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CIVIL INFRASTRUCTURE REPORT

Claremont Project, Howth

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PROJECT: **Claremont Development, Howth, Dublin**

PROJECT NO. **18.386**

DOCUMENT TITLE: **CIVIL ENGINEERING INFRASTRUCTURE REPORT FOR PLANNING**

DOCUMENT NO: **18.386 – IR – 01**

Issue	Date	Description	Orig.	PE	PD	Issue Check
P1	18.04.2019	Draft	MC	MC	VB	
P2	23.04.2019	Draft	MC	MC	VB	
P3	29.05.2019	Draft	MC	MC	VB	
PL1	06.06.2019	Planning	MC	MC	VB	
P4	12.07.2019	Irish Water Compliance	MC	MC	VB	
P5	09.10.2019	Draft	MC	MC	VB	
PL2	25.11.2019	Planning	MC	MC	VB	
PL3	05.12.2019	PLANNING	MC	MC	VB	

CONTENTS

1. EXECUTIVE SUMMARY

- Barrett Mahony Consulting Engineers has been commissioned by Atlas GP to design the Civil Infrastructure report to support the planning application for the proposed mix use development at the Claremont Site, Howth Road, Howth.

- Currently all water supplied to all three sites is from the public water mains in Howth Road and all foul generated from the developments is discharged into the public foul sewer in Howth Road.

- Currently there is two Irish Water Assets, 1500mm dia. foul pressure sewer and a 1200mm dia. storm overflow, crossing the western perimeter of the site coming from the pump house. These pipes are laid together and encased in concrete, forming a 3m to 4.7m wide mound @ 1.360m OD at 1:150.

- The Bloody Stream, which is currently diverted under the site, flows in a northerly direction from its source on the Hill of Howth and outfalls into the Bob Davis Culvert. The streams crosses paths with the Irish Water Assets and is forced to flow under in order to enter the Bob Davis culvert. The two smaller sits are completely hardstanding and the Techrete site is 70% hardstanding.

- Currently the discharge of wastewater on site is into a 400mm dia. sewer which is carried to a pumping station in Sutton. It is assumed that the three developments feed into the public sewer via a 225mm pipe with a capacity of circa 30 l/s.

- The proposed development comprises of a mixed-use development of residential, retail/non retail uses and a childcare facility in 4 no. blocks (A to D), over part basement. The residential component will consist of 512 no. residential units.

- It is proposed to de-culverted the stream with a riparian strip, circa 65m long, in line with previous approved applications.

- Historical records show flooding in 2004, this was due to sediment buildup at the mouth of the Bob Davis Culvert on entry to Baldoyle Bay. To resolve this problem, it is planned to dredge the existing culvert and line the base to a 1:75 fall. The benefits of raising the bed level are covered in section 4.2.

- Interception storage is to be used in the form of extensive and intensive green roofing, the build-up of which is fully in accordance with the manufacturer's specs. The proposed extensive green roof will have a capacity of 25 l/m² gives an interception storage of 208.125 m^3. The proposed intensive green roof podium slab provides a storage of 347.586m^3 meeting the desired 266.890m^3.

- All foul sewer will discharge into main 225mm dia sewer along the south boundary. This sewer flows east to west and discharges into the public 450mm dia sewer in Baltray park.

- In conclusion, the plan implements current infrastructure with the proposed upgrades and accounts for flood risk, storage and Irish Water guidelines.

2. INTRODUCTION

2.1 GENERAL DESCRIPTION

The following report has been prepared by Barrett Mahony Consulting Engineers (BMCE) to outline the drainage infrastructure for the proposed development at the Claremont site, Howth Road, Howth. The site is located on Howth Road, as you enter Howth village before the DART station.

Figure 1 - Site Location

Originally the site was broken into three separate premises: Techrete – Precast Concrete Manufacturing Plant, Teeling Motors- Car Garage, and the Garden Centre, Figure 2.

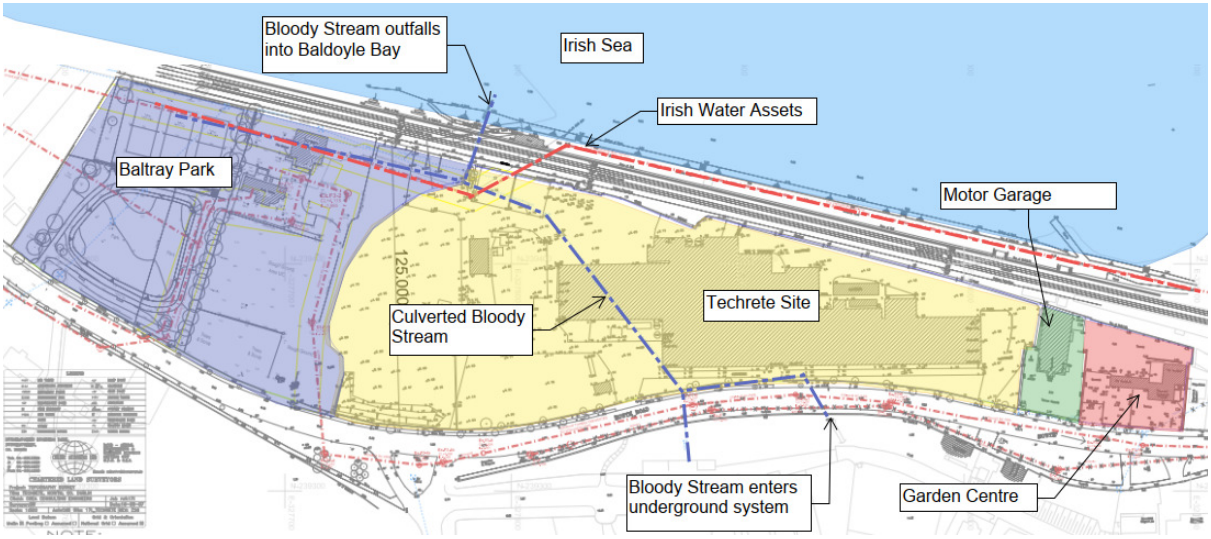

Figure 2 -Site Brake Down

The Techrete factory, in operation from 1985 till 2008, specialise in the design, manufacture and supply of architectural precast cladding to the Irish and UK construction markets. Since then the site has remained vacant. The site consists of offices, manufacturing and storage facilities located within a minimum 8 interconnected buildings a dozen or so interconnected, two-to-three story industrial style sheds with corrugated steel roof and masonry walls. These buildings are located mainly in the centre of the application site and spread towards the east, up to the Teeling Motors site and come within six metres of the southern site boundary with Howth Road. The remainder of the site was used as a storage area for manufacturing equipment/material and the storage of the finished products i.e. concrete panels The Techrete site comprises mostly of the overall application site (c.2.672 hectares).

The Teeling Motors site consists of is a steel portal frame structure with a corrugated roof, separate garage and car park. The third site consists of a single-story masonry building, corrugated roof and concrete yard. All three site are now vacant.

Currently running under the Techrete site is a culverted stream, "The Bloody Stream". The stream rises in the Hill of Howth and navigates it way towards Howth Castle. Presently there are water control measure in place, via three large retaining walls, which attenuate the flow before entering a piped system that traverses the site and outfalls via the "Bob Davis Culvert" into Baldoyle Bay. This stream is tidal influenced but only during high tide. During medium to low tide it is clear of sea water, Figure 2.

The whole site has historical contaminated land, and hotspots of contamination have been identified and documented in Golder Associates Ireland Limited, October 2019. Materials Management & Remedial Strategy Plan Claremont Development Site, Howth (Golder 2019). The findings, construction practices of handling the contaminated soil and the protection of the surface and ground water are discussed in the Outline Construction Environmental Management Plan (CEMP).

2.2 Scope of this Report

This report describes the proposed civil engineering infrastructure for the development and how it connects to the existing public infrastructure serving the area. Focusing on foul drainage, surface water drainage and water supply. The flood risk assessment, Traffic engineering and mobility management reports are discussed in separate reports. This report should be read in conjunction with the following drawings submitted with the Planning Application:

- 18.386-C1001 Basement Foul and SW Drainage
- 18.386-C1002 Ground Foul and SW Drainage
- 18.386 -C1003 Roof & Podium Level Drainage
- 18.386-C1004 Suds Strategy
- 18.386-C1005 Watermain Layout
- 18.386-C1010 Bloody Stream Details/Section
- 18.386-C1015 Foul Water Longitudinal Sections
- 18.386-C1200 Standard Drainage Details
- 18.386-C1205 SuDS Details
- 18.386-C1210 Road and Hardstanding Details
- 18.386-C1220 Watermain Details

2.3 Local Authority Correspondence

To-date several pre planning meetings have been conducted between the Engineers (BMCE) and representatives of Fingal County Council Planning Section (Niall McKiernan, Shane Keane, Niall Thornton), between November 2018 and July 2019.

Included in these meeting was two site visits, one as a general walk around and the second to agree the location of the 1500mm dia. and 1200mm dia. Irish Water Assets within the site boundaries, carried out on the 2nd July 2019, Figure 2.

The outcome from these meetings relevant for this report is outlined below:

- Surface Water Drainage System
- Foul Drainage System
- Water Supply
- Demonstrate SuDS system

The following topics are briefly discussed in this report, however due to the quantity of information these are in separate reports and should be referred to for a detailed understanding.

- Flood Risk Assessment Report – Includes the de-culverting of the Bloody Stream
- Traffic Management Plan
- Mobility Management Plan

Observations and comments made have been considered and incorporated into the development plans.

3. OVERVIEW

3.1 EXISTING

Presently in Howth the main foul sewer runs in the centre of Howth road and turns left after the Techrete site and enters the pump house. This is pumped to Sutton cross and across Dublin Harbour to Ringsend treatment plant. The other two sewers exiting the pump house is the 1500mm dia. pressure main which runs towards Howth harbour and out to Irelands Isle used as a back-up for Sutton Cross and the 1200mm dia. sewer used as a storm overflow pipe, which discharges into Baldoyle bay, Figure 3 & Figure 4.

Currently water supplied to all three sites is from the public water mains in Howth Road and all foul generated from the developments is discharged into the public foul sewer in Howth Road.

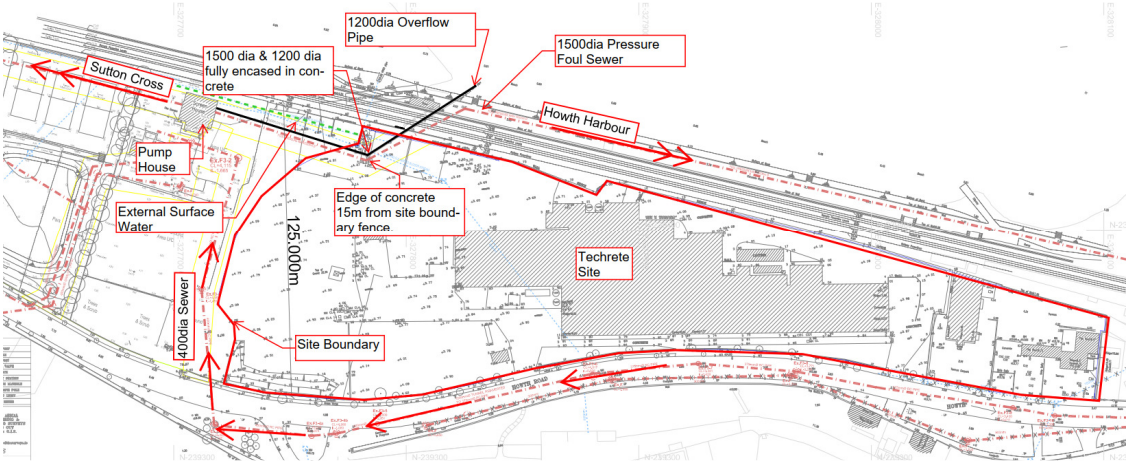

Figure 3 - Existing Services

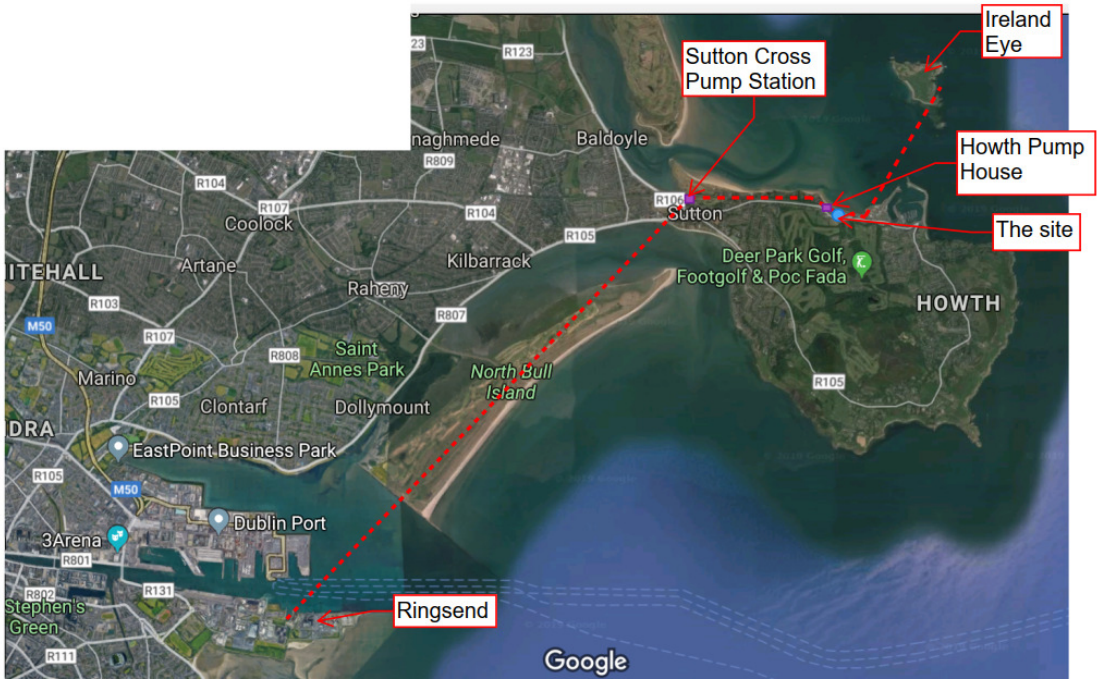

Figure 4 - General View

3.1.1 Site Investigation

Irish waters response to the pre-connection enquiry was to conduct a survey to determine the exact location of the 1500mm and the 1200mm concrete sewers within the site boundary.

The survey was carried out on the 2nd July 2019, in the presence of Margaret Costello (BMCE), Vincent Barrett (BMCE), Niall McKiernan (FCC), Michael King (FCC), Patrick Wallace (FCC), Dave O Rourke (FCC).

A series of excavations were carried out to determine the exact route of the pipe. The excavation found that the pipes were laid together and encased in concrete, forming a 3m to 4.7m wide mound @ 2.360m OD, at a gradient of 1:150 towards the DART line.

The agreed offset distance was 15m from the site fence, which since the closing of the Techrete factory, the DART service provider has installed a new fence, 300mm outside the site boundary line. Therefore, making the edge of concrete 14.7m.

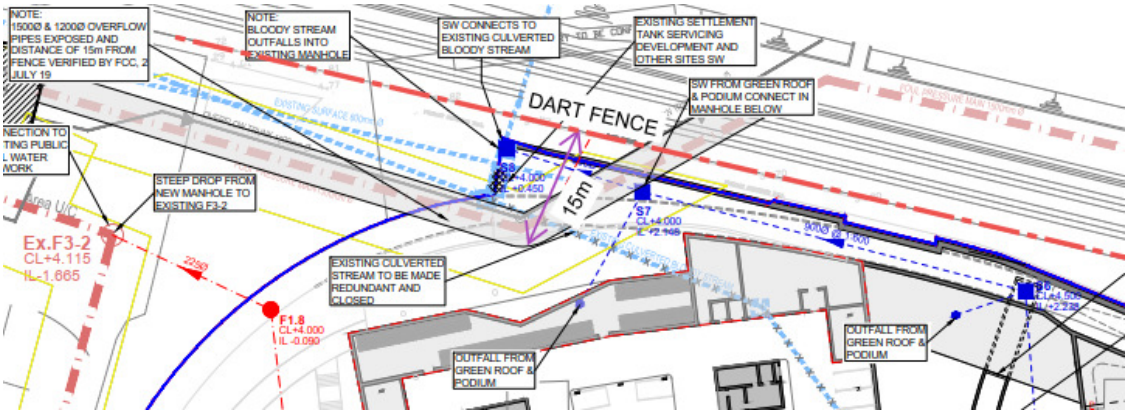

Figure 5 - Public Sewer

3.2 Approved Scheme

A scheme was originally approved in 2011, it involved the development of all three sites plus Baltray Park. The approved scheme is a mixed-use development consisting of 7 blocks broken down as follows:

- 250 residential units - 50 no. 1 bed apartments, 163 no. 2 bed apartments and 37 no. 3 bed apartments and 4 traveler accommodation. The units are split between 7 blocks with vary between 4 and 5 stories high.
- Office (70 sq.m), Retail (1078 sq.m), Creche (274 sq. m) and Restaurant (556sq.m)
- 467 no car parking spaces – West Basement 280 and East Basement 187 spaces.
- Provision of 4 no. vehicle access points from Howth Road to serve the separate parking areas.
- Provision of 2 no. substations and all associated site development, landscaping and boundary treatment works including upgrade to public paths.
- A range of public and semi-public open spaces including a public park, public plaza, residential courtyards and public pedestrian/cyclist routes.
- All associated site development, services provision, landscaping and boundary treatment works.
- De-culverting of Bloody Stream and creating a riparian strip across the development.
- Total GFA of the proposed development is 29,163 sq.m, basement 15,459sq.m (West Basement 6,153 sq.m and East Basement 9,306 sq.m)

Figure 6 - Granted Scheme

The scheme has two basements separated by the riparian strip extending to 0.680m OD, just over 3m below existing ground level, with the western basement set 7m from the Irish water Assets, Figure 7.

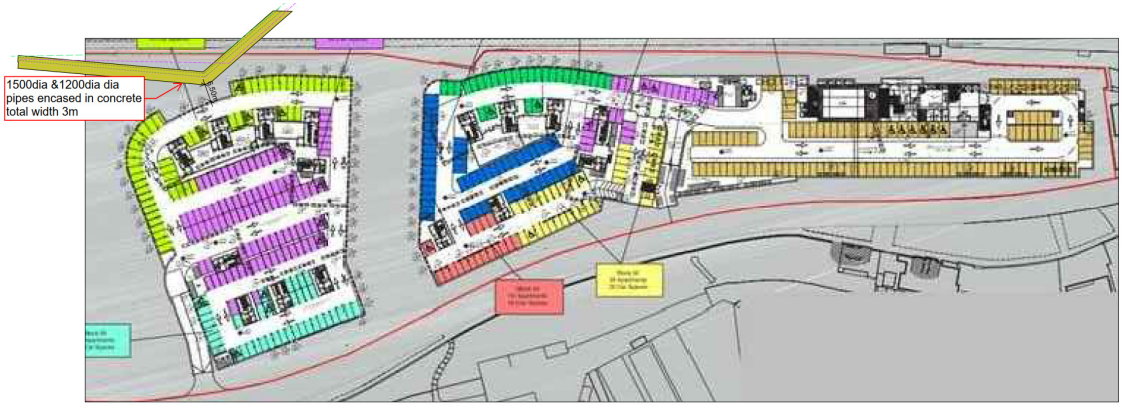

Figure 7 -2011 Basement

4. PROPOSED SCHEME

4.1 DESCRIPTION

The proposed development will occur at a site bounded to the south by the Howth Road, to the east by a private dwelling, to the north by the DART line, and to the west by Local Authority lands. The site incorporates the former Techrete manufacturing facility, the former Beshoff's Motors showroom, and the former Howth Garden Centre.

The proposed development will include the demolition of all structures on site (c.8,162sqm GFA) and excavation of a basement. The proposed development comprises of the provision of a mixed use development of residential, retail/restaurant/cafe uses and a creche in 4 no. blocks (A to D), over part basement. Blocks A, B, C and D with a height up to a maximum of seven storeys of apartments over lower ground floor and basement car parking levels (a total of eight storeys over basement level). The residential component will consist of 512 no. residential units. The proposed development includes the provision of two vehicular entrances on to Howth Road, excavation of basement to provide for car parking, plant, waste storage and ancillary use. Additional car parking spaces shall be provided at lower ground floor level. A total of 439 no. car parking spaces and 1,335 no. bicycle parking spaces, including 49 no. bicycle spaces to cater for the retail units and creche shall be provided. One vehicular access is located at Block A, serving car parking spaces. The second is at Block C, providing access to the basement, residential and retail parking, and a service

area for the retail units. A service route will be provided along part of the northern perimeter of the site with access from the western end of the site at a junction with Howth Road and at the main vehicular entrance at Block C;

A publicly accessible walkway/cycleway to the north of the site shall be provided at podium level. A civic plaza will be provided between Blocks D and C, and a landscaped park to the west of Block A. A channel to the sea for the Bloody Stream with associated riparian strip shall be incorporated as a feature within a designed open space between Blocks A and B. Communal gardens will be provided for Blocks A, B and C;

The residential component consists of 512 no. residential units, which includes 4 no. studio, 222 no. one bed, 276 no. two bed, 10 no. three bed apartments, and communal facilities of 708 sqm. Ground floor units onto the Howth Road will have own door access. The units will be served by balconies or terraces on all elevations;

Block A, with a maximum height of seven storeys of apartments over lower ground level car park (a total of eight storeys), will provide for 234 residential units, with residents' amenities to include a gym, residents' lounge, residents' support office, and 2 no. residents' multi-purpose rooms. Block B, with a maximum height of seven storeys of apartments over lower ground floor and basement car park (a total of eight storeys over basement), shall provide for 154 no. units, residents' lounge, residents' multi-purpose room, and creche of 236 sqm with outdoor play area. Own door access will be provided at ground floor. Block C, with a maximum height of seven storeys over basement car parking (a total of seven storeys) will provide for 83 no. residential units in two wings over a retail unit and Block D, with a maximum of 6 storeys over basement, shall provide for 41 no. residential units over retail units;

The commercial component in Blocks C and D consists of 4 no. units with 2,637 sqm gross floor area. In Block C, it consists of a 1,705 sqm anchor unit, accessed from the civic plaza. In Block D, it consists of a restaurant (243 sqm) and retail unit (603 sqm) and café (86 sqm). The restaurant and retail units are accessed from Howth Road, and the café is accessed from the upper level of the civic plaza.

The proposed development includes the provision of public and communal open space, green roofs, landscaping, boundary treatments, set down locations, substations, meter rooms, waste management and all ancillary site works, including upgrading of the public paths along Howth Road and relocation of bus stop in new setback with a bus shelter. Two set down areas are provided at either end of the site;

The gross floor area of the proposed development is 48,252 sqm (excluding enclosed car parking) on a site of 2.68 ha.

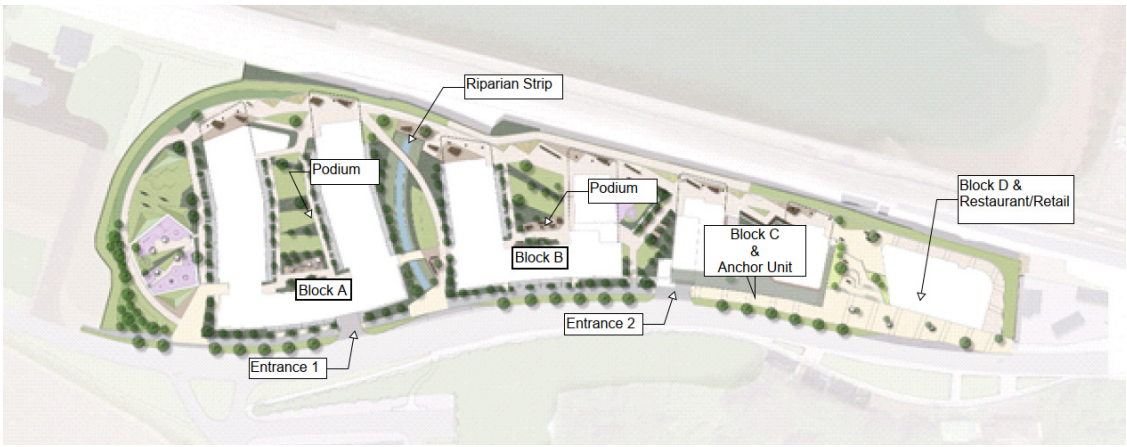

Figure 8 - Proposed

4.2 IRISH WATER ASSETS

The 2019 scheme west basement is to be set 7.5m from the concrete mound encasing the 1200 and the 1500mm public sewer, this is greater than the approved scheme. The area above will be part landscaped for recreational use and for a service access road, all of which will allow easy access in the event of repairs. Figure 5 - Public Sewer

5. SURFACE WATER DRAINAGE SYSTEM

5.1 EXISTING SURFACE WATER INFRASTRUCTURE

The combined site has been fully developed for several years. The largest of the sites, which makes up a significant portion of the development, Techrete, formerly a pre-cast concrete manufacturing plant, under this site the Bloody Stream is diverted. (Appendix

The Bloody Stream flows in a northerly direction from its source on the Hill of Howth, along the boundary between the golf course and Howth Castle. Here the stream flows through a valley lined with 3 No. 2.5m retaining walls designed to control the water in events of heavy rainfall. It then enters an underground system that re-appears before Howth road, creating a water feature as it drops below Howth road and into the underground system. It then crosses the Techrete site, diverts under the Irish Water Assets and into the Bob Davis Culvert which channels the water under the DART line and into Baldoyle Bay, see Figure 2.

A CCTV survey was initiated to understand the current underground system. However, after numerous attempts this proved unsuccessful. Throughout the course of the underground system blockages were encountered from street cones, sediment build up and sections of the sewer had water levels over a meter deep. This confirmed that the existing system is not operating as intended and in need of repair.

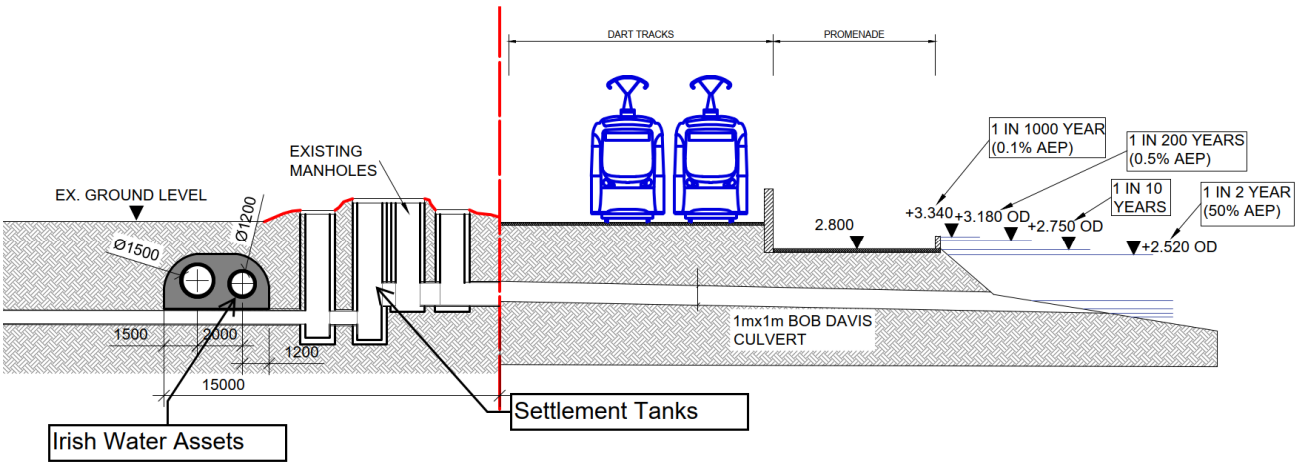

Figure 9 - Existing Outfall Configuration

The smaller two sites are completely hardstanding and the Techrete site is 70% hardstanding. All surface water is currently discharged into the Bloody Stream.

5.2 PROPOSED SURFACE WATER DRAINAGE SYSTEM

Based on the previous approved application on the site, the scheme intends to open-up the Bloody Stream circa 30m west of manhole S5 and create a landscaped riparian strip. This will enhance the proposed development landscape and the surrounding areas. (Appendix I – Foul and Surface Water Drainage)

When the stream was being culverted, the levels were restricted by the 300mm dia. foul sewer on the south side of the Howth Road as well as the requirement to go under the railway line using the Historical Bob Davis culvert. This sewer has since been decommissioned and was replaced by a considerably deeper (5m-6m) 450 mm dia. sewer in the centre of Howth road.

The invert level at the existing manhole at the location of our proposed new manhole S6 is 1.25m (ground level circa 4.0m). As a result of the decommissioning of the 300mm diameter

sewer in the road and the new deeper 400mm dia. sewer the opportunity exists to raise the stream as it traverses the site, above its current culverted level by over a meter, making the invert level at S4 - 2.400m. Normal spring tides come to 2.52m without costal surcharge and exceptional tides come to 3.34m without allowance for sea level rises. The raising of the level brings it out of the normal tidal range and will facilitate the landscaping plan to make it an amenity.

With regards to the public sewer on the northern boundary, the Bloody Stream will flow above the public sewer. The site survey carried out showed the pressure main top of concrete (TOC) at 2.360m OD at a gradient of 1:150. Based on this, the point of intersection between the foul pressure main and the Bloody Stream, the TOC will be at 1.93m OD. This is sufficient to allow the stream pass above at an invert level of 2.13m OD.

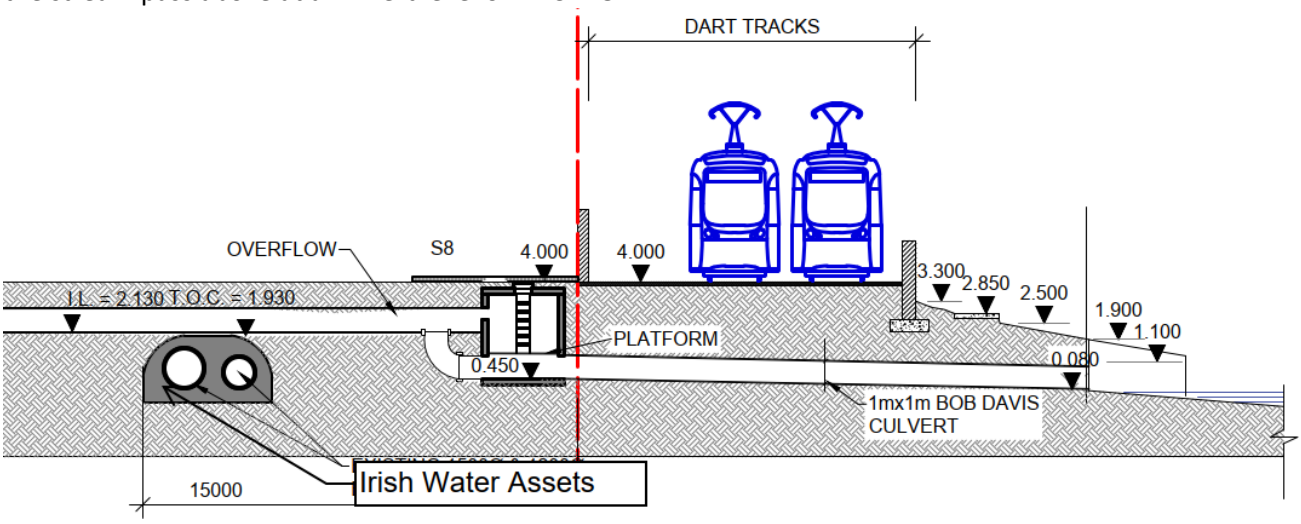

Figure 10- Proposed Outfall Configuration

Historical records report flooding during 2004, the reason being sediment build up, which is understandable given the current configuration resulting in a slow discharge rate, Figure 9. To resolve this problem it is planned to dredge the existing culvert, and the based lined to a 1:75 fall. This gradient will force the water to flow at a faster rate and thereby naturally clearing sediment build up on exit.

By raising the bed level there are several benefits:

1) Significant reduction in the number of times high tide will enter the stream bed. Based on 2018 figures, there were 13 high tides, of this only two would have entered the channel.
2) The depth of the stream at extreme tides reduces from 2m to 1m deep. Based on 2018 information max stream depth would have been 650mm.
3) It significantly reduces the number of tides entering the channel enhancing the water quality of the stream.
4) Results from the site investigations show the water table to be around 1.74m O.D (2.25m below current ground level). The open channel will start at 2.360m O.D, therefore above the water table.
5) The new gradient in the Bob Davis culvert will result in lower maintenance requirement as the higher velocity stream will reduce the sediment build up on entering Baldoyle Bay.

See Appendix I for proposed drainage drawing.

The plan is to increase pedestrian permeability through the site and to provide a raised walking concourse back from the railway level to afford sea views for walkers and bike users etc. To achieve this concept, the length of the exposed stream has been slightly reduced from the original planning. (See Appendix VII- Landscaped Plan)

It is proposed to use interception storage in the form of a green roof. It is planned to use a combination of intensive and extensive green roof system. The intensive system will be used in areas above the basement, at podium level and parts of the upper roof levels. All other roofs will be extensive green roofs. These areas will drain into the Bloody Stream throughout the development.

Water collected in the lower ground car park will be drained off into the foul drainage. Water gathered in the basement will drain into a sump and pumped to lower ground floor and outfall into the foul sewer at F1.3. The amount of surface water entering these areas will be minimal, either from the ramps or from the small number of opes.

Disposal of rainfall on permeable paving will be designed to replicate the green field infiltration rate and will therefore not be included in the surface water drainage system.

5.3 Compliance with the Principles of Sustainable Urban Drainage Systems

The existing site layout is almost entirely hardstanding with unattenuated outflow to the public drainage network. The proposed development will be designed in accordance with the principles of Sustainable Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS) and will significantly reduce run-off rates and improve storm water quality discharging to the public storm water system. The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanization by replicating the run-off characteristics of the greenfield site. The criteria provide a consistent approach to addressing the increase in both rate and volume of run-off, as well as ensuring the environment is protected from any pollution from roads and buildings. These drainage design criteria are as follows:

- Criterion 1 – River Water Quality Protection
- Criterion 2 – River Regime Protection
- Criterion 3 – Flood Risk Assessment
- Criterion 4 – River Flood Protection

The requirements of SuDS are typically addressed by provision of the following:

- Interception storage
- Treatment storage (not required if interception storage is provided)
- Attenuation storage
- Long term storage (not required if growth factors are not applied to Qbar when designing attenuation storage)

In the case of the subject site, the full implementation of SUDS measures is not deemed necessary because of the proximity to the sea and the fact that the surface water sewer discharge directly to the sea. This means that there is no impact of the development on any watercourse. It is proposed, however, to still reduce the discharge rate and increase the quality of the outflow from the site, compared to the existing situation by the implementation of SUDS measures on site.

For the purposes of the SuDS calculations, relevant areas in m2 are as follows:

Area Type	Area (m^2)
Total Roof	8,325
Total Podium	6,098
Total roof + Podium slab	**14,423**
Total Drained Area (Assuming the all site)	**26,689**

Figure 11- Catchment Areas

5.4 INTERCEPTION STORAGE

Interception storage where provided, should ensure that, at a minimum, the first 5mm and preferably the first 10mm of rainfall is intercepted on site and does not find its way to the receiving water.

In the context of the subject site the total area discharging to the drainage system = 26,689m2

5.4.1 Green Roof

The proposed green roof will be an extensive green roof in all roof areas. The build-up proposed is fully in accordance with the manufacturer's specification. The proposed green roof with a capacity of 25 l/m² gives an interception storage of:

$$= \quad 8{,}325 \times \frac{25}{1000} \quad = \quad \mathbf{208.125\ m^3}$$

It should be noted that the green roof on apartment buildings is specified on the highest roof levels (not accessible to private apartment residents) of each block and will be the responsibility of the management company to maintain.

5.4.2 Podium Slabs

The proposed podium will be an intensive green roof incorporating a mixture of hard and soft landscaping for recreational use. (An extensive green roof on the other hand is a low maintenance lightweight roof, not intended for general access or leisure purposes). Rainwater falling on the roof will be collected and taken via rain water pipes to the podium where it will be dispersed into the 95% permeable 'Retention Spacer' using short lengths of slotted land drain pipe.

Podium Interception Storage Volume = 6,098m² x 0.060 x 0.95 = **347.586**m^3

The proposed interception storage methods, green roof and podium slab, provide 208.125 m^3 and 347.586 m^3 of storage respectively. As outlined in the GDSDS Criterion 1, a new development should provide interception storage to retain the first 5mm to 10mm to fall over the new impermeable area of the site. In this case, the impermeable area of the site amounts to 26,689 m^2 requiring the storage of 133.445 m^3 to 266.89m^3.

The cumulative interception storage provided therefore is as follows:

Desirable Interception Storage (10mm criteria)	
Total Drained Area within Proposed Development Site (Refer to Table 2.1)	2.6689ha
Optimum level of interception storage as per GDSDS Table 6.3	10mm
∴ Minimum Required Interception Storage = (0.010 x 2.6689 x 10^4) = 66.30m^3	
Optimum Interception Storage	**266.89m^3**
Interception Storage Provided	

Extensive Green Roof Area = 8,325m^2	
(@ 25 l/m²))	208.125m^3
Podium area= 6,098m^2	
(@ 10 l/m²)	347.586m^3
Interception Storage Provided	**555.7 m^3**

Figure 12- Interception Storage

It is noted that the provided interception volume is above the optimum value, it is well in excess of the minimum requirement.

5.4.3 Permeable Paving Design

Permeable Paving will be used to discharge directly to the soil, replicating the green field infiltration rate. It will have a small storage capacity within the 30% voids ratio stone build-up, but this will not be taken into account in SUDS calculations, as the water will not be directed into the drainage system.

Design of the build-up for the permeable paving is in accordance with BS 7533-13:2009. This consists of a permeable geotextile at subgrade level, overlain by coarse open graded aggregate of 150mm to 350mm deep, depending on the use of the pavement as trafficked or for pedestrians. Above this there is a laying course of 50mm sand and the permeable surfacing which in this case will be bound gravel.

5.5 Attenuation Storage

The development is beside Baldoyle Bay and therefore, there is no requirement to provide storm water attenuation. Nevertheless, the landscaped areas, swales and bioretention areas shall reduce the surface water run-off considerably.

6. FOUL DRAINAGE SYSTEM

6.1 Existing Foul Sewer Infrastructure

The current discharge of wastewater on site is into the 400mm dia. sewer that outfalls into the local authority pumping station located to the west of the Claremont site. This then carries the waste water to a pumping station in Sutton which is then pumped across Dublin Bay treated at Ringsend Wastewater Treatment Plant and then released into the Irish Sea. There is no wastewater disposal into Baldoyle Bay.

It is assumed that the three developments feed into the public sewer via a 225mm pipe. This 225mm pipe has an existing capacity of approximately 30l/s.

6.2 Proposed Foul Sewer System

The foul drainage systems for the proposed development will be separate from the surface water. The foul for each block will be gathered, brought down through the building, slung under the first floor slab across the carpark out through the retaining wall/secant piled wall and outfalls into the main 225mm site sewer. This sewer runs from east to west, turns North after block A, veers off site and outfalls into the 450mm dia. public foul sewer in Baltray Park. (Appendix II)

The proposed foul effluent is calculated as follows:

Total Number of Units: 512

Allow 2.7 people per unit, in accordance with Irish Water Guidelines

Supermarket: 20 Staff

Specialist Store: 16 Staff

Restaurant: 10 Staff + 100 Customers

Café: 5 Staff + 30 Customers

Creche: 20 staff + 80 Children

Flow rates

Domestic Standard Residence: 150 l/day per person

Industrial Open Industry: 60 l/day per person

Restaurant: 15 l/day per person

Creche: 90 l/day per person

Foul Waste Water Discharge		No. of People	Flow *l/day*	Water Demand *l/day*	Average Day / Peak Rate *l/s*	Peak Discharge *l/s*
Domestic						
Units	512	1382	150	207360	2.4	14.4
Commerical						
Supermarket	Staff	20	60	1200	0.02	0.10
Specialist Store	Staff	16	60	960	0.01	0.08
Restaurant	Staff	10	60	600	0.01	0.05
	Customer	100	15	1500	0.02	0.13
Café	Staff	5	60	300	0.00	0.03
	Customer	30	15	450	0.01	0.04
Creche/ Other	Staff	20	90	1800	0.03	0.16
	Children	80	90	7200	0.10	0.63
Total Foul Waste Water Discharge					**2.6**	**15.62**

Table 1- Foul Discharge

(Calculations in accordance with Irish Water Guidelines on occupancy and water usage)

Foul Sewer Network Pipe Sizes

The proposed foul outfall pipe is 225mm diameter pipe at 1:150 minimum fall has a capacity = 38 l/s which is more than adequate. 100mm and 150mm diameter pipes with a capacity of at least 6 l/s and 17 l/s (at 1:150) respectively will be used for all other foul pipework within the site.

The proposed peak discharge flow is less than 49% of the capacity of the pipe as stated above.

6.3 IRISH WATER

A Statement of Design Acceptance has been received from Irish Water. See Appendix II.

7. WATER SUPPLY SYSTEM

7.1 EXISTING WATER SUPPLY INFRASTRUCTURE

Site is currently serviced via the 160m uPVC in Howth road.

7.2 PROPOSED WATER SUPPLY SYSTEM

It is planned that the new development will be supplied via the existing 160mm uPVC water main in Howth Road. It is planned to connect to the watermain with a 150mm diameter HDPE pipe at three locations along Howth Road. This will be metered on entering the site. (Appendix III – Water Main)

The majority of the watermains onsite will remain under the management of the development. Certain lines have been accepted by Irish Water. See drawing 18.386-BMD-XX-ZZ-DR-C-1005

Water Demand		No. of People	Flow *l/day*	Water Demand *l/day*	Average Day / Peak Rate *l/s*	Peak Demand *l/s*
Domestic						
Units	512	1382	150	207300	2.4	12
Commercial						
Supermarket	Staff	20	60	1200	0.02	0.09
Specialist Store	Staff	16	60	960	0.01	0.07
Restaurant	Staff	10	60	600	0.01	0.04
	Customer	100	15	1500	0.02	0.11
Café	Staff	5	60	300	0.00	0.02
	Customer	30	15	450	0.01	0.03
Creche/ Other	Staff	20	90	1800	0.03	0.13
	Children	80	90	7200	0.10	0.52
Daily Water Demand					**2.6**	**13.01**

Figure 13- Water Demand

The peak water demand for the development is 5 DWF. Using the figure layout in section 6.2, the water demand for the development is 13.01 l/day, Figure 13.

The development will have a 24 hour cold water storage provision.

7.3 IRISH WATER

A Statement of Design Conformance has been received from Irish Water, however this is on the bases that the following upgrades are completed:

1. A new 300mm trunk main between the North Fringe Water Supply pipeline and Corr Bridge PS - Works by Irish Water
2. DMA reconfiguration required; (by developer)
    a. A new cross connection upstream of Corr Bridge PS between the new trunk main and existing 9” pipe

b. New pressure reducing valve and DMA meter downstream of the new cross connection in the 9" pipe.

3. 220m of existing 100m UPV in Howth Road to be upgraded to 150mm NB (by developer)

8. FLOOD RISK ASSESSMENT

8.1 INTRODUCTION

The flood assessment for the development is carried out in a separate document
Ref: 18.386-FR-01

9. TRAFFIC AND ROADS

9.1 INTRODUCTION

Given the scale of the development a separate report has been carried out. Below is a overview of the traffic and roads for the development. For a more detailed analysis refer to the "Traffic Analysis Report" and the "Mobility Management Plan"

9.2 VEHICULAR ACCESS AND PARKING

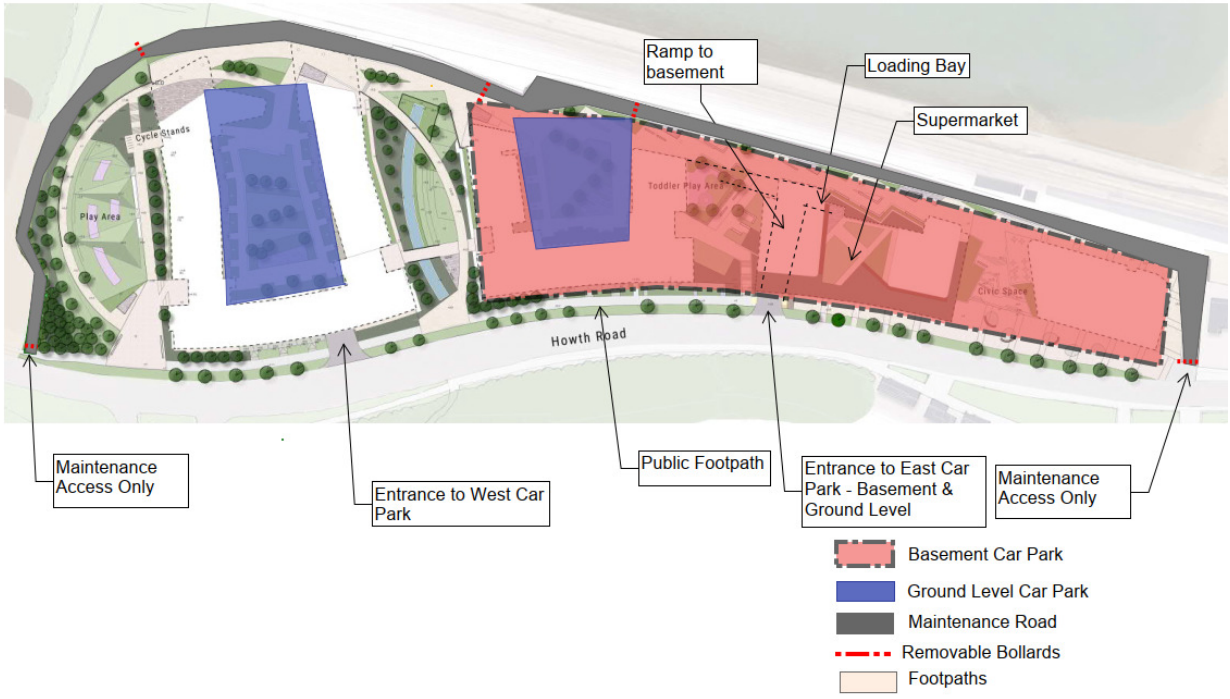

Figure 14- Vehicle and Access Points

Car parking on site to be provided in three locations. Two car parks at lower ground, one between Block A and the other between Block B. The basement will span east of the riparian strip to the end of the site. There will be two access points to the development, one entering the west car park and the other, a dual entrance for ground and basement. Figure 14.

Residential

Residential parking will be provided at ground and basement.
Commercial/Retail

Parking for this sector will be provided at basement via the east entrance.

For parking figures and a break down refer to “Traffic Analysis Report” and the “Mobility Management Plan”

9.3 Pedestrian Access and Cyclists

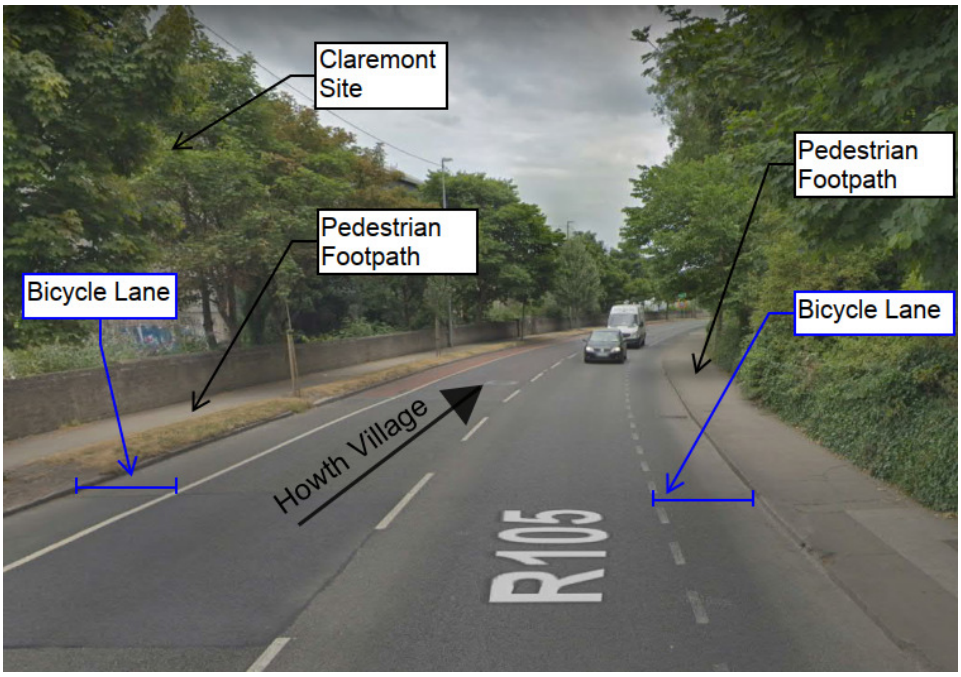

Figure 15 - Existing Road Layout

Pedestrians

The internal layout of the site has been designed to ensure a sense of pedestrian priority throughout the site. Footpaths are provided where desire lines are expected- including through the recreational green areas, and along the main internal carriageway routes – ultimately linking to the existing footpath on the R105. Shared surfacing will be provided, where appropriate to further enhance the sense of pedestrian priority in the site.

A raised podium providing pedestrian access has been provided along the north of the site, linking all the residential and retail areas.

On approach to the site there are 1.3m cycle lanes along Howth Road as well as 1.5m footpaths leading to Sutton and Howth villages.

There is a signalized pedestrian crossing to the east of the site which provides a link between the train station and the proposed site and Howth Village.

9.4 Public Transport

The subject site is within 100 metres of the Howth DART Station and within 700 metres of the centre of Howth Village, with excellent pedestrian links in place in all cases.

The pedestrian links to all transport, retail and employment centres in the vicinity of the subject site are of high standard.

Given the increased volume of people, the bus stop currently provided on the development side, is to be upgraded. The current bus stop is located on Howth Road, therefore disrupting traffic. The new bus stop will be recessed off Howth Road, allowing traffic to continue to flow.

To allow for taxi or drop offs, two set down areas will be provided on either end of the site.

For further information regarding public transport refer to the Mobility Management Plan.

9.5 Deliveries & Services

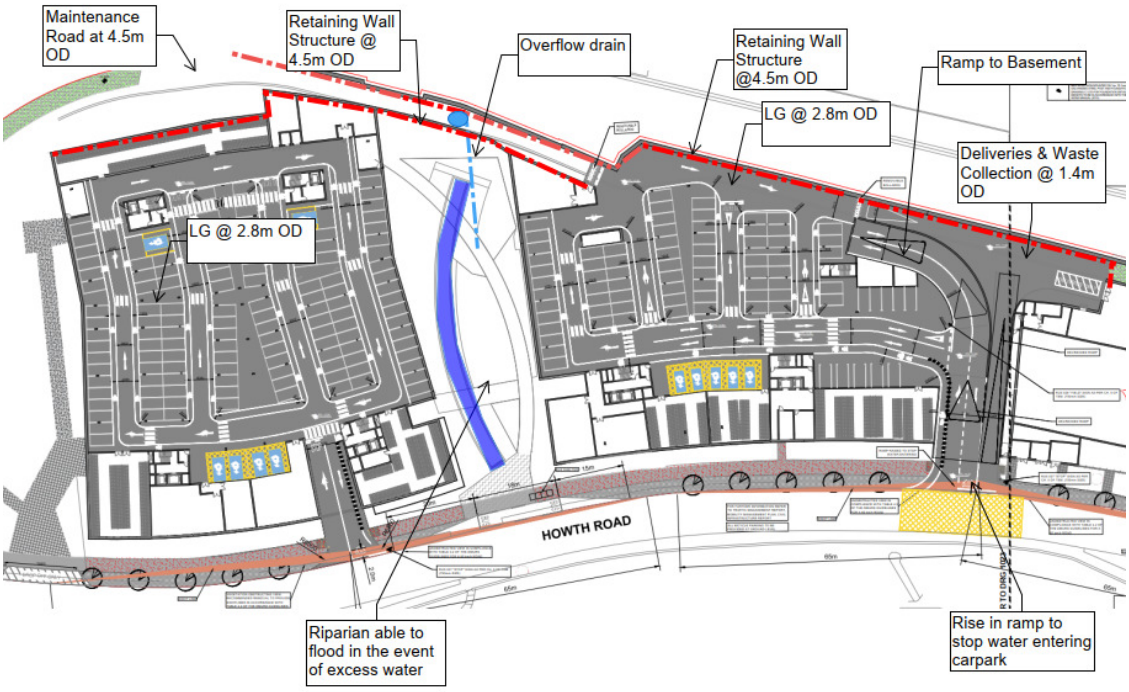

Figure 16 - Deliveries

Deliveries

Deliveries will access the site via separate designated road. The road will be part of the east entrance but will be separated via flexible bollards. This road is designed that a rigid truck can drive into the loading area, reverse into the delivery dock and drive out the same entrance. This road will also be used for waste collection. Figure 16

Maintenance

To minimise disruption to Howth Road, water disposal vehicles will access the site via the delivery ramp. Waste generated between the development will be transported from the basement and other areas via an internal forklift to the loading bay.

In the event of an emergency the maintenance road can be accessed via an additional entrance at the west of the boundary. Removable bollards will be used to control the use of this road. Figure 14

For further information refer to the Mobility Management Plan.

9.6 Bicycle Parking Spaces

Bicycle parking to be provided at ground level in both car parks. Refer to Mobility Management Plan for more information.

9.7 TRAFFIC IMPACT ASSESSMENT & MOBILITY MANAGEMENT PLAN

Refer to Traffic Impact Assessment Report & Mobility Management Plan.

APPENDIX I

Surface Water Analysis
&
Foul Water Analysis

NOTES

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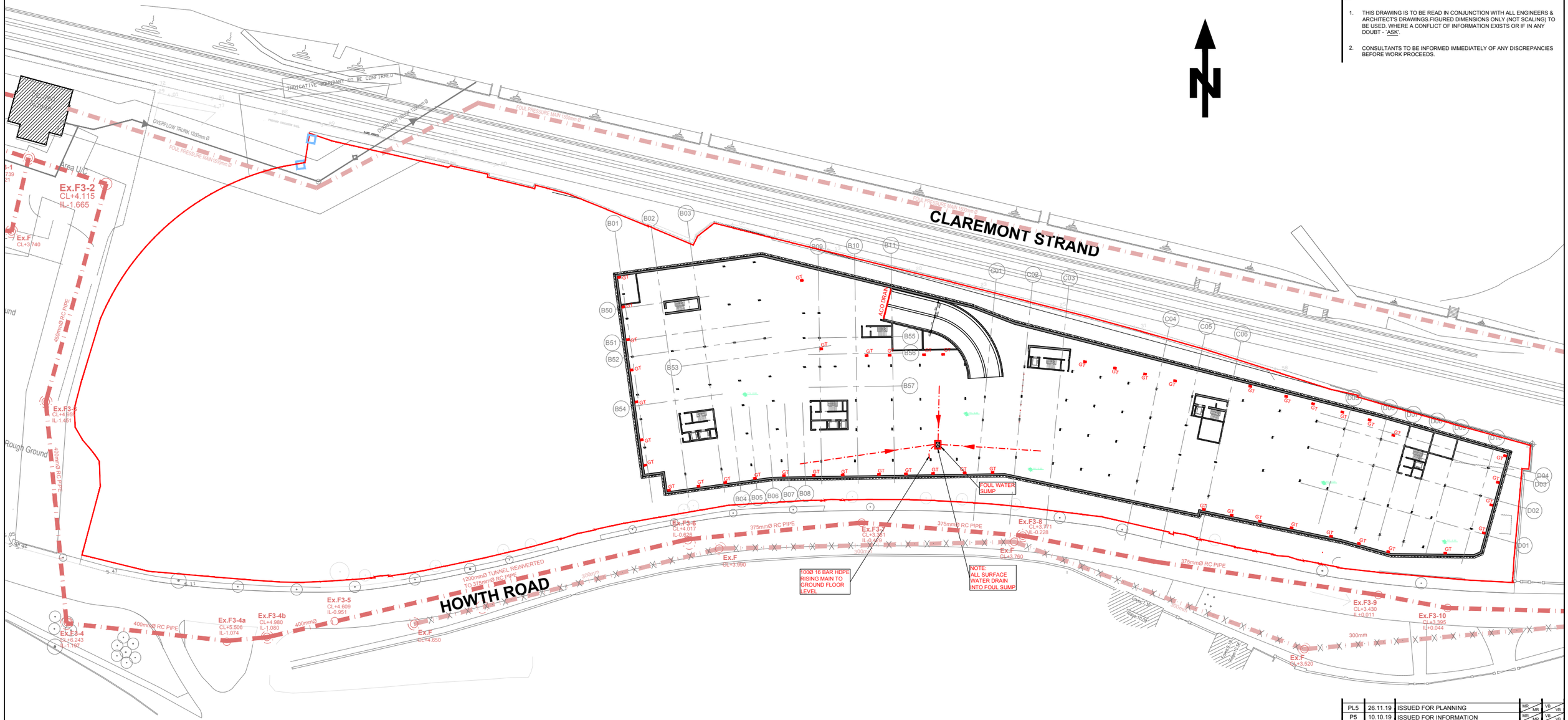

CIVIL LEGEND

EX. FOUL MANHOLE	Ex.F	EX. ROOF RAIN WATER MANHOLE	Ex.R
EX. FOUL PIPE	PIPE DESCRIPTION	EX. ROOF RAIN WATER PIPE	PIPE DESCRIPTION
NEW FOUL MANHOLE	F	NEW ROOF RAIN WATER MANHOLE	R
NEW FOUL PIPE	PIPE DESCRIPTION	NEW ROOF RAIN WATER PIPE	PIPE DESCRIPTION
EX. SURFACE WATER MANHOLE	Ex.S	DECOMMISSIONED LINE	PIPE DESCRIPTION
EX. SURFACE WATER PIPE	PIPE DESCRIPTION	FOUL ACCESS JUNCTION	AJ
NEW SURFACE WATER MANHOLE	S	SURFACE ACCESS JUNCTION	AJ
NEW SURFACE WATER PIPE	PIPE DESCRIPTION	RAINWATER PIPE	RWP
EX. COMBINED MANHOLE	Ex.C	SOIL VENT PIPE	SVP
EX. COMBINED PIPE	PIPE DESCRIPTION	ROAD GULLEY	RG
NEW COMBINED MANHOLE	C	BACK INLET GULLEY TRAP	BIGT
NEW COMBINED PIPE	PIPE DESCRIPTION	FOUL RODDING EYE	RE
NEW RISING MAIN	PIPE DESCRIPTION	SURFACE RODDING EYE	RE
PIPE CROSSOVER		GULLEY TRAP	GT

BASEMENT FOUL AND SW DRAINAGE

SCALE @ A1: 1:500
SCALE @ A3: 1:1000

ISSUE	DATE	DESCRIPTION	DRN.	P.E.
PL5	26.11.19	ISSUED FOR PLANNING	MR	VB
P5	10.10.19	ISSUED FOR INFORMATION	MR	VB
P4	04.09.19	GENERAL REVISIONS	MR	VB
P3	15.07.19	ISSUED TO IRISH WATER	MR	VB
PL4	06.06.19	ISSUED FOR PLANNING	MR	VB
P2	29.05.19	ISSUED FOR COMMENT	MR	VB
PL3	24.04.19	ISSUED FOR PLANNING	MC	VB
PL2	03.04.19	ISSUED FOR PLANNING	MR	VB
PL1	20.03.19	ISSUED FOR PLANNING	MR	VB
P1	08.03.19	ISSUED FOR COMMENT	MR	VB

DRAWING STAGE
PLANNING

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CLIENT
ATLAS GP LTD

PROJECT TITLE	BM PROJECT No.
CLAREMONT PROJECT	**18386**

MODEL REFERENCE	MODEL REV.	SUITABILITY

DRAWING TITLE
BASEMENT FOUL AND SW DRAINAGE

DRAWING No.	ISSUE
PPT-BMD-XX-ZZ-DR-C-1001	**PL5**

NOTES

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LEGEND

- WAY LEAVE SHOW ON PLANNING APPLICATION F15A/0362
- WAY LEAVE AGREED BY IRISH WATER

NOTE: 1500Ø & 1200Ø OVERFLOW PIPES EXPOSED AND DISTANCE OF 15m FROM FENCE VERIFIED BY FCC, 2 JULY 19

NOTE: BLOODY STREAM OUTFALLS INTO EXISTING MANHOLE

SW CONNECTS TO EXISTING CULVERTED BLOODY STREAM

EXISTING SETTLEMENT TANK SERVICING DEVELOPMENT AND OTHER SITES SW

CONNECTION TO EXISTING PUBLIC FOUL WATER NETWORK

STEEP DROP FROM NEW MANHOLE TO EXISTING F3-2

WAYLEAVE - NO FIXED STRUCTURE ALLOWED ABOVE (AND WITHIN)

EXISTING CULVERTED STREAM TO BE MADE REDUNDANT AND CLOSED

SW FROM GREEN ROOF & PODIUM CONNECT IN MANHOLE BELOW

OUTFALL FROM GREEN ROOF & PODIUM

OPEN CHANNEL DESCENDS UNDER WALKWAY AND OUTFLOWS TO MANHOLE S6

FURTHER DETAILS ON BLOODY STREAM REFER TO PPT-BMD-XX-ZZ-DR-C1010

CLAREMONT STRAND

BASEMENT OUTLINE

OUTFALL FROM GREEN ROOF & PODIUM

PORTABLE WATER DISCHARGE INTO BLOODY STREAM REFER TO DRAWING PPT-BMD-XX-ZZ-DR-C-1005 FOR DETAILS

BLOCK A

BLOCK B

BLOCK C

BLOCK D

OVERFLOW DRAIN

EXISTING CULVERT TO BE MADE REDUNDANT

OUTFALL FROM GREEN ROOF DROPS TO GROUND FLOOR & FEEDS INTO SW DRAIN

RISING MAIN FROM BASEMENT

OUTFALL FROM GREEN ROOF DROPS TO GROUND FLOOR & FEEDS INTO SW DRAIN

GREASE TRAP

GREASE TRAP

OUTFALL FROM GREEN ROOF IN BLOCK D

HOWTH ROAD

MANHOLE TO BE UPGRADED

NEW 600Ø SW PIPE

DISCHARGE MANHOLE TO STD-WW-29

FOUL LINE 1.5m FROM TREE

MANHOLE TO BE UPGRADED

NEW 450Ø SW PIPE

ABANDONED EXISTING FOUL LINE

PETROL INTERCEPTOR

SURFACE WATER & BLOODY STREAM FLOW INTO 3m WIDE OPEN CHANNEL

GROUND FLOOR FOUL AND SW DRAINAGE

SCALE @ A1: 1:500
SCALE @ A3: 1:1000

CIVIL LEGEND

EX. FOUL MANHOLE	Ex.F
EX. FOUL PIPE	PIPE DESCRIPTION
NEW FOUL MANHOLE	F
NEW FOUL PIPE	PIPE DESCRIPTION
EX. SURFACE WATER MANHOLE	Ex.S
EX. SURFACE WATER PIPE	PIPE DESCRIPTION
NEW SURFACE WATER MANHOLE	S
NEW SURFACE WATER PIPE	PIPE DESCRIPTION
EX. COMBINED MANHOLE	Ex.C
EX. COMBINED PIPE	PIPE DESCRIPTION
NEW COMBINED MANHOLE	C
NEW COMBINED PIPE	PIPE DESCRIPTION
NEW RISING MAIN	PIPE DESCRIPTION
PIPE CROSSOVER	

NEW FOUL WATER MANHOLE NOT TAKEN IN CHARGE	F
NEW FOUL WATER PIPE NOT TAKEN IN CHARGE	PIPE DESCRIPTION
DECOMMISSIONED LINE	PIPE DESCRIPTION
FOUL ACCESS JUNCTION	AJ
SURFACE ACCESS JUNCTION	AJ
RAINWATER PIPE	RWP
SOIL VENT PIPE	SVP
ROAD GULLEY	RG
BACK INLET GULLEY TRAP	BIGT
FOUL RODDING EYE	RE
SURFACE RODDING EYE	RE
GULLEY TRAP	GT
POP UP	P

NEW FOUL WATER INFRASTRUCTURE WILL BE IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WASTE WATER INFRASTRUCTURE AND IRISH WATERS WASTE WATER INFRASTRUCTURE STANDARD DETAIL

SEWER PIPE MATERIAL SHALL COMPLY WITH SECTION 3.13 OF IRISH WATER WASTEWATER INFRASTRUCTURE REPORT

NOTES ON DRAINAGE:

1. CONTRACTOR TO ALLOW FOR PROPRIETARY FIN DRAINAGE FROM PERMEABLE PARKING BAYS, AND CONNECTION TO MAINLINE DRAINAGE PIPE NETWORK.
2. ALL GRATINGS AND LIDS IN PUBLIC SPACES TO BE MIN. GRADE D400 LOAD RATING.
3. MANHOLE COVER LEVELS INDICATED ARE APPROXIMATE AND SHALL BE FINISHED FLUSH ON SITE WITH ADJACENT FINISHED ROAD / GROUND LEVEL.
4. REFER TO ARCHITECTS'S DRAINAGE LAYOUTS FOR DOMESTIC CONNECTIONS TO MAIN DRAINAGE NETWORK.
5. NOTE ALL PROPOSED CONNECTION LOCATIONS TO EXISTING FOUL NETWORKS ARE SUBJECT TO AGREEMENT WITH IRISH WATER.
6. ALL WORKS TO BE CARRIED OUT TO COMPLY WITH IRISH WATER STANDARD DETAILS.

ISSUE	DATE	DESCRIPTION	DRN / CHKD	P.E. / P.D.
PL5	26.11.19	ISSUED FOR PLANNING	MR / MR	VB / VB
P8	10.10.19	ISSUED FOR INFORMATION	MR / MR	VB / VB
P7	30.09.19	Notch Removed to Irish Water COMMENTS	MR / MR	VB / VB
P6	04.09.19	IRISH WATER COMMENTS	MR / MR	VB / VB
P5	14.08.19	IRISH WATER COMMENTS	MR / MR	VB / VB
P4	15.07.19	ISSUED TO IRISH WATER	MR / MR	VB / VB
PL4	06.06.19	ISSUED FOR PLANNING	MR / MR	VB / VB
P3	29.05.19	ISSUED FOR COMMENT	MR / MR	VB / VB
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PL3	24.04.19	ISSUED FOR PLANNING	MR / MR	VB / VB
PL2	03.04.19	ISSUED FOR PLANNING	MR / MR	VB / VB
PL1	20.03.19	ISSUED FOR PLANNING	MR / MR	VB / VB

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CLIENT: **ATLAS GP LTD**

PROJECT TITLE: **CLAREMONT PROJECT**

BM PROJECT No.: **18386**

MODEL REFERENCE | MODEL REV. | SUITABILITY

DRAWING TITLE: **GROUND FLOOR FOUL AND SW DRAINAGE**

DRAWING No.: **PPT-BMD-XX-ZZ-DR-C-1002**

ISSUE: **PL5**

NOTES

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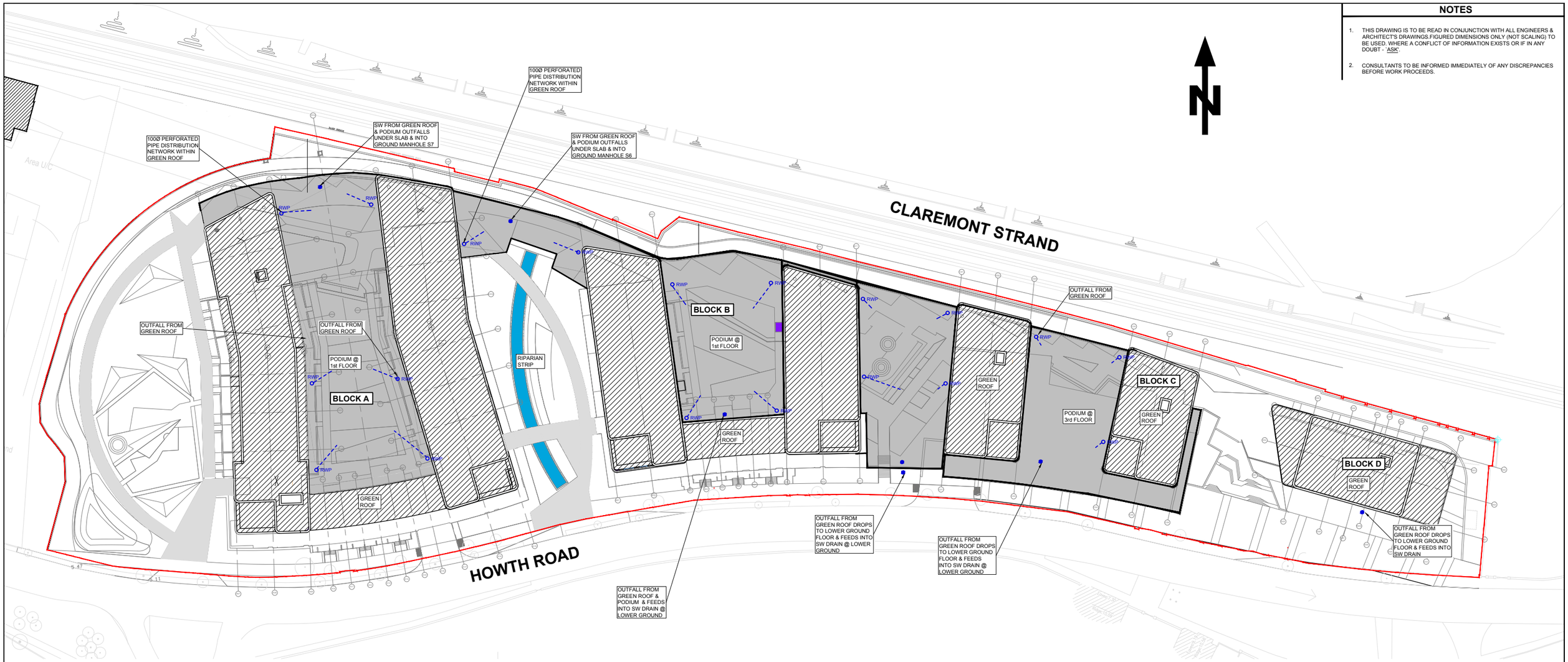

ROOF & PODIUM LEVEL DRAINAGE

SCALE @ A1: 1:500
SCALE @ A3: 1:1000

NOTE:
ALL ROOFS TO BE A COMBINATION OF INTENSIVE & EXTENSIVE GREEN ROOF. FOR PODIUM DETAILS REFER TOP LANDSCAPE ARCHITECTS DETAILS ULU314-AL-P1-GE-3-101

CIVIL LEGEND

EX. FOUL MANHOLE	Ex.F	EX. ROOF RAIN WATER MANHOLE	Ex.R
EX. FOUL PIPE	PIPE DESCRIPTION	EX. ROOF RAIN WATER PIPE	PIPE DESCRIPTION
NEW FOUL MANHOLE	F	NEW ROOF RAIN WATER MANHOLE	R
NEW FOUL PIPE	PIPE DESCRIPTION	NEW ROOF RAIN WATER PIPE	PIPE DESCRIPTION
EX. SURFACE WATER MANHOLE	Ex.S	DECOMMISSIONED LINE	PIPE DESCRIPTION
EX. SURFACE WATER PIPE	PIPE DESCRIPTION	FOUL ACCESS JUNCTION	AJ
NEW SURFACE WATER MANHOLE	S	SURFACE ACCESS JUNCTION	AJ
NEW SURFACE WATER PIPE	PIPE DESCRIPTION	RAINWATER PIPE	RWP
EX. COMBINED MANHOLE	Ex.C	SOIL VENT PIPE	SVP
EX. COMBINED PIPE	PIPE DESCRIPTION	ROAD GULLEY	RG
NEW COMBINED MANHOLE	C	BACK INLET GULLEY TRAP	BIGT
NEW COMBINED PIPE	PIPE DESCRIPTION	FOUL RODDING EYE	RE
NEW RISING MAIN	PIPE DESCRIPTION	SURFACE RODDING EYE	RE
PIPE CROSSOVER		GULLEY TRAP	GT
PODIUM			

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BM PROJECT No.: **18386**
MODEL REFERENCE
MODEL REV.
SUITABILITY

DRAWING TITLE: **ROOF & PODIUM LEVEL DRAINAGE**

DRAWING No.: **PPT-BMD-XX-ZZ-DR-C-1003**
ISSUE: **PL5**

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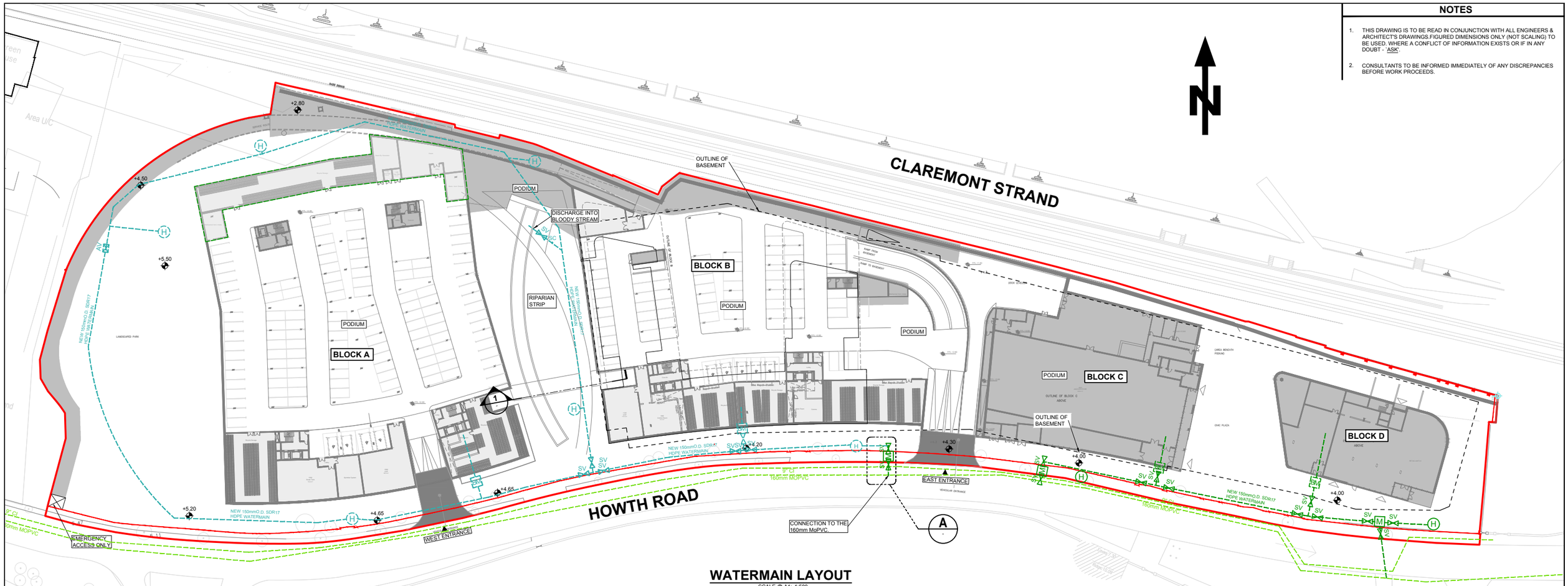


WATERMAIN LAYOUT

SCALE @ A1: 1:500
SCALE @ A3: 1:1000

WATERMAIN LEGEND

Ex. WATERMAIN	
WATERMAIN	
WATERMAIN NOT TAKEN IN CHARGE	
SLUICE VALVE	SV
STOP COCK	SC
AIR VALVE	AV
FIRE HYDRANT	H
MAGNETIC FLOW WATER METER	M
BULK METER	BM
IRRIGATION VALVE	IV
TRUST BLOCK	*

LEGEND

- RAISED PODIUM
- FIRE TENDER ROAD
- MAIN STRUCTURE

NOTES:

1. REFER TO DRAWING C-1220 FOR STANDARD WATERMAIN DETAILS.
2. ALL HYDRANTS, SLUICE VALVES AND AIR VALVES REQUIRE TOMBSTONES & MARKER PLATES IN ACCORDANCE WITH IRISH WATER REQUIREMENTS.
3. DIAMETER OF HDPE PIPEWORK SHOWN INDICATES OUTER DIAMETER.
4. HYDRANTS AND AIRVALVES TO BE OFF-LINE TYPE.
5. ALL HDPE PIPEWORK TO BE BUTT FUSION WELDED ON SITE IN ACCORDANCE WITH THE SPECIFICATION.
6. REFER TO SPECIFICATION FOR WATERMAINS TESTING & CHLORINATION REQUIREMENTS.
7. WATER METER ARRANGEMENTS TO BE AGREED WITH IRISH WATER.
8. 400mm WIDE WARNING MESH - PLYAGE HR 40D BLUE POLYETHENE OR SIMILAR - TO BE LAID OVER ALL WATERMAIN PIPES 350mm BELOW FGL.
9. 200mm WIDE WARNING MESH TO BE LAID OVER ALL SUPPLY/SERVICE CONNECTIONS 350mm BELOW FGL
10. ALL PLASTIC PIPES TO HAVE WARNING MESH INCORPORATING A POLYPROPYLENE REINFORCING BAND OF STAINLESS STEEL TRACER WIRE
11. EXACT LOCATION OF HYDRANTS TO BE AGREED WITH OFFALY COUNTY COUNCIL FIRE OFFICER AS PART OF THE FIRE CERT APPLICATION.

NOTE:
OFFLINE SCOUR CHAMBER WITH NON-RETURN VALVE CONNECTED TO SURFACE WATER MANHOLE AT LOCAL LOW POINT

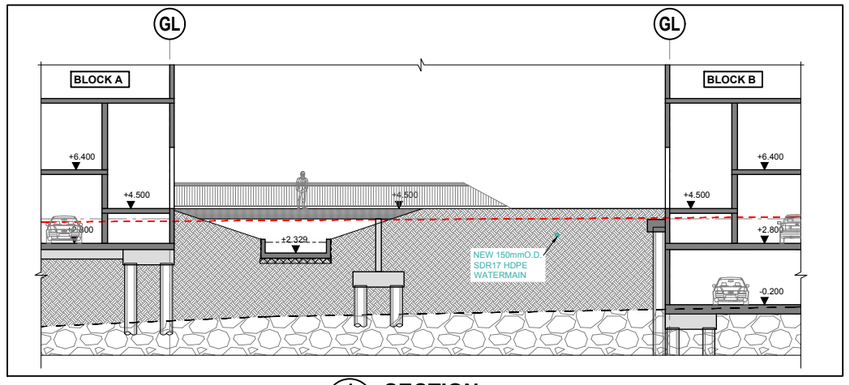
WATERMAIN PIPE MATERIAL SHALL COMPLY WITH SECTION 3.9 OF WATER CODE OF PRACTICE

NEW WATER INFRASTRUCTURE WILL BE IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE AND IRISH WATER INFRASTRUCTURE STANDARD DETAILS

FOR STANDARD DETAILS REFER TO PPT-BMC-XX-ZZ-DR-C-1220

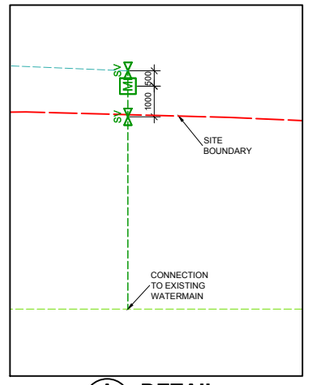
WHERE AIR VALVE AND HYDRANT'S COVERS ARE LOCATED IN GRASS AREAS, THEY SHALL BE SURROUNDED BY A CONCRETE PLINTH, 200mm ALL ROUND AND 100mm DEEP FORMED WITH C20/25 CONCRETE, 20mm AGGREGATE SIZE, BEDDED IN CLAUSE 804 MATERIAL. THE PLINTH SHALL INCORPORATE MILD STEEL REINFORCEMENT LINKS AND SHELL HAVE A BULL-NOSE FINISH AROUND ITS EXTERNAL PERIMETER. SEE SECTION 3.18 OF THE WATER CODE OF PRACTICE.

NEW WATER INFRASTRUCTURE WILL BE IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE AND IRISH WATERS WATER INFRASTRUCTURE STANDARD DETAIL



1 SECTION

SCALE @ A1: 1:150
SCALE @ A3: 1:300



A DETAIL

SCALE @ A1: 1:100
SCALE @ A3: 1:200

ISSUE	DATE	DESCRIPTION	DRN. ORIG.	P.E. P.D.
PL5	26.11.19	ISSUED FOR PLANNING	MR MR	VB VB
P8	10.10.19	ISSUED FOR INFORMATION	MR MR	VB VB
P7	04.10.19	ISSUED FOR COMMENT	MR MR	VB VB
P6	30.09.19	Notch Removed to Irish Water Comments	MR MR	VB VB
P5	04.09.19	IRISH WATER COMMENTS	MR MR	VB VB
P4	14.08.19	IRISH WATER COMMENTS	MR MR	VB VB
P3	15.07.19	ISSUED TO IRISH WATER	MR MR	VB VB
PL4	06.06.19	ISSUED FOR PLANNING	MR MR	VB VB
PL3	18.04.19	ISSUED FOR COMMENT	MC MR	VB VB
PL2	03.04.19	ISSUED FOR COMMENT	MR MR	VB VB
PL1	20.03.19	ISSUED FOR COMMENT	MR MR	VB VB
P1	08.03.19	ISSUED FOR COMMENT	MR MR	VB VB

DRAWING STAGE
PLANNING

BM BARRETT MAHONY
Dublin Office:
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CLIENT
ATLAS GP LTD

PROJECT TITLE
CLAREMONT PROJECT

BM PROJECT No.
18386

MODEL REFERENCE

MODEL REV.

SUITABILITY

DRAWING TITLE
WATERMAIN LAYOUT

DRAWING No.
PPT-BMD-XX-ZZ-DR-C-1005

ISSUE
PL5

APPENDIX II

STATEMENT OF DESIGN CONFORMANCE

Atlas GP Ltd
Heritage House,
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Dublin 2

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

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

29 October 2019

Re: Design Submission for connections at Project Pier, Former Techcrete Site, Howth Road, Dublin (the "Development") (the "Design Submission") / Connection Reference No: 7287699079

Dear Sir/Madam,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:

Name: Donal O'Dwyer
Phone: (022) 54606
Email: dodwyer@water.ie

Yours sincerely,

Maria O'Dwyer
Connections and Developer Services

Appendix A

Document Title & Revision

- [18386_PPT-BMD-XX-ZZ-DR-C-1002 Rev. P6 Foul & Surface Water Layout]
- [18386_PPT-BMD-XX-ZZ-DR-C-1005 Rev. P6 Watermain Layout]
- [18386_PPT-BMD-XX-ZZ-DR-C-1015 Rev. P4 Foul Water Longitudinal Sections]
- [18386_PPT-BMD-XX-ZZ-DR-C-1200 Rev. PL4 Standard Drainage Detials]
- [18389_PPT-BMD-XX-ZZ-DR-C-1220 Rev. PL4 Watermain Details]

Standard Details/Code of Practice Exemption:
<N/A>

For further information, visit ***www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

APPENDIX III

SuDS Calculations

FOUL SEWERAGE DESIGN

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	20
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200
Flow Per Person (l/per/day)	150.00	Maximum Backdrop Height (m)	1.500
Persons per House	2.70	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	41.948	0.280	149.8	0.000	0	1.4	1.500	o	225	Pipe/Conduit	
1.001	31.052	0.207	150.0	0.000	0	1.2	1.500	o	225	Pipe/Conduit	
1.002	45.697	0.305	149.8	0.000	0	1.2	1.500	o	225	Pipe/Conduit	
1.003	49.534	0.330	150.1	0.000	0	2.2	1.500	o	225	Pipe/Conduit	
1.004	50.783	0.429	118.5	0.000	0	2.2	1.500	o	225	Pipe/Conduit	
2.000	40.897	0.273	149.8	0.000	0	2.2	1.500	o	225	Pipe/Conduit	
2.001	41.161	0.274	150.2	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
3.000	39.595	0.264	150.0	0.000	0	2.2	1.500	o	225	Pipe/Conduit	
4.000	41.744	0.278	150.2	0.000	0	2.2	1.500	o	225	Pipe/Conduit	
4.001	15.834	0.106	150.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	2.500	0.000	1.4	0	0.3	32	0.46	0.94	37.3	1.6
1.001	2.220	0.000	2.5	0	0.5	44	0.56	0.94	37.2	3.0
1.002	2.013	0.000	3.7	0	0.7	52	0.63	0.94	37.2	4.4
1.003	1.708	0.000	5.9	0	1.2	66	0.72	0.94	37.2	7.0
1.004	1.378	0.000	8.0	0	1.6	73	0.86	1.05	41.9	9.6
2.000	1.675	0.000	2.2	0	0.4	41	0.54	0.94	37.3	2.6
2.001	1.400	0.000	2.2	0	0.4	41	0.54	0.94	37.2	2.6
3.000	1.390	0.000	2.2	0	0.4	41	0.54	0.94	37.2	2.6
4.000	1.510	0.000	2.2	0	0.4	41	0.54	0.94	37.2	2.6
4.001	1.232	0.000	2.2	0	0.4	41	0.54	0.94	37.2	2.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.002	26.402	0.176	150.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.005	64.505	0.430	150.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.006	53.967	0.360	150.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.007	37.720	0.251	150.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.008	23.833	0.159	150.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.002	1.126	0.000	6.6	0	1.3	70	0.74	0.94	37.2	7.9
1.005	0.949	0.000	14.6	0	2.9	109	0.92	0.94	37.2	17.5
1.006	0.519	0.000	14.6	0	2.9	109	0.92	0.94	37.2	17.5
1.007	0.159	0.000	14.6	0	2.9	109	0.92	0.94	37.2	17.5
1.008	-0.092	0.000	14.6	0	2.9	109	0.92	0.94	37.2	17.5

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	4.000	1.500	Open Manhole	1200	1.000	2.500	225				
2	4.000	1.780	Open Manhole	1200	1.001	2.220	225	1.000	2.220	225	
3	4.000	1.987	Open Manhole	1200	1.002	2.013	225	1.001	2.013	225	
4	4.000	2.292	Open Manhole	1200	1.003	1.708	225	1.002	1.708	225	
5	4.000	2.622	Open Manhole	1200	1.004	1.378	225	1.003	1.378	225	
6	2.800	1.125	Open Manhole	1200	2.000	1.675	225				
6	2.800	1.400	Open Manhole	1200	2.001	1.400	225	2.000	1.402	225	2
8	2.800	1.410	Open Manhole	1200	3.000	1.390	225				
9	2.800	1.290	Open Manhole	1200	4.000	1.510	225				
9	2.800	1.568	Open Manhole	1200	4.001	1.232	225	4.000	1.232	225	
6	2.800	1.674	Open Manhole	1200	2.002	1.126	225	2.001	1.126	225	
								3.000	1.126	225	
								4.001	1.126	225	
12	4.000	3.051	Open Manhole	1200	1.005	0.949	225	1.004	0.949	225	
								2.002	0.950	225	1
13	4.000	3.481	Open Manhole	1200	1.006	0.519	225	1.005	0.519	225	
14	4.000	3.841	Open Manhole	1200	1.007	0.159	225	1.006	0.159	225	
15	4.000	4.092	Open Manhole	1200	1.008	-0.092	225	1.007	-0.092	225	
	4.000	4.251	Open Manhole	0		OUTFALL		1.008	-0.251	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	4.000	2.500	1.275	Open Manhole	1200
1.001	o	225	2	4.000	2.220	1.555	Open Manhole	1200
1.002	o	225	3	4.000	2.013	1.762	Open Manhole	1200
1.003	o	225	4	4.000	1.708	2.067	Open Manhole	1200
1.004	o	225	5	4.000	1.378	2.397	Open Manhole	1200
2.000	o	225	6	2.800	1.675	0.900	Open Manhole	1200
2.001	o	225	6	2.800	1.400	1.175	Open Manhole	1200
3.000	o	225	8	2.800	1.390	1.185	Open Manhole	1200
4.000	o	225	9	2.800	1.510	1.065	Open Manhole	1200
4.001	o	225	9	2.800	1.232	1.343	Open Manhole	1200
2.002	o	225	6	2.800	1.126	1.449	Open Manhole	1200
1.005	o	225	12	4.000	0.949	2.826	Open Manhole	1200
1.006	o	225	13	4.000	0.519	3.256	Open Manhole	1200
1.007	o	225	14	4.000	0.159	3.616	Open Manhole	1200
1.008	o	225	15	4.000	-0.092	3.867	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	41.948	149.8	2	4.000	2.220	1.555	Open Manhole	1200
1.001	31.052	150.0	3	4.000	2.013	1.762	Open Manhole	1200
1.002	45.697	149.8	4	4.000	1.708	2.067	Open Manhole	1200
1.003	49.534	150.1	5	4.000	1.378	2.397	Open Manhole	1200
1.004	50.783	118.5	12	4.000	0.949	2.826	Open Manhole	1200
2.000	40.897	149.8	6	2.800	1.402	1.173	Open Manhole	1200
2.001	41.161	150.2	6	2.800	1.126	1.449	Open Manhole	1200
3.000	39.595	150.0	6	2.800	1.126	1.449	Open Manhole	1200
4.000	41.744	150.2	9	2.800	1.232	1.343	Open Manhole	1200
4.001	15.834	150.0	6	2.800	1.126	1.449	Open Manhole	1200
2.002	26.402	150.0	12	4.000	0.950	2.825	Open Manhole	1200
1.005	64.505	150.0	13	4.000	0.519	3.256	Open Manhole	1200
1.006	53.967	150.0	14	4.000	0.159	3.616	Open Manhole	1200
1.007	37.720	150.0	15	4.000	-0.092	3.867	Open Manhole	1200
1.008	23.833	150.0		4.000	-0.251	4.026	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008		4.000	-0.251	-1.665	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	16.000	Storm Duration (mins)	30
Ratio R	0.300		

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	15.400	Add Flow / Climate Change (%)	0
Ratio R	0.282	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.764	4-8	1.113	8-12	0.125

Total Area Contributing (ha) = 2.002

Total Pipe Volume (m³) = 228.289

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	61.232	0.223	274.6	0.400	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	30.766	0.123	250.1	0.174	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	19.828	0.079	251.0	0.117	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	14.000	0.047	297.9	0.000	4.00	120.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.30	3.000	0.400	0.0	0.0	0.0	0.78	31.2«	54.2
S1.001	50.00	5.93	2.850	0.574	0.0	0.0	0.0	0.82	32.7«	77.7
S1.002	50.00	6.33	2.727	0.691	0.0	0.0	0.0	0.82	32.6«	93.6
S2.000	50.00	4.20	2.700	0.000	120.0	0.0	0.0	1.17	186.5	120.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.003	36.501	0.081	450.6	0.245	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.004	39.887	0.089	448.2	0.307	0.00	0.0	0.600	o	900	Pipe/Conduit	
S3.000	18.700	0.053	352.8	0.000	4.00	360.0	0.600	o	600	Pipe/Conduit	
S1.005	8.400	0.018	466.7	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.006	3.650	0.012	300.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.007	76.000	0.109	700.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S1.008	53.700	0.090	596.7	0.759	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.009	19.500	0.033	590.9	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S4.000	13.000	0.065	200.0	0.000	4.00	480.0	0.600	o	600	Pipe/Conduit	
S1.010	22.800	0.380	60.0	0.000	0.00	0.0	0.600	o	1000	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.003	50.00	6.74	2.565	0.936	120.0	0.0	0.0	1.47	934.8	246.7
S1.004	50.00	7.19	2.502	1.243	120.0	0.0	0.0	1.47	937.4	288.3
S3.000	50.00	4.24	3.000	0.000	360.0	0.0	0.0	1.29	364.9	360.0
S1.005	50.00	7.27	2.400	1.243	480.0	0.0	0.0	1.73	1951.1	648.3
S1.006	50.00	7.30	2.371	1.243	480.0	0.0	0.0	2.15	2437.0	648.3
S1.007	50.00	8.20	2.353	1.243	480.0	0.0	0.0	1.41	1590.5	648.3
S1.008	50.00	8.90	2.238	2.002	480.0	0.0	0.0	1.28	811.4	751.1
S1.009	50.00	9.16	2.148	2.002	480.0	0.0	0.0	1.28	815.3	751.1
S4.000	50.00	4.13	1.103	0.000	480.0	0.0	0.0	1.72	485.8	480.0
S1.010	50.00	9.25	0.450	2.002	960.0	0.0	0.0	4.32	3394.0	1231.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdro (mm)
SS1	4.000	1.000	Open Manhole	1200	S1.000	3.000	225				
SS2	4.000	1.223	Open Manhole	1200	S1.001	2.850	225	S1.000	2.777	225	
SS2.1	4.300	1.573	Open Manhole	1200	S1.002	2.727	225	S1.001	2.727	225	
SS10	4.500	1.800	Open Manhole	1350	S2.000	2.700	450				
SS3	4.300	1.735	Open Manhole	1800	S1.003	2.565	900	S1.002	2.648	225	
								S2.000	2.653	450	
SS3.1	4.200	1.716	Open Manhole	1800	S1.004	2.502	900	S1.003	2.484	900	
SS11	4.000	1.000	Open Manhole	1500	S3.000	3.000	600				
SS4	4.000	1.600	Open Manhole	2100	S1.005	2.400	1200	S1.004	2.413	900	
								S3.000	2.947	600	
SS5	4.500	2.129	Open Manhole	2100	S1.006	2.371	1200	S1.005	2.382	1200	1
SCHANNEL	4.500	2.147	Open Manhole	2100	S1.007	2.353	1200	S1.006	2.359	1200	
SS6	4.500	2.262	Open Manhole	2100	S1.008	2.238	900	S1.007	2.244	1200	30
SS7	4.000	1.852	Open Manhole	1800	S1.009	2.148	900	S1.008	2.148	900	
SEX	4.000	2.897	Open Manhole	1500	S4.000	1.103	600				
SS8	4.000	3.550	Open Manhole	1900	S1.010	0.450	1000	S1.009	2.115	900	156
								S4.000	1.038	600	18
S	2.000	1.930	Open Manhole	0		OUTFALL		S1.010	0.070	1000	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	SS1	4.000	3.000	0.775	Open Manhole	1200
S1.001	o	225	SS2	4.000	2.850	0.925	Open Manhole	1200
S1.002	o	225	SS2.1	4.300	2.727	1.348	Open Manhole	1200
S2.000	o	450	SS10	4.500	2.700	1.350	Open Manhole	1350
S1.003	o	900	SS3	4.300	2.565	0.835	Open Manhole	1800
S1.004	o	900	SS3.1	4.200	2.502	0.798	Open Manhole	1800
S3.000	o	600	SS11	4.000	3.000	0.400	Open Manhole	1500
S1.005	o	1200	SS4	4.000	2.400	0.400	Open Manhole	2100
S1.006	o	1200	SS5	4.500	2.371	0.929	Open Manhole	2100
S1.007	o	1200	SCHANNEL	4.500	2.353	0.947	Open Manhole	2100
S1.008	o	900	SS6	4.500	2.238	1.362	Open Manhole	2100
S1.009	o	900	SS7	4.000	2.148	0.952	Open Manhole	1800
S4.000	o	600	SEX	4.000	1.103	2.297	Open Manhole	1500
S1.010	o	1000	SS8	4.000	0.450	2.550	Open Manhole	1900

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	61.232	274.6	SS2	4.000	2.777	0.998	Open Manhole	1200
S1.001	30.766	250.1	SS2.1	4.300	2.727	1.348	Open Manhole	1200
S1.002	19.828	251.0	SS3	4.300	2.648	1.427	Open Manhole	1800
S2.000	14.000	297.9	SS3	4.300	2.653	1.197	Open Manhole	1800
S1.003	36.501	450.6	SS3.1	4.200	2.484	0.816	Open Manhole	1800
S1.004	39.887	448.2	SS4	4.000	2.413	0.687	Open Manhole	2100
S3.000	18.700	352.8	SS4	4.000	2.947	0.453	Open Manhole	2100
S1.005	8.400	466.7	SS5	4.500	2.382	0.918	Open Manhole	2100
S1.006	3.650	300.0	SCHANNEL	4.500	2.359	0.941	Open Manhole	2100
S1.007	76.000	700.0	SS6	4.500	2.244	1.056	Open Manhole	2100
S1.008	53.700	596.7	SS7	4.000	2.148	0.952	Open Manhole	1800
S1.009	19.500	590.9	SS8	4.000	2.115	0.985	Open Manhole	1900
S4.000	13.000	200.0	SS8	4.000	1.038	2.362	Open Manhole	1900
S1.010	22.800	60.0	S	2.000	0.070	0.930	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.400	0.400	0.400
1.001	-	-	100	0.174	0.174	0.174
1.002	-	-	100	0.117	0.117	0.117
2.000	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.245	0.245	0.245
1.004	-	-	100	0.307	0.307	0.307
3.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.759	0.759	0.759
1.009	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.002	2.002	2.002

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S1.000	SS1	225	0.775	0.998	Unclassified	1200	0	0.775	Unclassified
S1.001	SS2	225	0.925	1.348	Unclassified	1200	0	0.925	Unclassified
S1.002	SS2.1	225	1.348	1.427	Unclassified	1200	0	1.348	Unclassified
S2.000	SS10	450	1.197	1.350	Unclassified	1350	0	1.350	Unclassified
S1.003	SS3	900	0.816	0.835	Unclassified	1800	0	0.835	Unclassified
S1.004	SS3.1	900	0.687	0.798	Unclassified	1800	0	0.798	Unclassified
S3.000	SS11	600	0.400	0.453	Unclassified	1500	0	0.400	Unclassified
S1.005	SS4	1200	0.400	0.918	Unclassified	2100	0	0.400	Unclassified
S1.006	SS5	1200	0.929	0.941	Unclassified	2100	0	0.929	Unclassified
S1.007	SCHANNEL	1200	0.947	1.056	Unclassified	2100	0	0.947	Unclassified
S1.008	SS6	900	0.952	1.362	Unclassified	2100	0	1.362	Unclassified
S1.009	SS7	900	0.952	0.985	Unclassified	1800	0	0.952	Unclassified
S4.000	SEX	600	2.297	2.362	Unclassified	1500	0	2.297	Unclassified
S1.010	SS8	1000	0.930	2.550	Unclassified	1900	0	2.550	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.010	S	2.000	0.070	0.006	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	12
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.400	Storm Duration (mins)	30
Ratio R	0.282		

Online Controls for Storm

Non Return Valve Manhole: SS5, DS/PN: S1.006, Volume (m³): 14.5

Time Area Diagram for Green Roof at Pipe Number S1.000 (Storm)

Area (m³) 1499 Evaporation (mm/day) 3
Depression Storage (mm) 38 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.027240	32	36	0.005500	64	68	0.001110	96	100	0.000224
4	8	0.022302	36	40	0.004503	68	72	0.000909	100	104	0.000184
8	12	0.018259	40	44	0.003687	72	76	0.000744	104	108	0.000150
12	16	0.014950	44	48	0.003018	76	80	0.000609	108	112	0.000123
16	20	0.012240	48	52	0.002471	80	84	0.000499	112	116	0.000101
20	24	0.010021	52	56	0.002023	84	88	0.000408	116	120	0.000082
24	28	0.008204	56	60	0.001656	88	92	0.000334			
28	32	0.006717	60	64	0.001356	92	96	0.000274			

Time Area Diagram for Green Roof at Pipe Number S1.000 (Storm)

Area (m³) 2559 Evaporation (mm/day) 3
Depression Storage (mm) 12 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.046502	32	36	0.009389	64	68	0.001896	96	100	0.000383
4	8	0.038073	36	40	0.007687	68	72	0.001552	100	104	0.000313
8	12	0.031171	40	44	0.006293	72	76	0.001271	104	108	0.000257
12	16	0.025521	44	48	0.005153	76	80	0.001040	108	112	0.000210
16	20	0.020895	48	52	0.004219	80	84	0.000852	112	116	0.000172
20	24	0.017107	52	56	0.003454	84	88	0.000697	116	120	0.000141
24	28	0.014006	56	60	0.002828	88	92	0.000571			
28	32	0.011467	60	64	0.002315	92	96	0.000467			

Time Area Diagram for Green Roof at Pipe Number S1.001 (Storm)

Area (m³) 349 Evaporation (mm/day) 3
Depression Storage (mm) 38 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.006342	20	24	0.002333	40	44	0.000858	60	64	0.000316
4	8	0.005192	24	28	0.001910	44	48	0.000703	64	68	0.000259
8	12	0.004251	28	32	0.001564	48	52	0.000575	68	72	0.000212
12	16	0.003481	32	36	0.001280	52	56	0.000471	72	76	0.000173
16	20	0.002850	36	40	0.001048	56	60	0.000386	76	80	0.000142

Time Area Diagram for Green Roof at Pipe Number S1.001 (Storm)

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
80	84	0.000116	92	96	0.000064	104	108	0.000035	116	120	0.000019
84	88	0.000095	96	100	0.000052	108	112	0.000029			
88	92	0.000078	100	104	0.000043	112	116	0.000023			

Time Area Diagram for Green Roof at Pipe Number S1.001 (Storm)

Area (m³) 999 Evaporation (mm/day) 3
Depression Storage (mm) 12 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.018154	32	36	0.003665	64	68	0.000740	96	100	0.000149
4	8	0.014863	36	40	0.003001	68	72	0.000606	100	104	0.000122
8	12	0.012169	40	44	0.002457	72	76	0.000496	104	108	0.000100
12	16	0.009963	44	48	0.002011	76	80	0.000406	108	112	0.000082
16	20	0.008157	48	52	0.001647	80	84	0.000332	112	116	0.000067
20	24	0.006678	52	56	0.001348	84	88	0.000272	116	120	0.000055
24	28	0.005468	56	60	0.001104	88	92	0.000223			
28	32	0.004477	60	64	0.000904	92	96	0.000182			

Time Area Diagram for Green Roof at Pipe Number S1.002 (Storm)

Area (m³) 353 Evaporation (mm/day) 3
Depression Storage (mm) 38 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.006415	32	36	0.001295	64	68	0.000261	96	100	0.000053
4	8	0.005252	36	40	0.001060	68	72	0.000214	100	104	0.000043
8	12	0.004300	40	44	0.000868	72	76	0.000175	104	108	0.000035
12	16	0.003520	44	48	0.000711	76	80	0.000144	108	112	0.000029
16	20	0.002882	48	52	0.000582	80	84	0.000117	112	116	0.000024
20	24	0.002360	52	56	0.000476	84	88	0.000096	116	120	0.000019
24	28	0.001932	56	60	0.000390	88	92	0.000079			
28	32	0.001582	60	64	0.000319	92	96	0.000064			

Time Area Diagram for Green Roof at Pipe Number S1.002 (Storm)

Area (m³) 539 Evaporation (mm/day) 3
Depression Storage (mm) 12 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.009795	12	16	0.005375	24	28	0.002950	36	40	0.001619
4	8	0.008019	16	20	0.004401	28	32	0.002415	40	44	0.001326
8	12	0.006566	20	24	0.003603	32	36	0.001978	44	48	0.001085

Time Area Diagram for Green Roof at Pipe Number S1.002 (Storm)

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
48	52	0.000889	68	72	0.000327	88	92	0.000120	108	112	0.000044
52	56	0.000727	72	76	0.000268	92	96	0.000098	112	116	0.000036
56	60	0.000596	76	80	0.000219	96	100	0.000081	116	120	0.000030
60	64	0.000488	80	84	0.000179	100	104	0.000066			
64	68	0.000399	84	88	0.000147	104	108	0.000054			

Time Area Diagram for Green Roof at Pipe Number S1.003 (Storm)

Area (m³) 921 Evaporation (mm/day) 3
Depression Storage (mm) 38 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.016736	32	36	0.003379	64	68	0.000682	96	100	0.000138
4	8	0.013703	36	40	0.002767	68	72	0.000559	100	104	0.000113
8	12	0.011219	40	44	0.002265	72	76	0.000457	104	108	0.000092
12	16	0.009185	44	48	0.001854	76	80	0.000374	108	112	0.000076
16	20	0.007520	48	52	0.001518	80	84	0.000307	112	116	0.000062
20	24	0.006157	52	56	0.001243	84	88	0.000251	116	120	0.000051
24	28	0.005041	56	60	0.001018	88	92	0.000205			
28	32	0.004127	60	64	0.000833	92	96	0.000168			

Time Area Diagram for Green Roof at Pipe Number S1.003 (Storm)

Area (m³) 812 Evaporation (mm/day) 3
Depression Storage (mm) 12 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.014756	32	36	0.002979	64	68	0.000601	96	100	0.000121
4	8	0.012081	36	40	0.002439	68	72	0.000492	100	104	0.000099
8	12	0.009891	40	44	0.001997	72	76	0.000403	104	108	0.000081
12	16	0.008098	44	48	0.001635	76	80	0.000330	108	112	0.000067
16	20	0.006630	48	52	0.001339	80	84	0.000270	112	116	0.000055
20	24	0.005428	52	56	0.001096	84	88	0.000221	116	120	0.000045
24	28	0.004444	56	60	0.000897	88	92	0.000181			
28	32	0.003639	60	64	0.000735	92	96	0.000148			

Time Area Diagram for Green Roof at Pipe Number S1.004 (Storm)

Area (m³) 1251 Evaporation (mm/day) 3
Depression Storage (mm) 38 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.022733	4	8	0.018612	8	12	0.015238	12	16	0.012476

Time Area Diagram for Green Roof at Pipe Number S1.004 (Storm)

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
16	20	0.010215	44	48	0.002519	72	76	0.000621	100	104	0.000153
20	24	0.008363	48	52	0.002062	76	80	0.000509	104	108	0.000125
24	28	0.006847	52	56	0.001688	80	84	0.000416	108	112	0.000103
28	32	0.005606	56	60	0.001382	84	88	0.000341	112	116	0.000084
32	36	0.004590	60	64	0.001132	88	92	0.000279	116	120	0.000069
36	40	0.003758	64	68	0.000927	92	96	0.000229			
40	44	0.003077	68	72	0.000759	96	100	0.000187			

Time Area Diagram for Green Roof at Pipe Number S1.004 (Storm)

Area (m³) 1049 Evaporation (mm/day) 3
Depression Storage (mm) 12 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.019062	32	36	0.003849	64	68	0.000777	96	100	0.000157
4	8	0.015607	36	40	0.003151	68	72	0.000636	100	104	0.000128
8	12	0.012778	40	44	0.002580	72	76	0.000521	104	108	0.000105
12	16	0.010462	44	48	0.002112	76	80	0.000426	108	112	0.000086
16	20	0.008565	48	52	0.001729	80	84	0.000349	112	116	0.000070
20	24	0.007013	52	56	0.001416	84	88	0.000286	116	120	0.000058
24	28	0.005741	56	60	0.001159	88	92	0.000234			
28	32	0.004701	60	64	0.000949	92	96	0.000192			

Time Area Diagram for Green Roof at Pipe Number S1.008 (Storm)

Area (m³) 3477 Evaporation (mm/day) 3
Depression Storage (mm) 38 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.063184	32	36	0.012757	64	68	0.002576	96	100	0.000520
4	8	0.051731	36	40	0.010444	68	72	0.002109	100	104	0.000426
8	12	0.042353	40	44	0.008551	72	76	0.001726	104	108	0.000349
12	16	0.034676	44	48	0.007001	76	80	0.001413	108	112	0.000285
16	20	0.028390	48	52	0.005732	80	84	0.001157	112	116	0.000234
20	24	0.023244	52	56	0.004693	84	88	0.000947	116	120	0.000191
24	28	0.019031	56	60	0.003842	88	92	0.000776			
28	32	0.015581	60	64	0.003146	92	96	0.000635			

Time Area Diagram for Green Roof at Pipe Number S1.008 (Storm)

Area (m³) 2084 Evaporation (mm/day) 3
Depression Storage (mm) 12 Decay Coefficient 0.050

Time Area Diagram for Green Roof at Pipe Number S1.008 (Storm)

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.037870	32	36	0.007646	64	68	0.001544	96	100	0.000312
4	8	0.031006	36	40	0.006260	68	72	0.001264	100	104	0.000255
8	12	0.025385	40	44	0.005125	72	76	0.001035	104	108	0.000209
12	16	0.020784	44	48	0.004196	76	80	0.000847	108	112	0.000171
16	20	0.017016	48	52	0.003436	80	84	0.000694	112	116	0.000140
20	24	0.013932	52	56	0.002813	84	88	0.000568	116	120	0.000115
24	28	0.011406	56	60	0.002303	88	92	0.000465			
28	32	0.009339	60	64	0.001885	92	96	0.000381			

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	12
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.282
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.400	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100, 200, 1000
Climate Change (%)	30, 30, 30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SS1	240 Winter	1	+30%	1/360 Winter	1000/30 Winter	
S1.001	SS2	240 Winter	1	+30%	1/15 Summer		
S1.002	SS2.1	240 Winter	1	+30%	1/15 Summer		
S2.000	SS10	600 Winter	1	+30%	1/15 Summer		
S1.003	SS3	240 Winter	1	+30%			
S1.004	SS3.1	360 Winter	1	+30%			
S3.000	SS11	180 Summer	1	+30%	1/15 Summer		
S1.005	SS4	720 Summer	1	+30%			
S1.006	SS5	600 Winter	1	+30%			
S1.007	SCHANNEL	240 Summer	1	+30%			
S1.008	SS6	1440 Winter	1	+30%	1000/120 Winter		
S1.009	SS7	1440 Winter	1	+30%			
S4.000	SEX	180 Winter	1	+30%	1/15 Summer		
S1.010	SS8	1440 Winter	1	+30%			

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SS1		3.223	-0.002	0.000	0.18		5.3	OK
S1.001	SS2		3.207	0.132	0.000	0.24		7.4	SURCHARGED
S1.002	SS2.1		3.191	0.239	0.000	0.29		8.5	SURCHARGED
S2.000	SS10		3.240	0.090	0.000	0.85		120.3	SURCHARGED
S1.003	SS3		3.177	-0.288	0.000	0.18		130.0	OK
S1.004	SS3.1		3.171	-0.231	0.000	0.18		131.3	OK
S3.000	SS11		3.646	0.046	0.000	1.33		360.0	SURCHARGED
S1.005	SS4		3.154	-0.446	0.000	0.66		494.5	OK
S1.006	SS5		3.173	-0.398	0.000	0.53		498.5	OK
S1.007	SCHANNEL		3.123	-0.430	0.000	0.39		510.0	OK
S1.008	SS6		3.101	-0.037	0.000	0.75		503.1	OK
S1.009	SS7		3.048	0.000	0.000	1.16		508.9	OK
S4.000	SEX		1.837	0.134	0.000	1.46		480.0	SURCHARGED
S1.010	SS8		1.033	-0.417	0.000	0.57		986.1	OK

PN	US/MH Name	Level Exceeded
S1.000	SS1	14
S1.001	SS2	
S1.002	SS2.1	
S2.000	SS10	
S1.003	SS3	
S1.004	SS3.1	
S3.000	SS11	
S1.005	SS4	
S1.006	SS5	
S1.007	SCHANNEL	
S1.008	SS6	
S1.009	SS7	
S4.000	SEX	
S1.010	SS8	

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	12
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.282
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.400	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100, 200, 1000
Climate Change (%)	30, 30, 30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SS1	120 Winter	30	+30%	1/360 Winter	1000/30 Winter	
S1.001	SS2	120 Winter	30	+30%	1/15 Summer		
S1.002	SS2.1	120 Winter	30	+30%	1/15 Summer		
S2.000	SS10	4320 Summer	30	+30%	1/15 Summer		
S1.003	SS3	120 Winter	30	+30%			
S1.004	SS3.1	120 Winter	30	+30%			
S3.000	SS11	180 Summer	30	+30%	1/15 Summer		
S1.005	SS4	120 Winter	30	+30%			
S1.006	SS5	120 Winter	30	+30%			
S1.007	SCHANNEL	120 Winter	30	+30%			
S1.008	SS6	120 Winter	30	+30%	1000/120 Winter		
S1.009	SS7	120 Winter	30	+30%			
S4.000	SEX	180 Summer	30	+30%	1/15 Summer		
S1.010	SS8	120 Winter	30	+30%			

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SS1		3.481	0.256	0.000	0.60		18.2	SURCHARGED
S1.001	SS2		3.399	0.324	0.000	0.83		25.3	SURCHARGED
S1.002	SS2.1		3.315	0.363	0.000	0.99		29.1	SURCHARGED
S2.000	SS10		3.240	0.090	0.000	0.85		120.1	SURCHARGED
S1.003	SS3		3.237	-0.228	0.000	0.22		154.9	OK
S1.004	SS3.1		3.223	-0.179	0.000	0.22		162.3	OK
S3.000	SS11		3.646	0.046	0.000	1.33		360.0	SURCHARGED
S1.005	SS4		3.209	-0.391	0.000	0.69		522.1	OK
S1.006	SS5		3.193	-0.378	0.000	0.55		522.1	OK
S1.007	SCHANNEL		3.185	-0.368	0.000	0.40		522.0	OK
S1.008	SS6		3.138	0.000	0.000	0.80		536.0	OK
S1.009	SS7		3.048	0.000	0.000	1.22		536.1	OK
S4.000	SEX		1.837	0.134	0.000	1.46		480.0	SURCHARGED
S1.010	SS8		1.004	-0.446	0.000	0.59		1016.1	OK

PN	US/MH Name	Level Exceeded
S1.000	SS1	14
S1.001	SS2	
S1.002	SS2.1	
S2.000	SS10	
S1.003	SS3	
S1.004	SS3.1	
S3.000	SS11	
S1.005	SS4	
S1.006	SS5	
S1.007	SCHANNEL	
S1.008	SS6	
S1.009	SS7	
S4.000	SEX	
S1.010	SS8	

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	12
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.282
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.400	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100, 200, 1000
Climate Change (%)	30, 30, 30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SS1	120 Winter	100	+30%	1/360 Winter	1000/30 Winter	
S1.001	SS2	120 Winter	100	+30%	1/15 Summer		
S1.002	SS2.1	120 Winter	100	+30%	1/15 Summer		
S2.000	SS10	720 Winter	100	+30%	1/15 Summer		
S1.003	SS3	120 Winter	100	+30%			
S1.004	SS3.1	120 Winter	100	+30%			
S3.000	SS11	180 Summer	100	+30%	1/15 Summer		
S1.005	SS4	120 Winter	100	+30%			
S1.006	SS5	120 Winter	100	+30%			
S1.007	SCHANNEL	120 Winter	100	+30%			
S1.008	SS6	120 Winter	100	+30%	1000/120 Winter		
S1.009	SS7	120 Winter	100	+30%			
S4.000	SEX	180 Summer	100	+30%	1/15 Summer		
S1.010	SS8	120 Winter	100	+30%			

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SS1		3.700	0.475	0.000	0.82		24.8	FLOOD RISK
S1.001	SS2		3.547	0.472	0.000	1.12		34.4	SURCHARGED
S1.002	SS2.1		3.388	0.436	0.000	1.34		39.6	SURCHARGED
S2.000	SS10		3.403	0.253	0.000	0.86		120.4	SURCHARGED
S1.003	SS3		3.243	-0.222	0.000	0.23		167.6	OK
S1.004	SS3.1		3.228	-0.174	0.000	0.24		178.0	OK
S3.000	SS11		3.646	0.046	0.000	1.33		360.0	SURCHARGED
S1.005	SS4		3.212	-0.388	0.000	0.71		538.0	OK
S1.006	SS5		3.196	-0.375	0.000	0.57		538.0	OK
S1.007	SCHANNEL		3.187	-0.366	0.000	0.41		537.8	OK
S1.008	SS6		3.138	0.000	0.000	0.83		557.9	OK
S1.009	SS7		3.048	0.000	0.000	1.27		557.8	OK
S4.000	SEX		1.837	0.134	0.000	1.46		480.0	SURCHARGED
S1.010	SS8		1.012	-0.438	0.000	0.60		1037.7	OK

PN	US/MH Name	Level Exceeded
S1.000	SS1	14
S1.001	SS2	
S1.002	SS2.1	
S2.000	SS10	
S1.003	SS3	
S1.004	SS3.1	
S3.000	SS11	
S1.005	SS4	
S1.006	SS5	
S1.007	SCHANNEL	
S1.008	SS6	
S1.009	SS7	
S4.000	SEX	
S1.010	SS8	

200 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	12
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.282
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.400	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100, 200, 1000
Climate Change (%)	30, 30, 30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SS1	120 Winter	200	+30%	1/360 Winter	1000/30 Winter	
S1.001	SS2	120 Winter	200	+30%	1/15 Summer		
S1.002	SS2.1	120 Winter	200	+30%	1/15 Summer		
S2.000	SS10	720 Summer	200	+30%	1/15 Summer		
S1.003	SS3	120 Winter	200	+30%			
S1.004	SS3.1	240 Winter	200	+30%			
S3.000	SS11	720 Summer	200	+30%	1/15 Summer		
S1.005	SS4	240 Winter	200	+30%			
S1.006	SS5	240 Winter	200	+30%			
S1.007	SCHANNEL	240 Winter	200	+30%			
S1.008	SS6	240 Winter	200	+30%	1000/120 Winter		
S1.009	SS7	240 Winter	200	+30%			
S4.000	SEX	180 Winter	200	+30%	1/15 Summer		
S1.010	SS8	240 Winter	200	+30%			

200 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SS1		3.869	0.644	0.000	0.96		29.0	FLOOD RISK
S1.001	SS2		3.660	0.585	0.000	1.32		40.3	SURCHARGED
S1.002	SS2.1		3.444	0.492	0.000	1.57		46.4	SURCHARGED
S2.000	SS10		3.281	0.131	0.000	0.85		120.3	SURCHARGED
S1.003	SS3		3.247	-0.218	0.000	0.24		175.8	OK
S1.004	SS3.1		3.232	-0.170	0.000	0.26		189.9	OK
S3.000	SS11		3.646	0.046	0.000	1.33		360.0	SURCHARGED
S1.005	SS4		3.215	-0.385	0.000	0.73		549.9	OK
S1.006	SS5		3.198	-0.373	0.000	0.58		549.9	OK
S1.007	SCHANNEL		3.189	-0.364	0.000	0.42		549.9	OK
S1.008	SS6		3.138	0.000	0.000	0.88		588.1	OK
S1.009	SS7		3.048	0.000	0.000	1.34		588.3	OK
S4.000	SEX		1.837	0.134	0.000	1.46		480.0	SURCHARGED
S1.010	SS8		1.022	-0.428	0.000	0.62		1068.3	OK

PN	US/MH Name	Level Exceeded
S1.000	SS1	14
S1.001	SS2	
S1.002	SS2.1	
S2.000	SS10	
S1.003	SS3	
S1.004	SS3.1	
S3.000	SS11	
S1.005	SS4	
S1.006	SS5	
S1.007	SCHANNEL	
S1.008	SS6	
S1.009	SS7	
S4.000	SEX	
S1.010	SS8	

1000 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	12
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.282
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.400	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100, 200, 1000
Climate Change (%)	30, 30, 30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SS1	120 Winter	1000	+30%	1/360 Winter	1000/30 Winter	
S1.001	SS2	60 Winter	1000	+30%	1/15 Summer		
S1.002	SS2.1	120 Winter	1000	+30%	1/15 Summer		
S2.000	SS10	960 Winter	1000	+30%	1/15 Summer		
S1.003	SS3	120 Winter	1000	+30%			
S1.004	SS3.1	120 Winter	1000	+30%			
S3.000	SS11	960 Winter	1000	+30%	1/15 Summer		
S1.005	SS4	120 Winter	1000	+30%			
S1.006	SS5	120 Winter	1000	+30%			
S1.007	SCHANNEL	120 Winter	1000	+30%			
S1.008	SS6	120 Winter	1000	+30%	1000/120 Winter		
S1.009	SS7	120 Winter	1000	+30%			
S4.000	SEX	180 Winter	1000	+30%	1/15 Summer		
S1.010	SS8	120 Winter	1000	+30%			

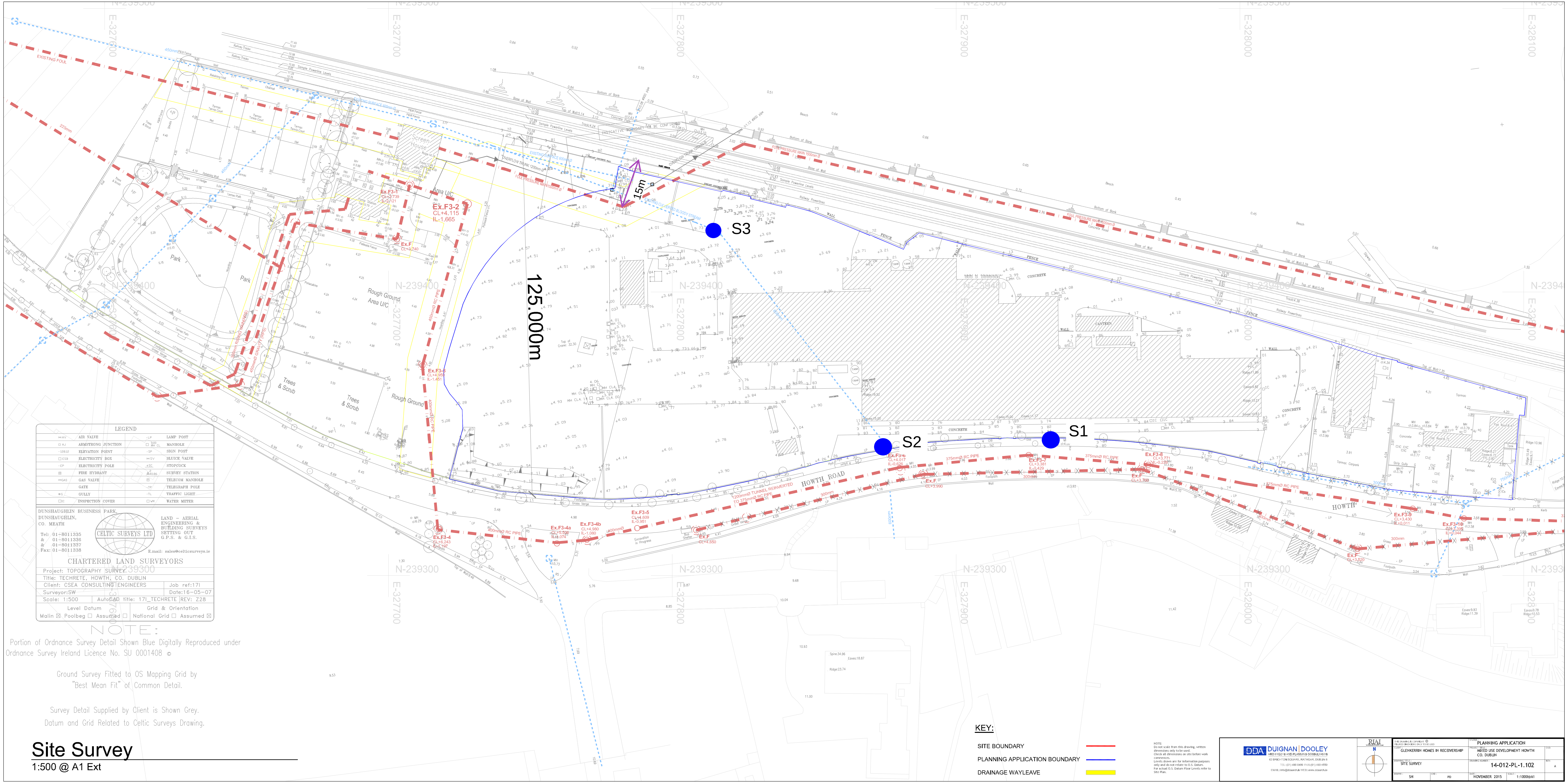
1000 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SS1		4.042	0.817	42.340	1.28		38.7	FLOOD
S1.001	SS2		3.845	0.770	0.000	1.54		47.0	FLOOD RISK
S1.002	SS2.1		3.583	0.631	0.000	2.03		59.9	SURCHARGED
S2.000	SS10		3.281	0.131	0.000	0.86		120.3	SURCHARGED
S1.003	SS3		3.268	-0.197	0.000	0.29		205.6	OK
S1.004	SS3.1		3.250	-0.152	0.000	0.32		237.2	OK
S3.000	SS11		3.646	0.046	0.000	1.33		360.1	SURCHARGED
S1.005	SS4		3.228	-0.372	0.000	0.79		596.1	OK
S1.006	SS5		3.209	-0.362	0.000	0.63		596.1	OK
S1.007	SCHANNEL		3.199	-0.354	0.000	0.46		597.3	OK
S1.008	SS6		3.140	0.002	0.000	1.01		675.3	SURCHARGED
S1.009	SS7		3.048	0.000	0.000	1.54		675.2	OK
S4.000	SEX		1.837	0.134	0.000	1.46		480.0	SURCHARGED
S1.010	SS8		1.051	-0.399	0.000	0.67		1155.1	OK

PN	US/MH Name	Level Exceeded
S1.000	SS1	14
S1.001	SS2	
S1.002	SS2.1	
S2.000	SS10	
S1.003	SS3	
S1.004	SS3.1	
S3.000	SS11	
S1.005	SS4	
S1.006	SS5	
S1.007	SCHANNEL	
S1.008	SS6	
S1.009	SS7	
S4.000	SEX	
S1.010	SS8	

APPENDIX IV

Existing Survey



S1
S2
S3
15m
125.000m
HOWTH ROAD
LEGEND
AV AIR VALVE
AJ ARMSTRONG JUNCTION
128.12 ELEVATION POINT
ESB ELECTRICITY BOX
EP ELECTRICITY POLE
FIRE HYDRANT
GAS GAS VALVE
GATE
G GULLY
IC INSPECTION COVER
LP LAMP POST
MH CL MANHOLE
SP SIGN POST
SV SLUICE VALVE
SC STOPCOCK
SURVEY STATION
TELECOM MANHOLE
TP TELEGRAPH POLE
TL TRAFFIC LIGHT
WM WATER METER
DUNSHAUGHLIN BUSINESS PARK, DUNSHAUGHLIN, CO. MEATH
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CHARTERED LAND SURVEYORS
Project: TOPOGRAPHY SURVEY
Title: TECHRETE, HOWTH, CO. DUBLIN
Client: CSEA CONSULTING ENGINEERS
Job ref:17I
Surveyor:SW
Date:16-05-07
Scale: 1:500
AutoCAD title: 17I_TECHRETE
REV: Z28
Level Datum: Malin ☒ Poolbeg ☐ Assumed ☐
Grid & Orientation: National Grid ☐ Assumed ☒
NOTE:
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Ground Survey Fitted to OS Mapping Grid by "Best Mean Fit" of Common Detail.
Survey Detail Supplied by Client is Shown Grey. Datum and Grid Related to Celtic Surveys Drawing.
Site Survey
1:500 @ A1 Ext
KEY:
SITE BOUNDARY
PLANNING APPLICATION BOUNDARY
DRAINAGE WAYLEAVE
NOTE:
Do not scale from this drawing, written dimensions only to be used.
Check all dimensions on site before work commences.
Levels shown are for information purposes only and do not relate to O.S. Datum.
For actual O.S. Datum Floor Levels refer to Site Plan.
DDA DUIGNAN | DOOLEY
ARCHITECTS AND PLANNING CONSULTANTS
62 BRIGHTON SQUARE, RATHGAR, DUBLIN 6
TEL: (01) 490 0499 FAX:(01) 490 4550
EMAIL: info@ddaarch.ie WEB: www.ddaarch.ie
RIAI
N
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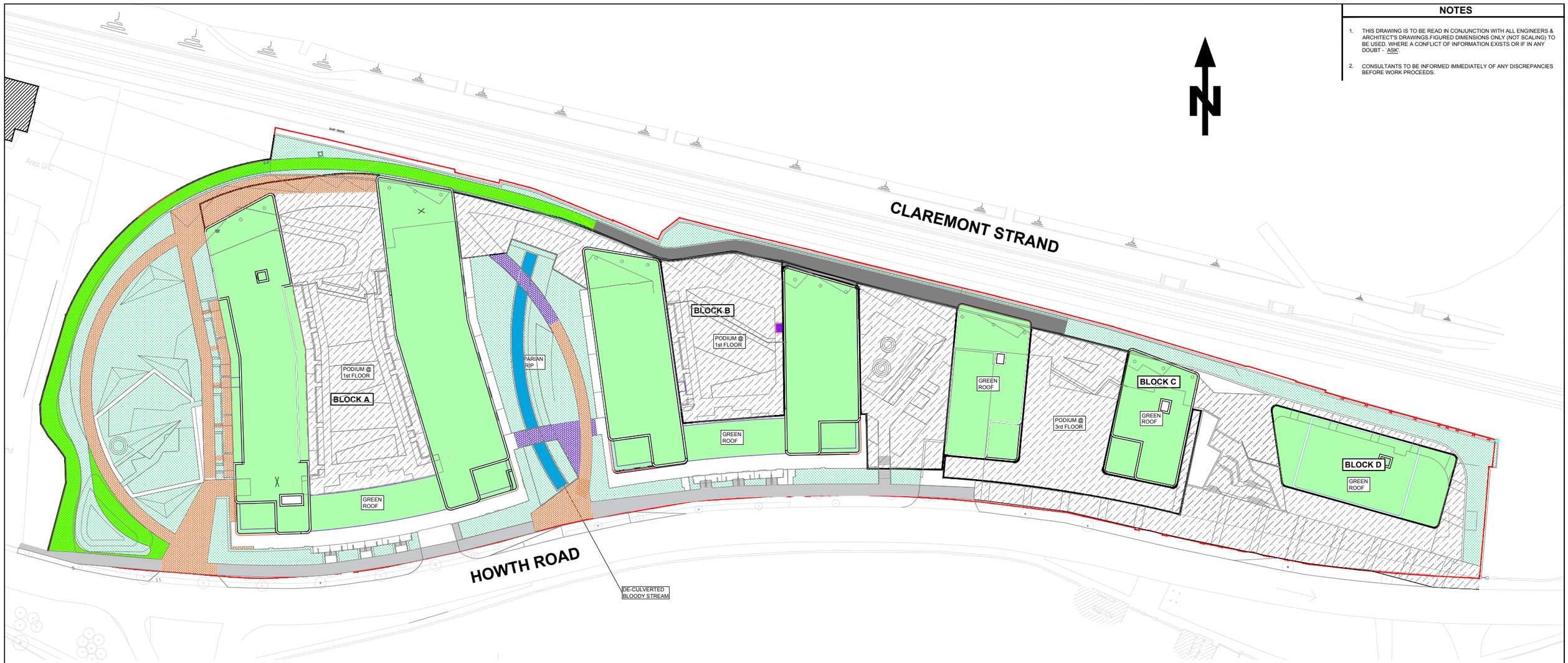
FIGURED DIMENSIONS ONLY TO BE USED
STATUS: PLANNING APPLICATION
CLIENT: GLENKERRIN HOMES IN RECEIVERSHIP
PROJECT TITLE: MIXED USE DEVELOPMENT HOWTH CO. DUBLIN
DRAWING TITLE: SITE SURVEY
DRAWING NUMBER: 14-012-PL-1.102
REV: A
DRAWN: SH
CKD: PD
DATE: NOVEMBER 2015
SCALE: 1:1000@A1

APPENDIX V

SuDS

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS & ARCHITECTS DRAWINGS.FIGURED DIMENSIONS ONLY (NOT SCALING) TO BE USED. WHERE A CONFLICT OF INFORMATION EXISTS OR IF IN ANY DOUBT - 'ASK'.
2. CONSULTANTS TO BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BEFORE WORK PROCEEDS.



PROPOSED SUDS STRATEGY

SCALE @ A1: 1:500
SCALE @ A3: 1:1000

LEGEND

- EXTENSIVE GREEN ROOF REFER TO DETAIL 'B' DRG C1205
- INTENSIVE GREEN ROOF / PODIUM REFER TO DETAIL 'C' DRG C1205
- INTENSIVE GREEN ROOF / PODIUM (LOWER LEVEL)
- PERMEABLE PAVING REFER TO DETAIL 'A' DRG C1205
- IMPERMEABLE PAVING
- PAVING - IMPERMEABLE
- GRASS CRETE
- GRASS

NOTE:
ALL ROOFS TO BE A COMBINATION OF INTENSIVE & EXTENSIVE GREEN ROOF. FOR PODIUM DETAILS REFER TOP LANDSCAPE ARCHITECTS DETAILS ULU314-AL-P1-GE-3-101

ISSUE	DATE	DESCRIPTION	DRN. / ORIG	P.E. / P.D.
PL5	26.11.19	ISSUED FOR PLANNING	MR / MR	VB / VB
P3	10.10.19	ISSUED FOR INFORMATION	MR / MR	VB / VB
PL4	06.06.19	ISSUED FOR PLANNING	MR / MR	VB / VB
P2	29.05.19	ISSUED FOR COMMENT	MR / MR	VB / VB
PL3	18.04.19	ISSUED FOR PLANNING	MR / MR	VB / VB
PL2	03.04.19	ISSUED FOR PLANNING	MR / MR	VB / VB
PL1	20.03.19	ISSUED FOR PLANNING	MR / MR	VB / VB
P1	08.03.19	ISSUED FOR COMMENT	MR / MR	VB / VB

DRAWING STAGE
PLANNING

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CLIENT
ATLAS GP LTD

PROJECT TITLE
CLAREMONT PROJECT

BM PROJECT No.
18386

MODEL REFERENCE

MODEL REV.

SUITABILITY

DRAWING TITLE
PROPOSED SUDS STRATEGY

DRAWING No.
PPT-BMD-XX-ZZ-DR-C-1004

ISSUE
PL5

APPENDIX VI

DEMURS

Design Manual for Urban Roads and Streets (DMURS)

Design Principles	*Provisions*	*Statement of Consistency*
Integrated Street Networks	• Does the development create connected centres that prioritise pedestrian movement and access to public transport?	Presently, there are well-established footpaths linking Claremont Development to the centre of Howth Village. ✓ Pedestrians making the journey to the site will generally be comfortable doing so provided the journey time does not exceed 30 minutes (approximate distance 3 km). Walking becomes highly desirable if the journey time does not exceed 15 minutes (approximate distance 1.5km). ✓ Residents can walk into Howth village in less than a 15 minute walk. ✓ Local amenities are available within c 10-15 minute walk-time of the subject site. ✓ Public transport links (DART and Bus) are available within 10 minutes' walk and less of the candidate site.
Movement and Place	• Does the development create a legible street hierarchy that is appropriate to its context? • Are the proposed streets connected, maximising the number of walkways & cycle routes between streets as well as specific destination (i.e. community centre, shops, creche, schools etc.)?	✓ The design incorporates a permeable and legible street network that offers route choice and flexibility for managing movement within it. ✓ There is a fully integrated pedestrian network with all the main landscape spaces connected to a universally accessible route. ✓ In line with best practice the design incorporates an orthogonal street layout thus promoting legibility as well as connectivity. ✓ The proposed network is structured and will draw future occupants toward focal points including the communal open space and riparian strip. ✓ A perimeter sea walkway is incorporated into the design. ✓ A designated cycle/pedestrian ramp is provided to both lower ground car parks.
Permeability and Legibility	• Has the street layout been well considered to maximise permeability for pedestrians and cyclists?	A podium is provided at 1st floor level, between the blocks. This hides the parking facilities at ground floor. It will be landscaped to provide walkways and cycle routes that

Design Manual for Urban Roads and Streets (DMURS)

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Permeability and Legibility	• Has the street layout been well considered to maximise permeability for pedestrians and cyclists?	A podium is provided at 1st floor level, between the blocks. This hides the parking facilities at ground floor. It will be landscaped to provide walkways and cycle routes that

	• Are the streets legible with maximum connection opportunities? • Are blocks of a reasonable size and permeability, with consideration to the site constraints?	overlook the sea. There will be no vehicles at this level. ✓ A high degree of pedestrian permeability throughout the site is created by providing footways that connect the spaces between each block. ✓ Additionally, the cycle route will link up with the Howth cycle route entering Howth village.
Management	• Is the layout designed to self-regulate vehicle speeds and traffic congestion? • Does the proposed layout minimise noise / air pollution wherever possible?	The parking for the development is split between basement and lower ground . Access to most of the units is at podium level, the remainder is from Howth Road. By assigning the car parking to these locations, pedestrian movement is prioritised at 1st floor/ podium level. ✓ Gradients proposed minimise the need for revving of engines and associated noise and emissions, while the road surface will absorb sound. ✓ Pedestrian priority will be provided at all internal junctions in the form of raised entry treatments which also serve as a traffic calming measure. ✓ A designated pedestrian/cycle path is provided from Howth road to the lower ground parking. ✓ The location of the site will promote the use of public transport thus contributing to reduced air emissions.
Movement, Place and Speed	• Does the proposed development balance speed management with the values of place and reasonable expectations of appropriate speed? • Does the design promote a reasonable balance of both physical and psychological measures to regulate speed?	See previous section. ✓ High levels of pedestrian movement are catered for which supports vibrant and sustainable places. The segregation and exclusion of vehicular traffic within the development also supports the sense of place. ✓ Both car parks are directly off Howth road. Drivers are instantly diverted into a one-way system around each car park. At no point is there a long stretch that may encourage speeding. The maintenance road at the back of the development will be inaccessible to the public, therefore

		removing any routes that would encourage speeding. ✓ Numerous Pedestrian crossing will be provided along with relative signage. ✓ Speed reducing measures to be provided in the form of bumps and signage on entering both car parks.
Streetscape	• Does the scheme create an appropriate sense of enclosure in addition to a strong urban / suburban structure? • Have street trees and areas of planting been provided where appropriate? • Have active street edges been provided where appropriate? • Is a palette of high quality surface materials and finishes provided?	✓ The scheme is developed to hide the lower ground carpark with 1st floor landscaped podiums. The podiums will span the breath of the car parks and link up with Baltray Park. ✓ The Bloody Stream is currently culverted under the site. A riparian strip is to be created and the bloody stream will be opened to flow across the site. In the event of a blockage in the riparian strip, an overflow system is provide to avoid outfall onto Howth Road. ✓ Street trees are proposed to provide a visual structure to the shared surface street on Howth Road. ✓ Throughout the rest of the scheme a comprehensive planting scheme including trees, shrubs and groundcover is proposed to create a comfortable and attractive urban environment. ✓ It is proposed that the shared surfaces and the general circulation paths will be coloured bitmac. Entrance areas, nodes and seating areas will be paved with stone or concrete slabs. All other areas would be paved/exposed aggregate concrete to create a public realm of a high visual quality.
Pedestrian and Cyclist Environment	• Are footways of appropriate width provided so as to ensure pedestrian safety? • Are verges provided adjacent to larger roadways so as to provide a buffer between vehicular routes and pedestrian paths? • Have pedestrian crossings, whether controlled or uncontrolled, been provided at appropriate locations?	✓ Excluding carparking areas, footpaths in the remainder of the development will be a minimum 2m which exceeds the minimum footway width of 1.8m outlined in Section 4.3.1 of DMURS. ✓ Pedestrian access to the development will be separate to vehicular traffic. The pedestrians will access the development via footways through the landscaped gardens and riparian strip. In the car

	• Are shared surfaces located appropriately in areas where an extension of the pedestrian domain is required? • Have cycle facilities been factored into the design?	park, pedestrian access will be via designated walkways. ✓ The podium level is a car free zone. ✓ Pedestrian priority will be provided by pedestrian crossings on entering the site which will serve as a traffic calming measure. ✓ Designated walkways will be provided in the ground floor carparks. They will be 1.2m wide, flush with the road and clearly displayed using coloured bitmac. ✓ A shared surface/home zone area is appropriately located in the basement ✓ Secure covered resident cycle parking is provided at ground floor level.
Carriageway Conditions	✓ Are vehicular carriageways sized appropriately for their function / location? ✓ Are surface materials appropriate to their application in order to inform drivers of the expected driving conditions? ✓ Are junctions designed to balance traffic concerns with the needs of pedestrians / cyclists? ✓ Have adequate parking / loading areas been provided?	✓ The carparks operate as a one-way system. The total width is 6 meters which includes pedestrian walkways on either side. This is in compliance with Section 4.4.9 of DMURS which is appropriate for Local Street parking. ✓ On entering the development the carriage way is 6.4m. The two-way system is only at the entry points to the car parks and will not encourage speeding due to the shortness of the road. ✓ The road carriageway will be surfaced in Stone Mastic Asphalt demonstrating a clear and obvious vehicular route into the development which will contrast visually with the finishes on pedestrian footways. ✓ Junctions have been designed to minimise corner radii in line with Section 4.3.3 of DMURS. A corner radius of 6.5m has been selected as appropriate for the junctions off Howth Road, while internal junction corner radii will be minimised further while still achieving the required dimensions to facilitate the swept path of vehicles. Pedestrian priority will be provided at all internal junctions in the form of

		raised entry treatments which also serve as a traffic calming measure. ✓ A total of 439 No. parking spaces are proposed. The parking is split between basement and lower ground level. ✓ A staging area for refuse collection will be provided in the delivery zone. Waste bins will be collected from the basement and both lower ground floor carparks via an internal vehicle and transported to the delivery zone, where there will be a collection space. The collection vehicle will enter via the delivery goods entrance and set-down and handle the communal waste before exiting via the same entrance.

SAFETY AUDIT FORM – FEEDBACK ON AUDIT REPORT

Scheme: Claremont (Project Pier), Howth.

Stage: 1 Road Safety Audit

Date Audit (Site visit) Completed: 9th April 2019

Paragraph No. in Safety Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Alternative measures (describe)	Alternative measures accepted by Auditors (Yes/No)
3.1	Yes	Yes	Drawing re-issued showing reduce road turn.	
3.2	Yes & No	Yes & No	Block A we have added a pedestrian crossing. However, in Block B this is not required as access to the building is to the South, pedestrian have no reason to cross between cars	Yes
3.3	Yes	Yes	Drawing re-issued showing removable bollards	
3.4	Yes	Yes	Separate drawing issued showing fire access route lighting addressed.	
3.5	Yes	Yes	Boundary wall to be 2.4m as per CIE's requirements	
3.6	Yes	Yes	Discussions to be held with the street lighting section of the council to review the Impacts of the development on the road lighting adjacent to the development.	
3.7	Yes	Yes	This was a drafting error, there is no road furniture here. However, the pedestrian crossing has been moved to start of the disability spaces.	
3.8	Yes	Yes	Drawing re-issued showing footpath	
3.9	Yes	Yes	Drawing re-issued showing recessed bus stop and bus shelter	
3.10	Yes	Yes	Within the road verge, grass is proposed with no shrubs that	

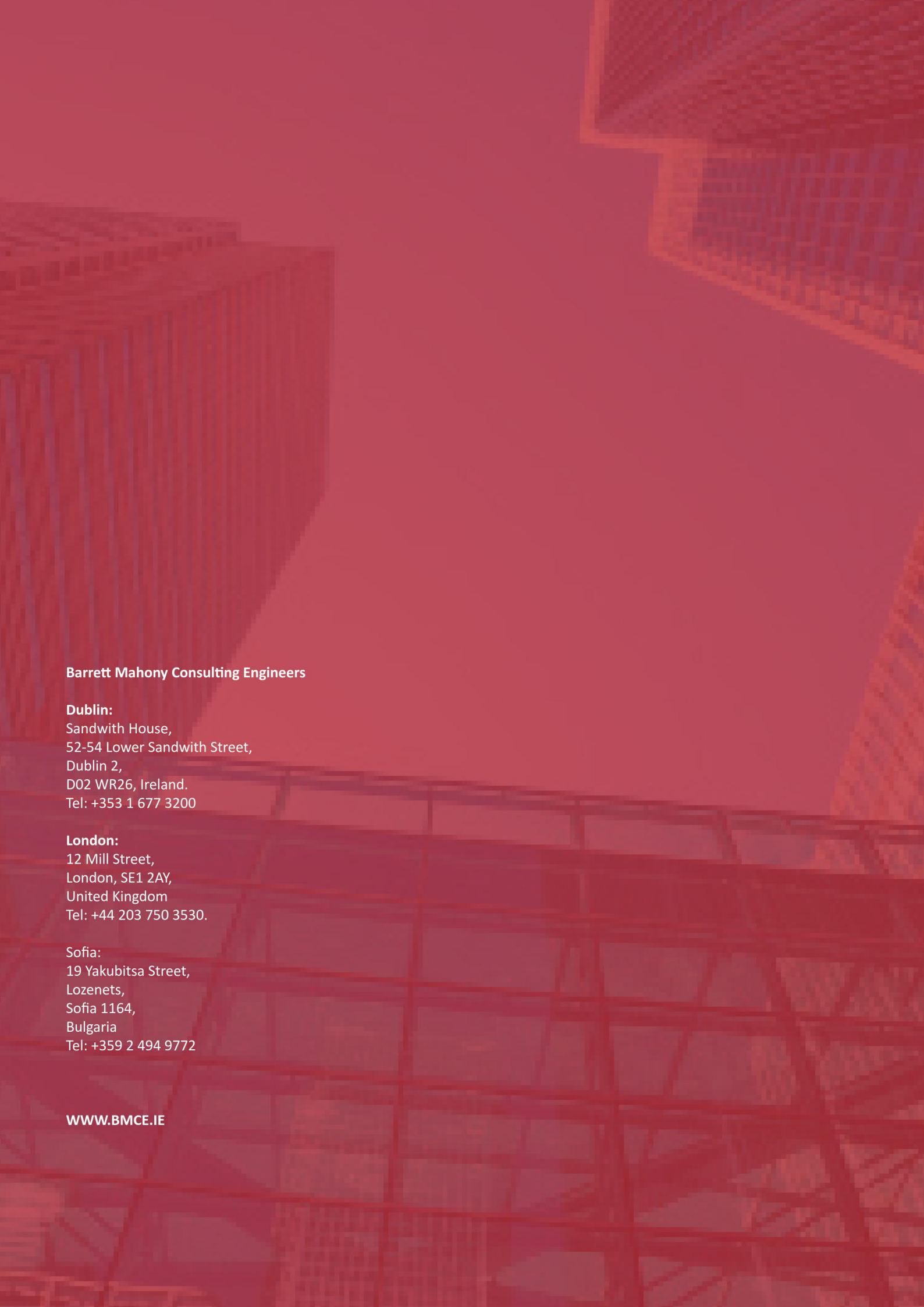
Paragraph No. in Safety Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Alternative measures (describe)	Alternative measures accepted by Auditors (Yes/No)
			would otherwise compromise visibility. The Trees that are proposed, will be planted as semi-mature specimens, with a clear stem extending to 2m in height (i.e. the canopy/leaves start 2m above the ground). The trees are at 10m spacing, set back (to the centre of the tree) from the face of the kerb by 1.5m and therefore on the basis of not compromising visibility, nor will they represent a risk to pedestrians or motorists. The proposed trees are Acer platanoides, which are a good, robust street tree. They will need to be the subject of ongoing inspection/maintenance as is the case for all trees in public environments.	

Signed Margaret Cotch Date 15/4/2019
Design Team Leader

Signed Norman Boulton Date: ...15/4/2019.....
Audit Team Leader

Signed.....
Employer MMRC Property Group

Date: 16/4/19



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