Building 401 Redevelopment

Drainage Strategy

Columbia Threadneedle Investments

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1 Introduction

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 the Building 401 site at Manchester Airport on behalf of Columbia Threadneedle Investments (CTI).

AECOM are appointed by CTI to provide a number of pre-planning services including flood risk and drainage.

The following document outlines the proposals for the discharge of foul and surface water drainage from the development site.

2 Surface Water Drainage Assessment

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.

2.1 Existing Site Drainage

The site is currently served via separate privately owned surface water and foul networks.

The surface water network is a gravity network which discharges at the north east corner into the MAG network in Avro Way. The MAG network conveys flows east and ultimately discharges into the United Utilities owned Bollin outfall sewer.

The existing building and site are served by a gravity foul network which discharges to a MAG owned pumping station in the south western corner of the site. The pumping station pumps flows across Pinfold Lane into MAG Pumping Station 2 where flows are then conveyed to the wider MAG network.

The pumping station and site outfall drain will remain in situ under the ownership of the Manchester Airport Group. Connections have been permitted by MAG to Columbia Threadneedle Investments under the terms of the land sale agreement.

The existing drainage serving the existing buildings and infrastructure on site will be abandoned or removed in line with the demolition and earthworks strategy.

2.2 Existing Discharge Rates

In addition to the NPPG guidance, the industry standards along with the Environment Agency and Sewers for Adoption 7th Edition 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. Given the nature of the site use and the proximity to buildings overland flooding will not be acceptable so in this instance all flows for the 1:100-year event will be attenuated below ground.

2.2.1 Existing Surface Water Discharge Rates

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. The rationale method was used in line with CIRIA SuDS Manual C753 Equation 24.5 for this, where;

$Q = 2.78 \times C_v \times i \times A_i$

Q = design event peak rate of runoff (l/s)

C_v = volumetric runoff coefficient (as the site is impermeable this is 1)

i = rainfall intensity for the design return period (in mm/hr)

A_i = impervious area (hectares)

Storm Event	Rainfall Intensity (mm/hr)	Area (Ha)	Existing Discharge Rate (l/s)	Brownfield Restriction (50%)
1 in 1 year	32.23	2.25	201 l/s	101 l/s
1 in 30 year	79.12	2.25	494 l/s	247l/s
1 in 100 year (40% Climate Change)	143.95	2.25	900 l/s	450 l/s

Table 2-1 Existing Discharge Rates (Rationale Method)

To achieve the discharge rates calculated above the existing pipe would need to be upsized back to the main drain in Avro Way which would cause disruption to a key airport owned highway. It is therefore proposed to retain the existing outfall pipe which is a 300mm diameter drain with a capacity of 83l/s.

2.3 Infiltration

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.

2.4 Impermeable Area

The existing site comprises an existing building and bus management and wash area with small outbuildings and infrastructure along with external hardstanding areas. The gross application site area is approximately 2.1ha. The proposed scheme will introduce soft landscaping reducing the overall impermeable area to 1.6ha.

3 Sustainable Drainage Hierarchy

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 Thames Water sewers was favoured over discharging to a combined sewer. These were assessed in the order below:

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.	Y	Permeable paving to be provided to car parking areas with SUDS aggregate provided below for storage purposes.
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.

Table 3-1 SuDS Hierarchy

4 Proposed Drainage

4.1 Climate Change

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.

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.

4.2 Proposed Outfall

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.

4.3 Proposed Discharge Rate

The proposed discharge rate will be limited to 83l/s to the existing network which is the maximum flow rate that can be received by the existing outfall pipe. This is less than the equivalent brownfield rate for the storm events outlined in Section 2.2.1.

4.4 Proposed Drainage Design

The proposed surface water network will implement a number of catchment methods including channel drains, gullies and kerb drains. All of these will be provided with suitable sump outlet units for the control and capture of silt.

The network drains via a series of below ground pipes and an inline storage tank providing attenuation to the network. A Hydrobrake is to be installed downstream of the final tank restricting the flows in the network to 83/s.

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.

The network will be designed to provide below ground storage for up to the 1:100 year event plus 40% allowance for climate change.

The Hydrobrake restriction will be 83l/s at the outfall providing a significant reduction on the existing brownfield rates.

4.5 Soft Landscaping, Tree Pits and Rain Garden’s

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)

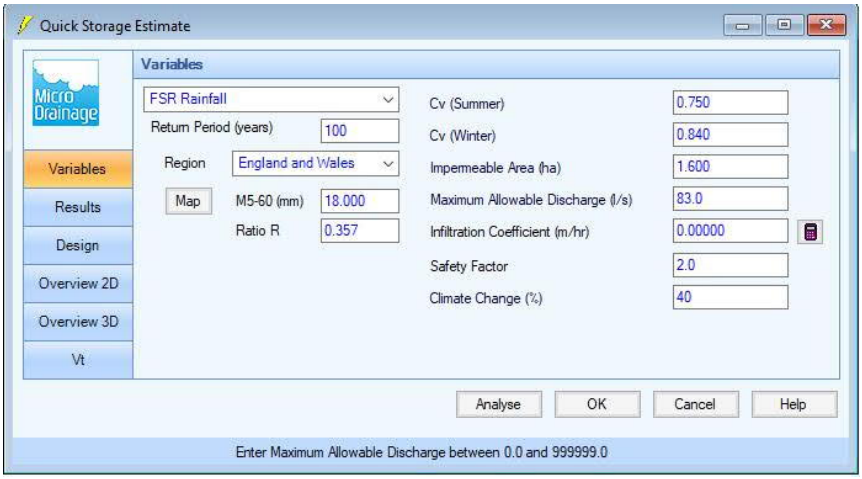
Storage options are limited to permeable paving and below ground storage however consideration should be given during the detailed design to creating soft landscaped areas to decrease the amount of impermeable area along with the use of tree pits and rain gardens where viable in hard landscaped areas.

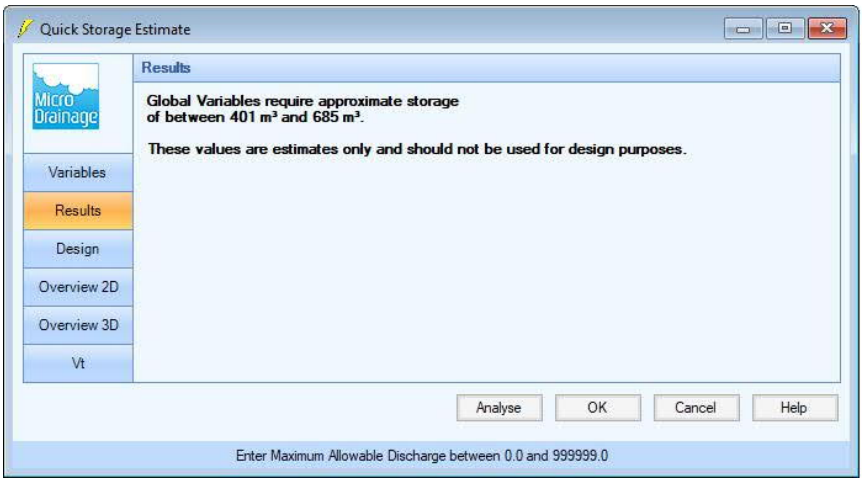
Most Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✔	✔	✔
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✔	✔	✔
	Filter strips and swales	✔	✔	✔
	Infiltration devices - soakaways - infiltration trenches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

Figure 1 - SUDs Manual C753 storage option hierarchy

4.6 Attenuation

A quick storage calculation has been undertaken using MicroDrainage software to estimate the required storage volumes.





A maximum storage volume of 685m^3 is estimated. This is likely to reduce during detailed design and will be provided via a below ground storage tank and permeable paving beneath the proposed car parks.

5 Maintenance Strategy

5.1 Introduction

The maintenance of SuDS, attenuation and separation features are vital in ensuring that they work as efficiently as intended.

It is assumed that site maintenance is to be managed by Columbia Threadneedle Investment's limited. This responsibility may be subcontracted to a third party however this will be confirmed in the future.

A full maintenance strategy must be prepared by the Contractor and submitted to the Local Authority as part of the detailed submission.

5.2 Soft Landscaping, and Tree Pits

5.2.1 Construction

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.

5.2.2 Maintenance Schedule

Table 6.2 below shows the operation and maintenance requirements for proposed SuDS features, adapted from the CIRIA C753 SuDS Manual.

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

Maintenance Schedule	Required Action	Typical Frequency
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Table 5-1 **Maintenance requirements for Attenuation Storage Tanks (CIRIA C753, 2015)**

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) **Remedial Actions**	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

Table 5-2 **Maintenance requirements for flow control devices**

6 Foul Drainage

The proposed foul network will discharge to the existing MAG owned pumping station present on site. A maximum discharge of 5l/s is permitted however it is envisaged the discharge from the development will be less than this.

The existing pumping station may need to be relocated to facilitate the construction of the building. This will be done if required via the construction of a new GRP package pumping station to replace the existing. The connection to the existing rising main will be maintained.

7 Appendix A – Drainage Strategy Drawing

EXISTING 300MM OUTFALL
DRAIN TO BE RETAINED

PROPOSED CLASS 1 PETROL
INTERCEPTOR

PROPOSED HYDROBRAKE
SET AT 83L/S

PROPOSED 600m3
ATTENUATION TANK

PROPOSED PERMEABLE
PAVING BENEATH PARKING
AREAS

Unit 1a
40k

Unit 1b
21k

Unit 1c
26k

Offices (1st)

Offices (1st)

Offices (1st)

4 Level Access

2 Level Access

3 Level Access

Cycles

Cycles

18 spaces (inc. 1 acc)

32 spaces (inc. 2 acc)

2 spaces (inc. 1 acc)

Landscaping

N

10m

SCALE 1:500

PLANNING BOUNDARY

EXISTING UU DRAINAGE

EXISTING MAG DRAINAGE

PROPOSED SW DRAINAGE

PROPOSED FOUL DRAINAGE

AECOM

BUILDING 401 DRAINAGE STRATEGY