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CIVIL AND STRUCTURAL CONSULTING ENGINEERS

Flood Risk Assessment and Drainage Strategy
Raise Rochdale PRU

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Project Name:	Brownhill School, Rochdale
Report Title:	Flood Risk Assessment and Drainage Strategy Report
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P1	S2	06/03/2026	BHB	AL	RP	Initial issue

Introduction

1.1 Background

Adept Consulting Engineers Ltd were appointed by Rochdale Borough Council to carry out a Flood Risk Assessment (FRA) and Drainage Strategy in support of a planning application for a new SEN school located in Rochdale.

1.2 Methodology

The study consisted of data collection and review, desk based research and consultation with regulatory bodies and third parties in relation to flood risk and drainage.

The Study provides a risk based assessment of potential flooding to the site caused by various sources, including fluvial, tidal, surface water/pluvial, groundwater, surcharged sewers and other man made sources. Mitigation measures are identified to address the risk to the site and any potential future risk to other land.

2.0 Limitations of report

This report has been prepared by Adept Consulting Engineers Limited on behalf of Rochdale Borough Council in accordance with the background and methodology described above in sections 1.1 and 1.2.

Preliminary calculations and a concept drainage design have been undertaken as part of this study. The preliminary calculations and concept design are based on the information and assumptions covered in this report at the time of preparation and provide a concept design for points of connection and general design parameters only.

The report is based on the interpretation and assessment of data provided by third parties. Adept Consulting Engineers Limited cannot guarantee the reliability of the third party information obtained. The conclusions and findings of the report may change if the third party data is subsequently amended or updated.

3.0 Executive Summary

SECTION	SUMMARY	
Location	Land West Of Mayfield Street, OL16 2UZ E:390758 N:414156	
Proposed Development	The proposed developed is a new SEN school.	
Land use	Greenfield	
Topography	The existing Topography for the proposed developed falls North to South. The existing topography has a upper and lower plateau with an existing 7m banking between the two. Upper plateau levels fall North To south, 135.3mAOD to 134.0mAOD. Lower plateau 129.1mAOD to 127.2mAOD.	
Site Boundaries	North	Mill view Lane (Residential area)
	East	Industrial Units
	South	Rochdale Borough Council Building and car park
	West	Mayfield Street and Industrial units.
Sequential and Exception Tests	N/A	
Fluvial (River) flooding	Low Risk	
Pluvial (Surface water) flooding	Low Risk	
Flooding from artificial sources	Low Risk	
Groundwater Flood Risk	Low Risk	
Development Impacts on Flood Risk	Whilst the construction of hard standings and buildings without mitigation will theoretically increase flood risk to downstream properties, this risk can be, and will be, safely managed as demonstrated within this report.	
Flood Risk Mitigation/management	In accordance with recommendations from the LLFA finished floor levels set generally 150mm above external levels.	
Surface Water Management	Infiltration has been ruled out following Ground investigation report. The site will discharge at 5.1l/s based off the proposed impermeable area against the greenfield run off rate. SuDS including permeable paving have been incorporated into the drainage scheme. Surface water will be stored in a basin on site to accommodate 100 year event including 45% for climate change.	
Foul Water Management	Foul water will discharge into an existing United Utilities Foul Water Sewer located in Mayfield Street.	
Residual Risks	No Significant groundwater flood risk is identified.	
Maintenance	A maintenance schedule is appended	

4.0 Description of the existing site

4.1 Site Location

The site is located West of Mayfield Street, Rochdale, OL16 2UZ E:390758 N:414156.

A site location plan is appended.

SITE DESCRIPTION	
Total Site Area	1.3Ha
Existing Impermeable Area	0.0Ha
Land use	Greenfield
Topography	The existing Topography for the proposed developed falls North to South. The existing topography has a upper and lower plateau with an existing 7m banking between the two. Upper plateau levels fall North To south, 135.3mAOD to 134.0mAOD. Lower plateau 129.1mAOD to 127.2mAOD.
Known Site Constraints	The ground investigation report notes that the development has contaminated ground from a previous use of the land. Groundwater has been encountered as seepages within the base of the made ground at depths of 0.80m and 3.30m at eight location within the development.

A topographical survey can be seen in Appendix A.

4.2 Existing Drainage

The law regarding responsibility for drains and sewers changed on the 1st October 2011. On this date, the Government transferred the majority of drainage pipes that are either outside a property's boundary or are shared with other buildings to the sewage/water companies. However, not all transferred sewers may be shown on the sewer records.

The site is greenfield and there are no signs of existing drainage through the development. There is a United Utilities Surface Water 300dia sewer and Foul Water 225dia Sewer located in Mayfield Street. The 2 existing united utilities sewers are going to be the discharge location for Surface Water and Foul Water.

A copy of the United Utilities records can be seen in appended.

5.0 Hydrology, hydrogeology and geology

5.1 Hydrology

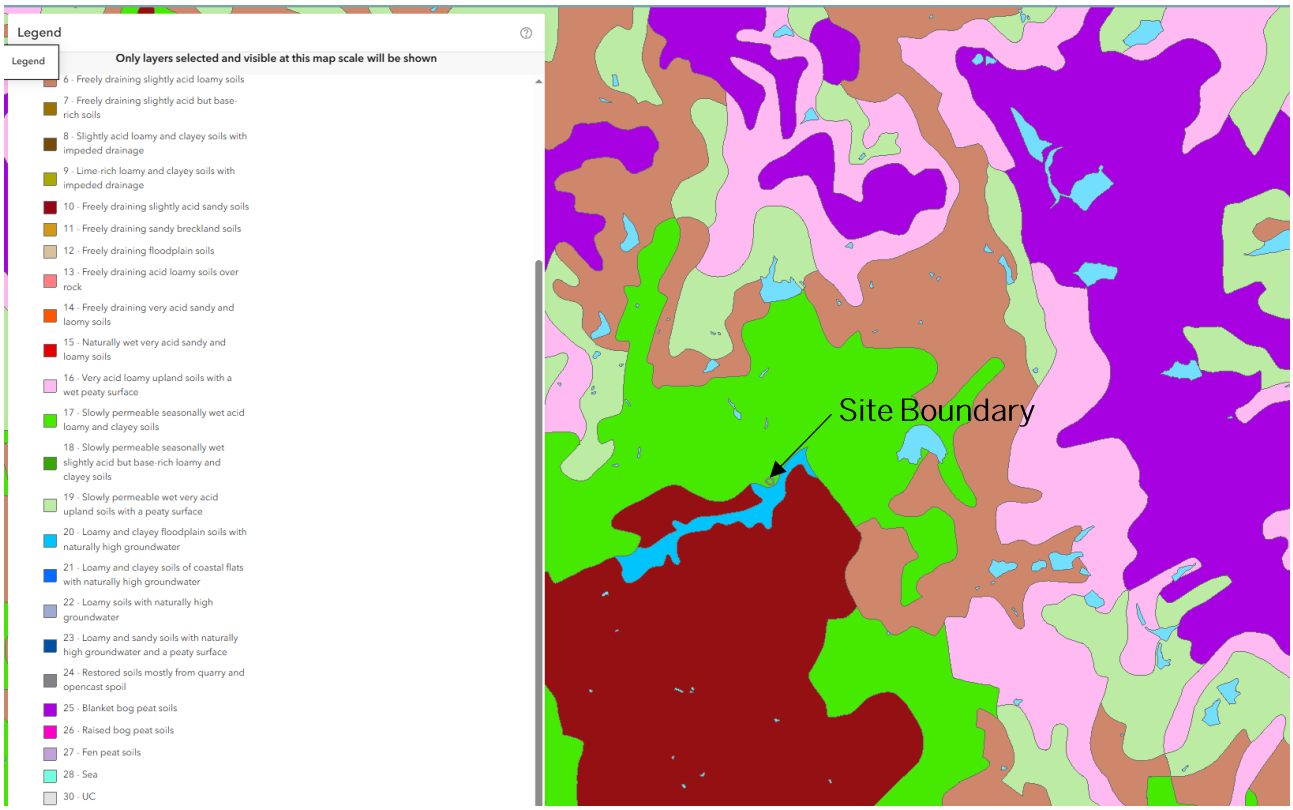
The closest body of water is the River Roch, which flows approximately 105m to the West of the site. To discharge into the river, 3rd party land including housing and highways would have to be crossed. Therefore, it has been concluded that the River Roch does not offer a viable point of discharge. This being said the United utilities Surface Water which is being proposed as our discharge point discharges into the River Roch.

5.2 Hydrogeology

The site is not located within any source protection zones.

5.3 Soil

DEFRA's 'Magic' online mapping indicated that the site is underlain mainly by "slowly permeable seasonally wet acid loamy and clayey soils"



5.4 Geology

According to the BGS Geology Viewer the site's ground composition is as follows:

Superficial deposits: Sedimentary deposits Till, Devensian-Diamicton Detrital deposits formed between 11.8 to 116 thousand years ago, during the Quaternary period.

Bedrock geology: Fluvial Deposits, palustrine and shallow-marine in origin – Old Lawrence Rock-Sandstone. Detrital deposits formed between 318 and 319 million years ago, during the carboniferous period.

6.0 Proposed development

6.1 Development Outline

The proposed development comprises the construction of a Special Educational Needs (SEN) school accommodating approximately 64 pupils. The site is currently undeveloped greenfield land and will be brought forward for educational use. The proposed layout includes the school building, associated hardstanding and access arrangements, and a dedicated on-site car park to serve staff and visitors.

Architectural plans are appended.

6.2 Proposed Surface Water Drainage Strategy

The discharge rate for the site has been set using the HR Wallingford Greenfield Run off. The calculation has been run using the proposed impermeable area of 0.615Ha. Using the HR Wallingford calculation for the 2 year peak flow rate the proposed discharge rate is 5.1l/s.

The proposed surface water strategy comprises of using multiple SuDS including a MUGA court and permeable paving. Due to poor infiltration rates the SuDs feature cannot infiltrate to ground and will have to be lined and the run off will drain through the surface water system.

The surface water drainage will be stored in an attenuation tank located in the car park before being restricted to 5.1l/d using a flow control decide. The restricted surface water run off is being proposed to connect into the existing 300dia United utilities sewer located in Mayfield Street.

A copy of the drainage strategy can be seen in appended.

Standard 1 – Runoff Destinations

Priority	Surface Water Discharge	Comments
1	Collected for non-potable use	Deemed to be not required, Development is within the United utilities region. United utilities are not currently a water stressed provider.
2	Infiltrated to ground	A ground investigation report has been completed by GEA, soakaway testing has been completed in 2 separate location within the development and the infiltration results are not viable. Refer to Appendix C for Ground investigation report.
3	Discharge to an above ground surface water body	The River Roch is located to the South East of the development, approximately 120m away from the site entrance. It is not feasible to directly connect into the

		River Roche as the drainage will have to cross third party land. See further details below.
4	Discharged to a surface water sewer, or another piped surface water drainage system	The United Utilities records shows a 300dia Surface water sewer located in Mayfield Street. Looking at the records the surface water sewer drains south to Belfield road and has a direct connection into the River Roche. Due to this connection we propose for the surface water from the development to discharge into the existing united utilities 300dia sewer in Mayfield Street which eventually discharges into the River Roch which complies with the drainage hierarchy.
5	Discharge to a combined sewer	N/A

Standards 2 – Management of Everyday rainfall (interception)

Standards 2.1 States "Apply a 'SuDS approach' so that at least the first 5mm of rainfall for the majority of rainfall events does not result in runoff from the site to surface waters or piped drainage systems."

In accordance with standard 2.1 the proposed development will have to retain 31m3 of surface water run off. This has been calculated by the 5mm (0.005m) x Impermeable Area (6156m2) x Coefficient (1) = 30.78m3.

The proposed surface water system has been designed in a way that the first 5mm of rainfall will apply a SuDs approach. This has been done in a way that the proposed roof drainage will be retained within a rainwater harvesting tank. The proposed parking bays will be permeable paving which is lined which will provide 160m3.

The above provides adequate storage for the first 5mm although it does connect into the surface water system we believe that there will be temporary detention during short duration rainfall events in the permeable paving and rainwater harvesting tank.

Standard 2.2 – "Evidence shall be provided that the approach to managing runoff from 'everyday' rainfall has been developed alongside and in support of the management of runoff quality (standard 4) and the delivery of amenity and biodiversity benefits (standards 5 and 6)."

In accordance with standard 2.2 please refer to section 6.5 for Water quality assessment.

Should the proposed development result in an increase in impermeable area, this will result in an increase of surface water runoff across the site. It will therefore be necessary to manage

surface water on-site in order to limit the discharge of surface water off-site to an agreed rate. Attenuation will be required to store the surface water up to the 1 in 100 year plus climate change rainfall event and provide improvements to water quality through appropriate source treatment.

Total impermeable area	0.615Ha
Peak discharge from site	5.1l/s
Maximum attenuation volume required to accommodate the peak 1 in 100 year + 45% CC storm	Attenuation Tank = 615m3

6.3 Hydraulic Calculations

The drainage strategy described above in section 6.2 has been hydraulically modelled using infodrainage. The surface water network for the development has been designed to the hydraulic standards of the Sewer Sector Guidance, these being:

- No surcharge of pipes for the 1 in 2-year storm return period.
- No flooding for the 1 in 30-year storm return period.
- Road, roofs and private hard standing areas have 100% impermeability (run-off coefficient) and full contribute to the flows in the surface water network.

The volumetric run-off values for both the summer and winter simulations have been set to 1.

A copy of the hydraulic results are appended.

6.4 Foul Drainage

Foul water will drain via gravity from the upper plateau to the lower plateau before having a single discharge connection into the existing 225dia United utilities Foul Water sewer. United Utilities have agreed to the proposed discharge point.

A copy of the correspondence with United Utilities has been appended.

6.5 Sustainable Drainage Systems (SuDS) and Water Quality

Sustainable Drainage Systems (SuDS) have the ability to address four core objectives: water quantity, water quality, amenity and biodiversity. In accordance with the National Planning Policy Framework (NPPF), the Non-Statutory Technical Standards for Sustainable Drainage Systems (2018) and the SuDS Manual (CIRIA 753) SuDS should be specified wherever possible to manage surface water runoff generated onsite.

Consideration should therefore firstly be given to using sustainable drainage (SuDS) techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands to reduce flood risk by attenuating the rate and quantity of surface water runoff from a site. This approach can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements. Approved document Part H of the Building Regulations (2015) sets out a hierarchy for the disposal of surface water which encourages a SuDS approach.

The order of priority according to the SuDS Manual, lists that surface water runoff that is not collected for use should follow in this order.

- Infiltration

site. This approach can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements. Approved document Part H of the Building Regulations (2015) sets out a hierarchy for the disposal of surface water which encourages a SuDS approach.

The order of priority according to the SuDS Manual, lists that surface water runoff that is not collected for use should follow in this order.

- Infiltration
- Discharge to Surface Waters (i.e. watercourse)
- Discharge to a surface water sewer, highway drain or another drainage system
- Discharge to a combined sewer.

SuDS are widely accepted as a better approach to managing rainfall than traditional drainage systems. They help create interesting places to learn, beautiful spaces and places for people and wildlife. It also helps to reduce the risk of waterlogging, local flooding, and water pollution. Developers are encouraged to incorporate SuDS for all developments where possible.

TECHNIQUE	DESCRIPTION	SuDS FEATURE	FEASIBILITY Y / N / M (MAYBE)
Rainwater Harvesting	Elements that capture rainwater and facilitate its use within the building or local environment	Rain Garden and Green Roof	Y
Porous and pervious surface materials	Structural surfaces that allow water to penetrate, thus reducing the amount of runoff that is conveyed to the drainage system	Permeable or pervious surfaces	Y
Infiltration Systems	Elements that facilitate the infiltration of water into the ground. These often include temporary storage areas which allow water to slowly soak into the soil	Infiltration Drain and Basins	N – Infiltration has been ruled out due to ground investigation findings of poor infiltration rates and ground contamination.
Conveyance Systems	Elements which convey flows to downstream storage	Swales and watercourses	N
Storage Systems	Elements which store surface water. This can infiltrate or discharge to local drainage systems	Wetlands, Ponds and Blue Roof	N
Treatment Systems	Elements that remove or facilitate the degradation of contaminants in the surface water runoff	Swale, permeable paving.	Y

The surface water discharge train has been assessed in line with the tables 26.2 and 26.3 of the SuDS manual and scored accordingly.

The previsions are detailed below.

Land use	Pollution hazard level	Pollution indices (TSS, metals, Hydrocarbons)	Mitigation measures	Mitigation indices (TSS, metals, Hydrocarbons)
Roofs	Low	0.3, 0.2, 0.05	n/a	n/a
Car parks	Medium	0.7, 0.6, 0.7	Permeable bays	0.7, 0.6, 0.7

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
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[1]	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[1]	High	0.8[2]	0.8[2]	0.9[2]

7.0 Flood risk sources and extents

7.1 Summary

A summary of the sources and level of flood risk (negligible, low, medium or high) is given in Table 7.1 below.

SOURCE	RISK LEVEL
Fluvial	Low Risk
Tidal - Coastal	Low Risk
Surface Water / Pluvial	Low Risk
Groundwater	Low Risk
Surcharged Sewers	Low Risk
Other Man Made Sources	Low Risk

The sources and level of flood risk are demonstrated below.

7.2 Flood Zone Definitions

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's web site, as indicated in the table below.

FLOOD ZONE	DEFINITION
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.(Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

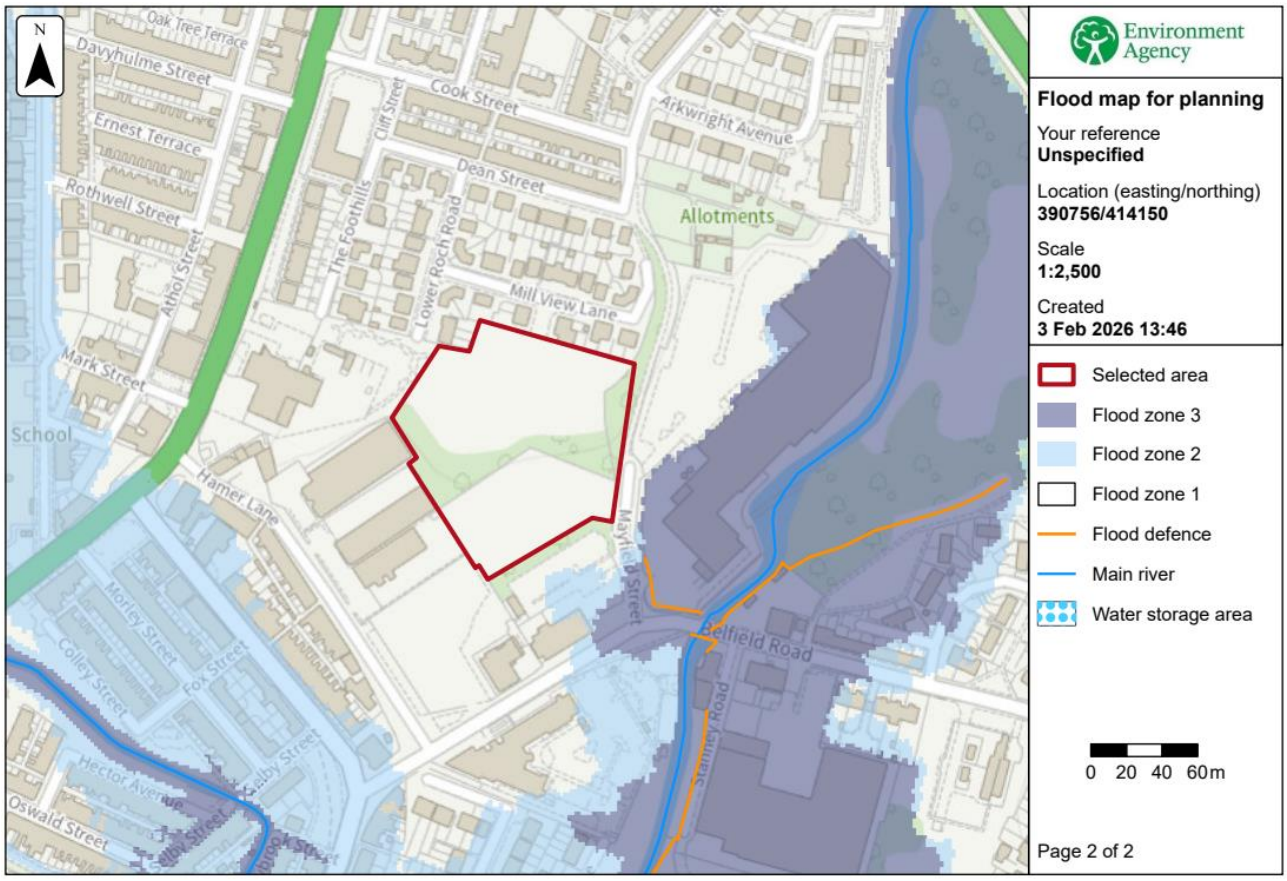
7.3 Fluvial

Fluvial flooding is when a river is surcharged and can happen when water exceeds the river banks in low lying land. The Environment Agency created Flood Map for Planning in 2004 using national generalised modelling to identify the level of risk for new developments against fluvial flooding. The model is routinely updated and revised using the results from catchment studies, topographical surveys and hydrological and/or hydraulic modelling as well as previous flood events.

Flood defences can be installed to protect vulnerable areas by forcing the water to overflow into less desirable areas. Whilst flood defences reduce the level of risk, they don't completely remove it as they can be overtopped or fail due to extreme weather or poor maintenance, therefore the Environment Agency website 'Risk of flooding from Rivers and Sea' map does not take into account the presence of any flood defences.

The proposed development is situated in Flood Zone 1. No further discussion required. There are no formal flood defences in the immediate vicinity of the site.

An extract from the gov.uk website is shown below,



7.4 Tidal

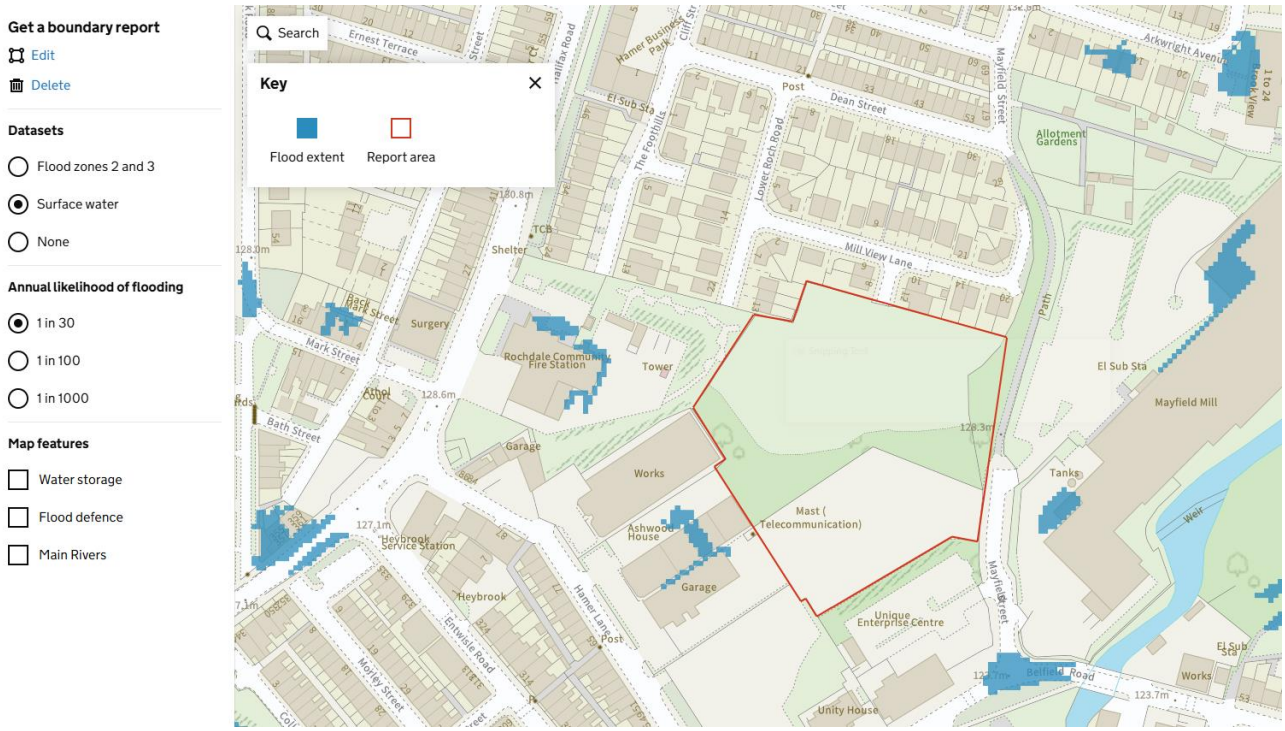
Tidal Flooding is the temporary flooding of coastal areas during exceptionally high tides or storm surges. The risk of tidal flooding can happen at any time and is not solely as a result of a rainfall event. The Environment Agency are estimating that there is an average of 1.33m across the country by year 2125.

The site is a considerable distance from the coast and is not at risk of tidal flooding.

7.5 Surface Water / Pluvial

When the infiltration capacity of land or the drainage capacity of a local sewer network is exceeded, excess rainwater flows overland. This water will collect in topographical depressions and at obstructions, which can inundate development in low lying areas. The severity of the rainfall event, the degree of saturation of the soil before the event, the permeability of soils and geology, and the gradient of the surrounding land and it's use; all contribute to and affect the severity of overland flow.

The Environment Agency Flood Map for Surface Water can be used to see the approximate areas that would experience surface water flooding from a range of AEP's. Mapping indicates that the site is generally at low risk of surface water flooding.



7.6 Groundwater Flooding

Groundwater flooding can occur when groundwater levels rise above ground surface levels. The underlying geology has a major influence on where this type of flooding takes place; it is most likely to occur in low lying areas underlain by permeable rocks (aquifers).

According to the gov.uk website, the site is located outside of a groundwater flood alert area – meaning that there may still be a risk of groundwater flooding.

Groundwater More about your groundwater flood risk

We use groundwater flood alert areas to check the risk of flooding from groundwater.

This location is outside of a groundwater flood alert area.

▶ What this means

What groundwater is

Groundwater is the water that is usually held in rocks and soil underground.

Groundwater flooding happens when this water rises and flows above the surface.

Flooding from rivers is more likely when groundwater levels are high.

7.7 Surcharged Sewers

Sewer and surface water flooding are often interconnected; insufficient drainage capacity in the sewer network can result in extensive surface water flooding and, by the same rationale, large volumes of surface water can overload the public sewers, causing the sewer network to back up, surcharge and ultimately flood.

Adopted sewerage is the responsibility of the statutory sewerage undertaker and therefore beyond the influence of this design.

7.8 Other Man Made Sources

Flood events can occur from a sudden release of large volumes of water from reservoirs, canals and artificial structures. The Reservoir Act defines a large reservoir as one that holds over

25,000 cubic metres of water. According to the Environment Agency's Flood Mapping the site is not at risk of reservoir or canal flooding.

Reservoirs More about your reservoir flood risk

Flooding from reservoirs is unlikely in this area.

What a reservoir is

A reservoir is a large natural or artificial lake that is designed to collect and store water.

They are usually formed by building a dam across a river, or by building a large tank or surrounding embankment. If one of these dams or embankments fails, then water could escape from the reservoir. This would result in land or properties being flooded.

7.9 Vulnerability

Defining or classifying flood risk vulnerability helps to determine the viability of a new development this also helps to understand if any additional considerations should be taken into account during future drainage strategy designs.

Assessing the vulnerability classifications below the proposed development can be considered 'less vulnerable'.

VULNERABILITY CLASSIFICATION	TYPE OF DEVELOPMENT
Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable	• Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for

	bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More Vulnerable	• Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	• Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-compatible Development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

FLOOD ZONES	FLOOD RISK VULNERABILITY CLASSIFICATION				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Key:

✓ Development is appropriate.

X Development should not be permitted.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.
" * " In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

7.10 Sequential Test

The Sequential Test aims to steer developments and redevelopments to areas of lower flood risk.
The test compares the proposed development site with other available sites, in terms of flood risk,
to aid the steering process.

The developed parts of the site all lies with in flood zone 1 and is in the most sequentially preferable location.

7.11 Exception Test

Where the Sequential Test is undertaken and alternative sites of lower flood risk are not available, then the proposed development may require an Exception Test in order to be granted planning permission. Where the exception test is required, it should be applied as soon as possible to all local development document allocations for developments and all planning applications other than for minor developments.

All three elements of the exception test have to be passed before development is allocated or

permitted. For the exception test to be passed:

1. It must demonstrate that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by an SRFA, where one has been prepared;
2. The development should be on developed land or on previously developed land;
3. A flood risk assessment must demonstrate that the development will be safe without increasing flood risk elsewhere, and where possible will reduce the overall flood risk.

As the development passes the sequential test, the exception test is not required.

7.12 Climate Change

Adept Consulting Engineers apply a climate change factor of 45% for 100 year storm.

8.0 Communications

Discussions with Environment Agency - N/A
Discussions with the Lead Local Flood Authority – Emailed 22/01/26, Response Received 27/01/26
Discussions with Sewerage Undertaker – Emailed 22/01/26, Response Received 20/02/26

A summary of the correspondence is detailed below

CONSULTEE	DATE	SUMMARY
LLFA (Rochdale Borough Council)	Emailed 22/01/26, Response Received 27/01/26. Follow up email sent 28/01/26. Awaiting response.	
United Utilities	Emailed 22/01/26, Response Received 20/02/26	Surface Water and Foul Water discharge location agreed.

9.0 Conclusions

9.1 Existing Drainage

The proposed development site is currently undeveloped greenfield land and there is no evidence of any existing on-site drainage infrastructure. United Utilities sewer records confirm the presence of an adopted 300mm diameter surface water sewer and a 225mm diameter foul water sewer located within Mayfield Street, adjacent to the site boundary. These sewers provide viable connection points for the proposed development. No existing drainage constraints have been identified that would prevent the site from being developed, subject to the implementation of an appropriate drainage strategy.

9.2 Proposed Drainage Strategy

The proposed drainage strategy has been designed in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems, CIRIA SuDS Manual (C753), and local authority requirements. Infiltration has been discounted following site-specific ground investigation and soakaway testing, which confirmed poor infiltration rates and the presence of contaminated ground.

Surface water runoff from the development will be managed through a sustainable drainage system incorporating rainwater harvesting, permeable paving, swales, and on-site attenuation. Surface water discharge from the site will be restricted to the calculated greenfield runoff rate of 5.1 l/s for all events up to and including the 1 in 100 year storm with an allowance for climate change. Attenuation storage will be provided on site to ensure no increase in flood risk downstream.

Foul water will discharge via gravity to the existing United Utilities foul sewer in Mayfield Street, subject to agreement with United utilities.

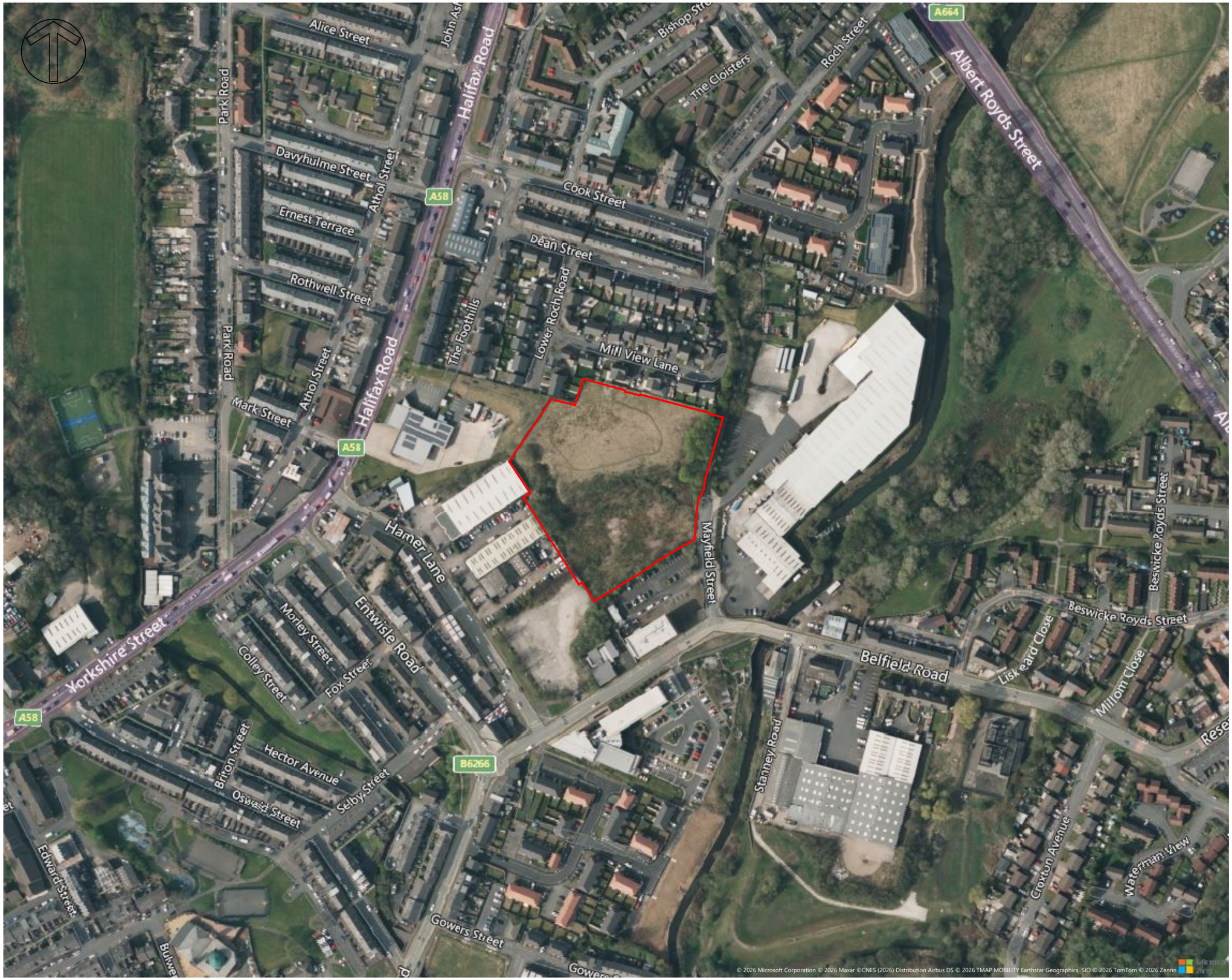
9.3 Flood Risk

The site is located entirely within Flood Zone 1 and is therefore at low risk of flooding from fluvial sources. Assessment of other potential sources of flooding, including surface water, groundwater, surcharged sewers, tidal flooding, and artificial sources, has confirmed that the site is at low risk.

The proposed development is considered sequentially appropriate and does not require the application of the Exception Test. Finished floor levels will be set a minimum of 150mm above adjacent external ground levels in accordance with LLFA guidance. With the implementation of the proposed drainage and flood mitigation measures, the development will be safe for its lifetime and will not increase flood risk elsewhere.

Appendix A

- Location Plan (Aerial Photograph)



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Do Not Scale

Drawing Notes

Drawing & schedule based on the following information:

Architect's drawing/model:	REF
Revision:	REV
Received:	RECIEVED DATE
Topographic Survey:	REF
Revision:	REV
Received:	RECEIVED DATE

Residual Hazards

Health, Safety & Environmental Notes

Key:

Site boundary

Address:
On the land West of Mayfield Street,
Rochdale
OL16 2UZ
United Kingdom

Easting: 390758
Northing: 414155

Datum: OS Level Datum
Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area conditions

Date	Description	By	Chk	Rev
15.01.26	Initial issue	JI	BHB	P1

ADEPT
CIVIL AND STRUCTURAL CONSULTING ENGINEERS

Web www.adeptcsce.com
Email inbox@adeptcsce.com
Tel 0113 239 4518
Office Address 1912 Mill, Sunny Bank Mills, Town Street, Farsley, LS28 5UJ

Project
Brownhill School, Rochdale

Title
Site Location Plan

Client
Rochdale Council

Scale @ A3	Initial author	Initial checker	Approver	Initial Date
1:2500	JI	BHB	TT	Jan 2026

Status	Purpose	Adept Project Number
S2	Preliminary	00.25079

Project-Originator-Functional Breakdown-Spatial Breakdown-Form-Discipline-Number	Rev.
00.25079-ACE-00-ZZ-DR-C-3000	P1

- Proposed Architectural Site Plans

KEY

Proposed Building Line

Existing Trees & Vegetation to be Retained
Existing trees & vegetation to be retained & protected
BS5837: 2012 Trees in Relation to Design, Demolition & Construction - Recommendations.
Refer to arboricultural report for more details

Existing Vegetation
Existing ground cover vegetation to be retained & protected
BS5837: 2012 Trees in Relation to Design, Demolition & Construction - Recommendations.
Refer to arboricultural report for more details

Existing Trees & Vegetation to be Removed
Existing trees & vegetation to be removed to BS3998: 2010

Proposed Hardworks

P01 Proposed Light Buff Tarmac (Vehicular) - 82m²
Coloured tarmac
Colour: Light Buff
Engineer's design & detail

P02 Proposed Granitic Sett Paving (Pedestrian) - 470m²
Block paving with natural aggregate
Finish: Textured & Smooth
Colour: Buff Mix

P03 Proposed Resin Bound Gravel - 200m²
Colour: Buff

P04 Proposed Porous Asphalt (Vehicular) - 2250m²
With white aggregate chippings & thermoplastic white lining to Engineer's design & detail

P05 Proposed Porous Asphalt (Pedestrian) -850m²
To Engineer's design & detail with thermoplastic design for road markings and to illustrate the MUGA . MUGA design approved by Landscape Architect.

P06 Proposed Safety Surface - 117m²
Rubber crumb with thermoplastic lining
Colour: Varies

P07 Proposed Cork Surfacing - 51m²
Product: Corkeen Play Surface
Natural cork fall protection system

P08 Proposed Granite Tactile Paving Blister
Colour: Grey (Sufficient visual contrast to surrounding material)
Finish: Flamed

P09 Proposed Granite Tactile Paving Corduroy
Colour: Grey (Sufficient visual contrast to surrounding material)
Finish: Flamed

P10 Proposed Granite Step Units
Colour: Mist, with demarcation nosing
Finish: Flamed

P11 Retaining Wall
To Engineer's design & detail

Proposed Softworks

T01 Proposed Welcome Trees - 5no.
Refer to planting plan and schedule for more details

T02 Proposed Woodland Trees - 50no.
Refer to planting plan and schedule for more details

T03 Proposed Amenity Trees - 39no.
9no. multistem & 15no. clear stem
Refer to planting plan and schedule for more details

H01 Proposed Mixed Native Hedge - 220 lin. m
Maintained at 0.5m
Refer to planting plan and schedule for more details

H02 Proposed Activity Area Hedge - 195 lin. m
Maintained at 1.2m
Refer to planting plan and schedule for more details

PT01 Proposed Scrub Mix - 1411m²
Native shrub, climber & herbaceous species
Refer to planting plan and schedule for more details

PT02 Proposed Woodland Understorey Planting - 330m²
Native shrub, ferns, grasses & bulb species
Refer to planting plan and schedule for more details

PT03 Proposed Slope Mix - 410m²
Mix of ornamental & native shrub, groundcover & bulb species
Refer to planting plan and schedule for more details

PT04 Proposed Welcome Planting Mix - 170m²
Ornamental mix of perennials, grasses, & ferns that can tolerate drought or flooded conditions
Refer to planting plan and schedule for more details

PT05 Proposed Activity Planting Mix - 144m²
Robust ornamental mix of perennials, grasses, ferns & bulbs
Refer to planting plan and schedule for more details

PT06 Proposed Sensory Planting Mix - 25m²
Ornamental mix of perennials, grasses, ferns & bulbs with sensory properties
Refer to planting plan and schedule for more details

PT07 Proposed Wet Meadow - 430m²
Reinstated wet meadow
Refer to planting plan and schedule for more details

PT08 Proposed Amenity Grass - 465m²
Amenity Grass
Refer to planting plan and schedule for more details

PT09 Proposed Swale - 105m²
Sun-tolerant wet meadow wildflower species
Product: WFT-SUD-37
Manufacturer: Wildflower Turf (or similar approved)

Proposed Furniture

F01 Bike Storage - 2no.
Manufacturer: Broxap
Product: Apollo Cycle Shelter Two Tier
8no. Sheffield Cycle Stands

F02 Gym Equipment - 4no.
Manufacturer: Nola
Product: Kebne Outdoor Gym Modules 2, 3 & 5, plus 1 information board

F03 Slackline - 1no.
Manufacturer: Rampline
Product: Slackline System

F04 Mini trampoline - 2no.
Manufacturer: Rampline
Product: Trampoline Loop

F05 Table Tennis Table - 1no.
Manufacturer: PingOut
Product: PingOut Table

F06 Stoop Seat - 6no.
Manufacturer: Vestre
Product: 2413 Stoop mini

F07 Picnic Table - 5no.
Manufacturer: Mmcité
Product: RTW151 Picnic Table

F08 Tree Seat - 9no.
Manufacturer: Vestre
Product: 3611HV Stripes Circle Bench

F09 Sun Lounger - 1no.
Manufacturer: Vestre
Product: 1566 Bloc sun bench

F10 Blocq Bench - 1no.
Manufacturer: Mmcité
Product: LBQ155 Blocq park bench with backrest & armrests

F10 Shelter - 1no.
Manufacturer: Mmcité
Product: PIN300

F11 Recycled Stone Seat - 40no.
Large stone blocks reclaimed from site as informal seating.
Rough dimensions 500 x 500 x 800mm (a variety of sizes around this range). Approval by Landscape Architect.

F12 Proposed Deadwood Hibernacula - 6no.
Existing felled trees logs to be used to create deadwood piles in the locations shown. At least 1m high by 2m wide.

F13 Proposed Bird Nest Boxes - 5no.
Vivara Pro: Nest Box Oval (or similar approved)

F14 Proposed Bat Roost Boxes - 2no.
Vivara Pro: Bat Tree Box (or similar approved)

Proposed Secure Boundaries & Gates

Secure Outer Fence Line - 476 lin. m
Refer to Manufacturer's design & detail

Secure Inner Fence Line - 370 lin.m
Refer to Manufacturer's design & detail

Vehicular Gate - 6no.
Refer to Manufacturer's design & detail

Pedestrian Gate - 15no.
Refer to Manufacturer's design & detail

Magnetic Fire Escape Gate - 1no.
Refer to Manufacturer's design & detail

Rev	Date	Description of changes	DRWN	APP
D04	04/03/26	Issue for comment	JP	
D03	02/03/26	Alternative MUGA location, smaller activity spaces & updated car park layout	JP	
D02	24/02/26	Issue for comment	JP	
D01	10/02/26	Issue for comment	JP	

CW Studio
Studio Nine
9 Stevenson Square
Manchester, M1 1DB
0161 464 3895 / info@cwstudio.co.uk
www.cwstudio.co.uk

CLIENT	DRAWING NAME		CREATED ON	CREATED BY	APPROVED BY
Rochdale Borough Council	General Arrangement		10/02/26	JP	LM
PROJECT NAME	**DRAWING NUMBER**	**STATUS / REVISION**	**DRAWING SCALE**	**SIZE**	**WORK STAGE**
RAISE Rochdale PRU	2535-CWS-XX-XX-DR-L-1000	S3 / D04	1:200	A0	Stage 3

NOTES:
1. Do not scale from this drawing.
2. Always work to noted dimensions.
3. All dimensions are in millimetres unless otherwise stated.
4. All setting out, levels and dimensions to be agreed on site.
5. The dimensions of all materials must be checked on site before being laid out.
6. This drawing must be read with the relevant specification clauses and detail drawings.
7. Order of construction and setting out to be agreed on site.

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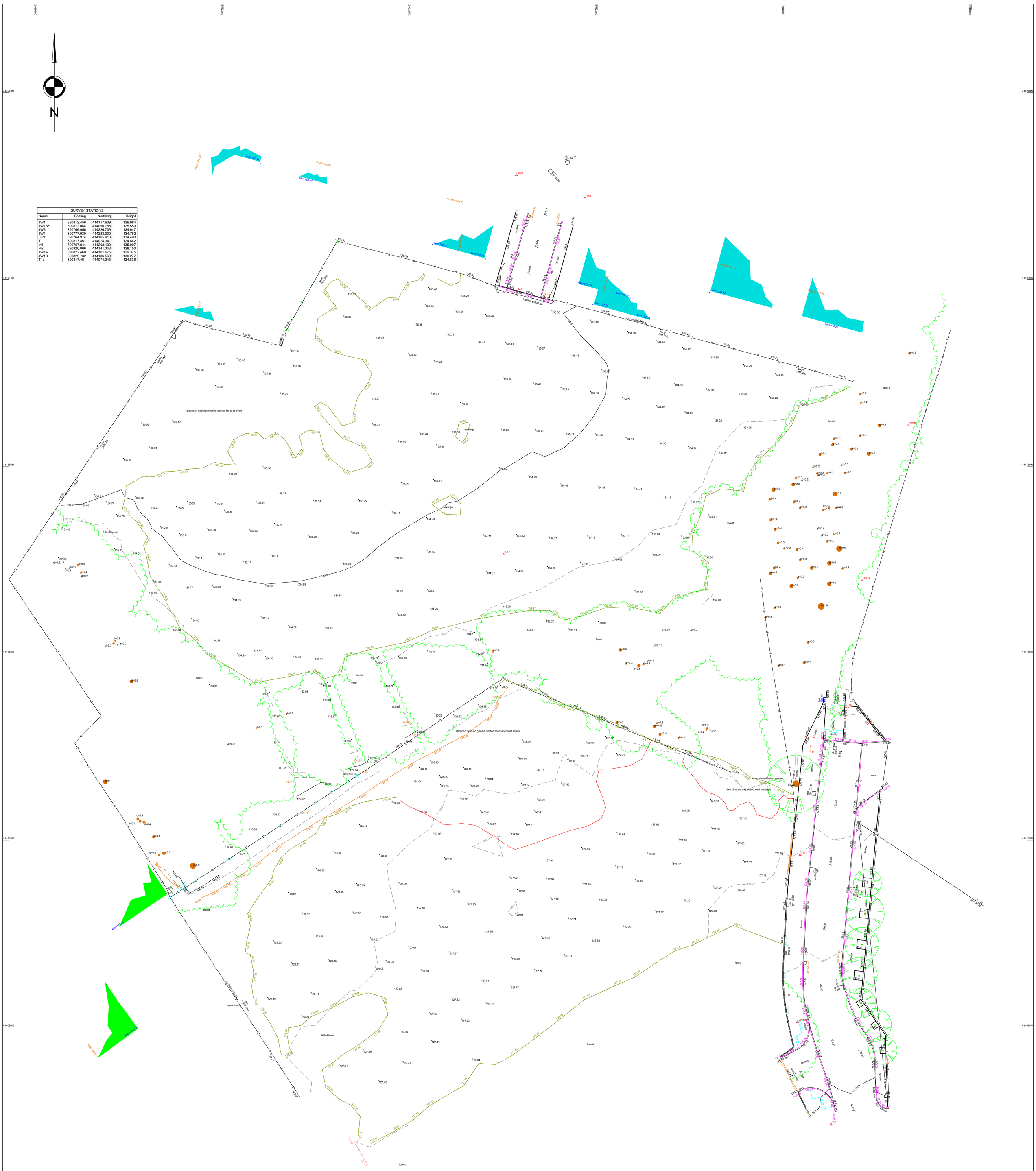
Appendix B
Existing Services

- Topographical Survey



SURVEY STATIONS			
Name	Easting	Northing	Height
JW1	390812.456	414117.639	126.984
JW1BS	390812.064	414090.788	125.559
JW3	390766.956	414226.739	134.947
JW4	390777.930	414223.000	134.762
OP1	390764.974	414165.918	134.490
T1	390817.451	414074.341	124.842
M1	390767.044	414208.100	135.097
M2	390820.066	414141.343	128.150
JW1A	390822.460	414161.675	129.375
JW1B	390829.732	414186.569	130.277
T1L	390817.451	414074.343	124.836

Annotations and Symbols

?	unknown cover	lp	lamp post	th	trial hole	twl=56.72	top of wall
ac box	air conditioning box	lt	left turn arrow	conc.	concrete	wal=56.19	water level
av	air valve	peg	peg	conc. boll	concrete bollard	cf=5.67	cellar floor level
bb	belisha beacon	phone box	phone box	conc. wall	concrete wall	.05level step	level step
bin	bin	post box	post box	edg.cut grass	edge cut grass	gu &ds=34.29	gulley with downspout
bt	bt line	pipe	pipe	el.sub st	elec. substation		level
bt	bt manhole	planter	planter	face conc	face of concrete	win top=13.59	window top
bt	bt post	post	post	face clad.	face of cladding	win bot=14.41	window bottom
bt box	bt box	rod. eye	rodding eye	face tim	face of timber	b/w	barbed wire
bm	OSBM	rsj	steel rsj	trel - trellis	trellis	c/l	chain link
block	blocked manhole	rt	right turn	hi pr. gas	high pressure gas	cl/b	close boarded
bus shelter	bus shelter	salt	salt box	no ri. turn	no right turn	c/i	corrugated iron
cable	cable	security cam	security camera	rough ground	rough ground	con/pan	concrete panel
can't lift	can't lift	seat	seat	ret. wall	retaining wall	cr/ba	crash barrier
ctv box	cable tv box	si	sign - with indicative text	sur. drain	surface drain	h/r	hand rail
ctv	cable tv manhole	slab=3.19	slab (generally conc.)	ped. studs	pedestrian studs	i/r	iron rail
data mh	data manhole	st.tap	stop tap	cl=5.32	manhole cover level	pal	palisade
dk	drop kerb	str.	straight on	dpc=56.45	dpc level	panel	panel
ds&g	down spout (with gulley)	sv.	sluice valve	eav=34.29	eaves level	p/b	public barrier
dsr	recessed downspout	tactile paving	tactile paving	ffl=5.34	finished floor level	pick	picket
ds	building step back	ts.	traffic signal	gu=34.29	gulley level	p/r	post & rail
	not surveyed	ts. mh	traffic signal manhole	gutter=34.29	gutter level	p/w	post & wire
el. post	electric post	ts.box	traffic signal box	hip=34.29	hip level	sec	security fence
el.	electric	trap	trap	il=5.34	invert level	wood	wooden fence
el. mh	electric manhole	smp	service marker post	cr=5.34	crown level		
el box	electric box	utility	utility (unknown)	sof=5.34	soffit level	deciduous tree	
earth	earth strap/spike	utility mh	utility manhole (unknown)	oh=5.34	overhead level		
f.hydr	fire hydrant	utility box	utility box (unknown)	ramp=5.34	ramp level	conifer tree	
gas	gas	water	water	rid=34.29	ridge level		
gas mh	gas man hole	water mh	water manhole	silt l=5.34	silt level	gate	gate
gas box	gas box	water box	water box	sill=5.34	sill level		
gu=5.68	gulley top	wo	wash out valve	silt l=5.34	silt level	station	MR 4 10.380
guy	guy rope/stay	tap	tap	slab=5.34	slab level		
.5 dia	pipe diameter	parking meter	parking meter	top conc=5.34	top of concrete	spot level	24.24
light	light	cycle rack	cycle rack	tpi=60.67dia.15	top of pipe		
mw	monitoring well	cycle shelter	cycle shelter	t.st.=10.36	top of step		

Line Features

bottom of batter / wood / ridge / timber face / gutter

top of batter

break line / discontinuity

wall (see text nearby for height / width / type)

retaining wall (see text nearby for height / width / type)

channel (all levels at channel unless noted)

kerb levels (shown parallel to channel -)

railway

drain / river / canal

overhead lines (not surveyed unless specified)

OH

concrete / ramp

building

stone

face of cladding / flower bed

canopy

verge

fence (see text nearby for height / width / type)

(panel / security / etc.)

columns / gridlines / conveyors / column face

brick

cycle lane / bus lane / white line (see text)

tanks / decking

hedge scaled to width

line may be as above, if just one edge
i.e. for level specific surveys both sides
measured not to show level change
(see text for type / height / width / etc)

path / window / door

track

contours 50.00
50.50

Sheet Layout

site surveying services

Site Surveying Services Ltd, Unit 1, Shawbridge Sawmill
Taylor St, Clitheroe BB7 1LY

T: 01200 438320 W: www.sitesurvey.co.uk

Surveyed by	Initials - MR,JW	Dates Surveyed - 08/10/25		
D				
C				
B				
A	24/11/25	Original Issue	MR	MK
Rev	Rev. Date	Purpose of revision	Drawn	Checked

1. The survey has been accurately positioned on the Ordnance Survey National Grid system using GPS observations to the OS Active Network and the latest Ordnance Survey transformation (OSTN15/OSGM15)

2. All levels relate to Ordnance Survey Datum (Newlyn). Vertical control has been established using GPS observations to the OS Active Network and the latest Ordnance Survey transformation (OSTN15/OSGM15).

3. Local Scale Factor has been removed to transform the survey to a flat earth grid (scale factor 1.00000).
Local Grid Origin is Control Station M1
This is the only point where OS Grid coordinates are true.

Client
Seven Architecture

Project
Land at Mayfield Street, Rochdale

Drawing title
Topographical Survey

Scale	1:200 @ A0	DO NOT SCALE
SSS Job No.	S250847	
Client Job No.	N/A	
Drawing number: S250847-DR-T-001		Rev: A

This drawing is not to be used in whole or part other than for the intended purpose and project as defined on this drawing. Refer to the contract for full terms and conditions.

- Existing Drainage / Sewer Records

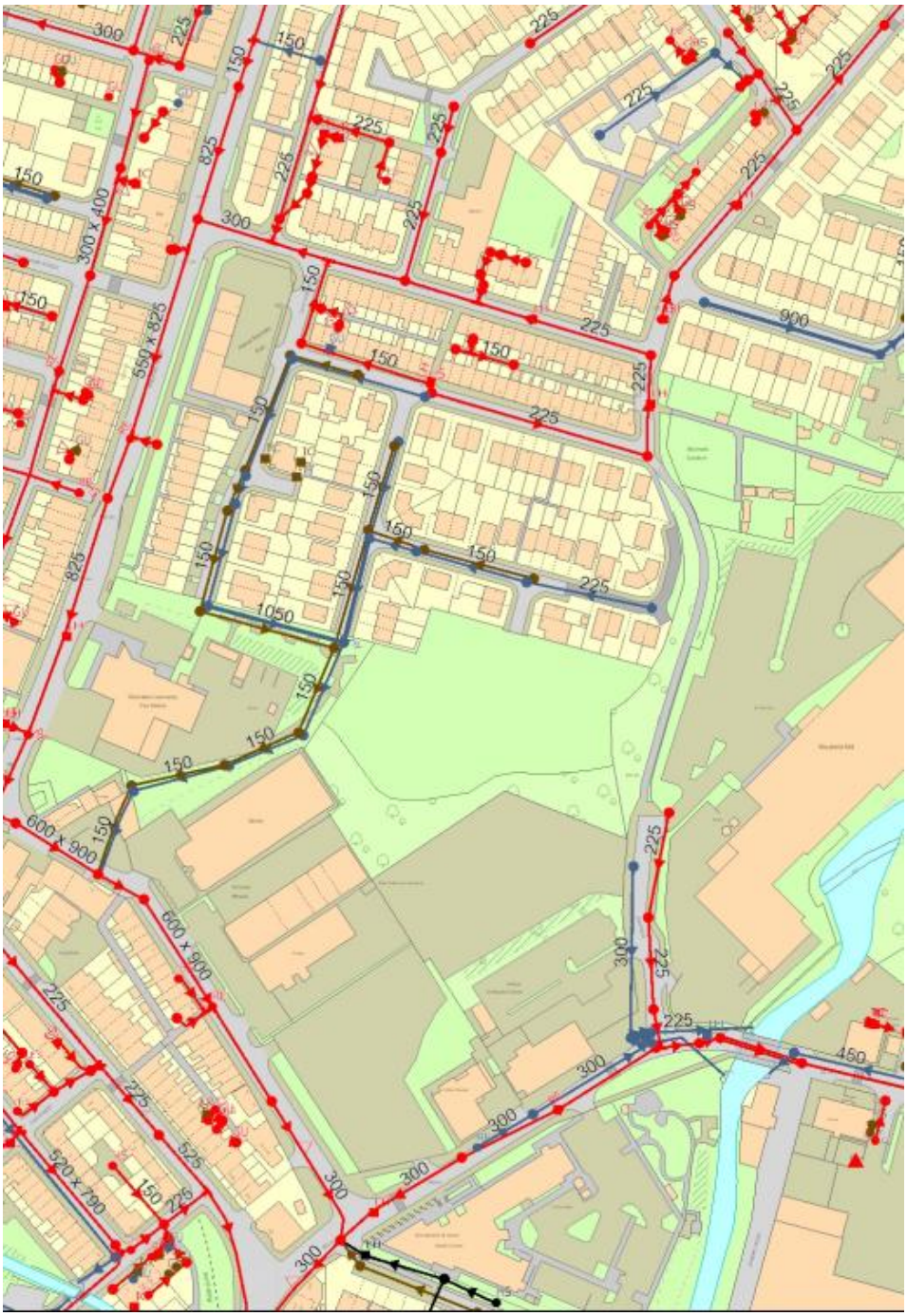


Figure 8 – Existing United Utilities Sewer Infrastructure Map

Summary

United Utilities Sewer records do not show any infrastructure affecting the site.

- Ground Investigation Report

Brownhill School SEN Hub
Mayfield Street
Rochdale
OL16 2UZ

Desk Study &
Ground Investigation

December 2025

J25291
Rev 0

Ground investigation | Geotechnical consultancy | Contaminated land assessment

Report prepared by

Luke Montgomery BSc (Hons) FGS
Senior Geotechnical Engineer

Report checked by

Martin Cooper BEng CEng MICE FGS
Technical Director

Approved for issue by

Steve Branch BSc MSc CGeol FGS FRGS
Managing Director

Rev No	Status	Revision Details	Date	Approved for Issue
0	Final		22 December 2025	

This report has been issued by the GEA office indicated below. Any enquiries regarding the report should be directed to the report project engineer at the office indicated or to Steve Branch in our main Herts office.

	Hertfordshire	tel 01727 824666
	Nottinghamshire	tel 01509 674888
✓	Manchester	tel 0161 209 3032

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This report is intended as a Ground Investigation Report (GIR) as defined in BS EN1997-2, unless specifically noted otherwise. The report is not a Geotechnical Design Report (GDR) as defined in EN1997-2 and recommendations made within this report are for guidance only.

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Contents

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4.0 Ground Conditions 8

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6.0 Advice & Recommendations 16

7.0 Outstanding Risks & Issues 20

Appendix

Executive summary

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

Brief

This report describes the findings of a site investigation carried out by Geotechnical and Environmental Associates Limited (GEA) on the instructions of Adept Civil and Structural Consulting Engineers, on behalf of Rochdale Borough Council, with respect to the redevelopment of the site through the construction of single and two-storey special needs school with multi-use games area, car park and bus drop off bays along with areas of soft landscaping. The purpose of the investigation has been to research the history of the site with respect to possible contaminative uses, to determine the ground conditions, provide an indication of the presence of contamination and to provide information to assist with the design of shallow and deep foundations.

Site history

The earliest map studied, dated 1851, shows the site to have been primarily occupied by open farmland with a drying shed, as well what were probably small residential or farming buildings in the centre and east. On the western boundary, additional residential buildings were present. Two mills and a boiler house were located approximately 50 m to the south, whilst a drying house and dye works were slightly further to the south. By 1893, the drying shed had been removed and residential buildings constructed on the eastern boundary of the site. By 1910, the dye works to the south had been demolished and several large cotton mills constructed. The 1930 map shows the formerly disused mill to the south had been expanded onto the southern boundary of the site. By 1958, the structures in the centre of the site had been removed and allotment gardens were in the western part. What appears to be a large mound was located in the northeastern corner of the site and the mill in the south is labelled as a works. . By 1971, all structures on site had been removed except for the works in the south which was labelled as a shoe factory. The 1984 map labels the site as a yard with the works to the north of the site having expanded and extended onto the northernmost part of the site. Although not clearly shown, it is believed that a significant slope and level change between the northern and southern sites was created at this time. The 2000 aerial image of the site shows that the works in the north had been expanded. By 2006 the works in the south had been demolished and at some time between 2006 and 2025, the remaining works in the north have been removed.

Ground conditions

The investigation encountered a generally significant, locally moderate, thickness of made ground overlying Alluvium which was underlain by Glacial Till. The made ground was encountered as dark greyish brown slightly sandy gravelly humic silt over dark grey, grey, greyish brown and brown sandy very clayey gravel, sandy gravel, gravelly silty clay with fragments of brick, concrete, ash, clinker, ceramic, plastic and glass. This material extended to depths of between 2.80 m and 6.10 m (128.10 m OD and 132.42 m OD) in the northern part and to depths of between 0.50 m and 3.20 m (124.70 m OD and 127.70 m OD) in the southern part. Beneath this material, Alluvium comprised light grey, yellowish brown very soft and firm sandy silt, clayey silt, slightly gravelly slightly sandy silty clay, pseudo-fibrous peat and sand extended to depths of between 5.60 m and 8.30 m (122.40 m OD and 129.85 m OD). Below this material, Glacial Till was encountered and initially consisted of stiff gravelly sandy silty clay, sandy silty clay and silty clay becoming medium dense becoming dense very silty sand and sandy gravel extended to the full depth of the investigation; 35.45 m (98.75 m OD).

Groundwater was encountered within the made ground at depths of 0.80 m and 3.30 m (127.10 m OD and 131.90 m OD) and locally within the Alluvium at depths of 3.00 m and 7.70 m (122.40 m OD and 126.50 m OD), settling at a depth of 6.03 m (128.17 m OD). Groundwater was also encountered within the granular Glacial Till at 26.50 m (107.70 m OD), rising to a depth of 7.70 m (126.50 m OD).

Recommendations

The thickness of made ground and soft Alluvium is such that shallow spread foundations are not considered to be feasible. For heavier structures, piled foundations will be required, with both bored and driven piles deemed feasible. Preliminary calculations suggest a 250 mm square driven pre-cast concrete pile is likely to have a working load capacity of 640 kN. For CFA bored piles, preliminary calculations suggest a 450 mm diameter pile is likely to have a working load capacity of 900 kN whilst a 600 mm diameter pile should be able to support a safe working load of 1250 kN. Shallow soakaways are not considered to be viable and a CBR value of ‘less than 2 %’ will be applicable for the preliminary design of pavements formed within made ground.

Samples of made ground have shown elevated concentrations of arsenic, lead, total PAHs, specifically benzo(a)pyrene, benzo(b)fluoranthene and dibenz(a,h)anthracene along with the widespread presence of asbestos. Samples from bodies of perched water within the made ground have revealed elevated concentrations of anthracene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene and indeno(1,2,3-cd)pyrene. Any perched water encountered during excavation should therefore be pumped into a secure tank or container and disposed of to appropriate treatment facilities.

Gas monitoring to date has revealed minimal positive flows but highly elevated concentrations of methane and carbon dioxide, meaning gas protection measures are likely to be required.

Part 1: Investigation Report

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2.

1.0 Introduction

Geotechnical and Environmental Associates Limited (GEA) has been commissioned by Adept Civil and Structural Consulting Engineers, on behalf of Rochdale Borough Council, to carry out a desk study and ground investigation at the proposed site of Brownhill School SEN Hub, Mayfield Street, Rochdale, OL16 2UZ.

1.1 Proposed Development

It is understood that it is proposed to redevelop the site into a new special educational needs (SEN) school. This is to include a main building of single and two-storey construction with the step spanning an existing site level difference as well as a multi-use games area, an area of car parking and bus drop off bays along with areas of soft landscaping.

This report is specific to the proposed development and the advice herein should be reviewed once the development proposals are finalised. The proposed layout of the development is shown across the page.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows:

- to check the history of the site with respect to previous contaminative uses;
- to provide an assessment of the risk of encountering unexploded ordnance (UXO);
- to research the coal mining risk to the site;
- to determine the ground conditions and their engineering properties;
- to use the above information to provide recommendations for shallow and deep foundations;
- to provide an indication of the degree of soil contamination present; and
- to assess the risk that any such contamination may pose to the proposed development, its users or the wider environment.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, followed by a ground investigation. The desk study comprised:

- a review of historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database;
- a review of readily available geology maps;
- commissioning and review of a Preliminary UXO Risk Assessment;
- sourcing and reviewing a Consultants' Coal Mining risk assessment from the Mining Remediation Authority; and
- a walkover survey of the site carried out prior to the fieldwork.

In the light of this desk study an intrusive ground investigation was carried out which comprised, in summary, the following activities:

- four boreholes advanced to depths of between 5.00 m and 35.45 m using a cable percussion rig;
- seven open-drive boreholes advanced to a maximum depth of 4.45 m;
- nine mechanically excavated trial pits to a maximum depth of 3.60 m;
- four large mechanically excavated trial trenches to investigate the potential presence of remnant buried foundations;
- two mechanically excavated trial pits to depths of 1.50 m and 1.80 m to facilitate soakage testing;
- standard penetration tests (SPTs) carried out at regular intervals within the boreholes to provide quantitative data on the strength of the soils;
- equivalent California Bearing Ratio (CBR) testing by means of hand-held in-situ Dynamic Cone Penetrometer (DCP);
- the installation of five combined gas and groundwater monitoring standpipes, and a subsequent programme of six monitoring visits; three of which have been completed at the time of this report;
- testing of selected soil samples for contamination and geotechnical purposes; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

This report includes a contaminated land assessment which has been undertaken by a suitably qualified and competent professional in accordance with the methodology presented by the Environment Agency in their Land contamination risk assessment (LCRM)[1] Updated 12 June 2025. This involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the United Kingdom. Risk management is divided into three stages; Risk Assessment, Options Appraisal and Remediation, and each stage comprises three tiers. The Risk Assessment stage includes preliminary risk assessment (PRA), generic quantitative risk assessment (GQRA) and detailed quantitative risk assessment (DQRA) and this report includes the PRA and GQRA.

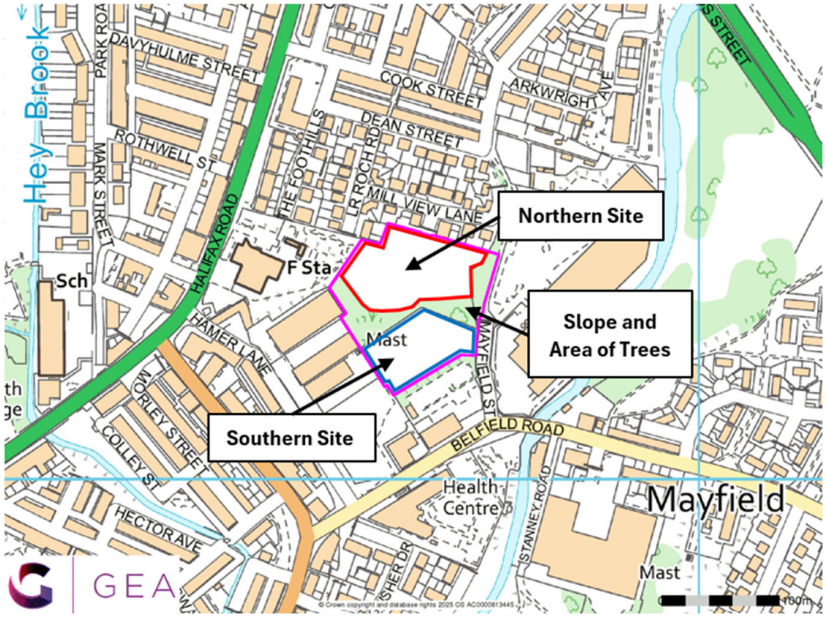
The exploratory methods adopted in this investigation have been selected on the basis of the constraints of the site including but not limited to access and space limitations, together with any budgetary or timing constraints. Where it has not been possible to reasonably use an EC7 compliant investigation technique a practical alternative has been adopted to obtain indicative soil parameters and any interpretation is based upon engineering experience, local precedent where applicable and relevant published information.

[1] https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm

2.0 The Site

2.1 Site Description

The site is located to the northeast of Rochdale town centre, approximately 1.65 km northeast of Rochdale railway station. It is bounded to the north by residential properties and by a fire station as well as commercial and industrial units to the west. To the south, the site is bounded by car parks and to the east by a public footpath and Mayfield Street. The site may be additionally located by National Grid Reference SD907141 and is shown on the map extract below.



A walkover of the site was carried out by a geotechnical engineer from GEA prior to fieldwork on 3rd October 2025. The site is irregular in shape measuring approximately 140 m north to south and 130 m west to east in maximum dimensions. The site is split into a northern part and a southern part, which are separated by an approximately 6 m high slope which is covered in shrubs, semi mature and mature trees.

The southern part of the site, which is located downslope, is an area of waste ground which, at the time of the investigation, was covered in cleared vegetation and felled trees, following a clearance exercise to provide access for this investigation. An area of shrubs, semi mature and mature trees is located along the southern edge, separating the site from the car park beyond the southern boundary. The surface is hummocky and uneven, sloping gently downwards towards the south and is accessed from Mayfield Street in the southeast through a secure gate.

The higher northern part of the site is an area of undeveloped soft landscaping containing numerous areas of shrubs and scattered saplings. An area of semi-mature and mature trees is located along the eastern edge and slopes gently down towards the southeast. This part of the site is accessed from the north through a pedestrian gate off Mill View Lane.

2.2 Site History

The site history has been researched by reference to internet sources and historical Ordnance Survey (OS) maps obtained from the Envirocheck database.

The earliest map studied, dated 1851, shows the site to have been primarily occupied by open farmland with a drying shed as well as what were probably small residential or farming buildings in the centre and east. On the western boundary, additional residential buildings were present. Two mills and a boiler house were located approximately 50 m to the south, whilst a drying house and dye works were slightly further to the south.

By 1893, the drying shed had been removed and residential buildings constructed on the eastern boundary of the site. Further mills had been constructed approximately 90 m to the west, 150 m to the north and 60 m to the east. To the south, the aforementioned mills are noted as either disused or having been converted to unknown works. Reservoirs had been excavated approximately 20 m to the northwest, 110 m to the south and 130 m to the southeast.

By 1910, the dye works to the south had been demolished and several large cotton mills constructed. The mill to the west is noted as a carriage works and the reservoir to the south had been infilled. The 1930 map shows the formerly disused mill to the south had been expanded onto the southern boundary of the site.

By 1958, the structures in the centre of the site had been removed and allotment gardens were in the western part. What appears to be a large mound was located in the northeastern corner of the site and the mill in the south is labelled as a works. On the same

map the carriage works to the west is no longer noted as such and many of the mills to the south are also noted as works. The reservoir to the northwest and one to the southeast had been infilled by this time and additional works had been constructed approximately 40 m to the southwest.

By 1971 all structures on site had been removed except for the works in the south which was labelled as a shoe factory. The works to the southwest had been expanded and the reservoir to the southeast filled in. An additional works had been constructed approximately 40 m to the north. The 1984 map labels the site as a yard with the works to the north of the site having expanded and extended onto the northernmost part of the site. The works in the south have also expanded and additional works had been established along the western boundary. Although not clearly shown, it is believed that a significant slope and level change between the northern and southern sites was created at this time.

The 2000 aerial image of the site shows that the works in the north had been expanded. By 2006 the works in the south had been demolished and at some time between 2006 and 2025, the remaining works in the north have been removed.

2.3 Other Information

A search of public registers and databases has been made via the Envirocheck database and relevant extracts from the search are appended. Full results of the search can be provided if required.

The Envirocheck report has indicated a single historic landfill within 250 m of the site, situated 196 m to the southeast, although a large landfill is also present 732 m to the south. The closer landfill was opened in December 1959 and its last input date is noted as taking place in December 1988, with the deposited waste including inert and industrial waste. The larger landfill was opened in December 1989 and its last input date is noted as taking place in December 1990, with the deposited waste which included inert and industrial waste. No waste management or waste transfer sites are located within 250 m of the site.

Three areas of potentially infilled land (water) are noted within 250 m, the closest being 28 m to the northwest. This appears to correlate with one of the reservoirs noted in the site history.

Two pollution incidents to controlled waters have been recorded within 250 m of the site, approximately 139 m to the southeast and 203 m to the northeast. The closer of the two incidents, which took place in March 1997, is noted to be of minor impact (Category 3) and involved soils and silts being discharged into a nearby watercourse. The other incident occurred in April 1995, is noted to be of minor impact (Category 3) however no details of the incident have been provided.

Information on Urban Soil Chemistry provided by the BGS indicates that background concentrations for arsenic, cadmium, chromium, lead and nickel on site are likely to range from 15 to 25 mg/kg, 3.0 to 6.0 mg/kg, 60 to 90 mg/kg, 600 to 1200 mg/kg and 30 to 45 mg/kg respectively. Therefore, relatively high concentrations of these metals may be encountered within any near surface soils present on the site and this will need to be taken into account in any subsequent risk assessment.

Reference to records compiled by the Health Protection Agency (formerly the National Radiological Protection Board) indicates that the site falls within an area where less than 1% of homes are affected by radon emissions and therefore radon protective measures will not be necessary.

The site is not within an area of sensitive land uses. There are no contemporary trade directory entries listed on site, but 27 are present within 200 m of the site, with nine being active. The active entries are summarised below.

Distance	Location	Entry	Active / Inactive
30 m W	Hamer Lane	Car Body Repairs	Active
83 m W	Hamer Lane	Tyre Dealers	Active
96 m W	84 Hamer Lane	Garage Services	Active
100 m E	Unit 1-3 Mayfield Centre	Pharmaceutical Manufacturers & Distributors	Active
100 m E	Mayfield Centre	Food Products - Manufacturers	Active
101 m SE	Bellfield Road	Garage Services	Active
126 m W	Halifax Road	Petrol Filling Station	Active
140 m W	Halifax Road	Sewing Machines - Industrial	Active
151 m N	Rochdale	Garage Services	Active

A single fuel filling station is located within 500 m of the site, located 126 m to the west and is listed as active. However it is unlikely to have an impact on the site because of its distance from the site.

A total of 11 Points of Interest relating to commercial services are listed within 250 m of the site, all relating to either vehicle repair, servicing and testing services, vehicle cleaning services or transport, storage and delivery. A further 13 Points of Interest relating to Manufacturing and Production are located within 250 m of the site, all relating to either unspecified works or factories. In addition, eight Points of Interest relating to public infrastructure are listed within 250 m of the site, relating to either a fire station, petrol station or weir/sluices.

2.4 Preliminary UXO Risk Assessment

A Preliminary UXO Risk Assessment has been completed by 1st Line Defence (report ref PA22685-00, dated 26th September 2025), and the report is included in the appendix. The risk assessment has been carried out in accordance with the guidelines provided by CIRIA[2], which state that the likelihood of encountering and detonating UXO below a site should be assessed along with establishing the consequences that may arise. The first phase comprises a preliminary risk assessment, which should be undertaken at an early stage of the development planning. If such an assessment identifies a high level of risk then a detailed risk assessment should be carried out by a UXO specialist, which will identify an appropriate course of action with regard to risk mitigation.

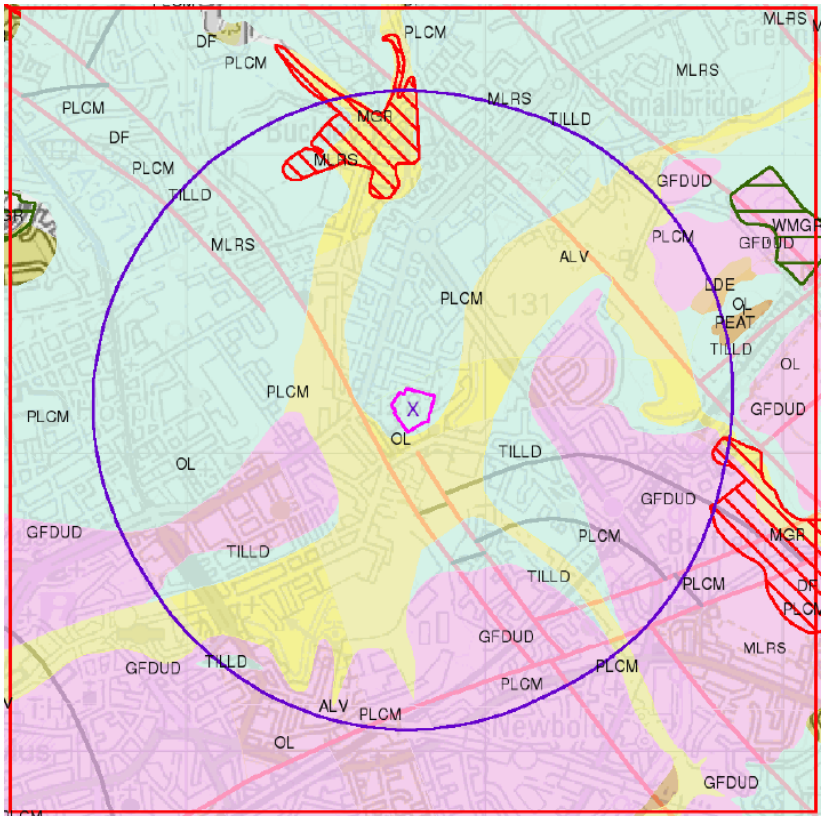
The report indicates that, during World War II (WWII), the site was located within the Rochdale County Borough which sustained an overall very low density of bombing with four items of ordnance recorded across the 9,556 acre borough. No positive evidence has been found to indicate that the site sustained any incidents of bombing throughout WWII and therefore, no further research is recommended.

However, because the risk of encountering UXO can never be entirely discounted, the following actions are recommended as a precaution:

- All ground operatives to be made aware of potential UXO risk, what to look out for, and what to do in the event that they encounter a suspect item.
- Compile a UXO Risk Management Plan for the site.

2.5 Geology

The British Geological Survey (BGS) map of the area indicates that the site is underlain by Glacial Till, described as heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape. This is in turn underlain by the Old Lawrence Rock, which is sandstone of the Pennine Lower Coal Measures Formation. Alluvium is present 20 m to the south and 100 m to the east of the site. Significant areas of made ground are noted 400 m to the north and 500 m to the southeast of the site.



2 CIRIA C681 (2009) *Unexploded ordnance (UXO) A guide for the construction industry*

A search of the BGS borehole database has found that a number of boreholes have been drilled on site. Below a 1.10 m thickness of made ground, firm to stiff brown, yellowish brown and grey mottled orange very silty sandy clay with bands of clayey silt and occasional gravel were encountered to a depth of 2.90 m. This was underlain by firm dark brown silty slightly sandy clay with fine to coarse gravel of mudstone, sandstone and coal. Bands of soft very silty laminated clay were encountered from a depth of 6.00 and these soils extended to the maximum depth investigated of 15.00 m.

2.6 Hydrology and Hydrogeology

Glacial Till is classified as a Secondary Undifferentiated Aquifer, which refers to aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type.

The Pennine Lower Coal Measures Formation is classified as a Secondary A Aquifer, defined as comprising permeable layers that can support local water supplies. The site is not within a Source Protection Zone.

The nearest surface water feature is the River Roch, which is located approximately 74 m to the southeast of the site.

The site is largely covered by vegetated areas resulting in any surface water draining directly into the ground.

The site is noted to have a limited potential for groundwater flooding to occur. It is not shown to be at risk from flooding from river or sea or from surface water flooding.

2.7 Consultant's Coal Mining Report

Mining Remediation Authority maps show the site to be within an area of historical coal mining activity. Therefore, a Consultant's Coal Mining Report (report ref 386266087_2 dated 23rd September 2025) has been completed and the report is included in the appendix. The report notes no underground or opencast mines within 500 m of the site and records no worked seams within the site area.

The report notes no probable unrecorded shallow workings and no recorded mine entries within 100 m. No opencast mines or Mining Remediation Authority managed tips are noted within 500 m. No mine gas or mine water treatment schemes are recorded within 500 m.

2.8 Preliminary Risk Assessment

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides the main regulatory regime for the identification and remediation of contaminated land. The determination of contaminated sites is based on a "suitable for use" approach which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of a source-pathway-receptor approach.

2.8.1 Source

The desk study findings indicate that the site has a potentially contaminative history as it has been developed with mills and works from some time between 1893 and 1910 until prior to 2006 with various other industrial developments including dye works having been present in close proximity to the site. Department of the Environment industry profiles[3] suggest contamination relating to metal and metalloids, inorganic compounds, oil and fuels, coolants, solvents as well as asbestos might be present.

The historic map records show that the works located within the northern part of the site and beyond the northern boundary had been demolished prior to 2006, meaning a significant thickness of made ground may be present. As this material was deposited approximately 20 years ago, it is likely that ground gas is currently being produced as these deposits are still within the time of their methanogenic potential.

Two historic landfills are noted within proximity of the site, but the closer of the two ceased accepting waster over 60 year ago meaning it is unlikely to still be producing ground gas. Although larger, the further of the two is at a distance where it should not pose a ground gas risk. On this basis, a viable gas risk from off-site sources is considered unlikely.

2.8.2 Receptor

The proposed redevelopment of the site for educational purposes will result in the end users representing relatively high sensitivity receptors. The underlying Secondary Undifferentiated Aquifer is a low sensitive receptor, as are adjacent sites. The deeper Secondary A aquifer would be a high sensitive receptor.

3 Department of Environment Industry Profile - Textile Works and Dye Works

Buried services are likely to come into contact with any contaminants present within the soils through which they pass and site workers are potential receptors during construction or maintenance works.

2.8.3 Pathway

The presence of potentially negligibly permeable Glacial Till will limit the potential for groundwater percolation into the underlying Secondary A Aquifer.

Within the site, end users will be isolated from direct contact with any contaminants present within the made ground by the presence of the buildings and the extent of hardstanding, although a direct pathway will exist in areas of soft landscaping. Buried services may be exposed to any contaminants present within the soil through direct contact and site workers will come into contact with the soils during groundworks.

A ground gas risk is anticipated within the northern part of the site but a risk of ground gas from recorded landfills is not considered likely.

2.8.4 Preliminary Risk Appraisal

On the basis of the above it is considered that there is a MODERATE / LOW risk of there being a significant contaminant linkage at this site which would result in a requirement for major remediation work.

3.0 Exploratory Work

In order to meet the objectives described in Section 1.2, a total of four boreholes were advanced to depths of between 5.00 m and 35.45 m using a cable percussion rig. Three boreholes were undertaken within the proposed footprint of the SEN building, with two undertaken to a depth of 15.45 m and another scheduled to a depth of 25.00 m, but extended to a depth of 35.00 m due to the bedrock not being present. Lastly, a shallower borehole was undertaken to a depth of 5.00 m to facilitate the installation of a gas / groundwater standpipe.

An opendrive sampling rig was used to advance an additional seven boreholes to depths of between 1.30 m and 4.45 m. The original purpose of these boreholes was to provide additional information on ground conditions across both sites, but upon encountering a layer of peat within Borehole No 4, these boreholes were used to investigate the extent of the peat present in the southern site.

Nine mechanically excavated trial pits were undertaken to depths of between 2.50 m and 3.60 m to confirm the presence or absence of remnant below ground structures relating to the previous buildings on site as well as to provide further coverage of the ground conditions of both sites. Additionally, upon encountering remnant structures within the central part of the southern site, four trial trenches were undertaken to depths of between 1.35 m and 1.75 m to expose and investigate the extent of these structures.

Additionally, two further mechanically excavated trial pits were undertaken to depths of 1.50 m and 1.80 m to facilitate soakage testing and three fill and empty cycles were undertaken within each pit.

Five standpipes have been installed, within Borehole Nos 1 to 4 and 11, to depths of between 1.00 m and 8.50 m to facilitate gas and groundwater monitoring. The response zones in Borehole Nos 1, 3 and 11 have been installed to target the made ground, a layer of peat within Borehole No 4 and the Alluvium within Borehole No 2. Monitoring has been carried out on three occasions to date.

During boring, disturbed and undisturbed samples were obtained from the boreholes for subsequent laboratory examination and testing. Standard Penetration Tests (SPTs) were carried out at regular intervals to provide additional quantitative data on the strength of soils encountered. A selection of the samples recovered from the boreholes was submitted to a soil mechanics laboratory for a programme of geotechnical testing and an analytical laboratory for a programme of contamination testing.

All of the above work was carried out under the supervision of a geotechnical engineer from GEA. The borehole and trial pit records are appended, together with a site plan indicating the exploratory positions. The Ordnance Datum (OD) levels on the borehole and trial pit records have been interpolated from a topographical survey drawing provided by the consulting engineers (S250277-DR-T-001 rev A, dated 29 August 2025).

3.1 Sampling Strategy

The trial pit and borehole locations were agreed with the consulting engineers, Adept Civil and Structural Consulting Engineers with the final positions adjusted by the onsite GEA engineer in the light of site constraints and findings.

Sixteen samples of the made ground, seven from the southern part and nine from the northern part, have been tested for the presence of contamination. The analytical suite of testing was selected to identify a range of typical industrial contaminants for the purposes of general coverage. The analytical suite for the soil included a range of metals, speciation of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols. Selected samples were also screened for the presence of asbestos. The analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. A summary of the MCERTs accreditation and test methods are included with the attached results and further details are available upon request.

In addition to the above analysis, two Waste Acceptance Criteria (WAC) tests of the made ground were carried out.

4.0 Ground Conditions

The investigation has not encountered the expected ground conditions in that a generally significant but locally moderate thickness of made ground was present over Alluvium. This was shown to be present to the south and east of the site but its presence had not been anticipated.

Beneath the Alluvium, Glacial Til was encountered to maximum depth of the investigation; 35.45 m (98.75 m OD). The expected Old Lawrence Rock was not encountered during the investigation.

4.1 Made Ground

4.1.1 Northern Site

The made ground initially comprised dark greyish brown slightly sandy gravelly humic silt over dark grey, grey, greyish brown and brown sandy very clayey gravel, sandy gravel, gravelly silty clay with fragments of brick, concrete, ash, clinker, ceramic, plastic, glass and metal with a slight organic odour. This material extended to a maximum depth of 6.10 m (128.10 m OD), but was generally encountered to depths of between 2.80 m and 4.70 m (130.30 m OD and 132.42 m OD).

From the presence of fragments of extraneous material noted above and the site history, there is evidence of contamination within the made ground. Based on these observations, seven samples of the made ground have been analysed for a range of contaminants and the results are detailed within Section 4.5.

Compaction testing on the made ground within the northern part has indicated a maximum dry density of 1.75 kg/m^3 and optimum moisture content of 14 %.

4.1.2 Southern Site

The made ground in this part of the site initially comprised dark greyish brown slightly sandy gravelly humic silt or a thickness of shrubs and felled vegetation over dark grey, grey, greyish brown and brown sandy very clayey gravel, sandy gravel, gravelly silty clay with fragments of brick, concrete, ash, clinker, ceramic, plastic, glass and metal. This material extended to depths of between 2.40 m and 3.20 m (124.70 m OD and 125.05 m OD) in the central, southern and eastern areas of the site, which coincides with the position of previous structures noted.

Within the northern and western parts, the made ground only extended to depths of between 0.50 m and 1.20 m (126.70 m OD and 127.70 m OD). Borehole Nos 08 and 10 terminated within these deposits.

Within the central part of the southern site remnant structures were encountered and four mechanically excavated trial trenches were undertaken in order to expose and investigate their extent. The findings of these excavations are summarised in the table below.

Position No	Type of Service	Depth to top of feature (m) [Level (m OD)]	Depth to base of feature (m) [Level (m OD)]
TT01 West	Concrete slab	1.55 [126.02]	1.65 [125.92]
TT01 West	Brick structure leading to slab	0.74 [126.83]	1.55 [126.02]
TT01 East	Brick wall and footings	0.50 [127.07]	1.36 [126.21]
TT02	Brick wall and footings	0.60 [126.97]	1.16 [126.41]
TT03	Brick wall and footings	0.80 [126.77]	1.23 [126.34]
TT04	Edge of concrete slab	1.70 [125.87]	n/a

From the presence of fragments of extraneous material noted above and the site history, there is evidence of contamination within the made ground. Based on these observations, nine samples of the made ground have been analysed for a range of contaminants and the results are detailed within Section 4.5.

Compaction testing on the made ground within the southern part has indicated maximum dry density of 1.87 kg/m^3 and optimum moisture content of 11 %.

4.2 Alluvium

4.2.1 Clay, Silt and Sand

Directly beneath the made ground, Alluvium was encountered as light grey, yellowish brown very soft to firm sandy silt, clayey silt, slightly gravelly slightly sandy silty clay and sand extending to depths of between 5.60 m and 8.30 m (122.40 m OD and 129.85 m OD). Borehole Nos 04 to 07 and 11, and Trial Pit Nos 01 to 09 terminated within these deposits.

Natural moisture content of the clay has been measured at between 29 % and 35.9 %. Atterberg testing of the clay has indicated liquid limits of 38 % and 39 %, a plasticity limit of 15 % and plasticity indexes of 23 % and 24 %. This indicates that the Alluvium is of medium volume change potential.

The results of quick undrained triaxial compression tests indicate the clay to be of low strength.

No visual of olfactory evidence of contamination was observed within the Alluvium.

4.2.2 Peat

Within the Alluvium in Borehole Nos 04, 07 and 09, brown and dark grey pseudo-fibrous peat with a slight putrid odour was encountered at depths of between 2.90 m and 3.70 m (123.77 m OD and 125.30 m OD) and extended to depths of between 3.40 m and 4.00 m (123.477 m OD and 124.80 m OD), with Borehole No 09 terminating within these deposits.

The organic content of the peat has been measured at 39.9 % and 48.8 %.

4.3 Glacial Till

4.3.1 Cohesive

The Glacial Till initially comprised stiff dark greyish brown slightly gravelly slightly sandy silty clay extending to a depth of 20.20 m (114.00 m OD), whereupon stiff dark greyish brown silty clay with occasional lenses of brown sand extended to a depth of 26.80 m (107.40 m OD). Cohesive Glacial Till was again encountered as stiff thinly laminated dark greyish brown silty clay to a depth of 30.50 m (103.70 m OD). Borehole No 01 and 03 terminated within these deposits.

Natural moisture content of the clay has been measured at between 15.5 % and 23.4 %. Atterberg testing of the clay has indicated liquid limits of 34 % and 42 %, plasticity limits of between 14 and 16 % and plasticity indexes of between 20 and 26 %. This indicates that the Glacial Till is to be of medium volume change potential.

The results of quick undrained triaxial compression tests indicate the clay to be of medium to high strength.

4.3.2 Granular

Below the initial significant layer cohesive Glacial Till, granular deposits were encountered and consisted of medium dense greyish brown very gravelly silty sand to a depth of 29.10 m (105.10 m OD). Granular Glacial Till was again encountered initially as medium dense greyish brown very gravelly silty sand to a depth of 31.40 m (105.10 m OD) whereupon

medium dense becoming dense very sandy silty gravel was encountered and extended to the maximum depth of the investigation; 35.45 m (98.75 m OD). Borehole No 02 terminated within these deposits at a depth within the range of a commercially viable pilling rig.

4.4 Groundwater

Groundwater was encountered as seepages within and at the base of the made ground at depths of 0.80 m and 3.30 m (127.10 m OD and 131.90 m OD) at eight locations and is believed to represent perched bodies of groundwater.

Groundwater was encountered locally within the Alluvium at depths of between 3.00 m and 5.60 m (122.40 m OD and 124.90 m OD) at two locations within the southern site and 7.70 m (126.50 m OD) at one location in the northern site, rising to a depth of 6.03 m (128.17 m OD) after 20 minutes.

Groundwater was also encountered locally within the granular Glacial Till at a depth of 26.50 m (107.70 m OD), rising to a depth of 7.70 m (126.50 m OD) respectively after 20 minutes.

Standpipes were installed in five of the boreholes and the findings of the three groundwater monitoring visit to date are presented in the table below.

Borehole No	Response Zone (m) and Target Lithology	Date	Depth to water (m) [Level (m OD)]
1	0.50 to 1.00 **Made Ground**	19/11/2025	0.68 [127.32]
		05/12/2025	0.45 [127.55]
		16/12/2025	0.32 [127.68]
2	6.00 to 8.50 **Alluvium**	19/11/2025	3.00 [131.20]
		05/12/2025	2.75 [131.45]
		16/12/2025	2.84 [131.36]
3	0.60 to 4.60 **Made Ground**	19/11/2025	4.14 [131.31]
		05/12/2025	3.47 [131.98]
		16/12/2025	3.52 [131.93]
4	3.90 to 4.40 **Alluvium (Peat)**	19/11/2025	2.00 [126.20]
		05/12/2025	0.65 [127.55]
		16/12/2025	0.67 [127.53]
11	0.30 to 4.30 **Made Ground**	19/11/2025	3.80 [131.20]
		05/12/2025	4.06 [130.94]
		16/12/2025	3.94 [131.06]

4.5 Soil Contamination

4.5.1 Made Ground – Northern Site

The table below sets out the values measured within the seven samples from within the northern site; all concentrations are in mg/kg unless otherwise stated.

Determinant	Maximum	Minimum	Number of samples below detection limit
pH	8.3	7.6	-
Arsenic	**180**	6.2	None
Cadmium	6.6	0.40	None
Chromium (Hexavalent)	<1.8	<1.8	All
Lead	**1700**	45	None
Mercury	0.40	<0.30	Six
Selenium	4.5	<1.0	Four

Determinant	Maximum	Minimum	Number of samples below detection limit
Copper	530	27	None
Nickel	84	17	None
Zinc	550	94	None
Total Cyanide	<1.0	<1.0	All
Total Phenols	<1.0	<1.0	All
Total PAH	71	2.98	None
Sulphide	42	<1.0	Three
Benzo(a)pyrene	5.2	0.20	None
Naphthalene	1.4	<0.05	One
Benzo(b)fluoranthene	**6.5**	0.32	None
Dibenz(a,h)anthracene	**0.82**	<0.05	Two
EPH (C8-C40)	180	10	None
Total Organic Carbon %	3.3	0.70	None

In addition, the seven samples of made ground have been screened for the presence of asbestos and the results are shown in the table overleaf.

BH/TP ref	Sample depth (m)	Asbestos detected	Quantification; total asbestos in sample	Potentially respirable fibres (fibres/g)
BH02	0.50	None	-	-
TP04	1.10	**Chrysotile– Loose fibres**	**<0.001%**	-
TP04	2.90-3.00	**Chrysotile– Loose fibres**	**<0.001%**	
TP06	1.20	None	-	-
TP07	0.60	**Chrysotile– Loose fibres**	**<0.001%**	-
TP08	0.80	**Chrysotile– Loose fibres**	**<0.001%**	-
TP09	0.20	**Chrysotile– Loose fibres**	**<0.001%**	-

4.5.2 Made Ground – Southern Site

The table below sets out the values measured within the nine samples from within the southern site; all concentrations are in mg/kg unless otherwise stated.

Determinant	Maximum	Minimum	Number of samples below detection limit
pH	10.4	7.2	-
Arsenic	30	5.0	None
Cadmium	1.7	0.20	None
Chromium (Hexavalent)	3.4	<1.8	Seven
Lead	**510**	75	None
Mercury	0.60	<0.30	Six
Selenium	1.6	<1.0	Four
Copper	110	30	None
Nickel	32	15	None
Zinc	250	78	None
Total Cyanide	<1.0	<1.0	All
Total Phenols	<1.0	<1.0	All
Total PAH	**121**	4.21	None
Sulphide	9.1	<1.0	One
Benzo(a)pyrene	**9.4**	<0.05	None
Naphthalene	0.37	<0.05	One
Benzo(b)fluoranthene	**10**	0.52	None
Dibenz(a,h)anthracene	**0.82**	<0.05	Two
EPH (C8-C40)	550	75	None
Total Organic Carbon %	3.7	1.0	None

In addition, these nine samples have been screened for the presence of asbestos and the results are shown in the table below.

BH/TP/TT ref	Sample depth (m)	Asbestos detected	Quantification; total asbestos in sample (%)	Potentially respirable fibres (fibres/g)
BH01	0.30	None	-	-
BH04	0.30-0.50	**Amosite / Chrysotile– Loose fibres, Loose fibrous débris**	**0.006%**	-
BH05	0.80-1.00	**Chrysotile– Loose fibres**	**0.001%**	-
BH07	0.60-0.80	**Chrysotile– Loose fibres**	**<0.001%**	-
BH08	0.30-0.40	None	-	-
TP02	1.00	**Amosite / Chrysotile– Loose fibrous débris**	**0.001%**	-
TP03	1.80	**Chrysotile– Loose fibres, Loose fibrous débris**	**0.002%**	
TP03	2.30	None	-	
TT01 East	1.00	**Chrysotile– Loose fibres**	**0.002%**	

4.5.3 Generic Quantitative Risk Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. Contaminants of concern are those that have values in excess of generic human health risk-based guideline values, which are either the CLEA[4] Soil Guideline Values where available, the Suitable 4 Use Values[5] (S4UL) produced by LQM/CIEH calculated using the CLEA UK Version 1.07[6] software, or the DEFRA Category 4 Screening values[7], assuming a residential end use without plant uptake. The key generic assumptions for this end use are as follows:

- that groundwater will not be a critical risk receptor;
- that the critical receptor for human health will be young female children aged less than six years old;
- that the exposure duration will be six years;
- that the critical exposure pathways will be indoor dust ingestion, skin contact with indoor dust, and inhalation of indoor and outdoor dust and vapours; and
- that the building type equates to a two-storey small terraced house.

It is considered that these assumptions are acceptable for this generic assessment of this SEN development site. The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of these generic screening values there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include;

- additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

On the basis of the above, the presence of widespread asbestos and elevated concentrations of arsenic, lead and total PAHs more specifically benzo(a)pyrene, benzo(b)fluoranthene and dibenz(a,h)anthracene were present within the made ground. The table below indicates the locations of the samples where the elevated concentrations were measured.

4 *Updated Technical Background to the CLEA Model (Science Report SC050021/SR3) Jan 2009* and Soil Guideline Value reports for specific contaminants; all DEFRA and Environment Agency.
5 *The LQM/CIEH S4Uls for Human Health Risk Assessment* S4UL3065 November 2014
6 Contaminated Land Exposure Assessment (CL|EA) Software Version 1.071 Environment Agency 2015
7 CL:AIRE (2013) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Final Project Report SP1010 and DEFRA (2014) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Policy Companion Document SP1010

Determinant	Location	Depth (m)	Stratum	Concentration (mg/kg)	Screening Value (mg/kg)
Arsenic	TP04	2.90-3.00	Made Ground	**180**	40
Lead	BH05	0.80-1.00	Made Ground	**510**	310
	BH08	0.30-0.40		**310**	
	TP04	1.10		**1700**	
Benzo(a)pyrene	TP03	1.80	Made Ground	**7.5**	5.3
	TT01 East	1.00		**9.4**	
Benzo(b)fluoranthene	BH07	0.60-0.80	Made Ground	**4.1**	4.0
	TP01	0.50		**5.3**	
	TP03	1.80		**8.4**	
	TP04	1.10		**5.4**	
	TP07	0.60		**6.5**	
	TT01 East	1.10		**10**	
Dibenz(a,h)anthracene	BH07	0.60-0.80	Made Ground	**0.40**	0.32
	TP01	0.50		**0.39**	
	TP03	1.80		**0.53**	
	TP04	1.10		**0.37**	
	TP07	0.60		**0.45**	
	TT01 East	1.00		**0.82**	

The significance of these results is considered further in Part 2 of the report.

4.6 Groundwater Contamination

Three samples of groundwater, one from within made ground and two within the Alluvium, have been tested for the presence of contamination. The full results are included in Appendix B. The results have indicated elevated concentrations of anthracene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene and indeno(1,2,3-cd)pyrene from the sample taken from the made ground. The elevated contaminants are consistent with what is outlined within the industry profiles and is likely to have derived from ash and clinker rich material and the part burnt elements within the clinker that are typically PAH rich.

Additionally, surface water was noted running off the site and into a drainage channel located on the footpath, which ran along the eastern site boundary. Within the channel, orange residue was noted, as shown in the photograph across the page and therefore a sample of the water was tested for the presence of contamination. The results have not indicated elevated concentrations of contaminants.

4.7 Soakage Testing

Two trial pit soakage tests were carried out, at depths of 1.50 m and 1.80 m (126.10 m OD and 126.85 m OD respectively) within the Alluvium and measured infiltration rates of between 5.3×10^{-7} m/s and 1.7×10^{-6} m/s. The full results are included in the Appendix and are summarised below.

Location	Soakage Test No	Soakage Rate (m/s)	Stratum	Response Zone (m)	Comments
SA01	1	1.7×10^{-6}	Alluvium	0.60 to 1.50	Did not reach 25 % effective depth after 112 minutes.
		0.14 m/day			
	2	1.4×10^{-6}			Did not reach 25 % effective depth after 120 minutes.
		0.12 m/day			
	3	1.4×10^{-6}			Did not reach 25 % effective depth after 60 minutes.
		0.12 m/day			
SA02	1	1.1×10^{-6}	Alluvium	0.53 to 1.80	Did not reach 25 % effective depth after 108 minutes.
		0.09 m/day			
	2	1.3×10^{-6}			Did not reach 25 % effective depth after 99 minutes.
		0.11 m/day			
	3	5.3×10^{-7}			Did not reach 25 % effective depth after 118 minutes.
		0.05 m/day			

4.8 Soil Gas

Three rounds of monitoring have been carried out to date and full results are given in the appendix. The monitoring has indicated significant concentration of methane and carbon dioxide gas and minimal positive pressures or flow within the standpipes.

Gas	Max concentration % vol.	Max flow rate l/hr
Methane	0.23	0.1
Carbon dioxide	0.101	0.1

Based on the values obtained at this stage, some form of gas protection measures are anticipated to be required, however the GSV and Characteristic Value cannot be provided until the six monitoring visits have been completed.

Part 2: Design Basis Report

This section of the report provides an interpretation of the findings detailed in Part 1, in the form of a ground model, and then provides advice and recommendations with respect to the proposed development.

5.0 Ground Model

It is proposed to redevelop the site from an area of wasteland into a new SEN school. This is to include a main building of single and two-storey construction with the step spanning an existing site level difference as well as a multi-use games area, an area of car parking and bus drop off bays along with areas of soft landscaping. The loads are not known but are anticipated to be moderate.

The desk study findings indicate that the site does have a potentially contaminative history as it has been developed with mills and works from sometime between 1893 and 1910 until 2006. On the basis of the fieldwork, the ground conditions can be characterised as follows:

- below a moderate to significant thickness of made ground, Alluvium is present, and is underlain by Glacial Till which extends to the maximum depth of the investigation, of 35.45 m (98.75 m OD);
- the made ground within the northern part of the site initially comprises dark greyish brown slightly sandy gravelly humic silt over dark grey, grey, greyish brown and brown sandy clayey gravel, sandy gravel, gravelly silty clay with fragments of brick, concrete, ash, clinker, ceramic, plastic, glass and metal with a slight organic odour to depths of between 2.80 m and 6.10 m ();
- the made ground within the southern part of the site initially comprises dark greyish brown slightly sandy gravelly humic silt or felled vegetation over dark grey, grey, greyish brown and brown sandy clayey gravel, sandy gravel, gravelly silty clay with fragments of brick, concrete, ash, clinker, ceramic, plastic, glass and metal to depths of between 0.50 m and 3.20 m (124.70 m OD and 127.70 m OD);
- obstructions such as remnant concrete slabs, brick walls and footings are present within the made ground within the southern part of the site;
- the Alluvium comprises light grey, yellowish brown very soft to firm sandy silt, clayey silt, slightly gravelly slightly sandy silty clay, pseudo-fibrous peat and sand extending to depths of between 5.60 m and 8.30 m (122.40 m OD and 129.85 m OD);
- Glacial Till consisting of stiff slightly gravelly slightly sandy silty clay, slightly sandy silty clay and silty clay and medium dense becoming dense very gravelly silty sand and very sandy gravel extending to the maximum depth of the investigation; 35.45 m (98.75 m OD);
- perched groundwater was encountered within the made ground at depths of 0.80 m and 3.30 m (127.10 m OD and 131.90 m OD) and groundwater was also encountered locally within the Alluvium at depths of 3.00 m and 7.70 m (122.40 m OD and 126.50 m OD), settling at 6.03 m (128.17 m OD). Groundwater was also encountered within the granular Glacial Till at 26.50 m (107.70 m OD), rising to a depth of 7.70 m (126.50 m OD);
- contamination testing has revealed the presence of arsenic, lead, total PAHs specially benzo(a)pyrene, benzo(b)fluoranthene and dibenz(a,h)anthracene and asbestos contamination within the made ground; and
- groundwater contamination testing has revealed elevated concentrations of anthracene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene and indeno(1,2,3-cd)pyrene within the sample taken from the made ground.

6.0 Advice & Recommendations

The thickness of made ground and soft Alluvium is such that shallow spread foundations and ground improvement are not considered to be feasibleEven though the proposals for the site are to only contain low-rise buildings, piled foundations are considered necessary.

6.1 Piled Foundations

Where the thickness of the made ground and soft Alluvium means that spread foundations are not feasible or the loads are too high for ground improvement, recourse to piled foundations will be required.

6.1.1 Driven Piles

Driven piles are considered to provide a suitable foundation solution. The piles are formed of reinforced precast concrete and would be driven to a set in the cohesive Glacial Till. They would not generate any spoil, are fully reinforced and with a smooth surface would be least affected by negative skin friction applied by settlement of the made ground or Alluvium. Each pile is effectively tested as it is driven and piles up to 15 m could be brought to site as single lengths whilst longer piles could be jointed.

The following table outlines the ultimate coefficients may be used for the preliminary design of piles on the northern part of the site, based on the SPT / depth graph in the Appendix.

Stratum	Depths m	kN/m²
Ultimate Skin Friction		
Made Ground	GL to 6.10	Ignore / NSF
Alluvium	6.10 to 8.30	20
Cohesive Glacial Till	8.30 to 26.80	70
Granular Glacial Till	26.80 to 29.10	100
Cohesive Glacial Till	29.10 to 30.50	70
Granular Glacial Till	Below 30.50 m	120
Ultimate End Bearing		
Cohesive Glacial Till	8.30 to 26.80	900
Granular Glacial Till	26.80 to 29.10	1500

BS EN 1997-1:2004; Eurocode 7: Geotechnical Design Part 1 (Eurocode 7) provides factors to be applied to the ultimate skin friction and ultimate end bearing capacity in calculating pile resistance (Rd,GEO). For driven piles, in the absence of either working load tests or combined working load tests and preliminary pile tests, a model factor of 1.3 should be combined with a factor of 1.5 to be applied to the skin friction, and with a factor of 1.7 to be applied to the end bearing.

On the basis of the above, and using the values outlined in the previous table, a 250 mm square pile driven to a depth of 18.00 m bearing within the cohesive Glacial Till shows the estimated pile resistance to be 400 kN, whilst a 350 mm square pile shows the estimated pile resistance to be 550 kN. If the piles were to extend to a depth of 23.00 m, estimated pile resistance would increase to 575 kN and 810 kN respectively.

6.1.2 Bored Piles

Conventional rotary open-bored or continuous flight auger (CFA) piles bearing in the Glacial Till are also considered to be capable of providing a suitable foundation solution. The choice between the two techniques will be largely dependent on the installation levels and the choice of piling rig. In a rotary open-bored pile, the depth and thickness of significant layers of granular soils together with variable groundwater levels within the Alluvium mean that temporary casing will be difficult to install and recover after concreting. As significant thicknesses of granular soils have been encountered, bentonite suspension, or similar such support fluid, may therefore be needed to support the bore during drilling. Such bored piles are unlikely to prove economical for a development of this size and nature.

The use of a continuous flight auger (CFA) technique would avoid the need for temporary casing and/or bentonite to deal with any granular soil and groundwater ingress and potential instability in the fill. Furthermore, the depth of 25.00 m for the stiff cohesive Glacial Till within the 25 m depth range of a medium sized CFA piling rig as might typically be adopted for a development of this size and nature.

BS EN 1997-1:2004; Eurocode 7: Geotechnical Design Part 1 (Eurocode 7) provides factors For CFA bored piles, in the absence of either working load tests or combined working load tests and preliminary pile tests, a model factor of 1.4 should be combined with a factor of 1.6 to be applied to the skin friction, and with a factor of 2.0 to be applied to the end bearing.

On the basis of the above, and using the values outlined in the previous table, 450 mm and 600 mm diameter CFA bored piles constructed to a depth of 18.00 m bearing within the

cohesive Glacial Till shows the estimated pile resistance to be 500 kN and 725 kN respectively. If the piles were to extend to a depth of 23.00 m, estimated pile resistance would increase to 725 kN and 1000 kN respectively.

Specialist piling contractors should be consulted with regard to the design of a suitable piling scheme and their attention should be drawn to potential groundwater inflows present within the Glacial Till.

6.2 Shallow Excavations

On the basis of the observations on site, it is considered that it will not be generally feasible to form excavations without the requirement for lateral support due to the thickness and density of the made ground.

As shallow groundwater has been recorded on site within the made ground, it is recommended that provision be made for battered side slopes or lateral support. Where personnel are required to enter excavations, a risk assessment should be carried out and temporary lateral support or battering of the excavation sides considered in order to comply with normal safety requirements.

6.3 Surface Water Drainage

The soakage testing has measured poor rates of infiltration within the shallow Glacial Till. Provision should therefore be made for attenuation on site and controlled discharge into the main drainage system.

6.4 Ground Floor Slab

The made ground is not considered to provide a suitable bearing material for ground bearing floor slabs.

If piled foundations are to be adopted for the proposed structure, a suspended floor slab should be assumed to avoid any damage caused by differential settlement.

6.5 Pavement Design

A series of equivalent CBR tests in the form of a hand-held dynamic cone penetrometer have been carried out at ten locations (CBR01 to CBR10) positioned to provide general coverage of both sites and the results are presented in the appendix.

The testing indicates a high degree of variability within the made ground. Assuming that it will be screened and recompacted during the reprofiling of the site, a CBR of 5% should be achievable, but this will need to confirmed by additional testing. In areas without such treatment, they should be designed for a CBR value of ‘less than 2 %.

6.6 Effect of Sulphates

Chemical analyses of the made ground have revealed relatively low concentrations of soluble sulphate and pHs which range near neutral to mildly alkaline. The majority of the made ground has a Class DS-1, which shows that an ACEC Class of AC-1s is required for static water conditions and AC-1 is required for mobile water conditions, however four samples of made ground have revealed high concentrations of soluble sulphate, leading to Classes of DS-2 and DS-3, and therefore an ACEC Class of AC-3 is required for mobile water conditions. It is assumed that the majority of the made ground is to remain on site, therefore for any concrete which will come into contact with the made ground, such as pile cap and small-scale structures, DS-3 conditions should be assumed..

Two samples of Alluvium and seven samples of Glacial Till all fall within Class DS-1 conditions showing that an ACEC class of AC-1 for mobile water conditions and AC-1s for static water conditions would be appropriate for the site. The guidelines contained in the digest should be followed in the design of foundation concrete.

6.7 Contamination Risk Assessment

The desk study findings indicate that the site does have a potentially contaminative history as it has been developed with mills and works from sometime between 1893 and 1910 until 2006. The results of the chemical analyses have indicated elevated concentrations arsenic, lead, total PAHs specially benzo(a)pyrene, benzo(b)fluoranthene and dibenz(a,h)anthracene along with widespread asbestos contamination within the made ground.

The exact source of the arsenic, lead and total PAH contamination is unknown but the made ground was noted as containing fragments of extraneous material and it is likely that fragments of such material, for example, ash, clinker, coal or old paint fragments, could account for the elevated concentration. The results of the WAC testing show that this contamination is not likely to be in a soluble state and should not, therefore, pose a risk to adjacent sites, groundwater or buried services.

Asbestos is only a risk to humans if the asbestos fibres become airborne. Given the positive identification of asbestos within eleven samples out of the sixteen samples of made ground tested, it can be assumed that some of the made ground contains a degree of asbestos. Quantification testing revealed the maximum concentration of asbestos found by this investigation to be 0.006 % to less than the detectable limit of 0.001% but it may be present at higher concentrations elsewhere on site.

According to the HSE, there is now significant monitoring evidence available within the ground investigation and remediation industry to suggest that significant visible quantities of bound ACMs will need to be present to give rise to exposures above 0.01 f/ml, equivalent to one tenth of the control limit, unless they are being subject to highly energetic processes (e.g. crushing, power screening and grading of demolition waste and made ground or soil). As the preparation of the site is likely to involve the excavation of the fill material, there is a risk of the release of asbestos fibres.

The groundwater monitoring has indicated elevated concentrations of PAH species including anthracene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene and indeno(1,2,3-cd)pyrene. Any perched water encountered within the made ground during excavation and site preparation should therefore be pumped into a secure tank or container and disposed of to appropriate treatment facilities as to not spread any such contamination into the surrounding soils.

6.7.1 Services

Consideration will need to be given to the protection of buried plastic potable water supply services laid within the made ground. Details of the proposed protection measures for buried plastic services will need to be approved by the EHO and the relevant service authority prior to the adoption of any scheme. Barrier pipe will be required or additional testing will need to be carried out.

6.7.2 Site Workers

Apart from the physical hazards represented by the fill materials, concentrations of potentially carcinogenic lead have been measured in the shallow soils in the southwest of the site. Site workers should be made aware of the contamination and a programme of working should be identified to protect workers handling any soil. The method of site working should be in accordance with guidelines set out by HSE[8] and CIRIA[9] and the requirements of the Local Authority Environmental Health Officer. Contractors should be made aware of the presence of asbestos in the soil and appropriate measures taken to prevent exposure and / or fugitive emissions of fibres. These may include but are not limited to:

- dampening down of ground to minimise the generation of dust;
- sheeting of stockpiles;
- road going vehicles separated from potentially contaminated soil by 'clean' haul roads
- wheel wash facilities at the access point to site; and
- all lorries containing contaminated fully sheeted prior to leaving site.

6.7.3 End Users

In its current form, it is considered there is a risk to human health as there is a viable pathway between the contamination encountered and the end users. It is recommended in locations of proposed soft landscaping, suitable precautions will be required through the removal of sufficient thickness of made ground to allow the placement of certified clean subsoil, topsoil and a brightly coloured anti-dig membrane. The thickness of clean subsoils and topsoil should be at least 300 mm below communal grassed areas and 450 mm below planting beds, in accordance with recommendations from BRE, with an anti-dig membrane placed at the base. It may be possible to reduce the final thickness of cover required, but this will need to be determined once final levels have been established and concentrations of potential contaminants within the imported materials are known. A clean cover system will also have the benefit of protecting end users from any asbestos in the made ground as it will create a barrier between the end users and any airborne fibres which could be released.

6.8 Waste Disposal

Under the Waste Framework Directive, waste is classified as being either Hazardous or Non-Hazardous and landfills receiving waste are classified as accepting hazardous or non-hazardous wastes or the non-hazardous sub-category of inert waste in accordance with the Waste Directive. Waste classification is a staged process and this investigation represents the preliminary sampling exercise of that process. Once the extent and location of the

8 HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land* HMSO

9 CIRIA (1996) *A guide for safe working on contaminated sites* Report 132, Construction Industry Research and Information Association

waste that is to be removed has been defined, further sampling and testing may be necessary. The results from this ground investigation should be used to help define the sampling plan for such further testing, which could include WAC leaching tests where the totals analysis indicates the soil to be a hazardous waste or inert waste from a contaminated site. It should however be noted that the Environment Agency guidance WM3[10] states that landfill WAC analysis, specifically leaching test results, must not be used for waste classification purposes.

Any spoil arising from excavations or landscaping works, which is not to be re-used in accordance with the CL:AIRE[11] guidance, will need to be disposed of to a licensed tip. Waste going to landfill is subject to landfill tax at either the current standard rate of £126.15 per tonne (about £231.00 per m^3) or at the lower rate of £4.05 per tonne (roughly £7.50 per m^3). However, the classifications for tax purposes and disposal purposes differ and currently all made ground and topsoil is taxable at the 'standard' rate and only naturally occurring soil and stones, which are accurately described as such in terms of the 2011 Order, would qualify for the 'lower rate' of landfill tax.

Based on the technical guidance provided by the EA it is considered likely that the soils encountered during this ground investigation, as represented by the chemical analyses carried out, would be generally classified as follows.

Soil Type	Waste Classification (Waste Code)	WAC Testing Required Prior to Landfill Disposal?	Current applicable rate of Landfill Tax
Made ground (TP04 – 1.10 m)	Hazardous (17 05 03)	Yes	£126.15/tonne (Standard rate)
Made ground	Non-hazardous (17 05 04)	No	£126.15/tonne (Standard rate)
Alluvium and Glacial Till	Inert non-hazardous (17 05 04)	Should not be required but confirm with receiving landfill	£4.05 / tonne (Reduced rate for uncontaminated naturally occurring rocks and soils)

Under the requirements of the Waste Directive all waste needs to be pre-treated prior to disposal. The pre-treatment process must be physical, thermal, chemical or biological, including sorting. It must change the characteristics of the waste in order to reduce its volume, hazardous nature, facilitate handling or enhance recovery. The waste producer can carry out the treatment but they will need to provide documentation to prove that this has been carried out. Alternatively, the treatment can be carried out by an approved contractor. The Environment Agency has issued a position paper[12] which states that in certain circumstances, segregation at source may be considered as pre-treatment and thus excavated material may not have to be treated prior to landfilling if the soils can be segregated onsite prior to excavation by sufficiently characterising the soils insitu prior to excavation.

The above opinion with regard to the classification of the excavated soils is provided for guidance only and should be confirmed by the receiving landfill once the soils to be discarded have been identified. The local waste regulation department of the Environment Agency (EA) should be contacted to obtain details of tips that are licensed to accept the soil represented by the test results. The tips will be able to provide costs for disposing of this material but may require further testing.

10 Environment Agency 2015. *Guidance on the classification and assessment of waste.* Technical Guidance WM3 First Edition

11 CL:AIRE March 2011. *The Definition of Waste: Development Industry Code of Practice* Version 2

12 Environment Agency 23 Oct 2007 *Regulatory Position Statement Treating non-hazardous waste for landfill - Enforcing the new requirement*

7.0 Outstanding Risks & Issues

This section of the report aims to highlight areas where further work is required as a result of limitations on the scope of this investigation, or where issues have been identified by this investigation that warrant further consideration. The scope of risks and issues discussed in this section is by no means exhaustive, but covers the main areas where additional work may be required.

7.1 Site-Specific Risks

Monitoring of the standpipes should be continued to determine equilibrium groundwater levels and to establish any seasonal fluctuations. In addition, any perched water encountered during excavation should be pumped into a secure tank or container and left to dry, with remaining material tested and disposed of appropriately.

The full six rounds of gas monitoring have not yet been completed, meaning no characteristic value can be given, however at this time, gas protection measures are anticipated to be required.

If any obstructions are anticipated below the proposed structure, they will need to be removed to avoid any issues for the piling rigs and the formation of hard spots causing differential settlement.

This investigation has identified the presence of contamination and there is a requirement for a separate remediation proposals report to be prepared to comply with planning requirements. The remediation will need to be supervised and verified by a geoenvironmental engineer and a completion or validation report will also probably be required to support the planning application.

These areas of doubt should be drawn to the attention of prospective contractors and further investigation will be required or sufficient contingency should be provided to cover the outstanding risk.

7.2 General Risks

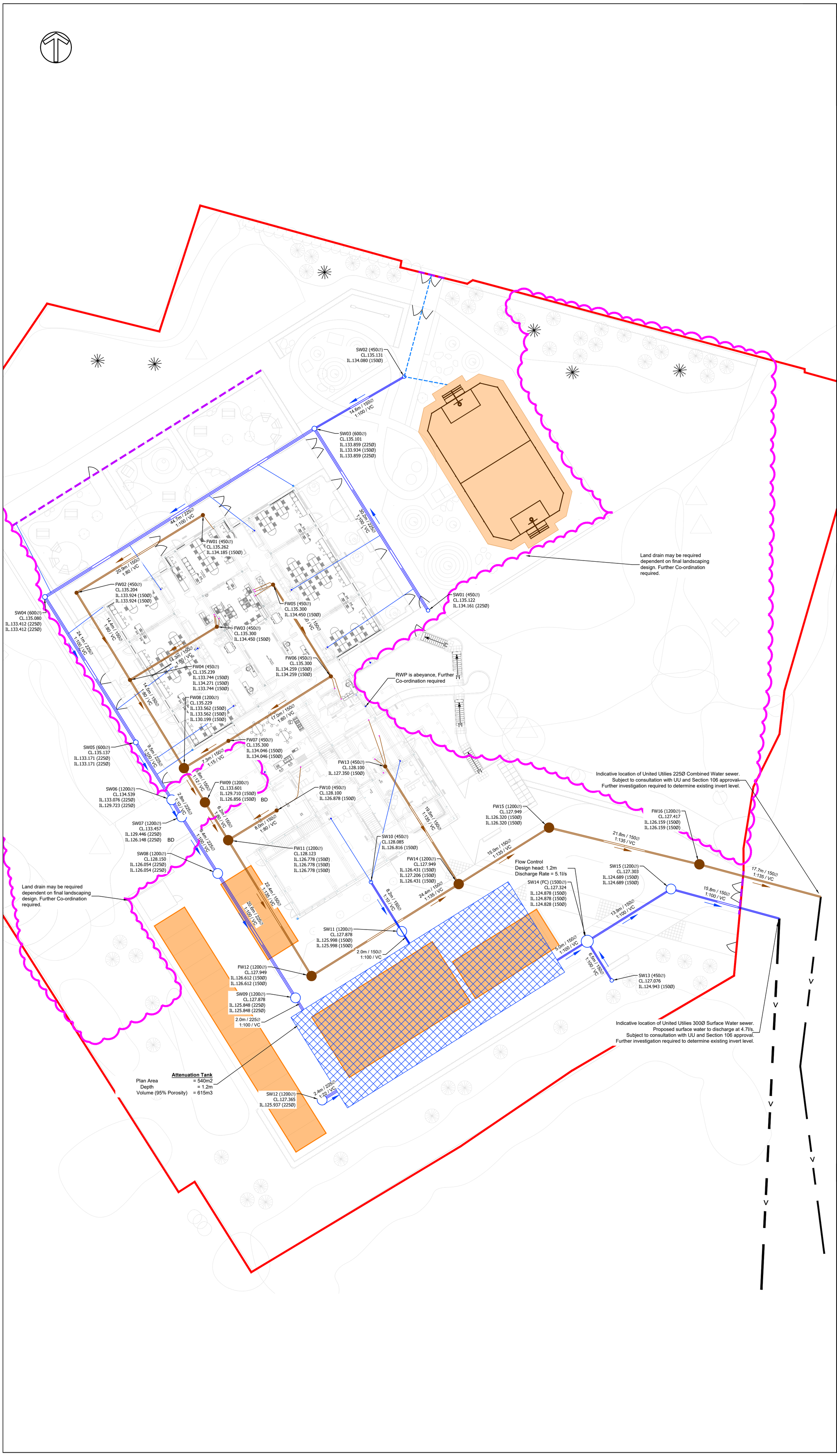
The ground is a heterogeneous natural material and variations will inevitably arise between the locations at which it is investigated. This report provides an assessment of the general ground conditions based on the discrete points at which the ground was sampled, but there may be ground conditions (including soil, rock, gas and groundwater) elsewhere on site that have not been revealed by this investigation and therefore could not have been taken into account in this report. The ground conditions should be subject to review as the development proceeds to ensure that any variations from the Ground Model are properly assessed by a suitably qualified person.

The comments made regarding gas and groundwater are based on observations made during the period the work has been carried out. Conditions may vary as a result of seasonal or other effects.

Where any conclusions and recommendations contained in this report have been based upon information provided by others, it has been assumed that all relevant information has been provided by those parties and that such information is accurate. Any such information has not been independently verified by GEA, unless otherwise stated in the report. GEA accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to GEA from others.

Appendix C
Drainage

- Proposed Drainage Plan



Do Not Scale

Drawing Notes

Residual Hazards

Health, Safety & Environmental Notes

General Notes:

1. This drawing to be read in accordance with all other relevant Adept drawings, third party drawings, specification and other supporting documentation.
2. All given dimensions are as follows.
A. Level, coordinates and chainages in meters.
B. Pipe diameter, trench widths and Manhole details in millimeters.
3. All works adhere to all relevant CDM Regulations, project related CDM Documentation and health & safety Risk Assessments.
4. Architects layout taken from 'Seven Architecture' drawing 'BAP-SEV-ZZ-00-M2-A-02330/1/2/3'.
5. Topo Information Taken from 'Site Surveying Services' Drawing 'S250277-DR-T-001'.
6. Internal Foul Drianage taken from "Silcock" drawing "BAP-SLCE-ZZ-00-DR-M-52000/1/2"
7. Rainwater Pipes taken from "Seven" drawing "BAP-SEV-ZZ-00-M2-A-02330/1/2/3"
8. Landscape layout taken from "CW Studio" drawing "2535-CWS-XX-XX-DR-L-1000"
9. Existing drainage has been interpolated using historic survey information. All existing drainage to be located on site and depths confirmed to inform future detailed design and coordination.

Surface Water Drainage

The surface water drainage has been designed to drain by gravity with a free discharge into an attenuation tank located within the car park. The Surface Water drainage will be restricted via a Flow control. The Restricted surface water will drain via gravity into the 300Ø United Utilities Surface Water sewer located in Mayfield Street. Subject to United utilities Section 106 approval.

The Discharge rate has been based off the proposed impermeable areas in accordance with the 2 Year flow rate greenfield run off.

Discharge Rate	= 5.1l/s
Impermeable Area	=0.616Ha
Attenuation Tank	
Plan Area	= 540m2
Depth	= 1.2m
Volume (95% Porosity)	= 615m3

Assumptions

FSR Data has been used

CV Values = 1.0 Summer / 1.0 Winter

Climate Change = 45%

As the surface water is being proposed to discharge into the 300Ø United utilities surface water sewer a Surcharged outfall has **NOT** being modeled.

KEY

- PCC Manhole / PPIC — Proposed Foul Water Drain
- PCC Manhole / PPIC — Proposed Surface Water Drain
- Proposed Attenuation Tank
- Permeable Asphalt
- United Utilities Sewer
- Channel Drain / Kerb Drain
- Site Boundary
- Internal Foul Pop Ups
- RWP Positions

Date	Description	By	Chk	Rev
11.03.26	Revised to clients comments	BHB	AL	P3
06.03.26	Stage 3 Issue	BHB	AL	P2
17.11.25	Initial Issue	BHB	RP	P1

ADEPT
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Project
Brownhill School, Rochdale

Title
Drainage Strategy

Client
Rochdale Borough Council

Scale @ A1	Initial author	Initial checker	Approver	Initial Date
1:250	BHB	RP	RP	NOV 25

Status	Purpose	Adept Project Number
S2	Preliminary	00.25079

Project-Originator-Functional Breakdown-Spatial Breakdown-Form-Discipline-Number: 00.25079-ACE-ZZ-ZZ-D-C-1200 — Rev. P3

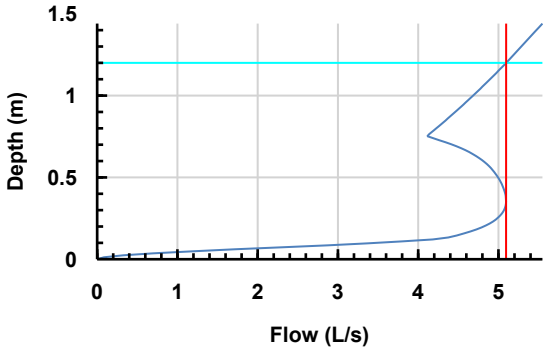
- Drainage Calculations

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
SW01 (SW Network)	Outlet	1.000	Free Discharge
SW05 (SW Network)	Outlet	1.003	Free Discharge
SW02 (SW Network)	Outlet	2.000	Free Discharge
SW04 (SW Network)	Outlet	1.002	Free Discharge
SW03 (SW Network)	Outlet	1.001	Free Discharge
SW06 (SW Network)	Outlet	1.004	Free Discharge
SW07 (SW Network)	Outlet	1.005	Free Discharge
SW08 (SW Network)	Outlet	1.006	Free Discharge
SW09 (SW Network)	Outlet	3.000	Free Discharge
SW10 (SW Network)	Outlet	3.001	Free Discharge
SW11 (SW Network)	Outlet	1.007	Free Discharge
SW14 (SW Network)	Outlet	4.000	Free Discharge
SW15 (SW Network)	Outlet	1.010	Free Discharge
SW14 (FC) (SW Network)	Outlet	1.009	Hydro-Brake®

Invert Level (m)	124.828
Design Depth (m)	1.200
Design Flow (L/s)	5.1
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0104-5100-1200-5100



SW13 (SW Network)	Outlet	5.000	Free Discharge

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Tank

Type : Tank

Dimensions

Exceedance Level (m)	127.344
Depth (m)	2.416
Base Level (m)	124.928
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:X)	0.00
Total Volume (m³)	616.816

Depth (m)	Area (m²)	Volume (m³)
0.000	540.00	0.000
1.200	540.00	615.600

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	4.000
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Point Inflow
Incoming Item(s)	1.007
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (3)

Inlet Type	Point Inflow
Incoming Item(s)	3.001
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.008
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	36.000

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

MUGA

Type : Porous Paving

Dimensions

Exceedance Level (m)	135.100
Depth (m)	0.650
Base Level (m)	134.450
Paving Layer Depth (mm)	300
Membrane Percolation (m/hr)	4.0
Porosity (%)	30
Length (m)	26.077
Long. Slope (1:X)	100.00
Width (m)	12.487
Total Volume (m³)	34.501

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (5)
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	50.0

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address:		

Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
1.000	30.150	Pipe	99.835		0.6	225	135.122	134.161
1.001	44.670	Pipe	99.933		0.6	225	135.101	133.859
1.002	24.111	Pipe	100.000		0.6	225	135.129	133.412
1.003	9.526	Pipe	100.005		0.6	225	135.136	133.171
1.004	2.770	Pipe	9.996		0.6	225	134.611	129.723
1.005	9.441	Pipe	100.438		0.6	225	132.257	126.148
1.006	20.613	Pipe	100.062		0.6	225	128.171	126.054
2.000	14.591	Pipe	100.000		0.6	150	135.131	134.080
3.000	8.176	Pipe	24.058		0.6	150	128.167	126.816
1.009	13.883	Pipe	100.000		0.6	150	127.357	124.828
1.010	15.784	Pipe	100.000		0.6	150	127.366	124.689
1.008	5.078	Pipe	50.778		0.6	300	127.344	124.928
1.007	2.073	Pipe	103.637		0.6	300	127.819	125.848
Pipe (5)	8.671	Pipe	23.434		0.6	150	135.100	134.450
3.001	2.102	Pipe	105.079		0.6	150	127.819	125.998
4.000	2.440	Pipe	21.782		0.6	225	127.365	125.937
5.000	6.492	Pipe	99.881		0.6	150	127.076	124.943

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Part Family	Lock	Flow Restriction (L/s)	Culvert Type	Culvert Entrance
1.000	135.101	133.859		Levels		(None)	(None)
1.001	135.129	133.412		Levels		(None)	(None)
1.002	135.136	133.171		Levels		(None)	(None)
1.003	134.611	133.076		Levels		(None)	(None)
1.004	132.257	129.446		Levels		(None)	(None)
1.005	128.171	126.054		Levels		(None)	(None)
1.006	127.819	125.848		Levels		(None)	(None)
2.000	135.101	133.934		Levels		(None)	(None)
3.000	127.819	126.476		Levels		(None)	(None)
1.009	127.366	124.689		Levels	5.5	(None)	(None)
1.010	124.839	124.531		Levels		(None)	(None)
1.008	127.357	124.828		None		(None)	(None)
1.007	127.344	125.828		Levels		(None)	(None)
Pipe (5)	135.131	134.080		None		(None)	(None)
3.001	127.344	125.978		Levels		(None)	(None)
4.000	127.344	125.825		Levels		(None)	(None)
5.000	127.357	124.878		Levels		(None)	(None)

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	MUGA		Time of Concentration	0.034	100	0	100	0.034
Catchment Area (1)	SW13 (SW Network)		Time of Concentration	0.117	100	0	100	0.117
Catchment Area (1) (1)	SW14 (SW Network)		Time of Concentration	0.117	100	0	100	0.117
Catchment Area (3)	SW03 (SW Network)		Time of Concentration	0.157	100	0	100	0.157
Catchment Area (4)	SW04 (SW Network)		Time of Concentration	0.020	100	0	100	0.020
Catchment Area (5)	SW03 (SW Network)		Time of Concentration	0.020	100	0	100	0.020
Catchment Area (6)	SW05 (SW Network)		Time of Concentration	0.028	100	0	100	0.028
Catchment Area (7)	SW01 (SW Network)		Time of Concentration	0.028	100	0	100	0.028
Catchment Area (8)	SW09 (SW Network)		Time of Concentration	0.009	100	0	100	0.009
Catchment Area (9)	SW09 (SW Network)		Time of Concentration	0.016	100	0	100	0.016
Catchment Area (10)	SW09 (SW Network)		Time of Concentration	0.019	100	0	100	0.019
TOTAL		**0.0**		**0.564**				**0.564**

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
EndNullStruct3	FSR: 100 years: +45 %: 1440 mins: Summer		124.531	124.586	0.055	5.1			5.1	762.816	OK
SW01 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	135.122	134.161	135.122	0.961	18.5	0.580	0.427	27.4	8.131	Flood
SW05 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	135.136	133.171	133.769	0.597	97.2	0.095	0.000	96.6	76.659	Surcharged
SW02 (SW Network)	FSR: 100 years: +45 %: 60 mins: Summer	135.131	134.080	134.897	0.817	24.2	0.130	0.000	24.6	35.339	Flood Risk
SW04 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	135.129	133.412	134.382	0.969	79.5	0.274	0.000	78.8	68.814	Surcharged
SW03 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	135.101	133.859	135.103	1.244	130.4	2.093	1.742	66.3	73.367	Flood
SW06 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	134.611	129.723	129.901	0.178	96.6	0.201	0.000	96.4	76.620	OK
SW07 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	132.257	126.148	127.243	1.095	96.4	1.238	0.000	93.0	76.534	Surcharged
SW08 (SW Network)	FSR: 100 years: +45 %: 30 mins: Summer	128.171	126.054	126.841	0.787	91.2	0.890	0.000	91.2	111.979	Surcharged
SW09 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	128.167	126.816	126.933	0.117	29.2	0.019	0.000	28.9	12.677	OK
SW10 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	127.819	125.998	126.241	0.243	28.9	0.275	0.000	28.2	12.675	Surcharged
SW11 (SW Network)	FSR: 100 years: +45 %: 30 mins: Summer	127.819	125.848	126.103	0.255	91.2	0.288	0.000	91.2	111.929	OK
SW14 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	127.365	125.937	126.134	0.197	78.1	0.222	0.000	77.4	33.877	OK
SW15 (SW Network)	FSR: 100 years: +45 %: 1440 mins: Summer	127.366	124.689	124.746	0.057	5.1	0.065	0.000	5.1	762.816	OK
SW14 (FC) (SW Network)	FSR: 100 years: +45 %: 960 mins: Winter	127.357	124.828	125.965	1.137	7.0	2.010	0.000	5.1	517.828	Surcharged
SW13 (SW Network)	FSR: 100 years: +45 %: 15 mins: Summer	127.076	124.943	126.449	1.506	78.1	0.239	0.000	70.9	33.601	Surcharged

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
MUGA	FSR: 100 years: +45 %: 60 mins: Summer	134.785	134.759	0.074	0.309	35.7	19.051	0.000	0.000	24.2	24.669	44.781	OK
Tank	FSR: 100 years: +45 %: 960 mins: Winter	125.966	125.966	1.038	1.038	29.0	532.276	0.000	0.000	4.8	359.116	13.706	OK

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		

FSR: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
1.000	FSR: 100 years: +45 %: 15 mins: Summer	Pipe	SW01 (SW Network)	SW03 (SW Network)	135.122	135.122	0.225	8.050	0.7	0.53	27.4	Flood
1.001	FSR: 100 years: +45 %: 60 mins: Summer	Pipe	SW03 (SW Network)	SW04 (SW Network)	135.101	135.101	0.225	128.477	1.7	1.33	69.2	Flood Risk
1.002	FSR: 100 years: +45 %: 15 mins: Summer	Pipe	SW04 (SW Network)	SW05 (SW Network)	135.129	134.382	0.225	68.814	2.0	1.52	78.8	Surcharged
1.003	FSR: 100 years: +45 %: 15 mins: Summer	Pipe	SW05 (SW Network)	SW06 (SW Network)	135.136	133.769	0.225	76.659	2.4	1.86	96.6	Surcharged
1.004	FSR: 100 years: +45 %: 15 mins: Summer	Pipe	SW06 (SW Network)	SW07 (SW Network)	134.611	129.901	0.150	76.620	3.4	0.58	96.4	OK
1.005	FSR: 100 years: +45 %: 15 mins: Summer	Pipe	SW07 (SW Network)	SW08 (SW Network)	132.257	127.243	0.225	76.534	2.3	1.79	93.0	Surcharged
1.006	FSR: 100 years: +45 %: 30 mins: Summer	Pipe	SW08 (SW Network)	SW11 (SW Network)	128.171	126.841	0.225	111.979	2.3	1.75	91.2	Surcharged
2.000	FSR: 100 years: +45 %: 30 mins: Winter	Pipe	SW02 (SW Network)	SW03 (SW Network)	135.131	134.877	0.150	9.928	1.4	1.41	25.0	Flood Risk
3.000	FSR: 100 years: +45 %: 15 mins: Summer	Pipe	SW09 (SW Network)	SW10 (SW Network)	128.167	126.933	0.109	12.677	2.1	0.79	28.9	OK
1.009	FSR: 100 years: +45 %: 60 mins: Summer	Pipe	SW14 (FC) (SW Network)	SW15 (SW Network)	127.357	125.488	0.057	32.787	0.8	0.29	5.1	Surcharged
1.010	FSR: 100 years: +45 %: 1440 mins: Summer	Pipe	SW15 (SW Network)	EndNull Struct3	127.366	124.746	0.056	762.816	0.9	0.29	5.1	OK
1.008	FSR: 100 years: +45 %: 15 mins: Winter	Pipe	Tank	SW14 (FC) (SW Network)	127.344	125.215	0.300	0.000	0.1	0.03	5.3	OK
1.007	FSR: 100 years: +45 %: 30 mins: Summer	Pipe	SW11 (SW Network)	Tank	127.819	126.103	0.232	111.929	1.6	0.84	91.2	OK
Pipe (5)	FSR: 100 years: +45 %: 30 mins: Winter	Pipe	MUGA	SW02 (SW Network)	135.100	134.626	0.150	9.787	1.4	0.67	24.7	Surcharged

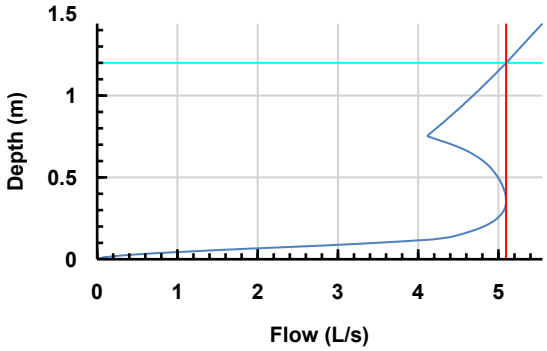
3.001	FSR: 100 years: +45 %: 15 mins: Summer	Pipe	SW10 (SW Network)	Tank	127.819	126.241	0.150	12.675	1.6	1.63	28.2	Surch arged
4.000	FSR: 100 years: +45 %: 15 mins: Summer	Pipe	SW14 (SW Network)	Tank	127.365	126.134	0.167	33.877	2.4	0.69	77.4	OK
5.000	FSR: 100 years: +45 %: 15 mins: Summer	Pipe	SW13 (SW Network)	SW14 (FC) (SW Network)	127.076	126.449	0.150	33.581	4.0	3.99	70.9	Surch arged

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
SW01 (SW Network)	Outlet	1.000	Free Discharge
SW05 (SW Network)	Outlet	1.003	Free Discharge
SW02 (SW Network)	Outlet	2.000	Free Discharge
SW04 (SW Network)	Outlet	1.002	Free Discharge
SW03 (SW Network)	Outlet	1.001	Free Discharge
SW06 (SW Network)	Outlet	1.004	Free Discharge
SW07 (SW Network)	Outlet	1.005	Free Discharge
SW08 (SW Network)	Outlet	1.006	Free Discharge
SW09 (SW Network)	Outlet	3.000	Free Discharge
SW10 (SW Network)	Outlet	3.001	Free Discharge
SW11 (SW Network)	Outlet	1.007	Free Discharge
SW14 (SW Network)	Outlet	4.000	Free Discharge
SW15 (SW Network)	Outlet	1.010	Free Discharge
SW14 (FC) (SW Network)	Outlet	1.009	Hydro-Brake®

Invert Level (m)	124.828
Design Depth (m)	1.200
Design Flow (L/s)	5.1
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0104-5100-1200-5100



SW13 (SW Network)	Outlet	5.000	Free Discharge

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Tank

Type : Tank

Dimensions

Exceedance Level (m)	127.344
Depth (m)	2.416
Base Level (m)	124.928
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:X)	0.00
Total Volume (m³)	616.816

Depth (m)	Area (m²)	Volume (m³)
0.000	540.00	0.000
1.200	540.00	615.600

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	4.000
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Point Inflow
Incoming Item(s)	1.007
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (3)

Inlet Type	Point Inflow
Incoming Item(s)	3.001
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.008
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	36.000

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

MUGA

Type : Porous Paving

Dimensions

Exceedance Level (m)	135.100
Depth (m)	0.650
Base Level (m)	134.450
Paving Layer Depth (mm)	300
Membrane Percolation (m/hr)	4.0
Porosity (%)	30
Length (m)	26.077
Long. Slope (1:X)	100.00
Width (m)	12.487
Total Volume (m³)	34.501

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (5)
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	50.0

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address:		

Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
1.000	30.150	Pipe	99.835		0.6	225	135.122	134.161
1.001	44.670	Pipe	99.933		0.6	225	135.101	133.859
1.002	24.111	Pipe	100.000		0.6	225	135.129	133.412
1.003	9.526	Pipe	100.005		0.6	225	135.136	133.171
1.004	2.770	Pipe	9.996		0.6	225	134.611	129.723
1.005	9.441	Pipe	100.438		0.6	225	132.257	126.148
1.006	20.613	Pipe	100.062		0.6	225	128.171	126.054
2.000	14.591	Pipe	100.000		0.6	150	135.131	134.080
3.000	8.176	Pipe	24.058		0.6	150	128.167	126.816
1.009	13.883	Pipe	100.000		0.6	150	127.357	124.828
1.010	15.784	Pipe	100.000		0.6	150	127.366	124.689
1.008	5.078	Pipe	50.778		0.6	300	127.344	124.928
1.007	2.073	Pipe	103.637		0.6	300	127.819	125.848
Pipe (5)	8.671	Pipe	23.434		0.6	150	135.100	134.450
3.001	2.102	Pipe	105.079		0.6	150	127.819	125.998
4.000	2.440	Pipe	21.782		0.6	225	127.365	125.937
5.000	6.492	Pipe	99.881		0.6	150	127.076	124.943

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Part Family	Lock	Flow Restriction (L/s)	Culvert Type	Culvert Entrance
1.000	135.101	133.859		Levels		(None)	(None)
1.001	135.129	133.412		Levels		(None)	(None)
1.002	135.136	133.171		Levels		(None)	(None)
1.003	134.611	133.076		Levels		(None)	(None)
1.004	132.257	129.446		Levels		(None)	(None)
1.005	128.171	126.054		Levels		(None)	(None)
1.006	127.819	125.848		Levels		(None)	(None)
2.000	135.101	133.934		Levels		(None)	(None)
3.000	127.819	126.476		Levels		(None)	(None)
1.009	127.366	124.689		Levels	5.5	(None)	(None)
1.010	124.839	124.531		Levels		(None)	(None)
1.008	127.357	124.828		None		(None)	(None)
1.007	127.344	125.828		Levels		(None)	(None)
Pipe (5)	135.131	134.080		None		(None)	(None)
3.001	127.344	125.978		Levels		(None)	(None)
4.000	127.344	125.825		Levels		(None)	(None)
5.000	127.357	124.878		Levels		(None)	(None)

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	MUGA		Time of Concentration	0.034	100	0	100	0.034
Catchment Area (1)	SW13 (SW Network)		Time of Concentration	0.117	100	0	100	0.117
Catchment Area (1) (1)	SW14 (SW Network)		Time of Concentration	0.117	100	0	100	0.117
Catchment Area (3)	SW03 (SW Network)		Time of Concentration	0.157	100	0	100	0.157
Catchment Area (4)	SW04 (SW Network)		Time of Concentration	0.020	100	0	100	0.020
Catchment Area (5)	SW03 (SW Network)		Time of Concentration	0.020	100	0	100	0.020
Catchment Area (6)	SW05 (SW Network)		Time of Concentration	0.028	100	0	100	0.028
Catchment Area (7)	SW01 (SW Network)		Time of Concentration	0.028	100	0	100	0.028
Catchment Area (8)	SW09 (SW Network)		Time of Concentration	0.009	100	0	100	0.009
Catchment Area (9)	SW09 (SW Network)		Time of Concentration	0.016	100	0	100	0.016
Catchment Area (10)	SW09 (SW Network)		Time of Concentration	0.019	100	0	100	0.019
TOTAL		**0.0**		**0.564**				**0.564**

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
EndNullStruct3	FSR: 30 years: +0 %: 120 mins: Summer		124.531	124.586	0.055	5.1			5.1	65.037	OK
SW01 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	135.122	134.161	134.435	0.274	10.5	0.044	0.000	2.8	4.346	Surcharged
SW05 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	135.136	133.171	133.517	0.345	67.6	0.055	0.000	66.6	42.000	Surcharged
SW02 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	135.131	134.080	134.381	0.301	4.8	0.048	0.000	5.1	4.467	Surcharged
SW04 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	135.129	133.412	133.870	0.458	61.0	0.129	0.000	57.8	37.788	Surcharged
SW03 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	135.101	133.859	134.404	0.545	63.2	0.154	0.000	53.9	35.564	Surcharged
SW06 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	134.611	129.723	129.856	0.133	66.6	0.151	0.000	66.3	41.979	OK
SW07 (SW Network)	FSR: 30 years: +0 %: 30 mins: Summer	132.257	126.148	126.623	0.475	64.2	0.537	0.000	63.8	60.651	Surcharged
SW08 (SW Network)	FSR: 30 years: +0 %: 30 mins: Summer	128.171	126.054	126.419	0.365	63.8	0.413	0.000	63.5	60.620	Surcharged
SW09 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	128.167	126.816	126.891	0.075	15.6	0.012	0.000	15.5	6.786	OK
SW10 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	127.819	125.998	126.126	0.128	15.5	0.145	0.000	15.0	6.784	OK
SW11 (SW Network)	FSR: 30 years: +0 %: 30 mins: Summer	127.819	125.848	126.046	0.198	63.5	0.224	0.000	63.4	60.581	OK
SW14 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	127.365	125.937	126.061	0.124	41.8	0.140	0.000	41.5	18.132	OK
SW15 (SW Network)	FSR: 30 years: +0 %: 120 mins: Summer	127.366	124.689	124.746	0.057	5.1	0.065	0.000	5.1	65.037	OK
SW14 (FC) (SW Network)	FSR: 30 years: +0 %: 960 mins: Summer	127.357	124.828	125.371	0.543	6.0	0.959	0.000	5.1	424.071	Surcharged
SW13 (SW Network)	FSR: 30 years: +0 %: 15 mins: Summer	127.076	124.943	125.554	0.611	41.8	0.097	0.000	39.3	17.987	Surcharged

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
MUGA	FSR: 30 years: +0 %: 60 mins: Summer	134.746	134.489	0.035	0.039	7.9	4.337	0.000	0.000	5.4	9.267	87.428	OK
Tank	FSR: 30 years: +0 %: 960 mins: Summer	125.371	125.371	0.443	0.443	23.7	227.192	0.000	0.000	5.1	335.654	63.167	OK

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		

FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
1.000	FSR: 30 years: +0 %: 30 mins: Summer	Pipe	SW01 (SW Network)	SW03 (SW Network)	135.122	134.343	0.225	6.019	0.3	0.13	6.7	OK
1.001	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	SW03 (SW Network)	SW04 (SW Network)	135.101	134.404	0.225	34.762	1.4	1.04	53.9	Surcharged
1.002	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	SW04 (SW Network)	SW05 (SW Network)	135.129	133.870	0.225	37.788	1.5	1.11	57.8	Surcharged
1.003	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	SW05 (SW Network)	SW06 (SW Network)	135.136	133.517	0.225	42.000	1.7	1.28	66.6	Surcharged
1.004	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	SW06 (SW Network)	SW07 (SW Network)	134.611	129.856	0.116	41.979	3.2	0.4	66.3	OK
1.005	FSR: 30 years: +0 %: 30 mins: Summer	Pipe	SW07 (SW Network)	SW08 (SW Network)	132.257	126.623	0.225	60.651	1.6	1.23	63.8	Surcharged
1.006	FSR: 30 years: +0 %: 30 mins: Summer	Pipe	SW08 (SW Network)	SW11 (SW Network)	128.171	126.419	0.225	60.620	1.6	1.22	63.5	Surcharged
2.000	FSR: 30 years: +0 %: 60 mins: Summer	Pipe	SW02 (SW Network)	SW03 (SW Network)	135.131	134.267	0.150	9.297	0.9	0.3	5.4	Surcharged
3.000	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	SW09 (SW Network)	SW10 (SW Network)	128.167	126.891	0.071	6.786	1.9	0.42	15.5	OK
1.009	FSR: 30 years: +0 %: 480 mins: Winter	Pipe	SW14 (FC) (SW Network)	SW15 (SW Network)	127.357	125.368	0.057	261.233	0.8	0.29	5.1	Surcharged
1.010	FSR: 30 years: +0 %: 120 mins: Summer	Pipe	SW15 (SW Network)	EndNull Struct3	127.366	124.746	0.056	65.037	0.9	0.29	5.1	OK
1.008	FSR: 30 years: +0 %: 60 mins: Summer	Pipe	Tank	SW14 (FC) (SW Network)	127.344	125.211	0.300	0.000	0.1	0.03	5.1	OK
1.007	FSR: 30 years: +0 %: 30 mins: Summer	Pipe	SW11 (SW Network)	Tank	127.819	126.046	0.181	60.581	1.4	0.58	63.4	OK
Pipe (5)	FSR: 30 years: +0 %: 60 mins: Summer	Pipe	MUGA	SW02 (SW Network)	135.100	134.494	0.111	9.267	1.1	0.14	5.4	OK

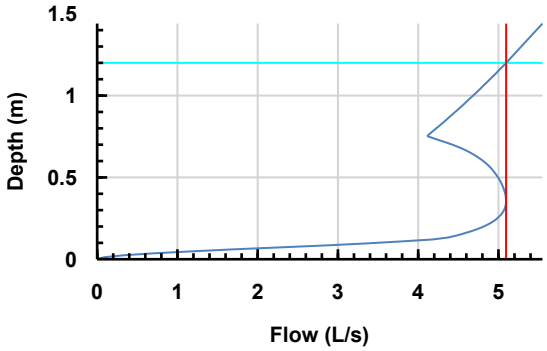
3.001	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	SW10 (SW Network)	Tank	127.819	126.126	0.117	6.784	1.0	0.87	15.0	OK
4.000	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	SW14 (SW Network)	Tank	127.365	126.061	0.109	18.132	2.2	0.37	41.5	OK
5.000	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	SW13 (SW Network)	SW14 (FC) (SW Network)	127.076	125.554	0.150	17.977	2.2	2.21	39.3	Surch arged

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
SW01 (SW Network)	Outlet	1.000	Free Discharge
SW05 (SW Network)	Outlet	1.003	Free Discharge
SW02 (SW Network)	Outlet	2.000	Free Discharge
SW04 (SW Network)	Outlet	1.002	Free Discharge
SW03 (SW Network)	Outlet	1.001	Free Discharge
SW06 (SW Network)	Outlet	1.004	Free Discharge
SW07 (SW Network)	Outlet	1.005	Free Discharge
SW08 (SW Network)	Outlet	1.006	Free Discharge
SW09 (SW Network)	Outlet	3.000	Free Discharge
SW10 (SW Network)	Outlet	3.001	Free Discharge
SW11 (SW Network)	Outlet	1.007	Free Discharge
SW14 (SW Network)	Outlet	4.000	Free Discharge
SW15 (SW Network)	Outlet	1.010	Free Discharge
SW14 (FC) (SW Network)	Outlet	1.009	Hydro-Brake®

Invert Level (m)	124.828
Design Depth (m)	1.200
Design Flow (L/s)	5.1
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☑
Unit Reference	SHE-0104-5100-1200-5100



SW13 (SW Network)	Outlet	5.000	Free Discharge

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Tank

Type : Tank

Dimensions

Exceedance Level (m)	127.344
Depth (m)	2.416
Base Level (m)	124.928
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:X)	0.00
Total Volume (m³)	616.816

Depth (m)	Area (m²)	Volume (m³)
0.000	540.00	0.000
1.200	540.00	615.600

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	4.000
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Point Inflow
Incoming Item(s)	1.007
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (3)

Inlet Type	Point Inflow
Incoming Item(s)	3.001
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	1.008
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	36.000

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

MUGA

Type : Porous Paving

Dimensions

Exceedance Level (m)	135.100
Depth (m)	0.650
Base Level (m)	134.450
Paving Layer Depth (mm)	300
Membrane Percolation (m/hr)	4.0
Porosity (%)	30
Length (m)	26.077
Long. Slope (1:X)	100.00
Width (m)	12.487
Total Volume (m³)	34.501

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (5)
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	50.0

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address:		

Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
1.000	30.150	Pipe	99.835		0.6	225	135.122	134.161
1.001	44.670	Pipe	99.933		0.6	225	135.101	133.859
1.002	24.111	Pipe	100.000		0.6	225	135.129	133.412
1.003	9.526	Pipe	100.005		0.6	225	135.136	133.171
1.004	2.770	Pipe	9.996		0.6	225	134.611	129.723
1.005	9.441	Pipe	100.438		0.6	225	132.257	126.148
1.006	20.613	Pipe	100.062		0.6	225	128.171	126.054
2.000	14.591	Pipe	100.000		0.6	150	135.131	134.080
3.000	8.176	Pipe	24.058		0.6	150	128.167	126.816
1.009	13.883	Pipe	100.000		0.6	150	127.357	124.828
1.010	15.784	Pipe	100.000		0.6	150	127.366	124.689
1.008	5.078	Pipe	50.778		0.6	300	127.344	124.928
1.007	2.073	Pipe	103.637		0.6	300	127.819	125.848
Pipe (5)	8.671	Pipe	23.434		0.6	150	135.100	134.450
3.001	2.102	Pipe	105.079		0.6	150	127.819	125.998
4.000	2.440	Pipe	21.782		0.6	225	127.365	125.937
5.000	6.492	Pipe	99.881		0.6	150	127.076	124.943

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Part Family	Lock	Flow Restriction (L/s)	Culvert Type	Culvert Entrance
1.000	135.101	133.859		Levels		(None)	(None)
1.001	135.129	133.412		Levels		(None)	(None)
1.002	135.136	133.171		Levels		(None)	(None)
1.003	134.611	133.076		Levels		(None)	(None)
1.004	132.257	129.446		Levels		(None)	(None)
1.005	128.171	126.054		Levels		(None)	(None)
1.006	127.819	125.848		Levels		(None)	(None)
2.000	135.101	133.934		Levels		(None)	(None)
3.000	127.819	126.476		Levels		(None)	(None)
1.009	127.366	124.689		Levels	5.5	(None)	(None)
1.010	124.839	124.531		Levels		(None)	(None)
1.008	127.357	124.828		None		(None)	(None)
1.007	127.344	125.828		Levels		(None)	(None)
Pipe (5)	135.131	134.080		None		(None)	(None)
3.001	127.344	125.978		Levels		(None)	(None)
4.000	127.344	125.825		Levels		(None)	(None)
5.000	127.357	124.878		Levels		(None)	(None)

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	MUGA		Time of Concentration	0.034	100	0	100	0.034
Catchment Area (1)	SW13 (SW Network)		Time of Concentration	0.117	100	0	100	0.117
Catchment Area (1) (1)	SW14 (SW Network)		Time of Concentration	0.117	100	0	100	0.117
Catchment Area (3)	SW03 (SW Network)		Time of Concentration	0.157	100	0	100	0.157
Catchment Area (4)	SW04 (SW Network)		Time of Concentration	0.020	100	0	100	0.020
Catchment Area (5)	SW03 (SW Network)		Time of Concentration	0.020	100	0	100	0.020
Catchment Area (6)	SW05 (SW Network)		Time of Concentration	0.028	100	0	100	0.028
Catchment Area (7)	SW01 (SW Network)		Time of Concentration	0.028	100	0	100	0.028
Catchment Area (8)	SW09 (SW Network)		Time of Concentration	0.009	100	0	100	0.009
Catchment Area (9)	SW09 (SW Network)		Time of Concentration	0.016	100	0	100	0.016
Catchment Area (10)	SW09 (SW Network)		Time of Concentration	0.019	100	0	100	0.019
TOTAL		**0.0**		**0.564**				**0.564**

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FSR: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
EndNullStruct3	FSR: 2 years: +0 %: 480 mins: Summer		124.531	124.585	0.054	5.0			5.0	190.569	OK
SW01 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	135.122	134.161	134.207	0.046	5.2	0.007	0.000	5.0	2.276	OK
SW05 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	135.136	133.171	133.343	0.171	42.5	0.027	0.000	40.6	21.721	OK
SW02 (SW Network)	FSR: 2 years: +0 %: 120 mins: Summer	135.131	134.080	134.117	0.037	2.3	0.006	0.000	2.3	6.557	OK
SW04 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	135.129	133.412	133.568	0.156	40.0	0.044	0.000	37.3	19.497	OK
SW03 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	135.101	133.859	134.005	0.146	39.0	0.041	0.000	36.2	17.944	OK
SW06 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	134.611	129.723	129.819	0.096	40.6	0.108	0.000	40.3	21.706	OK
SW07 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	132.257	126.148	126.319	0.171	40.3	0.193	0.000	39.4	21.677	OK
SW08 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	128.171	126.054	126.210	0.156	39.4	0.177	0.000	37.8	21.633	OK
SW09 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	128.167	126.816	126.867	0.051	8.3	0.008	0.000	8.2	3.592	OK
SW10 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	127.819	125.998	126.080	0.082	8.2	0.093	0.000	8.0	3.590	OK
SW11 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	127.819	125.848	125.991	0.143	37.8	0.162	0.000	36.6	21.583	OK
SW14 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	127.365	125.937	126.020	0.083	22.2	0.094	0.000	21.9	9.611	OK
SW15 (SW Network)	FSR: 2 years: +0 %: 480 mins: Summer	127.366	124.689	124.745	0.056	5.0	0.064	0.000	5.0	190.569	OK
SW14 (FC) (SW Network)	FSR: 2 years: +0 %: 480 mins: Summer	127.357	124.828	125.137	0.309	5.5	0.547	0.000	5.0	191.193	Surcharged
SW13 (SW Network)	FSR: 2 years: +0 %: 15 mins: Summer	127.076	124.943	125.201	0.258	22.2	0.041	0.000	21.2	9.550	Surcharged

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FSR: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
MUGA	FSR: 2 years: +0 %: 60 mins: Summer	134.734	134.475	0.023	0.025	4.2	2.869	0.000	0.000	2.2	4.587	91.684	OK
Tank	FSR: 2 years: +0 %: 480 mins: Summer	125.138	125.138	0.210	0.210	21.4	107.569	0.000	0.000	4.9	150.654	82.561	OK

Project:	Date: 11/03/2026		
	Designed by: Billy.Humphreys	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		

FSR: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
1.000	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW01 (SW Network)	SW03 (SW Network)	135.122	134.207	0.096	2.276	0.3	0.1	5.0	OK
1.001	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW03 (SW Network)	SW04 (SW Network)	135.101	134.005	0.151	17.944	1.3	0.7	36.2	OK
1.002	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW04 (SW Network)	SW05 (SW Network)	135.129	133.568	0.163	19.497	1.2	0.72	37.3	OK
1.003	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW05 (SW Network)	SW06 (SW Network)	135.136	133.343	0.160	21.721	1.3	0.78	40.6	OK
1.004	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW06 (SW Network)	SW07 (SW Network)	134.611	129.819	0.085	21.706	2.9	0.24	40.3	OK
1.005	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW07 (SW Network)	SW08 (SW Network)	132.257	126.319	0.164	21.677	1.3	0.76	39.4	OK
1.006	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW08 (SW Network)	SW11 (SW Network)	128.171	126.210	0.150	21.633	1.3	0.73	37.8	OK
2.000	FSR: 2 years: +0 %: 120 mins: Summer	Pipe	SW02 (SW Network)	SW03 (SW Network)	135.131	134.117	0.037	6.557	0.7	0.13	2.3	OK
3.000	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW09 (SW Network)	SW10 (SW Network)	128.167	126.867	0.050	3.592	1.6	0.22	8.2	OK
1.009	FSR: 2 years: +0 %: 480 mins: Summer	Pipe	SW14 (FC) (SW Network)	SW15 (SW Network)	127.357	125.137	0.056	190.597	0.8	0.28	5.0	Surcharged
1.010	FSR: 2 years: +0 %: 480 mins: Summer	Pipe	SW15 (SW Network)	EndNull Struct3	127.366	124.745	0.055	190.569	0.8	0.28	5.0	OK
1.008	FSR: 2 years: +0 %: 240 mins: Summer	Pipe	Tank	SW14 (FC) (SW Network)	127.344	125.121	0.243	85.983	0.2	0.03	4.9	OK
1.007	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW11 (SW Network)	Tank	127.819	125.991	0.131	21.583	1.2	0.34	36.6	OK
Pipe (5)	FSR: 2 years: +0 %: 120 mins: Summer	Pipe	MUGA	SW02 (SW Network)	135.100	134.479	0.031	6.563	0.9	0.06	2.3	OK

3.001	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW10 (SW Network)	Tank	127.819	126.080	0.077	3.590	0.9	0.46	8.0	OK
4.000	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW14 (SW Network)	Tank	127.365	126.020	0.075	9.611	1.9	0.2	21.9	OK
5.000	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	SW13 (SW Network)	SW14 (FC) (SW Network)	127.076	125.201	0.150	9.547	1.2	1.19	21.2	Surcharged

Appendix D
Communication

- Relevant Communications

WASTEWATER PRE-DEVELOPMENT ENQUIRY

United Utilities
Water for the North West

United Utilities Grasmere House, 2nd Floor
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

20/02/2026

Dear **Billy,**

Pre-Development Enquiry for **Brownhill School, Mayfield Street, Rochdale, OL16 2UZ** UU Reference Number: **08803730**

We have assessed your application based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your strategy will need review by other authorities as part of the planning process. We advise conducting necessary site investigations to confirm viability of your proposals.

Modelled Flood Risk Please see the image at the end of this letter for details

I can confirm that we do not have modelled flood risk within the vicinity of the proposed development.

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

Please see **comment 2** of the attached guidance sheet

Asset Protection

1. We have reviewed our records and can confirm that there does not appear to be any charted public sewers located within the boundary of the proposed development.

Please see **comment 3** of the attached guidance sheet and **Working Near Our Pipelines Guidance document**

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

Our preferred point of discharge would be to the 225mm diameter public combined within Mayfield Street, at an unrestricted rate.

Manhole reference SD90148101, **Grid reference** 390828, 414136

Please see the images at the end of this letter for clarification

WASTEWATER PRE-DEVELOPMENT ENQUIRY

United Utilities
Water for the North West

Surface Water

Follow the National Planning Policy Guidance drainage hierarchy and Provide evidence for discounting higher options before considering public sewer discharge. Consult the Lead Local Flood Authority regarding surface water concerns.

Please see comment **4** within the guidance sheet

Infiltration

Please see comment **4** within the guidance sheet

Public Sewer

United Utilities will consider a connection to the 300mm diameter public surface water within Mayfield Street located South of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities requests that any agreed rate does not exceed **5.1l**/s.

Manhole reference SD90148102, **Grid reference** 390814, 414116

Please see images at the end of this letter for clarification

WASTEWATER PRE-DEVELOPMENT ENQUIRY

Site Images

Foul only connection point

WASTEWATER PRE-DEVELOPMENT ENQUIRY

Surface water only connection point

Appendix E
Maintenance

Drainage Asset Maintenance Schedule

Surface Foul

Maintenance Activity	Drainage Component	Required Action	Typical Frequency
Visual Inspection	Gully Sump unit Catch pit / silt trap Attenuation structures Channel drain Outlet chamber Flow control chamber Swale Soakaway Pond and wetland Bioretention	Inspect for sediment and debris Inspect inlets and outlets for blockage (where applicable)	Monthly for first year and twice yearly thereafter, after severe storm
	Pipework		Twice yearly
	Full retention interceptor Bypass interceptor Forecourt interceptor		Twice yearly or after severe storm as a minimum, refer to manufacturer guidance. Forecourt interceptor requires emptying after fuel spillage
Monitoring	Attenuation structures	Check attenuation inspection points to ensure emptying is occurring (little to no water should be present after consecutive days of dry weather)	Twice yearly, once after heavy rainfall and once after consecutive dry weather
	Soakaway	Check to ensure emptying is occurring	Annually
	Bioretention	Check operation of underdrains by inspection of flows after rain	Annually

Litter and Debris Removal	Pond and wetland Manhole Pervious paving Swale Soakaway Bioretention All sump units (gullies, channel drains and catch pits)	Remove all litter and debris	Twice yearly or after severe storm
Litter and Debris Removal - Continued	Access chambers and pre-treatment devices Flow control chamber Gutters & leaf guards		Twice yearly (spring, start of winter), or as required
Grass Cutting	Pond and wetland Swale	Grass should be cut to retain grass height within specified design range (typically 75-150mm)	Monthly (during growing season), or as required
Jet Wash	Pipework	High pressure jet-wash any pipe work which has silt accumulation. Care must be taken that any silts within the pipework are not unnecessarily flushed into the attenuation structures (use of bungs and jet-vac of chamber prior to removal of bungs)	Twice yearly, or as required
	Attenuation structures	High pressure jet-wash all perforated pipework and or access points. All water to be jet vac to remove any suspended silts within the water	Five yearly, or as required
Sweeping	Pervious paving	Pervious surfaces need to be regularly cleaned of silt and sediment to preserve their infiltration capacity	Yearly, often less where inspections indicate that it is not required
Silt and Rubber Cleaning	Pervious paving	Jet wash if visible signs of silt and rubber build up. Further maintenance options include locally removing block and geotextile, removing the silt/rubber and replacing as before	Paving to be inspected every spring (when dry)

	Repair/Reinstate – Remedial Actions	Soakaway Bioretention	Remove and reconstruct soakaway and/or replace or clean void fill if performance deteriorates or failure occurs Infill any holes in or remove and replace filter medium	As required As required
	Vegetation Management	Pond and wetland Bioretention	Build-up of dead vegetation from previous seasons should be removed to reduce organic silt accumulation Emergent vegetation may need to be harvested to maintain flood volumes Assess plants for disease infection, poor growth, invasive species etc., and replace as necessary.	Convenient intervals e.g., every three years at the end of landscape contract periods Every two – ten years, or as required Quarterly inspection, replacement as required
	Sediment Management and Removal	ALL SUDS	Sediment accumulation should be monitored as part of the inspection regime, rate of sediment accumulation noted	Appropriate frequencies determined upon inspection
	Inspection	Pipework Manhole Pumping station/rising main Grease trap	Check if functioning correctly Impellers will need inspecting and cleaning as required – refer to manufacturer guidance Monthly inspection with removal of grease as required	Once site is fully operational: twice yearly for 1st year, annually after Refer to manufacturer guidance Monthly
	Sediment Removal	Washdown separator	Inspect for build-up of sediment and remove as required. Refer to manufacturer guidance	Quarterly for 1st year, twice yearly after. Refer to manufacturer guidance

Additional notes:

- Any defects (broken/misaligned pipes, root infestation, damage to soakaways, missing parts, etc.) that are identified during inspections/maintenance should be reported back to the property/site owner so that the remedial actions can be undertaken promptly to repair these defects.

- SuDS maintenance based on CIRIA 2015 Chapter 32 where further information can also be found.
- Refer to manufacturer guidance for maintenance schedules of all propriety treatment systems.