



Relocation of The Limes: Fallowfield Campus Drainage Management Strategy

For University of Manchester

Date 11 December 2024

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Executive Summary

The Proposed Development will combine the University's Catering Central Processing Unit (CPU), Maintenance Services Unit (MSU), Environmental Services Unit (ESU) and Residences Team to form a facility consisting of facility management stores and workshops, catering facilities, staff workspaces and storage facilities.

The site is divided into two main sections: the western part is designated for parking, while the eastern section houses the building, which is split into the main building and the external stores.

The surface water drainage hierarchy has been considered and the preferred drainage solution for disposal of surface water is to discharge unrestricted to the existing private sewer via a below ground gravity network. The total site area is approximately 0.537 hectares.

The use of Sustainable Drainage Systems (SuDS) has been considered. Pollution prevention and site control methods will be utilised prior to outfall.

Pollution treatment measures will be provided in the form of Class 1 oil separators and silt traps on drainage elements which will filter and trap silts and debris and mitigate against the risk of pollution entering the sewer network. The use of permeable paving will also provide additional pollution treatment. All separators will be alarmed and remotely monitored at all times to ensure reliability.

The SuDS and other drainage elements will be regularly maintained by a nominated management company on behalf of the client/occupier.

Foul flows will be discharged to the existing private network at an unrestricted rate before connecting into the public United Utilities combined sewer south of the site. (See Appendix C and E)

1. Introduction

1.1 Development Context

- 1.1.1 This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of The University of Manchester to support the planning application. The Proposed Development will combine the University's Catering Central Processing Unit (CPU), Maintenance Services Unit (MSU), Environmental Services Unit (ESU) and Residences Team to form a facility consisting of facility management stores and workshops, catering facilities, staff workspaces and storage facilities.
- 1.1.2 The site is divided into two main sections: the western part is designated for parking, while the eastern section houses the building, which is split into the main building and the external stores.
- 1.1.3 The proposed site building is located just north of the Richmond Park Student Accommodation (M14 6YY) in the Fallowfield Campus of the University of Manchester (see Appendix A).
- 1.1.4 The site is currently used as a staff carpark and is therefore considered to be 'brownfield'.

1.2 Flood Risk

- 1.2.1 Previously BDP prepared a Flood Risk Assessment and Drainage Strategy (110184-EFR-0001, October 2015, which was submitted under planning application 110184/FO/2015/S1) and considers the flood risk posed to the site from all sources, in accordance with the NPPF and the local Strategic Flood Risk Assessment (SFRA).
- 1.2.2 The Flood Risk Assessment for this site has been produced by Hydrock, reference LINES-HYD-XX-XX-RP-WENV-0001.

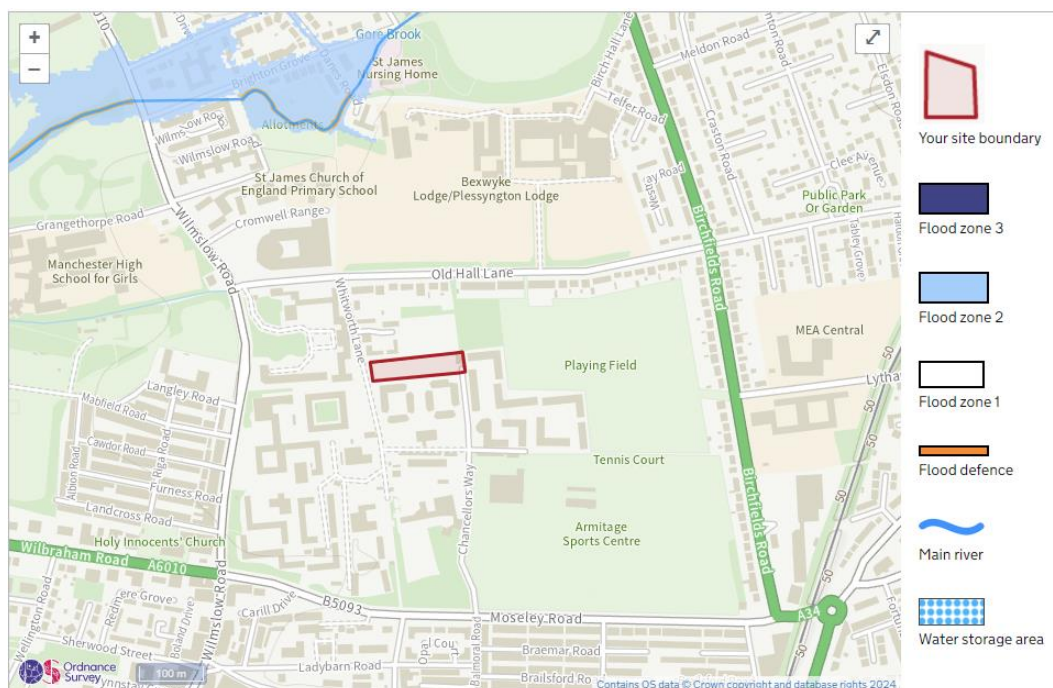


Figure 1: Surface water flood risk map

2. Development Description and Location

2.1 Site Location

2.1.1 This site is referenced in Table 1, and a location plan is provided in Figure 1.

Site Referencing Information	
Site Name	The Limes Relocation
Site Address & Location	Fallowfield, Manchester, M14 6YY
Council Area	Manchester City Council
Approximate Grid Reference	385894E, 394332N
Site Area	The total site area is 0.537ha.
Boundaries & Surrounding Land	The site is bound by Whitworth Lane to the west, houses and fields to the north, Unsworth Park student accommodation to the east and Richmond Park student accommodation to the south. There is also an access road (Chancellors way), south east of the site.
Existing Land Use and Access	The site is currently an existing carpark.
Elevation and Topography	A topographical survey has been undertaken and indicates that the site falls from South to North, from a level of ~45.2m AOD to ~44.2m AOD. See Appendix B for the full topographical survey.
Development Proposals	The proposed development is for the construction of a new office/kitchen for the Fallowfield Campus with associated car parking.
Vehicular access	The main vehicular access to the site will be from the existing access road, Chancellors way, south east of the site.

Table 1: Site referencing information



Figure 2: Site location

3. Drainage Strategy

3.1 Existing surface water runoff

- 1.1.1 The existing site is considered to be 'brownfield.'
- 1.1.2 The drainage strategy for the adjacent halls of residence (approved planning document, within application 110184/FO/2015/S1) sets out a drainage strategy for this site includes suitable attenuation for this area. The proposed approach is to discharge to the as-constructed system in line with this previously approved strategy.
- 1.1.3 The total site area is approximately 0.537 hectares.
- 3.1.1 The proposed site is to discharge into this system and not exceed its agreed upon 74l/s discharge rate.

3.2 Infiltration

- 3.2.1 Infiltration into ground is not considered feasible as the underlying ground is cohesive, based on investigations undertaken by Hydrock Consultants Ltd. See LINES-HYD-XX-XX-RP-G-2001.

3.3 Sustainable Drainage Systems (SuDS)

- 3.3.1 Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed to manage both the environmental risks resulting from the urban runoff and to contribute, wherever possible, to environmental enhancement. Therefore, SuDS objectives are to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).
- 3.3.2 SuDS help to mimic the natural flow of water ensuring that both the quantity and quality of the surface water is dealt with before feeding it into the drainage network. SuDS features usually come with added maintenance, however the benefits they reap are considered to outweigh this. The selection of the most appropriate SuDS features should consider constraints, requirements and maintenance of the site. It should be remembered that Local Planning Authorities expect SuDS to be investigated on construction projects. The implementation of SuDS features can assist in achieving the drainage requirements set out in the National Planning Policy Framework.
- 3.3.3 A strong design theme is essential if maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale SuDS should link with the individual plot structure, planting and amenity areas, gaining multiple benefits from a limited area of land.
- 3.3.4 The 'Management Train Approach' should be central to the surface water drainage strategy of a proposed site. The main objective is the treatment and control of runoff as near to source as possible, thus protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:
 - » Prevention - The use of good site design and housekeeping measures to prevent runoff and pollution (e.g. rainwater re-use).

- » Source Control - Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
- » Site Control - Management of water in a local area (e.g. ground storage/attenuation, detention ponds/basins).
- » Regional Control - Management of water from a site or various sites (e.g. wetlands, balancing ponds).

3.3.5 The SuDS philosophy for a development site is the promotion of Pollution Prevention and Site Control Techniques. The following design philosophy is proposed:

- » Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance.
- » Surface water discharge into the watercourse via attenuation ponds.
- » Site Control features (attenuation) to accommodate the additional surface water runoff generated by the development site before discharging into the watercourse.
- » Prevention measures in the form of rainwater re-use systems (tbc).
- » Provision of suitable oil separators in line with Pollution Prevention Guidance 3 criteria (where applicable).
- » Aim to limit, where possible, the impermeable fraction of development.

3.3.6 It is proposed that the development site has two levels of treatment. Source control via the use of SuDS features is considered as the first level of treatment and the provision of suitable oil separators as the second.

3.3.7 A review of the possible SuDS solutions that are feasible include:

- » SuDS Planters (subject to suitable RWP locations)
- » Filter Strips
- » Permeable paving
- » Oil separators

3.4 Prevention and Source Control - Principles and Objectives

3.4.1 The main objective of prevention and source control is the treatment and control of runoff as near to source as possible. Application of these techniques will require reduction of impermeable areas and techniques to restrict the runoff rates.

3.4.2 Prevention measures to be considered, where possible, as part of the overall approach to the management train at this site include rainwater harvesting. Typical examples are given in the SuDS Manual (Ciria C697) and are briefly described in Table 2 below. It must be noted that the effectiveness of each system is dependent on the final design as well as the actual site conditions.

SuDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for use on site?
Retention	Balancing Pond/Swale		Provides both storm water attenuation and treatment. Run-off from each rain event is detained and treated in the pool. The retention time promotes pollutant removal through sedimentation.	Good removal of pollutants, can be used where groundwater is vulnerable, good community acceptability, high ecological, and amenity benefits.	No reduction in run-off volume, land take may limit use in high density sites.	Unsuitable due to lack of available land.
	Sub-Surface Attenuation		Oversized pipes, tank systems and modular geo-cellular systems that can be used to create a below ground storage structure.	Modular and flexible, dual usage (infiltration/storage, high void ratios), can be installed beneath trafficked and soft landscaped areas.	No water quality treatment.	Sub-surface storage can be used.
Infiltration	Infiltration Trench		Surface water run-off can be discharged directly to ground for infiltration by soakaways, basins, or trenches. A prerequisite is that both groundwater and ground conditions are appropriate to receive the quality and quantity of water generated.	Reduces the volume of run-off, effective at pollutant removal, contributes to groundwater recharge, simple and cost effective, easy performance observation.	Requires appropriate pre-treatment, basins require a large flat area, offset from foundations.	Infiltration is not considered to be feasible.
	Infiltration Basin					
	Soakaway					

	Porous Paving		Block or porous paving allows run-off to infiltrate through to sub base layer. Water can then be infiltrated into ground or conveyed into storage or drainage systems.	Reduces the volume of run-off and if designed for infiltration contributes towards groundwater recharge. Easy to install and retrofit. Simple to manage. If lined can be used where groundwater is sensitive.	Not suitable for heavily trafficked areas or adoptable roads. Requires regular sweeping to prevent clogging with dirt.	Permeable paving with a liner may be used which will be conveyed into the proposed drainage system.
	Permeable Paving					
Detention	Detention Basin		Surface storage basins that provide flow control through attenuation. Normally dry and in certain situations the land may also function as a recreational facility.	Cater for a wide range of rainfall events, can be used where groundwater is vulnerable, potential for dual land use, easy to maintain.	Land take, little reduction in run-off volume, detention depths constrained by levels.	Unsuitable due to lack of available land.
	Enhanced Dry Swale		Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate.	Incorporate into landscaping, good removal of pollutants, reduces run-off rates and volumes, low cost.	Not suitable for steep areas, significant land take, not suitable in areas with roadside parking.	Unsuitable due to lack of available land.
	Enhanced Wet Swale					

Source Control	Green/Brown Roof		Multi-layered system that covers the roof of a building with vegetation cover/landscaping over a drainage layer. Designed to intercept and retain precipitation, reducing the volume of run-off and attenuating peak flows.	Mimics greenfield state of building footprint for high density developments, good removal of pollutants, ecological benefits, insulates buildings, sound absorption.	Additional weight, not appropriate for steep roofs, maintenance of roof vegetation.	Unsuitable due to the additional weight on the large span structure.
	Rainwater Harvesting		Similar to the use of water butts this prevention method stores rainwater runoff from roofs and external areas in below ground tanks. The water can then be used for irrigation purposes to the soft landscaping areas or alternatively pumped to an internal storage tank where the 'Grey' water can be used for WC's and washing machines.	Harvested grey water will collect and automatically be used for various systems, such as toilet flushing, outside taps etc. The result will be less water usage and cheaper bills and a greener building or commercial premises.	Rainfall is hard to predict and sometimes little or no rainfall can limit the supply of rainwater. It also should have a "mains water" top up to ensure that you don't run out of water.	Rainwater Harvesting can be used. If appropriate.
Filtration	Surface Sand Filter		Structures designed to treat surface water run-off through filtration using a sand bed filter medium. The filters can be designed with or without infiltration.	Flexibility of design, efficient in removing pollutants, suitable for retrofits and in	Not for high sediment content, detention times can support algae growth, minimum hydraulic head of	There is no requirement for high pollution reduction at this site.
	Sub-surface Sand Filter					

	Perimeter Sand Filter		Temporary storage of run-off is achieved through ponding above the filter layer. They are used where particularly high pollutant removal is required.	tightly constrained urban locations.	1.2m required, possible odour problems, high capital and maintenance cost.	
	Bioretention/ filter swale		Vegetated strips of land designed to accept run-off as overland sheet flow between a hard-surfaced area and a receiving system.	Landscaping features, effective in removing pollutants, flexible layout to fit into landscape, suited for highly impervious areas, good retrofit, capability, effective pre-treatment option.	Requires landscaping and management, large land required, not suitable for steep sites; no significant attenuation or reduction of flows.	No requirement for high pollution reduction; large land areas not available.

	Filter trench/drain		Shallow excavations filled with rubble or stone that create temporary subsurface storage for filtration of storm water run-off. Receive lateral inflow from an adjacent impermeable surface.	Hydraulic benefits achieved with filter trenches, trenches can be incorporated into site landscaping and fit well beside roads and car parks.	High clogging potential without effective pre-treatment, limited to small catchments, high cost of replacing filter material.	Filter drains can be used.
Conveyance	Conveyance Swales		Formal linear drainage features in which surface water can be stored or conveyed. They can be incorporated with water features such as ponds or waterfalls where appropriate.	Negate the need for underground pipework. Can provide some attenuation. Possible reduction in run-off volume via plant uptake and infiltration.	Potential trip/wheel hazard, disabled access issues.	Could be used where conveyance is required but the lack of formal outside spaces at the site makes the aesthetic aspects unnecessary.
	Rills					
Wetland	Shallow Wetland		Wetlands provide storm water attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation.	Good pollutant removal and if lined can be used where groundwater is vulnerable. Good community acceptability,	Land take is high, requires base flow, little reduction in run-off volume, not suitable for steep sites.	Unsuitable due to lack of available land.
	Extended Detention Wetland					
	Pond Wetland					
	Pocket Wetland					

	Submerged Gravel Wetland		Wetlands detail flows for an extended period to allow sediments to settle and to remove contaminants. They can provide significant ecological benefits.	ecological and amenity benefits.		
	Wetland Channel					

Table 2: SuDS considerations

3.5 Surface Water Drainage Strategy

- 3.5.1 Surface Water Drainage Strategies must follow the hierarchy of surface water disposal as set out in Building Regulations - Approved Document H, as listed below;
- » **Option 1** - Into the ground (infiltration)
 - » **Option 2** - To a watercourse
 - » **Option 3** - To a public/private sewer
- 3.5.2 Infiltration into ground is not considered feasible as the underlying ground is cohesive. based on investigations undertaken by Hydrock Consultants Ltd.
- 3.5.3 Option 2, to a watercourse, is not considered feasible due to there being no available watercourses within the vicinity of the site.
- 3.5.4 Therefore, Option 3 is the preferred method, whereby surface water will discharge into the nearest private surface water within Chancellors Way.
- 3.5.5 Surface water runoff from roofs will be directed to rainwater pipes. Run off from the roofs and external areas will then be directed to the below ground gravity network. Run off from car parks will be directed to an oil interceptor before joining the wider private drainage network of carrier drains (see Appendix C Hydrock proposed surface water drainage layout).
- 3.5.6 A hydraulic model has been created using drainage software as part of the preliminary drainage design, which defines pipe sizes and attenuation volumes. Hydraulic calculations have been provided in Appendix D. It is noted that these rates and volumes are preliminary and may change at detailed design stage when more specific information is available.
- 3.5.7 A climate change allowance of 40% has been applied.
- 3.5.8 The proposed drainage layout is designed in accordance with Design and Construction Guidance. No above ground flooding for the 1 in 30-year storm event should occur. An assessment of extreme storm event, the 100-year event plus 40% climate change has been carried out. The storm-water volumes generated by this event are classed as exceedance flooding and will be safely contained on site and directed away from the buildings, where they will sit in the low points of the site and drain into the surface water infrastructure via filter drains as water levels recede.
- 3.5.9 As part of the drainage strategy, we are proposing the following:
- » The proposed drainage system will be a managed gravity system discharging into the existing private surface water sewer.
 - » The car parking catchment areas will be drained via drainage channels, kerb drains, filter strips and permeable paving and then discharge into the new private surface water network. Surface runoff from the roof will also discharge to the new private surface water network.
 - » Some surface water runoff from the external areas of the development will be treated via the proposed permeable paving system or filter strip, before being directed to the oil interceptor.
 - » Pollution treatment measures will be provided in the form of Class 1 oil separators and silt traps on drainage elements which will filter and trap silts and debris and mitigate against the risk of pollution entering the sewer network. All separators will be alarmed and remotely monitored at all times to ensure reliability.

3.6 Water Quality

- 3.6.1 The primary pollution control measure for the infrastructure elements will be in the form of an oil interceptor. Additionally, SuDS features (filter strip and permeable paving) have been integrated into the design to manage pollution for a portion of the site. Further pollution control will be provided in the form of trapped gullies.

3.7 Foul Drainage Strategy

- 3.7.1 Foul flows will outfall at an unrestricted rate to the existing private foul sewer network, east of the site before discharging into the public united utilities sewer located in Moseley Road, south of the site. (See Appendix E)
- 3.7.2 A map showing the location of the existing United Utilities public sewer is included in Appendix E.

3.8 Management, Maintenance and Residual Risk

- 3.8.1 The proposed drainage layout will be designed in accordance with building regulations. SuDS guidance will be taken from Ciria C753.
- 3.8.2 Run-off from roofs is considered to be generally clean with limited contamination, and will be discharged directly to SuDS planters before entering the proposed drainage infrastructure. Silt is to be prevented from entering the drainage system by the use of trapped gullies, interceptors or by the use of sustainable drainage techniques.
- 3.8.3 Run-off from car park and other external areas will be treated via proprietary treatment system of a full-retention oil interceptor.
- 3.8.4 A private management company will maintain the drainage infrastructure as part of a site-wide management and maintenance schedule as shown in Table 3.
- 3.8.5 Access and egress arrangements to and from the new development, should exceedance flooding occur, will be via the access road in Chancellors way, south east of the site.
- 3.8.6 Flood risk to people and property can be managed but it can never be completely removed. Residual risk remains after flood management or mitigation measures have been put in place. This relates to a rainfall event beyond what can be fully quantified.

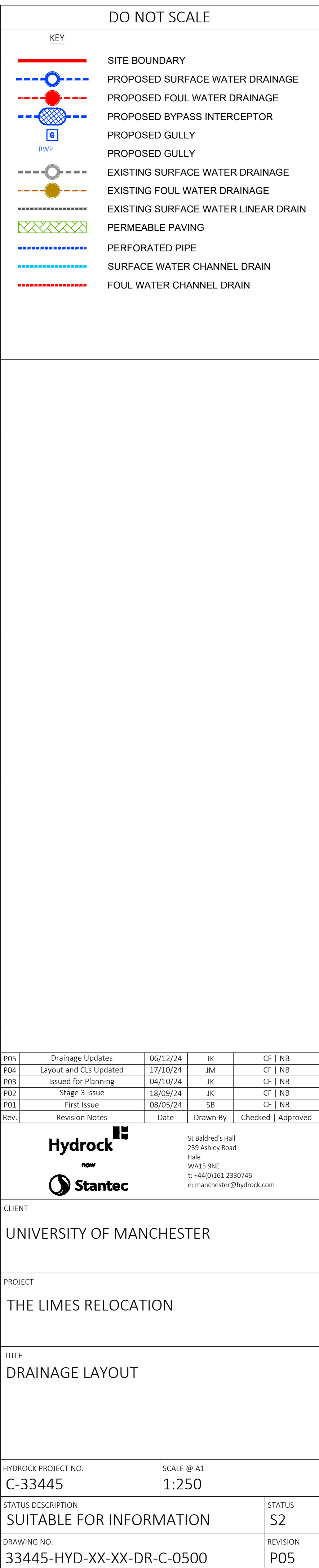
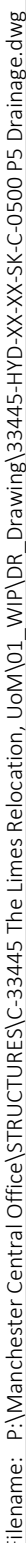
Item	Maintenance	Frequency per year
Gullies	Removal of silt accumulation from mud bucket. Gratings checked for operation/damage – replaced if required.	2
Foul Water Manholes	Manholes covers checked for operation/damage – seating's re-greased or replaced as required. Check for blockages and or damage to invert channel/inlets – jetting pipe runs if blocked, any damage to be repaired. All access ladders & other associated ironworks to be checked for corrosion & fixings to be checked for deterioration. To be repaired or replaced dependant of extent of damage.	1
Surface Water Manholes, Flow Controls	As Above All catch pits/Vortex Separators to have silt/solid accumulation removed & base jetted clean.	1
Drainage Channels	All catch/access pits to have silt/solid accumulation removed. Channel run to be jetted through between access points. Any channel grates to be inspected for damage & replaced as necessary.	2

Table 3: Drainage maintenance

Appendix A

Appendix B

Appendix C



Appendix D

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		



Porous Paving

Type : Porous Paving

Dimensions	
Exceedance Level (m)	44.938
Depth (m)	0.500
Base Level (m)	44.438
Paving Layer Depth (mm)	130
Membrane Percolation (m/hr)	1.0
Porosity (%)	30
Length (m)	39.627
Long. Slope (1:X)	10000.00
Width (m)	4.979
Total Volume (m³)	22.390

Under Drain	
Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Inlets	
Inlet	
Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area (11)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets	
Outlet	
Outgoing Connection	Pipe (14)
Outlet Type	Under Drain

Advanced	
Conductivity (m/hr)	216.0

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		



Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
Pipe	10.790	Pipe	224.786		0.6	375	44.780	43.880
Pipe (1)	57.981	Pipe	230.084		0.6	375	45.000	43.832
Pipe (2)	26.678	Pipe	229.984		0.6	375	44.840	43.580
Pipe (3)	26.284	Pipe	230.560		0.6	375	45.060	43.464
Pipe (4)	11.861	Pipe	409.008		0.6	375	45.030	43.739
Pipe (5)	3.134	Pipe	10.011		0.6	375	45.110	43.710
Pipe (6)	9.609	Pipe	204.452		0.6	375	45.110	43.397
Pipe (7)	11.610	Pipe	127.577		0.6	225	44.730	43.830
Pipe (14)	1.808	Pipe	2.107		0.6	150	44.942	44.438
Pipe (11)	24.430	Pipe	198.616		0.6	150	44.778	43.998
Pipe (12)	12.906	Pipe	201.649		0.6	150	44.776	43.875
Pipe (13)	29.292	Pipe	200.631		0.6	225	44.781	43.811
Pipe (15)	17.163	Pipe	201.918		0.6	225	44.781	43.665
Pipe (16)	16.168	Pipe	149.702		0.6	150	44.775	44.025
Pipe (17)	10.585	Pipe	168.009		0.6	150	44.754	43.917
Pipe (18)	7.164	Pipe	152.420		0.6	150	44.754	43.854
Pipe (19)	48.522	Pipe	150.224		0.6	150	44.893	43.807
Pipe (20)	3.138	Pipe	156.914		0.6	150	44.889	43.484
Pipe (8)	23.582	Pipe	203.296		0.6	300	44.742	43.580

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Part Family	Lock	Flow Restriction (L/s)	Culvert Type	Culvert Entrance
Pipe	45.000	43.832		None		(None)	(None)
Pipe (1)	44.840	43.580		None		(None)	(None)
Pipe (2)	45.060	43.464		None		(None)	(None)
Pipe (3)	45.366	43.350		None		(None)	(None)
Pipe (4)	45.110	43.710		None		(None)	(None)
Pipe (5)	45.110	43.397		None		(None)	(None)
Pipe (6)	45.366	43.350		None		(None)	(None)
Pipe (7)	45.030	43.739		None		(None)	(None)
Pipe (14)	44.840	43.580		None	0.0	(None)	(None)
Pipe (11)	44.776	43.875		None		(None)	(None)
Pipe (12)	44.781	43.811		None		(None)	(None)
Pipe (13)	44.781	43.665		None		(None)	(None)
Pipe (15)	44.742	43.580		None		(None)	(None)
Pipe (16)	44.754	43.917		None		(None)	(None)
Pipe (17)	44.754	43.854		None		(None)	(None)
Pipe (18)	44.893	43.807		None		(None)	(None)
Pipe (19)	44.889	43.484		None		(None)	(None)
Pipe (20)	45.060	43.464		None		(None)	(None)
Pipe (8)	45.060	43.464		None		(None)	(None)

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		



Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	S12		Time of Concentration	0.015	100	0	100	0.015
Catchment Area (1)	S07		Time of Concentration	0.008	100	0	100	0.008
Catchment Area (2)	S14		Time of Concentration	0.014	100	0	100	0.014
Catchment Area (3)	S14		Time of Concentration	0.018	100	0	100	0.018
Catchment Area (4)	S13		Time of Concentration	0.018	100	0	100	0.018
Catchment Area (5)	S01		Time of Concentration	0.112	100	0	100	0.112
Catchment Area (6)	S02		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (7)	S02		Time of Concentration	0.007	100	0	100	0.007
Catchment Area (8)	S02		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (9)	S02		Time of Concentration	0.047	100	0	100	0.047
Catchment Area (10)	S03		Time of Concentration	0.041	100	0	100	0.041
Catchment Area (11)	Porous Paving		Time of Concentration	0.020	100	0	100	0.020
Catchment Area (12)	S15		Time of Concentration	0.020	100	0	100	0.020
Catchment Area (13)	S03		Time of Concentration	0.006	100	0	100	0.006
Catchment Area (14)	S04		Time of Concentration	0.018	100	0	100	0.018
Catchment Area (15)	S11		Time of Concentration	0.013	100	0	100	0.013
Catchment Area (16)	S11		Time of Concentration	0.015	100	0	100	0.015
Catchment Area (17)	S13		Time of Concentration	0.028	100	0	100	0.028
Catchment Area (18)	S06		Time of Concentration	0.012	100	0	100	0.012
Catchment Area (19)	S08		Time of Concentration	0.007	100	0	100	0.007
TOTAL		0.0		0.429				0.429

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		



Flow Options

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

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Cover Depth (m)	1.200
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Manhole Options

Apply Offset	☐
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Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024			
	Designed by: JK	Checked by:	Approved By:	
Report Details: Type: Outfall Details Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE			

Outfalls

Outfall	Outfall Type	Gated	Fixed Surcharged Level (m)	Level Curve
EX S05	Free Discharge			

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		





FSR: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max.
Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Porous Paving	FSR: 2 years: +0 %: 120 mins: Winter	44.476	44.454	0.034	0.016	1.0	1.800	0.000	0.000	0.4	2.186	91.962	OK

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		



FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max.
Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Porous Paving	FSR: 30 years: +0 %: 60 mins: Winter	44.495	44.469	0.053	0.031	2.9	2.882	0.000	0.000	1.2	3.297	87.126	OK

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		



FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By:
Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Porous Paving	FSR: 100 years: +40 %: 60 mins: Winter	44.525	44.496	0.083	0.058	5.4	4.533	0.000	0.000	2.9	6.996	79.752	OK

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		




FSR: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S01	S02	44.780	43.983	0.109	8.223	0.7	0.13	17.5	OK
Pipe (1)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S02	S03	45.000	43.947	0.120	12.978	0.8	0.19	25.6	OK
Pipe (2)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S03	S04	44.840	43.705	0.147	16.640	0.7	0.22	29.6	OK
Pipe (3)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S04	EX S05	45.060	43.634	0.162	29.951	1.1	0.37	48.5	OK
Pipe (4)	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	EX S18	EX S19	45.030	43.739	0.000	0.000	0.0	0	0.0	OK
Pipe (5)	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	EX S19	EX S20	45.110	43.710	0.050	0.000	0.0	0	0.0	OK
Pipe (6)	FSR: 2 years: +0 %: 30 mins: Summer	Pipe	EX S20	EX S05	45.110	43.493	0.119	0.000	0.2	0.02	2.9	OK
Pipe (7)	FSR: 2 years: +0 %: 15 mins: Summer	Pipe	EX S17	EX S18	44.730	43.830	0.000	0.000	0.0	0	0.0	OK
Pipe (14)	FSR: 2 years: +0 %: 120 mins: Winter	Pipe	Porous Paving	S03	44.942	44.468	0.040	2.184	0.5	0	0.4	OK
Pipe (11)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S11	S12	44.778	44.059	0.070	2.068	0.5	0.34	4.3	OK
Pipe (12)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S12	S13	44.776	43.955	0.087	3.184	0.6	0.5	6.3	OK
Pipe (13)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S13	S14	44.781	43.904	0.103	6.491	0.7	0.35	12.8	OK
Pipe (15)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S14	S15	44.781	43.778	0.106	8.773	0.9	0.46	16.7	OK
Pipe (16)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S06	S07	44.775	44.061	0.042	0.884	0.4	0.13	1.8	OK
Pipe (17)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S07	S08	44.754	43.966	0.052	1.440	0.5	0.21	2.9	OK
Pipe (18)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S08	S09	44.754	43.910	0.053	1.937	0.7	0.27	3.9	OK
Pipe (19)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S09	S10	44.893	43.856	0.100	1.938	0.4	0.24	3.5	OK
Pipe (20)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S10	S04	44.889	43.635	0.150	1.919	0.2	0.22	3.1	Surcharged
Pipe (8)	FSR: 2 years: +0 %: 15 mins: Winter	Pipe	S15	S04	44.742	43.680	0.135	10.211	0.6	0.24	18.9	OK

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		




FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S01	S02	44.780	44.031	0.157	15.549	0.8	0.25	33.1	OK
Pipe (1)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S02	S03	45.000	43.995	0.178	24.546	1.0	0.38	49.3	OK
Pipe (2)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S03	S04	44.840	43.773	0.226	31.729	0.8	0.43	56.2	OK
Pipe (3)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S04	EX S05	45.060	43.722	0.244	56.985	1.2	0.71	93.8	OK
Pipe (4)	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	EX S18	EX S19	45.030	43.739	0.000	0.000	0.0	0	0.0	OK
Pipe (5)	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	EX S19	EX S20	45.110	43.710	0.086	0.000	0.0	0	0.0	OK
Pipe (6)	FSR: 30 years: +0 %: 30 mins: Summer	Pipe	EX S20	EX S05	45.110	43.556	0.183	0.000	0.2	0.04	5.9	OK
Pipe (7)	FSR: 30 years: +0 %: 15 mins: Summer	Pipe	EX S17	EX S18	44.730	43.830	0.000	0.000	0.0	0	0.0	OK
Pipe (14)	FSR: 30 years: +0 %: 60 mins: Winter	Pipe	Porous Paving	S03	44.942	44.487	0.072	3.292	0.7	0.01	1.2	OK
Pipe (11)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S11	S12	44.778	44.086	0.113	3.907	0.6	0.65	8.2	OK
Pipe (12)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S12	S13	44.776	44.012	0.138	6.019	0.7	0.94	11.7	OK
Pipe (13)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S13	S14	44.781	43.950	0.160	12.262	0.8	0.66	24.3	OK
Pipe (15)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S14	S15	44.781	43.845	0.173	16.579	1.0	0.86	31.5	OK
Pipe (16)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S06	S07	44.775	44.075	0.061	1.669	0.5	0.24	3.5	OK

Project: The Limes Relocation for the University of Manchester		Date: 04/10/2024		
		Designed by: JK	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase		Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		



Pipe (17)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S07	S08	44.754	43.988	0.077	2.722	0.6	0.41	5.5	OK
Pipe (18)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S08	S09	44.754	43.936	0.078	3.670	0.8	0.51	7.4	OK
Pipe (19)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S09	S10	44.893	43.881	0.150	3.663	0.4	0.48	6.9	OK
Pipe (20)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S10	S04	44.889	43.730	0.150	3.645	0.4	0.44	6.2	Surch arged
Pipe (8)	FSR: 30 years: +0 %: 15 mins: Winter	Pipe	S15	S04	44.742	43.747	0.213	19.300	0.6	0.44	34.2	OK

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		




FSR: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S01	S02	44.780	44.100	0.225	28.165	0.9	0.45	59.8	OK
Pipe (1)	FSR: 100 years: +40 %: 15 mins: Summer	Pipe	S02	S03	45.000	44.053	0.285	39.690	1.0	0.65	85.9	OK
Pipe (2)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S03	S04	44.840	44.023	0.375	58.269	0.8	0.68	89.1	Surcharged
Pipe (3)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S04	EX S05	45.060	43.934	0.375	104.259	1.4	1.14	149.5	Surcharged
Pipe (4)	FSR: 100 years: +40 %: 15 mins: Summer	Pipe	EX S18	EX S19	45.030	43.739	0.005	0.000	0.0	0	0.0	OK
Pipe (5)	FSR: 100 years: +40 %: 30 mins: Summer	Pipe	EX S19	EX S20	45.110	43.721	0.136	0.000	0.0	0	1.5	OK
Pipe (6)	FSR: 100 years: +40 %: 15 mins: Summer	Pipe	EX S20	EX S05	45.110	43.724	0.350	0.000	0.4	0.22	30.9	OK
Pipe (7)	FSR: 100 years: +40 %: 15 mins: Summer	Pipe	EX S17	EX S18	44.730	43.830	0.000	0.000	0.0	0	0.0	OK
Pipe (14)	FSR: 100 years: +40 %: 60 mins: Winter	Pipe	Porous Paving	S03	44.942	44.515	0.118	6.990	0.8	0.02	2.9	OK
Pipe (11)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S11	S12	44.778	44.499	0.150	7.094	0.6	0.81	10.1	Flood Risk
Pipe (12)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S12	S13	44.776	44.412	0.150	10.939	0.9	1.25	15.5	Surcharged
Pipe (13)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S13	S14	44.781	44.323	0.225	22.269	0.8	0.92	33.5	Surcharged
Pipe (15)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S14	S15	44.781	44.180	0.225	30.104	1.2	1.28	46.8	Surcharged
Pipe (16)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S06	S07	44.775	44.094	0.112	3.023	0.5	0.44	6.4	OK

Project: The Limes Relocation for the University of Manchester	Date: 04/10/2024		
	Designed by: JK	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address: St Baldred's Hall 239 Ashley Road, Hale WA15 9NE		



Pipe (17)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S07	S08	44.754	44.073	0.150	4.931	0.5	0.56	7.6	Surcharged
Pipe (18)	FSR: 100 years: +40 %: 15 mins: Summer	Pipe	S08	S09	44.754	44.020	0.150	5.942	0.6	0.68	9.7	Surcharged
Pipe (19)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S09	S10	44.893	44.033	0.150	6.660	0.6	0.71	10.3	Surcharged
Pipe (20)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S10	S04	44.889	43.935	0.150	6.635	0.7	0.92	12.9	Surcharged
Pipe (8)	FSR: 100 years: +40 %: 15 mins: Winter	Pipe	S15	S04	44.742	44.004	0.300	35.052	0.8	0.7	54.1	Surcharged

Appendix E

