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FRA & Outline Drainage Strategy Report

One Castlefield, Manchester

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Executive Summary

This Flood Risk Assessment and Drainage Strategy has been prepared in support of the proposed redevelopment of the site known as One Castlefield, located off Ellesmere Street, Manchester, M15 4YG. The site comprises approximately 0.72 hectares of previously developed brownfield land and is located adjacent to the Bridgewater Canal. The site lies wholly within Flood Zone 1, as defined by the Environment Agency Flood Map for Planning, and is therefore considered to be at low probability of fluvial and tidal flooding. However, given that the proposed development includes a full-site basement, a site-specific Flood Risk Assessment is required to demonstrate that the development will remain safe for its lifetime and will not increase flood risk elsewhere.

The existing site is predominantly impermeable, comprising concrete slabs and hardstanding associated with previous development. The existing impermeable area is approximately 0.72 ha. Under the proposed development, the effective impermeable area will reduce to approximately 0.59 ha, providing a betterment of approximately 0.13 ha through the introduction of soft landscaping, permeable paving and SuDS features. This reduction in impermeable area will contribute to a reduction in surface water runoff volume from the site.

The site is located within a Critical Drainage Area, where the existing sewer network is recognised as sensitive to additional surface water runoff. As such, the drainage strategy has been developed to provide significant betterment over the existing brownfield condition. Surface water runoff from the completed development will be restricted to 5.0 l/s prior to discharge into the United Utilities combined sewer network within Ellesmere Street. This restricted rate will be achieved through a vortex flow control device located within the final manhole before the point of connection.

Preliminary hydraulic modelling has been undertaken using InfoDrainage. The drainage system has been designed to accommodate the 1 in 100 year storm event plus a 45% climate change allowance, with the required attenuation volume currently estimated to be between 424 m^3 and 644 m^3. Storage will be provided through a combination of SuDS and engineered attenuation features, including permeable paving, soft landscaping, bioretention areas and below-ground geocellular attenuation.

Infiltration has been discounted due to the historic industrial use of the site and the associated risk of remobilising contaminants within made ground. Discharge to the Bridgewater Canal has also not been pursued as part of the current strategy. The proposed approach therefore consists of lined or contained SuDS features that provide attenuation, water quality treatment and controlled conveyance prior to discharge to the combined sewer network.

The proposed site includes residential roof areas, podium and pedestrian hardstanding, lightly trafficked access areas, car parking, refuse and commercial servicing areas. The SuDS treatment train includes permeable paving, soft landscaped SuDS areas, trapped gullies, silt traps and catchpit manholes.

The assessment of flood risk from all sources concludes that the site is at low risk of flooding from rivers, tidal sources, surface water, groundwater, sewers, canals and reservoirs, subject to the implementation of the proposed mitigation measures. Particular attention has been given to the basement, which will be fully tanked and designed in accordance with appropriate below-ground waterproofing principles. Basement drainage will be pumped, and backflow protection will be incorporated to protect against sewer surcharge.

Overall, the proposed development is considered acceptable in flood risk and drainage terms. The scheme will provide a significant reduction in surface water discharge compared with the existing brownfield condition, incorporate SuDS where practicable, provide appropriate attenuation for climate change, and ensure that the site remains safe for its lifetime without increasing flood risk elsewhere.

Introduction

This Flood Risk Assessment has been produced to support a full planning application for the redevelopment of the One Castlefield site off Ellesmere Street, Manchester. Despite being wholly within Flood Zone 1, where there is less than a 0.1% chance of fluvial or tidal flooding in any year, an FRA is necessary due to the scale of basement proposals and also because the site falls within an identified Critical Drainage Area from the Manchester and Greater Manchester Combined Authority Strategic Flood Risk Assessment (SFRA), requiring investigation of surface water flooding and sewer capacity issues in more detail.

The objective of this report is to identify all sources of flooding risk, assess the effect of the proposed development on existing drainage conditions and recommend suitable mitigation measures to ensure the proposed development will not be adversely affected by flooding during its lifetime, and will not exacerbate flood risk further upstream or downstream. This Flood Risk Assessment and Outline Drainage Strategy has been prepared in accordance with the National Planning Policy Framework, August 2026, including Policies F4 to F8 and Annex F; the Flood Risk and Coastal Change Planning Practice Guidance; the National Standards for Sustainable Drainage Systems; Environment Agency climate change guidance; CIRIA C753, The SuDS Manual; and relevant local policy and guidance, including Manchester Core Strategy Policy EN14 and the Greater Manchester Strategic Flood Risk Assessment.

Development Proposal

The application seeks full planning application for a residential commercial development which comprises two new high-quality buildings. Block A will be 46 storeys and have an approximate footprint of 830 m^2. Block B will be 9 storeys in height and have an approximate footprint of 2,000 m^2. The buildings would form part of a wider programme of regeneration in the Castlefield area which would deliver improved public realm, landscaped external spaces and pedestrian access.

Key to this scheme is a single basement which would run under the entire development area. The basement would be approximately 5.5 metres at its deepest point. It would house plant and storage rooms, refuse handling areas and plant rooms along with back-of-house operational facilities. Both cores would be linked to the basement via lifts and staircases. The proposed basement slab level would be at 24.000 m AOD with the ground floor FFLs ranging between 28.500 m and 29.500 m AOD for blocks A and B respectively.

The proposals also incorporate a contemporary landscape strategy comprising a series of green and grey infrastructure features which have been strategically placed throughout the site.

Existing Site Conditions

The site is a 0.72-hectare brownfield plot that has been cleared of previous buildings. The ground currently comprises remnants of hardstanding surfaces, including concrete slabs associated with former industrial and commercial activities. The presence of made ground across the site indicates a legacy of historic development, and the underlying geology is known to comprise red sandstone bedrock. This combination of made ground and underlying sandstone means that while the site may exhibit variable permeability, there is a risk that infiltration could mobilise contaminants previously trapped in the ground, rendering infiltration-based SuDS inappropriate.

The red-line boundary for the site differs slightly from the boundary used in historic planning reports, but the fundamental characteristics of the site remain similar. The plot is bounded to the west by the Bridgewater Canal, to the south by Ellesmere Street, and by a mix of residential and commercial developments on other sides.



Figure 1 - One Castlefield, Manchester

There is no usable CCTV survey of any residual drainage infrastructure on site, and the earlier stub connection into the Ellesmere Street combined sewer lies within the footprint of the proposed Block B. This connection will therefore be abandoned and replaced by a new discharge point into the United Utilities combined sewer within Ellesmere Street. The assumed cover and invert levels of the receiving sewer are 29.370 m and 25.860 m respectively.

As identified in previous assessments, the site falls within a designated Critical Drainage Area. Critical Drainage Areas indicate parts of the city where the sewer network and overland flow routes already experience capacity constraints, meaning new development must reduce its peak runoff rates and incorporate meaningful attenuation.

Planning Policy

4.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) 2026 requires that development should be located in areas with the lowest flood risk practicable, applying a sequential, risk-based approach that accounts for all sources of flood risk and anticipated climate change. Development proposed in Flood Zones 2 or 3 must demonstrate the Sequential Test has been applied; where appropriate, the Exception Test must also be satisfied. This requires justification that the development offers sustainability benefits outweighing flood risk and can remain safe for its lifetime without increasing flood risk elsewhere.
Site-specific Flood Risk Assessments are mandatory in Flood Zones 2 and 3 and should include mitigation measures and demonstrate that flood risk is not exacerbated by development. Submissions should also explore opportunities for reducing flood risk.

The Castlefield site falls within Flood Zone 1 but is located in a Critical Drainage Area as identified in local studies. Thus, despite being outside higher flood zones, a site-specific FRA is proportionate given the complexity of local drainage and the presence of low-lying land and development constraints.

4.2 Flood Risk & Coastal Change Planning Practice Guidance (FRCC-PPG)

FRCC-PPG provides detailed guidance underpinning the NPPF, defining Flood Zones and vulnerability classifications, and outlining expectations for site-specific FRAs and consideration of climate change.

'More Vulnerable' uses — including residential and commercial with basements — are acceptable in Flood Zone 1 without needing an Exception Test, provided Sequential and site-specific assessments (including groundwater and sewer considerations) are carried out. Basement development is specifically referenced in PPG and must follow resilience and flood resistance best practice (e.g., compliance with BS 8102:2022).

4.1.2 Flood Risk Categorisation

The NPPF references the Flood Zones defined on the Environment Agency's Flood Map for Planning (Rivers and Sea) and uses these to guide the appropriateness of development through the sequential approach. The Flood Risk and Coastal Change PPG provides the formal definitions of Flood Zones and their application in planning; these are summarised in Table 1 (extracted from Table 1 of the PPG).

Table 1: Flood Zone definition

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 (0.1%) annual probability of river or sea flooding. Land shown as 'clear' on the Flood Map for Planning (all land outside Zones 2, 3a and 3b).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 (1% and 0.1%) annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 (0.5% and 0.1%) annual probability of sea flooding. Land shown in light blue on the Flood Map for Planning.

Zone 3A High Probability	Land having a 1 in 100 (1%) or greater annual probability of river flooding; or land having a 1 in 200 (0.5%) or greater annual probability of sea flooding. Land shown in dark blue on the Flood Map for Planning.
Zone 3B Functional Flood Plain	Functional Floodplain | This zone comprises land where water must flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: - Land having a 1 in 30 (3.3%) or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or - Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. This Zone is not separately distinguished from Zone 3a on the Flood Map for Planning.

4.1.3 Flood Risk Vulnerability and Flood Zone Compatibility

Annex F, Table 2 of the NPPF defines the type and nature of different development classifications in the context of their flood risk vulnerability. The information in Annex F was extracted and is presented in Table 2.

Table 2: Flood Risk Vulnerability

Classification	Description
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 infrastructure for electricity supply including generation, storage, and distribution systems; including electricity generating power stations, grid and primary substations storage; and water treatment works that need to remain operational in times of flood. - Wind turbines. - Solar farms.
Highly Vulnerable	Police and ambulance stations; fire stations and command centers; 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 waterside 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. -Car parks.
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 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.

Table 3: Flood Risk Vulnerability zone

Flood Zones	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	Y	Y	Y	Y	Y
Zone 2	Y	Exception Test	Y	Y	Y
Zone 3A	Exception Test**	N	Exception Test	Y	Y
Zone 3B	Exception Test*	N	N	N	Y
Y= Permitted Development N= Unpermitted Development					

4.2.1 Sequential Test

Policy F5 of the NPPF seeks to steer development towards areas at the lowest risk of flooding from any source. The site lies wholly within Flood Zone 1 and is not affected by mapped fluvial or tidal flooding. The identified risks principally relate to localised surface water flooding, sewer surcharge and residual risk associated with artificial sources.

The Environment Agency surface water mapping identifies localised areas of low risk along Ellesmere Street, with the mapped risk predominantly confined to the public highway. The proposed building footprints, entrances and internal accommodation are not located within the identified surface water flow route. Finished floor levels, external levels, exceedance routes, basement waterproofing and drainage mitigation will ensure that users remain safe throughout the anticipated lifetime of the development without increasing flood risk elsewhere.

In accordance with Policy F5(2)(b), the site-specific FRA demonstrates that the proposed layout, design and mitigation appropriately address the current and future surface water risk. On this basis, a separate Sequential Test is not considered necessary.

4.3 Local Policy & Strategic Guidance

4.3.1 Manchester Core Strategy – Policy EN14: Flood Risk

Policy EN14 requires new development to manage flood risk sustainably and contribute to reducing surface water discharge. It mandates integrated SuDS, climate resilient design, and protecting existing flood water storage capacity. EN14 remains effectively part of the Development Plan even where superseded by PfE policies and is reflected in the current local plan framework.

4.3.2 Greater Manchester Strategic Flood Risk Assessment (SFRA)

The Greater Manchester Level 1 (2019) and Level 2 (2011/2019) SFRAs are the primary flood risk evidence base. These identify key strategic flood risk areas around Manchester's rivers, canals, and urban drainage systems. Notably:

- The Irwell, Medlock, and Manchester Ship Canal form critical flood corridors.
- Castlefield is located in a **Critical Drainage Area**, where surface water and sewer flooding risk is heightened.
- Functional Floodplain delineation is provided via the GM Level 2 SFRA.
- SFRAs support Sequential and Exception Tests, resource safeguarding, and SuDS prioritisation.

4.3.3 Manchester Local Flood Risk Management Strategy (LFRMS)

As the Lead Local Flood Authority, Manchester City Council's LFRMS guides local flood risk reduction strategies, emphasizing the importance of SuDS, partnerships, and risk-based interventions. This includes reducing surface water flooding and preserving natural drainage functions.

4.3.4 United Utilities Surface Water Hierarchy

United Utilities promotes a hierarchy favouring infiltration, then discharge to watercourses, then sewers as a last resort. Where connection to combined sewers is necessary, discharge must be tightly controlled: i.e., connection to the combined sewer is acceptable here — supported by full hydraulic justification and attenuation to greenfield rates.

4.4 Climate Change Allowances

In accordance with Environment Agency flood risk assessment guidance, climate change allowances have been applied to the flood risk and drainage assessment for the proposed development within the River Irwell Management Catchment. The Environment Agency publishes peak rainfall climate change allowances by management catchment for use in flood risk assessments, strategic flood risk assessments, and flood and coastal risk management schemes.

For the River Irwell Management Catchment, the relevant upper-end peak rainfall climate change allowance is 45%. This allowance has therefore been adopted for the assessment of future flood risk and has been incorporated into the drainage strategy.

The proposed development is assumed to have a design life of 100 years. On this basis, the drainage strategy has been designed to accommodate the appropriate future climate change scenario, using the 1% Annual Exceedance Probability flood event plus a 45% climate change allowance.

Table 4: River Irwell Peak Rainfall climate change allowance

Epoch	Central Allowance	Upper End Allowance
3.3% Annual Exceedance Rainfall Event		
2050's	25%	35%
2070's	30%	40%
1% Annual Exceedance Rainfall Event		
2050's	25%	40%
2070's	30%	45%

*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development between 2061 and 2125. The proposed development is assumed to have a design life of 100 years, and therefore the 2070s epoch has been adopted for the application of climate change allowances. In accordance with Environment Agency guidance and the requirements of Manchester City Council as Lead Local Flood Authority, the drainage strategy will be designed to accommodate the 1% AEP rainfall event including a 45% climate change allowance.

This approach ensures that the proposed drainage strategy is robust, aligns with national and local policy requirements, and provides resilience to future climate conditions over the lifetime of the development.

Hydrological Assessment

5.1 Flooding History

The Environment Agency's Historic Flood Map and local Strategic Flood Risk Assessment (SFRA) evidence confirm that there are no recorded fluvial flood events affecting the site. The site is located within an established urban area of Manchester and has historically been developed, with no documented evidence of flooding attributable to rivers, canals, or tidal sources.

It is recognised that historic flood datasets have inherent limitations and do not always capture localised surface water flooding associated with intense rainfall or drainage exceedance. However, no records have been identified to suggest that the site has been subject to recurring flood incidents from any source. As such, flooding history does not indicate an elevated baseline risk to the site.

5.2 Fluvial Flood Risk

The Environment Agency Flood Map for Planning confirms that the site lies wholly within Flood Zone 1, where the annual probability of fluvial flooding is less than 0.1%. There are no mapped fluvial flood extents affecting the site, and there are no overland flow pathways connecting nearby main rivers to the development.

While the wider Castlefield area is influenced by watercourses such as the River Irwell and the River Medlock, these features are located at a sufficient distance and elevation relative to the site, and intervening topography and urban infrastructure prevent fluvial flood pathways from affecting the site.

On this basis, the risk of fluvial flooding to the site is considered low, and fluvial flood risk does not represent a constraint to development.

5.3 Tidal Flood Risk

Manchester is located inland and is not influenced by tidal processes. There is no credible pathway for tidal flooding to affect the site. Accordingly, tidal flood risk is assessed as negligible.

5.4 Surface Water Flood Risk

Surface water flooding is a key consideration for development in urban areas, particularly within Critical Drainage Areas where drainage networks can be constrained during extreme rainfall events.

The Environment Agency's Risk of Flooding from Surface Water mapping identifies localised areas of low surface water flood risk along Ellesmere Street during extreme rainfall scenarios. Predicted depths are shallow and largely confined to the public highway, with no mapped flow routes directing surface water into the site.

The proposed development has been designed to respond appropriately to this context. Finished floor levels at ground floor will be set well above predicted surface water flood depths, and the site layout avoids the creation of low points where water could pond. Surface water flow across podium and public realm areas will be directed away from entrances, vents, and building thresholds.

A comprehensive SuDS-led drainage strategy is proposed, incorporating measures such as permeable paving, rain gardens & bio retention areas, and other green SuDS types to manage runoff close to source. Surface water discharge will be restricted

to a controlled rate of 5.0 l/s, representing a significant reduction compared to existing conditions. This approach ensures that the development manages its own runoff effectively and does not exacerbate surface water flooding elsewhere.
Overall, with mitigation in place, the risk of surface water flooding is considered low.

5.5 Groundwater Flood Risk

The site is underlain by made ground over sandstone, meaning shallow or perched groundwater conditions could occur locally. However, there is no evidence of persistent groundwater flooding affecting the site.

All proposed SuDS components will be lined, preventing infiltration and minimising interaction with groundwater. In addition, the basement will be fully waterproofed, providing protection against any potential groundwater ingress.
Given these measures, groundwater flood risk is considered low.

5.6 Sewer Flood Risk

The site lies within a Critical Drainage Area, where combined sewer capacity can be constrained during periods of intense rainfall. Sewer flooding is therefore recognised as a potential secondary risk.

This risk is mitigated through the proposed drainage strategy, which significantly reduces surface water discharge rates compared to the existing situation. Runoff will be attenuated on site and discharged at a restricted rate of 5.0 l/s, reducing pressure on the combined sewer network.

Basement drainage systems will incorporate non-return valves and pumped discharge arrangements to prevent sewer surcharge from propagating into lower levels. With these measures in place, the risk of flooding from sewers is assessed as low.

5.7 Canal Flood Risk

The Bridgewater Canal runs adjacent to the western boundary of the site. The canal is an impounded water body with carefully managed levels and a long history of stable operation.

There is no record of canal overtopping or breach affecting the site, and the canal water level is significantly lower than the proposed finished floor levels. The site is also physically separated from the canal by robust retaining structures.
As such, the risk of canal-related flooding is considered very low.

5.8 Reservoir Flood Risk

Environment Agency reservoir flood mapping indicates that the site lies within the outer extent of a highly conservative reservoir inundation zone associated with remote reservoirs. The probability of such an event is described by the EA as extremely low.

The probability is extremely low and any residual risk would be managed through emergency planning and safe access arrangements. Given the structural robustness of the proposed buildings and the basement waterproofing strategy, reservoir flood risk is considered negligible.

5.9 Summary of Flood Risk

The assessment of all flood sources indicates that the site is at low risk of flooding from all mechanisms. The site lies within Flood Zone 1, with no fluvial or tidal flood pathways, and localised surface water risk is effectively managed through design and drainage mitigation.

Table 5: Summary of Flood Risk

Source of flooding	Risk to the site
Fluvial	LOW
Surface Water	LOW
Groundwater	LOW
Reservoir	NEGLIGABLE
Sewer	LOW
Canal	VERY LOW

5.10 Proposed Flood Mitigation and Resilience Measures

Flood resilience is embedded throughout the design of the development.

Ground floor finished floor levels will be set with substantial freeboard above predicted surface water flood levels. The basement will be constructed in accordance with BS 8102:2022, using a combined waterproofing strategy comprising structural waterproofing (Type B) and an internal drained cavity system (Type C). This ensures the basement remains dry and functional under extreme rainfall and groundwater conditions.

Plant, electrical equipment, and sensitive infrastructure located at basement level will be installed on raised plinths. Surface water across podium and public realm areas will be directed away from building entrances and other points of ingress.

Pedestrian access and egress will remain available during extreme rainfall events, with multiple routes provided so that occupants are not reliant on a single access point.

5.11 Critical Drainage Area Considerations

The site falls within an identified Critical Drainage Area (CDA) in accordance with the Greater Manchester Level 2 Strategic Flood Risk Assessment. Critical Drainage Areas have been identified across Greater Manchester where the existing drainage network, predominantly the combined sewer system experiences hydraulic pressures and a risk of surface water flooding during high rainfall events. Proposals located within these areas will be expected to make betterment to surface water drainage to help reduce pressure on the surrounding drainage infrastructure.

As the site falls within a Critical Drainage Area (CDA), developers are required to make betterment to surface water drainage infrastructure. The existing site conditions consisted of an impermeable brownfield plot of land which discharged directly to the combined sewer. In addition to limiting peak flow rate, the proposed surface water drainage strategy will create a reduction in the timing of runoff contributions to the sewer system. As such, the development proposals will make betterment to surface water runoff when compared to the existing site conditions and reduce downstream flood risk.

Although not required by Manchester City Council planning policy, the scheme will store water at multiple stages rather than focusing on a singular attenuation volume. This distributed SuDS approach makes use of differing SuDS types across the site to minimise pressures on any one attenuation element and limits rapid conveyance of runoff to the sewer network. Surface water is also managed at source through the use of grey and green infrastructure which encourages evapotranspiration.

The development proposal will create less loading on the drainage network by reducing the amount of impervious area across the site. The existing brownfield site is 100% hardstanding land and covers an area of approximately 0.72 hectares. Although the proposed scheme does not significantly reduce impervious area across the site (site coverage is approx. 90%), the inclusion of attenuation and attenuation features will result in a lower runoff volume when compared with that of the existing condition. The proposed development reduces the impervious area to approximately 0.593 hectares.

Rainfall that exceeds the attenuation capacity of the site will be conveyed across the development site as overland flow. Over surface flow routes have been carefully considered to avoid flowing directly into or around building entrances. Paths of travel have been designed to intersect with attenuation features where possible and safely convey runoff away from the development. Additional storage is provided through the incorporation of external landscaping areas which will act as designated flood zones during high rainfall events. Water will be temporarily stored within these areas and then gradually conveyed towards the public highway, preventing hazardous flooding of the site.

Since the site lies within a Critical Drainage Area, sewer flooding from sewer surcharge also needed to be carefully considered. All below-ground drainage connections will be protected from backflow with non-return valves or similar to ensure that any sewer surcharge cannot enter the development. The basement drainage system will also be pumped to ensure wastewater and surface water removal is not affected by gravity sewer conditions. These precautions will protect the development from sewer flooding and ensure the site is resilient to flooding issues affecting the surrounding area.

Although the proposed scheme discharges surface water to the combined sewer network, this decision was made following consideration of all other acceptable surface water drainage options. Infiltration was discounted due to the presence of contaminated made ground and the potential for pollutants to enter the groundwater system. Discharge to the adjacent Bridgewater canal was discounted due to road level constraints and limitations set by third party navigation authority requirements and the absence of a technically suitable gravity outfall. The only remaining outfall option was connection to the existing combined sewer network. Due to the significant attenuation and reduction in runoff rate provided by the proposed surface water drainage strategy, discharge to the combined sewer will make a positive contribution to the performance of the drainage system.

Climate change will be accounted for by increasing rainfall intensities by 45% for the Adopted District Level 1 Strategy standard of the 1 in 100 year design event, in line with Environment Agency advice.

The proposed development has been assessed against Policy F7 of the NPPF. The proposed finished floor levels, external levels strategy, surface water drainage system, basement waterproofing, backflow protection and pumped basement drainage will ensure that occupiers, users and visitors remain safe throughout the anticipated lifetime of the development. Residual risks from surface water exceedance, sewer surcharge, the Bridgewater Canal and reservoirs will be managed through flood-resilient design and appropriate access and escape arrangements. The restriction of surface water discharge to 5.0 l/s and the provision of on-site attenuation will ensure that the development does not increase flood risk elsewhere.

Outline Drainage Strategy

6. Proposed Surface Water Drainage Strategy

6.1 Point of Discharge

Policy F8 of the NPPF requires development proposals that could affect drainage to incorporate proportionate SuDS designed in accordance with the National Standards for Sustainable Drainage Systems. In accordance with the surface water discharge hierarchy, the following discharge options have been considered in order of preference:

1. Into the ground (infiltration)
2. To a surface water body
3. To a surface water sewer, highway drain or another drainage system
4. To a combined sewer

An appraisal of the drainage hierarchy follows, with a summary in Table 7:

Infiltration based system

Theoretically the use of soakaway drainage methods could be applied to the site (subject to completion of infiltration test). However, the adjacency of the canal may have impacted upon the groundwater levels within the sands which could constrain infiltration potential, the speed of infiltration and water storage. In addition the site has a long standing industrial heritage having had a mill and a brewery as previous developments. The use of infiltration techniques has the potential to mobilise sources of contamination within site soils which could, in turn, have an impact on surface water quality within the principal aquifer.

The availability of site area to install an appropriately sized soakaway to deal with a drained area of 0.72 ha is also limited.

Surface Waterbody

The Bridgewater Canal sits adjacent to site and discussions as part of a previous planning application for the site indicated that an agreement was made between the developer and Peel Holdings who are the Navigation Authority for the canal to be able to discharge into the canal (limited to 0.5m/s). Having reviewed the site constraints we do not believe a viable connection to the canal is feasible, given the height between the proposed site and the canal toe path below which es estimated to be between 3-4m. The canal freeboard height would also make a gravity fed connection which would not surcharge unfeasible.

Surface Water Sewer

There is a 2210 dia. surface water sewer at the Junction between Ellesmere St and Hulme Hall Rd. This asset is over 120m away from the development boundary and getting a gravity fed connection at soffit level with the UU asset at this location is unfeasible. We assume there are also a number of other utilities in this area which would likely clash with any drainage installation along this highway. A pumped solution has been queried to allow for a gravity fed solution from the outfall to the surface water sewer at the junction of Ellesmere St and Hulme Hall Road (approximately 120m away) however we believe a pump would be an unsustainable solution compared with a solely gravity fed solution which is directly adjacent to the site in the form of a combined sewer system.

Combined Sewer

There is a 375 dia. combined sewer which runs along Ellesmere St. A stub connection into the site is assumed to have previously served the whole site drainage. The current connection will need to be grubbed up and abandoned as it clashes with the proposed building footprint, as indicated on the drainage general arrangement drawing. It is intended that a new connection will be made on the existing combined sewer below, what will be the new proposed access to site, bell mouth junction. A proposed discharge rate of 5 l/s has been assumed, subject to final approval by United Utilities & the LLFA.

Table 6: Suitability of Discharge Methods

Point of Discharge	Suitability
Infiltration	NO
Surface Waterbody	NO
Surface Water Sewer	NO
Combined Sewer	YES

6.2 Site Requirements

The existing site is predominantly impermeable, covering approximately 0.72 ha. The proposed development reduces the effective impermeable area to approximately 0.59 ha through the introduction of soft landscaping and SuDS features, representing a betterment of 0.13 ha and a reduction in overall runoff volume.

Table 7: Site Drained Areas

Phase	Impermeable Area
Existing	0.72 ha
Proposed	0.59 ha
Betterment	0.13 ha

Greenfield runoff rates have been calculated using FEH data within the HR Wallingford Greenfield Runoff Estimation Tool (refer to Figure 2). Whilst the calculated QBar rate provides a theoretical target, it has been deemed impractically low for operational purposes due to increased risk of blockage;

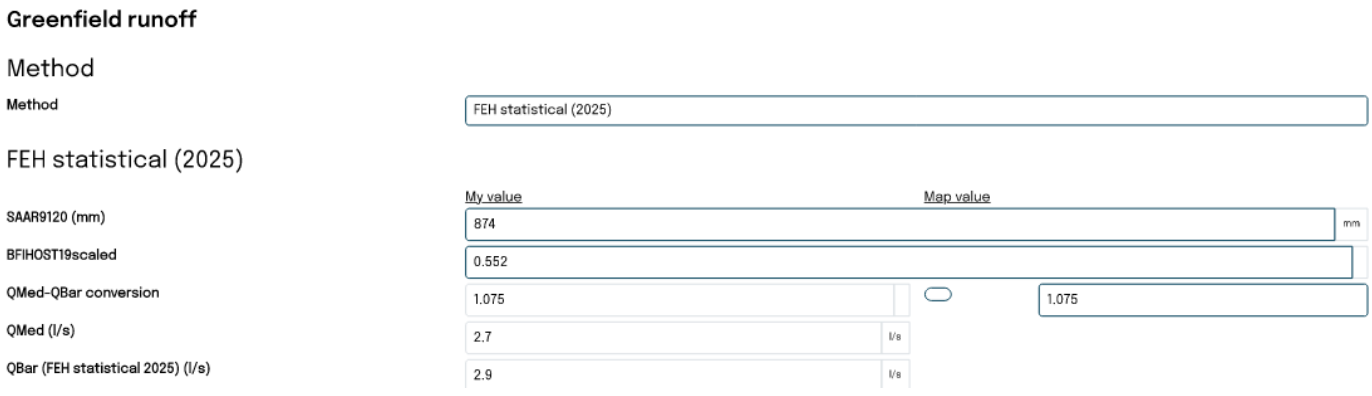


Figure 2 – HR Wallingford Greenfield Run off estimation

6.3 Hydraulic Modelling

The site has been considered as a single-phase development. Run-off from the completed scheme will be limited to a discharge rate of 5.0 l/s prior to entering United Utilities combined sewer system via Ellesmere Street.

The discharge rate will provide substantial betterment of the existing brownfield site condition and is felt to be suitable given the sites location within a CDA. Limitation of the discharge rate will be achieved by the installation of a vortex flow control device within the last manhole prior to discharge into the receiving sewer.

The drainage scheme will be designed such that the agreed discharge rate is not exceeded during a 1 in 100 year storm event, plus 45% for climate change.

Modelling has been carried out to establish the attenuation volume required to limit the site discharge to 5.0 l/s. This was completed using InfoDrainage to provide a preliminary attenuation volume.

The drainage strategy has been based around the 1 in 100 year storm event, plus 45% climate change. This will be refined further during the detailed design stage but currently falls within the range of 424m^3 to 644m^3.

Attenuation will be provided by means of SuDS and engineered storage features including permeable paving, soft landscaping, rain gardens/tree pits and underground drainage where necessary.

Table 8: Quick Storage Estimate Values

Storm Event	Required Attenuation Volume
1 in 100 year + 45% climate change	424 m^3 – 644 m^3

The final storage volume will be confirmed through detailed drainage modelling once the proposed drainage layout, finished levels, and SuDS areas are fixed.

6.4 SuDS Interception and Water Quality

The proposed drainage strategy incorporates SuDS features to provide source control, interception storage, attenuation and water quality treatment prior to discharge to the receiving combined sewer network. Although the final outfall is to the United Utilities combined sewer rather than directly to a watercourse, the inclusion of SuDS remains appropriate to reduce sediment, metals, hydrocarbons and other pollutants entering the drainage system.

The total area expected to receive first 5 mm interception is approximately 0.176 ha, equivalent to 1,760 m^2. This includes the permeable paving area and soft landscaped SuDS features receiving runoff from adjacent hard standing. Based on the first 5 mm rainfall depth, this equates to an interception volume of approximately 8.8 m^3.

Table 9: SuDs Features

SuDS Feature / Catchment	Area Intercepted
Permeable paving and associated catchment	Included within total
Soft landscaped SuDS receiving adjacent hardstanding runoff	Included within total
Total area receiving first 5 mm interception	1,760 m^2
Equivalent first 5 mm interception volume	8.8 m^3

Roof areas which drain direct to the sub-drainage system have not been included in this interception calculation. They will be attenuated within the wider drainage system prior to limited discharge but are not considered to provide any first 5 mm interception storage.

A preliminary water quality assessment has been completed using the Simple Index Approach described in CIRIA C753 The SuDS Manual. This method allocates pollution hazard indices to various land uses and compares these to the mitigation indices achieved by the proposed SuDS treatment train.

The following pollution hazard indices have been applied for the purposes of this assessment.

Table 10: Pollution Hazard Indices for Proposed Land Uses (CIRIA C753 Table 26.2)

Surface Type	Pollution Hazard Level	TSS	Metals	Hydrocarbons
Residential roof areas	Very Low	0.2	0.2	0.05
Podium / pedestrian hard standing	Low	0.5	0.4	0.4
Lightly trafficked access routes	Low to Medium	0.5–0.7	0.4–0.6	0.4–0.7
Car parking areas	Medium	0.7	0.6	0.7
Refuse / commercial servicing areas	Medium	0.7	0.6	0.7

The proposed treatment train includes permeable paving, soft landscaped SuDS, silt traps, catchpit manholes and trapped gullies. Runoff from car parking and access areas will drain through permeable paving and sub-base storage prior to entering the wider drainage network. Runoff from public realm areas will be directed towards landscaped SuDS features where practicable.

The following mitigation indices have been adopted for the principal SuDS components.

Table 11: Pollution Mitigation Indices

SuDS Component	TSS	Metals	Hydrocarbons
Permeable pavement	0.7	0.6	0.7
Bioretention / rain garden	0.8	0.8	0.8
Swale / vegetated conveyance	0.5	0.6	0.6
Tree pit / engineered soft landscape system	0.6	0.6	0.6

On this basis, car parking areas draining through permeable paving achieve mitigation indices of 0.7 for TSS, 0.6 for metals and 0.7 for hydrocarbons, which meets the medium pollution hazard indices associated with car parking runoff. Public realm and pedestrian areas draining to landscaped SuDS or rain garden features also receive treatment indices greater than the anticipated low pollution hazard level.

Table 12: Water Quality Mitigation Compliance Matrix

Catchment	Hazard Indices TSS / Metals / Hydrocarbons	Proposed Treatment	Mitigation Indices TSS / Metals / Hydrocarbons	Compliance
Car parking / access areas	0.7 / 0.6 / 0.7	Permeable paving	0.7 / 0.6 / 0.7	Complies
Public realm / pedestrian hard standing	0.5 / 0.4 / 0.4	Soft landscape / rain gardens / tree pits	0.6–0.8 / 0.6–0.8 / 0.6–0.8	Complies
Residential roofs	0.2 / 0.2 / 0.05	Attenuation prior to sewer discharge	Very low hazard source	Acceptable
Refuse / commercial servicing areas	0.7 / 0.6 / 0.7	Trapped gullies, catchpits and silt traps	Pre-treatment / maintenance feature	To be confirmed at detailed design

It can be seen from the above assessment that SuDS treatment measures have been incorporated into the design to ensure that the main trafficked and hard standing areas are treated appropriately for the likely pollution risk. Car parking and light traffic areas are treated with permeable paving; where suitable, or rain gardens/tree pits/soft landscaped SuDS features to provide further filtration and sedimentation treatment to public realm runoff.

Areas of refuse storage and commercial vehicular servicing are disconnected and drained via trapped gullies, catchpits and silt traps which will trap sediment and gross pollutants before discharge. Gullies and traps will require maintenance in order to ensure they function correctly. If the adopted detailed layout demonstrates areas of concentrated higher-risk runoff from refuse or servicing areas then further localised treatment would be required to ensure the treatment train provides adequate treatment as set out in CIRIA C753.

In summary, it is considered that the SuDS proposed will ensure adequate pollution control measures are provided throughout the development. This SuDS strategy will also provide interception, attenuation and betterment to runoff volumes prior to discharge into the restricted CS network.

6.5 National SuDS Standards Compliance Statement

The drainage strategy utilises a number of SuDS measures to control surface water runoff from the development site subject to local constraints. Key SuDS measures consist of soft landscaping, bioretention features, permeable paving and sub-surface geocellular attenuation.

SuDS features have been incorporated across the site to manage runoff as localised to source as is realistically possible. However, due to the site's previous industrial use and the likelihood of made ground containing contaminants, infiltration SuDS measures were considered inappropriate for risk of contaminant mobilisation. SuDS measures will be designed as either lined or contained systems to facilitate attenuation, treatment and controlled conveyance rather than infiltration to water courses.

Permeable paving will be incorporated where possible within parking and access areas to provide interception, treatment and attenuation at source. Paved hard landscaped areas and public realm spaces will runoff towards landscaping features and bioretention where levels allow, providing opportunity for runoff to be slowed and treated before entering the downstream drainage infrastructure. Sub-surface geocellular systems will be provided where required to provide additional attenuation storage to supplement the capacity of the SuDS measures implemented at ground level. The storage within SuDS features will be sized to ensure enough capacity is available to accommodate a 1 in 100 year rainfall event with an additional 45% climate change factor, allowing only excess runoff to be discharged to the United Utilities combined sewer sewer via a restricted outlet.

6.6 SuDS Management and Maintenance

The proposed surface water drainage system will remain under private management, with responsibility assigned to the site owner or appointed management company. A detailed SuDS management and maintenance plan will be prepared before construction and retained for the operational lifetime of the development.

The maintenance plan will include inspection frequencies, routine maintenance requirements, access arrangements, sediment and vegetation management, remedial procedures and records of completed works. It will cover the permeable paving, bioretention areas, soft landscaped SuDS, geocellular attenuation, flow-control chamber, catchpits, silt traps, trapped gullies, pumps and non-return devices.

The drainage layout will provide suitable access for inspection, cleansing, repair and replacement. Maintenance frequencies will initially reflect manufacturer recommendations and CIRIA C753 guidance and will be adjusted where necessary based on site inspections and operational performance.

Component	Principal requirement	Indicative frequency
Permeable paving	Sweep surface, remove sediment and inspect for ponding	Quarterly and after significant storms
Bioretention/soft SuDS	Remove litter, manage vegetation and inspect inlets/outlets	Monthly during establishment, then quarterly
Catchpits and silt traps	Inspect sediment depth and cleanse as required	Six-monthly
Geocellular attenuation	Inspect upstream/downstream chambers and check for blockage	Annually
Vortex flow control	Inspect and remove debris	Six-monthly and after significant storms
Pumps and non-return valves	Functional testing and servicing	In accordance with manufacturer requirements

Summary & Conclusions

Covering approximately 0.72 ha, the site is wholly within Flood Zone 1, where low risk of fluvial or tidal flooding exists. Despite this, both the inclusion of a full-site basement and site location within a Critical Drainage Area necessitate the undertaking of a full FRA to understand flood risk and drainage constraints.

The proposed development includes buildings, external works and landscaping, public realm, car parking and a full site basement. Basement levels are proposed to be at a depth of around 5.5m below the surrounding ground levels. Plant, storage and refuse accommodation is proposed within the basement. The basement slab level is proposed to be at around 24.000 m AOD, with accommodation above at finished floor levels varying between approximately 28.500 m AOD and 29.500 m AOD.

Flooding from rivers, tidal sources, groundwater, canals and reservoirs have all been considered as part of the FRA. Risk from these sources has been determined to be low or very low. Surface water and sewerage flood risk remains the principal design considerations due to the site's designation as a Critical Drainage Area and presence of a basement. These risks can be successfully mitigated against through careful basement level design, waterproofing of the basement, pumped basement drainage installations, non-return devices where necessary, and managed surface water discharge from the site.

Existing site conditions are predominantly impermeable, comprising an impervious area of approximately 0.72 ha. Following the implementation of the proposed scheme, the effective impervious area will be reduced to approximately 0.59 ha. This is betterment of approximately 0.13 ha. Surface water runoff from the completed development will be limited to 5.0 l/s prior to discharge into the United Utilities combined sewer network located within Ellesmere Street. This is a large improvement upon the existing brownfield surface water runoff and will help alleviate pressure on the downstream sewerage network.

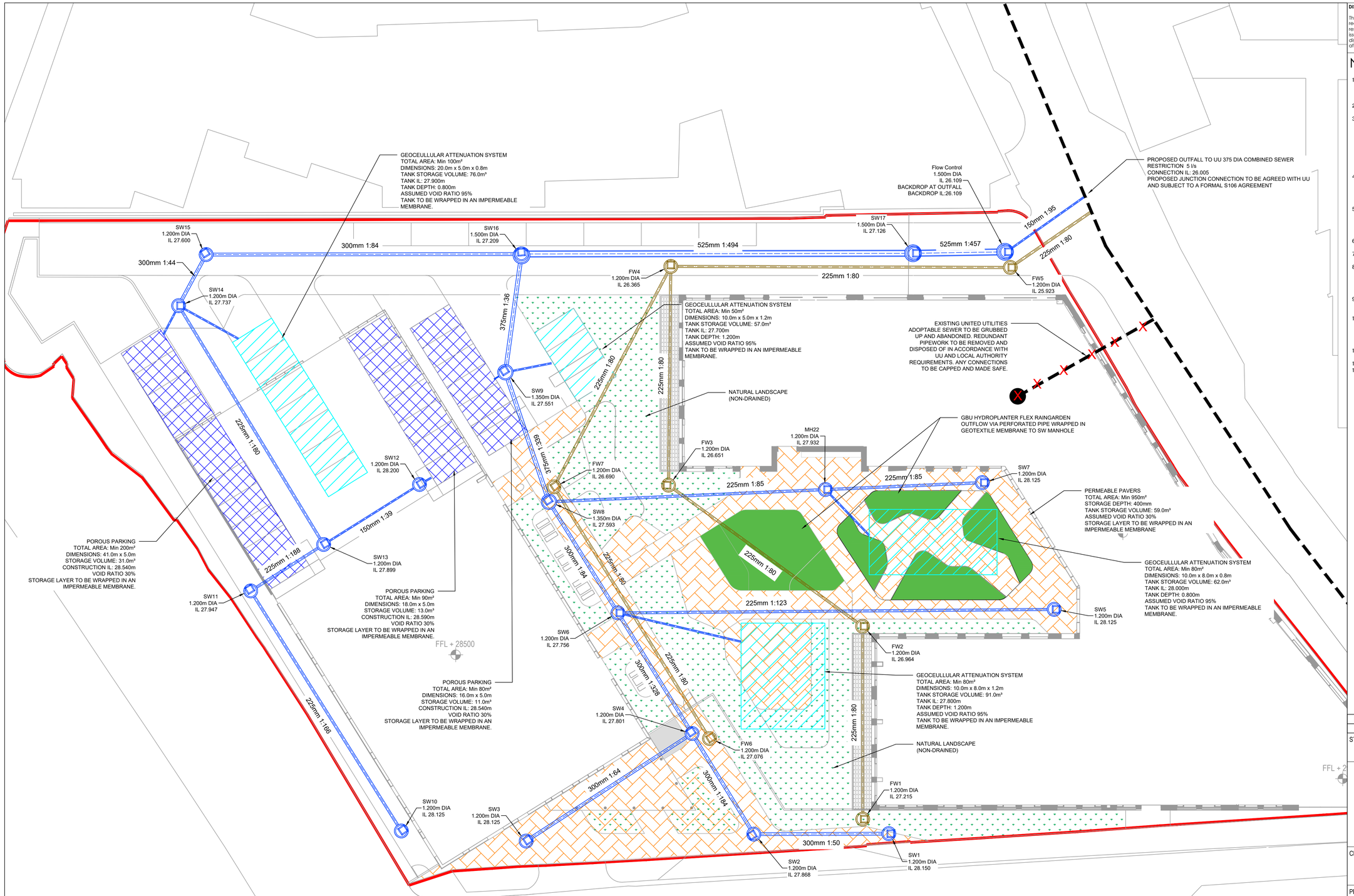
Preliminary attenuation calculations were undertaken using InfoDrainage. Modelling suggests that between 424 m^3 and 644 m^3 of attenuation storage will be required to accommodate a 1 in 100 year rainfall event, with a 45% allowance for climate change. The storage requirement will be split between several SuDS features, including permeable paving, soft landscaping, bioretention areas and below-ground attenuation within geocellular crates.

Runoff from roofs, pedestrian hard standing, vehicular parking areas, access roads, service areas and refuse rooms present a combined pollution hazard from mud/dirt, oil and hydrocarbons and toxic pollutants and pesticides. As part of the drainage strategy, a preliminary water quality assessment has been undertaken. Initial findings suggest that the proposed SuDS treatment train will be appropriate for the anticipated pollution hazard levels present across the development. Treatment measures will be provided by incorporating permeable paving, bioretention, landscaped areas, trapped gullies, upstream silt traps and catchpit manholes where appropriate.

The assessment has been reviewed against the National Planning Policy Framework published in August 2026. The preparation of the FRA satisfies Policy F4 because the site is located within Flood Zone 1 but is identified by the SFRA and LLFA as being within a Critical Drainage Area and at risk from surface water flooding. The FRA demonstrates that the requirements of Policies F5 and F7 are satisfied through the proposed layout, finished floor levels, basement protection, safe access arrangements and drainage mitigation. The proposed drainage strategy also complies with Policy F8 through the provision of proportionate SuDS, restricted discharge, runoff reduction, water-quality treatment, climate-change resilience and lifetime maintenance arrangements.

It can therefore be concluded that the proposed development poses no issues from a flood risk or drainage perspective. Additionally, through the introduction of SuDS and reduction of effective impervious area, provision of storage attenuation for climate change allowances and restriction of surface water runoff from the site, the proposed development provides betterment against the existing drainage condition.

Appendix A – Drainage GA



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Notes:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED. WHERE THERE APPEARS TO BE A CONFLICT BETWEEN DIMENSIONS OR WHERE DIMENSIONS CANNOT BE DETERMINED FROM THE DRAWINGS, CONSULT THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.
3. THE CONTRACTOR SHALL:
   - 3.1. VERIFY EXISTING UTILITIES BEFORE STARTING WORKS.
   - 3.2. VERIFY THE DIMENSIONS SHOWN ON THE DRAWINGS BEFORE FABRICATION, SETTING OUT OR EXCAVATION OF THE WORK, AND SHALL BE HELD RESPONSIBLE FOR ANY ERRORS OR INACCURACIES RESULTING FROM FAILURE TO DO SO.
   - 3.3. CHECK AND VERIFY THE LOCATION AND LEVELS ALL EXISTING DRAINS, SEWERS, INSPECTION CHAMBERS AND MANHOLES AGAINST DRAWINGS AND REPORT ANY DISCREPANCIES TO THE ENGINEER.
4. THE SURFACE WATER DRAINAGE HAS BEEN DESIGNED FOR NO FLOODING FOR A 1 IN 100 YEAR PLUS 45% ALLOWANCE FOR CLIMATE CHANGE. THE SURFACE WATER NETWORK HAS BEEN DESIGNED TO RESTRICT THE DISCHARGE RATE FROM THE SITE TO 5 l/s FOR THE 1:100 RAINFALL EVENT PLUS 45% CLIMATE CHANGE.
5. THE PROPOSED BUILDING OUTLINES SHOWN ON THIS DRAWING ARE FOR INFORMATION ONLY. REFER TO ARCHITECTS PLANS FOR PRECISE LOCATION SETTING OUT INFORMATION AND DETAILS. EXTERNAL MANHOLE COVER LEVELS TO BE CONFIRMED BY LANDSCAPE ARCHITECT AND ARE SUBJECT TO THE RECEIPT OF A PROPOSED LEVELS STRATEGY.
6. ALL DRAINAGE BELOW SLAB AND ALL DRAINAGE OUTSIDE BUILDING TO BE STRUCTURED WALL PVC-u.
7. ALL DROP POINTS TAKEN BELOW UNDERSIDE OF SLAB WITHIN VOIDED AREA UNLESS OTHERWISE NOTED.
8. ALL DRAINAGE PIPEWORK SHALL BE LAID SOFFIT TO SOFFIT UNLESS OTHERWISE STATED. ALL STACK CONNECTIONS TO BELOW THE SLAB AND RAINWATER PIPES TO HAVE RODDABLE ACCESS ABOVE SLAB. ALL STACK CONNECTIONS TO BELOW THE SLAB AND RAINWATER PIPES TO HAVE RODDABLE ACCESS ABOVE GROUND.
9. ALL UNDERSLAB DRAINAGE SHALL BE CLEAR OF FOUNDATIONS UNLESS SHOWN OTHERWISE. USE OF SHORT/ LONG RADIUS BENDS IS ACCEPTABLE PROVIDED THEY ARE KEPT TO A MINIMUM AND USED WHERE UNAVOIDABLE.
10. CONTRACTOR TO PROVIDE ADEQUATE PROTECTION TO SHALLOW PIPES. PIPE PROTECTION DETAIL TO BE PROVIDED FOR PIPES WITH COVER LESS THAN 0.9m ABOVE THE CROWN OF THE PIPE FOR ROADS AND 0.6m FOR SOFT AND PEDESTRIAN AREAS AND UNDER ALL FOUNDATIONS AND WHERE PIPES LAID WITHIN 1m OF FOUNDATIONS.
11. CONCRETE ENCASEMENT OF THE PIPEWORK SHALL BE REQUIRED WHERE THE VERTICAL CLEARANCE BETWEEN TWO PIPES CROSSING IS LESS THAN 300mm.
12. ROCKER PIPES ARE TO BE PROVIDED AT ALL CONCRETE CASED INTERFACES.
13. ALL PROPRIETARY PRODUCTS / SYSTEMS TO BE VERIFIED BY THE MANUFACTURER AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATION / DETAILS.

LEGEND

- NON-DRAINED NATURAL LANDSCAPING FEATURE
- SuDS FEATURE (RAIN GARDEN / SWALE / TREE PIT)
- POROUS PARKING
  - PERFORATED PIPE WRAPPED WITH GEOTEXTILE MEMBRANE
  - 500mm CLEAN GRANULAR MATERIAL WITH 30% VOID RATIO
  - SUB-BASE TO BE LINED WITH VISQUEEN OR SIMILAR APPROVED
- POROUS PAVING
  - PERFORATED PIPE WRAPPED WITH GEOTEXTILE MEMBRANE
  - 250mm CLEAN GRANULAR MATERIAL WITH 30% VOID RATIO
  - SUB-BASE TO BE LINED WITH VISQUEEN OR SIMILAR APPROVED
- SURFACE WATER PROPOSED DRAINAGE
- FOUL WATER PROPOSED DRAINAGE
- UNITED UTILITIES COMBINED SEWER

No.	DATE	ISSUE
P01	29/06/26	FOR PLANNING

STATUS CODE: S2

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CLIENT: **Kirindolam 8 Limited**

PROJECT: **No.1 Castlefield**

SKETCH TITLE: **Drainage General Arrangement**

PROJECT No.: 250288

DATE: 29 JUN 2026

SCALE @ A1: 1:200

DRAWN BY: QK

DESIGNED BY: EW

DRAWING No.: 5001

REV: P01

CHECKED BY: EW

APPROVED BY: DEP

NC1-DCE-ZZ-XZZ-D-C-005001

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Do not scale from this drawing, figured dimensions only should be used. If in doubt ASK.

Appendix B – Hydraulic Calculations

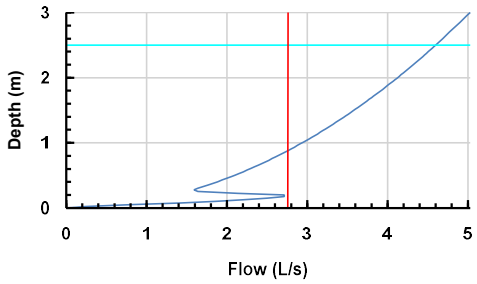
Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
SW6	Manhole	22.334	27.916	29.300	1.544	27.756	Circular	1.200
SW5	Manhole	67.819	28.278	29.350	1.225	28.125	Circular	1.200
SW7	Manhole	60.333	41.497	29.350	1.225	28.125	Circular	1.200
SW8	Manhole	15.148	39.498	29.300	1.707	27.593	Circular	1.350
SW2	Manhole	36.499	4.842	29.350	1.482	27.868	Circular	1.200
SW9	Manhole	7.927	51.471	29.300	1.749	27.551	Circular	1.350
SW16	Manhole	11.783	63.226	28.900	1.691	27.209	Circular	1.500
SW15	Manhole	-21.462	63.289	28.900	1.300	27.600	Circular	1.200
SW14	Manhole	-23.470	59.949	29.300	1.563	27.737	Circular	1.200
SW13	Manhole	-8.350	35.044	29.350	1.451	27.899	Circular	1.200
SW17	Manhole	53.092	63.247	29.300	2.174	27.126	Circular	1.500
SW3	Manhole	12.772	4.121	29.350	1.225	28.125	Circular	1.200
SW4	Manhole	30.067	15.336	29.350	1.549	27.801	Circular	1.200
SW10	Manhole	-0.244	5.174	29.350	1.225	28.125	Circular	1.200
SW11	Manhole	-15.954	30.203	29.350	1.403	27.947	Circular	1.200
SW12	Manhole	5.307	43.592	29.350	1.150	28.200	Circular	1.200
SW1	Manhole	67.205	5.729	29.350	1.200	28.150	Circular	1.200
OUTFALL	Manhole	73.356	66.277	28.795	2.790	26.005	Circular	1.200
Flow Control	Manhole	63.358	63.225	29.300	3.191	26.109	Circular	1.500
Manhole	Manhole	43.187	40.739	29.331	1.408	27.923	Circular	1.200

Name	Lock
SW6	None
SW5	None
SW7	None
SW8	None
SW2	None
SW9	None
SW16	None
SW15	None
SW14	None
SW13	None
SW17	None
SW3	None
SW4	None
SW10	None
SW11	None
SW12	None
SW1	All
OUTFALL	All
Flow Control	None
Manhole	None

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
SW6	Outlet	1.004	Free Discharge
SW5	Outlet	3.001	Free Discharge
SW7	Outlet	4.001	Free Discharge
SW8	Outlet	1.005	Free Discharge
SW2	Outlet	1.002	Free Discharge
SW9	Outlet	1.006	Free Discharge
SW16	Outlet	1.007	Free Discharge
SW15	Outlet	5.005	Orifice
	Diameter (m)	0.100	
	Coefficient of Discharge	0.600	
	Invert Level (m)	27.600	
SW14	Outlet	5.004	Free Discharge
SW13	Outlet	5.003	Free Discharge
SW17	Outlet	1.008	Free Discharge
SW3	Outlet	2.001	Free Discharge
SW4	Outlet	1.003	Free Discharge
SW10	Outlet	5.001	Free Discharge
SW11	Outlet	5.002	Free Discharge
SW12	Outlet	6.001	Free Discharge
SW1	Outlet	1.001	Free Discharge
Flow Control	Outlet	1.009	Hydro-Brake®
	Invert Level (m)	26.109	
	Design Depth (m)	2.500	
	Design Flow (L/s)	4.6	
	Objective	Minimise Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0078-4600-2500-4600	
			
Manhole	Outlet	4.001 (1)	Free Discharge

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Porous Paving 1

Type : Porous Paving

Dimensions

Exceedance Level (m)	29.300
Depth (m)	0.390
Base Level (m)	28.910
Paving Layer Depth (mm)	140
Membrane Percolation (m/hr)	396.0
Porosity (%)	30
Length (m)	36.046
Long. Slope (1:X)	100.00
Width (m)	5.943
Total Volume (m³)	16.222

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.125
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Footpath 2
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet (1)

Outgoing Connection	Pipe (5)
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	150.0

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Porous Paving 2

Type : Porous Paving

Dimensions

Exceedance Level (m)	29.350
Depth (m)	0.390
Base Level (m)	28.960
Paving Layer Depth (mm)	140
Membrane Percolation (m/hr)	396.0
Porosity (%)	30
Length (m)	55.220
Long. Slope (1:X)	100.00
Width (m)	6.294
Total Volume (m³)	26.220

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.125
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

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

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Footpath 6
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (7)
Outlet Type	Under Drain

Advanced

Conductivity (m/hr)	150.0

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Porous Parking 1

Type : Porous Paving

Dimensions

Exceedance Level (m)	29.300
Depth (m)	0.760
Base Level (m)	28.540
Paving Layer Depth (mm)	260
Membrane Percolation (m/hr)	396.0
Porosity (%)	30
Length (m)	40.840
Long. Slope (1:X)	100.00
Width (m)	4.930
Total Volume (m³)	30.661

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.225
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Main Car Park 2
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Main Car Park 2
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe
Outlet Type	Under Drain

Advanced

Conductivity (m/hr)	150.0



Porous Parking 3

Type : Porous Paving

Dimensions

Exceedance Level (m)	29.350
Depth (m)	0.760
Base Level (m)	28.590
Paving Layer Depth (mm)	260
Membrane Percolation (m/hr)	396.0
Porosity (%)	30
Length (m)	18.139
Long. Slope (1:X)	100.00
Width (m)	4.813
Total Volume (m³)	13.321

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.225
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Main Car Park 3
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (2)
Outlet Type	Under Drain

Advanced

Conductivity (m/hr)	150.0

Porous Parking 4

Type : Porous Paving

Dimensions

Exceedance Level (m)	29.300
Depth (m)	0.760
Base Level (m)	28.540
Paving Layer Depth (mm)	260
Membrane Percolation (m/hr)	396.0
Porosity (%)	30
Length (m)	15.621
Long. Slope (1:X)	100.00
Width (m)	4.709
Total Volume (m³)	11.228

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.225
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Small Car Park 1
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Small Car Park 2
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (3)
Outlet Type	Under Drain

Advanced

Conductivity (m/hr)	150.0

Porous Paving

Type : Porous Paving

Dimensions

Exceedance Level (m)	29.300
Depth (m)	0.390
Base Level (m)	28.910
Paving Layer Depth (mm)	140
Membrane Percolation (m/hr)	396.0
Porosity (%)	30
Length (m)	24.927
Long. Slope (1:X)	100.00
Width (m)	5.161
Total Volume (m³)	9.803

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.125
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

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

Outlets

Outlet

Outgoing Connection	Pipe (1)
Outlet Type	Under Drain

Advanced

Conductivity (m/hr)	150.0



Porous Paving (1)

Type : Porous Paving

Dimensions

Exceedance Level (m)	29.300
Depth (m)	0.390
Base Level (m)	28.910
Paving Layer Depth (mm)	140
Membrane Percolation (m/hr)	396.0
Porosity (%)	30
Length (m)	24.532
Long. Slope (1:X)	100.00
Width (m)	3.609
Total Volume (m³)	6.794

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.125
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Footpath 3
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (10)
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	150.0

Cellular Storage

Type : Cellular Storage

Dimensions

Exceedance Level (m)	28.810
Depth (m)	0.800
Base Level (m)	28.000
Number of Crates Long	1
Number of Crates Wide	1
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	9
Crate Width (m)	9
Crate Height (m)	0.8
Total Volume (m³)	61.570

Inlets

Inlet

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

Outlets

Outlet

Outgoing Connection	Pipe (8)
Outlet Type	Free Discharge

Cellular Storage (1)

Type : Cellular Storage

Dimensions

Exceedance Level (m)	29.010
Depth (m)	1.200
Base Level (m)	27.800
Number of Crates Long	1
Number of Crates Wide	1
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	10
Crate Width (m)	8
Crate Height (m)	1.2
Total Volume (m³)	91.210

Inlets

Outlets

Outlet

Outgoing Connection	Pipe (6)
Outlet Type	Free Discharge

Cellular Storage (3)

Type : Cellular Storage

Dimensions

Exceedance Level (m)	28.710
Depth (m)	0.800
Base Level (m)	27.900
Number of Crates Long	1
Number of Crates Wide	1
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	20
Crate Width (m)	5
Crate Height (m)	0.8
Total Volume (m³)	76.010

Inlets

Outlets

Outlet (1)

Outgoing Connection	Pipe (9)
Outlet Type	Free Discharge

Cellular Storage (2)

Type : Cellular Storage

Dimensions

Exceedance Level (m)	28.910
Depth (m)	1.200
Base Level (m)	27.700
Number of Crates Long	1
Number of Crates Wide	1
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	10
Crate Width (m)	5
Crate Height (m)	1.2
Total Volume (m³)	57.010

Inlets

Outlets

Outlet

Outgoing Connection	Pipe (4)
Outlet Type	Free Discharge

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	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)
1.002	12.308	Pipe	181.856		0.6	300	29.350	27.868
1.003	14.767	Pipe	327.738		0.6	300	29.350	27.801
1.004	13.630	Pipe	83.577		0.6	300	29.300	27.756
1.005	13.982	Pipe	332.938		0.6	375	29.300	27.593
1.006	12.371	Pipe	36.253		0.6	375	29.300	27.551
1.007	41.309	Pipe	494.005		0.6	525	28.900	27.209
6.001	16.112	Pipe	53.483		0.6	150	29.350	28.200
5.003	29.135	Pipe	180.161		0.6	225	29.350	27.899
5.004	3.897	Pipe	28.441		0.6	300	29.300	27.737
5.005	33.246	Pipe	85.106		0.6	300	28.900	27.600
5.001	29.550	Pipe	166.228		0.6	225	29.350	28.125
5.002	9.014	Pipe	185.916		0.6	225	29.350	27.947
2.001	20.613	Pipe	63.571		0.6	225	29.350	28.125
1.001	30.719	Pipe	109.097		0.6	300	29.350	28.150
3.001	45.487	Pipe	123.167		0.6	225	29.350	28.125
1.008	10.266	Pipe	494.861		0.6	525	29.300	27.126
1.009	10.454	Pipe	100.517		0.6	150	29.300	26.109
Pipe	6.151	Pipe	7.211		0.6	100	29.708	28.590
Pipe (2)	9.636	Pipe	21.901		0.6	100	29.531	28.640
Pipe (3)	3.287	Pipe	3.162		0.6	100	29.456	28.590
4.001	17.162	Pipe	84.953		0.6	225	29.350	28.125
4.001 (1)	28.066	Pipe	84.953		0.6	225	29.331	27.923
Pipe (7)	1.991	Pipe	1.831		0.6	100	29.902	29.010
Pipe (8)	13.587	Pipe	176.406		0.6	100	28.810	28.000
Pipe (6)	18.403	Pipe	415.318		0.6	100	29.010	27.800
Pipe (9)	17.613	Pipe	108.071		0.6	100	28.710	27.900
Pipe (4)	10.292	Pipe	68.891		0.6	100	28.910	27.700
Pipe (1)	4.205	Pipe	5.036		0.6	100	29.549	28.960
Pipe (10)	4.014	Pipe	3.853		0.6	100	29.545	28.910
Pipe (5)	10.856	Pipe	9.405		0.6	100	29.660	28.910

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address:		

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Part Family	Lock	Flow Restriction (L/s)	Culvert Type	Culvert Entrance
1.002	29.350	27.801		None		(None)	(None)
1.003	29.300	27.756		None		(None)	(None)
1.004	29.300	27.593		None		(None)	(None)
1.005	29.300	27.551		None		(None)	(None)
1.006	28.900	27.209		None		(None)	(None)
1.007	29.300	27.126		None		(None)	(None)
6.001	29.350	27.899		None		(None)	(None)
5.003	29.300	27.737		None		(None)	(None)
5.004	28.900	27.600		None		(None)	(None)
5.005	28.900	27.209		None	23.34	(None)	(None)
5.001	29.350	27.947		None		(None)	(None)
5.002	29.350	27.899		None		(None)	(None)
2.001	29.350	27.801		None		(None)	(None)
1.001	29.350	27.868		None		(None)	(None)
3.001	29.300	27.756		None		(None)	(None)
1.008	29.300	27.105		None		(None)	(None)
1.009	28.795	26.005		None	5.03	(None)	(None)
Pipe	29.300	27.737		None	0.00	(None)	(None)
Pipe (2)	29.350	28.200		None	0.00	(None)	(None)
Pipe (3)	29.300	27.551		None	0.00	(None)	(None)
4.001	29.331	27.923		None		(None)	(None)
4.001 (1)	29.300	27.593		None		(None)	(None)
Pipe (7)	29.331	27.923		None	0.00	(None)	(None)
Pipe (8)	29.331	27.923		None		(None)	(None)
Pipe (6)	29.300	27.756		None		(None)	(None)
Pipe (9)	29.300	27.737		None		(None)	(None)
Pipe (4)	29.300	27.551		None		(None)	(None)
Pipe (1)	29.350	28.125		None	0.00	(None)	(None)
Pipe (10)	29.350	27.868		None		(None)	(None)
Pipe (5)	29.300	27.756		None		(None)	(None)

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address:		

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

FEH

Type: FEH

Site Location	GB 384894 392658 SJ 84894 92658
Return Period (years)	100.0
Rainfall Version	2022

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Cover Depth (m)	1.000
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Backdrop (m)	0.500
Max. Backdrop (m)	1.500
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Pipe Size Library

Default

Add. Increment (mm)	75
Max. Diameter (mm)	0

Diameter (mm)	Min. Slope (1:X)	Max. Slope (1:X)
100	0.00	0.00
150	0.00	0.00

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address:		

Manhole Options

Apply Offset	☐

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Outfall Details Storm Phase: Phase	Company Address:		

Outfalls

Outfall	Outfall Type	Gated	Fixed Surcharged Level (m)	Level Curve
OUTFALL	Free Discharge			

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

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: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Outflow

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
SW6	FEH: 100 years: +45 %: 30 mins: Summer	29.300	27.756	28.943	1.188	53.0	1.343	0.000	39.2	50.740	Surcharged
SW5	FEH: 100 years: +45 %: 30 mins: Summer	29.350	28.125	29.025	0.900	21.5	1.017	0.000	22.0	18.319	Surcharged
SW7	FEH: 100 years: +45 %: 30 mins: Summer	29.350	28.125	28.949	0.824	19.9	0.931	0.000	20.3	17.147	Surcharged
SW8	FEH: 30 years: +0 %: 15 mins: Summer	29.300	27.593	28.213	0.621	59.7	0.888	0.000	57.1	21.442	Surcharged
SW2	FEH: 100 years: +45 %: 60 mins: Summer	29.350	27.868	28.962	1.093	19.7	1.237	0.000	19.7	22.468	Surcharged
SW9	FEH: 30 years: +0 %: 15 mins: Summer	29.300	27.551	28.210	0.659	57.1	0.943	0.000	56.3	21.088	Surcharged
SW16	FEH: 30 years: +0 %: 15 mins: Summer	28.900	27.209	28.209	0.999	68.8	1.766	0.000	29.3	11.524	Surcharged
SW15	FEH: 30 years: +0 %: 15 mins: Summer	28.900	27.600	28.265	0.665	14.1	0.752	0.000	12.8	7.329	Surcharged
SW14	FEH: 100 years: +45 %: 30 mins: Summer	29.300	27.737	28.904	1.167	26.4	1.320	0.000	13.9	30.362	Surcharged
SW13	FEH: 100 years: +45 %: 30 mins: Summer	29.350	27.899	28.983	1.084	26.3	1.226	0.000	26.4	21.924	Surcharged
SW17	FEH: 2 years: +0 %: 15 mins: Winter	29.300	27.126	27.717	0.591	30.9	1.044	0.000	21.1	8.838	Surcharged
SW3	FEH: 100 years: +45 %: 15 mins: Winter	29.350	28.125	28.904	0.779	7.4	0.881	0.000	3.3	1.293	Surcharged
SW4	FEH: 100 years: +45 %: 30 mins: Summer	29.350	27.801	28.958	1.158	41.2	1.309	0.000	31.0	29.265	Surcharged
SW10	FEH: 100 years: +45 %: 15 mins: Winter	29.350	28.125	28.914	0.789	16.5	0.892	0.000	11.9	7.564	Surcharged
SW11	FEH: 100 years: +45 %: 30 mins: Summer	29.350	27.947	28.990	1.042	11.8	1.179	0.000	11.9	9.227	Surcharged
SW12	FEH: 100 years: +45 %: 30 mins: Summer	29.350	28.200	29.004	0.804	8.0	0.909	0.000	7.7	7.727	Surcharged
SW1	FEH: 100 years: +45 %: 15 mins: Summer	29.350	28.150	28.899	0.749	23.5	0.847	0.000	22.9	10.615	Surcharged
OUTFALL	FEH: 100 years: +45 %: 30 mins: Winter	28.795	26.005	26.058	0.053	4.8	0.000	0.000	4.8	14.035	OK
Flow Control	FEH: 100 years: +45 %: 60 mins: Summer	29.300	26.109	28.914	2.805	12.5	4.957	0.000	4.8	28.990	Surcharged
Manhole	FEH: 30 years: +0 %: 15 mins: Summer	29.331	27.923	28.217	0.294	16.2	0.333	0.000	15.3	9.011	Surcharged

Project:	Date: 23/02/2026		
	Designed by: Ethan.Worrall	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

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 (m^3)	Max. Flooded Volume (m^3)	Total Lost Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Percentage Available (%)	Status
Porous Paving 1	FEH: 100 years: +45 %: 60 mins: Summer	29.400	28.981	0.129	0.071	8.7	6.844	0.000	0.000	5.2	6.601	57.809	OK
Porous Paving 2	FEH: 100 years: +45 %: 960 mins: Summer	29.735	29.378	0.222	0.418	2.0	20.837	1.979	0.000	1.0	22.220	20.530	Flood
Porous Parking 1	FEH: 100 years: +45 %: 30 mins: Summer	29.763	28.900	0.814	0.360	24.9	21.146	2.853	0.000	1.3	0.743	31.033	Flood
Porous Parking 3	FEH: 100 years: +45 %: 60 mins: Summer	29.099	28.936	0.328	0.346	7.7	7.803	0.000	0.000	1.0	2.334	41.422	OK
Porous Parking 4	FEH: 100 years: +45 %: 60 mins: Summer	29.127	28.942	0.431	0.402	8.8	8.824	0.000	0.000	2.2	4.629	21.415	OK
Cellular Storage	FEH: 100 years: +45 %: 1440 mins: Summer	28.551	28.551	0.551	0.551	4.2	42.402	0.000	0.000	0.9	49.233	31.132	OK
Cellular Storage (1)	FEH: 100 years: +45 %: 1440 mins: Summer	28.551	28.551	0.751	0.751	4.2	57.066	0.000	0.000	1.5	56.773	37.435	OK
Cellular Storage (3)	FEH: 100 years: +45 %: 1440 mins: Summer	28.556	28.556	0.656	0.656	4.8	62.341	0.000	0.000	1.3	62.162	17.983	OK
Cellular Storage (2)	FEH: 100 years: +45 %: 1440 mins: Summer	28.551	28.551	0.851	0.851	3.9	40.412	0.000	0.000	1.9	40.371	29.115	OK
Porous Paving	FEH: 100 years: +45 %: 960 mins: Summer	29.291	29.134	0.132	0.224	0.7	6.121	0.000	0.000	0.6	7.723	37.564	OK
Porous Paving (1)	FEH: 100 years: +45 %: 60 mins: Summer	29.255	28.967	0.099	0.057	3.1	2.344	0.000	0.000	3.0	3.018	65.503	OK

Appendix C – HR Wallingford Greenfield Estimation Tool

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

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

Project details

Date	25/06/2026
Calculated by	EW
Reference	Castelfield No1
Model version	2.2.3

Location

Site name	Castlefield
Site location	Manchester



Site easting (British National Grid)	382474
Site northing (British National Grid)	397125

Site details

Total site area (ha)	0.72 ha

Greenfield runoff

Method

Method	FEH statistical (2025)

FEH statistical (2025)

	My value		Map value
SAAR9120 (mm)	874 mm		
BFIHOST19scaled	0.552		
QMed-QBar conversion	1.075		1.075
QMed (l/s)	2.7 l/s		
QBar (FEH statistical 2025) (l/s)	2.9 l/s		

Growth curve factors

	My value		Map value
Hydrological region	10		10
1 year growth factor	0.87		
2 year growth factor	0.93		
10 year growth factor	1.38		
30 year growth factor	1.7		
100 year growth factor	2.08		
200 year growth factor	2.37		

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	2.5 l/s
Flow rate 2 year (l/s)	2.7 l/s
Flow rate 10 years (l/s)	3.9 l/s
Flow rate 30 years (l/s)	4.8 l/s
Flow rate 100 years (l/s)	5.9 l/s
Flow rate 200 years (l/s)	6.8 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix D – Flood Map For Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
Unspecified	**382478/397128**	**29 June 2026 10:35**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- in an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2026 AC0000807064. https://flood-map-for-planning.service.gov.uk/os-terms



Environment Agency

Flood map for planning

Your reference
Unspecified

Location (easting/northing)
382478/397128

Scale
1:2,500

Created
29 Jun 2026 10:35

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60 m

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Appendix E – United Utilities Sewer Map

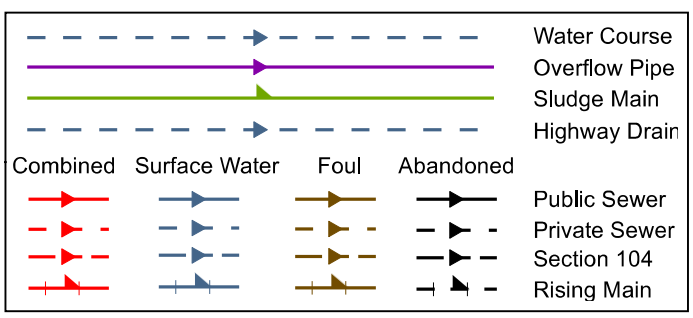
Printed By: Property Searches

Date: 23/05/2016

Extract From Map of Public Sewers

Ellesmere House Ellesmere Street/Trentham Street Castlefield Manchester

Legend



The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown

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Appendix F – Communications

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

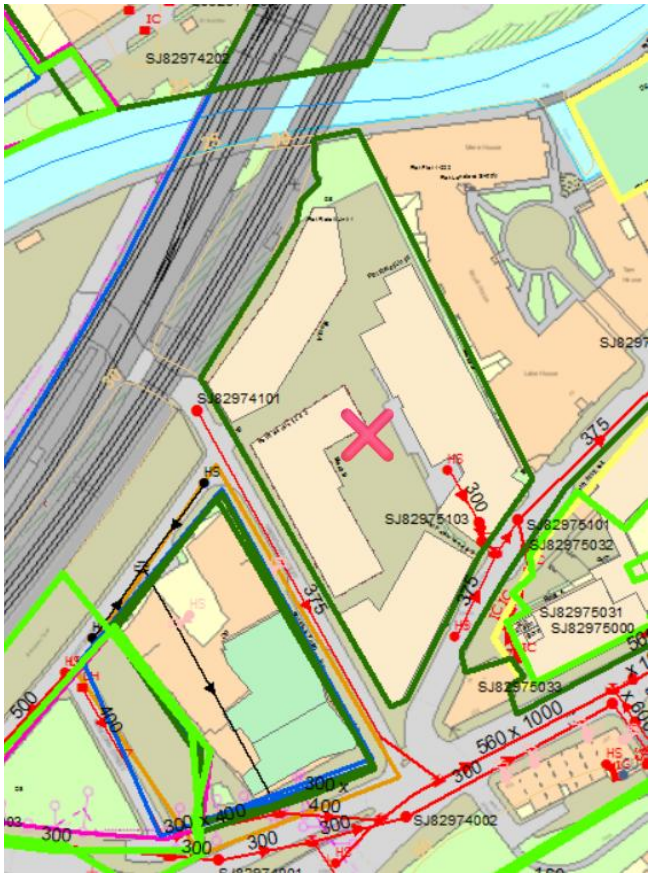
Public Sewer

United Utilities will consider a connection to the 2210mm diameter public surface water sewer within Hulme Hall Road located East 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 **10l**/s.

Manhole reference SJ82976104, **Grid reference** 382646, 397124.

Please see images at the end of this letter for clarification

Site Images



WASTEWATER PRE-DEVELOPMENT ENQUIRY

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

27.04.26

Dear **Ethan Worrall – DeSimone Consultant Engineers,**

Pre-Development Enquiry for **Ellesmere Street, Manchester, M15 4YG.**

UU Reference Number: **09228256.**

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

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

According to our public sewer records, there are public sewers located within your site boundary. This requires an easement of **6m.** If you cannot achieve the required clearance, you may wish to consider diverting and or abandoning the public sewer.

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

Foul Water

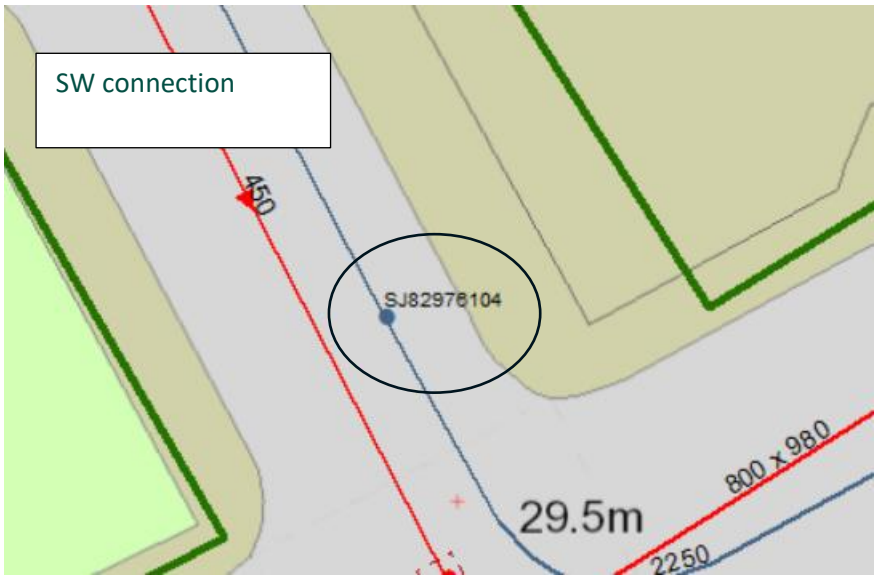
Foul flow from this site will be allowed to drain into the public combined sewer system.

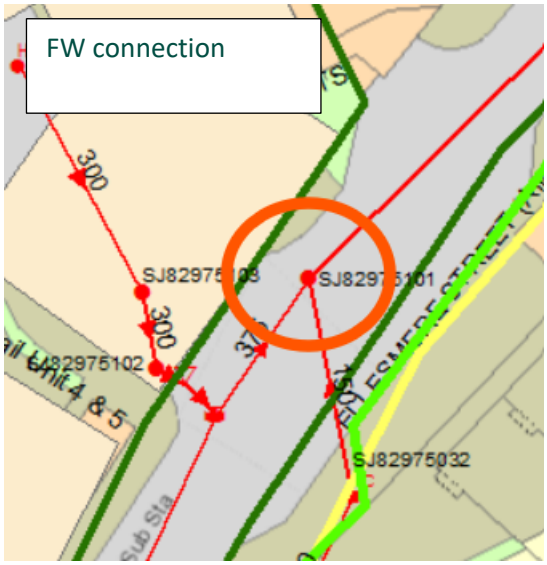
Our preferred point of discharge would be to the 375mm diameter public combined sewer within Ellesmere Street located South of your proposed development at an unrestricted rate.

Manhole reference SJ82975101, **Grid reference** 382519, 397107.

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

WASTEWATER PRE-DEVELOPMENT ENQUIRY





Ethan Worrall

From: Ethan Worrall
Sent: 23 June 2026 14:01
To: 'seweradoptions@uuplc.co.uk'
Cc: Qaasim Khan
Subject: RE: FW: {EXT} REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Hello Mike,

Apologies for the delayed response. I have been discussing internally with our consultants whether a pumped surface water connection was feasible. Although considered at length, we feel this should be discounted due to the fact that a gravity solution has been proven possible to the adjacent combined system.

The inclusion of a pumped solution would add unnecessary complexity both from an operational standpoint, ongoing maintenance and long term reliability. Additionally, it would be a less sustainable solution when compared to a gravity fed system that requires no mechanical parts. We are aware that the stub connection currently running under the site would have fed the previous development and that proposed discharge rate is significantly less than what would have been pumped to the network historically.

Likewise, routing a pumped connection along Ellesmere Street would most probably entail other constraints such as interference with existing utilities/services, along with general delivery issues. For these reasons we feel that gravity discharge would provide a more robust, practical and sustainable solution. That being said we will accommodate UU decision on the final agreed discharge point but thought it important to explain the reasoning behind our proposed method.

Many thanks,

DeSimone

Ethan Worrall
Project Manager

ethan.worrall@desimone.com
desimone.com

O. +44 (0)1422 750070
D. +44 (0)161 520 2357

Suite 3, Unit 8, Pennine Industrial Park, Valley Road
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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: 03 June 2026 08:46
To: Ethan Worrall <ethan.worrall@desimone.com>

Cc: Qaasim Khan <qaasim.khan@desimone.com>
Subject: RE: FW: {EXT} REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Morning Ethan,

Following the hierarchy we need to ensure all options have been exhausted before sending the SW to the combined; has pumping to the SW been investigated?

Information below for MH:
MH5101 CL 29.31m / Chamber depth 3.53m.

Regards,

United Utilities
Water for the North West

Mike Rimmer
Developer Engineer
Developer Services & Metering
M: 07341 686020
unitedutilities.com

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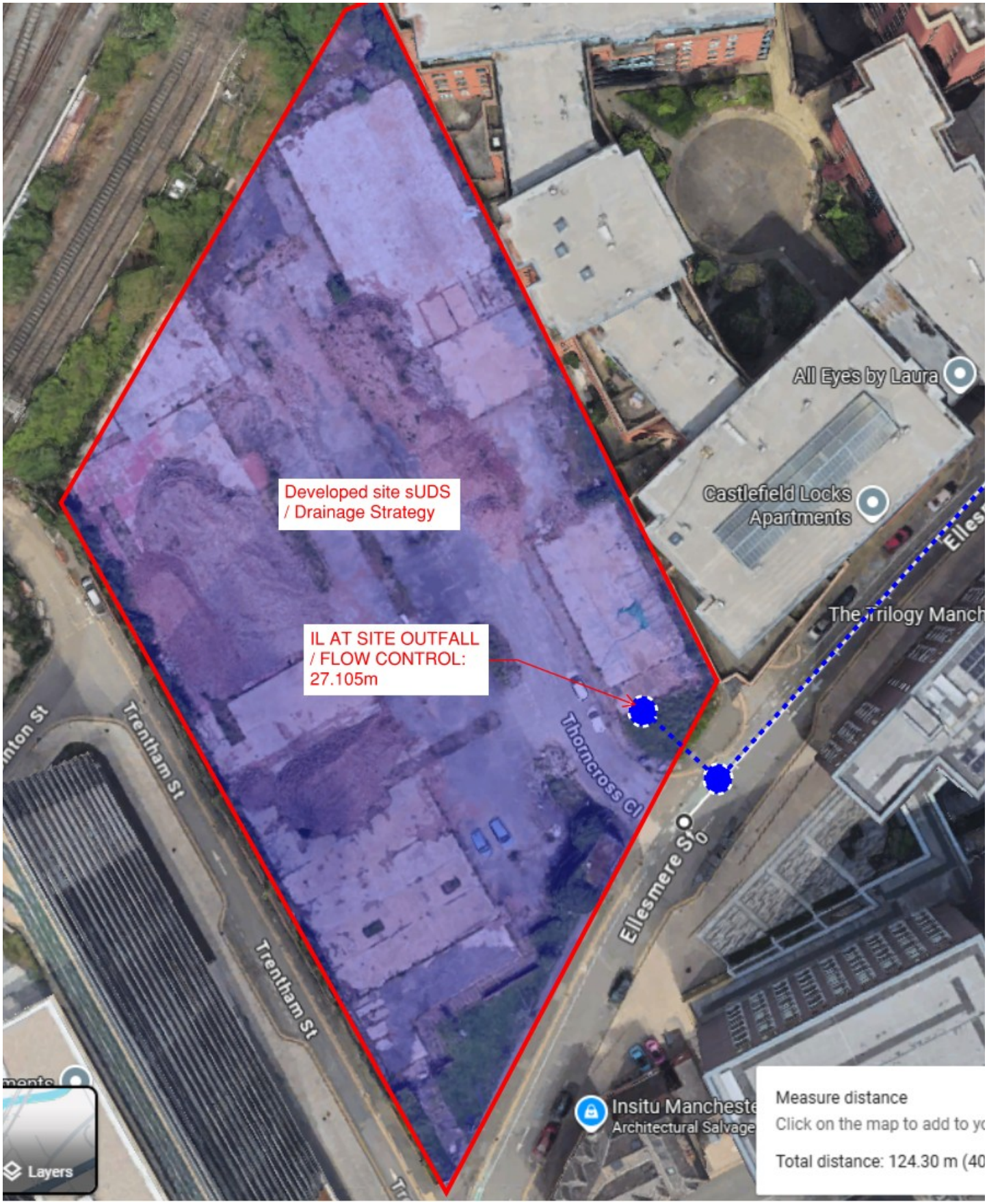
---------- Original Message ----------
From: Ethan Worrall [ethan.worrall@desimone.com]
Sent: 02/06/2026 10:47
To: seweradoptions@uuplc.co.uk
Cc: qaasim.khan@desimone.com
Subject: RE: FW: {EXT} REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Morning Mike,

Thanks for the additional information. We've reviewed the feasibility of a connection to the 2210m dia pipe at the jct of Ellesmere St / Hulme Hall Road.

The proposed connection to chamber (SJ82976104) is around 120m away. Our internal drainage / SuDS strategy requires an outfall invert level at the flow control / site outfall of circa 27.105m as can be seen from the mark up below. As you can see a soffit connection to the 2210m pipe at manhole SJ82976104 would be 27.840m which is significantly higher than our intended site outfall invert of 27.105m. We believe that this, coupled with the likelihood of encountering many buried services along that stretch of highway would make the connection as this location unfeasible.

What we would like to pursue, is a connection to the 375 dia combined sewer which runs directly in front of the proposed development near or on chamber SJ82975101. We've assumed the connection to the combined asset at this location would be circa 26.410m (UU to confirm) and would be a much easier connection to achieve. Can you please review and let me know your thoughts?


Developed site sUDS / Drainage Strategy
IL AT SITE OUTFALL / FLOW CONTROL: 27.105m
All Eyes by Laura
Castlefield Locks Apartments
Trentham St
Trentham St
Thorncross Cl
Ellesmere St
Insitu Manchester
Architectural Salvage
Layers
Measure distance
Total distance: 124.30 m

Kind Regards,

DeSimone

Ethan Worrall
Project Manager

ethan.worrall@desimone.com
desimone.com

O. +44 (0)1422 750070
D. +44 (0)161 520 2357

Suite 3, Unit 8, Pennine Industrial Park, Valley Road
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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: 27 May 2026 09:39
To: Ethan Worrall <ethan.worrall@desimone.com>
Subject: RE: FW: {EXT} REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Morning Ethan,

Please see below the details you require:

1. MH CL 29.31m
2. Chamber depth 3.53m

If you require any more information please let me know.

Regards,

Mike Rimmer
Developer Engineer
Developer Services & Metering
M: 07341 686020
unitedutilities.com

Water for the North West

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---------- Original Message ----------
From: Ethan Worrall [ethan.worrall@desimone.com]
Sent: 14/05/2026 11:29
To: seweradoptions@uuplc.co.uk
Subject: FW: {EXT} REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Morning Mike,

In relation to the attached predevelopment information, can you please provide your sewer plans with manhole cover / depth information for manhole ref: SJ82976104 so we can assess the suitability of a connection at this location.

Thanks,

DeSimone

Ethan Worrall
Project Manager

ethan.worrall@desimone.com
desimone.com

O. +44 (0)1422 750070
D. +44 (0)161 520 2357

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Hebden Bridge, WYORKS HX7 7BZ, UK

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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: 27 April 2026 11:17
To: Ethan Worrall <ethan.worrall@desimone.com>
Subject: {EXT} REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Good morning Ethan,

Please see attached Pre-Development advice for Ellesmere Street, Manchester.

Regards,

United Utilities
Water for the North West

Mike Rimmer
Developer Engineer
Developer Services & Metering
M: 07341 686020
unitedutilities.com

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---------- Original Message ----------
From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]
Sent: 16/04/2026 13:20
To: ethan.worrall@desimone.com
Subject: RE: {EXT} REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Hi Ethan

Thank you for providing the location plan.

Kind Regards,

Laura Owens
Customer Advisor Advanced
Developer Services & Metering
Customer Services
T: 0345 026 8989
unitedutilities.com

If you feel you have received a good service from myself, please can you take two minutes to fill in the survey below. This will be much appreciated

Visit: *https://unitedutilities.thewowawards.co.uk/nominate*

---------- Original Message ----------
From: Ethan Worrall [ethan.worrall@desimone.com]
Sent: 15/04/2026 16:12
To: seweradoptions@uuplc.co.uk
Subject: RE: {EXT} REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Hi Jayne,

See updated location plan.

Thanks,

Ethan Worrall
Project Manager

ethan.worrall@desimone.com
desimone.com

O. +44 (0)1422 750070
D. +44 (0)161 520 2357

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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: 15 April 2026 11:30
To: Ethan Worrall <ethan.worrall@desimone.com>
Subject: {EXT} REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Good Morning

PROPOSED Pre development AT Ellesmere St, Manchester - UU Ref – 09228256

Thank you for your **card** payment for £575.74 received 15/04/26.
Before we can proceed with your application we are still awaiting the following:

Location plan showing 2 street names

Please forward as soon as possible

Kind regards

United Utilities
Water for the North West

Jayne Guest
Customer Advisor Advanced
Developer Services & Metering
Customer Services
T: 0345 026 8989
unitedutilities.com

If you feel you have received a good service from myself, please can you take two minutes to fill in the survey below. This will be much appreciated



Visit: *https://unitedutilities.thewowawards.co.uk/nominate*

---------- Original Message ----------
From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]
Sent: 02/04/2026 09:53
To: ethan.worrall@desimone.com
Subject: REF - 09228256 - Wastewater Pre-Development - Ellesmere St, Manchester

Good Morning

PRE DEVELOPMENT APPLICATION AT: Ellesmere St, Manchester – UU Ref 09228256

Thank you for your application submitted on 01.04.26 for the above development. We have now logged this on our system under reference 09228256. Please use this reference in any future correspondence.

I have reviewed your application and attachments and can confirm we have not received the following documents :

Location plan showing 2 street names

Before we can proceed with passing this to our Engineering Team, we kindly ask that you submit a payment of £575.73. This can be made via BACS to the account below, using reference 09228256.

NatWest Sort Code:	01-09-17
NatWest Account Number:	58934014
Account Name:	UUW Sundry Debtors Receipts

Alternatively, please call us on 0345 026 8989 to make payment over the phone.

Please note that until payment is received your application will not be progressed.

If you have any questions, feel free to reach out.

Kind regards

Jayne Guest
Customer Advisor Advanced
Developer Services & Metering
Customer Services
T: 0345 026 8989 option 4
unitedutilities.com

If you feel you have received a good service from myself, please can you take two minutes to fill in the survey below. This will be much appreciated

Visit: *https://unitedutilities.thewowawards.co.uk/nominate*

---------- Original Message ----------
From: [donotreply@uu-web.co.uk]
Sent: 01/04/2026 10:11
To: seweradoptions@uuplc.co.uk; webmaster@uuplc.co.uk
Subject: Wastewater Pre-Development Enquiry Submission

Question	Answer
Section 1 - Your Details	
Developer/Consultant/Land owner/Other	Consultant
Name	Ethan Worrall
Company Name	DeSimone Consultant Engineers
Address	Suite 3, Unit 8 Pennine Industrial Park, Valley Road
Contact Number	01422750070
Email Address	ethan.worrall@desimone.com
Section 2 - Development Details	
Do you intend to offer any of the sewers for adoption by United Utilities under S104?	No
Site Address	Ellesmere St M15 4YG
Site Postcode	#Development postcode#
Site Name	Castlefield No1
Grid Reference Number	SJ 82479 97131

Question	Answer
Development Type	Residential
Approx. Number Units	400
Total Site Area (hectares)	0.72
Does this site have planning permission?	No
Planning Reference Number	
Council Area	Manchester City Council
Have you approached us about this site previously?	No
If yes, please provide reference number	
Is the development part of a larger site that will be developed in phases?	No
Location Plan	Castlefield No1 Location Plan.pdf

Section 3: Previous Land Use

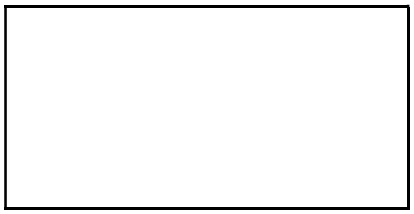
Please confirm what the land was previously used for:	Brownfield
Brownfield evidence of positive drainage to the public sewer	

Section 4 - Drainage Strategy

Foul connection: How are you proposing to drain foul flows from the site?	Via a new connection to the public sewer
Via an existing connection to the public sewer?	No
Surface water connection: How are you proposing to drain your site, following the surface water hierarchy, as outlined in National Planning Policy Guidance?	Combined sewer
SuDS: Have SuDS features been considered in the surface water drainage strategy?	Yes

Additional Supporting Information

There is an existing UU asset within site. However this will need to be abandoned. Infiltration unfeasible due to site constraints and historic site usage. Discharge to nearby canal not possible due to level change adjacent to site. No surface water sewer nearby. Can we discharge at 50% brownfield betterment on site?

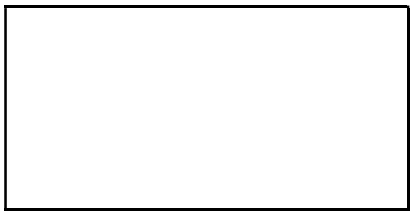


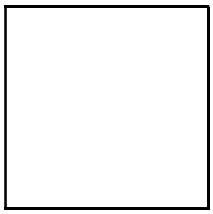
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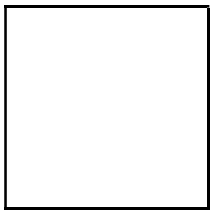
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Case Ref:	CAS/M15/A/PRE
Site Name:	Castlefield No1
LLFA Advice Suitability Stage:	☐ **RIBA 0 – 2** (Strategic appraisals, feasibility, and concept design). ☒ **RIBA 3 – 7** (to prepare a Planning application and to discharge Planning Conditions for pre-commencement through to handover & occupation).

LLFA Comments 02/06/2026

Site checked in Asset Register	Yes
Data Screen Recommended	No
FRA Required	Yes: The site is in a critical drainage area and at risk of flooding from surface water. FFLs must be appropriately raised above the estimated flood level.

Standard Condition Clauses (Pre-commencement and Pre-occupation)	**Notes made to appraise proposals against the Clauses**
Progression through the drainage hierarchy must be evidence based and supported by site investigation including assessments of ground conditions and infiltration testing in accordance with BRE365. Proposals of attenuation should achieve half drain time within 24 hours.	Results of infiltration tests must be provided. Please provide evidence to discount discharging to the canal adjacent to the site.
Where surface water is connected to the public sewer, agreement in principle from United Utilities is required that there is adequate spare capacity in the existing system taking future development requirements into account. An email of acceptance of proposed flows and/or new connection will suffice.	

Maximised integration of green SuDS components (utilising infiltration or attenuation) if practicable.	
Details of surface water attenuation to align with the Manchester, Trafford and Salford Strategic Flood Risk Assessment. For brownfield sites a minimum of 50% betterment is required for reduction in runoff rate compared to the existing rates with the aim of reducing to the Greenfield runoff rates.	50% betterment required with the aim of reducing to as close to the greenfield rate as possible.
A finalised drainage layout showing all components, outfalls, levels and connectivity.	
An existing and proposed impermeable areas drawing to accompany all discharge rate calculations.	
Hydraulic calculations of the proposed drainage system, including all design parameters. Calculations must Include Critical Storm Events for the 1 in 2, 1 in 30 and 1 in 100 + 45% Climate Change. Results must demonstrate no surcharge for the 1 in 2, no flooding in the 1 in 30 and no flooding of buildings for the 1 in 100 + 45% Climate Change.	
An assessment of surface water pollution risk in-line with CIRIA C753 and, where required, evidence of pollution control measures (preferably through SuDS) to treat surface water prior to discharge.	
A plan indicating surface water overland flow routes for extreme events to ensure flows are diverted away from existing and proposed buildings (including basements).	
Construction details of flow control and SuDS elements.	
A plan indicating easements. SuDS features (including attenuation tanks) should be appropriately positioned, including a 2.5m easement from the existing highway and a 5m easement from any dwellings, guaranteeing accessibility for future maintenance and contingency for asset failure. This practice is in accordance with SuDS Manual (C753).	

Important Information
• **Our review and advice are proportional to the development stage of the proposal. Details of LLFA Advice Suitability Stage are in the top table of page 1.**
• **Where LLFA Advice Suitability Stage is RIBA 3 – 7, formal Planning submissions must contain information at approvable standard for all above clauses to avoid or discharge a Condition.**
• **Some matters cannot be Conditioned because they affect proposal viability. The LLFA may recommend an Objection if applications do not contain viability information to support the Planning Application. This includes but is not limited to inconsideration of drainage assets near development, inconsideration of flood risk assessment, inconsideration of securing at least one viable option to drain the site.**
• **This review has been made based on information presented**