

Building 402 Redevelopment

Level 2 Floor Risk Assessment

Threadneedle Curtis Ltd

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Glossary

AEP	Annual Exceedance Probability
DRN	Detailed River Network
EA	Environment Agency
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
Ha	Hectare
LPA	Local Planning Authority
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
LLFA	Lead Local Flood Authority
MCC	Manchester City Council
MAG	Manchester Airport Group
LiDAR	Light Detection and Ranging
OSNGR	Ordnance Survey National Grid Reference
UU	United Utilities

Common Terms

Flood Zone	Environment Agency defined zone of flood risk used for planning
Main River	Main rivers are usually larger rivers and streams. The EA carries out maintenance, improvement or construction work on main rivers to manage flood risk.
Ordinary Watercourse	Ordinary watercourses include every river, stream, ditch, drain, cut, dike/dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a main river.

1. Introduction

AECOM has been commissioned by Columbia Threadneedle Investments (CTI) to produce a Level 2 Flood Risk Assessment (FRA) in support of the planning application for a logistics development on the site of the former Building 402 at Manchester Airport adjacent to Pinfold Lane and Wilmslow Old Road.

A Level 2 FRA is a qualitative appraisal of the flood risks posed to a site and the potential impacts development could have on flood risk elsewhere, providing recommendation of possible measures to reduce the level of flood risk, where necessary. This Level 2 FRA report has been prepared in accordance with National Planning Policy Framework (NPPF)¹ and the associated Planning Practice Guidance (PPG)².

This FRA is based on the best available flood risk information available at the time of writing. Data has been provided by the Environment Agency, United Utilities and other external sources.

1.1 Description of the Proposed Site

The proposed development site is located to the North of Wilmslow Old Road and west of Pinfold Lane as shown in Figure 1-1. The Ordnance Survey National Grid Reference (OSNGR) for the site is 381009, 384731. Vehicular access to the site is via Pinfold Lane which runs along the site's most north eastern boundary.

Cotterill Clough Brook Ordinary Watercourse appears to rise within the Manchester Airport development approx. 170 metres from the site, runs in a south westerly direction to its confluence with the River Bollin.

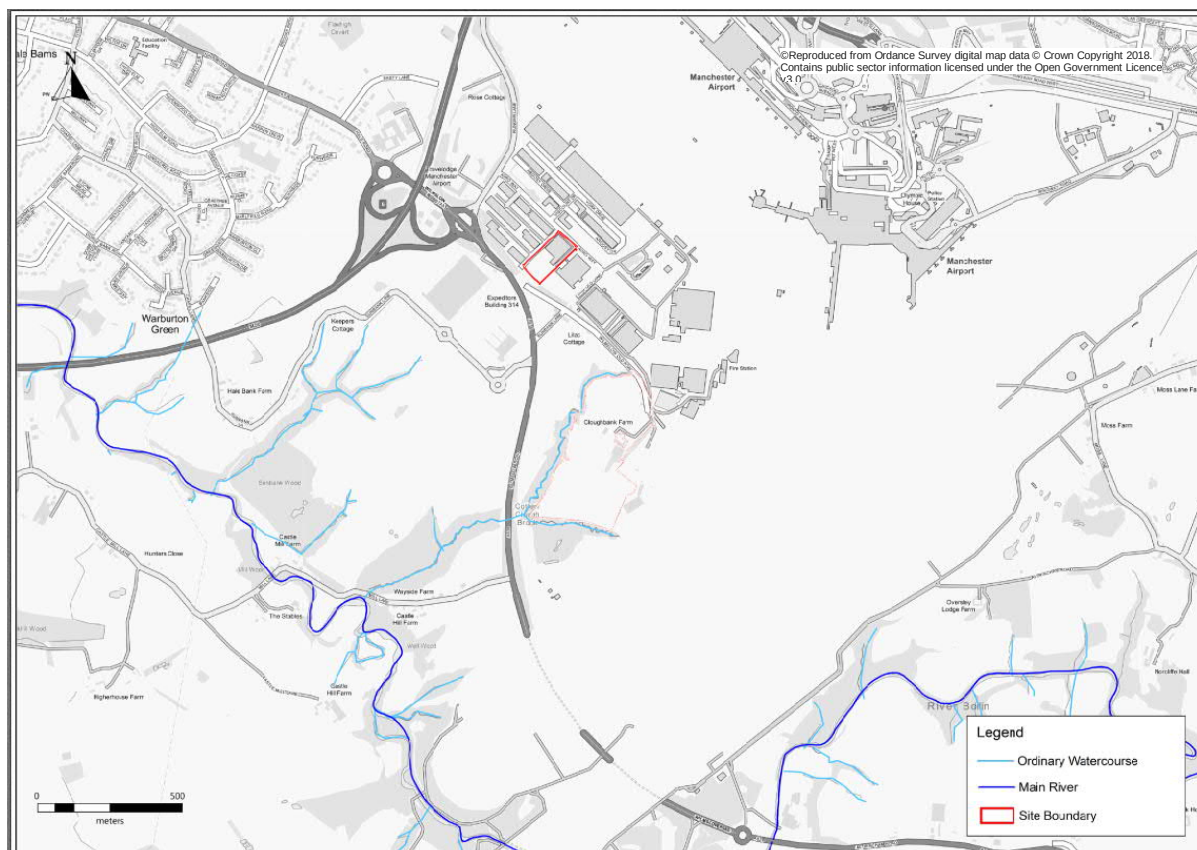


Figure 1-1 Proposed Site Location Plan

The site is currently owned by Columbia Threadneedle Investments. The site has been classified as Brownfield for the purpose of this FRA due to previous site usage.

1.2 Topography

Figure 1-2 shows the topography of the site, as demonstrated by LiDAR. Site visits and photography show levels are relatively flat and a topographical survey is being undertaken at the in February 2022 to confirm actual levels.

¹ Department for Communities and Local Government (2018) *National Planning Policy Framework*. London.

² Department for Communities and Local Government (2018) *Planning Practice Guidance: Flood Risk and Coastal Change*. London

From existing topographical data within the vicinity the highest elevation is indicated to be approximately 70m Above Ordnance Datum (AOD).

As indicated by the LiDAR, approximately 2 kilometres (km) to the east of the site boundary, the topography gently increases up to an elevation of 90 mAOD. Immediately south of the site, land levels fall southwards towards the River Bollin flood plain.

Review of the outline design drawings and the Environment Agency Flood Map for Planning (FMfP)³ suggests the site is approximately 1.9 hectares (ha) in area and located in Flood Zone 1, see Figure 1-2 below. The NPPF and associated PPG specify that any development greater than 1 ha and located in Flood Zone 1 must be supported by a site-specific FRA and the Manchester Local Flood risk strategy states a requirement for an FRA for sites over 0.5ha.

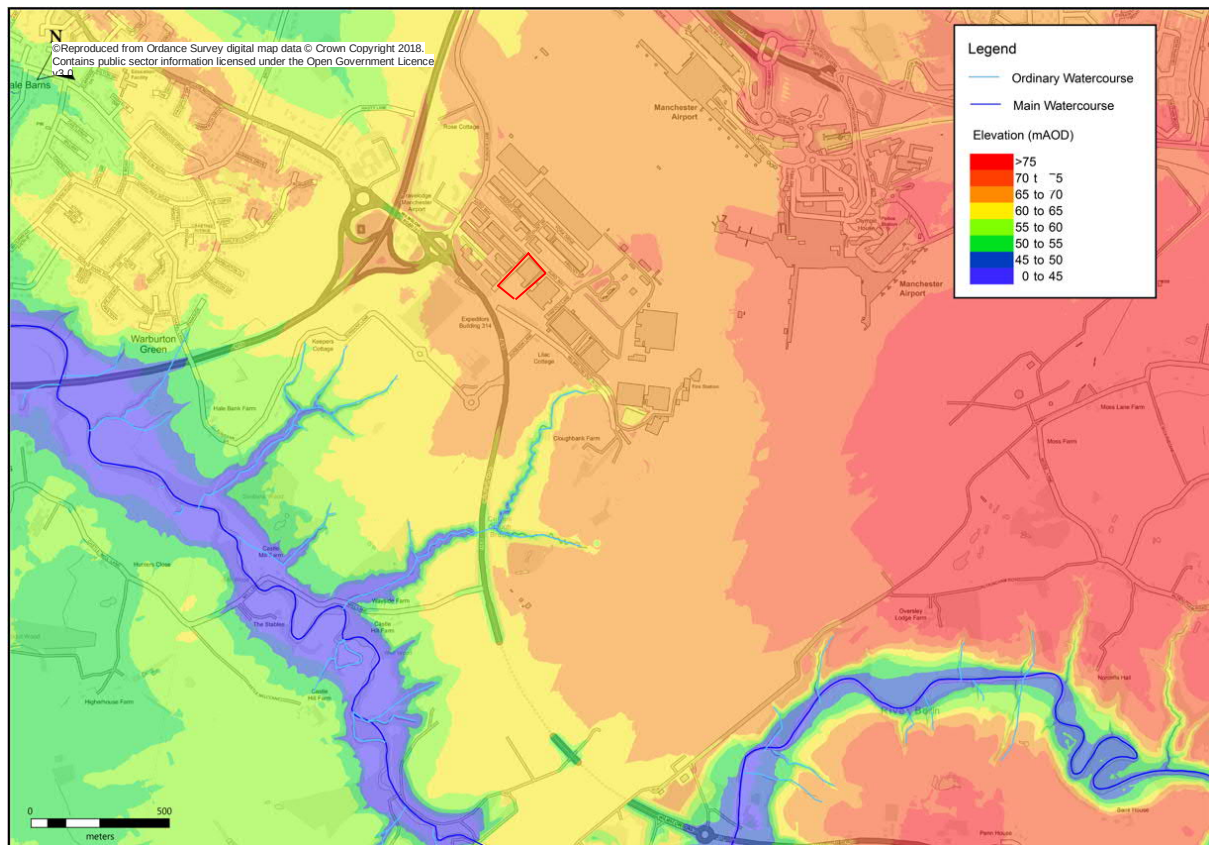


Figure 1-2 Topography (LiDAR) surrounding the site

1.3 Description of the Proposed Works

The proposed development is for a logistics warehouse, including:

- New logistics warehousing
- Integral Offices
- External service yards
- Car Parking
- Landscaping to boundary
- Drainage + Infrastructure

A layout plan for the proposed development is presented in Appendix A.

³ Environment Agency (2018) Flood Map for Planning: Rivers and the Sea. Online. Available at: <https://flood-map-for-planning.service.gov.uk/>

2. Evaluation of Flood Policy

2.1 National Planning Policy

Section 14 of the 2018 updated National Planning Policy Framework (NPPF) and the 2014 Flood Risk and Coastal Change Planning Practice Guidance (PPG) both advise how the planning process can take account of the risks associated with flooding.

2.1.1 Flood risk vulnerability classification

Table 2⁴ of the PPG describes flood vulnerability classifications associated with broad types of development.

Table 3⁵ of the PPG, shown below in Figure 3-1, provides a matrix style appraisal of the suitability of development (based on its vulnerability) to placement within the different Flood Zones.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	x	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	x	x	x	✓*

Key:

✓ Development is appropriate

x Development should not be permitted.

Figure 2-1 Flood Risk vulnerability classification

2.2 Regional & Local Planning Policy

Manchester City Council (MCC) are the Lead Local Flood Authority (LLFA) and the Local Planning Authority (LPA) within the vicinity of the proposed development and therefore have responsibility for the management of development and flood risk; alongside, the responsibility for the preparation of local plans and policies to manage flooding.

⁴ Environment Agency (2018) Flood Risk and Coastal Change, Table 2 [online] Available from <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>.

⁵ Environment Agency (2018) Flood Risk and Coastal Change, Table 3 [online] Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575184/Table_3_-_Flood_risk_vulnerability_and_flood_zone_compatibility.pdf.

2.2.1 Manchester City Council Core Strategy

The Manchester City Council Core Strategy⁶ was adopted in the 11th July 2012 and sets out planning policies for the district up to 2027. This strategy supersedes the Unitary Development Framework and includes updates to the long term strategic policies for developments in Manchester and forms the framework that planning applications will be assessed against.

Relevant district wide policies with regards to development, flood risk and surface water management within the Core Strategy have been reviewed. These policies include:

Policy EN 14: Flood Risk

- *"In line with the risk-based sequential approach contained within PPS25, development should be directed away from sites at the greatest risk of flooding, and towards sites with little or no risk of flooding; this should take account of all sources of flooding identified in the Manchester-Salford-Trafford Strategic Flood Risk Assessment (SFRA).*
- *In addition to the requirements for site-specific Flood Risk Assessments (FRAs) set out in PPS25, an appropriate FRA will also be required for all development proposals, including changes of use, on sites greater than 0.5 ha within Critical Drainage Areas (CDAs) and Canal Hazard Zones identified in the SFRA.*
- *All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In CDAs, evidence to justify the surface water run-off approach / rates will be required.*
- *The City of Manchester contains many sections of rivers which are culverted or 'hidden'; [...] where feasible and appropriate development should seek to open up culverted/hidden rivers to reduce the associated flood risk and danger of collapse [...]."*

Policy EN 8: Adaptation to Climate Change

"All new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- *Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rainwater permeability"*

Policy EN 17: Water Quality

"With reference to the Manchester-Salford-Trafford SFRA and other relevant documents:

- *Development should minimise surface water run-off from development and associated roads, and maximise the use of appropriate sustainable drainage systems, to minimise groundwater contamination, and to avoid pollutants reaching watercourses"*

2.2.2 Preliminary Flood Risk Assessment (PFRA)

The purpose of a PFRA document is to provide a high-level summary of significant flood risk, based on available and readily derivable information, describing both the probability and harmful consequences of past and future flooding. MCC as the LLFA have produced a PFRA⁷ in 2011 which considers flooding from; surface water, groundwater, ordinary watercourses, canals and sewer flooding plus any interaction these may have with main rivers across their administrative area. An addendum⁸ to the PFRA was added in December 2017 following a review by MCC of the flood risk area in 2017 using updated surface water mapping a methodology. No updates have been identified to the PFRA since the review of new information.

The PFRA identified 10 national 'Indicative Flood Risk Areas' based on the Flood Map for Surface Water (FMfSW) and flood risk thresholds. The proposed development site is not identified as being within one of the identified 'Indicative Flood Risk Areas'.

⁶ Manchester City Council (2012) Manchester's Local Development Framework, Core Strategy Development Plan Document

⁷ JBA (2011) Preliminary Flood Risk Assessment

⁸ Manchester City Council (2017) Preliminary Flood Risk Assessment [online]

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698404/PFRA_Manchester_City_Council_2017.pdf

2.2.3 Strategic Flood Risk Assessment (SFRA)

The SFRA analyses the flood risk from multiple sources associated with three administrative boundaries: Manchester, Salford and Trafford, who updated their Level 2 SFRA⁹ in 2011. The proposed development site falls within the Manchester administrative boundary. A SFRA is a required evidence document to inform future development, in particular the Local Authorities' Core Strategies, with the purpose of enabling flood risk to be considered at the earliest stage of the planning process. For MCC it is reported that the main sources of flood risk are fluvial flooding and surface water flooding, although areas are also at risk from canal sources.

The SFRA notes there is a low risk of localised surface water flooding to the Airport site (M0007) where the proposed development is located. This area is predominantly at risk from surface water sources with a secondary risk from fluvial sources. The SFRA concludes that careful management of surface water run-off is crucial in this area but overall the area is considered to be at low risk of localised surface water flooding and development within this area will be acceptable subject to a site-specific Flood Risk Assessment (FRA). However, it is stated that any development in the area should look to incorporate SuDs to mitigate run off. Run off rates should not increase as a result of development and where possible, a betterment of the existing run off rate should be sought.

The SFRA also defines several Critical drainage Areas (CDAs) based on surface water flood risk data. These are areas where there is a localised risk of flooding from ordinary watercourses, including culvert surcharging, overland surface water flows, as well as flooding from the sewer network. The proposed development is located within the Manchester and Trafford South CDA where there are predicted to be, on average, between 5 and 20 properties at risk per 0.25 km². Climate change shows a general increase in the number of properties at risk. Surface water run-off from these sites should not increase as a result of development (reduced run-off should be sought if possible in some areas) and not discharge into the combined sewer system.

The SFRA proposes a suite of options be used for surface water management in order to provide a holistic approach. These include measures such as SuDs, Green Infrastructure and increasing capacity of sewers and watercourses.

2.2.4 Local Flood Risk Management Strategy (LFRMS)

In the capacity as an LLFA and following the Flood and Water Management Act 2010, Manchester City Council (MCC) produced a LFRMS¹⁰ (2014) and subsequent Action Plan to provide an overview and assessment of local flood risk throughout Manchester.

The LFRMS sets out its objectives to "*reduce the likelihood, severity and consequences of flooding from Ordinary Watercourses, from Groundwater, and from Surface Water Runoff*". In order to achieve this the LFRMS highlights that any new development should incorporate appropriate mitigation and/or resilience measures to prevent the increase of flood risk on or off-site.

Following a review of this document there are no areas of notable risk identified within the proposed site boundary.

2.3 Other Relevant Studies and Reports

2.3.1 Greater Manchester Surface Water Management Plan

A Strategic Assessment of Surface Water Flood Risk (Stage 1)¹¹ was conducted by JBA in 2012 on behalf of MCC. This report looked to identify potential areas of significant risk ('surface water hotspots') and produced a strategic flood map. The report reviewed records of historical surface water flooding around the region, using the PFRA, SFRA, flood maps and records. The proposed development site has no record of significant historical surface water floods.

2.3.2 Upper Mersey Catchment Management Plan

The Upper Mersey Catchment Flood Management Plan (CFMP)¹² was produced in 2009 and includes the River Bollin which runs past the southern side of the proposed site boundary.

⁹ JBA (2011) Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

¹⁰ Manchester City Council (2014) Local Flood Risk Management Strategy. Available online [https://secure.manchester.gov.uk/downloads/download/5603/lfrms_documents]. Accessed 24/02/2022

¹¹ Greater Manchester Surface Water Management Plan (2012) Stage 1 – A Strategic Assessment of Surface Water Flood Risk. [online] Available from: <https://www.bury.gov.uk/CHttpHandler.ashx?id=11439&p=0>. Accessed 24/02/2022

¹² Environment Agency (2009) Upper Mersey Catchment Flood Management Plan. [online] Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/293774/Upper_Mersey_Catchment_Flood_Management_Plan.pdf. Accessed 24/02/2022

The Upper Mersey has historically suffered sudden, intense flooding most notably from fluvial sources, however also from surface water, sewers and groundwater. Flood risk in the catchment is currently managed through engineering schemes installed over the last 30 years as well as activities to decrease the probability and consequences of flooding.

The site is covered under Policy 4:

“Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change”

3. Assessment of Flood Risk

This section of the report considers the potential risks posed to the proposed development from all sources of flooding. Where a flood risk is considered 'moderate' or 'high', then mitigation measures may be required, which will be discussed in Section 6.

3.1 Flood Risk from Fluvial Sources

Fluvial flooding occurs when the capacity of a river is exceeded either due to high flows from the catchment draining into the river or a combination of high flows and high tides, which causes the river to overflow or overtop its banks.

3.1.1 Flood Risk from Main Rivers

Review of the Environment Agency Flood Map for Planning (FMfP) shows the proposed development site to be located in Flood Zone 1, which represents land classified as being at low risk (less than 1 in 1,000 Annual Exceedance Probability (AEP)) of flooding from rivers and sea (Refer to Figure 3-1).

The Environment Agency Detailed River Network (DRN) shows that the River Bollin is classified by the Environment Agency as a Main River. The River Bollin rises in Macclesfield Forest at the western edge of the Peak District and flows westerly for approximately 3.8km before passing the site, approximately 0.6km south of the site's southern boundary. The river continues westwards for approximately 10 km before discharging into the River Mersey via the Manchester Ship Canal.

The River Bollin is situated approximately 1.31km from the site. A review of the FMfP shows that the site has a very low risk of flooding from the river..

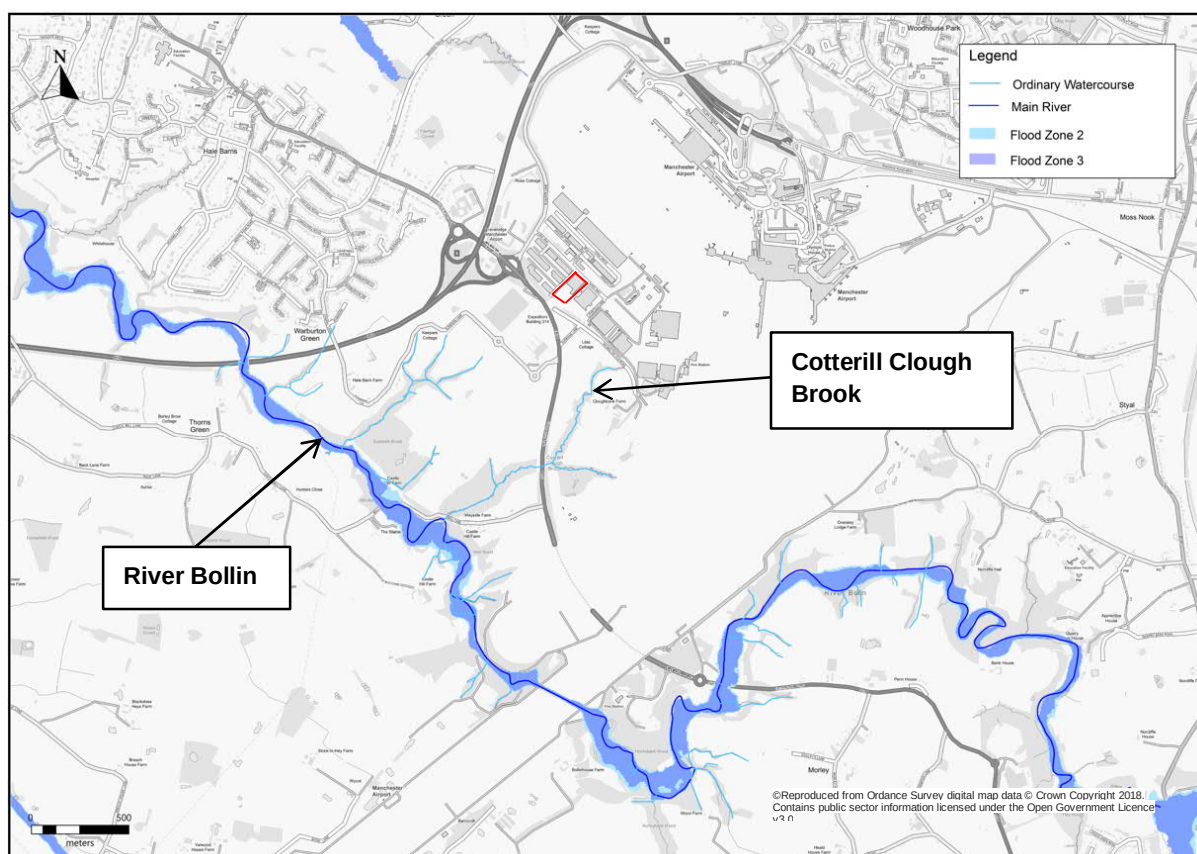


Figure 3-1 Environment Agency Flood Map for Planning

The site is therefore considered to be at very low risk of flooding from Main Rivers and no mitigation is required.

3.1.2 Flooding from Ordinary Watercourses

Following review of Ordnance Survey (OS) mapping and aerial photography, the closest ordinary watercourse to the site is Cotterill Clough Brook, a tributary of the River Bollin. Cotterill Clough has two branches, both of which originate within the MAG site with the closest being 170 metres from the site. The watercourses are thought to take much of the outflow from the MAG Airport Drainage network. The two branches merge as they pass beneath Wilmslow Road (A538), before discharging into the River Bollin 0.6 km downstream.

Given the proximity of these features to the site, there is a risk of Ordinary Watercourse flooding to the site. Furthermore, as the watercourses hold Ordinary Watercourse status, no detailed flood mapping is available from the Environment Agency and the flood extents from this watercourse remains unknown. However, based on consultation with the design team, the proposed Finished Ground Levels (FGL) for the site will be approximately 7m above the riverbed. In addition, the site drainage will be designed for a 100 year event with appropriate attenuation provide. As a result, the risk of flooding to the site is considered to be low but a residual risk of flooding still remains, refer to Section 5.5.

3.2 Flood Risk from Surface Water

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

No infiltration testing has to date been undertaken however some SI for the site and a full SI for the adjacent site indicate underlying soils that are not suitable for infiltration. Testing will be undertaken to confirm this as part of the Phase 2 ground investigation.

Following a review of the Environment Agency Risk of Flooding from Surface Water (RoFFSW) dataset, the area around the proposed site is considered to be at high risk of flooding in a 3.33% AEP event. However, following a review of the flood extents within the site boundary there are only a limited number of locations at risk from flooding.

These include a small area of flooding near to the buildings in the North-east of the site which are at risk of flooding in the 3.33% AEP event (refer to Figure 3-2).

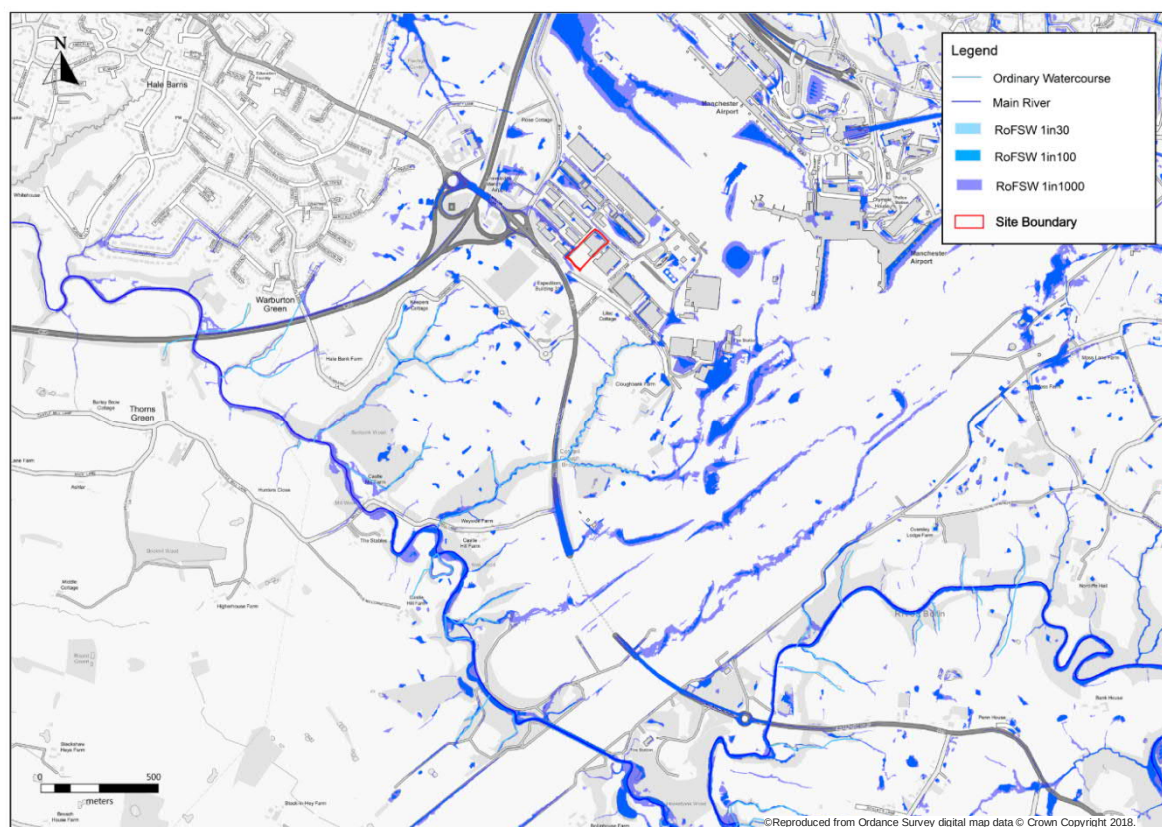


Figure 3-2 Environment Agency Risk of Flooding from Surface Water

Additionally, the development site is considered to be within the Manchester and Trafford South Critical Drainage Area, and is known to suffer from surface water flooding. This is supported by the review of the SWMP, which shows the Airport and its surrounding areas as being at risk from surface water flooding.

As a result, the risk of flooding to the development from surface water is considered to be low to medium and no further mitigation in addition to that included with the site design is likely to be required.

3.3 Flood Risk from Ground Water

Groundwater flooding occurs when the natural level of water stored within the ground rises above local ground level. This can result in deep and long-lasting flooding of low lying or belowground areas such as underpasses and basements. It tends to occur after long periods of sustained high rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at a shallow depth. Groundwater flooding is most likely to occur in areas underlain by major aquifers, although it is also associated with more localised floodplain sands and gravels.

Based on the SI undertaken for the site ground water is not encountered until 3.5 metres deep with some perched water in the glacial material under the former Hangar slab.

A review of British Geological Survey¹³ (BGS) data shows that the site is underlain by Bollin Mudstone with superficial deposits recorded as Devensian Till. Mudstone is generally characterised by being particularly impermeable bedrock. According to the Environment Agency Flood Map for Planning (Groundwater)¹⁴ the site is a Secondary B Bedrock aquifer.

Groundwater flood risk is considered to be medium.

¹³ British Geological Survey (2018) Geology of Britain Viewer. Online. <http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html> Accessed: 22/08/2018

¹⁴ Environment Agency (2018) Flood Map for Planning: Groundwater. Online. <http://maps.environment-agency.gov.uk/wiyby> Accessed: 22/08/2018

3.4 Flood Risk from Sewer Infrastructure

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

3.4.1 Public Sewer Network

The United Utilities (UU) public sewer network is shown in Figure 3-3 and indicates that the Bollin Outfall Sewer runs adjacent to the site within the DNATA site on the opposite side of Pinfold Lane. This is the main outfall for the airfield and is around 20 metres deep with a large redundant capacity available and therefore the risk from this sewer is deemed to be very low.

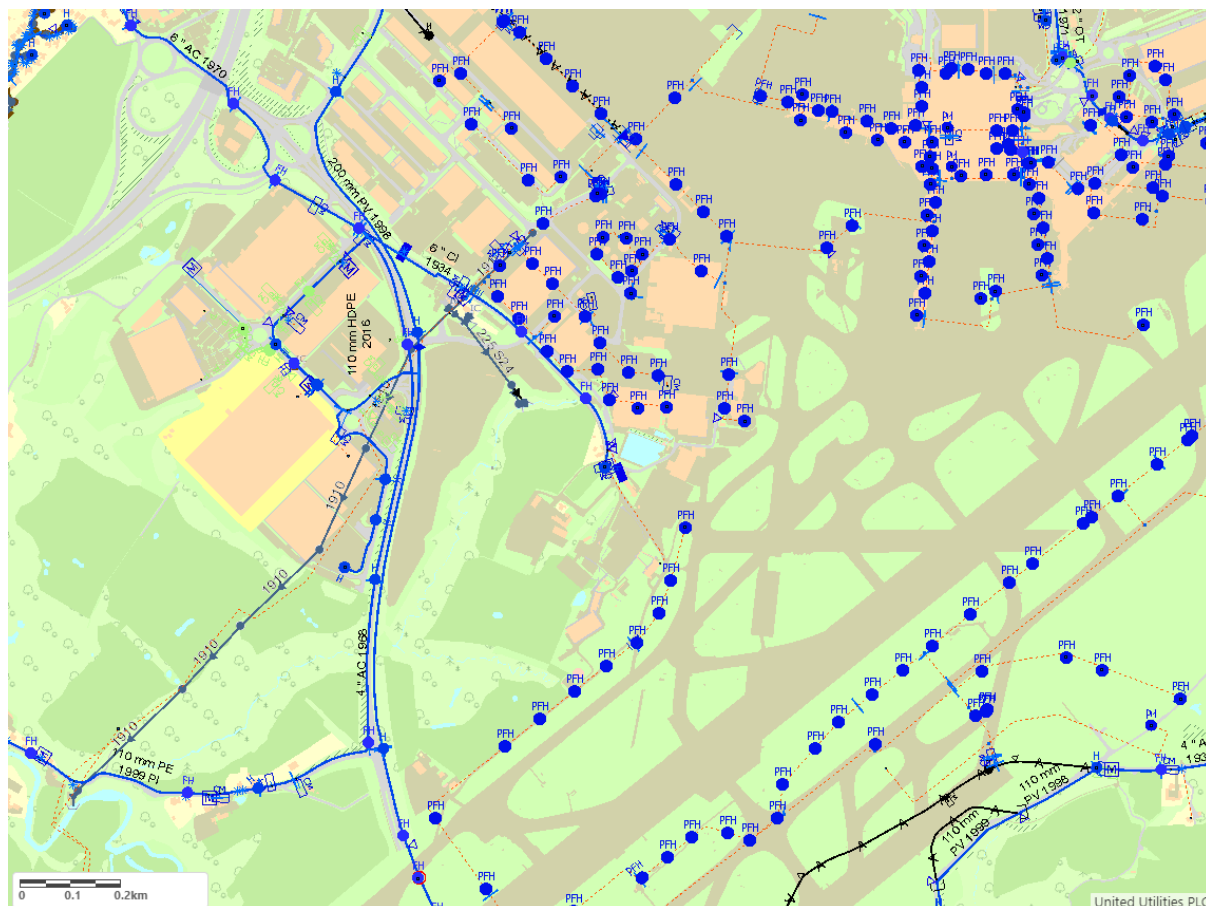


Figure 3-3 United Utilities Public Sewer Network

3.4.2 Private Sewer Network

Following a review of the private MAG drainage plans for the Manchester Airport site, a significant proportion of the Manchester Airport surface water drainage network discharges via piped outfall into the western tributary of the Cotteril Brook Ordinary Watercourse.

A review of the topography surrounding the Cotteril Brook Ordinary Watercourse suggests that the watercourse is at a significantly lower elevation than the proposed development site. Following consultation with the design team, the lowest elevation within the site boundary is approximately 7m higher than the bed level of the watercourse. Based on the evidence supplied and given that system unlikely designed to current design standards, also include that there is no anecdotal evidence of sewer flooding, the risk of flooding to the site from the private airport drainage network is considered to be low.

3.5 Flood Risk from Canal Systems

A review of Ordnance Survey mapping indicates that there are no canal systems within close proximity to the proposed development site. As such, the risk of flooding from canal systems is considered to be low and no mitigation is required.

3.6 Flood Risk from Reservoirs

Reservoir failure can be particularly dangerous as it causes the release of large volumes of water at a high velocity, which can result in deep and widespread flooding. However, reservoir inspection and design procedures are very rigorous such that the probability of failure is generally regarded as extremely low due to the nearest commercial reservoir being located 20 miles north..

In accordance with the Environment Agency's flood map showing 'Risk of Flooding from Reservoirs'¹⁵ the site is located outside of the extent of reservoir flooding. However, a review of aerial mapping suggests that Ross Mere natural reservoir located approximately 3 km south of the site and discharges via ordinary watercourse into the River Bollin, approximately 1.6 km upstream of the site. However, in the unlikely event of failure, flood flows would be channelled into the low lying River Bollin River Valley (lying approximately 34.5 mAOD below the site) and away from the proposed development.

3.7 Flood Risk from Land Drainage Systems and Flood Risk Management Infrastructure

A review of the FMfP suggests there are no flood defences close to the development site and no land drainage features can be observed on aerial mapping.

The risk to the Site from the failure of artificial drainage systems is therefore considered to be low and no mitigation is required.

3.8 Summary of Flood Risks to the Proposed Development

Table 3-1 Summary of Key Flood Risks to the Proposed Development

Flood Risk	Summary of Risk to Development Site (High / Medium/ Low)	Notes	Mitigation Required
Fluvial	Low	The site is located in Flood Zone 1 and is therefore at low risk of flooding from Main Rivers. Cotteril Brook Ordinary Watercourse forms the sites western and southern boundary and could pose a risk to the development. However, the site is elevated 4 m above the watercourse. There is a residual risk of flooding to the site from Ordinary Watercourse flooding.	No
Surface Water	Low to Medium	Following a review of the Environment Agency Risk of Flooding from Surface Water (RoFfSW) dataset there are some small, localized areas of surface water flooding within the site boundary.	Yes
Groundwater	Medium	There are a number of local features including small watercourses and a pond which could indicate elevated ground water levels at the site. The risk to the development from ground water flooding is considered to be medium but is not known to affect the operation of the current site.	No
Sewer and Water Supply Infrastructure	Low to medium	Whilst there are public sewers within close proximity of the site, exceedance flows from these systems would likely to	Yes

¹⁵ Environment Agency 2014, Available at: <http://maps.environment-agency.gov.uk> [Accessed 08th August 2018]

		captured by the proposed drainage network. There is also a risk to the site from the MAG drainage network,	
Reservoir	Low	The site is located outside of the extent of reservoir flooding. However, aerial mapping suggests that there is a commercial Reservoir is located approximately 20miles north of the site. As this is commercially managed, it has been assumed that this reservoir is subject to regular inspection and maintenance regimes.	No
Canal	Low	A review of Ordnance Survey mapping indicates that there are no canal systems within close proximity to the proposed development site.	No
Artificial Drainage Systems and Flood Risk Management Infrastructure	Low	There are no artificial drainage systems and flood risk management infrastructure located in close proximity to the site.	No

4. Sequential Test and Exception Test

In accordance with Table 3, 'Less Vulnerable' developments are permitted in Flood Zones 1, 2 and 3a. The proposed development on a brownfield site, within the airport freight and logistics centre, with good transport links generally, means there isn't a better location and it meets the local planning and development criteria to pass the Sequential Test. Figure 3-1 also shows that the Exception test is not required for a development within Zone 1.

As part of the FRA, the NPPF requires that developers consider not just the flood risk to the development but also the impact that the proposed development might have on flood risk elsewhere. As well as fluvial and coastal flooding, it is also necessary to consider flood risk from all other sources, including surface water, groundwater, ordinary watercourses, and artificial drainage systems and infrastructure failure. However, in this instance it is important to note that coastal flooding has not been assessed, as the site is located approximately 30 km from the sea (Mersey Estuary).

5. Impacts of the Development on Flood Risk

5.1 Impact of Fluvial Flooding

It is possible that the proposed development could have an impact on fluvial flooding due to an alteration of flood mechanisms and flows and through increasing the impermeable area and constructing a new, more efficient surface water drainage system. As such, the development has been assessed in relation to these two potential issues.

5.1.1 Impact on Floodplain Storage

The site is located in Flood Zone 1 and is at low risk of fluvial and tidal flooding. Therefore, the proposed development is not considered to affect floodplain storage, and no provision for compensatory storage is required.

5.1.2 Impact on additional surface water runoff entering watercourses

The proposed development will more efficiently intercept surface water and provide higher capacity sewers plus attenuation which will mitigate surface water runoff to the Brook.

All Surface water runoff will be directed into the Bollin Outfall sewer which has significant redundant capacity and is circa 20 metres deep.

The Development Drainage Strategy contained will include a surface water drainage system which is capable of attenuating flows from the development up to and including the 1 in 100 year plus 40% climate change event. This drainage network will discharge flows into the MAG network and then into the Bollin Outfall Sewer.

As a result the risk of flooding in other areas as a result of the development is considered to be low and no further mitigation is required.

5.2 Impact on Surface Water

As discussed in Section 4.1.2, the impermeable area of the site will reduce.

In accordance with the requirements of the NPPF and the local planning policies discussed in Section 2.2, all increases in surface water runoff would need to be managed on site through the installation of appropriate SuDS techniques to ensure that the development does not increase the risk of surface water flooding elsewhere. As discussed, in Section 4.1.2, the development will include a below ground drainage network suitable for attenuating flows up to and including the 1 in 100 year plus 40% climate change event. As a result, the ability of the development to increase flooding in other areas as a result of increased runoff is considered to be low and no further mitigation is required.

5.3 Impact on Groundwater

The development will involve the creation of below ground elements associated with the proposed below ground drainage network.

This element could potentially lead to a change in subsurface flow regimes and a reduction in the natural storage capacity of the ground as well as and increasing the risk of groundwater flooding. However, considering the

development is located within a 'Secondary B' groundwater aquifer and the groundwater catchment surrounding the site is likely to be relatively large, the volume loss due to the proposed development is likely to have a negligible impact on groundwater storage capacities or subsurface flow regimes.

Therefore, the proposed development is likely to have negligible impact on groundwater storage capacities or subsurface flow regimes.

5.4 Impact on Sewer Infrastructure

As previously discussed, the development will include an appropriate drainage network which will capture and attenuate all generated flows up to and including the 1 in 100 plus 40% climate change, meaning the scheme will provide a betterment in terms of runoff rate and volume. As such, any increase in runoff as a result of the proposed development will remain within the development boundary and will not enter an external drainage network or public sewer system.

The proposed development will generate additional foul flow which will be discharged to the existing MAG network via Pumping Station 2 prior to being pumped to the other side of the airport.. Modelling of the foul network undertaken by Jacobs as advised by MAG indicate capacity is available in Pumping Station for the developments peak flow rate of 2.09 l/s, see Drainage Strategy within Appendix C

The impact of the development on the risk of flooding from the sewer network is considered to be low and no mitigation is required.

5.5 Impact on Flooding from Reservoirs, Canals and Flood Risk Management Infrastructure

As discussed in Section 3.6, there is a commercial reservoir in close proximity to the proposed site, approximately 40m north. However, there would be no works that could affect the structural integrity of this asset. The impact of the proposed development on flooding due to reservoir failure is therefore considered to be low and no mitigation is required.

There are no canal systems within the area, therefore the impact of the development on these features is considered to be limited and no mitigation is required.

There is are no flood defences within close proximity to the proposed development site and as such, the risk of increased flooding elsewhere as a result of defence failure is considered to be low and no mitigation is required.

5.6 Land Drainage Infrastructure

There is no evidence of any land drainage infrastructure near to the proposed development and therefore the impact of the proposed development is considered to be low and no mitigation is required.

5.7 Summary of Flood Risks from the Development

Table 5-1 Summary of Key Flood Risks from the Proposed Development

Flood Risk	Summary of Risk to Development Site	Notes	Mitigation Required
Fluvial	Low	The site is located in Flood Zone 1 and surface water runoff generated by the site will be attenuated within the red line planning boundary and discharged into the privately owned MAG surface water network at the greenfield run off rate.	No
Surface Water	Low	As discussed above, there will be no increase in runoff from the proposed development into other areas as all flows will be attenuated by the proposed drainage network, up to and including the 1 in 100 year plus 40% climate change event.	No
Groundwater	Low	The development will include a minimal amount of below ground development, primarily associated with the new drainage system. A development of this scale is unlikely to disrupt local groundwater regimes.	No
Sewer and Water Supply Infrastructure	Low	The development will include an appropriate drainage network which will capture and attenuate all generated flows up to and including the 1 in 100 plus 40% climate change event. Whilst the development incorporates the construction of a café, the foul flow created by this will be minimal and is unlikely to increase flood risk to the surrounding area.	No
Reservoir	Low	There is a commercial reservoir in close proximity to the proposed site, approximately 20miles north of the site boundary. However, there would be no works that could affect the structural integrity of this asset.	No
Canal	Low	There are no canal systems within the area, therefore the impact of the development on these features is considered to be limited and no mitigation is required.	No
Artificial Drainage Systems and Flood Risk Management Infrastructure	Low	There are no artificial drainage systems or flood risk management infrastructure within close proximity to the proposed development site and as such, the risk of increased flooding elsewhere as a result of defense failure is considered to be low and no mitigation is required.	No

6. Climate Change

6.1 Context

The NPPF requires site specific FRAs accompanying planning applications to assess the risk of all sources of flooding to and from the development and to demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

The EA published updated climate change guidance in February 2016¹⁶. The guidance indicates that climate change is likely to increase river flows, sea levels, rainfall intensity, wave height and wind speed.

From discussions with Manchester City Council a 40% climate change allowance is required for rainfall intensities.

6.2 Impact of Climate Change

6.2.1 Fluvial Flooding

Given that the Proposed Development lies within Flood Zone 1 it is concluded that climate change will not significantly increase the risk of Main River flooding to the site.

As discussed in Section 1.1 two tributaries of the Cotteril Clough Ordinary Watercourses flow along the sites western and southern boundaries. There is the potential for increased flows as a result of climate change to increase the risk of fluvial flooding to the site. However, the watercourse in these locations is steeply incised relative to the proposed development and based on discussions with the design team, the proposed development is elevated approximately 4m above the watercourse. As such, the risk to the site from fluvial flooding is likely to be low and no further mitigation is required. However there is a residual risk of flooding to the site from Ordinary Watercourses remains.

6.2.2 Groundwater

The predicted increase in the wetness of winters and the intensity of storm events could result in the groundwater level fluctuations at the site and possibly increase the level of the water table. However, the development will be designed in such a way to be resistant to groundwater ingress and will be designed to withstand hydrostatic pressure. Therefore the risk to the development as a result of increased groundwater levels is considered to be low.

6.2.3 Sewer Flooding

It is difficult to precisely predict the impact of climate change on sewer flooding due to lack of data; however, the anticipated increase in rainfall intensity may cause greater volumes of rainfall to enter the sewer network during storm events. It is not anticipated that the risk from the sewer system, which is currently considered to be low, would increase significantly to the point that it would pose a risk to the site. The design for surface water management includes an allowance for 40% climate change and has attenuation to provide outfall at greenfield runoff rates.

6.2.4 Surface Water Runoff Generation and Overland Flow

An increase in rainfall intensity will increase runoff rates and consequently runoff volumes. Climate change must be taken into account when considering surface water runoff generated by development sites. However, the proposed drainage system has taken into account the likely impacts of climate change, and has been designed to attenuate flows to the plus 40% climate change event.

¹⁶ Environment Agency (2016) Flood risk assessments: climate change allowances [online] Available from <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>.

6.3 Residual Flood Risk

6.3.1 Residual Risk from Ordinary Watercourses

As discussed in Section 3.1.2, there is a residual risk of fluvial flooding from Cotteril Clough Ordinary Watercourse and its tributaries. This risk cannot be excluded explicitly due to a lack of detailed information about the site, including modelled water levels and / or recorded flood extents.

The development itself is a fully drained logistics site which sits some 170 metres away and 4 metres higher than the watercourse therefore no further action is deemed to be required.

6.4 Flood Risk design mitigation

Consultation with the design team suggests that the proposed development will include a below ground drainage system which will be designed to accommodate the 1 in 100 year plus 40% climate change flows. As such, any surface water flooding at the site is likely to be intercepted by this drainage system and attenuated within the site before being discharged into the Bollin Outfall Sewer which is around 20 metres deep and offers significant capacity transferring flows directly to the River Bollin.

7. Drainage Strategy

Given the nature of the development and the proximity to buildings overland flooding will not be acceptable so in this instance all flows for the 1 in 100-year event will be attenuated below ground. This will ensure safe ingress and egress to the site for occupiers, vehicles and pedestrians is maintained throughout intense periods of rainfall.

The full Drainage Strategy, shown in Appendix B, details how the proposed development provides a 50% betterment to the existing brownfield run off rates using the 50mm/hr rainfall intensity for a 1 in 10-year storm event following the SuDS hierarchy. The proposed drainage network is designed to manage a 1 in 100 year event plus a 40% climate change allowance.

Long term drainage storage will be provided within the attenuation volume.

The site manages flows through surface water inlets via channel drains, kerbs and gully's and enhances existing soft landscaping around perimeter of the development in line with the landscape management plan. The total impermeable area for the site is 1.54ha.

8. Summary and Conclusions

This FRA has been completed in accordance with the NPPF and the accompanying Technical Guidance.

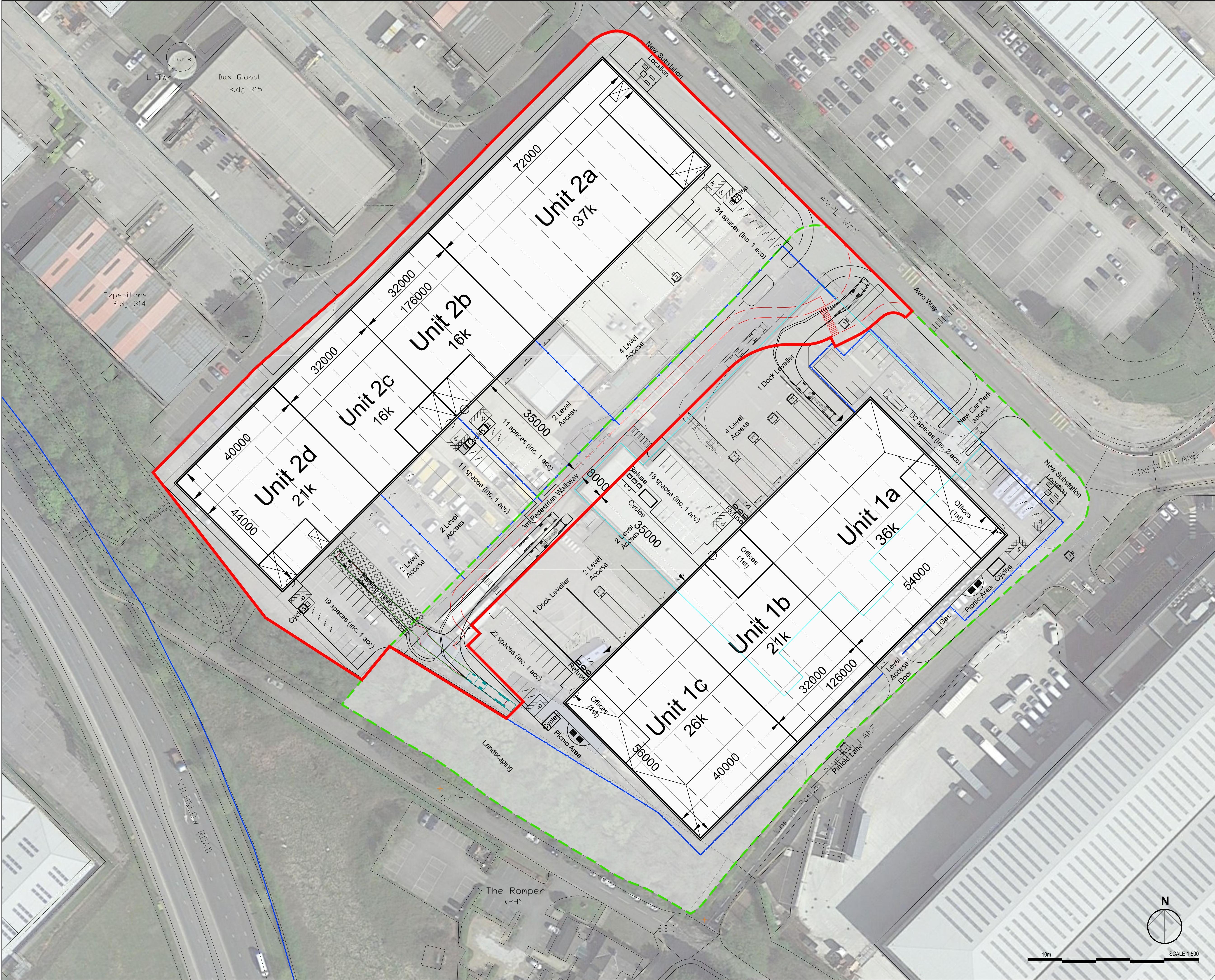
8.1 Summary of Flood Risk

- A review of the NPPF and local planning policies suggests the proposed development is considered to be 'General Industry', and is classified as 'Less Vulnerable' to the effects of flooding. In accordance with Table 3, 'Less Vulnerable' developments are permitted in Flood Zone(s) 1, 2 and 3a. The proposed development is on a brownfield site with transport links to the airport and local highways and is therefore considered to meet the requirements of the Sequential Test and no requirement for the Exception Test.
- The risk to the proposed development from flooding due to main rivers, surface water, ground water, canal and reservoirs, sewer and water supply infrastructure and artificial drainage systems and flood risk management infrastructure is considered to be low, following mitigation of which the proposed development will include a below ground drainage system which will be designed to accommodate the 1 in 100 year plus 40% climate change flows.
- The impact of the proposed development on flood risk from all sources, i.e. from main rivers, ordinary watercourses, surface water, groundwater, canals, reservoirs, sewer and water supply infrastructure and artificial drainage systems is considered to be low, following mitigation. Although there is residual sewer flood risk, the development provides a betterment to surface water drainage, plus there is capacity in the foul network.
- Refer to Appendix B for the full Drainage Strategy

8.2 Conclusion

This study has demonstrated that it will be possible to manage flood risks to and from the proposed development in compliance with the NPPF and PPG, and a strategy has been developed to control and discharge surface water runoff and foul discharge in an acceptable, conventional and sustainable manner.

Appendix A - Indicative Site Layout Plan



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Key

Overall Site 1.45Ha 3.605acres

Schedule of Accommodation	
Unit 2a (10% Offices)	c.37k
Unit 2b (10% Offices)	c.16k
Unit 2c (10% Offices)	c.16k
Unit 2d (10% Offices)	c.21k
Overall Total	8,604 sqm 92,613 sqft

All areas include offices at 1st floor

Please note: all retaining wall locations are subject to engineering design

P01	First Issue	LL	MJH	16/02/22
Rev	Description	By	Ckd	Date



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Project MAG, Building 401, Manchester Airport

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Appendix B - Drainage Strategy

Building 402

Drainage Strategy

Threadneedle Curtis Ltd

60663052-ACM-402-XX-RP-C-00001

04 February 2022

Quality information

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1. Introduction

- 1.1 The following drainage strategy is written in support of the Flood Risk Assessment being provided as part of the planning submission for the proposed redevelopment of Building 402 site at Manchester Airport on behalf of Threadneedle Curtis Ltd.
- 1.2 AECOM are appointed by Threadneedle Curtis Ltd to provide a number of pre-planning services including flood risk and drainage.
- 1.3 The following document outlines the proposals for the discharge of foul and surface water drainage from the development site.

2. Surface Water Drainage Assessment

- 2.1 The following section outlines the proposals for disposal of surface water drainage in line with the National Planning Practice Guidance and the Stockport Council Developer Guidance.

Existing Site Drainage

- 2.2 The site is currently served via separate privately owned surface water and foul networks.
- 2.3 The surface water network is a gravity network which discharges at the north east corner into the Manchester Airport Group (MAG) network in Avro Way. The MAG networks conveys flows east and ultimately discharges into the United Utilities owned Bolin River outfall sewer.
- 2.4 The existing building and site are served by a gravity foul network which discharges to a MAG owned pumping station. There is a pumping station located within the southern extension of the warehouse which discharges into the Skycheff Pumping Station south of the site. The pumping station to the south of the site pumps flows across Pinfold Lane into MAG Pumping Station 2 where flows are then conveyed to the wider MAG network.

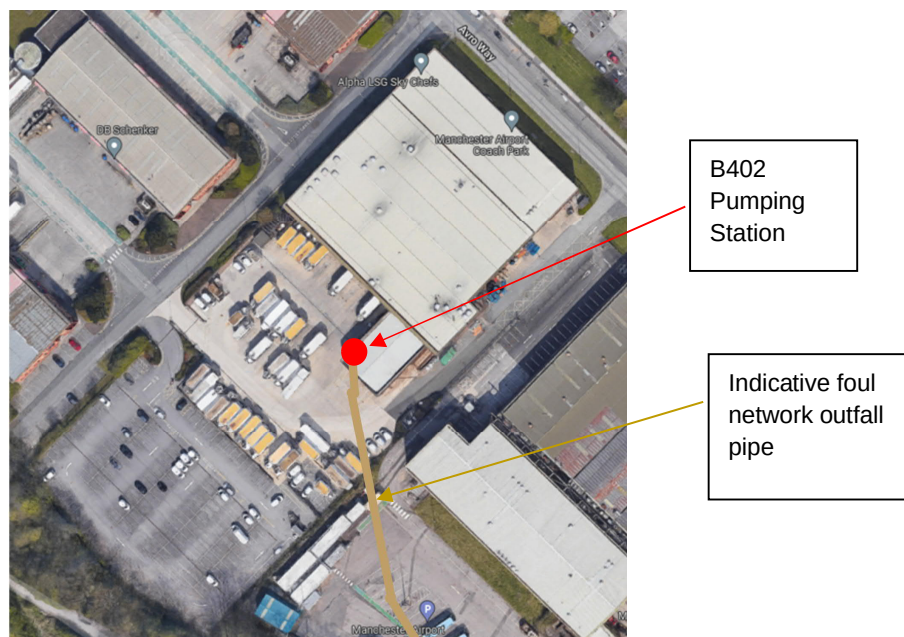


Figure 1: B402 pumping station and indicative foul network pipes

- 2.5 Subject to site levels and confirmation of drainage invert levels the pumping station shown in Figure 1 will be made redundant and new connections made to the offsite outfall drain which will remain in situ under

the ownership of MAG of which connections have been permitted by MAG to Threadneedle Curtis Ltd under the terms of the land sale agreement.

- 2.6 The existing drainage serving the existing buildings and infrastructure on site will be abandoned or removed in line with the demolition and earthworks strategy.
- 2.7 The gross application site has an area of approximately 1.9ha with an existing impermeable area of approximately 1.54ha.

Existing Discharge Rates

- 2.8 In addition to the NPPG guidance, the industry standards along with the Environment Agency and Design and Construction Guidance for foul and surface water sewers¹ dictates for below ground surface water drainage such that:

- There will be no surcharging of the drainage system for a 1 in 1-year storm.
- The drainage can be surcharged with no flooding for a 1 in 30-year storm.
- The drainage can flood on-site for a 1 in a 100-year storm with a 40% Climate Change allowance provided the flood water remains on site and does not affect safe ingress and egress to the site for occupiers, vehicles and pedestrians. Given the nature of the development and the proximity to buildings overland flooding will not be acceptable so in this instance all flows for the 1 in 100-year event plus 40% climate change will be attenuated below ground.

Existing Surface Water Discharge Rates and Volumes

- 2.9 Since the site is entirely impermeable and has been developed a calculation of expected surface water discharge for the site in its current state was undertaken. Assuming the current drainage has the capacity to accept a maximum rainfall intensity of 50mm/hr (which is roughly equivalent to a 10yr storm), this gives a maximum discharge rate of $2.78 \times 1\text{ha} \times 50\text{mm/hr} = 139\text{l/s/ha}$, which equates to 214l/s based on the existing impermeable area of 1.54ha.
- 2.10 Using MicroDrainage Greenfield Runoff Volume for the site it has been calculated as 263.4m^3 .

Infiltration

- 2.11 No infiltration testing has to date been undertaken however some SI for the site and a full SI for the adjacent site indicate underlying soils that are not suitable for infiltration. Testing will be undertaken to confirm this as part of the Phase 2 ground investigation.

Impermeable Area

- 2.12 The existing site comprises a building and a car park. The gross application site area is approximately 1.9ha.

Sustainable Drainage Hierarchy

- 2.13 The surface water flow from the proposed development must drain in accordance with the SUDs hierarchy as outlined in the National Planning Practice Guidance (NPPG). Various outfall options have been assessed for the discharge of surface water drainage for the proposed development. The National planning Practice Guidance stipulates that sites should "aim to discharge surface water run-off as high up the SUDs hierarchy as reasonably practicable". Hence, discharge to the existing separate MAG/UU sewers was favoured over discharging to a combined sewer. These were assessed in the order below:

¹ Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code")

Table 1 - SuDS Hierarchy

Order of Priority	Sustainable Drainage Measures	Suitability (Y/N)	Comments
1	Store rainwater for later use	Y	Rainwater harvesting via collection into an external below ground tank is potentially viable. The building is intended to have multiple tenants so the management and implementation of this may be challenging and the viability will need to be confirmed at a later stage.
2	Use infiltration techniques, such as porous surfaces in non-clay areas	N	Discounted – the site is underlain by non-productive clay. Infiltration testing has not been undertaken but previous SI gives a reasonable picture.
3	Attenuate rainwater in ponds or open water features for gradual release	N	Discounted due to proximity to the airfield and safeguarding restrictions to prevent the attraction of bird's presenting a strike risk to aircraft.
4	Implement green roofs for water retention.	N	Pitch roof design of proposed warehouse will not permit green roof.
5	Attenuate rainwater beneath permeable surfaces such as car parks.	N	Discounted due to required volume, tanking and potential maintenance issues
6	Attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Underground attenuation storage to be provided via a sealed tank.
7	Discharge rainwater direct to a watercourse	N	Discounted – significant constraints in the form of existing structures and utilities constrain the route along with third party land issues.
8	Discharge rainwater to a surface water sewer/drain	Y	Surface water to discharge to the existing surface water drain serving the site.
9	Discharge rainwater to the combined sewer.	N	Discharge to the local surface water sewer is considered preferential.

3. Proposed Surface Water Drainage

Climate Change

- 3.1 Table 5 of the updated guidance on climate change allowances published by the Environment Agency considers that until 2069, climate change is expected to result in a 10-20% increase in rainfall intensity. Beyond this it is expected there will be up to a 20-40% increase up to 2115. In determining which factors should be applied and tested for climate change, the expected lifespan of the development should be determined.
- 3.2 It is considered that the proposed development will have a lifespan of approximately 50 years. An increase in rainfall intensity of 40% has therefore been considered in line with for the design of the surface water drainage system.

Proposed Outfall

- 3.3 The proposed surface water network will outfall to the existing outfall drain serving the site owned by the Manchester Airport Group. Permission for discharge is granted to the landowner by MAG under the terms of the land sale agreement.

Proposed Impermeable Area

- 3.4 The catchment area for the proposed drainage network is considered cognisant of the proposed adjacent 401 development which has recently had planning approval granted, Ref: 131892/FO/2021 dated 2 February 2022. Therefore the catchment for this development is 1.54ha, of which the existing and proposed impermeable area are approximately the same based on google maps.

Proposed Discharge Rate

- 3.5 The proposed discharge rate will be limited to 107 l/s which is equivalent to brownfield rate for storm events outlined in Section 2.7 with a 50% betterment.

Proposed Drainage Design

- 3.6 The proposed surface water network will implement a number of interception methods including channel drains gullies and kerb drains which will be considered during detailed design. All of these will be provided with suitable sump outlet units for the control and capture of silt.
- 3.7 A Class 1 bypass oil separator as per EN858-1 and PPG13 guidance will be provided prior to the outfall to the existing MAG drainage.
- 3.8 The network will be designed to provide underground attenuation storage for up to the 1 in 100-year event plus 40% allowance for climate change. Allowance for long term storage will be included within the attenuation volume and will be discharge at a controlled rate of 2l/s/ha to the exiting surface water drainage network. Volume will be calculated which considers the delta in volume between the pre-development infiltration volumes compared with the reduced post development infiltration volume to provide attenuation to store the equivalent volume and outfall this at 2l/s/ha to the existing network.
- 3.9 The proposed surface water network drains via a series of below ground pipes and an online attenuation tank that will be sized to ensure flooding does not occur during the 1 in 100 year storm event plus 40 % climate change. A complex flow control device will be installed downstream of the attenuation tank and will restrict the discharge rate to a maximum of 107l/s. This will provide 50% betterment to the existing brownfield surface water discharge rate based on a rainfall intensity of 50mm/hr.

Soft Landscaping, Tree Pits and Rain Garden's

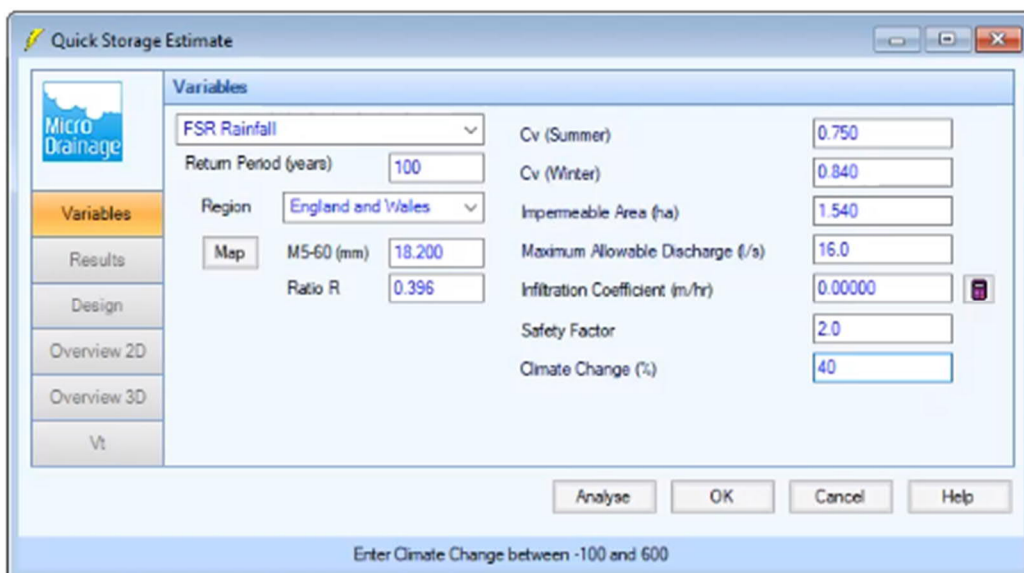
- 3.10 To reduce the site surface water discharge rate attenuation will be required. Options for proposed attenuation have been assessed in accordance with the SUDS hierarchy as per CIRIA SuDS Manual C753 (below). (refer to table 3-1)
- 3.11 Storage options are limited to below ground storage however consideration should be given during the detailed design to creating soft landscaped areas to decrease the amount of impermeable area along with the use of tree pits and rain gardens where viable in hard landscaped areas.

Most Sustainable  Least Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviers	✓	✓	
	Tanked systems - over-sized pipes/tanks - storms cells	✓		

Figure 2: SUDs Manual C753 storage option hierarchy

Attenuation

- 3.12 A quick storage calculation has been undertaken using Micro Drainage to estimate the required storage volumes.
- 3.13 A maximum storage volume of 1016m³ is estimated. This is likely to reduce during detailed design and will be provided via a below ground storage tank beneath the proposed car parks and .

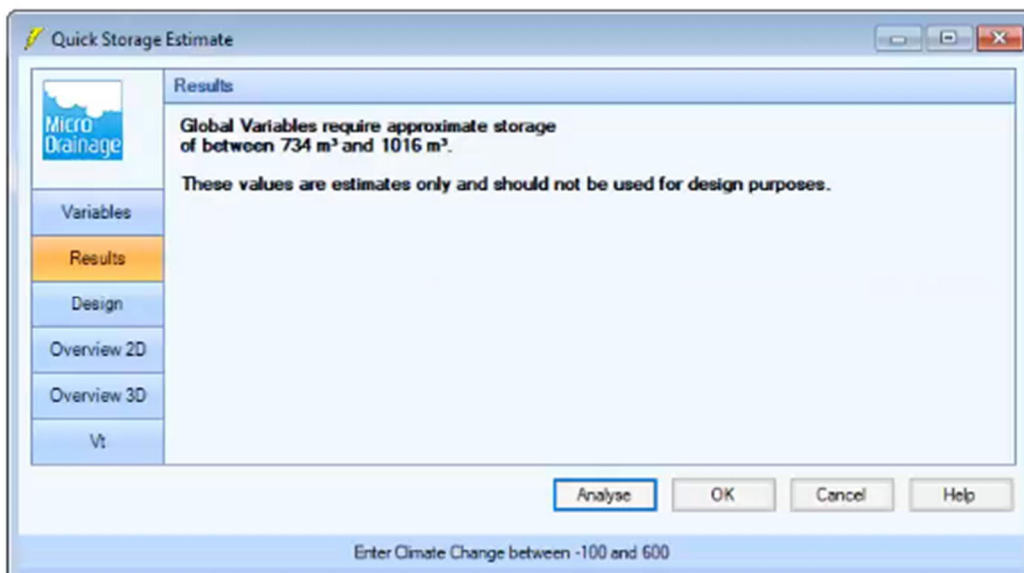


The 'Quick Storage Estimate' window shows the 'Variables' tab. The left sidebar has buttons for Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area contains input fields for various parameters:

Parameter	Value
FSR Rainfall	[Dropdown]
Return Period (years)	100
Region	England and Wales
Map	M5-60 (mm)
Ratio R	0.396
Cv (Summer)	0.750
Cv (Winter)	0.840
Impermeable Area (ha)	1.540
Maximum Allowable Discharge (l/s)	16.0
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	40

Buttons at the bottom: Analyse, OK, Cancel, Help. A footer note says: Enter Climate Change between -100 and 600.

Figure 3: Micro Drainage Quick Storage Estimate Variables



The 'Quick Storage Estimate' window shows the 'Results' tab. The left sidebar has buttons for Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area displays the following text:

Global Variables require approximate storage of between 734 m³ and 1016 m³.

These values are estimates only and should not be used for design purposes.

Buttons at the bottom: Analyse, OK, Cancel, Help. A footer note says: Enter Climate Change between -100 and 600.

Figure 4: Micro Drainage Quick Storage Estimate Results

4. Maintenance Strategy

Introduction

- 4.1 The maintenance of SuDS, attenuation and separation features are vital in ensuring that they work as efficiently as intended.
- 4.2 It is assumed that site maintenance is to be managed by Threadneedle Curtis Ltd. This responsibility may be subcontracted to a third party however this will be confirmed in the future.
- 4.3 A full maintenance strategy must be prepared by the Contractor and submitted to the Local Authority as part of the detailed submission.

Soft Landscaping, and Tree Pits

Construction

- 4.4 Heavy construction vehicles and equipment not directly involved in the construction of the proposed vegetation should be kept away from these areas. Excavations for the soft landscaping ground make-up should aim to be undertaken in times of dry weather, when possible, to prevent mobilisation of sediments from exposed surfaces. Exposed surfaces after excavations should be stabilised where required as soon as possible with grass seed and straw mulch. Perimeter controls should be installed prior to construction to protect neighbouring properties.

Maintenance Schedule

- 4.5 Table 2 below shows the operation and maintenance requirements for proposed SuDS features, adapted from the CIRIA C753 SuDS Manual.

Table 2 - Maintenance requirements for Attenuation Storage Tanks (CIRIA C753, 2015)

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

Table 3 - Maintenance requirements for flow control devices

Maintenance Schedule	Required Action	Typical Frequency
Before Start Regular Maintenance (as per manufacturer's requirements) Remedial Actions Monitoring	Removal of any inappropriate material from within the chambers and dispose off-site	At Start
	Removal of debris (which could include leaves, rubbish and branches) from areas served by the drainage (where it may cause risk to performance)	Monthly
	For blockages resulting in flooded manhole chambers, drain down manhole chamber and unblock	As required

	Inspect unit and hose down is required	Monthly at the start for three months, then six monthly
Before Start	Removal of any inappropriate material from within the chambers and dispose off-site	At Start
Regular Maintenance (as per manufacturer's requirements)	Removal of debris (which could include leaves, rubbish and branches) from areas served by the drainage (where it may cause risk to performance)	Monthly
Remedial Actions	For blockages resulting in flooded manhole chambers, drain down manhole chamber and unblock	As required

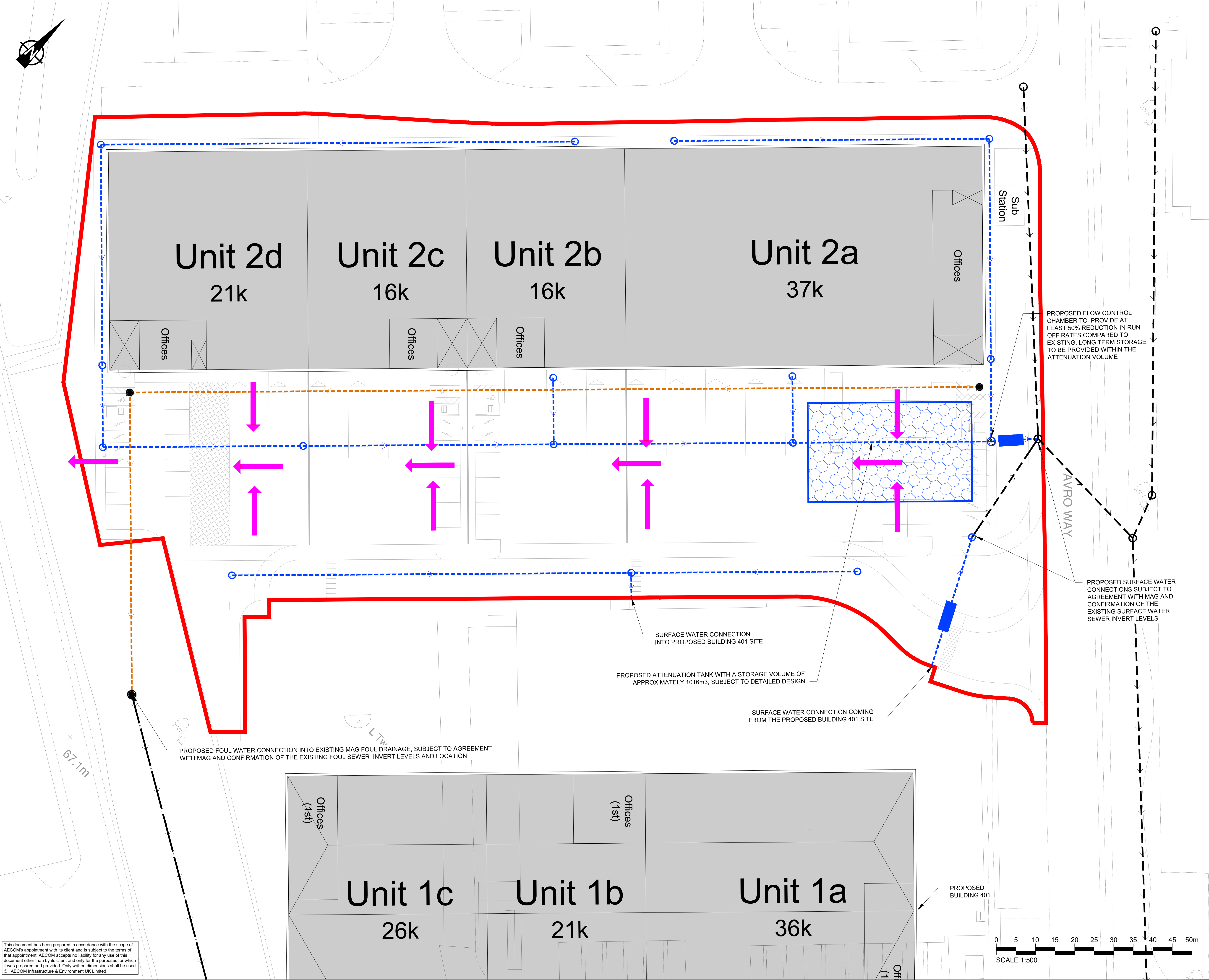
5. Foul Drainage

- 5.1 The capacity of the existing pump stations are to be investigated further at the detailed design stage which will determine if they need to be upgraded, replaced or retained. Within detail design there will be a capacity for 24hr emergency storage in case of pump failure.
- 5.2 The proposed foul network will discharge to the existing MAG owned pumping station present on site. A maximum discharge of 2.09l/s is expected and the new development is envisaged to have a lower discharge than existing due to the change in use from Catering to Logistics and distribution.
- 5.3 The existing on site pumping station will need to be relocated or made redundant to facilitate the construction of the building. The proposed foul drainage network will need to discharge into the MAG foul gravity network upstream from the Skychef pump station.

6. Summary

- 6.1 The proposed development on site is expected to retain a similar impermeable area of 1.54Ha. The network will be designed to provide underground attenuation storage for up to the 1 in 100-year event plus 40% allowance for climate change.
- 6.2 Underground attenuation will be provided that will be designed not to flood in a 1 in 100-year event, ensuring safe ingress and egress for the site occupiers, vehicles and pedestrians.
- 6.3 The complex flow control device will be installed downstream of the attenuation tank and will restrict the maximum discharge rate to 107l/s, this results in a 50% betterment to the existing brownfield surface water discharge rate based on a rainfall intensity of 50mm/hr. From a quick storage estimate undertaken using MicroDrainage it is estimated a maximum storage volume of 1016m³ is required.
- 6.4 For the foul network the capacity of the existing pump stations are to be investigated further at the detailed design stage which will determine if they need to be upgraded, replaced or retained. Within detail design there will be a capacity for 24hr emergency storage in case of pump failure

Appendix A Drainage Strategy Drawing



AECOM

PROJECT
BUILDING 402 - MANCHESTER AIRPORT

CLIENT
COLUMBIA THREADNEEDLE INVESTMENTS

CONSULTANT
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KEY

- BUILDING 402 SITE BOUNDARY
- EXISTING MANCHESTER AIRPORT GROUP SURFACE WATER SEWER
- EXISTING MANCHESTER AIRPORT GROUP FOUL WATER SEWER
- PROPOSED FOUL WATER DRAIN AND MANHOLE
- PROPOSED SURFACE WATER DRAIN AND MANHOLE
- PROPOSED SURFACE WATER ATTENUATION TANK
- PROPOSED FULL RETENTION SEPARATOR
- OVERLAND SURFACE WATER FLOW

NOTES

- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE RELEVANT DRAWINGS AND SPECIFICATIONS.
- IF RECEIVED ELECTRONICALLY, IT IS THE RECIPIENT'S RESPONSIBILITY TO PRINT TO THE CORRECT SCALE AT A0. ONLY WRITTEN DIMENSIONS SHALL BE USED.
- ALL DIMENSIONS IN METRES UNLESS STATED OTHERWISE.
- THE DESIGN OF BOTH THE PROPOSED FOUL AND SURFACE WATER DRAINAGE NETWORKS ARE SUBJECT TO COMPLETION AND REVIEW OF THE TOPOGRAPHICAL AND EXISTING DRAINAGE NETWORK SURVEY.
- PROPOSED BUILDING 401 SITE HAS RECEIVED PLANNING APPROVAL (REF: 131892/FO/2021 DATED 2 FEBRUARY 2022)
- DISCLAIMER THAT THE FINAL DESIGN WILL BE SUBJECT TO LOCATION OF EXISTING SERVICES AND DRAINAGE.
- SURFACE WATER DRAINAGE NETWORK WILL BE DESIGNED FOR STORM EVENTS UP TO THE 100 YEAR + 40% CLIMATE CHANGE.

KEY PLAN

ISSUE/REVISION

P1	25/02/2022	FOR PLANNING
IR	DATE	DESCRIPTION

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60663052

SHEET TITLE
BUILDING 402 DRAINAGE STRATEGY SHEET 1

SHEET NUMBER
60663052-ACM-402-XX-DR-C-25001

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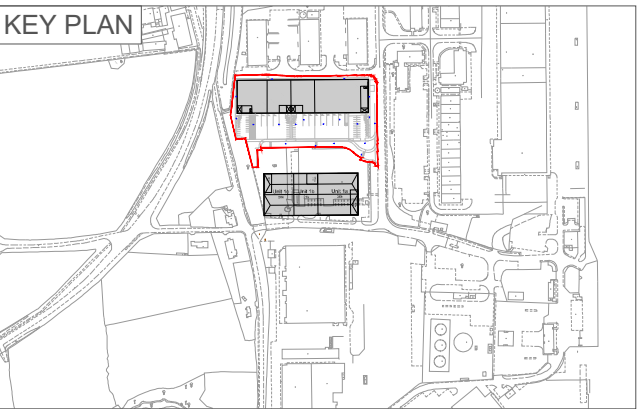
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 - EXISTING MANCHESTER AIRPORT GROUP FOUL WATER SEWER
 - EXISTING PUMPING STATION

- NOTES
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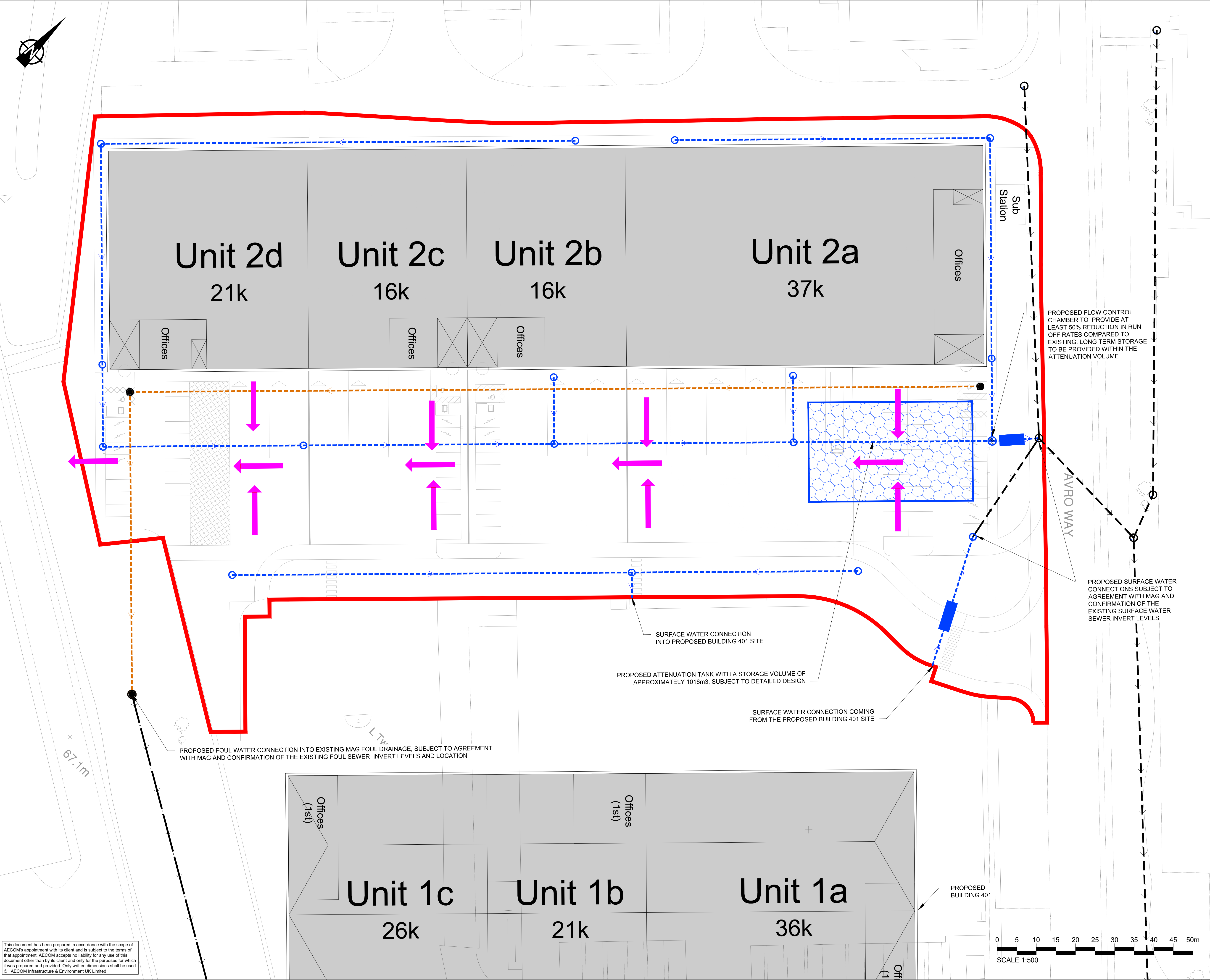
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 SHEET TITLE
 BUILDING 402 DRAINAGE STRATEGY SHEET 2
 SHEET NUMBER
 60663052-ACM-402-XX-DR-C-25002

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Appendix C - Drainage Strategy Drawing



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PROJECT
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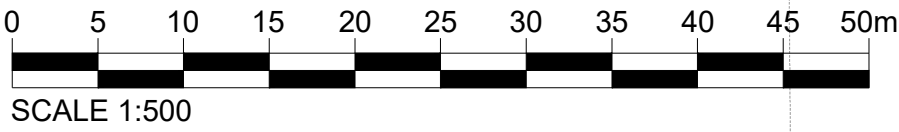
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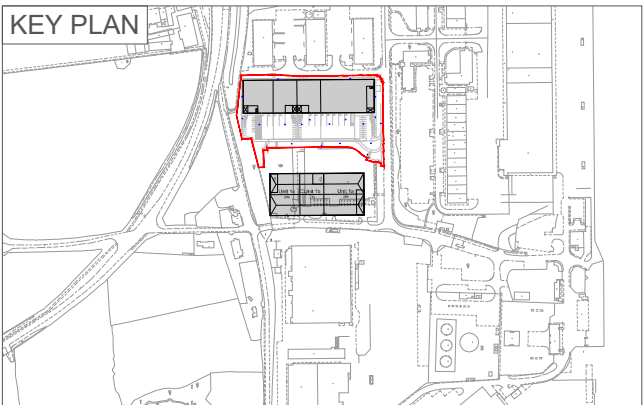
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 SHEET 2

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