

Flood Risk Assessment and Drainage Strategy

**Unit A Finlan Road, Stakehill Industrial
Estate, Middleton, M24 2SJ**

Report Details

Client	Savills
Report Title	Flood Risk Assessment and Drainage Strategy
Site Address	Unit A Finlan Road, Stakehill Industrial Estate, Middleton, M24 2SJ
Project No.	120999
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Quality Assurance

Issue No.	Status	Issue Date	Comments	Authors	Technical Review	Authorised
2	Final	28 th April 2023	Updated Site Plan	Isaac McKenna Graduate Lucy Antell Consultant	Rachel Shepherd Principal	Rachel Shepherd Principal
3	Final	March 2025	Updates to local planning policy	Ollie Eglington Consultant	Luke Bland Principal	Luke Bland Principal

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Reference of Terms

Canal Failure

Canal failure can include a breach or overtopping of a canal system due to the effects of a high intensity rainfall event or structural failure that is not associated with a rainfall event. Such failure can be very dangerous as it can involve the rapid release of large volumes of water at high velocity, however, it is typically limited to reaches of canal that are raised above the surrounding ground level on one or both side and where watercourses or other structures pass beneath the canal. The size and nature of canals themselves can also have a hydraulic control on the mechanisms of flooding associated with a failure, resulting in a rapid peak in flow followed by a gradual reduction as the flow becomes restricted by the capacity of the canal itself to rapidly pass flow to the breach or failure point.

Fluvial Flooding

Fluvial flooding typically occurs when a river's capacity is exceeded, and the excess water overtops the river banks. It can also occur when the watercourse has a high level downstream, perhaps due to structures or blockage, thus limiting conveyance. This creates a back-up of water which can overtop the banks. Typical flooding issues occur when the natural floodplain has been urbanised and the river has been confined.

Groundwater Flooding

Groundwater flooding is caused by the emergence of water from beneath the ground at either point or diffuse locations when the natural level of the water table rises above ground level. This can result in deep and long-lasting flooding of low-lying or below-ground infrastructure such as underpasses and basements. Groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.

Reservoirs Failure

Reservoir failure can be a particularly dangerous form of flooding as it results in the sudden release of large volumes of water that can travel at high velocity. This can result in deep and widespread flooding, potentially resulting in significant damage. The likelihood of reservoir flooding occurring is generally extremely low given that all large reservoirs are managed in accordance with the Reservoirs Act 1975. Under the Reservoirs Act 1975, a large raised reservoir is defined as one that holds over 10,000 cubic metres of water above the

level of the surrounding land. The EA's online reservoir inundation map illustrates the maximum flood extents that could potentially occur in the event of a reservoir failure.

Sewer Flooding

Flooding from sewers primarily occurs when flow entering a system exceeds available capacity or if the network capacity has been reduced through blockage or collapse. In the case of surface water sewers that discharge to watercourses, the same effect can be caused as a result of high water levels in the receiving watercourse. As a result, water can begin to surcharge the sewer network, emerging at ground level through gullies and manholes and potentially causing flooding to highways and properties. If this occurs flooding can represent a significant hazard to human health due to the potential for contaminants in flood water.

Surface Water Runoff

Surface water runoff is defined as water flowing over the ground that has not yet entered a drainage channel or similar. It usually occurs as a result of an intense period of rainfall which exceeds the infiltration capacity of the ground. Typically, runoff occurs on sloping land or where the ground surface is relatively impermeable. The ground can be impermeable either naturally due to the soil type or geology, or due to development which places impervious material over the ground surface (e.g. paving and roads).

Tidal Flooding

Tidal flooding is caused by high tides coinciding with a low-pressure storm system which raises sea and tidal water levels, overwhelming coastal and river defences. This may be made worse by gale force winds blowing the raised body of water up tidal river basins some distance from the coast, due to floodwater being forced up the tidal reaches of rivers and estuaries. Such flooding may become more frequent in future years due to rising sea levels.

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1.0 Introduction

1.1 Appointment

- 1.1.1 Lucion Delta Simons Limited ("Lucion") was instructed by UBS Triton Property Fund (the "Client") to carry out a Flood Risk Assessment (FRA) and Drainage Strategy (DS) at Unit A Finlan Road, Stakehill Industrial Estate, Middleton, M24 2SJ (the "Site"). The proposed development is for the demolition of existing single storey extension and service yard canopy, erection of extension and alterations to existing building, change of use to allow a flexible use within Classes B2, B8 and/or E(g)(iii) and a series of physical works to reconfigure the site including an extension to the service yard, new hard and soft landscaping and associated infrastructure.
- 1.1.2 The assessment considers potential flood risks from all sources and provides options for managing any Site-specific flood risks identified, assuming the continued current commercial use of the Site.

1.2 Project Understanding

- 1.2.1 On the Environment Agency (EA) Flood Map for Planning, the Site is shown to be located wholly within Flood Zone 1. However, the Site is bound by a watercourse to the south and is shown on the EA's long term flood map to be partially at risk from surface water flooding. The Site is also in excess of 1 hectare and therefore the application requires a Flood Risk Assessment and Drainage Strategy.
- 1.2.2 The aim of this report is to assess the potential flood risk to the Site, the impact of the proposed development on flood risk elsewhere, and the proposed measures which could be incorporated to mitigate the identified risk. This report has been prepared in accordance with the guidance contained in the National Planning Policy Framework (NPPF) revised in 2024, and the National Planning Practice Guidance (NPPG) Flood Risk and Coastal Change.
- 1.2.3 Rochdale Metropolitan Borough Council as Lead Local Flood Authority (LLFA) is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of the Sustainable Drainage Strategy is to identify water management measures, including Sustainable Drainage Systems (SuDS), to provide surface water runoff reduction and treatment.

1.3 Scope of Works

- 1.3.1 The scope of works has been as follows for this FRA:
- Assess flood risk from all sources using best available information including review of EA data and mapping, topography and historical records;
 - Assess previous relevant studies, local authority plans or strategies;
 - Advise on flood mitigation measures and residual risks;
 - Assess evacuation routes;
 - Advise on availability of flood warnings;
 - Identify the requirement for a Sequential Test; and
 - Prepare FRA Report.
- 1.3.2 The DS has included the following:
- Review existing conditions including sewer plans, British Geological Survey information and topographical information;
 - Review Lead Local Flood Authority (LLFA) drainage policies;

- Submit developer enquiry to Sewage Provider;
- Analyses existing and proposed impermeable areas;
- Calculate existing runoff rates (excluding existing drainage system modelling);
- Assess method of surface water runoff disposal (soakaway/watercourse/sewer);
- Establish surface water discharge rate in consultation with the LLFA/sewerage provider;
- Estimate required attenuation volume using Micro Drainage or similar;
- Assess and advise on suitable forms of SuDS;
- Advise on drainage system maintenance measures;
- Advise on surface water treatment methods;
- Establish method of foul water drainage;
- Prepare concept drainage sketch; and
- Prepare DS section.

1.3.3 This report takes into account the following national and local policies:

- National Planning Policy Framework (NPPF) (2024)¹;
- National Planning Practice Guidance (NPPG) (2014)²;
- CIRIA Guidance: The SuDS Manual (C753) (2017)³;
- Greater Manchester Combined Authority Development and Planning Policies; and
- Rochdale Metropolitan Borough Council Local Development and Planning Policies.

1.4 Sources of Information

1.4.1 The following sources of information have been reviewed and assessed for the purpose of this FRA:

- EA online flood maps⁴;
- British Geological Society (BGS) Interactive Map⁵;
- MAGIC Interactive Map⁶;
- Bury, Rochdale and Oldham Strategic Flood Risk Assessment Volume 1 (2009 SFRA);
- Bury, Rochdale and Oldham Strategic Flood Risk Assessment Volume 2 Level 1 (2009 Level 1 SFRA);
- Bury, Rochdale and Oldham Strategic Flood Risk Assessment Volume 3 Level 2 (2009 Level 2 SFRA);
- Rochdale Metropolitan Borough Council Preliminary Flood Risk Assessment (2011 PFRA); and
- Rochdale Borough's Strategy for Flood Risk Management 2014 - 2024 (2014 LFRMS).

1 <https://www.gov.uk/government/publications/national-planning-policy-framework-->

2 <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

3 https://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

4 <https://flood-map-for-planning.service.gov.uk/>

5 <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

6 <http://www.magic.gov.uk/>

1.5 Project Limitations

1.5.1 The wider Lucion limitations are contained within Appendix A.\

2.0 Site Description

2.1.1 The aim of this section of the report is to outline key environmental information associated with the baseline environment.

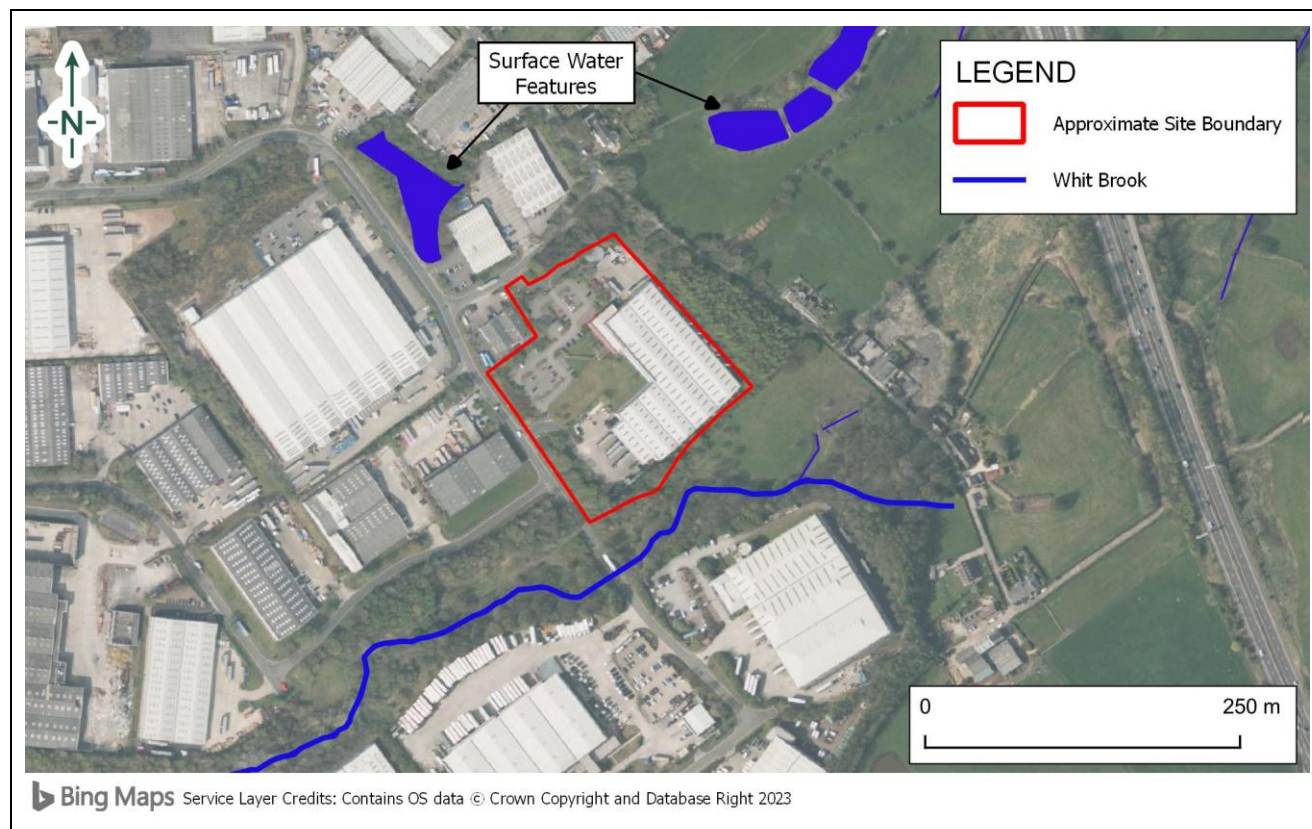


Figure 1: Site Location Plan

Co-ordinates	Centred approximately at National Grid Reference (NGR) 389230, 408020.	Area (approx.)	2.7 ha
Site Location	The Site is located to the north-east of Middleton and the north-west of Oldham, approximately 2 km north of Mills Hills Train Station and approximately 500 m south of Junction 2 of the A627 (M) motorway.		
Existing Site Conditions	The Site currently comprises of a singular 'L' shaped warehouse unit in the south and east, with external parking in the north and northwest and service yards located in the west and northeast. The Site is located within a predominately industrial setting. Areas of soft landscaping are present along the Site boundaries and within the Site. Access and egress to the Site is provided via Finlan Road to the north and west. Hardstanding areas on Site currently occupy 17,823.1 m² or 66.1% of the total Site area. The remaining permeable, soft landscaped areas occupy 9,146.9m² or 33.9% of the total Site area. Values have been calculated using a Topographic Survey of the Site, undertaken by O'Brien & Noël Architects in April 2023. The Topographic Survey is included in Appendix B.		
Topography	The topographical survey undertaken by Castle Keep Surveys, Appendix B, shows that the Site slopes from 139 metres Above Ordnance Datum (m AOD) on the south-eastern boundary to approximately 136.1 m AOD in the south-eastern corner adjacent		

	to the building to 130 m AOD in the west. The majority of the developed extent of the Site is located between approximately 134 and 136 m AOD. Topographic levels to metres AOD have also been derived from a 1 m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM), included in Appendix C. This broadly reflects the topographic survey.
Hydrology	The nearest watercourse is the Whit Brook, a Main River (under the jurisdiction of the EA) which is located approximately 10 m south of the Site at its closest point. The Brook flows in a westerly direction and is culverted beneath the adjacent Finlan Road. Other water features in the area include a series of large ponds located approximately 120 m north-east of the Site, another large pond approximately 130 m north-west of the Site and the Rochdale Canal approximately 670 m west of the Site at its closest point (under the jurisdiction of the Canal & River Trust).
Geology	Reference to the British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the Site is underlain by superficial deposits of Devensian Till described as comprising of diamicton. The superficial deposits are identified as being underlain by Pennine Lower Coal Measures Formation described as comprising of mudstone, siltstone and sandstone. The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a Site-specific basis. A Site ground investigation was undertaken by Delta-Simons from 12th to 13th December 2022, and on 15th February 2023 (Delta-Simons project number: 90720.554769) which detailed the observed ground conditions: • Topsoil- Grass over dark greyish brown slightly sandy clay (0.12-0.15 m bgl); • Made Ground- tarmac (0.08-0.09 m bgl); • Made ground- grey sandy gravelly cobbles of sandstone, limestone, concrete and brick (0.6-1.05 m bgl); • Devensian Till- Very soft greyish brown slightly sandy slightly gravelly clay with low cobble content of sandstone and limestone (0.42-1.8 m bgl); • Devensian Till- Loose to medium dense light brown slightly gravelly clayey fine to coarse sand (1.08- 7.2 m bgl); and • Devensian Till- Firm to stiff brown slightly sandy clay with frequent 2 – 10 cm bands of orangish brown silt to medium sand (2.2 – unproven m bgl).
Hydrogeology	According to the EA's Aquifer Designation data, obtained from MAGIC Map's online mapping [accessed 21/12/2022], the superficial Devensian Till deposits and the underlying Pennine Lower Coal Measures Formation are classified as Secondary A Aquifers. Secondary A Aquifers are 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'. The EA's 'Source Protection Zones' data, obtained from MAGIC Map's online mapping [accessed 21/12/2022], indicates that the Site is not located within a Groundwater Source Protection Zone. The Delta-Simons ground investigation found that water was struck on two occasions; Exploratory Holes CP101 and DS101 where water was struck at 3.2 m bgl and 2.7 m bgl respectively.

	Shallow groundwater is expected to generally flow to the south-west following local topography towards Whit Brook, but this may be influenced by the nature and variable permeability of the Devensian Till.
Local Drainage	Private Sewer records have been obtained within the Utility Survey undertaken by Castle Keep Surveys in February 2022, included in Appendix B. The private sewers show the following: • There are two 150 mm surface water sewers which run northwards in the north-east of the Site, joining a 150 surface water sewer along the northern extent of Finlan Road. The sewer along Finlan Road then runs in a north-westerly direction off-Site; • There are also several 150 mm and 225 mm surface water sewers in the western extents of the Site which flow towards a 450 mm surface water sewer along the western extent of Finlan Road; and • There is also a 150 mm private foul water sewer which originates at the north of the existing building and flows in a south-westerly direction, connecting to the public foul water along Finlan Road (detailed below). Public sewer records have been obtained from United Utilities and are included in Appendix D. The United Utilities sewer records show the following: • A 300 mm public surface water sewer is located approximately 15 m north of the Site along Finlan Road, which flows in a westerly direction. This appears to potentially connect into a foul sewer; • A 450 mm public surface water sewer located along Finlan Road approximately 20 m west of the Site. The sewer runs in a south-easterly direction where it joins a second surface water sewer (which flows in a northerly direction along Finlan Road) to form a 450 mm surface water sewer which then runs in a westerly direction along Boswell Way; • A 300 mm public combined sewer is located approximately 25 m east of the Site which runs in a southeast to northwest direction; and • A 150 mm public foul sewer is located approximately 20 m northwest of the Site. The sewer runs in a south-easterly direction where it joins a second foul water sewer (which flows in a northerly direction along Finlan Road) to form a 225 mm foul water sewer which then runs in a westerly direction along Boswell Way. Invert and cover levels were not provided by United Utilities. The EA's 'areas with critical drainage problems' GIS layer indicates that the Site is not within a Critical Drainage Area.
Proposed Site Conditions	The proposed development is for the demolition of existing single storey extension and service yard canopy, erection of extension and alterations to existing building, change of use to allow a flexible use within Classes B2, B8 and/or E(g)(iii) and a series of physical works to reconfigure the site including an extension to the service yard, new hard and soft landscaping and associated infrastructure. A proposed development plan is included within Appendix E. The proposed development will result in an increase in hardstanding areas in the form of buildings. Hardstanding will comprise 21,701 m² or 80.5% of the total Site area. The remaining permeable, soft landscaped areas will occupy 5,269 m² or 19.5% of the total

	Site area. Values have been calculated using a DWG plan provided by the client provided by client (drawing reference 0127-P105E).
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3.0 Relevant Planning Policy and Guidance

3.1 Introduction

- 3.1.1 The aim of this section of the report is to discuss the main aspects of the local and national planning policies that are relevant to any proposed development on the Site and relevant guidance and legislation.

3.2 Assessment of Flood Risk

- 3.2.1 The flood risk from fluvial (Main Rivers) and coastal flooding is assessed through the use of the EA Flood Map for Planning. This map defines three zones of different flood risk, the third of which is subdivided into two categories:

- Zone 1 “Low probability of flooding” - This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Zone 2 “Medium probability of flooding” - This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year;
- Zone 3a “High probability of flooding” - This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year; and
- Zone 3b “Functional floodplain” - A sub-part of Zone 3, this zone comprises land where water has to flow or be stored in times of flood. This zone is not normally included within the national Flood Map for Planning and is calculated where necessary using detailed hydraulic modelling.

3.3 National Planning Policy Framework

- 3.3.1 Flood risk in England is normally considered through the planning process in the NPPF (2024), produced by Ministry of Housing, Communities and Local Government.

- 3.3.2 The principal aim of the NPPF assessment of flood risk is that:

“Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere”.

- 3.3.3 The NPPF requires an FRA to be produced where development Sites are:

- Greater than one hectare in size;
- All proposals for new development (including minor development and change of use) in Flood Zones 2 and 3;
- Or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the EA);
- Identified in a Strategic Flood Risk Assessment as being at increased risk in the future; and
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

- 3.3.4 The NPPF requires that developers consider not just the flood risk to the development but also the impact that the development might have on flood risk elsewhere. As well as Main Rivers and the sea, it is also necessary to consider flood risk from other sources, including surface water, groundwater, Ordinary Watercourses, artificial drainage systems, canals and reservoirs.

Sequential Test

- 3.3.5 A key part of the NPPF is that a proposed development must first pass a “Sequential Test” to demonstrate that the overall development proposal is appropriate in terms of flood risk. It ensures that a sequential approach is followed to guide new development to areas with the lowest probability of flooding.

Exception Test

- 3.3.6 The Exception Test determines whether the benefits of the proposed development will outweigh the potential flood risk.

Vulnerability Classification

- 3.3.7 In accordance with Annex 3 of the NPPG: Flood Risk and Coastal Change, industrial developments are considered to be ‘less vulnerable’.

Table 1: Flood Risk Vulnerability Classification

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water-Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	✗	Exception Test required	✓	✓
Zone 3b	Exception Test required	✗	✗	✗	✓

✓ Exception Test is not required

✗ development should not be permitted

- 3.3.8 Annex 3 of the NPPG (reproduced above as Table 1), states that ‘less vulnerable’ development is considered appropriate within Flood Zone 1. The Site is located wholly within Flood Zone 1 and therefore, the development passes the flood risk Sequential Test from a fluvial flood risk perspective and the Exception Test does not need to be applied from a fluvial flood risk perspective. The latest NPPF guidance now requires that all sources of flood risk pass the Sequential Test depending on the level of risk. This will be broadly assessed as part of the formal assessment below.

Exception Test

- 3.3.9 The Exception Test determines whether the benefits of the proposed development will outweigh the potential flood risk. Within the NPPF, the Exception Test states that:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and
- A Site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

- 3.3.10 Further consideration of the requirements of the Sequential and Exception Test is provided in Section 6 in consideration of the assessment of the sources of flooding described in Section 4.

3.4 Local Policy

- 3.4.1 The Rochdale Metropolitan Borough Council's adopted Core Strategy Plan (adopted in October 2016) contains the following policies relating to flood risk, drainage and climate change and contains the following requirements for a Sustainable Drainage Strategy:

Policy G1 - Tackling and adapting to climate change

'New developments will be expected to address the impacts of climate change by incorporating comprehensive adaptation measures, including the incorporation of appropriate water conservation and management measures, such as Sustainable Drainage Systems (SuDS), including ensuring that the rate of run-off on 'greenfield' sites is not increased and on 'brownfield' sites is significantly reduced, and avoiding the use of impermeable surfaces.'

Policy G8 - Managing water resources and flood risk

'It is ensured that new developments (including flood risk mitigated measures) does not lead to any form of increased flooding locally or further downstream, does not impede natural water and flood risk management, is not detrimental to existing or potential flood storage areas, contributes where possible to alleviating existing flood risk, is itself well protected from flood risk and ensures prudent use of water resources. Developments will require:

- *Incorporation of appropriate measures for the management of surface and flood water, including flood storage areas, Sustainable Urban Drainage Systems (SUDS) and the protection of 'overland flow paths';*
- *Compliance with any Surface Water Management Plan or drainage strategies produced, such as for the identified critical drainage areas of Littleborough and Heywood;*
- *The avoidance of culverting, and support the opening up of existing culverts wherever possible;*
- *The incorporation of measures for the conservation of water to minimise potable water consumption, including rainwater collection measures, which should be integral to the design of buildings and spaces;*
- *Development that does not directly or indirectly lead to pollution of existing water resources such as watercourses and groundwater or the derogation of the quantity of groundwater;*
- *The incorporation of measures to improve water quality; and*
- *The taking of opportunities to improve the habitat value of watercourses and water bodies.'*

- 3.4.2 The Greater Manchester Places for Everyone Joint Development Plan 2022-2039 contains the following policies relating to flood risk and drainage:

Policy JP-S4: Flood Risk and the Water Environment

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

1. *Returning rivers to a more natural state, where practicable;*
2. *Working with natural processes and adopting a natural flood management approach to slow the speed of water drainage and intercept water pollutants;*
3. *Locating and designing development so as to minimise the impacts of current and future flood risk, including retrofitting or relocating existing developments, infrastructure and places to increase resilience to flooding;*

4. *Expecting developments to manage surface water run-off through sustainable drainage systems and as close to source as possible. Development should achieve greenfield run-off rates unless it is demonstrated to be impracticable. District local plans should consider setting more detailed surface water drainage policies to reflect local circumstances, including alternative surface water discharge rates, such as in areas with critical drainage issues;*
5. *Ensuring that sustainable drainage systems:*
 - i. *Are designed to provide multifunctional benefits wherever possible, including for water quality, nature conservation and recreation;*
 - ii. *Avoid adverse impacts on water quality and any possibility of discharging hazardous substances to ground;*
 - iii. *Are delivered in a holistic and integrated manner, including on larger sites split into different phases; and*
 - iv. *Are managed and maintained appropriately to ensure their proper functioning over the lifetime of the development.*
6. *Securing the remediation of contaminated land and the careful design of developments to minimise the potential for urban diffuse pollution to affect the water environment; and*
7. *As a minimum, residential development should meet the mandatory water efficiency standard of 125 litres/person/day as set out in Building Regulations. District local plans may and should consider setting a tighter water efficiency standard of 110 litres/person/day where there is a clear local need with reference to national guidance on housing optional technical standards.*

3.5 Consultation

- 3.5.1 As the Site is located within Flood Zone 1, the Environment Agency have not been contacted for further data.
- 3.5.2 A consultation request was submitted to Rochdale Metropolitan Borough Council in December 2022. A response was received in January 2023 which provided a link to relevant Council flood reports.
- 3.5.3 Sewer plans were obtained from United Utilities (UU) and are included in Appendix D. A pre-development enquiry was undertaken with United Utilities to clarify whether there is capacity within the existing network to accommodate flows from the proposed development. The response is provided in Appendix D. It was confirmed that there is sufficient capacity within the foul network to accommodate the proposed scheme and that provided the Drainage Hierarchy is satisfactorily addressed, surface water flows could be accommodated to 14.6 l/s (note: 14.6 l/s was provided to UU as the QBAR rate based on superseded Site layout plans).
- 3.5.4 The Site is not located within an Internal Drainage Board (IDB) District.

4.0 Assessment of Flood Risk

4.1 Tidal Flood Risk

- 4.1.1 The Site is situated inland at a minimum of approximately 130 m AOD and is significantly above sea level. Therefore, the risk from tidal flooding is considered to be **Negligible**.

4.2 Fluvial Flood Risk

- 4.2.1 The EA's Flood Risk Map for Planning indicates that the Site is located wholly within Flood Zone 1. The nearest watercourse is the Whit Brook which is located approximately 10 m south of the Site. The Brook is noted to be at approximately 130 m AOD and flows in a westerly direction.

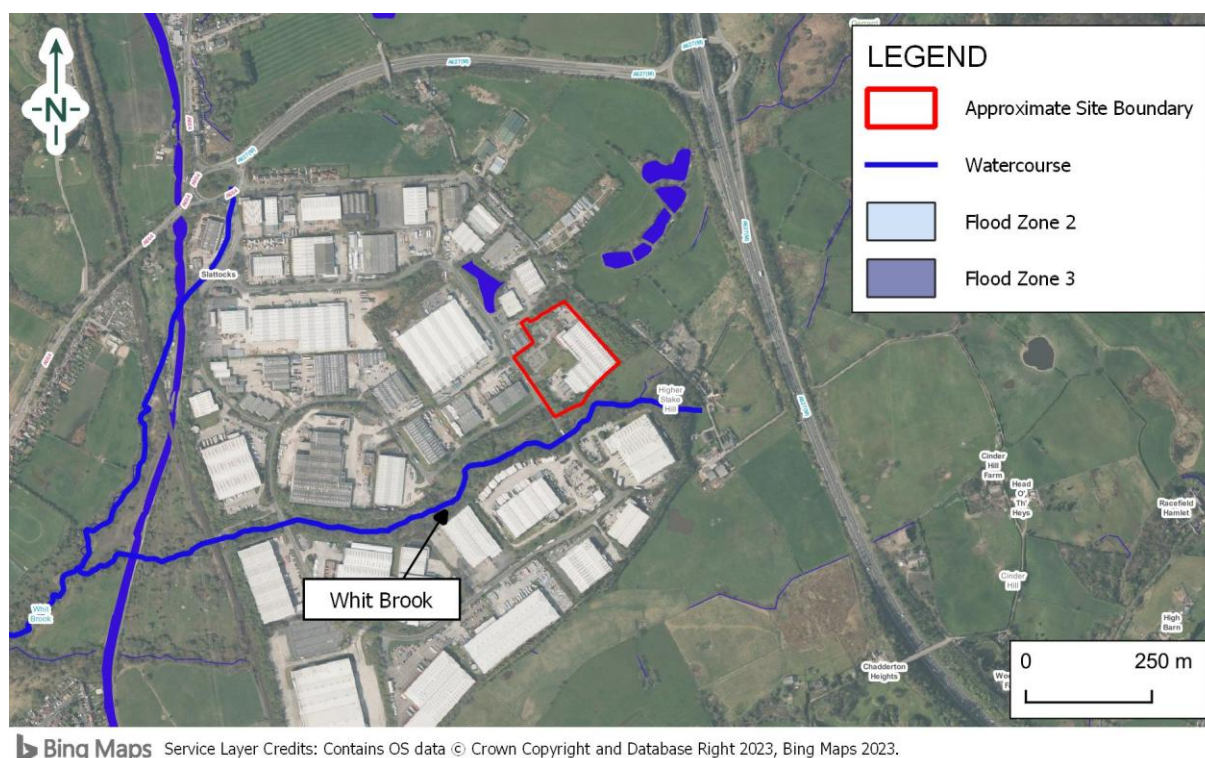


Figure 2: EA's Flood Map for Planning

- 4.2.2 The EA 'Historical Flood Map' (Appendix F) indicates that the Site has not been affected by any recorded fluvial flood events.
- 4.2.3 Third party reports do not identify any known incidents of fluvial flooding within the Site.
- 4.2.4 The developed part of the Site is situated at a minimum of 134 m AOD, the nearest watercourse (Whit Brook) is situated at approximately 130 m AOD and is therefore the Site is elevated significantly from the watercourse. Whilst the EA do not appear to have formally modelled the floodplain associated with White Brook, the EA's surface water flood risk map can be used as a proxy for fluvial flood risk. This indicates that there would not be significant out of channel flooding, with flood extents contained almost entirely in channel. Any out of channel flooding from the watercourse is unlikely to flow toward the Site and is likely to flow to west away from the Site following the local topography.
- 4.2.5 The 2009 Level 2 SFRA 'Flooding from multiple sources' mapping identifies that the Site is not within an area at risk of any sources of flooding.
- 4.2.6 Based on the above, the overall risk of fluvial flooding to the proposed development is considered to be **Low**.

4.3 Surface Water Flood Risk

- 4.3.1 The EA Long Term Flood Risk Map was updated in January 2025 with new national flood risk information for flooding and coastal erosion. The new national flood risk assessment (NaFRA2) model uses more up to date information and provides higher resolution maps that make it easier to analyse potential risk, as well as providing some information on the effects of climate change, based on the UK Climate Projections (UKCP18).
- 4.3.2 The EA Long Term Flood Risk Map (Surface Water) indicates that the majority of the Site has a Very Low (annual probability $<0.1\%$) chance of surface water flooding. There are two areas located in the northern car park and along the eastern edge of the main building which are shown to have a Medium (annual probability between $1\% - 3.3\%$) chance of surface water flooding, and three larger areas located in the northern car park, and along the eastern and western edges of the main building shown to have a Low (annual probability between $0.1\% - 1\%$) chance of flooding. Depth mapping indicates that the flood extents are unlikely to exceed 20 cm.

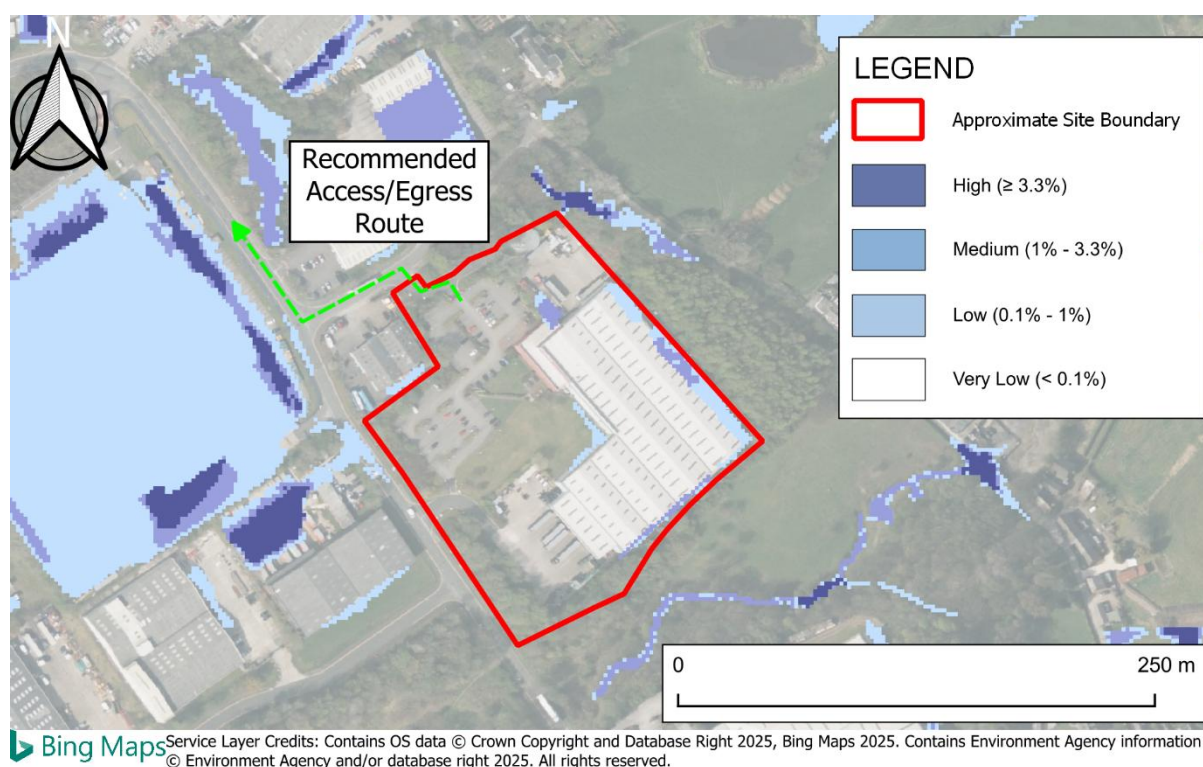


Figure 3: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water)

- 4.3.3 The EA Long Term Flood Risk Map (Surface Water) also contains modelled climate change flood extents for the 2040 – 2060 epoch. During this scenario, the flood extents are shown to increase so that the majority of the main building has a Low chance of flooding. The flood extents around the boundaries of the building to the north, east, and west are also shown to increase to Medium with some limited areas of High (annual probability $>3.3\%$) chance. This is illustrated in Figure 4 overleaf.

4.3.4

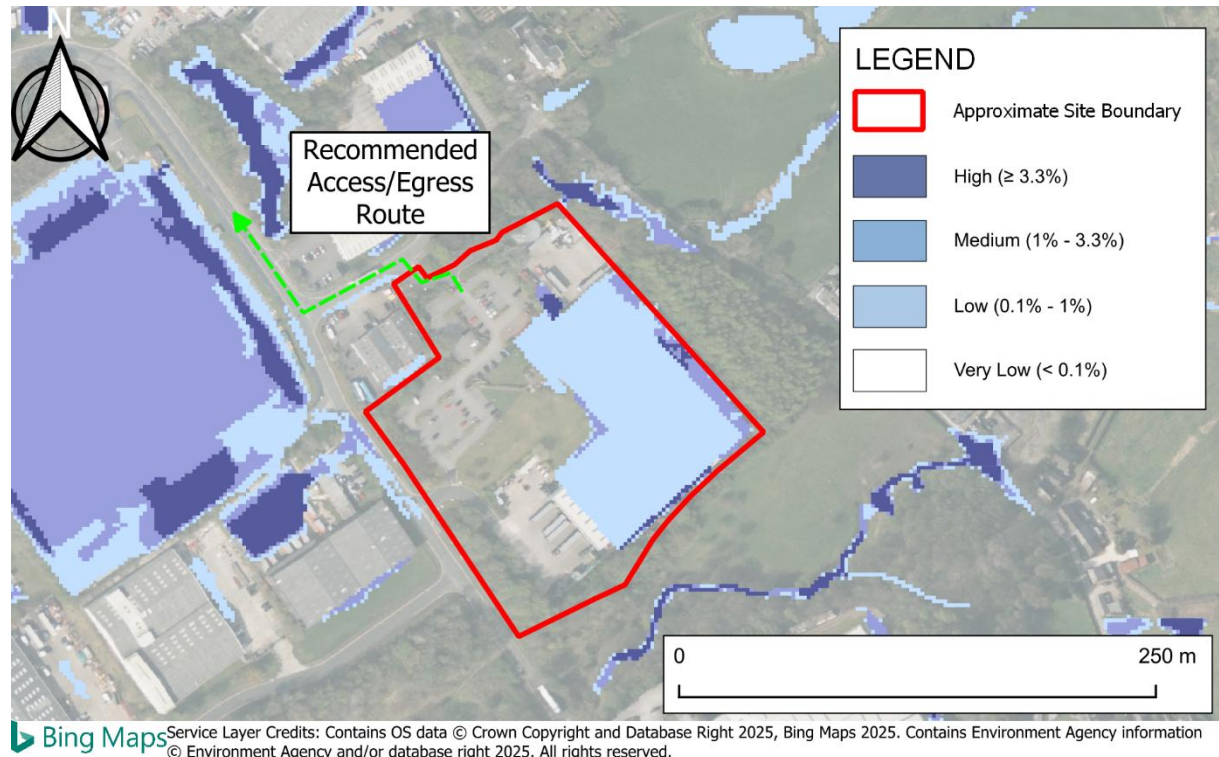


Figure 4: EA's Long Term Flood Risk Map (Surface Water) - CC Extents

- 4.3.5 Surface water depth mapping indicates that in the climate change scenario, the majority of the indicated flood extents have a Very Low chance of exceeding 20 cm. Therefore, in both the present day and future scenarios, access and egress is considered achievable via Finlan Road to the north.
- 4.3.6 There is no indication within relevant third-party reports that the Site has been historically impacted by surface water flooding. Mapping contained within the 2009 Level 2 SFRA indicates that the Site is not located within an area deemed at risk from any sources of flooding.
- 4.3.7 It can therefore be concluded that the proposed development is at a **Low** risk of surface water flooding.

4.4 Groundwater Flood Risk

- 4.4.1 The Site is identified as being directly underlain by superficial Devensian Till deposits with bedrock of Pennine Lower Coal Measures Formation. Both the superficial deposits and the underlying bedrock are classified as Secondary A Aquifers.
- 4.4.2 The Delta-Simons ground investigation found that water was stuck on two occasions, at 3.2 m bgl and 2.7 m bgl respectively. This indicates that significant quantities of shallow groundwater are unlikely to be present. Shallow groundwater is expected to generally flow to the south-west following local topography towards Whit Brook, but this may be influenced by the nature and variable permeability of the Devensian Till.
- 4.4.3 BGS mapping included within the Envirocheck report states that the eastern half of the Site is not considered to be at risk of groundwater flooding; however the western areas of the Site are considered to be at risk of groundwater flooding to property below ground level. The mapping does not indicate that any of the Site is likely to be impacted by groundwater flooding at the surface and no basement levels are proposed.
- 4.4.4 Groundwater levels correspond with river levels, as such groundwater flooding could occur in the wider area during periods of prolonged high-water levels in the Whit Brook. However, the developed part of the Site is located at a minimum of approximately 134 m AOD and is therefore significantly elevated above Whit Brook and unlikely to be impacted by groundwater movements associated with the Brook.

- 4.4.5 The proposed development will be predominantly hardstanding, limiting the vertical migration of groundwater.
- 4.4.6 The 2009 SFRA did not record any incidents of groundwater flooding at or near to the Site.
- 4.4.7 It can therefore be concluded that the risk to the proposed development of groundwater flooding is **Low**.

4.5 Artificial Sources Flood Risk

Sewer Flooding

- 4.5.1 Sewer records have been obtained by United Utilities and are detailed above in Section 2.
- 4.5.2 Any potential flooding arising from the 300 mm combined sewer to the east, or the 300 mm surface water sewer to the north is likely to be held on the roads between the kerbs and is unlikely to flow onto the Site. The Site is elevated above the sewers in Finlan Road to the west.
- 4.5.3 The 2009 SFRA did not indicate any historical sewer flood incidents within the Site. A review of relevant third party reports did not indicate that the Site has been historically impacted by sewer flooding.
- 4.5.4 United Utilities have confirmed that they have capacity to receive foul and surface water flows from the proposed development, restricted to appropriate rates.
- 4.5.5 It can therefore be concluded that the risk to the proposed development of sewer flooding is **Low**.

Canal Flooding

- 4.5.6 Rochdale Canal is located approximately 670 m west of the Site at its closest point and is located at an elevation of approximately 120 m AOD. Therefore the Site is elevated by approximately 10 m above the canal and the risk from canal flooding is considered to be **Negligible**.

Reservoir Flooding

- 4.5.7 According to the EA Long Term Reservoir Flood Map, the Site is shown to be located within an area that is not at risk from reservoir flooding. The risk to the proposed development of reservoir flooding is therefore considered to be **Negligible**.

4.6 Summary of Flood Risk

- 4.6.1 It can be concluded that the Site is at low risk of flooding from all sources. Therefore, no Site-specific mitigation measures are considered necessary. However, in accordance with Building Regulations, finished floor level of the extension should be set 150mm above surrounding ground levels, where feasible.

4.7 Residual Risks

- 4.7.1 A residual risk is an exceedance event, such as beyond a 1 in 1000 year (>0.1% AEP) rainfall event or fluvial flood event that could overtop Whit Brook and potentially impact the Site. As the probability of a greater than a 1 in 1000 year flood event occurring is <0.1% in any given year, the probability is low and, therefore, no further mitigation beyond what is proposed is required.

5.0 Drainage Strategy

5.1 Introduction

- 5.1.1 The Site currently comprises an 'L' shaped building which has been in use for manufacturing and distribution. The proposed development is for an extension to the existing development in an ongoing light industrial/commercial use.
- 5.1.2 A Site visit was completed on 4th January 2023 where the Site representative indicated that all surface water drains lead to an interceptor in a grassed area in the west of the Site. Rainwater from the external bund areas was discharged to the foul water sewer (two reported on-Site), which is understood to have required testing beforehand. No information relating to the discharge consent or testing was available.
- 5.1.3 The proposed development will result in a total hardstanding area of 21,701 m² (a 3,877.9 m² or 21.8% increase), resulting in an increase in surface water runoff rates and volumes if unmitigated. In order to ensure the proposed development will not increase flood risk elsewhere, surface water discharge from the Site will be controlled.
- 5.1.4 EA Guidance states: 'For development with a lifetime between 2061 and 2100... use the central allowance for the 2070s epoch (2061 to 2125)', therefore, as the Site is a commercial development, the central allowance can be utilised for the Site. This equates to 25% for the 1 in 30 year event and 30% for the 1 in 100 year event.

5.2 Surface Water Discharge

- 5.2.1 Based on the greenfield nature of the Site's extension area, surface water runoff rates for the total proposed impermeable area have been estimated using the ICP SuDS method, provided as Table 2 below and in Appendix G. The QBAR greenfield rate for the 21,701 m² total impermeable area is 15.2 l/s.

Table 2: Greenfield Runoff Rates

Return Period (Years)	Runoff Rate whole Site (l/s)
1 in 2	13.6
QBAR	15.2
1 in 30	29.8
1 in 100	39.1

5.3 Attenuation Storage

- 5.3.1 In order to achieve a discharge rate of 15.2 l/s, attenuation storage will be required. Storage estimates have been provided using Micro Drainage.
- 5.3.2 The storage estimates are based on a flow rate of 15.2 l/s, storage within a tank or pond structure, an impermeable drainage area of 21,701 m², a design head of 1 m and Hydrobrake flow control. MicroDrainage calculations are included as Appendix H and summarised in Table 3 below.

Table 3: Summary of Attenuation Requirements

Storm Event	Attenuation Volume (m ³)
1 in 30 year + 25% CC	879 - 1,478
1 in 100 year + 30% CC	1,366 - 2,123

- 5.3.3 The attenuation volumes are provided for indicative purposes only and should be verified at the detailed design stage.

5.4 Drainage Hierarchy

- 5.4.1 The recommended surface water drainage hierarchy (Paragraph 080 of the NPPG: Flood Risk and Coastal Change) is to utilise soakaway systems or infiltration as the preferred option, followed by discharging to an appropriate watercourse. If this is not feasible, the final option is to discharge to an existing public sewer.

Surface Water Discharge to Soakaway

- 5.4.2 The first consideration for the disposal of surface water is infiltration (soakaways and permeable surfaces). As described above the Site is underlain by superficial deposits of Devensian Till (diamicton) which is underlain by Pennine Lower Coal Measures Formation (mudstone, siltstone and sandstone). According to Soilsmap mapping [accessed 27/02/23], the Site is located in '*freely draining slightly acid sandy soils*'. The Delta-Simons Ground Investigation struck groundwater at 3.2 m bgl and 2.7 m bgl respectively. Soakaway tests were also undertaken to BRE 365 in two pits and failed.

- 5.4.3 It can be concluded that soakaways are not suitable for the discharge of surface water runoff.

Surface Water Discharge to Watercourse

- 5.4.4 Where soakaways are not suitable a connection to watercourse is the next consideration. The nearest watercourse is Whit Brook, located approximately 10 m south of the Site. However, the Site slopes down in the opposite direction to Whit Brook and therefore based on levels and to avoid a requirement for pumping, discharge to Whit Brook is unlikely to be feasible. Pumping is not considered to be a sustainable method of facilitating discharge as it would require an electrical connection (and therefore back-up pump and generator) to help minimise the risk of flooding. As such, a gravity discharge will be pursued.

Surface Water Discharge to Sewer

- 5.4.5 Where a connection to watercourse is not suitable, the next consideration is discharge to a surface water sewer. There is a 450 mm diameter surface water sewer beneath Finlan Road to the west of the Site, which the Site currently connects into as demonstrated in the Utility Survey. Discharge to this sewer, at a limited discharge rate of 15.2 l/s appears to be feasible via gravity.
- 5.4.6 UU have, subject to appropriate application of the Drainage Hierarchy and chiefly suitably demonstration that pumped discharge to the watercourse is not suitable, agreed that surface water runoff can discharge to their 450 mm diameter surface water sewer beneath Finlan Road. Whilst UU stated that a maximum discharge rate of 14.6 l/s is acceptable, this rate was provided to them as the greenfield QBAR rate based on a previous iteration of the proposed development plan. It is therefore anticipated that they will accept the updated QBAR discharge rate of 15.2 l/s.

5.5 Sustainable Drainage Systems

- 5.5.1 Attenuation storage should be provided in the form of Sustainable Drainage Systems (SuDS) where practical. The following SuDS options have been considered:

Soakaways

- 5.5.2 As described above, the use of infiltration for the disposal of surface water runoff has not been considered further at this stage.

Swales, Detention Basins and Ponds

- 5.5.3 The Site will be predominantly occupied by the buildings, access and parking and there is limited space to accommodate above ground storage features such as ponds and basins.

Rainwater Harvesting

- 5.5.4 The attenuation benefits provided through the use of rainwater harvesting are considered to be limited and would only be realised when the tanks were not full. However, rainwater harvesting techniques such as water butts could be incorporated within the final design.

Green Roofs

- 5.5.5 Green roofs are not identified on development plans. Given the nature of the proposed development, the significant additional cost involved in installing and maintaining green roofs and the additional works required to allow for the additional loading on the building, green roofs are not considered a practical option. The benefits achieved through installing a green roof would be disproportionate to the significant ongoing maintenance and construction costs involved.

Porous/Permeable Paving

- 5.5.6 Permeable paving could potentially be incorporated within the proposed carparking spaces. Storage would be provided within the sub-grade material prior to controlled release to the receiving watercourse. The amount of storage offered by permeable paving is subject to sub-grade depth and Site gradient. The use of permeable paving should be considered at the detailed design stage.

Underground Attenuation Tanks

- 5.5.7 Storage could be provided within underground attenuation tanks or within oversized pipes. Sufficient space for an underground tank is provided in the northern carparking area. This is discussed further below.

5.6 Preferred Drainage Scheme

- 5.6.1 Surface water runoff will be discharged to the public surface water sewer beneath Finlan Road to the west of the Site at a rate of 15.2 l/s, which appears feasible via gravity.
- 5.6.2 Surface water runoff up to the 1 in 30 year plus 25% climate change allowance event will be attenuated on Site within geocellular storage crates which can accommodate up to 1012.7 m³ of attenuation, MicroDrainage Source Control calculations are included within Appendix I.
- 5.6.3 During the more significant 1 in 100 year plus 30% climate change event, MicroDrainage calculations (Appendix I) identified that there would be an excess volume of water, not attenuated below ground within the proposed geocellular crates, of 379.9 m³. The excess volume which is not attenuated within the proposed pipes, gully pots and manholes would surcharge above ground and create shallow flooding on the Site surface, in line with S8 of the Non Statutory Technical Standards for SuDS (NSTSfS). Based on an external area of approximately 17,050 m², this would correspond to flood depths of 22 mm, during the 1 in 100 year plus 30% climate change event.
- 5.6.4 These very shallow average depths are considered safe and would not adversely affect Site operations. It is additionally noted that should permeable paving be provided, this could reduce the flood volumes and depths further.
- 5.6.5 A conceptual drainage sketch is provided in Appendix J which illustrates the above. Overall, there will be a significant reduction in surface water runoff from the Site, compared to the current unrestricted brownfield situation. This will result in a reduction in surface water flood risk.

5.7 Event Exceedance

- 5.7.1 Storm events in excess of the 1 in 100 year plus 30% CC event should be permitted to produce further temporary flooding within the car park, service yard, access road and/or landscaped areas. Finished floor levels will be set at a minimum of 150 mm above surrounding ground levels, where feasible, to help ensure that exceedance flooding will not affect the buildings.

5.8 Surface Water Treatment

- 5.8.1 In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), other roofs (typically commercial/industrial roofs) have a 'low' pollution hazard level, with yard and delivery areas roads classified as having a 'medium' pollution hazard level. Table 4 below shows the pollution hazard indices for each land use.

Table 4: Pollution Hazard Indices*

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other Roofs (typically commercial/industrial roofs)	Low	0.5	0.2**	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2

* Indices values range from 0-1.

** up to 0.8 where there is potential for metals to leach from the roof

- 5.8.2 Water treatment will need to be provided by a suitably sized separator. Mitigation indices are not provided for separators in the SuDS Manual, however, it is considered that they will be able to provide sufficient treatment. The design of the separator should be considered further at the detailed drainage design stage.

5.9 Maintenance

- 5.9.1 Maintenance of drainage features such as an attenuation tank and the water drainage systems can be arranged through appointment of a Site management company.
- 5.9.2 A maintenance schedule for an attenuation tank is included in Appendix K. Maintenance of the separator will be as per the manufacturer's guidance.

5.10 Foul Water Discharge

- 5.10.1 Foul flows should continue to be discharged to the existing public combined sewer located beneath Finlan Road to the west of the Site. United Utilities have advised that discharge to the 225 mm diameter foul sewer beneath Finlan Road is acceptable.

6.0 Sequential and Exception Test

6.1 Sequential Test

- 6.1.1 The NPPF requires the Local Planning Authority to apply the Sequential Test when considering new development. The aim is to steer development to areas at the lowest probability of flooding.
- 6.1.2 It is acknowledged that whilst the Site is in fluvial and tidal Flood Zone 1, EA surface water flood risk mapping identifies a limited potential surface water flood risk. This FRA has demonstrated that once the on-Site attenuation system is incorporated as part of the development, surface water ponding should be significantly reduced during the 0.1% AEP event (which can be taken as a conservative proxy for the 1% AEP + CC event). Additionally, it is recommended that ground floor levels are raised by 150 mm, to protect the building from the ingress of residual ponded surface water. All these measures reduce the risk to an acceptable level for the nature of the proposed development.
- 6.1.3 Furthermore, the proposed development comprises of a demolition and redevelopment of a brownfield extension which will provide a betterment of the existing situation. No significant flood risks have been identified from any of the other sources assessed.
- 6.1.4 On this basis it is considered that the Sequential Test has been passed.

6.2 Exception Test

- 6.2.1 Annex 3 of the NPPG (reproduced in Table 1, Section 3 of this report), states that 'less vulnerable' development is considered appropriate within Flood Zone 1. As such, application of the Exception Test is not required.

7.0 Conclusions and Recommendations

7.1 Conclusions

- 7.1.1 The Site is located within Flood Zone 1 on the Environment Agency (EA) 'Flood Map for Planning (Rivers and Sea)' – an area considered to have the lowest probability of fluvial and tidal flooding. The Site is shown to be located outside of the extreme 0.1% annual probability flood extent.
- 7.1.2 Whilst a limited area at surface water flood risk is located in the north of the Site, this does not impact the building footprint and depths would predominantly remain below 300 mm. Safe access and egress is available in the 1% annual probability flood event.
- 7.1.3 The proposed development for the Site is for the existing warehouse structure to be extended to create a square structure which occupies the central Site area.
- 7.1.4 The proposed development will result in an increase in hardstanding areas of 3,877.9 m², increasing the impermeable drainage area and surface water runoff. In order to ensure the increase in surface water runoff will not increase flood risk elsewhere, flow control will be used, and attenuation provided on Site to accommodate storm events up to and including the 1 in 30 year plus 25% climate change event. Surface water will be retained on-Site for the 1 in 100 year plus 30% climate change event.
- 7.1.5 All methods of surface water discharge have been assessed. As soakaways and discharge to watercourse are not possible, discharge of surface water to the public surface water sewer to the west of the Site, at a rate of 15.2 l/s appears to be the most practicable option and appears to be feasible via gravity. The principle of discharge to this sewer at QBAR rates has been agreed with United Utilities.
- 7.1.6 Attenuation storage will be required on Site in order to restrict surface water discharge to 15.2 l/s. Attenuation can be provided within geocellular storage crates which can accommodate 1012.7 m³ of attenuation, which provides attenuation up to the 1 in 30 year plus 25% climate change allowance event. Very shallow above ground flooding will manage the 1 in 100 year event plus 30% CC.
- 7.1.7 Foul flows should continue to be discharged to the existing foul sewer adjacent to the Site, as agreed with United Utilities.

7.2 Recommendations

Flood Risk

- In accordance with Building Regulations, finished floor levels of the buildings should be set 150 mm above surrounding ground levels, where feasible.

Drainage Strategy

- Verify the attenuation volumes included in this report when undertaking detailed drainage design;
- Make provision for attenuation features across the Site; and
- Survey the public sewer to determine invert levels.

Appendix A - Limitations

Limitations

The recommendations contained in this Report represent Lucion's professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Lucion does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Lucion obtained, reviewed and evaluated information in preparing this Report from the Client and others. Lucion conclusions, opinions and recommendations has been determined using this information. Lucion does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Lucion has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

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Appendix B – Topographical Information and Utility Survey

Appendix C - LiDAR Plan

Appendix D - Sewer Plans and Pre-Development Enquiry

Appendix E – Proposed Site Plan

Appendix F - Historic Flood Map

Appendix G - ICP SUDS Calculations

Appendix H - Quick Storage Estimates

Appendix I – Microdrainage Calculations

Appendix J - Conceptual Drainage Sketch

Appendix K - Maintenance Schedules