Engineering Assessment Report

Proposed Large-Scale Residential Development at Rathmullan, Drogheda, Co. Meath.

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This document has been prepared and checked in accordance with
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Comments

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Content

1. Introduction

This report has been prepared by Waterman Moylan Consulting Engineers, on behalf of Earlsfort Developments Drogheda Limited, for a proposed large-scale residential development at Rathmullan, Drogheda, Co. Meath, situated to the west of Drogheda town centre. This report describes the criteria used to design the stormwater discharge, disposal of foul water, water supply and vehicular access to the developed site. The proposal relates to a residential development of 249 No. residential units and a creche for which this report will show is suitable for a residential development.

1.1 Site Location and Description

The site is located on Rathmullan Road in Drogheda, Co. Meath. The site is situated approximately 2.5 km west of Drogheda town centre. The proposed development is bounded to the south by agricultural land. The site is bound to the east by existing residential development, consisting of two-storey terraced houses and three-storey duplexes. The site is bound to the north by Rathmullan Road, the Boyne Greenway and the Boyne River. To the west the site is bound by agricultural land, and the M1 Motorway is c. 500m away from the vicinity of the site in the same direction. The proposed development will be accessed from Rathmullan Road via a new signal-controlled four-arm junction.

The proposed site area within the proposed red line boundary is approximately 9.20 hectares. The current agricultural lands exhibit a general slope from the south-west to the north-east towards the River Boyne, with existing ground levels ranging from 30 m to 6m OD Malin within the proposed red line boundary. Access to the site is currently facilitated through an existing entrance located off the Rathmullan Road to the east of the overall site.

Please refer to Waterman Moylan drawing No. 18-014-P401 – Rev A for the exact site location and surrounding lands as outlined above.

Figure 1: Proposed Development Location

1.2 Description of the Proposed Development

The proposed development includes (i) demolition/removal of all existing farm buildings/structures and associated hard standing on site; (ii) construction of a large-scale residential development (LRD) of 249 no. units comprising 170 no. two-storey houses (including 37 no. two-bedroom houses, 111 no. three-bedroom houses and 22 no. four-bedroom houses), 16 no. three-storey duplex buildings (accommodating 16 no. one-bedroom and 16 no. two-bedroom units) and a mix of 8 no. three-storey and 3 no. four-storey apartments blocks accommodating a total of 22 no. one-bedroom and 25 no. two-bedroom apartments); (iii) construction of a new vehicular entrance and access road off Rathmullan Road with associated junction works and associated internal access road network with pedestrian and cyclist infrastructure; (iv) provision of a three-storey creche facility (411sq.m) with external play areas at ground and second floor levels and vehicular/bicycle parking area; and, (v) all ancillary site and infrastructural works, inclusive of removal of existing vehicular entrances, general landscaping and public open space provision, vehicular parking provision (396 no. spaces in total), bicycle parking, boundary treatments, foul/surface water drainage, attenuation areas, provision of a pumping station and provision of an ESB substation, as necessary to facilitate the proposed development. Each house will be served by vehicular parking to the front and private amenity space in the form of a rear garden. Each duplex building will be served by vehicular parking to the front and private amenity space in the form of balcony/terrace spaces to the rear. Each apartment block

will have shared access to adjoining car parking bays with communal amenity space and bicycle/bin stores provided to the rear and each apartment will be provided with private amenity space in the form of a balcony or terrace. The development includes provision of a landscaped area of public open space to the north of the site, with 2 no. pedestrian/cyclist connections (via the northern/eastern site boundaries) to Rathmullan Road which will be subsequently ceded to Meath County Council. The application is accompanied by a Natura Impact Statement (NIS) and an Environmental Impact Assessment Report (EIAR).

The application for this development also includes all the necessary associated infrastructure to service the above. This includes the installation of a network of foul water and storm water pipes, watermains, and a network of roads and footpaths.

The proposed estate road levels around the site, range from 19m to 30.20m. Additionally, the proposed finished floor levels for the housing units also range between 19.6m and 30.2m above the OD Malin.

In terms of access to the site, the existing Rathmullan Road will be extended towards the site with the existing road, footpath and cycle path removed and area landscaped. Details can be seen in Waterman Moylan drawing No. RAT-WMX-PH2-00-DR-C-P416 – Rev A. Main point of junction entry will be provided via a newly proposed four-armed signalized junction. This junction will connect the Rathmullan Road (East), the Rathmullan Road (North), the proposed site access and the Oldbridge Road.

The design and layout of the proposal has been prepared to fully comply with the current relevant design standards and specifications applicable to this form of development. The relevant design standards and specifications that the layout has been designed in accordance with but not limited to are as follows:

- DMURS
- Uisce Eireann Code of Practice (CoP) and Standard Details (Water and Wastewater)
- Transport Infrastructure Ireland (TII)
- Cycle Design Manual
- SuDS Manual Ciria C753
- Technical Guidance Documents, Section H etc.

1.3 Background of Report and Summary

This report describes the criteria used to design and detail the options available for the disposal of foul water, disposal of storm water (subject to a restriction to the discharge rate), water supply and roads network to serve the development site including the upgrade and construction of the proposed 4 arm signalised junction on Rathmullan Road and the removal of existing road, footpath and cycle path as part of the upgrading works.

The subject site has been the subject of a previous application which was granted for development (but quashed following judicial review) including demolition of existing farm buildings/structures, construction of 661 no. residential dwellings and a neighbourhood centre adjacent to the site's eastern boundary, consisting of a childcare facility (486sqm), café (63sqm) and retail unit (318sqm), construction of a four-arm signalised junction, 2 no. priority junctions and the construction of a strategic foul water pumping station in the north-eastern corner of the site. The Planning Application Reference is SH305552.

It is proposed that the foul drainage from the site will drain via a new network of gravity sewers to a new pumping station located at the low point in the north-eastern corner of the subject site along the northern

boundary of the site. Existing residential units for Riverbank States and Old Bridge Manor will also be connected to the proposed development due to the removal of old pumping station to the east of the site. 2 no, pre-connection enquiries were submitted to Uisce Eireann each for 99 residential units based upon the development being constructed in two phases (CDS23000770 & CDS23000784). Confirmations of Feasibility for 198 no. residential units have been received. Based on the 2 no. COF received, a PCE that covers for 240 no residential units, which is subject to the proposed current development, has been sent to the Uisce Eireann in November 2024, CDS24009836. Confirmation of feasibility has been received on 1st April, 2025 and will be attached to Appendix A also.

Foul drainage will be pumped via the proposed pumping station and outfalls to the existing foul water drainage network at the junction of Rathmullan Road and Marley's Lane. All foul water drainage details shall be in accordance with Uisce Éireann requirements. An existing rising main along the Rathmullan Road has been noted which runs from the entrance to the proposed development to Marleys Lane. Uisce Eireann have indicated in the COF(CDS23000770 & CDS23000784) that this existing rising main could be utilised for the proposed development to connect and pump via the same. CDS24009836 has approved the strategy.

The overall proposed development is divided in 2 no. surface water catchments, southern catchment and northern catchment. In order to incorporate the SUDS measures, grass swales are provided along the internal roadways where feasible, permeable paving is applied to all private driveways. 2 no. aboveground grass detention basins plus underground storage tank systems are proposed, the southern detention basin is located at the central open space which collects the stormwater from the southern catchment. The northern catchment receives flows from the southern catchment. The northern catchment will be attenuated in a grass detention basin which is located at the north of the site. The northern detention basin will discharge by gravity at a restricted rate to the existing 1200mm surface water culvert/open drain adjacent to Rathmullan Road, the existing culvert merges into a ditch c.120m to the north of the proposed outfall location. The ditch travels for c.60m northwards before outfalling into the River Boyne which is tidal at this location. The flow restriction for both attenuation is achieved by means of a Hydro-brake, or similar approved, installed at the outfall manhole of each surface water catchment within the development, with the excess storm water stored on site for the duration of the storm. Please refer to Waterman Moylan drawing No. 18-014-P450 & P451 – Rev A for the proposed foul and surface water network layout

According to the previous COF received, Uisce Eireann have identified that there are some upgrades to be carried out to facilitate water supply for the proposed development. All upgrade works will be carried out by Uisce Eireann as part of the connection agreement. Water supply for subject site will be via a connection to the existing watermain on Rathmullan Road. Uisce Eireann required c. 140m of existing 150mm diameter watermain to be upsized to 200mm diameter along Rathmullan Road. There is also a requirement for c. 50m new 450mm diameter watermain together with a new flow control valve. COF CDS24009836 approved the proposed watermain strategy. All water supply details shall be in accordance with Uisce Éireann requirements. Watermain details will be illustrated in section 4 of this report. Please refer to Waterman Moylan drawing No. 18-014-P481&P482-Rev A for the proposed watermain network layout.

The proposed development will be accessed from Rathmullan Road via a newly proposed four-arm signal-controlled junction which will be designed to comply with the current NTA Cycle Design Manual, published 31st August 2023, according to NTA Detail Drawing TL503 or similar approach, located at the east of the subject site. Pedestrian access links from the proposed development and the existing footpath on Rathmullan Road will also be provided through a new footpath. The upgrade works involve removal of existing road, footpath and cycle path and area will be landscaped. It is noted that Meath County Council currently have proposals to construct a new greenway along the Rathmullan Road which will connect the

proposed site entrance to the existing Boyne Greenway. The greenway received planning permission from An Bord Pleanala in May 2024 and is currently under construction. However, due to the fact that Road L-16014 to the east of the proposed development is unacceptable for a bicycle lane as the gradient would exceed the design standard limits, an alternative pedestrian and cycle shared route from within the proposed development is provided and joins the greenway at the north-east of the site Therefore the proposed development will provide connectivity to the Boyne Greenway. The proposed development also provides various potential access points for future development and neighbouring residential development, the connectivity to the surroundings for pedestrian, cyclists and vehicles will be illustrated further in the DMURS report that will be issued in a separate cover.

2. Foul Water Drainage

2.1 Introduction

It is proposed that the foul drainage from the site will drain via a network of gravity sewers to a proposed pumping station located at the low point in the north-eastern corner of the subject site.

Foul water will be pumped from the proposed pumping station and connect to outfalls to the existing foul water drainage network at the junction of Rathmullan Road and Marley's Lane. Uisce Éireann had previously advised that a new pumping station is required to cater for the development. The new pumping station is to be sized to replace the adjacent existing old pumping station and further catchment areas. The new pumping station is designed to comply with Uisce Éireann`s Wastewater Infrastructure Standard Details, connection application will be issued to Uisce Éireann for approval with pumping station included prior to commencement of works onsite.

Waterman Moylan drawing No's 18-014-P451&P452 – Proposed Drainage Layout -Rev A show the proposed foul water sewer network for the subject site.

2.2 Uisce Éireann Pre-Connection Enquiry

Two pre-connection enquiries were submitted to Uisce Eireann each for 99 no. residential units based upon the development being constructed in two phases (CDS23000770 & CDS23000784). Confirmations of Feasibility for 198 residential units have been received. The previously issued confirmation of feasibility advised that connection is feasible, subject to upgrades, see attached in Appendix A.

Based on the two COF received, a PCE that covers for 240 no residential units has been sent to Uisce Eireann in November 2024, CDS24009836. Confirmation of feasibility was received on 1st April, 2025, attached in Appendix A. The proposed pumping station will pump wastewater to the existing foul water drainage network at the junction of Rathmullan Road/ Marley's Lane. There is an existing rising main along the Rathmullan Road which runs from the entrance of the proposed development to Marleys Lane. 2.2 Uisce Éireann have indicated in their COF that this existing rising main could be utilised for the proposed development. The proposed new pumping station will be designed to facilitate flows from the adjacent Riverbank and Oldbridge Manor Developments

2.3 Foul Water – General

Foul water sewers within the proposed development will be laid to comply with the requirements of the Building Regulations, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Foul water sewers which will be taken into charge will be laid strictly in accordance with Uisce Éireann's requirements for taking in charge.

In accordance with the Uisce Éireann "*Code of Practice for Wastewater Infrastructure*", 150mm nominal internal diameter sewers have been proposed for carrying wastewater from 20 properties or less; whilst 225mm nominal internal diameter have been proposed for carrying wastewater from more than 20 properties. Furthermore, where there are at least ten dwelling units connected, the 150mm diameter pipes are laid at a minimum gradient of 1:60 for up to nine connected dwelling units.

The pumping station has been located with a 20m separation distance from the nearest dwelling. This complies with Section 5.5 of the Uisce Éireann "*Code of Practice for Wastewater Supply"*, which states that a Type 3 pumping station require a minimum buffer zone of 15m.

2.4 Foul Water Calculations

The foul water drainage for the proposed development has been designed so that minimum cleansing velocities outlined in "Uisce Éireann`s Code of Practice for Wastewater Infrastructure" are achieved for all foul sewers. The peak foul flow is based on Uisce Éireann`s recommended peak demand/flow factors which are provided in the 'Code of Practice for Wastewater Infrastructure', Appendix D - Wastewater Flow Rates for Design. Pipe capacities and velocities have been calculated using the Colebrook-White formula with a roughness coefficient (Ks) of 1.5mm.

The estimated foul flows generated from the proposed development and existing / approved developments which the new strategic pumping station will ultimately serve are as follows:

Table 1: Calculation of proposed Foul Water Flow

Description	No. of Units	Population per unit	PE	Flow l/hd/day	Infiltration Factor	Total Discharge (l/d)
Proposed Development						
Residential Units	249 Units	2.7	673	150	1.1	108,735
Crèche	411 sqm		47 children 5 staff	50	1.1	2,860
						113,905
Riverbank (Existing)						
Residential Units	200 Units	2.7	540	150	1.1	89,100
Old Bridge Manor (Existing)						
Residential	156 Units	2.7	421.2	150	1.1	69,498
					TOTAL	***272,503***

Calculation of Proposed Peak Foul Flow for proposed development		
Total Daily Discharge *(from Table 1.)*	272,503	l/d
Dry Weather Flow (DWF)	3.154	l/s

Peak Foul Flow (=3 x DWF)	***9.462***	***l/s***

The proposed foul outfall from the subject site is a 225 mm-diameter pipe laid at a gradient of 1:200, giving a capacity of 32 l/s and which therefore has adequate capacity to cater for the flows from the development.

2.5 Foul Water Pumping Station and Preliminary Specification

2.5.1 General

As set out in 2.1 above, it is proposed to construct a new pumping station at the north-eastern side of the site. The pumping station will be sized to accommodate the proposed development as per the calculations below. The proposed pumping station will be designed in compliance with the Uisce Éireann Code of Practice and Uisce Éireann`s Wastewater Infrastructure Standard Details.

The proposed storage to be provided is calculated by utilising the following Uisce Éireann code of Practice table:

Houses	Storage Hours	Max Storage Volume (m^3)
0 – 250	24	112
250 - 333	24 for 250 and 18 thereafter	139
334 - 1667	24 for 250, 18 up to 333 and 12 thereafter	437
1668 - 3333	24 for 250, 18 up to 333, 12 up to 1667 and 10 thereafter	746

$$((624.26 - 333) * 150l/PE/d * 1.1 * 2.7)/1000 + 139 = 268.76m^3$$

The proposed pump station has provision for foul water storage from the proposed development with a total capacity of 270 m^3 which has sufficient storage to cater the foul generated throughout the overall residential development.

2.5.2 Pumping Chamber Design Criteria

The capacity of the pumping chamber has been based on the following design criteria:

Table 2: Pumping Station Design Criteria

Static Head	26.25	m
Rising Main	110	mm Ø
Length of Rising Main	1140	m
Dry Weather Flow	3.154	l/sec

Based on the above, the volume of the foul rising main is 10.828 m^3. At 3.154 l/s dry weather flow, this represents a retention time in the rising main of 0.95 hours. Therefore, there will be no septicity in the rising main.

2.5.3 Emergency Storage

The total volume of storage available in the pump sump to this level is c.10.828 m³ with a further 268.76 m³ available in the adjacent storage tanks.

In addition there is storage available in the foul water manholes and sewers but this will not be required as the 24 hour storage as required is provided within the pump sump and adjacent storage tanks

At 3.154 l/sec (1*DWF) the total volume required to be stored in a 24-hour period is 268.76 m³, which is less than the emergency storage available.

2.5.4 Pumping Station Equipment to be provided

Mechanical and electrical equipment for the proposed pumping chamber is to be provided by an approved specialist contractor to include features as detailed on the pumping chamber drawings and to meet with Uisce Éireann requirements.

The following is a checklist of the equipment proposed (or similar approved).

Pump Sets

Two submersible pumps: one duty and one standby. The pumps are to be fitted with impellers capable of pumping 100-mm diameter solids. The pump motor is to be suitable for 400V/3ph/50Hz electricity power supply. The unit is fitted with over temperature protection, as well as mechanical seal monitoring.

The pumps shall be supplied complete with quick couple release mechanisms for removal and reinstallation of the pumps, 50mm diameter twin galvanised guide rails, holding brackets lifting chains etc.

Pipework & Valves

Pump pipework is to be 110mm ductile iron, complete with couplings, riser pipes, bends and tee pieces, tapers etc as required, all complete with flange sets, consisting of zinc plated nuts, bolts, washers and gaskets.

100mm-diameter cast iron non-return valves and gate valves complete with handwheels for clockwise closing as required.

Electrical Equipment

- Pump power cables complete with cable glands.
- Earth spike and bonding.
- ESB distribution board in kiosk.

Control Equipment Panel

Ultrasonic level controller, complete with 5 programmable output relays for automatic stop and start of pumps.

Ultrasonic transducer head complete with 10m of signal cable and mounting brackets.

Control panel containing the following: -

- Cyclic relay for alternating duty pump

- Ammeters
- Hour run meters
- Hand, off, Auto switches.
- Run/trip/alarm lights
- DI relays for seal monitoring
- High level alarm beacon

Control Kiosk

A control kiosk shall be provided adjacent to the pumping station.

2.5.5 Emergency Equipment and Procedures

The pumping station is being provided with the following emergency equipment and procedures: -

- Standby pump in the event of a pump failure
- Telemetry system to facilitate Uisce Éireann monitoring of the station
- High level alarms to warn of increases in level of effluent in the pump sump
- Storage capacity within the sump and pipe network in excess of 24 hours
- Over-pumping facilities on the rising main to facilitate the installation of a temporary external pump to empty the sump directly into the rising main when required.

The above emergency equipment and procedures provide a very high level of redundancy and backup in the event of a failure in the mechanical systems in the pumping station when required.

3. Surface Water Drainage

3.1 Introduction

It is proposed that the surface water from the proposed development shall drain via gravity and discharge at a restricted rate into the existing 1200mm culvert adjacent to Rathmullan Road at the north-east of the site. This culvert merges into a ditch on the opposite side of the existing road 120 m to the north of the proposed outfall location. The ditch travels for c.60m northwards before outfalling into the River Boyne which is tidal at this location.

Runoff will be restricted to the equivalent of the existing greenfield runoff and excess stormwater will be attenuated, as further described throughout this section. Surface water runoffs shall be restricted via hydrobrakes or similar approved.

From above we can conclude that since the ditch the proposed onsite surface water is outflowing to is existing. No changes will be made on the ditch as the outflow is restricted to greenfield runoff rate, there is no increase in flow from the subject site with and without the proposed development.

The layout of the proposed surface water drainage network is shown on Waterman Moylan Drawing No. 18-014-P451 & P452 - Proposed Drainage Layout -Rev A.

3.2 Surface Water – General

Sustainable Urban Drainage Systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban storm water drainage practice that typically consisted of piping runoff of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as sustainable urban drainage systems; they are typically made up of one or more structures built to manage surface water runoff.

The proposed surface water drainage system for this development has been designed as a sustainable urban drainage system and uses, water butts, permeable pavement, grass swales, attenuation storage together with flow control device and petrol interceptor to:

- Treat runoff and remove pollutants to improve quality
- Restrict outflow and to control quantity
- Increase amenity value

Strict separation of surface water and wastewater will be implemented within the development. Drains will be laid out to minimise the risk of inadvertent connection of waste pipes etc. to the surface water system.

Surface water local drains will be 150 mm to 225 mm wide and generally will consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with the requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Surface water public sewers will be 225 mm to 525 mm wide and generally will consist of PVC or concrete socket and spigot pipes (to IS 6) and laid strictly in accordance with the requirements of Meath County Council.

3.3 Proposed Surface Water Drainage Strategy

The surface water network for the proposed development has been divided into two separate catchments as shown in the following figure, referred to in this report and associated drawings as Northern Catchment and Southern Catchment. These catchments operate in series with runoff from the Southern Catchment flowing into the downstream northern catchment area at a restricted rate and outfalls flowing into the existing 1200mm surface water culvert/open drain adjacent to Rathmullan Road.

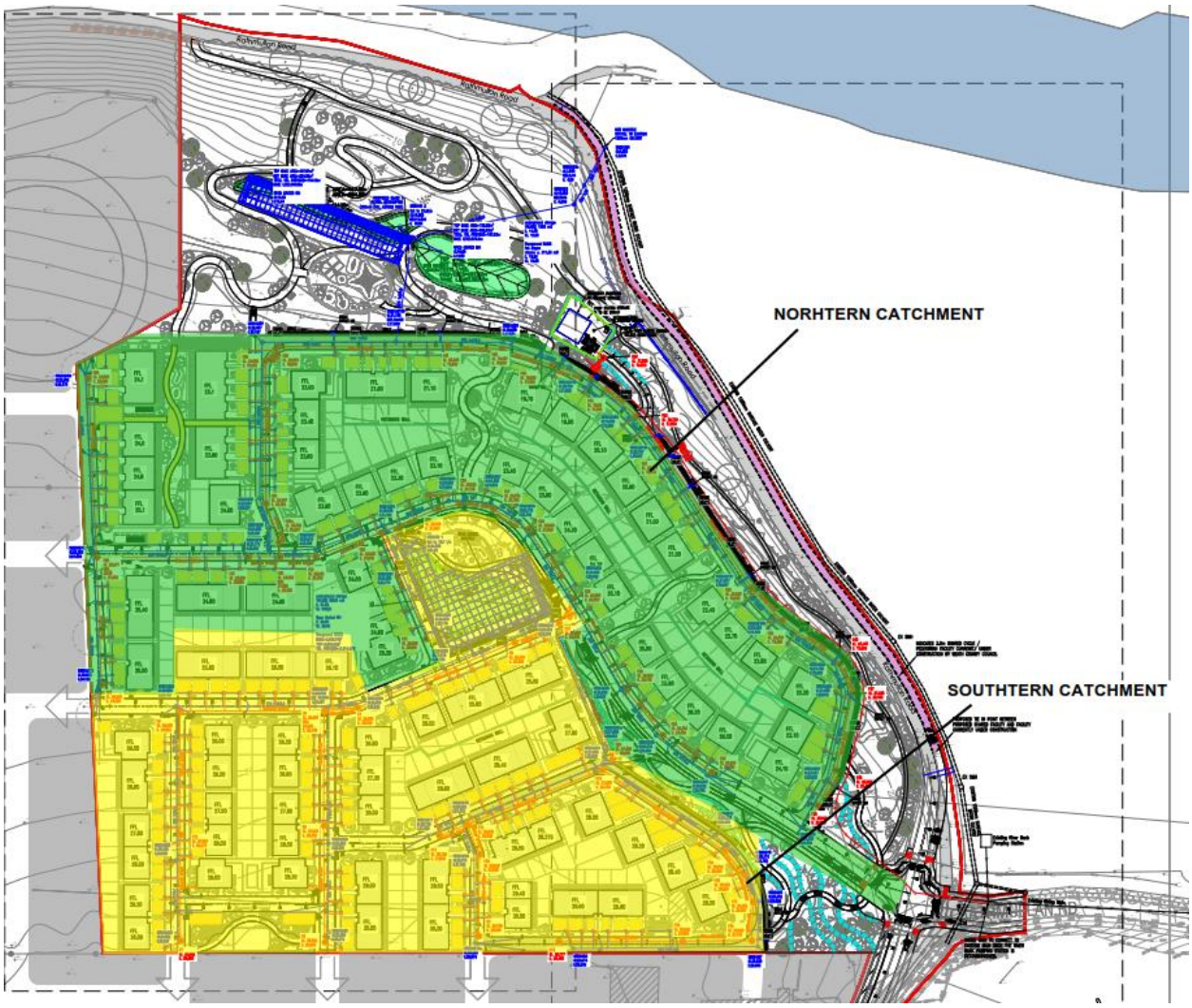


Figure 2: Catchment Division

The rainfall runoff for the proposed development will be limited to the equivalent of the existing agricultural runoff rate (Qbar). The greenfield runoff rate for the site has been calculated using the Institute of Hydrology report No 124 “Flood Estimation for Small Catchments”. The greenfield calculations can be seen in Appendix C for each of the catchment of the proposed development.

Surface water runoff shall be restricted via a hydrobrake installed at the outfall manhole of each surface water catchment with excess storm water attenuated in grass detention basins with stormtech tanks below, or similar approved. The detention basin systems will facilitate infiltration and have been sized on this basis.

Sustainable urban drainage systems have been implemented within the proposed development to ensure that the runoff quality and rate are managed in accordance with the recommendations of the Greater Dublin Strategic Drainage Scheme, "GDSDS" which were adopted by Meath County Council, Kildare County Council, Wicklow County Council and the four Dublin local authorities in 2011. The SuDS strategy for the proposed development is set out in Section 3.4 below.

The layout of the proposed surface water drainage network is shown on Waterman Moylan Drawing No's 18-014-P451 & P452-Proposed Drainage Layout -Rev A.

The subject site is located on the boundary between Soil Type 1 and 2 on the 1978 Soil Map of Ireland. However, given the steep topography of the site and the moderate percolation qualities of the site soils, it was concluded that the map was not an accurate reflection of the soils on the subject site. Data from the Site Investigation was examined against the criteria outlined in the GDSDS in order to ascertain a more accurate soil type and runoff factor.

To accurately determine the soil type for the purpose of assessing the greenfield site rate of runoff, a Site Investigation was commissioned as shown in Appendix D Site Investigation Report.

The site investigation reports that on-site soil conditions can generally be classified as per the following:

- Geotechnical Boring Records show that soils are generally classified as silty clays with some gravel and cobbles present.
- The percolation is relatively low.
- The slope of the land is generally c.3-5%.

These soils characteristics are representative of either a Soil Type 3 or 4 as set out in Appendix D-1 of the Greater Dublin Regional Drainage Study, and further detailed in the Flood Studies Report (FSR) statistical and rainfall runoff – various methods (National Environment Research Council, 1975). To ensure a conservative approach with regards to surface water management, Soil Type 3 has been adopted. Soil Type 3 is described as having a moderate winter rain acceptance parameter (i.e. moderate infiltration potential), with moderate runoff and is typical of intermediate silty soils.

Southern Catchment

Southern Catchment is located on the centre public greenland area of the site and covers a catchment area of c. 3.019 hectares. The total impermeable area is c. 1.589 hectares. The attenuation storage for this catchment is sized to accommodate the Qbar runoff rate of 10.70 l/s. Runoff will be restricted via the hydrobrake manhole with excess runoff stored in an attenuation system located on central open space. The southern catchment will outfalls into an attenuation system, with an underground attenuation storage which caters the surface water up to a return year of 1 in 30 years which gives a volume of 896 cubic metres. The excess surface water for the 1 in 100-year storm will be attenuated in the overground detention basin that has a volume of 214.40 cubic metres. Therefore, the total surface water storage provided within the proposed attenuation system is c. 1110.4 cubic metres. While the storage required is calculated to be c. 1057.54 cubic metres, the storage requirement calculations is conducted based on a 1 in 100-year return period, the critical storm. This catchment outfalls to the downstream Northern Catchment.

Northern Catchment

Northern Catchment is located at the northern open space area of the proposed development and covers a catchment area of c. 3.167 hectares along with the outfall from the Southern Catchment. The northern impermeable area is approximately 1.971 hectares. The attenuation storage for this catchment is sized to

accommodate the Qbar runoff rate of 11.23 l/s. Runoff will be restricted via the hydrobrake manhole with excess runoff stored in the aboveground grass detention basin system with underground attenuation storage below. This catchment outfalls to the existing 1200 mm culvert on Rathmullan Road at a restricted rate of 21.93 l/s (sum of all catchments).

The northern catchment will outfalls into an attenuation system, including the additional flow from the southern catchment, with an underground attenuation storage which caters the surface water up to a return year of 1 in 30 years which gives a volume of 1000 m^3. The excess surface water in 1 in 100-year storm will be attenuated in the overground detention basin that has a volume of 311.35 cubic metres that will be split in two parts that are inter connected. Therefore, the total surface water storage provided within the proposed attenuation system is c. 1311.35 m^3. The storage required is calculated to be c. 1300 cubic metres. The storage requirement calculations are done based on a 1 in 100 year return period, the critical storm. This catchment outfalls to the downstream Northern Catchment to the north of the proposed development site.

Summary

The total capacity of the attenuation storage for both catchments is 2368.89 m^3. This is sufficient storage capacity to store water from the critical 100-year storm for the subject site with 20 percent climate change allowed for in the calculations to facilitate climate change. Noted that both of the attenuation systems are designed to cater the 1 in 30-year storm in the underground attenuation. The storm degree exceeds the 1 in 30-year storm, the above ground detention basin will be filled up slowly and dissipate over the time while the storm passes. The purpose of it is to ensure the above ground grass detention basin is dry for majority of time.

3.4 Sustainable Drainage System (SuDS) Selection Criteria

The SuDS selection process used for this site is in accordance with SuDS selection flow chart, Volume 3, Section 6.5, Figure 48 of the GDSDS. The characteristics of the site are utilised to select the various SuDS techniques that would be applicable.

The applicant has considered the use of all appropriate SuDS devices as part of the site SuDS strategy.

- Water Butts – utilised within each residential unit
- Permeable Pavement
- Swales - utilised in grass verges alongside internal roads
- Grass Detention Basin/attenuation storage – located at the green open space areas
- Flow control device (e.g. hydrobrake) – installed at the outfall manhole of each catchment
- Petrol Interceptor – installed downstream of each flow control device manhole

The effectiveness of each SuDS/drainage mechanism proposed is outlined below:

Management Train:

The management train commences with **source control** through the provision of filter drains.

The second stage of the management train, **site control**, is provided by the introduction of swales, all of which provide a degree of treatment before discharging to the detention basin. The rate of runoff is controlled through the provision of a hydro-brake.

The detention basin/attenuation storage offers a third stage of treatment, **regional control**, by slowing the storm water discharge down and removing any additional silt which may remain in the storm water.

Water Butts:

It is proposed to provide water butts for the individual dwellings for external gardening and wash down use only, which will ensure interception of roof runoff at source.

Permeable Pavement:

Permeable pavements are alternative paving surfaces to standard finishes that allow stormwater run-off to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or infiltrated.

Permeable paving will be utilised for the on-curtilage car parking area to provide treatment and storage to rainwater falling on these areas.

Swales:

Swales has been incorporated adjacent to the roads at different areas where possible throughout the proposed development. It is intended to drain roadways to swales where appropriate. The swales incorporate an infiltration trench at the invert of the swales which will encourage surface water to drain direct to ground as recommended by SUDS. Any remaining water which does not filtrate direct to ground will drain to the surface water network.

Detention basin/Attenuation storage:

The detention basin/attenuation storage attenuates surface water to restrict the outflow to the equivalent of the existing agricultural runoff. This ensures the development will not give rise to any impact downstream of the site

Flow Control Device:

It is proposed that surface water from the subject site's outfall rate be reduced to the agricultural outflow (Qbar) by means of a Hydro-Brake, or similar flow control device.

Petrol Interceptor:

It is proposed that surface water will pass through a petrol interceptor prior to each outfall into the attenuation in order to ensure primary treatment of any pollutants

3.5 Site Characteristics

The greenfield runoff rate for this site has been calculated using the Institute of Hydrology report No 124 "Flood Estimation for Small Catchments". The greenfield runoff calculations can be seen in Appendix B. We would note that the subject catchment consists of Northern Catchment and Southern Catchment within the proposed development.

Table 3: Surface Water Catchment Details

	Drainage Details Northern Catchment	Drainage Details Southern Catchment
Catchment Area – Ha	3.167	3.019

Impermeable Area - Ha	1.710	1.589
Percentage Impermeable	62.23%	52.62%
SAAR - mm	838	838
SOIL Index	0.37	
Climate Change	20%	

Hardstanding area for the development includes the roads, footpath, cycle path, parking spaces, included as part of this planning application, and the gross floor area.

3.6 Outflow Limits and Attenuation Sizing

The outflow limits are calculated in accordance with the Institute of Hydrology report No 124 “Flood Estimation for Small Catchments”, where:

- Qbar = $0.00108(\text{Area})^{0.89} \times (\text{SAAR})^{1.17} \times (\text{SOIL})^{2.17}$
- Greenfield Run-off = Qbar x ("n-year" factor)
- Allowable Discharge = Greenfield Run-off x Area

Where:

- Area = Site area in km2 (Or 50 Hectares if site is less than 50 ha)
- SAAR = Taken from “Extreme Rainfall in Ireland” maps (762 mm)
- SOIL = Runoff constant (Varies between 0.1 and 0.53: Given as 0.37 for the soil type 3 on the subject site)

$\therefore \text{Qbar} = 0.00108(0.5)^{0.89} \times (762)^{1.17} \times (0.37)^{2.17}$

Qbar = 158.6 l/s (For a 50 hectare site)

Qbar = 3.17 l/s/Ha

Report for the combined catchments outfall rate can be seen in Appendix B. To achieve a restricted outflow, a Hydro-Brake, or similar approved flow control device is required.

3.7 Storm Water Calculations

The total impermeable area of the proposed design including roads, footpaths, car-parking and roofs, is c. 3.299 ha. It is proposed that the 1 in 100-year critical design storm, plus an additional 20 per cent for climate change, will be used for stormwater attenuation volumetric calculations.

Calculations for pipe sizes and gradients are based on storm water runoff from the roofs and surfaced areas using the Rational Method for surface water design (Bilhams Formula from Bilham 1935, modified by Holland 1967), with a storm return period (N) of 5 years.

Pipe capacities and velocities have been calculated using the Colebrook-White formula with a roughness coefficient (Ks) of 0.6mm.

The total impermeable area for the subject site set out above was used in the FLOW calculations for the design of the surface water system which are included in Appendix C.

It is proposed that the subject site outfalls into the existing watercourse traversing the site along the eastern boundary.

Excess stormwater shall be attenuated in an attenuation tank combined with a detention basin, which provides c. 1311.35 m^3 of storage to cater for the northern catchments. For the southern catchment, the excess stormwater will be attenuated in an attenuation system combined with an overground detention basin and an underground attenuation storage system which give a total storage of c. 1110.4 m^3 as calculated.

It is noted that Permeable paving and swales will be attenuating a portion of the surface water from the development within both catchment areas, and excess water will drain via the gravity network toward the tank and basin. Development is designed based on the above-mentioned site characteristics, to cater for the 1 in 100-year critical storm event, plus an allowance for an additional 20 per cent climate change factor for the catchment.

Storage estimate calculation can be found in Appendix B.

3.8 SUDS Maintenance Section

In order to comply with the Meath County Development Plan 2021-2027 “Development Design Standards,” it is proposed to:

- Separate foul and surface water
- Include appropriate on-site disposal of surface water
- Comply with the standards set out in the GDSDS
- Implement appropriate SUDS measures

All SUDS measures included will be designed in accordance with the CIRIA SUDS Manual C753 as required by the GDSDS adopted by Meath County Council and the other Local Authorities in the Greater Dublin Area.

For the proposed SuDS strategy to work as designed it is important that the entire drainage system is well maintained. It will be the responsibility of the site management team to ensure the drainage system is maintained during the construction stage and initial plots of occupation. The management company who will be employed to maintain the site will be required to ensure maintenance of the SuDS features as part of their role. This will include maintenance and cleaning of gullies, drain manholes (including catch pits) and the attenuation basin to ensure adequate performance. The recommended program is outlined in the tables below.

Table 4: Swale Maintenance Schedule

	Maintenance period	Maintenance Task	Frequency
Swale	Regular	Remove the litter and debris	Monthly, or as required
		Cut grass – to retain height within specified design range.	Monthly (during growing season), or as required

		Manage other vegetation and remove nuisance plants.	Monthly at start, then as required
		Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
		Inspect infiltration coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
		Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
	Occasional	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if soil is exposed over 10% or more of the swale treatment area
	Remedial actions	Repair erosion or other damage by re-turfing or re-seeding	As required
		Re-level uneven surfaces and reinstate design levels	As required
		Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
		Remove and dispose of oils or petrol residues using safe standards practices	As required

Filter Drain Maintenance:

Filter drains will require regular maintenance to ensure continuing operation to the design standards, and designers should provide detailed specifications and frequencies for the required maintenance activities. Regular inspection is important for the effective operation of these drains. Adequate access should always be provided for inspection and maintenance to be carried out.

The full advised maintenance tasks to be carried out by the property owner are summarized in the table below.

Table 5: Filter Drains Maintenance Schedule

SUDS Element	**Maintenance**		
Filter Drains	**Maintenance period**	Maintenance Task	Frequency
	Regular	Removing litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Six monthly (or as required)
		Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Six monthly

		Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
		Remove sediment from pre-treatment devices	Six monthly (or as required)
	Occasional	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG 2007 or BS 3998:2010)	As required
		At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly (or as required)
		Clear perforated pipework from blockages	As required

Table 6: Detention Basin Maintenance Schedule

	Maintenance period	Maintenance Task	Frequency
Detention Basin	Regular	Remove the litter and debris	Monthly, or as required
		Cut grass – to retain height within specified design range.	Monthly (during growing season), or as required
		Manage other vegetation and remove nuisance plants.	Monthly at start, then as required
		Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
		Inspect infiltration coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
		Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
	Occasional	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if soil is exposed over 10% or more of the swale treatment area
	Remedial actions	Repair erosion or other damage by re-turfing or re-seeding	As required
		Re-level uneven surfaces and reinstate design levels	As required
		Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
		Remove and dispose of oils or petrol residues using safe standards practices	As required

Table 7: Permeable Paving Maintenance Schedule

SUDS Element	Maintenance		
Permeable Paving	**Maintenance period**	Maintenance Task	Frequency
	Regular	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or as required, based on site specific observations of clogging or manufacturer's recommendations.
	Occasional	Removal of weeds	As required
	Remedial work	Remediation work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required
	Monitoring	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor inspection chambers	Annually

3.8.1 Petrol Interceptor

Petrol Interceptor Maintenance should be carried out in accordance with British Standards BS EN 858-2:2003 Separator system for light liquids (e.g. oil and petrol – Part 2:selection of nominal size, installation, operation and maintenance which provides specific guidance on how to maintain petrol interceptors.)

The above mentioned standard states the following:

All parts which have to be regularly maintained shall be at all times reachable. Maintenance if the systems has to be carried out at least every six months by experience personnel. The maintenance shall be carried out in accordance with the manufacturer's instructions, but at least shall include the following

a) sludge trap

• determination of sludge volume

b) separator

• measure the thickness of light liquids

• check the operation of the automatic closure device

• check the coalescing devices for permeability, if the water levels in front and behind the coalescing device show significant difference

• check the function of the warning device

c) sampling shaft

• clean the drain channel

Light liquid and sludge shall be removed as required. Before putting in service sludge trap and separator shall be re-filled with fresh water.

NOTE Emptying is recommended when one half of the sludge volume or 80 % of the storage capacity of the separator is reached.

In exceptional circumstances, when personnel need to enter the separator, it shall be fully drained and thoroughly ventilated.

In intervals of at maximum five years the separator system shall be emptied and then submitted to general inspection covering the following items:

• tightness of the system;

• structural condition;

• internal coatings, if present;

• state of inbuilt parts;

• state of electrical devices and installations;

• checking of adjustment of automatic closure device, e.g. floating bodies.

The cleaning and maintenance records shall be kept and made available to the authorities upon request and shall contain remarks on specific events (e.g. repairs, accidents).

Oil/Petrol interceptor maintenance should be conducted by experienced personnel at least every six months. Usually, an interceptor service will not be necessary every six months and an interception inspection will be sufficient to fulfil this requirement.

This should also include a 5-year integrity check

3.8.2 Hydrobrakes/ Flow control device

These should be serviced and maintained strictly in accordance with the recommendation of the manufacturers. It is recommended that these be serviced on a three-, six- or twelve-month basis, depending on the device installed.

3.9 Flood Risk Assessment

JBA Consulting have prepared a detailed Site-Specific Flood Risk Assessment for the proposed development. Whilst the CFRAM study indicated that the site is within Flood Zone A/B, the assessment

provided by JBA notes this study used out-dated catchment conditions and does not reflect the intersection of a watercourse and the incorporation of its flows into the M1 surface water drainage network.

JBA's assessment shows that the proposed development and its associated surface water drainage network has been appropriately designed in order to mitigate flood risk and should be read together with this report.

The Site-Specific Flood Risk Assessment is included in this Large Scale Residential Development submission under separate cover which has been prepared by JBA Consulting.

4. Water Supply

4.1 Introduction

Water supply to the subject site will be provided via a new proposed connection to the existing 150mm HPPE watermain on Rathmullan Road to the east of the site which is subject to upgrades, details will be mentioned in section 4.2 below. All upgrade works will be carried out by Uisce Eireann as part of the connection agreement. All water supply details shall be in accordance with Uisce Éireann requirements.

Please refer to Waterman Moylan Drawing No's. 18-014-P481&P482-Water Supply Layout -Rev A for details of the watermain layout to serve the subject site.

4.2 Uisce Éireann Pre Connection Enquiry

Two pre-connection enquiries were submitted to Uisce Eireann each for 99 residential units based upon the development being constructed in two phases (CDS23000770 & CDS23000784). Confirmations of Feasibility for 198 no. residential units were received on 20th August, 2024. The previously issued confirmation of feasibility advised that connection is feasible, subject to upgrades, see attached in Appendix A. Based on the two COF received, a PCE that covers for 240 no residential units was sent to the Uisce Eireann in November 2024, CDS24009836 and confirmation of feasibility received on 1st April, 2025.

According to the previous COF received, Uisce Eireann have identified several upgrades required to facilitate the proposed development. Water supply to the subject site will be connected to the existing 150mm watermain which is to be upgraded to 200mm diameter on the Rathmullan Road. c. 140m of existing 150mm diameter watermain needs to be upgraded to 200mm diameter along Rathmullan Road. There is also a requirement for c. 50m new 450mm diameter watermain together with a new flow control valve, please see attached screenshot referenced in the IW COF, CDS23000770, CDS23000784 & CDS24009836 for the location of the upgrades. All upgrade works will be carried out by Uisce Eireann as part of the connection agreement. All water supply details shall be in accordance with Uisce Éireann requirements. Please refer to Waterman Moylan drawing No. 18-014-P481&P482- Water Supply Layout -Rev A for the proposed watermain network layout

Figure 1 - Water Upgrades

Figure 3: Watermain Upgrades Location CDS23000770 & CDS23000784

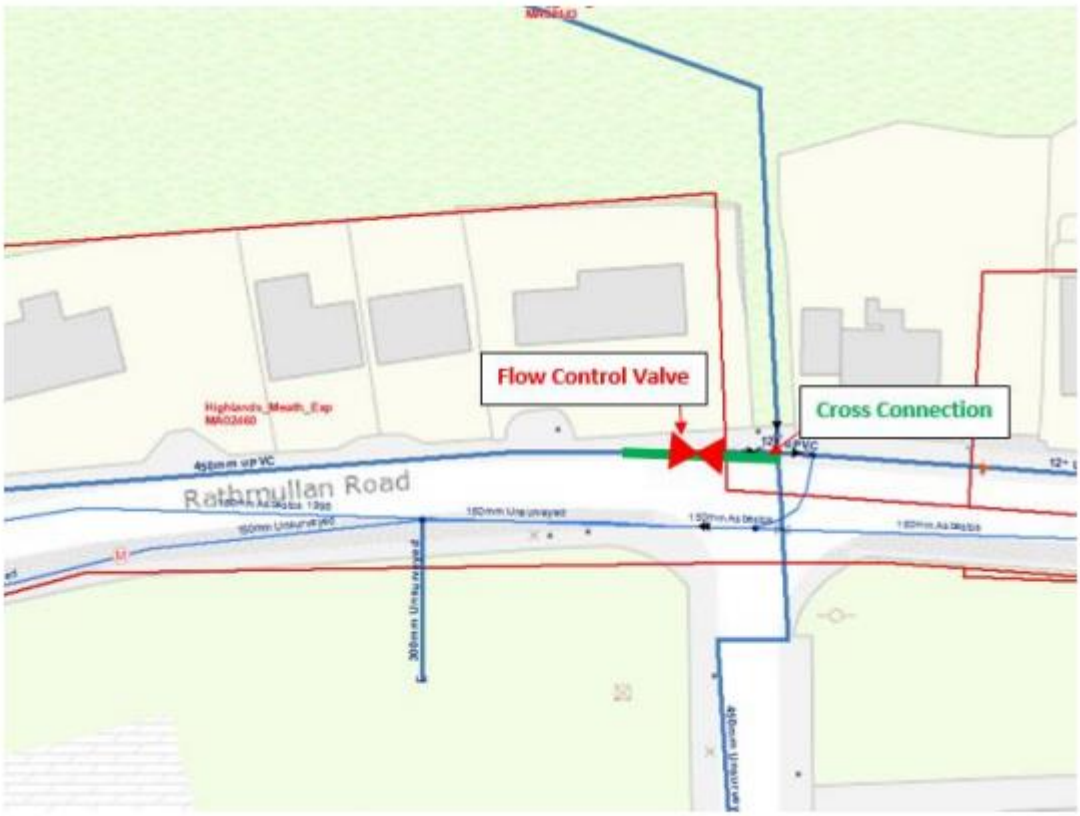


Figure 2 - Water Upgrades

Figure 4: Flow Control Valve Location CDS23000770 & CDS23000784

Figure 5: CDS24009836 Watermain Upgrades Location and Flow Control Valve and Cross Connection

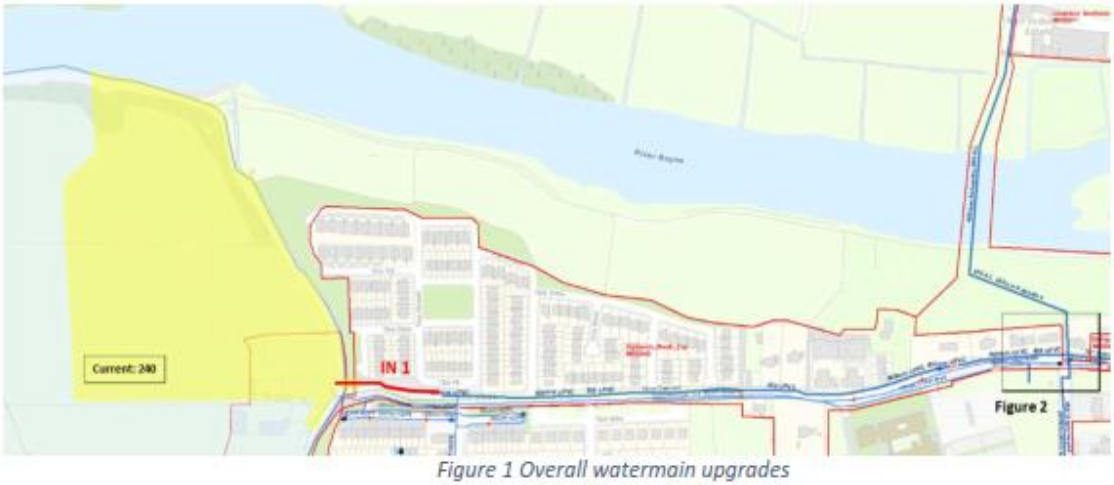


Figure 1 Overall watermain upgrades

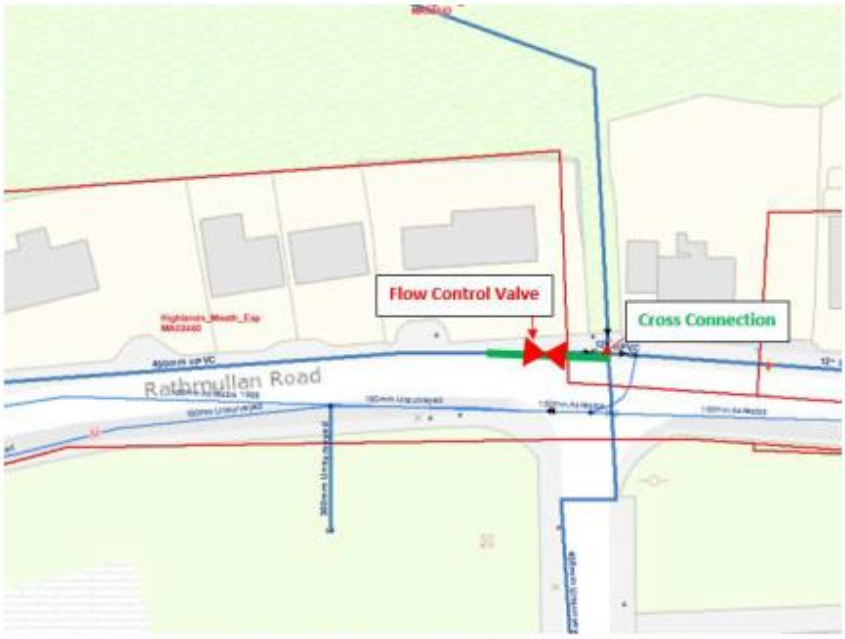


Figure 2 flow control valve and cross connection.

4.3 Water Demand Calculation

Water calculations providing details of the anticipated water consumption for the proposed development are illustrated in Table 8 below.

Table 8: Total Water Demand

Description	No. of Units	Population per Unit	PE	Flow l/h/day	Total Discharge (l/d)

Residential Units	249	2.7	673	150	100,950
Crèche	411 sqm		47 children 5 staff	50	2,600
				Total	103,550

The total water requirement from the public supply, for the development, is estimated at 103.55 m^3/day.

4.4 Water Supply – General

Watermains suitable for Works and approved by Uisce Éireann shall be either ductile iron (DI) or polyethylene (PE), with PE80 or PE100 rating (MDPE, HDPE or HPPE).

The minimum depth of cover from the finished ground level to the external crown of a watermain shall be 900mm. A greater depth of cover and/or greater strength pipe and/or a higher class of bedding may be required where high traffic loading is anticipated. Depths may be altered to avoid obstructions, including separation distances between other utility services. The desirable maximum cover for a Service Connection pipe or a watermain should be 1200mm, where practicable. We can confirm that all watermain proposed within the proposed development will have maximum cover less than 1200mm.

Sluice valves will be provided so that no more than 40 houses can be isolated at any time and hydrants provided so that each part of the dwellings are within 46m of a hydrant.

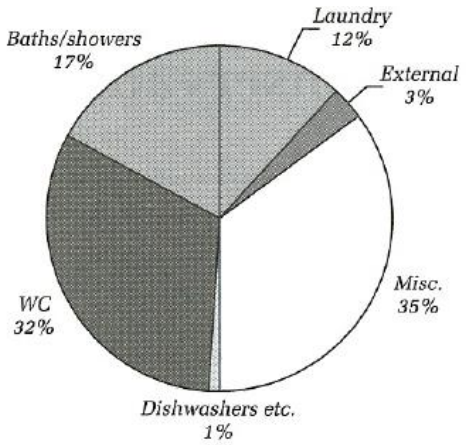
4.5 Water Conservation

The water demand for the development can be subdivided as follows:

- Potable / Non-potable Breakdown

Detailed studies have quantified the breakdown between potable and non-potable uses for residential uses.

The following diagram illustrates the current percentage breakdown of water usage in domestic circumstances and is from Griggs and Shouler 1994 as published in Chapter 11 of 'Water, Sanitary & Waste Services for Buildings' by Wise and Sheffield, remains the state-of-the-art.



It is proposed, as part of this development, to provide rain water butts on all properties to cater for the external water demand.

In addition, water conservation measures will be used, to further reduce overall water demand, including:

- Low volume flush / dual flush WC's
- Aerated shower heads
- Spray Taps
- Draw off tap controls
- Rainwater reuse – water butts, as outlined above
- Leak detection measures – through the metering of supply

5. Transport

5.1 Introduction

A separate Traffic and Transport Assessment has been carried out and is included as part of this submission under separate cover and should be read in conjunction with this report.

5.2 Site Access

The proposed development relates to the construction of a proposed Large-Scale Residential Development on residentially zoned lands located 2.5 kilometres west of Drogheda town centre. The proposed development includes the construction of a residential housing scheme comprising 170 no. houses, 32 no. duplexes and 47 no. apartment units, providing a total of 249 residential units and a creche, on the 9.20 ha site within the site red line boundary.

Access to the subject site will be provided through the proposed four-arm signalized junction located on Rathmullan Road to the east of the subject site. The signal controlled junction will be designed according to the current *NTA Cycle Design Manual*, published 31st August 2023, TL503 or similar approach. See Figure 6 below.

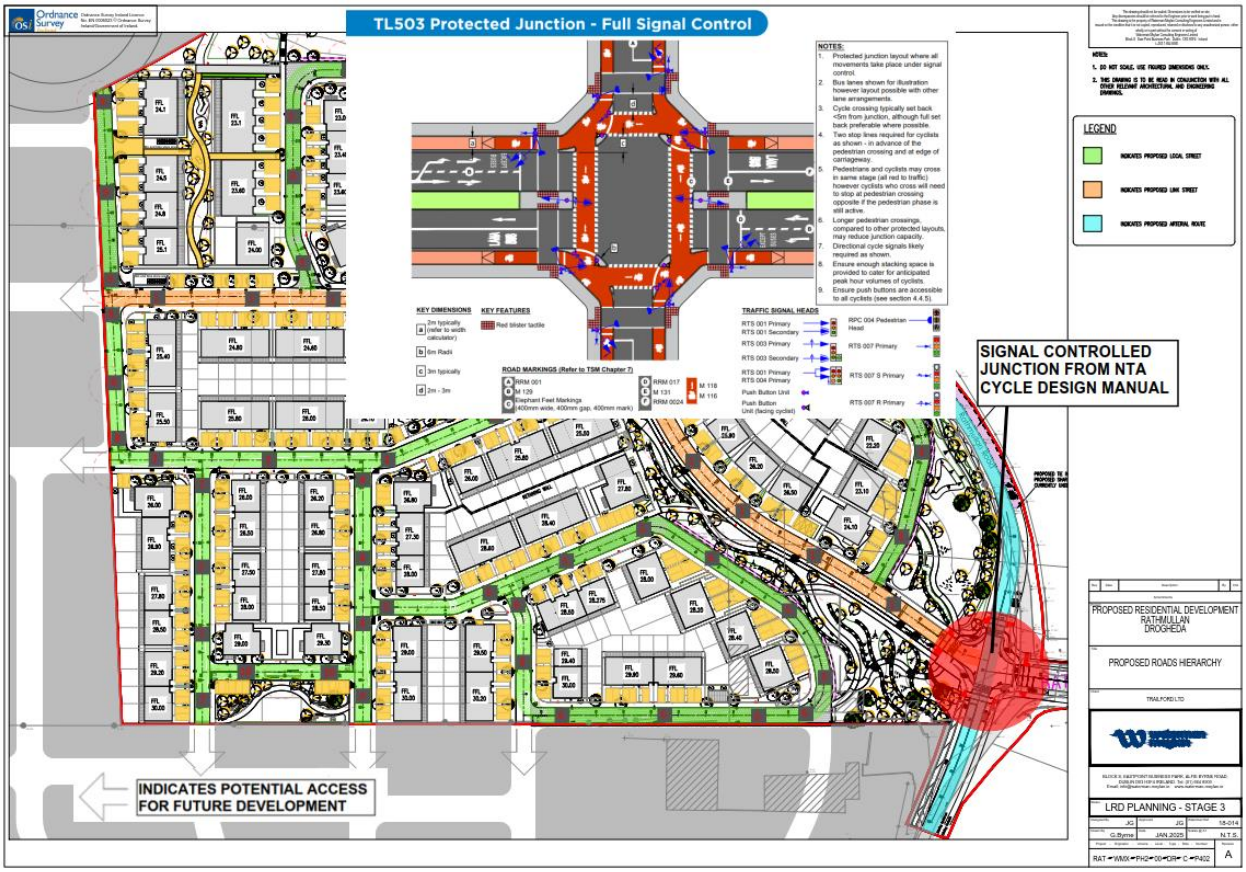


Figure 6: Location of Proposed Site

5.3 Bus and Railway Services

The closest bus stop near the area is Stop ID 126191, c. 350 m away and serviced by Bus Eireann, route 173 every 60 minutes on The Drive/ The View and on Rathmullan Road. The Drogheda Bus Station and the nearest bus stops are located at the intersection of Donore Road. and George's St. It is 2.4km from the subject site. This distance can be reached in 33-minutes walking, or 11-minutes cycling or 5-minutes on bus (Bus Route 173). This bus stop is served by various other Bus Eireann routes, including 100, 100x, 101, 10x, 105, 168, 182, 182a, 190, D1, D2, D4, and D5, as well as Local Link LMF routes 163 and 188

The Figure 7 below shows the bus stops located in the vicinity of the subject site, followed by the bus routes served by each bus stop and their distance from the site and table 4 below indicates the weekday frequency of the bus route.

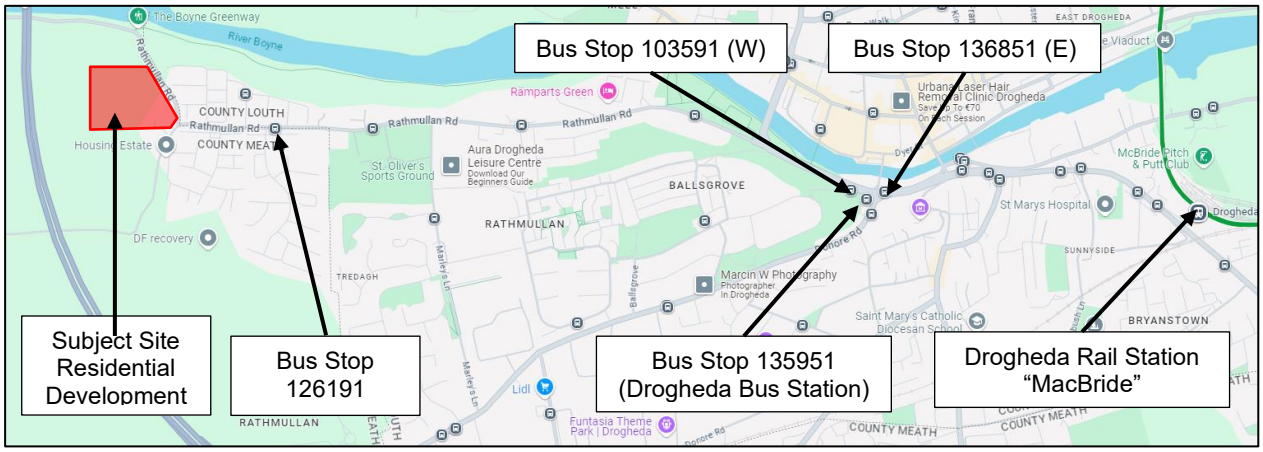


Figure 7 | *Location of Closest Bus Stops*
(Source: Transport for Ireland)

Table 4 Summary of Bus Services

Route No.	Route Name	Frequency
Bus Stop 126191		
173	Drogheda West St - Dominick St.	11 services every hour between 9:00 and 19:00
Bus Stop 135951		
188	Drogheda, Hospital - Kildalkey Road, Athboy Church Car Park	8 services 6:30, 8:00, 11:00, 13:00, 15L00, 19:00 and 21:00
100	Drogheda - Dundalk - Newry	Every hour between 06:45 and 18:00
100X	Wilton Tce - Airport - Dundalk	Every hour between 06:40 and 0:55
100X	Dundalk - Airport - Wilton Tce	Every hour between 6:00 and 22:10

101	Drogheda - Dublin - Airport	Every 20-30 Minutes between 05:20 and 23:00 and every hour between 23:00 and 5:00.
101X	Termon Abbey - Drogheda - Wilton Tce	5 services 5:54, 6:22, 6:42, 6:57 and 7:12
101X	Wilton Tce - Drogheda - Termon Abbey	4 services 17:44, 18:24, 18:54 and 19:14
105	Drogheda - Ashbourne - Blanchardstown	Every hour between 5:30 and 20:30
168	Annagassan - Dundalk	10 services between 7:00 and 23:30
182	Drogheda - Collon - Ardee - Monaghan	Every two hours between 8:10 and 20:10
182a	Drogheda - Hosptial - Ardee	Every two hours between 7:10 and 17:10
190	Drogheda - Navan - Trim	Every hour between 5:30 and 23:30
D1	Drogheda - Laytown	Every 30 minutes between 5:30 and 0:00
D2	Drogheda - Laytown via coast Road	Every 30 minutes between 5:30 and 23:30
Bus Stop 136851		
163	Drogheda - Donore	5 services 9:07, 11:27, 13:27, 16:37 and 17:52
D4	Ballymakenny - Southgate SC	Every 20-30 minutes between 6:10 and 23:14
D5	Termonabbey - Colpe Road	Every 30 minutes between 6:30 and 22:40
Bus Stop 103591		
168	Kildalkey Road, Athboy Church Car Park - Drogheda, Hospital	8 services 7:35, 9:00, 12:00, 14:00, 16:00, 18:00, 20:00 and 22:00
D4	Southgate SC - Ballymakenny	Every 20-30 minutes between 6:10 and 23:14
D5	Colpe Road - Termonabbey	Every 30 minutes between 6:30 and 22:40

Drogheda Rail Station (MacBride) is located c. 3.8km from the site entrance to the east direction. The site entrance is a c. 55-minutes walk from the railway station. However, residents can take Route 173 to get there, getting on at Stop ID: 126311, and get off at Stop ID 126191 to travel back from the MacBride rail station within 45 – 50 mins.

5.4 Road Design

Roadways

The roads throughout the development are to be 5.5m to 6m wide as standard. Gradients vary from 1 in 20 to 1 in 150. Road levels within the range of 19.60 meters to 36.50 meters OD Malin. Turning radii at internal junctions are between 3m and 4.5m throughout the site. Roads layout and design has been carried out in accordance with Design Manual for Urban Roads and Streets “DMURS”, published by Department of Transport.

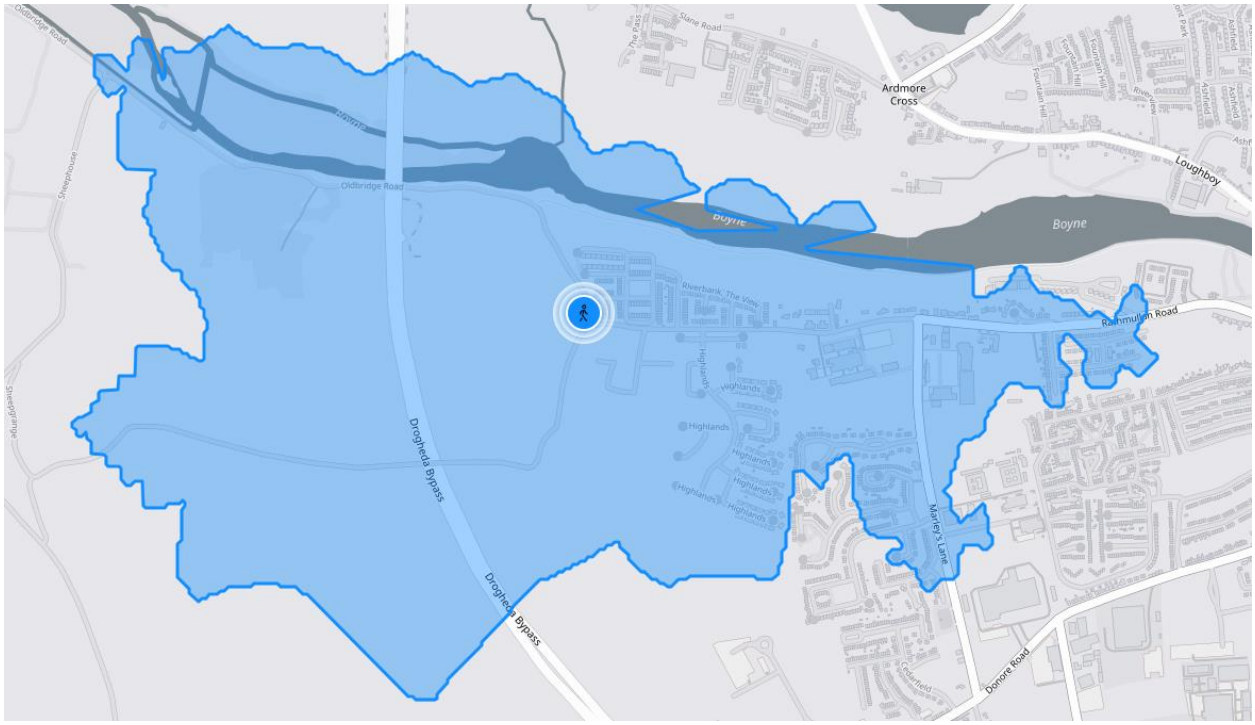
Pedestrian Facilities

The following pedestrian facilities are to be provided as part of the proposed development:

- The provision of a 2 m wide footpath on all residential roads throughout the development.
- The provision of appropriate road crossing points throughout the development with dropped kerbs and tactile paving.
- The Provision of a 3m wide cycle&pedestrian shared surface along the main linkage street within the proposed development.

The pedestrian facilities have been designed in accordance with DMURS. The provision of appropriate road crossing points throughout the development with dropped kerbs and appropriate tactile paving fully complies with the DMURS. Below is an analysis of walking isochrone from the proposed site considering a 20-minute walk, starting point taken at the entrance of the proposed site on Rathmullan Road.

Figure 8 : Isochrone for Walking (20min)

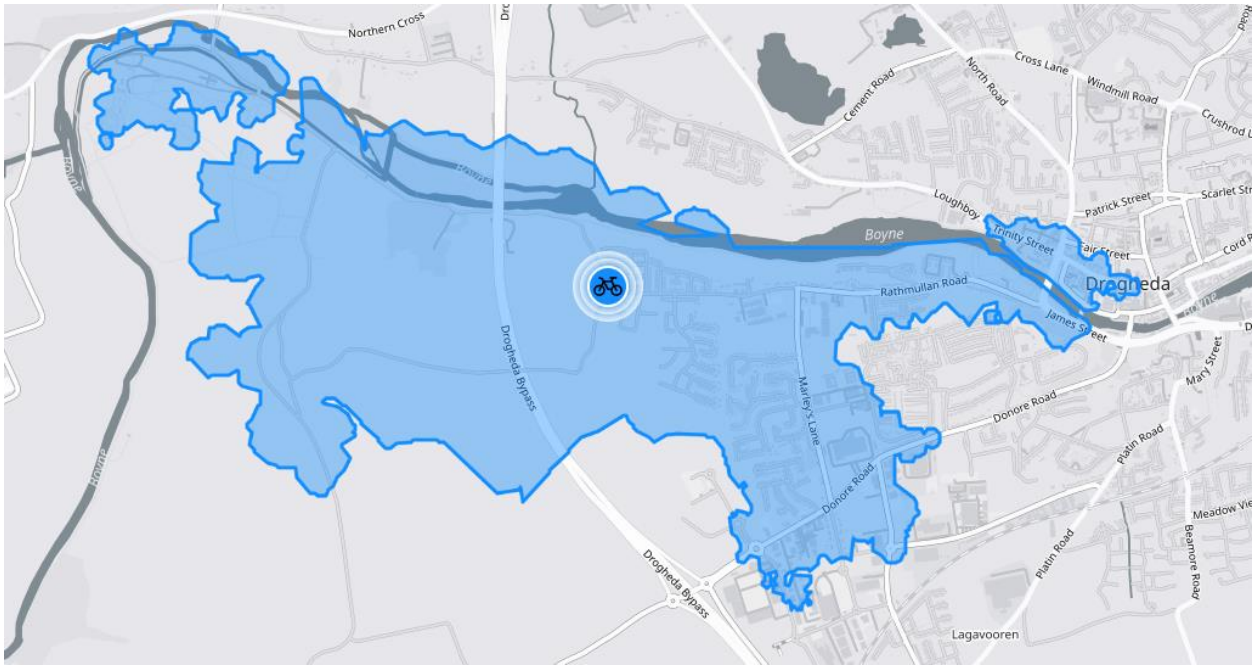


Cycle Facilities

It is proposed to provide cycle paths on the entrance junction through the development. Shared surface for Cyclist, pedestrians and vehicles is proposed on the rest of the internal road network. The cycle facilities have been designed in accordance with the National Cycle Manual by National Transport Authority (NTA).

Similar to above, below is the cycling isochrone for the site area for a 10-minutes cycle.

Figure 9: Isochrone for Cycling (10min)



By providing the pedestrian facilities and bicycle facilities described above, the proposed development encourages and provides residents with the opportunity to travel on foot or by bicycle as part of their daily travel. In accordance with the Louth County Council Drogheda Active Travel Plan, the R132 North Road contains active travel facilities. Whilst the R132 North Road is located approximately 2.1km east of the proposed site, the development provides good connectivity to North Road via the Rathmullan Road, since the end of Rathmullan Road connects directly to the R132 North Road. In addition, according to Meath County Council Sustainable Transport and Active Travel Greenway Network scheme, the Boyne Greenway along the Boyne River is located approximately 350m north of the proposed site. It begins at Dominic's Park on the south bank of the Boyne River near the Drogheda Peace Bridge. The total length of the greenway is approximately 4.5 km. The good connectivity of the two routes follows the concept of Greenways, Active Travel & National Cycle Network introduced by Transport Infrastructure Ireland in 2021.

It is noted that Meath County Council currently have proposals to construct a new greenway along Rathmullan Road which will connect the proposed site entrance to the Existing Boyne Greenway. This greenway received planning permission from An Bord Pleanala in May 2024 and is currently under construction. Therefore, it is expected that the construction of the greenway is likely to be completed before the construction of the proposed development.

Noted that Road L-16014 to the east of the proposed development has been noted as being unsuitable for a bicycle lane as the gradient would exceed the design standard limits. An alternative pedestrian and cycle shared route from within the proposed development is provided and joins the greenway at the north-east of the site. See figure below.

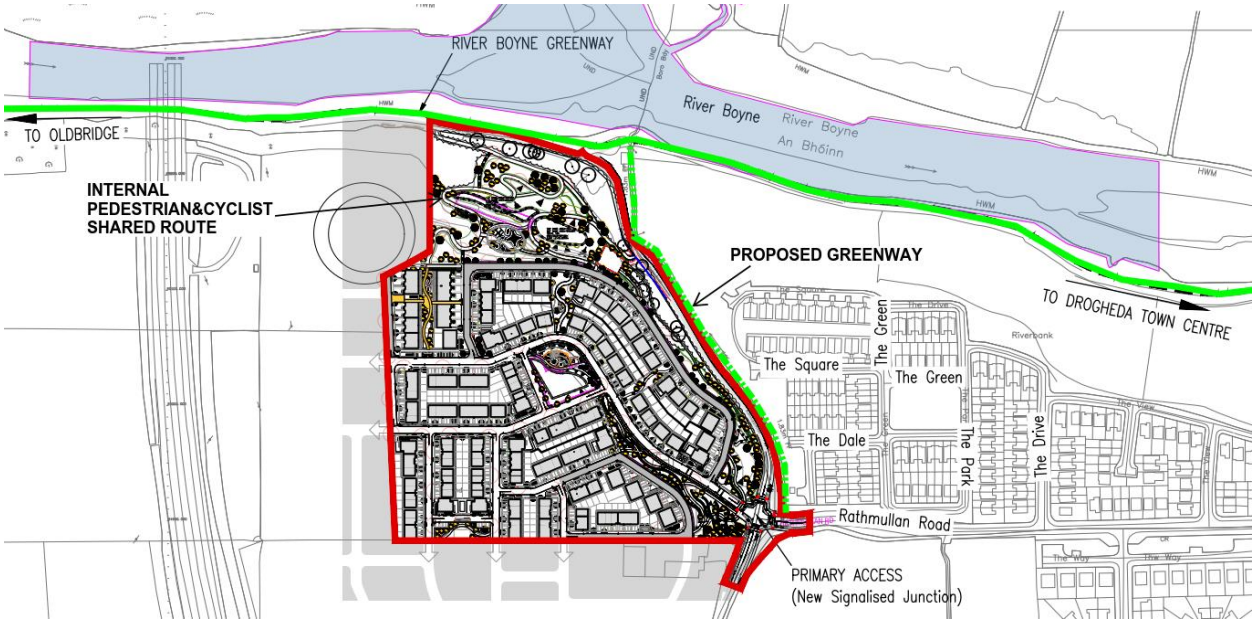


Figure 10: Proposal of Greenway

6. Parking Provision

6.1 Car Parking / Bicycle parking

Refer to Traffic and Transport Assessment report that will be issued in a separate cover for the details on car and bicycle parking.

It is proposed to provide a total of 396 no. car parking spaces including 386 no. car parking spaces destinated for residents, 8 no. parking spaces for creche and 4 no. car parking spaces for visitors as part of the development.

Furthermore, the site provides several cycling facilities, such as dedicated cycle infrastructure and bicycle storage areas to support a resilient and sustainable transport infrastructure. It is proposed to provide a total of 170 no. cycle parking spaces are provided which follows the minimum number of cycle parking spaces required as part of the development.

APPENDICES

A. Confirmation of Feasibility

CONFIRMATION OF FEASIBILITY

Ian Worrell

Waterman Moylan
Block S
Eastpoint Business Park
Alfie Byrne Road
Dublin
D03H3F4

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

1 April 2025

Our Ref: CDS24009836 Pre-Connection Enquiry
Rathmullan Road, LRD, Drogheda, Co. Meath

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 240 unit(s) at Rathmullan Road, LRD, Drogheda, Co. Meath, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible Subject to upgrades

- In order to accommodate the proposed connection at the Premises, upgrade works are required to increase the capacity of the Uisce Eireann network. Approximately 50m of new 450mm ID watermain (Green line) & a Flow Control Valve is to be laid (See Figure 2 below). Developer must liaise with the UÉ Asset Planning team for design and installation.
- Approximately 140m of new 200mm ID watermain (red line in Fig 1 mapping below) is to be laid to connect the site development to the existing 300mm uPVC main. These works are not currently on the Uisce Eireann investment plan therefore, the applicant will be required to fund these local network upgrades. The fee will be calculated at connection application stage.

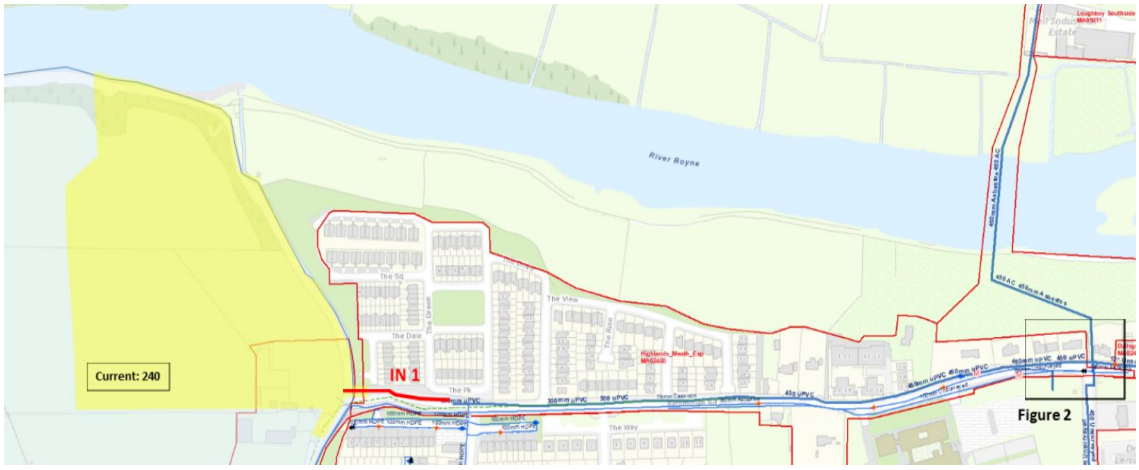


Figure 1 Overall watermain upgrades

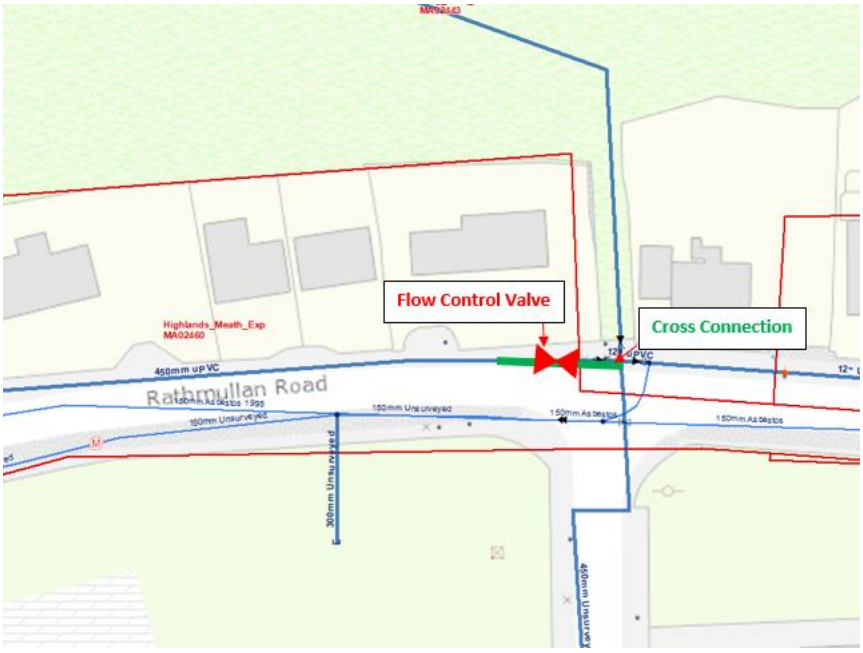


Figure 2 flow control valve and cross connection.

- **Wastewater Connection** - Feasible Subject to upgrades

- Customer to provide for additional upsizing and storage at proposed PS to accommodate diversion of flows from Riverbank / Dale PS and Old Bridge Manor PS. These works are not currently on the Uisce Eireann investment plan therefore, the applicant will be required to fund these local network upgrades and the decommissioning of the Dale/Riverbank PS.
- The customer could utilize the existing rising main from the Dale / Riverbank PS for approx 300units from the proposed site after which the rising main will need to be upgraded. The number of units will be again assessed at connection application stage.
- It is important to note the Uisce Éireann does not have funding to support any of the works noted above.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

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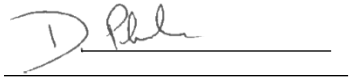
For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Uisce Éireann's Network(s)

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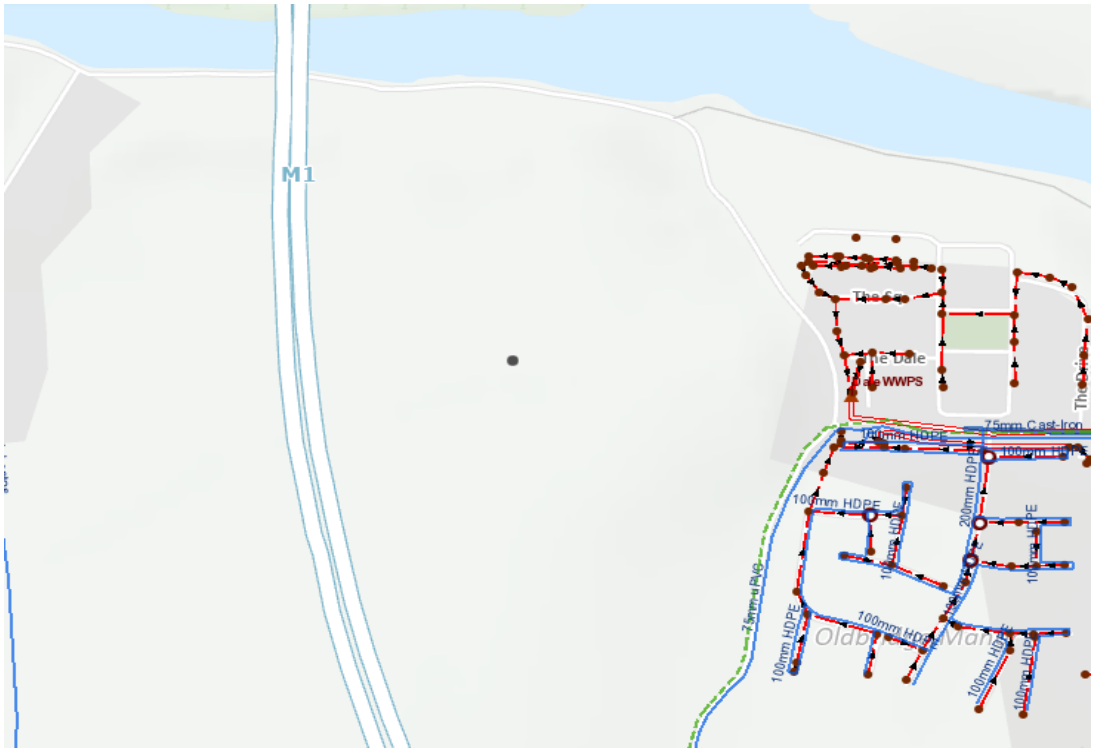

Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

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CONFIRMATION OF FEASIBILITY

Laura Ruiz Garrido

Block 5 Eastpoint Business Park
Alfie Byrne Road
Dublin 3
Co. Dublin

20 August 2024

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

Our Ref: CDS23000770 Pre-Connection Enquiry
Rathmullan Road, Phase 1, Drogheda, Drogheda, Meath

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 99 unit(s) at Rathmullan Road, Phase 1, Drogheda, Drogheda, Meath, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection**
  - Feasible Subject to upgrades
  - In order to accommodate the proposed connection at the Premises, upgrade works are required to increase the capacity of the Uisce Eireann network. Approximately 50m of new 450mm ID watermain & a Flow Control Valve is to be laid (See Figure 2 below). Developer must liaise with UÉ Asset Planning team for design and installation.

    Approximately 140m of new 200mm ID watermain is to be laid to connect the site development to the existing 300mm uPVC main (See Figure 2 below).

    These works are not currently on the Uisce Eireann investment plan therefore,

		the applicant will be required to fund these local network upgrades. The fee will be calculated at connection application stage.
• **Wastewater Connection**	-	Feasible Subject to upgrades
	-	Customer to provide for additional upsizing and storage at proposed PS to accommodate diversion of flows from Riverbank / Dale PS and Old Bridge Manor PS. These works are not currently on the Uisce Eireann investment plan therefore, the applicant will be required to fund these local network upgrades and the decommissioning of the Dale/Riverbank PS. The customer could utilize the existing rising main from the Dale / Riverbank PS for approx 300units from the proposed site after which the rising main will need to be upgraded. The number of units will be again assessed at connection application stage. It is important to note the Uisce Éireann does not have funding to support any of the works noted above.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

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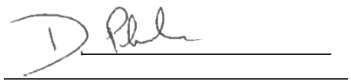
For any further information, visit **www.water.ie/connections, email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
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Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
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Section B – Details of Uisce Éireann's Network(s)

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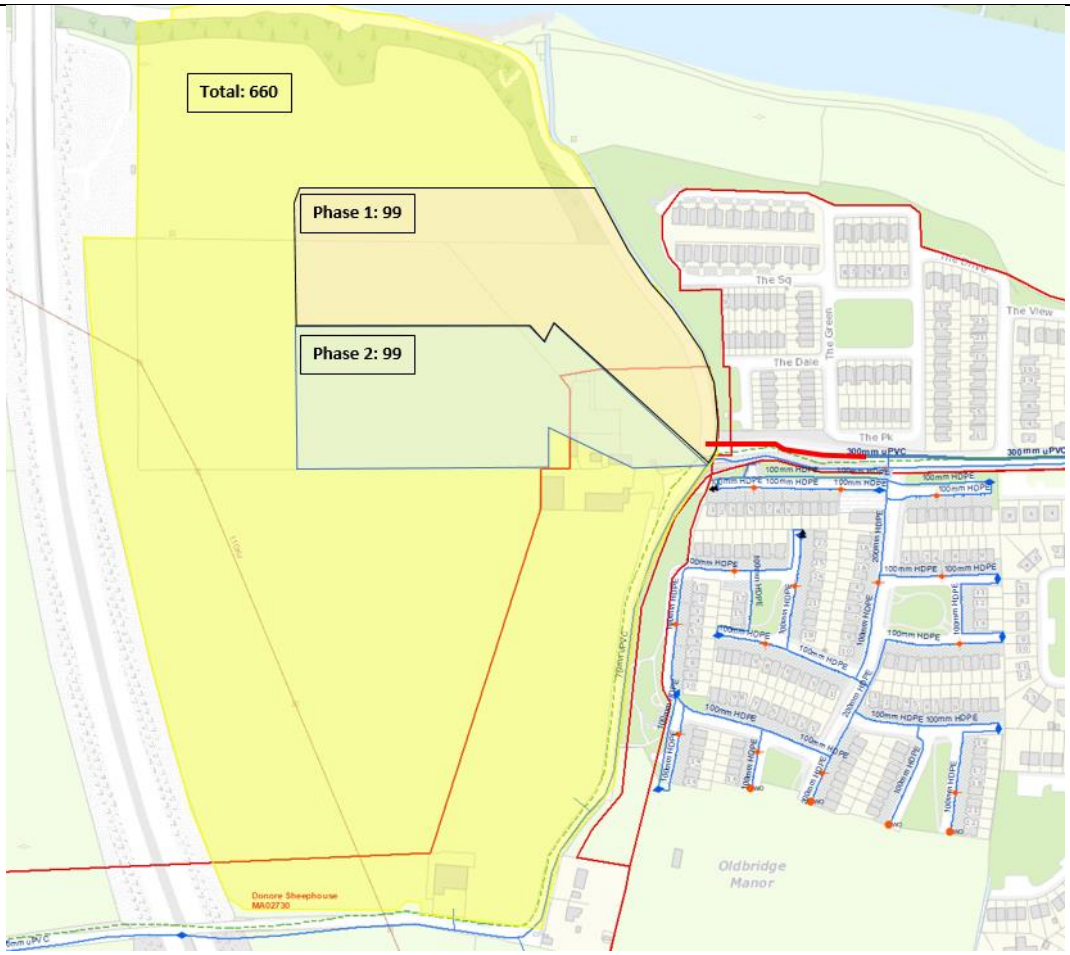

Figure 1 - Water Upgrades

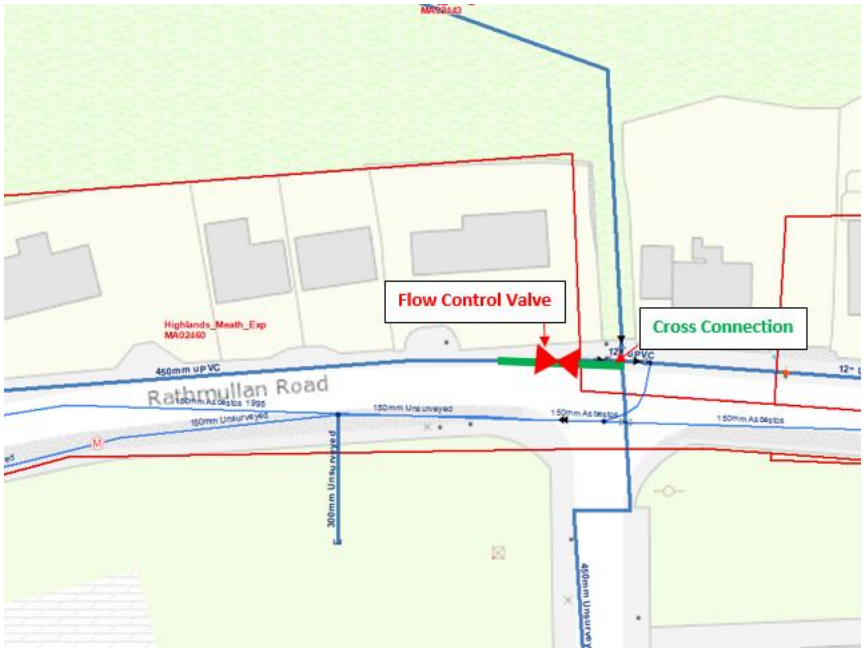

Figure 2 - Water Upgrades

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CONFIRMATION OF FEASIBILITY

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

Laura Ruiz Garrido

Block 5 Eastpoint Business Park
Alfie Byrne Road
Dublin 3
Co. Dublin

20 August 2024

Our Ref: CDS23000784 Pre-Connection Enquiry
Rathmullan Road, Phase 2, Drogheda, Drogheda, Meath

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 99 unit(s) at Rathmullan Road, Phase 2, Drogheda, Drogheda, Meath, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection**
  - Feasible Subject to upgrades
  - In order to accommodate the proposed connection at the Premises, upgrade works are required to increase the capacity of the Uisce Eireann network. Approximately 50m of new 450mm ID watermain & a Flow Control Valve is to be laid (See Figure 2 below). Developer must liaise with UÉ Asset Planning team for design and installation.

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- **Wastewater Connection** - Feasible Subject to upgrades
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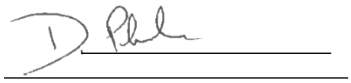

Dermot Phelan
Connections Delivery Manager

Section A - What is important to know?

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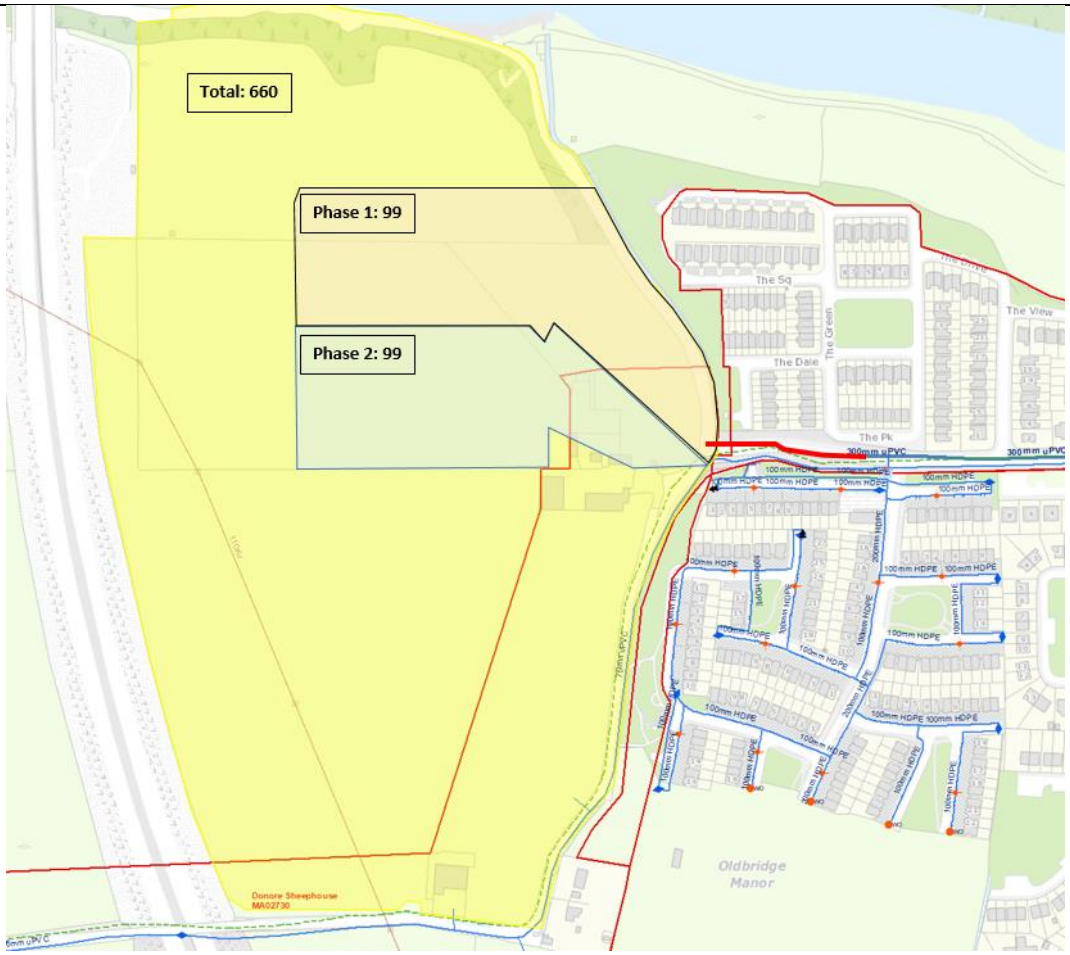
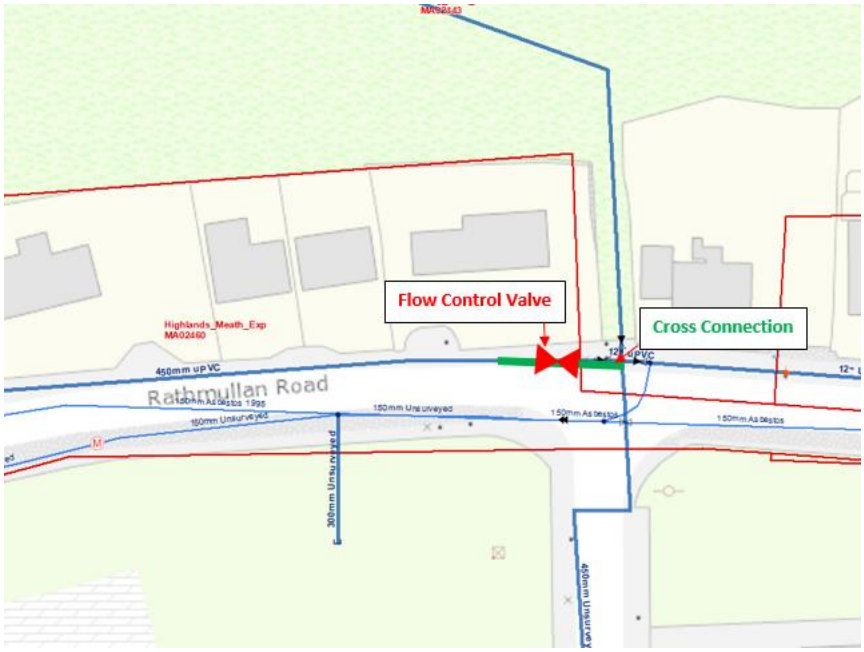


Figure 1 - Water Upgrades



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B. Surface Water Attenuation Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	15.100	Minimum Backdrop Height (m)	0.200
Ratio-R	0.270	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PP1	0.065	4.00	29.700		706208.122	775084.983	0.500
6	0.056	4.00	29.674	1200	706194.812	775076.036	1.425
7	0.016	4.00	28.444	1200	706267.020	775076.798	1.508
8	0.012	4.00	28.297	1200	706267.252	775094.383	1.471
PP2	0.064	4.00	28.300		706251.933	775105.251	0.500
10	0.011	4.00	28.174	1200	706261.776	775108.386	1.442
11			28.051	1200	706250.265	775120.333	1.501
PP3	0.068	4.00	27.900		706220.809	775128.521	0.400
J1	0.033	4.00	27.846		706229.458	775133.466	1.501
PP4	0.032	4.00	30.000		706164.549	775092.745	0.500
PP5	0.063	4.00	30.000		706149.576	775092.741	0.500
14	0.046	4.00	30.000	1200	706156.321	775078.056	1.425
15	0.018	4.00	28.615	1200	706156.178	775113.635	1.425
PP48	0.045	4.00	28.500		706170.260	775124.730	0.500
17	0.019	4.00	28.725	1200	706138.148	775120.131	1.425
18			28.515	1200	706151.843	775125.929	1.500
PP6	0.123	4.00	28.300		706172.131	775142.071	0.500
J2	0.050	4.00	28.082		706175.156	775135.313	1.524
21	0.008	4.00	27.600	1200	706206.526	775147.941	1.657
PP10	0.047	4.00	30.000		706032.878	775085.468	0.500
23	0.048	4.00	29.852	1200	706040.339	775080.553	1.425
PP11	0.045	4.00	28.500		706032.464	775115.868	0.500
25	0.016	4.00	28.363	1200	706040.339	775110.553	1.425
PP13	0.055	4.00	26.900		706033.089	775146.943	0.500
PP12	0.087	4.00	27.500		706047.589	775134.413	0.500
J4	0.048	4.00	26.870		706040.339	775140.553	1.432
26	0.080	4.00	25.586	1350	706040.339	775170.553	1.798
PP14	0.115	4.00	26.000		706075.867	775178.053	0.500
J5			25.850		706073.821	775170.553	2.229
PP7	0.063	4.00	30.000		706106.792	775093.110	0.500
28	0.051	4.00	30.000	1200	706098.819	775080.553	1.425
29	0.015	4.00	28.286	1200	706098.819	775117.028	1.425
PP9	0.089	4.00	26.800		706091.319	775134.413	0.500
PP8	0.068	4.00	27.300		706106.319	775142.205	0.500
J3	0.070	4.00	27.220		706098.784	775140.553	1.535
33	0.022	4.00	26.045	1350	706098.819	775170.553	2.624
34	0.034	4.00	25.888	1350	706113.284	775173.127	2.540
PP46	0.068	4.00	25.800		706141.365	775176.093	0.500
38	0.040	4.00	25.510	1350	706143.533	775186.319	2.327
PP47	0.041	4.00	25.500		706175.446	775189.612	0.500

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
J6			25.111		706172.138	775197.832	2.082
41	0.018	4.00	25.000	1500	706183.392	775202.361	2.182
42			24.700	1500	706180.363	775209.625	1.913
BASIN 01	0.024	4.00	24.000		706161.468	775221.106	2.318
HB 1			24.000	1500	706147.811	775243.580	2.406
59			23.147	1200	706146.160	775250.835	1.603

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	PP1	6	16.038	0.600	29.200	29.040	0.160	100.0	150	4.27	50.0
1.001	6	7	72.212	0.600	28.249	26.936	1.313	55.0	225	4.95	50.0
1.002	7	8	17.587	0.600	26.936	26.826	0.110	160.0	225	5.23	50.0
1.003	8	10	15.036	0.600	26.826	26.732	0.094	160.0	225	5.47	50.0
2.000	PP2	10	10.330	0.600	27.800	27.697	0.103	100.0	150	4.17	50.0
1.004	10	11	16.590	0.600	26.732	26.625	0.107	155.0	225	5.74	50.0
1.005	11	J1	24.605	0.600	26.550	26.345	0.205	120.0	300	6.02	50.0
3.000	PP3	J1	9.963	0.600	27.500	27.400	0.100	100.0	150	4.17	50.0
1.006	J1	21	27.118	0.600	26.345	26.119	0.226	120.0	300	6.34	50.0
4.000	PP4	14	16.836	0.600	29.500	29.332	0.168	100.0	100	4.37	50.0
5.000	PP5	14	16.161	0.600	29.500	29.338	0.162	100.0	150	4.27	50.0
4.001	14	15	35.579	0.600	28.575	27.190	1.385	25.7	225	4.59	50.0
4.002	15	18	13.036	0.600	27.190	27.090	0.100	130.4	225	4.78	50.0
6.000	PP48	18	18.456	0.600	28.000	27.815	0.185	100.0	150	4.31	50.0
7.000	17	18	14.872	0.600	27.300	27.090	0.210	70.8	225	4.16	50.0
4.003	18	J2	25.131	0.600	27.015	26.558	0.457	55.0	300	4.98	50.0
8.000	PP6	J2	7.404	0.600	27.800	27.726	0.074	100.0	225	4.09	50.0

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	1.005	17.8	11.8	0.350	0.484	0.065	0.0	89	1.073
1.001	1.767	70.3	21.9	1.200	1.283	0.121	0.0	86	1.562
1.002	1.031	41.0	24.8	1.283	1.246	0.137	0.0	126	1.077
1.003	1.031	41.0	26.9	1.246	1.217	0.149	0.0	133	1.098
2.000	1.005	17.8	11.5	0.350	0.327	0.064	0.0	88	1.069
1.004	1.047	41.6	40.4	1.217	1.201	0.224	0.0	180	1.188
1.005	1.434	101.4	40.4	1.201	1.201	0.224	0.0	132	1.355
3.000	1.005	17.8	12.2	0.250	0.296	0.068	0.0	92	1.082
1.006	1.434	101.4	58.5	1.201	1.181	0.324	0.0	164	1.484
4.000	0.769	6.0	5.7	0.400	0.568	0.032	0.0	78	0.874
5.000	1.005	17.8	11.4	0.350	0.512	0.063	0.0	88	1.066
4.001	2.591	103.0	25.5	1.200	1.200	0.141	0.0	76	2.158
4.002	1.143	45.5	28.7	1.200	1.200	0.159	0.0	130	1.207
6.000	1.005	17.8	8.2	0.350	0.550	0.045	0.0	71	0.983
7.000	1.556	61.9	3.5	1.200	1.200	0.019	0.0	36	0.840
4.003	2.124	150.1	40.3	1.200	1.224	0.223	0.0	106	1.810
8.000	1.307	52.0	22.3	0.275	0.131	0.123	0.0	103	1.260

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)
4.004	J2	21	33.816	0.600	26.558	25.943	0.615	55.0	300	5.25	50.0
1.007	21	41	59.133	0.600	25.943	23.500	2.443	24.2	300	6.65	50.0
9.000	PP10	23	8.934	0.600	29.500	29.411	0.089	100.0	150	4.15	50.0
9.001	23	25	30.000	0.600	28.427	26.938	1.489	20.1	225	4.32	50.0
10.000	PP11	25	9.501	0.600	28.000	27.905	0.095	100.0	150	4.16	50.0
9.002	25	J4	30.000	0.600	26.938	25.438	1.500	20.0	225	4.49	50.0
11.000	PP13	J4	9.664	0.600	26.400	26.303	0.097	100.0	150	4.16	50.0
12.000	PP12	J4	9.501	0.600	27.000	26.050	0.950	10.0	100	4.06	50.0
9.003	J4	26	30.000	0.600	25.438	23.938	1.500	20.0	225	4.66	50.0
9.004	26	J5	33.482	0.600	23.788	23.621	0.167	200.0	375	5.10	50.0
13.000	PP14	J5	7.774	0.600	25.500	25.422	0.078	100.0	225	4.10	50.0
9.005	J5	33	24.998	0.600	23.621	23.496	0.125	200.0	375	5.42	50.0
14.000	PP7	28	14.874	0.600	29.500	29.351	0.149	100.0	150	4.25	50.0
14.001	28	29	36.475	0.600	28.575	26.861	1.714	21.3	225	4.46	50.0
14.002	29	J3	23.525	0.600	26.861	25.685	1.176	20.0	225	4.59	50.0
15.000	PP9	J3	9.666	0.600	26.300	26.203	0.097	100.0	150	4.16	50.0
16.000	PP8	J3	7.714	0.600	26.800	26.723	0.077	100.0	150	4.13	50.0
14.003	J3	33	30.001	0.600	25.685	24.185	1.500	20.0	225	4.76	50.0
9.006	33	34	14.692	0.600	23.421	23.348	0.073	200.0	450	5.59	50.0
9.007	34	38	33.000	0.600	23.348	23.183	0.165	200.0	450	5.98	50.0
17.000	PP46	38	10.453	0.600	25.300	25.039	0.261	40.0	150	4.11	50.0
9.008	38	J6	30.835	0.600	23.183	23.029	0.154	200.0	450	6.34	50.0
18.000	PP47	J6	8.861	0.600	25.000	24.778	0.222	40.0	100	4.12	50.0

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)
4.004	2.124	150.1	71.7	1.224	1.357	0.397	0.0	146	2.102
1.007	3.208	226.8	131.7	1.357	1.200	0.729	0.0	164	3.324
9.000	1.005	17.8	8.5	0.350	0.291	0.047	0.0	73	0.993
9.001	2.928	116.4	17.2	1.200	1.200	0.095	0.0	58	2.118
10.000	1.005	17.8	8.1	0.350	0.308	0.045	0.0	71	0.983
9.002	2.939	116.8	28.3	1.200	1.207	0.156	0.0	75	2.433
11.000	1.005	17.8	9.9	0.350	0.417	0.055	0.0	80	1.031
12.000	2.458	19.3	15.7	0.400	0.720	0.087	0.0	68	2.733
9.003	2.939	116.8	62.5	1.207	1.423	0.346	0.0	117	2.989
9.004	1.277	141.1	77.0	1.423	1.854	0.426	0.0	197	1.303
13.000	1.307	52.0	20.8	0.275	0.203	0.115	0.0	99	1.236
9.005	1.277	141.1	97.8	1.854	2.174	0.541	0.0	230	1.375
14.000	1.005	17.8	11.3	0.350	0.499	0.063	0.0	87	1.064
14.001	2.849	113.3	20.5	1.200	1.200	0.114	0.0	65	2.177
14.002	2.939	116.8	23.3	1.200	1.310	0.129	0.0	68	2.311
15.000	1.005	17.8	16.0	0.350	0.867	0.089	0.0	112	1.134
16.000	1.005	17.8	12.4	0.350	0.347	0.068	0.0	92	1.084
14.003	2.939	116.8	64.3	1.310	1.635	0.356	0.0	119	3.006
9.006	1.434	228.0	166.1	2.174	2.090	0.919	0.0	286	1.558
9.007	1.434	228.0	172.2	2.090	1.877	0.953	0.0	293	1.569
17.000	1.596	28.2	12.3	0.350	0.321	0.068	0.0	69	1.544
9.008	1.434	228.0	191.8	1.877	1.632	1.062	0.0	318	1.598
18.000	1.223	9.6	7.4	0.400	0.233	0.041	0.0	65	1.344

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)
9.009	J6	41	12.131	0.600	23.029	22.968	0.061	200.0	450	6.48	50.0
1.008	41	42	7.870	0.600	22.818	22.787	0.031	250.0	600	6.73	49.9
1.009	42	BASIN 01	22.110	0.600	22.787	21.682	1.105	20.0	600	6.80	49.7
1.010	BASIN 01	HB 1	26.298	0.600	21.682	21.594	0.088	300.0	600	7.11	48.8
1.011	HB 1	59	7.440	0.600	21.594	21.544	0.050	148.8	225	7.23	0.0

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)
9.009	1.434	228.0	199.2	1.632	1.582	1.102	0.0	327	1.607
1.008	1.535	434.1	333.3	1.582	1.313	1.849	0.0	396	1.684
1.009	5.461	1544.0	331.9	1.313	1.718	1.849	0.0	188	4.399
1.010	1.400	396.0	330.0	1.718	1.806	1.873	0.0	421	1.558
1.011	1.069	42.5	0.0	2.181	1.378	1.873	0.0	0	0.000

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	16.038	100.0	150	Circular	29.700	29.200	0.350	29.674	29.040	0.484
1.001	72.212	55.0	225	Circular	29.674	28.249	1.200	28.444	26.936	1.283
1.002	17.587	160.0	225	Circular	28.444	26.936	1.283	28.297	26.826	1.246
1.003	15.036	160.0	225	Circular	28.297	26.826	1.246	28.174	26.732	1.217
2.000	10.330	100.0	150	Circular	28.300	27.800	0.350	28.174	27.697	0.327
1.004	16.590	155.0	225	Circular	28.174	26.732	1.217	28.051	26.625	1.201
1.005	24.605	120.0	300	Circular	28.051	26.550	1.201	27.846	26.345	1.201
3.000	9.963	100.0	150	Circular	27.900	27.500	0.250	27.846	27.400	0.296
1.006	27.118	120.0	300	Circular	27.846	26.345	1.201	27.600	26.119	1.181
4.000	16.836	100.0	100	Circular	30.000	29.500	0.400	30.000	29.332	0.568
5.000	16.161	100.0	150	Circular	30.000	29.500	0.350	30.000	29.338	0.512
4.001	35.579	25.7	225	Circular	30.000	28.575	1.200	28.615	27.190	1.200
4.002	13.036	130.4	225	Circular	28.615	27.190	1.200	28.515	27.090	1.200
6.000	18.456	100.0	150	Circular	28.500	28.000	0.350	28.515	27.815	0.550

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	PP1		Junction		6	1200	Manhole	Adoptable
1.001	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.002	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.003	8	1200	Manhole	Adoptable	10	1200	Manhole	Adoptable
2.000	PP2		Junction		10	1200	Manhole	Adoptable
1.004	10	1200	Manhole	Adoptable	11	1200	Manhole	Adoptable
1.005	11	1200	Manhole	Adoptable	J1		Junction	
3.000	PP3		Junction		J1		Junction	
1.006	J1		Junction		21	1200	Manhole	Adoptable
4.000	PP4		Junction		14	1200	Manhole	Adoptable
5.000	PP5		Junction		14	1200	Manhole	Adoptable
4.001	14	1200	Manhole	Adoptable	15	1200	Manhole	Adoptable
4.002	15	1200	Manhole	Adoptable	18	1200	Manhole	Adoptable
6.000	PP48		Junction		18	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)
7.000	14.872	70.8	225	Circular	28.725	27.300	1.200	28.515	27.090	1.200
4.003	25.131	55.0	300	Circular	28.515	27.015	1.200	28.082	26.558	1.224
8.000	7.404	100.0	225	Circular	28.300	27.800	0.275	28.082	27.726	0.131
4.004	33.816	55.0	300	Circular	28.082	26.558	1.224	27.600	25.943	1.357
1.007	59.133	24.2	300	Circular	27.600	25.943	1.357	25.000	23.500	1.200
9.000	8.934	100.0	150	Circular	30.000	29.500	0.350	29.852	29.411	0.291
9.001	30.000	20.1	225	Circular	29.852	28.427	1.200	28.363	26.938	1.200
10.000	9.501	100.0	150	Circular	28.500	28.000	0.350	28.363	27.905	0.308
9.002	30.000	20.0	225	Circular	28.363	26.938	1.200	26.870	25.438	1.207
11.000	9.664	100.0	150	Circular	26.900	26.400	0.350	26.870	26.303	0.417
12.000	9.501	10.0	100	Circular	27.500	27.000	0.400	26.870	26.050	0.720
9.003	30.000	20.0	225	Circular	26.870	25.438	1.207	25.586	23.938	1.423
9.004	33.482	200.0	375	Circular	25.586	23.788	1.423	25.850	23.621	1.854
13.000	7.774	100.0	225	Circular	26.000	25.500	0.275	25.850	25.422	0.203
9.005	24.998	200.0	375	Circular	25.850	23.621	1.854	26.045	23.496	2.174
14.000	14.874	100.0	150	Circular	30.000	29.500	0.350	30.000	29.351	0.499
14.001	36.475	21.3	225	Circular	30.000	28.575	1.200	28.286	26.861	1.200
14.002	23.525	20.0	225	Circular	28.286	26.861	1.200	27.220	25.685	1.310
15.000	9.666	100.0	150	Circular	26.800	26.300	0.350	27.220	26.203	0.867
16.000	7.714	100.0	150	Circular	27.300	26.800	0.350	27.220	26.723	0.347
14.003	30.001	20.0	225	Circular	27.220	25.685	1.310	26.045	24.185	1.635
9.006	14.692	200.0	450	Circular	26.045	23.421	2.174	25.888	23.348	2.090
9.007	33.000	200.0	450	Circular	25.888	23.348	2.090	25.510	23.183	1.877
17.000	10.453	40.0	150	Circular	25.800	25.300	0.350	25.510	25.039	0.321

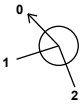
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.000	17	1200	Manhole	Adoptable	18	1200	Manhole	Adoptable
4.003	18	1200	Manhole	Adoptable	J2		Junction	
8.000	PP6		Junction		J2		Junction	
4.004	J2		Junction		21	1200	Manhole	Adoptable
1.007	21	1200	Manhole	Adoptable	41	1500	Manhole	Adoptable
9.000	PP10		Junction		23	1200	Manhole	Adoptable
9.001	23	1200	Manhole	Adoptable	25	1200	Manhole	Adoptable
10.000	PP11		Junction		25	1200	Manhole	Adoptable
9.002	25	1200	Manhole	Adoptable	J4		Junction	
11.000	PP13		Junction		J4		Junction	
12.000	PP12		Junction		J4		Junction	
9.003	J4		Junction		26	1350	Manhole	Adoptable
9.004	26	1350	Manhole	Adoptable	J5		Junction	
13.000	PP14		Junction		J5		Junction	
9.005	J5		Junction		33	1350	Manhole	Adoptable
14.000	PP7		Junction		28	1200	Manhole	Adoptable
14.001	28	1200	Manhole	Adoptable	29	1200	Manhole	Adoptable
14.002	29	1200	Manhole	Adoptable	J3		Junction	
15.000	PP9		Junction		J3		Junction	
16.000	PP8		Junction		J3		Junction	
14.003	J3		Junction		33	1350	Manhole	Adoptable
9.006	33	1350	Manhole	Adoptable	34	1350	Manhole	Adoptable
9.007	34	1350	Manhole	Adoptable	38	1350	Manhole	Adoptable
17.000	PP46		Junction		38	1350	Manhole	Adoptable

Pipeline Schedule

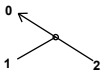
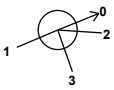
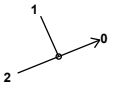
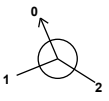
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
9.008	30.835	200.0	450	Circular	25.510	23.183	1.877	25.111	23.029	1.632
18.000	8.861	40.0	100	Circular	25.500	25.000	0.400	25.111	24.778	0.233
9.009	12.131	200.0	450	Circular	25.111	23.029	1.632	25.000	22.968	1.582
1.008	7.870	250.0	600	Circular	25.000	22.818	1.582	24.700	22.787	1.313
1.009	22.110	20.0	600	Circular	24.700	22.787	1.313	24.000	21.682	1.718
1.010	26.298	300.0	600	Circular	24.000	21.682	1.718	24.000	21.594	1.806
1.011	7.440	148.8	225	Circular	24.000	21.594	2.181	23.147	21.544	1.378

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
9.008	38	1350	Manhole	Adoptable	J6		Junction	
18.000	PP47		Junction		J6		Junction	
9.009	J6		Junction		41	1500	Manhole	Adoptable
1.008	41	1500	Manhole	Adoptable	42	1500	Manhole	Adoptable
1.009	42	1500	Manhole	Adoptable	BASIN 01		Junction	
1.010	BASIN 01		Junction		HB 1	1500	Manhole	Adoptable
1.011	HB 1	1500	Manhole	Adoptable	59	1200	Manhole	Adoptable

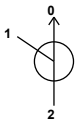
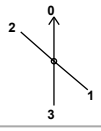
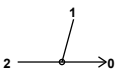
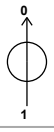
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PP1	706208.122	775084.983	29.700	0.500			0 1.000	29.200	150
6	706194.812	775076.036	29.674	1.425	1200		1 1.000	29.040	150
							0 1.001	28.249	225
7	706267.020	775076.798	28.444	1.508	1200		1 1.001	26.936	225
							0 1.002	26.936	225
8	706267.252	775094.383	28.297	1.471	1200		1 1.002	26.826	225
							0 1.003	26.826	225
PP2	706251.933	775105.251	28.300	0.500			0 2.000	27.800	150
10	706261.776	775108.386	28.174	1.442	1200		1 2.000	27.697	150
							2 1.003	26.732	225
							0 1.004	26.732	225
11	706250.265	775120.333	28.051	1.501	1200		1 1.004	26.625	225
							0 1.005	26.550	300

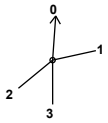
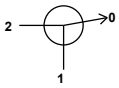
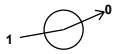
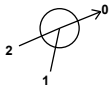
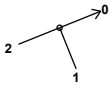
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PP3	706220.809	775128.521	27.900	0.400			0	3.000	27.500	150
J1	706229.458	775133.466	27.846	1.501			1	3.000	27.400	150
							2	1.005	26.345	300
							0	1.006	26.345	300
PP4	706164.549	775092.745	30.000	0.500			0	4.000	29.500	100
PP5	706149.576	775092.741	30.000	0.500			0	5.000	29.500	150
14	706156.321	775078.056	30.000	1.425	1200		1	5.000	29.338	150
							2	4.000	29.332	100
							0	4.001	28.575	225
15	706156.178	775113.635	28.615	1.425	1200		1	4.001	27.190	225
							0	4.002	27.190	225
PP48	706170.260	775124.730	28.500	0.500			0	6.000	28.000	150
17	706138.148	775120.131	28.725	1.425	1200		0	7.000	27.300	225
18	706151.843	775125.929	28.515	1.500	1200		1	7.000	27.090	225
							2	6.000	27.815	150
							3	4.002	27.090	225
							0	4.003	27.015	300
PP6	706172.131	775142.071	28.300	0.500			0	8.000	27.800	225
J2	706175.156	775135.313	28.082	1.524			1	8.000	27.726	225
							2	4.003	26.558	300
							0	4.004	26.558	300
21	706206.526	775147.941	27.600	1.657	1200		1	4.004	25.943	300
							2	1.006	26.119	300
							0	1.007	25.943	300
PP10	706032.878	775085.468	30.000	0.500			0	9.000	29.500	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
23	706040.339	775080.553	29.852	1.425	1200	 1	9.000	29.411	150
						0	9.001	28.427	225
PP11	706032.464	775115.868	28.500	0.500		 0	10.000	28.000	150
25	706040.339	775110.553	28.363	1.425	1200	 1	10.000	27.905	150
						2	9.001	26.938	225
						0	9.002	26.938	225
PP13	706033.089	775146.943	26.900	0.500		 0	11.000	26.400	150
PP12	706047.589	775134.413	27.500	0.500		 0	12.000	27.000	100
J4	706040.339	775140.553	26.870	1.432		 1	12.000	26.050	100
						2	11.000	26.303	150
						3	9.002	25.438	225
						0	9.003	25.438	225
26	706040.339	775170.553	25.586	1.798	1350	 1	9.003	23.938	225
						0	9.004	23.788	375
PP14	706075.867	775178.053	26.000	0.500		 0	13.000	25.500	225
J5	706073.821	775170.553	25.850	2.229		 1	13.000	25.422	225
						2	9.004	23.621	375
						0	9.005	23.621	375
PP7	706106.792	775093.110	30.000	0.500		 0	14.000	29.500	150
28	706098.819	775080.553	30.000	1.425	1200	 1	14.000	29.351	150
						0	14.001	28.575	225
29	706098.819	775117.028	28.286	1.425	1200	 1	14.001	26.861	225
						0	14.002	26.861	225
PP9	706091.319	775134.413	26.800	0.500		 0	15.000	26.300	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PP8	706106.319	775142.205	27.300	0.500			0	16.000	26.800	150
J3	706098.784	775140.553	27.220	1.535			1	16.000	26.723	150
							2	15.000	26.203	150
							3	14.002	25.685	225
							0	14.003	25.685	225
33	706098.819	775170.553	26.045	2.624	1350		1	14.003	24.185	225
							2	9.005	23.496	375
							0	9.006	23.421	450
34	706113.284	775173.127	25.888	2.540	1350		1	9.006	23.348	450
							0	9.007	23.348	450
PP46	706141.365	775176.093	25.800	0.500			0	17.000	25.300	150
38	706143.533	775186.319	25.510	2.327	1350		1	17.000	25.039	150
							2	9.007	23.183	450
							0	9.008	23.183	450
PP47	706175.446	775189.612	25.500	0.500			0	18.000	25.000	100
J6	706172.138	775197.832	25.111	2.082			1	18.000	24.778	100
							2	9.008	23.029	450
							0	9.009	23.029	450
41	706183.392	775202.361	25.000	2.182	1500		1	9.009	22.968	450
							2	1.007	23.500	300
							0	1.008	22.818	600
42	706180.363	775209.625	24.700	1.913	1500		1	1.008	22.787	600
							0	1.009	22.787	600
BASIN 01	706161.468	775221.106	24.000	2.318			1	1.009	21.682	600
							0	1.010	21.682	600
HB 1	706147.811	775243.580	24.000	2.406	1500		1	1.010	21.594	600
							0	1.011	21.594	225
59	706146.160	775250.835	23.147	1.603	1200		1	1.011	21.544	225

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	15.100	Additional Storage (m³/ha)	20.0
Ratio-R	0.270	Starting Level (m)	
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Node HB 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.011	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0143-1070-1500-1070
Invert Level (m)	21.594	Min Outlet Diameter (m)	0.225
Design Depth (m)	1.500	Min Node Diameter (mm)	0
Design Flow (l/s)	10.7		

Node PP3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	27.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	13

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.350	100.0	0.0	0.351	0.0	0.0

Node PP1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	5

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	125.0	0.0	0.350	125.0	0.0	0.351	0.0	0.0

Node PP2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	27.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	5

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.350	100.0	0.0	0.351	0.0	0.0

Node PP4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	5

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	62.5	0.0	0.350	62.5	0.0	0.351	0.0	0.0

Node PP5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	125.0	0.0	0.350	125.0	0.0	0.351	0.0	0.0

Node PP6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	27.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	6

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	275.0	0.0	0.350	275.0	0.0	0.351	0.0	0.0

Node PP7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	112.5	0.0	0.350	112.5	0.0	0.351	0.0	0.0

Node PP8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	26.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	5

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	112.5	0.0	0.350	112.5	0.0	0.351	0.0	0.0

Node PP9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	26.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	8

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	187.5	0.0	0.350	187.5	0.0	0.351	0.0	0.0

Node PP10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	3

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.350	100.0	0.0	0.351	0.0	0.0

Node PP11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	28.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	3

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.350	100.0	0.0	0.351	0.0	0.0

Node PP12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	27.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	187.5	0.0	0.350	187.5	0.0	0.351	0.0	0.0

Node PP13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	26.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	112.5	0.0	0.350	112.5	0.0	0.351	0.0	0.0

Node PP14 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	25.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	5

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	237.5	0.0	0.350	237.5	0.0	0.351	0.0	0.0

Node BASIN 01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	21.500
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)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	610.0	0.0	1.501	1.1	0.0	2.001	550.0	0.0	2.500	784.0	0.0
1.500	610.0	0.0	2.000	1.1	0.0	2.250	665.0	0.0			

Node PP46 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	25.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	2

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	137.5	0.0	0.350	137.5	0.0	0.351	0.0	0.0

Node PP47 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	25.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	0.350	75.0	0.0	0.351	0.0	0.0

Node PP48 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	28.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	3

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	62.5	0.0	0.350	62.5	0.0	0.351	0.0	0.0

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP1	20	29.307	0.107	23.0	5.6103	0.0000	OK
30 minute summer	6	18	28.354	0.105	31.6	0.2003	0.0000	OK
30 minute summer	7	20	27.200	0.264	36.6	0.3549	0.0000	SURCHARGED
30 minute summer	8	20	27.115	0.289	35.2	0.3724	0.0000	SURCHARGED
30 minute summer	PP2	19	27.914	0.114	22.5	4.8539	0.0000	OK
30 minute summer	10	20	27.026	0.294	52.5	0.3789	0.0000	SURCHARGED
30 minute summer	11	20	26.711	0.161	52.6	0.1820	0.0000	OK
30 minute summer	PP3	19	27.616	0.115	23.8	4.9919	0.0000	OK
30 minute summer	J1	19	26.546	0.201	76.8	0.0872	0.0000	OK
30 minute summer	PP4	20	29.599	0.099	11.2	2.5971	0.0000	OK
30 minute summer	PP5	20	29.604	0.104	22.2	5.4356	0.0000	OK
30 minute summer	14	18	28.664	0.088	34.2	0.1574	0.0000	OK
30 minute summer	15	18	27.368	0.178	40.0	0.2461	0.0000	OK
30 minute summer	PP48	19	28.097	0.097	15.9	2.5923	0.0000	OK
15 minute summer	17	10	27.354	0.054	7.3	0.0755	0.0000	OK
30 minute summer	18	18	27.144	0.129	57.9	0.1458	0.0000	OK
30 minute summer	PP6	20	27.909	0.109	43.6	12.5626	0.0000	OK
30 minute summer	J2	19	26.733	0.175	95.3	0.1154	0.0000	OK
30 minute summer	21	19	26.150	0.207	174.8	0.2545	0.0000	OK
30 minute summer	PP10	19	29.591	0.091	16.6	3.8198	0.0000	OK
30 minute summer	23	18	28.499	0.072	26.4	0.1311	0.0000	OK
30 minute summer	PP11	19	28.088	0.088	15.8	3.6661	0.0000	OK
30 minute summer	25	18	27.030	0.092	41.6	0.1248	0.0000	OK
30 minute summer	PP13	19	26.496	0.096	19.4	4.5097	0.0000	OK
30 minute summer	PP12	19	27.086	0.086	30.7	6.7587	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)
30 minute summer	PP1	1.000	6	14.5	1.107	0.819	0.2107	
30 minute summer	6	1.001	7	31.3	1.208	0.446	2.0687	
30 minute summer	7	1.002	8	31.9	0.939	0.778	0.6995	
30 minute summer	8	1.003	10	34.6	0.870	0.844	0.5980	
30 minute summer	PP2	2.000	10	15.5	1.109	0.872	0.1443	
30 minute summer	10	1.004	11	52.6	1.333	1.263	0.6268	
30 minute summer	11	1.005	J1	52.7	1.191	0.520	1.0896	
30 minute summer	PP3	3.000	J1	16.8	1.155	0.945	0.1449	
30 minute summer	J1	1.006	21	76.7	1.569	0.756	1.3255	
30 minute summer	PP4	4.000	14	6.4	0.879	1.057	0.1232	
30 minute summer	PP5	5.000	14	14.0	1.103	0.790	0.2056	
30 minute summer	14	4.001	15	34.0	1.391	0.330	0.8570	
30 minute summer	15	4.002	18	39.0	1.231	0.858	0.4142	
30 minute summer	PP48	6.000	18	12.8	1.086	0.722	0.2180	
15 minute summer	17	7.000	18	7.3	1.028	0.118	0.1056	
30 minute summer	18	4.003	J2	57.6	1.618	0.384	0.8965	
30 minute summer	PP6	8.000	J2	25.1	1.313	0.483	0.1415	
30 minute summer	J2	4.004	21	96.1	2.044	0.640	1.5947	
30 minute summer	21	1.007	41	174.7	3.482	0.770	2.9661	
30 minute summer	PP10	9.000	23	11.3	1.043	0.639	0.0973	
30 minute summer	23	9.001	25	26.3	2.015	0.226	0.3942	
30 minute summer	PP11	10.000	25	10.7	1.033	0.605	0.0989	
30 minute summer	25	9.002	J4	41.3	1.923	0.353	0.6521	
30 minute summer	PP13	11.000	J4	13.1	1.111	0.738	0.1143	
30 minute summer	PP12	12.000	J4	20.3	2.752	1.051	0.0710	

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	J4	18	25.589	0.151	88.9	0.1004	0.0000	OK
30 minute summer	26	19	24.180	0.392	114.4	0.9110	0.0000	SURCHARGED
30 minute summer	PP14	20	25.609	0.109	40.6	10.8970	0.0000	OK
30 minute summer	J5	20	24.072	0.451	134.2	0.0000	0.0000	SURCHARGED
30 minute summer	PP7	19	29.607	0.107	22.1	5.0742	0.0000	OK
30 minute summer	28	18	28.655	0.080	30.2	0.1478	0.0000	OK
30 minute summer	29	18	26.945	0.084	35.2	0.1135	0.0000	OK
30 minute summer	PP9	20	26.414	0.114	31.2	8.9907	0.0000	OK
30 minute summer	PP8	19	26.913	0.113	24.1	5.4021	0.0000	OK
30 minute summer	J3	18	25.835	0.150	88.0	0.1368	0.0000	OK
30 minute summer	33	20	23.951	0.530	215.6	0.8467	0.0000	SURCHARGED
30 minute summer	34	20	23.841	0.493	223.7	0.8369	0.0000	SURCHARGED
30 minute summer	PP46	19	25.389	0.089	24.0	5.1528	0.0000	OK
30 minute summer	38	20	23.641	0.458	248.3	0.8144	0.0000	SURCHARGED
30 minute summer	PP47	19	25.088	0.088	14.4	2.7850	0.0000	OK
720 minute winter	J6	675	23.460	0.431	41.9	0.0000	0.0000	OK
720 minute winter	41	675	23.460	0.642	70.1	1.2400	0.0000	SURCHARGED
720 minute winter	42	675	23.458	0.671	70.1	1.1858	0.0000	SURCHARGED
720 minute winter	BASIN 01	675	23.460	1.778	84.7	804.8477	0.0000	SURCHARGED
720 minute winter	HB 1	675	23.459	1.865	44.9	3.2959	0.0000	SURCHARGED
15 minute summer	59	1	21.544	0.000	10.7	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)
30 minute summer	J4	9.003	26	87.7	3.181	0.750	0.9989	
30 minute summer	26	9.004	J5	112.3	1.227	0.796	3.6930	
30 minute summer	PP14	13.000	J5	25.2	1.317	0.485	0.1489	
30 minute summer	J5	9.005	33	131.8	1.261	0.934	2.7572	
30 minute summer	PP7	14.000	28	14.6	1.108	0.821	0.1956	
30 minute summer	28	14.001	29	30.1	2.301	0.266	0.4776	
30 minute summer	29	14.002	J3	35.1	1.691	0.301	0.4895	
30 minute summer	PP9	15.000	J3	16.6	1.154	0.937	0.1394	
30 minute summer	PP8	16.000	J3	16.3	1.150	0.921	0.1099	
30 minute summer	J3	14.003	33	87.3	3.181	0.747	0.8233	
30 minute summer	33	9.006	34	213.6	1.349	0.937	2.3279	
30 minute summer	34	9.007	38	222.2	1.403	0.975	5.2286	
30 minute summer	PP46	17.000	38	17.3	1.634	0.615	0.1109	
30 minute summer	38	9.008	J6	249.2	1.583	1.093	4.8201	
30 minute summer	PP47	18.000	J6	10.1	1.391	1.051	0.0663	
720 minute winter	J6	9.009	41	41.9	1.090	0.184	1.9081	
720 minute winter	41	1.008	42	70.1	1.696	0.162	2.2168	
720 minute winter	42	1.009	BASIN 01	70.1	1.548	0.045	6.2279	
720 minute winter	BASIN 01	1.010	HB 1	44.9	0.411	0.113	7.4075	
720 minute winter	HB 1	Hydro-Brake®	59	11.9				528.8

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP1	20	29.333	0.133	29.7	7.0009	0.0000	OK
30 minute summer	6	18	28.371	0.122	40.9	0.2336	0.0000	OK
30 minute summer	7	19	27.466	0.530	47.6	0.7121	0.0000	SURCHARGED
30 minute summer	8	19	27.323	0.497	45.1	0.6407	0.0000	SURCHARGED
30 minute summer	PP2	20	27.944	0.144	29.0	6.1271	0.0000	OK
30 minute summer	10	19	27.175	0.443	66.9	0.5705	0.0000	SURCHARGED
30 minute summer	11	20	26.737	0.187	66.5	0.2116	0.0000	OK
30 minute summer	PP3	20	27.646	0.146	30.8	6.3128	0.0000	OK
30 minute summer	J1	19	26.589	0.244	97.4	0.1060	0.0000	OK
30 minute summer	PP4	21	29.635	0.135	14.5	3.5479	0.0000	SURCHARGED
30 minute summer	PP5	20	29.629	0.129	28.7	6.7715	0.0000	OK
30 minute summer	14	18	28.676	0.101	42.9	0.1789	0.0000	OK
30 minute summer	15	18	27.439	0.249	50.5	0.3446	0.0000	SURCHARGED
30 minute summer	PP48	19	28.118	0.118	20.6	3.1597	0.0000	OK
15 minute summer	17	10	27.360	0.060	9.2	0.0838	0.0000	OK
30 minute summer	18	18	27.165	0.150	73.8	0.1697	0.0000	OK
30 minute summer	PP6	20	27.932	0.132	56.3	15.1956	0.0000	OK
30 minute summer	J2	18	26.770	0.212	125.1	0.1404	0.0000	OK
30 minute summer	21	19	26.202	0.259	224.8	0.3189	0.0000	OK
30 minute summer	PP10	19	29.611	0.111	21.5	4.6548	0.0000	OK
30 minute summer	23	18	28.511	0.084	34.6	0.1512	0.0000	OK
30 minute summer	PP11	19	28.107	0.107	20.5	4.4614	0.0000	OK
30 minute summer	25	18	27.045	0.107	54.8	0.1459	0.0000	OK
30 minute summer	PP13	19	26.517	0.117	25.1	5.5151	0.0000	OK
30 minute summer	PP12	21	27.121	0.121	39.7	9.4999	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	PP1	1.000	6	18.1	1.130	1.020	0.2573	
30 minute summer	6	1.001	7	40.7	1.260	0.579	2.2292	
30 minute summer	7	1.002	8	41.1	1.033	1.002	0.6995	
30 minute summer	8	1.003	10	44.6	1.122	1.089	0.5980	
30 minute summer	PP2	2.000	10	18.6	1.122	1.049	0.1710	
30 minute summer	10	1.004	11	66.5	1.673	1.597	0.6467	
30 minute summer	11	1.005	J1	66.7	1.241	0.658	1.3209	
30 minute summer	PP3	3.000	J1	20.1	1.195	1.130	0.1675	
30 minute summer	J1	1.006	21	96.7	1.624	0.954	1.6184	
30 minute summer	PP4	4.000	14	6.9	0.891	1.146	0.1252	
30 minute summer	PP5	5.000	14	17.8	1.130	1.001	0.2549	
30 minute summer	14	4.001	15	42.8	1.432	0.416	1.0128	
30 minute summer	15	4.002	18	49.6	1.263	1.091	0.4873	
30 minute summer	PP48	6.000	18	16.5	1.129	0.927	0.2689	
15 minute summer	17	7.000	18	9.3	1.076	0.150	0.1397	
30 minute summer	18	4.003	J2	73.6	1.654	0.490	1.1130	
30 minute summer	PP6	8.000	J2	34.3	1.416	0.661	0.1796	
30 minute summer	J2	4.004	21	125.2	2.141	0.834	1.9926	
30 minute summer	21	1.007	41	228.8	3.637	1.009	3.9941	
30 minute summer	PP10	9.000	23	14.9	1.099	0.840	0.1213	
30 minute summer	23	9.001	25	34.6	2.165	0.297	0.4818	
30 minute summer	PP11	10.000	25	14.2	1.094	0.801	0.1237	
30 minute summer	25	9.002	J4	54.5	2.040	0.467	0.8771	
30 minute summer	PP13	11.000	J4	17.0	1.157	0.956	0.1421	
30 minute summer	PP12	12.000	J4	20.6	2.768	1.068	0.0743	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	J4	19	26.088	0.650	110.0	0.4337	0.0000	SURCHARGED
30 minute summer	26	19	24.834	1.046	140.7	2.4308	0.0000	SURCHARGED
30 minute summer	PP14	20	25.632	0.132	52.4	13.1036	0.0000	OK
30 minute summer	J5	19	24.677	1.056	162.0	0.0000	0.0000	SURCHARGED
30 minute summer	PP7	20	29.634	0.134	28.6	6.3554	0.0000	OK
30 minute summer	28	18	28.667	0.092	39.0	0.1704	0.0000	OK
30 minute summer	29	18	26.958	0.097	45.6	0.1308	0.0000	OK
30 minute summer	PP9	20	26.445	0.145	40.4	11.3744	0.0000	OK
30 minute summer	PP8	20	26.942	0.142	31.2	6.7794	0.0000	OK
30 minute summer	J3	18	25.868	0.183	113.3	0.1666	0.0000	OK
30 minute summer	33	19	24.482	1.061	276.7	1.6963	0.0000	SURCHARGED
30 minute summer	34	19	24.295	0.947	288.4	1.6073	0.0000	SURCHARGED
30 minute summer	PP46	19	25.408	0.108	31.0	6.2604	0.0000	OK
30 minute summer	38	19	23.942	0.759	325.2	1.3498	0.0000	SURCHARGED
30 minute summer	PP47	20	25.124	0.124	18.6	3.9236	0.0000	SURCHARGED
720 minute winter	J6	690	23.936	0.907	54.0	0.0000	0.0000	SURCHARGED
720 minute winter	41	690	23.937	1.119	90.8	2.1615	0.0000	SURCHARGED
720 minute winter	42	690	23.935	1.148	90.8	2.0283	0.0000	SURCHARGED
720 minute winter	BASIN 01	690	23.937	2.255	93.8	1088.9980	0.0000	FLOOD RISK
720 minute winter	HB 1	690	23.937	2.343	48.1	4.1394	0.0000	FLOOD RISK
15 minute summer	59	1	21.544	0.000	10.7	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)
30 minute summer	J4	9.003	26	104.1	3.154	0.891	1.1931	
30 minute summer	26	9.004	J5	127.8	1.252	0.906	3.6930	
30 minute summer	PP14	13.000	J5	34.2	1.418	0.658	0.1876	
30 minute summer	J5	9.005	33	164.7	1.493	1.167	2.7572	
30 minute summer	PP7	14.000	28	18.2	1.131	1.024	0.2393	
30 minute summer	28	14.001	29	39.0	2.459	0.344	0.5781	
30 minute summer	29	14.002	J3	45.5	1.768	0.390	0.5984	
30 minute summer	PP9	15.000	J3	20.1	1.195	1.131	0.1622	
30 minute summer	PP8	16.000	J3	20.2	1.202	1.135	0.1289	
30 minute summer	J3	14.003	33	116.0	3.262	0.993	1.1142	
30 minute summer	33	9.006	34	276.6	1.746	1.213	2.3279	
30 minute summer	34	9.007	38	288.4	1.820	1.265	5.2286	
30 minute summer	PP46	17.000	38	22.7	1.721	0.805	0.1378	
30 minute summer	38	9.008	J6	325.3	2.053	1.426	4.8856	
30 minute summer	PP47	18.000	J6	10.3	1.385	1.072	0.0686	
720 minute winter	J6	9.009	41	54.0	1.167	0.237	1.9221	
720 minute winter	41	1.008	42	90.8	1.825	0.209	2.2168	
720 minute winter	42	1.009	BASIN 01	90.8	1.704	0.059	6.2279	
720 minute winter	BASIN 01	1.010	HB 1	48.1	0.329	0.121	7.4075	
720 minute winter	HB 1	Hydro-Brake®	59	13.2				616.8

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	15.100	Minimum Backdrop Height (m)	0.200
Ratio-R	0.270	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PP15	0.037	4.00		25.000		706128.512	775200.890	0.500
36	0.016	4.00		24.539	1200	706137.321	775199.136	1.425
PP16	0.053	4.00		25.500		706242.593	775157.063	0.500
47	0.027	4.00		26.250	1200	706247.160	775143.544	1.468
48	0.024	4.00		26.031	1200	706227.184	775159.114	1.425
PP17	0.079	4.00		25.500		706215.120	775190.750	0.500
50	0.041	4.00		25.656	1200	706213.597	775176.823	1.425
PP18	0.051	4.00		24.700		706196.072	775222.114	0.500
52	0.019	4.00		24.830	1200	706192.844	775213.524	1.425
PP19	0.025	4.00		23.800		706181.744	775243.594	0.300
54	0.013	4.00		23.666	1200	706173.937	775242.830	1.425
PP20	0.031	4.00		23.400		706171.475	775252.530	0.500
PP21	0.027	4.00		23.000		706158.463	775257.369	0.500
57	0.010	4.00		23.330	1200	706162.621	775249.942	1.500
PP22	0.028	4.00		23.100		706144.756	775257.148	0.500
59	0.016	4.00	10.0	23.147	1200	706146.160	775250.835	1.603
PP23	0.029	4.00		24.150		706120.186	775222.368	0.500
61	0.013	4.00		24.204	1200	706128.158	775222.080	1.425
PP24	0.012	4.00		23.300		706131.614	775252.565	0.500
PP25	0.046	4.00		23.600		706117.771	775246.814	0.500
64	0.019	4.00		23.535	1350	706120.629	775240.204	2.343
PP26	0.028	4.00		23.900		706106.256	775241.976	0.500
J7				23.700		706108.603	775235.635	2.637
67	0.025	4.00		23.880	1350	706094.051	775230.250	2.972
PP32	0.053	4.00		24.100		706014.321	775296.697	0.500
69	0.022	4.00		23.800	1200	706004.259	775300.273	1.425
PP31	0.084	4.00		24.800		706014.321	775258.489	0.500
J11	0.044	4.00		24.744		706006.111	775260.467	2.635
72	0.001	4.00		25.550	1200	706009.501	775180.387	1.425
PP30	0.074	4.00		25.400		706016.382	775201.149	0.500
J10	0.041	4.00		25.404		706008.732	775200.524	1.481
PP29	0.005	4.00		25.000		706026.186	775234.627	0.500
75	0.057	4.00		25.200	1200	706007.310	775230.491	3.366
PP28	0.090	4.00		24.800		706058.827	775221.748	0.500
PP27	0.018	4.00		24.500		706054.686	775234.627	0.500
J9				24.467		706056.637	775230.294	2.962
79	0.028	4.00		24.173	1350	706076.435	775230.294	3.516
80	0.012	4.00		24.000	1350	706076.391	775240.254	3.393
81	0.031	4.00		23.773	1500	706072.369	775251.612	3.301
PP33	0.074	4.00		23.400		706080.551	775270.959	0.500

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PP34	0.049	4.00		23.500		706066.051	775269.497	0.500
J12	0.045	4.00		23.409		706072.590	775269.763	3.028
PP35	0.070	4.00		23.100		706066.051	775294.749	0.500
J13				22.864		706073.031	775296.542	2.617
87	0.016	4.00		22.650	1500	706073.294	775312.543	2.483
PP36	0.040	4.00		21.600		706112.346	775305.042	0.500
J14	0.052	4.00		21.625		706111.218	775312.690	2.406
PP37	0.063	4.00		21.100		706132.516	775305.077	0.500
91	0.019	4.00		20.075	1500	706142.945	775312.827	1.725
PP38	0.034	4.00		20.000		706168.553	775302.968	0.500
93	0.017	4.00		19.875	1500	706170.473	775311.199	1.725
94	0.033	4.00		25.250	1200	706267.109	775132.997	1.425
95	0.028	4.00		24.250	1200	706283.935	775123.334	1.395
PP40	0.089	4.00		23.400		706289.070	775158.010	0.500
97	0.019	4.00		23.500	1200	706294.066	775141.926	1.425
98	0.013	4.00		21.500	1200	706301.654	775175.790	1.425
99	0.023	4.00		21.750	1200	706296.768	775187.498	1.760
PP41	0.048	4.00		22.800		706268.167	775200.379	0.500
100	0.013	4.00		22.500	1200	706272.993	775204.411	2.757
101				21.917	1200	706260.270	775218.899	2.270
PP42	0.074	4.00		21.500		706238.071	775241.890	0.500
PP43	0.025	4.00		21.000		706230.298	775254.000	0.500
J15	0.041	4.00		20.750		706239.265	775251.459	1.511
PP44	0.029	4.00		20.500		706217.888	775271.937	0.500
105	0.016	4.00		20.167	1200	706226.503	775271.138	1.500
PP45	0.034	4.00		19.800		706203.225	775286.524	0.500
106	0.020	4.00		19.583	1200	706214.581	775286.709	1.500
PP39	0.032	4.00		19.600		706186.544	775296.766	0.500
108				19.292	1500	706193.509	775302.905	3.292
109				18.800	1500	706193.934	775307.414	2.875
BASIN 2				16.000		706175.753	775330.401	3.006
HB 2				16.000	1500	706167.660	775350.046	3.360
3				10.000	1200	706195.144	775366.352	1.425
4				5.000	1200	706206.168	775386.256	1.425

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)
8.000	PP15	36	8.982	0.600	24.500	24.201	0.299	30.0	100	4.11	50.0
8.001	36	61	24.706	0.600	23.114	22.779	0.335	73.7	225	4.38	50.0
1.022	BASIN 2	HB 2	21.247	0.600	12.994	12.640	0.354	60.0	525	8.22	45.8
1.000	PP16	47	14.270	0.600	25.000	24.857	0.143	100.0	150	4.24	50.0
1.001	47	48	25.327	0.600	24.782	24.606	0.176	143.9	225	4.62	50.0
1.002	48	50	22.321	0.600	24.606	24.231	0.375	59.5	225	4.84	50.0
2.000	PP17	50	14.027	0.600	25.000	24.860	0.140	100.0	150	4.23	50.0
1.003	50	52	42.162	0.600	24.231	23.405	0.826	51.0	225	5.23	50.0
3.000	PP18	52	9.176	0.600	24.200	24.108	0.092	100.0	150	4.15	50.0
1.004	52	54	34.876	0.600	23.405	22.241	1.164	30.0	225	5.47	50.0
4.000	PP19	54	7.844	0.600	23.500	23.343	0.157	50.0	100	4.12	50.0
1.005	54	57	13.365	0.600	22.241	21.905	0.336	39.8	225	5.58	50.0
5.000	PP20	57	9.224	0.600	22.900	22.808	0.092	100.0	100	4.20	50.0
6.000	PP21	57	8.512	0.600	22.500	22.415	0.085	100.0	100	4.18	50.0
1.006	57	59	16.485	0.600	21.830	21.544	0.286	57.6	300	5.71	50.0
7.000	PP22	59	6.467	0.600	22.600	22.535	0.065	100.0	100	4.14	50.0
1.007	59	64	27.656	0.600	21.544	21.267	0.277	100.0	300	6.00	50.0
9.000	PP23	61	7.977	0.600	23.650	23.570	0.080	100.0	100	4.17	50.0
8.002	61	64	19.626	0.600	22.779	22.125	0.654	30.0	225	4.51	50.0
10.000	PP24	64	16.537	0.600	22.800	22.635	0.165	100.0	100	4.36	50.0
11.000	PP25	64	7.201	0.600	23.100	23.028	0.072	100.0	150	4.12	50.0
1.008	64	J7	12.865	0.600	21.192	21.063	0.129	100.0	375	6.12	50.0

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)
8.000	1.414	11.1	6.8	0.400	0.238	0.037	0.0	57	1.485
8.001	1.524	60.6	9.6	1.200	1.200	0.053	0.0	60	1.119
1.022	2.895	626.7	382.8	2.481	2.835	2.250	10.0	297	3.032
1.000	1.005	17.8	9.7	0.350	1.243	0.053	0.0	79	1.025
1.001	1.088	43.2	14.6	1.243	1.200	0.081	0.0	90	0.985
1.002	1.698	67.5	18.9	1.200	1.200	0.105	0.0	81	1.462
2.000	1.005	17.8	14.3	0.350	0.646	0.079	0.0	102	1.116
1.003	1.835	72.9	40.6	1.200	1.200	0.225	0.0	120	1.882
3.000	1.005	17.8	9.2	0.350	0.572	0.051	0.0	77	1.016
1.004	2.399	95.4	53.4	1.200	1.200	0.295	0.0	121	2.467
4.000	1.092	8.6	4.6	0.200	0.223	0.025	0.0	52	1.110
1.005	2.080	82.7	60.4	1.200	1.200	0.334	0.0	143	2.263
5.000	0.769	6.0	5.6	0.400	0.422	0.031	0.0	76	0.872
6.000	0.769	6.0	4.8	0.400	0.815	0.027	0.0	68	0.853
1.006	2.075	146.6	72.5	1.200	1.303	0.401	0.0	149	2.070
7.000	0.769	6.0	5.1	0.400	0.512	0.028	0.0	70	0.860
1.007	1.572	111.1	90.5	1.303	1.968	0.446	10.0	207	1.745
9.000	0.769	6.0	5.2	0.400	0.534	0.029	0.0	71	0.864
8.002	2.397	95.3	17.0	1.200	1.185	0.094	0.0	64	1.818
10.000	0.769	6.0	2.2	0.400	0.800	0.012	0.0	42	0.708
11.000	1.005	17.8	8.2	0.350	0.357	0.046	0.0	72	0.986
1.008	1.812	200.1	121.5	1.968	2.262	0.617	10.0	211	1.895

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)
12.000	PP26	J7	6.761	0.600	23.400	23.332	0.068	100.0	100	4.15	50.0
1.009	J7	67	15.516	0.600	21.063	20.908	0.155	100.0	375	6.26	50.0
1.010	67	79	17.616	0.600	20.908	20.732	0.176	100.0	375	6.43	50.0
13.000	PP32	69	10.679	0.600	23.600	23.493	0.107	100.0	150	4.18	50.0
13.001	69	J11	39.849	0.600	22.375	22.109	0.266	150.0	225	4.80	50.0
14.000	PP31	J11	8.445	0.600	24.300	24.216	0.084	100.0	150	4.14	50.0
13.002	J11	75	30.000	0.600	22.109	21.909	0.200	150.0	225	5.27	50.0
15.000	72	J10	20.152	0.600	24.125	23.923	0.202	100.0	225	4.26	50.0
16.000	PP30	J10	7.675	0.600	24.900	24.823	0.077	100.0	150	4.13	50.0
15.001	J10	75	30.001	0.600	23.923	23.623	0.300	100.0	225	4.64	50.0
17.000	PP29	75	19.324	0.600	24.500	24.307	0.193	100.0	100	4.42	50.0
13.003	75	J9	49.327	0.600	21.834	21.505	0.329	150.0	300	5.91	50.0
18.000	PP28	J9	8.822	0.600	24.300	24.124	0.176	50.0	150	4.10	50.0
19.000	PP27	J9	4.752	0.600	24.000	23.952	0.048	100.0	100	4.10	50.0
13.004	J9	79	19.798	0.600	21.505	21.373	0.132	150.0	300	6.17	50.0
1.011	79	80	9.960	0.600	20.657	20.607	0.050	200.0	450	6.54	50.0
1.012	80	81	12.049	0.600	20.607	20.547	0.060	200.0	450	6.68	50.0
1.013	81	J12	18.152	0.600	20.472	20.381	0.091	200.0	525	6.87	49.5
20.000	PP33	J12	8.050	0.600	22.900	22.819	0.081	100.0	150	4.13	50.0
21.000	PP34	J12	6.544	0.600	23.000	22.935	0.065	100.0	150	4.11	50.0
1.014	J12	J13	26.783	0.600	20.381	20.247	0.134	200.0	525	7.16	48.6
22.000	PP35	J13	7.207	0.600	22.600	22.528	0.072	100.0	150	4.12	50.0
1.015	J13	87	16.018	0.600	20.247	20.167	0.080	200.0	525	7.32	48.2
1.016	87	J14	37.924	0.600	20.167	19.219	0.948	40.0	525	7.50	47.7

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)
12.000	0.769	6.0	5.1	0.400	0.268	0.028	0.0	71	0.862
1.009	1.812	200.1	126.5	2.262	2.597	0.645	10.0	217	1.913
1.010	1.812	200.1	131.1	2.597	3.066	0.670	10.0	222	1.926
13.000	1.005	17.8	9.6	0.350	0.157	0.053	0.0	78	1.022
13.001	1.065	42.3	13.6	1.200	2.410	0.075	0.0	87	0.950
14.000	1.005	17.8	15.3	0.350	0.378	0.084	0.0	108	1.127
13.002	1.065	42.3	36.9	2.410	3.066	0.204	0.0	163	1.196
15.000	1.307	52.0	0.3	1.200	1.256	0.001	0.0	12	0.342
16.000	1.005	17.8	13.3	0.350	0.431	0.074	0.0	97	1.101
15.001	1.307	52.0	21.1	1.256	1.352	0.116	0.0	100	1.241
17.000	0.769	6.0	0.9	0.400	0.793	0.005	0.0	25	0.541
13.003	1.281	90.6	69.1	3.066	2.662	0.383	0.0	197	1.406
18.000	1.426	25.2	16.3	0.350	0.193	0.090	0.0	88	1.513
19.000	0.769	6.0	3.2	0.400	0.415	0.018	0.0	52	0.781
13.004	1.281	90.6	88.6	2.662	2.500	0.490	0.0	242	1.452
1.011	1.434	228.0	224.7	3.066	2.943	1.188	10.0	366	1.623
1.012	1.434	228.0	226.9	2.943	2.776	1.200	10.0	370	1.622
1.013	1.580	342.0	230.1	2.776	2.503	1.232	10.0	316	1.689
20.000	1.005	17.8	13.4	0.350	0.440	0.074	0.0	98	1.102
21.000	1.005	17.8	8.9	0.350	0.324	0.049	0.0	75	1.006
1.014	1.580	342.0	256.2	2.503	2.092	1.401	10.0	340	1.726
22.000	1.005	17.8	12.7	0.350	0.186	0.070	0.0	93	1.089
1.015	1.580	342.0	266.0	2.092	1.958	1.471	10.0	349	1.738
1.016	3.549	768.2	266.1	1.958	1.881	1.486	10.0	213	3.239

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)
23.000	PP36	J14	7.731	0.600	21.100	21.023	0.077	100.0	150	4.13	50.0
1.017	J14	91	31.727	0.600	19.219	18.350	0.869	36.5	525	7.64	47.3
24.000	PP37	91	12.993	0.600	20.600	19.301	1.299	10.0	100	4.09	50.0
1.018	91	93	27.576	0.600	18.350	18.150	0.200	137.9	525	7.89	46.7
25.000	PP38	93	8.452	0.600	19.500	19.415	0.085	100.0	150	4.14	50.0
1.019	93	108	24.484	0.600	18.150	17.567	0.583	42.0	525	8.00	46.4
26.000	94	95	19.403	0.600	23.825	22.855	0.970	20.0	225	4.11	50.0
26.001	95	97	21.173	0.600	22.855	22.075	0.780	27.1	225	4.25	50.0
27.000	PP40	97	16.842	0.600	22.900	22.732	0.168	100.0	150	4.28	50.0
26.002	97	98	34.704	0.600	22.075	20.340	1.735	20.0	225	4.48	50.0
26.003	98	99	12.687	0.600	20.075	19.990	0.085	150.0	225	4.67	50.0
26.004	99	100	29.177	0.600	19.990	19.818	0.172	169.6	225	5.16	50.0
28.000	PP41	100	6.289	0.600	22.300	22.174	0.126	50.0	150	4.07	50.0
26.005	100	101	19.282	0.600	19.743	19.647	0.096	200.0	300	5.45	50.0
26.006	101	J15	38.747	0.600	19.647	19.239	0.408	95.0	300	5.85	50.0
29.000	PP42	J15	9.643	0.600	21.000	20.518	0.482	20.0	100	4.09	50.0
30.000	PP43	J15	9.322	0.600	20.500	20.407	0.093	100.0	100	4.20	50.0
26.007	J15	105	23.455	0.600	19.239	18.992	0.247	95.0	300	6.09	50.0
31.000	PP44	105	8.652	0.600	20.000	19.913	0.087	100.0	100	4.19	50.0
26.008	105	106	19.611	0.600	18.667	18.083	0.584	33.6	300	6.21	50.0
32.000	PP45	106	11.358	0.600	19.300	19.186	0.114	100.0	150	4.19	50.0
26.009	106	108	26.577	0.600	18.083	17.792	0.291	91.3	300	6.48	50.0
33.000	PP39	108	9.284	0.600	19.100	19.007	0.093	100.0	100	4.20	50.0
1.020	108	109	4.529	0.600	16.000	15.925	0.075	60.0	525	8.03	46.3

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)
23.000	1.005	17.8	7.2	0.350	0.452	0.040	0.0	67	0.953
1.017	3.715	804.2	279.9	1.881	1.200	1.579	10.0	213	3.394
24.000	2.458	19.3	11.5	0.400	0.674	0.063	0.0	56	2.568
1.018	1.905	412.5	290.2	1.200	1.200	1.661	10.0	326	2.056
25.000	1.005	17.8	6.2	0.350	0.310	0.034	0.0	61	0.917
1.019	3.463	749.7	296.9	1.200	1.200	1.712	10.0	229	3.272
26.000	2.939	116.8	6.0	1.200	1.170	0.033	0.0	35	1.567
26.001	2.521	100.2	11.1	1.170	1.200	0.061	0.0	51	1.679
27.000	1.005	17.8	16.1	0.350	0.618	0.089	0.0	112	1.135
26.002	2.939	116.8	30.6	1.200	0.935	0.169	0.0	79	2.490
26.003	1.065	42.3	33.0	1.200	1.535	0.182	0.0	150	1.174
26.004	1.001	39.8	37.1	1.535	2.457	0.205	0.0	173	1.132
28.000	1.426	25.2	8.7	0.350	0.176	0.048	0.0	61	1.296
26.005	1.108	78.3	48.1	2.457	1.970	0.266	0.0	170	1.163
26.006	1.613	114.0	48.1	1.970	1.211	0.266	0.0	136	1.546
29.000	1.734	13.6	13.5	0.400	0.132	0.074	0.0	81	1.974
30.000	0.769	6.0	4.5	0.400	0.243	0.025	0.0	64	0.843
26.007	1.613	114.0	73.5	1.211	0.875	0.407	0.0	175	1.710
31.000	0.769	6.0	5.3	0.400	0.154	0.029	0.0	73	0.867
26.008	2.722	192.4	81.7	1.200	1.200	0.452	0.0	136	2.614
32.000	1.005	17.8	6.2	0.350	0.247	0.034	0.0	61	0.917
26.009	1.645	116.3	91.4	1.200	1.200	0.506	0.0	201	1.816
33.000	0.769	6.0	5.8	0.400	0.185	0.032	0.0	79	0.875
1.020	2.895	626.7	386.6	2.767	2.350	2.250	10.0	299	3.038

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)
1.021	109	BASIN 2	29.308	0.600	15.925	12.994	2.931	10.0	525	8.10	46.1
1.023	HB 2	3	31.957	0.600	12.640	8.575	4.065	7.9	225	8.33	0.0
1.024	3	4	22.753	0.600	8.575	3.575	5.000	4.6	225	8.40	0.0

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)
1.021	7.111	1539.2	385.2	2.350	2.481	2.250	10.0	178	5.963
1.023	4.695	186.7	10.0	3.135	1.200	2.250	10.0	35	2.507
1.024	6.175	245.5	10.0	1.200	1.200	2.250	10.0	30	3.036

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)
8.000	8.982	30.0	100	Circular	25.000	24.500	0.400	24.539	24.201	0.238
8.001	24.706	73.7	225	Circular	24.539	23.114	1.200	24.204	22.779	1.200
1.022	21.247	60.0	525	Circular	16.000	12.994	2.481	16.000	12.640	2.835
1.000	14.270	100.0	150	Circular	25.500	25.000	0.350	26.250	24.857	1.243
1.001	25.327	143.9	225	Circular	26.250	24.782	1.243	26.031	24.606	1.200
1.002	22.321	59.5	225	Circular	26.031	24.606	1.200	25.656	24.231	1.200
2.000	14.027	100.0	150	Circular	25.500	25.000	0.350	25.656	24.860	0.646
1.003	42.162	51.0	225	Circular	25.656	24.231	1.200	24.830	23.405	1.200
3.000	9.176	100.0	150	Circular	24.700	24.200	0.350	24.830	24.108	0.572
1.004	34.876	30.0	225	Circular	24.830	23.405	1.200	23.666	22.241	1.200
4.000	7.844	50.0	100	Circular	23.800	23.500	0.200	23.666	23.343	0.223
1.005	13.365	39.8	225	Circular	23.666	22.241	1.200	23.330	21.905	1.200
5.000	9.224	100.0	100	Circular	23.400	22.900	0.400	23.330	22.808	0.422
6.000	8.512	100.0	100	Circular	23.000	22.500	0.400	23.330	22.415	0.815

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
8.000	PP15		Junction		36	1200	Manhole	Adoptable
8.001	36	1200	Manhole	Adoptable	61	1200	Manhole	Adoptable
1.022	BASIN 2		Junction		HB 2	1500	Manhole	Adoptable
1.000	PP16		Junction		47	1200	Manhole	Adoptable
1.001	47	1200	Manhole	Adoptable	48	1200	Manhole	Adoptable
1.002	48	1200	Manhole	Adoptable	50	1200	Manhole	Adoptable
2.000	PP17		Junction		50	1200	Manhole	Adoptable
1.003	50	1200	Manhole	Adoptable	52	1200	Manhole	Adoptable
3.000	PP18		Junction		52	1200	Manhole	Adoptable
1.004	52	1200	Manhole	Adoptable	54	1200	Manhole	Adoptable
4.000	PP19		Junction		54	1200	Manhole	Adoptable
1.005	54	1200	Manhole	Adoptable	57	1200	Manhole	Adoptable
5.000	PP20		Junction		57	1200	Manhole	Adoptable
6.000	PP21		Junction		57	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)
1.006	16.485	57.6	300	Circular	23.330	21.830	1.200	23.147	21.544	1.303
7.000	6.467	100.0	100	Circular	23.100	22.600	0.400	23.147	22.535	0.512
1.007	27.656	100.0	300	Circular	23.147	21.544	1.303	23.535	21.267	1.968
9.000	7.977	100.0	100	Circular	24.150	23.650	0.400	24.204	23.570	0.534
8.002	19.626	30.0	225	Circular	24.204	22.779	1.200	23.535	22.125	1.185
10.000	16.537	100.0	100	Circular	23.300	22.800	0.400	23.535	22.635	0.800
11.000	7.201	100.0	150	Circular	23.600	23.100	0.350	23.535	23.028	0.357
1.008	12.865	100.0	375	Circular	23.535	21.192	1.968	23.700	21.063	2.262
12.000	6.761	100.0	100	Circular	23.900	23.400	0.400	23.700	23.332	0.268
1.009	15.516	100.0	375	Circular	23.700	21.063	2.262	23.880	20.908	2.597
1.010	17.616	100.0	375	Circular	23.880	20.908	2.597	24.173	20.732	3.066
13.000	10.679	100.0	150	Circular	24.100	23.600	0.350	23.800	23.493	0.157
13.001	39.849	150.0	225	Circular	23.800	22.375	1.200	24.744	22.109	2.410
14.000	8.445	100.0	150	Circular	24.800	24.300	0.350	24.744	24.216	0.378
13.002	30.000	150.0	225	Circular	24.744	22.109	2.410	25.200	21.909	3.066
15.000	20.152	100.0	225	Circular	25.550	24.125	1.200	25.404	23.923	1.256
16.000	7.675	100.0	150	Circular	25.400	24.900	0.350	25.404	24.823	0.431
15.001	30.001	100.0	225	Circular	25.404	23.923	1.256	25.200	23.623	1.352
17.000	19.324	100.0	100	Circular	25.000	24.500	0.400	25.200	24.307	0.793
13.003	49.327	150.0	300	Circular	25.200	21.834	3.066	24.467	21.505	2.662
18.000	8.822	50.0	150	Circular	24.800	24.300	0.350	24.467	24.124	0.193
19.000	4.752	100.0	100	Circular	24.500	24.000	0.400	24.467	23.952	0.415
13.004	19.798	150.0	300	Circular	24.467	21.505	2.662	24.173	21.373	2.500
1.011	9.960	200.0	450	Circular	24.173	20.657	3.066	24.000	20.607	2.943
1.012	12.049	200.0	450	Circular	24.000	20.607	2.943	23.773	20.547	2.776

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	57	1200	Manhole	Adoptable	59	1200	Manhole	Adoptable
7.000	PP22		Junction		59	1200	Manhole	Adoptable
1.007	59	1200	Manhole	Adoptable	64	1350	Manhole	Adoptable
9.000	PP23		Junction		61	1200	Manhole	Adoptable
8.002	61	1200	Manhole	Adoptable	64	1350	Manhole	Adoptable
10.000	PP24		Junction		64	1350	Manhole	Adoptable
11.000	PP25		Junction		64	1350	Manhole	Adoptable
1.008	64	1350	Manhole	Adoptable	J7		Junction	
12.000	PP26		Junction		J7		Junction	
1.009	J7		Junction		67	1350	Manhole	Adoptable
1.010	67	1350	Manhole	Adoptable	79	1350	Manhole	Adoptable
13.000	PP32		Junction		69	1200	Manhole	Adoptable
13.001	69	1200	Manhole	Adoptable	J11		Junction	
14.000	PP31		Junction		J11		Junction	
13.002	J11		Junction		75	1200	Manhole	Adoptable
15.000	72	1200	Manhole	Adoptable	J10		Junction	
16.000	PP30		Junction		J10		Junction	
15.001	J10		Junction		75	1200	Manhole	Adoptable
17.000	PP29		Junction		75	1200	Manhole	Adoptable
13.003	75	1200	Manhole	Adoptable	J9		Junction	
18.000	PP28		Junction		J9		Junction	
19.000	PP27		Junction		J9		Junction	
13.004	J9		Junction		79	1350	Manhole	Adoptable
1.011	79	1350	Manhole	Adoptable	80	1350	Manhole	Adoptable
1.012	80	1350	Manhole	Adoptable	81	1500	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)
1.013	18.152	200.0	525	Circular	23.773	20.472	2.776	23.409	20.381	2.503
20.000	8.050	100.0	150	Circular	23.400	22.900	0.350	23.409	22.819	0.440
21.000	6.544	100.0	150	Circular	23.500	23.000	0.350	23.409	22.935	0.324
1.014	26.783	200.0	525	Circular	23.409	20.381	2.503	22.864	20.247	2.092
22.000	7.207	100.0	150	Circular	23.100	22.600	0.350	22.864	22.528	0.186
1.015	16.018	200.0	525	Circular	22.864	20.247	2.092	22.650	20.167	1.958
1.016	37.924	40.0	525	Circular	22.650	20.167	1.958	21.625	19.219	1.881
23.000	7.731	100.0	150	Circular	21.600	21.100	0.350	21.625	21.023	0.452
1.017	31.727	36.5	525	Circular	21.625	19.219	1.881	20.075	18.350	1.200
24.000	12.993	10.0	100	Circular	21.100	20.600	0.400	20.075	19.301	0.674
1.018	27.576	137.9	525	Circular	20.075	18.350	1.200	19.875	18.150	1.200
25.000	8.452	100.0	150	Circular	20.000	19.500	0.350	19.875	19.415	0.310
1.019	24.484	42.0	525	Circular	19.875	18.150	1.200	19.292	17.567	1.200
26.000	19.403	20.0	225	Circular	25.250	23.825	1.200	24.250	22.855	1.170
26.001	21.173	27.1	225	Circular	24.250	22.855	1.170	23.500	22.075	1.200
27.000	16.842	100.0	150	Circular	23.400	22.900	0.350	23.500	22.732	0.618
26.002	34.704	20.0	225	Circular	23.500	22.075	1.200	21.500	20.340	0.935
26.003	12.687	150.0	225	Circular	21.500	20.075	1.200	21.750	19.990	1.535
26.004	29.177	169.6	225	Circular	21.750	19.990	1.535	22.500	19.818	2.457
28.000	6.289	50.0	150	Circular	22.800	22.300	0.350	22.500	22.174	0.176
26.005	19.282	200.0	300	Circular	22.500	19.743	2.457	21.917	19.647	1.970
26.006	38.747	95.0	300	Circular	21.917	19.647	1.970	20.750	19.239	1.211
29.000	9.643	20.0	100	Circular	21.500	21.000	0.400	20.750	20.518	0.132
30.000	9.322	100.0	100	Circular	21.000	20.500	0.400	20.750	20.407	0.243
26.007	23.455	95.0	300	Circular	20.750	19.239	1.211	20.167	18.992	0.875

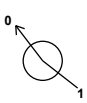
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.013	81	1500	Manhole	Adoptable	J12		Junction	
20.000	PP33		Junction		J12		Junction	
21.000	PP34		Junction		J12		Junction	
1.014	J12		Junction		J13		Junction	
22.000	PP35		Junction		J13		Junction	
1.015	J13		Junction		87	1500	Manhole	Adoptable
1.016	87	1500	Manhole	Adoptable	J14		Junction	
23.000	PP36		Junction		J14		Junction	
1.017	J14		Junction		91	1500	Manhole	Adoptable
24.000	PP37		Junction		91	1500	Manhole	Adoptable
1.018	91	1500	Manhole	Adoptable	93	1500	Manhole	Adoptable
25.000	PP38		Junction		93	1500	Manhole	Adoptable
1.019	93	1500	Manhole	Adoptable	108	1500	Manhole	Adoptable
26.000	94	1200	Manhole	Adoptable	95	1200	Manhole	Adoptable
26.001	95	1200	Manhole	Adoptable	97	1200	Manhole	Adoptable
27.000	PP40		Junction		97	1200	Manhole	Adoptable
26.002	97	1200	Manhole	Adoptable	98	1200	Manhole	Adoptable
26.003	98	1200	Manhole	Adoptable	99	1200	Manhole	Adoptable
26.004	99	1200	Manhole	Adoptable	100	1200	Manhole	Adoptable
28.000	PP41		Junction		100	1200	Manhole	Adoptable
26.005	100	1200	Manhole	Adoptable	101	1200	Manhole	Adoptable
26.006	101	1200	Manhole	Adoptable	J15		Junction	
29.000	PP42		Junction		J15		Junction	
30.000	PP43		Junction		J15		Junction	
26.007	J15		Junction		105	1200	Manhole	Adoptable

Pipeline Schedule

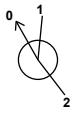
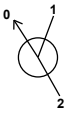
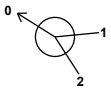
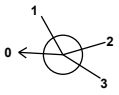
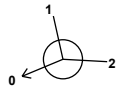
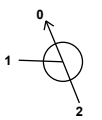
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
31.000	8.652	100.0	100	Circular	20.500	20.000	0.400	20.167	19.913	0.154
26.008	19.611	33.6	300	Circular	20.167	18.667	1.200	19.583	18.083	1.200
32.000	11.358	100.0	150	Circular	19.800	19.300	0.350	19.583	19.186	0.247
26.009	26.577	91.3	300	Circular	19.583	18.083	1.200	19.292	17.792	1.200
33.000	9.284	100.0	100	Circular	19.600	19.100	0.400	19.292	19.007	0.185
1.020	4.529	60.0	525	Circular	19.292	16.000	2.767	18.800	15.925	2.350
1.021	29.308	10.0	525	Circular	18.800	15.925	2.350	16.000	12.994	2.481
1.023	31.957	7.9	225	Circular	16.000	12.640	3.135	10.000	8.575	1.200
1.024	22.753	4.6	225	Circular	10.000	8.575	1.200	5.000	3.575	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
31.000	PP44		Junction		105	1200	Manhole	Adoptable
26.008	105	1200	Manhole	Adoptable	106	1200	Manhole	Adoptable
32.000	PP45		Junction		106	1200	Manhole	Adoptable
26.009	106	1200	Manhole	Adoptable	108	1500	Manhole	Adoptable
33.000	PP39		Junction		108	1500	Manhole	Adoptable
1.020	108	1500	Manhole	Adoptable	109	1500	Manhole	Adoptable
1.021	109	1500	Manhole	Adoptable	BASIN 2		Junction	
1.023	HB 2	1500	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.024	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable

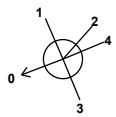
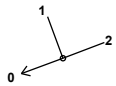
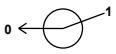
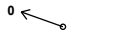
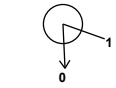
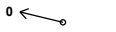
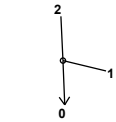
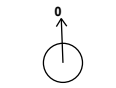
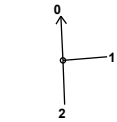
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PP15	706128.512	775200.890	25.000	0.500		 0	8.000	24.500	100
36	706137.321	775199.136	24.539	1.425	1200	 1	8.000	24.201	100
						0	8.001	23.114	225
PP16	706242.593	775157.063	25.500	0.500		 0	1.000	25.000	150
47	706247.160	775143.544	26.250	1.468	1200	 1	1.000	24.857	150
						0	1.001	24.782	225
48	706227.184	775159.114	26.031	1.425	1200	 1	1.001	24.606	225
						0	1.002	24.606	225
PP17	706215.120	775190.750	25.500	0.500		 0	2.000	25.000	150

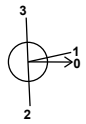
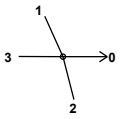
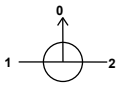
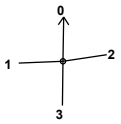
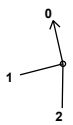
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
50	706213.597	775176.823	25.656	1.425	1200		1	2.000	24.860	150
							2	1.002	24.231	225
							0	1.003	24.231	225
PP18	706196.072	775222.114	24.700	0.500			0	3.000	24.200	150
52	706192.844	775213.524	24.830	1.425	1200		1	3.000	24.108	150
							2	1.003	23.405	225
							0	1.004	23.405	225
PP19	706181.744	775243.594	23.800	0.300			0	4.000	23.500	100
54	706173.937	775242.830	23.666	1.425	1200		1	4.000	23.343	100
							2	1.004	22.241	225
							0	1.005	22.241	225
PP20	706171.475	775252.530	23.400	0.500			0	5.000	22.900	100
PP21	706158.463	775257.369	23.000	0.500			0	6.000	22.500	100
57	706162.621	775249.942	23.330	1.500	1200		1	6.000	22.415	100
							2	5.000	22.808	100
							3	1.005	21.905	225
							0	1.006	21.830	300
PP22	706144.756	775257.148	23.100	0.500			0	7.000	22.600	100
59	706146.160	775250.835	23.147	1.603	1200		1	7.000	22.535	100
							2	1.006	21.544	300
							0	1.007	21.544	300
PP23	706120.186	775222.368	24.150	0.500			0	9.000	23.650	100
61	706128.158	775222.080	24.204	1.425	1200		1	9.000	23.570	100
							2	8.001	22.779	225
							0	8.002	22.779	225
PP24	706131.614	775252.565	23.300	0.500			0	10.000	22.800	100

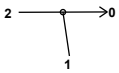
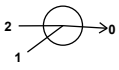
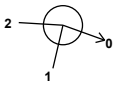
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PP25	706117.771	775246.814	23.600	0.500			0	11.000	23.100	150
64	706120.629	775240.204	23.535	2.343	1350		1	11.000	23.028	150
							2	10.000	22.635	100
							3	8.002	22.125	225
							4	1.007	21.267	300
							0	1.008	21.192	375
PP26	706106.256	775241.976	23.900	0.500			0	12.000	23.400	100
J7	706108.603	775235.635	23.700	2.637			1	12.000	23.332	100
							2	1.008	21.063	375
							0	1.009	21.063	375
67	706094.051	775230.250	23.880	2.972	1350		1	1.009	20.908	375
							0	1.010	20.908	375
PP32	706014.321	775296.697	24.100	0.500			0	13.000	23.600	150
69	706004.259	775300.273	23.800	1.425	1200		1	13.000	23.493	150
							0	13.001	22.375	225
PP31	706014.321	775258.489	24.800	0.500			0	14.000	24.300	150
J11	706006.111	775260.467	24.744	2.635			1	14.000	24.216	150
							2	13.001	22.109	225
							0	13.002	22.109	225
72	706009.501	775180.387	25.550	1.425	1200		0	15.000	24.125	225
PP30	706016.382	775201.149	25.400	0.500			0	16.000	24.900	150
J10	706008.732	775200.524	25.404	1.481			1	16.000	24.823	150
							2	15.000	23.923	225
							0	15.001	23.923	225
PP29	706026.186	775234.627	25.000	0.500			0	17.000	24.500	100

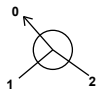
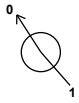
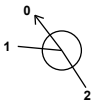
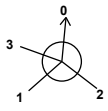
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
75	706007.310	775230.491	25.200	3.366	1200		1	17.000	24.307	100
							2	15.001	23.623	225
							3	13.002	21.909	225
							0	13.003	21.834	300
PP28	706058.827	775221.748	24.800	0.500			0	18.000	24.300	150
PP27	706054.686	775234.627	24.500	0.500			0	19.000	24.000	100
J9	706056.637	775230.294	24.467	2.962			1	19.000	23.952	100
							2	18.000	24.124	150
							3	13.003	21.505	300
							0	13.004	21.505	300
79	706076.435	775230.294	24.173	3.516	1350		1	13.004	21.373	300
							2	1.010	20.732	375
							0	1.011	20.657	450
80	706076.391	775240.254	24.000	3.393	1350		1	1.011	20.607	450
							0	1.012	20.607	450
81	706072.369	775251.612	23.773	3.301	1500		1	1.012	20.547	450
							0	1.013	20.472	525
PP33	706080.551	775270.959	23.400	0.500			0	20.000	22.900	150
PP34	706066.051	775269.497	23.500	0.500			0	21.000	23.000	150
J12	706072.590	775269.763	23.409	3.028			1	21.000	22.935	150
							2	20.000	22.819	150
							3	1.013	20.381	525
							0	1.014	20.381	525
PP35	706066.051	775294.749	23.100	0.500			0	22.000	22.600	150
J13	706073.031	775296.542	22.864	2.617			1	22.000	22.528	150
							2	1.014	20.247	525
							0	1.015	20.247	525
87	706073.294	775312.543	22.650	2.483	1500		1	1.015	20.167	525
							0	1.016	20.167	525

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PP36	706112.346	775305.042	21.600	0.500					
						0	23.000	21.100	150
J14	706111.218	775312.690	21.625	2.406			1	23.000	21.023	150
							2	1.016	19.219	525
							0	1.017	19.219	525
PP37	706132.516	775305.077	21.100	0.500					
						0	24.000	20.600	100
91	706142.945	775312.827	20.075	1.725	1500		1	24.000	19.301	100
							2	1.017	18.350	525
							0	1.018	18.350	525
PP38	706168.553	775302.968	20.000	0.500					
						0	25.000	19.500	150
93	706170.473	775311.199	19.875	1.725	1500		1	25.000	19.415	150
							2	1.018	18.150	525
							0	1.019	18.150	525
94	706267.109	775132.997	25.250	1.425	1200				
						0	26.000	23.825	225
95	706283.935	775123.334	24.250	1.395	1200		1	26.000	22.855	225
							0	26.001	22.855	225
PP40	706289.070	775158.010	23.400	0.500					
						0	27.000	22.900	150
97	706294.066	775141.926	23.500	1.425	1200		1	27.000	22.732	150
							2	26.001	22.075	225
							0	26.002	22.075	225
98	706301.654	775175.790	21.500	1.425	1200		1	26.002	20.340	225
							0	26.003	20.075	225
99	706296.768	775187.498	21.750	1.760	1200		1	26.003	19.990	225
							0	26.004	19.990	225
PP41	706268.167	775200.379	22.800	0.500					
						0	28.000	22.300	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
100	706272.993	775204.411	22.500	2.757	1200		1	28.000	22.174	150
							2	26.004	19.818	225
							0	26.005	19.743	300
101	706260.270	775218.899	21.917	2.270	1200		1	26.005	19.647	300
							0	26.006	19.647	300
PP42	706238.071	775241.890	21.500	0.500			0	29.000	21.000	100
PP43	706230.298	775254.000	21.000	0.500			0	30.000	20.500	100
J15	706239.265	775251.459	20.750	1.511			1	30.000	20.407	100
							2	29.000	20.518	100
							3	26.006	19.239	300
							0	26.007	19.239	300
PP44	706217.888	775271.937	20.500	0.500			0	31.000	20.000	100
105	706226.503	775271.138	20.167	1.500	1200		1	31.000	19.913	100
							2	26.007	18.992	300
							0	26.008	18.667	300
PP45	706203.225	775286.524	19.800	0.500			0	32.000	19.300	150
106	706214.581	775286.709	19.583	1.500	1200		1	32.000	19.186	150
							2	26.008	18.083	300
							0	26.009	18.083	300
PP39	706186.544	775296.766	19.600	0.500			0	33.000	19.100	100
108	706193.509	775302.905	19.292	3.292	1500		1	33.000	19.007	100
							2	26.009	17.792	300
							3	1.019	17.567	525
							0	1.020	16.000	525
109	706193.934	775307.414	18.800	2.875	1500		1	1.020	15.925	525
							0	1.021	15.925	525
BASIN 2	706175.753	775330.401	16.000	3.006			1	1.021	12.994	525
							0	1.022	12.994	525

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
HB 2	706167.660	775350.046	16.000	3.360	1500	1	1.022	12.640	525
									
						0	1.023	12.640	225
3	706195.144	775366.352	10.000	1.425	1200	1	1.023	8.575	225
									
						0	1.024	8.575	225
4	706206.168	775386.256	5.000	1.425	1200	1	1.024	3.575	225
									

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	15.100	Additional Storage (m³/ha)	20.0
Ratio-R	0.270	Starting Level (m)	
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Node HB 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.023	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0200-2190-1500-2190
Invert Level (m)	12.640	Min Outlet Diameter (m)	0.225
Design Depth (m)	1.500	Min Node Diameter (mm)	0
Design Flow (l/s)	21.9		

Node PP15 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	1

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	0.350	75.0	0.0	0.351	0.0	0.0

Node PP16 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	25.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.350	100.0	0.0	0.351	0.0	0.0

Node PP17 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	25.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	7

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	0.350	150.0	0.0	0.351	0.0	0.0

Node PP18 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.350	100.0	0.0	0.351	0.0	0.0

Node PP19 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	23.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	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	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP20 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	6

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP21 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	6

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP22 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP24 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP25 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	23.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	3

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP23 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	23.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	62.5	0.0	0.350	62.5	0.0	0.351	0.0	0.0

Node PP26 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	23.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP27 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	0.350	75.0	0.0	0.351	0.0	0.0

Node PP28 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	0.350	200.0	0.0	0.351	0.0	0.0

Node PP29 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP30 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	6

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	0.350	150.0	0.0	0.351	0.0	0.0

Node PP31 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	7

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	0.350	150.0	0.0	0.351	0.0	0.0

Node PP32 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	23.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	0.350	75.0	0.0	0.351	0.0	0.0

Node PP33 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	6

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	125.0	0.0	0.350	125.0	0.0	0.351	0.0	0.0

Node PP34 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	23.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	3

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	0.350	75.0	0.0	0.351	0.0	0.0

Node PP35 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	5

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.350	100.0	0.0	0.351	0.0	0.0

Node PP36 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	21.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	87.5	0.0	0.350	87.5	0.0	0.351	0.0	0.0

Node PP37 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	20.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	2

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.350	100.0	0.0	0.351	0.0	0.0

Node PP38 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	19.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	1

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP39 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	19.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	6

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP40 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	8

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	0.350	150.0	0.0	0.351	0.0	0.0

Node PP41 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.350	100.0	0.0	0.351	0.0	0.0

Node PP42 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	21.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	7

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	0.350	150.0	0.0	0.351	0.0	0.0

Node PP43 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	20.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	2

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP44 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	20.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	5

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node PP45 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	19.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.40	Time to half empty (mins)	1

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	0.350	50.0	0.0	0.351	0.0	0.0

Node BASIN 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	13.000
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)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	680.0	0.0	1.501	1.1	0.0	2.001	243.0	0.0	3.000	656.0	0.0
1.500	680.0	0.0	2.000	1.1	0.0	2.500	436.0	0.0			

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP15	19	24.578	0.078	13.2	2.4574	0.0000	OK
30 minute summer	36	18	23.191	0.077	14.7	0.1035	0.0000	OK
30 minute summer	PP16	19	25.099	0.099	18.8	4.1555	0.0000	OK
30 minute summer	47	18	24.897	0.115	21.0	0.1723	0.0000	OK
30 minute summer	48	18	24.709	0.103	28.8	0.1515	0.0000	OK
30 minute summer	PP17	20	25.117	0.117	28.0	7.3982	0.0000	OK
30 minute summer	50	18	24.385	0.154	56.5	0.2633	0.0000	OK
30 minute summer	PP18	19	24.297	0.097	18.0	4.0608	0.0000	OK
30 minute summer	52	19	23.555	0.150	73.7	0.2104	0.0000	OK
30 minute summer	PP19	19	23.572	0.072	8.9	1.5477	0.0000	OK
30 minute summer	54	20	22.664	0.423	83.9	0.5579	0.0000	SURCHARGED
30 minute summer	PP20	20	23.008	0.108	10.9	2.2911	0.0000	SURCHARGED
30 minute summer	PP21	19	22.592	0.092	9.4	1.9294	0.0000	OK
30 minute summer	57	20	22.244	0.414	93.4	0.5206	0.0000	SURCHARGED
30 minute summer	PP22	20	22.697	0.097	9.9	2.0414	0.0000	OK
30 minute summer	59	20	22.076	0.532	114.6	0.7103	0.0000	SURCHARGED
30 minute summer	PP23	20	23.740	0.090	10.1	2.3522	0.0000	OK
30 minute summer	61	18	22.860	0.081	24.6	0.1061	0.0000	OK
30 minute summer	PP24	19	22.848	0.048	4.2	0.9930	0.0000	OK
15 minute summer	PP25	11	23.206	0.106	17.3	2.3069	0.0000	OK
30 minute summer	64	20	21.707	0.515	155.1	0.8202	0.0000	SURCHARGED
30 minute summer	PP26	19	23.493	0.093	9.9	1.9741	0.0000	OK
30 minute summer	J7	20	21.602	0.539	162.4	0.0000	0.0000	SURCHARGED
30 minute summer	67	20	21.469	0.561	167.8	0.8972	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	PP15	8.000	36	9.9	1.553	0.892	0.0573	
30 minute summer	36	8.001	61	14.6	1.176	0.240	0.3061	
30 minute summer	PP16	1.000	47	13.0	1.085	0.733	0.1714	
30 minute summer	47	1.001	48	20.8	1.109	0.480	0.4820	
30 minute summer	48	1.002	50	28.6	1.218	0.424	0.5218	
30 minute summer	PP17	2.000	50	16.2	1.121	0.910	0.2022	
30 minute summer	50	1.003	52	55.8	1.983	0.765	1.1941	
30 minute summer	PP18	3.000	52	12.4	1.066	0.698	0.1069	
30 minute summer	52	1.004	54	72.7	2.103	0.762	1.1833	
30 minute summer	PP19	4.000	54	7.0	1.188	0.813	0.0460	
30 minute summer	54	1.005	57	78.6	2.179	0.951	0.5315	
30 minute summer	PP20	5.000	57	6.6	0.876	1.092	0.0680	
30 minute summer	PP21	6.000	57	6.3	0.875	1.040	0.0608	
30 minute summer	57	1.006	59	93.6	1.539	0.638	1.1609	
30 minute summer	PP22	7.000	59	6.4	0.877	1.066	0.0472	
30 minute summer	59	1.007	64	113.5	1.713	1.022	1.9475	
30 minute summer	PP23	9.000	61	6.2	0.875	1.031	0.0566	
30 minute summer	61	8.002	64	24.3	1.955	0.255	0.2442	
30 minute summer	PP24	10.000	64	2.8	0.752	0.464	0.0616	
15 minute summer	PP25	11.000	64	13.9	1.082	0.782	0.0924	
30 minute summer	64	1.008	J7	155.7	1.646	0.778	1.4190	
30 minute summer	PP26	12.000	J7	6.8	0.925	1.122	0.0494	
30 minute summer	J7	1.009	67	162.9	1.533	0.814	1.7114	
30 minute summer	67	1.010	79	168.4	1.527	0.842	1.9430	

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP32	19	23.707	0.107	18.7	3.4298	0.0000	OK
30 minute summer	69	20	22.510	0.135	21.2	0.1951	0.0000	OK
30 minute summer	PP31	20	24.422	0.122	29.8	7.7145	0.0000	OK
30 minute summer	J11	19	22.473	0.364	51.5	0.1229	0.0000	SURCHARGED
15 minute summer	72	11	24.141	0.016	0.5	0.0180	0.0000	OK
30 minute summer	PP30	20	25.009	0.109	26.0	6.8374	0.0000	OK
30 minute summer	J10	18	24.042	0.119	28.1	0.0660	0.0000	OK
60 minute summer	PP29	36	24.526	0.026	1.3	0.5173	0.0000	OK
30 minute summer	75	19	22.211	0.377	94.2	0.5538	0.0000	SURCHARGED
30 minute summer	PP28	20	24.399	0.099	31.8	8.2921	0.0000	OK
30 minute summer	PP27	20	24.056	0.056	6.3	1.7328	0.0000	OK
30 minute summer	J9	19	21.859	0.354	111.4	0.0000	0.0000	SURCHARGED
30 minute summer	79	20	21.282	0.625	283.7	0.9929	0.0000	SURCHARGED
30 minute summer	80	20	21.122	0.515	286.7	0.7749	0.0000	SURCHARGED
30 minute summer	81	19	20.889	0.417	293.3	0.8170	0.0000	OK
30 minute summer	PP33	20	23.016	0.116	26.2	6.1541	0.0000	OK
30 minute summer	PP34	19	23.099	0.099	17.4	3.1591	0.0000	OK
30 minute summer	J12	20	20.787	0.406	335.2	0.1218	0.0000	OK
30 minute summer	PP35	19	22.720	0.120	24.7	5.1318	0.0000	OK
30 minute summer	J13	20	20.657	0.410	352.7	0.0000	0.0000	OK
30 minute summer	87	20	20.426	0.259	356.6	0.4910	0.0000	OK
30 minute summer	PP36	19	21.182	0.082	14.1	3.0154	0.0000	OK
30 minute summer	J14	20	19.467	0.248	377.8	0.1078	0.0000	OK
30 minute summer	PP37	19	20.681	0.081	22.4	3.4255	0.0000	OK
30 minute summer	91	20	18.792	0.442	399.1	0.8764	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)
30 minute summer	PP32	13.000	69	14.3	1.098	0.808	0.1395	
30 minute summer	69	13.001	J11	20.8	0.678	0.491	1.2871	
30 minute summer	PP31	14.000	J11	17.6	1.150	0.992	0.1296	
30 minute summer	J11	13.002	75	48.1	1.262	1.136	1.1931	
15 minute summer	72	15.000	J10	0.5	0.061	0.010	0.2182	
30 minute summer	PP30	16.000	J10	15.6	1.145	0.881	0.1049	
30 minute summer	J10	15.001	75	27.5	1.325	0.528	0.6247	
60 minute summer	PP29	17.000	75	0.9	0.545	0.142	0.0304	
30 minute summer	75	13.003	J9	88.6	1.340	0.978	3.4736	
30 minute summer	PP28	18.000	J9	19.6	1.583	0.777	0.1091	
30 minute summer	PP27	19.000	J9	3.7	0.816	0.615	0.0216	
30 minute summer	J9	13.004	79	110.8	1.583	1.223	1.3311	
30 minute summer	79	1.011	80	284.3	1.794	1.247	1.5781	
30 minute summer	80	1.012	81	287.2	1.831	1.259	1.8044	
30 minute summer	81	1.013	J12	294.2	1.623	0.860	3.2956	
30 minute summer	PP33	20.000	J12	17.0	1.158	0.955	0.1179	
30 minute summer	PP34	21.000	J12	13.7	1.116	0.773	0.0805	
30 minute summer	J12	1.014	J13	335.5	1.864	0.981	4.8227	
30 minute summer	PP35	22.000	J13	17.3	1.152	0.972	0.1094	
30 minute summer	J13	1.015	87	352.4	2.451	1.031	2.3006	
30 minute summer	87	1.016	J14	357.3	3.462	0.465	3.9155	
30 minute summer	PP36	23.000	J14	10.4	1.050	0.586	0.0765	
30 minute summer	J14	1.017	91	378.2	2.516	0.470	4.6663	
30 minute summer	PP37	24.000	91	18.0	2.721	0.931	0.0858	
30 minute summer	91	1.018	93	400.2	2.382	0.970	4.5799	

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	PP38	11	19.586	0.086	13.0	1.8299	0.0000	OK
30 minute summer	93	20	18.471	0.321	412.8	0.6291	0.0000	OK
15 minute summer	94	10	23.875	0.050	12.7	0.0799	0.0000	OK
15 minute summer	95	10	22.928	0.073	23.2	0.1121	0.0000	OK
30 minute summer	PP40	20	23.029	0.129	31.4	8.1845	0.0000	OK
15 minute summer	97	10	22.171	0.096	42.7	0.1344	0.0000	OK
15 minute summer	98	11	20.461	0.386	46.6	0.5064	0.0000	SURCHARGED
30 minute summer	99	19	20.327	0.337	52.2	0.4671	0.0000	SURCHARGED
30 minute summer	PP41	19	22.381	0.081	17.0	3.3966	0.0000	OK
30 minute summer	100	19	19.964	0.221	68.6	0.2710	0.0000	OK
30 minute summer	101	19	19.817	0.170	68.8	0.1923	0.0000	OK
30 minute summer	PP42	20	21.101	0.101	26.3	6.3778	0.0000	SURCHARGED
30 minute summer	PP43	19	20.584	0.084	8.8	1.7645	0.0000	OK
30 minute summer	J15	19	19.469	0.230	100.4	0.1252	0.0000	OK
30 minute summer	PP44	20	20.102	0.102	10.4	2.1572	0.0000	SURCHARGED
30 minute summer	105	19	18.853	0.186	111.4	0.2498	0.0000	OK
15 minute summer	PP45	11	19.385	0.085	13.0	1.8125	0.0000	OK
30 minute summer	106	19	18.471	0.388	126.6	0.5405	0.0000	SURCHARGED
30 minute summer	PP39	20	19.213	0.113	11.3	2.4018	0.0000	SURCHARGED
30 minute summer	108	20	16.498	0.498	544.3	0.8795	0.0000	OK
15 minute summer	109	12	16.159	0.234	524.5	0.4133	0.0000	OK
720 minute winter	BASIN 2	690	14.471	1.477	108.1	1000.6710	0.0000	SURCHARGED
720 minute winter	HB 2	690	14.470	1.830	147.3	3.2343	0.0000	SURCHARGED

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	PP38	25.000	93	10.3	1.022	0.581	0.0853	
30 minute summer	93	1.019	108	413.7	3.293	0.552	3.0749	
15 minute summer	94	26.000	95	12.7	1.443	0.109	0.1721	
15 minute summer	95	26.001	97	23.2	1.766	0.231	0.2896	
30 minute summer	PP40	27.000	97	17.7	1.130	0.998	0.2654	
15 minute summer	97	26.002	98	41.8	2.647	0.358	0.6428	
15 minute summer	98	26.003	99	45.3	1.140	1.071	0.5046	
30 minute summer	99	26.004	100	52.1	1.322	1.310	1.1008	
30 minute summer	PP41	28.000	100	12.9	1.387	0.514	0.0587	
30 minute summer	100	26.005	101	68.8	1.414	0.878	0.9336	
30 minute summer	101	26.006	J15	68.8	1.394	0.603	1.9195	
30 minute summer	PP42	29.000	J15	14.5	1.957	1.065	0.0755	
30 minute summer	PP43	30.000	J15	6.2	0.901	1.029	0.0642	
30 minute summer	J15	26.007	105	100.8	1.798	0.884	1.3148	
30 minute summer	PP44	31.000	105	6.4	0.879	1.064	0.0635	
30 minute summer	105	26.008	106	111.2	1.879	0.578	1.1411	
15 minute summer	PP45	32.000	106	10.3	1.027	0.580	0.1139	
30 minute summer	106	26.009	108	125.0	1.810	1.075	1.8177	
30 minute summer	PP39	33.000	108	6.7	0.877	1.117	0.0688	
30 minute summer	108	1.020	109	544.6	3.477	0.869	0.6759	
15 minute summer	109	1.021	BASIN 2	525.5	8.470	0.341	2.8839	
720 minute winter	BASIN 2	1.022	HB 2	147.3	0.944	0.235	4.5900	
720 minute winter	HB 2	Hydro-Brake®	3	24.1				

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	3	690	8.624	0.049	24.1	0.0551	0.0000	OK
720 minute winter	4	690	3.622	0.047	24.1	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)
720 minute winter	3	1.024	4	24.1	3.901	0.098	0.1404	1214.6

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP15	20	24.602	0.102	17.1	3.2090	0.0000	SURCHARGED
30 minute summer	36	18	23.200	0.086	18.0	0.1161	0.0000	OK
30 minute summer	PP16	19	25.121	0.121	24.4	5.1014	0.0000	OK
30 minute summer	47	18	24.918	0.136	27.4	0.2040	0.0000	OK
30 minute summer	48	20	24.792	0.186	37.6	0.2732	0.0000	OK
30 minute summer	PP17	20	25.150	0.150	36.1	9.4487	0.0000	OK
30 minute summer	50	20	24.726	0.495	73.3	0.8440	0.0000	SURCHARGED
30 minute summer	PP18	19	24.318	0.118	23.3	4.9773	0.0000	OK
30 minute summer	52	20	24.136	0.731	88.8	1.0266	0.0000	SURCHARGED
30 minute summer	PP19	19	23.589	0.089	11.5	1.9308	0.0000	OK
30 minute summer	54	20	23.203	0.962	95.3	1.2696	0.0000	SURCHARGED
30 minute summer	PP20	20	23.047	0.147	14.1	3.1282	0.0000	SURCHARGED
30 minute summer	PP21	21	22.663	0.163	12.2	3.4372	0.0000	SURCHARGED
30 minute summer	57	20	22.643	0.813	104.7	1.0228	0.0000	SURCHARGED
30 minute summer	PP22	20	22.730	0.130	12.8	2.7560	0.0000	SURCHARGED
30 minute summer	59	19	22.447	0.903	125.6	1.2051	0.0000	SURCHARGED
30 minute summer	PP23	20	23.770	0.120	13.0	3.1324	0.0000	SURCHARGED
30 minute summer	61	18	22.870	0.091	30.1	0.1195	0.0000	OK
30 minute summer	PP24	19	22.859	0.059	5.5	1.2007	0.0000	OK
15 minute summer	PP25	11	23.229	0.129	22.0	2.8129	0.0000	OK
30 minute summer	64	19	22.028	0.836	176.9	1.3322	0.0000	SURCHARGED
30 minute summer	PP26	20	23.526	0.126	12.8	2.6612	0.0000	SURCHARGED
30 minute summer	J7	19	21.893	0.830	183.5	0.0000	0.0000	SURCHARGED
30 minute summer	67	19	21.725	0.817	191.6	1.3067	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	PP15	8.000	36	11.3	1.556	1.017	0.0703	
30 minute summer	36	8.001	61	18.0	1.243	0.298	0.3587	
30 minute summer	PP16	1.000	47	16.7	1.127	0.943	0.2122	
30 minute summer	47	1.001	48	27.2	1.148	0.629	0.7176	
30 minute summer	48	1.002	50	37.8	1.250	0.560	0.8355	
30 minute summer	PP17	2.000	50	18.7	1.128	1.052	0.2338	
30 minute summer	50	1.003	52	66.9	1.978	0.917	1.6768	
30 minute summer	PP18	3.000	52	16.1	1.115	0.907	0.1327	
30 minute summer	52	1.004	54	81.6	2.121	0.856	1.3871	
30 minute summer	PP19	4.000	54	8.6	1.210	1.000	0.0583	
30 minute summer	54	1.005	57	90.8	2.283	1.098	0.5315	
30 minute summer	PP20	5.000	57	7.6	0.968	1.252	0.0696	
30 minute summer	PP21	6.000	57	7.7	0.980	1.268	0.0666	
30 minute summer	57	1.006	59	106.4	1.550	0.725	1.1609	
30 minute summer	PP22	7.000	59	7.4	0.952	1.230	0.0487	
30 minute summer	59	1.007	64	127.6	1.813	1.149	1.9475	
30 minute summer	PP23	9.000	61	7.0	0.899	1.156	0.0594	
30 minute summer	61	8.002	64	30.1	2.066	0.315	0.2857	
30 minute summer	PP24	10.000	64	3.8	0.808	0.630	0.0779	
15 minute summer	PP25	11.000	64	17.2	1.116	0.967	0.1128	
30 minute summer	64	1.008	J7	176.0	1.653	0.879	1.4190	
30 minute summer	PP26	12.000	J7	7.6	0.978	1.266	0.0511	
30 minute summer	J7	1.009	67	184.1	1.669	0.920	1.7114	
30 minute summer	67	1.010	79	191.9	1.740	0.959	1.9430	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP32	19	23.733	0.133	24.2	4.2587	0.0000	OK
30 minute summer	69	19	23.150	0.775	26.9	1.1211	0.0000	SURCHARGED
30 minute summer	PP31	20	24.456	0.156	38.5	9.8916	0.0000	SURCHARGED
30 minute summer	J11	19	23.051	0.942	59.3	0.3184	0.0000	SURCHARGED
15 minute summer	72	10	24.143	0.018	0.7	0.0208	0.0000	OK
30 minute summer	PP30	20	25.036	0.136	33.7	8.5547	0.0000	OK
30 minute summer	J10	18	24.063	0.140	36.2	0.0781	0.0000	OK
30 minute summer	PP29	20	24.531	0.031	2.2	0.6244	0.0000	OK
30 minute summer	75	19	22.623	0.789	114.6	1.1585	0.0000	SURCHARGED
30 minute summer	PP28	20	24.423	0.123	41.1	10.2656	0.0000	OK
30 minute summer	PP27	20	24.069	0.069	8.1	2.1053	0.0000	OK
30 minute summer	J9	19	22.041	0.536	143.6	0.0000	0.0000	SURCHARGED
30 minute summer	79	19	21.483	0.826	344.0	1.3127	0.0000	SURCHARGED
30 minute summer	80	19	21.248	0.641	347.9	0.9642	0.0000	SURCHARGED
30 minute summer	81	19	20.986	0.514	358.6	1.0057	0.0000	OK
30 minute summer	PP33	20	23.048	0.148	33.8	7.8295	0.0000	OK
30 minute summer	PP34	19	23.121	0.121	22.5	3.8638	0.0000	OK
30 minute summer	J12	19	20.859	0.478	412.5	0.1434	0.0000	OK
30 minute summer	PP35	20	22.753	0.153	31.9	6.5331	0.0000	SURCHARGED
30 minute summer	J13	21	20.699	0.452	432.0	0.0000	0.0000	OK
30 minute summer	87	19	20.459	0.292	437.5	0.5524	0.0000	OK
30 minute summer	PP36	19	21.199	0.099	18.2	3.6174	0.0000	OK
30 minute summer	J14	19	19.523	0.304	467.3	0.1321	0.0000	OK
30 minute summer	PP37	20	20.711	0.111	28.9	4.7291	0.0000	SURCHARGED
30 minute summer	91	20	18.978	0.628	489.3	1.2457	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	PP32	13.000	69	17.9	1.124	1.007	0.1706	
30 minute summer	69	13.001	J11	26.2	0.683	0.620	1.5848	
30 minute summer	PP31	14.000	J11	20.4	1.198	1.149	0.1429	
30 minute summer	J11	13.002	75	60.1	1.511	1.419	1.1931	
15 minute summer	72	15.000	J10	0.7	0.061	0.013	0.2678	
30 minute summer	PP30	16.000	J10	19.7	1.200	1.110	0.1260	
30 minute summer	J10	15.001	75	35.7	1.403	0.688	0.7655	
30 minute summer	PP29	17.000	75	1.2	0.605	0.205	0.0395	
30 minute summer	75	13.003	J9	114.5	1.626	1.264	3.4736	
30 minute summer	PP28	18.000	J9	24.7	1.629	0.980	0.1431	
30 minute summer	PP27	19.000	J9	5.0	0.867	0.822	0.0272	
30 minute summer	J9	13.004	79	143.4	2.037	1.583	1.3723	
30 minute summer	79	1.011	80	343.6	2.169	1.507	1.5781	
30 minute summer	80	1.012	81	347.7	2.195	1.525	1.9029	
30 minute summer	81	1.013	J12	358.9	1.706	1.049	3.8235	
30 minute summer	PP33	20.000	J12	20.3	1.203	1.144	0.1359	
30 minute summer	PP34	21.000	J12	17.4	1.152	0.981	0.0999	
30 minute summer	J12	1.014	J13	411.6	2.048	1.204	5.3842	
30 minute summer	PP35	22.000	J13	20.4	1.203	1.149	0.1219	
30 minute summer	J13	1.015	87	432.0	2.670	1.263	2.5537	
30 minute summer	87	1.016	J14	435.2	3.542	0.567	4.7902	
30 minute summer	PP36	23.000	J14	13.7	1.116	0.774	0.0951	
30 minute summer	J14	1.017	91	465.0	2.518	0.578	5.4795	
30 minute summer	PP37	24.000	91	20.0	2.694	1.035	0.1016	
30 minute summer	91	1.018	93	490.0	2.405	1.188	5.2433	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	PP38	11	19.602	0.102	16.6	2.1849	0.0000	OK
30 minute summer	93	20	18.523	0.373	506.4	0.7321	0.0000	OK
15 minute summer	94	10	23.881	0.056	16.2	0.0903	0.0000	OK
15 minute summer	95	10	22.939	0.084	29.6	0.1278	0.0000	OK
30 minute summer	PP40	21	23.069	0.169	40.6	10.7500	0.0000	SURCHARGED
15 minute summer	97	10	22.183	0.108	55.1	0.1505	0.0000	OK
15 minute summer	98	11	20.725	0.650	60.8	0.8535	0.0000	SURCHARGED
30 minute summer	99	19	20.523	0.533	65.1	0.7401	0.0000	SURCHARGED
30 minute summer	PP41	19	22.397	0.097	22.0	4.0815	0.0000	OK
30 minute summer	100	19	20.007	0.264	86.1	0.3234	0.0000	OK
15 minute summer	101	11	19.840	0.193	84.9	0.2188	0.0000	OK
30 minute summer	PP42	21	21.144	0.144	34.0	9.0665	0.0000	SURCHARGED
30 minute summer	PP43	20	20.611	0.111	11.4	2.3348	0.0000	SURCHARGED
30 minute summer	J15	19	19.554	0.315	121.9	0.1718	0.0000	SURCHARGED
30 minute summer	PP44	20	20.138	0.138	13.4	2.9324	0.0000	SURCHARGED
30 minute summer	105	19	19.057	0.390	132.2	0.5233	0.0000	SURCHARGED
15 minute summer	PP45	11	19.401	0.101	16.5	2.1566	0.0000	OK
30 minute summer	106	19	18.682	0.599	151.1	0.8341	0.0000	SURCHARGED
30 minute summer	PP39	20	19.254	0.154	14.6	3.2722	0.0000	SURCHARGED
30 minute summer	108	20	16.658	0.658	665.7	1.1630	0.0000	SURCHARGED
15 minute summer	109	11	16.183	0.258	633.2	0.4564	0.0000	OK
960 minute winter	BASIN 2	750	15.725	2.731	123.3	1300.0870	0.0000	FLOOD RISK
960 minute winter	HB 2	750	15.724	3.084	75.7	5.4495	0.0000	FLOOD RISK

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	PP38	25.000	93	13.4	1.081	0.755	0.1048	
30 minute summer	93	1.019	108	508.0	3.421	0.678	3.6285	
15 minute summer	94	26.000	95	16.2	1.541	0.139	0.2055	
15 minute summer	95	26.001	97	29.7	1.856	0.296	0.3401	
30 minute summer	PP40	27.000	97	19.4	1.131	1.094	0.2827	
15 minute summer	97	26.002	98	54.6	2.693	0.467	1.0149	
15 minute summer	98	26.003	99	55.9	1.407	1.321	0.5046	
30 minute summer	99	26.004	100	64.4	1.621	1.619	1.1334	
30 minute summer	PP41	28.000	100	17.1	1.473	0.678	0.0729	
30 minute summer	100	26.005	101	86.6	1.503	1.105	1.0952	
15 minute summer	101	26.006	J15	84.4	1.416	0.740	2.2573	
30 minute summer	PP42	29.000	J15	14.5	1.953	1.066	0.0754	
30 minute summer	PP43	30.000	J15	7.0	0.914	1.154	0.0694	
30 minute summer	J15	26.007	105	119.4	1.821	1.047	1.5962	
30 minute summer	PP44	31.000	105	7.4	0.952	1.229	0.0651	
30 minute summer	105	26.008	106	131.3	1.883	0.682	1.3810	
15 minute summer	PP45	32.000	106	13.3	1.085	0.751	0.1396	
30 minute summer	106	26.009	108	150.6	2.139	1.295	1.8471	
30 minute summer	PP39	33.000	108	7.7	0.985	1.274	0.0702	
30 minute summer	108	1.020	109	666.1	3.675	1.063	0.7155	
15 minute summer	109	1.021	BASIN 2	634.1	8.678	0.412	3.6678	
960 minute winter	BASIN 2	1.022	HB 2	75.7	-0.501	0.121	4.5900	
960 minute winter	HB 2	Hydro-Brake®	3	30.9				

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	3	750	8.630	0.055	30.9	0.0627	0.0000	OK
960 minute winter	4	750	3.628	0.053	30.9	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)
960 minute winter	3	1.024	4	30.9	4.184	0.126	0.1682	1775.5

C. Attenuation Estimation

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	15.100	Minimum Backdrop Height (m)	0.200
Ratio-R	0.270	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Catchment1	1.580	20.000	20.000	64.381	1.100

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m³/ha)	20.0
M5-60 (mm)	15.100	Starting Level (m)	
Ratio-R	0.270	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Node Catchment1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.900
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	1000.0	0.0	1.000	1000.0	0.0	1.001	0.0	0.0

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment1	720	19.579	0.679	72.1	698.0264	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute summer	Catchment1	Hydro-Brake®	10.7	581.5

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment1	855	19.817	0.917	90.1	943.0824	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute summer	Catchment1	Hydro-Brake®	10.7	556.5

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	15.100	Minimum Backdrop Height (m)	0.200
Ratio-R	0.270	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	Add Inflow (l/s)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Catchment2	1.970	10.6	20.000	20.000	64.381	1.100

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m³/ha)	20.0
M5-60 (mm)	15.100	Starting Level (m)	
Ratio-R	0.270	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Node Catchment2 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	18.900	Product Number	CTL-SHE-0200-2190-1500-2190
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	21.9	Min Node Diameter (mm)	0

Node Catchment2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.900
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	1500.0	0.0	1.000	1500.0	0.0	1.001	0.0	0.0

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment2	1050	19.595	0.695	77.5	1068.0580	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Catchment2	Hydro-Brake®	21.9	1771.4

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment2	1260	19.808	0.908	93.5	1395.1110	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Catchment2	Hydro-Brake®	21.9	1727.8

D. Site Investigation Report

PRELIMINARY DRAFT REPORT

RATHMULLAN DROGHEDA
PROPOSED HOUSING
CLARD DEVELOPMENTS

WATERMAN MOYLAN
CONSULTING ENGINEERS

CONTENTS

APPENDICES

FOREWORD

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

General.

Recommendations made, and opinions expressed in the report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held for conditions which have not been revealed by exploratory work, or which occur between exploratory hole locations. Whilst the report may suggest the likely configuration of strata, both between exploratory hole locations, or below the maximum depth of the investigation, this is only indicative, and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

Boring Procedures.

Unless otherwise stated, the 'Shell and Auger' technique of soft ground boring has been employed. All boring operations sampling and/or logging of soils and in-situ testing complies with the recommendations of the British Standard Code of Practice BS 5930 (1981), 'Site Investigation' and BS 1377:1990, 'Methods of test for soils for civil engineering purposes'.

Whilst the technique allows the maximum data to be obtained in soft ground, some disturbance and variation of soft and layered soils is unavoidable. Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Where peat has been encountered during siteworks, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 & Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986).

Routine Sampling.

Undisturbed samples of soils, predominantly cohesive in nature are obtained unless otherwise stated by a 104mm diameter open-drive tube sampler. In granular soils, and where undisturbed sampling is inappropriate, disturbed samples are collected. Smaller disturbed samples are also recovered at intervals to allow a visual examination of the full strata section.

In-Situ Testing.

Standard penetration tests, utilising either the standard split spoon sampler or solid cone and automatic trip-hammer are conducted unless otherwise where required by instruction. Subsequent to a seating drive of 150mm, a summation for the number of blows for 300mm penetration is recorded on the boring records together with the blow count for each 75mm penetration. In cases where incomplete penetration is obtained, the number of blows for the recorded value of penetration are noted. In coarse granular soils, a cone end is fitted to the sampler and a similar procedure adopted.

Groundwater.

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level.

Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage condition, tidal variation or other causes.

Retention of Samples.

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

REPORT ON A SITE INVESTIGATION
FOR A HOUSING DEVELOPMENT
AT WEST DROGHEDA
COUNTY MEATH

FOR
CLARD DEVELOPMENTS LTD

WATERMAN MOYLAN
CONSULTING ENGINEERS

Report No. 21345 **NOVEMBER 2018**

I Introduction

A new housing development is proposed for a greenfield site located at Rathmullan, Drogheda West.

An investigation of sub soil conditions in the area of development has been ordered by Waterman Moylan, Consulting Engineers on behalf of Clard Developments Ltd.

The programme of the investigation included the construction of Boreholes, Trial Pits and Dynamic Probes to establish criteria on which to base foundation and infra-structural design. Work was carried out in accordance with BS 5930, Code of Practice for Site Investigations (1999).

In addition percolation testing to BRE Digest 365 was scheduled and carried out at several locations to establish soil percolation characteristics.

A programme of laboratory testing to confirm geotechnical and environmental soil parameters followed site operations.

This report includes all factual data pertaining to the project and comments on the findings relative to the new development.

II Fieldwork

The proposed development is to be undertaken on existing farm land located at Rathmullan, Drogheda West. The development area is bounded by the M1 Motorway to the West, The River Boyne to the North and The Riverbank Housing Estate to the East. The location is shown on the site map in Appendix VI. This drawing also shows the location of the various exploratory positions.

The field investigation included the following elements.

- Cable Percussion Boreholes at five locations
- Machine Excavated Trial Pits at five locations
- HD Dynamic Probes at five locations
- BRE Digest 365 Percolation Tests at five locations

The various locations have been referenced to national grid and OD levels established. Photographs of all excavations are included with this report in the relevant appendices.

Boreholes

Five exploratory holes were scheduled and bored with conventional 200mm cable-tool methods using a Dando Exploratory Rig. Each location was electronically scanned and shallow trial pits were opened to ensure that existing services were not damaged. One additional hole (BH02A) was bored when shallow refusal was recorded in the original location.

Detailed geotechnical records are contained in Appendix I to this report - the records give details of stratification, sampling, in-situ testing and groundwater. Note is also taken of any obstructions to normal boring requiring the use of the heavy chisel for advancement. In general it was not possible to recover undisturbed samples because of the high stone/cobble content of the strata encountered.

The boreholes consistently identified surface topsoil (300mm) overlying initially firm brown sandy gravelly CLAY. The gravelly CLAY stratum increases in strength to stiff and very stiff below about 1.20 metres with holes continuing to completion at depths between 5.80 and 8.50 metres. Angular and sub-angular cobbles and boulders were noted at varying depths in each borehole. The soils represent GLACIAL TILL or BOULDER CLAY deposition, typical of the region.

The final refusal depths may be indicative of boulders in the glacial clay or possibly the local bedrock horizon. Proof core drilling would be required to confirm the presence of bedrock in the area.

No water was encountered during the course of boring. Long-term ground water observation was not required.

Trial Pits

A JCB excavator was used under geotechnical engineering supervision to open trial pits at five locations.

Detailed trial pit records are presented in Appendix II. These records note stratification and ground water regime and detail sampling, obstructions and excavation stability. Photographs of each location are also included with the records.

The records confirm the borehole findings with topsoil overlying firm to stiff brown very sandy gravelly CLAY, typically containing cobble and boulder fragments. Difficulty in advancing the trial pits was noted in each location. Three pits were terminated on boulder obstructions between 1.50 and 2.00 metres BGL however TP01 continued to 2.60 metres and TP03 to 3.00 metres.

Ground water was not encountered during excavation of the trial pits. The pits were backfilled and compacted with the excavated spoil.

Dynamic Probes

Heavy Duty Probes were taken at a total of five locations each adjacent to an excavated trial pit and referenced DP01 to DP05.

Probing was in accordance with the heavy-duty probe specification of BS 1377: Part 9: 1990. In these tests, the soil resistance is measured in terms of the number of drop-hammer blows required to drive the test probe through each 100 mm increment of penetration. Probing is terminated when the blow count exceeds 25/100mm to avoid damage to the apparatus. Where loose material is present a single blow count may drive the apparatus in excess of 100mm. In this instance blow counts of zero may be recorded. Individual probe records are contained in Appendix III.

The probe graphs generally reflect a pattern of gradually increasing soil strength with penetration depth with probe refusals generally occurring between 1.20 and 3.00 metres. Isolate thin soft zones (100mm to 200mm thick) were noted at 1.70 metres BGL in DP01 and DP02.

A probe resistance of N100 = 4 with no significant underlying deterioration is indicative of an allowable bearing pressure of 100 Kpa, suitable for traditional two storey house construction.

Probe No.	**Depth to $N_{100} = 5$**	**Refusal**
DP01	0.50	2.50
DP02	1.80	3.10
DP03	0.50	1.20
DP04	0.50	1.50
DP05	0.50	1.10

Percolation Test to BRE Digest 365

Infiltration testing was performed at five locations in accordance with BRE Digest 365 'Soakaway Design'. The test pit was excavated and logged. The test material was firm to stiff brown very sandy gravelly CLAY with cobbles and boulders

To obtain a measure of the infiltration rate of the sub-soils, water is poured into the test pit, and records taken of the fall in water level against time. The test is carried out over two cycles following initial soakage.

The infiltration rate is the volume of water dispersed per unit exposed area per unit of time, and is generally expressed as metres/minute or metres/second. In these calculations the exposed area is the sum of the base area and the average internal area of the permeable stratum over the test duration. Designs are based on the slowest infiltration rate, which has been calculated from the final cycle.

In the test locations the water level dropped slowly over the test period. The design calculations are presented in Appendix IV, with the infiltration rates as follows:

SA 01	**Infiltration Rate (f)**	**0.00057 m/min**
SA02	**Infiltration Rate (f)**	**0.00068 m/min**
SA03	**Infiltration Rate (f)**	**0.00029 m/min**
SA04	**Infiltration Rate (f)**	**0.00052 m/min**
SA05	**Infiltration Rate (f)**	**0.00051 m/min**

The results are typical of low-permeability glacial till deposition.

III Testing

a. In-Situ

Standard penetration tests were carried out in each borehole at 1.00 metre intervals to establish relative soil strength. Results are presented in the right hand column of the boring records and are summarised as follows:

Stratum	**N Value Range**	**Comment**
Brown sandy gravelly CLAY		
1.00 metres BGL	10 to 18	Firm to Stiff
2.00 metres BGL	16 to 30	Stiff
3.00 metres BGL	25 to 33	Stiff to Very Stiff
4.00 metres BGL	31 to 51	Very Stiff to Hard
5.00 metres BGL	23 to 53	Stiff to Hard

b. Laboratory

All geotechnical samples from the boreholes and trial pits have been returned to the IGSL laboratory for initial visual inspection, a schedule of testing was prepared and tests carried out.

The programme of testing included the following elements and all results are presented in Appendix V. Standard geotechnical testing is carried out by IGSL in it's INAB-accredited laboratory. Chemical and environmental testing was carried out by CHEMTEST in the UK.

a. Classification (Liquid and Plastic Limits)
b. Particle size distribution (Sieve Analysis and Hydrometer)
c. Sulphate and pH determination
d. RILTA Environmental Suite

Classification and Moisture Content

Liquid and plastic limits were determined for samples of the cohesive soils from the trial pits and boreholes. Results are detailed and plotted on the standard Casagrande Classification Chart.

Particle Size Distribution

Grading curves for selected samples of the gravelly clay stratum from the boreholes were determined by wet sieve and hydrometer analysis.

Chemical (pH and Sulphate)

Four samples were submitted for chemical analysis.

RILTA Environmental Suite

Five sample were submitted for RILTA Suite (WAC) analysis.

IV Discussion

The proposed new housing development is to be undertaken on agricultural land at Rathmullan in Drogheda North.

A comprehensive investigation of sub soil conditions has been carried out for Waterman Moylan on behalf of Clard Developments Ltd.

This preliminary report is based on field findings, detailed geotechnical and environmental testing is being carried out to confirm design parameters.

The detailed findings are presented earlier in this report and these can be summarised as follows:

Boreholes indicate topsoil overlying firm brown sandy gravelly CLAY which extends to about 1.20 metres BGL. This overlies stiff to very stiff to hard brown gravelly CLAY (Brown Boulder CLAY). Boreholes were completed on refusal at depths between 5.80 and 8.50 metres. The final borehole depths are not indicative of rock horizon. No ground water was encountered.

Trial Pits confirmed this general pattern, with numerous cobble and boulder particles noted and recovered and excavation difficulty noted in several locations.

NEW HOUSE FOUNDATIONS

Standard Penetration Tests and Dynamic Probes indicate that an allowable bearing pressure of at least 125 kN/sq.m. can be taken at a depth of 1.00 metre BGL. Conventional reinforced strip or pad foundations will therefore be appropriate for this development with foundations placed 0.70 to 0.80 metres BGL.

At one probe location (DP02) a reduction in soil strength was noted between 1.60 and 1.80 metres. The overlying soils are stiff and consideration could be given to founding at 0.70 metres with a reduced bearing pressure of 75 kN/sq.m. to avoid overstressing the weaker underlying zone.

Alternatively foundations in this area could be deepened to 1.80 metres to achieve the higher allowable bearing pressure.

The sub soils increase in strength with depth and results indicate an allowable bearing pressure of 250 kN/sq.m. on the soils below 2.00 metres.

Careful visual inspection of foundation excavations is advised to ensure uniformity and suitability of the founding medium. This is particularly relevant given the variation noted at DP02.

PERCOLATION

Testing to BRE Digest 365 was carried out at five location with relatively low infiltration available in the gravelly boulder clay formation. An average infiltration rate (f) of 0.00050 metres/minute has been obtained.

ENVIRONMENTAL

CONCRETE

IGSL/JC
November 2018

Appendix I Boring Records

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen,Drogheda,Co.Louth	BOREHOLE NO.	BH01
		SHEET	Sheet 1 of 1
CO-ORDINATES	RIG TYPE Dando 2000	DATE COMMENCED	02/11/2018
GROUND LEVEL (m AOD)	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED	05/11/2018
	BOREHOLE DEPTH (m) 4.20		
CLIENT	SPT HAMMER REF. NO.	BORED BY	W.Cahill
ENGINEER Waterman Moylan	ENERGY RATIO (%)	PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL/subsoil			0.30						
1	Firm light brown sandy SILT/CLAY with some gravel and occasional cobbles			1.80	AA11709	B	1.00		N = 10 (2, 2, 3, 3, 2, 2)	
2	Stiff to very stiff dark brown sandy SILT/CLAY with grvael and occasional cobbles and boulders				AA11710	B	2.00		N = 21 (4, 4, 5, 5, 5, 6)	
3					AA11711	B	3.00		N = 33 (5, 5, 7, 9, 7, 10)	
4	Obstruction End of Borehole at 4.20 m			4.20	AA11712	B	4.00		N = 48/75 mm (15, 10, 48)	
5										
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4	4.2	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Cat scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen,Drogheda,Co.Louth	**BOREHOLE NO.**	**BH01A**
		SHEET	Sheet 1 of 1
CO-ORDINATES	**RIG TYPE** Dando 2000	**DATE COMMENCED**	02/11/2018
GROUND LEVEL (m AOD)	**BOREHOLE DIAMETER (mm)** 200	**DATE COMPLETED**	05/11/2018
	BOREHOLE DEPTH (m) 6.20		
CLIENT	**SPT HAMMER REF. NO.**	**BORED BY**	W.Cahill
ENGINEER Waterman Moylan	**ENERGY RATIO (%)**	**PROCESSED BY**	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL/subsoil			0.30						
	firm light brown sandy SILT/CLAY with some gravel and occasional cobbles				AA10561	B	1.00		N = 11 (2, 3, 2, 3, 3, 3)	
1				1.80						
	Stiff to very stiff dark brown sandy SILT/CLAY with grvael and occasional cobbles and boulders				AA10562	B	2.00		N = 21 (4, 6, 4, 6, 5, 6)	
2										
					AA10563	B	3.00		N = 31 (5, 4, 5, 6, 9, 11)	
3				3.60						
	Dense grey/brown fine to coarse clayey GRAVEL with cobbles and some boulders				AA10564	B	4.00		N = 42 (6, 6, 9, 9, 10, 14)	
4				4.20						
	Very stiff dark brown SILT			4.50						
	Very stiff dark brown very gravelly SILT/CLAY with cobbbles and occasional boulders				AA10565	B	5.00		N = 41 (5, 7, 9, 9, 11, 12)	
5										
					AA10566	B	6.00		N = 50/75 mm (7, 18, 50)	
6				6.20						
	Obstruction End of Borehole at 6.20 m									
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.5	3.7	0.75	
6	6.2	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Cat scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen,Drogheda,Co.Louth	BOREHOLE NO.	BH02
		SHEET	Sheet 1 of 1
CO-ORDINATES	RIG TYPE Dando 2000	DATE COMMENCED	06/11/2018
GROUND LEVEL (m AOD)	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED	06/11/2018
	BOREHOLE DEPTH (m) 6.50		
CLIENT	SPT HAMMER REF. NO.	BORED BY	W.Cahill
ENGINEER Waterman Moylan	ENERGY RATIO (%)	PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL			0.15						
	Subsoil			0.35						
	Firm to stiff light brown sandy SILT/CLAY with gravel and occasional cobbles				AA105601	B	1.00		N = 18 (2, 3, 3, 4, 6, 5)	
1										
					AA105602	B	2.00		N = 16 (3, 3, 4, 4, 4, 4)	
2				2.90						
	Very stiff to hard light brown sandy SILT/CLAY with gravel,cobbles and some boulders				AA105603	B	3.00		N = 35 (5, 6, 6, 8, 10, 11)	
3										
					AA105604	B	4.00		N = 51 (6, 9, 11, 13, 14, 13)	
4										
					AA105605	B	5.00		N = 53 (11, 13, 10, 9, 19, 15)	
5										
					AA105606	B	6.00		N = 50/75 mm (25, 50)	
6				6.50						
	Obstruction End of Borehole at 6.50 m									
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.2	4.5	0.75	
5.4	5.6	1	
6.3	6.5	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Cat scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen,Drogheda,Co.Louth	BOREHOLE NO.	BH03
		SHEET	Sheet 1 of 1
CO-ORDINATES	RIG TYPE Dando 2000	DATE COMMENCED	12/11/2018
GROUND LEVEL (m AOD)	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED	12/11/2018
	BOREHOLE DEPTH (m) 7.50		
CLIENT	SPT HAMMER REF. NO.	BORED BY	W.Cahill
ENGINEER Waterman Moylan	ENERGY RATIO (%)	PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL/subsoil			0.20						
1	Firm dark brown sandy SILT/CLAY with some gravel and occasional cobbles			1.60	AA105620	B	1.00		N = 15 (2, 2, 2, 3, 3, 7)	
2	Stiff light brown sandy SILT/CLAY with gravel and some cobbles and boulders				AA105621	B	2.00		N = 22 (2, 3, 4, 5, 6, 7)	
3				3.20	AA105622	B	3.00		N = 36 (4, 6, 8, 8, 9, 11)	
4	Very stiff light brown sandy SILT/CLAY with gravel and some cobbles and boulders				AA105623	B	4.00		N = 50 (7, 9, 12, 11, 12, 15)	
5					AA105624	B	5.00		N = 23 (4, 4, 4, 6, 6, 7)	
6					AA105625	B	6.00		N = 30 (5, 6, 7, 7, 8, 8)	
7				7.50	AA105626	B	7.00		N = 50/150 mm (8, 14, 16, 34)	
8	Obstruction End of Borehole at 7.50 m									
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.3	4.5	0.75	
7.2	7.5	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Cat scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen,Drogheda,Co.Louth	**BOREHOLE NO.**	**BH04**
		SHEET	Sheet 1 of 1
CO-ORDINATES	**RIG TYPE** Dando 2000	**DATE COMMENCED**	09/11/2018
GROUND LEVEL (m AOD)	**BOREHOLE DIAMETER (mm)** 200	**DATE COMPLETED**	09/11/2018
	BOREHOLE DEPTH (m) 8.50		
CLIENT	**SPT HAMMER REF. NO.**	**BORED BY**	W.Cahill
ENGINEER Waterman Moylan	**ENERGY RATIO (%)**	**PROCESSED BY**	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Soft dark brown sandy SILT/CLAY with some gravel (subsoil)			0.20						
	Firm to stiff light brown sandy SILT/CLAY with gravel and some cobbles and boulders									
1					AA105612	B	1.00		N = 17 (2, 4, 3, 5, 5, 4)	
2					AA105613	B	2.00		N = 21 (3, 2, 4, 4, 4, 9)	
3				3.30	AA105614	B	3.00		N = 25 (3, 5, 4, 5, 7, 9)	
	Very stiff brown gravelly CLAY with cobbles									
4					AA105615	B	4.00		N = 31 (6, 5, 7, 7, 9, 8)	
5				5.80	AA105616	B	5.00		N = 33 (5, 5, 5, 5, 8, 15)	
6	Stiff light brown sandy SILT/CLAY with gravel			6.80	AA105617	B	6.00		N = 24 (3, 6, 4, 5, 5, 10)	
7	Very stiff mottled light and dark brown sandy SILT/CLAY with gravel and angular cobbles				AA105618	B	7.00		N = 35 (8, 7, 9, 10, 8, 8)	
8				8.50	AA105619	B	8.00		N = 50/150 mm (8, 7, 15, 35)	
	Obstruction End of Borehole at 8.50 m									
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
5.4	5.6	0.5	
8.3	8.5	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Cat scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen,Drogheda,Co.Louth	**BOREHOLE NO.**	**BH05**
		SHEET	Sheet 1 of 1
CO-ORDINATES	**RIG TYPE** Dando 2000	**DATE COMMENCED**	07/11/2018
GROUND LEVEL (m AOD)	**BOREHOLE DIAMETER (mm)** 200	**DATE COMPLETED**	07/11/2018
	BOREHOLE DEPTH (m) 5.80		
CLIENT	**SPT HAMMER REF. NO.**	**BORED BY**	W.Cahill
ENGINEER Waterman Moylan	**ENERGY RATIO (%)**	**PROCESSED BY**	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL/subsoil			0.25						
1	Firm to stiff light brown sandy SILT/CLAY with gravel,cobbles and occasional boulders			1.90	AA105607	B	1.00		N = 18 (2, 3, 3, 4, 5, 6)	
2	Very stiff dark brown sandy SILT/CLAY with gravel,cobbles and occasional boulders				AA105608	B	2.00		N = 30 (3, 4, 5, 7, 9, 9)	
3					AA105609	B	3.00		N = 50/225 mm (8, 12, 14, 15, 21)	
4					AA105610	B	4.00		N = 36 (6, 9, 9, 10, 9, 8)	
5					AA105611	B	5.00		N = 31 (2, 4, 5, 7, 7, 12)	
6	Obstruction End of Borehole at 5.80 m			5.80					N = 50/225 mm (12, 13, 16, 15, 19)	
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.1	3.3	0.75	
5.6	5.8	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Cat scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21345.GPJ IGSL.GDT 14/11/18

Appendix II Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 21345

CONTRACT 21345	TRIAL PIT NO. TP01
	SHEET Sheet 1 of 1
LOGGED BY TOS	CO-ORDINATES
	DATE STARTED 05/11/2018
	DATE COMPLETED 05/11/2018
CLIENT	GROUND LEVEL (m)
	EXCAVATION METHOD JCB 3CX
ENGINEER Waterman Moylan	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.30							
Firm / stiff brown sandy gravelly CLAY with medium cobble content / low boulder content. Sand is fine to coarse gravel is angular / subangular of grey limestone					AA104513	B	0.50		
1.0									
Compact very gravelly SAND with medium cobble content and medium boulder content. Sand is fine to coarse gravel is subangular / subrounded fine to coarse of grey limestone		1.30			AA104514	B	1.50		
2.0									
End of Trial Pit at 2.60m		2.60			AA104515	B	2.50		
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Trial pit terminated at 2.6 due to refusal in Boulders

IGSL TP LOG 21345.GPJ IGSL.GDT 19/11/18

TRIAL PIT RECORD

REPORT NUMBER 21345

CONTRACT 21345	TRIAL PIT NO. TP02
	SHEET Sheet 1 of 1
LOGGED BY TOS	CO-ORDINATES
	DATE STARTED 05/11/2018
	DATE COMPLETED 05/11/2018
CLIENT	GROUND LEVEL (m)
ENGINEER Waterman Moylan	EXCAVATION METHOD JCB 3CX

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL					AA104510	B	0.20		
		0.35							
Firm / stiff orange brown slightly gravelly sandy CLAY. Sand is fine to coarse gravel is angular / subangular fine to coarse of dark grey limestone					AA104511	B	0.50		
1.0									
		1.30							
Compact BOULDERS and COBBLES with gravelly very sandy clay. Sand is fine to coarse gravel is angular / subangular fine to coarse of grey limestone					AA104512	B	1.50		
2.0									
		2.30							
End of Trial Pit at 2.30m									
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Trial pit terminated at 2.3 due to refusal in Boulders

IGSL TP LOG 21345.GPJ IGSL.GDT 19/11/18

TRIAL PIT RECORD

REPORT NUMBER 21345

CONTRACT 21345		**TRIAL PIT NO.**	**TP03**
		SHEET	Sheet 1 of 1
LOGGED BY TOS	**CO-ORDINATES**	**DATE STARTED**	05/11/2018
		DATE COMPLETED	05/11/2018
CLIENT	**GROUND LEVEL (m)**	**EXCAVATION METHOD**	JCB 3CX
ENGINEER Waterman Moylan			

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.30							
Firm / stiff brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse gravel is subangular / subrounded fine to coarse of grey limestone		1.00			AA104506	B	0.50		
1.0 Compact very gravelly SAND with medium cobble content and medium boulder content. Sand is fine to coarse gravel is subangular / subrounded fine to coarse of grey limestone					AA104507	B	1.20		
2.0					AA104508	B	2.00		
3.0 End of Trial Pit at 3.00m		3.00			AA104509	B	3.00		
4.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Trial pit terminated at scheduled depth

IGSL TP LOG 21345.GPJ IGSL.GDT 19/11/18

TRIAL PIT RECORD

REPORT NUMBER 21345

CONTRACT 21345	TRIAL PIT NO. TP04
	SHEET Sheet 1 of 1
LOGGED BY TOS	CO-ORDINATES
	DATE STARTED 05/11/2018
	DATE COMPLETED 05/11/2018
CLIENT	GROUND LEVEL (m)
	EXCAVATION METHOD JCB 3CX
ENGINEER Waterman Moylan	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm / stiff orange brown slightly gravelly sandy CLAY. Sand is fine to coarse gravel is angular / subangular fine to coarse of dark grey limestone		0.30			AA104503	B	0.20		
					AA104504	B	0.50		
1.0									
Compact BOULDERS and COBBLES with gravelly very sandy clay. Sand is fine to coarse gravel is angular / subangular fine to coarse of grey limestone		1.50			AA104505	B	1.60		
2.0									
End of Trial Pit at 2.30m		2.30							
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Trial pit terminated at 2.3 due to slow progress in compact boulders and cobbles

IGSL TP LOG 21345.GPJ IGSL.GDT 19/11/18

TRIAL PIT RECORD

REPORT NUMBER 21345

CONTRACT 21345	TRIAL PIT NO. TP05
	SHEET Sheet 1 of 1
LOGGED BY TOS	CO-ORDINATES
	DATE STARTED 05/11/2018
	DATE COMPLETED 05/11/2018
CLIENT	GROUND LEVEL (m)
ENGINEER Waterman Moylan	EXCAVATION METHOD JCB 3CX

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm / stiff orange brown slightly gravelly sandy CLAY. Sand is fine to coarse gravel is angular / subangular fine to coarse of dark grey limestone		0.40			AA104501	B	0.50		
1.0 Compact BOULDERS and COBBLES with gravelly very sandy clay. Sand is fine to coarse gravel is angular / subangular fine to coarse of grey limestone		1.00			AA104502	B	1.20		
End of Trial Pit at 1.60m		1.60							
2.0									
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Trial pit terminated at 1.6 due to slow progress in compact boulders and cobbles

IGSL TP LOG 21345.GPJ IGSL.GDT 19/11/18

Appendix III Probe Records

DYNAMIC PROBE RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen , Drogheda , Co.Louth	PROBE NO.	DP01
		SHEET	Sheet 1 of 1
CO-ORDINATES		DATE DRILLED	05/11/2018
GROUND LEVEL (mOD)	HAMMER MASS (kg) 50	DATE LOGGED	05/11/2018
CLIENT	INCREMENT SIZE (mm) 100		
ENGINEER Waterman Moylan	FALL HEIGHT (mm) 500	PROBE TYPE	DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0						0.00	0
						0.10	3
						0.20	4
						0.30	4
						0.40	5
						0.50	8
						0.60	8
						0.70	5
						0.80	5
						0.90	5
1.0						1.00	6
						1.10	6
						1.20	7
						1.30	5
						1.40	4
						1.50	5
						1.60	4
						1.70	4
						1.80	2
						1.90	11
2.0						2.00	11
						2.10	11
						2.20	14
						2.30	20
						2.40	25
	End of Probe at 2.50 m						
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 21345.GPJ IGSL.GDT 6/11/18

DYNAMIC PROBE RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen , Drogheda , Co.Louth	PROBE NO.	DP02
		SHEET	Sheet 1 of 1
CO-ORDINATES		DATE DRILLED	05/11/2018
GROUND LEVEL (mOD)	HAMMER MASS (kg) 50	DATE LOGGED	05/11/2018
CLIENT	INCREMENT SIZE (mm) 100		
ENGINEER Waterman Moylan	FALL HEIGHT (mm) 500	PROBE TYPE	DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0						0.00	0
						0.10	0
						0.20	1
						0.30	5
						0.40	4
						0.50	3
						0.60	5
						0.70	6
						0.80	7
						0.90	6
1.0						1.00	6
						1.10	4
						1.20	4
						1.30	3
						1.40	3
						1.50	2
						1.60	2
						1.70	1
						1.80	2
						1.90	6
2.0						2.00	10
						2.10	11
						2.20	9
						2.30	9
						2.40	11
						2.50	14
						2.60	16
						2.70	16
						2.80	18
						2.90	19
3.0	End of Probe at 3.10 m					3.00	25
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 21345.GPJ IGSL.GDT 6/11/18

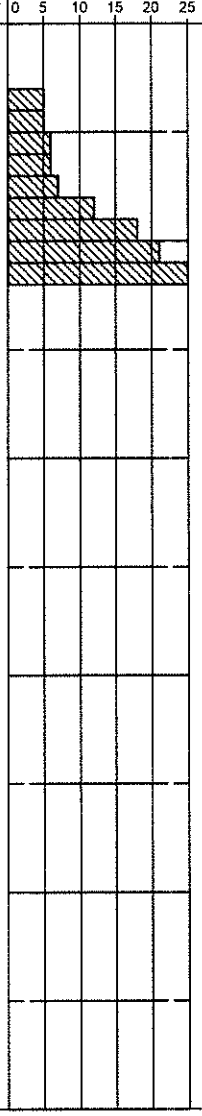
DYNAMIC PROBE RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen , Drogheda , Co.Louth	PROBE NO.	DP03
		SHEET	Sheet 1 of 1
CO-ORDINATES		DATE DRILLED	05/11/2018
GROUND LEVEL (mOD)	HAMMER MASS (kg) 50	DATE LOGGED	05/11/2018
CLIENT	INCREMENT SIZE (mm) 100	PROBE TYPE	DPH
ENGINEER Waterman Moylan	FALL HEIGHT (mm) 500		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	0
						0.30	5
						0.40	5
						0.50	6
						0.60	6
						0.70	7
						0.80	12
						0.90	18
1.0						1.00	21
	End of Probe at 1.20 m					1.10	25
2.0							
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 21345.GPJ IGSL.GDT 6/11/18

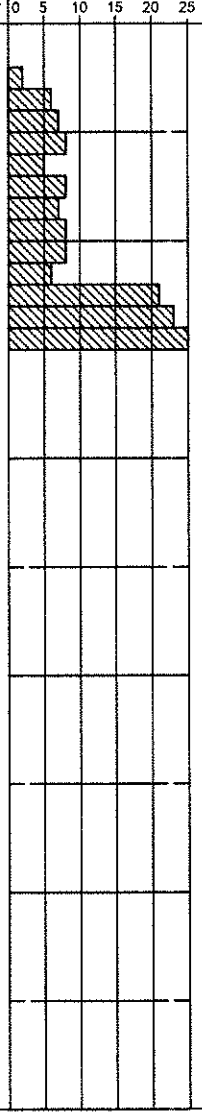
DYNAMIC PROBE RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen , Drogheda , Co.Louth	PROBE NO.	DP04
		SHEET	Sheet 1 of 1
CO-ORDINATES		DATE DRILLED	05/11/2018
GROUND LEVEL (mOD)	HAMMER MASS (kg) 50	DATE LOGGED	05/11/2018
CLIENT	INCREMENT SIZE (mm) 100	PROBE TYPE	DPH
ENGINEER Waterman Moylan	FALL HEIGHT (mm) 500		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	2
						0.30	6
						0.40	7
						0.50	8
						0.60	5
						0.70	8
						0.80	7
						0.90	8
1.0						1.00	8
						1.10	6
						1.20	21
						1.30	23
						1.40	25
	End of Probe at 1.50 m						
2.0							
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 21345.GPJ IGSL.GDT 6/11/18

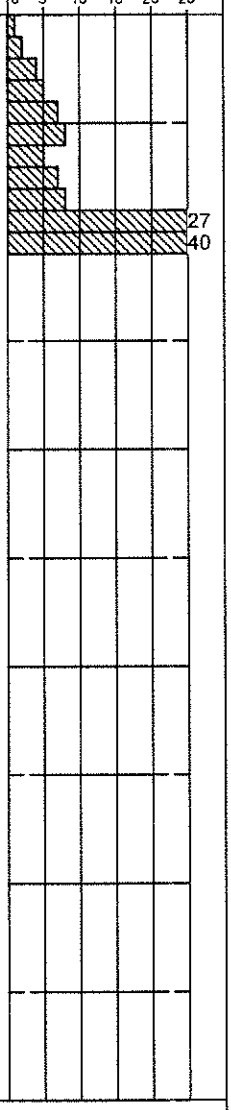
DYNAMIC PROBE RECORD

REPORT NUMBER 21345

CONTRACT	Rathmullen , Drogheda , Co.Louth	PROBE NO.	DP05
		SHEET	Sheet 1 of 1
CO-ORDINATES		DATE DRILLED	05/11/2018
GROUND LEVEL (mOD)	HAMMER MASS (kg) 50	DATE LOGGED	05/11/2018
CLIENT	INCREMENT SIZE (mm) 100	PROBE TYPE	DPH
ENGINEER Waterman Moylan	FALL HEIGHT (mm) 500		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0						0.00	1
						0.10	2
						0.20	4
						0.30	5
						0.40	7
						0.50	8
						0.60	5
						0.70	7
						0.80	8
						0.90	27
1.0						1.00	40
	End of Probe at 1.10 m						
2.0							
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 21345.GPJ IGSL.GDT 6/11/18

Appendix IV BRE Digest 365

Soakaway Design f -value from field tests (F2C) IGSL

Contract: Rathmullan, Drogheda Contract No. 21345
Test No. SA01
Client Waterman Moylan
Date: 06/11/2018

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	
0.30	1.50	Firm / stiff brown slightly gravelly sandy CLAY with medium cobble	
		content	

Notes:

Field Data

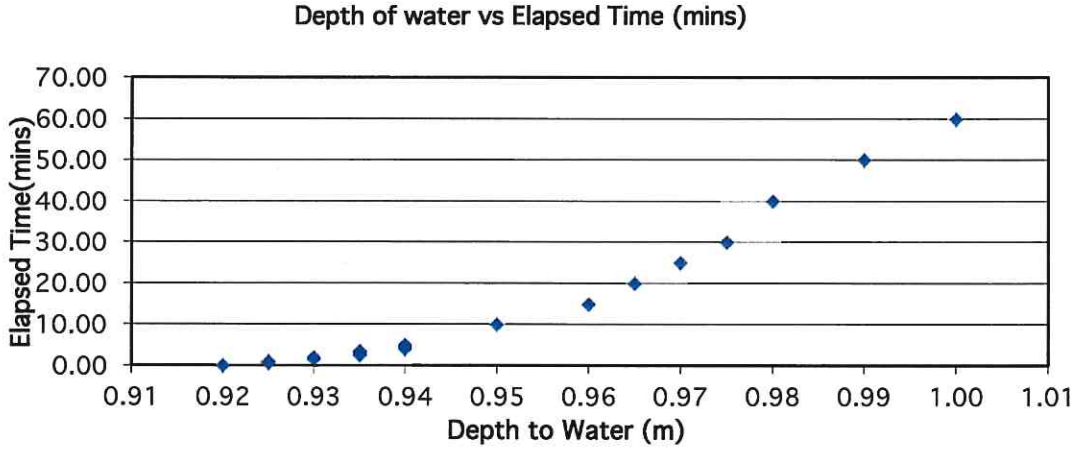
Depth to Water (m)	Elapsed Time (min)
0.92	0.00
0.93	0.50
0.93	1.00
0.93	1.50
0.93	2.00
0.94	2.50
0.94	3.00
0.94	3.50
0.94	4.00
0.94	4.50
0.94	5.00
0.95	10.00
0.96	15.00
0.97	20.00
0.97	25.00
0.98	30.00
0.98	40.00
0.99	50.00
1.00	60.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	1.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	0.92	m
Final depth to water =	1.00	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	2.7	m2
*Av. side area of permeable stratum over test period=	3.564	m2
Total Exposed area =	6.264	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00057 m/min or 9.5785E-06 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: Rathmullan, Drogheda Contract No. 21345
Test No. SA02
Client Waterman Moylan
Date: 06/11/2018

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	
0.30	1.50	Firm / stiff brown slightly gravelly sandy CLAY with medium cobble	
		content	

Notes:

Field Data

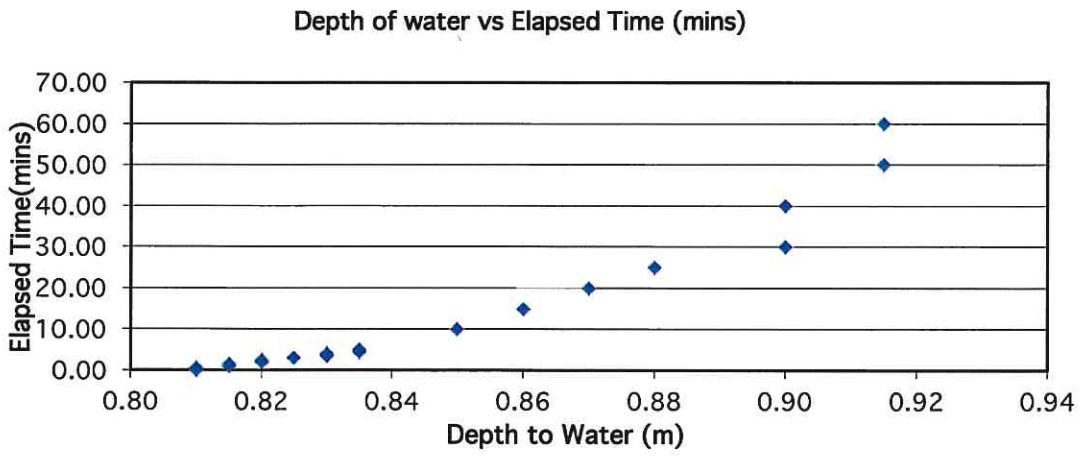
Depth to Water (m)	Elapsed Time (min)
0.81	0.00
0.81	0.50
0.82	1.00
0.82	1.50
0.82	2.00
0.82	2.50
0.83	3.00
0.83	3.50
0.83	4.00
0.84	4.50
0.84	5.00
0.85	10.00
0.86	15.00
0.87	20.00
0.88	25.00
0.90	30.00
0.90	40.00
0.92	50.00
0.92	60.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	1.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	0.81	m
Final depth to water =	0.92	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	2.7	m2
*Av. side area of permeable stratum over test period=	4.2075	m2
Total Exposed area =	6.9075	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00068 m/min or 1.1401E-05 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: Rathmullan, Drogheda Contract No. 21345
Test No. SA03
Client Waterman Moylan
Date: 06/11/2018

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	
0.30	1.50	Firm / stiff brown slightly gravelly sandy CLAY	

Notes:

Field Data

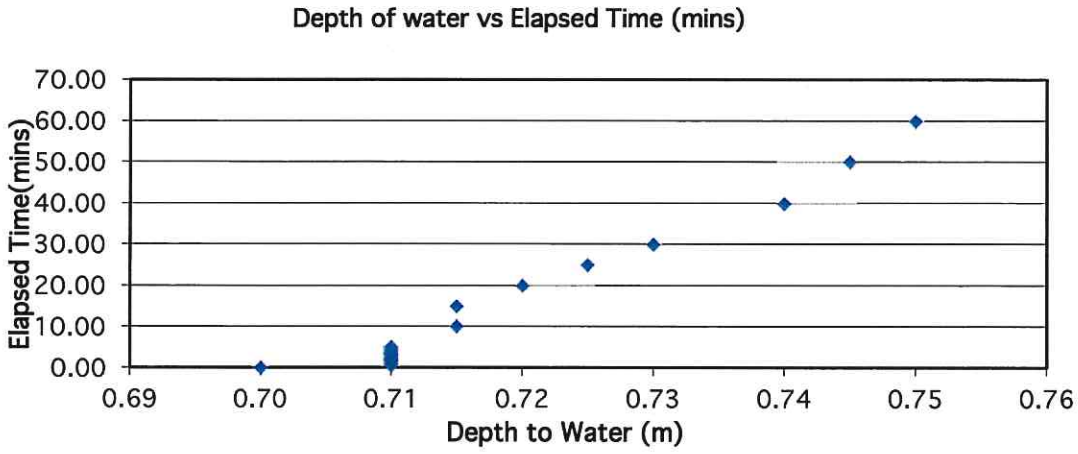
Depth to Water (m)	Elapsed Time (min)
0.70	0.00
0.71	0.50
0.71	1.00
0.71	1.50
0.71	2.00
0.71	2.50
0.71	3.00
0.71	3.50
0.71	4.00
0.71	4.50
0.71	5.00
0.72	10.00
0.72	15.00
0.72	20.00
0.73	25.00
0.73	30.00
0.74	40.00
0.75	50.00
0.75	60.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	1.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	0.70	m
Final depth to water =	0.75	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	2.7	m2
*Av. side area of permeable stratum over test period=	5.115	m2
Total Exposed area =	7.815	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00029 m/min or 4.7985E-06 m/sec



Soakaway Design f -value from field tests (F2C) IGSI

Contract: Rathmullan, Drogheda Contract No. 21345
Test No. SA04
Client Waterman Moylan
Date: 06/11/2018

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	
0.30	1.50	Firm / stiff brown slightly gravelly sandy CLAY	

Notes:

Field Data

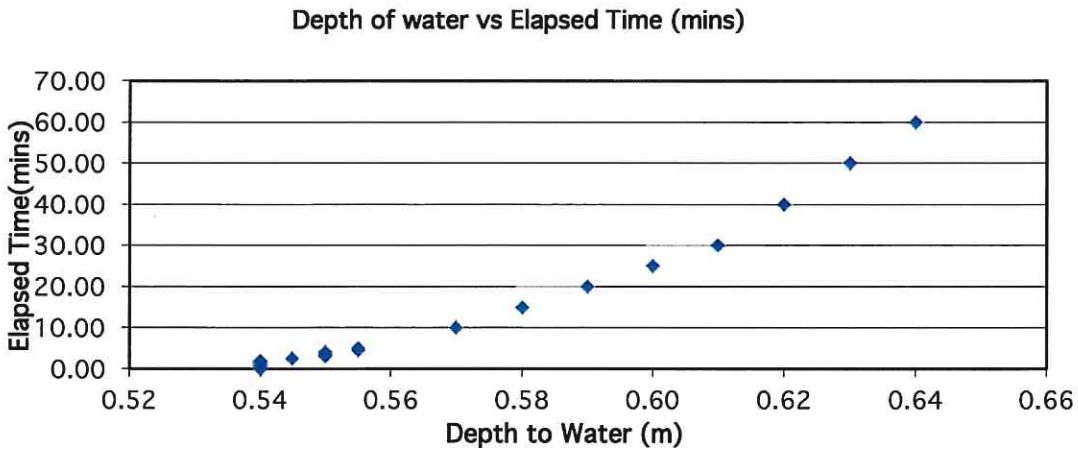
Depth to Water (m)	Elapsed Time (min)
0.54	0.00
0.54	0.50
0.54	1.00
0.54	1.50
0.54	2.00
0.55	2.50
0.55	3.00
0.55	3.50
0.55	4.00
0.56	4.50
0.56	5.00
0.57	10.00
0.58	15.00
0.59	20.00
0.60	25.00
0.61	30.00
0.62	40.00
0.63	50.00
0.64	60.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	1.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	0.54	m
Final depth to water =	0.64	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	2.7	m2
*Av. side area of permeable stratum over test period=	6.006	m2
Total Exposed area =	8.706	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00052 m/min or 8.6147E-06 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: Rathmullan, Drogheda Contract No. 21345
Test No. SA05
Client Waterman Moylan
Date: 06/11/2018

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	
0.30	1.30	Firm / stiff orange brown slightly gravelly sandy CLAY	

Notes: Refusal at 1.3 due to cobble

Field Data

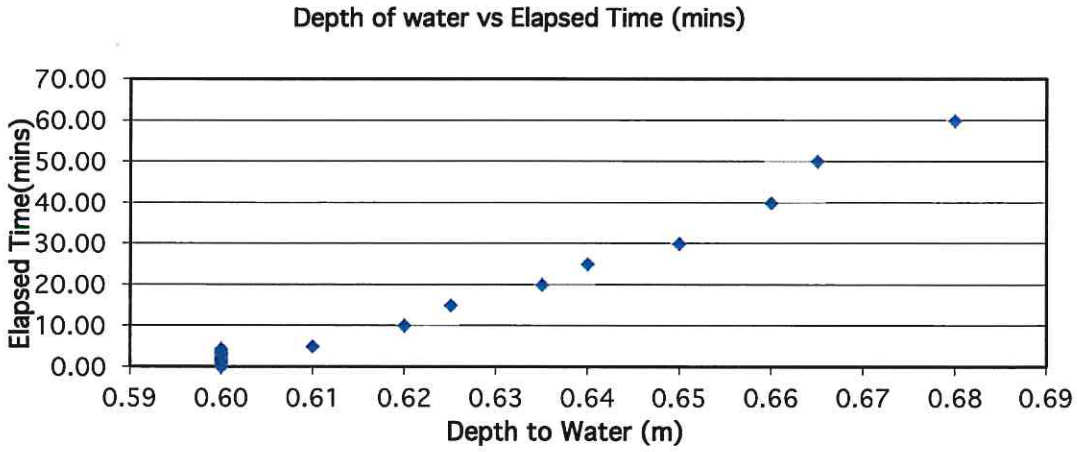
Depth to Water (m)	Elapsed Time (min)
0.60	0.00
0.60	0.50
0.60	1.00
0.60	1.50
0.60	2.00
0.60	2.50
0.60	3.00
0.60	3.50
0.60	4.00
0.60	4.50
0.61	5.00
0.62	10.00
0.63	15.00
0.64	20.00
0.64	25.00
0.65	30.00
0.66	40.00
0.67	50.00
0.68	60.00

Field Test

Depth of Pit (D)	1.30	m
Width of Pit (B)	1.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	0.60	m
Final depth to water =	0.68	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	2.7	m2
*Av. side area of permeable stratum over test period=	4.356	m2
Total Exposed area =	7.056	m2

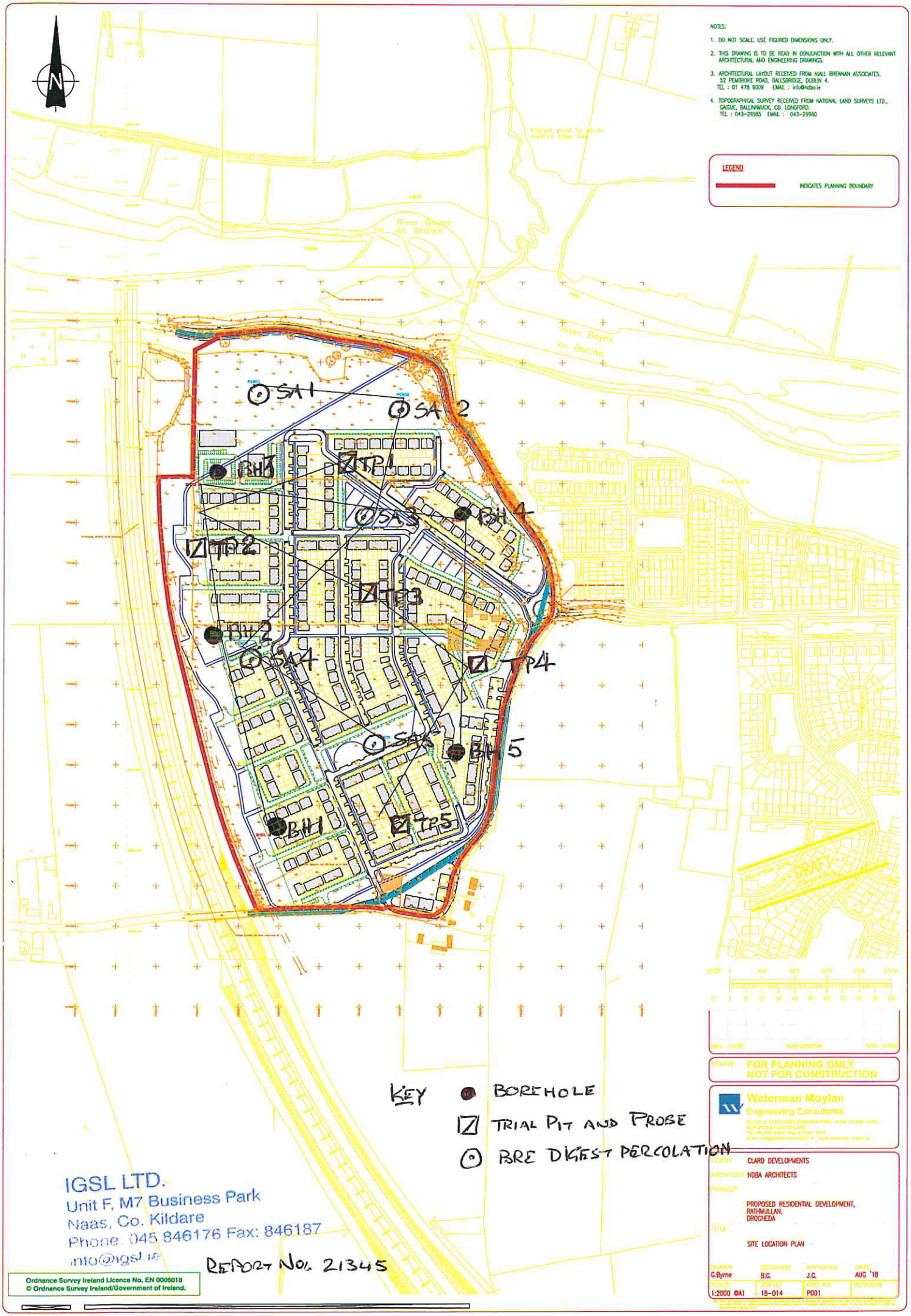
Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00051 m/min or 8.5034E-06 m/sec



Appendix V Laboratory Data

Appendix VI Site Plan


NOTES:
1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. ARCHITECTURAL LAYOUT RECEIVED FROM HALL BRENNAN ASSOCIATES, 52 PEMBROKE ROAD, BALLSBRIDGE, DUBLIN 4. TEL : 01 478 9009 EMAIL : info@nbba.ie
4. TOPOGRAPHICAL SURVEY RECEIVED FROM NATIONAL LAND SURVEYS LTD., SAGUE, BALLINAMUCK, CO. LONGFORD. TEL : 043-29955 EMAIL : 043-29980
LEGEND
INDICATES PLANNING BOUNDARY
River Boyne
An Bhóinn
SA1
SA2
SA3
SA4
SA5
BH1
BH2
BH3
BH4
BH5
TP1
TP2
TP3
TP4
TP5
KEY
BOREHOLE
TRIAL PIT AND PROBE
BRE DIGEST PERCOLATION
FOR PLANNING ONLY
NOT FOR CONSTRUCTION
Waterman Moylan
Engineering Consultants
CLIENT CLARD DEVELOPMENTS
ARCHITECT NOBA ARCHITECTS
PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT, RATHMULLAN, DROGHEDA
TITLE
SITE LOCATION PLAN
DRAWN G.Byrne
DESIGNED B.G.
APPROVED J.C.
DATE AUG '18
SCALE 1:2000 @A1
JOB NO 18-014
DWG NO P001
REVISION
IGSL LTD.
Unit F, M7 Business Park
Naas, Co. Kildare
Phone: 045 846176 Fax: 846187
info@igsl.ie
REPORT NO. 21345
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UK and Ireland Office Locations