

Mayfield Site Compound

Drainage Strategy

0046688-BHE-XX-XX-RP-C-1001

0046688

29 November 2023

Revision P01

Revision	Description	Issued by	Date	Checked
P01	Draft Issue	NC	29/11/2023	CB

[https://burohappold.sharepoint.com/sites/046688/05_Discipline Specific/08_Civils - Infrastructure/Network Rail Compound SW Report/Drainage Strategy Report/0046688-BHE-XX-XX-RP-C-1001 P01.docx](https://burohappold.sharepoint.com/sites/046688/05_Discipline%20Specific/08_Civils%20-%20Infrastructure/Network%20Rail%20Compound%20SW%20Report/Drainage%20Strategy%20Report/0046688-BHE-XX-XX-RP-C-1001%20P01.docx)

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Glossary

Term	Definition
Attenuation	A method to reduce a flood peak to prevent flooding, often utilising temporary storage, but increasing the duration of the flow.
Brownfield	Land previously developed that has potential to be regenerated.
Catchment	A surface water catchment is the area which water drains into a watercourse. A groundwater catchment is the area that consists of the groundwater river flow.
Design Flood Level	This is the level of flooding that flood defences or mitigation measures are designed against. This is typically the 1% (1 in 100) flood level.
Discharge	The rate of flow of water measured in terms of volume per unit time.
EA	Environment Agency.
Flood Defence	A natural or man-made infrastructure used to prevent certain areas from inundation from flooding, and / or the provision of flood warning systems.
Floodplain	Area of land adjacent to a water course which water flows or is stored during a flood event or would otherwise be flooded in the absence of flood defences.
Flood Resilience	Improving flood resistance, e.g. reducing the risk of properties against flooding events.
Flood Risk	The level of risk to personal safety and damage to property resulting from flooding due to the frequency or likelihood of flood events.
Flood Risk Assessment (FRA)	An assessment of the flood risks to the proposed development over its expected lifetime and the possible flood risks to the surrounding areas, assessing flood flows, flood storage capacity and runoff.
Flood Risk Management (FRM)	Managing and/or reducing flood risk to people, property and the environment.
Flood Zones	The statistical chance of a flood event occurring in any one year, stated as a percentage. PPS25 identifies three flood zones.
Fluvial Flooding	Related or connected to a watercourse (river or stream).
Greenfield	Land which has not been previously developed.
Groundwater	Water present within underground strata known as aquifers.
Inundation	Flooding of land with water.
m AOD	Metres Above Ordnance Datum.
Mitigation	Actions taken to reduce either the probability of flooding or the consequences of flooding or a combination of the two.
Previously Developed Land	Land which is or was occupied by a permanent structure (excluding agricultural or forestry buildings) and associated fixed surface infrastructure.
Red line boundary	Boundary drawn to indicate the site area on which the planning application is based.
Residual Risk	The risk that remains after risk management and mitigation measures have been implemented
Risk	Risk is the probability that an event will occur and the impact (or consequences) associated with that event.
Runoff	Water flow over surfaces to the drainage system. Runoff occurs if the ground is impermeable or if permeable ground is saturated.
Strategic Flood Risk Assessment (SFRA)	An SFRA is the assessment and 'categorisation' of flood risk on an area-wide basis in accordance with PPS25.
Surface Water Flooding	Surface water flooding occurs when the volume of water is unable to filtrate through the ground to enter drainage systems, and therefore runs quickly off land and results in localised flooding. This type of flooding is usually associated with intense rainfall.
Sustainable Drainage Systems (SuDS)	SuDS are used as a strategy to manage surface water in a sustainable manner or least damaging solution through management practices and physical structures.
Sustainable Development	Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.
Water Table	The top surface of the saturated zone within the aquifer.

1 Executive Summary

This drainage strategy has been prepared in support of the discharge planning conditions and to set the principles for the drainage design to serve the Mayfield Site Compound. The latest proposed site plan is located in **Figure 3**.

The Site is located to the east of Manchester City Centre, approximately 400m south-east of Manchester Piccadilly Railway Station. The postcode and grid reference for the site are M12 6HG and 385324E, 397537N. The site area is approximately 1.05 hectare (ha). The site is bound by Temperance Street to the northeast, a railway viaduct to the north, the A635 Mancunian Way to the south and Hoyle Street runs through the middle of the proposed development, as shown in **Figure 1**. The existing site is used as a construction yard and temporary storage of materials.

The drainage strategy will be in accordance with Section H of the Building Regulations, the Manchester City Council Lead Local Flood Authority (LLFA) and United Utilities (UU) requirements.

As a result of consultation with Manchester City Council (MCC) who are the Lead Local Flood Authority (LLFA), the proposed discharge rate is to be restricted to 50% of the existing brownfield runoff rate with 2l/s/ha to be subtracted from this peak 50% discharge rate. Refer to document 'Stage 4 Drainage Strategy Mayfield Park 0042912 Revision P07' for agreed peak discharge rates.

The proposed surface water drainage will consist of traditional gullies and channels since the proposed development will be subjected to frequent heavy vehicle loading. The surface water network will ultimately discharge to the River Medlock via an existing outfall to the south of the site, constructed as part of the Mayfield Park development.

It is not anticipated that any foul water drainage will be required for the proposed development.

2 Introduction

2.1 Appointment and Brief

This drainage strategy has been prepared in support of the planning application for the Network Rail Compound as part of the wider Mayfield development (herein referred to as the proposed development).

2.2 Limitations

This report is based on the interpretation and assessment of data provided by third parties. It should be noted that the detailed design of the drainage and associated Sustainable Drainage Systems (SuDS) features is agreed in principle and the assumptions and information presented herein is subject to design development.

Operation and maintenance of all SuDS (including proprietary systems) will need to be considered once the proposed development has been finalised with all specific information presented to those responsible for the maintenance of the facility. Buro Happold cannot be held responsible for the accuracy of third-party data or the conclusions that come from this information or as a result of changes arising from the developing design. The conclusions and findings of this report may change if the proposed development is amended or updated after the date of publishing.

2.3 Review of Available Information

The following information has been made available to inform the surface water drainage strategy presented within this report:

- Mayfield Park Stage 4 Drainage Strategy produced by Buro Happold (March 2021)
- Topographical Survey produced by Survey Systems (January 2021)
- United Utilities Asset Records (June 2017)

3 Site Description

3.1 Existing Site

The proposed development is located to the east of Manchester City Centre, approximately 400m south-east of Manchester Piccadilly Railway Station. The post code and grid reference of the site are M12 6HG and 385324E, 397537N. The site is bound by Temperance Street to the northeast, a railway viaduct to the north, the A635 Mancunian Way to the south and Hoyle Street to the west of the proposed development. Figure 1 shows the boundary of the site and its relative location.

The existing site is brownfield in nature and currently occupied by existing to the south of the site. The immediate surrounding area comprises urban development including Mayfield Park.

Based on the Flood Map for Planning the site is located in Flood Zone 2; Flood Zone 2 is classified as land having a medium probability of flooding. This means the land has between a 1% and 0.1% annual probability of river (fluvial) flooding and between a 0.5% and 0.1% annual probability of sea (tidal) flooding. The Manchester City, Salford City and Trafford SFRA identifies the site as being located within the Conurbation Core Critical Drainage Area. The site is not located within a groundwater Source Protection Zone (SPZ).



Figure 1 - Site Location Plan (Map Data from Google Earth©2023)

3.2 Existing Topography

The highest elevation point within the existing site is 42.63m Above Ordnance Datum (AOD) which is located at the south of the site. On average, the overall site existing levels fall from south to north and from east to west towards

Hoyle Street. The lowest elevation point is approximately 37.17m AOD which is located to the north of the site. Refer to **Appendix A** for Topographical Survey.

3.3 Existing Waterbodies

The River Medlock is culverted beneath the site and is daylighted to the west of Hoyle Street, approximately 13m from the site boundary.

3.4 Existing Drainage

3.4.1 Public Drainage

Record information obtained from United Utilities (UU) indicates that the site is surrounded by an extensive public sewer system as shown in Figure 2. The following drainage systems are present in the vicinity of the site:

- 900mm / 890x1390mm diameter combined sewer runs in a southern direction beneath Hoyle Street.
- 640mm diameter combined sewer runs in a westerly direction beneath Chapelfield Road.
- 740mm / 610x810mm diameter combined sewer runs in a north westerly direction beneath Temperance Street.
- 1500mm diameter combined sewers runs in a westerly direction to the south of the site, along Mancunian Way.

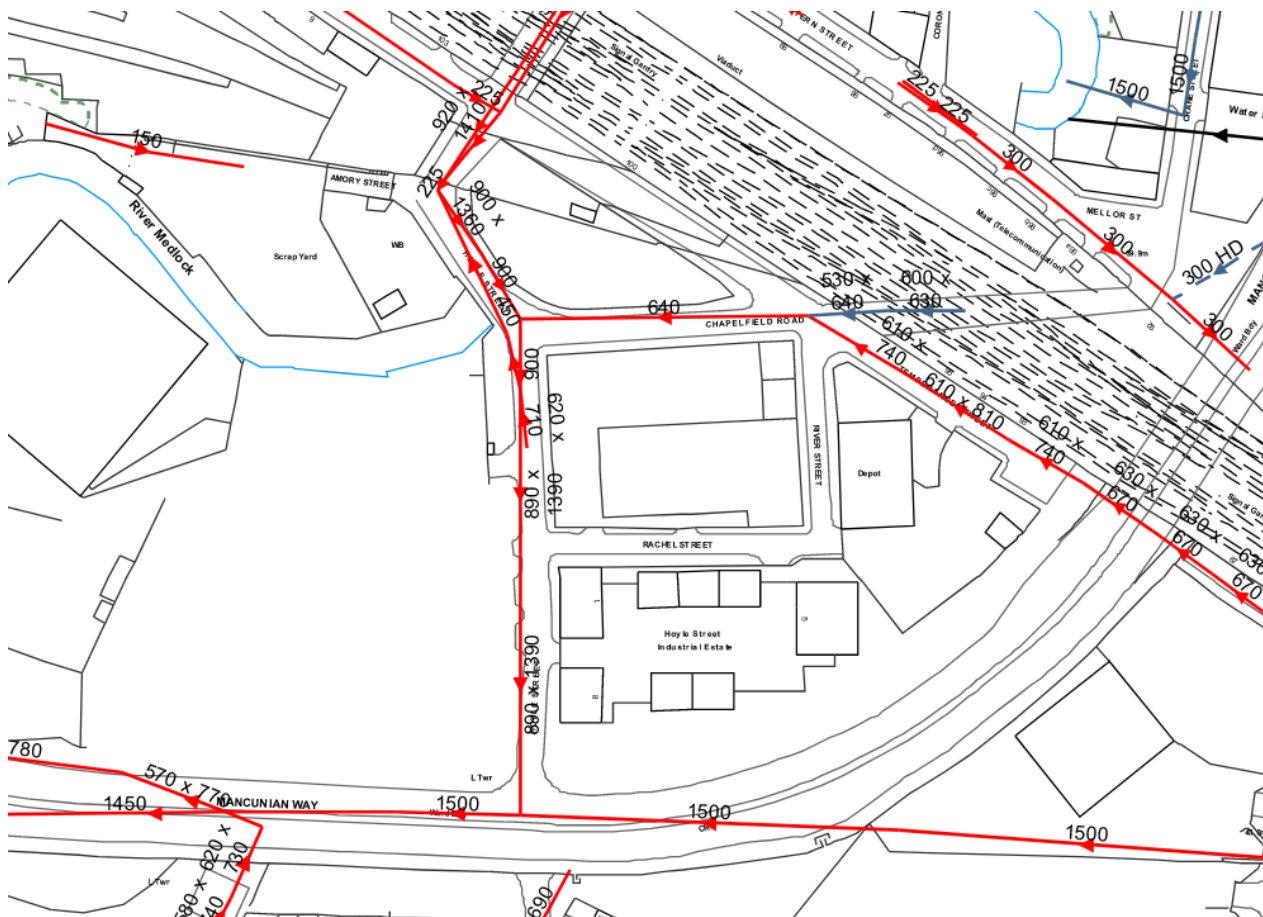


Figure 2 - United Utilities Sewer Asset Record (Map Data from United Utilities Water)

3.4.2 Private Drainage

There is no formal recorded drainage within the site. It is understood that the surface water from the existing hardstanding drains to the existing highway gullies within Hoyle Street. This is supported by the existing topography of the site.

4 Proposed Development

The proposed development comprises of a site compound to the east of Hoyle Street for 'laydown and material storage/fabrication' for the use of Network Rail.

Figure 3 illustrates the proposed site plan.

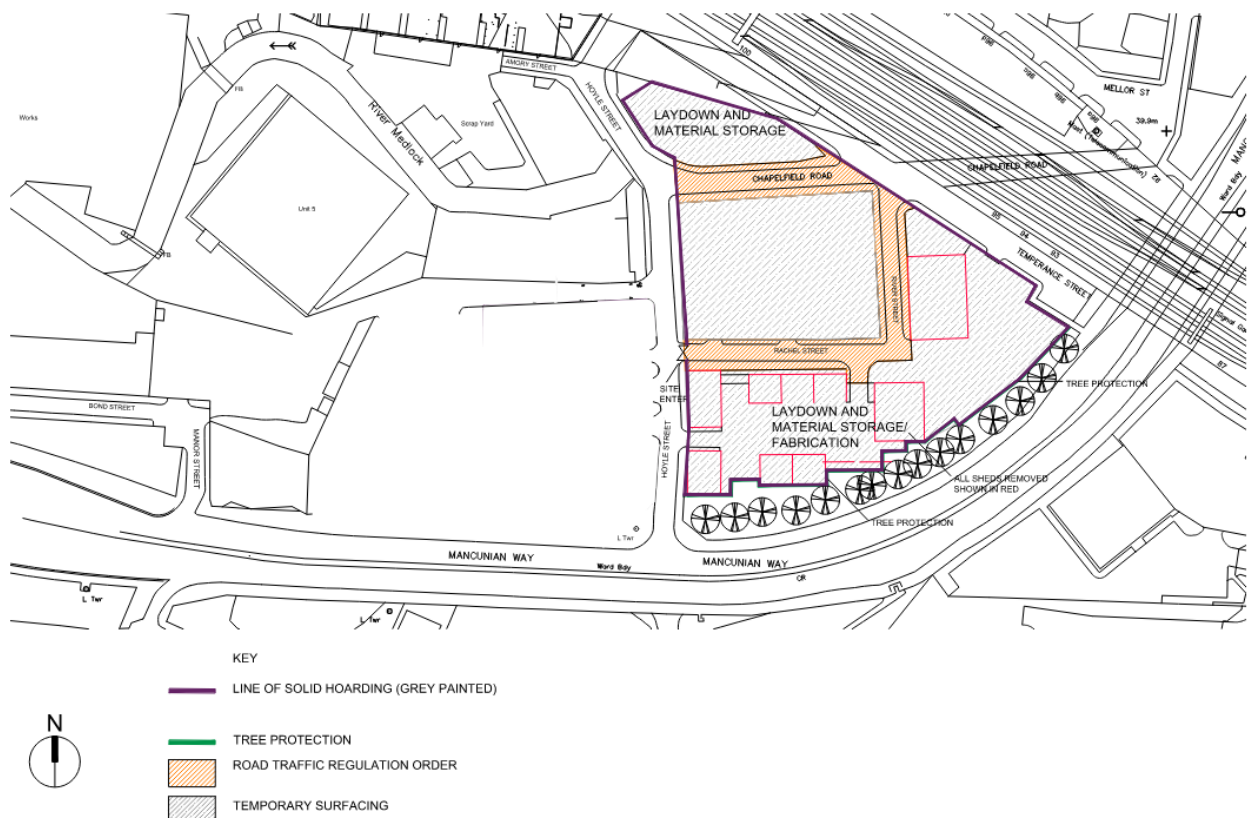


Figure 3 – Proposed Site Compound Masterplan

4.1 Site Context: Statutory & Non-Statutory Policies and Guidance

4.1.1 National Policy

The National Planning Policy Framework (NPPF) provides planning policy from central government. Clause 163 of the document states that "local planning authorities should ensure flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment."

The Building Regulations Part H specify a hierarchy for the disposal of surface water which should be adhered to as part of any surface water drainage design. This hierarchy, which is echoed within the Non-Statutory Technical Standards for Sustainable Drainage, is as follows:

- An adequate soakaway or some other adequate infiltration system; or, where that is not practicable,
- A watercourse; or, where that is not practicable,

- A sewer.

4.1.2 Local Policy

New developments are required to cater for all surface water that will be generated within the site, so as not to cause flooding, damage or inconvenience to on-site or off-site areas. In accordance with associated legislation, local policy and general best practice, this will typically require the introduction of a dedicated surface water drainage network that intercepts, treats and stores surface water runoff prior to it being discharged from site.

Due to the site location within Manchester City Centre it is anticipated that the Lead Local Flood Authority (LLFA) will require surface water runoff rates to be reduced by a minimum of 50% from new development areas, as outlined within the Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment.

However, the Mayfield development has previously agreed with the LLFA on the surface water discharge requirements within the site that reflects the unique situation of the site, which is detailed in a later chapter.

4.1.3 Best Practice

The Ciria SuDS Manual C753 is widely considered to set the best practice standard for the design of Sustainable Drainage Systems. Along with design guidance for the hydraulic performance of SuDS, the Manual also provides a qualitative means of assessing the quality of runoff using indices of likely pollution levels and SuDS performance capacities.

5 Proposed Surface Water Drainage Strategy

5.1 General

A surface water drainage system will be provided to collect surface water runoff from hardstanding areas. Primary runoff from ground will be from hard impermeable surfaces such as roof and any exposed areas of hard standing. Surface water from the site will be collected by traditional drainage channels, and discharge to the River Medlock via an existing private outfall constructed as part of the Mayfield Park development.

5.2 Consultation

5.2.1 United Utilities

United Utilities do not need to be consulted regarding the proposed development since no changes or alterations are being made to the public sewer network and no discharge is entering the public sewer network.

5.2.2 Manchester City Council (Lead Local Flood Authority)

The site was considered in the Mayfield Park drainage strategy submitted as part of the planning application CDM/20/0691. Design parameters and discharge rates were agreed following consultation with the LLFA. Therefore, it is proposed to discharge this site to the River Medlock in accordance with the following parameters as agreed with MCC:

- Proposed discharge rate is to be restricted to 50% of the existing brownfield runoff rate with 2 l/s/ha to be subtracted from this peak 50% discharge rate.
- No flooding of buildings occurs in the 1 in 100-year rainfall event plus climate change allowance. Plot designers will need to accommodate all the necessary surface water attenuation within the plot demise. The attenuation will need to be designed to accommodate the 1 in 100-year storm events plus climate change allowance based on a 50% brownfield rate with a further reduction of 2 l/s/ha for long-term storage.
- Surface flooding of open spaces is acceptable for short periods in events over 1 in 30-year rainfall events.
- Overland flow routes for extreme events are diverted away from buildings.
- As the existing site is brownfield, the 1 in 100-year, 6-hour rainfall runoff volume shall be constrained to a maximum of the existing brownfield runoff volume for the same event.
- For surface car parks (>50 spaces) and areas of unusual pollution risk, pollution control measures will be provided (likely to be a combination of petrol interceptors and SuDS features where applicable).

Table 1 shows the proposed peak discharge rates as agreed with the LLFA. The proposed site area is located within catchment C16, C15 and B5 as shown in **Figure 4**. Taking into account the proposed site areas from each catchment and the associated agreed proposed peak discharge rate, a proposed peak discharge rate of 107.87 l/s has been calculated pro-rata for the proposed site development, as shown in **Table 2**. The drainage strategy has been developed based on this peak discharge rate.

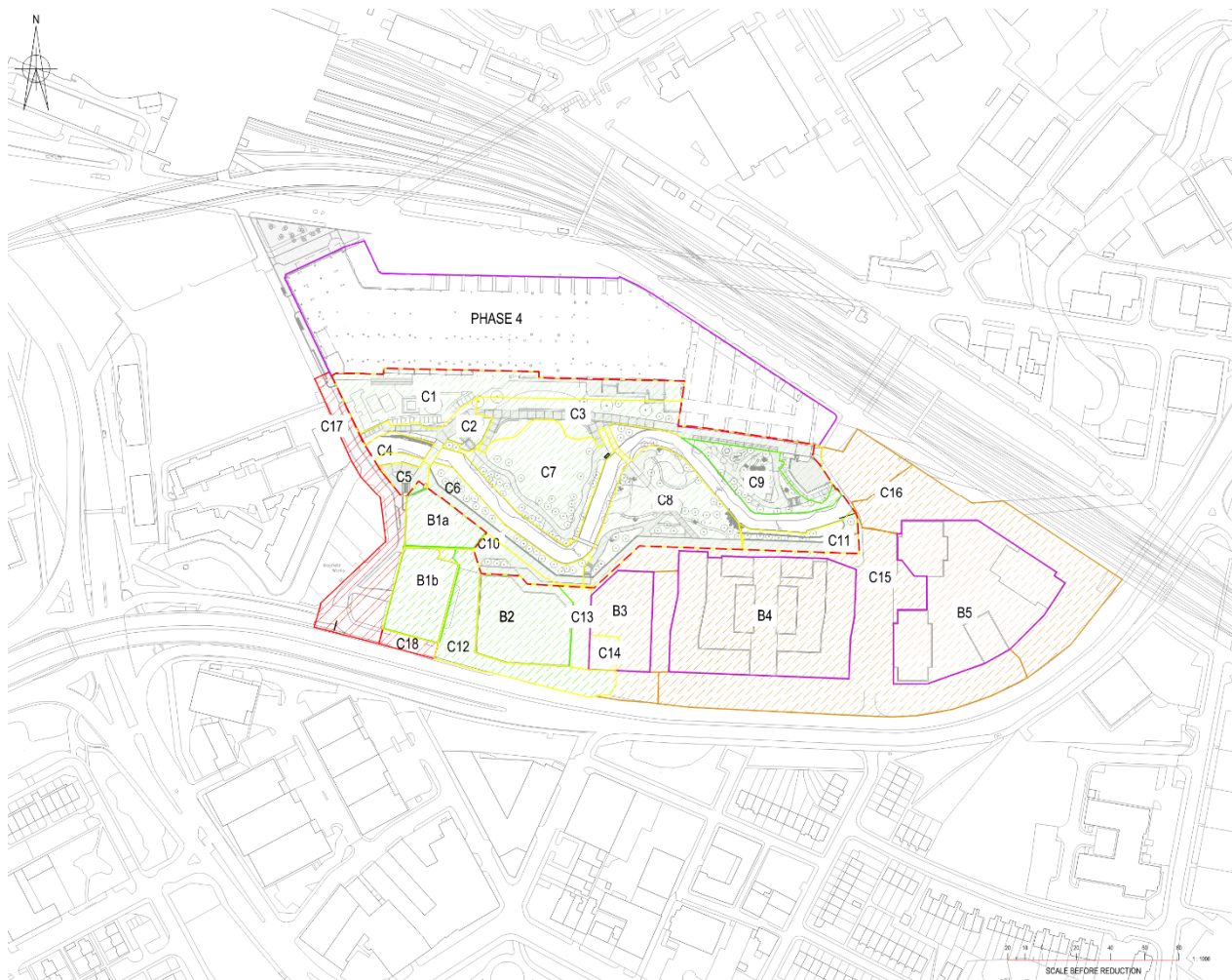


Figure 4 – Mayfield Development Partnership Proposed Catchment Areas

The remainder of the C16, C15 and B5 catchments are currently undeveloped and discharge to the public sewer network. The remaining catchments will be developed at a later stage at which point attenuation will be provided within the catchment to ensure the total discharge rate is less than the respective proposed peak discharge rates. The total flow draining to the River Medlock will therefore not exceed that agreed with Manchester City Council (MCC) in the Mayfield Park drainage strategy.

Table 1 - Existing vs Proposed Peak Discharge Requirement (* = Flow Control on this catchment)

Outfall	Associated Catchments	Brownfield Peak Discharge (l/s)	Proposed Peak Discharge (l/s)
1a & 1b	C15	C15 = 171.00	C15 = 83.94*
	C16	C16 = 146.11	C16 = 71.92*
	B3	B3 = 49.80	B3 = 17.52*
	B4	B4 = 193.35	B4 = 63.43*
	B5	B5 = 163.03	B5 = 57.12*
		Total = 750.33	Total = 293.92

Table 2 - Proposed Peak Discharge for the Proposed Site Compound Development

Associated Catchments	Total Area of Catchment (m2)	Area of Catchment within Proposed Development (m2)	Ratio of Proposed Area to Total Catchment Area	Total Proposed Peak Discharge of Catchment (l/s)	Proposed Peak Discharge Rate within Proposed Development (l/s)
C15	6817.47	1294.75	1294.75/6817.47 = 0.19 (19%)	83.94	83.94*0.19 = 15.94
C16	5791.01	2841.54	2841.54/5791.01 = 0.49 (49%)	71.92	71.92*0.49 = 35.29
B5	6488.90	6434.60	6434.60/6488.90 = 0.99 (99%)	57.12	57.12*0.99 = 56.64
					Total = 107.87

5.3 Climate Change

Climate change allowances for the proposed site are based on the Irwell Management Catchment peak rainfall allowance table for the 1% annual exceedance rainfall event produced by the EA, as shown in Table 1.

Allowance category	Total potential change anticipated for the 2050's	Total potential change anticipated for the 2070's
Upper End	+40%	+45%
Central	+25%	+30%

Table 3 - Climate change allowances for peak rainfall in England (1981-2000 baseline)

Based on consultation with the LLFA, the climate change allowance is considered to be 30% however, attenuation volumes should also be checked against a 40% allowance.

5.4 Drainage Hierarchy

Surface water disposal should be in accordance with the drainage hierarchy in Building Regulations Part H 2010 (2015 Edition). This hierarchy is briefly described below:

- Step 1: Disposal on Site**

Disposal via infiltration SuDS (Sustainable Drainage Systems) methods should be considered as the first option. The SuDS Manual (CIRIA C753) provides descriptions of the various methods of providing infiltration SuDS including systems such as soakaways, basins and filter strips, together with swales, pervious pavements, detention basins, ponds and other wetland solutions.

The Ground Investigation Report undertaken for the Mayfield Park development investigated the land immediately west of Hoyle Street, which is the nearest point to the proposed site. The investigation shows that the site is underlain mostly by made ground and clay. Due to the expected ground conditions and proximity to title boundaries, disposal via infiltration is therefore considered not to be viable. Refer to

Appendix B for the relevant extract of the Ground Investigation Report.

- **Step 2: Disposal to a Watercourse**

The River Medlock is culverted beneath the site and is daylighted approximately 13m from the site boundary, therefore, it is feasible to discharge into the river. Appropriate pollution mitigation will be required prior to discharge into the watercourse.

- **Step 3: Disposal to a Public Sewer**

In the event that infiltration SuDS are deemed not suitable, surface water flows will need to be restricted and connected into the existing public sewers. The site is surrounded by an extensive public sewer network with combined sewers located within Hoyle Street and Chapelfield Road. Therefore, disposal to public sewer is also a viable option.

In accordance with the drainage hierarchy and the proposed Mayfield Park drainage strategy, it is proposed to discharge surface water from the proposed development to the River Medlock via the existing private drainage network within the Mayfield Park.

5.5 Sustainable Urban Drainage Systems (SuDS)

Sustainable Urban Drainage Systems are used to reduce the impact of surface water from storm events on the existing environment mimicking the natural run-off characteristics of the site and removing pollutants from the urban run-off at source. There are various solutions which are described in the SuDS Manual (CIRIA C753) and include ground level features including swales and ponds, below ground systems (such as tanks, and infiltration techniques like soakaways).

The CIRIA SuDS Manual contains a hierarchy of sustainable methods of capturing and storing rainwater in a descending order: from drainage into the ground to recharging water resources.

The hierarchy of SuDS techniques is shown in Table alongside comments regarding the suitability of each.

Table 4 - SuDS techniques

	SUDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Suitability for the Proposed Development	Comments
Most Sustainable 	Living roofs	√	√	√	No	Living roofs are not considered for this scheme, as no suitable buildings are proposed on the site.
	Basins & ponds	√	√	√	No	The proposed site is a large, open area for laydown of materials and vehicular movement. Therefore, due to its intended uses, there is no suitable location to accommodate a basin or pond.
	-Constructed Wetlands				No	
	-Balancing ponds				No	
	-Detention basins				No	
	-Retention ponds				No	The perimeter of the site provides a potential opportunity to incorporate filter strips since there will be less chance of vehicular overrun at these locations.
	Filter strips & swales	√	√	√	Yes	

Least Sustainable ↓						
	Rain Gardens	✓	✓	✓	No	Due its intended uses of material laydown and vehicle movements, there are no suitable locations to accommodate rain gardens.
	Infiltration devices	✓	✓	✓	No	The ground conditions are not suitable for infiltration.
	-Soakaways				No	
	-Infiltration trenches & basins				No	
	Permeable surfaces	✓	✓		No	Due to the nature of activities for the proposed development, permeable surfaces are not considered suitable due to the increased risk of sediments entering the system.
	-Gravelled areas				No	
	-Solid paving blocks				No	
	-Porous pavers				No	
	Tanked systems	✓			Yes	Tanked systems are considered suitable for the proposed development.
	-Over-sized pipes/tanks				Yes	Oversized pipes are considered suitable for the proposed development.
	-Attenuation cells				Yes	Attenuation cells are considered suitable for the proposed development.

5.6 Proposed SuDS Measures

5.6.1 Underground Tanks/Cellular Crates

Tanks and/or cellular crates provide an underground storage structure with a high void ratio that is suitable for attenuating surface water flows. Depending on ground conditions, the flows can be released either into the ground through infiltration or into the sewer drainage system via flow control devices.

Due to the nature of the proposals, underground storage structures will form part of the proposed drainage strategy.

5.6.2 Filter Drains/French Drains

Filter drains are shallow trenches filled with stone/gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff. Filter drains may be lined or may allow infiltration depending on the suitability of the underlying soils and the protection they afford to the groundwater.

Due its intended uses of material laydown and vehicle movements, filter drains will be proposed at the perimeter of the site and form part of the proposed drainage strategy.

5.7 SuDS Operation and Maintenance Plan

5.7.1 Details of the Party Responsible for Each Feature

Regular maintenance of the sustainable drainage system is essential to maintain its performance and avoid failure of the mechanical/electrical components. It is anticipated that the maintenance of the attenuation tanks will be undertaken by an experienced contractor, in cases where geocellular units are installed the suppliers will normally offer a maintenance contract for periodic inspections and flushing the system to remove any silt and debris that have been collected.

It is anticipated that maintenance of the filter drains will be undertaken by developer. It is anticipated that the filter drains will include a geotextile layer which will require regular cleaning or replacement to ensure the filter drains are functioning correctly.

An agreed maintenance programme will be prepared in accordance with the CIRIA guidance and supervised by the adopting authority. This will be included within the Building Manual for the development on completion. An outline maintenance plan is shown in **Appendix C**.

5.7.2 SuDS Adoption

It is currently understood that all drainage, including SuDS features will remain within the ownership of the developer.

5.7.3 Inspection and Maintenance

A specification for inspection and maintenance actions, including frequency of maintenance tasks required for each proposed SuDS, setting out a minimum standard to which the SuDS system must be maintained. This will include information relating to:

- Schedule of cleaning;
- Inspection;
- General repair and maintenance; and
- Replacement details and lifespan.

This information will include specific requirements of proprietary products. This information will need to be collated during the detailed design as part of the H&S File and O&M Manual for the building(s). Maintenance will be in accordance with the specific requirements of each feature and the chosen attenuation supplier, generally:

- Geocellular tank – operation and maintenance in accordance with the tank manufacturers guidance and warranty requirements. This will be product specific.
- Filter drains - operation and maintenance in accordance the manufacturer's guidance and warranty requirements. This will be product specific.

5.8 Maintenance Options, Risks and Safeguards

There are many options that will allow the successful operation and maintenance of a SuDS feature for the lifetime of the proposed development. With each maintenance option, there may be associated risks for the onsite and surrounding land and property owners.

The most appropriate maintenance option will be specific to the SuDS features employed.

5.9 Safety and Access

Consideration will be given to safety in design and appropriate consideration of access during the design of the SuDS features used.

CDM Regulations 2015 will be considered and applied to the planning, design and construction and long-term maintenance of the SuDS systems used.

5.10 Existing and Proposed Impermeable Areas

The site boundary has a total area of 1.058ha, the existing and proposed permeable/impermeable areas are summarised in Table .

	Existing Area (m ²)	Proposed Area (m ²)
Permeable	0	0
Impermeable	10581	10581

Table 5 - Existing and proposed permeable/impermeable areas

5.11 Proposed Discharge Rate

The as built surface water plan drawing (see **Appendix C**) for the Mayfield Park drainage, shows that a manhole (SWMH1) was constructed to serve the proposed site compound development. As previously described in Section 5.2.2, the proposed discharge rate for the site compound has been calculated based on proposed site areas from each catchment and the respective total agreed proposed peak discharge rate for each catchment. This results in a proposed peak discharge rate of **107.9 l/s**.

5.12 Proposed Strategy

The strategy for the surface water drainage of the scheme will be to collect the surface water runoff via surface water linear channel drains and filter drains. A below ground pipe network will then convey the water to a below ground attenuation tank to store it before discharging the surface water runoff into the existing manhole SWMH1, located adjacent to Hoyle Street within the Mayfield Park development. A flow control device will be implanted prior to SWMH1 to ensure the runoff is restricted to discharge at the proposed peak discharge rate.

The filter drains will provide attenuation, conveyance and improvements to water quality however, it is proposed that a petrol interceptor will be installed downstream of the flow control manhole and prior to discharge into the existing manhole SWMH1.

The drainage network will be conveyed to an underground attenuation tank located to the west of the site, that will provide a storage volume of approximately 330m³. A flow control chamber will be located downstream of the attenuation tank to restrict the flow to 107.89 l/s, as agreed with the LLFA, prior to discharging to the existing manhole which ultimately discharges to the River Medlock.

Refer to **Appendix E** for the proposed drainage general arrangement.

A hydraulic model of the drainage system using Microdrainage has been undertaken to assess the performance of the proposed drainage strategy against the 1 in 2, 1 in 30 and 1 in 100-year storm return period plus 30% climate change, as agreed with the LLFA, to ensure the proposed development is protected against flooding.

Refer to **Appendix F** for full details of the network and hydraulic performance. Table 6 presents a summary of the results.

Critical Storm Event	Return Period (year)	Flow (l/s)
120 min Winter	2	28.7
60 min Winter	30	95.8
120 min Winter	100+30% CC	107.1

Table 6 – Hydraulic Model Summary results

A flooding volume of 1.5m³ has been identified for the 1 in 100-year storm event. Given the location of the flooding, levels on the site and filter drains at the perimeter of the site, it is anticipated that this flooding will be contained within the site boundary until there is capacity within the site system.

5.13 Designing for Exceedance

It has been assumed that in general the proposed site levels will correspond to existing site levels. This means that the proposed site will generally fall from south to north and from east to west. Any exceedance events will follow the flow paths north along Hoyle Street and northwest along Temperance Street within the highway. Proposed levels should be implemented to direct flows away from proposed buildings and vulnerable areas. This is the responsibility of the contractor to ensure the proposed development and level changes do not increase the flood risk of the site or surrounding areas.

Overland flood flow routes drawings can be found in **Appendix D**.

6 Foul Drainage Strategy

It is not anticipated that any foul water drainage will be required for the proposed development.

7 Conclusions

This drainage strategy has been prepared in support of the planning application to set the principles for the drainage design to serve the Mayfield Site Compound development. The exact configuration and nature of the drainage will be determined at the detailed design / discharge of planning conditions stage.

As a result of the existing conditions on site, surface water flows are anticipated to follow the existing topography and levels and discharge to the existing surface water manhole constructed as part of the Mayfield Park development, located to the west of Hoyle Street, which ultimately discharges into the River Medlock.

The strategy for the surface water drainage of the scheme will be to collect the surface water runoff generated via filter drains located at the perimeter of the site alongside an array of linear drainage channels which flows towards a below ground attenuation tank and discharge at a restricted flow rate, as agreed as part of the overall Mayfield masterplan development, into the existing manhole.

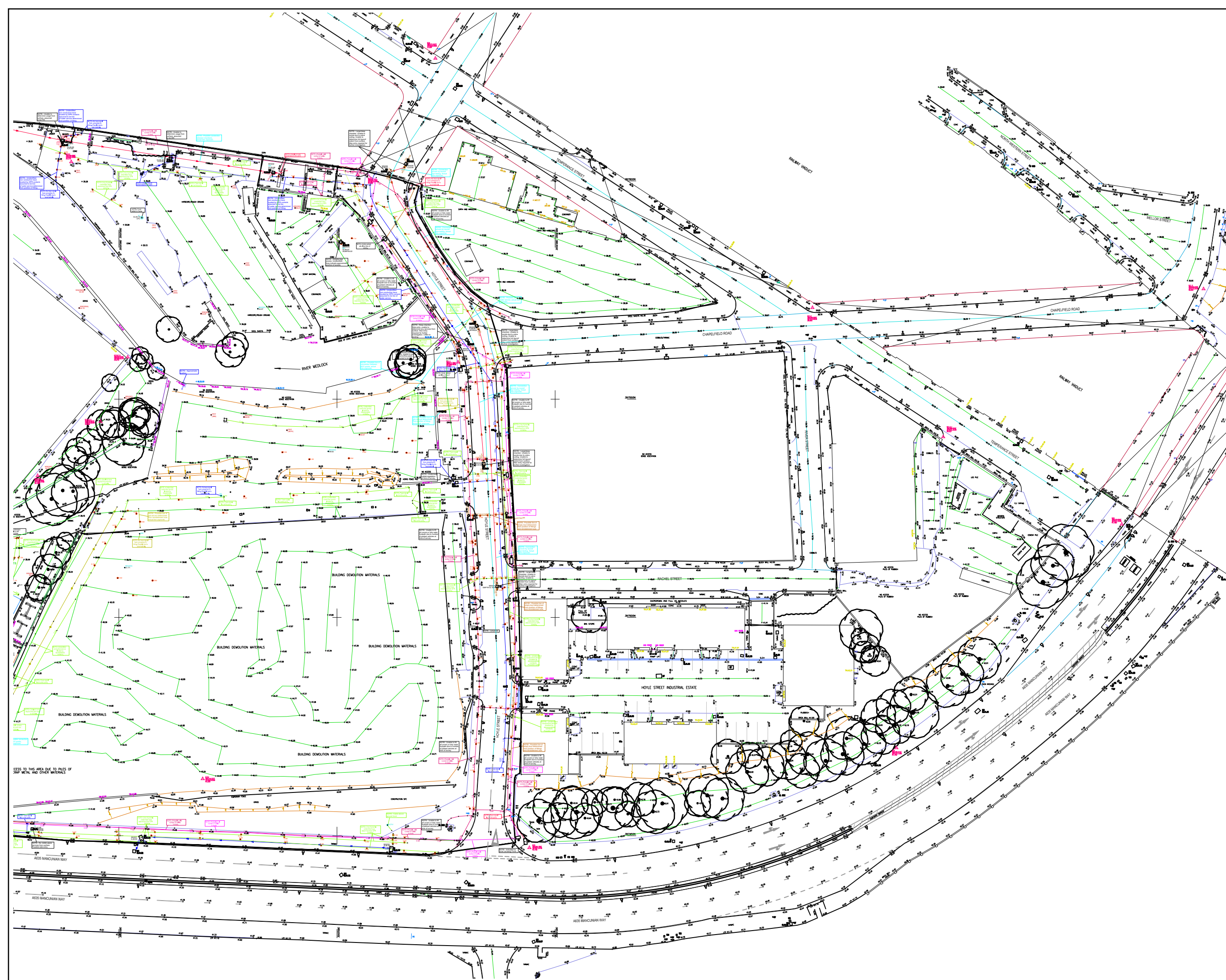
Attenuation storage will be required to facilitate the reduction of the proposed flows, and SuDS will be included wherever practicable.

Proposed surface water discharge rate is **107.9 l/s** and the attenuation volume require will be approximately **330m³**. This attenuation will be provided in the form of below ground geo-cellular tank.

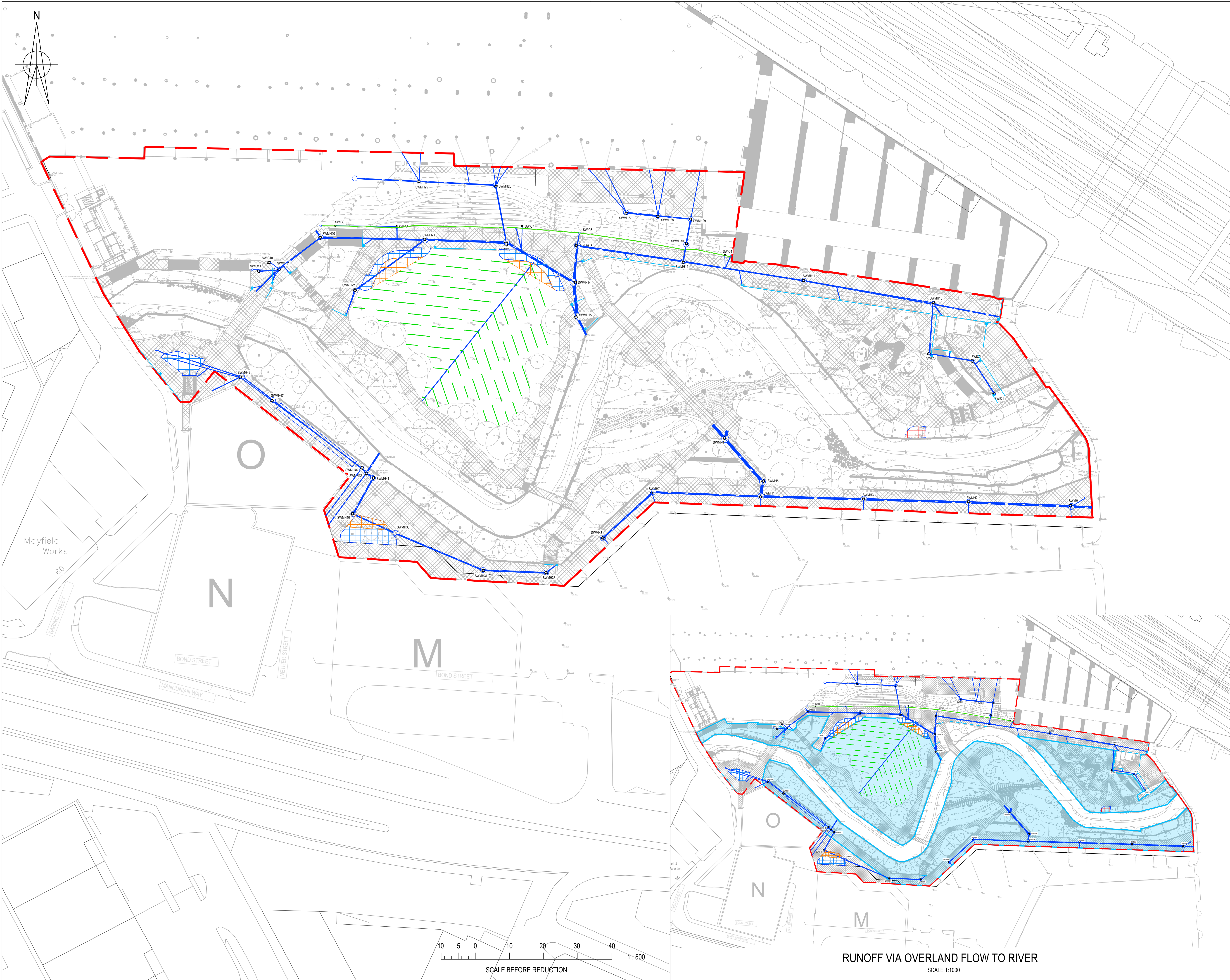
It is not anticipated that any foul water drainage will be required for the proposed development.

Appendix A Topographical Survey

Date:	Initials:	Revision:
11/2023	NC	01



Appendix B Mayfield Park As-built Drawings



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- WORKS IN PROXIMITY TO LIVE SERVICES
- WORKS ADJACENT TO LIVE ROADS
- WORKS IN CONTAMINATED GROUND CONDITIONS
- WORK IN PROXIMITY TO FLOOD ZONE

MAINTENANCE/CLEANING/OPERATION

- WORKS WITHIN POTENTIAL CONFINED SPACE CONDITIONS
- WORKS IN PROXIMITY TO LIVE SERVICES
- WORKS ADJACENT TO LIVE ROADS
- WORK IN PROXIMITY TO FLOOD ZONE

DECOMMISSIONING/DEMOLITION

- WORKS WITHIN POTENTIAL CONFINED SPACE CONDITIONS
- WORKS IN PROXIMITY TO LIVE SERVICES
- WORKS ADJACENT TO LIVE ROADS
- WORKS IN CONTAMINATED GROUND CONDITIONS
- WORK IN PROXIMITY TO FLOOD ZONE

Notes

- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWING MANHOLE SCHEDULE MAY101-WSD-EXT-BUR-DR-7020-3150 AB.
- DRAWING BASED ON:
 - ARCHITECT'S PLAN P20567-00-001-GIL-XR MASTER LANDSCAPE LAYOUT RECEIVED FROM GILLESPIES ON 21/07/2021
 - BELOW GROUND DRAINAGE GA 1076-01-CE-YY-DR-C-001-T02 RECEIVED FROM PLOT ENGINEERS ON 22/09/2020
 - TOPOGRAPHICAL SURVEY RECEIVED SEPT 2020 FROM SURVEY OPERATIONS.

LEGEND

EXISTING DRAINAGE

- EXISTING COMBINED WATER SEWER
- EXISTING RWP
- EXISTING SURFACE WATER PIPE (GPR SURVEY)

AS BUILT DRAINAGE

- 375mmØ
- SURFACE WATER
- SURFACE WATER MANHOLE
- INSPECTION CHAMBER
- SURFACE WATER BACKDROP
- HYDROBRAKE
- OUTFALL
- GULLY
- FILTER DRAIN
- ACO 'MULTIDRAIN' LINEAR DRAIN (UNLESS OTHERWISE STATED)
- LINEAR DRAIN SUMP
- RAIN GARDEN EXTENTS ON SURFACE
- RAIN GARDEN EXTENTS (GRAVEL) BELOW GROUND
- RAIN GARDEN EXTENTS (GRAVEL) OUTSIDE OF ABOVE GROUND FOOTPRINT
- DRAINAGE VIA OPENINGS IN RETAINING WALL TO SOFT LANDSCAPING
- PARK BOUNDARY
- STONE BELOW PLAY SURFACE

A AS BUILT DRAWING 09.12.22 EE CB

Rev	Description	Date	Dm	Ch'd
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AS BUILT

Status of drawing

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Architect GILLESPIES
Project MAYFIELD DEVELOPMENT PARTNERSHIP
Drg Title AS BUILT DRAWING
SURFACE WATER PLAN

Scales@A1 1:500	Job No. 046688
Drawn by EE	Date DECEMBER 22
Checked by CB	Rev A

Drawing No. 0042912-BHE-XX-XX-DR-C-7060-3120 AB

10 5 0 10 20 30 40 1:500

SCALE BEFORE REDUCTION

RUNOFF VIA OVERLAND FLOW TO RIVER

SCALE 1:1000

Filename: D:\asbuilt\2020\22\Mayfield Development Partnership\AS BUILT\AS BUILT SURFACE WATER PLAN.dwg Date: 09/12/2022 15:12:00

MANHOLE SCHEDULE - As Built SW								
NAME	TYPE	COVER LEVEL [m]	COVER LOADING	DEPTH [m]	INCOMING PIPE DIAMETER [mm]	INCOMING PIPE IL [m]	OUTGOING PIPE DIAMETER [mm]	OUTGOING PIPE IL [m]
SWIC1	SfA Manhole Type 3 Circular (450 Dia)	36.386	C250	1.386	150		150	34.971
SWIC2	SfA Manhole Type 3 Circular (450 Dia)	36.180	C250	1.330	150	34.719	150	34.719
SWIC3	SfA Manhole Type 3 Circular (450 Dia)	35.621	C250	1.971	150	33.516	150	34.516
SWIC4	SfA Manhole Type 3 Circular (450 Dia)	35.380	C250	1.890	150	33.790	150	
SWIC6	SfA Manhole Type 3 Circular (450 Dia)	35.439	C250	2.229	150		150	34.100
SWIC7	SfA Manhole Type 3 Circular (450 Dia)	35.432	C250	2.282	150	33.470	150	33.470
SWIC8	SfA Manhole Type 3 Circular (450 Dia)	35.227	C250	2.127	150	33.260	150	
SWIC9	SfA Manhole Type 3 Circular (450 Dia)	35.400	C250	1.830	150		150	33.990
SWIC10	SfA Manhole Type 3 Circular (450 Dia)	35.687	C250	1.508	150		150	34.687
SWIC11	SfA Manhole Type 3 Circular (450 Dia)	35.702	C250	1.572	150		150	34.702
SWMH1	SfA Manhole Type 2 (1,500 Dia)	38.418	D400	2.222	150		450	36.080
SWMH2	SfA Manhole Type 2 (1,500 Dia)	37.325	D400	1.595	450	35.590	450	35.590
SWMH3	SfA Manhole Type 2 (1,500 Dia)	36.570	D400	1.789	450	34.781	450	34.781
SWMH4	SfA Manhole Type 2 (1,500 Dia)	35.705	D400	1.425	450 450	34.205 34.205	600	34.180
SWMH5	SfA Manhole Type 2 (1,500 Dia)	35.630	D400	1.520	600	34.080	600	34.080
SWMH6	SfA Manhole Type 2 (1,800 Dia)	35.218	C250	1.498	600	33.650	600 600	33.650 33.650
SWMH7	SfA Manhole Type 2 (1,200 Dia)	35.670	D400	1.021	150	34.644	450	34.296
SWMH8	SfA Manhole Type 2 (1,200 Dia)	35.890	D400	0.915			150	34.970
SWMH10	SfA Manhole Type 2 (1,200 Dia)	35.725	D400	2.471	150	34.163	225	34.103
SWMH11	SfA Manhole Type 2 (1,200 Dia)	35.350	D400	1.927	225	33.423	225	33.423
SWMH12	SfA Manhole Type 2 (1,200 Dia)	35.015	D400	1.852	225 225	33.163 33.163	300	33.088
SWMH13	SfA Manhole Type 2 (1,500 Dia)	35.032	D400	2.240	300	32.792	375	32.717
SWMH14	SfA Manhole Type 1A (1,800 Dia)	34.835	C250	2.398	375 450	32.437 32.212	600	32.212
SWMH15	SfA Manhole Type 1A (1,800 Dia)	34.510	C250	2.380	600	32.130	375	32.130
SWMH20	SfA Manhole Type 2 (1,200 Dia)	35.215	D400	2.350	150	33.015	300	32.865
SWMH21	SfA Manhole Type 2 (1,500 Dia)	34.940	D400	2.379	300 150	32.560 32.786	375	32.561
SWMH22	SfA Manhole Type 2 (1,200 Dia)	34.400	C250	1.512			150	33.318
SWMH23	SfA Manhole Type 2 (1,500 Dia)	34.940	D400	2.544	375 225	32.396 32.621	450	32.396
SWMH25	SfA Manhole Type 2 (1,200 Dia)	38.760	C250	1.502			225	36.246
SWMH26	SfA Manhole Type 1A (1,200 Dia)	38.590	C250	2.143	225	35.445	225	35.445
SWMH27	SfA Manhole Type 2 (1,200 Dia)	38.645	D400	2.070			225	36.586
SWMH28	SfA Manhole Type 2 (1,200 Dia)	38.698	D400	2.358	225	36.328	225	36.328
SWMH29	SfA Manhole Type 1A (1,200 Dia)	39.330	C250	3.220	225	36.000	225	34.600
SWMH30	SfA Manhole Type 2 (1,200 Dia)	35.825	D400	2.375	225	33.450	225	33.216
SWMH31	SfA Manhole Type 2 (1,200 Dia)	35.650	D400	2.600	150 150	34.021 34.021	150	34.021
SWMH36	SfA Manhole Type 2 (1,200 Dia)	36.062	D400	1.385			150	34.701
SWMH37	SfA Manhole Type 2 (1,200 Dia)	36.074	D400	1.565	150	34.445	150	34.445
SWMH38	SfA Manhole Type 2 (1,200 Dia)	36.079	D400	1.901	150	34.129	225	34.129
SWMH40	SfA Manhole Type 2 (1,200 Dia)	36.096	D400	3.772	225	32.386	300	32.386

MANHOLE SCHEDULE - As Built SW								
NAME	TYPE	COVER LEVEL [m]	COVER LOADING	DEPTH [m]	INCOMING PIPE DIAMETER [mm]	INCOMING PIPE IL [m]	OUTGOING PIPE DIAMETER [mm]	OUTGOING PIPE IL [m]
SWMH41	SfA Manhole Type 2 (1,200 Dia)	36.076	D400	3.752	300	32.064	300	32.064
SWMH42	SfA Manhole Type 1A (1,200 Dia)	36.077	D400	4.077	300 150	32.034 33.344	150 300	33.450 32.034
SWMH46	SfA Manhole Type 2 (1,200 Dia)	36.072	D400	2.622	150	33.500	150 150	33.400 33.400
SWMH47	SfA Manhole Type 2 (1,200 Dia)	36.077	D400	2.542	150	33.535	150	33.650
SWMH48	SfA Manhole Type 2 (1,200 Dia)	36.117	D400	0.483			150 150	33.714 33.714

MANHOLE SCHEDULE - As Built FW									
NAME	TYPE	COVER LEVEL [m]	COVER LOADING	COVER TYPE	DEPTH [m]	INCOMING PIPE DIAMETER [mm]	INCOMING PIPE IL [m]	OUTGOING PIPE DIAMETER [mm]	OUTGOING PIPE IL [m]
FWMH1	SfA Manhole Type 1A (1,200 Dia)								

COVER TYPE ABBREVIATIONS

RE - RECESSED/ INFILLED

DI - DUCTILE IRON

MANHOLE NAMES

SWIC - ACCESS CHAMBERS

SWMH - PROPOSED MANHOLES

SWMH-AB - AS BUILT MANHOLES

BD - BACKDROP

* DENOTES LEVEL FROM BASIS OF PPQC SURVEY AND TOPOGRAPHICAL SURVEY. EXACT INVERT IS TO BE CONFIRMED WHEN PROPOSED MANHOLE IS INSTALLED ONLINE OF EXISTING FOUL NETWORK.

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- WORKS IN PROXIMITY TO LIVE SERVICES
- WORKS ADJACENT TO LIVE ROADS
- WORKS IN CONTAMINATED GROUND CONDITIONS
- WORK IN PROXIMITY TO FLOOD ZONE

MAINTENANCE/CLEANING/OPERATION:

- WORKS WITHIN POTENTIAL CONFINED SPACE CONDITIONS
- WORKS IN PROXIMITY TO LIVE SERVICES
- WORKS ADJACENT TO LIVE ROADS
- WORK IN PROXIMITY TO FLOOD ZONE

DECOMMISSIONING/DEMOLITION:

- WORKS WITHIN POTENTIAL CONFINED SPACE CONDITIONS
- WORKS IN PROXIMITY TO LIVE SERVICES
- WORKS ADJACENT TO LIVE ROADS
- WORKS IN CONTAMINATED GROUND CONDITIONS
- WORK IN PROXIMITY TO FLOOD ZONE

Notes

1. TO BE READ IN CONJUNCTION WITH DRAWINGS
0042912-BHE-XX-XX-DR-C-7060-3120 AB FOR SURFACE WATER DRAINAGE AND DRAWING 0042912-BHE-XX-XX-DR-C-7060-3200 FOR FOUL WATER DRAINAGE AB.
2. MANHOLE SIZES ARE TO BE IN ACCORDANCE WITH TABLE BELOW (TAKEN FROM SEWERS FOR ADOPTION)

Nominal Internal diameter of largest pipe in manhole (mm)	Minimum nominal internal dimension of manhole (mm)
Less than 375	1200
375 - 450	1350
500 - 700	1500
750 - 900	1800
Greater than 900	Pipe Diameter + 900

A	AS BUILT DRAWING	08.08.22	EE	CB
Rev	Description	Date	Dn	Ch'd

AS BUILT

Status of drawing

BUROHAPPOLD
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Architect	GILLESPIES		
Project	MAYFIELD DEVELOPMENT PARTNERSHIP		
Drg Title	AS BUILT DRAWING MANHOLE SCHEDULE		
Scales@A1 N.T.S		Job No.	046688
Drawn by	EE	Date	AUGUST 22
Checked by	CB	Rev	A
Drawing No.		MAY101-WSD-EXT-BUR-DR-7020-3150 AB	

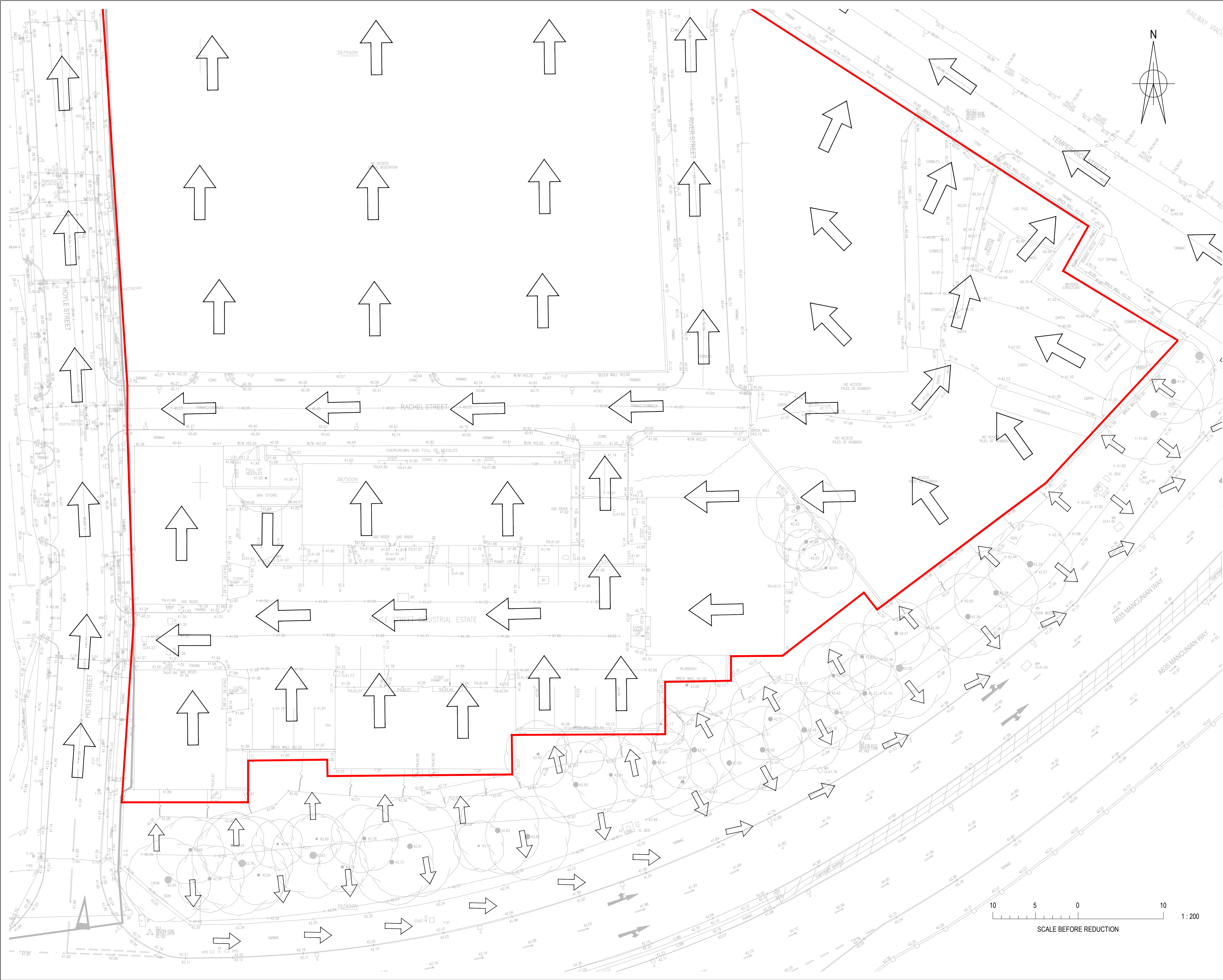
0042912-Mayfield Park Partnership Information (P&S) - 10/01 - Sheet 05, Built Drawing MAY101-WSD-EXT-BUR-DR-7020-3150 AB.dwg

Appendix C SuDS Maintenance Plan

The table below is based on the CIRIA C753 SuDs Manual, 2015.

SUDS COMPONENTS MAINTENANCE REQUIREMENTS		
SUDS COMPONENT	Geocellular Attenuation Tanks	
MAINTENANCE	ACTION	FREQUENCY
Regular maintenance	Check inlets, outlets, control structures and overflows	Monthly or annually, as required
Occasional tasks	Jetting and suction where silt has settled	As required
Remedial work	Reinstate	As required
SUDS COMPONENT	Filter Drain	
MAINTENANCE	ACTION	FREQUENCY
Regular maintenance	Litter and debris removal	Monthly
	Inspect surface, inlets, outlets and control structures for blockages, clogging, standing water or structural damage	Monthly
	Inspect pre-treatment systems	Six monthly
	Remove sediment from pre-treatment systems	Six monthly, or as required
Occasional tasks	Remove or control tree roots	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Appendix D Overland Flood Flow Routes Drawing



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CONSTRUCTION

MAINTENANCE/CLEANING/OPERATION

DECOMMISSIONING/DEMOLITION

NOTES

1. THIS DRAWING IS BASED ON TOPOGRAPHICAL SURVEY "SURVEY OPERATIONS, A0 20/217, NOV 2020".

2. THIS DRAWING IS INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN.

3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DRAWINGS AND REPORT.

LEGEND

— SITE BOUNDARY / SOLID LINE OF HOARDING

→ OVERLAND FLOOD FLOW ROUTE

A DRAFT ISSUE 29.11.2023 NC CB

Rev	Description	Date	Iss'd	Rev'd	App'd
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STAGE 2

Project Stage

INFORMATION

Status of Drawing

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Client: **GILLESPIES**

Architect: **MAYFIELD DEVELOPMENT PARTNERSHIP**

Project: **Mayfield Network Rail Compound**

Org Title: **NETWORK RAIL COMPOUND OVERLAND FLOOD FLOW ROUTE PLAN**

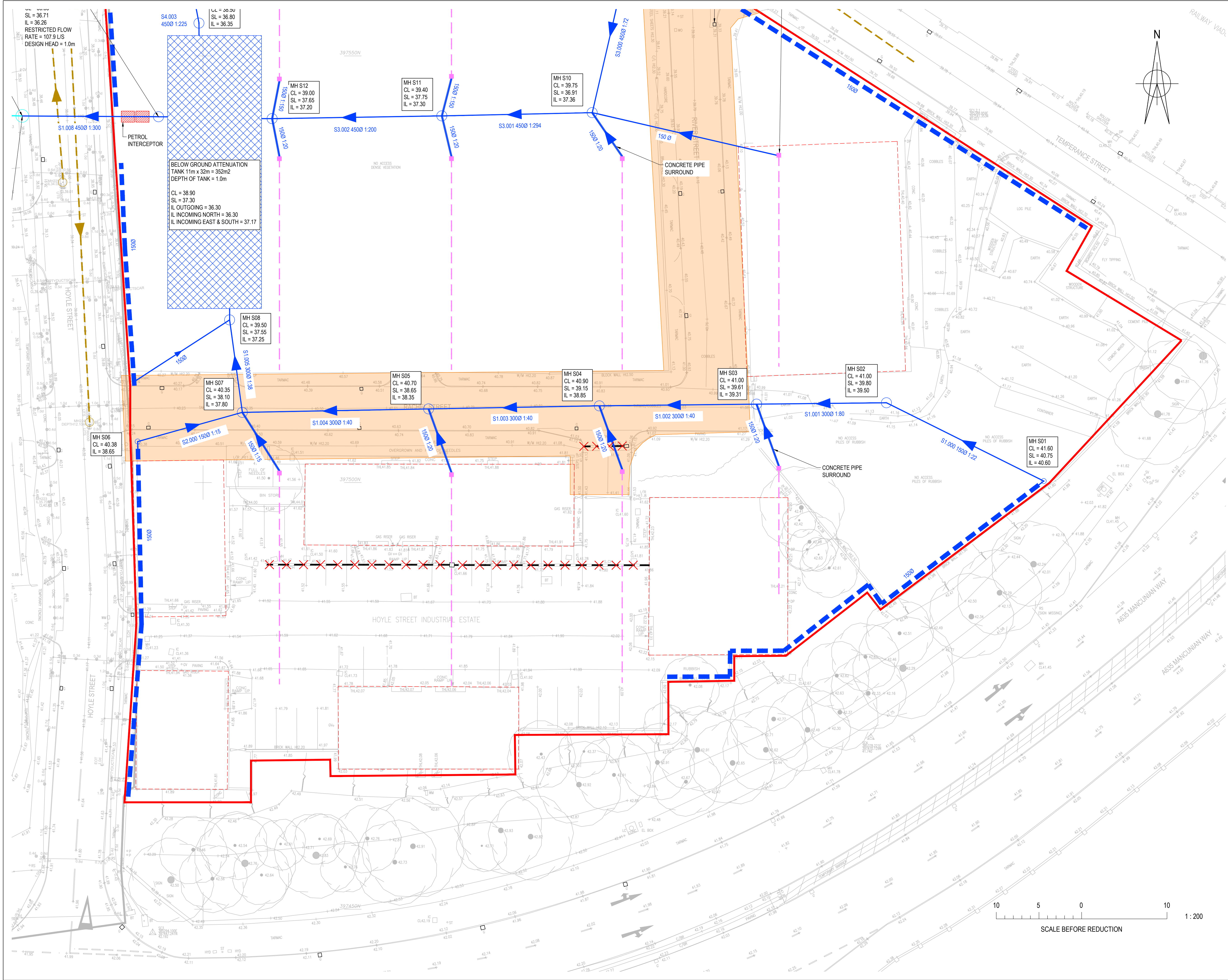
Job No: **0046688** Scale: **A1**

Drawn/Designed By: **NC** Checked By: **CB** Approved By: **CB**

Drawing No: **0046688-BHE-XX-XX-DR-C-1101**

Revision: **A**

Appendix E Proposed Drainage Strategy



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MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

NOTES

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- THIS DRAWING IS INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN.
- ALL DRAINAGE PROPOSALS ARE TO BE AGREED IN PRINCIPLE WITH THE LEAD LOCAL FLOOD AUTHORITY.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DRAWINGS AND REPORT.

LEGEND

- SITE BOUNDARY / SOLID LINE OF HOARDING
- EXISTING PUBLIC COMBINED SEWER
- EXISTING CHANNEL DRAIN TO BE REMOVED
- EXISTING SHED TO BE REMOVED
- EXISTING PRIVATE SURFACE WATER DRAINAGE
- PROPOSED PRIVATE SURFACE WATER DRAINAGE
- PROPOSED BELOW GROUND ATTENUATION TANK
- PROPOSED SPEL STORMCEPTOR
- PROPOSED NON-RETURN VALVE
- PROPOSED ACO 'MULTIDRAIN' LINEAR DRAIN AND UNIVERSAL GULLY
- PROPOSED FILTER DRAIN
- PROPOSED GULLY
- ROAD TRAFFIC REGULATION ORDER

A DRAFT ISSUE 29.11.2023 NC CB

Rev	Description	Date	Iss'd	Rev'd	App'd
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STAGE 2

Project Stage

INFORMATION

Status of Drawing

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Client: **GILLESPIES**
Architect: **MAYFIELD DEVELOPMENT PARTNERSHIP**
Project: **Mayfield Network Rail Compound**
Org Title: **NETWORK RAIL COMPOUND PROPOSED SURFACE WATER DRAINAGE PLAN**

Job No: **0046688** Scale: **A1**
1:200
Drawn/Designed By: **NC** Checked By: **CB** Approved By: **CB**
Drawing No: **0046688-BHE-XX-XX-DR-C-1001**

Revision: **A**

North Arrow: 0046688-BHE-XX-XX-DR-C-1001 Rev'd A.dwg

Appendix F Hydraulic calculation results

BuroHappold Ltd		Page 1
Camden Mill Lower Bristol Road Bath	Mayfield Network Rail Compound	
Date 14/04/2023 File 231129 Storm Model with	Designed by Y.L. Checked by D.C.	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Outlet 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.000	43.098	0.431	100.0	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	3.769	0.013	289.9	0.008	5.00	0.0	0.600	o	300	Pipe/Conduit	
S4.001	21.484	0.072	298.4	0.043	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	17.315	0.304	57.0	0.052	5.00	0.0	0.600	o	300	Pipe/Conduit	
S4.002	19.592	0.316	62.0	0.020	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	11.233	0.050	224.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.000	12.725	0.850	15.0	0.073	5.00	0.0	0.600	o	150	Pipe/Conduit	
S7.000	20.586	0.950	21.7	0.079	5.00	0.0	0.600	o	150	Pipe/Conduit	
S7.001	15.216	0.190	80.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.002	18.415	0.460	40.0	0.029	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.003	20.004	0.500	40.0	0.052	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.004	21.821	0.550	39.7	0.081	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.001	10.938	0.550	19.9	0.084	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.002	23.756	0.080	296.9	0.058	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	20.753	0.290	71.6	0.098	5.00	0.0	0.600	o	450	Pipe/Conduit	
S8.001	17.615	0.060	293.6	0.106	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.002	19.982	0.100	199.8	0.121	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.000	50.00	5.46	39.550	0.000	0.0	0.0	0.0	1.57	111.1	0.0
S4.000	50.00	5.07	36.901	0.008	0.0	0.0	0.0	0.92	64.9	1.1
S4.001	50.00	5.46	36.888	0.051	0.0	0.0	0.0	0.90	64.0	6.9
S5.000	50.00	5.14	37.120	0.052	0.0	0.0	0.0	2.09	147.6	7.0
S4.002	50.00	5.59	36.666	0.123	0.0	0.0	0.0	2.59	411.2	16.7
S4.003	50.00	5.73	36.350	0.123	0.0	0.0	0.0	1.35	215.1	16.7
S6.000	50.00	5.08	38.650	0.073	0.0	0.0	0.0	2.62	46.2	9.9
S7.000	50.00	5.16	40.600	0.079	0.0	0.0	0.0	2.17	38.4	10.7
S7.001	50.00	5.30	39.500	0.079	0.0	0.0	0.0	1.76	124.3	10.7
S7.002	50.00	5.43	39.310	0.108	0.0	0.0	0.0	2.49	176.2	14.6
S7.003	50.00	5.56	38.850	0.160	0.0	0.0	0.0	2.49	176.2	21.7
S7.004	50.00	5.70	38.350	0.241	0.0	0.0	0.0	2.50	177.0	32.6
S6.001	50.00	5.76	37.800	0.398	0.0	0.0	0.0	3.54	250.3	53.9
S6.002	50.00	6.19	37.250	0.456	0.0	0.0	0.0	0.91	64.1	61.7
S8.000	50.00	5.14	37.650	0.098	0.0	0.0	0.0	2.41	382.6	13.3
S8.001	50.00	5.39	37.360	0.204	0.0	0.0	0.0	1.18	187.9	27.6
S8.002	50.00	5.62	37.300	0.325	0.0	0.0	0.0	1.43	228.2	44.0

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Outlet 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S8.003	6.688	0.030	222.9	0.152	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	6.527	0.040	163.2	0.041	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.005	15.949	0.040	398.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.006	36.401	0.050	728.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S9.000	2.034	0.010	203.4	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S9.001	7.808	0.073	107.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.007	59.638	1.325	45.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S10.000	3.366	0.022	150.0	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S10.001	10.654	0.426	25.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	1.451	0.009	161.3	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S11.001	5.510	0.055	100.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.002	19.567	0.326	60.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	33.111	0.331	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.008	2.828	0.016	176.7	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S4.009	21.454	0.059	363.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S4.010	3.370	0.034	99.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S8.003	50.00	5.71	37.200	0.477	0.0	0.0	0.0	1.36	215.9	64.6
S4.004	50.00	6.26	36.300	1.097	0.0	0.0	0.0	1.59	252.7	148.5
S4.005	50.00	6.52	36.260	1.097	0.0	0.0	0.0	1.01	160.9	148.5
S4.006	50.00	7.34	36.210	1.097	0.0	0.0	0.0	0.75	118.6	148.5
S9.000	50.00	5.04	38.000	0.000	0.0	0.0	0.0	0.91	36.3	0.0
S9.001	50.00	5.12	35.200	0.000	0.0	0.0	0.0	1.52	107.3	0.0
S4.007	50.00	7.66	36.034	1.097	0.0	0.0	0.0	3.04	483.0	148.5
S10.000	50.00	5.05	38.000	0.000	0.0	0.0	0.0	1.07	42.4	0.0
S10.001	50.00	5.10	35.056	0.000	0.0	0.0	0.0	3.64	401.7	0.0
S11.000	50.00	5.02	38.000	0.000	0.0	0.0	0.0	1.03	40.8	0.0
S11.001	50.00	5.08	35.000	0.000	0.0	0.0	0.0	1.57	111.0	0.0
S11.002	50.00	5.24	34.975	0.000	0.0	0.0	0.0	2.03	143.7	0.0
S11.003	50.00	5.59	34.649	0.000	0.0	0.0	0.0	1.57	111.1	0.0
S4.008	50.00	7.69	34.239	1.097	0.0	0.0	0.0	1.68	364.1	148.5
S4.009	50.00	7.97	34.148	1.097	0.0	0.0	0.0	1.27	359.4	148.5
S4.010	50.00	8.00	34.128	1.097	0.0	0.0	0.0	2.45	691.6	148.5

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Manhole Schedules for Outlet 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWMHF4	385174.971	397464.800	385174.971	397464.800	Required	
SWMHF5	385218.057	397463.756			No Entry	
SWMH01	385273.988	397585.032	385273.988	397585.032	Required	
SWMH02	385277.135	397582.958	385277.135	397582.958	Required	
SWMH03	385306.253	397587.292	385306.253	397587.292	Required	
SWMH04	385296.253	397573.156	385296.253	397573.156	Required	
SWMH6	385299.525	397553.839	385299.525	397553.839	Required	
SWMH14	385292.344	397504.807	385292.344	397504.807	Required	
SWMH09	385398.472	397500.169	385398.472	397500.169	Required	
SWMH10	385380.048	397509.352	385380.048	397509.352	Required	
SWMH11	385364.833	397509.190	385364.833	397509.190	Required	
SWMH12	385346.419	397508.983	385346.419	397508.983	Required	
SWMH13	385326.418	397508.627	385326.418	397508.627	Required	
SWMH15	385304.601	397508.225	385304.601	397508.225	Required	
SWMH16	385303.111	397519.061	385303.111	397519.061	Required	
SWMH05	385350.266	397563.565	385350.266	397563.565	Required	
SWMH06	385345.584	397543.347	385345.584	397543.347	Required	
SWMH07	385327.973	397542.966	385327.973	397542.966	Required	
SWMH08	385307.994	397542.628	385307.994	397542.628	Required	

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Manhole Schedules for Outlet 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWMH17	385301.307	397542.748	385301.307	397542.748	Required	
SWMH18	385294.781	397542.868	385294.781	397542.868	Required	
SWMH1	385278.832	397542.958	385278.832	397542.958	Required	
SWMHB5	385243.115	397533.990	385243.115	397533.990	Required	
SWMHB6	385243.001	397536.021	385243.001	397536.021	Required	
SWMH2	385242.441	397543.808	385242.441	397543.808	Required	
SWMHB7	385180.191	397532.262	385180.191	397532.262	Required	
SWMHB8	385182.646	397534.566	385182.646	397534.566	Required	
SWMHB9	385140.658	397528.009	385140.658	397528.009	Required	
SWMHB10	385140.020	397529.313	385140.020	397529.313	Required	
SWMH8	385135.671	397532.697	385135.671	397532.697	Required	
SWMH7	385149.727	397546.310	385149.727	397546.310	Required	
SWMH4	385182.820	397545.218	385182.820	397545.218	Required	
SWMH5	385182.940	397548.044	385182.940	397548.044	Required	
SWMH6	385169.039	397564.385	385169.039	397564.385	Required	
SWMHOutfall 1	385166.939	397567.021			No Entry	

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Area Summary for Outlet 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
3.000	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.008	0.008	0.008
4.001	-	-	100	0.043	0.043	0.043
5.000	-	-	100	0.052	0.052	0.052
4.002	-	-	100	0.020	0.020	0.020
4.003	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.073	0.073	0.073
7.000	-	-	100	0.079	0.079	0.079
7.001	-	-	100	0.000	0.000	0.000
7.002	-	-	100	0.029	0.029	0.029
7.003	-	-	100	0.052	0.052	0.052
7.004	-	-	100	0.081	0.081	0.081
6.001	-	-	100	0.084	0.084	0.084
6.002	-	-	100	0.058	0.058	0.058
8.000	-	-	100	0.098	0.098	0.098
8.001	-	-	100	0.106	0.106	0.106
8.002	-	-	100	0.121	0.121	0.121
8.003	-	-	100	0.152	0.152	0.152
4.004	User	-	100	0.041	0.041	0.041
4.005	-	-	100	0.000	0.000	0.000
4.006	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.000	0.000	0.000
9.001	-	-	100	0.000	0.000	0.000
4.007	-	-	100	0.000	0.000	0.000
10.000	-	-	100	0.000	0.000	0.000
10.001	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.000	0.000	0.000
11.001	-	-	100	0.000	0.000	0.000
11.002	-	-	100	0.000	0.000	0.000
11.003	-	-	100	0.000	0.000	0.000
4.008	-	-	100	0.000	0.000	0.000
4.009	-	-	100	0.000	0.000	0.000
4.010	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.097	1.097	1.097

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Online Controls for Outlet 1

Non Return Valve Manhole: SWMH02, DS/PN: S4.001, Volume (m³): 1.2

Non Return Valve Manhole: SWMH04, DS/PN: S4.002, Volume (m³): 5.2

Hydro-Brake® Optimum Manhole: SWMH18, DS/PN: S4.005, Volume (m³): 4.5

Unit Reference	MD-SHE-0409-1079-0900-1079
Design Head (m)	0.900
Design Flow (l/s)	107.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	409
Invert Level (m)	36.260
Minimum Outlet Pipe Diameter (mm)	450
Suggested Manhole Diameter (mm) Site Specific Design (Contact Hydro International)	

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	107.9	Kick-Flo®	0.792	101.4
Flush-Flo™	0.548	107.8	Mean Flow over Head Range	-	79.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	11.2	0.800	101.9	2.000	159.2	4.000	223.4	7.000	294.1
0.200	40.1	1.000	113.6	2.200	166.8	4.500	236.7	7.500	304.2
0.300	77.8	1.200	124.1	2.400	174.0	5.000	249.3	8.000	314.1
0.400	104.9	1.400	133.8	2.600	180.9	5.500	261.2	8.500	323.6
0.500	107.5	1.600	142.8	3.000	194.1	6.000	272.6	9.000	332.8
0.600	107.5	1.800	151.2	3.500	209.3	6.500	283.6	9.500	338.3

Hydro-Brake® Optimum Manhole: SWMHB6, DS/PN: S9.001, Volume (m³): 5.5

Unit Reference	MD-SHE-0244-3170-0850-3170
Design Head (m)	0.850
Design Flow (l/s)	31.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	244
Invert Level (m)	35.200
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.850	31.7	Kick-Flo®	0.663	28.1
Flush-Flo™	0.371	31.7	Mean Flow over Head Range	-	25.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

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Hydro-Brake® Optimum Manhole: SWMHB6, DS/PN: S9.001, Volume (m³): 5.5

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.0	0.800	30.8	2.000	47.8	4.000	66.9	7.000	87.9
0.200	24.8	1.000	34.3	2.200	50.1	4.500	70.9	7.500	90.9
0.300	31.4	1.200	37.4	2.400	52.2	5.000	74.6	8.000	93.8
0.400	31.6	1.400	40.3	2.600	54.3	5.500	78.1	8.500	96.6
0.500	31.0	1.600	43.0	3.000	58.2	6.000	81.5	9.000	98.8
0.600	29.7	1.800	45.5	3.500	62.7	6.500	84.8	9.500	101.5

Hydro-Brake® Optimum Manhole: SWMHB8, DS/PN: S10.001, Volume (m³): 7.2

Unit Reference	MD-SHE-0228-3170-2000-3170
Design Head (m)	2.000
Design Flow (l/s)	31.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	228
Invert Level (m)	35.056
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	31.7	Kick-Flo®	1.275	25.6
Flush-Flo™	0.590	31.7	Mean Flow over Head Range	-	27.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.6	0.800	31.2	2.000	31.7	4.000	44.2	7.000	58.0
0.200	22.8	1.000	30.0	2.200	33.2	4.500	46.8	7.500	60.0
0.300	29.4	1.200	27.4	2.400	34.6	5.000	49.3	8.000	61.9
0.400	30.9	1.400	26.7	2.600	35.9	5.500	51.6	8.500	63.7
0.500	31.5	1.600	28.5	3.000	38.5	6.000	53.8	9.000	65.5
0.600	31.7	1.800	30.1	3.500	41.5	6.500	55.9	9.500	67.3

Hydro-Brake® Optimum Manhole: SWMHB10, DS/PN: S11.001, Volume (m³): 5.7

Unit Reference	MD-SHE-0172-1750-2000-1750
Design Head (m)	2.000
Design Flow (l/s)	17.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	172
Invert Level (m)	35.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	17.5	Kick-Flo®	1.219	13.8
Flush-Flo™	0.581	17.4	Mean Flow over Head Range	-	15.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake®

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Hydro-Brake® Optimum Manhole: SWMHB10, DS/PN: S11.001, Volume (m³): 5.7

Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.1	0.800	17.1	2.000	17.5	4.000	24.3	7.000	31.9
0.200	14.6	1.000	16.2	2.200	18.3	4.500	25.8	7.500	32.9
0.300	16.2	1.200	14.2	2.400	19.1	5.000	27.1	8.000	34.0
0.400	17.0	1.400	14.8	2.600	19.8	5.500	28.4	8.500	35.0
0.500	17.3	1.600	15.7	3.000	21.2	6.000	29.6	9.000	36.0
0.600	17.4	1.800	16.6	3.500	22.8	6.500	30.7	9.500	36.9

Non Return Valve Manhole: SWMH6, DS/PN: S4.010, Volume (m³): 7.5

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Storage Structures for Outlet 1

Cellular Storage Manhole: SWMH17, DS/PN: S4.004

Invert Level (m) 36.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	340.0	0.0	1.010	0.0	0.0
1.000	340.0	0.0	2.600	0.0	0.0

Cellular Storage Manhole: SWMHB6, DS/PN: S9.001

Invert Level (m) 35.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	75.0	64.0	2.000	75.0	129.6	2.100	0.0	129.6

Cellular Storage Manhole: SWMHB8, DS/PN: S10.001

Invert Level (m) 35.056 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	75.0	16.0	2.000	75.0	48.0	2.100	0.0	48.0

Cellular Storage Manhole: SWMHB10, DS/PN: S11.001

Invert Level (m) 35.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	40.0	50.0	2.000	40.0	110.0	2.100	0.0	110.0

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Outlet 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 7 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 385108 397575 SJ 85108 97575 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged
									Level (m)	Depth (m)
S3.000	SWMHF4	15 Summer	2	+0%					39.550	-0.300
S4.000	SWMH01	15 Winter	2	+0%	100/30 Winter	100/60 Winter			36.959	-0.242
S4.001	SWMH02	15 Winter	2	+0%	100/30 Winter				36.957	-0.231
S5.000	SWMH03	15 Winter	2	+0%	100/60 Winter				37.169	-0.251
S4.002	SWMH04	15 Winter	2	+0%	100/30 Summer				36.734	-0.382
S4.003	SWMH6	120 Winter	2	+0%	30/15 Winter				36.548	-0.252
S6.000	SWMH14	15 Winter	2	+0%	30/15 Summer				38.703	-0.097
S7.000	SWMH09	15 Winter	2	+0%	100/15 Summer				40.660	-0.090
S7.001	SWMH10	15 Winter	2	+0%	100/15 Summer				39.568	-0.232
S7.002	SWMH11	15 Winter	2	+0%	100/15 Summer				39.375	-0.235
S7.003	SWMH12	15 Winter	2	+0%	100/15 Summer				38.927	-0.223
S7.004	SWMH13	15 Winter	2	+0%	30/15 Summer				38.444	-0.206
S6.001	SWMH15	15 Winter	2	+0%	30/15 Summer				37.912	-0.188
S6.002	SWMH16	15 Winter	2	+0%	2/15 Winter				37.553	0.003
S8.000	SWMH05	15 Winter	2	+0%	100/15 Summer				37.714	-0.386
S8.001	SWMH06	15 Winter	2	+0%	30/15 Summer				37.505	-0.305
S8.002	SWMH07	15 Winter	2	+0%	30/15 Summer				37.464	-0.286
S8.003	SWMH08	15 Winter	2	+0%	30/15 Summer				37.417	-0.233
S4.004	SWMH17	120 Winter	2	+0%	30/15 Summer				36.547	-0.203
S4.005	SWMH18	120 Winter	2	+0%	30/15 Summer				36.560	-0.150
S4.006	SWMH1	120 Winter	2	+0%					36.372	-0.288
S9.000	SWMHB5	15 Summer	2	+0%					38.000	-0.225
S9.001	SWMHB6	360 Winter	2	+0%	2/15 Summer				36.092	0.592
S4.007	SWMH2	180 Winter	2	+0%					36.098	-0.386
S10.000	SWMHB7	15 Summer	2	+0%					38.000	-0.225
S10.001	SWMHB8	15 Summer	2	+0%					35.056	-0.375
S11.000	SWMHB9	15 Summer	2	+0%					38.000	-0.225
S11.001	SWMHB10	15 Summer	2	+0%					35.000	-0.300
S11.002	SWMH8	15 Summer	2	+0%					34.945	-0.330
S11.003	SWMH7	15 Summer	2	+0%					34.649	-0.300
S4.008	SWMH4	180 Winter	2	+0%					34.363	-0.401

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Outlet 1

PN	US/MH Name	Flooded		Half Drain		Pipe	Status	Level Exceeded
		Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)		
S3.000	SWMHF4	0.000	0.00			0.0	OK	72
S4.000	SWMH01	0.000	0.02			1.2	OK	2
S4.001	SWMH02	0.000	0.12			6.8	OK	
S5.000	SWMH03	0.000	0.06			8.0	OK	
S4.002	SWMH04	0.000	0.05			17.2	OK	
S4.003	SWMH6	0.000	0.04			5.9	OK	
S6.000	SWMH14	0.000	0.27			11.2	OK	
S7.000	SWMH09	0.000	0.33			12.1	OK	
S7.001	SWMH10	0.000	0.11			12.0	OK	
S7.002	SWMH11	0.000	0.10			15.8	OK	
S7.003	SWMH12	0.000	0.15			22.6	OK	
S7.004	SWMH13	0.000	0.21			33.1	OK	
S6.001	SWMH15	0.000	0.30			54.9	OK	
S6.002	SWMH16	0.000	1.09			61.9	SURCHARGED	
S8.000	SWMH05	0.000	0.05			15.0	OK	
S8.001	SWMH06	0.000	0.19			28.4	OK	
S8.002	SWMH07	0.000	0.24			43.6	OK	
S8.003	SWMH08	0.000	0.46			62.1	OK	
S4.004	SWMH17	0.000	0.19		60	29.4	OK	34
S4.005	SWMH18	0.000	0.26			28.7	OK	
S4.006	SWMH1	0.000	0.28			28.8	OK	3
S9.000	SWMHB5	0.000	0.00			0.0	OK	
S9.001	SWMHB6	0.000	0.01			0.7	SURCHARGED	
S4.007	SWMH2	0.000	0.05			21.7	OK	
S10.000	SWMHB7	0.000	0.00			0.0	OK	
S10.001	SWMHB8	0.000	0.00			0.0	OK	
S11.000	SWMHB9	0.000	0.00			0.0	OK	
S11.001	SWMHB10	0.000	0.00			0.0	OK	
S11.002	SWMH8	0.000	0.00			0.0	OK	
S11.003	SWMH7	0.000	0.00			0.0	OK	
S4.008	SWMH4	0.000	0.13			21.7	OK	72

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Outlet 1

US/MH		Return Climate First (X)		First (Y)		First (Z)		Overflow		Water Level	Surcharged Depth	Flooded Volume
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.		(m)	(m)	(m³)
S4.009	SWMH5	180 Winter	2	+0%						34.277	-0.471	0.000
S4.010	SWMH6	180 Winter	2	+0%						34.235	-0.493	0.000

US/MH		Half Drain Pipe		Flow / Overflow		Time		Flow		Level	
PN	Name	Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded				
S4.009	SWMH5	0.08			21.8	OK					
S4.010	SWMH6	0.07			21.8	OK				72	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Outlet 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 7 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 385108 397575 SJ 85108 97575 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged
									Level (m)	Depth (m)
S3.000	SWMHF4	15 Summer	30	+30%					39.550	-0.300
S4.000	SWMH01	15 Winter	30	+30%	100/30 Winter	100/60 Winter			37.026	-0.175
S4.001	SWMH02	15 Winter	30	+30%	100/30 Winter				37.025	-0.163
S5.000	SWMH03	15 Winter	30	+30%	100/60 Winter				37.207	-0.213
S4.002	SWMH04	60 Winter	30	+30%	100/30 Summer				37.006	-0.110
S4.003	SWMH6	60 Winter	30	+30%	30/15 Winter				37.001	0.201
S6.000	SWMH14	15 Winter	30	+30%	30/15 Summer				39.117	0.317
S7.000	SWMH09	15 Winter	30	+30%	100/15 Summer				40.719	-0.031
S7.001	SWMH10	15 Winter	30	+30%	100/15 Summer				39.621	-0.179
S7.002	SWMH11	15 Winter	30	+30%	100/15 Summer				39.428	-0.182
S7.003	SWMH12	15 Winter	30	+30%	100/15 Summer				39.030	-0.120
S7.004	SWMH13	15 Winter	30	+30%	30/15 Summer				38.937	0.287
S6.001	SWMH15	15 Winter	30	+30%	30/15 Summer				38.714	0.614
S6.002	SWMH16	15 Winter	30	+30%	2/15 Winter				38.297	0.747
S8.000	SWMH05	15 Winter	30	+30%	100/15 Summer				37.923	-0.177
S8.001	SWMH06	15 Winter	30	+30%	30/15 Summer				37.878	0.068
S8.002	SWMH07	15 Winter	30	+30%	30/15 Summer				37.845	0.095
S8.003	SWMH08	15 Winter	30	+30%	30/15 Summer				37.736	0.086
S4.004	SWMH17	60 Winter	30	+30%	30/15 Summer				36.998	0.248
S4.005	SWMH18	60 Winter	30	+30%	30/15 Summer				37.050	0.340
S4.006	SWMH1	30 Winter	30	+30%					36.546	-0.114
S9.000	SWMHB5	15 Summer	30	+30%					38.000	-0.225
S9.001	SWMHB6	240 Winter	30	+30%	2/15 Summer				36.142	0.642
S4.007	SWMH2	180 Winter	30	+30%					36.162	-0.322
S10.000	SWMHB7	15 Summer	30	+30%					38.000	-0.225
S10.001	SWMHB8	15 Summer	30	+30%					35.056	-0.375
S11.000	SWMHB9	15 Summer	30	+30%					38.000	-0.225
S11.001	SWMHB10	15 Summer	30	+30%					35.000	-0.300
S11.002	SWMH8	15 Summer	30	+30%					34.945	-0.330
S11.003	SWMH7	15 Summer	30	+30%					34.649	-0.300
S4.008	SWMH4	180 Winter	30	+30%					34.490	-0.274

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Outlet 1

PN	US/MH Name	Flooded		Half Drain		Pipe	Status	Level Exceeded
		Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)		
S3.000	SWMHF4	0.000	0.00			0.0	OK	72
S4.000	SWMH01	0.000	0.08			3.7	OK	2
S4.001	SWMH02	0.000	0.43			24.0	OK	
S5.000	SWMH03	0.000	0.18			23.3	OK	
S4.002	SWMH04	0.000	0.09			28.3	OK	
S4.003	SWMH6	0.000	0.17			26.1	SURCHARGED	
S6.000	SWMH14	0.000	0.71			30.0	SURCHARGED	
S7.000	SWMH09	0.000	0.98			35.3	OK	
S7.001	SWMH10	0.000	0.34			35.0	OK	
S7.002	SWMH11	0.000	0.32			48.5	OK	
S7.003	SWMH12	0.000	0.47			72.7	OK	
S7.004	SWMH13	0.000	0.64			99.9	SURCHARGED	
S6.001	SWMH15	0.000	0.86			160.4	SURCHARGED	
S6.002	SWMH16	0.000	3.20			182.4	SURCHARGED	
S8.000	SWMH05	0.000	0.14			42.5	OK	
S8.001	SWMH06	0.000	0.58			86.6	SURCHARGED	
S8.002	SWMH07	0.000	0.77			137.7	SURCHARGED	
S8.003	SWMH08	0.000	1.51			202.1	SURCHARGED	
S4.004	SWMH17	0.000	0.60		70	93.9	SURCHARGED	34
S4.005	SWMH18	0.000	0.86			95.8	SURCHARGED	
S4.006	SWMH1	0.000	0.91			95.4	OK	3
S9.000	SWMHB5	0.000	0.00			0.0	OK	
S9.001	SWMHB6	0.000	0.02			1.3	SURCHARGED	
S4.007	SWMH2	0.000	0.18			80.5	OK	
S10.000	SWMHB7	0.000	0.00			0.0	OK	
S10.001	SWMHB8	0.000	0.00			0.0	OK	
S11.000	SWMHB9	0.000	0.00			0.0	OK	
S11.001	SWMHB10	0.000	0.00			0.0	OK	
S11.002	SWMH8	0.000	0.00			0.0	OK	
S11.003	SWMH7	0.000	0.00			0.0	OK	
S4.008	SWMH4	0.000	0.47			80.6	OK	72

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Outlet 1

US/MH		Return Climate First (X)		First (Y)		First (Z)		Overflow		Water Level	Surcharged Depth	Flooded Volume
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.		(m)	(m)	(m³)
S4.009	SWMH5	120 Winter	30	+30%						34.395	-0.353	0.000
S4.010	SWMH6	120 Winter	30	+30%						34.346	-0.382	0.000

US/MH		Half Drain Pipe		Flow / Overflow		Time		Flow		Level	
PN	Name	Cap.	(l/s)			(mins)		(l/s)	Status	Exceeded	
S4.009	SWMH5	0.29						79.5	OK		
S4.010	SWMH6	0.27						79.9	OK		72

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Outlet 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 7 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 385108 397575 SJ 85108 97575 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged
									Level (m)	Depth (m)
S3.000	SWMHF4	15 Summer	100	+30%					39.550	-0.300
S4.000	SWMH01	60 Winter	100	+30%	100/30 Winter	100/60 Winter			37.422	0.221
S4.001	SWMH02	120 Winter	100	+30%	100/30 Winter				37.506	0.318
S5.000	SWMH03	60 Winter	100	+30%	100/60 Winter				37.528	0.108
S4.002	SWMH04	60 Winter	100	+30%	100/30 Summer				37.522	0.406
S4.003	SWMH6	180 Winter	100	+30%	30/15 Winter				37.589	0.789
S6.000	SWMH14	15 Winter	100	+30%	30/15 Summer				39.989	1.189
S7.000	SWMH09	15 Winter	100	+30%	100/15 Summer				41.330	0.580
S7.001	SWMH10	15 Winter	100	+30%	100/15 Summer				40.100	0.300
S7.002	SWMH11	15 Winter	100	+30%	100/15 Summer				39.972	0.362
S7.003	SWMH12	15 Winter	100	+30%	100/15 Summer				39.802	0.652
S7.004	SWMH13	15 Winter	100	+30%	30/15 Summer				39.603	0.953
S6.001	SWMH15	15 Winter	100	+30%	30/15 Summer				39.297	1.197
S6.002	SWMH16	15 Winter	100	+30%	2/15 Winter				38.688	1.138
S8.000	SWMH05	15 Winter	100	+30%	100/15 Summer				38.228	0.128
S8.001	SWMH06	15 Winter	100	+30%	30/15 Summer				38.051	0.241
S8.002	SWMH07	15 Winter	100	+30%	30/15 Summer				38.005	0.255
S8.003	SWMH08	15 Winter	100	+30%	30/15 Summer				37.877	0.227
S4.004	SWMH17	180 Winter	100	+30%	30/15 Summer				37.587	0.837
S4.005	SWMH18	120 Winter	100	+30%	30/15 Summer				37.457	0.747
S4.006	SWMH1	120 Winter	100	+30%					36.660	0.000
S9.000	SWMHB5	15 Summer	100	+30%					38.000	-0.225
S9.001	SWMHB6	180 Winter	100	+30%	2/15 Summer				36.164	0.664
S4.007	SWMH2	120 Winter	100	+30%					36.179	-0.305
S10.000	SWMHB7	15 Summer	100	+30%					38.000	-0.225
S10.001	SWMHB8	15 Summer	100	+30%					35.056	-0.375
S11.000	SWMHB9	15 Summer	100	+30%					38.000	-0.225
S11.001	SWMHB10	15 Summer	100	+30%					35.000	-0.300
S11.002	SWMH8	15 Summer	100	+30%					34.945	-0.330
S11.003	SWMH7	15 Summer	100	+30%					34.649	-0.300
S4.008	SWMH4	120 Winter	100	+30%					34.531	-0.233

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Outlet 1

PN	US/MH Name	Flooded		Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Volume (m³)	Flow						
S3.000	SWMHF4	0.000	0.00				0.0	OK	72
S4.000	SWMH01	1.498	0.25				12.1	FLOOD	2
S4.001	SWMH02	0.000	0.18				10.0	FLOOD RISK	
S5.000	SWMH03	0.000	0.14				17.2	SURCHARGED	
S4.002	SWMH04	0.000	0.12				36.9	SURCHARGED	
S4.003	SWMH6	0.000	0.10				15.0	SURCHARGED	
S6.000	SWMH14	0.000	0.92				38.7	SURCHARGED	
S7.000	SWMH09	0.000	1.16				41.8	FLOOD RISK	
S7.001	SWMH10	0.000	0.43				44.4	SURCHARGED	
S7.002	SWMH11	0.000	0.45				68.6	SURCHARGED	
S7.003	SWMH12	0.000	0.57				87.9	SURCHARGED	
S7.004	SWMH13	0.000	0.74				114.9	SURCHARGED	
S6.001	SWMH15	0.000	1.04				192.6	SURCHARGED	
S6.002	SWMH16	0.000	3.89				221.5	SURCHARGED	
S8.000	SWMH05	0.000	0.19				58.2	SURCHARGED	
S8.001	SWMH06	0.000	0.81				120.5	SURCHARGED	
S8.002	SWMH07	0.000	1.09				194.3	SURCHARGED	
S8.003	SWMH08	0.000	2.13				285.6	SURCHARGED	
S4.004	SWMH17	0.000	0.65			96	101.9	SURCHARGED	34
S4.005	SWMH18	0.000	0.96				107.1	SURCHARGED	
S4.006	SWMH1	0.000	1.02				107.0	OK	3
S9.000	SWMHB5	0.000	0.00				0.0	OK	
S9.001	SWMHB6	0.000	0.01				1.0	SURCHARGED	
S4.007	SWMH2	0.000	0.23				102.6	OK	
S10.000	SWMHB7	0.000	0.00				0.0	OK	
S10.001	SWMHB8	0.000	0.00				0.0	OK	
S11.000	SWMHB9	0.000	0.00				0.0	OK	
S11.001	SWMHB10	0.000	0.00				0.0	OK	
S11.002	SWMH8	0.000	0.00				0.0	OK	
S11.003	SWMH7	0.000	0.00				0.0	OK	
S4.008	SWMH4	0.000	0.60				102.6	OK	72

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Outlet 1

									Water	Surcharged	Flooded	
	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume
PN	Name	Storm		Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)
S4.009	SWMH5	120	Winter	100	+30%					34.425	-0.323	0.000
S4.010	SWMH6	120	Winter	100	+30%					34.373	-0.355	0.000

US/MH		Half Drain		Pipe	Level	
PN	Name	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status Exceeded
S4.009	SWMH5	0.37			102.4	OK
S4.010	SWMH6	0.35			102.3	OK

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