

ROCHDALE STATION SQUARE

Drainage Design Basis Statement

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ROCHDALE STATION SQUARE ROCHDALE STATION SQUARE

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1. Introduction

1.1 Scope

Arcadis Consulting (UK) have been appointed by Rochdale Borough Council, to progress the proposed re-development of Rochdale Station Square through RIBA Stage 3 and RIBA Stage 4. The scheme comprises works to public highways and the creation of an area of public realm to the north of Rochdale Railway Station. Rochdale Station Square is a large public space located to the front entrance of Rochdale Station, and is bisected by a number of roads, including Station Road, Dowling Street, Lower Tweeddale Street and Maclure Road.

This Drainage Design Basis Statement intends to document the design parameters and approach that will be used when developing drainage designs for the scheme. The report also explains the approach taken with regards to surface water drainage strategy for the development. It evaluates the selection of SuDS and highlights how the drainage disposal hierarchy will be followed. The overall goal is to promote sustainability and reduce the flood risk both on and off site.

1.2 Site Location Plan and Topography

The site is located to the north of Rochdale Railway station and is approximately 1.195 hectares, shown in Figure 1 below, the existing site is mostly made up of road and footpaths, which are impermeable and there is no existing watercourse within the scheme extents.

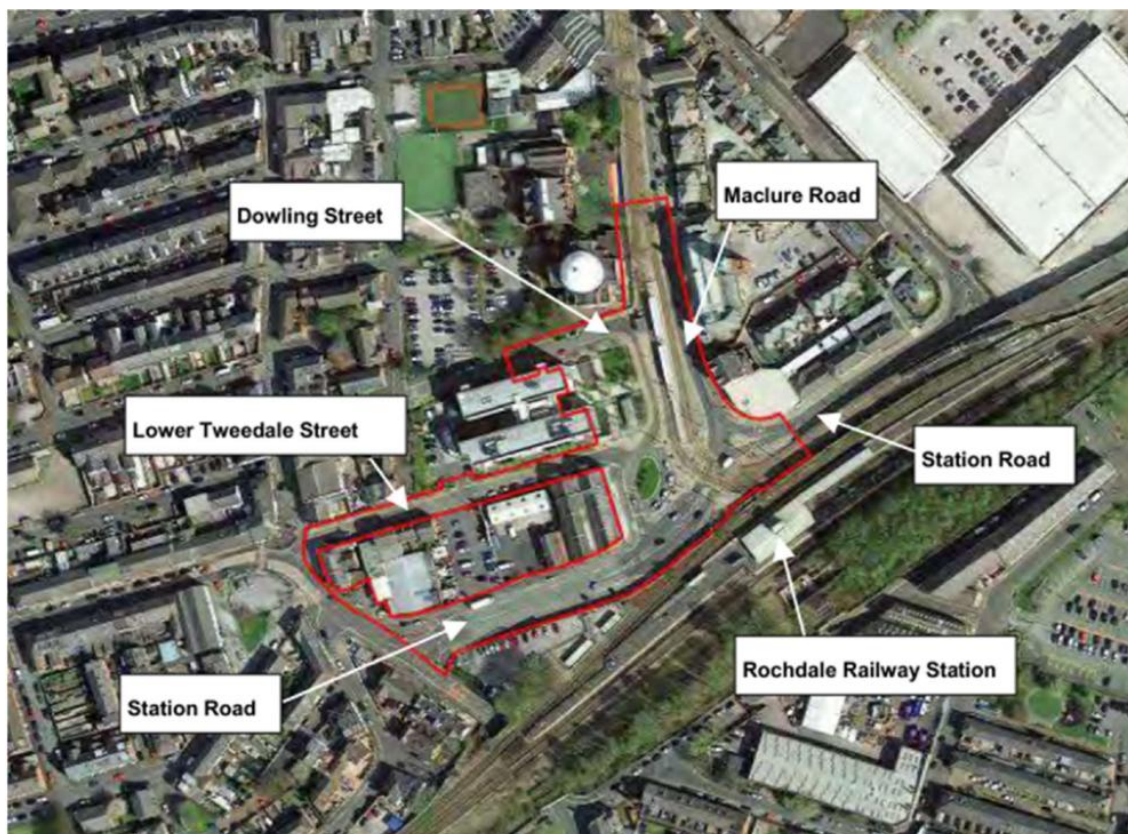


Figure 1- Existing site and scheme boundary

The topography of the site is highest at the south, at 144m AOD, which drops down to 141m AOD at the northern extent of the site. An existing chamber (considered to be road drainage) in the centre of the square has pipes running at approximately 138.78m AOD, which then ties into an existing United Utilities combined sewer adjacent to the metro and Station Road. This combined sewer is flowing East – West at approximately 136.11m AOD.

2. Existing Site

2.1 Existing Drainage

The site is currently served by traditional means of positive highways drainage by means of kerb gullies either connected to carrier drain systems (up to diameter 300mm) that inflow into the United Utilities combined sewers or direct connections of the gullies to the Combined sewers. There are numerous public sewers within the vicinity of the proposed development in the area, with the majority being combined sewers. Records indicate that the existing sewers generally flow from north to south and from east to west. The sewer records indicate that the majority of the network in this area is a combined foul and surface water system, with pipe diameters within the scheme extents typically varying between 225mm and 525mm.

There is a short length of private drainage within the vicinity of the existing taxi rank and which discharges into the existing United Utilities combined sewer in Station Road. This is presumed to be highway drainage as surveys have shown this to receive incoming connections from existing highway gullies. Surveys have indicated the presence of numerous private connections between buildings and the United Utilities public sewer. These are not affected by the proposed scheme and there are no plans to modify these connections in any way.

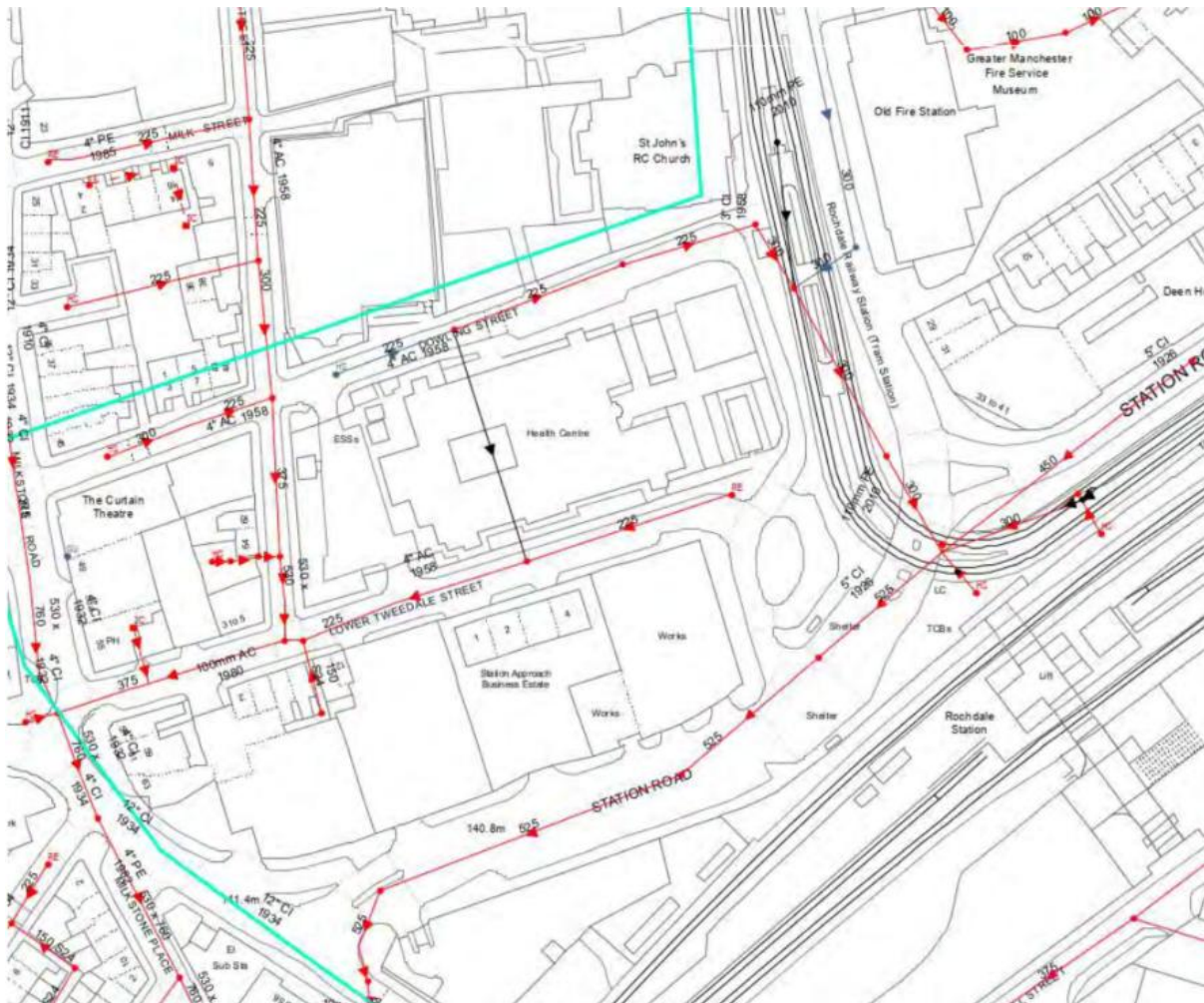


Figure 2- Public Sewer Records Extract

2.2 Existing Utilities

A GPR survey has been conducted to determine the utilities present on the site, the survey identified many drainage assets including combined sewers and surface water sewers from United Utilities, other major utilities were also identified including gas mains as well as water mains. SuDS features proposed within the scheme will need to be assessed for suitability based on these utilities present.

2.3 Existing Green Areas and Permeable/Impermeable Areas

It is proposed to convert areas within the scheme from permeable to impermeable as well as the other way around. This conversion of space will greatly affect the amount of betterment is provided to the existing drainage runoff rates.

The existing permeable/impermeable area split is shown in the table and figure below.

Table 1 – Existing permeability

	Gross Area (m ²)
Permeable	525
Impermeable	11425
Total	11950

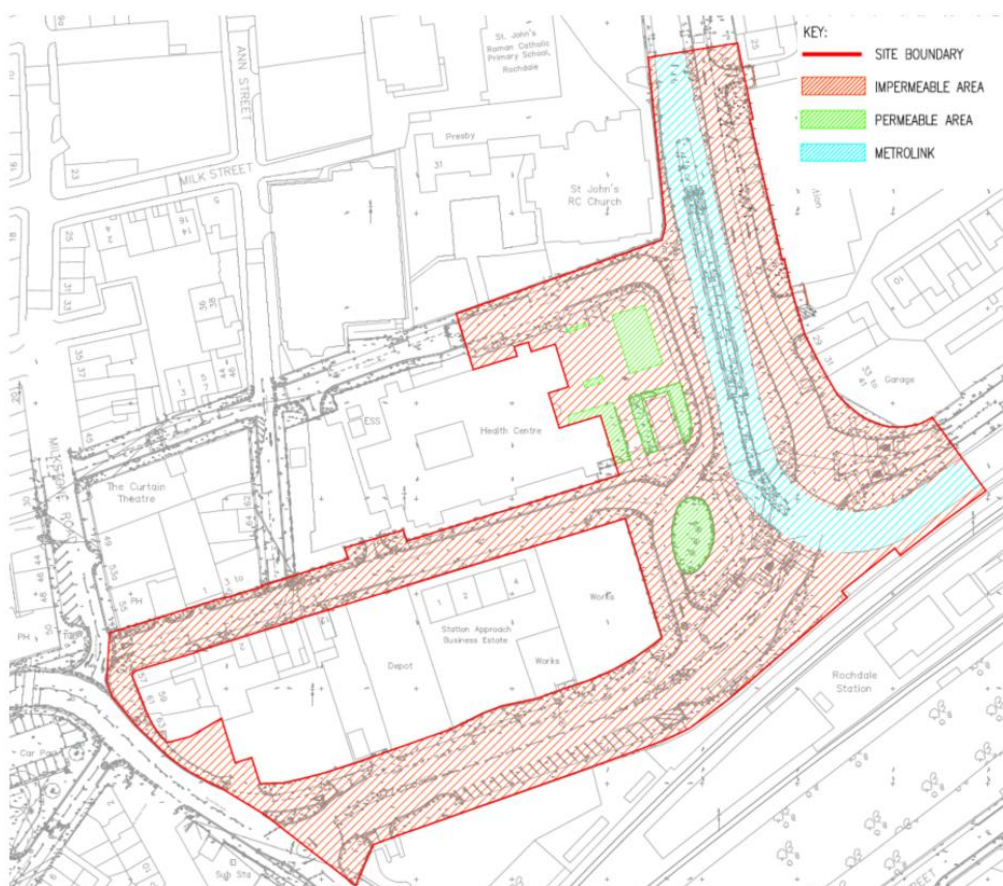


Figure 3 – Existing Site Permeability

The current green areas present on site are proposed to be converted into impermeable area to accommodate the new design. Green roofs, green landscape, raingardens and bioretention storage will be proposed to offset this area as well as provide additional betterment to the drainage runoff.

3. Proposed Development

Rochdale Station Square will provide an important and much needed space for local communities and is an exciting opportunity to develop a new civic space to the north of the railway station that can create an enhanced gateway experience to the town, act as a catalyst for investment in the station area and support the wider regeneration strategy of the town and borough.

These will be pedestrian prioritised routes and traffic calmed through design. Low kerbs, narrowed carriageways, widened footways and clear movement routes are proposed. Vehicle parking, loading, access and circulation is incorporated into the design. Taxi ranking is relocated to Station Road (east) as is the bus stop. Thresholds between the streets/Square create a transition point to mark the changing character and emphasise arrival within the square.

Movements within the square are simplified, reducing conflict points and prioritising pedestrians. A controlled access and bus route is incorporated within the square along Maclure Rd. A plaza is divided into parts supporting both passive and formal activity. Outside Nye Bevin house a community garden provides space for informal dwell, meeting friends and health exercise. Next to the station a more open, flexible area provide a stage for events and activities.

It is proposed to convert areas within the scheme from permeable to impermeable as well as the other way around. This conversion of space will greatly affect the amount of betterment is provided to the existing drainage runoff rates.

The Proposed permeable/impermeable area split is shown in the table below.

Table 2 – Proposed permeability

	Gross Area (m ²)
Permeable	151
Impermeable	11799
Total	11950

Reference should be made to the Drainage GA plan layout in Appendix A to see the drainage proposals.

4. Previous Studies and Consultations

This report follows a previous drainage design submission by WSP and updates the drainage strategy prepared by them in their “Flood Risk Assessment & Drainage Strategy” (2022) report. Following feedback from Rochdale Borough Council. Rochdale Borough Council advised the improvements suggested in the “Flood Risk Assessment & Drainage Strategy” (2022) report were not adequate and further work was required to demonstrate ‘The Hierarchy of Drainage’ from the National Planning Practise Guidance has been followed.

Previous planning application had been put forward and approved, this report follows conditions within this planning permissions document. Planning permissions conditions have been attached to this document and can be seen in Appendix B.

Previous United Utilities pre-development enquiry had also been submitted as part of the last WSP drainage submission. Outcome of this enquiry gives an overview of the scheme and proposed surface water drainage strategy. United Utilities have confirmed that, in principle, they have no objection to the existing connections being maintained whereby surface water discharges at an

unrestricted rate into the public sewerage system. Response from United Utilities regarding the enquiry can be found in Appendix C.

5. Drainage Discharge Hierarchy

The following drainage hierarchy for surface water drainage destination have been considered for the design:

- Priority Level 1: Surface water is collected for use by rainwater harvesting.
- Priority Level 2: Surface water is infiltrated to ground.
- Priority Level 3: Surface water is discharged to a surface water body.
- Priority Level 4: Surface water is discharged to a surface water sewer, Highway drain, or other drainage system.
- Priority Level 5: Surface water is discharged to a combined sewer.

5.1 Appraising the use of Rainwater Harvesting

Although direct rainwater harvesting cannot be integrated into the project, the use of RootSpace Units or similar equivalent system in the central square region of the scheme will be considered as a means of tree irrigation. This will also provide a means of betterment to the drainage system.

5.2 Appraising the use of Infiltration Techniques

Building Regulations Part H states any infiltration device should not be constructed within 5 metres of any building or road to avoid the infiltrated water having a negative impact on nearby structures. The main area of development is adjacent to the existing Rochdale Town Centre Metrolink station and is bounded by buildings on all sides. This paired with the fact that maintenance of soakaways in public realm areas being particularly challenging is why infiltration techniques have not been proposed within the site.

5.3 Appraising the use of Open Water Features

There are no watercourses within the site boundary or meaningful vicinity of the site and so open water features have not been proposed.

5.4 Appraising the discharge to Surface water sewer, Highway Drain, or Other System

There are a few existing surface water sewers identified within the scheme, however these were found to discharge into the combined sewers. The scheme will retain the existing surface water sewers where practical.

5.5 Appraising the discharge to Combined Sewer

The United Utilities combined sewers present on site is identified as the most preferred discharge location for the surface water discharge from the proposed development. Since existing drainage already discharges into these sewers, new gullies can be connected to the existing gully outlet, reducing the need for new connections to the combined sewers.

6. Drainage Design Principles and Strategy

Specific design criteria for the proposed surface water drainage system include:

- Flooding does not occur on any part of the site for a 1 in 30 year rainfall event with climate change. The surface water system is designed to prevent flooding in any part of the site for the critical duration. Unless an area is designated to hold and/or convey water as part of the design.
- Surface water system design will be designed with the aspirations of 50% reduction in discharge rate from current rate following best practice. The improvements will be provided to areas where catchment areas/impermeable areas have increased, such as the area surrounding Station Square. Since the catchment areas/impermeable areas have not increased on the other areas, it is assumed that the existing flows are to be retained and a climate change uplift to be applied. However, sustainability will be promoted by incorporating Sustainable Drainage Systems (SuDS) in the design on the public highways where feasible with the objective of meeting the climate adaption requirements and to assist with reducing existing surface water runoff rates. Although this is not a primary design factor, betterment will be applied where possible and committed betterment percentage cannot be provided at this stage for the public highways runoff.
- The drainage design is constraint by the existing connections to the United Utilities Combined Sewers, adding new direct connections or new manholes in the existing Unites Utilities sewers is likely to be more costly and less acceptable to United Utilities, therefore the new drainage system will have to reconnect to the existing gully outlets/connections, ensuring that the final vertical alignment is sloping towards the sewer with a sufficient gradient.

A site wide maintenance and management plan will be required to set out the respective responsibilities between adoptable and private systems. It is envisaged that management will be undertaken by Rochdale Council to oversee the maintenance of Rochdale Station Square development. The Sustainable Drainage Systems within the proposed drainage network will require maintenance to ensure they function as intended. Maintenance will be in accordance with the SuDS Manual, CIRIA C753 guidance and included in the Appendix D of the report.

7. SuDS Suitability and Proposals

7.1 SuDS and Storage Features Selection

The table below summarises the key SuDS and storage features that are available as outlined in CIRIA C753, the SuDS manual and comments on their suitability for use on the proposed development.

Table 3- SuDS features suitability assessment

SuDS Feature	Description	Incorporated in Proposed development	Suitability/Constraints
Rainwater Harvesting	Rainwater Harvesting is the collection, storage, treatment of rainwater runoff from roofs and other impermeable areas for reuse within the site. In addition, to reducing volume runoff from the site, they can reduce the water demand of the site delivering climate resilience and sustainability benefits.	Partial for tree irrigation (RootSpace Units)	Although there is no foreseeable demand for non-potable water on the site throughout its design life, the RootSpace Units proposed at a number of tree pits can be seen as a form of rainwater harvesting as a means of tree irrigation.
Green Roofs	Green Roofs are areas of living vegetation included on the roofscape of buildings. They can either extensive or intensive and accessible or non-accessible. The plant and soil reduce the rate of discharge extending the time between rainwater falling on the roof and reaching the rainwater outlet.	Yes	Green roofs have been proposed on the proposed bike shelters within the scheme.
Infiltration systems	Infiltration systems hold water and allow it to percolate back into the ground as it would naturally in the permeable areas. They can either be traditional shallow soakaways or deep bore soakaways. Their suitability dependent on the soil permeability.	No	Infiltration techniques could not be proposed on this site due to the close proximity of railway tracks and building infrastructure.
Filter Strips	Filter strips are uniformly graded gently sloping strips of grass or vegetation to treat runoff by slowing down flows, promoting sedimentation and infiltration.	No	Filter strips are not feasible here due to the nature of the development.
Filter Drains	Filter drains are shallow trenches filled with gravel to attenuate, treat, and convey surface water runoff. They can convey/attenuate only or allow infiltration to the ground.	No	Filter strips are not feasible here due to the nature of the development.
Swales	Swales are shallow flat-bottomed channels to convey, infiltrate (where possible) and treat surface water runoff. They can enhance site design and provide biodiversity enhancements. They are often used to drain roads paths or car parks. Swales can replace traditional pipes to convey flows and used as part of a SuDS train of elements.	No	Swales are not feasible here due to the nature of the development.
Bioretention systems (rain gardens)	Bioretention systems are shallow landscaped depressions to treat and store runoff using engineered soils and vegetation. They provide amenity and visual benefits.	Yes	Raingardens have been proposed at locations throughout the scheme
Bioretention systems (Modular Structure)	These systems are modular suspended pavement systems that use soil volumes to support large tree growth and provide powerful on-site stormwater management through absorption, evapotranspiration, and interception. The cells support the loads from the overlying pavement, provide more rootable volume to the trees and prevent compaction of the tree soil. It provides a guaranteed volume of soil for the tree roots, extra volume for surface water runoff attenuation and structural support to prevent the soil becoming compacted at the surface.	Yes	Bioretention with modular structures (RootSpace Units) implemented at a number of viable tree pits to provide tree irrigation.
Pervious Pavements	Pervious pavements provide pavement surfaces suitable for pedestrian/trafficked applications whilst allowing	No	Permeable paving are not proposed as it was recognized

	runoff to permeate through their structure. This provides filtration benefit to treat runoff. Pervious pavements are used to collect, treat, and convey flow only, or if site condition permits, allow infiltration to ground direct from their base.		as maintenance obligations of pavements on RBC as highways authority.
Attenuation Storage	Attenuation storage temporarily hold water for gradual release or reuse at a controlled rate to reduce the peak runoff rate. They can be in the form of above ground or below ground geocellular /concrete tanks or oversized pipes.	No	Attenuation tanks as well as oversized pipes are not feasible here due to space constraint and high density of utilities underground.
Detention basins	Detention basins are landscaped depressions which are normally dry except for during and immediately after storm events. They attenuate flows through controls on the outfalls to store rainwater upstream in networks providing treatment and amenity benefits. With careful design, these can be used for leisure.	No	Detention basins are not feasible here due to space constraints and the nature of the development.

7.2 SuDS Proposed Based on Suitability

A number of SuDS will be implemented to improve the sustainability of the drainage system.

7.2.1 Bioretention System within Modular Structures (RootSpace Units/Silva Cells or Similar Equivalent)

These Cells are modular suspended pavement systems that use soil volumes to support large tree growth and provide powerful on-site stormwater management through absorption, evapotranspiration, and interception. The cells support the loads from the overlying pavement and prevent compaction of the tree soil. It provides a guaranteed volume of soil for the tree roots, extra volume for surface water runoff attenuation and structural support to prevent the soil becoming compacted at the surface. These cells will be proposed at the central square location, capturing a number of tree pits as shown in the drainage GA plan layout in Appendix A. These systems will not only reduce the existing runoff rates to United Utilities sewers, but also reduce the requirement of additional watering to the tree once established and improve water quality, amenity and biodiversity. The key features of these systems include:

7.2.2 Raingardens

Raingardens are shallow landscaped depressions that can reduce runoff rates and volumes as well as treat pollution through the use of engineered soils and vegetation. They are particularly effective in delivering interception and can also provide:

- Attractive landscape features that are self-irrigating and fertilising
- A source for new habitat and biodiversity
- Cooling of the local microclimate due to evapotranspiration

They are generally used for managing and treating runoff from frequent rainfall events. Runoff is collected by the system and ponds temporarily on the surface and then filters through the vegetation and underlying soils. The filtered runoff is collected using an underdrain system. The typical section through a raingarden with outlet pipe is shown in the figure below.

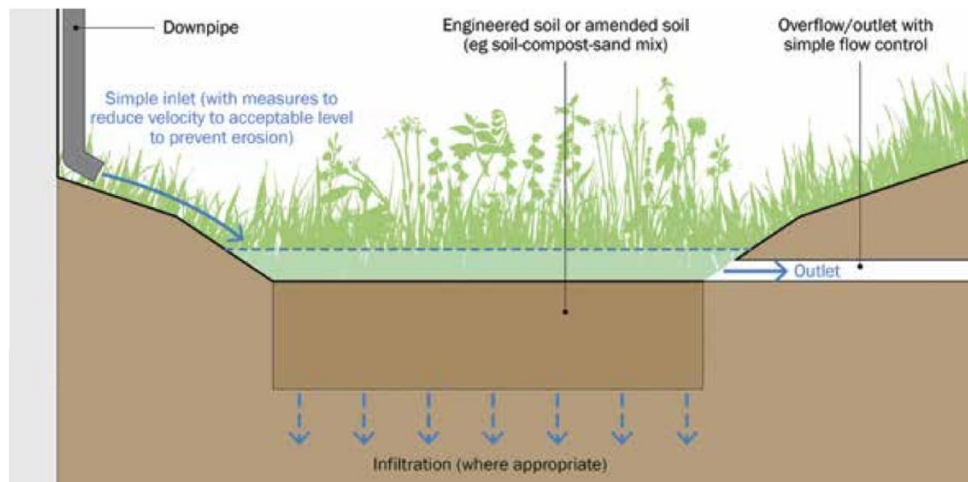


Figure 4- Typical section through a raingarden

7.2.3 Green roofs

Green roofs are areas of living vegetation, installed on the top of buildings or other structures for a range of reasons including visual benefits, ecological values and the reduction of surface water runoff. Types of green roofs can be divided into 2 main categories:

- Extensive roofs, have low substrate depths (and therefore low loadings on the building structure), they have simple planting and low maintenance requirements, they tend not to be accessible.
- Intensive roofs (or roof gardens) have deeper substrates (and therefore higher loadings on the building structure) that can support a wide variety of planting but tends to require more maintenance; they are usually accessible.

Extensive green roofs have been proposed at new bike shed facilities provided by the scheme which will provide a number of benefits including:

- Provide habitat for pollinating insects
- Helps improve biodiversity
- Provide visual interest through spring/summer colour as plants begin to blossom
- Contribute to improving air quality through fine dust filtration
- Encourages 'green awareness'

The typical make-up of an extensive green roof showing its layers and components is shown in figure 5 below.

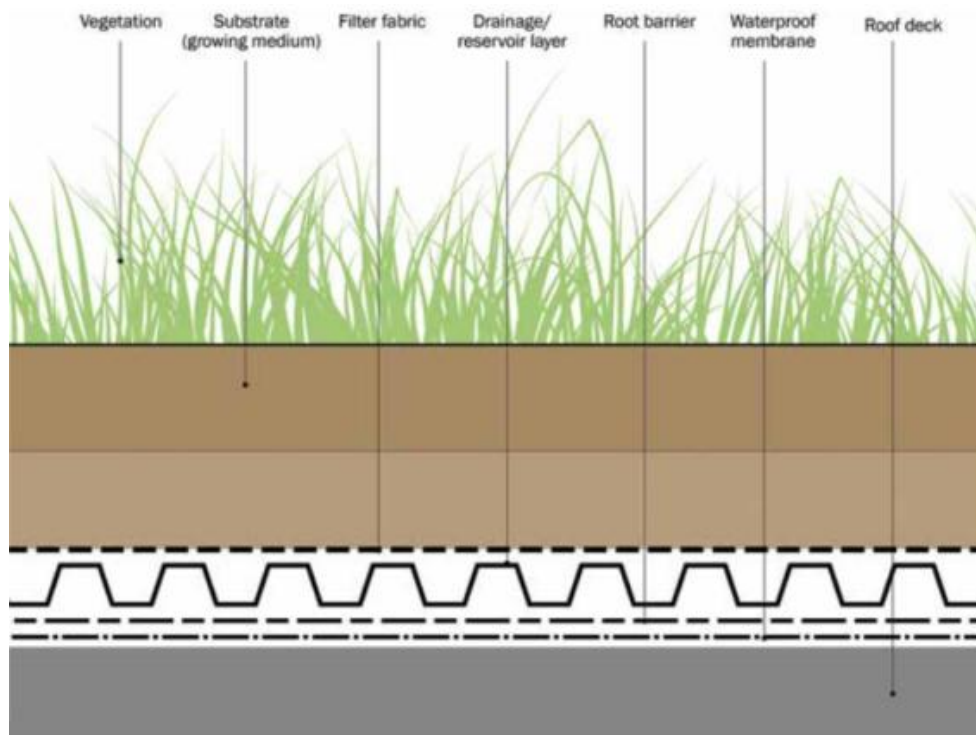


Figure 5 – Section showing typical extensive green roof components

8. Drainage Design Parameters

Hydraulic modelling will be undertaken for an existing scenario as well as a proposed scenario to highlight the provided betterment to the drainage system.

The hydraulic modelling will be carried out using InfoDrainage as an industry accepted design software and the below parameters will be applied:

- M5-60: 19 mm/hr
- Ratio, 'r': 0.26
- Volumetric runoff coefficient: 1 (summer and winter)
- Global time of entry: 5 minutes
- PIMP (%): 100% impermeable area
- Minimum velocity 0.75m/s (for new network)
- Maximum velocity 3m/s (for new network)
- PIMP (%): 100% impermeable area, 50% for green and permeable areas
- 30% climate change uplift in rainfall intensities will be taken into consideration in the design.

(Note: A climate change allowance of 30% has been adopted for modelling in accordance with Department for Environment Food and Rural Affairs, climate change allowances ([Climate change allowances for peak rainfall](#)), since the design life for the scheme is 40 yrs this lies within Epoch 2070s for which the central allowance is 30% and the upper allowance is 40%. For determining whether the central allowance or upper allowance is utilised, the Flood risk assessments: climate change allowances from The Environment Agency ([Flood risk assessments: climate change allowances - GOV.UK](#)) was used, which suggests that for assessing surface water flood risk, the central allowance should be used, and for flood risk assessments, the upper allowance should be adopted, therefore, the central allowance of 30% has been adopted within the scheme.)

8.2 Bioretention systems (raingardens) modelling parameters

The bioretention systems are designed based on following criteria:

- 30% porosity has been considered to perform calculations for a range of rainfall durations to verify the performance of available storage.
- Base and sides of cell system are to be wrapped in an impermeable geomembrane.

Table 5 – Typical raingarden layers:

Structure Layer/attributes	Thickness/Details
Raingardens: Topsoil / planting material and semi-organic sands	Minimum 500mm deep, consisting of minimum 350mm sand-based planting soil and 150mm for semi-organic sands. 50mm Mulch
Drainage layer	Typically 100-200mm depth, however minimum depth around under-drain pipe will be 300mm
Under-drain	150mm diameter fully perforated pipes will be proposed at least 75mm from bottom of drainage layer.
Overflow system	The permeability of topsoil and drainage layers, and the use of a fully perforated under-drain ensure that the water level within the outfall chamber will be approximately equal to the water level in the rest of the raingarden. The raingarden shall overflow into the public sewer when the weir level (see overflow weir plate below) is exceeded.
Overflow weir plate	Weir plate within outfall chamber. Weir level set in such a way that the full peak flow extreme events (i.e. no flow through the orifice) will spill over the weir without backing up on the carriageway or footway
Orifice	The weir control with an orifice is to be proposed to maximise attenuation. The orifice will have an absolute minimum diameter of 20mm diameter and larger (up to 30mm) if needed to prevent water overflowing for storm event of 1 in 2 year or more frequent, provided that the attenuation volume – once filled up by a critical storm event - does not fully empty in less than 6 hour after the storm event ended.
Impermeable Geomembrane	
Compacted Subgrade	95% compacted native soil to support the system load

9 Conclusion

The detailed drainage design has been completed using the above mentioned strategy, design parameters and approach.

The proposed design includes Sustainable Drainage Systems including Tree Pits, Rain Gardens, Green Roof, soft landscaping and Modular Crate systems. Surface water system design has been designed with the aspirations of 50% reduction in discharge rate from current rate following best practice.

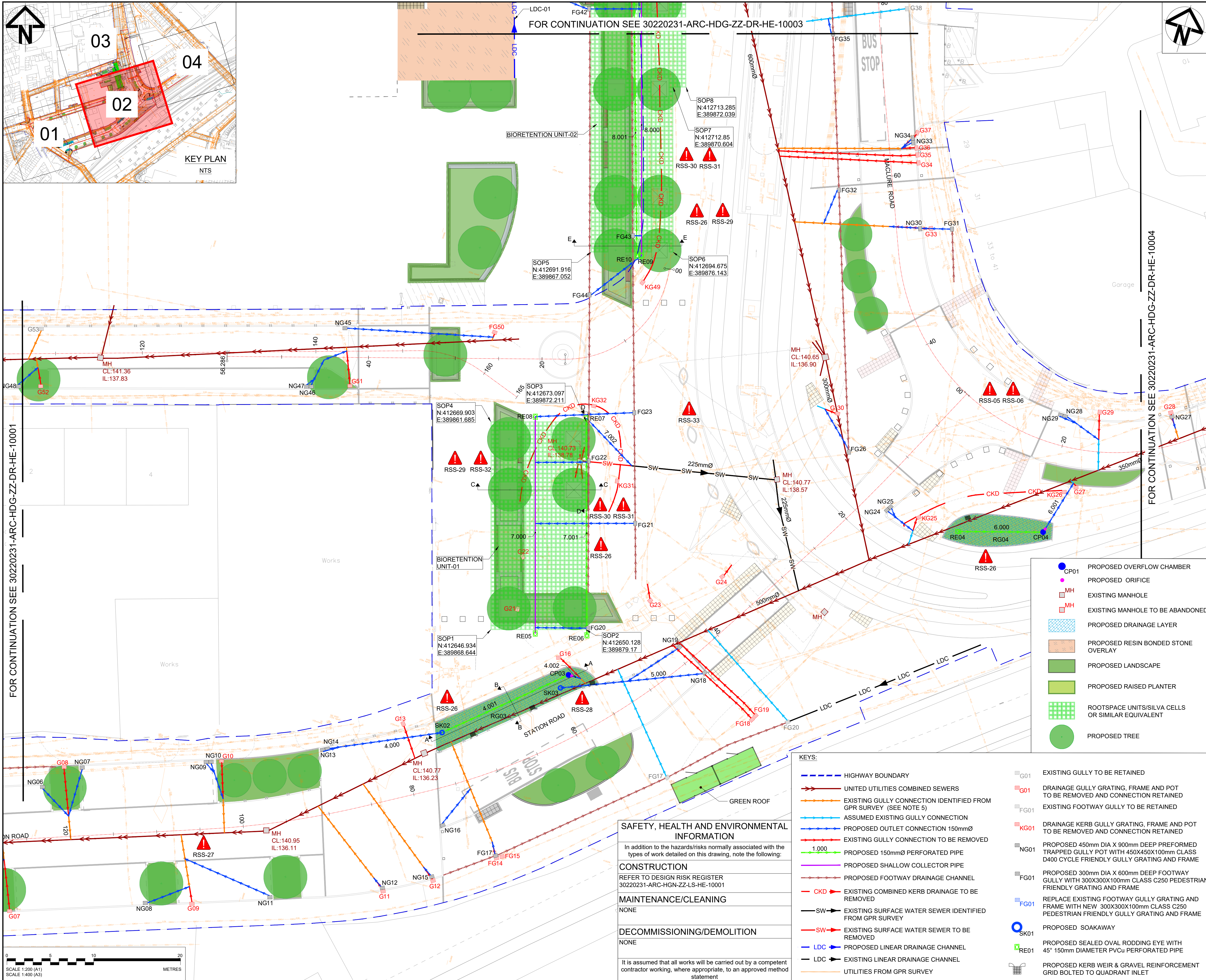
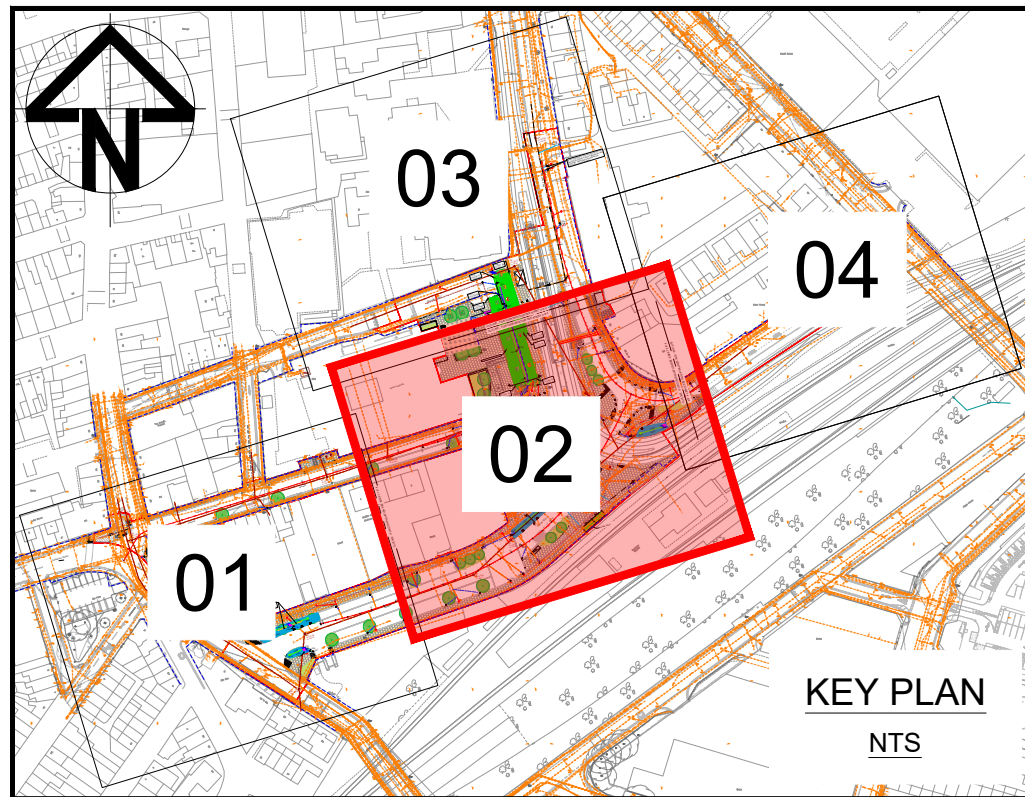
All SuDS features implemented have been designed as per CIRIA guidance and the design parameters defined in the report with a 30% climate change uplift.

The results demonstrate that the current SuDS proposals are to provide betterment to the existing runoff rate to around 50% up to the 1 in 100 year peak rainfall events (with no climate change) across the contributing areas of Station Square and Station Road.

The LLFA condition states that at least 50% betterment is to be provided to surface water discharge in areas outside of the public highways. This would cover only the area of Station Square within the scheme. The hydraulic results demonstrates that the betterment in station square will be over 52% across all peak events up to 1 in 100 year rainfall (with no climate change), meeting the LLFA requirements.

Lower Tweeddale Street as well as Maclure Road did not have any reasonable suitability for SuDS and hence runoff rates are expected to remain as existing on these streets.

Appendix A – Proposed Drainage General Arrangement



NOTES:

- THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL THE DRAWINGS, SCHEDULES AND SPECIFICATIONS LISTED ON THE DRAWING REGISTER 30220231-ARC-HGN-ZZ-LS-HE-10002. REFER 30220231-ARC-HDG-ZZ-DR-HE-10006, 30220231-ARC-HDG-ZZ-DR-HE-10007, 30220231-ARC-HDG-ZZ-DR-HE-10008, 30220231-ARC-HDG-ZZ-DR-HE-10009, 30220231-ARC-HDG-ZZ-DR-HE-10010 & 30220231-ARC-HDG-ZZ-DR-HE-10011 FOR DRAINAGE DETAILS AND 30220231-ARC-HDG-ZZ-SCH-HE-00001, 30220231-ARC-HDG-ZZ-SCH-HE-00002 & 30220231-ARC-HDG-ZZ-SCH-HE-00003 FOR DRAINAGE SCHEDULES.
- DO NOT SCALE FROM THIS DRAWING.
- ALL DIMENSIONS ARE IN MILLIMETERS & ALL LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
- ALL EXISTING GULLY CONNECTIONS TO BE CLEANED AND CLEARED OF OBSTRUCTIONS PRIOR TO REUSE. IF CONNECTION IS DAMAGED BEYOND REPAIR THEN NEW CONNECTION TO BE PROVIDED.
- ALL NEW GULLIES GRATES/LINING AND FRAMES TO BE CYCLE FRIENDLY AND CLASS D400 FOR CARRIAGE WAY AND C250 FOR FOOTWAY GULLIES.
- PROPOSED NEW GULLIES ARE TO BE CONNECTED TO EXISTING GULLY OUTLETS BY MEANS OF A 'Y' JUNCTION AND NO SADDLE CONNECTION SHALL BE CONSTRUCTED.
- ALL DRAINAGE PIPES ARE TO A MINIMUM OF 150mm DIAMETER AND A MAXIMUM BEND OF 45 DEGREES FOR ANY CHANGE IN DIRECTION. IF CHANGE IN DIRECTION IS 90 DEGREE COMBINATIONS OF 2X45 DEGREE BENDS SHOULD BE USED. ALL CONNECTIONS ARE SHOWN INDICATIVELY.
- LOCATIONS OF THE EXISTING DRAINAGE ARE SHOWN BASED ON THE GPR SURVEYS. ASSUMPTIONS HAVE BEEN MADE WHEN SURVEY ARE INCONSISTENT OR NON CONCLUSIVE. PRIOR TO CONSTRUCTION, THEREFORE THE CONTRACTOR MUST CONFIRM EXISTING TIE-IN INFORMATION AT ALL DRAINAGE CONNECTION POINTS.
- NO CCTV INFORMATION AVAILABLE AT THE TIME OF PRODUCTION OF THIS DRAWING.

HEALTH AND SAFETY :

HEALTH AND SAFETY SYMBOL AND REFERENCE NUMBER TO BE READ IN CONJUNCTION WITH THE DESIGN RISK REGISTER 30220231-ARC-HGN-ZZ-LS-HE-10001.

RSS-XX

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P01	01/08/25	FIRST ISSUE				

Project:

Rochdale Station Square
- Detailed Design

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Drawing Title:

Rochdale Station Square
Drainage
Sheet 02 of 04

Designed:	Signed:	Date:
R Asthana	Digitally Signed	01/08/25

Produced:	Signed:	Date:
P K R	Digitally Signed	01/08/25

Checked:	Signed:	Date:
B Singh	Digitally Signed	01/08/25

Reviewed:	Signed:	Date:
R Asthana	Digitally Signed	01/08/25

Approved:	Signed:	Date:
R Asthana	Digitally Signed	01/08/25

Design Stage: Detailed Design

Original Size:	Grid:	Datum:
A1	OS	AOD

Status Code:	Scale:	Project Number:
S3	1:200	30220231

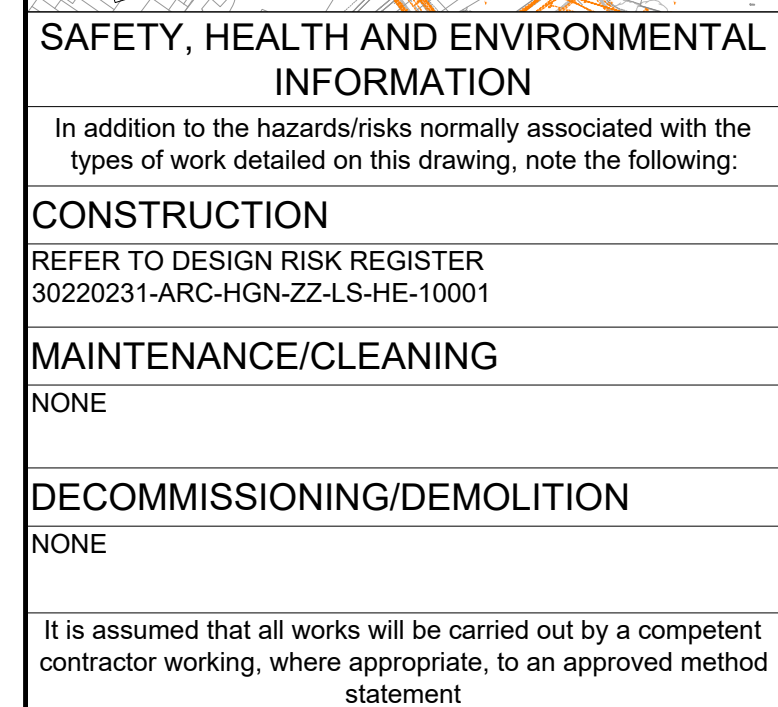
Status Description:

Suitable for Review and Comment

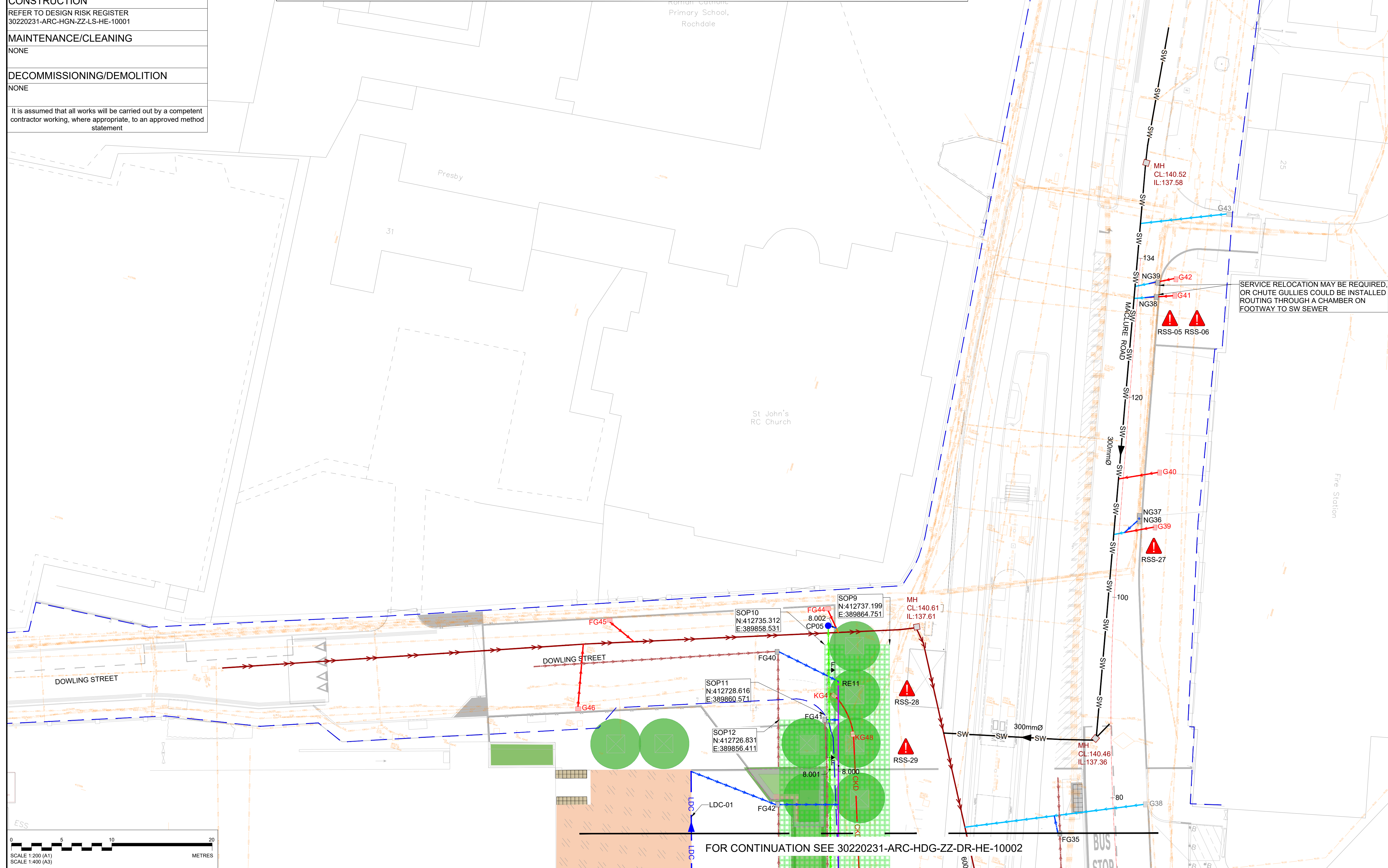
Security Classification:

Drawing Number: 30220231 - ARC - HDG - ZZ - DR - HE - 10002

Revision: P01



- | KEYS: | |
|-------|--|
| | HIGHWAY BOUNDARY |
| | UNITED UTILITIES COMBINED SEWERS |
| | EXISTING GULLY CONNECTION IDENTIFIED FROM GPR SURVEY (SEE NOTE 5) |
| | ASSUMED EXISTING GULLY CONNECTION |
| | PROPOSED OUTLET CONNECTION 150mmØ |
| | EXISTING GULLY CONNECTION TO BE REMOVED |
| | PROPOSED 150mmØ PERFORATED PIPE |
| | PROPOSED SHALLOW COLLECTOR PIPE |
| | PROPOSED FOOTWAY DRAINAGE CHANNEL |
| | EXISTING COMBINED KERB DRAINAGE TO BE REMOVED |
| | EXISTING SURFACE WATER SEWER IDENTIFIED FROM GPR SURVEY |
| | EXISTING SURFACE WATER SEWER TO BE REMOVED |
| | PROPOSED LINEAR DRAINAGE CHANNEL |
| | EXISTING LINEAR DRAINAGE CHANNEL |
| | UTILITIES FROM GPR SURVEY |
| | EXISTING GULLY TO BE RETAINED |
| | DRAINAGE GULLY GRATING, FRAME AND POT TO BE REMOVED AND CONNECTION RETAINED |
| | EXISTING FOOTWAY GULLY TO BE RETAINED |
| | DRAINAGE KERB GULLY GRATING, FRAME AND POT TO BE REMOVED AND CONNECTION RETAINED |
| | PROPOSED 450mm DIA X 900mm DEEP PREFORMED TRAPPED GULLY POT WITH 450X450X100mm CLASS D400 CYCLE FRIENDLY GULLY GRATING AND FRAME |
| | PROPOSED 300mm DIA X 600mm DEEP FOOTWAY GULLY WITH 300X300X100mm CLASS C250 PEDESTRIAN FRIENDLY GRATING AND FRAME |
| | REPLACE EXISTING FOOTWAY GULLY GRATING AND FRAME WITH NEW 300X300X100mm CLASS C250 PEDESTRIAN FRIENDLY GULLY GRATING AND FRAME |
| | PROPOSED SOAKAWAY |
| | PROPOSED SEALED OVAL RODDING EYE WITH 45° 150mm DIA METER PVCu PERFORATED PIPE |
| | PROPOSED KERB WEIR & GRAVEL REINFORCEMENT GRID BOLTED TO QUADRANT INLET |
| | PROPOSED OVERFLOW CHAMBER |
| | PROPOSED ORIFICE |
| | EXISTING MANHOLE |
| | EXISTING MANHOLE TO BE ABANDONED |
| | PROPOSED DRAINAGE LAYER |
| | PROPOSED RESIN BONDED STONE OVERLAY |
| | PROPOSED LANDSCAPE |
| | PROPOSED RAISED PLANTER |
| | ROOTSPACE UNITS/SILVA CELLS OR SIMILAR EQUIVALENT |
| | PROPOSED TREE |



- NOTES:
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL THE DRAWINGS, SCHEDULES AND SPECIFICATIONS LISTED ON THE DRAWING REGISTER 30202231-ARC-HGN-ZZ-LS-HE-10002.
 2. REFER 30202231-ARC-HDG-ZZ-DR-HE-10006, 30202231-ARC-HDG-ZZ-DR-HE-10007, 30202231-ARC-HDG-ZZ-DR-HE-10008, 30202231-ARC-HDG-ZZ-DR-HE-10009, 30202231-ARC-HDG-ZZ-DR-HE-10010 & 30202231-ARC-HDG-ZZ-DR-HE-10011 FOR DRAINAGE DETAILS AND 30202231-ARC-HDG-ZZ-SCH-HE-00001, 30202231-ARC-HDG-ZZ-SCH-HE-00002 & 30202231-ARC-HDG-ZZ-SCH-HE-00003 FOR DRAINAGE SCHEDULES.
 3. DO NOT SCALE FROM THIS DRAWING.
 4. ALL DIMENSIONS ARE IN MILLIMETERS & ALL LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
 5. ALL EXISTING GULLY CONNECTIONS TO BE CLEANED AND CLEARED OF OBSTRUCTIONS PRIOR TO REUSE. IF CONNECTION IS DAMAGED BEYOND REPAIR THEN NEW CONNECTION TO BE PROVIDED.
 6. ALL NEW GULLIES GRATES/LINING AND FRAMES TO BE CYCLE FRIENDLY AND CLASS D400 FOR CARRIAGE WAY AND C250 FOR FOOTWAY GULLIES.
 7. PROPOSED NEW GULLIES ARE TO BE CONNECTED TO EXISTING GULLY OUTLETS BY MEANS OF A "Y" JUNCTION AND NO SADDLE CONNECTION SHALL BE CONSTRUCTED.
 8. ALL DRAINAGE PIPES ARE TO A MINIMUM OF 150mm DIAMETER AND A MAXIMUM BEND OF 45 DEGREES FOR ANY CHANGE IN DIRECTION. IF CHANGE IN DIRECTION IS 90 DEGREE, COMBINATIONS OF 2X45 DEGREE BENDS SHOULD BE USED. ALL CONNECTIONS ARE SHOWN INDICATIVELY.
 9. LOCATIONS OF THE EXISTING DRAINAGE ARE SHOWN BASED ON THE GPR SURVEYS. ASSUMPTIONS HAVE BEEN MADE WHEN SURVEY ARE INCONSISTENT OR NON CONCLUSIVE. PRIOR TO CONSTRUCTION, THEREFORE THE CONTRACTOR MUST CONFIRM EXISTING TIE-IN INFORMATION AT ALL DRAINAGE CONNECTION POINTS.
 10. NO CCTV INFORMATION AVAILABLE AT THE TIME OF PRODUCTION OF THIS DRAWING.

HEALTH AND SAFETY :

 HEALTH AND SAFETY SYMBOL AND
REFERENCE NUMBER TO BE READ IN
CONJUNCTION WITH THE DESIGN RISK
REGISTER
30220231-ARC-HGN-ZZ-LS-HE-10001.

P01	01/08/25	FIRST ISSUE		PK	BS	RA	RA
Rev	Date	Description		Prod.	Chk.	Rev.	App.



Project: Rochdale Station Square
- Detailed Design

Site	Client
Rochdale OL11 1DR Manchester	Transport for Greater Manchester 2 Piccadilly Pl, Manchester M1 3BG www.tfgm.com



Registered office: 80 Fenchurch Street
London
EC3M 4BY

Coordinating office:
16th Floor,
103 Colmore Row,
Birmingham B3 3AG
Tel: 44 (0)121 516 1818

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Drawing Title:

Rochdale Station Square
Drainage
Sheet 03 of 04

Designed:	Signed	Date
R.Asthana		01/08/25
Produced:	Signed	Date
P.K.R		01/08/25
Checked:	Signed	Date
B.Singh		01/08/25
Reviewed:	Signed	Date
R.Asthana		01/08/25
Approved:	Signed	Date
R.Asthana		01/08/25

Design Stage:	Detailed Design
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Original Size:	Grid:	Datum:
A1	OS	AOD
Status Code:	Scale:	Project Number:
S3	1:200	30220231

Status Description:	Suitable for Review and Comment
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Drawing Number:	Revision:
30220231 - ARC - HDG - ZZ - DR - HE - 10003	P01

Appendix B – Planning Permissions Conditions

PLANNING PERMISSION GRANTED

APPLICATION REFERENCE: 22/01551/FUL

Part I - Particulars of Application

Date of
Application: 20 February 2023

Proposal:	Public realm works including: new public square; relocation of taxi rank and car parking spaces; and associated works.
Location:	Rochdale Station Square , Rochdale, OL11 1DR

8. Prior to the commencement of development, details of a sustainable surface water drainage scheme shall be submitted to and approved in writing by the Local Planning Authority. The drainage scheme must include:

(i) An investigation of the hierarchy of drainage options in the National Planning Practice Guidance (or any subsequent amendment thereof). This investigation shall include evidence of an assessment of ground conditions and the potential for infiltration of surface water in accordance with BRE365 guidance.

(ii) For areas outside the public highway, any discharges to public combined sewer shall incorporate a reduction in the rate of discharge of surface water of at least 50%.

(iii) Levels of the proposed drainage systems including proposed ground levels in AOD.

(iv) A brief Maintenance Document for any SUDs that are included.

(v) Details of Highway Drainage to the public highways that pass through the site, although it is acknowledged that the highway does not require surface water attenuation.

The calculation of the existing surface water runoff from the site shall be based upon the Rational Method, or other similar agreed method. The flow control rate of surface water to public sewer shall be for 50% of the existing Qbar rate. Qbar is the average annual flood event and accepted as the storm event for 1 in 2.3 year return period). The Council's Lead Local Flood Authority Officer can be consulted to agree the calculation method.

It is expected that the proposed sustainable surface water drainage scheme will require the use of attenuation storage. The approved schemes shall also be in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacement national standards.

The approved drainage schemes shall be completed in full in accordance with the approved details prior to the first public opening of the approved development, and retained thereafter for the lifetime of the development.

Reason: To promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution. To prevent an increased risk of flooding as a result of the development and to ensure satisfactory disposal of surface water from the site in accordance with Policy G8 of the adopted Rochdale Core Strategy, saved Policy EM/7 of the adopted Rochdale Unitary Development Plan and the National Planning Policy Framework.

Reason for pre-commencement condition: Drainage infrastructure will need to be implemented prior to commencement of above ground works and a scheme therefore needs to be agreed in advance of the same.

Appendix C – United Utilities Enquiry Response

Rochdale Borough Council
By email

Your ref: 22/01551/FUL
Our ref: DC/23/1899 v2
Date: 07-JUN-23

Dear Planning Team

Location: Rochdale Station Square Rochdale OL11 1DR.

Proposal: Public realm works including: new public square; relocation of taxi rank and car parking spaces; and associated works.

United Utilities wish to make the following comments regarding the proposal detailed above.

DRAINAGE

Following our review of the submitted drainage documents; Flood Risk Assessment, prepared by wsp, Ref: 97916-WSP-FRA-001 and Drainage Strategy Drawing 70097916-WSP-01-XX-DR-C-008, Rev P03 - Dated 11/11/2022, the plans are not acceptable to United Utilities.

This is because the applicant increased the impermeable area by replacing green areas with pavement, which will increase the run-off rate to the public combined sewer. An attenuation tank should be considered with the design and rate of discharge to be controlled for any new areas (maximum 5l/s).

Also, we noted the applicant's calculations are based on the Rational Method for a rainfall intensity of 85mm/hr. Following the Ciria SuDS manual which states the rational method can only be used for very simple sites, or an indicative design, the rational method is not appropriate on the development site of this scale, because it does not take time of entry or the existing surcharge level in the receiving sewer into account. We would not accept the proposed rates in this instance. Besides, the 85mm/hr is for 100 years + CC, the applicant should use the QBar rate (2 years storm event) with a lower rain intensity rate.

Furthermore, following the North West Suds Proforma, all sites should strive to meet Greenfield rates. As this is a brownfield site, a 30% betterment is required in Rochdale to our network.

Should planning permission be granted we request the following condition is attached to any subsequent Decision Notice:

CONDITION:

Prior to the commencement of development, details of a sustainable surface water drainage scheme and a foul water drainage scheme shall be submitted to and approved in writing by the Local Planning Authority. The drainage schemes must include:

- (i) An investigation of the hierarchy of drainage options in the National Planning Practice Guidance (or any subsequent amendment thereof). This investigation shall include evidence of an assessment of ground conditions and the potential for infiltration of surface water in accordance with BRE365;***
- (ii) A restricted rate of discharge of surface water agreed with the local planning authority (if it is agreed that infiltration is discounted by the investigations);***
- (iii) Levels of the proposed drainage systems including proposed ground and finished floor levels in AOD;***
- (iv) Incorporate mitigation measures to manage the risk of sewer surcharge where applicable; and***
- (v) Foul and surface water shall drain on separate systems.***

The approved schemes shall also be in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacement national standards.

Prior to occupation of the proposed development, the drainage schemes shall be completed in accordance with the approved details and retained thereafter for the lifetime of the development.

Reason: To promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution.

The applicant can discuss any of the above with Developer Engineer, **Mohammed Aljafarawi**, by email at wastewaterdeveloperservices@uuplc.co.uk.

Please note, United Utilities is not responsible for advising on rates of discharge to the local watercourse system. This is a matter for discussion with the Lead Local Flood Authority and / or the Environment Agency (if the watercourse is classified as main river).

If the applicant intends to offer wastewater assets forward for adoption by United Utilities, their proposed detailed design will be subject to a technical appraisal by our Developer Services team and must meet the requirements outlined in 'Sewerage Sector Guidance Appendix C – Design and Construction Guidance v2-2' dated 29 June 2022 or any subsequent iteration. This is important as drainage design can be a key determining factor of site levels and layout.

Acceptance of a drainage strategy does not infer that a detailed drainage design will meet the requirements for a successful adoption application. We strongly recommend that no construction commences until the detailed drainage design, has been assessed and accepted in writing by United Utilities. Any work carried out prior to the technical assessment being approved is done entirely at the developer's own risk and could be subject to change.

Management and Maintenance of Sustainable Drainage Systems

Without effective management and maintenance, sustainable drainage systems can fail or become ineffective. We believe we have a duty to advise the Local Planning Authority of this potential risk to ensure the longevity of the surface water drainage system and the service it provides to people. We also wish to minimise the risk of a sustainable drainage system having a detrimental impact on the public sewer network should the two systems interact. We therefore recommend the Local Planning Authority include a condition in any subsequent Decision Notice regarding a management and maintenance regime for any sustainable drainage system that is included as part of the proposed development. The following may be a useful example.

Prior to occupation of the development a sustainable drainage management and maintenance plan for the lifetime of the development shall be submitted to the local planning authority and agreed in writing. The sustainable drainage management and maintenance plan shall include as a minimum:

- a. Arrangements for adoption by an appropriate public body or statutory undertaker, or, management and maintenance by a resident's management company; and*
- b. Arrangements for inspection and ongoing maintenance of all elements of the sustainable drainage system to secure the operation of the surface water drainage scheme throughout its lifetime.*

The development shall subsequently be completed, maintained and managed in accordance with the approved plan.

Reason: To ensure that management arrangements are in place for the sustainable drainage system in order to manage the risk of flooding and pollution during the lifetime of the development.

Please note United Utilities cannot provide comment on the management and maintenance of an asset that is owned by a third party management and maintenance company and we would not be involved in the discharge of the management and maintenance condition in these circumstances.

UNITED UTILITIES PROPERTY, ASSETS AND INFRASTRUCTURE

Where United Utilities' assets cross the proposed red line boundary, developers must contact our Developer Services team prior to commencing any works on site, including trial holes, groundworks or demolition. Please see 'Contacts' section below.

Water pipelines

United Utilities will not allow building over or in close proximity to a water main.

Water mains cross the site. They must not be built over, or our access to the pipeline compromised in any way. We require an access strip as detailed in our 'Standard Conditions for Works Adjacent to Pipelines', which can be found on our website: <https://www.unitedutilities.com/builders-developers/your-development/planning/building->

[over-or-working-near-our-assets/working-near-our-pipes/](#). The applicant must comply with this document to ensure pipelines are adequately protected both during and after the construction period.

Wastewater pipelines

United Utilities will not allow a new building to be erected over or in close proximity to a public sewer or any other wastewater pipeline. This will only be reviewed in exceptional circumstances. *Nb. Proposals to extend domestic properties either above, or in close proximity to a public sewer will be reviewed on a case by case basis by either by a building control professional or following a direct application to United Utilities (see our website for further details).*

A number of public sewers cross the site and we will not allow building over them. We require an access strip for maintenance or replacement of each sewer and this access must not be compromised in any way. The minimum distances that might be acceptable to United Utilities are detailed within Part H of the Building Regulations however, we recommend the applicant determines the precise location, size, depth and condition of each pipeline as this is likely to influence the required stand-off distance from any structure.

Important information regarding water and wastewater pipelines and apparatus

It is the applicant's responsibility to investigate and demonstrate the exact relationship between United Utilities' assets and the proposed development.

A number of providers offer a paid for mapping service, including United Utilities (see 'Contacts' section below). The position of the underground apparatus shown on water and wastewater asset maps is approximate only and is given in accordance with the best information currently available. Therefore, we strongly recommend the applicant, or any future developer, does not rely solely on the asset maps to inform decisions relating to the detail of their site and instead investigates the precise location of any underground pipelines and apparatus. Where additional information is requested to enable an assessment of the proximity of proposed development features to United Utilities assets, the proven location of pipelines should be confirmed by site survey; an extract of asset maps will not suffice. The applicant should seek advice from our Developer Services team on this matter. See 'Contacts' Section below. United Utilities Water will not accept liability for any loss or damage caused by the actual position of our assets and infrastructure being different from those shown on asset maps.

Developer's should investigate the existence and the precise location of water and wastewater pipelines as soon as possible as this could significantly impact the preferred site layout and/or diversion of the asset(s) may be required. Unless there is specific provision within the title of the property or an associated easement, any necessary disconnection or diversion of assets to accommodate development, will be at the applicant/developer's expense. In some circumstances, usually related to the size and nature of the assets impacted by proposals, developers may discover the cost of diversion is prohibitive in the context of their development scheme.

Any agreement to divert our underground assets will be subject to a diversion application, made directly to United Utilities. This is a separate matter to the determination of a planning application. We will not guarantee, or infer acceptance of, a proposed diversion through the planning process (where diversion is indicated on submitted plans). In the event that an application to divert or abandon underground assets is submitted to United Utilities and subsequently rejected (either before or after the determination of a planning application), applicants should be aware that they may need to amend their proposed layout to accommodate United Utilities' assets.

Where United Utilities' assets exist, the level of cover to United Utilities pipelines and apparatus must not be compromised either during or after construction and there should be no additional load bearing capacity on pipelines without prior agreement from United Utilities. This would include sustainable drainage features, earth movement and the transport and position of construction equipment and vehicles.

Any construction activities in the vicinity of United Utilities' assets, including any assets or infrastructure that may be located outside the applicant's red line boundary, must comply with national building and construction standards and where applicable, our 'Standard Conditions for Works Adjacent to Pipelines', a copy of which is available on our website. The applicant, and/or any subsequent developer should note that our 'Standard Conditions' guidance applies to any design and construction activities in close proximity to water pipelines and apparatus that are no longer in service, as well as pipelines and apparatus that are currently operational.

It is the applicant's responsibility to ensure that United Utilities' required access is provided within any proposed layout and that our infrastructure is appropriately protected. The developer would be liable for the cost of any damage to United Utilities' assets resulting from their activity.

WATER AND WASTEWATER SERVICES

If the applicant intends to receive water and/or wastewater services from United Utilities they should visit our website or contact the Developer Services team for advice at the earliest opportunity. This includes seeking confirmation of the required metering arrangements for the proposed development. See 'Contacts' Section below.

If the proposed development site benefits from existing water and wastewater connections, the applicant should not assume that the connection(s) will be suitable for the new proposal or that any existing metering arrangements will suffice. In addition, if reinforcement of the water network is required to meet potential demand, this could be a significant project and the design and construction period should be accounted for.

In some circumstances we may require a compulsory meter is fitted. For detailed guidance on whether the development will require a compulsory meter please visit <https://www.unitedutilities.com/my-account/your-bill/our-household-charges-20212022/> and go to section 7.7 for compulsory metering.

To promote sustainable development United Utilities offers a reduction in infrastructure charges for applicant's delivering water efficient homes and draining surface water sustainably (criteria

applies). For further information, we strongly recommend the applicant visits our website when considering any water or wastewater design <https://www.unitedutilities.com/builders-developers/your-development/planning/building-sustainable-homes/>

Business customers can find additional information on our sustainable drainage incentive scheme at <https://www.unitedutilities.com/Business-services/retailers/incentive-schemes/>

To avoid any unnecessary costs and delays being incurred by the applicant or any subsequent developer, we strongly recommend the applicant seeks advice regarding water and wastewater services, and metering arrangements, at the earliest opportunity. Please see 'Contacts' Section below.

CONTACTS

Website

For detailed guidance on water and wastewater services, including application forms and the opportunity to talk to the Developer Services team using the '**Live Chat**' function, please visit:

<http://www.unitedutilities.com/builders-developers.aspx>

Email

For advice on water and wastewater services or to discuss proposals near to pipelines, email the Developer Services team as follows:

Water mains and water supply, including metering - DeveloperServicesWater@uuplc.co.uk

Public sewers and drainage - WastewaterDeveloperServices@uuplc.co.uk

Telephone - 0345 072 6067

Property Searches (for asset maps):

A number of providers offer a paid for mapping service including United Utilities. For more information, or to purchase a sewer and water plan from United Utilities, please visit <https://www.unitedutilities.com/property-searches/>

Water and sewer records can be viewed for free at our Warrington Head Office by calling 0370 751 0101. Appointments must be made in advance. Public sewer records can be viewed at local authority offices. Arrangements should be made directly with the local authority.

We request that a copy of this letter is made available to the applicant.

Yours faithfully

The Planning, Landscape and Ecology Team

Appendix D – SuDS Management Plan

SuDS operation and maintenance

There are three types of maintenance activities associated with surface water drainage systems. The SuDS Manual, CIRIA C753, defines these as:

- Regular Maintenance – ‘basic tasks undertaken on a frequent and predictable schedule’ including vegetation management, litter and debris removal, and inspections.’
- Occasional Maintenance – ‘tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).’
- Remedial Maintenance – ‘intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design.

Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.’

Specific maintenance needs should be monitored, and maintenance schedules adjusted to suit the location and condition of the drainage feature in question.

The table below gives an overview of the maintenance required for each of the SuDS elements proposed on the site. The tables are taken from the SuDS Manual (CIRIA C753) giving the operation and maintenance requirements for various surface water drainage components.

Source: CIRIA C753 - Table 32.1

TABLE 32.1 Typical key SuDS components operation and maintenance activities (for full specifications, see Chapters 11–23)

Operation and maintenance activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter drain	Modular storage	Pervious pavement	Swale/bioretention/trees	Filter strip	Green roofs	Proprietary treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter and debris removal	■	■	■	■	□	■	■	□	■	■	■		□
Grass cutting	■	■	■	■	□	■	■	□	□	■	■		
Weed and invasive plant control	□	□	□	□		□	□		□		□	■	
Shrub management (including pruning)	□	□	□	□					□	□	□		
Shoreline vegetation management	■	■	□										
Aquatic vegetation management	■	■	□										
Occasional maintenance													
Sediment management ¹	■	■	■	■	■	■	■	■	■	■	■		■
Vegetation replacement	□	□	□	□						□	□	■	
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation /repair	□	□	□	□	□	□	□	□	□	□	□	□	
Infiltration surface reconditioning				□	□	□	□		□	□	□		

Key

■ will be required

□ may be required

Notes

1 Sediment should be collected and managed in pre-treatment systems, upstream of the main device.

Green Roofs

Source: CIRIA C753 - Table 12.5

The table below outlines the maintenance required for the effective operation of green roofs.

TABLE 12.5 Operation and maintenance requirements for green roofs		
Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Bioretention (Raingardens and tree irrigation cells)

Source: CIRIA C753 - Table 18.1

The table below outlines the maintenance required for the effective operation of raingardens.

TABLE 18.3	Operation and maintenance requirements for bioretention systems		
	Maintenance schedule	Required action	Typical frequency
	Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
		Check operation of underdrains by inspection of flows after rain	Annually
		Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
		Inspect inlets and outlets for blockage	Quarterly
	Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
		Replace any plants, to maintain planting density	As required
		Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
	Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
		Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
	Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

Other Components

Source: CIRIA C753 – SuDS Manual

In addition to the mentioned SuDS components of the network, the network also consists of gullies, channels and other components to collect the flow into the network. It is at these locations that silt is most likely to enter the system.

Pipes and manholes:

Inspect manholes and silt traps for the build-up of silt and general debris (minimum six monthly or to suit site requirements). If silt/debris is building up then clean with jetting lorry/gully sucker and inspect pipe, repeat cleaning if required. Following any extreme storm events, pipes and manholes should be inspected to ensure continuing effective operation. Any build-up of silt or debris should be removed.

Gullies/channels:

Inspection and removal of debris from silt traps every three months, preferably after leaf fall in the autumn (timeframe can be adjusted to suit actual site conditions). Removal of any suspended oil or other organic chemical from gulley pots by competent operator.

Flow control devices:

Flow control devices should be inspected as specified by the manufacturer, monthly of the first three months and every six months thereafter. Cleaning of the device should be performed where deemed necessary to ensure continual correct operation of the device.

Health and Safety

Source: CIRIA C753 – SuDS Manual

All those responsible for maintenance should take appropriate health, safety and welfare precautions for all activities including lone working, if relevant. Risk assessments should always be undertaken before carrying out any works either inside or outside of the site.

To comply with the Construction (Design and Management) Regulations (CDM) 2015, designers must assess all foreseeable risks during construction and maintenance and the design must minimise them by the following (in order of preference):

- Avoid
- Reduce
- Identify and mitigate residual risks.

All those responsible for maintenance should take appropriate health and safety precautions for all activities (including lone working, if relevant), and risk assessments should always be undertaken.

Appendix E – Hydraulic Simulation Results

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		



Name	Junction Type	Easting (m)	Northing (m)	Cover Elevation (m)	Depth (m)	Invert Elevation (m)	Chamber Shape	Diameter (m)
MH 16	Manhole	389715.012	412631.062	142.380	5.400	136.980	Circular	1.200
MH 15	Manhole	389764.034	412647.379	141.910	4.360	137.550	Circular	1.200
MH 14	Manhole	389789.792	412663.913	141.590	2.560	139.030	Circular	1.200
MH 13	Manhole	389792.534	412655.983	141.670	3.940	137.730	Circular	1.200
MH 12	Manhole	389816.438	412663.779	141.360	3.530	137.830	Circular	1.200
MH 1	Manhole	389781.420	412571.861	140.450	4.820	135.630	Circular	1.200
MH 2	Manhole	389783.823	412593.802	141.320	5.580	135.740	Circular	1.200
MH 3	Manhole	389850.614	412617.316	140.950	4.840	136.110	Circular	1.200
MH 4	Manhole	389865.420	412631.127	140.770	4.540	136.230	Circular	1.200
MH 6	Manhole	389895.187	412673.072	140.770	2.200	138.570	Circular	1.200
MH 8	Manhole	389896.443	412688.154	140.650	3.750	136.900	Circular	1.200
MH 9	Manhole	389887.101	412734.173	140.460	3.100	137.360	Circular	1.200
MH 11	Manhole	389866.838	412739.667	140.610	3.000	137.610	Circular	1.200
MH 10	Manhole	389875.267	412790.577	140.520	2.940	137.580	Circular	1.200
Simple Junction (1)	Simple Junction	389959.714	412708.037					
Simple Junction	Simple Junction	389908.046	412667.252					
Simple Junction (2)	Simple Junction	389901.274	412661.542					
Simple Junction (3)	Simple Junction	389782.230	412563.177					
Simple Junction (4)	Simple Junction	389709.293	412647.455					
Simple Junction (5)	Simple Junction	389711.074	412647.865					
Simple Junction (6)	Simple Junction	389731.989	412646.232					
Simple Junction (8)	Simple Junction	389762.433	412665.981					
Simple Junction (9)	Simple Junction	389816.261	412670.119					
Simple Junction (10)	Simple Junction	389862.033	412679.942					
Simple Junction (11)	Simple Junction	389801.809	412715.655					
Simple Junction (7)	Simple Junction	389769.905	412640.781					
Simple Junction (13)	Simple Junction	389730.422	412593.336					
Simple Junction (14)	Simple Junction	389734.351	412637.499					
Simple Junction (15)	Simple Junction	389872.464	412730.322					
Simple Junction (12)	Simple Junction	389877.322	412669.366					
Simple Junction (16)	Simple Junction	389880.827	412644.197					
Simple Junction (17)	Simple Junction	389777.392	412574.583					
Simple Junction (18)	Simple Junction	389782.921	412585.564					
CP03	Manhole	389878.731	412644.563	140.697	1.032	139.665	Circular	0.600
CP02	Manhole	389783.626	412587.600	140.892	0.775	140.117	Circular	0.600
CP01	Manhole	389777.340	412597.456	140.920	0.775	140.145	Circular	0.600
CP04	Manhole	389926.265	412676.161	140.586	0.954	139.632	Circular	0.600
Simple Junction (19)	Simple Junction	389927.253	412682.413					

Project:	Date: 02-01-2025			
	Designed by: singhb1974	Checked by:	Approved By:	
	Report Details: Type: Junctions Storm Phase: Phase			
Company Address:				

Name	Lock
MH 16	None
MH 15	None
MH 14	None
MH 13	None
MH 12	None
MH 1	None
MH 2	None
MH 3	None
MH 4	None
MH 6	None
MH 8	None
MH 9	None
MH 11	None
MH 10	None
Simple Junction (1)	
Simple Junction	
Simple Junction (2)	
Simple Junction (3)	
Simple Junction (4)	
Simple Junction (5)	
Simple Junction (6)	
Simple Junction (8)	
Simple Junction (9)	
Simple Junction (10)	
Simple Junction (11)	
Simple Junction (7)	
Simple Junction (13)	
Simple Junction (14)	
Simple Junction (15)	
Simple Junction (12)	
Simple Junction (16)	
Simple Junction (17)	
Simple Junction (18)	
CP03	None
CP02	None
CP01	None
CP04	None
Simple Junction (19)	

Inlets

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		



Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
MH 16	Inlet	Pipe (11) (1)	(None)	No Restriction
	Inlet (1)	Pipe (12)	(None)	No Restriction
MH 15	Inlet (2)	Pipe (16)	(None)	No Restriction
	Inlet (3)	Pipe (14)	(None)	No Restriction
	Inlet (4)	Pipe (15)	(None)	No Restriction
MH 13	Inlet (1)	Pipe (18)	(None)	No Restriction
	Inlet (2)	Pipe (17)	(None)	No Restriction
MH 12	Inlet (1)	Pipe (19)	(None)	No Restriction
	Inlet (2)	Pipe (20)	(None)	No Restriction
MH 1	Inlet	Pipe (29)	(None)	No Restriction
MH 2	Inlet	Pipe (1)	(None)	No Restriction
	Inlet (1)	No Delay (5)	(None)	No Restriction
MH 3	Inlet	Pipe (2)	(None)	No Restriction
	Inlet (1)	Catchment Area (2)	(None)	No Restriction
	Inlet (10)	Catchment Area (5)	(None)	No Restriction
	Inlet (11)	Catchment Area (9)	(None)	No Restriction
	Inlet (4)	Catchment Area (6)	(None)	No Restriction
	Inlet (5)	Catchment Area (3)	(None)	No Restriction
	Inlet (6)	Catchment Area (7)	(None)	No Restriction
	Inlet (7)	Catchment Area (8)	(None)	No Restriction
	Inlet (8)	Catchment Area (1)	(None)	No Restriction
MH 4	Inlet (9)	Catchment Area (4)	(None)	No Restriction
	Inlet	Catchment Area (10)	(None)	No Restriction
	Inlet (1)	Pipe (6) (1)	(None)	No Restriction
	Inlet (2)	Catchment Area (12)	(None)	No Restriction
	Inlet (3)	Catchment Area (13)	(None)	No Restriction
MH 6	Inlet	Pipe (3) (1)	(None)	No Restriction
MH 8	Inlet	Pipe (21) (1)	(None)	No Restriction
MH 9	Inlet	Pipe (24)	(None)	No Restriction
MH 11	Inlet	Pipe (23)	(None)	No Restriction
	Inlet (3)	Pipe (26)	(None)	No Restriction
Simple Junction	Inlet	Pipe (4) (1)	(None)	No Restriction
	Inlet (1)	Pipe (22)	(None)	No Restriction
Simple Junction (2)	Inlet	Pipe (5)	(None)	No Restriction
	Inlet (1)	Pipe (7)	(None)	No Restriction
	Inlet (2)	Catchment Area (16)	(None)	No Restriction
	Inlet (3)	Catchment Area (14)	(None)	No Restriction
Simple Junction (3)	Inlet	Pipe (9)	(None)	No Restriction
Simple Junction (11)	Inlet	Catchment Area (28)	(None)	No Restriction
	Inlet (1)	Catchment Area (27)	(None)	No Restriction
Simple Junction (13)	Inlet	Pipe (10)	(None)	No Restriction
Simple Junction (14)	Inlet	Pipe (11)	(None)	No Restriction
	Inlet (1)	Pipe (13)	(None)	No Restriction
Simple Junction (15)	Inlet	Pipe (21)	(None)	No Restriction
	Inlet (1)	Pipe (25)	(None)	No Restriction
Simple Junction (12)	Inlet (1)	Pipe (27)	(None)	No Restriction
Simple Junction (16)	Inlet	Pipe (6)	(None)	No Restriction
	Inlet (1)	No Delay	(None)	No Restriction
Simple Junction (17)	Inlet	Pipe (8)	(None)	No Restriction
Simple Junction (18)	Inlet	Pipe	(None)	No Restriction
	Inlet (2)	No Delay (4)	(None)	No Restriction
CP03	Inlet	No Delay (3)	(None)	No Restriction
CP02	Inlet	No Delay (1)	(None)	No Restriction
CP01	Inlet	No Delay (2)	(None)	No Restriction
CP04	Inlet	No Delay (6)	(None)	No Restriction
Simple Junction (19)	Inlet	Pipe (4)	(None)	No Restriction
	Inlet (1)	No Delay (7)	(None)	No Restriction

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		



Outlets			
Junction	Outlet Name	Outgoing Connection	Outlet Type
MH 16	Outlet	Pipe (10)	Free Discharge
MH 15	Outlet	Pipe (11)	Free Discharge
MH 14	Outlet	Pipe (17)	Free Discharge
MH 13	Outlet	Pipe (16)	Free Discharge
MH 12	Outlet	Pipe (18)	Free Discharge
MH 1	Outlet	Pipe (9)	Free Discharge
MH 2	Outlet	Pipe	Free Discharge
MH 3	Outlet	Pipe (1)	Free Discharge
MH 4	Outlet	Pipe (2)	Free Discharge
MH 6	Outlet	Pipe (7)	Free Discharge
MH 8	Outlet	Pipe (22)	Free Discharge
MH 9	Outlet	Pipe (25)	Free Discharge
MH 11	Outlet	Pipe (21)	Free Discharge
MH 10	Outlet	Pipe (24)	Free Discharge
Simple Junction (1)	Outlet	Pipe (4)	Free Discharge
Simple Junction	Outlet	Pipe (5)	Free Discharge
Simple Junction (2)	Outlet	Pipe (6)	Free Discharge
Simple Junction (4)	Outlet	Pipe (8)	Free Discharge
Simple Junction (5)	Outlet	Pipe (12)	Free Discharge
Simple Junction (6)	Outlet	Pipe (13)	Free Discharge
Simple Junction (8)	Outlet	Pipe (15)	Free Discharge
Simple Junction (9)	Outlet	Pipe (19)	Free Discharge
Simple Junction (10)	Outlet	Pipe (20)	Free Discharge
Simple Junction (11)	Outlet	Pipe (23)	Free Discharge
Simple Junction (7)	Outlet	Pipe (14)	Free Discharge
Simple Junction (14)	Outlet	Pipe (11) (1)	Free Discharge
Simple Junction (15)	Outlet	Pipe (21) (1)	Free Discharge
Simple Junction (12)	Outlet	Pipe (3) (1)	Free Discharge
Simple Junction (16)	Outlet	Pipe (6) (1)	Free Discharge
Simple Junction (18)	Outlet	Pipe (29)	Free Discharge
CP03	Outlet (1)	No Delay	Orifice
	Diameter (m)	0.030	
	Coefficient of Discharge	0.600	
	Invert Elevation (m)	139.665	
CP02	Outlet	No Delay (4)	Orifice
	Diameter (m)	0.030	
	Coefficient of Discharge	0.600	
	Invert Elevation (m)	140.117	
CP01	Outlet	No Delay (5)	Orifice
	Diameter (m)	0.030	
	Coefficient of Discharge	0.600	
	Invert Elevation (m)	140.145	
CP04	Outlet	No Delay (7)	Orifice
	Diameter (m)	0.030	
	Coefficient of Discharge	0.600	
	Invert Elevation (m)	139.632	
Simple Junction (19)	Outlet	Pipe (4) (1)	Free Discharge

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		





Bioretention

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	140.425
Depth (m)	0.400
Base Elevation (m)	140.025
Top Area (m²)	416.41
Side Slope (1:x)	0.00
Base Area (m²)	416.41
Freeboard (mm)	400
Porosity (%)	1
Length (m)	45.511
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	216.0
Friction Scheme	Manning's n
n	0.017
Total Volume (m³)	100.501

Filter Area

Base Elevation (m)	139.225
--------------------	---------

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Friction Scheme	Manning's n
n	0.013
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	modular storage	600	30	216.0	Soil Type
	aggregate subbase	200	30	216.0	

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (21) Catchment Area (25) Catchment Area (24)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (26)
Outlet Type	Free Discharge

Project:	Date: 02-01-2025			
	Designed by: singhb1974	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			

Advanced

Ponding Area

Base Perimeter (m)	109.322
Top Perimeter (m)	109.322



Bioretention (1)

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	140.783
Depth (m)	0.400
Base Elevation (m)	140.383
Top Area (m²)	263.86
Side Slope (1:x)	0.00
Base Area (m²)	263.86
Freeboard (mm)	400
Porosity (%)	1
Length (m)	26.416
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	216.0
Friction Scheme	Manning's n
n	0.017
Total Volume (m³)	63.654

Filter Area

Base Elevation (m)	139.583
--------------------	---------

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Friction Scheme	Manning's n
n	0.013
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	modular storage	600	30	216.0	Soil Type
	aggregate subbase	200	30	216.0	

Project:	Date: 02-01-2025			
	Designed by: singhb1974	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Stormwater Controls Storm Phase: Phase				

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (20)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (17)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (22)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (27)
Outlet Type	Free Discharge

Advanced

Ponding Area

Base Perimeter (m)	72.810
Top Perimeter (m)	72.810



Bioretention (2)

Type : Bioretention

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Ponding Area

Exceedance Elevation (m)	140.920
Depth (m)	0.050
Base Elevation (m)	140.870
Top Area (m²)	87.70
Side Slope (1:x)	0.00
Base Area (m²)	87.70
Freeboard (mm)	50
Porosity (%)	30
Length (m)	26.719
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	216.0
Friction Scheme	Manning's n
n	0.017
Total Volume (m³)	18.747

Filter Area

Base Elevation (m)	140.170
--------------------	---------

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Friction Scheme	Manning's n
n	0.013
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	Soil	550	30	216.0	Soil Type
	Storage	150	30	216.0	

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	No Delay (2)
Outlet Type	Under Drain

Advanced

Ponding Area

Base Perimeter (m)	60.002
Top Perimeter (m)	60.002

Project:	Date: 02-01-2025			
	Designed by: singhb1974	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Stormwater Controls Storm Phase: Phase				



Bioretention (3)

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	140.696
Depth (m)	0.050
Base Elevation (m)	140.646
Top Area (m²)	63.45
Side Slope (1:x)	0.00
Base Area (m²)	63.45
Freeboard (mm)	50
Porosity (%)	30
Length (m)	20.316
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	216.0
Friction Scheme	Manning's n
n	0.017
Total Volume (m³)	17.382

Filter Area

Base Elevation (m)	139.746
--------------------	---------

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Friction Scheme	Manning's n
n	0.013
Release Height (m)	0.075

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	Soil	550	30	216.0	Soil Type
	Storage	350	30	216.0	

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase		Company Address:	



Inlets

Inlet (1)

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

Inlet (2)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (18)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (4)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (15)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (5)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (19)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (26)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet (1)

Outgoing Connection	No Delay (3)
Outlet Type	Under Drain

Advanced

Ponding Area

Base Perimeter (m)	46.878
Top Perimeter (m)	46.878



Bioretention (4)

Type : Bioretention

Project:	Date: 02-01-2025			
	Designed by: singhb1974	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Stormwater Controls Storm Phase: Phase				

Ponding Area

Exceedance Elevation (m)	140.892
Depth (m)	0.050
Base Elevation (m)	140.842
Top Area (m²)	22.87
Side Slope (1:x)	0.00
Base Area (m²)	22.87
Freeboard (mm)	50
Porosity (%)	30
Length (m)	10.287
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	216.0
Friction Scheme	Manning's n
n	0.017
Total Volume (m³)	4.931

Filter Area

Base Elevation (m)	140.142
--------------------	---------

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Friction Scheme	Manning's n
n	0.013
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	Soil	550	30	216.0	Soil Type
	Storage	150	30	216.0	

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (23)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	No Delay (1)
Outlet Type	Under Drain

Advanced

Ponding Area

Base Perimeter (m)	25.021
Top Perimeter (m)	25.021

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		





Bioretention (5)

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	140.589
Depth (m)	0.050
Base Elevation (m)	140.539
Top Area (m²)	37.02
Side Slope (1:x)	0.00
Base Area (m²)	37.02
Freeboard (mm)	50
Porosity (%)	30
Length (m)	12.775
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	216.0
Friction Scheme	Manning's n
n	0.017
Total Volume (m³)	7.932

Filter Area

Base Elevation (m)	139.839
--------------------	---------

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Friction Scheme	Manning's n
n	0.013
Release Height (m)	0.075

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☒	Soil	550	30	216.0	Soil Type
	Storage	150	30	216.0	

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (29)
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	No Delay (6)
Outlet Type	Under Drain

Project:	Date: 02-01-2025			
	Designed by: singhb1974	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Stormwater Controls Storm Phase: Phase				

Advanced

Ponding Area

Base Perimeter (m)	31.346
Top Perimeter (m)	31.346

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase		Company Address:	



Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analyzed (ha)
Catchment Area	Bioretention (2)		Time of Concentration	0.053	100	0	100	0.053
Catchment Area (1)	MH 3		Time of Concentration	0.013	100	0	100	0.013
Catchment Area (2)	MH 3		Time of Concentration	0.007	100	0	100	0.007
Catchment Area (3)	MH 3		Time of Concentration	0.014	100	0	100	0.014
Catchment Area (4)	MH 3		Time of Concentration	0.017	100	0	100	0.017
Catchment Area (5)	MH 3		Time of Concentration	0.019	100	0	100	0.019
Catchment Area (6)	MH 3		Time of Concentration	0.017	100	0	100	0.017
Catchment Area (7)	MH 3		Time of Concentration	0.004	100	0	100	0.004
Catchment Area (8)	MH 3		Time of Concentration	0.016	100	0	100	0.016
Catchment Area (9)	MH 3		Time of Concentration	0.016	100	0	100	0.016
Catchment Area (10)	MH 4		Time of Concentration	0.014	100	0	100	0.014
Catchment Area (11)	Bioretention (3)		Time of Concentration	0.015	100	0	100	0.015
Catchment Area (12)	MH 4		Time of Concentration	0.009	100	0	100	0.009
Catchment Area (13)	MH 4		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (14)	Simple Junction (2)		Time of Concentration	0.026	100	0	100	0.026
Catchment Area (15)	Bioretention (3)		Time of Concentration	0.011	100	0	100	0.011
Catchment Area (16)	Simple Junction (2)		Time of Concentration	0.041	100	0	100	0.041
Catchment Area (17)	Bioretention (1)		Time of Concentration	0.066	100	0	100	0.066
Catchment Area (18)	Bioretention (3)		Time of Concentration	0.023	100	0	100	0.023
Catchment Area (19)	Bioretention (3)		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (20)	Bioretention (1)		Time of Concentration	0.031	100	0	100	0.031
Catchment Area (21)	Bioretention		Time of Concentration	0.049	100	0	100	0.049
Catchment Area (22)	Bioretention (1)		Time of Concentration	0.034	100	0	100	0.034
Catchment Area (23)	Bioretention (4)		Time of Concentration	0.017	100	0	100	0.017
Catchment Area (24)	Bioretention		Time of Concentration	0.027	100	0	100	0.027
Catchment Area (25)	Bioretention		Time of Concentration	0.075	100	0	100	0.075
Catchment Area (26)	Bioretention (3)		Time of Concentration	0.008	100	0	100	0.008
Catchment Area (27)	Simple Junction (11)		Time of Concentration	0.017	100	0	100	0.017
Catchment Area (28)	Simple Junction (11)		Time of Concentration	0.028	100	0	100	0.028
Catchment Area (29)	Bioretention (5)		Time of Concentration	0.016	100	0	100	0.016
TOTAL		0.0		0.698				0.698

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Network Design Criteria Storm Phase: Phase		Company Address:	



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	Minimize Excavation
Design Level	Level Crowns
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	☐

Pipe Size Library

Default

Add. Increment (mm)	75
Max. Diameter (mm)	0

Diameter (mm)	Min. Slope (1:x)	Max. Slope (1:x)
100	0.00	0.00
150	0.00	0.00

Project:	Date: 02-01-2025			
	Designed by: singhb1974	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Network Design Criteria Storm Phase: Phase				

Manhole Options

Apply Offset	☐
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Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

Project:	Date: 02-01-2025			
	Designed by: singhb1974	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Outfall Details Storm Phase: Phase				

Outfalls

Outfall	Outfall Type	Fixed Surcharged Elevation (m)	Elevation Curve
Simple Junction (3)	Free Discharge		
Simple Junction (13)	Free Discharge		
Simple Junction (17)	Free Discharge		

Project:	Date:			
	02-01-2025			
	Designed by:	Checked by:	Approved By:	
Report Title:	singhb1974			
Rainfall Analysis Criteria	Company Address:			

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform First Flush Analysis	☐

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





FSR with cc: 1 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH 16	FSR with cc: 1 years: +30 %: 15 mins: Summer	142.380	136.980	136.980	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 15	FSR with cc: 1 years: +30 %: 15 mins: Summer	141.910	137.550	137.550	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 14	FSR with cc: 1 years: +30 %: 15 mins: Summer	141.590	139.030	139.030	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 13	FSR with cc: 1 years: +30 %: 15 mins: Summer	141.670	137.730	137.730	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 12	FSR with cc: 1 years: +30 %: 15 mins: Summer	141.360	137.830	137.830	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 1	FSR with cc: 1 years: +30 %: 120 mins: Summer	140.450	135.630	135.763	0.133	39.5	0.150	0.000	39.6	132.310	OK
MH 2	FSR with cc: 1 years: +30 %: 120 mins: Summer	141.320	135.740	135.878	0.138	38.4	0.156	0.000	38.7	129.055	OK
MH 3	FSR with cc: 1 years: +30 %: 15 mins: Summer	140.950	136.110	136.233	0.123	43.2	0.139	0.000	38.4	27.588	OK
MH 4	FSR with cc: 1 years: +30 %: 120 mins: Summer	140.770	136.230	136.336	0.106	28.6	0.119	0.000	28.6	94.529	OK
MH 6	FSR with cc: 1 years: +30 %: 60 mins: Summer	140.770	138.570	138.604	0.034	10.5	0.038	0.000	10.5	17.147	OK
MH 8	FSR with cc: 1 years: +30 %: 120 mins: Winter	140.650	136.900	136.953	0.053	9.8	0.060	0.000	9.8	36.306	OK
MH 9	FSR with cc: 1 years: +30 %: 120 mins: Winter	140.460	137.360	137.394	0.034	0.3	0.039	0.000	0.1	0.184	OK
MH 11	FSR with cc: 1 years: +30 %: 120 mins: Winter	140.610	137.610	137.658	0.048	9.8	0.054	0.000	9.8	36.361	OK
MH 10	FSR with cc: 1 years: +30 %: 15 mins: Summer	140.520	137.580	137.580	0.000	0.0	0.000	0.000	0.0	0.000	OK
Simple Junction (1)	FSR with cc: 1 years: +30 %: 15 mins: Summer		136.840	136.840	0.000	0.0			0.0	0.000	OK
Simple Junction	FSR with cc: 1 years: +30 %: 120 mins: Summer		136.510	136.583	0.073	10.5			10.6	37.602	OK
Simple Junction (2)	FSR with cc: 1 years: +30 %: 120 mins: Summer		136.470	136.570	0.100	25.1			25.1	76.946	OK
Simple Junction (3)	FSR with cc: 1 years: +30 %: 120 mins: Summer		135.586	135.708	0.122	39.6			39.6	132.310	OK
Simple Junction (4)	FSR with cc: 1 years: +30 %: 15 mins: Summer		136.183	136.183	0.000	0.0			0.0	0.000	OK
Simple Junction (5)	FSR with cc: 1 years: +30 %: 15 mins: Summer		137.170	137.170	0.000	0.0			0.0	0.000	OK

Project:		Date: 02-01-2025			
		Designed by: singhb1974	Checked by:	Approved By:	
Report Details: Type: Junctions Summary Storm Phase: Phase		Company Address:			

Simple Junction (6)	FSR with cc: 1 years: +30 %: 15 mins: Summer		137.295	137.295	0.000	0.0				0.0	0.000	OK
Simple Junction (8)	FSR with cc: 1 years: +30 %: 15 mins: Summer		137.737	137.737	0.000	0.0				0.0	0.000	OK
Simple Junction (9)	FSR with cc: 1 years: +30 %: 15 mins: Summer		137.893	137.893	0.000	0.0				0.0	0.000	OK
Simple Junction (10)	FSR with cc: 1 years: +30 %: 15 mins: Summer		138.024	138.024	0.000	0.0				0.0	0.000	OK
Simple Junction (11)	FSR with cc: 1 years: +30 %: 15 mins: Summer		138.303	138.367	0.064	8.5				7.9	3.692	OK
Simple Junction (7)	FSR with cc: 1 years: +30 %: 15 mins: Summer		137.642	137.642	0.000	0.0				0.0	0.000	OK
Simple Junction (13)	FSR with cc: 1 years: +30 %: 15 mins: Summer		136.527	136.527	0.000	0.0				0.0	0.000	OK
Simple Junction (14)	FSR with cc: 1 years: +30 %: 15 mins: Summer		137.205	137.205	0.000	0.0				0.0	0.000	OK
Simple Junction (15)	FSR with cc: 1 years: +30 %: 120 mins: Winter		137.330	137.394	0.064	9.8				9.8	36.524	OK
Simple Junction (12)	FSR with cc: 1 years: +30 %: 120 mins: Summer		138.738	138.814	0.076	10.5				10.5	24.963	OK
Simple Junction (16)	FSR with cc: 1 years: +30 %: 120 mins: Summer		136.333	136.437	0.104	26.3				26.3	87.562	OK
Simple Junction (17)	FSR with cc: 1 years: +30 %: 15 mins: Summer		135.654	135.654	0.000	0.0				0.0	0.000	OK
Simple Junction (18)	FSR with cc: 1 years: +30 %: 120 mins: Summer		135.699	135.833	0.134	39.5				39.5	132.365	OK
CP03	FSR with cc: 1 years: +30 %: 120 mins: Summer	140.697	139.665	140.094	0.429	1.4	0.121	0.000		1.2	10.656	Surcharged
CP02	FSR with cc: 1 years: +30 %: 120 mins: Summer	140.892	140.117	140.292	0.175	0.8	0.049	0.000		0.8	3.342	Surcharged
CP01	FSR with cc: 1 years: +30 %: 120 mins: Summer	140.920	140.145	140.320	0.175	1.3	0.049	0.000		0.8	8.322	Surcharged
CP04	FSR with cc: 1 years: +30 %: 120 mins: Winter	140.586	139.632	139.808	0.176	0.9	0.050	0.000		0.8	1.736	Surcharged
Simple Junction (19)	FSR with cc: 1 years: +30 %: 120 mins: Winter		136.633	136.650	0.018	0.8				0.7	1.732	OK

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





FSR with cc: 5 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH 16	FSR with cc: 5 years: +30 %: 15 mins: Summer	142.380	136.980	136.980	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 15	FSR with cc: 5 years: +30 %: 15 mins: Summer	141.910	137.550	137.550	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 14	FSR with cc: 5 years: +30 %: 15 mins: Summer	141.590	139.030	139.030	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 13	FSR with cc: 5 years: +30 %: 15 mins: Summer	141.670	137.730	137.730	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 12	FSR with cc: 5 years: +30 %: 15 mins: Summer	141.360	137.830	137.830	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 1	FSR with cc: 5 years: +30 %: 60 mins: Summer	140.450	135.630	135.805	0.175	65.6	0.197	0.000	65.3	140.218	OK
MH 2	FSR with cc: 5 years: +30 %: 60 mins: Summer	141.320	135.740	135.927	0.187	65.9	0.211	0.000	65.0	136.728	OK
MH 3	FSR with cc: 5 years: +30 %: 15 mins: Summer	140.950	136.110	136.275	0.165	73.7	0.187	0.000	66.6	48.058	OK
MH 4	FSR with cc: 5 years: +30 %: 120 mins: Summer	140.770	136.230	136.360	0.130	41.6	0.147	0.000	41.4	146.157	OK
MH 6	FSR with cc: 5 years: +30 %: 60 mins: Summer	140.770	138.570	138.605	0.035	10.9	0.039	0.000	10.9	28.109	OK
MH 8	FSR with cc: 5 years: +30 %: 120 mins: Summer	140.650	136.900	136.962	0.062	13.7	0.071	0.000	13.6	57.184	OK
MH 9	FSR with cc: 5 years: +30 %: 120 mins: Summer	140.460	137.360	137.406	0.046	0.5	0.052	0.000	0.1	0.284	OK
MH 11	FSR with cc: 5 years: +30 %: 120 mins: Summer	140.610	137.610	137.668	0.058	14.0	0.065	0.000	14.0	57.248	OK
MH 10	FSR with cc: 5 years: +30 %: 15 mins: Summer	140.520	137.580	137.580	0.000	0.0	0.000	0.000	0.0	0.000	OK
Simple Junction (1)	FSR with cc: 5 years: +30 %: 15 mins: Summer		136.840	136.840	0.000	0.0			0.0	0.000	OK
Simple Junction	FSR with cc: 5 years: +30 %: 120 mins: Summer		136.510	136.601	0.091	14.6			14.5	59.979	OK
Simple Junction (2)	FSR with cc: 5 years: +30 %: 120 mins: Summer		136.470	136.591	0.121	35.5			35.4	121.338	OK
Simple Junction (3)	FSR with cc: 5 years: +30 %: 60 mins: Summer		135.586	135.744	0.157	65.3			65.3	140.218	OK
Simple Junction (4)	FSR with cc: 5 years: +30 %: 15 mins: Summer		136.183	136.183	0.000	0.0			0.0	0.000	OK
Simple Junction (5)	FSR with cc: 5 years: +30 %: 15 mins: Summer		137.170	137.170	0.000	0.0			0.0	0.000	OK

Project:	Date: 02-01-2025			
	Designed by: singhb1974	Checked by:	Approved By:	
Report Details: Type: Junctions Summary Storm Phase: Phase		Company Address:		

Simple Junction (6)	FSR with cc: 5 years: +30 %: 15 mins: Summer		137.295	137.295	0.000	0.0			13.4	0.0	0.000	OK
Simple Junction (8)	FSR with cc: 5 years: +30 %: 15 mins: Summer		137.737	137.737	0.000	0.0				0.0	0.000	OK
Simple Junction (9)	FSR with cc: 5 years: +30 %: 15 mins: Summer		137.893	137.893	0.000	0.0				0.0	0.000	OK
Simple Junction (10)	FSR with cc: 5 years: +30 %: 15 mins: Summer		138.024	138.024	0.000	0.0				0.0	0.000	OK
Simple Junction (11)	FSR with cc: 5 years: +30 %: 15 mins: Summer		138.303	138.387	0.084	14.3				13.4	6.196	OK
Simple Junction (7)	FSR with cc: 5 years: +30 %: 15 mins: Summer		137.642	137.642	0.000	0.0				0.0	0.000	OK
Simple Junction (13)	FSR with cc: 5 years: +30 %: 15 mins: Summer		136.527	136.527	0.000	0.0				0.0	0.000	OK
Simple Junction (14)	FSR with cc: 5 years: +30 %: 15 mins: Summer		137.205	137.205	0.000	0.0				0.0	0.000	OK
Simple Junction (15)	FSR with cc: 5 years: +30 %: 120 mins: Summer		137.330	137.406	0.076	14.0				13.7	57.508	OK
Simple Junction (12)	FSR with cc: 5 years: +30 %: 60 mins: Summer		138.738	138.815	0.077	10.9				10.9	28.124	OK
Simple Junction (16)	FSR with cc: 5 years: +30 %: 120 mins: Summer		136.333	136.458	0.125	36.6				36.4	135.355	OK
Simple Junction (17)	FSR with cc: 5 years: +30 %: 15 mins: Summer		135.654	135.654	0.000	0.0				0.0	0.000	OK
Simple Junction (18)	FSR with cc: 5 years: +30 %: 60 mins: Summer		135.699	135.877	0.179	65.8				65.6	140.358	OK
CP03	FSR with cc: 5 years: +30 %: 120 mins: Summer	140.697	139.665	140.095	0.430	1.6	0.122	0.000		1.2	14.115	Surcharged
CP02	FSR with cc: 5 years: +30 %: 60 mins: Winter	140.892	140.117	140.292	0.175	1.0	0.049	0.000	0.8	3.752	Surcharged	
CP01	FSR with cc: 5 years: +30 %: 120 mins: Winter	140.920	140.145	140.320	0.175	1.3	0.050	0.000	0.8	9.155	Surcharged	
CP04	FSR with cc: 5 years: +30 %: 60 mins: Winter	140.586	139.632	139.968	0.336	1.9	0.095	0.000	1.1	2.280	Surcharged	
Simple Junction (19)	FSR with cc: 5 years: +30 %: 60 mins: Winter		136.633	136.653	0.021	1.1			1.1	2.272	OK	

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





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

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH 16	FSR with cc: 30 years: +30 %: 15 mins: Summer	142.380	136.980	136.980	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 15	FSR with cc: 30 years: +30 %: 15 mins: Summer	141.910	137.550	137.550	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 14	FSR with cc: 30 years: +30 %: 15 mins: Summer	141.590	139.030	139.030	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 13	FSR with cc: 30 years: +30 %: 15 mins: Summer	141.670	137.730	137.730	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 12	FSR with cc: 30 years: +30 %: 15 mins: Summer	141.360	137.830	137.830	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 1	FSR with cc: 30 years: +30 %: 60 mins: Summer	140.450	135.630	135.848	0.218	97.3	0.246	0.000	97.0	205.669	OK
MH 2	FSR with cc: 30 years: +30 %: 60 mins: Summer	141.320	135.740	135.978	0.238	97.7	0.269	0.000	96.8	201.441	OK
MH 3	FSR with cc: 30 years: +30 %: 15 mins: Summer	140.950	136.110	136.318	0.208	109.4	0.235	0.000	99.9	68.006	OK
MH 4	FSR with cc: 30 years: +30 %: 60 mins: Summer	140.770	136.230	136.390	0.160	60.2	0.181	0.000	59.8	150.672	OK
MH 6	FSR with cc: 30 years: +30 %: 120 mins: Summer	140.770	138.570	138.608	0.038	13.2	0.043	0.000	13.2	59.664	OK
MH 8	FSR with cc: 30 years: +30 %: 120 mins: Summer	140.650	136.900	136.972	0.072	18.2	0.082	0.000	18.1	87.071	OK
MH 9	FSR with cc: 30 years: +30 %: 120 mins: Summer	140.460	137.360	137.418	0.058	0.5	0.065	0.000	0.2	0.385	OK
MH 11	FSR with cc: 30 years: +30 %: 15 mins: Summer	140.610	137.610	137.678	0.068	19.6	0.077	0.000	18.5	13.016	OK
MH 10	FSR with cc: 30 years: +30 %: 15 mins: Summer	140.520	137.580	137.580	0.000	0.0	0.000	0.000	0.0	0.000	OK
Simple Junction (1)	FSR with cc: 30 years: +30 %: 15 mins: Summer		136.840	136.840	0.000	0.0			0.0	0.000	OK
Simple Junction	FSR with cc: 30 years: +30 %: 60 mins: Summer		136.510	136.624	0.114	18.6			18.4	62.312	OK
Simple Junction (2)	FSR with cc: 30 years: +30 %: 60 mins: Summer		136.470	136.615	0.145	49.8			49.4	131.434	OK
Simple Junction (3)	FSR with cc: 30 years: +30 %: 60 mins: Summer		135.586	135.780	0.194	97.0			97.0	205.669	OK
Simple Junction (4)	FSR with cc: 30 years: +30 %: 15 mins: Summer		136.183	136.183	0.000	0.0			0.0	0.000	OK
Simple Junction (5)	FSR with cc: 30 years: +30 %: 15 mins: Summer		137.170	137.170	0.000	0.0			0.0	0.000	OK

Project:		Date: 02-01-2025			
		Designed by: singhb1974	Checked by:	Approved By:	
Report Details: Type: Junctions Summary Storm Phase: Phase		Company Address:			

Simple Junction (6)	FSR with cc: 30 years: +30 %: 15 mins: Summer		137.295	137.295	0.000	0.0			0.0	0.000	OK
Simple Junction (8)	FSR with cc: 30 years: +30 %: 15 mins: Summer		137.737	137.737	0.000	0.0			0.0	0.000	OK
Simple Junction (9)	FSR with cc: 30 years: +30 %: 15 mins: Summer		137.893	137.893	0.000	0.0			0.0	0.000	OK
Simple Junction (10)	FSR with cc: 30 years: +30 %: 15 mins: Summer		138.024	138.024	0.000	0.0			0.0	0.000	OK
Simple Junction (11)	FSR with cc: 30 years: +30 %: 15 mins: Summer		138.303	138.407	0.104	20.9			19.6	9.039	OK
Simple Junction (7)	FSR with cc: 30 years: +30 %: 15 mins: Summer		137.642	137.642	0.000	0.0			0.0	0.000	OK
Simple Junction (13)	FSR with cc: 30 years: +30 %: 15 mins: Summer		136.527	136.527	0.000	0.0			0.0	0.000	OK
Simple Junction (14)	FSR with cc: 30 years: +30 %: 15 mins: Summer		137.205	137.205	0.000	0.0			0.0	0.000	OK
Simple Junction (15)	FSR with cc: 30 years: +30 %: 120 mins: Summer		137.330	137.418	0.088	18.3			18.2	87.504	OK
Simple Junction (12)	FSR with cc: 30 years: +30 %: 60 mins: Summer		138.738	138.824	0.086	13.2			13.2	43.487	OK
Simple Junction (16)	FSR with cc: 30 years: +30 %: 60 mins: Summer		136.333	136.483	0.150	50.6			50.1	138.378	OK
Simple Junction (17)	FSR with cc: 30 years: +30 %: 15 mins: Summer		135.654	135.654	0.000	0.0			0.0	0.000	OK
Simple Junction (18)	FSR with cc: 30 years: +30 %: 60 mins: Summer		135.699	135.924	0.226	97.5			97.3	205.885	OK
CP03	FSR with cc: 30 years: +30 %: 30 mins: Summer	140.697	139.665	140.095	0.430	1.9	0.122	0.000	1.2	3.388	Surcharged
CP02	FSR with cc: 30 years: +30 %: 120 mins: Summer	140.892	140.117	140.292	0.175	0.8	0.049	0.000	0.8	7.751	Surcharged
CP01	FSR with cc: 30 years: +30 %: 120 mins: Summer	140.920	140.145	140.320	0.175	1.1	0.049	0.000	0.8	9.450	Surcharged
CP04	FSR with cc: 30 years: +30 %: 60 mins: Summer	140.586	139.632	139.988	0.356	1.7	0.101	0.000	1.1	3.272	Surcharged
Simple Junction (19)	FSR with cc: 30 years: +30 %: 60 mins: Winter		136.633	136.654	0.021	1.1			1.1	3.671	OK

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





FSR with cc: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH 16	FSR with cc: 100 years: +30 %: 15 mins: Summer	142.380	136.980	136.980	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 15	FSR with cc: 100 years: +30 %: 15 mins: Summer	141.910	137.550	137.550	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 14	FSR with cc: 100 years: +30 %: 15 mins: Summer	141.590	139.030	139.030	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 13	FSR with cc: 100 years: +30 %: 15 mins: Summer	141.670	137.730	137.730	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 12	FSR with cc: 100 years: +30 %: 15 mins: Summer	141.360	137.830	137.830	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 1	FSR with cc: 100 years: +30 %: 60 mins: Summer	140.450	135.630	135.885	0.255	127.6	0.288	0.000	127.3	263.605	OK
MH 2	FSR with cc: 100 years: +30 %: 60 mins: Summer	141.320	135.740	136.023	0.283	128.2	0.321	0.000	127.1	259.371	OK
MH 3	FSR with cc: 100 years: +30 %: 15 mins: Summer	140.950	136.110	136.353	0.243	141.6	0.274	0.000	130.5	87.339	OK
MH 4	FSR with cc: 100 years: +30 %: 60 mins: Summer	140.770	136.230	136.419	0.189	78.6	0.214	0.000	78.3	194.063	OK
MH 6	FSR with cc: 100 years: +30 %: 60 mins: Summer	140.770	138.570	138.614	0.044	17.8	0.050	0.000	17.8	58.079	OK
MH 8	FSR with cc: 100 years: +30 %: 60 mins: Summer	140.650	136.900	136.984	0.084	24.4	0.094	0.000	24.2	74.956	OK
MH 9	FSR with cc: 100 years: +30 %: 60 mins: Summer	140.460	137.360	137.433	0.073	1.4	0.083	0.000	0.5	0.398	OK
MH 11	FSR with cc: 100 years: +30 %: 60 mins: Summer	140.610	137.610	137.690	0.080	25.1	0.090	0.000	25.0	75.761	OK
MH 10	FSR with cc: 100 years: +30 %: 15 mins: Summer	140.520	137.580	137.580	0.000	0.0	0.000	0.000	0.0	0.000	OK
Simple Junction (1)	FSR with cc: 100 years: +30 %: 15 mins: Summer		136.840	136.840	0.000	0.0			0.0	0.000	OK
Simple Junction	FSR with cc: 100 years: +30 %: 60 mins: Summer		136.510	136.648	0.138	25.3			25.0	79.160	OK
Simple Junction (2)	FSR with cc: 100 years: +30 %: 60 mins: Summer		136.470	136.639	0.169	64.9			64.6	170.884	OK
Simple Junction (3)	FSR with cc: 100 years: +30 %: 60 mins: Summer		135.586	135.812	0.225	127.3			127.3	263.605	OK
Simple Junction (4)	FSR with cc: 100 years: +30 %: 15 mins: Summer		136.183	136.183	0.000	0.0			0.0	0.000	OK
Simple Junction (5)	FSR with cc: 100 years: +30 %: 15 mins: Summer		137.170	137.170	0.000	0.0			0.0	0.000	OK

Project:		Date: 02-01-2025			
		Designed by: singhb1974	Checked by:	Approved By:	
Report Details: Type: Junctions Summary Storm Phase: Phase		Company Address:			

Simple Junction (6)	FSR with cc: 100 years: +30 %: 15 mins: Summer		137.295	137.295	0.000	0.0			0.0	0.000	OK
Simple Junction (8)	FSR with cc: 100 years: +30 %: 15 mins: Summer		137.737	137.737	0.000	0.0			0.0	0.000	OK
Simple Junction (9)	FSR with cc: 100 years: +30 %: 15 mins: Summer		137.893	137.893	0.000	0.0			0.0	0.000	OK
Simple Junction (10)	FSR with cc: 100 years: +30 %: 15 mins: Summer		138.024	138.024	0.000	0.0			0.0	0.000	OK
Simple Junction (11)	FSR with cc: 100 years: +30 %: 15 mins: Summer		138.303	138.423	0.120	26.9			25.4	11.662	OK
Simple Junction (7)	FSR with cc: 100 years: +30 %: 15 mins: Summer		137.642	137.642	0.000	0.0			0.0	0.000	OK
Simple Junction (13)	FSR with cc: 100 years: +30 %: 15 mins: Summer		136.527	136.527	0.000	0.0			0.0	0.000	OK
Simple Junction (14)	FSR with cc: 100 years: +30 %: 15 mins: Summer		137.205	137.205	0.000	0.0			0.0	0.000	OK
Simple Junction (15)	FSR with cc: 100 years: +30 %: 60 mins: Summer		137.330	137.433	0.103	25.0			24.4	75.824	OK
Simple Junction (12)	FSR with cc: 100 years: +30 %: 60 mins: Summer		138.738	138.838	0.100	17.8			17.8	58.101	OK
Simple Junction (16)	FSR with cc: 100 years: +30 %: 60 mins: Summer		136.333	136.509	0.176	65.8			65.4	177.915	OK
Simple Junction (17)	FSR with cc: 100 years: +30 %: 15 mins: Summer		135.654	135.654	0.000	0.0			0.0	0.000	OK
Simple Junction (18)	FSR with cc: 100 years: +30 %: 60 mins: Summer		135.699	135.966	0.267	127.9			127.6	263.882	OK
CP03	FSR with cc: 100 years: +30 %: 15 mins: Summer	140.697	139.665	140.095	0.430	2.2	0.122	0.000	1.2	1.558	Surcharged
CP02	FSR with cc: 100 years: +30 %: 120 mins: Winter	140.892	140.117	140.292	0.175	0.9	0.050	0.000	0.8	9.599	Surcharged
CP01	FSR with cc: 100 years: +30 %: 15 mins: Summer	140.920	140.145	140.320	0.175	1.3	0.049	0.000	0.8	0.948	Surcharged
CP04	FSR with cc: 100 years: +30 %: 60 mins: Winter	140.586	139.632	139.988	0.356	1.3	0.101	0.000	1.1	5.198	Surcharged
Simple Junction (19)	FSR with cc: 100 years: +30 %: 15 mins: Summer		136.633	136.654	0.021	1.1			1.1	1.124	OK

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





FSR with cc: 10 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH 16	FSR with cc: 10 years: +30 %: 15 mins: Summer	142.380	136.980	136.980	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 15	FSR with cc: 10 years: +30 %: 15 mins: Summer	141.910	137.550	137.550	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 14	FSR with cc: 10 years: +30 %: 15 mins: Summer	141.590	139.030	139.030	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 13	FSR with cc: 10 years: +30 %: 15 mins: Summer	141.670	137.730	137.730	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 12	FSR with cc: 10 years: +30 %: 15 mins: Summer	141.360	137.830	137.830	0.000	0.0	0.000	0.000	0.0	0.000	OK
MH 1	FSR with cc: 10 years: +30 %: 60 mins: Summer	140.450	135.630	135.820	0.190	76.3	0.215	0.000	76.1	164.054	OK
MH 2	FSR with cc: 10 years: +30 %: 60 mins: Summer	141.320	135.740	135.944	0.204	76.6	0.231	0.000	75.8	160.136	OK
MH 3	FSR with cc: 10 years: +30 %: 15 mins: Summer	140.950	136.110	136.291	0.181	86.0	0.204	0.000	77.8	54.702	OK
MH 4	FSR with cc: 10 years: +30 %: 60 mins: Summer	140.770	136.230	136.369	0.139	47.3	0.157	0.000	46.9	119.617	OK
MH 6	FSR with cc: 10 years: +30 %: 60 mins: Summer	140.770	138.570	138.606	0.036	11.9	0.041	0.000	11.9	33.658	OK
MH 8	FSR with cc: 10 years: +30 %: 120 mins: Summer	140.650	136.900	136.966	0.066	15.4	0.075	0.000	15.4	67.877	OK
MH 9	FSR with cc: 10 years: +30 %: 120 mins: Summer	140.460	137.360	137.411	0.051	0.5	0.057	0.000	0.2	0.320	OK
MH 11	FSR with cc: 10 years: +30 %: 120 mins: Summer	140.610	137.610	137.671	0.061	15.6	0.069	0.000	15.5	67.945	OK
MH 10	FSR with cc: 10 years: +30 %: 15 mins: Summer	140.520	137.580	137.580	0.000	0.0	0.000	0.000	0.0	0.000	OK
Simple Junction (1)	FSR with cc: 10 years: +30 %: 15 mins: Summer		136.840	136.840	0.000	0.0			0.0	0.000	OK
Simple Junction	FSR with cc: 10 years: +30 %: 120 mins: Summer		136.510	136.608	0.098	16.4			16.3	71.346	OK
Simple Junction (2)	FSR with cc: 10 years: +30 %: 120 mins: Summer		136.470	136.598	0.128	39.4			39.3	143.712	OK
Simple Junction (3)	FSR with cc: 10 years: +30 %: 60 mins: Summer		135.586	135.757	0.170	76.1			76.1	164.054	OK
Simple Junction (4)	FSR with cc: 10 years: +30 %: 15 mins: Summer		136.183	136.183	0.000	0.0			0.0	0.000	OK
Simple Junction (5)	FSR with cc: 10 years: +30 %: 15 mins: Summer		137.170	137.170	0.000	0.0			0.0	0.000	OK

Project:		Date: 02-01-2025		
		Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase		Company Address:		



Simple Junction (6)	FSR with cc: 10 years: +30 %: 15 mins: Summer		137.295	137.295	0.000	0.0			0.0	0.000	OK
Simple Junction (8)	FSR with cc: 10 years: +30 %: 15 mins: Summer		137.737	137.737	0.000	0.0			0.0	0.000	OK
Simple Junction (9)	FSR with cc: 10 years: +30 %: 15 mins: Summer		137.893	137.893	0.000	0.0			0.0	0.000	OK
Simple Junction (10)	FSR with cc: 10 years: +30 %: 15 mins: Summer		138.024	138.024	0.000	0.0			0.0	0.000	OK
Simple Junction (11)	FSR with cc: 10 years: +30 %: 15 mins: Summer		138.303	138.394	0.091	16.6			15.5	7.174	OK
Simple Junction (7)	FSR with cc: 10 years: +30 %: 15 mins: Summer		137.642	137.642	0.000	0.0			0.0	0.000	OK
Simple Junction (13)	FSR with cc: 10 years: +30 %: 15 mins: Summer		136.527	136.527	0.000	0.0			0.0	0.000	OK
Simple Junction (14)	FSR with cc: 10 years: +30 %: 15 mins: Summer		137.205	137.205	0.000	0.0			0.0	0.000	OK
Simple Junction (15)	FSR with cc: 10 years: +30 %: 120 mins: Summer		137.330	137.410	0.081	15.5			15.4	68.239	OK
Simple Junction (12)	FSR with cc: 10 years: +30 %: 60 mins: Summer		138.738	138.819	0.081	11.9			11.9	33.675	OK
Simple Junction (16)	FSR with cc: 10 years: +30 %: 120 mins: Summer		136.333	136.466	0.132	40.5			40.4	158.201	OK
Simple Junction (17)	FSR with cc: 10 years: +30 %: 15 mins: Summer		135.654	135.654	0.000	0.0			0.0	0.000	OK
Simple Junction (18)	FSR with cc: 10 years: +30 %: 60 mins: Summer		135.699	135.894	0.195	76.5			76.3	164.214	OK
CP03	FSR with cc: 10 years: +30 %: 15 mins: Summer	140.697	139.665	140.095	0.430	4.3	0.122	0.000	1.2	1.463	Surcharged
CP02	FSR with cc: 10 years: +30 %: 60 mins: Winter	140.892	140.117	140.292	0.175	0.8	0.050	0.000	0.8	4.200	Surcharged
CP01	FSR with cc: 10 years: +30 %: 60 mins: Winter	140.920	140.145	140.320	0.175	1.3	0.050	0.000	0.8	4.431	Surcharged
CP04	FSR with cc: 10 years: +30 %: 120 mins: Summer	140.586	139.632	139.988	0.356	1.7	0.101	0.000	1.1	3.504	Surcharged
Simple Junction (19)	FSR with cc: 10 years: +30 %: 60 mins: Winter		136.633	136.654	0.021	1.1			1.1	2.831	OK

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		





FSR with cc: 1 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank
By: Max. Outflow

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Bioretention	FSR with cc: 1 years: +30 %: 120 mins: Summer	139.542	139.258	0.317	0.033	15.2	26.383	0.000	0.000	7.8	26.803	73.749	OK
Bioretention (1)	FSR with cc: 1 years: +30 %: 120 mins: Summer	139.791	139.629	0.208	0.046	13.2	15.743	0.000	0.000	10.5	24.972	75.267	OK
Bioretention (2)	FSR with cc: 1 years: +30 %: 30 mins: Winter	140.447	140.320	0.277	0.150	6.6	6.280	0.000	0.000	1.3	2.077	66.501	OK
Bioretention (3)	FSR with cc: 1 years: +30 %: 60 mins: Summer	140.098	140.084	0.352	0.338	7.6	7.622	0.000	0.000	1.4	6.193	56.148	OK
Bioretention (4)	FSR with cc: 1 years: +30 %: 15 mins: Summer	140.293	140.251	0.151	0.109	3.2	1.212	0.000	0.000	1.3	0.818	75.417	OK
Bioretention (5)	FSR with cc: 1 years: +30 %: 120 mins: Summer	139.989	139.940	0.150	0.101	1.2	1.868	0.000	0.000	0.9	1.425	76.446	OK

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		





FSR with cc: 5 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank
By: Max. Outflow

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Bioretention	FSR with cc: 5 years: +30 %: 120 mins: Summer	139.995	139.259	0.770	0.034	23.6	37.004	0.000	0.000	8.3	42.520	63.180	OK
Bioretention (1)	FSR with cc: 5 years: +30 %: 60 mins: Summer	140.250	139.629	0.667	0.046	26.5	23.694	0.000	0.000	10.9	28.139	62.777	OK
Bioretention (2)	FSR with cc: 5 years: +30 %: 15 mins: Winter	140.705	140.320	0.535	0.150	15.9	7.820	0.000	0.000	1.8	1.085	58.288	OK
Bioretention (3)	FSR with cc: 5 years: +30 %: 15 mins: Winter	140.129	140.095	0.383	0.349	18.2	7.960	0.000	0.000	4.5	1.891	54.204	OK
Bioretention (4)	FSR with cc: 5 years: +30 %: 15 mins: Summer	140.481	140.292	0.339	0.150	5.4	1.933	0.000	0.000	1.3	1.134	60.792	OK
Bioretention (5)	FSR with cc: 5 years: +30 %: 60 mins: Winter	139.990	139.970	0.151	0.131	2.2	2.206	0.000	0.000	1.9	2.282	72.189	OK

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		





FSR with cc: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank
By: Max. Outflow

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Bioretention	FSR with cc: 30 years: +30 %: 120 mins: Summer	140.411	139.263	1.186	0.038	35.4	52.767	0.000	0.000	10.1	65.041	47.496	Flood Risk
Bioretention (1)	FSR with cc: 30 years: +30 %: 120 mins: Summer	140.639	139.635	1.056	0.052	30.8	33.079	0.000	0.000	13.2	59.681	48.034	Flood Risk
Bioretention (2)	FSR with cc: 30 years: +30 %: 30 mins: Winter	140.914	140.329	0.744	0.159	16.2	14.906	0.000	0.000	1.3	2.319	20.489	Flood Risk
Bioretention (3)	FSR with cc: 30 years: +30 %: 15 mins: Summer	140.671	140.095	0.925	0.349	28.2	11.721	0.000	0.000	2.4	2.012	32.569	Flood Risk
Bioretention (4)	FSR with cc: 30 years: +30 %: 30 mins: Summer	140.867	140.407	0.725	0.265	5.5	3.828	0.000	0.000	1.4	2.402	22.362	Flood Risk
Bioretention (5)	FSR with cc: 30 years: +30 %: 30 mins: Summer	140.049	139.988	0.210	0.149	3.9	2.613	0.000	0.000	2.9	2.201	67.059	OK

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		





FSR with cc: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank
By: Max. Outflow

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Bioretention	FSR with cc: 100 years: +30 %: 120 mins: Summer	140.637	139.268	1.412	0.043	46.5	67.460	0.177	0.000	12.5	86.112	32.876	Flood
Bioretention (1)	FSR with cc: 100 years: +30 %: 60 mins: Summer	140.840	139.645	1.257	0.062	52.3	43.259	0.037	0.000	17.8	58.125	32.041	Flood
Bioretention (2)	FSR with cc: 100 years: +30 %: 15 mins: Summer	140.913	140.320	0.743	0.150	31.9	14.186	0.000	0.000	1.3	1.152	24.329	Flood Risk
Bioretention (3)	FSR with cc: 100 years: +30 %: 15 mins: Summer	140.689	140.130	0.943	0.384	36.4	15.197	0.000	0.000	2.2	2.061	12.568	Flood Risk
Bioretention (4)	FSR with cc: 100 years: +30 %: 60 mins: Summer	141.062	141.062	0.920	0.920	6.7	6.316	1.167	0.000	1.0	4.912	-28.080	Flood
Bioretention (5)	FSR with cc: 100 years: +30 %: 60 mins: Summer	140.449	139.989	0.610	0.150	4.8	4.139	0.000	0.000	3.1	4.548	47.825	OK

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		





FSR with cc: 10 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank
By: Max. Outflow

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Bioretention	FSR with cc: 10 years: +30 %: 120 mins: Summer	140.264	139.262	1.039	0.037	27.6	42.026	0.000	0.000	9.5	50.729	58.184	Flood Risk
Bioretention (1)	FSR with cc: 10 years: +30 %: 60 mins: Summer	140.472	139.632	0.889	0.049	31.1	27.259	0.000	0.000	11.9	33.691	57.177	Flood Risk
Bioretention (2)	FSR with cc: 10 years: +30 %: 15 mins: Summer	140.864	140.320	0.694	0.150	19.6	8.956	0.000	0.000	1.8	1.098	52.225	OK
Bioretention (3)	FSR with cc: 10 years: +30 %: 15 mins: Summer	140.422	140.096	0.676	0.350	22.4	9.238	0.000	0.000	4.2	1.965	46.855	OK
Bioretention (4)	FSR with cc: 10 years: +30 %: 15 mins: Summer	140.619	140.292	0.477	0.150	6.2	2.251	0.000	0.000	1.5	1.188	54.360	OK
Bioretention (5)	FSR with cc: 10 years: +30 %: 60 mins: Summer	139.989	139.985	0.150	0.146	2.8	2.369	0.000	0.000	2.3	2.420	70.140	OK

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		





FSR with cc: 1 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe (1)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	MH 3	MH 2	140.950	136.233	0.124	27.588	1.0	0.12	38.4	OK
Pipe (2)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	MH 4	MH 3	140.770	136.336	0.112	94.529	0.9	0.09	28.6	OK
Pipe (5)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	Simple Junction	Simple Junction (2)	141.200	136.583	0.086	37.602	0.5	0.04	10.6	OK
Pipe (7)	FSR with cc: 1 years: +30 %: 60 mins: Summer	Pipe	MH 6	Simple Junction (2)	140.770	138.604	0.061	17.147	1.2	0.05	10.5	OK
Pipe (9)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	MH 1	Simple Junction (3)	140.450	135.763	0.127	132.310	1.0	0.13	39.6	OK
Pipe (10)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	MH 16	Simple Junction (13)	142.380	136.980	0.000	0.000	0.0	0	0.0	OK
Pipe (12)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (5)	MH 16	142.380	137.170	0.000	0.000	0.0	0	0.0	OK
Pipe (11)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	MH 15	Simple Junction (14)	141.910	137.550	0.000	0.000	0.0	0	0.0	OK
Pipe (11) (1)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (14)	MH 16	142.195	137.205	0.000	0.000	0.0	0	0.0	OK
Pipe (13)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (6)	Simple Junction (14)	142.380	137.295	0.000	0.000	0.0	0	0.0	OK
Pipe (16)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	MH 13	MH 15	141.670	137.730	0.000	0.000	0.0	0	0.0	OK
Pipe (18)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	MH 12	MH 13	141.360	137.830	0.000	0.000	0.0	0	0.0	OK
Pipe (19)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (9)	MH 12	141.360	137.893	0.000	0.000	0.0	0	0.0	OK
Pipe (20)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (10)	MH 12	141.360	138.024	0.000	0.000	0.0	0	0.0	OK

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Pipe (17)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	MH 14	MH 13	141.590	139.030	0.000	0.000	0.0	0	0.0	OK
Pipe (14)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (7)	MH 15	141.900	137.642	0.000	0.000	0.0	0	0.0	OK
Pipe (15)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (8)	MH 15	141.900	137.737	0.000	0.000	0.0	0	0.0	OK
Pipe (22)	FSR with cc: 1 years: +30 %: 120 mins: Winter	Pipe	MH 8	Simple Junction	140.650	136.953	0.063	36.306	0.9	0.07	9.8	OK
Pipe (23)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (11)	MH 11	140.610	138.367	0.053	3.692	1.1	0.15	7.9	OK
Pipe (24)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	MH 10	MH 9	140.520	137.580	0.009	0.000	0.0	0	0.0	OK
Pipe (21)	FSR with cc: 1 years: +30 %: 120 mins: Winter	Pipe	MH 11	Simple Junction (15)	140.610	137.658	0.056	36.361	1.1	0.06	9.8	OK
Pipe (21) (1)	FSR with cc: 1 years: +30 %: 120 mins: Winter	Pipe	Simple Junction (15)	MH 8	140.617	137.394	0.059	36.337	1.0	0.09	9.8	OK
Pipe (25)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	MH 9	Simple Junction (15)	140.460	137.378	0.031	0.000	0.1	0.01	0.3	OK
Pipe (3) (1)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (12)	MH 6	140.738	138.814	0.055	24.963	1.4	0.21	10.5	OK
Pipe (27)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	Bioretention (1)	Simple Junction (12)	140.783	139.785	0.044	24.972	2.4	0.18	10.5	Surcharged
Pipe (6)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (2)	Simple Junction (16)	141.000	136.570	0.102	76.946	0.9	0.08	25.1	OK
Pipe (6) (1)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (16)	MH 4	140.770	136.437	0.105	87.562	0.9	0.09	26.3	OK
Pipe (8)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (4)	Simple Junction (17)	142.380	136.183	0.000	0.000	0.0	0	0.0	OK
Pipe	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	MH 2	Simple Junction (18)	141.320	135.878	0.136	129.055	0.9	0.13	38.7	OK
Pipe (29)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (18)	MH 1	140.993	135.833	0.133	132.365	0.9	0.13	39.5	OK
Pipe (26)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	Bioretention	MH 11	140.425	139.448	0.032	26.803	2.8	0.1	7.8	Surcharged

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No Delay (3)	FSR with cc: 1 years: +30 %: 60 mins: Summer	No Delay	Bioretention (3)	CP03		140.097	0.012	6.192	0.0		1.4	
No Delay	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	CP03	Simple Junction (16)	140.697	140.094	0.008	10.654	3.2	0.01	1.2	Surcharged
No Delay (1)	FSR with cc: 1 years: +30 %: 15 mins: Summer	No Delay	Bioretention (4)	CP02		140.292	0.027	0.815	0.0		1.3	
No Delay (4)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	CP02	Simple Junction (18)	140.892	140.292	0.006	3.347	3.0	0	0.8	Surcharged
No Delay (2)	FSR with cc: 1 years: +30 %: 30 mins: Winter	No Delay	Bioretention (2)	CP01		140.352	0.025	2.077	0.0		1.4	
No Delay (5)	FSR with cc: 1 years: +30 %: 120 mins: Summer	Pipe	CP01	MH 2	140.920	140.320	0.072	8.314	0.7	0.01	0.8	Surcharged
No Delay (6)	FSR with cc: 1 years: +30 %: 120 mins: Summer	No Delay	Bioretention (5)	CP04		139.989	0.008	1.425	0.0		0.9	
Pipe (4)	FSR with cc: 1 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (1)	Simple Junction (19)	141.500	136.840	0.000	0.000	0.0	0	0.0	OK
Pipe (4) (1)	FSR with cc: 1 years: +30 %: 120 mins: Winter	Pipe	Simple Junction (19)	Simple Junction	141.312	136.650	0.045	1.732	0.1	0	0.7	OK
No Delay (7)	FSR with cc: 1 years: +30 %: 120 mins: Winter	Pipe	CP04	Simple Junction (19)	140.586	139.808	0.009	1.735	1.9	0.01	0.8	Surcharged

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FSR with cc: 5 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe (1)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	MH 3	MH 2	140.950	136.275	0.170	48.058	1.1	0.22	66.6	OK
Pipe (2)	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	MH 4	MH 3	140.770	136.360	0.141	146.157	0.9	0.13	41.4	OK
Pipe (5)	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	Simple Junction	Simple Junction (2)	141.200	136.601	0.106	59.979	0.6	0.05	14.5	OK
Pipe (7)	FSR with cc: 5 years: +30 %: 60 mins: Summer	Pipe	MH 6	Simple Junction (2)	140.770	138.605	0.075	28.109	1.1	0.05	10.9	OK
Pipe (9)	FSR with cc: 5 years: +30 %: 60 mins: Summer	Pipe	MH 1	Simple Junction (3)	140.450	135.805	0.166	140.218	1.1	0.22	65.3	OK
Pipe (10)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	MH 16	Simple Junction (13)	142.380	136.980	0.000	0.000	0.0	0	0.0	OK
Pipe (12)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (5)	MH 16	142.380	137.170	0.000	0.000	0.0	0	0.0	OK
Pipe (11)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	MH 15	Simple Junction (14)	141.910	137.550	0.000	0.000	0.0	0	0.0	OK
Pipe (11) (1)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (14)	MH 16	142.195	137.205	0.000	0.000	0.0	0	0.0	OK
Pipe (13)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (6)	Simple Junction (14)	142.380	137.295	0.000	0.000	0.0	0	0.0	OK
Pipe (16)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	MH 13	MH 15	141.670	137.730	0.000	0.000	0.0	0	0.0	OK
Pipe (18)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	MH 12	MH 13	141.360	137.830	0.000	0.000	0.0	0	0.0	OK
Pipe (19)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (9)	MH 12	141.360	137.893	0.000	0.000	0.0	0	0.0	OK
Pipe (20)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (10)	MH 12	141.360	138.024	0.000	0.000	0.0	0	0.0	OK

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Pipe (17)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	MH 14	MH 13	141.590	139.030	0.000	0.000	0.0	0	0.0	OK
Pipe (14)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (7)	MH 15	141.900	137.642	0.000	0.000	0.0	0	0.0	OK
Pipe (15)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (8)	MH 15	141.900	137.737	0.000	0.000	0.0	0	0.0	OK
Pipe (22)	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	MH 8	Simple Junction	140.650	136.962	0.076	57.184	1.0	0.1	13.6	OK
Pipe (23)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (11)	MH 11	140.610	138.387	0.070	6.196	1.3	0.26	13.4	OK
Pipe (24)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	MH 10	MH 9	140.520	137.580	0.014	0.000	0.0	0	0.0	OK
Pipe (21)	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	MH 11	Simple Junction (15)	140.610	137.668	0.067	57.248	1.2	0.08	14.0	OK
Pipe (21) (1)	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (15)	MH 8	140.617	137.406	0.069	57.221	1.1	0.13	13.7	OK
Pipe (25)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	MH 9	Simple Junction (15)	140.460	137.388	0.047	0.000	0.1	0.01	0.7	OK
Pipe (3) (1)	FSR with cc: 5 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (12)	MH 6	140.738	138.815	0.056	28.124	1.4	0.22	10.9	OK
Pipe (27)	FSR with cc: 5 years: +30 %: 60 mins: Summer	Pipe	Bioretention (1)	Simple Junction (12)	140.783	139.900	0.045	28.139	2.4	0.19	10.9	Surcharged
Pipe (6)	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (2)	Simple Junction (16)	141.000	136.591	0.123	121.338	0.9	0.12	35.4	OK
Pipe (6) (1)	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (16)	MH 4	140.770	136.458	0.127	135.355	0.9	0.12	36.4	OK
Pipe (8)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (4)	Simple Junction (17)	142.380	136.183	0.000	0.000	0.0	0	0.0	OK
Pipe	FSR with cc: 5 years: +30 %: 60 mins: Summer	Pipe	MH 2	Simple Junction (18)	141.320	135.927	0.183	136.728	1.0	0.22	65.0	OK
Pipe (29)	FSR with cc: 5 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (18)	MH 1	140.993	135.877	0.177	140.358	1.1	0.22	65.6	OK
Pipe (26)	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	Bioretention	MH 11	140.425	139.539	0.033	42.520	2.8	0.1	8.3	Surcharged

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No Delay (3)	FSR with cc: 5 years: +30 %: 15 mins: Winter	No Delay	Bioretention (3)	CP03		140.104	0.021	1.890	0.0		4.5	
No Delay	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	CP03	Simple Junction (16)	140.697	140.095	0.008	14.106	3.2	0.01	1.2	Surcharged
No Delay (1)	FSR with cc: 5 years: +30 %: 15 mins: Summer	No Delay	Bioretention (4)	CP02		140.355	0.027	1.130	0.0		1.3	
No Delay (4)	FSR with cc: 5 years: +30 %: 60 mins: Winter	Pipe	CP02	Simple Junction (18)	140.892	140.292	0.006	3.750	3.0	0	0.8	Surcharged
No Delay (2)	FSR with cc: 5 years: +30 %: 15 mins: Winter	No Delay	Bioretention (2)	CP01		140.416	0.030	1.084	0.0		1.8	
No Delay (5)	FSR with cc: 5 years: +30 %: 120 mins: Summer	Pipe	CP01	MH 2	140.920	140.320	0.093	9.090	0.6	0.01	0.8	Surcharged
No Delay (6)	FSR with cc: 5 years: +30 %: 60 mins: Winter	No Delay	Bioretention (5)	CP04		139.989	0.011	2.282	0.0		1.9	
Pipe (4)	FSR with cc: 5 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (1)	Simple Junction (19)	141.500	136.840	0.008	0.000	0.0	0	0.0	OK
Pipe (4) (1)	FSR with cc: 5 years: +30 %: 60 mins: Winter	Pipe	Simple Junction (19)	Simple Junction	141.312	136.653	0.052	2.272	0.1	0	1.1	OK
No Delay (7)	FSR with cc: 5 years: +30 %: 60 mins: Winter	Pipe	CP04	Simple Junction (19)	140.586	139.968	0.010	2.278	2.1	0.01	1.1	Surcharged

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

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe (1)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	MH 3	MH 2	140.950	136.318	0.217	68.006	1.2	0.32	99.9	OK
Pipe (2)	FSR with cc: 30 years: +30 %: 60 mins: Summer	Pipe	MH 4	MH 3	140.770	136.390	0.179	150.672	1.0	0.18	59.8	OK
Pipe (5)	FSR with cc: 30 years: +30 %: 120 mins: Summer	Pipe	Simple Junction	Simple Junction (2)	141.200	136.619	0.124	91.590	0.6	0.07	19.2	OK
Pipe (7)	FSR with cc: 30 years: +30 %: 120 mins: Summer	Pipe	MH 6	Simple Junction (2)	140.770	138.608	0.086	59.664	1.2	0.06	13.2	OK
Pipe (9)	FSR with cc: 30 years: +30 %: 60 mins: Summer	Pipe	MH 1	Simple Junction (3)	140.450	135.848	0.206	205.669	1.3	0.32	97.0	OK
Pipe (10)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	MH 16	Simple Junction (13)	142.380	136.980	0.000	0.000	0.0	0	0.0	OK
Pipe (12)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (5)	MH 16	142.380	137.170	0.000	0.000	0.0	0	0.0	OK
Pipe (11)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	MH 15	Simple Junction (14)	141.910	137.550	0.000	0.000	0.0	0	0.0	OK
Pipe (11) (1)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (14)	MH 16	142.195	137.205	0.000	0.000	0.0	0	0.0	OK
Pipe (13)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (6)	Simple Junction (14)	142.380	137.295	0.000	0.000	0.0	0	0.0	OK
Pipe (16)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	MH 13	MH 15	141.670	137.730	0.000	0.000	0.0	0	0.0	OK
Pipe (18)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	MH 12	MH 13	141.360	137.830	0.000	0.000	0.0	0	0.0	OK
Pipe (19)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (9)	MH 12	141.360	137.893	0.000	0.000	0.0	0	0.0	OK
Pipe (20)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (10)	MH 12	141.360	138.024	0.000	0.000	0.0	0	0.0	OK

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Pipe (17)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	MH 14	MH 13	141.590	139.030	0.000	0.000	0.0	0	0.0	OK
Pipe (14)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (7)	MH 15	141.900	137.642	0.000	0.000	0.0	0	0.0	OK
Pipe (15)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (8)	MH 15	141.900	137.737	0.000	0.000	0.0	0	0.0	OK
Pipe (22)	FSR with cc: 30 years: +30 %: 120 mins: Summer	Pipe	MH 8	Simple Junction	140.650	136.972	0.090	87.071	1.0	0.13	18.1	OK
Pipe (23)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (11)	MH 11	140.610	138.407	0.086	9.039	1.4	0.38	19.6	OK
Pipe (24)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	MH 10	MH 9	140.520	137.580	0.022	0.000	0.0	0	0.0	OK
Pipe (21)	FSR with cc: 30 years: +30 %: 60 mins: Summer	Pipe	MH 11	Simple Junction (15)	140.610	137.678	0.078	59.674	1.3	0.1	18.6	OK
Pipe (21) (1)	FSR with cc: 30 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (15)	MH 8	140.617	137.418	0.080	87.115	1.2	0.17	18.2	OK
Pipe (25)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	MH 9	Simple Junction (15)	140.460	137.403	0.062	0.000	0.1	0.02	1.0	OK
Pipe (3) (1)	FSR with cc: 30 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (12)	MH 6	140.738	138.824	0.062	59.671	1.5	0.26	13.2	OK
Pipe (27)	FSR with cc: 30 years: +30 %: 120 mins: Summer	Pipe	Bioreten tion (1)	Simple Junction (12)	140.783	140.447	0.050	59.681	2.6	0.23	13.2	Flood Risk
Pipe (6)	FSR with cc: 30 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (2)	Simple Junction (16)	141.000	136.615	0.148	131.434	1.0	0.16	49.4	OK
Pipe (6) (1)	FSR with cc: 30 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (16)	MH 4	140.770	136.483	0.155	138.378	1.0	0.16	50.1	OK
Pipe (8)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (4)	Simple Junction (17)	142.380	136.183	0.000	0.000	0.0	0	0.0	OK
Pipe	FSR with cc: 30 years: +30 %: 60 mins: Summer	Pipe	MH 2	Simple Junction (18)	141.320	135.978	0.232	201.441	1.1	0.32	96.8	OK
Pipe (29)	FSR with cc: 30 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (18)	MH 1	140.993	135.924	0.222	205.885	1.2	0.32	97.3	OK
Pipe (26)	FSR with cc: 30 years: +30 %: 120 mins: Summer	Pipe	Bioreten tion	MH 11	140.425	140.102	0.037	65.041	3.0	0.13	10.1	Flood Risk

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Report Details: Type: Connections Summary Storm Phase: Phase		Company Address:				

No Delay (3)	FSR with cc: 30 years: +30 %: 15 mins: Summer	No Delay	Bioretention (3)	CP03		140.652	0.015	2.011	0.0		2.4	
No Delay	FSR with cc: 30 years: +30 %: 30 mins: Summer	Pipe	CP03	Simple Junction (16)	140.697	140.095	0.008	3.379	3.2	0.01	1.2	Surcharged
No Delay (1)	FSR with cc: 30 years: +30 %: 30 mins: Summer	No Delay	Bioretention (4)	CP02		140.850	0.024	2.399	0.0		1.4	
No Delay (4)	FSR with cc: 30 years: +30 %: 120 mins: Summer	Pipe	CP02	Simple Junction (18)	140.892	140.292	0.006	7.751	3.0	0	0.8	Surcharged
No Delay (2)	FSR with cc: 30 years: +30 %: 15 mins: Winter	No Delay	Bioretention (2)	CP01		140.877	0.026	1.132	0.0		1.3	
No Delay (5)	FSR with cc: 30 years: +30 %: 15 mins: Winter	Pipe	CP01	MH 2	140.920	140.320	0.113	0.920	0.1	0.01	0.8	Surcharged
No Delay (6)	FSR with cc: 30 years: +30 %: 30 mins: Summer	No Delay	Bioretention (5)	CP04		140.009	0.014	2.201	0.0		2.9	
Pipe (4)	FSR with cc: 30 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (1)	Simple Junction (19)	141.500	136.840	0.010	0.000	0.0	0	0.0	OK
Pipe (4) (1)	FSR with cc: 30 years: +30 %: 30 mins: Summer	Pipe	Simple Junction (19)	Simple Junction	141.312	136.654	0.062	2.148	0.1	0	1.1	OK
No Delay (7)	FSR with cc: 30 years: +30 %: 60 mins: Summer	Pipe	CP04	Simple Junction (19)	140.586	139.988	0.010	3.271	2.1	0.01	1.1	Surcharged

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		





FSR with cc: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe (1)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	MH 3	MH 2	140.950	136.353	0.256	87.339	1.3	0.42	130.5	OK
Pipe (2)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	MH 4	MH 3	140.770	136.419	0.210	194.063	1.0	0.24	78.3	OK
Pipe (5)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	Simple Junction	Simple Junction (2)	141.200	136.648	0.153	79.160	0.6	0.09	25.0	OK
Pipe (7)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	MH 6	Simple Junction (2)	140.770	138.614	0.103	58.079	1.3	0.08	17.8	OK
Pipe (9)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	MH 1	Simple Junction (3)	140.450	135.885	0.240	263.605	1.4	0.42	127.3	OK
Pipe (10)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	MH 16	Simple Junction (13)	142.380	136.980	0.000	0.000	0.0	0	0.0	OK
Pipe (12)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (5)	MH 16	142.380	137.170	0.000	0.000	0.0	0	0.0	OK
Pipe (11)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	MH 15	Simple Junction (14)	141.910	137.550	0.000	0.000	0.0	0	0.0	OK
Pipe (11) (1)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (14)	MH 16	142.195	137.205	0.000	0.000	0.0	0	0.0	OK
Pipe (13)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (6)	Simple Junction (14)	142.380	137.295	0.000	0.000	0.0	0	0.0	OK
Pipe (16)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	MH 13	MH 15	141.670	137.730	0.000	0.000	0.0	0	0.0	OK
Pipe (18)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	MH 12	MH 13	141.360	137.830	0.000	0.000	0.0	0	0.0	OK
Pipe (19)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (9)	MH 12	141.360	137.893	0.000	0.000	0.0	0	0.0	OK
Pipe (20)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (10)	MH 12	141.360	138.024	0.000	0.000	0.0	0	0.0	OK

Project:		Date: 02-01-2025		
		Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase		Company Address:		



Pipe (17)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	MH 14	MH 13	141.590	139.030	0.000	0.000	0.0	0	0.0	OK
Pipe (14)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (7)	MH 15	141.900	137.642	0.000	0.000	0.0	0	0.0	OK
Pipe (15)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (8)	MH 15	141.900	137.737	0.000	0.000	0.0	0	0.0	OK
Pipe (22)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	MH 8	Simple Junction	140.650	136.984	0.111	74.956	1.0	0.17	24.2	OK
Pipe (23)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (11)	MH 11	140.610	138.423	0.100	11.662	1.5	0.49	25.4	OK
Pipe (24)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	MH 10	MH 9	140.520	137.580	0.029	0.000	0.0	0	0.0	OK
Pipe (21)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	MH 11	Simple Junction (15)	140.610	137.690	0.091	75.761	1.4	0.14	25.0	OK
Pipe (21) (1)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (15)	MH 8	140.617	137.433	0.093	75.285	1.3	0.23	24.4	OK
Pipe (25)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	MH 9	Simple Junction (15)	140.460	137.418	0.076	0.000	0.1	0.03	1.3	OK
Pipe (3) (1)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (12)	MH 6	140.738	138.838	0.072	58.101	1.6	0.36	17.8	OK
Pipe (27)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	Bioreten tion (1)	Simple Junction (12)	140.783	140.536	0.059	58.125	2.7	0.3	17.8	Flood
Pipe (6)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (2)	Simple Junction (16)	141.000	136.639	0.172	170.884	1.1	0.21	64.6	OK
Pipe (6) (1)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (16)	MH 4	140.770	136.509	0.183	177.915	1.0	0.22	65.4	OK
Pipe (8)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (4)	Simple Junction (17)	142.380	136.183	0.000	0.000	0.0	0	0.0	OK
Pipe	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	MH 2	Simple Junction (18)	141.320	136.023	0.275	259.371	1.1	0.42	127.1	OK
Pipe (29)	FSR with cc: 100 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (18)	MH 1	140.993	135.966	0.261	263.882	1.2	0.42	127.6	OK
Pipe (26)	FSR with cc: 100 years: +30 %: 120 mins: Summer	Pipe	Bioreten tion	MH 11	140.425	140.217	0.041	86.112	3.2	0.16	12.5	Flood

Project:		Date: 02-01-2025				
		Designed by:	Checked by:	Approved By:		
		singhb1974				
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No Delay (3)	FSR with cc: 100 years: +30 %: 15 mins: Summer	No Delay	Bioretention (3)	CP03		140.665	0.015	2.060	0.0		2.2	
No Delay	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	CP03	Simple Junction (16)	140.697	140.095	0.008	1.548	3.2	0.01	1.2	Surcharged
No Delay (1)	FSR with cc: 100 years: +30 %: 60 mins: Summer	No Delay	Bioretention (4)	CP02		141.062	0.021	4.909	0.0		1.0	
No Delay (4)	FSR with cc: 100 years: +30 %: 120 mins: Winter	Pipe	CP02	Simple Junction (18)	140.892	140.292	0.006	9.593	3.0	0	0.8	Surcharged
No Delay (2)	FSR with cc: 100 years: +30 %: 15 mins: Summer	No Delay	Bioretention (2)	CP01		140.889	0.026	1.152	0.0		1.3	
No Delay (5)	FSR with cc: 100 years: +30 %: 30 mins: Summer	Pipe	CP01	MH 2	140.920	140.320	0.144	2.146	0.1	0.01	0.8	Surcharged
No Delay (6)	FSR with cc: 100 years: +30 %: 60 mins: Summer	No Delay	Bioretention (5)	CP04		140.152	0.015	4.548	0.0		3.1	
Pipe (4)	FSR with cc: 100 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (1)	Simple Junction (19)	141.500	136.840	0.011	0.000	0.0	0	0.0	OK
Pipe (4) (1)	FSR with cc: 100 years: +30 %: 15 mins: Winter	Pipe	Simple Junction (19)	Simple Junction	141.312	136.654	0.060	1.160	0.1	0	1.1	OK
No Delay (7)	FSR with cc: 100 years: +30 %: 30 mins: Summer	Pipe	CP04	Simple Junction (19)	140.586	139.988	0.010	2.731	2.1	0.01	1.1	Surcharged

Project:	Date: 02-01-2025		
	Designed by: singhb1974	Checked by:	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		





FSR with cc: 10 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe (1)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	MH 3	MH 2	140.950	136.291	0.187	54.702	1.2	0.25	77.8	OK
Pipe (2)	FSR with cc: 10 years: +30 %: 60 mins: Summer	Pipe	MH 4	MH 3	140.770	136.369	0.155	119.617	0.9	0.14	46.9	OK
Pipe (5)	FSR with cc: 10 years: +30 %: 120 mins: Summer	Pipe	Simple Junction	Simple Junction (2)	141.200	136.608	0.113	71.346	0.6	0.06	16.3	OK
Pipe (7)	FSR with cc: 10 years: +30 %: 60 mins: Summer	Pipe	MH 6	Simple Junction (2)	140.770	138.606	0.080	33.658	1.2	0.06	11.9	OK
Pipe (9)	FSR with cc: 10 years: +30 %: 60 mins: Summer	Pipe	MH 1	Simple Junction (3)	140.450	135.820	0.180	164.054	1.2	0.25	76.1	OK
Pipe (10)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	MH 16	Simple Junction (13)	142.380	136.980	0.000	0.000	0.0	0	0.0	OK
Pipe (12)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (5)	MH 16	142.380	137.170	0.000	0.000	0.0	0	0.0	OK
Pipe (11)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	MH 15	Simple Junction (14)	141.910	137.550	0.000	0.000	0.0	0	0.0	OK
Pipe (11) (1)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (14)	MH 16	142.195	137.205	0.000	0.000	0.0	0	0.0	OK
Pipe (13)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (6)	Simple Junction (14)	142.380	137.295	0.000	0.000	0.0	0	0.0	OK
Pipe (16)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	MH 13	MH 15	141.670	137.730	0.000	0.000	0.0	0	0.0	OK
Pipe (18)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	MH 12	MH 13	141.360	137.830	0.000	0.000	0.0	0	0.0	OK
Pipe (19)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (9)	MH 12	141.360	137.893	0.000	0.000	0.0	0	0.0	OK
Pipe (20)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (10)	MH 12	141.360	138.024	0.000	0.000	0.0	0	0.0	OK

Project:				Date: 02-01-2025					
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Pipe (17)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	MH 14	MH 13	141.590	139.030	0.000	0.000	0.0	0	0.0	OK
Pipe (14)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (7)	MH 15	141.900	137.642	0.000	0.000	0.0	0	0.0	OK
Pipe (15)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (8)	MH 15	141.900	137.737	0.000	0.000	0.0	0	0.0	OK
Pipe (22)	FSR with cc: 10 years: +30 %: 120 mins: Summer	Pipe	MH 8	Simple Junction	140.650	136.966	0.082	67.877	1.0	0.11	15.4	OK
Pipe (23)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (11)	MH 11	140.610	138.394	0.075	7.174	1.3	0.3	15.5	OK
Pipe (24)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	MH 10	MH 9	140.520	137.580	0.016	0.000	0.0	0	0.0	OK
Pipe (21)	FSR with cc: 10 years: +30 %: 120 mins: Summer	Pipe	MH 11	Simple Junction (15)	140.610	137.671	0.071	67.945	1.2	0.09	15.5	OK
Pipe (21) (1)	FSR with cc: 10 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (15)	MH 8	140.617	137.410	0.074	67.916	1.1	0.15	15.4	OK
Pipe (25)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	MH 9	Simple Junction (15)	140.460	137.393	0.052	0.000	0.1	0.02	0.8	OK
Pipe (3) (1)	FSR with cc: 10 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (12)	MH 6	140.738	138.819	0.059	33.675	1.4	0.24	11.9	OK
Pipe (27)	FSR with cc: 10 years: +30 %: 60 mins: Summer	Pipe	Bioreten tion (1)	Simple Junction (12)	140.783	140.405	0.047	33.691	2.5	0.2	11.9	Flood Risk
Pipe (6)	FSR with cc: 10 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (2)	Simple Junction (16)	141.000	136.598	0.130	143.712	1.0	0.13	39.3	OK
Pipe (6) (1)	FSR with cc: 10 years: +30 %: 120 mins: Summer	Pipe	Simple Junction (16)	MH 4	140.770	136.466	0.135	158.201	0.9	0.13	40.4	OK
Pipe (8)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (4)	Simple Junction (17)	142.380	136.183	0.000	0.000	0.0	0	0.0	OK
Pipe	FSR with cc: 10 years: +30 %: 60 mins: Summer	Pipe	MH 2	Simple Junction (18)	141.320	135.944	0.200	160.136	1.0	0.25	75.8	OK
Pipe (29)	FSR with cc: 10 years: +30 %: 60 mins: Summer	Pipe	Simple Junction (18)	MH 1	140.993	135.894	0.192	164.214	1.1	0.25	76.3	OK
Pipe (26)	FSR with cc: 10 years: +30 %: 120 mins: Summer	Pipe	Bioreten tion	MH 11	140.425	140.073	0.036	50.729	2.9	0.12	9.5	Flood Risk

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		singhb1974				
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No Delay (3)	FSR with cc: 10 years: +30 %: 15 mins: Summer	No Delay	Bioretention (3)	CP03		140.178	0.020	1.964	0.0		4.3	
No Delay	FSR with cc: 10 years: +30 %: 60 mins: Summer	Pipe	CP03	Simple Junction (16)	140.697	140.095	0.008	7.000	3.2	0.01	1.2	Surcharged
No Delay (1)	FSR with cc: 10 years: +30 %: 15 mins: Summer	No Delay	Bioretention (4)	CP02		140.401	0.028	1.185	0.0		1.5	
No Delay (4)	FSR with cc: 10 years: +30 %: 60 mins: Winter	Pipe	CP02	Simple Junction (18)	140.892	140.292	0.006	4.195	3.0	0	0.8	Surcharged
No Delay (2)	FSR with cc: 10 years: +30 %: 15 mins: Summer	No Delay	Bioretention (2)	CP01		140.459	0.030	1.097	0.0		1.8	
No Delay (5)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	CP01	MH 2	140.920	140.320	0.099	0.885	0.2	0.01	0.8	Surcharged
No Delay (6)	FSR with cc: 10 years: +30 %: 60 mins: Summer	No Delay	Bioretention (5)	CP04		139.989	0.013	2.420	0.0		2.3	
Pipe (4)	FSR with cc: 10 years: +30 %: 15 mins: Summer	Pipe	Simple Junction (1)	Simple Junction (19)	141.500	136.840	0.009	0.000	0.0	0	0.0	OK
Pipe (4) (1)	FSR with cc: 10 years: +30 %: 120 mins: Winter	Pipe	Simple Junction (19)	Simple Junction	141.312	136.654	0.055	4.060	0.1	0	1.1	OK
No Delay (7)	FSR with cc: 10 years: +30 %: 120 mins: Summer	Pipe	CP04	Simple Junction (19)	140.586	139.988	0.010	3.503	2.1	0.01	1.1	Surcharged