MHL & ASSOCIATES LTD.

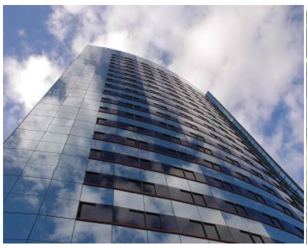
For: **Longview Estates Limited**

Proposed Residential Development,
N7 Longview, Ballyvolane, Cork.

Drainage Impact Assessment
SUDS Statement

June 2026

MHL & Associates Ltd.
Consulting Engineers

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1 INTRODUCTION

This Drainage Impact Assessment (DIA) has been carried out by MHL & Associates Ltd. on behalf of Longview Estates Limited for a proposed Large Scale Residential Development (LRD) for zoned lands in Longview N7, Ballyvolane, Cork.

This DIA has been prepared in compliance with the Cork City Development Plan 2022 which states that efforts should be made to limit the extent of hard surfacing at new developments.

1.1 Site Location

Located to the north-east of Cork City, the site is situated approximately 3km north-east of Cork City Centre. Access to the site is granted via the constructed Longview Estates main distributor road with connect the lands to Ballyhooly Road. The site is bounded to the north and east by the Longview Estates neighbourhoods 2 & 5, respectfully. Both neighbourhoods are presently under construction. The site is bounded to the west by a proposed public open space for the Longview Estates development and to the south by agricultural lands zoned as new residential neighbourhoods in the most recent Cork City Development Plan.

Figure 1.1: Subject's Site Location

Figure 1.2: Site Location & Surrounding Area

1.2 Site Description

The proposed development will consist of a largescale residential development (LRD) of 262no. residential dwellings comprising the following: 54no. apartments arranged in 2no. apartment blocks; 14no. duplex dwellings and 194no. houses. The proposed development also includes a crèche.

The proposed development will include provision for car parking, including EV charging points, bicycle parking, the provision for private, communal, and public open spaces; internal roads and pathways with potential for future links to adjacent lands; pedestrian and cyclist routes; hard and soft landscaping and boundary treatments; waste storage; plant; signage; public lighting, ESB substations, all associated site development works; and all drainage and foul sewer infrastructure and network works, including nature-based SUDS measures.

Access to the development will be via the Longview Estates main distributor road with links the scheme lands to Ballyhooly Rd. to the west.

Figure 1.3: Development Site Layout (c: Wilson Architecture)

Figure 1.3 above shows the layout of the proposed development with access provided via the Longview Estates main distributor road.

1.3 Existing Site Hydrology

Local hydrology is intrinsically connected to the hydrogeological setting within the greater development area. According to the EPA on-line mapping, the proposed development site lies within the BRIDE (Cork City)_020 River Sub Basin which has an area of 16.74km^2. The sub catchment for the site is the Kiln_SC_010 19_1 sub catchment and can be seen in yellow in **Figure 1.4** below.

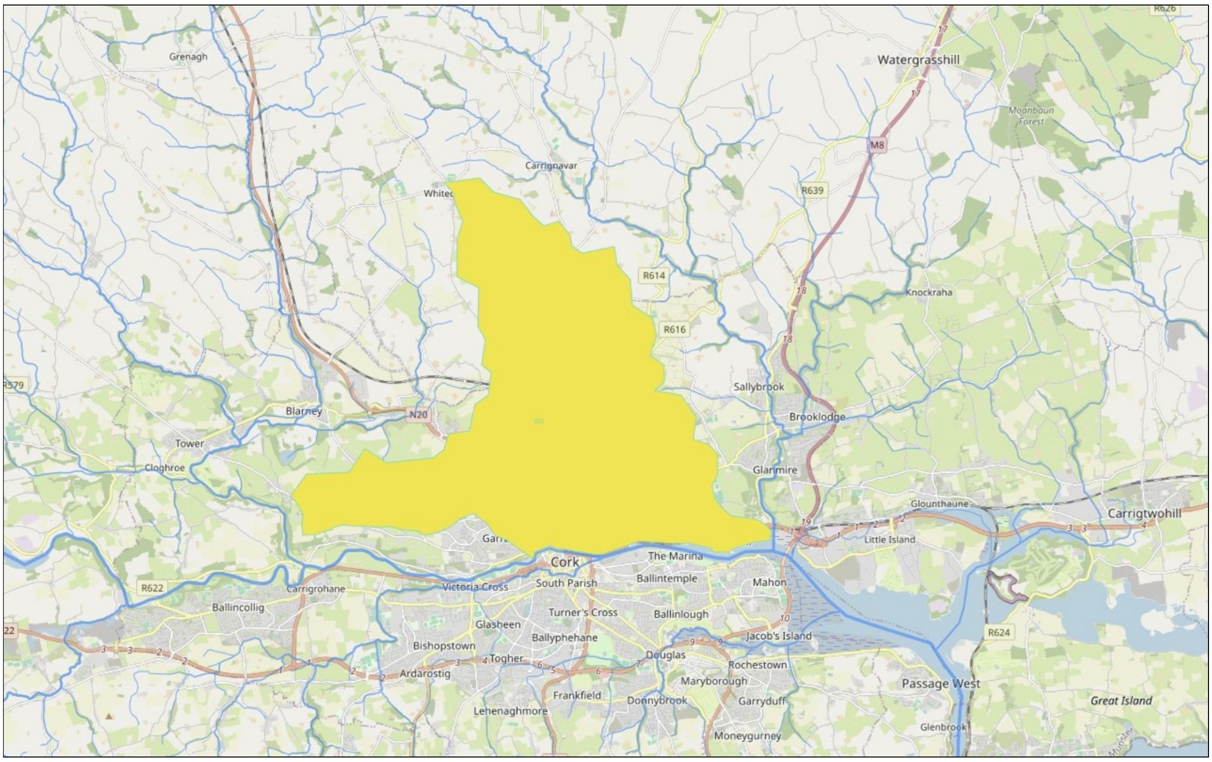


Figure 1.4: Sub Catchment Area (c: EPA mapping)

An existing watercourse runs north to south on the western side of Ballyhooly Road which serves as an outfall for surface water falling on the public road and housing to the north (incl. Longview Estates via outfall as shown in Figure 1.6). This watercourse is culverted over a portion of its length from the Kilbarry Link Road south to Kempton Park where it is designated by the EPA as Bride (Cork City)_020, links with the Glen River and ultimately is culverted under the N20 Blackpool Bypass out-falling to the River Lee on Camden Quay. **Figure 1.5** depicts the location of the site in relation to the surrounding watercourses.

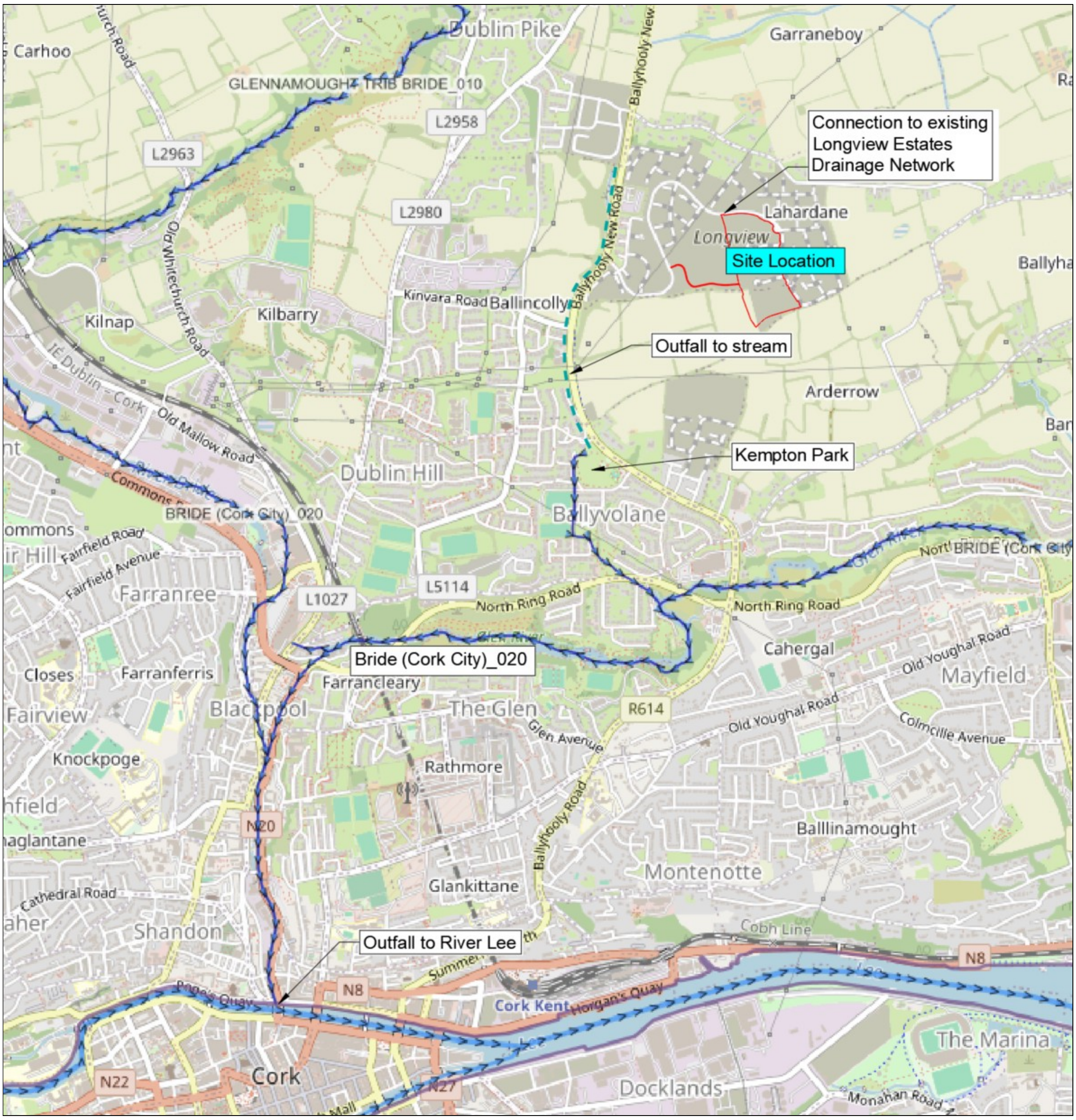


Figure 1.5: Local Watercourses

1.4 Existing Longview Estates Drainage Network

Presently under construction, the existing Longview Estates residential development consisting of 6 neighbourhoods was granted planning permission in 2020 and is located to the north, east and west of the proposed scheme. Access is provided to each of the six neighbourhoods via a main distributor road which starts at a junction with Ballyhooly Rd. before running in a general eastward direction. The infrastructure constructed as part of the main distributor road includes drainage runs and attenuation tanks sized to cater for some or all the surface water from neighbourhoods 1, 2, 3, 4, and 6 as required. The Longview Estates drainage network exits the site via the main Ballyhooly Rd. junction before heading south and ultimately discharging into the stream located on the western side of Ballyhooly Rd (refer to **Figure 1.7**). In accordance with the granted permission, the existing drainage network is sized with flow rates less than QBar and attenuation tanks designed for 100-year storm events and 20% climate change.

The allowed flow rates and sizing for each of the attenuation tanks constructed as part of the main distributor infrastructure is shown in **Figure 1.6** below. The attenuation tanks are daisy-chained in nature with flow rates controlled via installed hydro-brake flow control devices at the outflow of each tank.

Main Distributor Attenuation Tanks		
Tank ID	Volume (m^3)	Design Flow Rate (l/s)
AT-D	1305	20.1
AT-C	1040	41.0
AT-A	575	76.3

Figure 1.6: Main Distributor Attenuation Tank sizing in constructed network

Prior to discharging into the stream, the outflow from AT-A (76.3 l/s) will be joined by additional flows from neighbourhoods 4 & 6 when they are constructed (refer to **Figure 1.7**). Design flow rates from neighbourhood 4 and neighbourhood 6 amount to 10.8 l/s and 5.0 l/s, respectively. This calculates at a total design flow rate of 92.1 l/s from the existing Longview Estates network. QBAR for the site was calculated at 138.5 l/s.

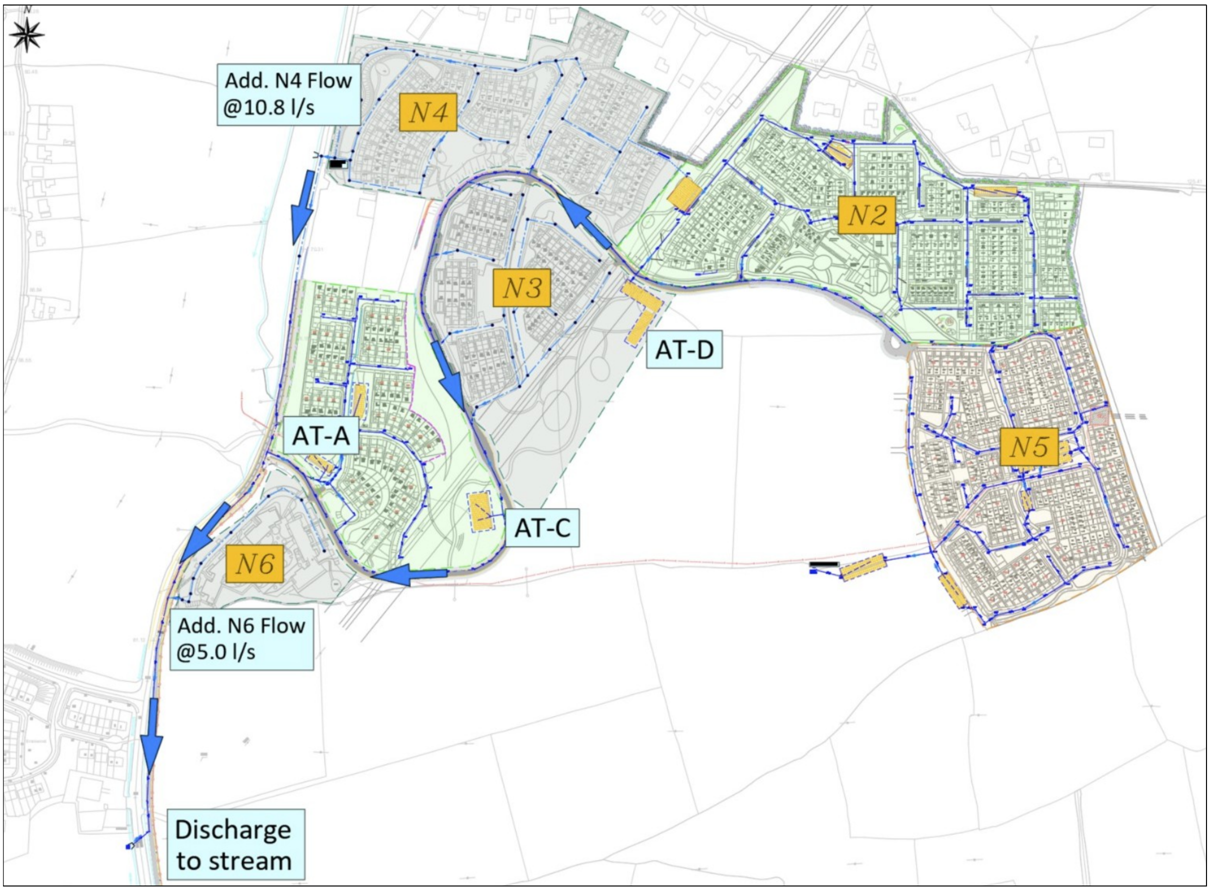


Figure 1.7: Longview Estates drainage network and location of stream outfall

2 PROPOSED DEVELOPMENT SURFACE WATER MANAGEMENT SYSTEM

The proposed surface water management system is designed, as much as is feasible, in accordance with the principles of Sustainable Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS).

The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimise the impact of urbanisation by replicating the runoff characteristics of a greenfield site. The criteria provide a consistent approach to addressing both rate and volume of runoff as well as ensuring the environment is protected from pollution that is washed off roads and buildings.

These drainage design criteria are as follows:
- Criterion 1 - River Water Quality Protection
- Criterion 2 - River Regime Protection
- Criterion 3 - Flood Risk Assessment
- Criterion 4 - River Flood Protection

2.1 Principle Design Considerations

During the design of the storm water drainage for the proposed site, including SuDS, the following key documents / standards were taken into consideration.
- Cork City Development Plan 2022-2028
- Greater Dublin Strategic Drainage Study (GDSDS)
- CIRIA report C753 The Suds Manual-v6
- Greater Dublin Regional Code of Practice for Drainage (GDRCoP)

2.2 Storm Water Drainage System Overview

2.2.1 Predevelopment Conditions

For this development, the permissible outflow is calculated using the estimation method contained in the Institute of Hydrology Report No.124: Flood estimation for small catchments:

$$QBAR = 0.00108 \times (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$$

- QBAR is the Mean Annual Peak Flow (Permissible outflow in m3/sec)
- AREA is the Catchment site area in km2.
- SAAR is the Standard Annual Average Rainfall
- SOIL is the soil index.

Given that the development is smaller than 50 hectares, the analysis for determining the permissible outflow employs 50 hectares in the formula. It then linearly interpolates the flow rate values based on the ratio of the development size to 50 hectares. Design summary sheets for the Qbar value can be found in the appendix of this report, outlining the Mean Annual Flow (permissible outflow) specifically calculated for the designated development area. The allowable runoff estimates method utilizes IH124 and the Standard Percentage Runoff (SPR) coefficient taken from UK SuDS as 0.37.

2.2.2 Greenfield Runoff

The area of the greenfield site is approximately 7.62 hectares with the estimated greenfield runoff rate (Qbar) calculated for the development as per **Figure 2.1**. This was calculated for this planning application using the HR Wallingford Greenfield runoff estimation online tool. Details of this calculation are attached in **Appendix B** of this report. A summary of the design values output by the HR Wallingford Greenfield runoff estimation online tool is also shown in **Figure 2.2**.

GREENFIELD RUNOFF			
	Area (ha)	QBar (l/s)	1in1yr (l/s)
Site	7.62	38.8	33.0
Per ha	1	5.1	4.3

Figure 2.1: Greenfield Runoff for Site

Soil Type	3
SPR	0.37
SAAR	1141
Hydrological Region	13

Figure 2.2: Summary of design values for Greenfield Runoff Estimation

The M5-60 is the rainfall depth (specified in mm) for a 60-minute storm with a 5-year return period. The rainfall depth for this site was obtained from Met Eireann. **Figure 2.3** below shows the M5-60 value of 18.5mm from the Rainfall Return Period Table obtained from Met Eireann. This can also be found in **Appendix C** of this report

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 169343, Northing: 75103,

DURATION	Interval 6months,	1year,	Years 2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	3.3,	4.4,	5.0,	5.8,	6.4,	6.8,	8.1,	9.6,	10.5,	11.9,	13.0,	13.9,	15.2,	16.2,	17.0,	N/A ,
10 mins	4.6,	6.2,	6.9,	8.1,	8.9,	9.5,	11.3,	13.4,	14.7,	16.5,	18.1,	19.3,	21.2,	22.6,	23.7,	N/A ,
15 mins	5.4,	7.2,	8.2,	9.5,	10.4,	11.1,	13.3,	15.7,	17.3,	19.4,	21.3,	22.7,	24.9,	26.5,	27.9,	N/A ,
30 mins	7.2,	9.5,	10.7,	12.4,	13.5,	14.3,	17.1,	20.0,	21.9,	24.5,	26.8,	28.5,	31.1,	33.1,	34.7,	N/A ,
1 hours	9.5,	12.4,	13.9,	16.0,	17.4,	18.5,	21.9,	25.5,	27.8,	31.0,	33.7,	35.8,	38.9,	41.3,	43.2,	N/A ,
2 hours	12.7,	16.3,	18.2,	20.8,	22.6,	23.9,	28.0,	32.4,	35.3,	39.1,	42.4,	44.9,	48.7,	51.5,	53.9,	N/A ,
3 hours	14.9,	19.1,	21.2,	24.3,	26.2,	27.7,	32.4,	37.4,	40.5,	44.8,	48.5,	51.3,	55.5,	58.7,	61.2,	N/A ,
4 hours	16.8,	21.4,	23.7,	27.0,	29.2,	30.8,	35.9,	41.3,	44.7,	49.4,	53.4,	56.4,	60.9,	64.3,	67.1,	N/A ,
6 hours	19.8,	25.1,	27.7,	31.5,	33.9,	35.7,	41.5,	47.6,	51.4,	56.6,	61.1,	64.4,	69.4,	73.2,	76.3,	N/A ,
9 hours	23.4,	29.4,	32.4,	36.7,	39.4,	41.5,	48.0,	54.8,	59.1,	64.9,	69.9,	73.6,	79.2,	83.4,	86.8,	N/A ,
12 hours	26.3,	32.9,	36.2,	40.9,	43.9,	46.1,	53.2,	60.6,	65.3,	71.5,	76.9,	80.9,	86.9,	91.4,	95.1,	N/A ,
18 hours	31.0,	38.6,	42.3,	47.6,	51.0,	53.6,	61.5,	69.8,	75.0,	82.0,	88.0,	92.4,	99.1,	104.1,	108.1,	N/A ,
24 hours	34.9,	43.2,	47.3,	53.1,	56.8,	59.6,	68.2,	77.2,	82.8,	90.4,	96.8,	101.6,	108.8,	114.1,	118.5,	133.0,
2 days	44.0,	53.7,	58.4,	65.1,	69.3,	72.5,	82.2,	92.3,	98.6,	107.0,	114.1,	119.3,	127.2,	133.0,	137.7,	153.4,
3 days	51.5,	62.4,	67.6,	75.0,	79.7,	83.2,	93.8,	104.9,	111.7,	120.8,	128.4,	134.1,	142.5,	148.8,	153.8,	170.6,
4 days	58.2,	70.1,	75.8,	83.8,	88.8,	92.6,	104.1,	115.9,	123.2,	132.9,	141.1,	147.1,	156.1,	162.7,	168.1,	185.8,
6 days	70.1,	83.7,	90.3,	99.3,	105.0,	109.3,	122.2,	135.5,	143.6,	154.4,	163.4,	170.1,	180.0,	187.3,	193.2,	212.6,
8 days	80.9,	96.0,	103.2,	113.2,	119.5,	124.2,	138.3,	152.8,	161.7,	173.4,	183.2,	190.4,	201.1,	209.0,	215.3,	236.2,
10 days	90.8,	107.3,	115.2,	126.0,	132.8,	137.9,	153.2,	168.8,	178.3,	190.8,	201.3,	209.1,	220.5,	228.9,	235.6,	257.9,
12 days	100.2,	118.0,	126.5,	138.1,	145.4,	150.8,	167.1,	183.7,	193.8,	207.2,	218.3,	226.5,	238.5,	247.5,	254.6,	278.1,
16 days	117.9,	138.1,	147.6,	160.6,	168.8,	174.8,	193.0,	211.5,	222.7,	237.4,	249.7,	258.7,	272.0,	281.8,	289.6,	315.3,
20 days	134.6,	156.8,	167.3,	181.6,	190.6,	197.2,	217.1,	237.2,	249.4,	265.4,	278.7,	288.5,	302.9,	313.5,	321.9,	349.6,
25 days	154.3,	179.0,	190.6,	206.4,	216.2,	223.5,	245.4,	267.4,	280.8,	298.3,	312.7,	323.4,	339.0,	350.5,	359.6,	389.6,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

Figure 2.3: Met Eireann Rainfall Return Period for site lands

2.2.3 Post Development Conditions

The stormwater management plan for this development incorporates a range of measures, including both soft and hard solutions. While soft drainage measures are incorporated where applicable, the underlying drainage design is hard in nature as ground conditions such as shallow rock and clayey soil deposits are not suitable for including only infiltration measures within the scheme.

The traditional method of disposing of surface water runoff from impermeable surfaces such as roofs, roads and carparks is collection and redirection to drainage systems. This can result in localised flooding, higher waste treatment costs and the transfer of contaminants (such as oil from carparks) directly to water courses, resulting in pollution and affecting a river's ability to recharge naturally. Sustainable Urban Drainage Systems (SuDS) offer a more integrated approach to rainwater management. It involves a method of replicating the natural characteristics of rainfall runoff from any site, ensuring water is infiltrated or conveyed more slowly to the drainage system and ultimately to water courses via permeable paving, swales, green roofs, rainwater harvesting, detention basins, ponds, wetlands and attenuation tanks. SuDS comprise a series of water management measures designed to reduce and manage surface water in an environmentally sustainable way. When implemented correctly, SuDS not only help reduce the risk of localised flooding but also help to alleviate downstream flood risk. There are multiple SuDS measures that can be utilised depending on site-specific circumstances however, SuDS strategies will not be uniform and will differ from site to site owing to site characteristics, location and existing constraints. Chapters 5 & 9 of the Cork City Development Plan 2022-2028 include information and guidance on the use of SuDS for new developments.

The proposed development will include a number of SuDS measures where possible, including swales, green roofs, and tree-pits. These measures will be backed by a series of concrete attenuation tanks providing a hard drainage solution for the development. Together, these elements provide conveyance, interception storage, and attenuation storage for rainwater runoff.

All surface water runoff from the paved development will be directed away from the site. The attenuation tanks are specifically designed to handle a 100-year storm event with 20% climate change. Moreover, the maximum discharge from the attenuation tanks will be restricted to less than the calculated permissible runoff (Qbar) for the site.

Collection

Surface water collected on the building roofs will discharge via down pipes and underground pipes to either private soak pits located within the back gardens or in to the public stormwater network which will discharge to attenuation tanks.

Surface water runoff from paved surfaces will be collected by swales/tree pits or by drainage channels where it will be directed via road gullies to underground pipes/ attenuation tanks before discharging off site.

The surface water drainage system for the proposed development will be separate to the foul water system.

Treatment

Where possible, surface water will be drained by gravity directly to SuDs measures such as swales and tree pits located in public areas. These SuDs measures will be suitably sized using infiltration results. The remainder of runoff from roofs as well as the paved areas, roads etc will discharge to attenuation systems via a bypass interceptor or similar approved.

Discharge

Runoff from the swales/tree pits will discharge directly into the ground during normal weather conditions with these measures incorporating a piped outflow connection to the attenuated drainage network where necessary for storm events. Runoff from the private soak pits will discharge directly into the ground. It is proposed to discharge the attenuated surface water flow by gravity to the constructed storm sewer network located in the Distributor Road (total outfall rate of 26 l/s). This outflow will then continue downstream to the existing attenuation tank (AT-D) located to the west of the site which was constructed as part of the Distributor Rd works. The discharge rate from AT-D will be increased from 20.1 l/s to 24.5 l/s to cater for the discharge from the proposed site. Further attenuation tanks located downstream of tank AT-D catering for the granted Longview Estates scheme and the AT-D outflow will not require any alterations to their design flow. Modelling analysis of the existing Longview Estates surface water network has been undertaken to ensure the network has sufficient capacity to cater for the additional flow.

Pipe Design

Pipes carrying surface water within the site are suitably sized to cater for a rainfall intensity of 50mm per hour applied to all external impermeable areas and roofs. Surface water runoff from impermeable areas is calculated using the Modified Rational Method.

Design Details

It is proposed to attenuate to 3no. tanks, providing sufficient capacity (m^3) which is greater than the storage requirement for the 100-year return period plus 20% climate change. Regarding limiting outflow from the storm network, hydro-brake (or similar approved) flow control devices are to be fitted at the outlet of each attenuation tank.

The GDSDS recommends that the design of the drainage network be assessed using events with a range of different durations to determine the critical event for each period analysed as follows:

- 1 in 30-year return period events were used to ensure no flooding occurs within the site.
- 1 in 100-year return period events were used to ensure that attenuation tanks were sufficiently sized with no flooding occurring. Areas were risk of localised overland flooding present to be managed within the development.

It should be noted that climate change has been accounted in the design. The GDSDS recommend a factor of 20% which has been incorporated into the design.

The layout of the proposed storm water network is shown in the Proposed Stormwater Sewer layout plans.

As per section 16 of the GDRCoP and in particular the criteria as set out in section 16.3, compliance with all 4 Criteria is summarised as follows:

Criterion 1 (River Water Quality Protection):

Interception provided by way of:

- Surface water runoff to conveyancing swales which will have partial infiltration.
- Surface water runoff to attenuation tanks which will be equipped with silt chambers and hydrocarbon interceptors.

Criterion 2 (Stream Regime Protection):

Discharge rate restricted to QBAR for all storm events up to and including the 1 in 100-year storm event.

Criterion 3 (Level of service (flooding) for the site) :

A review of the Office of Public Works (OPW) Flood Maps website indicates that there are no records of flooding incidents at the site of the proposed development.

Two past flood events, one from January 1988 and one from June 2012, are reported to have occurred south of the site along Ballyhooly road and the Kempton Park area respectively. The report on the 1988 flood indicates that a partial blockage on the Glen Stream north of Mervue Lawn was the cause. The report on the 2012 flood event notes that pluvial flooding occurred in the Kempton Park, Meelick Park, and Park Court housing estates with residents noting that the culvert under the R614 Regional Road and the number of drains within the housing estates were blocked by flood debris.

- No Site Flooding.
- No internal property flooding.
- All FFLs are a minimum of 500mm above adjacent on-site attenuation/infiltration tanks.
- Run-off from green areas during high intensity storm events can be catered for in on-site attenuation tanks.

Criterion 4 (River Flood Protection):

Maximum discharge rate of QBAR for all attenuated storage is proposed which is considerably less than the 30-year and 100-year greenfield run-off rates. No reduction in terms of run-off has been allowed for in the sizing of attenuation tanks because of proposed Suds measures.

For the operational phase of the scheme the provision of Suds interception measures will ensure that the first 5mm of rainfall is prevented from discharging from the site. It is often the case that the initial run-off from roads and hard pavement areas has a concentration of pollutants. This first-flush is being addressed on site thus ensuring the quality of the receiving waters is not impacted.

The storm water management proposals for the site have been informed by the relevant standards and comply with best practice in terms of Suds (Sustainable Urban Drainage Design). By providing the measures as outlined, the impact of the proposed development on the Hydrological area has been minimised and results in a reduction in the existing greenfield runoff rate for the site.

3 LAYOUT OF STORM NETWORK

The proposed surface water network has been split into 3 sub catchment areas as depicted in Figure 3.2 with 3 attenuation tanks in total across the site. The furthest downstream tank in the scheme acts in a daisy chain scenario for the two other tanks. There is 1no. outfall proposed which connects to the Longview Estates main distributor drainage infrastructure via an existing manhole to the northwest of the site as shown in **Figure 3.1**. The proposed network also makes allowance for an overflow from the Longview Estates Neighbourhood 5 surface water network as shown in Figure 3.1. The potential additional flow from the overflow has been included in the design capacity calculations.

The proposed surface water network will include a storm drainage pipe network and SuDS features, including nature-based features, which will aid the reduction of runoff volumes by slowing surface water flows, both providing the opportunity for evapotranspiration and rainwater storage. Both the interception and attenuation storage requirements of GDSDS will be sufficiently met through the provision of these features.
An assessment of the potential SuDS measures that could be incorporated within the site was conducted using the SuDS Manual, CIRIA 753 as guidance.

The proposed surface water discharge rate from the development will be restricted to less than Qbar, as specified. Each catchment will have a hydrobrake flow-control device installed downstream to limit discharge to the pre-development greenfield discharge rate.

To facilitate the removal of grit from runoff before it enters the SuDS systems, grit-sump manholes will be positioned upstream of the attenuation tanks areas. Manholes will also be constructed at various points along pipe runs, including changes in sewer direction, changes in gradients, significant sewer connections, and at intervals not exceeding 90m along straight sections of pipework.

The SuDS strategy for the development involves a combination of measures such as swales, tree-pits, and attenuation tanks. Together, these elements provide conveyance, interception storage, and attenuation storage for rainwater runoff.

All surface water generated on the site will be routed through a new site storm network as shown in **Figure 3.1**. Design calculations for the developments storm water network can be found in **Appendix D** of this report.

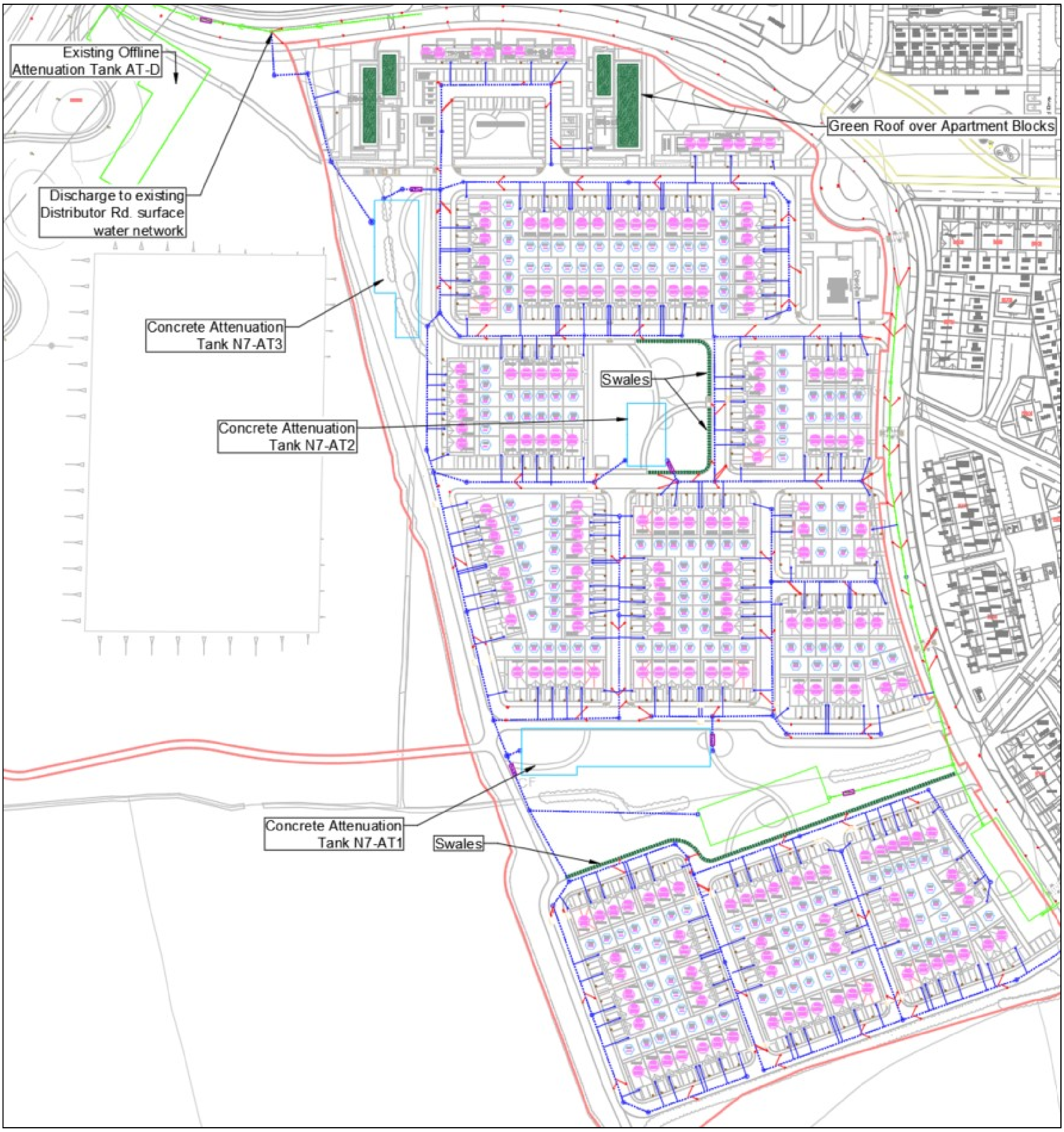


Figure 3.1: Proposed Surface Water Drainage Network

- The proposed storm network has been designed for a 1in30year storm event, the attenuation tanks are designed for a 1in100year storm event.

Please refer to the Surface Water Drainage layout drawings accompanying this application. As part of the design process the "Interim Code of Practice for Sustainable Drainage System" published in July 2004 by the National SUDS Working Group was consulted. The construction of the storm sewer pipe network shall be in accordance with Section 3 of the Department of Environment and Local Government publication "Recommendations for Site Development Works for Housing Areas".

The storm system proposed will incorporate:

- Bypass Hydrocarbon Inceptors: Conder Bypass Separators or similar approved
- Hydro-brake flow control to be installed to control outflow rate l/s or similar approved.
- Attenuation tanks (Concrete)
- Sustainable urban drainage systems as described in greater detail in Section 4 of this report.

3.1 Catchment Plan

The development has been split into 3No. sub catchment areas, as shown in **Figure 3.2** below. Please also refer to drawings 24083HD-SL7-P01 & P02.

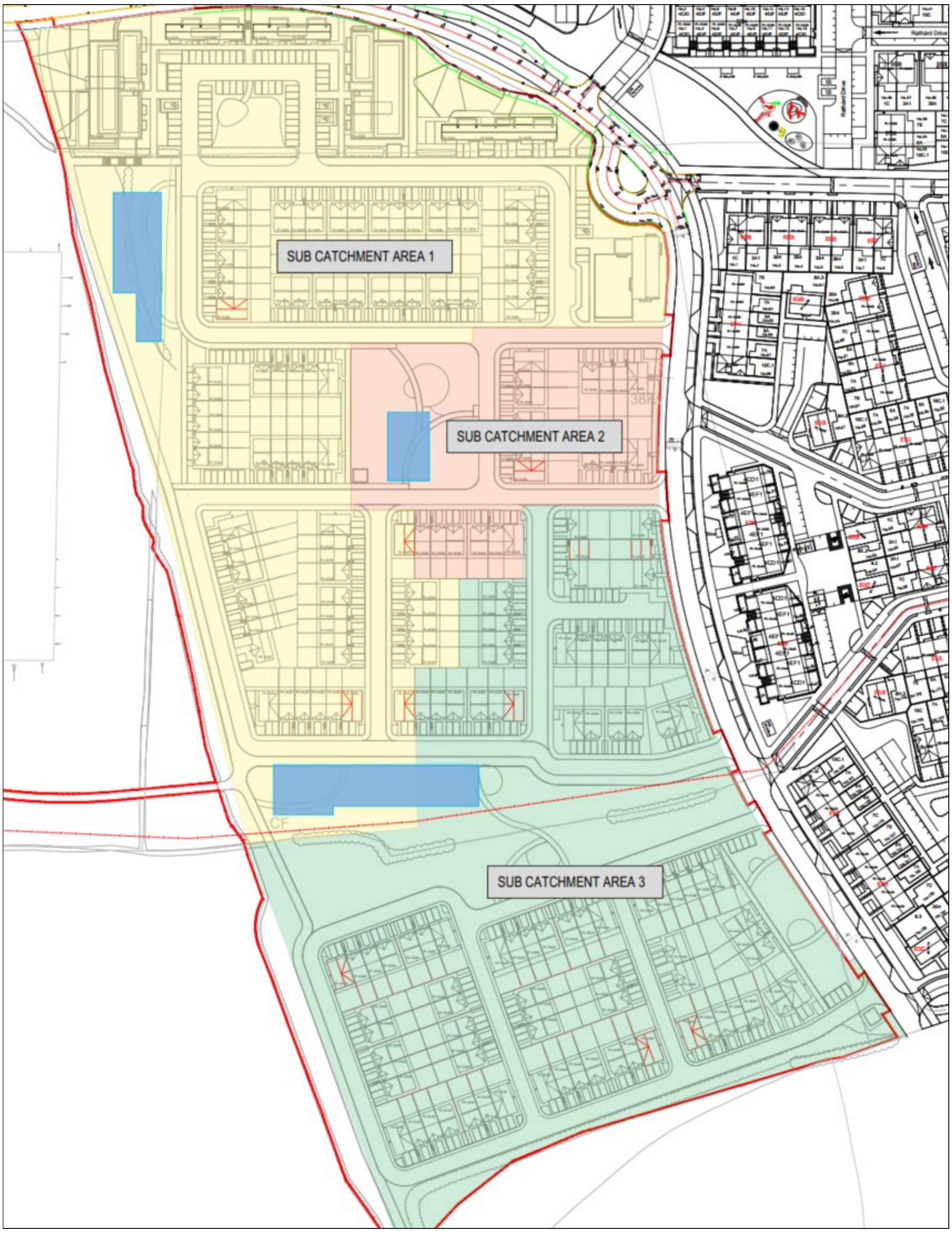


Figure 3.2: Contributing Catchment Areas

Using the permitted greenfield runoff rate (Qbar 38.7l/s) as previously discussed in Section 2.3, the discharge rate for each tank was calculated. These can be seen below in Figure 3.3. The proposed attenuation tanks are daisy chained in nature with the final total outfall discharge rate allowing for the catchment area of the entire scheme.

Attenuation Tank Discharge Rates	
Tank ID	Design Discharge Rate (l/s)
N7-AT1	26.0
N7-AT2	3.5
N7-AT3	17.0

Figure 3.3: Discharge rates per attenuation tank

Per above, overall design discharge rate from site is proposed at 26.0 l/s which is considerably lower than the site Qbar. Tanks identified as N7-AT2 and N7-AT3 both outflow into tank N7-AT1 which in turn outflows into the existing Longview Estates main distributor road drainage infrastructure.

3.2 Sub Catchment Area 01

Sub Catchment Area 01 (SCA 01) is located to the north of the site and comprises 96 houses, and two apartment blocks.

There is 1no. attenuation tank within this sub catchment area, namely N7-AT1. The upstream attenuation tanks N7-AT2 & N7-AT3 daisy chain into this tank. Tree pits will also be constructed in suitable areas within the catchment to capture runoff from the adjacent hard standing areas. The tree pits will allow for infiltration during normal rainfall events but will contain a positive outfall to the surface water network to cater for larger storm events.

The attenuation tank has been sized to accommodate a 1in100year storm event, plus 20% climate change, with no flooding occurring. A hydrocarbon interceptor will be fitted in advance of the final outfall from this SCA. The final discharge from Sub Catchment Area 01 forms the site outfall.

3.3 Sub Catchment Area 02

Sub Catchment Area 02 (SCA 02) is located towards the centre of the scheme, as shown in **Figure 3.2**, and comprises 21 houses. Two swales will be provided along the eastern edge of the centre green space to cater for runoff from the adjacent roadway and footpath. These swales will be constructed per best practice with a perforated drain suitable sized to cater for run off. Like the tree pits in SCA 01, the swales will allow for infiltration during normal rainfall events but will contain a positive outfall to the surface water network to cater for larger storm events. Tree pits will also be constructed in suitable areas within the catchment similar to SCA 01.

There is 1no. attenuation tank within this SCA, namely N7-AT2. This tank discharges into the storm network at a discharge rate of 3.5 l/s utilising a hydro brake or similar device to limit the flow. This network then flows downstream to attenuation tank N7-AT1 before discharging to the Longview Estates main distributor road drainage infrastructure at a combined rate of 26.0 l/s.

The attenuation tanks have been sized to accommodate a 1in100year storm event, plus 20% climate change, with no flooding occurring. A hydrocarbon interceptor will be fitted in advance of the tank.

3.4 Sub Catchment Area 03

Sub Catchment Area 03 (SCA 03) is located at the south and east of the site and comprises 91 housing units. The swales as mentioned in SCA 02 are similarly proposed for SCA 03 along the length of the estate road to the south of the public green space.

This SCA also caters for a connection to the overflow of the existing Longview Estates neighbourhood 5 attenuation tank located within the extents of the proposed scheme. This overflow is controlled via a flow control device and will connect to the proposed drainage network at a location as shown on the stormwater drainage layout drawings.

There is 1no. attenuation tank catering for this SCA, namely N7-AT3. This tank discharges into the storm network at a discharge rate of 17.0 l/s utilising a hydro brake or similar device to limit the flow. This network then flows downstream to attenuation tank N7-AT1 before discharging to the Longview Estates main distributor road drainage infrastructure at a combined rate of 26.0 l/s.

The attenuation tanks have been sized to accommodate a 1in100year storm event, plus 20% climate change, with no flooding occurring. A hydrocarbon interceptor will be fitted in advance of the tank.

3.5 Impact upon Longview Estates Main Distributor drainage infrastructure

As noted previously, SCA 01 will discharge to the existing surface water infrastructure constructed as part of the Longview Estates main distributor road. To allow for the additional flow from the proposed scheme, the flow control device at existing tank AT-D (refer to **Figure 3.5**) will need to be adjusted. No change is required to the flow control devices installed at the other tanks downstream. Existing attenuation tanks and pipework have sufficient capacity to cater for the additional inflow from N7 without works.

Main Distributor Attenuation Tanks with N7			
Tank ID	Volume (m^3)	Existing Design Flow Rate (l/s)	Proposed Design Flow Rate l/s
AT-D	1305	20.1	24.5
AT-C	1040	41.0	No change
AT-A	575	76.3	No change

Figure 3.4: Main Distributor Attenuation Tank sizing with N7

Figure 3.4 above presents the impact the proposed scheme has on the existing Longview Estates discharge rates. Refer to **Figure 1.7** for the respective location of each tank within the scheme. As noted, there is no change proposed to the final discharge from the previously permitted Longview Estates development when N7 is added.

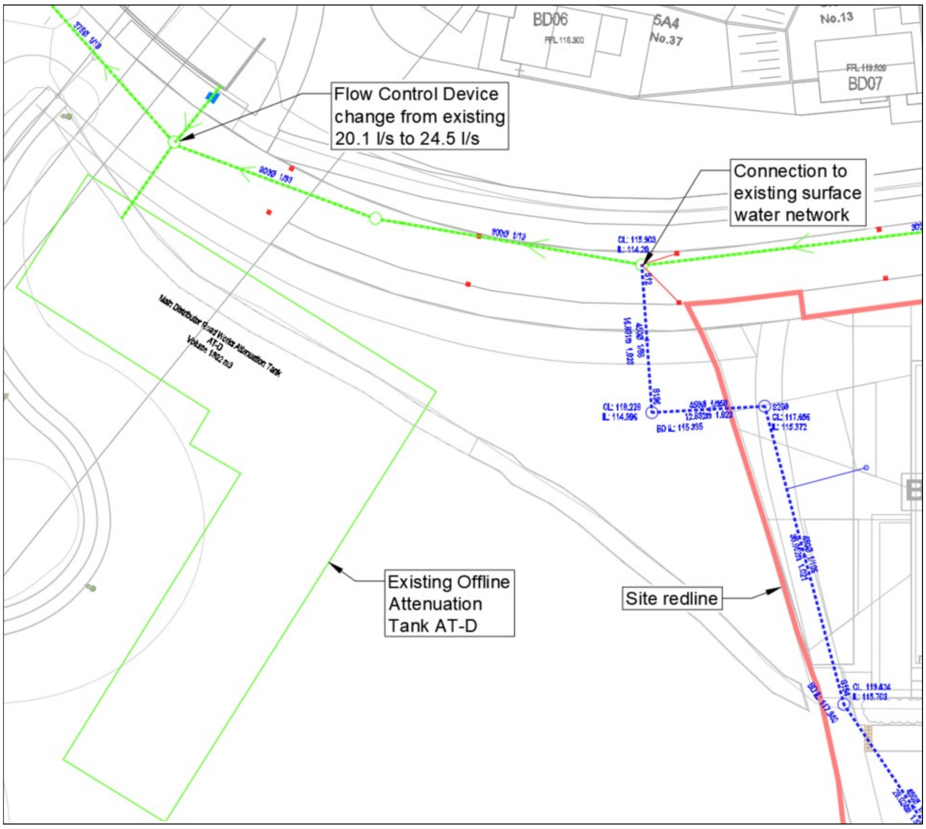


Figure 3.5: Longview Estates existing drainage network and location of N7 connection

3.6 Attenuation Tank

3.6.1 Volume of Attenuation

The proposed rate of surface water discharge from the development will be limited to less than Qbar, as described. Attenuation storage will be provided in the concrete attenuation tanks which will cater for the 1 in 100-year storm event with a 20% climate change allowance added. The proposed surface water network has been populated with various nature-based SuDS components being proposed as part of the development, which will provide some attenuation, reduce flow rates, and will disperse surface water runoff via evapotranspiration and infiltration. Details of the proposed attenuation tanks can be seen in the submitted planning pack. The capacity is summarized as follows:

Attenuation Tank Volumes	
Tank ID	Volume (m^3)
N7-AT1	1520
N7-AT2	250
N7-AT3	1700

Figure 3.6: Attenuation Tank Capacities

Each storm run will pass through a hydrocarbon bypass interceptor, an attenuation tank, and flow control manhole before out falling downstream. The figures below are typical attenuation tank details provided courtesy of Carlow Tanks. Concrete attenuation tank design to incorporate appropriately sized access chambers for maintenance. All access covers to be fitted with fall arrest systems.

Figure 3.7 Attenuation TC tanks – typical installation (Carlow tanks)

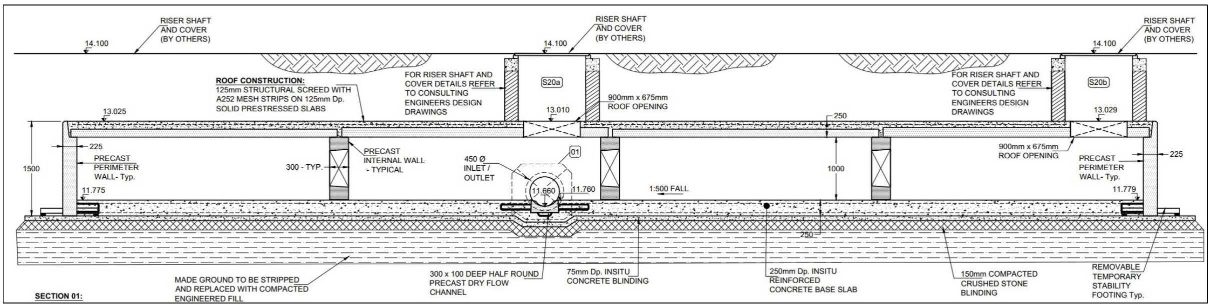


Figure 3.8: Attenuation RC tanks -typical cross section detail (Carlow tanks)

3.6.2 Hydrocarbon Treatment

In construction, a petrol interceptor serves as a crucial trap designed to filter out hydrocarbon pollutants from rainwater runoff, preventing fuel contamination of streams that carry away the runoff.

The functioning principle of petrol interceptors relies on the fact that certain hydrocarbons, such as petroleum and diesel, tend to float on water. When rainwater runoff, potentially carrying contaminants, flows off roads or hardstanding areas, it enters the interceptor, typically deposited into the first tank.

The initial tank accumulates a layer of hydrocarbons and other scum. Typically, petrol interceptors consist of three separate tanks, each interconnected with a dip pipe. As more liquid enters the interceptor, water moves into the second tank, leaving the majority of hydrocarbons behind because they cannot enter the dip pipe. The dip pipe's opening into the second tank is positioned below the surface.

While some contaminants may inadvertently enter the second tank, it does not accumulate as much hydrocarbon on its surface. Similarly, as water continues to enter the second tank, it is then pushed into the third tank.

The third tank is designed to be clear of any floating hydrocarbons on its surface. As an additional precaution, the outlet pipe also functions as a dip pipe. When water exits the third tank through the outlet pipe, it should be free of contaminants.

There are 3 different sub catchment areas that eventually discharge from the development. Each local network will have a petrol interceptor incorporated into the system to reduce the risk of pollutants.

3.6.3 Silt Control

The proposed bypass interceptors can also include a silt storage capacity in addition to the oil storage capacity that allow silt to be collected in the interceptor prior to discharge to the proposed attenuation tanks. This silt build up can then be removed from the tanks.

3.6.4 Flow Control

A flow control device will be provided for each of the 3no. stormwater attenuation tanks. It is proposed to use Hydro brake vortex control or similar to manage the discharge rates as shown in **Figure 3.3**. The existing attenuation tank AT-D located to the west of the proposed scheme will require it’s existing flow control device to be swapped out for a different flow rate as shown in **Figure 3.4**.

4 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

The proposed surface water drainage network is to be designed in accordance with Sustainable Urban Drainage Systems (SUDS) principles. Surface water is a valuable resource, and it is intended to incorporate various nature-based SUDS systems in the scheme, particularly within the various amenity areas. Appropriate nature-based SUDS tools will be employed to enhance biodiversity, beauty, tranquillity and the natural aesthetic of buildings, places and landscapes and it can help make them more resilient to the changing climate.

This SUDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area to manage downstream flood risk and reducing the risk of that runoff causing pollution. This is achieved by infiltrating, slowing, storing, conveying, and treating runoff on site and, where possible, on the surface rather than underground.

The surface water strategy will employ a series of nature based Sustainable Urban Drainage tools ensuring that the development will:

- Manage and control runoff volumes and flow rates from impermeable surfaces, reducing the impact of urbanisation on flooding.
- Promote groundwater and aquifer body recharge.
- Protect natural flow regimes in watercourses.
- Encourage evapotranspiration from planted and other storage area.

The SuDS strategy for the development involves a combination of measures such as swales, tree-pits, and attenuation tanks. Together, these elements provide conveyance, interception storage, and attenuation storage for rainwater runoff.

4.1 SUDs Objectives

4.1.1 Quantity Control Processes – Outline

Various techniques can be applied to manage runoff from a development, each offering specific benefits in stormwater control, flood risk management, water conservation, and groundwater recharge.

a) Infiltration:
Involves soaking water into the ground, considered the most favourable method for restoring the natural hydrologic process, impacted by subsoil characteristics.
b) Detention / Attenuation:
Slows down surface water flows using storage volumes and constrained outlets, ideally above ground, reducing peak flow rates while maintaining overall runoff volume.
c) Conveyance:
Transfers runoff through channels, trenches, and pipes, crucial for linking Sustainable Drainage System (SuDS) components; uncontrolled conveyance to the environment is not sustainable.
d) Water Harvesting:
Captures and uses runoff on-site for domestic or irrigation purposes, contributing to Flood Risk Management by efficiently managing and utilizing runoff.

4.1.2 Quality Control Processes

A number of natural water quality treatment processes can be exploited within SuDS design. Different processes will predominate for each SuDS technique and will be present at different stages in the treatment train.

a)	Sedimentation – reducing flow velocities to a level at which the sediment particles fall out of suspension;
b)	Filtration & Biofiltration – trapping pollutants within the soil or aggregate matrix, on plants or on geotextile layers;
c)	Adsorption – pollutants attach or bind to the surface of soil or aggregate particles;
d)	Biodegradation – Microbial communities in the ground degrade organic pollutants such as oils and grease;
e)	Volatilisation – transfer of a compound from solution in water to the soil atmosphere and then to the general atmosphere;
f)	Precipitation – transform dissolved constituents to form a suspension of particles of insoluble precipitates;
g)	Plant Uptake – removal of nutrients from water by plants in ponds and wetland;
h)	Nitrification – Ammonia and ammonium ions can be oxidised by bacteria in the ground to form nitrate which readily used as a nutrient by plants;
i)	Photolysis – The breakdown of organic pollutants by exposure to ultraviolet light.

4.1.3 Amenity & Biodiversity Processes

SuDS provides opportunities to create attractive landscaping features which offer a variety of amenity/biodiversity. The following are typical SuDS components offering aesthetic, amenity, and ecological benefits.

Typical Primary Processes:	
a)	Green Roofs
b)	Grassed channels/Swales
c)	Filter strips
d)	Bioretention Areas
e)	Vegetated swales and detention basins
f)	Infiltration Basins (Not part of this application)
Benefits subject to design:	
a)	Ponds
b)	Wetlands

4.2 SUDs Techniques

Apart from the previously mentioned goals, the replication of a natural drainage system requires the implementation of a 'Management Train.' This hierarchy of Sustainable Drainage System (SuDS) techniques follows a sequence:

- Prevention: Aims to prevent both runoff and pollution.
- Source Control: Focuses on controlling runoff at or close to its source.
- Site Control: Involves managing surface water within the site or local area.
- Regional Control: Encompasses the collective management of surface water from multiple sites.

Different SuDS components align with these objectives and are better suited for specific stages of the Management Train. The fundamental principle is to locally manage surface water in smaller sub-catchments, reducing the reliance on conveyance to larger systems downstream.

Source Control	Site Control	Regional Control
Rainwater Harvesting	Permeable Paving	Detention Ponds/Basins
Green Roofs	Bioretention Strips	Retention Ponds/Basins
Permeable Paving	Infiltration Trenches	Wetlands
Bioretention Strips	Filter Drains	Infiltration Basins
Filter Drains	Filter Strips	Detention Basins
Infiltration Trenches	Swales	Petrol Interceptors
Filter Strips	Sand Filters	
Soakaways	Infiltration Basins	
Swales	Detention Basins	
	Petrol Interceptors*	

Figure 4.1: SuDS Techniques for Source, Site & Regional Control

As noted above, source control, site control and regional control that are used on site have been highlighted. Please refer to the appendices of this report which provides further details on the SUDs elements proposed to be used on site as part of the stormwater management train system.

The overall slope of the site presents challenges that need to be considered as part of the design process. The risk of infiltrating water reappearing as spring lines further down the slope to the west has been taken into account when selecting the location and suitability of SuDS features. The presence of shallow rock in areas is also a factor in this regard. Additionally, the likely velocities in swales due to steep gradients has been evaluated.

The site's impervious areas are proposed to be attenuated by tanking solutions with SUDs methods coupled where feasible. The SUDs design philosophy will incorporate multiple controls to ensure the water management train is developed throughout the site.

The following SuDS features have been identified as applicable and will be provided within the proposed scheme:

- Tree Pits: Tree pits will be used where feasible across the development to provide interception storage and will contain engineered soil-filled tree boxes with drainage pipes beneath.

- Swales: Swales will run alongside road edges where suitable and will receive runoff from the development's roads and footpaths. The swales will be a shallow landscaped depression at the surface with a drainage layer beneath and will be utilised to convey surface water flows.

- Green Roofs: Green roofs are proposed on the roofs of apartment blocks A & B only to enhance building performance and reduce the surface water runoff from the buildings.

- Private Soak Ways will be located in private gardens and used to take half roof area where feasible

- Concrete Attenuation Tanks: will be required to manage the volume of runoff expected as previously noted.

Refer to **Appendix A** for further detail regarding the proposed SuDS measures.

This proposed storm system will alleviate any untoward effects of the development on downstream receiving environment, habitats/water quality and represent a sustainable design solution.

5 OPERATION AND MAINTENANCE

To uphold the intended performance standards, it's essential to conduct regular inspections and maintenance of all proposed Sustainable Drainage Systems (SuDS) areas. Following the guidelines outlined in CIRIA C753, a "passive maintenance" strategy will be adopted, integrating many SuDS maintenance tasks into typical site management practices. This approach encompasses a range of routine, periodic, and corrective maintenance measures to ensure the effective functioning of the SuDS system.

The site management plan must incorporate regular removal of litter from all applicable Sustainable Drainage Systems (SuDS) features, including permeable paving, swales, and tree pits. Grass maintenance is also crucial for all SuDS components. Typically, grass within swales should be maintained between 75-150 mm in length, with longer lengths unlikely to affect functionality. It's essential to remove grass clippings from swales and dispose of them properly. For detention basins, grass cover should be kept between 35-50mm in length, with cuttings left in place. Proper management of SuDS vegetation green waste should be integrated into regular site green waste protocols.

Regular inspections of the inlets and outlets of SuDS features are necessary to identify and remove any silt or debris buildup. These inspections should occur periodically. Additionally, to ensure accessibility for maintenance purposes, inlets and outlets should be strimmed approximately 1.0m all around. Control chambers should undergo annual inspections, and any accumulated silt should be removed as necessary during these inspections.

Annual inspections of swales and tree pits are recommended to assess for silt accumulation. If any buildup is identified, it should be promptly removed. Silt removed from the site can undergo dewatering and then be applied to land outside the SuDS component profile. This ensures the continued effectiveness and functionality of the SuDS features while managing silt in an environmentally responsible manner.

Petrol Interceptors requires periodic inspection and removal of the separated oils and petrol residues to ensure it continues to operate effectively. Safe access must be provided for the provision of maintenance to the petrol interceptor.

The proposed Sustainable Drainage Systems (SuDS) are designed to require low maintenance, as many of the listed actions are part of standard site upkeep and are necessary regardless. Regular inspections should be conducted to detect any damage or operational issues with the SuDS system. In case of the need for cleaning or other interventions, appropriate all-terrain machinery can be utilized in these areas to access outfalls effectively. This approach ensures that maintenance can be carried out efficiently while minimizing disruption to the surrounding environment.

6 AMENITY AND BIODIVERSITY

Achieving amenity and biodiversity standards is all about creating attractive, pleasant, and liveable urban areas for both people and nature.

The proposed Sustainable Drainage Systems (SuDS) features in this development are carefully designed to offer a range of benefits. They will not only enhance the visual appeal but also create habitats for wildlife while managing rainfall effectively.

Vegetation selection for tree pits, and swales is meticulously planned to maximize both ecological value and aesthetic appeal, enhancing the overall amenity value of the area.

The construction details of these features will be finalized through collaboration with landscape design and ecological experts, ensuring that they are effective and environmentally friendly. The attached drawings provide initial guidelines, which will be further refined before construction begins on-site.

6.1 Summary of Ecological Importance

Site flora and fauna assessments and bat surveys are being carried out. The results of these surveys will be provided as part of the full application. Surveys undertaken as part of the previous Longview Estates scheme noted no terrestrial mammals, or signs of mammals of conservation importance on site. Similarly, no flora of conservation importance was noted on site.

6.2 Sensitive Receptors

Please refer to Ecology Report submitted as part of this application. Potential receptors are as noted in the figure below.

Sensitive Receptor	Location/ Potential Impact
Watercourses	Onsite works will also involve ground clearance, re-profiling, groundworks, and construction, with potential for runoff, dust, light, and noise impacts.
Residents	Mitigation measures should be put in place to avoid impacting the residents proximal to the proposed development during the site clearance and construction phase of the project in regards to dust, light, and noise.
Terrestrial Fauna and Flora	On-site Fauna and flora of conservation importance to be reviewed by Ecologist.
Birds	Native species mixes will be promoted to support bird life.
Bats	No bats are recorded on site

Figure 6.1: Sensitive Receptors/ Potential Impact

7 SITE INVESTIGATION

As part of the original Longview Estates planning application, Priority Geotechnical Ltd. completed site investigation works on the green field site in 2017 & 2019. In total, these works consisted of 13 No. rotary core holes to measure the depth and strength of rock, 34 No. trial pits to measure the depth of soil and rock and 10 No. infiltration pits to measure the on-site infiltration rate.

Figure 7.1 below depicts the locations of the complete SI works in 2017 & 2019.

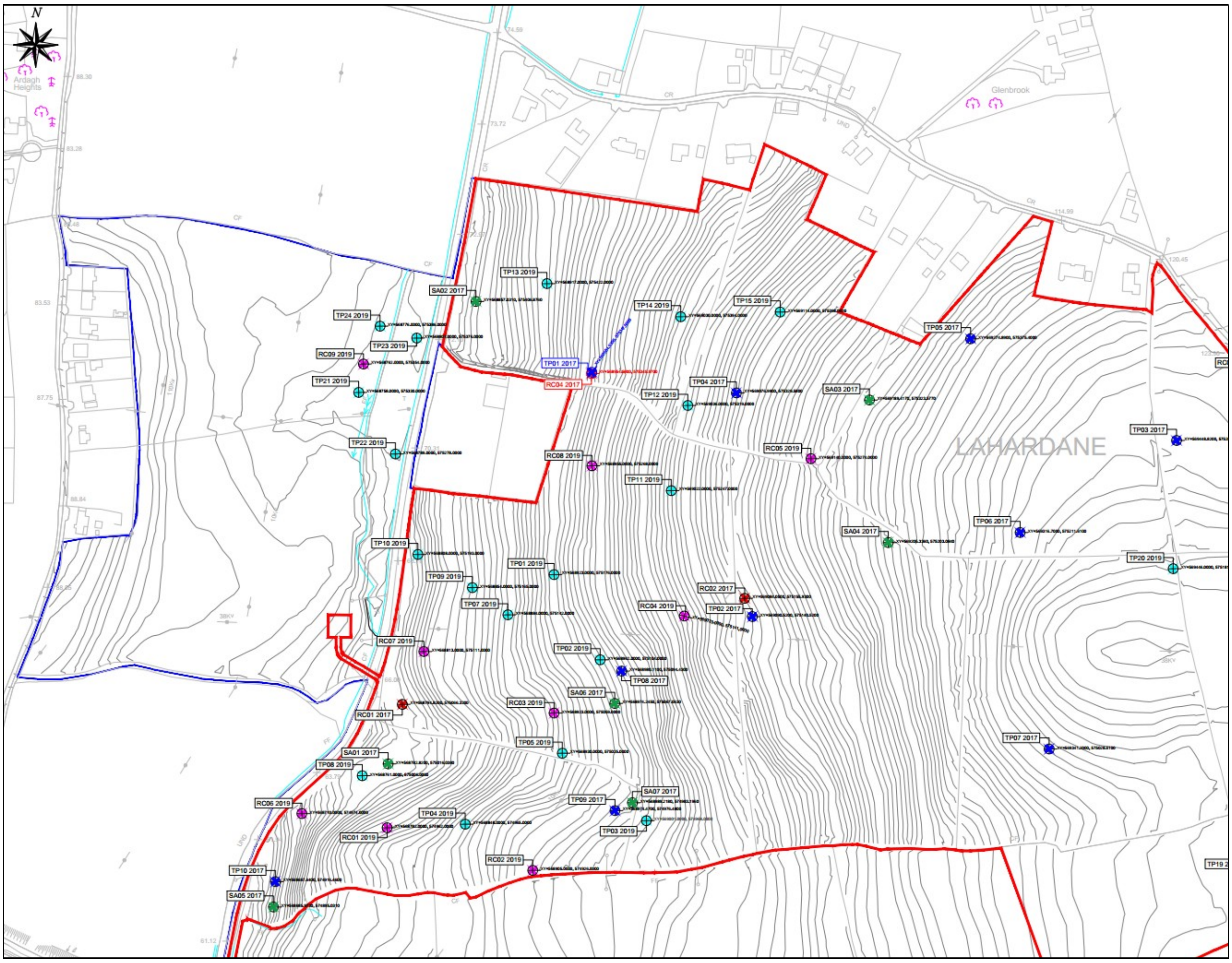


Figure 7.1: Site investigation locations undertaken 2017/2019

In addition to the above, further site investigation works were completed in August 2024 by Priority Geotechnical Ltd. to inform the construction stage design for N5 of Longview Estates and provide additional information for the planning stage of N7, the subject of this application.

Figure 7.2 shows the location of the additional trial pits and infiltration tests carried out at this time

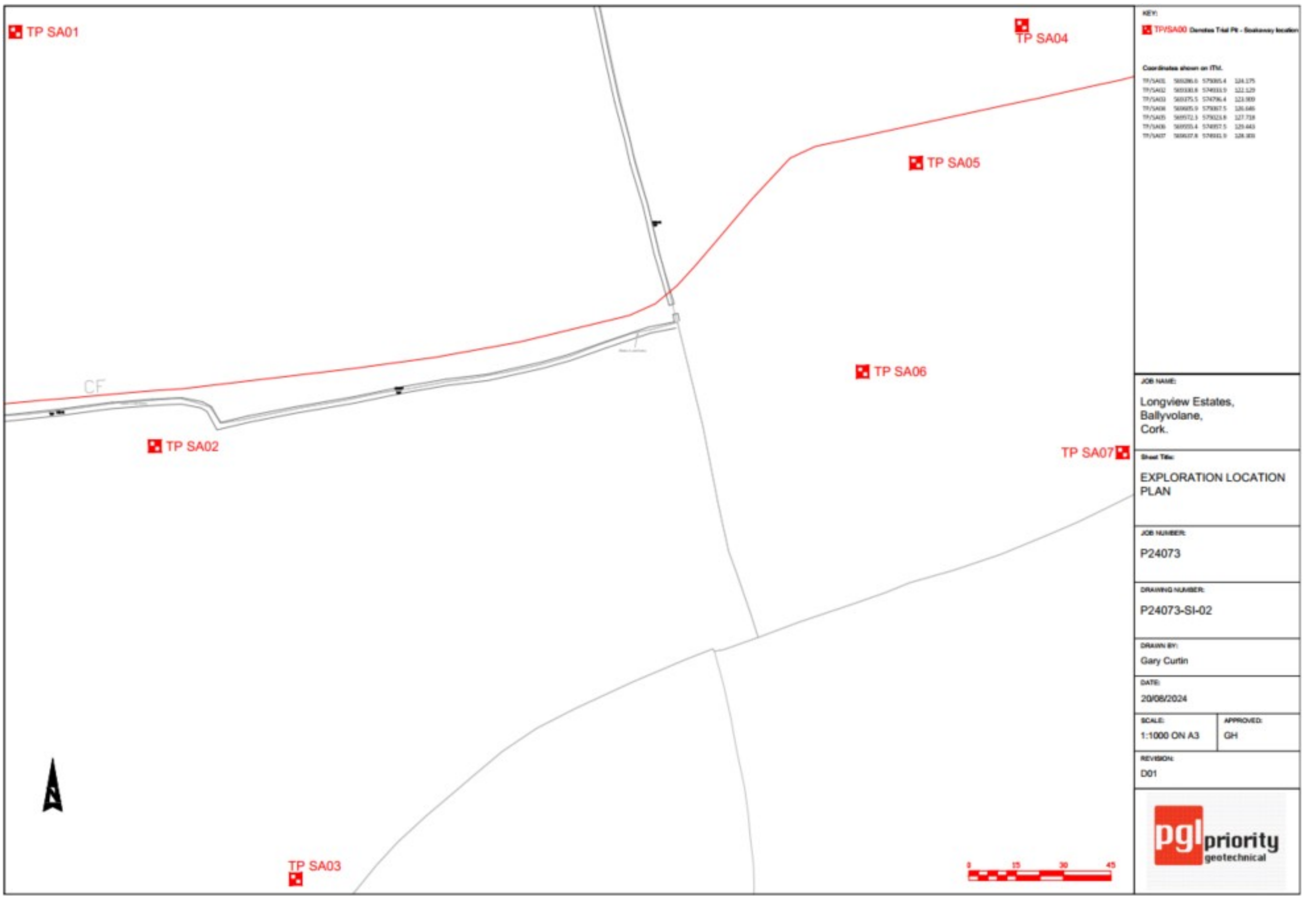


Figure 7.2: Site investigation locations undertaken in 2024

In addition to the site investigation, reference was made to the Groundwater Seepage Assessment completed by JBA Consulting as part of the original Longview Estates application. This report provides an assessment of groundwater conditions on site and outlines the potential for seepage to occur in areas of cut. JBA Consulting concluded that the nature of the substrate is not highly water-bearing and should be manageable by construction mitigation measures.

7.1 Findings

Location	Final depth, m bgl	Stratum Description	Groundwater Remarks
RC01	5.2	CLAY with cobble content. Rock MUDSTONE rock at 3.3m bgl	None encountered
RC02	8.3	Sandy CLAY. Rock SANDSTONE at 3.2m depth	None encountered
RC03	5.0	CLAY boulders, cobbles. Rock SANDSTONE at 2.2m bgl	None encountered
RC04	5.0	CLAY soft weathered rock. Rock SANDSTONE at 0.5m bgl	None encountered
TP01	4.0	Silty sandy GRAVEL. Rock SILTSTONE at 2.0m bgl	2.1m bgl, trickle flow
TP02	7.0	Silty sandy GRAVEL. Rock SILTSTONE at 2.7m bgl	2.8m bgl, trickle flow
TP03	4.0	Gravelly SILT. Rock SILTSTONE at 2.4m bgl	None encountered
TP04	4.0	Gravelly sandy SILT. Rock SILTSTONE at 1.5m bgl	None encountered
TP05	4.0	Gravelly sandy SILT. Rock SILTSTONE at 0.5m bgl	3.6m bgl, trickle flow
TP06	4.0	Gravelly sandy SILT. Rock SANDSTONE at 1.4m bgl	None encountered
TP07	4.0	Sandy Gravelly SILT. Rock SILTSTONE at 0.6m bgl	None encountered
TP08	4.0	Clayey sandy GRAVEL. Rock SANDSTONE at 3.8m bgl	None encountered
TP09	4.0	Gravelly sandy SILT. Rock SANDSTONE at 3.7m bgl	None encountered
TP10	4.0	Silty sandy GRAVEL. Rock SANDSTONE at 1.5m bgl	1.8m bgl, slow flow. 2.7m bgl, stready flow

Figure 7.3: August 2017 Site Investigation Results Summary (c: Priority Ltd.)

Location	Final depth, m bgl	Stratum Description	Groundwater Remarks
RC01	6.5	Sandy gravelly CLAY. Rock SILTSTONE at 1.3m bgl	1.3m bgl
RC02	6.8	Sandy gravelly CLAY. Rock SANDSTONE at 1.4m bgl	1.5m bgl
RC03	9.5	Sandy gravelly CLAY. Rock SANDSTONE at 4.3m bgl	4.3m bgl
RC04	6.7	Sandy gravelly CLAY. Rock SANDSTONE at 1.5m bgl	7.5m bgl
RC05	7.5	Sandy gravelly CLAY. Rock SANDSTONE at 1.3m bgl	3.3m bgl
RC06	3.3	Sandy gravelly CLAY. Rock SANDSTONE at 1.3m bgl	1.3m bgl
RC07	4.5	Sandy gravelly CLAY. Rock SANDSTONE at 1.5m bgl	3.0m bgl
RC08	3.5	Sandy gravelly CLAY. Rock SANDSTONE at 1.5m bgl	1.5m bgl
RC09	3.0	Sandy peaty CLAY. Sandy GRAVEL.	1.1m bgl
TP01	2.1	Silty sandy GRAVEL. Rock SILTSTONE at 1.2m bgl	None encountered
TP02	3.0	Sandy gravelly SILT. Rock SANDSTONE at 2.4m bgl	None encountered
TP03	3.4	Sandy clayey GRAVEL. Rock SILTSTONE at 2.8m bgl	None encountered
TP04	3.4	Very sandy GRAVEL. Rock SILTSTONE at 2.4m bgl	None encountered
TP05	2.9	Sandy gravelly CLAY. Cobbles and boulders at 1.8m bgl	None encountered
TP06	2.1	Gravelly SILT. Rock SILTSTONE at 0.9m bgl	None encountered
TP07	3.5	Clayey sandy GRAVEL. Rock SILTSTONE at 1.9m bgl	3.5m bgl, slow flow
TP08	1.8	Sandy gravelly SILT. Rock SANDSTONE at 1.1m bgl	1.8m bgl, slow flow
TP09	3.2	Sandy gravelly CLAY. Rock SILTSTONE at 2.9m bgl	1.8m bgl, trickling flow
TP10	3.6	Gravelly SILT. Rock SILTSTONE at 2.7m bgl	3.6m bgl, trickling flow
TP11	3.0	Sandy gravelly SILT. Cobbles and boulders at 0.9m bgl	None encountered
TP12	2.4	Silty GRAVEL. Sandy CLAY with boulder content	1.5m bgl, slow flow
TP13	2.5	Sandy gravelly CLAY. Rock SILTSTONE at 1.6m	None encountered
TP14	2.5	Clayey sandy GRAVEL. Cobbles and boulders.	None encountered
TP15	2.9	Sandy gravelly SILT. Cobbles mudstone/Siltstone. Rock at 2.7m bgl.	None encountered
TP16	2.4	Gravelly sandy SILT. Cobbles and boulders. Rock at 2.4m bgl	2.4m bgl, slow flow
TP17	2.7	Sandy gravelly CLAY. Cobbles. Rock at 2.7m bgl	2.7m bgl, slow flow
TP18	2.9	Rock recovered as Cobbles and boulders. Competent rock at 2.9m bgl	None encountered
TP19	1.9	Clayey sandy GRAVEL. Rock at 1.9m bgl	None encountered
TP20	2.5	Slightly sandy GRAVEL. Rock SILTSTONE at 2.5m bgl	None encountered
TP21	3.5	Very sandy GRAVEL. Very clayey SAND at 2.5m bgl	0.8m bgl, steady flow
TP22	3.6	Sandy GRAVEL. Rock at 3.6m bgl	2.5m bgl, steady flow
TP23	3.5	Sandy gravelly CLAY. Very sandy GRAVEL at 1.0m bgl	1.2m bgl, steady flow
TP24	3.5	Very sandy GRAVEL. Clayey gravelly SAND at 2.2m bgl	0.7m bgl – 2.2m bgl, steady flow

Figure 7.4: January 2019 Site Investigation Results Summary (c: Priority Ltd.)

Location	Final depth, m bgl	Stratum Description	Groundwater Remarks
TP-SA01	1.4	Fractured bedrock, SANDSTONE	None encountered
TP-SA02	1.8	Fractured bedrock, SILTSTONE	None encountered
TP-SA03	0.9	Fractured bedrock, SANDSTONE	None encountered
TP-SA04	2.3	Sandy, gravelly SILT, Very gravelly SAND.	None encountered
TP-SA05	3.3	Sandy gravelly SILT. Clayey, very gravelly SAND	None encountered
TP-SA06	2.6	Sandy gravelly SILT. Very gravelly SILT. Fractured bedrock SANSTONE at 0.6m bgl	None encountered
TP-SA07	3.1	Gravelly, very sandy SILT	None encountered

Figure 7.5: August 2024 Site Investigation Results Summary (c: Priority Ltd.)

With regards to the design of the storm water network, infiltration testing was carried out to determine infiltration feasibility.

Location	Depth, m bgl	Strata at base of excavation	Infiltration rate, ms^{-1}
TP-SA01	1.40	Fractured bedrock, SANDSTONE	2.6 E-04
TP-SA02	1.80	Fractured bedrock, SILTSTONE	4.5 E-06
TP-SA03	0.90	Fractured bedrock, SANDSTONE	2.7 E-07

Figure 7.6: August 2024 Site Investigation Infiltration Testing Results (c: Priority Ltd.)

Infiltration viability may be given full consideration where an infiltration coefficient of magnitude 10^{-8} ms^{-1} or greater exists (SUDS Manual C753, 2015). Figure 7.5 presents the criteria for the use of the different types of infiltration. The bulk of the site will fall into category Type B: partial infiltration. This will allow the use of a number of infiltration-based SUDS (Sustainable Urban Drainage Systems) including swales and tree pits in suitable locations. In a Type B system, the proportion of rainfall that exceeds the infiltration capacity of the subsoils flows to the receiving drainage system. The SuDS measures proposed will therefore be backed by hard drainage measures.

TABLE 20.1 Guidance on selection of a pavement system type (after Interpave, 2010)

Ground characteristics		Type A: total infiltration	Type B: partial infiltration	Type C: no infiltration
Permeability of subgrade defined by coefficient of permeability k (m/s)	1×10^{-6} to 1×10^{-3}	✓	✓	✓
	1×10^{-8} to 1×10^{-6}	×	✓	✓
	1×10^{-10} to 1×10^{-8}	×	× (1)	✓
Highest expected water level within 1000 mm of formation level		×	×	✓
Pollutants present in subgrade		×	×	✓
Ground conditions such that infiltration of water is not recommended (solution features, old mine working etc, Chapter 8)		×	×	✓

Note

1 Partial infiltration systems may be used in soils with permeability less than 10^{-8} m/s but the infiltration of water is not allowed for in the storage design. This helps with the provision of Interception.

Figure 7.7: Ciria (C753) SUDS Manual

Although the infiltration rates obtained from the infiltration testing indicate that the bulk of the site is suitable for category Type B: partial infiltration, it should be noted that the strata upon which the testing was completed was fractured bedrock. Indeed, the trial pits completed within the site extents note the general presence of shallow rock across the scheme. While infiltration rates were produced for the pits dug into the shallow rock, the potential exists for water infiltrating directly onto rock to emerge west of the proposed site within the existing Longview Estates development in the form of springs. The drainage design therefore proposes to only provide infiltration measures in non-fill areas with sufficient soil depth.

8 SUDS STATEMENT

SUDSSELECTIONHIERARCHYSHEETFORLARGE-SCALE DEVELOPMENT AND AGRICULTURAL DEVELOPMENT				
Suds Measures	**Measures to be used on site**	**Rational for selecting / not selecting measure**	**Area of feature (m^2)**	**Attenuation volume of feature (m^3) (see No. 8)**
Source Control Providing storage at source				
Swales	YES	Site geometry/ SI findings	As per submitted layouts	Infiltration is allowed in normal rain conditions. Omitted from attenuation calcs due to SI findings.
Integrated constructed tree pits	YES	Site geometry/ SI findings	As per submitted layouts	Infiltration is allowed in normal rain conditions. Omitted from attenuation calcs due to SI findings
Rainwater Butts	NO	Site geometry/ SI findings		
Soak ways	YES	Site geometry/ SI findings	Will be used only where feasible in private gardens.	Omitted from attenuation calcs to ensure robust analysis.
Infiltration trenches	NO	Site geometry/ SI findings		
Permeable pavement (Grass Crete, Block Paving, Porous Asphalt etc.)	NO	Site geometry/ SI findings		
Green Roofs	YES	Site geometry/ SI findings	As per submitted layouts	To be used on roofs of apartment blocks only. Omitted from attenuation calcs to ensure robust analysis.
Green wall	NO	Site geometry/ SI findings		
Filter strips	NO	Site geometry/ SI findings		
Bio-retention systems/Raingardens	NO	Site geometry/ SI findings		
Site Control				
Detention Basins	NO	Site geometry/ SI findings		
Retention basins	NO	Site geometry/ SI findings		
Regional Control				
Ponds	NO	Site geometry/ SI findings		
Wetlands	NO	Site geometry/ SI findings		
Other				
Petrol/Oil interceptor/Grit Trap	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Attenuation tank –	YES	Site geometry/ SI findings	As per submitted layouts	As per submitted layout proposals
Oversized pipes– only as a last resort where other measures are not feasible	NO	Site geometry/ SI findings		
Other	NO	Site geometry/ SI findings		

9 APPENDIX A: SUDS DETAILS- TYPICAL

9.1 Swales

Swales are expansive, shallow, and vegetated drainage channels designed for the conveyance or storage of surface water. Ideal for small catchments with impermeable areas, swales are commonly located along roads in grass verges. These features can be tailored for either infiltration into the subsoil or detention and conveyance to another stage in the management train. Conveyance may occur in the open channel or through a perforated pipe within a filter bed beneath the channel's base.

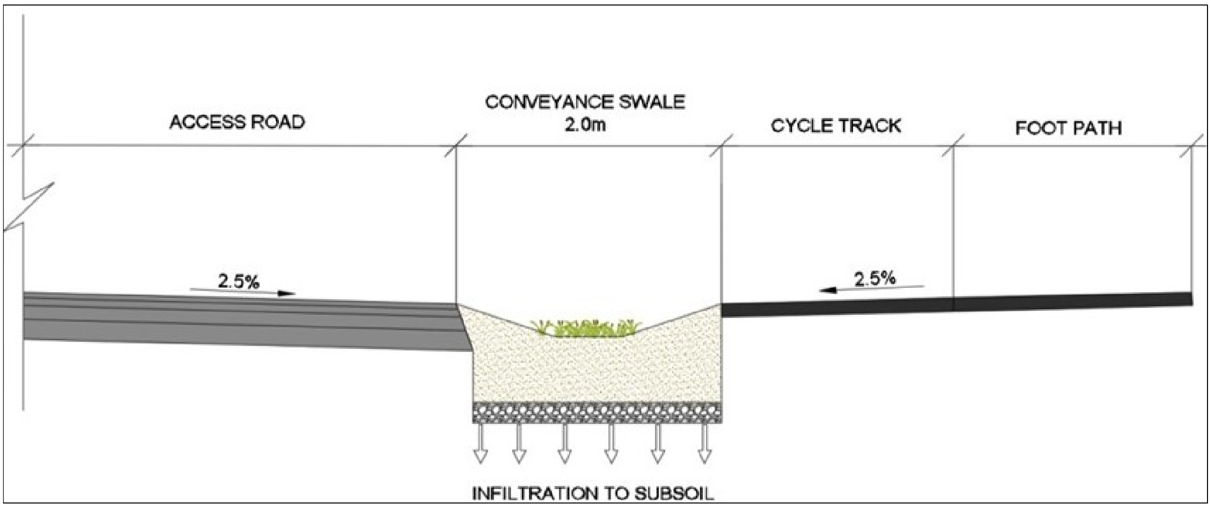


Figure 9.1: Typical Swale detail – Full Infiltration

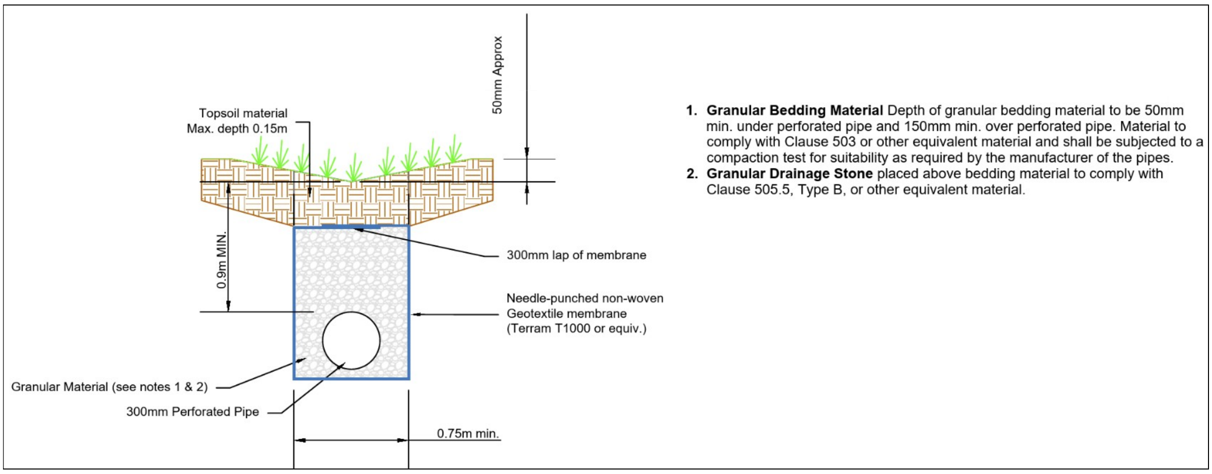


Figure 9.2: Typical Swale detail – Infiltration with positive outfall during storm events

Swales are recommended for managing runoff from access roads, offering water treatment, and mitigating peak flow. Dry swales, particularly recommended based on local subsoil conditions, facilitate infiltration, further reducing runoff volume. In situations where both vehicle and pedestrian access are necessary across a swale, a causeway can be installed. The levels at the outer swale banks will be higher than at the centre of the crossing point, creating a drop in level that serves as an overflow route for runoff during extreme rainfall events.

9.2 Tree Pits

Tree pits areas function as stormwater controls, collecting and treating runoff through the use of soils and vegetation in shallow landscaped basins to remove pollutants. The treated runoff can then be collected and conveyed downstream, and/or allowed to infiltrate into the subsoil. Additionally, a portion of the runoff volume is naturally reduced through processes like evaporation and plant transpiration.

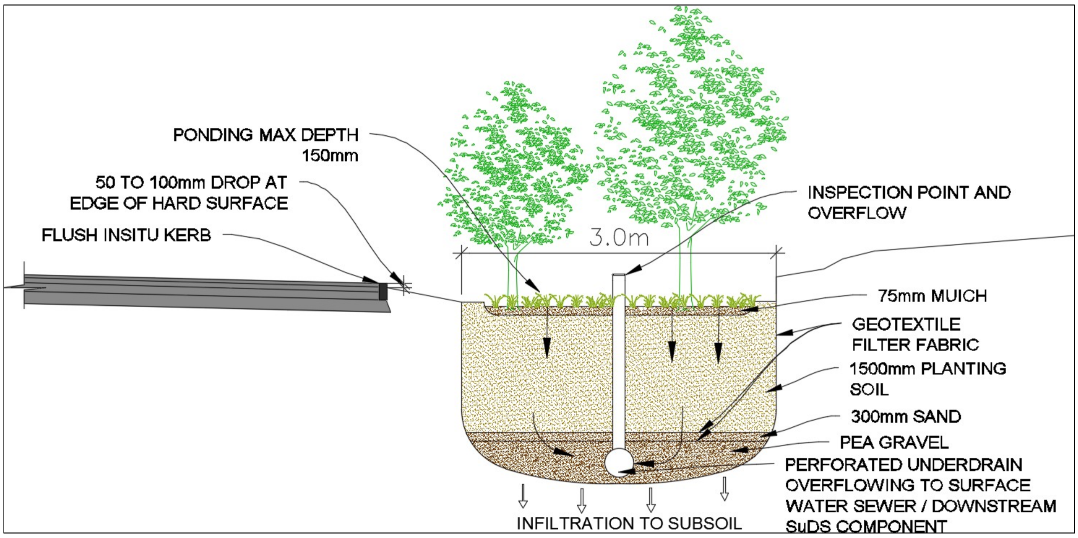


Figure 9.3: Typical Tree Pit schematic

9.3 Green Roofs

A green roof is a vegetated roofing system which is functionally integrated onto a roof area. Green roofs are designed to intercept and retain precipitation, reducing the volume of runoff from the roof area and slowing its entry into the wider drainage network.

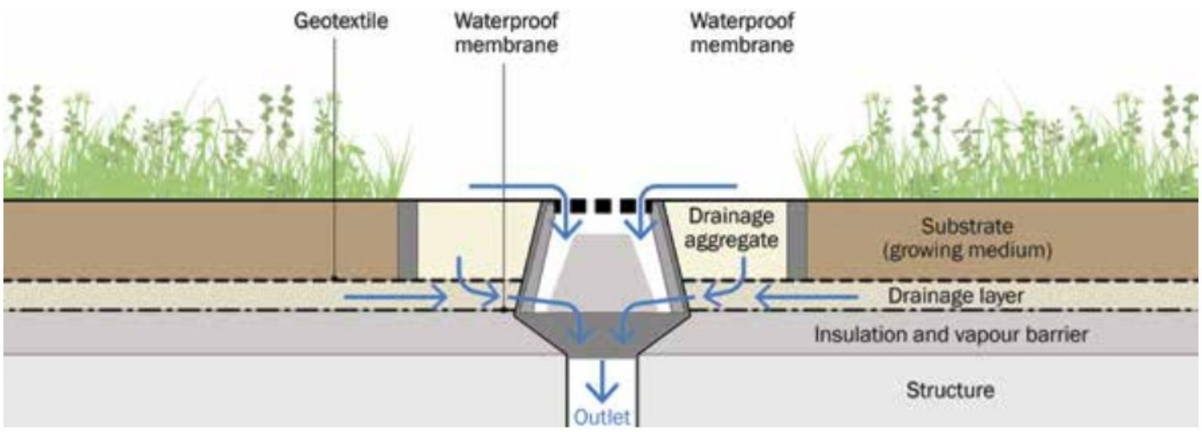


Figure 9.4: Typical Green Roof detail with outlet (SuDS Manual Figure 12.14)

10 APPENDIX B: HR WALLINGFORD GREENFIELD RUNOFF ESTIMATION

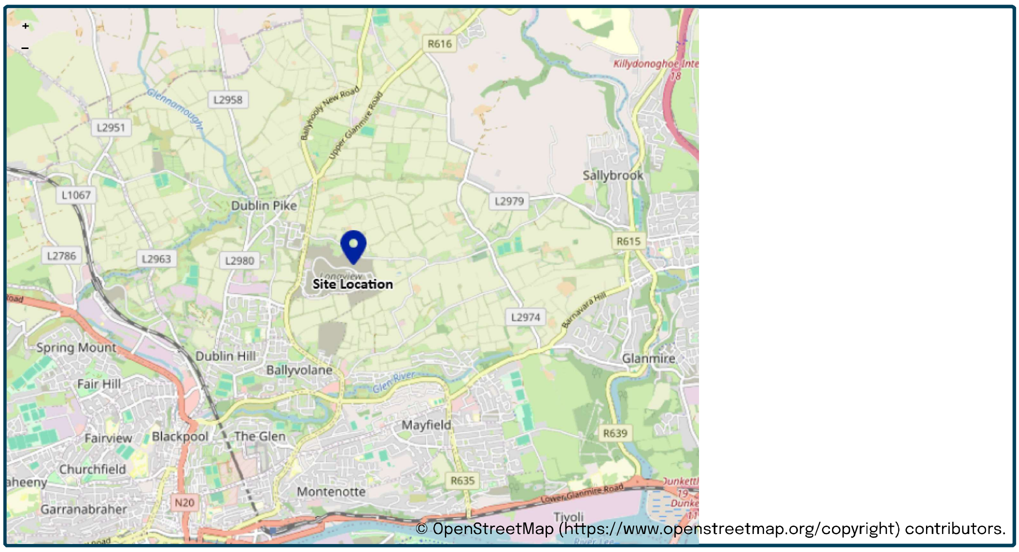
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	05/06/2026
Calculated by	Shane Moriarty
Reference	Longview N7 Planning
Model version	2.2.3

Location

Site name	Longview N7
Site location	Ballyvolane



Site easting (Irish Grid)	169435
Site northing (Irish Grid)	75050
Site easting (Irish Transverse Mercator)	569392
Site northing (Irish Transverse Mercator)	575112

Site details

Total site area (ha)	7.62 ha

Greenfield runoff

Method

Method	IH124		

IH124

	My value	Map value	
SAAR (mm)	1141 mm		1141
How should SPR be derived?	WRAP soil type		
WRAP soil type	3		4
SPR	0.37		
QBar (IH124) (l/s)	38.8 l/s		

Growth curve factors

	My value	Map value	
Hydrological region	13		13
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.4		
30 year growth factor	1.65		
100 year growth factor	1.95		
200 year growth factor	2.15		

Results

Method	IH124
Flow rate 1 year (l/s)	33.0 l/s
Flow rate 2 year (l/s)	36.8 l/s
Flow rate 10 years (l/s)	54.3 l/s
Flow rate 30 years (l/s)	64.0 l/s
Flow rate 100 years (l/s)	75.6 l/s
Flow rate 200 years (l/s)	83.4 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

11 APPENDIX C: RAINFALL RETURN PERIOD TABLE

Met Eireann

Return Period Rainfall Depths for sliding Durations

Irish Grid: Easting: 169343, Northing: 75103,

	Interval		Years													
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	3.3,	4.4,	5.0,	5.8,	6.4,	6.8,	8.1,	9.6,	10.5,	11.9,	13.0,	13.9,	15.2,	16.2,	17.0,	N/A ,
10 mins	4.6,	6.2,	6.9,	8.1,	8.9,	9.5,	11.3,	13.4,	14.7,	16.5,	18.1,	19.3,	21.2,	22.6,	23.7,	N/A ,
15 mins	5.4,	7.2,	8.2,	9.5,	10.4,	11.1,	13.3,	15.7,	17.3,	19.4,	21.3,	22.7,	24.9,	26.5,	27.9,	N/A ,
30 mins	7.2,	9.5,	10.7,	12.4,	13.5,	14.3,	17.1,	20.0,	21.9,	24.5,	26.8,	28.5,	31.1,	33.1,	34.7,	N/A ,
1 hours	9.5,	12.4,	13.9,	16.0,	17.4,	18.5,	21.9,	25.5,	27.8,	31.0,	33.7,	35.8,	38.9,	41.3,	43.2,	N/A ,
2 hours	12.7,	16.3,	18.2,	20.8,	22.6,	23.9,	28.0,	32.4,	35.3,	39.1,	42.4,	44.9,	48.7,	51.5,	53.9,	N/A ,
3 hours	14.9,	19.1,	21.2,	24.3,	26.2,	27.7,	32.4,	37.4,	40.5,	44.8,	48.5,	51.3,	55.5,	58.7,	61.2,	N/A ,
4 hours	16.8,	21.4,	23.7,	27.0,	29.2,	30.8,	35.9,	41.3,	44.7,	49.4,	53.4,	56.4,	60.9,	64.3,	67.1,	N/A ,
6 hours	19.8,	25.1,	27.7,	31.5,	33.9,	35.7,	41.5,	47.6,	51.4,	56.6,	61.1,	64.4,	69.4,	73.2,	76.3,	N/A ,
9 hours	23.4,	29.4,	32.4,	36.7,	39.4,	41.5,	48.0,	54.8,	59.1,	64.9,	69.9,	73.6,	79.2,	83.4,	86.8,	N/A ,
12 hours	26.3,	32.9,	36.2,	40.9,	43.9,	46.1,	53.2,	60.6,	65.3,	71.5,	76.9,	80.9,	86.9,	91.4,	95.1,	N/A ,
18 hours	31.0,	38.6,	42.3,	47.6,	51.0,	53.6,	61.5,	69.8,	75.0,	82.0,	88.0,	92.4,	99.1,	104.1,	108.1,	N/A ,
24 hours	34.9,	43.2,	47.3,	53.1,	56.8,	59.6,	68.2,	77.2,	82.8,	90.4,	96.8,	101.6,	108.8,	114.1,	118.5,	133.0,
2 days	44.0,	53.7,	58.4,	65.1,	69.3,	72.5,	82.2,	92.3,	98.6,	107.0,	114.1,	119.3,	127.2,	133.0,	137.7,	153.4,
3 days	51.5,	62.4,	67.6,	75.0,	79.7,	83.2,	93.8,	104.9,	111.7,	120.8,	128.4,	134.1,	142.5,	148.8,	153.8,	170.6,
4 days	58.2,	70.1,	75.8,	83.8,	88.8,	92.6,	104.1,	115.9,	123.2,	132.9,	141.1,	147.1,	156.1,	162.7,	168.1,	185.8,
6 days	70.1,	83.7,	90.3,	99.3,	105.0,	109.3,	122.2,	135.5,	143.6,	154.4,	163.4,	170.1,	180.0,	187.3,	193.2,	212.6,
8 days	80.9,	96.0,	103.2,	113.2,	119.5,	124.2,	138.3,	152.8,	161.7,	173.4,	183.2,	190.4,	201.1,	209.0,	215.3,	236.2,
10 days	90.8,	107.3,	115.2,	126.0,	132.8,	137.9,	153.2,	168.8,	178.3,	190.8,	201.3,	209.1,	220.5,	228.9,	235.6,	257.9,
12 days	100.2,	118.0,	126.5,	138.1,	145.4,	150.8,	167.1,	183.7,	193.8,	207.2,	218.3,	226.5,	238.5,	247.5,	254.6,	278.1,
16 days	117.9,	138.1,	147.6,	160.6,	168.8,	174.8,	193.0,	211.5,	222.7,	237.4,	249.7,	258.7,	272.0,	281.8,	289.6,	315.3,
20 days	134.6,	156.8,	167.3,	181.6,	190.6,	197.2,	217.1,	237.2,	249.4,	265.4,	278.7,	288.5,	302.9,	313.5,	321.9,	349.6,
25 days	154.3,	179.0,	190.6,	206.4,	216.2,	223.5,	245.4,	267.4,	280.8,	298.3,	312.7,	323.4,	339.0,	350.5,	359.6,	389.6,

NOTES:

N/A Data not available

These values are derived from a Depth Duration Frequency (DDF) Model

For details refer to:

'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

12 APPENDIX D: STORMWATER NETWORK DESIGN CALCULATIONS

Design Settings

Rainfall Methodology	FSR
Return Period (years)	1
Additional Flow (%)	0
FSR Region	Scotland and Ireland
M5-60 (mm)	18.300
Ratio-R	0.252
CV	0.750
Time of Entry (mins)	5.00

Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
S200		5.00		128.202	1350	569522.266	574890.760	1.522	126.680
S199	0.011	5.00		127.624	1350	569500.306	574876.990	1.624	126.000
S198		5.00		127.046	1350	569432.909	574926.310	1.576	125.470
S91	0.205	5.00		126.700	1350	569456.559	574861.562	1.880	124.820
S92	0.167	5.00		126.071	1200	569403.213	574842.261	1.633	124.438
S205	0.018	5.00		126.297	1200	569388.300	574883.815	2.199	124.098
S96		5.00		128.085	1350	569490.324	574914.539	1.998	126.087
S180	0.018	5.00		127.556	1200	569466.486	574949.975	1.929	125.627
S98	0.103	5.00		126.957	1200	569417.021	574932.188	1.935	125.022
S93	0.163	5.00		126.119	1200	569376.258	574917.542	2.332	123.787
S917				126.061	1350	569373.998	574923.954	2.661	123.400
S915				125.920	1350	569369.131	574929.228	3.020	122.900
S101		5.00		126.020	1350	569396.652	574839.831	1.425	124.595
S102	0.090	5.00		125.733	1350	569358.792	574826.079	1.704	124.029
S103				125.666	1350	569349.314	574829.914	1.865	123.801
S104	0.043	5.00		125.419	1350	569337.159	574863.522	1.872	123.547
S107	0.135	5.00		125.165	1350	569322.205	574905.416	1.840	123.325
S189	0.073	5.00		125.205	1350	569328.471	574914.818	2.985	122.220
N5 S91		5.00		125.107	1350	569377.735	574940.551	2.599	122.508
N5 S81			13.0	123.377	1350	569351.962	574941.141	1.377	122.000
S916				124.700	1350	569317.711	574930.877	2.863	121.837
S125		5.00		128.367	1350	569446.133	575030.002	1.948	126.419
S122		5.00		129.257	1350	569406.182	575057.870	1.800	127.457
S121	0.169	5.00		128.062	1350	569406.032	575030.038	1.895	126.167
S195	0.008	5.00		127.146	1350	569448.157	574971.502	1.462	125.684
S123	0.093	5.00		126.271	1350	569411.829	574971.525	1.536	124.735
S120	0.093	5.00		126.031	1350	569406.545	574978.469	1.781	124.250
S914	0.078	5.00		124.769	1350	569359.978	574978.226	1.425	123.344
S192	0.044	5.00		125.440	1350	569383.400	574978.112	3.245	122.195
S201				125.228	1350	569383.525	574964.972	4.175	121.053
S918				123.600	1350	569309.448	574965.004	2.547	121.053
S174				124.055	1800	569304.565	574963.138	3.028	121.027
S126	0.008	5.00		127.898	1350	569347.729	575055.195	3.808	124.090
S145	0.130	5.00		126.110	1350	569347.549	575017.070	3.420	122.690
S112	0.070	5.00		124.472	1200	569347.546	574977.642	2.314	122.158
S183	0.159	5.00		123.813	1350	569299.326	574976.694	2.823	120.990
S157	0.128	5.00		124.425	1350	569289.116	575018.443	3.542	120.883
S140		5.00		129.426	1350	569440.480	575124.366	1.526	127.900
S141	0.090	5.00		130.021	1200	569384.165	575124.190	2.470	127.551
S127		5.00		129.166	1200	569440.888	575068.678	2.251	126.915
S128	0.234	5.00		129.218	1200	569384.287	575068.544	2.576	126.642

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
S176	0.028	5.00		128.959	1200	569370.117	575068.411	3.061	125.898
S175				129.027	1350	569366.101	575076.533	3.329	125.698
S118				128.513	1350	569349.963	575076.588	2.815	125.698
S179	0.059	5.00		128.064	1350	569337.950	575068.285	2.684	125.380
S185	0.074	5.00		126.372	1350	569289.032	575068.278	3.462	122.910
S130				125.685	1350	569276.390	575072.095	4.940	120.745
S186				125.432	1350	569273.629	575080.698	4.710	120.722
S187	0.039	5.00		125.413	1350	569273.888	575128.190	4.809	120.604
S142		5.00		129.772	1200	569371.672	575124.608	3.632	126.140
S912	0.083	5.00		128.175	1200	569334.190	575124.679	3.009	125.166
S204	0.141	5.00		125.920	1200	569286.283	575124.382	2.270	123.650
S135				125.582	1350	569278.682	575133.296	4.996	120.586
S158		5.00		129.463	1350	569412.891	575134.836	1.503	127.960
S197	0.144	5.00		128.494	1200	569412.674	575175.897	1.964	126.530
S147				128.260	1200	569406.613	575183.071	2.090	126.170
S148	0.145	5.00		126.816	1350	569351.209	575183.485	1.755	125.061
S202	0.114	5.00		125.138	1200	569287.684	575183.641	2.335	122.803
S156		5.00		125.725	1200	569321.515	575190.438	2.315	123.410
S155	0.118	5.00		124.795	1200	569321.359	575221.078	1.835	122.960
S154	0.103	5.00		123.645	1200	569279.207	575220.798	1.955	121.690
S203	0.073	5.00		123.981	1200	569279.369	575203.039	2.586	121.395
S188	0.195	5.00		125.015	1350	569278.849	575180.712	4.991	120.024
S919				123.959	1350	569264.293	575180.823	4.744	119.215
S920				122.862	1350	569257.173	575177.285	4.044	118.818
S138				121.942	2100	569252.555	575168.232	3.125	118.817
S194				119.424	1350	569236.901	575191.475	3.721	115.703
S208				117.639	1350	569227.906	575225.353	2.267	115.372
S196				118.228	1350	569215.094	575224.639	3.832	114.396
S12				115.903	1350	569213.944	575241.431	1.703	114.200

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S200	S199	25.920	0.012	126.680	126.000	0.680	38.1	225	5.22	42.4
1.001	S199	S91	46.388	0.012	126.000	124.820	1.180	39.3	225	5.61	41.3
2.000	S198	S91	68.931	0.012	125.470	124.820	0.650	106.0	300	5.80	40.8
1.002	S91	S92	56.730	0.012	124.820	124.438	0.382	148.5	300	6.58	38.9
1.003	S92	S205	44.149	0.012	124.438	124.098	0.340	129.9	300	7.14	37.7
1.004	S205	S93	35.812	0.012	124.098	123.787	0.311	115.2	300	7.57	36.8
3.003	S96	S180	42.708	0.012	126.087	125.627	0.460	92.8	225	5.56	41.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.982	78.8	0.0	1.297	1.399	0.000	0.0	0	0.000
1.001	1.951	77.6	1.2	1.399	1.655	0.011	0.0	20	0.721
2.000	1.439	101.7	0.0	1.276	1.580	0.000	0.0	0	0.000
1.002	1.216	86.0	22.8	1.580	1.333	0.216	0.0	105	1.026
1.003	1.301	91.9	39.1	1.333	1.899	0.383	0.0	137	1.249
1.004	1.381	97.6	40.0	1.899	2.032	0.401	0.0	134	1.313
3.003	1.270	50.5	0.0	1.773	1.704	0.000	0.0	0	0.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.004	S180	S98	52.566	0.012	125.627	125.022	0.605	86.9	300	6.11	40.0
3.005	S98	S93	43.315	0.012	125.022	123.787	1.235	35.1	300	6.40	39.3
1.005	S93	S917	6.799	0.012	123.787	123.400	0.387	17.6	375	7.60	36.7
1.006	S917	S915	7.176	0.012	123.400	122.901	0.499	14.4	375	7.63	36.7
1.007	S915	S189	43.137	0.012	122.900	122.220	0.680	63.4	450	7.92	36.1
4.003	S101	S102	40.280	0.012	124.595	124.029	0.566	71.2	225	5.46	41.7
4.004	S102	S103	10.225	0.012	124.029	123.801	0.228	44.8	225	5.56	41.4
4.005	S103	S104	35.739	0.012	123.801	123.622	0.179	199.7	300	6.12	40.0
4.006	S104	S107	44.482	0.012	123.547	123.325	0.222	200.4	375	6.73	38.6
4.007	S107	S189	11.299	0.012	123.325	123.268	0.057	198.2	450	6.87	38.3
1.008	S189	S916	19.331	0.012	122.220	121.837	0.383	50.5	450	8.04	35.9
5.000	N5 S91	N5 S81	25.780	0.012	122.508	122.000	0.508	50.7	450	5.16	42.6
5.001	N5 S81	S916	35.756	0.012	122.000	121.837	0.163	219.4	450	5.61	41.3
1.009	S916	S174	34.836	0.012	121.837	121.027	0.810	43.0	450	8.24	35.5
6.003	S125	S121	40.102	0.012	126.419	126.167	0.252	159.1	225	5.69	41.1
8.000	S122	S121	27.832	0.012	127.457	126.167	1.290	21.6	225	5.18	42.5
6.004	S121	S120	51.572	0.012	126.167	124.250	1.917	26.9	225	6.05	40.2
9.004	S195	S123	36.329	0.012	125.684	124.735	0.949	38.3	225	5.31	42.1
9.005	S123	S120	8.725	0.012	124.735	124.250	0.485	18.0	300	5.35	42.0
6.005	S120	S192	23.148	0.012	124.250	123.227	1.023	22.6	300	6.18	39.9
10.000	S914	S192	23.423	0.012	123.344	123.227	0.117	200.2	225	5.45	41.7
6.006	S192	S201	13.141	0.012	122.195	121.053	1.142	11.5	375	6.22	39.8
6.007	S201	S918	74.077	0.012	121.053	121.053	0.000	0.0	450	7.46	37.0
6.008	S918	S174	5.227	0.012	121.053	121.027	0.026	201.0	450	7.52	36.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.004	1.590	112.4	2.0	1.629	1.635	0.018	0.0	27	0.600
3.005	2.502	176.9	12.9	1.635	2.032	0.121	0.0	55	1.458
1.005	4.103	453.2	68.2	1.957	2.286	0.685	0.0	99	2.957
1.006	4.535	500.9	68.1	2.286	2.644	0.685	0.0	93	3.170
1.007	2.438	387.8	67.1	2.570	2.535	0.685	0.0	127	1.830
4.003	1.450	57.7	0.0	1.200	1.479	0.000	0.0	0	0.000
4.004	1.827	72.6	10.1	1.479	1.640	0.090	0.0	57	1.286
4.005	1.049	74.1	9.8	1.565	1.497	0.090	0.0	74	0.727
4.006	1.215	134.2	13.9	1.497	1.465	0.133	0.0	82	0.786
4.007	1.379	219.4	27.8	1.390	1.487	0.268	0.0	109	0.947
1.008	2.734	434.8	99.8	2.535	2.413	1.026	0.0	146	2.216
5.000	2.726	433.6	0.0	2.149	0.927	0.000	0.0	0	0.000
5.001	1.311	208.5	13.0	0.927	2.413	0.000	13.0	76	0.729
1.009	2.961	471.0	111.9	2.413	2.578	1.026	13.0	149	2.424
6.003	0.970	38.6	0.0	1.723	1.670	0.000	0.0	0	0.000
8.000	2.634	104.7	0.0	1.575	1.670	0.000	0.0	0	0.000
6.004	2.359	93.8	18.4	1.670	1.556	0.169	0.0	67	1.827
9.004	1.977	78.6	0.9	1.237	1.311	0.008	0.0	17	0.667
9.005	3.494	247.0	11.5	1.236	1.481	0.101	0.0	44	1.787
6.005	3.116	220.2	39.2	1.481	1.913	0.363	0.0	86	2.356
10.000	0.865	34.4	8.8	1.200	1.988	0.078	0.0	78	0.724
6.006	5.070	559.9	52.3	2.870	3.800	0.485	0.0	77	3.174
6.007	1.000	159.0	48.7	3.725	2.097	0.485	0.0	450	0.000
6.008	1.370	217.8	48.5	2.097	2.578	0.485	0.0	145	1.103

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.010	S174	S183	14.533	0.012	121.027	120.990	0.037	392.8	450	8.48	35.1
11.000	S126	S145	38.126	0.012	124.090	122.690	1.400	27.2	300	5.22	42.4
11.001	S145	S112	39.428	0.012	122.690	122.158	0.532	74.1	375	5.55	41.5
11.002	S112	S183	48.229	0.012	122.158	120.990	1.168	41.3	300	5.90	40.5
1.011	S183	S157	42.979	0.012	120.990	120.883	0.107	401.7	450	9.22	33.9
1.012	S157	S130	55.141	0.012	120.883	120.745	0.138	399.6	450	10.17	32.5
12.000	S140	S141	56.315	0.012	127.900	127.551	0.349	161.4	300	5.80	40.8
12.001	S141	S128	55.646	0.012	127.551	126.642	0.909	61.2	300	6.29	39.6
14.003	S127	S128	56.601	0.012	126.915	126.642	0.273	207.3	300	5.92	40.5
12.002	S128	S176	14.171	0.012	126.642	126.593	0.049	289.2	300	6.57	38.9
12.003	S176	S175	9.060	0.012	125.898	125.698	0.200	45.3	300	6.63	38.8
12.004	S175	S118	16.138	0.012	125.698	125.698	0.000	0.0	300	6.90	38.2
12.005	S118	S179	14.603	0.012	125.698	125.380	0.318	45.9	375	7.00	38.0
12.006	S179	S185	48.919	0.012	125.380	122.910	2.470	19.8	375	7.21	37.5
12.007	S185	S130	13.205	0.012	122.910	122.705	0.205	64.4	375	7.31	37.3
1.013	S130	S186	9.035	0.012	120.745	120.722	0.023	392.8	450	10.32	32.2
1.014	S186	S187	47.493	0.012	120.722	120.604	0.118	402.5	450	11.14	31.1
1.015	S187	S135	7.003	0.012	120.604	120.586	0.018	389.1	450	11.26	31.0
15.002	S142	S912	37.481	0.012	126.140	125.166	0.974	38.5	300	5.26	42.3
15.003	S912	S204	47.908	0.012	125.166	123.650	1.516	31.6	300	5.56	41.4
15.004	S204	S135	11.715	0.012	123.650	123.100	0.550	21.3	300	5.63	41.3
1.016	S135	S188	47.416	0.012	120.586	120.058	0.528	89.8	450	11.64	30.5
17.003	S158	S197	41.062	0.012	127.960	126.530	1.430	28.7	225	5.30	42.2
17.004	S197	S147	9.392	0.012	126.530	126.245	0.285	33.0	225	5.37	41.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.010	0.980	155.8	156.8	2.578	2.373	1.511	13.0	371	1.117
11.000	2.840	200.7	0.9	3.508	3.120	0.008	0.0	15	0.728
11.001	1.998	220.6	15.5	3.045	1.939	0.138	0.0	67	1.149
11.002	2.306	163.0	22.9	2.014	2.523	0.208	0.0	76	1.627
1.011	0.969	154.1	185.4	2.373	3.092	1.878	13.0	450	0.982
1.012	0.972	154.5	189.4	3.092	4.490	2.006	13.0	450	0.985
12.000	1.167	82.5	0.0	1.226	2.170	0.000	0.0	0	0.000
12.001	1.894	133.9	9.7	2.170	2.276	0.090	0.0	55	1.103
14.003	1.029	72.8	0.0	1.951	2.276	0.000	0.0	0	0.000
12.002	0.871	61.6	34.2	2.276	2.066	0.324	0.0	160	0.894
12.003	2.202	155.6	37.0	2.761	3.029	0.352	0.0	99	1.803
12.004	1.000	70.7	36.4	3.029	2.515	0.352	0.0	300	0.000
12.005	2.538	280.3	36.2	2.440	2.309	0.352	0.0	91	1.750
12.006	3.864	426.8	41.8	2.309	3.087	0.411	0.0	79	2.460
12.007	2.143	236.7	49.1	3.087	2.605	0.485	0.0	116	1.692
1.013	0.980	155.8	230.6	4.490	4.260	2.491	13.0	450	0.993
1.014	0.968	154.0	223.3	4.260	4.359	2.491	13.0	450	0.981
1.015	0.985	156.6	225.5	4.359	4.546	2.530	13.0	450	0.998
15.002	2.389	168.9	0.0	3.332	2.709	0.000	0.0	0	0.000
15.003	2.636	186.4	9.3	2.709	1.970	0.083	0.0	45	1.370
15.004	3.211	227.0	25.1	1.970	2.182	0.224	0.0	67	2.110
1.016	2.049	325.9	240.8	4.546	4.507	2.754	13.0	288	2.242
17.003	2.283	90.8	0.0	1.278	1.739	0.000	0.0	0	0.000
17.004	2.131	84.7	16.4	1.739	1.790	0.144	0.0	67	1.650

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
17.005	S147	S148	55.405	0.012	126.170	125.061	1.109	50.0	300	5.81	40.8
17.006	S148	S202	63.525	0.012	125.061	122.803	2.258	28.1	300	6.19	39.8
17.007	S202	S188	9.307	0.012	122.803	122.400	0.403	23.1	300	6.24	39.7
19.000	S156	S155	30.640	0.012	123.410	122.960	0.450	68.1	225	5.34	42.0
19.001	S155	S154	42.152	0.012	122.960	121.690	1.270	33.2	225	5.68	41.1
19.002	S154	S203	17.759	0.012	121.690	121.395	0.295	60.2	225	5.86	40.6
19.003	S203	S188	22.334	0.012	121.395	121.321	0.074	301.8	300	6.30	39.6
1.017	S188	S919	14.557	0.012	120.024	119.215	0.809	18.0	450	11.70	30.5
1.018	S919	S920	7.950	0.012	119.215	118.818	0.397	20.0	450	11.73	30.4
1.019	S920	S138	10.163	0.012	118.818	118.817	0.001	10163.0	450	12.61	29.4
1.020	S138	S194	28.024	0.012	118.817	117.340	1.477	19.0	450	12.71	29.3
1.021	S194	S208	35.052	0.012	115.703	115.372	0.331	105.9	450	13.02	29.0
1.022	S208	S196	12.832	0.012	115.372	115.335	0.037	346.8	450	13.23	28.7
1.023	S196	S12	16.831	0.012	114.396	114.200	0.196	85.9	450	13.36	28.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
17.005	2.097	148.2	15.9	1.790	1.455	0.144	0.0	67	1.370
17.006	2.794	197.5	31.2	1.455	2.035	0.289	0.0	81	2.039
17.007	3.084	218.0	43.4	2.035	2.315	0.403	0.0	91	2.401
19.000	1.483	59.0	0.0	2.090	1.610	0.000	0.0	0	0.000
19.001	2.124	84.4	13.2	1.610	1.730	0.118	0.0	60	1.546
19.002	1.577	62.7	24.3	1.730	2.361	0.221	0.0	97	1.476
19.003	0.853	60.3	31.5	2.286	3.394	0.294	0.0	154	0.862
1.017	4.578	728.1	313.9	4.541	4.294	3.646	13.0	206	4.405
1.018	4.340	690.2	313.6	4.294	3.594	3.646	13.0	213	4.239
1.019	0.193	30.6	303.6	3.594	2.675	3.646	13.0	450	0.195
1.020	4.458	709.1	302.4	2.675	1.634	3.646	13.0	205	4.281
1.021	1.887	300.1	299.2	3.271	1.817	3.646	13.0	368	2.151
1.022	1.043	165.9	297.0	1.817	2.443	3.646	13.0	450	1.057
1.023	2.096	333.3	295.7	3.382	1.253	3.646	13.0	330	2.368

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	25.920	38.1	225	Circular	128.202	126.680	1.297	127.624	126.000	1.399
1.001	46.388	39.3	225	Circular	127.624	126.000	1.399	126.700	124.820	1.655
2.000	68.931	106.0	300	Circular	127.046	125.470	1.276	126.700	124.820	1.580
1.002	56.730	148.5	300	Circular	126.700	124.820	1.580	126.071	124.438	1.333
1.003	44.149	129.9	300	Circular	126.071	124.438	1.333	126.297	124.098	1.899
1.004	35.812	115.2	300	Circular	126.297	124.098	1.899	126.119	123.787	2.032

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S200	1350	Manhole	Adoptable	S199	1350	Manhole	Adoptable
1.001	S199	1350	Manhole	Adoptable	S91	1350	Manhole	Adoptable
2.000	S198	1350	Manhole	Adoptable	S91	1350	Manhole	Adoptable
1.002	S91	1350	Manhole	Adoptable	S92	1200	Manhole	Adoptable
1.003	S92	1200	Manhole	Adoptable	S205	1200	Manhole	Adoptable
1.004	S205	1200	Manhole	Adoptable	S93	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.003	42.708	92.8	225	Circular	128.085	126.087	1.773	127.556	125.627	1.704
3.004	52.566	86.9	300	Circular	127.556	125.627	1.629	126.957	125.022	1.635
3.005	43.315	35.1	300	Circular	126.957	125.022	1.635	126.119	123.787	2.032
1.005	6.799	17.6	375	Circular	126.119	123.787	1.957	126.061	123.400	2.286
1.006	7.176	14.4	375	Circular	126.061	123.400	2.286	125.920	122.901	2.644
1.007	43.137	63.4	450	Circular	125.920	122.900	2.570	125.205	122.220	2.535
4.003	40.280	71.2	225	Circular	126.020	124.595	1.200	125.733	124.029	1.479
4.004	10.225	44.8	225	Circular	125.733	124.029	1.479	125.666	123.801	1.640
4.005	35.739	199.7	300	Circular	125.666	123.801	1.565	125.419	123.622	1.497
4.006	44.482	200.4	375	Circular	125.419	123.547	1.497	125.165	123.325	1.465
4.007	11.299	198.2	450	Circular	125.165	123.325	1.390	125.205	123.268	1.487
1.008	19.331	50.5	450	Circular	125.205	122.220	2.535	124.700	121.837	2.413
5.000	25.780	50.7	450	Circular	125.107	122.508	2.149	123.377	122.000	0.927
5.001	35.756	219.4	450	Circular	123.377	122.000	0.927	124.700	121.837	2.413
1.009	34.836	43.0	450	Circular	124.700	121.837	2.413	124.055	121.027	2.578
6.003	40.102	159.1	225	Circular	128.367	126.419	1.723	128.062	126.167	1.670
8.000	27.832	21.6	225	Circular	129.257	127.457	1.575	128.062	126.167	1.670
6.004	51.572	26.9	225	Circular	128.062	126.167	1.670	126.031	124.250	1.556
9.004	36.329	38.3	225	Circular	127.146	125.684	1.237	126.271	124.735	1.311
9.005	8.725	18.0	300	Circular	126.271	124.735	1.236	126.031	124.250	1.481
6.005	23.148	22.6	300	Circular	126.031	124.250	1.481	125.440	123.227	1.913
10.000	23.423	200.2	225	Circular	124.769	123.344	1.200	125.440	123.227	1.988
6.006	13.141	11.5	375	Circular	125.440	122.195	2.870	125.228	121.053	3.800
6.007	74.077	0.0	450	Circular	125.228	121.053	3.725	123.600	121.053	2.097
6.008	5.227	201.0	450	Circular	123.600	121.053	2.097	124.055	121.027	2.578

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.003	S96	1350	Manhole	Adoptable	S180	1200	Manhole	Adoptable
3.004	S180	1200	Manhole	Adoptable	S98	1200	Manhole	Adoptable
3.005	S98	1200	Manhole	Adoptable	S93	1200	Manhole	Adoptable
1.005	S93	1200	Manhole	Adoptable	S917	1350	Manhole	Adoptable
1.006	S917	1350	Manhole	Adoptable	S915	1350	Manhole	Adoptable
1.007	S915	1350	Manhole	Adoptable	S189	1350	Manhole	Adoptable
4.003	S101	1350	Manhole	Adoptable	S102	1350	Manhole	Adoptable
4.004	S102	1350	Manhole	Adoptable	S103	1350	Manhole	Adoptable
4.005	S103	1350	Manhole	Adoptable	S104	1350	Manhole	Adoptable
4.006	S104	1350	Manhole	Adoptable	S107	1350	Manhole	Adoptable
4.007	S107	1350	Manhole	Adoptable	S189	1350	Manhole	Adoptable
1.008	S189	1350	Manhole	Adoptable	S916	1350	Manhole	Adoptable
5.000	N5 S91	1350	Manhole	Adoptable	N5 S81	1350	Manhole	Adoptable
5.001	N5 S81	1350	Manhole	Adoptable	S916	1350	Manhole	Adoptable
1.009	S916	1350	Manhole	Adoptable	S174	1800	Manhole	Adoptable
6.003	S125	1350	Manhole	Adoptable	S121	1350	Manhole	Adoptable
8.000	S122	1350	Manhole	Adoptable	S121	1350	Manhole	Adoptable
6.004	S121	1350	Manhole	Adoptable	S120	1350	Manhole	Adoptable
9.004	S195	1350	Manhole	Adoptable	S123	1350	Manhole	Adoptable
9.005	S123	1350	Manhole	Adoptable	S120	1350	Manhole	Adoptable
6.005	S120	1350	Manhole	Adoptable	S192	1350	Manhole	Adoptable
10.000	S914	1350	Manhole	Adoptable	S192	1350	Manhole	Adoptable
6.006	S192	1350	Manhole	Adoptable	S201	1350	Manhole	Adoptable
6.007	S201	1350	Manhole	Adoptable	S918	1350	Manhole	Adoptable
6.008	S918	1350	Manhole	Adoptable	S174	1800	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.010	14.533	392.8	450	Circular	124.055	121.027	2.578	123.813	120.990	2.373
11.000	38.126	27.2	300	Circular	127.898	124.090	3.508	126.110	122.690	3.120
11.001	39.428	74.1	375	Circular	126.110	122.690	3.045	124.472	122.158	1.939
11.002	48.229	41.3	300	Circular	124.472	122.158	2.014	123.813	120.990	2.523
1.011	42.979	401.7	450	Circular	123.813	120.990	2.373	124.425	120.883	3.092
1.012	55.141	399.6	450	Circular	124.425	120.883	3.092	125.685	120.745	4.490
12.000	56.315	161.4	300	Circular	129.426	127.900	1.226	130.021	127.551	2.170
12.001	55.646	61.2	300	Circular	130.021	127.551	2.170	129.218	126.642	2.276
14.003	56.601	207.3	300	Circular	129.166	126.915	1.951	129.218	126.642	2.276
12.002	14.171	289.2	300	Circular	129.218	126.642	2.276	128.959	126.593	2.066
12.003	9.060	45.3	300	Circular	128.959	125.898	2.761	129.027	125.698	3.029
12.004	16.138	0.0	300	Circular	129.027	125.698	3.029	128.513	125.698	2.515
12.005	14.603	45.9	375	Circular	128.513	125.698	2.440	128.064	125.380	2.309
12.006	48.919	19.8	375	Circular	128.064	125.380	2.309	126.372	122.910	3.087
12.007	13.205	64.4	375	Circular	126.372	122.910	3.087	125.685	122.705	2.605
1.013	9.035	392.8	450	Circular	125.685	120.745	4.490	125.432	120.722	4.260
1.014	47.493	402.5	450	Circular	125.432	120.722	4.260	125.413	120.604	4.359
1.015	7.003	389.1	450	Circular	125.413	120.604	4.359	125.582	120.586	4.546
15.002	37.481	38.5	300	Circular	129.772	126.140	3.332	128.175	125.166	2.709
15.003	47.908	31.6	300	Circular	128.175	125.166	2.709	125.920	123.650	1.970
15.004	11.715	21.3	300	Circular	125.920	123.650	1.970	125.582	123.100	2.182
1.016	47.416	89.8	450	Circular	125.582	120.586	4.546	125.015	120.058	4.507
17.003	41.062	28.7	225	Circular	129.463	127.960	1.278	128.494	126.530	1.739
17.004	9.392	33.0	225	Circular	128.494	126.530	1.739	128.260	126.245	1.790
17.005	55.405	50.0	300	Circular	128.260	126.170	1.790	126.816	125.061	1.455

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.010	S174	1800	Manhole	Adoptable	S183	1350	Manhole	Adoptable
11.000	S126	1350	Manhole	Adoptable	S145	1350	Manhole	Adoptable
11.001	S145	1350	Manhole	Adoptable	S112	1200	Manhole	Adoptable
11.002	S112	1200	Manhole	Adoptable	S183	1350	Manhole	Adoptable
1.011	S183	1350	Manhole	Adoptable	S157	1350	Manhole	Adoptable
1.012	S157	1350	Manhole	Adoptable	S130	1350	Manhole	Adoptable
12.000	S140	1350	Manhole	Adoptable	S141	1200	Manhole	Adoptable
12.001	S141	1200	Manhole	Adoptable	S128	1200	Manhole	Adoptable
14.003	S127	1200	Manhole	Adoptable	S128	1200	Manhole	Adoptable
12.002	S128	1200	Manhole	Adoptable	S176	1200	Manhole	Adoptable
12.003	S176	1200	Manhole	Adoptable	S175	1350	Manhole	Adoptable
12.004	S175	1350	Manhole	Adoptable	S118	1350	Manhole	Adoptable
12.005	S118	1350	Manhole	Adoptable	S179	1350	Manhole	Adoptable
12.006	S179	1350	Manhole	Adoptable	S185	1350	Manhole	Adoptable
12.007	S185	1350	Manhole	Adoptable	S130	1350	Manhole	Adoptable
1.013	S130	1350	Manhole	Adoptable	S186	1350	Manhole	Adoptable
1.014	S186	1350	Manhole	Adoptable	S187	1350	Manhole	Adoptable
1.015	S187	1350	Manhole	Adoptable	S135	1350	Manhole	Adoptable
15.002	S142	1200	Manhole	Adoptable	S912	1200	Manhole	Adoptable
15.003	S912	1200	Manhole	Adoptable	S204	1200	Manhole	Adoptable
15.004	S204	1200	Manhole	Adoptable	S135	1350	Manhole	Adoptable
1.016	S135	1350	Manhole	Adoptable	S188	1350	Manhole	Adoptable
17.003	S158	1350	Manhole	Adoptable	S197	1200	Manhole	Adoptable
17.004	S197	1200	Manhole	Adoptable	S147	1200	Manhole	Adoptable
17.005	S147	1200	Manhole	Adoptable	S148	1350	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
17.006	63.525	28.1	300	Circular	126.816	125.061	1.455	125.138	122.803	2.035
17.007	9.307	23.1	300	Circular	125.138	122.803	2.035	125.015	122.400	2.315
19.000	30.640	68.1	225	Circular	125.725	123.410	2.090	124.795	122.960	1.610
19.001	42.152	33.2	225	Circular	124.795	122.960	1.610	123.645	121.690	1.730
19.002	17.759	60.2	225	Circular	123.645	121.690	1.730	123.981	121.395	2.361
19.003	22.334	301.8	300	Circular	123.981	121.395	2.286	125.015	121.321	3.394
1.017	14.557	18.0	450	Circular	125.015	120.024	4.541	123.959	119.215	4.294
1.018	7.950	20.0	450	Circular	123.959	119.215	4.294	122.862	118.818	3.594
1.019	10.163	10163.0	450	Circular	122.862	118.818	3.594	121.942	118.817	2.675
1.020	28.024	19.0	450	Circular	121.942	118.817	2.675	119.424	117.340	1.634
1.021	35.052	105.9	450	Circular	119.424	115.703	3.271	117.639	115.372	1.817
1.022	12.832	346.8	450	Circular	117.639	115.372	1.817	118.228	115.335	2.443
1.023	16.831	85.9	450	Circular	118.228	114.396	3.382	115.903	114.200	1.253

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
17.006	S148	1350	Manhole	Adoptable	S202	1200	Manhole	Adoptable
17.007	S202	1200	Manhole	Adoptable	S188	1350	Manhole	Adoptable
19.000	S156	1200	Manhole	Adoptable	S155	1200	Manhole	Adoptable
19.001	S155	1200	Manhole	Adoptable	S154	1200	Manhole	Adoptable
19.002	S154	1200	Manhole	Adoptable	S203	1200	Manhole	Adoptable
19.003	S203	1200	Manhole	Adoptable	S188	1350	Manhole	Adoptable
1.017	S188	1350	Manhole	Adoptable	S919	1350	Manhole	Adoptable
1.018	S919	1350	Manhole	Adoptable	S920	1350	Manhole	Adoptable
1.019	S920	1350	Manhole	Adoptable	S138	2100	Manhole	Adoptable
1.020	S138	2100	Manhole	Adoptable	S194	1350	Manhole	Adoptable
1.021	S194	1350	Manhole	Adoptable	S208	1350	Manhole	Adoptable
1.022	S208	1350	Manhole	Adoptable	S196	1350	Manhole	Adoptable
1.023	S196	1350	Manhole	Adoptable	S12	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S200	569522.266	574890.760	128.202	1.522	1350	0	1.000	126.680	225
S199	569500.306	574876.990	127.624	1.624	1350	1	1.000	126.000	225
						0	1.001	126.000	225
S198	569432.909	574926.310	127.046	1.576	1350	0	2.000	125.470	300
S91	569456.559	574861.562	126.700	1.880	1350	1	2.000	124.820	300
						2	1.001	124.820	225
						0	1.002	124.820	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S92	569403.213	574842.261	126.071	1.633	1200	1	1.002	124.438	300
						0	1.003	124.438	300
S205	569388.300	574883.815	126.297	2.199	1200	1	1.003	124.098	300
						0	1.004	124.098	300
S96	569490.324	574914.539	128.085	1.998	1350				
						0	3.003	126.087	225
S180	569466.486	574949.975	127.556	1.929	1200	1	3.003	125.627	225
						0	3.004	125.627	300
S98	569417.021	574932.188	126.957	1.935	1200	1	3.004	125.022	300
						0	3.005	125.022	300
S93	569376.258	574917.542	126.119	2.332	1200	1	3.005	123.787	300
						2	1.004	123.787	300
						0	1.005	123.787	375
S917	569373.998	574923.954	126.061	2.661	1350	1	1.005	123.400	375
						0	1.006	123.400	375
S915	569369.131	574929.228	125.920	3.020	1350	1	1.006	122.901	375
						0	1.007	122.900	450
S101	569396.652	574839.831	126.020	1.425	1350				
						0	4.003	124.595	225
S102	569358.792	574826.079	125.733	1.704	1350	1	4.003	124.029	225
						0	4.004	124.029	225
S103	569349.314	574829.914	125.666	1.865	1350	1	4.004	123.801	225
						0	4.005	123.801	300
S104	569337.159	574863.522	125.419	1.872	1350	1	4.005	123.622	300
						0	4.006	123.547	375
S107	569322.205	574905.416	125.165	1.840	1350	1	4.006	123.325	375
						0	4.007	123.325	450

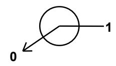
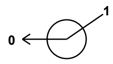
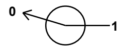
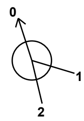
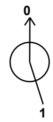
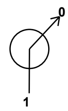
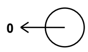
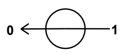
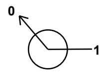
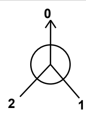
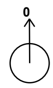
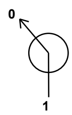
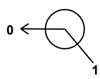
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S189	569328.471	574914.818	125.205	2.985	1350	1	4.007	123.268	450
						2	1.007	122.220	450
						0	1.008	122.220	450
N5 S91	569377.735	574940.551	125.107	2.599	1350	0	5.000	122.508	450
N5 S81	569351.962	574941.141	123.377	1.377	1350	1	5.000	122.000	450
						0	5.001	122.000	450
S916	569317.711	574930.877	124.700	2.863	1350	1	5.001	121.837	450
						2	1.008	121.837	450
						0	1.009	121.837	450
S125	569446.133	575030.002	128.367	1.948	1350	0	6.003	126.419	225
S122	569406.182	575057.870	129.257	1.800	1350	0	8.000	127.457	225
S121	569406.032	575030.038	128.062	1.895	1350	1	8.000	126.167	225
						2	6.003	126.167	225
						0	6.004	126.167	225
S195	569448.157	574971.502	127.146	1.462	1350	0	9.004	125.684	225
S123	569411.829	574971.525	126.271	1.536	1350	1	9.004	124.735	225
						0	9.005	124.735	300
S120	569406.545	574978.469	126.031	1.781	1350	1	9.005	124.250	300
						2	6.004	124.250	225
						0	6.005	124.250	300
S914	569359.978	574978.226	124.769	1.425	1350	0	10.000	123.344	225
S192	569383.400	574978.112	125.440	3.245	1350	1	10.000	123.227	225
						2	6.005	123.227	300
						0	6.006	122.195	375
S201	569383.525	574964.972	125.228	4.175	1350	1	6.006	121.053	375
						0	6.007	121.053	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S918	569309.448	574965.004	123.600	2.547	1350	1	6.007	121.053	450
						0	6.008	121.053	450
S174	569304.565	574963.138	124.055	3.028	1800	1	6.008	121.027	450
						2	1.009	121.027	450
						0	1.010	121.027	450
S126	569347.729	575055.195	127.898	3.808	1350	0	11.000	124.090	300
S145	569347.549	575017.070	126.110	3.420	1350	1	11.000	122.690	300
						0	11.001	122.690	375
S112	569347.546	574977.642	124.472	2.314	1200	1	11.001	122.158	375
						0	11.002	122.158	300
S183	569299.326	574976.694	123.813	2.823	1350	1	11.002	120.990	300
						2	1.010	120.990	450
						0	1.011	120.990	450
S157	569289.116	575018.443	124.425	3.542	1350	1	1.011	120.883	450
						0	1.012	120.883	450
S140	569440.480	575124.366	129.426	1.526	1350	0	12.000	127.900	300
S141	569384.165	575124.190	130.021	2.470	1200	1	12.000	127.551	300
						0	12.001	127.551	300
S127	569440.888	575068.678	129.166	2.251	1200	0	14.003	126.915	300
S128	569384.287	575068.544	129.218	2.576	1200	1	14.003	126.642	300
						2	12.001	126.642	300
						0	12.002	126.642	300
S176	569370.117	575068.411	128.959	3.061	1200	1	12.002	126.593	300
						0	12.003	125.898	300
S175	569366.101	575076.533	129.027	3.329	1350	1	12.003	125.698	300
						0	12.004	125.698	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S118	569349.963	575076.588	128.513	2.815	1350		1	12.004	125.698	300
							0	12.005	125.698	375
S179	569337.950	575068.285	128.064	2.684	1350		1	12.005	125.380	375
							0	12.006	125.380	375
S185	569289.032	575068.278	126.372	3.462	1350		1	12.006	122.910	375
							0	12.007	122.910	375
S130	569276.390	575072.095	125.685	4.940	1350		1	12.007	122.705	375
							2	1.012	120.745	450
							0	1.013	120.745	450
S186	569273.629	575080.698	125.432	4.710	1350		1	1.013	120.722	450
							0	1.014	120.722	450
S187	569273.888	575128.190	125.413	4.809	1350		1	1.014	120.604	450
							0	1.015	120.604	450
S142	569371.672	575124.608	129.772	3.632	1200					
							0	15.002	126.140	300
S912	569334.190	575124.679	128.175	3.009	1200		1	15.002	125.166	300
							0	15.003	125.166	300
S204	569286.283	575124.382	125.920	2.270	1200		1	15.003	123.650	300
							0	15.004	123.650	300
S135	569278.682	575133.296	125.582	4.996	1350		1	15.004	123.100	300
							2	1.015	120.586	450
							0	1.016	120.586	450
S158	569412.891	575134.836	129.463	1.503	1350					
							0	17.003	127.960	225
S197	569412.674	575175.897	128.494	1.964	1200		1	17.003	126.530	225
							0	17.004	126.530	225
S147	569406.613	575183.071	128.260	2.090	1200		1	17.004	126.245	225
							0	17.005	126.170	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S148	569351.209	575183.485	126.816	1.755	1350	1	17.005	125.061	300
						0	17.006	125.061	300
S202	569287.684	575183.641	125.138	2.335	1200	1	17.006	122.803	300
						0	17.007	122.803	300
S156	569321.515	575190.438	125.725	2.315	1200	0	19.000	123.410	225
S155	569321.359	575221.078	124.795	1.835	1200	1	19.000	122.960	225
						0	19.001	122.960	225
S154	569279.207	575220.798	123.645	1.955	1200	1	19.001	121.690	225
						0	19.002	121.690	225
S203	569279.369	575203.039	123.981	2.586	1200	1	19.002	121.395	225
						0	19.003	121.395	300
S188	569278.849	575180.712	125.015	4.991	1350	1	19.003	121.321	300
						2	17.007	122.400	300
						3	1.016	120.058	450
						0	1.017	120.024	450
S919	569264.293	575180.823	123.959	4.744	1350	1	1.017	119.215	450
						0	1.018	119.215	450
S920	569257.173	575177.285	122.862	4.044	1350	1	1.018	118.818	450
						0	1.019	118.818	450
S138	569252.555	575168.232	121.942	3.125	2100	1	1.019	118.817	450
						0	1.020	118.817	450
S194	569236.901	575191.475	119.424	3.721	1350	1	1.020	117.340	450
						0	1.021	115.703	450
S208	569227.906	575225.353	117.639	2.267	1350	1	1.021	115.372	450
						0	1.022	115.372	450
S196	569215.094	575224.639	118.228	3.832	1350	1	1.022	115.335	450
						0	1.023	114.396	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S12	569213.944	575241.431	115.903	1.703	1350	1	1.023	114.200	450

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	Scotland and Ireland	Drain Down Time (mins)	240
M5-60 (mm)	18.300	Additional Storage (m^3/ha)	0.0
Ratio-R	0.252	Starting Level (m)	
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160
30	120	240	480	720	1440	2880

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	20	0	0
100	20	0	0

Node S174 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	121.027	Product Number	CTL-SHE-0178-1700-1500-1700
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	17.0	Min Node Diameter (mm)	1800

Node S118 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	125.698	Product Number	CTL-SHE-0045-1000-1200-1000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node S138 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	118.817	Product Number	CTL-SHE-0210-2600-1900-2600
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	26.0	Min Node Diameter (mm)	2100

Node S175 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	125.698
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	358.9	0.0	1.500	359.7	0.0	1.501	0.0	0.0

Node S201 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	121.053
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1132.4	0.0	1.800	1134.2	0.0	1.801	0.0	0.0

Node S920 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	118.818
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	758.2	0.0	2.200	759.6	0.0	2.201	0.0	0.0

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S200	1	126.680	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S199	11	126.033	0.033	3.6	0.0466	0.0000	OK
15 minute summer	S198	1	125.470	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S91	12	125.129	0.309	70.7	0.4415	0.0000	SURCHARGED
15 minute winter	S92	11	124.958	0.519	110.2	0.5875	0.0000	SURCHARGED
15 minute winter	S205	11	124.464	0.366	107.9	0.4141	0.0000	SURCHARGED
15 minute summer	S96	1	126.087	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S180	11	125.673	0.046	5.9	0.0521	0.0000	OK
15 minute winter	S98	10	125.117	0.095	39.3	0.1079	0.0000	OK
15 minute winter	S93	11	124.007	0.220	194.0	0.2489	0.0000	OK
15 minute winter	S917	11	123.601	0.201	194.7	0.2875	0.0000	OK
15 minute winter	S915	13	123.143	0.243	194.9	0.3474	0.0000	OK
15 minute summer	S101	1	124.595	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S102	10	124.137	0.108	29.6	0.1546	0.0000	OK
15 minute winter	S103	11	123.936	0.135	29.1	0.1936	0.0000	OK
15 minute winter	S104	11	123.692	0.145	42.2	0.2074	0.0000	OK
15 minute winter	S107	11	123.541	0.216	84.5	0.3088	0.0000	OK
15 minute winter	S189	13	123.006	0.786	301.8	1.1250	0.0000	SURCHARGED
15 minute winter	N5 S91	13	122.807	0.299	19.3	0.4276	0.0000	OK
15 minute winter	N5 S81	13	122.818	0.818	87.7	1.1705	0.0000	SURCHARGED
15 minute winter	S916	13	122.805	0.968	288.4	1.3854	0.0000	SURCHARGED
15 minute summer	S125	1	126.419	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S122	1	127.457	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S121	10	126.290	0.123	55.5	0.1762	0.0000	OK
15 minute winter	S195	10	125.712	0.028	2.6	0.0400	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S200	1.000	S199	0.0	0.000	0.000	0.0444	
15 minute winter	S199	1.001	S91	3.5	0.167	0.045	1.0043	
15 minute summer	S198	2.000	S91	0.0	0.000	0.000	2.1269	
15 minute winter	S91	1.002	S92	62.1	0.966	0.722	3.9949	
15 minute winter	S92	1.003	S205	102.0	1.449	1.110	3.1089	
15 minute winter	S205	1.004	S93	105.5	1.803	1.081	2.2529	
15 minute summer	S96	3.003	S180	0.0	0.000	0.000	0.1206	
15 minute winter	S180	3.004	S98	5.7	0.451	0.050	0.6819	
15 minute winter	S98	3.005	S93	38.4	1.037	0.217	1.6133	
15 minute winter	S93	1.005	S917	194.7	3.059	0.430	0.4328	
15 minute winter	S917	1.006	S915	194.9	3.008	0.389	0.4714	
15 minute winter	S915	1.007	S189	194.6	1.791	0.502	5.2978	
15 minute summer	S101	4.003	S102	0.0	0.000	0.000	0.3640	
15 minute winter	S102	4.004	S103	29.1	1.344	0.400	0.2212	
15 minute winter	S103	4.005	S104	28.9	0.961	0.390	1.0742	
15 minute winter	S104	4.006	S107	42.2	0.806	0.315	2.3335	
15 minute winter	S107	4.007	S189	84.6	1.202	0.385	0.7950	
15 minute winter	S189	1.008	S916	288.4	2.400	0.663	3.0629	
15 minute winter	N5 S91	5.000	N5 S81	19.4	0.181	0.045	3.4827	
15 minute winter	N5 S81	5.001	S916	-74.7	0.921	-0.358	5.6653	
15 minute winter	S916	1.009	S174	266.6	1.683	0.566	5.5195	
15 minute summer	S125	6.003	S121	0.0	0.000	0.000	0.4304	
15 minute summer	S122	8.000	S121	0.0	0.000	0.000	0.2987	
15 minute winter	S121	6.004	S120	54.3	1.991	0.579	1.3979	
15 minute winter	S195	9.004	S123	2.5	0.384	0.032	0.2581	

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S123	10	124.809	0.074	33.0	0.1061	0.0000	OK
15 minute winter	S120	10	124.419	0.169	117.6	0.2418	0.0000	OK
15 minute winter	S914	10	123.495	0.151	25.6	0.2161	0.0000	OK
15 minute winter	S192	7	123.127	0.932	155.0	1.3339	0.0000	SURCHARGED
2880 minute winter	S201	2820	122.265	1.212	19.1	1374.9620	0.0000	SURCHARGED
15 minute winter	S918	13	122.346	1.293	251.0	1.8507	0.0000	SURCHARGED
15 minute winter	S174	13	122.448	1.421	266.6	3.6172	0.0000	SURCHARGED
15 minute winter	S126	10	124.114	0.024	2.6	0.0343	0.0000	OK
15 minute winter	S145	10	122.806	0.116	45.2	0.1665	0.0000	OK
15 minute winter	S112	11	122.292	0.133	67.4	0.1509	0.0000	OK
15 minute winter	S183	12	121.840	0.850	131.2	1.2167	0.0000	SURCHARGED
15 minute winter	S157	12	121.747	0.864	157.0	1.2364	0.0000	SURCHARGED
15 minute summer	S140	1	127.900	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S141	10	127.646	0.095	29.6	0.1069	0.0000	OK
15 minute winter	S127	11	127.036	0.121	11.3	0.1365	0.0000	OK
15 minute winter	S128	11	127.015	0.373	105.4	0.4224	0.0000	SURCHARGED
15 minute winter	S176	7	126.570	0.672	103.9	0.7601	0.0000	SURCHARGED
2880 minute winter	S175	2760	126.415	0.717	13.1	258.3481	0.0000	SURCHARGED
2880 minute winter	S118	2760	126.415	0.717	1.1	1.0254	0.0000	SURCHARGED
15 minute winter	S179	10	125.434	0.054	19.4	0.0777	0.0000	OK
15 minute winter	S185	10	123.027	0.117	43.4	0.1680	0.0000	OK
15 minute winter	S130	12	121.567	0.822	192.6	1.1767	0.0000	SURCHARGED
15 minute winter	S186	12	121.488	0.766	194.8	1.0967	0.0000	SURCHARGED
15 minute winter	S187	12	121.226	0.622	207.3	0.8894	0.0000	SURCHARGED
15 minute summer	S142	1	126.140	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S123	9.005	S120	32.8	1.228	0.133	0.2373	
15 minute winter	S120	6.005	S192	115.7	2.989	0.525	0.8978	
15 minute winter	S914	10.000	S192	24.8	0.953	0.723	0.6134	
15 minute winter	S192	6.006	S201	156.4	5.004	0.279	0.7345	
2880 minute winter	S201	6.007	S918	-11.8	-0.364	-0.074	11.7370	
15 minute winter	S918	6.008	S174	-251.0	-1.584	-1.152	0.8282	
15 minute winter	S174	1.010	S183	24.9	0.545	0.160	2.3027	
15 minute winter	S126	11.000	S145	2.5	0.207	0.013	0.5308	
15 minute winter	S145	11.001	S112	44.4	1.386	0.201	1.2653	
15 minute winter	S112	11.002	S183	66.2	1.133	0.406	2.4282	
15 minute winter	S183	1.011	S157	127.0	0.867	0.824	6.8097	
15 minute winter	S157	1.012	S130	158.8	1.002	1.028	8.7367	
15 minute summer	S140	12.000	S141	0.0	0.000	0.000	0.5166	
15 minute winter	S141	12.001	S128	28.6	0.536	0.213	2.4878	
15 minute winter	S127	14.003	S128	-11.3	-0.226	-0.155	2.7428	
15 minute winter	S128	12.002	S176	95.3	1.379	1.548	0.9270	
15 minute winter	S176	12.003	S175	104.3	2.803	0.670	0.3356	
2880 minute winter	S175	12.004	S118	1.1	0.049	0.016	1.1364	
2880 minute winter	S118	12.005	S179	0.8	0.614	0.003	0.0227	
15 minute winter	S179	12.006	S185	19.1	1.008	0.045	0.9600	
15 minute winter	S185	12.007	S130	42.4	1.531	0.179	0.3669	
15 minute winter	S130	1.013	S186	194.8	1.230	1.250	1.4315	
15 minute winter	S186	1.014	S187	199.6	1.260	1.296	7.5250	
15 minute winter	S187	1.015	S135	212.3	1.442	1.355	1.1096	
15 minute summer	S142	15.002	S912	0.0	0.000	0.000	0.2590	

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S912	10	125.243	0.077	27.3	0.0873	0.0000	OK
15 minute winter	S204	10	123.780	0.130	73.1	0.1474	0.0000	OK
15 minute winter	S135	12	121.143	0.557	271.9	0.7970	0.0000	SURCHARGED
15 minute summer	S158	1	127.960	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S197	10	126.666	0.136	47.3	0.1535	0.0000	OK
15 minute winter	S147	10	126.285	0.115	46.5	0.1301	0.0000	OK
15 minute winter	S148	11	125.205	0.144	93.5	0.2063	0.0000	OK
15 minute winter	S202	11	123.004	0.201	128.8	0.2273	0.0000	OK
15 minute summer	S156	1	123.410	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S155	10	123.067	0.106	38.8	0.1204	0.0000	OK
15 minute winter	S154	11	122.245	0.555	72.0	0.6275	0.0000	SURCHARGED
15 minute winter	S203	11	121.783	0.388	91.3	0.4389	0.0000	SURCHARGED
15 minute winter	S188	10	120.751	0.727	528.2	1.0409	0.0000	SURCHARGED
15 minute winter	S919	8	120.498	1.283	533.2	1.8361	0.0000	SURCHARGED
1440 minute winter	S920	1320	120.211	1.393	115.5	1059.0450	0.0000	SURCHARGED
1440 minute winter	S138	1320	120.210	1.393	26.6	4.8263	0.0000	SURCHARGED
120 minute summer	S194	278	115.793	0.090	26.0	0.1287	0.0000	OK
120 minute summer	S208	278	115.498	0.126	26.0	0.1806	0.0000	OK
120 minute summer	S196	278	114.486	0.090	26.0	0.1286	0.0000	OK
60 minute winter	S12	87	114.285	0.085	26.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S912	15.003	S204	26.8	1.240	0.144	1.0457	
15 minute winter	S204	15.004	S135	72.1	2.640	0.318	0.3200	
15 minute winter	S135	1.016	S188	284.8	2.146	0.874	7.5128	
15 minute summer	S158	17.003	S197	0.0	0.000	0.000	0.4941	
15 minute winter	S197	17.004	S147	46.5	2.007	0.549	0.2177	
15 minute winter	S147	17.005	S148	45.9	1.578	0.310	1.6139	
15 minute winter	S148	17.006	S202	91.8	2.195	0.465	2.6564	
15 minute winter	S202	17.007	S188	128.3	2.841	0.588	0.4196	
15 minute summer	S156	19.000	S155	0.0	0.000	0.000	0.2733	
15 minute winter	S155	19.001	S154	38.2	1.219	0.453	1.2277	
15 minute winter	S154	19.002	S203	68.7	1.728	1.096	0.7063	
15 minute winter	S203	19.003	S188	91.3	1.327	1.515	1.4484	
15 minute winter	S188	1.017	S919	533.2	3.416	0.732	2.3065	
15 minute winter	S919	1.018	S920	538.9	4.474	0.781	0.9288	
1440 minute winter	S920	1.019	S138	26.6	0.220	0.867	1.6103	
1440 minute winter	S138	1.020	S194	26.0	2.083	0.037	0.3496	
120 minute summer	S194	1.021	S208	26.0	0.890	0.087	1.0311	
120 minute summer	S208	1.022	S196	26.0	0.788	0.157	0.4236	
120 minute summer	S196	1.023	S12	26.0	1.200	0.078	0.3647	481.6

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.37%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S200	1	126.680	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S199	11	126.037	0.037	4.7	0.0529	0.0000	OK
15 minute winter	S198	13	125.650	0.180	22.5	0.2577	0.0000	OK
15 minute winter	S91	12	125.623	0.803	91.9	1.1491	0.0000	SURCHARGED
15 minute winter	S92	12	125.438	1.000	122.9	1.1308	0.0000	SURCHARGED
15 minute winter	S205	12	124.832	0.734	127.0	0.8306	0.0000	SURCHARGED
15 minute summer	S96	1	126.087	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S180	11	125.679	0.052	7.7	0.0592	0.0000	OK
15 minute winter	S98	10	125.132	0.110	51.2	0.1241	0.0000	OK
15 minute winter	S93	12	124.271	0.484	237.8	0.5470	0.0000	SURCHARGED
15 minute winter	S917	12	124.086	0.686	231.9	0.9817	0.0000	SURCHARGED
15 minute winter	S915	13	123.902	1.002	230.7	1.4340	0.0000	SURCHARGED
15 minute summer	S101	1	124.595	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S102	10	124.158	0.129	38.4	0.1847	0.0000	OK
15 minute winter	S103	11	123.959	0.158	37.7	0.2265	0.0000	OK
15 minute winter	S104	11	123.715	0.168	54.8	0.2399	0.0000	OK
15 minute winter	S107	13	123.680	0.355	110.2	0.5074	0.0000	OK
15 minute winter	S189	13	123.665	1.444	330.8	2.0670	0.0000	SURCHARGED
15 minute winter	N5 S91	13	123.373	0.864	38.4	1.2371	0.0000	SURCHARGED
15 minute winter	N5 S81	13	123.373	1.373	99.0	1.9651	0.0000	FLOOD RISK
15 minute winter	S916	13	123.368	1.531	320.5	2.1902	0.0000	SURCHARGED
15 minute summer	S125	1	126.419	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S122	1	127.457	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S121	10	126.313	0.146	72.0	0.2089	0.0000	OK
15 minute winter	S195	10	125.716	0.032	3.4	0.0453	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S200	1.000	S199	0.0	0.000	0.000	0.0538	
15 minute winter	S199	1.001	S91	4.5	0.171	0.058	1.0209	
15 minute winter	S198	2.000	S91	-22.5	-0.412	-0.221	3.9488	
15 minute winter	S91	1.002	S92	75.2	1.068	0.875	3.9949	
15 minute winter	S92	1.003	S205	119.8	1.702	1.304	3.1089	
15 minute winter	S205	1.004	S93	122.7	1.842	1.257	2.5219	
15 minute summer	S96	3.003	S180	0.0	0.000	0.000	0.1450	
15 minute winter	S180	3.004	S98	7.4	0.484	0.065	0.8258	
15 minute winter	S98	3.005	S93	50.2	1.132	0.284	2.0003	
15 minute winter	S93	1.005	S917	231.9	3.110	0.512	0.7499	
15 minute winter	S917	1.006	S915	230.7	2.944	0.461	0.7915	
15 minute winter	S915	1.007	S189	207.9	1.779	0.536	6.8348	
15 minute summer	S101	4.003	S102	0.0	0.000	0.000	0.4549	
15 minute winter	S102	4.004	S103	37.7	1.425	0.520	0.2704	
15 minute winter	S103	4.005	S104	37.5	1.033	0.506	1.2986	
15 minute winter	S104	4.006	S107	55.0	0.862	0.410	3.3045	
15 minute winter	S107	4.007	S189	110.0	1.266	0.502	1.5924	
15 minute winter	S189	1.008	S916	319.0	2.391	0.734	3.0629	
15 minute winter	N5 S91	5.000	N5 S81	-38.4	-0.314	-0.088	4.0847	
15 minute winter	N5 S81	5.001	S916	-86.0	0.921	-0.412	5.6653	
15 minute winter	S916	1.009	S174	319.7	2.018	0.679	5.5195	
15 minute summer	S125	6.003	S121	0.0	0.000	0.000	0.5269	
15 minute summer	S122	8.000	S121	0.0	0.000	0.000	0.3657	
15 minute winter	S121	6.004	S120	70.5	2.132	0.752	1.6776	
15 minute winter	S195	9.004	S123	3.3	0.412	0.042	0.3098	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.37%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S123	10	124.820	0.085	43.0	0.1213	0.0000	OK
15 minute winter	S120	10	124.454	0.203	152.9	0.2912	0.0000	OK
15 minute winter	S914	10	123.530	0.186	33.3	0.2656	0.0000	OK
15 minute winter	S192	6	123.323	1.128	201.7	1.6146	0.0000	SURCHARGED
2880 minute winter	S201	2820	122.474	1.421	24.0	1611.8640	0.0000	SURCHARGED
15 minute winter	S918	12	122.707	1.654	306.8	2.3672	0.0000	SURCHARGED
15 minute winter	S174	12	122.855	1.828	319.7	4.6510	0.0000	SURCHARGED
15 minute winter	S126	10	124.117	0.027	3.4	0.0388	0.0000	OK
15 minute winter	S145	13	122.940	0.249	58.8	0.3570	0.0000	OK
15 minute winter	S112	12	122.910	0.752	88.6	0.8500	0.0000	SURCHARGED
15 minute winter	S183	12	122.750	1.760	147.9	2.5190	0.0000	SURCHARGED
15 minute winter	S157	12	122.668	1.785	181.2	2.5549	0.0000	SURCHARGED
15 minute summer	S140	1	127.900	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S141	10	127.660	0.109	38.4	0.1229	0.0000	OK
15 minute winter	S127	11	127.171	0.256	17.2	0.2892	0.0000	OK
15 minute winter	S128	11	127.161	0.519	137.1	0.5873	0.0000	SURCHARGED
15 minute winter	S176	6	126.757	0.859	136.8	0.9718	0.0000	SURCHARGED
2880 minute winter	S175	2760	126.598	0.900	11.8	324.5312	0.0000	SURCHARGED
2880 minute winter	S118	2760	126.598	0.900	1.5	1.2879	0.0000	SURCHARGED
15 minute winter	S179	10	125.442	0.062	25.3	0.0884	0.0000	OK
15 minute winter	S185	10	123.046	0.136	56.5	0.1950	0.0000	OK
15 minute winter	S130	12	122.485	1.740	221.2	2.4905	0.0000	SURCHARGED
15 minute winter	S186	12	122.396	1.674	233.4	2.3952	0.0000	SURCHARGED
15 minute winter	S187	11	122.138	1.534	252.3	2.1950	0.0000	SURCHARGED
15 minute summer	S142	1	126.140	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S123	9.005	S120	42.7	1.286	0.173	0.2931	
15 minute winter	S120	6.005	S192	150.7	3.151	0.684	1.1091	
15 minute winter	S914	10.000	S192	32.2	1.019	0.936	0.7405	
15 minute winter	S192	6.006	S201	202.9	5.148	0.362	0.7413	
2880 minute winter	S201	6.007	S918	-15.2	-0.367	-0.096	11.7370	
15 minute winter	S918	6.008	S174	-306.8	-1.937	-1.409	0.8282	
15 minute winter	S174	1.010	S183	24.6	0.584	0.158	2.3027	
15 minute winter	S126	11.000	S145	3.3	0.221	0.017	1.2415	
15 minute winter	S145	11.001	S112	58.7	1.442	0.266	3.7092	
15 minute winter	S112	11.002	S183	96.1	1.365	0.590	3.3963	
15 minute winter	S183	1.011	S157	159.2	1.005	1.033	6.8097	
15 minute winter	S157	1.012	S130	192.9	1.217	1.248	8.7367	
15 minute summer	S140	12.000	S141	0.0	0.000	0.000	0.6261	
15 minute winter	S141	12.001	S128	37.3	0.675	0.278	2.5992	
15 minute winter	S127	14.003	S128	-17.2	-0.335	-0.236	3.8033	
15 minute winter	S128	12.002	S176	125.6	1.785	2.039	0.9697	
15 minute winter	S176	12.003	S175	137.1	2.630	0.881	0.4230	
2880 minute winter	S175	12.004	S118	1.5	0.049	0.021	1.1364	
2880 minute winter	S118	12.005	S179	0.9	0.633	0.003	0.0234	
15 minute winter	S179	12.006	S185	24.9	1.074	0.058	1.1730	
15 minute winter	S185	12.007	S130	55.2	1.637	0.233	0.4474	
15 minute winter	S130	1.013	S186	233.4	1.473	1.498	1.4315	
15 minute winter	S186	1.014	S187	245.6	1.550	1.595	7.5250	
15 minute winter	S187	1.015	S135	265.7	1.677	1.697	1.1096	
15 minute summer	S142	15.002	S912	0.0	0.000	0.000	0.3126	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.37%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S912	10	125.254	0.088	35.4	0.0997	0.0000	OK
15 minute winter	S204	10	123.804	0.154	94.9	0.1737	0.0000	OK
15 minute winter	S135	11	122.064	1.478	316.7	2.1147	0.0000	SURCHARGED
15 minute summer	S158	1	127.960	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S197	10	126.695	0.165	61.5	0.1863	0.0000	OK
15 minute winter	S147	10	126.303	0.133	60.5	0.1503	0.0000	OK
15 minute winter	S148	11	125.230	0.169	121.5	0.2414	0.0000	OK
15 minute winter	S202	11	123.055	0.252	167.6	0.2849	0.0000	OK
15 minute summer	S156	1	123.410	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S155	11	123.112	0.151	50.4	0.1713	0.0000	OK
15 minute winter	S154	11	122.669	0.979	90.9	1.1074	0.0000	SURCHARGED
15 minute winter	S203	11	121.930	0.535	116.2	0.6051	0.0000	SURCHARGED
15 minute winter	S188	11	121.507	1.483	650.9	2.1221	0.0000	SURCHARGED
15 minute winter	S919	7	120.675	1.460	653.9	2.0889	0.0000	SURCHARGED
2160 minute winter	S920	1740	120.550	1.732	64.0	1316.9400	0.0000	SURCHARGED
2160 minute winter	S138	1740	120.549	1.732	26.4	6.0000	0.0000	SURCHARGED
30 minute winter	S194	45	115.793	0.090	26.0	0.1287	0.0000	OK
30 minute winter	S208	46	115.498	0.126	26.0	0.1806	0.0000	OK
30 minute winter	S196	46	114.486	0.090	26.0	0.1286	0.0000	OK
30 minute winter	S12	46	114.285	0.085	26.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S912	15.003	S204	34.8	1.310	0.187	1.2823	
15 minute winter	S204	15.004	S135	93.7	2.801	0.413	0.3921	
15 minute winter	S135	1.016	S188	327.2	2.246	1.004	7.5128	
15 minute summer	S158	17.003	S197	0.0	0.000	0.000	0.6146	
15 minute winter	S197	17.004	S147	60.5	2.107	0.713	0.2690	
15 minute winter	S147	17.005	S148	59.7	1.684	0.403	1.9636	
15 minute winter	S148	17.006	S202	119.2	2.277	0.604	3.3018	
15 minute winter	S202	17.007	S188	166.9	2.949	0.765	0.5226	
15 minute summer	S156	19.000	S155	0.0	0.000	0.000	0.3830	
15 minute winter	S155	19.001	S154	47.0	1.308	0.556	1.4374	
15 minute winter	S154	19.002	S203	86.9	2.185	1.386	0.7063	
15 minute winter	S203	19.003	S188	116.0	1.653	1.924	1.5129	
15 minute winter	S188	1.017	S919	653.9	4.127	0.898	2.3065	
15 minute winter	S919	1.018	S920	661.0	5.258	0.958	1.0945	
2160 minute winter	S920	1.019	S138	26.4	0.220	0.861	1.6103	
2160 minute winter	S138	1.020	S194	26.0	2.083	0.037	0.3496	
30 minute winter	S194	1.021	S208	26.0	0.890	0.087	1.0311	
30 minute winter	S208	1.022	S196	26.0	0.788	0.157	0.4236	
30 minute winter	S196	1.023	S12	26.0	1.200	0.078	0.3647	391.5

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