2.2 mg/kg
Dibenzo(a,h)anthracene	0.16 mg/kg	Residential gardens criteria for human health 0.24 mg/kg
Total PAH(16)	21.4 mg/kg	Residential gardens criteria for human health – None
- TPH:

The Aliphatic TPHs were all less than the detection limits.

The Aromatic C5 to C10 fractions were all less than the detection Limit:

Aromatic >C ₁₀ - C ₁₂	9.0 mg/kg	Residential gardens criteria for human health 74 mg/kg
Aromatic >C ₁₂ - C ₁₆	30 mg/kg	Residential gardens criteria for human health 160 mg/kg
Aromatic >C ₁₆ - C ₂₁	60 mg/kg	Residential gardens criteria for human health 260 mg/kg
Aromatic >C ₂₁ - C ₃₅	42 mg/kg	Residential gardens criteria for human health 110 mg/kg
Aromatic C ₅ - C ₃₅	140 mg/kg	Residential gardens criteria for human health – None
Total TPH >C ₅ - C ₃₅	140 mg/kg	Residential gardens criteria for human health – None

Note that:

 1. The Human Health Criteria above assume that the soils are exposed at the surface and vegetable are grown in these soils.
 2. The commercial land use criteria are considerably higher than the above criteria.
 3. The site will be covered by the building or hard standing so there is no pathway to human health for these higher molecular weight contaminants.

The TPH concentrations indicate that the source is the PAHs and by using double ratio PAH plots this indicates that the PAHs are likely to be present due to coal derived ash rather than a petroleum hydrocarbon origin.

Overall, the field and laboratory testing of the soils indicates an absence of petroleum hydrocarbon contamination in the soils below the site.

6.2 Controlled Waters Assessment Methodology

The assessment of contamination has been carried out in accordance with the overall guidance presented in Environment Agency (2023) “Land Contamination Risk Management (LCRM) procedures.” The risks to controlled waters (groundwater and surface waters) from contaminants on-site have also been assessed in accordance with the EA documents “The Environment Agency’s Approach to Groundwater Protection” (2017) and Remedial Targets Methodology (RTM, 2006). Pollutant inputs from contaminated land sites are considered as passive inputs under the European Water Framework Directive (2000/60/EC) (WFD) and its daughter Directives, and as such are regulated under the Agency’s ‘limit’ pollution

objective. Acceptable water quality targets (WQT) are defined for protection of human health (based on Drinking Water Standards (DWS)) and for protection of aquatic ecosystems (Environmental Quality Standards (EQS)).

It should be noted that in terms of risk to controlled waters:

- The risk to surface waters is negligible given the 1.8 km distance to the nearest surface water body down gradient of the site.
- The risk to the bedrock Secondary A aquifer is negligible due to the absence of a viable pathway because there are two non-aquifer strata above the bedrock which are low permeability, one being the laminated clays and sands within the glacial drift deposits and also the basal clay deposits located above the bedrock. Also note that no piling is to be carried out at the site so the construction will not create new pathways.
- There is a risk that there could be hydrocarbons in the shallow strata of the glacial drift deposits.

6.3 Groundwater Test Results

PAHs

All the PAHs in MW1, MW3 and MW4 were lower than the detection limits. In MW2 four PAHs were detected above the detection limit but these were all less than the assessment limits. However, in MW5, there were elevated PAHs in this well with the response zone principally in the ashly Made Ground:

Table 6: Summary of Water Analysis for PAHs

Contaminant	Units	Drinking Water Standard	EQS Freshwater		Other	Groundwater Test Results				
			Annual Average	Maximum Admissible Concentration		MW1	MW2	MW3	MW4	MW5
Naphthalene	ug/l	10 ^[2]	2.0	130	10	<0.01	<0.01	<0.01	<0.01	0.43
Acenaphthylene	ug/l	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	ug/l	-	-	-	-	<0.01	0.13	<0.01	<0.01	1.10
Fluorene	ug/l	-	-	-	-	<0.01	<0.01	<0.01	<0.01	0.58
Phenanthrene	ug/l	-	-	-	-	<0.01	0.17	<0.01	<0.01	6.40
Anthracene	ug/l	-	0.10	0.10	-	<0.01	<0.01	<0.01	<0.01	2.10
Fluoranthene	ug/l	-	0.01	0.12	0.10	<0.01	0.33	<0.01	<0.01	18.00
Pyrene	ug/l	-	-	-	-	<0.01	0.32	<0.01	<0.01	17.00
Benzo[a]anthracene	ug/l	-	-	-	-	<0.01	<0.01	<0.01	<0.01	9.90
Chrysene	ug/l	-	-	-	-	<0.01	<0.01	<0.01	<0.01	9.70
Benzo[b]fluoranthene	ug/l	-	1.70	0.017	-	<0.01	<0.01	<0.01	<0.01	13.00
Benzo[k]fluoranthene	ug/l	-	1.70	0.017	-	<0.01	<0.01	<0.01	<0.01	4.30
Benzo[a]pyrene	ug/l	0.01	1.70	0.27	0.70	<0.01	<0.01	<0.01	<0.01	11.00
Indeno[1,2,3-cd]pyrene	ug/l	-	-	-	-	<0.01	<0.01	<0.01	<0.01	5.50
dibenzo[a,h]anthracene	ug/l	-	-	-	-	<0.01	<0.01	<0.01	<0.01	1.60
Benzo[ghi]perylene	ug/l	-	1.70	8.2	-	<0.01	<0.01	<0.01	<0.01	6.40
Total EPA-16 PAHs	ug/l	-	-	-	-	<0.16	0.95	<0.16	<0.16	107.00
PAH Total 4 DWS [#]	ug/l	0.1	-	-	0.1	<0.04	<0.04	<0.04	<0.04	29.20

Note:

Pink shading indicates above UKEQS.

Total of 4 Drinking Water Standard PAHs: Benzo[b]fluoranthene, Benzo[k]fluoranthene, Indeno[1,2,3-cd]pyrene, Benzo[ghi]perylene

TPH <C₁₀, VOCs including BTEX

All volatile hydrocarbons (i.e. TPH <C₁₀, VOCs including BTEX) are all less than the detection limits.

TPH >C₁₀

All TPH fractions for MW1 to MW4 were less than the detection limits. For MW5 (the well in the Made Ground in the elevated eastern part of the site where ash was present) there were no aliphatic PAHs or aromatic less than the C₁₂ range but there were slightly elevated aromatic TPH fragments greater than C₁₂:

TPH - Aromatic >C ₁₂ - C ₁₆	25 µg/l
TPH - Aromatic >C ₁₆ - C ₂₁	160 µg/l
TPH - Aromatic >C ₂₁ - C ₃₅	180 µg/l
TPH - Aromatic >C ₅ - C ₃₅	360 µg/l

Overall, the TPH concentrations indicate that the source in MW5 is the PAHs as per the soil sample of Made Ground in this location.

It should be noted that there are no UK set Environmental Quality Standards for TPH. The UK Drinking water standard for TPH (total) is 10 µg/l.

pH, sulphate

pH was in the range 7.2 to 8.5 which is relatively normal for a site like this, particularly given the site history and the recent construction works.

Sulphate concentrations range from 64.3 to 101 mg/l with an average of 82.1 mg/l and are relatively low and much less than the freshwater EQS.

Metals

The metal concentrations in the groundwater are summarised below:

Contaminant	Units	Drinking Water Standard	EQS Freshwater		Other	Groundwater Test Results					Summary of Groundwater Test Results		
			Annual Average	Maximum Admissible Concentration		MW1	MW2	MW3	MW4	MW5	Minimum	Average	Maximum
Arsenic	ug/l	10	50	-	50	0.42	1.51	1.71	0.69	1.49	0.42	1.16	1.71
Cadmium	ug/l	5	0.15	0.45	5	0.04	0.05	< 0.02	< 0.02	< 0.02	< 0.02	0.03	0.05
Chromium (total)	ug/l	-	-	-	-	1.30	3.7	6.4	2.2	14.2	1.3	5.6	14.2
Chromium (III)	ug/l	-	4.7	-	-								
Chromium (VI)	ug/l	-	3.4	-	-								
Copper	ug/l	2000	1*	-	28	1.0	7.5	14	1.6	2.4	1.0	5.3	14
Lead	ug/l	25	1.2	14	-	< 0.2	0.3	< 0.2	0.2	0.5	< 0.2	0.3	0.5
Mercury	ug/l	1	-	0.07	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	ug/l	20	4*	34	200	1.5	4.8	1.4	0.8	1.0	0.8	1.9	4.8
Selenium	ug/l	10	-	-	10	1.8	6	0.8	1.0	8.6	0.8	3.64	8.6
Zinc	ug/l	5000	10.9*	-	500	18	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	4.0	18

Note: Pink shading indicates above UK EQS.

The results of the metals analysis indicate that there is:

- Locally elevated chromium concentrations
- Widespread slightly elevated copper concentrations
- Locally elevated zinc concentrations at MW1.

It is assessed that the copper concentrations are probably due to the general background concentrations at the site as this is widespread and unlikely to be related to previous land use. The elevated chromium and zinc concentrations are localised and do not warrant further assessment.

6.4 Summary of Controlled Waters Assessment

In terms of petroleum hydrocarbons in soil samples there was no trace encountered in the natural strata below the site in any of the nine samples tested as part of this investigation and all of the 32 PID tests on soil samples were less than detection limit of 1 ppm. Additionally, the five new wells were also monitored for ground gases on two occasions and all readings were less than the detection limit for methane and PID readings were again less than 1 ppm.

There was a limited amount to PAHs in the Made Ground in MW5 (located in the upper level) but this is due to the presence of ash rather than petroleum hydrocarbons. Aromatic TPHs were present in this sample commensurate with the presence of the PAHs.

Overall, there is no evidence of significant concentrations of petroleum hydrocarbons present in the soils at this site as assessed in this investigation or at the earlier investigations.

The groundwater sampling and testing found similar results to the soil samples. Again, there was no TPH or BTEX/VOCs in the down gradient holes (MW1 to MW3) or MW4 located below the main tank farm. There were elevated PAHs and corresponding aromatic TPH fractions in the well in MW5 but this is again assessed as being due to PAHs. It is assessed that this does not pose a significant risk that requires further assessment or mitigation because there is no evidence of contamination in the four wells located within the basement area and all of these are down-gradient of thus upper area. Also, with the completed development having almost 100% impermeable cover (the building and hard standing) there will be negligible rainwater penetrating into the site and this will reduce potential contaminant leaching and groundwater flows.

It is recognised that there were no samples taken directly below the former fuel pumps, but this was due to known obstructions and difficulty in direct investigation of this area. However, if there had been any significant spillages in this area, the hydrocarbons would migrate to the southwest of the site and would be encountered and measured in the four down-gradient wells located within the footprint of the basement. This was not encountered so if there is any residual hydrocarbons present they are not mobile and do not pose a risk to controlled waters.

There are slightly elevated concentrations of some metals in the groundwater at this site but this is assessed to be due to general background conditions in the area and not due to the former site use.

It is acknowledged that only the groundwater in the upper strata of the granular glacial deposits has been sampled and tested but if there had been significant leakage of fuel, there would be evidence in this upper stratum. The presence of the lower permeability strata at a depth of about 6.0 m below the basement would also mean that higher concentrations of petroleum hydrocarbons would be encountered at shallow depth rather than depth.

Given the concentrations in the shallow drift and that there is a layer of low permeability sandy clay immediately above the bedrock, the risk to the Secondary A bedrock aquifer is assessed as being negligible.

Note that all of the soil samples had concentrations of volatile hydrocarbons (the lighter TPH fractions and BTEX) less than the detection limit. There were also no volatile TPH or BTEX/VOC compounds present in the groundwater samples across the site. If there had been significant spillages of petrol (which was the majority of the fuel sold at this site) then it is anticipated that there would be at least some of these compounds still present.

7.0 CONCLUSION

Previous phases of investigation have found no evidence of significant concentrations of hydrocarbons present at this site that warranted further investigation or remediation.

This supplementary investigation also demonstrated that there is no evidence of significant concentrations of petroleum hydrocarbons present in the soils at this site as assessed in this investigation and there were no significant concentrations of hydrocarbons in the four wells installed below the basement which is down hydraulic gradient of the upper area of the former fuel dispensing pumps and the proposed car park.

There were no volatile hydrocarbons present at the site in the TPH CWG and BTEX testing of the soil. There was also no volatile TPH or BTEX/VOC compounds present in the groundwater samples across the site. If there had been significant spillages of petrol (which was the majority of the fuel sold at this site) then it is anticipated that there would be at least some of these compounds present.

Based on the negligible measured concentrations of total contaminant concentrations at the site in the soils in both this investigation and in the earlier investigations and the recent groundwater sampling and testing there is a negligible risk to controlled waters with no further action required.

END OF REPORT



APPENDIX I – LIMITATIONS

APPENDIX I - LIMITATIONS

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between Eccles Associates Ltd and the Client as indicated in Section 1.0.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency/Natural Resources Wales. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. In addition to the above Eccles Associates Ltd note that when investigating, or developing, potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and also with time. The absence of certain ground, ground gas, and contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Due to the presence of existing buildings and structures access could not be obtained to all areas. Additional contamination may be identified following the removal of the buildings or hard standing.
7. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
8. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
9. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
10. This report presents an interpretation of the geotechnical information established by excavation, observation, and testing. Whilst every effort is made in interpretative reporting to assess the soil conditions over the Site it should be noted that natural strata vary from point to point and that man-made deposits are subject to an even greater diversity. Groundwater conditions are dependent on seasonal and other factors. Consequently, there may be conditions present not revealed by this investigation.
11. Eccles Associates Ltd cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by Eccles Associates Ltd is owned by them and no such plans or documents may be reproduced, published, or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by Eccles Associates Ltd in this connection without their explicit written agreement there to by Eccles Associates Ltd.
12. Rather, this investigation has been undertaken to provide a preliminary characterisation of the existing sub-surface geotechnical characteristics and make up and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.
13. This investigation has been undertaken to reasonably characterise existing sub-surface conditions and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II – SITE PHOTOGRAPHS



Photograph Location Plan



1



2



3



4



5 Substation



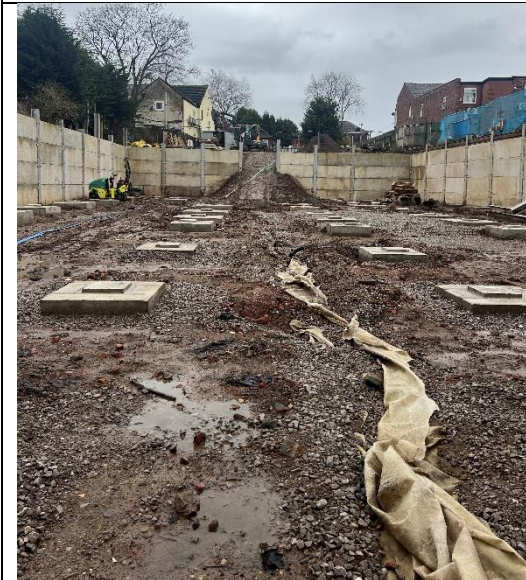
6



7 Adjacent Land



8



9



10



11



12: MW3 in progress

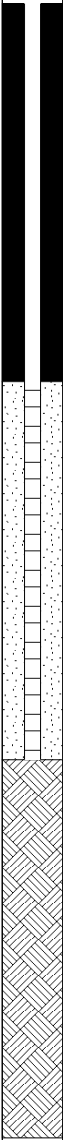
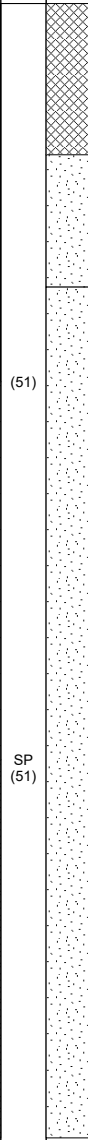
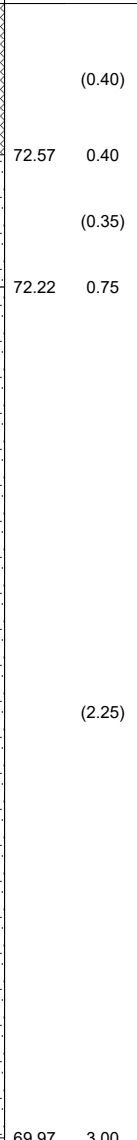
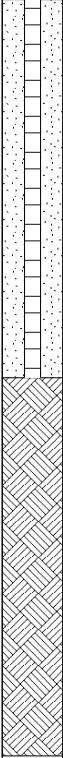
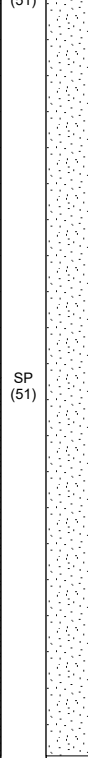
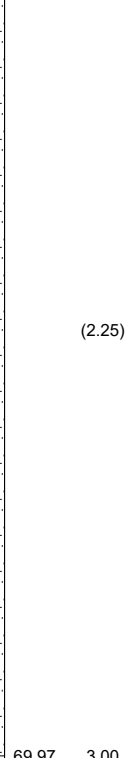
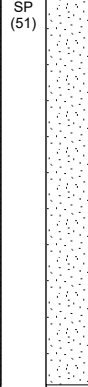
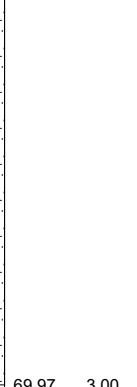
APPENDIX III – EXPLORATORY HOLE LOGS AND INSITU TESTING

EAL Dynamic Sample Log										Exploratory position reference: MW1 Sheet 1 of 1					
Borehole formation details:										Location details:					
Type: WLS	From: 0.00	To: 3.00	Start date: 14-03-24	End date: 14-03-24	Crew:	Plant: DART	Logger: CK	Logged: 14-03-24	Remarks:		mE: 382852.42				
												mN: 402502.27			
												mOD: 73.04			
												Grid: OSGB			
Backfill/Instaln	Water-strike	Legend	Level	Depth (thickness)	Stratum Description	Samples & In Situ Testing									
						Water	Casing	Depth	Type & No	Results					
			72.74	0.30	Brown slightly gravelly fine to coarse SAND. Gravel is angular brick, concrete and tile. Fabric at base. (MADE GROUND)			0.50 0.50	PID ES1	<1.0 ppmv					
				(0.30)	Light brown fine to coarse SAND. Occasional dark grey laminations. (GLACIALFLUVIO SHEET DEPOSITS - DEVENSIAN - SAND AND GRAVEL) 0.30 m: Fabric										
				(0.70)											
				72.04											
				1.00	Light brown silty fine to coarse SAND. (GLACIALFLUVIO SHEET DEPOSITS - DEVENSIAN - SAND AND GRAVEL)								0.70	PID	<1.0 ppmv
(2.00)															
70.04	3.00	Dynamic sample ends at 3.00 m (Refusal)			3.00 3.00	PID ES2	<1.0 ppmv								
(51)															
SP (51)															

Inst (Ø)						Water	Casing	Depth	Type & No	Results	
Groundwater entries:		Casing:		Depth related remarks:				Run details:			
Struck: Rose to:	Casing: Sealed:	Cased to:	Diameter (mm):	From 0.00	to: 3.00	Remarks Wet		From: 0.00	to: 1.00	Ø 90	Duration: 100
								1.00	2.00	90	100
								2.00	3.00	90	100
Log issue: DRAFT		Project: Former Petrol Filling Station, Bury Old Road				Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.					
Scale: 1:20		Project No: 24-011									
Checked/approved by: DD/CSE		Client: Unimore Ltd									
Printed: 21/03/2024 16:12											

Location details:

	Inst (Ø)										Water	Casing		Depth	Type & No	Results	
Groundwater entries:				Casing:			Depth related remarks:						Run details:				
Struck: Rose to: Casing: Sealed:				Cased to: Diameter (mm):			From to: Remarks 0.00 2.00 Wet						From: to: Ø Duration: Recovery: 0.00 1.00 90 100 1.00 2.00 90 100				
Log issue: DRAFT				Project: Former Petrol Filling Station, Bury Old Road										Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.			
Scale: 1:20				Project No: 24-011													
Checked/approved by: DD/CSE				Client: Unimore Ltd													
Printed: 21/03/2024 16:12																	

EAL Dynamic Sample Log										Exploratory position reference: MW3 Sheet 1 of 1									
Borehole formation details:															Location details:				
Type: WLS	From: 0.00	To: 3.00	Start date: 14-03-24	End date: 14-03-24	Crew:	Plant: DART	Logger: CK	Logged: 14-03-24	Remarks:						mE: 382855.67				
															mN: 402513.45				
															mOD: 72.97				
															Grid: OSGB				
Backfill/Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing													
						Water	Casing	Depth	Type & No	Results									
			72.57	0.40 (0.35)	Brown and grey slightly clayey sandy fine to coarse angular limestone GRAVEL with occasional brick (HARDCORE). Fabric at base. (MADE GROUND)			0.50	PID	<1.0 ppmv									
					Light brown silty fine to coarse SAND. Occasional laminations of fine dark grey carbonaceous mudstone sand and gravel. (GLACIALFLUVIO SHEET DEPOSITS - DEVENSIAN - SAND AND GRAVEL)														
					Light brown silty fine to coarse SAND. (GLACIALFLUVIO SHEET DEPOSITS - DEVENSIAN - SAND AND GRAVEL)														
			72.22	0.75 (2.25)				1.50	PID	<1.0 ppmv									
			69.97	3.00	Dynamic sample ends at 3.00 m (Refusal)			3.00 3.00	PID ES2	<1.0 ppmv									
Inst (Ø)															Water	Casing	Depth	Type & No	Results
Groundwater entries:					Casing:			Depth related remarks:				Run details:							
Struck: Rose to: Casing: Sealed:					Cased to: Diameter (mm):			From to: Remarks 0.00 3.00 Wet				From: to: Ø Duration: Recovery: 0.00 1.00 90 100 1.00 2.00 70 100							
Log issue: DRAFT					Project: Former Petrol Filling Station, Bury Old Road					Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.									
Scale: 1:20					Project No: 24-011														
Checked/approved by: DD/CSE					Client: Unimore Ltd														
Printed: 21/03/2024 16:12																			

EAL Dynamic Sample Log										Exploratory position reference: MW4 Sheet 1 of 1				
Borehole formation details:										Location details:				
Type: WLS	From: 0.00	To: 4.00	Start date: 14-03-24	End date: 14-03-24	Crew:	Plant: DART	Logger: CK	Logged: 14-03-24	Remarks:	mE: 382862.68	mN: 402519.02	mOD: 73.25	Grid: OSGB	
Backfill/Instaln	Water-strike	Legend	Level	Depth (thickness)	Stratum Description	Samples & In Situ Testing								
						Water	Casing	Depth	Type & No	Results				
				(0.50)	Brown and grey fine to coarse angular GRAVEL of limestone, carbonaceous mudstone, brick, tile and concrete. (HARDCORE). Fabric at base. (MADE GROUND)			0.30	PID	<1.0 ppmv				
	(51)		72.75	0.50	Light brown silty slightly gravelly fine to coarse SAND. Gravel is rounded quartz. Occasional fine dark grey carbonaceous mudstone gravel. (GLACIALFLUVIO SHEET DEPOSITS - DEVANSIAN - SAND AND GRAVEL)			0.80	PID	<1.0 ppmv				
								1.50	PID	<1.0 ppmv				
				(3.50)				3.00	PID	<1.0 ppmv				
								3.20	PID	<1.0 ppmv				
								3.20	ES1	<1.0 ppmv				
								3.50	PID	<1.0 ppmv				
								4.00	PID	<1.0 ppmv				
								4.00	ES2	<1.0 ppmv				
Dynamic sample ends at 4.00 m (Target depth)														
Inst (Ø)						Water	Casing	Depth	Type & No	Results				
Groundwater entries:			Casing:			Depth related remarks:			Run details:					
Struck: Rose to: Casing: Sealed:			Cased to: Diameter (mm):			From to: Remarks 0.00 4.00 Wet			From: to: Ø Duration: Recovery: 0.00 1.00 90 100 1.00 2.00 90 100 2.00 3.00 90 100 3.00 4.00 60 100					
Log issue: DRAFT			Project: Former Petrol Filling Station, Bury Old Road			Notes: For explanation of symbols and abbreviations see Key Sheet.								
Scale: 1:20			Project No: 24-011			All depths and reduced levels are in metres.								
Checked/approved by: DD/CSE			Client: Unimore Ltd											
Printed: 21/03/2024 16:12														

EAL Dynamic Sample Log										Exploratory position reference: MW5 Sheet 1 of 2				
Borehole formation details:										Location details:				
Type: WLS	From: 0.00	To: 6.00	Start date: 14-03-24	End date: 14-03-24	Crew:	Plant: DART	Logger: CK	Logged: 14-03-24	Remarks:	mE: 382887.52	mN: 402529.95	mOD: 77.44	Grid: OSGB	
Backfill/Instal'n	Water-strike	Legend	Level	Depth (thickness)	Stratum Description	Samples & In Situ Testing								
						Water	Casing	Depth	Type & No	Results				
			77.19	0.25	Dark brown clayey sandy fine to coarse angular GRAVEL of concrete, brick and occasional carbonaceous mudstone. Occasional rounded quartz. (MADE GROUND)									
			(51)	(2.50)	Brown and grey clayey sandy fine to coarse GRAVEL with a high cobble content. Gravel and cobbles of brick, mortar, concrete and sandstone. Occasional carbonaceous mudstone and ash. (MADE GROUND)			0.70	PID	<1.0 ppmv				
							1.80	PID	<1.0 ppmv					
			74.69	2.75	Soft dark brown and dark grey very sandy slightly gravelly CLAY. Gravel is angular of glass, ash and mortar. Occasional rounded quartz. 1 piece of rubber. (MADE GROUND)			2.80	PID	<1.0 ppmv				
			74.44	3.00	Light brown slightly silty slightly gravelly fine to coarse SAND. Occasional carbonaceous mudstone. Rare gravel of rounded quartz. (GLACIALFLUVIO SHEET DEPOSITS - DEVENSIAN - SAND AND GRAVEL)			3.00 3.00	PID ES1	<1.0 ppmv				
							3.40	PID	<1.0 ppmv					
							4.00 4.00	PID ES2	<1.0 ppmv					
Inst (Ø)						Water	Casing	Depth	Type & No	Results				
Groundwater entries:			Casing:			Depth related remarks:			Run details:					
Struck: Rose to: Casing: Sealed:			Cased to: Diameter (mm):			From to: Remarks 4.00 6.00 Wet			From: to: Ø Duration: Recovery: 0.00 1.00 90 80 1.00 2.00 90 50 2.00 3.00 90 70 3.00 4.00 70 100					
Log issue: DRAFT			Project: Former Petrol Filling Station, Bury Old Road			Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.								
Scale: 1:20			Project No: 24-011											
Checked/approved by: DD/CSE			Client: Unimore Ltd											
Printed: 21/03/2024 16:12														

EAL Dynamic Sample Log										Exploratory position reference: MW5 Sheet 2 of 2									
Borehole formation details:															Location details:				
Type: WLS	From: 0.00	To: 6.00	Start date: 14-03-24	End date: 14-03-24	Crew:	Plant: DART	Logger: CK	Logged: 14-03-24	Remarks:						mE: 382887.52				
										mN: 402529.95									
										mOD: 77.44									
										Grid: OSGB									
Backfill/Instal'n	Water-strike	Legend	Level	Depth (thickness)	Stratum Description	Samples & In Situ Testing													
						Water	Casing	Depth	Type & No	Results									
				(2.70)	Light brown silty slightly gravelly fine to coarse SAND. Occasional carbonaceous mudstone. Rare gravel of rounded quartz. (GLACIALFLUVIO SHEET DEPOSITS - DEVANSIAN - SAND AND GRAVEL)			4.50	PID	<1.0 ppmv									
								5.00	PID	<1.0 ppmv									
								6.00 6.00	PID ES3	<1.0 ppmv									
			71.74	5.70	Light brown and greyish brown banded silty fine to coarse SAND. Very faint oily odour, no sheen. (GLACIALFLUVIO SHEET DEPOSITS - DEVANSIAN - SAND AND GRAVEL)														
			(0.30)																
			71.44	6.00	Dynamic sample ends at 6.00 m (Target depth)														
Inst (Ø)						Water	Casing	Depth	Type & No	Results									
Groundwater entries:			Casing:			Depth related remarks:			Run details:										
Struck: Rose to: Casing: Sealed:			Cased to: Diameter (mm):			From to: Remarks			From: to: Ø Duration: Recovery:										
									4.00 5.00 60 100										
									5.00 6.00 50 65										
Log issue: DRAFT			Project: Former Petrol Filling Station, Bury Old Road						Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.										
Scale: 1:20			Project No: 24-011																
Checked/approved by: DD/CSE			Client: Unimore Ltd																
Printed: 21/03/2024 16:12																			

EAL Dynamic Sample Log										Exploratory position reference: MW5A Sheet 1 of 1				
Borehole formation details:										Location details:				
Type: WLS	From: 0.00	To: 0.70	Start date: 14-03-24	End date: 14-03-24	Crew:	Plant: DART	Logger: CK	Logged: 14-03-24	Remarks:	mE: 382884.50	mN: 402534.99	mOD: 77.42	Grid: OSGB	
Backfill/Instal'n	Water-strike	Legend	Level	Depth (thickness)	Stratum Description	Samples & In Situ Testing								
						Water	Casing	Depth	Type & No	Results				
			77.22	0.20	Grey fine to coarse angular limestone GRAVEL (HARDCORE) (MADE GROUND)			0.50	PID	<1.0 ppmv				
			(0.30)	Brown very gravelly silty fine to coarse SAND. Gravel is of rounded quartz, occasional brick. (MADE GROUND)										
			76.92	0.50	Whole bricks and pieces of wood. (MADE GROUND)									
			76.72	0.70	Dynamic sample ends at 0.70 m (Refusal)									
Inst (Ø)						Water	Casing	Depth	Type & No	Results				
Groundwater entries:			Casing:			Depth related remarks:			Run details:					
Struck: Rose to: Casing: Sealed:			Cased to: Diameter (mm):			From to: Remarks			From: to: Ø Duration: Recovery: 0.00 0.70 90 100					
Log issue: DRAFT Scale: 1:20 Checked/approved by: DD/CSE Printed: 21/03/2024 16:12			Project: Former Petrol Filling Station, Bury Old Road Project No: 24-011 Client: Unimore Ltd			Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.								





