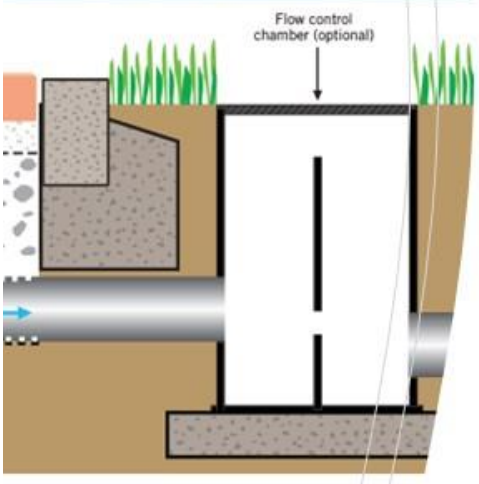






EARTH ENVIRONMENTAL
& GEOTECHNICAL

Surface Water Drainage Strategy

Longsight Bowling Club

September 2024

On behalf of

VIEWS

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1. Introduction

Earth Environmental and Geotechnical Ltd, has been commissioned to prepare a Surface Water Drainage Strategy for proposed residential development at Longsight Bowling Club, East Road, Manchester, M12 5GZ.

This drainage strategy has been prepared to support a planning application for new development and has been designed in accordance with national and local planning policy and guidance on sustainable drainage (SuDS), as detailed in Section 3. It is recognised that the introduction of impermeable surfaces via new development can increase surface water runoff rates compared to pre-development conditions. The drainage strategy has been designed to ensure appropriate management of surface water runoff, to manage the risk of surface water flooding to the development and to ensure no increased surface water flood risk to others.

2. Site Setting and Description

2.1. Site Location and Land Use

The application site comprises the former Longsight Bowling Club, located adjacent to East Road within the Longsight suburb of Manchester, M12 5GZ, as indicated on the Site Location Plan within Appendix A. The total site area is approximately 0.26 hectares.

The site is located within a predominantly residential area, approximately 4.5km south-east of Manchester city centre; the co-ordinates of the centre of the site are: Easting: 387435, Northing: 395273.

The site is currently accessed off Armitage Avenue, via Longsight Cricket Club pavilion and comprises the former bowling green, as indicated in Figure 1 below.

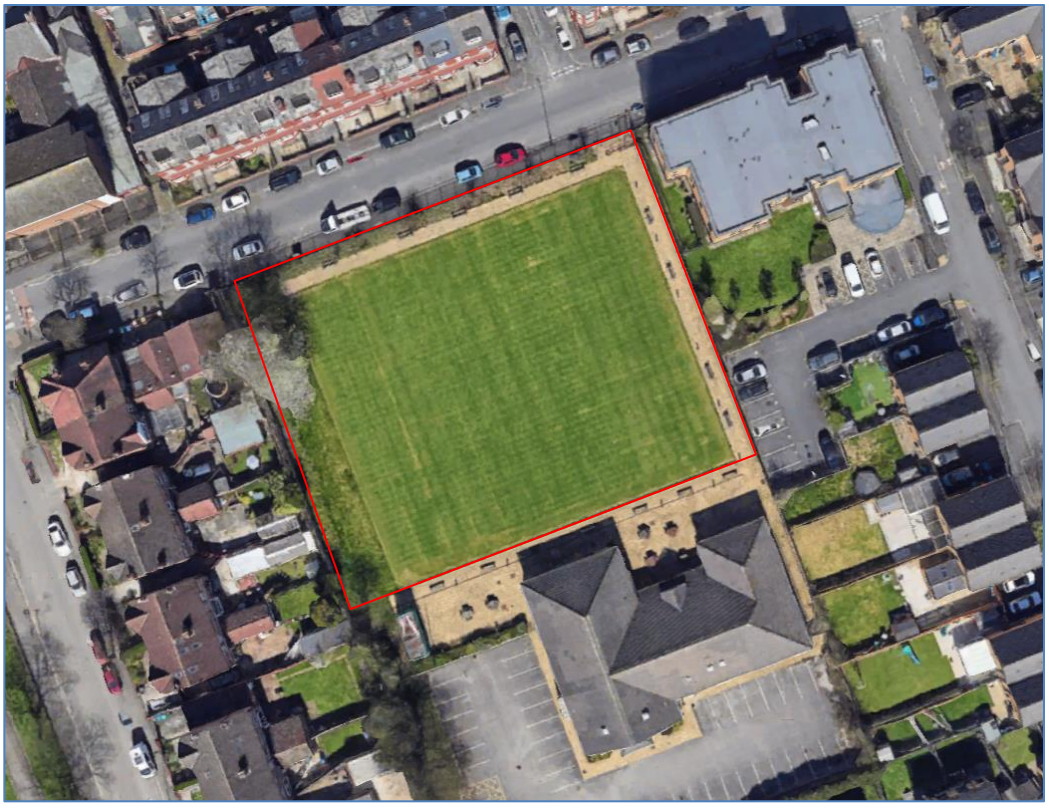


Figure 1. Current Land Use (extracted from Google Earth)

2.2. Proposed Development

The proposed development comprises the erection of 20no. residential dwellings (16no. three-bedroom dwellings and 4no. four-bedroom dwellings) with associated parking and garden areas. A new vehicular access is proposed in the north, off East Road. External surfaces including the access road, driveways, patios, and pathways shall comprise permeable surfaces, including permeable paving and gravel.

Proposed development plans are included within Appendix B.

2.3. Topography

Review of Ordnance Survey mapping indicates that the local topography falls gently from the application site to the north and north-west towards local watercourses; an external ground level of approximately 56mAOD is indicated within the site.

Figure 2 presents an extract of the Environment Agency's 2022 1m DTM LiDAR data, extending across the application site and local area; the approximate site boundary is indicated by the red line. The LiDAR data indicate perimeter site levels of 56mAOD to 57mAOD and a local direction of topographic fall towards the north-west.



Figure 2 – EA 2022 1m DTM LIDAR Data (1m contour interval)

The site development plans (Appendix B) include spot height elevations around the perimeter of the application site. Perimeter site levels range from approximately 55.4mAOD in the north-west corner to approximately 56.5mAOD in the south-west corner of the site, with an elevation of approximately 56.1mAOD inferred for the bowling green.

Proposed finished floor levels range from 56.19mAOD to 56.38mAOD.

2.4. Local Hydrology

The application site is located within the surface water catchment of Gore Brook, which flows in a south-easterly direction passing approximately 300m north of the site and is culverted for significant stretches. The local hydrological site setting is presented as Figure 3 which includes culverted watercourses.

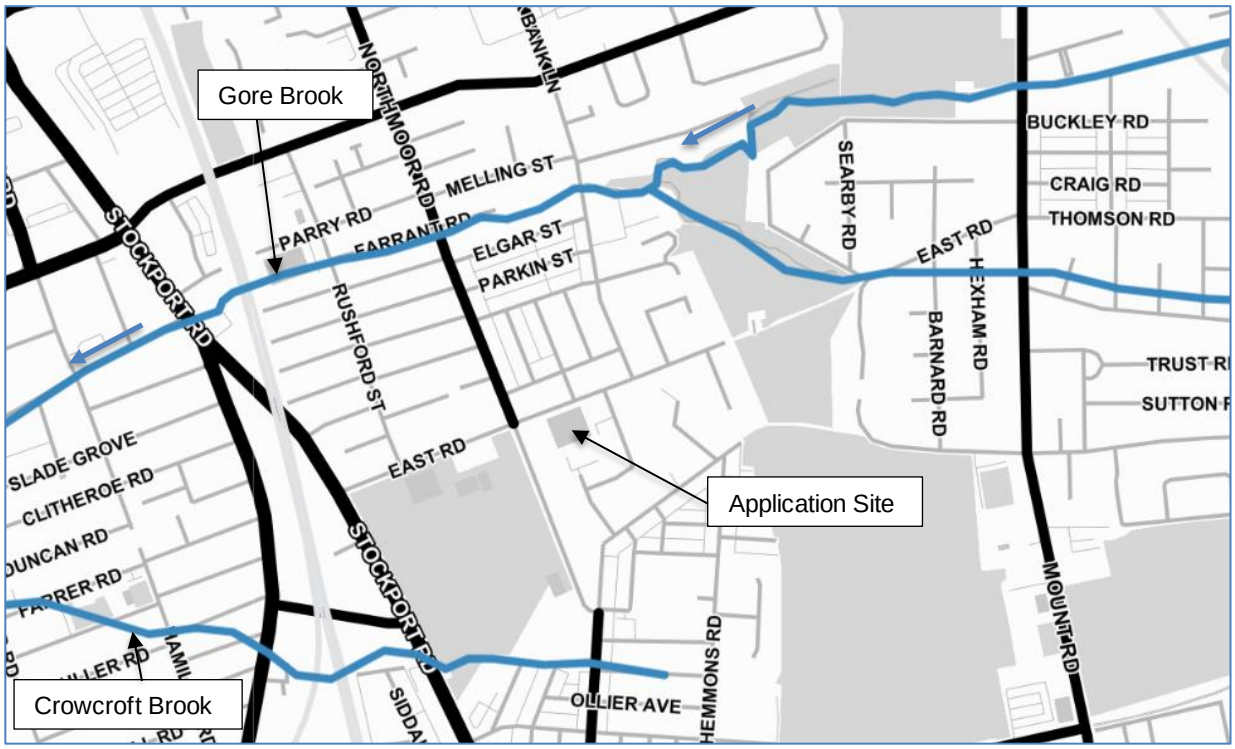


Figure 3. Hydrological Site Setting (extract from Hidden Manchester Map[1])

No open surface water courses or surface water bodies have been identified within a 250m radius of the site. Due to the urban site setting, surface water runoff will discharge via the local public sewer systems.

2.5. Flood Risk

Review of the Environment Agency's online Flood Map for Planning confirms that the application site lies entirely within Flood Zone 1, defined as land with a low probability of tidal or fluvial flooding (<0.1% annual probability of flooding).

The site is also shown to have a very low risk of flooding from surface water runoff, defined as land with <0.1% annual probability of flooding from surface water, and is shown to be within an area where the risk of flooding from groundwater and reservoirs is 'unlikely.'

Therefore, no significant sources of flood risk to the site have been identified for consideration within the surface water drainage design.

2.6. Drains and Sewers

An extract of United Utilities' asset map is included as Appendix C and indicates the presence of public combined sewers in East Road immediately north of the site.

2.7. Ground Conditions

Review of the British Geological Survey's online mapping indicates that the ground conditions beneath the application site comprise sandstone of the Chester Formation (a member of the Sherwood Sandstone Group), overlain by Devensian Till (Diamicton).

The Devensian Till, formerly referred to as Boulder Clay, is typically characterized as a heterogenous, over-

[1] Hidden Manchester Map | A map of the tunnels, rivers, mines & subterranean spaces that make up Hidden Manchester. (hidden-manchester.org.uk)

consolidated clay with varying sand, silt, gravel, and/or boulder content.

A published geological log is available for a borehole installed in 1986 near the junction of Northmoor Road and Mackenzie Street (BGS reference: SJ89NE722), approximately 170m north-west of the site; the following ground conditions are confirmed:

0.0 to 0.3m below ground level (mbgl): bituminous surface
0.3 to 0.9mbgl: made ground
0.9 to 8.05mbgl (base of borehole): very stiff silty and sandy clay with occasional fissures and root inclusions in the upper zone with fine/medium gravel, some silt and sand lenses and bands, occasional coal fragments and becoming stiff/very stiff from 5.5mbgl - 7.0mbgl.

Due to the low permeability ground conditions and proximity of existing and proposed development, infiltration drainage is not considered viable for the development.

2.8. Climate Change

The Environment Agency's climate change allowances guidance confirms that the application site lies within the Upper Mersey Management Catchment, where peak rainfall intensity for the 1% annual probability rainfall event is predicted to increase by between 30% (central allowance) and 45% (upper end allowance) by the 2070's (2061 to 2125).

The Environment Agency's guidance confirms that a minimum lifetime of 100 years should be considered for residential development. For new development with a lifetime beyond 2100, the guidance states that drainage systems should be designed for the upper end allowance to the 1% annual probability rainfall event, to ensure the development is safe from surface water flooding, with no increase in flood risk elsewhere. Appropriate allowance for climate change has been incorporated into the drainage strategy design.

3. National & Local Surface Water Drainage Policy

3.1. National Planning Policy Framework (NPPF) and Technical Guidance for Flood Risk and Coastal Change

The NPPF (last updated: December 2023) sets out the Government's national policy on development and flood risk and includes consideration of surface water management.

NPPF Paragraph 173 states that local planning authorities should ensure that flood risk is not increased elsewhere as a result of development.

NPPF Paragraph 175 states that major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. With regards residential development, major development, as defined within the Town and Country Planning (Development Management Procedure) (England) Order 2015 (Article 2), comprises development where 10 or more houses will be provided, or the site has an area of 0.5ha or greater. The proposed development therefore constitutes major development.

3.2. Manchester City Council's Core Strategy

Manchester City Council's Core Strategy, 2012-2027 (adopted July 2012) sets out the Council's vision for future development, together with the policies and proposals for implementation. A number of the Core Strategy policies have been partially replaced by the Places for Everyone Joint Development Plan Document (adopted March 2024).

The following policies are currently relevant for the management of surface water runoff:

Places for Everyone Joint Development Plan **Policy JP-S4: Flood Risk and the Water Environment** includes the following relevant statements:

An integrated catchment-based approach will be taken to protect the quantity and quality of water bodies with reference to the North West River Basin Management Plan and managing flood risk, by:

4. Expecting developments to manage surface water runoff through sustainable drainage systems and as close to source as possible. Development should achieve greenfield run-off rates unless it is demonstrated to be impracticable. District local plans should consider setting more detailed surface water drainage policies to reflect local circumstances, including alternative surface water discharge rates, such as in areas with critical drainage issues.

5. Ensuring that sustainable drainage systems:

> *i. Are designed to provide multifunctional benefits wherever possible, including for water quality, nature conservation and recreation;*
>
> *ii. Avoid adverse impacts on water quality and any possibility of discharging hazardous substances to ground;*
>
> *iii. Are delivered in a holistic and integrated manner, including on larger sites split into different phases; and*
>
> *iv. Are managed and maintained appropriately to ensure their proper functioning over the lifetime of the development*

4. Surface Water Drainage Strategy

4.1. Introduction

This sustainable surface water drainage strategy for proposed residential development at Longsight Bowling Club, Manchester has been prepared based on the development proposals and in accordance with PolicyJP-S4 of Manchester City Council's Places for Everyone Joint Development Plan and national SuDS guidance (CIRIA Report C753, 2015, The SuDS Manual).

4.2. Existing Drainage Arrangements & Pre-Development Runoff Rate

The application site comprises a former bowling green which is assumed to benefit from underdrainage discharging to the public combined sewer system with no on-site attenuation.

The pre-development Greenfield surface water runoff rate from the proposed development footprint contributing to the site drainage system has also been calculated using HR Wallingford's online Tools for Sustainable Drainage Systems (www.uksuds.com). The catchment area contributing to the drainage system is indicated within Appendix E as 2362m^2 and represents the total proposed roof area (966m^2) and external roads, driveways and paths (1396m^2), as measured from the development plans.

Based on the site development plan, all other areas of the proposed development comprise areas of garden or planters.

Greenfield runoff calculations for the 2362m^2 (0.236ha) site area are included within Appendix E and summarised below:

Rainfall Event	Greenfield Runoff Rate
	0.2362ha development area
QBAR	1.50
1-year	1.31
30-year	2.55
100-year	3.12

4.3. Surface Water Runoff Destination

The proposed method of surface water discharge has been chosen based on the following hierarchy of drainage options presented within the technical guidance to the NPPF:

1. Infiltration to ground
2. Discharge to a surface water body
3. Discharge to a surface water sewer or highway drain
4. Discharge to a combined sewer

As detailed within Section 2.7, the ground conditions comprise low permeability glacial till; therefore, infiltration drainage is not considered viable. There are no surface water courses, surface water bodies or surface water sewers within the vicinity of the site. Local highway drains are not designed to accept private drainage and are assumed to discharge to the public combined sewer, due to lack of alternative discharge options.

Therefore, in accordance with the discharge hierarchy, it is proposed that surface water runoff shall discharge to the 300mm diameter public combined sewer in East Road. United Utilities has provided a response to a pre-

development enquiry confirming the potential to discharge to the public combined sewer, subject to the drainage hierarchy; a copy of the response is included as Appendix D.

4.4. Design Rainfall Event and Surface Water Discharge Rate

Section 3.2 of this report confirms Manchester City Council's policy requirement for new development to attenuate surface water runoff to the pre-development Greenfield rate where practicable.

The pre-development Q_{BAR} Greenfield runoff rate for the area of proposed development has been calculated in Section 4.2 as 1.50l/s. United Utilities has confirmed that a peak discharge rate of 5.0l/s would be acceptable (refer to Appendix D).

In accordance with current guidance, it is proposed that surface water runoff will be attenuated on site to the Greenfield Q_{BAR} rate of 1.5l/s for all rainfall events up to and including the 100-year + 45% climate change event.

4.5. Sustainable Surface Water Drainage Strategy

The proposed surface water drainage layout plan and supporting calculations are presented within Appendix E.

Roof drainage would be collected via standard guttering and downpipes with a rear downpipe at each dwelling discharging via a standard water butt. Whilst water butts can provide surface water attenuation and reduce peak flow rates, they may be full prior to the design rainfall event occurring and therefore their presence has not been considered within the drainage calculations.

The access road, property driveways, patios and pathways would be constructed as permeable paving or permeable plastic grid bound gravel, as indicated on the proposed development plans (Appendix B). Type B (partial infiltration) permeable paving with granular sub-base storage is proposed, with a minimum 500mm thickness of granular sub-base to attenuate incident rainfall. Additional attenuation storage is provided by an area of geocellular sub-base storage beneath the internal access road; this crate storage system benefits from 95% void ratio. The sub-base storage would incorporate a controlled discharge to the public combined sewer via a Hydro-Brake ® flow control device. No infiltration loss to ground has been assumed within the calculations, as a worst-case.

A typical design of Type B concrete block permeable paving is presented as Figure 4.

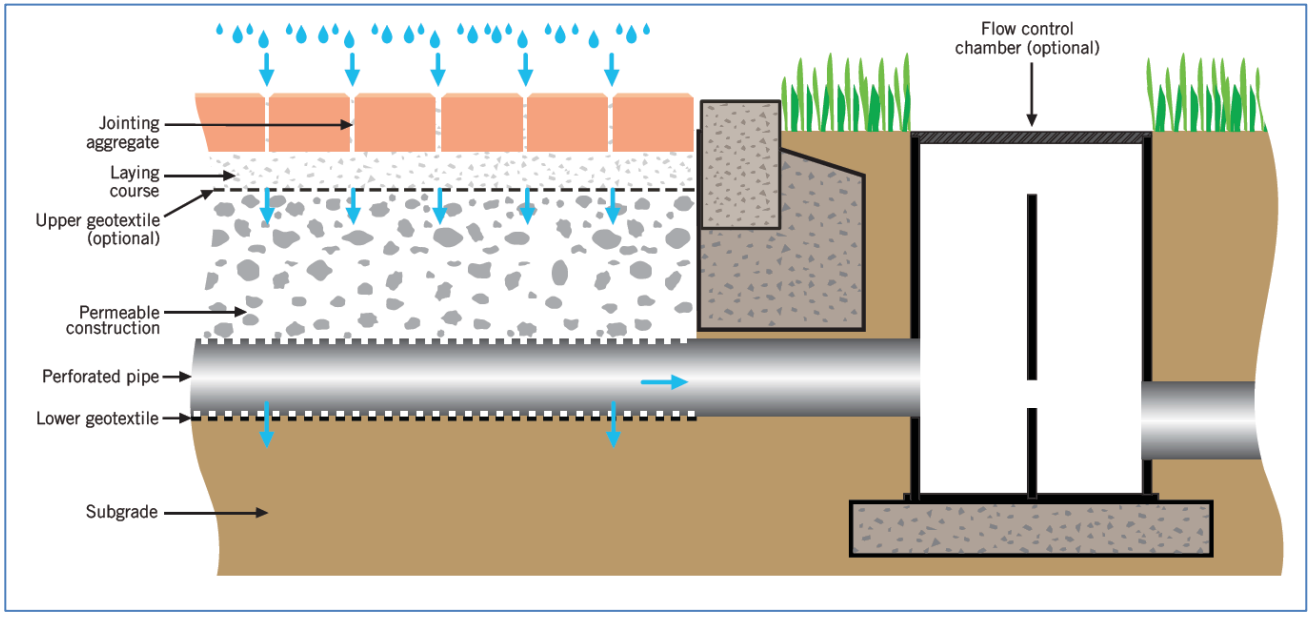


Figure 4. Type B Permeable Paving Schematic (extracted from Interpave, December 2018, Design & Construction of Concrete Block Permeable Pavements)

The permeable paving should be constructed in accordance with the manufacturer's design guidance, BS 7533-13:2009 - *Guide for the design of permeable pavements constructed with concrete paving blocks and flags, natural stone slabs and setts and clay pavers* and CIRIA Report C753 The SuDS Manual.

The drainage system has been designed to attenuate runoff for all rainfall events, up to and including the 100-year event with 45% allowance for climate change, to 1.5l/s, with controlled discharge to the public combined sewer in East Road. The drainage system has been modelled and the permeable paving sub-base storage sized using the industry standard Causeway Flow drainage design software; calculations are included within Appendix E.

The following assumptions have been incorporated into the calculations:

- Design rainfall event: 100-year + 45% climate change.
- Catchment area discharging to the drainage system: 0.236 hectares (0.0966 hectare roof area and 0.1396 hectare external area).
- Runoff coefficient (Cv): summer: 0.75; winter: 0.84 (defaults for impermeable surfaces).
- Sub-base storage: 500mm (minimum) thickness of granular storage beneath all areas of permeable paving / permeable gravel, with 30% void ratio assumed. Sub-base replaced beneath central access road by geocellular crate storage system (e.g. Polystorm) with 95% void ratio and 800mm thickness.
- Peak off-site discharge rate to sewer: 1.5l/s, controlled via a Hydro-Brake flow control device.

The calculations indicate that the proposed attenuation storage (granular sub-base and geocellular crate storage), provides the attenuation volume required to restrict surface water runoff rates to 1.5l/s during the 100-year plus 45% climate change rainfall event. A hydro-brake, or similar flow control device, would be incorporated within the outlet to the public sewer.

Final drainage cover levels and invert levels are dependent on the invert level of the receiving public sewer and final site levels.

4.6. Maintenance Schedule

The drainage system will remain private (not offered for adoption) and to ensure the system continues to operate as designed, maintenance tasks need to be carried out at appropriate intervals. General requirements:

- Clean roof guttering at least six-monthly.
- Retain site drainage plans and protect all below ground drainage infrastructure during any future site works.

All components of the surface water drainage strategy should be maintained by the property owner / manager in accordance with the manufacturer's recommendations; the following maintenance schedules are typical for permeable paving, attenuation storage and proprietary treatment systems (silt traps, flow control devices) (after CIRIA, 2015, UK SuDS Manual).

Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Operation and maintenance requirements for attenuation storage tanks		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

An example of operation and maintenance requirements for a proprietary treatment system		
Maintenance schedule	**Required action**	**Typical frequency**
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

4.7. Foul Drainage

United Utilities has confirmed, via pre-development enquiry (refer to Appendix D), that foul drainage can discharge to the 300mm diameter public combined sewer in East Road.

5. Residual Risk

This surface water drainage strategy has been prepared in accordance with relevant national and local planning policy and guidance. A low residual risk of external surface water flooding remains in the event of a rainfall event greater than the design event.

It will be the owner's /occupier's responsibility to ensure external surfaces are completed with a topographic fall away from existing and new development and to regularly upkeep the drainage network on site throughout the lifetime of the development to ensure that flood risk on and off site is managed effectively.

Appendix A - Site Location Plan

Appendix B - Proposed Development Plans

Appendix C - United Utilities Asset Map

Appendix D - United Utilities Pre-Development Enquiry Response

Appendix E - Surface Water Drainage Layout Plan & Calculations

Appendix F - Environment Agency Flood Maps