Waterman Moylan
Engineering Consultants

Engineering Assessment Report

Proposed Residential Development Site at Brewery Road, Stillorgan

August 2019

Waterman Moylan Consulting Engineers Limited
Block S, EastPoint Business Park, Alfie Byrne Road, Dublin 3
www.watermangroup.com

Waterman Moylan
Engineering Consultants

Client Name:	KW PRS ICAV acting for an on behalf of its sub-fund KW PRS Fund 10
Document Reference:	18-093r.002
Project Number:	18-093

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
No. 1	Aug 2019	E. Caulwell	J Gibbons	J Gibbons

Comments

Disclaimer

Content

Appendices

A. Site Investigation Borehole Logs and Water level logs

B. Greenfield Calculations

C. Attenuation Calculations – Main Apartment Block

D. Attenuation Calculations – Cascade of features discharging to Block N

E. Surface Water Network Calculations – Main Apartment Block

F. Foul Water Network Long Sections

G. Irish Water Confirmation of Feasibility

H. Irish Water Statement of Design Acceptance

1. Introduction

Waterman Moylan have been appointed by KW PRS ICAV acting for an on behalf of its sub-fund KW PRS Fund 10 to provide Engineering services on the development of the lands to the north of The Grange Development on Stillorgan Road (N11) Co. Dublin. This report has been prepared as part of a planning submission to Dun Laoghaire-Rathdown County Council, for the proposed development of 287 No. residential units and a new Crèche to accommodate 23 staff and 115 children at The Grange, Brewery Road, Stillorgan.

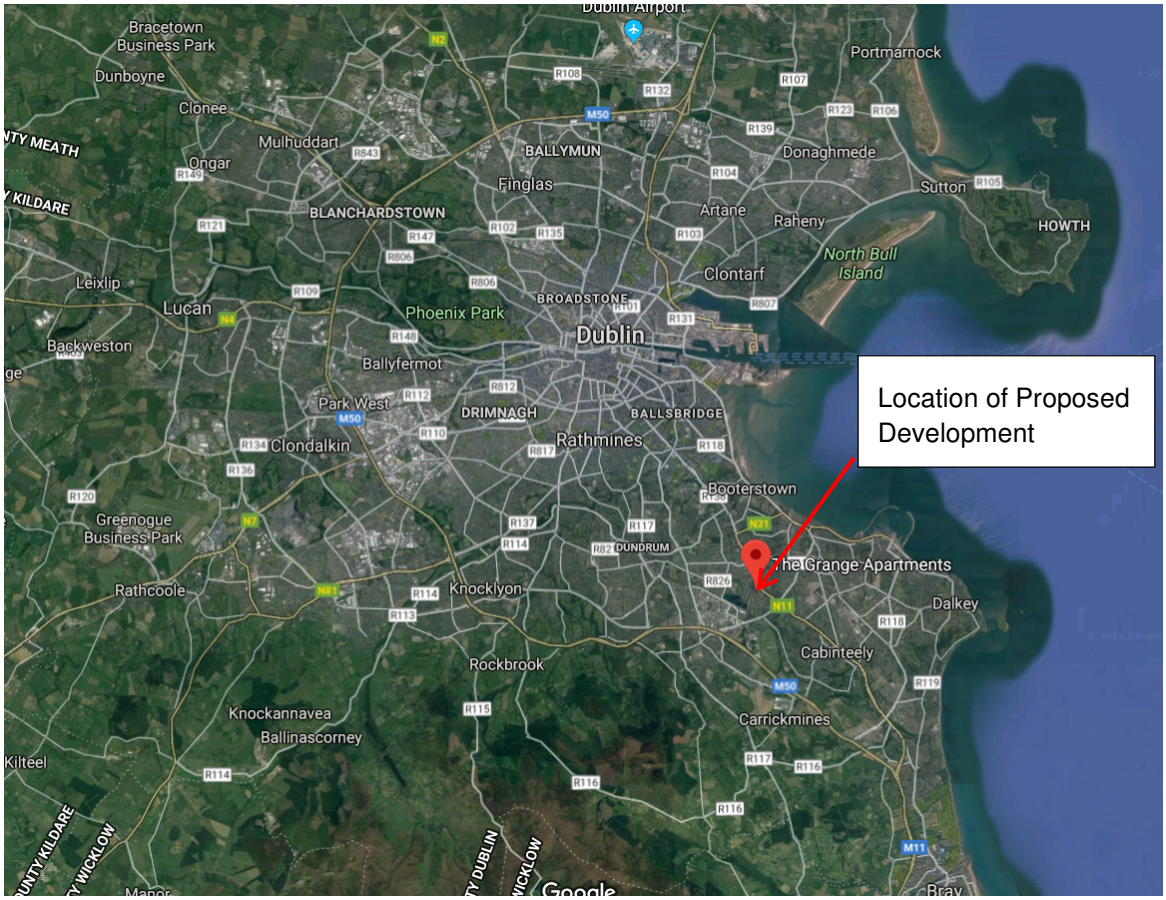
This report describes the criteria used to design the storm water discharge, disposal of foul water, water supply and vehicular access to the developed site.

2. Site Description

2.1 Site Location

The site is in Stillorgan, Co.Dublin. It is bounded to the north by Brewery Road, to the east by Stillorgan Road, to the southwest by the Leopardstown Tennis Club and to the southeast by existing residential developments. The proposed development is approximately 2.5km from the coastline at Blackrock. Refer to Figure 1 for the location of the proposed development.

Figure 1: Site Location (image taken from Google Earth)



2.2 Existing Development

The total site area is approximately 1.8 hectares and is currently 50% hardstanding. The site falls from south east to northwest ranging in level from 74.00m in the south east to 66.00m in the northwest. The Grange Marketing Suite, The Lodge (an existing 2-storey house south of the main entrance), Oaktree Business Centre and the now redundant site set up for the neighbouring development currently occupy the site. There are also a number of well-established trees and foliage on site.

2.3 Proposed Development

It is proposed to construct 287 No. residential units with the associated tenant amenities over a double level basement carpark. The proposals also include the construction of a new Crèche to accommodate 23 staff and 115 children on site. The developer will construct all associated infrastructure to service the development including a network of foul water and surface water drains, watermain and a realigned access road and footpaths.

The existing road levels around the site range from 66.01m – 74.00m OD. The ground floor of the proposed building steps across the site to mimic the existing levels on site as much as reasonably practicable. The lowest Ground Floor level is immediately adjacent to Brewery Road and is at a level of 66.00m OD.

The site's main vehicular access will be provided from Brewery Road. The existing access onto Brewery Road will be modified to improve the junction layout and forward visibility. The majority of the carparking onsite will be accessed from a ramp off the main site access road. There is a total of 84 No. parking spaces proposed at basement level and 8 surface level parking spaces, 596 No. bicycle parking spaces and 5 No. Motorcycle spaces are also provided. Pedestrian access will be provided along the building elevation facing onto Brewery Road and from the footway provided on both sides of the vehicular entrance road. Pedestrian access will also be provided to basement level via a pedestrian access ramp next to the vehicular access.

3. Foul Water Drainage

3.1 Receiving Environment

There is an existing 225mm diameter foul sewer on Brewery Road to the northwest of the subject site which drains the residential properties on this road. There is also an existing private foul sewer within the site which serves the existing Grange development to the south of the proposed development.

The proposed development can drain all foul drainage on site to the existing on-site private drainage system, which eventually drains to the public foul sewer, or directly to the public foul sewer in Brewery Road by gravity.

A Pre-Connection Enquiry form was submitted to Irish Water on 09th of September 2018 which outlined the foul water discharge proposal. A response was received on 31st January 2019 stating that a connection to the foul water sewer is feasible without an upgrade meaning the existing network has sufficient capacity to drain the proposed development.

The proposed development will consist of 287 residential units and a new Crèche to accommodate 23 staff and 115 children. Based on Irish Waters Code of Practice, the peak foul flow from the proposed development will be as follows:

Table 1: Calculation of proposed Foul Water Flow

Description	No. of Units	Flow l/h/day	Population per Unit	Infiltration Factor	Total Discharge (l/d)
Residential Units	287	150	2.7	1.1	127,858.5
Crèche	1	50	138	1.1	7,590
				Totals	***135,448.5 l/d***

Calculation of Proposed Peak Foul Flow		
Total Daily Discharge *(from Table 1.)*	135,449	l/d
Dry Weather Flow (DWF)	1.57	l/s
Peak Foul Flow (=6 x DWF)	***9.41***	***l/s***

Waterman Moylan Drawing No's 18-093-P200, P201 and P202 illustrate the proposed layout for the foul water sewer outfall for the subject site. The proposed foul water outfall from the development is a 225mm diameter pipe laid at a minimum gradient of 1:200, giving a minimum capacity of 32 l/s. Therefore, the proposed outfall has adequate capacity to cater for the flows from the development.

The Stillorgan Catchment area is part of the Dun Laoghaire West Pier Drainage Areas, located approximately 10 kilometres south-east of Dublin City Centre. The Dun Laoghaire West Pier Drainage Areas comprises circa 2,300ha of urban and suburban area including Blackrock, Monsktown, Stillorgan, Sandyford, Dun Laoghaire, Glasthule, Dalkey and Sallynoggin. The drainage system discharges by gravity and pumped systems to the West Pier Pumping Station, Monkstown. Flows arriving at the West Pier Pumping Station are pumped across Dublin Bay for treatment at Dublin City Council's Waste Water Treatment Plant at Ringsend.

Irish Water commenced work on an €80 million, 400,000 population equivalent upgrade to the Ringsend Wastewater Treatment Plant in February 2018. Ringsend is the largest wastewater treatment plant in Ireland and was built to treat the wastewater for the equivalent of 1.64 million people. Currently the plant services over 40% of the national population and is treating wastewater for the equivalent of 1.9 million people.

This upgrade will take approximately two years to construct and will accommodate the current demand, support planned housing in the Dublin Region and will improve the quality of the treated wastewater discharged to the Liffey estuary.

This capacity upgrade is one part of an overall investment of €400 million by Irish Water in the Ringsend Wastewater Treatment Plant Upgrade Project. The overall upgrade project will enable full treatment of wastewater for the equivalent of 2.04 million people, meeting all foreseeable development needs to at least 2025. In December 2017, Irish Water awarded the Capacity Upgrade Contract to Veolia Water Ireland Ltd & PJ Hegarty & Sons DC Joint Venture for the construction of this phase of the upgrade.

3.2 Network Design

Drains will generally consist of Ductile Iron pipework fixed to the underside of the ground floor slab. Drains in other areas, i.e outside or under the basement, will be uPVC to Irish Water specification or concrete socket and spigot pipes (to IS 6).

Drains will be laid to comply with the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Foul water sewers outside the basement will consist of uPVC or concrete socket and spigot pipes (to IS 6) and will be laid strictly in accordance with Irish Waters code of practice for Wastewater Infrastructure and Dun-Laoghaire Rathdown County Council requirements for taking in charge.

All manholes will be constructed in block work or cast in-situ concrete. Construction details for the proposed drainage systems are included in the accompanying planning submission drawings.

4. Surface Water Drainage

4.1 Introduction

The following section deals with surface water drainage design including details of the SUDS measures proposed as part of the development. It also aims to address the comments received from DLRCC/An Bord Pleanala during the pre-application process with An Bord Pleanala. A detailed response to each item raised has been included, under a separate cover, in the Planning Consultants report.

The existing site drains surface water, unrestricted, to an existing 1500mm dia. surface water sewer which runs along Brewery Road. It is proposed that the development will attenuate the surface water on site before discharging it, at a restricted rate, via two outfalls, to the existing surface water public sewer on Brewery Road.

The existing run-off rate was estimated for the 1 in 1, 1 in 30 and 1 in 100 year return periods using the modified rational method:

Q = 2.78 x A x i (where A is the catchment area in Hectares and i is the rainfall intensity in mm/hr as estimated for the 60min storm from WinDes using Met Eireann Data.)

A = 8794m2 = 0.879ha (current hard standing as measured from topographical survey)

i – 1 year return period = 12.163mm/h

30 year return period = 26.39mm/h

100 year return period = 34.237mm/h

Table 2: Existing Run-off Rates

Rainfall Event	Existing development run-off (l/sec)
Q1	2.78 x 0.879 x 12.163= **29.72**
Q30	2.78 x 0.879 x 26.39= **64.49**
Q100	2.78 x 0.879 x 34.237 = **83.66**

4.2 Site Characteristics

The following parameters have been used in greenfield run-off rate calculations which can been seen in Appendix A.

Table 3: Surface Water Catchment Details

	Catchment
Site Area (Catchment) *1 – Ha	1.80
SAAR - mm*2	835
SOIL Index*3	0.37
Climate Change	20%

*1 – The total site area within the application red line boundary.

*2 – From MetEireann data.

*3 – The soil type map of Ireland indicated Soil Type 1 however the SI would suggest this is not correct for this particular site with soil conditions being an overburden, generally of made ground or cobbles and Granite Rock present at a depth of between 0.8m and 2.6m below ground level which are more in line with those expected for Soil Type 3. Therefore 0.37 is used as the Soil Index for this site. In addition, there is a natural average slope of c. 1:30 across the site which will increase the rate of run-off from site, even in its greenfield state.

4.3 Greenfield run-off rates

The Local Authority requirements are that post-development run-off rates are limited to greenfield run-off rates for the site. The greenfield run-off rates for the site have been calculated in accordance with the Institute of Hydrology report No 124 “Flood Estimation for Small Catchments”, using the UK SUDS Website. As outlined above, the Site Investigation suggest a Soil Type 3 and therefore, a Soil Index of 0.37 was used in our drainage design calculations. The Site Investigation borehole logs can be found in Appendix A. The Greenfield run-off for the whole site is 6.36 l/s (Qbar).

It is proposed to limit the discharge from site to 6.36 l/s. This has been agreed with Johanne Codd of DLRCC and will be split across two outfalls. A Hydrobreak will be installed on both outfalls. This will greatly reduce the run-off from site when compared to the existing run-off as calculated in Table 2 above, reducing the impact of the development on the surrounding environment and reducing the risk of the public surface water sewer surcharging during high storm events.

4.4 SUDS Assessment

In accordance with the Dun-Laoghaire Rathdown County Council, Greater Dublin Strategic Drainage Study (GDSDS) guidelines and CIRIA documents, surface water run-off should be managed as close to its source as possible, with the re-use of rainwater within the building prioritised. Sustainable Urban Drainage systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban storm water drainage practice that typically consisted of piping run-off of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as sustainable urban drainage systems; they are typically made up of one or more structures built to manage surface water run-off.

The following drainage hierarchy was used to determine the most suitable and sustainable SUDS strategy. This is in accordance with the GDSDS initiative that all new developments will conform to Best Management Practices for urban storm water drainage.

1. The use of green roofs;
2. Store rainwater for later use;
3. Use infiltration techniques, such as porous surfaces in non-clay areas;
4. Attenuate rainwater in ponds or open water features for gradual release;
5. Attenuate rainwater by storing in tanks or sealed water features for gradual release;
6. Discharge rainwater direct to a watercourse;
7. Discharge rainwater to a surface water sewer/drain;
8. Discharge rainwater to the combined sewer.

Green Roofs

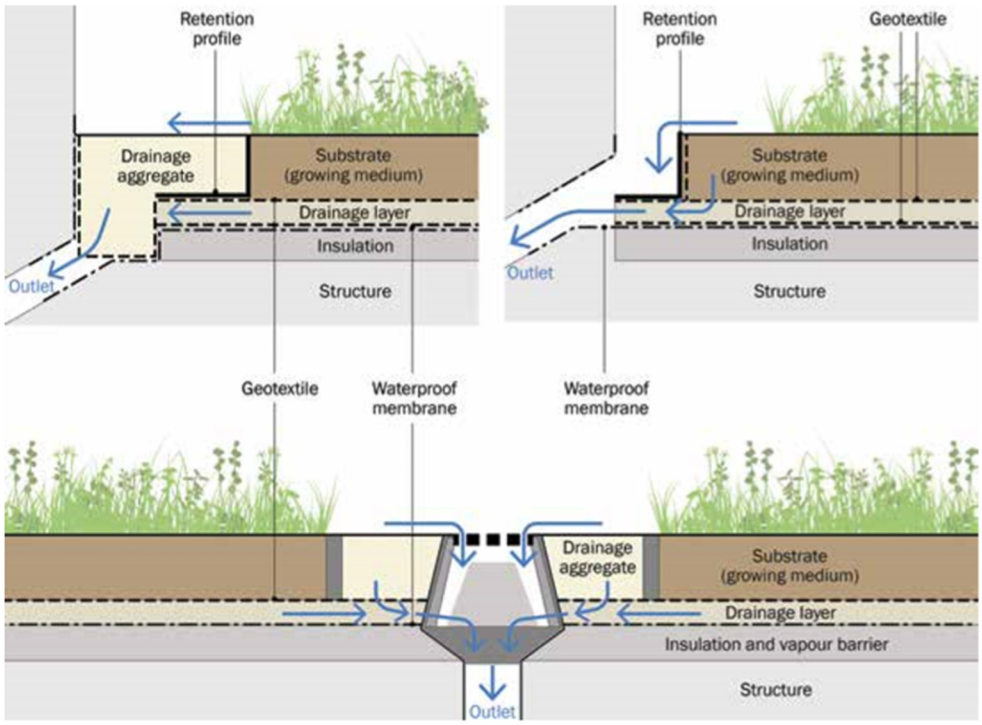
Green Roofs have been considered and incorporated into the development proposals in accordance with Appendix 16 of DLRCC County Development Plan. The locations of the green roofs are illustrated on the accompanying Waterman Moylan SUDS Drawing 18-093-P205. The total roof and podium area on site is 5447.2m^2 and the area of green roof provided is 3820m^2 providing a 70% coverage in green roof. This is in excess of the minimum requirement of 60% outlined in section 3.1 of DLRCC Green Roof guidance document.

As well as providing ecological benefits, green roofs contribute the following positive effects to surface water drainage design:

- The retention of water, through storage in the growing medium and evapotranspiration from the roof's plants and substrate, reducing run-off volumes and the burden on the drainage network.
- Due to the time for water to infiltrate and permeate the substrate, there is also a reduction in peak rates of run-off, helping to reduce the risk of flooding.
- They improve water quality through the filtration of pollutants during the process of water infiltration. This provides treatment in line with CIRIA SUDS Manual management train.

Although green roof space can reduce peak flow rates in the small storm events and aid in reducing the volume of run-off from the site, they operate as conventional roofs in higher storm events. Therefore, green roofs cannot be considered in the surface water drainage run-off calculations for the development. As stated in CIRIA C697 *"although green roofs absorb most of the rainfall that they receive during ordinary events, there is still the need to discharge excess water to the building's drainage system. This is because their hydraulic performance during extreme events tends to be fairly similar to standard roofs."*

Figure 2: Example Details of outlets from a green roof (CIRIA C697)



Rainwater storage for later use

Rainwater harvesting is often considered the most sustainable solution as it will reduce the total volume of water draining to the outfall as well as reducing the water demand for the proposed buildings. It must be assumed, however, that any water harvesting tanks are full prior to a storm event, and therefore cannot be considered as providing any rainwater attenuation.

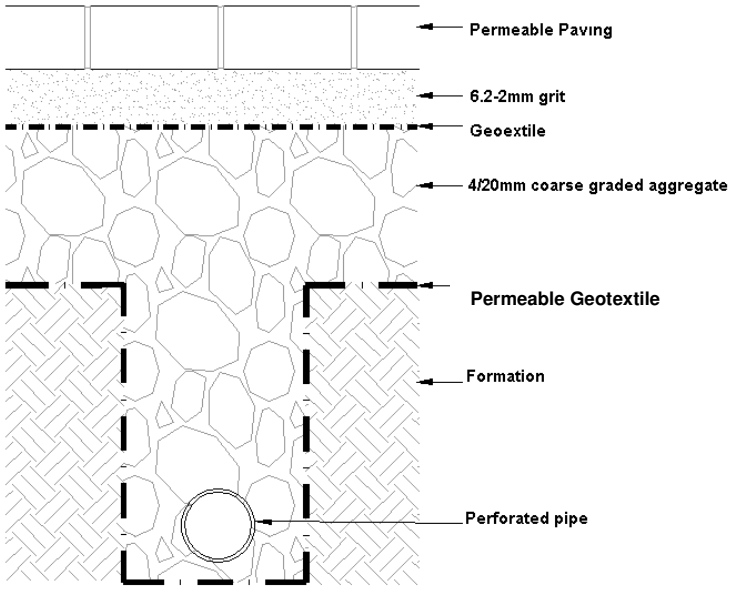
Drainage to ground and attenuation in open features

As the site is underlain by Granite, which is impermeable, infiltration techniques cannot be utilised on site. However, it is proposed to use both the treatment and storage properties of swales on site to improve the quality and reduce the volume of water to be discharged into the public surface water sewer.

In addition, permeable paving will be used both on the podium levels and for surface level carparking to provide interception treatment to surface water run-off. Permeable pavements are very effective at removing a wide range of pollutants from surface water runoff as they are either retained on the pavement surface or flushed into the granular subbase where they become trapped and are degraded over time.

In the carparking area, instead of infiltrating, the permeable paving sub-base will be used for attenuation purposes. It will include a perforated pipe to convey surface water via a swale next to the access road to the attenuation tank on front of Block N. The permeable paving build-up detail which will be used for the Crèche carpark is shown below in Figure 3.

Figure 3: Proposed residential area permeable paving build-up



Attenuate rainwater

It is proposed to provide attenuation in a concrete tank below the basement carpark for the apartment blocks to the north east of the access road and a portion of the access road and pavement. A modular attenuation tank will be provided to the south west of the access road on front of Block N to serve the Crèche, the realigned access road and Block N. A sketch outlining the areas discharging to each SUDS

feature accompanies the attenuation calculations provided in Appendix C. In addition, Waterman Moylan Drainage Drawings 18-093-P200, P201 and P202 outline the proposals in greater detail.

4.5 Proposed Surface Water Strategy

There is an existing 1500mm dia. surface water sewer located on Brewery Road. It is proposed that the surface water run-off from the development will drain via gravity to this sewer. As described in section 4.3, run-off will be restricted to 6.36 l/s greatly reducing the run-off rate from site. It will be necessary to treat and then store excess storm water within the site. This will be achieved by using a Sustainable drainage network of Green Roofs, Swales and Permeable Paving all discharging the treated water to underground storage tanks. Surface water run-off will be restricted by two separate hydrobrakes, which equate to a total outfall rate for the proposed development of 6.36 l/s. The storm water system will be designed to cater for the 1 in 100-year storm plus a 20% allowance for climate change.

The proposed sustainable urban drainage system will:

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

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

The calculations for the storage design are included in Appendix C. These indicate that for a return period of 100 years plus a 20% allowance for climate change, a storage volume of 396m^3 is required in the concrete tank within the basement carpark with a discharge rate of 2l/s. A attenuation tank with a volume of 175m^3 and a discharge rate of 4.3l/s is required to the western section of the site.

The surface water drainage design including the attenuation will cater for this development only. It is considered that any potential future development can be self-contained with its own attenuation and outfall to the existing public sewer on Brewery Road.

4.6 Interception Storage

Interception storage is defined in the SUDS Manual as *"the capture and retention on site of the first 5mm of the majority of rainfall events"*. In accordance with the table 24.6 of the SUDS Manual CIRIA C753 the following guidelines have been used in calculating the area of the site benefiting from interception storage;

Table 4: Interception Mechanisms (Table 24.6 The SUDS Manual)

Systems	Interception methods assumed compliant for zero runoff from the first 5mm of rainfall for 80% of events during the summer and 50% in winter.
Green Roofs	All surfaces that have green roofs
Permeable Paving	All permeable pavements, whether lined or not, can be assumed to comply, provided there is no extra area drained to the permeable pavement. Where the pavement also drains an adjacent impermeable area, compliance can be assumed for all soil types where the pavement is unlined, as long as the extra paved area is no greater than the permeable pavement area
Filter strips/Swales	Roads drained by filters strips/swales, where the longitudinal gradient of the vegetated area is less than 1:100, are suitable for Interception delivery for impermeable surface areas up to 5 times the base of the vegetated surface area receiving the runoff. Components steeper than 1 in 100 cannot be deemed to provide Interception unless additional effective Interception design can be demonstrated.

As described in section 4.4 and 4.5 the proposed development will provide, Green Roofs, Permeable Paving and Swales. In order to calculate the percentage area of site benefiting from each form of interception storage the site areas are described in Table 5 below and demonstrated on Waterman Moylan drawing 18-093-P205;

Table 5: Interception Storage Provided

Area	Total Hard standing Area	Interception mechanism	Interception Area	Percentage Benefiting
Block H	1576.1 m^2	Green Roof	1140 m^2	81 %
		Terrace area draining to gravel filter strip.	137 m^2	
Block J	1619 m^2	Green Roof	1276 m^2	91.9 %
		Terrace area draining to gravel filter strip.	212 m^2	
Block M	1383 m^2	Green Roof	978 m^2	88.2 %
		Terrace area draining to gravel filter strip.	233 m^2	
Block N	537 m^2	Green Roof	426 m^2	83.61 %
		Terrace area draining to gravel filter strip.	23m^2	
Creche	332.1 m^2	Terrace area draining to gravel filter strip.	223m^2	67 %
Hard Standing	547 m^2	Swale	65m^2	28 %
		Tree Pits	89.5m^2	
Total	**5994.2m^2**		**4802.5m^2**	**80.12%**

Note: As the measured water table is within 1m of the base of all SUDS features these features will be lined and therefore the interception area is calculated as the surface area, in line with the SUDS Manual.

The existing access road is being realigned as part of the proposed development and a number of swales and type tree pits will be installed along the length of the new access road to greatly improve the interception storage on this part of the site. In addition, the rainfall from this road will be attenuated as part of the development further reducing the impact of the site on the surrounding drainage network.

Within the basement carpark area, any rainwater entering the system as a result of snow melt or raindrops from cars will pass through a petrol interceptor providing treatment.

5. SUDS Maintenance

For the SUDS strategy to work as designed it is important that the entire drainage system is well maintained. It will be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, drain manholes (including catch pits) and attenuation tanks will ensure adequate performance. The recommended program is outlined in the tables below.

Table 6: Concrete Attenuation Tank Maintenance Schedule

SUDS Element	Maintenance		
Attenuation Tanks	Maintenance Issues	Failure of components, blockage from debris	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect and identify any elements that are not operating correctly. If required, take remedial action.	Monthly for three months, then annually
		Remove sediment/debris from catchment surface that may lead to blockage of structures.	Monthly or as required
		Remove sediment/debris from catch pits/ gullies and control structures.	Annually, after severe storms or as required
	Remedial Work	Repair inlets, outlets, vents, overflows and control structures.	As required
	Monitoring	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are in good condition and operating as designed.	Annually or after severe storms
		Survey inside of tank for sediment build-up and remove if necessary	Every five years or as required

Table 7: Permeable Paving Maintenance Schedule

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

Table 8: Green Roof Maintenance Schedule

SUDS Element	Maintenance		
Green Roof	Maintenance Issues	Vegetation becoming either overgrown or dying	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
		Inspect soil substrate for evidence of erosion channels and identify any sediment source	Annually and after severe storms
		Inspect drain inlets to ensure unrestricted run-off from the drainage layer to conveyance or roof drain system.	Annually and after severe storms
		Inspect underside of roof for evidence of leakage.	Annually and after severe storms
		Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.	Six monthly and annually or as required
		During establishment (i.e. year one), replace dead plants as required.	Monthly
		Post-establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
		Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate.	Six monthly or as required
	Remedial Work	If erosion channels are evident, these should be established with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
		If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Table 9: Swale Maintenance Schedule

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

6. Benefits to the Surrounding Existing Drainage Network

It is important to note the very significant benefit the proposed development will have on the existing drainage network. The site currently discharges surface water, unrestricted to the public surface water sewer. The proposed development will significantly reduce the surface water run-off to the public sewer as demonstrated in Table 10 below. The introduction of the SUDS measures outlined earlier will also improve the quality of the discharge.

Table 10: Surface Water Run-off Rates

Rainfall Event	**Existing run-off (l/sec)**	**Proposed run-off (l/sec)**	**Difference (%)**
Q1	**29.72l/s**	2 + 4.1 = **6.1l/s**	**- 79.48%**
Q30	**64.49l/s**	2 + 4.1 = **6.1l/s**	**- 90.54%**
Q100	**83.66l/s**	2 + 4.1 = **6.1l/s**	**- 93.70%**

7. Water Supply

7.1 Water Supply – General

There is an existing 4 inches watermain on Brewery Road to the north of the subject site. A Pre-Connection Enquiry form was submitted to Irish Water on 09th of September 2018 which outlined our proposals for the provision of water supply and the response received from Irish Water states that a new connection from the 200mm MOPVC main on Stillorgan Road, approximately 140m from the site, will be needed to serve the development. This connection to the existing 200mm dia watermain will be provided by Irish Water as part of the formal connection agreement.

Table 11: Total Water Demand

Description	No. of Units	Flow l/h/day	Population per Unit	Total Discharge (l/d)
Residential Units	287	150	2.7	116,235
Crèche	1	50	138	6,900
Total				***123,135 l/d***

The total water requirement from the public supply, for the development, is estimated at 123 m^3/day.

Waterman Moylan Drawing No's 18-093-P100 shows the proposed indicative water supply layout for the subject site.

It is noted from the Irish Water record drawings that there appears to be a large diameter (1200mm) watermain passing under the existing building in the south west corner of the site. We are currently engaging with Irish water to establish the exact location of this watermain. Irish Water advise that the relocation of the watermain can be addressed by way of a diversion agreement between the Applicant and Irish Water.

8. Transport

8.1 Introduction

A site-specific Transport and Traffic Assessment (TTA) has been carried out by Waterman Moylan. This is included under separate cover as part of this application.

In addition, a Carparking Strategy and Mobility Management Plan together with a Construction Management Plan, have been prepared and are provided under a separate cover. These supporting traffic and associated reports incorporate responses to comments received as part of the pre-application process with An Bord Pleanala. A detailed response to each item raised has also been included in the accompanying Planning Consultants report.

8.2 Site Access

The site will be accessed via the existing access road to The Grange off of Brewery Road. It is proposed to re-configure the alignment of this access road as part of the development proposals. The site access from Brewery Road is located in a 50 km/h zone. A 2.4m x 49m sightline, which is in compliance with the requirements of the Department of Transport 'Design Manual for Urban Roads and Streets' recommendation for a road of design speed of 50 km/h, can provided at the access road junction onto Brewery Road. No development works will infringe upon this existing sightline provision.

8.3 Car Parking

Section 8.2.4.5 of the Dun Laoghaire Rathdown County Council Development Plan 2016 – 2022 consider the car parking requirements for various types of development. Specifically, Tables 8.2.3 set out the car parking standards for residential developments.

Based on these standards, Table 12 below details the maximum car parking spaces permitted for the proposed development.

Table 12: Car Parking Required and Provided.

Land Use	Units/ Staff Members	DLRCC Car Parking Standards	Maximum Parking Permitted	Parking Provided
Residential/Studio	19	1 space per 1-bed unit	19	92
Residential/1 Bed	125	1 space per 1-bed unit	125	
Residential/2 Bed	143	1.5 space per 2-bed unit	215	
Crèche	23	1 space per 1 staff member	23	8
TOTAL	287 units 23 staff		382	100

8 visitor/go-car spaces will be provided at surface level. As shown in Table 12 above, the development will provide 92 No. car parking spaces for the proposed 287 No. apartments. This equates to 0.32 car parking spaces for every apartment. In addition, the applicant owns and controls 275 car parking spaces within the existing Grange Development, which is immediately adjacent. There are currently 100 spaces vacant/unused due to low demand from existing tenants. These spaces are available and can be used to support this phase of the development. In addition, it is anticipated that those employed in the Crèche will be living in the locality and will be encouraged to travel to and from work by sustainable modes of transport. There are 8 No. dedicated spaces provided for the Crèche.

- Justification for the reduced parking provision and the parking management strategy is set out in Waterman Moylan Report "Parking Strategy and Mobility Management Plan" which accompanies this application.

8.4 Cycle Parking

- Section 4.1 of the 'Standard for Cycle Parking and Associated Cycling Facilities for New Developments – Dun Laoghaire-Rathdown County Council 2018' sets out the cycle parking requirements as follows:

Table 13: Total cycle parking spaces required (DLRCC)

	Units	Short stay parking required	Long stay parking required	Total parking required
Apartments	287	58	287	345
Crèche	23 staff 115 children	12	5	17
Total		70	290	362

- The Design Standards for New Apartments, who set out a requirement of 1 long stay space per bedroom and 1 visitor space for every two units, have also been reviewed with regards to cycle parking requirements and are set out in table 14 below.

Table 14: Total cycle parking spaces required (National Standards)

Land Use	Units		Long stay parking required	Short stay parking required
Residential/Studio	19	1 space per 1-bed unit	19	9.5
Residential/1 Bed	125	1 space per 1-bed unit	125	62.5
Residential/2 Bed	143	2 spaces per 2-bed unit	286	71.5
TOTAL	287 units		430	143.5

- As the National standards are more onerous than the DLRCC standards for apartments the total number of bike parking spaces provided are in line with the National Standards. A total of 596 spaces will be provided (See table 15). This is well in excess of the DLRCC cycle standards and aligns with the National Standards which will encourage travel by bike.
- Dun Laoghaire Rathdown County Council (DLRCC) have launched the first county-wide, station-less, bike-sharing scheme in Ireland. The scheme called the Bleeperbike begun a six-month pilot in November 2018 and it is planned to expand the scheme across DLRCC. 58 cycle parking spaces will be provided at ground level to accommodate visitors and those using the Bleeperbike scheme. The cycle parking will be provided as outlined in Table 15 overleaf.

Table 15: Total cycle parking spaces provided.

	Level -1	Surface	Total
Apartments	518		518
Crèche		20	20
Surface level visitor spaces		58	58
Total	518	78	596

APPENDICES

A. Site Investigation Borehole Logs and Water level logs

Ground Investigations Ireland Ltd.,
Catherinestown House,
Hazelhatch Road,
Newcastle, Co Dublin.
Tel: 01 601 5175 / 5176 | Fax: 01 601 5173
Email: info@gii.ie | Web: gii.ie

Ground Investigations Ireland

Brewery Road Apartments

Ground Investigation Report

DOCUMENT CONTROL SHEET

Project Title	Brewery Road Apartments
Engineer	Waterman Moylan
Project No	7967-08-18
Document Title	Ground Investigation Report

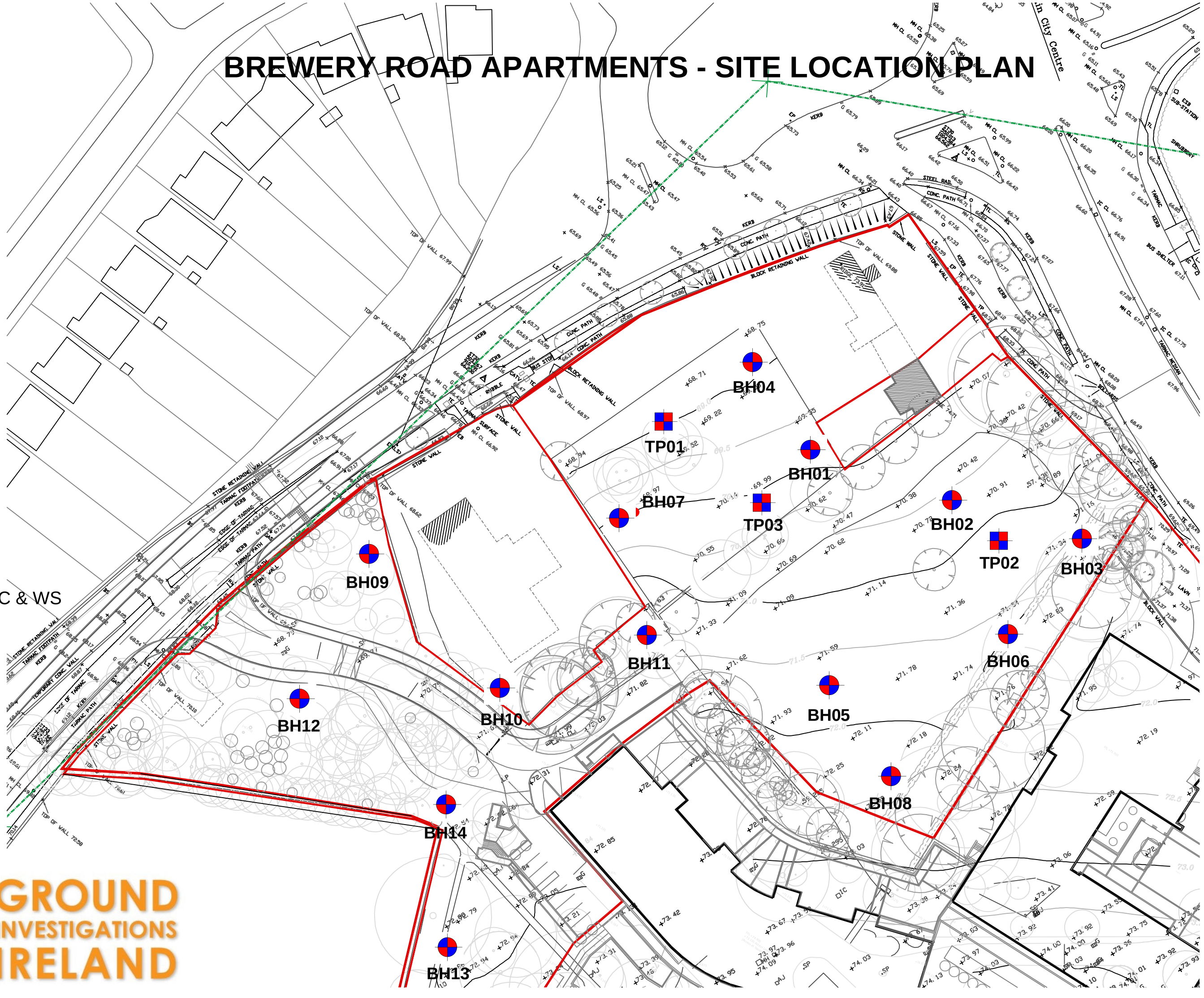
Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	S. Connolly	C. Finnerty	C. Finnerty	Dublin	08 October 2018

APPENDIX 1 - Site Location Plan

BREWERY ROAD APARTMENTS - SITE LOCATION PLAN

Trial Pit Locations

Borehole RC & WS Locations



GROUND INVESTIGATIONS IRELAND

APPENDIX 3 – Window Sample Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS01
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client**
	Location Brewery Road	**Dates** 24/08/2018-30/09/2018	**Engineer** Waterman Moylan
Job Number 7967-08-18			**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.55 0.00-1.00	B EN				(0.55)	POSSIBLE MADE GROUND: Greyish brown slightly clayey gravelly Sand		
0.55-1.00	B				0.55 (0.45)	POSSIBLE MADE GROUND: Brown slightly sandy slightly gravelly Clay. Sand is fine and gravel is fine to medium		
1.00-1.50	B				1.00 (0.25)	Soft brown slightly sandy gravelly CLAY. Sand is fine		
					1.25 (0.25)	Soft brown slightly sandy gravelly CLAY. Sand is fine and gravel is fine to medium		
1.50-1.77	B				1.50 (0.27)	Orange/yellow slightly clayey gravelly SAND. Sand is fine to coarse and gravel is fine to coarse		
					1.77	Complete at 1.77m		

Remarks
1.00 - 2.00m BGL 77% recovery
Window sample refused at 1.77m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS01

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS02
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 2.00m	**Ground Level (mOD)** 70.29	**Client**	**Job Number** 7967-08-18
	Location 720456.9 E 727224.6 N	**Dates** 24/08/2018-30/09/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.20 0.00-1.00	B EN				(0.20)	MADE GROUND: Dark grey sandy angular to subangular Gravel. With occasional plastic fragments (>2%)		
0.20-0.50	B			70.09	0.20	MADE GROUND: Brown sandy angular to subangular gravelly Clay. With occasional plastic fragments (>2%)		
0.50-1.00	B			69.79	(0.30) 0.50	MADE GROUND: Dark brown slightly sandy angular to subangular slightly gravelly Clay		
1.00-1.30 1.00-2.00	B EN			69.29	(0.50) 1.00	MADE GROUND: Brown sandy angular to subangular gravelly Clay. Sand is fine. With occasional plastic fragments (<2%)		
1.30-1.90	B			68.59	(0.70) 1.70	WEATHERED GRANITE: Recovered as brown mottled yellow slightly clayey angular to subangular gravelly Sand		
				68.29	(0.30) 2.00	Complete at 2.00m		

Remarks
Window sample refused at 2.00m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS02

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS03
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 2m	**Ground Level (mOD)** 71.44	**Client**	**Job Number** 7967-08-18
	Location 720487.7 E 727212.2 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.10	B				(0.10)	MADE GROUND: Brown fine Sand		
0.00-1.00	EN			71.34	0.10			
0.10-0.30	B				(0.20)	MADE GROUND: Grey sandy angular to subangular gravelly Clay. Sand is fine		
				71.14	0.30			
0.30-0.90	B					MADE GROUND: Brown angular to subangular gravelly Clay with some concrete fragments		
					(0.60)			
0.90-1.00	B			70.54	0.90			
					(0.10)	MADE GROUND: Concrete fragments		
1.00-1.50	B			70.44	1.00			
1.00-2.00	EN					POSSIBLE MADE GROUND: Brown slightly sandy angular to subangular gravelly Clay		
					(0.50)			
1.50-2.00	B			69.94	1.50			
					(0.35)	Stiff brown mottled orange slightly sandy angular to subangular gravelly CLAY		
				69.59	1.85			
						Complete at 1.85m		

Remarks
Window sample refused at 1.85m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS03

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS04
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 1.00m	**Ground Level (mOD)** 68.46	**Client**	**Job Number** 7967-08-18
	Location 720414.8 E 727250.6 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.60 0.00-1.00	B EN				(0.60)	Firm to stiff brown slightly sandy angular to subangular slightly gravelly CLAY		
0.60-0.85	B			67.86	0.60			
					(0.25)	Grey slightly clayey sandy angular to subangular GRAVEL with occasional subangular granite cobbles		
				67.61	0.85	Complete at 0.85m		

Remarks
Window sample refused at 0.85m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS04

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS05
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 1.23m	**Ground Level (mOD)** 71.40	**Client**	**Job Number** 7967-08-18
	Location 720431 E 727190.6 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.15 0.00-1.00 0.15-0.40	B EN B				(0.15)	Topsoil		
				71.25	0.15	POSSIBLE MADE GROUND: Brown slightly clayey angular to subangular gravelly Sand		
					(0.25)			
0.40-0.90	B			71.00	0.40	Firm to stiff brown slightly sandy angular to subangular gravelly CLAY		
					(0.50)			
0.90-1.23	B			70.50	0.90	WEATHERED GRANITE: Recovered as yellow gravelly Sand		
					(0.33)			
				70.17	1.23	Complete at 1.23m		

Remarks
Window sample refused at 1.23m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS05

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS06
Machine : GEOTECH 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 2.65m	**Ground Level (mOD)** 72.20	**Client**	**Job Number** 7967-08-18
	Location 720474.5 E 727193.2 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.40 0.00-1.00	B EN				(0.40)	MADE GROUND: Black sandy angular to subangular Gravel with occasional plastic fragments (<2%)		
0.40-0.70	B			71.80	0.40 (0.30)	MADE GROUND: Brown clayey angular to subangular gravelly Sand.		
0.70-1.00	B			71.50	0.70 (0.30)	MADE GROUND: Brown slightly sandy angular to subangular slightly gravelly Clay with occasional plastic and fabric fragments (>2%)		
1.00-1.20 1.00-2.00	B EN			71.20	1.00 (0.20)	Brown angular to subangular gravelly SAND		
1.20-2.35	B			71.00	1.20 (1.15)	Brown slightly clayey angular to subangular gravelly SAND		
2.00-3.00	EN							
2.35-2.65	B			69.85	2.35 (0.30)	WEATHERED GRANITE: Recovered as orange angular to subangular gravelly Sand		
				69.55	2.65	Complete at 2.65m		

Remarks
Window sample refused at 2.65m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS06

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS07
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 1.00m	**Ground Level (mOD)** 69.57	**Client**	**Job Number** 7967-08-18
	Location 720396.4 E 727218.6 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.35 0.00-1.00	B EN				(0.35)	MADE GROUND: Brownish grey slightly clayey gravelly Sand with occasional red brick and plastic fragments		
				69.22	0.35			
0.35-0.50	B				(0.15)	MADE GROUND: Brown sandy gravelly Clay with occasional plastic fragments		
0.50-0.90	B			69.07	0.50	Firm brown slightly sandy slightly gravelly CLAY. Sand is fine		
					(0.40)			
0.90-1.00	B			68.67	0.90			
				68.57	(0.10) 1.00	Firm dark brown sandy slightly gravelly CLAY. Sand is fine. With some rootlets		
						Complete at 1.00m		

Remarks
Window sample refused at 1.00m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS07

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS08
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 1.00m	**Ground Level (mOD)** 72.42	**Client**	**Job Number** 7967-08-18
	Location 720442.3 E 727165.1 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.35 0.00-1.00	B EN				(0.35)	Topsoil		
0.35-0.85	B			72.07	0.35 (0.50)	Stiff reddish brown slightly sandy slightly gravelly CLAY. Sand is fine. With some rootlets		
0.85-1.00	B			71.57	0.85 (0.15)	WEATHERED GRANITE: Recovered as brownish white sandy Gravel		
				71.42	1.00	Complete at 1.00m		

Remarks
Window sample refused at 1.00m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS08

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS09
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 1.00m	**Ground Level (mOD)** 67.68	**Client**	**Job Number** 7967-08-18
	Location 720338.3 E 727199.3 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.50 0.00-1.00	B EN				(0.50)	MADE GROUND: Brown slightly sandy gravelly Clay. Sand is fine. With occasional plastics (<2%)		
0.50-1.00	B			67.18	0.50	Firm to stiff light brown slightly sandy slightly gravelly CLAY. Sand is fine		
					(0.50)			
				66.68	1.00	Complete at 1.00m		

Remarks
Window sample refused at 1.00m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS09

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS10
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 1.45m	**Ground Level (mOD)** 69.91	**Client**	**Job Number** 7967-08-18
	Location 720373.6 E 727176.4 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.40	B				(1.00)	MADE GROUND: Brown slightly clayey gravelly Sand with occasional red brick and plastic fragments (>2%)		
1.00-1.10	B			68.91	1.00			
					(0.45)	WEATHERED GRANITE: Recovered as orange/white sandy Gravel		
				68.46	1.45	Complete at 1.45m		

Remarks
Window sample refused at 1.45m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS10

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS11
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 0.78m	**Ground Level (mOD)** 71.94	**Client**	**Job Number** 7967-08-18
	Location 720405.6 E 727180.9 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.30 0.00-1.00	B EN				(0.30)	MADE GROUND: grey sandy gravelly Clay with occasional plastic and waste ash fragments (>2%)		
0.30-0.78	B			71.64	0.30	POSSIBLE MADE GROUND: Brown slightly sandy gravelly Clay. Sand is fine		
					(0.48)			
				71.16	0.78	Complete at 0.78m		

Remarks
Window sample refused at 0.78m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS11

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS13
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions** 88mm to 1.00m	**Ground Level (mOD)** 73.44	**Client**	**Job Number** 7967-08-18
	Location 720370.6 E 727117.9 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.40 0.00-1.00	B EN				(0.40)	MADE GROUND: Brown slightly sandy gravelly Clay with occasional red brick and plastic fragments (>2%)		
0.40-1.00	B			73.04	0.40	Firm to stiff brown slightly gravelly CLAY		
					(0.60)			
				72.44	1.00	Complete at 1.00m		

Remarks
Window sample refused at 1.00m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS13

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Number** WS14
Machine : GEOTEC 10 **Method :** Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)** 72.50	**Client**	**Job Number** 7967-08-18
	Location 720367 E 727146.4 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.30 0.00-1.00	B EN				(0.30)	Topsoil		
0.30-0.60	B			72.20	0.30 (0.30)	MADE GROUND: Black slightly clayey gravelly Sand		
0.60-1.00	B			71.90	0.60 (0.40)	MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional plastic fragments (<2%)		
1.00-1.60 1.00-1.60	B EN			71.50	1.00 (0.60)	POSSIBLE MADE GROUND: Brown slightly sandy gravelly Clay		
				70.90	1.60	Complete at 1.60m		

Remarks
Window sample refused at 1.60m BGL

Scale (approx)	Logged By
1:25	EB

Figure No. 7967-08-18.WS14

APPENDIX 4 - Rotary Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH01
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 6.60m	**Ground Level (mOD)** 69.74	**Client**
	Location 720423.5 E 727232.1 N	**Dates** 24/08/2018-30/09/2018	**Engineer** Waterman Moylan
			Job Number 7967-08-18
			Sheet 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	23						(1.65)	OVERBURDEN: Recovery consists of brown sandy Clay. Drillers notes: Clay sand. See adjacent window sample log for overburden detail		
1.65				NI		68.09	1.65			
2.10	100	43	34	8			(2.45)	Medium strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange surface staining on fractures from clay mineral dissolution and oxidation 1.65 - 6.60m BGL Two fracture sets: FS1: 0 - 25 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
2.60										
3.40				NI						
3.60	100	47	47	6		65.64	4.10	Strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange surface staining on fractures from clay mineral dissolution and oxidation		
4.20				NI						
4.60				4						
5.10	100	27	23				(2.50)			
5.50				NI						
6.60						63.14	6.60	Complete at 6.60m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH01

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH02
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 5.20m	**Ground Level (mOD)** 70.29	**Client**	**Job Number** 7967-08-18
	Location 720456.9 E 727224.6 N	**Dates** 24/08/2018-30/09/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	36						(1.90)	OVERBURDEN: Poor recovery. Recovery consists of clayey Gravel with subangular to subrounded cobbles. Drillers notes: Fill clay cobbles. See adjacent window sample log for overburden detail		
1.90						68.39	1.90			
2.10	90	36	36	NI				Medium strong massive crystalline coarse grained white with orange staining GRANITE. Partially weathered		
3.60	84	70	70	8			(3.30)	3.60 - 5.20m BGL Two fracture sets: FS1: 0 - 30 degrees closely to medium spaced rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium to widely spaced rough planar tight to open with orange staining on fracture surfaces.		
5.20						65.09	5.20	Complete at 5.20m		

Remarks
50mm slotted standpipe with a pea gravel surround installed from 5.20m to 1.00m BGL.
50mm plain standpipe with a bentonite seal installed from 1.00m BGL to GL, with a flush cover.
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH02

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH03
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :**	**Casing Diameter** 100mm to 5.90m **Location** 720487.7 E 727212.2 N	**Ground Level (mOD)** 71.44 **Dates** 24/08/2018-31/08/2018	**Client** **Engineer** Waterman Moylan	**Job Number** 7967-08-18 **Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	31						(2.20)	OVERBURDEN: Poor recovery. Recovery consists of brown, grey and black Gravel with occasional subangular to subrounded cobbles. Drillers notes: Soil/Gravel . See adjacent window sample log for overburden details		
2.10 2.20	66	25	25			69.24	2.20	Weak to medium strong massive crystalline coarse grained white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
3.60	100	48	33	12			(3.70)	2.20 - 5.90m BGL Two fracture sets: FS1: 0 - 30 degrees closely to medium spaced rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium to widely spaced rough planar tight to open with orange staining on fracture surfaces.		
5.20	100	79	74							
5.90						65.54	5.90	Complete at 5.90m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH03

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH04
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 3.80m	**Ground Level (mOD)** 68.46	**Client**	**Job Number** 7967-08-18
	Location 720414.8 E 727250.6 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(0.80)	OVERBURDEN: No recovery. See Window Sample log for overburden details		
	56	50	44	7		67.66	0.80	Strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange surface staining on fracture surfaces.		
1.80						66.66	(1.00) 1.80	Medium strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange surface staining on fracture surfaces. 0.80 - 3.80m BGL Two fracture sets: FS1: 0 - 25 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
	100	36	36				(2.00)			
3.00				NI						
3.10				6						
3.80						64.66	3.80	Complete at 3.80m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH04

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH05
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 3.60m	**Ground Level (mOD)** 71.40	**Client**
	Location 720431 E 727190.6 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan
			Job Number 7967-08-18
			Sheet 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(0.80)	OVERBURDEN: Recovery consists of brown clayey sandy Gravel. Drillers notes: Fill clay. See adjacent window sample log for overburden details		
0.80	62	20	20			70.60	0.80	Weak to medium strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
2.10	100	100	100	4			(2.80)	0.80 - 3.60m BGL Two fracture sets: FS1: 0 - 25 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
3.60						67.80	3.60	Complete at 3.60m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH05

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH06
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 5.60m	**Ground Level (mOD)** 72.20	**Client**
	Location 720474.5 E 727193.2 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan
			Job Number 7967-08-18
			Sheet 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	21						(2.50)	OVERBURDEN: Poor recovery. Recovery consists of black sandy gravelly Clay with granite subangular to subrounded cobbles. Drillers notes: Fill boulder Clay. See adjacent window sample for overburden details		
2.10										
2.50	77	47	12	12		69.70	2.50	Weak massive crystalline coarse grained white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation 2.50 - 5.60m BGL Two fracture sets: FS1: 0 - 30 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
3.60	93	80	63				(1.85)			
4.35				0		67.85	4.35	Medium strong massive crystalline coarse grained white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
5.10	100	46	26	7		67.10	5.10	Weak massive crystalline coarse grained white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
5.60						66.60	(0.50) 5.60	Complete at 5.60m		

Remarks
Borehole backfilled upon cpmpletion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH06

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH07
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 4.10m	**Ground Level (mOD)** 69.57	**Client**	**Job Number** 7967-08-18
	Location 720396.4 E 727218.6 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.00)	OVERBURDEN: Recovery consists of brown clayey sandy Gravel. Drillers notes: Sand/Gravel. See adjacent window sample log for overburden details		
1.00	76	47	29			68.57	1.00	Weak to medium strong to strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange surface staining on fracture surfaces from clay mineral dissolution and oxidation		
2.10	100	83	63	6			(3.10)	1.00 - 4.10m BGL Two fracture sets: FS1: 0 - 25 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
3.60	100	50	50							
4.10						65.47	4.10	Complete at 4.10m		

Remarks
Borehole backfilled upon completion
50mm slotted standpipe with a pea gravel surround installed from 4.00m to 1.00m BGL
50mm plain standpipe with a bentonite seal installed from 1.00m BGL to GL, with a flush cover

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH07

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH08
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 4.60m	**Ground Level (mOD)** 72.42	**Client**	**Job Number** 7967-08-18
	Location 720442.3 E 727165.1 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.90	55	18	18			71.52	(0.90) 0.90	OVERBURDEN: Poor recovery. Recovery consists of brown gravelly Clay with occasional subangular to subrounded cobbles. Drillers notes: Clay cobbles. See adjacent window sample log for overburden details		
2.10	100	45	45	12			(3.70)	Weak to medium strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange surface staining on fracture surfaces from clay mineral dissolution and oxidation 0.90 - 4.60m BGL Two fracture sets: FS1: 0 - 25 degrees closely spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
3.60 3.90	100	95	86	5						
4.60						67.82	4.60	Complete at 4.60m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH08

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH09
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 4.30m	**Ground Level (mOD)** 67.68	**Client**	**Job Number** 7967-08-18
	Location 720338.3 E 727199.3 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.20)	Driller notes Brown sandy gravelly Clay with occasional cobbles. Open hole pit - Inspection Pit. See adjacent WS log for overburden details		
1.20						66.48	1.20			
1.60	89	17	17	NI			(0.90)	Weak massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
2.10						65.58	2.10	Strong massive crystalline coarse grained greyish white unweathered GRANITE.		
	93	55	55	6			(2.20)	1.20 - 4.30m BGL Two fracture sets: FS1: 0 - 25 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
3.40										
3.60	100	97	97	3						
4.30						63.38	4.30	Complete at 4.30m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH09

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH10
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 5.80m	**Ground Level (mOD)** 69.91	**Client**	**Job Number** 7967-08-18
	Location 720373.6 E 727176.4 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	40						(2.60)	OVERBURDEN: Poor recovery. Recovery consists of MADE GROUND tarmacadam, gravels, and subangular to subrounded cobbles of granite. Drillers notes: Fill cobbles. See adjacent window sample log for more detailed overburden description		
2.10										
2.60	66	33	28			67.31	2.60 (0.40)	Weak to medium strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
						66.91	3.00			
3.60	100	100	93	3			(1.60)	Very strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
4.60	100	100	86			65.31	4.60 (1.20)	Strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation 2.60 - 5.80m BGL Two fracture sets: FS1: 0 - 30 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
5.80						64.11	5.80	Complete at 5.80m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH10

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH11
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 5.10m	**Ground Level (mOD)** 71.94	**Client**	**Job Number** 7967-08-18
	Location 720405.6 E 727180.9 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.00)	Driller notes Brown sandy gravelly Clay with occasional cobbles. Open hole pit - Inspection Pit. See adjacent WS log for overburden details		
1.00						70.94	1.00			
1.15						70.79	(0.15) 1.15	OVERBURDEN: Poor recovery. Recovery consists of brown sandy gravelly Clay. Drillers notes: Soil/Gravel. See adjacent window sample log for overburden details		
	48	10	10	NI			(0.95)	Weak to medium strong massive crystalline coarse grained orange/white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
1.75				4						
2.10						69.84	2.10	Medium strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
	100	85	85	1						
2.95										
3.60							(3.00)			
	47	39	28	5				1.15 - 5.10m BGL Two fracture sets: FS1: 0 - 25 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
5.10						66.84	5.10	Complete at 5.10m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH11

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH12
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Cored	**Casing Diameter** 100mm to 4.70m	**Ground Level (mOD)**	**Client**	**Job Number** 7967-08-18
	Location	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.65	76	26	25		EN		(1.40)	OVERBURDEN: Recovery consists of POSSIBLE MADE GROUND: Brown slightly sandy slightly gravelly Clay with granite cobbles. Drillers notes: Clay cobbles. See adjacent window sample log for overburden details		
1.40							1.40			
							(0.70)	Medium strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
2.10	100	74	61	7			2.10	Strong massive crystalline coarse grained greyish white unweathered GRANITE.		
							(2.60)	1.40 - 4.70m BGL Two fracture sets: FS1: 0 - 25 degrees closely spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
3.60 3.70	91	82	82	0						
4.70							4.70	Complete at 4.70m		

Remarks
Borehole backfilled upon completion. RC BH completed adjacent to concrete slab.

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH12

Ground Investigations Ireland Ltd
www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH13
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 4.20m	**Ground Level (mOD)** 73.44	**Client**	**Job Number** 7967-08-18
	Location 720370.6 E 727117.9 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.00)	Driller notes Brown sandy gravelly Clay with occasional cobbles. Open hole pit - Inspection Pit. See adjacent WS log for overburden details		
1.00						72.44	1.00			
						72.34	1.10	OVERBURDEN: Recovery consists of POSSIBLE MADE GROUND brown sandy gravelly Clay. Drillers notes: Clay cobbles. See adjacent window sample log for overburden details		
							(0.40)			
1.50	100	36	21			71.94	1.50	OVERBURDEN: Recovery consists of granite Gravel with occasional subrounded cobbles. Drillers notes: Clay cobbles.		
2.10				9			(2.00)	Medium strong to strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation 1.50 - 4.20m BGL Two fracture sets: FS1: 0 - 30 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces. FS2: 45 - 65 degrees medium spaced rough planar to rough undulating tight to open with orange staining on fracture surfaces.		
	93	63	63							
3.50				NI		69.94	3.50			
3.80	100	58	39	3			(0.70)	Weak to medium strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
4.20						69.24	4.20	Complete at 4.20m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH13

Ground Investigations Ireland Ltd

www.gii.ie

Site Brewery Road Apartments			**Borehole Number** BH14
Machine : Beretta T44 **Flush :** Water **Core Dia :** 68 mm **Method :** Rotary Core	**Casing Diameter** 100mm to 5.20m	**Ground Level (mOD)** 72.50	**Client**	**Job Number** 7967-08-18
	Location 720367 E 727146.4 N	**Dates** 24/08/2018-31/08/2018	**Engineer** Waterman Moylan	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.20)	Driller notes Brown sandy gravelly Clay with occasional cobbles. Open hole pit - Inspection Pit. See adjacent WS log for overburden details		
1.20	56	33	33			71.30	1.20 (0.60)	OVERBURDEN: Recovery consists of POSSIBLE MADE GROUND brown sandy gravelly Clay. Drillers notes: Clay gravel. See adjacent window sample log for overburden detail		
1.80				1		70.70	1.80	Medium strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation		
2.10 2.30	87	59	32	15			(1.80)			
3.45 3.60	100	100	100	0		68.90	3.60	Very strong massive crystalline coarse grained greyish white GRANITE. Partially weathered with orange staining on fracture surfaces from clay mineral dissolution and oxidation 1.80 - 5.20m BGL One fracture set: FS1: 0 - 30 degrees closely to medium spaced, rough planar tight to open with orange staining on fracture surfaces.		
4.50	100	100	100				(1.60)			
5.20						67.30	5.20	Complete at 5.20m		

Remarks
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	EB

Figure No. 7967-08-18.BH14

APPENDIX 6 – Groundwater Monitoring

Ground Investigations Ireland Ltd.,
Catherinestown House,
Hazelhatch Road,
Newcastle, Co Dublin.
Tel: 01 601 5175 / 5176 | Fax: 01 601 5173
Email: info@gii.ie | Web: gii.ie

GROUNDWATER MONITORING

Brewery Road Apartments

BOREHOLE		DATE	TIME	GROUNDWATER (mBGL)	GROUNDWATER (mOD)
Number	Elev mOD				
BH02	**70.29**	04/09/2018	16.00	2.80	67.49
BH07	**69.57**	04/09/2018	16.00	2.60	66.97
BH09	**67.68**	04/09/2018	16.00	1.25	66.43

B. Greenfield Calculations

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	
Site name:	The Grange
Site location:	Stillorgan

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	53.28132° N
Longitude:	6.19399° W

Reference:	
Date:	2019-08-22 10:52

Methodology	IH124

Site characteristics

Total site area (ha)	1.8

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	1	3
HOST class	---	---
SPR/SPRHOST	0.1	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm)	846	835
Hydrological region	12	12
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.13	2.13
Growth curve factor: 100 year	2.61	2.61

Notes:

(1) Is Q_{BAR} < 2.0 l/s/ha?

Normally limiting discharge rates which are less than 2.0 l/s/ha are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consents are usually set at 5.0l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	0.38	6.36
1 in 1 year (l/s)	0.32	5.4
1 in 30 years (l/s)	0.8	13.54
1 in 100 years (l/s)	0.99	16.59

C. Attenuation Calculations – Main Apartment Block

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	64.523	0.473	1.3	104.0	O K
30 min Summer	64.691	0.641	1.3	141.1	O K
60 min Summer	64.862	0.812	1.5	178.6	O K
120 min Summer	65.044	0.994	1.6	218.6	O K
180 min Summer	65.153	1.103	1.6	242.7	O K
240 min Summer	65.231	1.181	1.7	259.8	O K
360 min Summer	65.337	1.287	1.7	283.1	O K
480 min Summer	65.407	1.357	1.8	298.5	O K
600 min Summer	65.455	1.405	1.8	309.1	O K
720 min Summer	65.489	1.439	1.8	316.6	O K
960 min Summer	65.530	1.480	1.8	325.5	O K
1440 min Summer	65.547	1.497	1.9	329.3	O K
2160 min Summer	65.528	1.478	1.8	325.2	O K
2880 min Summer	65.500	1.450	1.8	319.0	O K
4320 min Summer	65.448	1.398	1.8	307.5	O K
5760 min Summer	65.393	1.343	1.8	295.5	O K
7200 min Summer	65.336	1.286	1.7	283.0	O K
8640 min Summer	65.279	1.229	1.7	270.3	O K
10080 min Summer	65.221	1.171	1.7	257.7	O K
15 min Winter	64.581	0.531	1.3	116.9	O K
30 min Winter	64.770	0.720	1.4	158.5	O K
60 min Winter	64.963	0.913	1.5	200.8	O K
120 min Winter	65.170	1.120	1.6	246.4	O K
180 min Winter	65.296	1.246	1.7	274.0	O K
240 min Winter	65.386	1.336	1.8	293.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.889	0.0	106.8	38
30 min Summer	64.406	0.0	106.2	53
60 min Summer	41.084	0.0	185.0	82
120 min Summer	25.560	0.0	228.3	140
180 min Summer	19.213	0.0	232.9	198
240 min Summer	15.655	0.0	236.9	258
360 min Summer	11.703	0.0	244.9	374
480 min Summer	9.509	0.0	253.3	492
600 min Summer	8.090	0.0	259.8	610
720 min Summer	7.087	0.0	264.7	728
960 min Summer	5.749	0.0	271.3	964
1440 min Summer	4.281	0.0	276.7	1378
2160 min Summer	3.185	0.0	506.0	1728
2880 min Summer	2.580	0.0	504.7	2120
4320 min Summer	1.915	0.0	495.8	2948
5760 min Summer	1.549	0.0	670.6	3768
7200 min Summer	1.314	0.0	710.7	4616
8640 min Summer	1.148	0.0	745.3	5448
10080 min Summer	1.024	0.0	775.5	6256
15 min Winter	94.889	0.0	107.2	38
30 min Winter	64.406	0.0	106.8	52
60 min Winter	41.084	0.0	207.4	80
120 min Winter	25.560	0.0	233.1	138
180 min Winter	19.213	0.0	239.5	196
240 min Winter	15.655	0.0	246.0	252

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
360 min Winter	65.511	1.461	1.8	321.4	O K
480 min Winter	65.595	1.545	1.9	339.9	O K
600 min Winter	65.655	1.605	1.9	353.2	O K
720 min Winter	65.700	1.650	1.9	362.9	O K
960 min Winter	65.757	1.707	2.0	375.6	O K
1440 min Winter	65.802	1.752	2.0	385.4	O K
2160 min Winter	65.787	1.737	2.0	382.1	O K
2880 min Winter	65.756	1.706	2.0	375.4	O K
4320 min Winter	65.667	1.617	1.9	355.8	O K
5760 min Winter	65.580	1.530	1.9	336.6	O K
7200 min Winter	65.488	1.438	1.8	316.4	O K
8640 min Winter	65.396	1.346	1.8	296.1	O K
10080 min Winter	65.307	1.257	1.7	276.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
360 min Winter	11.703	0.0	259.0	368
480 min Winter	9.509	0.0	268.1	484
600 min Winter	8.090	0.0	274.6	598
720 min Winter	7.087	0.0	279.4	714
960 min Winter	5.749	0.0	285.6	942
1440 min Winter	4.281	0.0	289.8	1384
2160 min Winter	3.185	0.0	527.4	1956
2880 min Winter	2.580	0.0	534.3	2236
4320 min Winter	1.915	0.0	528.7	3172
5760 min Winter	1.549	0.0	750.6	4096
7200 min Winter	1.314	0.0	796.1	4984
8640 min Winter	1.148	0.0	834.8	5880
10080 min Winter	1.024	0.0	855.9	6752

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.500	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.601

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.131	8	12	0.091	16	20	0.093
4	8	0.100	12	16	0.093	20	24	0.093

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Model Details

Storage is Online Cover Level (m) 66.450

Tank or Pond Structure

Invert Level (m) 64.050

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	220.0	1.000	220.0	1.500	220.0	4.000	0.0	5.000	0.0
0.200	220.0	1.100	220.0	1.600	220.0	4.200	0.0		
0.400	220.0	1.200	220.0	1.700	220.0	4.400	0.0		
0.600	220.0	1.300	220.0	1.800	220.0	4.600	0.0		
0.800	220.0	1.400	220.0	1.801	0.0	4.800	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0057-2000-1950-2000
Design Head (m)	1.950
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	57
Invert Level (m)	63.900
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.950	2.0	Kick-Flo®	0.512	1.1
Flush-Flo™	0.251	1.3	Mean Flow over Head Range	-	1.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.3	2.000	2.0	4.000	2.8	7.000	3.6
0.200	1.3	1.000	1.5	2.200	2.1	4.500	2.9	7.500	3.7
0.300	1.3	1.200	1.6	2.400	2.2	5.000	3.1	8.000	3.8
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.2	8.500	4.0
0.500	1.1	1.600	1.8	3.000	2.4	6.000	3.4	9.000	4.1
0.600	1.2	1.800	1.9	3.500	2.6	6.500	3.5	9.500	4.2

D. Attenuation Calculations – Cascade of features discharging to Block N

Cascade Summary of Results for North Permeable Paving.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	Swale 1.SRCX	(None)

Half Drain Time : 2 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	71.026	0.076	0.0	14.6	14.6	1.9	O K
30 min Summer	71.015	0.065	0.0	14.5	14.5	1.5	O K
60 min Summer	70.972	0.022	0.0	14.2	14.2	0.3	O K
120 min Summer	70.950	0.000	0.0	10.9	10.9	0.0	O K
180 min Summer	70.950	0.000	0.0	8.4	8.4	0.0	O K
240 min Summer	70.950	0.000	0.0	6.9	6.9	0.0	O K
360 min Summer	70.950	0.000	0.0	5.2	5.2	0.0	O K
480 min Summer	70.950	0.000	0.0	4.2	4.2	0.0	O K
600 min Summer	70.950	0.000	0.0	3.6	3.6	0.0	O K
720 min Summer	70.950	0.000	0.0	3.1	3.1	0.0	O K
960 min Summer	70.950	0.000	0.0	2.5	2.5	0.0	O K
1440 min Summer	70.950	0.000	0.0	1.9	1.9	0.0	O K
2160 min Summer	70.950	0.000	0.0	1.4	1.4	0.0	O K
2880 min Summer	70.950	0.000	0.0	1.1	1.1	0.0	O K
4320 min Summer	70.950	0.000	0.0	0.8	0.8	0.0	O K
5760 min Summer	70.950	0.000	0.0	0.7	0.7	0.0	O K
7200 min Summer	70.950	0.000	0.0	0.6	0.6	0.0	O K
8640 min Summer	70.950	0.000	0.0	0.5	0.5	0.0	O K
10080 min Summer	70.950	0.000	0.0	0.4	0.4	0.0	O K
15 min Winter	71.033	0.083	0.0	14.7	14.7	2.1	O K
30 min Winter	71.003	0.053	0.0	14.5	14.5	1.2	O K
60 min Winter	70.950	0.000	0.0	12.8	12.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.889	0.0	8.9	12
30 min Summer	64.406	0.0	12.4	20
60 min Summer	41.084	0.0	16.3	34
120 min Summer	25.560	0.0	20.2	0
180 min Summer	19.213	0.0	22.8	0
240 min Summer	15.655	0.0	24.8	0
360 min Summer	11.703	0.0	27.9	0
480 min Summer	9.509	0.0	30.2	0
600 min Summer	8.090	0.0	32.1	0
720 min Summer	7.087	0.0	33.8	0
960 min Summer	5.749	0.0	36.6	0
1440 min Summer	4.281	0.0	40.8	0
2160 min Summer	3.185	0.0	45.5	0
2880 min Summer	2.580	0.0	49.1	0
4320 min Summer	1.915	0.0	54.5	0
5760 min Summer	1.549	0.0	58.5	0
7200 min Summer	1.314	0.0	61.9	0
8640 min Summer	1.148	0.0	64.7	0
10080 min Summer	1.024	0.0	67.1	0
15 min Winter	94.889	0.0	10.0	12
30 min Winter	64.406	0.0	14.2	20
60 min Winter	41.084	0.0	18.1	0

Cascade Summary of Results for North Permeable Paving.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
120 min Winter	70.950	0.000	0.0	8.1	8.1	0.0	O K
180 min Winter	70.950	0.000	0.0	6.1	6.1	0.0	O K
240 min Winter	70.950	0.000	0.0	5.0	5.0	0.0	O K
360 min Winter	70.950	0.000	0.0	3.7	3.7	0.0	O K
480 min Winter	70.950	0.000	0.0	3.0	3.0	0.0	O K
600 min Winter	70.950	0.000	0.0	2.6	2.6	0.0	O K
720 min Winter	70.950	0.000	0.0	2.3	2.3	0.0	O K
960 min Winter	70.950	0.000	0.0	1.8	1.8	0.0	O K
1440 min Winter	70.950	0.000	0.0	1.4	1.4	0.0	O K
2160 min Winter	70.950	0.000	0.0	1.0	1.0	0.0	O K
2880 min Winter	70.950	0.000	0.0	0.8	0.8	0.0	O K
4320 min Winter	70.950	0.000	0.0	0.6	0.6	0.0	O K
5760 min Winter	70.950	0.000	0.0	0.5	0.5	0.0	O K
7200 min Winter	70.950	0.000	0.0	0.4	0.4	0.0	O K
8640 min Winter	70.950	0.000	0.0	0.4	0.4	0.0	O K
10080 min Winter	70.950	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	25.560	0.0	22.7	0
180 min Winter	19.213	0.0	25.6	0
240 min Winter	15.655	0.0	27.9	0
360 min Winter	11.703	0.0	31.3	0
480 min Winter	9.509	0.0	33.9	0
600 min Winter	8.090	0.0	36.1	0
720 min Winter	7.087	0.0	37.9	0
960 min Winter	5.749	0.0	41.0	0
1440 min Winter	4.281	0.0	45.8	0
2160 min Winter	3.185	0.0	51.1	0
2880 min Winter	2.580	0.0	55.1	0
4320 min Winter	1.915	0.0	61.2	0
5760 min Winter	1.549	0.0	65.8	0
7200 min Winter	1.314	0.0	69.5	0
8640 min Winter	1.148	0.0	72.7	0
10080 min Winter	1.024	0.0	75.5	0

Cascade Rainfall Details for North Permeable Paving.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.500	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.054

Time (mins) From:	To:	Area (ha)
0	4	0.054

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

Cascade Model Details for North Permeable Paving.SRCX

Storage is Online Cover Level (m) 71.550

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	27.8	Slope (1:X)	750.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	70.950	Membrane Depth (m)	0

Pipe Outflow Control

Diameter (m)	0.100	Roughness k (mm)	0.600	Upstream Invert Level (m)	70.090
Slope (1:X)	100.0	Entry Loss Coefficient	0.500		
Length (m)	12.000	Coefficient of Contraction	0.600		

Cascade Summary of Results for Swale 1.SRCX

Upstream Structures	Outflow To	Overflow To
North Permeable Paving.SRCX Block N.SRCX		(None)

Half Drain Time : 11 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	70.391	0.991	0.0	14.8	14.8	13.0	Flood Risk
30 min Summer	70.454	1.054	0.0	15.2	15.2	14.9	Flood Risk
60 min Summer	70.429	1.029	0.0	15.0	15.0	14.1	Flood Risk
120 min Summer	70.291	0.891	0.0	14.3	14.3	10.4	Flood Risk
180 min Summer	70.162	0.762	0.0	13.5	13.5	7.4	O K
240 min Summer	70.057	0.657	0.0	12.9	12.9	5.4	O K
360 min Summer	69.932	0.532	0.0	11.1	11.1	3.4	O K
480 min Summer	69.857	0.457	0.0	9.5	9.5	2.4	O K
600 min Summer	69.809	0.409	0.0	8.3	8.3	1.8	O K
720 min Summer	69.775	0.375	0.0	7.4	7.4	1.5	O K
960 min Summer	69.738	0.338	0.0	6.1	6.1	1.1	O K
1440 min Summer	69.713	0.313	0.0	4.5	4.5	0.9	O K
2160 min Summer	69.694	0.294	0.0	3.4	3.4	0.8	O K
2880 min Summer	69.683	0.283	0.0	2.7	2.7	0.7	O K
4320 min Summer	69.667	0.267	0.0	2.0	2.0	0.6	O K
5760 min Summer	69.659	0.259	0.0	1.7	1.7	0.6	O K
7200 min Summer	69.654	0.254	0.0	1.4	1.4	0.6	O K
8640 min Summer	69.651	0.251	0.0	1.2	1.2	0.6	O K
10080 min Summer	69.649	0.249	0.0	1.1	1.1	0.5	O K
15 min Winter	70.457	1.057	0.0	15.2	15.2	15.0	Flood Risk
30 min Winter	70.529	1.129	0.0	15.5	15.5	17.2	Flood Risk
60 min Winter	70.451	1.051	0.0	15.1	15.1	14.8	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.889	0.0	21.9	15
30 min Summer	64.406	0.0	30.2	24
60 min Summer	41.084	0.0	39.1	40
120 min Summer	25.560	0.0	48.6	72
180 min Summer	19.213	0.0	54.9	102
240 min Summer	15.655	0.0	59.7	130
360 min Summer	11.703	0.0	67.0	188
480 min Summer	9.509	0.0	72.7	248
600 min Summer	8.090	0.0	77.3	308
720 min Summer	7.087	0.0	81.3	368
960 min Summer	5.749	0.0	88.0	488
1440 min Summer	4.281	0.0	98.3	726
2160 min Summer	3.185	0.0	109.7	1076
2880 min Summer	2.580	0.0	118.4	1432
4320 min Summer	1.915	0.0	131.7	2132
5760 min Summer	1.549	0.0	141.9	2840
7200 min Summer	1.314	0.0	150.2	3576
8640 min Summer	1.148	0.0	157.3	4248
10080 min Summer	1.024	0.0	163.6	5120
15 min Winter	94.889	0.0	24.7	16
30 min Winter	64.406	0.0	34.1	25
60 min Winter	41.084	0.0	43.7	42

Cascade Summary of Results for Swale 1.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
120 min Winter	70.234	0.834	0.0	14.0	14.0	9.0	O K
180 min Winter	70.046	0.646	0.0	12.8	12.8	5.2	O K
240 min Winter	69.941	0.541	0.0	11.3	11.3	3.5	O K
360 min Winter	69.826	0.426	0.0	8.8	8.8	2.0	O K
480 min Winter	69.769	0.369	0.0	7.2	7.2	1.4	O K
600 min Winter	69.739	0.339	0.0	6.1	6.1	1.2	O K
720 min Winter	69.727	0.327	0.0	5.4	5.4	1.1	O K
960 min Winter	69.711	0.311	0.0	4.4	4.4	0.9	O K
1440 min Winter	69.692	0.292	0.0	3.3	3.3	0.8	O K
2160 min Winter	69.677	0.277	0.0	2.4	2.4	0.7	O K
2880 min Winter	69.666	0.266	0.0	2.0	2.0	0.6	O K
4320 min Winter	69.655	0.255	0.0	1.5	1.5	0.6	O K
5760 min Winter	69.651	0.251	0.0	1.2	1.2	0.6	O K
7200 min Winter	69.647	0.247	0.0	1.0	1.0	0.5	O K
8640 min Winter	69.644	0.244	0.0	0.9	0.9	0.5	O K
10080 min Winter	69.641	0.241	0.0	0.8	0.8	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	25.560	0.0	54.5	74
180 min Winter	19.213	0.0	61.6	102
240 min Winter	15.655	0.0	67.0	130
360 min Winter	11.703	0.0	75.2	188
480 min Winter	9.509	0.0	81.5	246
600 min Winter	8.090	0.0	86.7	306
720 min Winter	7.087	0.0	91.2	366
960 min Winter	5.749	0.0	98.7	480
1440 min Winter	4.281	0.0	110.2	728
2160 min Winter	3.185	0.0	123.0	1092
2880 min Winter	2.580	0.0	132.8	1448
4320 min Winter	1.915	0.0	147.7	2192
5760 min Winter	1.549	0.0	159.1	2936
7200 min Winter	1.314	0.0	168.5	3648
8640 min Winter	1.148	0.0	176.5	4288
10080 min Winter	1.024	0.0	183.5	4960

Cascade Rainfall Details for Swale 1.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.500	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.075

Time (mins) From:	To:	Area (ha)
0	4	0.075

Cascade Model Details for Swale 1.SRCX

Storage is Online Cover Level (m) 70.590

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	11.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	5.0	Slope (1:X)	30.0
Porosity	0.45	Cap Volume Depth (m)	1.100
Invert Level (m)	69.400	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.8		

Pipe Outflow Control

Diameter (m)	0.100	Roughness k (mm)	0.600	Upstream Invert Level (m)	69.600
Slope (1:X)	27.0	Entry Loss Coefficient	0.500		
Length (m)	19.000	Coefficient of Contraction	0.600		

Cascade Summary of Results for Permeable Paving .SRCX

Upstream Structures	Outflow To	Overflow To
(None)	Swale 2.SRCX	(None)

Half Drain Time : 1 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	71.790	0.460	0.0	30.3	30.3	3.2	Flood Risk
30 min Summer	71.763	0.433	0.0	29.2	29.2	2.8	O K
60 min Summer	71.646	0.316	0.0	24.4	24.4	1.5	O K
120 min Summer	71.519	0.189	0.0	17.8	17.8	0.5	O K
180 min Summer	71.483	0.153	0.0	14.0	14.0	0.4	O K
240 min Summer	71.461	0.131	0.0	11.6	11.6	0.3	O K
360 min Summer	71.435	0.105	0.0	8.7	8.7	0.2	O K
480 min Summer	71.420	0.090	0.0	7.1	7.1	0.1	O K
600 min Summer	71.407	0.077	0.0	6.0	6.0	0.1	O K
720 min Summer	71.397	0.067	0.0	5.3	5.3	0.1	O K
960 min Summer	71.386	0.056	0.0	4.3	4.3	0.0	O K
1440 min Summer	71.375	0.045	0.0	3.2	3.2	0.0	O K
2160 min Summer	71.366	0.036	0.0	2.4	2.4	0.0	O K
2880 min Summer	71.358	0.028	0.0	1.9	1.9	0.0	O K
4320 min Summer	71.350	0.020	0.0	1.4	1.4	0.0	O K
5760 min Summer	71.355	0.025	0.0	1.7	1.7	0.0	O K
7200 min Summer	71.349	0.019	0.0	1.4	1.4	0.0	O K
8640 min Summer	71.345	0.015	0.0	1.1	1.1	0.0	O K
10080 min Summer	71.341	0.011	0.0	1.0	1.0	0.0	O K
15 min Winter	71.804	0.474	0.0	30.8	30.8	3.4	Flood Risk
30 min Winter	71.728	0.398	0.0	27.9	27.9	2.4	O K
60 min Winter	71.573	0.243	0.0	20.9	20.9	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.889	0.0	15.7	11
30 min Summer	64.406	0.0	21.5	19
60 min Summer	41.084	0.0	27.5	34
120 min Summer	25.560	0.0	34.4	62
180 min Summer	19.213	0.0	38.8	92
240 min Summer	15.655	0.0	42.2	122
360 min Summer	11.703	0.0	47.3	182
480 min Summer	9.509	0.0	51.2	240
600 min Summer	8.090	0.0	54.5	300
720 min Summer	7.087	0.0	57.3	360
960 min Summer	5.749	0.0	62.0	486
1440 min Summer	4.281	0.0	69.2	732
2160 min Summer	3.185	0.0	77.2	1072
2880 min Summer	2.580	0.0	82.9	1440
4320 min Summer	1.915	0.0	92.3	2124
5760 min Summer	1.549	0.0	97.5	2960
7200 min Summer	1.314	0.0	105.3	3552
8640 min Summer	1.148	0.0	109.4	4248
10080 min Summer	1.024	0.0	113.3	4648
15 min Winter	94.889	0.0	17.6	11
30 min Winter	64.406	0.0	24.1	19
60 min Winter	41.084	0.0	30.9	34

Cascade Summary of Results for Permeable Paving .SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
120 min Winter	71.479	0.149	0.0	13.6	13.6	0.3	O K
180 min Winter	71.450	0.120	0.0	10.3	10.3	0.2	O K
240 min Winter	71.432	0.102	0.0	8.4	8.4	0.2	O K
360 min Winter	71.410	0.080	0.0	6.3	6.3	0.1	O K
480 min Winter	71.395	0.065	0.0	5.1	5.1	0.1	O K
600 min Winter	71.387	0.057	0.0	4.4	4.4	0.0	O K
720 min Winter	71.381	0.051	0.0	3.8	3.8	0.0	O K
960 min Winter	71.374	0.044	0.0	3.1	3.1	0.0	O K
1440 min Winter	71.364	0.034	0.0	2.3	2.3	0.0	O K
2160 min Winter	71.354	0.024	0.0	1.7	1.7	0.0	O K
2880 min Winter	71.352	0.022	0.0	1.6	1.6	0.0	O K
4320 min Winter	71.350	0.020	0.0	1.4	1.4	0.0	O K
5760 min Winter	71.344	0.014	0.0	1.1	1.1	0.0	O K
7200 min Winter	71.338	0.008	0.0	0.9	0.9	0.0	O K
8640 min Winter	71.334	0.004	0.0	0.7	0.7	0.0	O K
10080 min Winter	71.331	0.001	0.0	0.6	0.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	25.560	0.0	38.6	62
180 min Winter	19.213	0.0	43.5	92
240 min Winter	15.655	0.0	47.3	124
360 min Winter	11.703	0.0	53.1	182
480 min Winter	9.509	0.0	57.5	238
600 min Winter	8.090	0.0	61.1	300
720 min Winter	7.087	0.0	64.2	356
960 min Winter	5.749	0.0	69.4	476
1440 min Winter	4.281	0.0	77.7	722
2160 min Winter	3.185	0.0	86.4	1056
2880 min Winter	2.580	0.0	93.0	1212
4320 min Winter	1.915	0.0	103.2	2076
5760 min Winter	1.549	0.0	110.3	2880
7200 min Winter	1.314	0.0	115.7	3376
8640 min Winter	1.148	0.0	122.6	4240
10080 min Winter	1.024	0.0	128.9	5160

Cascade Rainfall Details for Permeable Paving .SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.500	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.091

Time (mins) From:	To:	Area (ha)
0	4	0.091

Cascade Model Details for Permeable Paving .SRCX

Storage is Online Cover Level (m) 72.080

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	27.8	Slope (1:X)	20.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	71.330	Membrane Depth (m)	0

Pipe Outflow Control

Diameter (m)	0.150	Roughness k (mm)	0.600	Upstream Invert Level (m)	71.300
Slope (1:X)	31.0	Entry Loss Coefficient	0.500		
Length (m)	12.000	Coefficient of Contraction	0.600		

Cascade Summary of Results for Swale 2.SRCX

Upstream Structures	Outflow To	Overflow To
Permeable Paving .SRCX Block N.SRCX		(None)

Half Drain Time : 13 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	69.368	0.668	0.0	13.5	13.5	13.5	O K
30 min Summer	69.414	0.714	0.0	14.0	14.0	15.6	O K
60 min Summer	69.404	0.704	0.0	13.9	13.9	15.1	O K
120 min Summer	69.338	0.638	0.0	13.0	13.0	12.2	O K
180 min Summer	69.277	0.577	0.0	11.9	11.9	9.8	O K
240 min Summer	69.228	0.528	0.0	11.0	11.0	8.1	O K
360 min Summer	69.154	0.454	0.0	9.4	9.4	5.8	O K
480 min Summer	69.106	0.406	0.0	8.3	8.3	4.5	O K
600 min Summer	69.074	0.374	0.0	7.3	7.3	3.7	O K
720 min Summer	69.051	0.351	0.0	6.6	6.6	3.2	O K
960 min Summer	69.029	0.329	0.0	5.5	5.5	2.7	O K
1440 min Summer	69.006	0.306	0.0	4.1	4.1	2.3	O K
2160 min Summer	68.989	0.289	0.0	3.1	3.1	2.0	O K
2880 min Summer	68.978	0.278	0.0	2.5	2.5	1.8	O K
4320 min Summer	68.963	0.263	0.0	1.9	1.9	1.6	O K
5760 min Summer	68.956	0.256	0.0	1.5	1.5	1.5	O K
7200 min Summer	68.952	0.252	0.0	1.3	1.3	1.4	O K
8640 min Summer	68.949	0.249	0.0	1.1	1.1	1.4	O K
10080 min Summer	68.947	0.247	0.0	1.0	1.0	1.4	O K
15 min Winter	69.408	0.708	0.0	14.0	14.0	15.3	O K
30 min Winter	69.454	0.754	0.0	14.0	14.0	17.5	O K
60 min Winter	69.420	0.720	0.0	14.0	14.0	15.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.889	0.0	19.7	16
30 min Summer	64.406	0.0	27.2	24
60 min Summer	41.084	0.0	35.0	40
120 min Summer	25.560	0.0	43.9	72
180 min Summer	19.213	0.0	49.7	102
240 min Summer	15.655	0.0	54.1	132
360 min Summer	11.703	0.0	60.7	192
480 min Summer	9.509	0.0	65.8	250
600 min Summer	8.090	0.0	70.1	310
720 min Summer	7.087	0.0	73.7	368
960 min Summer	5.749	0.0	79.8	490
1440 min Summer	4.281	0.0	89.2	734
2160 min Summer	3.185	0.0	99.6	1096
2880 min Summer	2.580	0.0	107.2	1444
4320 min Summer	1.915	0.0	119.5	2164
5760 min Summer	1.549	0.0	126.8	2888
7200 min Summer	1.314	0.0	136.5	3560
8640 min Summer	1.148	0.0	142.1	4408
10080 min Summer	1.024	0.0	147.3	5072
15 min Winter	94.889	0.0	22.2	16
30 min Winter	64.406	0.0	30.6	25
60 min Winter	41.084	0.0	39.4	42

Cascade Summary of Results for Swale 2.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
120 min Winter	69.316	0.616	0.0	12.6	12.6	11.3	O K
180 min Winter	69.232	0.532	0.0	11.1	11.1	8.2	O K
240 min Winter	69.169	0.469	0.0	9.8	9.8	6.2	O K
360 min Winter	69.091	0.391	0.0	7.8	7.8	4.1	O K
480 min Winter	69.048	0.348	0.0	6.5	6.5	3.1	O K
600 min Winter	69.031	0.331	0.0	5.6	5.6	2.8	O K
720 min Winter	69.019	0.319	0.0	4.9	4.9	2.6	O K
960 min Winter	69.004	0.304	0.0	4.0	4.0	2.3	O K
1440 min Winter	68.987	0.287	0.0	3.0	3.0	2.0	O K
2160 min Winter	68.972	0.272	0.0	2.2	2.2	1.7	O K
2880 min Winter	68.962	0.262	0.0	1.8	1.8	1.6	O K
4320 min Winter	68.953	0.253	0.0	1.3	1.3	1.5	O K
5760 min Winter	68.949	0.249	0.0	1.1	1.1	1.4	O K
7200 min Winter	68.945	0.245	0.0	0.9	0.9	1.3	O K
8640 min Winter	68.942	0.242	0.0	0.8	0.8	1.3	O K
10080 min Winter	68.939	0.239	0.0	0.7	0.7	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	25.560	0.0	49.3	74
180 min Winter	19.213	0.0	55.8	106
240 min Winter	15.655	0.0	60.7	134
360 min Winter	11.703	0.0	68.2	192
480 min Winter	9.509	0.0	74.0	250
600 min Winter	8.090	0.0	78.6	306
720 min Winter	7.087	0.0	82.7	366
960 min Winter	5.749	0.0	89.5	488
1440 min Winter	4.281	0.0	100.2	730
2160 min Winter	3.185	0.0	111.6	1100
2880 min Winter	2.580	0.0	120.3	1460
4320 min Winter	1.915	0.0	133.7	2136
5760 min Winter	1.549	0.0	143.2	2896
7200 min Winter	1.314	0.0	150.7	3560
8640 min Winter	1.148	0.0	159.3	4272
10080 min Winter	1.024	0.0	167.1	5008

Cascade Rainfall Details for Swale 2.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.500	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.027

Time (mins) From:	To:	Area (ha)
0	4	0.027

Cascade Model Details for Swale 2.SRCX

Storage is Online Cover Level (m) 69.800

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	26.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	5.0	Slope (1:X)	100.0
Porosity	0.45	Cap Volume Depth (m)	1.000
Invert Level (m)	68.700	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Pipe Outflow Control

Diameter (m)	0.100	Roughness k (mm)	0.600	Upstream Invert Level (m)	68.900
Slope (1:X)	20.0	Entry Loss Coefficient	0.500		
Length (m)	69.000	Coefficient of Contraction	0.600		

Cascade Summary of Results for Swale 3 .SRCX

Upstream Structures	Outflow To	Overflow To
(None)	Block N.SRCX	(None)

Half Drain Time : 6 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	69.136	0.336	0.0	5.9	5.9	1.9	O K
30 min Summer	69.143	0.343	0.0	6.4	6.4	2.0	O K
60 min Summer	69.125	0.325	0.0	5.3	5.3	1.8	O K
120 min Summer	69.100	0.300	0.0	3.8	3.8	1.6	O K
180 min Summer	69.087	0.287	0.0	3.0	3.0	1.5	O K
240 min Summer	69.077	0.277	0.0	2.4	2.4	1.4	O K
360 min Summer	69.064	0.264	0.0	1.9	1.9	1.3	O K
480 min Summer	69.057	0.257	0.0	1.5	1.5	1.2	O K
600 min Summer	69.053	0.253	0.0	1.3	1.3	1.2	O K
720 min Summer	69.050	0.250	0.0	1.2	1.2	1.2	O K
960 min Summer	69.046	0.246	0.0	0.9	0.9	1.1	O K
1440 min Summer	69.039	0.239	0.0	0.7	0.7	1.1	O K
2160 min Summer	69.033	0.233	0.0	0.5	0.5	1.0	O K
2880 min Summer	69.030	0.230	0.0	0.4	0.4	1.0	O K
4320 min Summer	69.026	0.226	0.0	0.3	0.3	1.0	O K
5760 min Summer	69.023	0.223	0.0	0.3	0.3	1.0	O K
7200 min Summer	69.021	0.221	0.0	0.2	0.2	0.9	O K
8640 min Summer	69.020	0.220	0.0	0.2	0.2	0.9	O K
10080 min Summer	69.019	0.219	0.0	0.2	0.2	0.9	O K
15 min Winter	69.144	0.344	0.0	6.4	6.4	2.0	O K
30 min Winter	69.138	0.338	0.0	6.1	6.1	2.0	O K
60 min Winter	69.112	0.312	0.0	4.5	4.5	1.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.889	0.0	2.8	12
30 min Summer	64.406	0.0	4.0	19
60 min Summer	41.084	0.0	5.4	34
120 min Summer	25.560	0.0	6.9	64
180 min Summer	19.213	0.0	7.9	94
240 min Summer	15.655	0.0	8.6	124
360 min Summer	11.703	0.0	9.7	184
480 min Summer	9.509	0.0	10.6	246
600 min Summer	8.090	0.0	11.3	306
720 min Summer	7.087	0.0	12.0	366
960 min Summer	5.749	0.0	13.0	488
1440 min Summer	4.281	0.0	14.6	726
2160 min Summer	3.185	0.0	16.4	1088
2880 min Summer	2.580	0.0	17.8	1444
4320 min Summer	1.915	0.0	19.9	2148
5760 min Summer	1.549	0.0	21.5	2864
7200 min Summer	1.314	0.0	22.9	3544
8640 min Summer	1.148	0.0	24.0	4400
10080 min Summer	1.024	0.0	25.0	5008
15 min Winter	94.889	0.0	3.2	12
30 min Winter	64.406	0.0	4.6	19
60 min Winter	41.084	0.0	6.1	34

Cascade Summary of Results for Swale 3 .SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
120 min Winter	69.086	0.286	0.0	2.9	2.9	1.5	O K
180 min Winter	69.072	0.272	0.0	2.2	2.2	1.3	O K
240 min Winter	69.063	0.263	0.0	1.8	1.8	1.3	O K
360 min Winter	69.054	0.254	0.0	1.4	1.4	1.2	O K
480 min Winter	69.049	0.249	0.0	1.1	1.1	1.1	O K
600 min Winter	69.046	0.246	0.0	1.0	1.0	1.1	O K
720 min Winter	69.043	0.243	0.0	0.8	0.8	1.1	O K
960 min Winter	69.038	0.238	0.0	0.7	0.7	1.1	O K
1440 min Winter	69.033	0.233	0.0	0.5	0.5	1.0	O K
2160 min Winter	69.028	0.228	0.0	0.4	0.4	1.0	O K
2880 min Winter	69.025	0.225	0.0	0.3	0.3	1.0	O K
4320 min Winter	69.022	0.222	0.0	0.2	0.2	0.9	O K
5760 min Winter	69.020	0.220	0.0	0.2	0.2	0.9	O K
7200 min Winter	69.018	0.218	0.0	0.2	0.2	0.9	O K
8640 min Winter	69.017	0.217	0.0	0.1	0.1	0.9	O K
10080 min Winter	69.016	0.216	0.0	0.1	0.1	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	25.560	0.0	7.8	64
180 min Winter	19.213	0.0	8.9	94
240 min Winter	15.655	0.0	9.7	124
360 min Winter	11.703	0.0	11.0	184
480 min Winter	9.509	0.0	12.0	238
600 min Winter	8.090	0.0	12.8	306
720 min Winter	7.087	0.0	13.5	370
960 min Winter	5.749	0.0	14.7	480
1440 min Winter	4.281	0.0	16.5	726
2160 min Winter	3.185	0.0	18.5	1088
2880 min Winter	2.580	0.0	20.0	1428
4320 min Winter	1.915	0.0	22.4	2188
5760 min Winter	1.549	0.0	24.2	2952
7200 min Winter	1.314	0.0	25.7	3488
8640 min Winter	1.148	0.0	27.0	4376
10080 min Winter	1.024	0.0	28.1	4960

Cascade Rainfall Details for Swale 3 .SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.500	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.020

Time (mins) From:	To:	Area (ha)
0	4	0.020

Cascade Model Details for Swale 3 .SRCX

Storage is Online Cover Level (m) 69.900

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	9.5
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	5.0	Slope (1:X)	500.0
Porosity	0.45	Cap Volume Depth (m)	1.100
Invert Level (m)	68.800	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.4		

Pipe Outflow Control

Diameter (m)	0.100	Roughness k (mm)	0.600	Upstream Invert Level (m)	69.000
Slope (1:X)	10.4	Entry Loss Coefficient	0.500		
Length (m)	28.000	Coefficient of Contraction	0.600		

Cascade Summary of Results for Block N.SRCX

Upstream Structures	Outflow To	Overflow To
Swale 2.SRCX Permeable Paving .SRCX Swale 1.SRCX North Permeable Paving.SRCX Swale 3 .SRCX	(None)	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	66.328	0.828	3.0	57.9	O K
30 min Summer	66.646	1.146	3.0	80.2	O K
60 min Summer	66.961	1.461	3.3	102.3	O K
120 min Summer	67.241	1.741	3.6	121.8	O K
180 min Summer	67.357	1.857	3.7	130.0	O K
240 min Summer	67.408	1.908	3.8	133.6	O K
360 min Summer	67.435	1.935	3.8	135.5	O K
480 min Summer	67.435	1.935	3.8	135.4	O K
600 min Summer	67.421	1.921	3.8	134.5	O K
720 min Summer	67.399	1.899	3.8	132.9	O K
960 min Summer	67.347	1.847	3.7	129.3	O K
1440 min Summer	67.230	1.730	3.6	121.1	O K
2160 min Summer	67.048	1.548	3.4	108.4	O K
2880 min Summer	66.874	1.374	3.3	96.2	O K
4320 min Summer	66.566	1.066	3.0	74.6	O K
5760 min Summer	66.258	0.758	3.0	53.0	O K
7200 min Summer	65.944	0.444	3.0	31.1	O K
8640 min Summer	65.790	0.290	3.0	20.3	O K
10080 min Summer	65.704	0.204	2.9	14.3	O K
15 min Winter	66.436	0.936	3.0	65.5	O K
30 min Winter	66.794	1.294	3.2	90.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.889	0.0	64.1	39
30 min Summer	64.406	0.0	88.3	53
60 min Summer	41.084	0.0	113.9	74
120 min Summer	25.560	0.0	142.3	124
180 min Summer	19.213	0.0	160.8	182
240 min Summer	15.655	0.0	174.9	240
360 min Summer	11.703	0.0	196.4	308
480 min Summer	9.509	0.0	212.9	374
600 min Summer	8.090	0.0	226.6	438
720 min Summer	7.087	0.0	238.3	508
960 min Summer	5.749	0.0	258.0	648
1440 min Summer	4.281	0.0	288.2	924
2160 min Summer	3.185	0.0	322.0	1336
2880 min Summer	2.580	0.0	347.4	1732
4320 min Summer	1.915	0.0	386.8	2520
5760 min Summer	1.549	0.0	415.1	3344
7200 min Summer	1.314	0.0	441.9	3896
8640 min Summer	1.148	0.0	462.2	4504
10080 min Summer	1.024	0.0	480.4	5240
15 min Winter	94.889	0.0	72.2	41
30 min Winter	64.406	0.0	99.5	55

Cascade Summary of Results for Block N.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	67.147	1.647	3.5	115.3	O K
120 min Winter	67.481	1.981	3.9	138.7	O K
180 min Winter	67.628	2.128	4.0	148.9	O K
240 min Winter	67.701	2.201	4.0	154.1	O K
360 min Winter	67.745	2.245	4.1	157.1	O K
480 min Winter	67.738	2.238	4.1	156.6	O K
600 min Winter	67.720	2.220	4.1	155.4	O K
720 min Winter	67.688	2.188	4.0	153.2	O K
960 min Winter	67.604	2.104	4.0	147.3	O K
1440 min Winter	67.413	1.913	3.8	133.9	O K
2160 min Winter	67.127	1.627	3.5	113.9	O K
2880 min Winter	66.866	1.366	3.2	95.6	O K
4320 min Winter	66.397	0.897	3.0	62.8	O K
5760 min Winter	65.845	0.345	3.0	24.1	O K
7200 min Winter	65.678	0.178	2.8	12.5	O K
8640 min Winter	65.614	0.114	2.5	8.0	O K
10080 min Winter	65.598	0.098	2.3	6.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	41.084	0.0	127.8	76
120 min Winter	25.560	0.0	159.7	124
180 min Winter	19.213	0.0	180.4	180
240 min Winter	15.655	0.0	196.3	236
360 min Winter	11.703	0.0	220.4	342
480 min Winter	9.509	0.0	238.9	390
600 min Winter	8.090	0.0	254.2	464
720 min Winter	7.087	0.0	267.3	544
960 min Winter	5.749	0.0	289.2	698
1440 min Winter	4.281	0.0	323.3	998
2160 min Winter	3.185	0.0	360.9	1432
2880 min Winter	2.580	0.0	389.7	1848
4320 min Winter	1.915	0.0	433.5	2700
5760 min Winter	1.549	0.0	466.5	3192
7200 min Winter	1.314	0.0	493.2	3824
8640 min Winter	1.148	0.0	518.3	4496
10080 min Winter	1.024	0.0	540.6	5128

Cascade Rainfall Details for Block N.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.500	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.112

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.060	8	12	0.013	16	20	0.013
4	8	0.000	12	16	0.013	20	24	0.013

Cascade Model Details for Block N.SRCX

Storage is Online Cover Level (m) 68.500

Tank or Pond Structure

Invert Level (m) 65.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	70.0	1.200	70.0	2.400	70.0	3.600	0.0	4.800	0.0
0.200	70.0	1.400	70.0	2.500	70.0	3.800	0.0	5.000	0.0
0.400	70.0	1.600	70.0	2.501	0.0	4.000	0.0		
0.600	70.0	1.800	70.0	3.000	0.0	4.200	0.0		
0.800	70.0	2.000	70.0	3.200	0.0	4.400	0.0		
1.000	70.0	2.100	70.0	3.400	0.0	4.600	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0080-4300-2500-4300
Design Head (m)	2.500
Design Flow (l/s)	4.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	80
Invert Level (m)	65.500
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.500	4.3	Kick-Flo®	0.716	2.4
Flush-Flo™	0.348	3.0	Mean Flow over Head Range	-	3.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	0.800	2.5	2.000	3.9	4.000	5.4	7.000	7.0
0.200	2.9	1.000	2.8	2.200	4.0	4.500	5.7	7.500	7.2
0.300	3.0	1.200	3.1	2.400	4.2	5.000	5.9	8.000	7.4
0.400	3.0	1.400	3.3	2.600	4.4	5.500	6.2	8.500	7.6
0.500	2.9	1.600	3.5	3.000	4.7	6.000	6.5	9.000	7.8
0.600	2.8	1.800	3.7	3.500	5.0	6.500	6.7	9.500	8.1

E. Surface Water Network Calculations – Main Apartment Block

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)	5	PIMP (%)	100
M5-60 (mm)	17.500	Add Flow / Climate Change (%)	0
Ratio R	0.370	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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)
0-4	0.487	4-8	0.140

Total Area Contributing (ha) = 0.627

Total Pipe Volume (m³) = 9.936

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
S2.000	13.459	0.090	150.0	0.051	4.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	22.688	0.151	150.0	0.033	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	26.350	0.176	150.0	0.054	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.003	3.696	0.025	150.0	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.004	12.569	0.084	149.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	7.834	0.052	150.0	0.000	4.00	0.0	0.600	o	225	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)
S2.000	50.00	4.21	71.250	0.051	0.0	0.0	0.0	1.07	42.4	7.0
S2.001	50.00	4.57	71.160	0.085	0.0	0.0	0.0	1.07	42.4	11.5
S2.002	50.00	4.98	71.009	0.139	0.0	0.0	0.0	1.07	42.4	18.8
S2.003	50.00	5.04	70.833	0.162	0.0	0.0	0.0	1.07	42.4	21.9
S2.004	50.00	5.23	65.480	0.162	0.0	0.0	0.0	1.07	42.4	21.9
S3.000	50.00	4.12	65.480	0.000	0.0	0.0	0.0	1.07	42.4	0.0

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
S2.005	14.585	0.097	150.4	0.061	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.006	16.175	0.108	149.8	0.067	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	5.935	0.040	148.4	0.046	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	14.564	0.097	150.1	0.027	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	9.089	0.061	150.0	0.097	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	23.635	0.166	142.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.007	7.758	0.052	149.2	0.082	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.008	18.860	0.126	149.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	24.662	0.986	25.0	0.024	4.00	0.0	0.600	o	225	Pipe/Conduit	
S2.009	4.127	0.103	40.1	0.062	0.00	0.0	0.600	o	300	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)
S2.005	50.00	5.46	65.170	0.223	0.0	0.0	0.0	1.06	42.3	30.2
S2.006	50.00	5.71	65.080	0.290	0.0	0.0	0.0	1.07	42.4	39.3
S4.000	50.00	4.09	65.650	0.046	0.0	0.0	0.0	1.07	42.6	6.2
S5.000	50.00	4.23	65.480	0.027	0.0	0.0	0.0	1.06	42.3	3.6
S5.001	50.00	4.37	65.383	0.123	0.0	0.0	0.0	1.07	42.4	16.7
S4.001	50.00	4.73	65.322	0.169	0.0	0.0	0.0	1.09	43.4	22.9
S2.007	50.00	5.81	64.000	0.541	0.0	0.0	0.0	1.28	90.8	73.3
S2.008	50.00	6.06	63.948	0.541	0.0	0.0	0.0	1.28	90.7	73.3
S6.000	50.00	4.16	65.000	0.024	0.0	0.0	0.0	2.63	104.5	3.3
S2.009	50.00	6.09	63.822	0.627	0.0	0.0	0.0	2.49	176.1	84.9

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	User	-	100	0.051	0.051	0.051
2.001	User	-	100	0.033	0.033	0.033
2.002	User	-	100	0.054	0.054	0.054
2.003	User	-	100	0.023	0.023	0.023
2.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.000	0.000	0.000
2.005	User	-	100	0.061	0.061	0.061
2.006	User	-	100	0.049	0.049	0.049
	User	-	100	0.018	0.018	0.067
4.000	User	-	100	0.046	0.046	0.046
5.000	User	-	100	0.027	0.027	0.027
5.001	User	-	100	0.097	0.097	0.097
4.001	-	-	100	0.000	0.000	0.000
2.007	User	-	100	0.052	0.052	0.052
	User	-	100	0.030	0.030	0.082
2.008	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.024	0.024	0.024
2.009	User	-	100	0.025	0.025	0.025
	User	-	100	0.037	0.037	0.062
				Total	Total	Total
				0.627	0.627	0.627

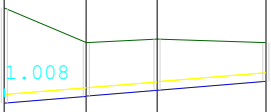
F. Foul Water Network Long Sections

MH Name	F6	F5	F4		F1	
Hor Scale 1500 Ver Scale 200 Datum (m) 66.000				2.000		
PN		F1.003	F1.002		F1.000	
Dia (mm)		225	225		225	
Slope (1:X)		87.4	21.3		21.3	
Cover Level (m)	71.770	71.250	71.000	72.250	72.250	
Invert Level (m)		68.275 / 68.505	68.505 / 69.560	69.560 / 70.145	70.145 / 71.425	
Length (m)		20.064	22.483		27.256	

MH Name	F			F9	F6	
Hor Scale 1500 Ver Scale 200 Datum (m) 63.000			4.002		3.000	
PN				F1.006	F1.004	
Dia (mm)				225	225	
Slope (1:X)				20.0	36.9	
Cover Level (m)	66.430	66.920	67.360 / 67.400	69.000	71.770	
Invert Level (m)		64.403	64.561 / 65.374 / 65.826	65.826 / 66.800	66.810 / 68.275	
Length (m)				19.478	54.056	

MH Name	F3		
Hor Scale 1500 Ver Scale 200 Datum (m) 67.000		1.000	
PN			
Dia (mm)			
Slope (1:X)			
Cover Level (m)	72.250	72.250	
Invert Level (m)		70.685 71.425	
Length (m)			

MH Name	F8		
Hor Scale 1500 Ver Scale 200 Datum (m) 64.000		1.004	
PN			
Dia (mm)			
Slope (1:X)			
Cover Level (m)	69.030	69.600	
Invert Level (m)		66.810 67.160	
Length (m)			

MH Name	F15			F12	
Hor Scale 1500 Ver Scale 200 Datum (m) 61.000					
PN				F4.000	
Dia (mm)				225	
Slope (1:X)				90.0	
Cover Level (m)	66.920	66.000	66.100	66.000	
Invert Level (m)		64.403 64.584	64.584 64.740	64.740 64.980	
Length (m)				21.568	

G. Irish Water Confirmation of Feasibility

Matteo Iannucci
Block S
East Point Business Park
Alfie Byrne Road
Dublin 3

Uisce Éireann
Bosca OP 6000
Baile Átha Cliath 1
Éire

Irish Water
PO Box 6000
Dublin 1
Ireland

T: +353 1 89 25000
F: +353 1 89 25001
www.water.ie

31 January 2019

Dear Sir/Madam,

Re: Customer Reference No 574765781 pre-connection enquiry - Subject to contract | Contract denied
[Connection for Strategic Housing Development of 280 no. domestic units]

Irish Water has reviewed your pre-connection enquiry in relation to water and wastewater connections at Brewery Road Apartments, Sillorgan, Dublin. Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated.

In the case of wastewater connections this assessment does not confirm that a gravity connection is achievable. Therefore a suitably sized pumping station may be required to be installed on your site. All infrastructure should be designed and installed in accordance with the Irish Water Code of Practice.

Water:
The connection should be made from 200mm MOPVC main which has to be extended for approximately 140m along N11 road.
Irish Water currently does not have any plans to extend its network in this area.
Please note that Irish Water can not guarantee a flow rate to meet fire flow requirements.

Wastewater:
New connection to the existing network is feasible without upgrade.

There are Irish Water infrastructure (4'uPVC watermain, 1200 mm DI watermain and 225mm Concrete sewer) within and in close proximity of the site boundaries.
The Developer will be required to survey the site to determine the exact location of the infrastructure. Any trial investigations shall be carried out with the agreement and in the presence of DLR County Council Inspector.
Diversion of the infrastructure may be required subject to layout proposal of the development and separation distances.
The diversion will be subject to customer entering diversion agreement with Irish Water. A wayleave in favour of Irish Water, will be required over all Infrastructure on the site that is not located within the Public Space.
For further information related to Diversion please visit www.water.ie/connections/developer-services/diversions.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details.

Strategic Housing Development

Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:

A. In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.

B. You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.

A connection agreement can be applied for by completing the connection application form available 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.

If you have any further questions, please contact Marina Byrne from the design team on 018925991 or email mzbyrne@water.ie. For further information, visit **www.water.ie/connections**

Yours sincerely,

Maria O'Dwyer
Connections and Developer Services

H. Irish Water Statement of Design Acceptance

Emma Caulwell,
Waterman Moylan Consulting Engineers,
Block S,
Eastpoint Business Park,
Alfie Byrne Road,
Dublin 3

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

22 August 2019

Re: Design Submission for Brewery Road Apartments, Stillorgan (the "Development") (the "Design Submission") / 574765781.

Dear Emma Caulwell,

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: Marina Bynre
Phone: 01 8925991
Email: mzbyrne@water.ie

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

Appendix A

Document Title & Revision

- 18-093-P100-A Road Levels And Watermain Layout Sheet 1 of 2
- 18-093-P101 Road Levels And Watermain Layout Sheet 2 of 2
- 18-093-P130 Proposed Water Supply Details Sheet 1 of 3
- 18-093-P131 Proposed Water Supply Details Sheet 2 of 3
- 18-093-P133 Proposed Water Supply Details Sheet 3 of 3
- 18-093-P201-A Proposed Drainage Layout Level 01
- 18-093-P232 Public Foul Water Drainage Details Sheet 1 of 2
- 18-093-P233 Public Foul Water Drainage Details Sheet 2 of 2
- 18-093-P234 Public Foul Water Drainage Details

Standard Details/Code of Practice Exemption:

This statement of design acceptance is conditional upon entering into a diversion agreement at connection application stage regarding the existing 1200mm watermain indicated underneath Block N.

*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.

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. WATERMAIN MATERIAL TO BE PE 100 (SDR 11 OR 17) IN COMPLIANCE WITH SECTION 3.9 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'.
4. AIR VALVE AND HYDRANTS COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH IN COMPLIANCE WITH SECTION 3.18 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'.
5. THRUST BLOCKS TO BE PROVIDED AT EACH BEND ALONG THE COURSE OF THE WATERMAIN IN COMPLIANCE WITH SECTION 4.6 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'.
6. ENSURE DEPTH OF COVER TO WATERMAIN CROWN IS ACHIEVED IN COMPLIANCE WITH SECTION 3.11 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'.
7. WHERE PLANTING OF TREES IS PROPOSED, APPROPRIATE PROTECTION MEASURES WILL BE PROVIDED TO PREVENT ROOT INGRESS
8. METERS FOR APARTMENTS AND SIMILAR PROPERTIES SHALL BE INSTALLED INTERNALLY WITHIN THE PREMISES IN ACCORDANCE WITH THE BUILDING CONTROL AUTHORITY'S REQUIREMENTS AND SUBJECT TO REVIEW BY IRISH WATER

LEGEND:

- EXISTING WATERMAIN
- PROPOSED 150mmØ HD PE WATERMAIN
- PROPOSED 150mmØ HD PE WATERMAIN (SLUNG)
- PROPOSED SLUICE VALVE
- PROPOSED HYDRANT
- PROPOSED AIR VALUE
- PROPOSED SCOUR VALVE
- PROPOSED BULK WATER METER
- PROPOSED BOUNDARY BOX
- PROPOSED ROAD LEVEL
- EXISTING ROAD LEVEL
- EX TREE AND ROOT PROTECTION AREA
- PROPOSED CHAINAGE
- PROPOSED FALLS

NOTE:
WATERMAIN MATERIAL TO BE PE 100 (SDR 11 OR 17) IN COMPLIANCE WITH SECTION 3.9 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'

NOTE:
AIR VALVE AND HYDRANTS COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH IN COMPLIANCE WITH SECTION 3.18 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'

NOTE:
THRUST BLOCKS TO BE PROVIDED AT EACH BEND ALONG THE COURSE OF THE WATERMAIN IN COMPLIANCE WITH SECTION 4.6 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'

NOTE:
ENSURE DEPTH OF COVER TO WATERMAIN CROWN IS ACHIEVED IN COMPLIANCE WITH SECTION 3.11 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'

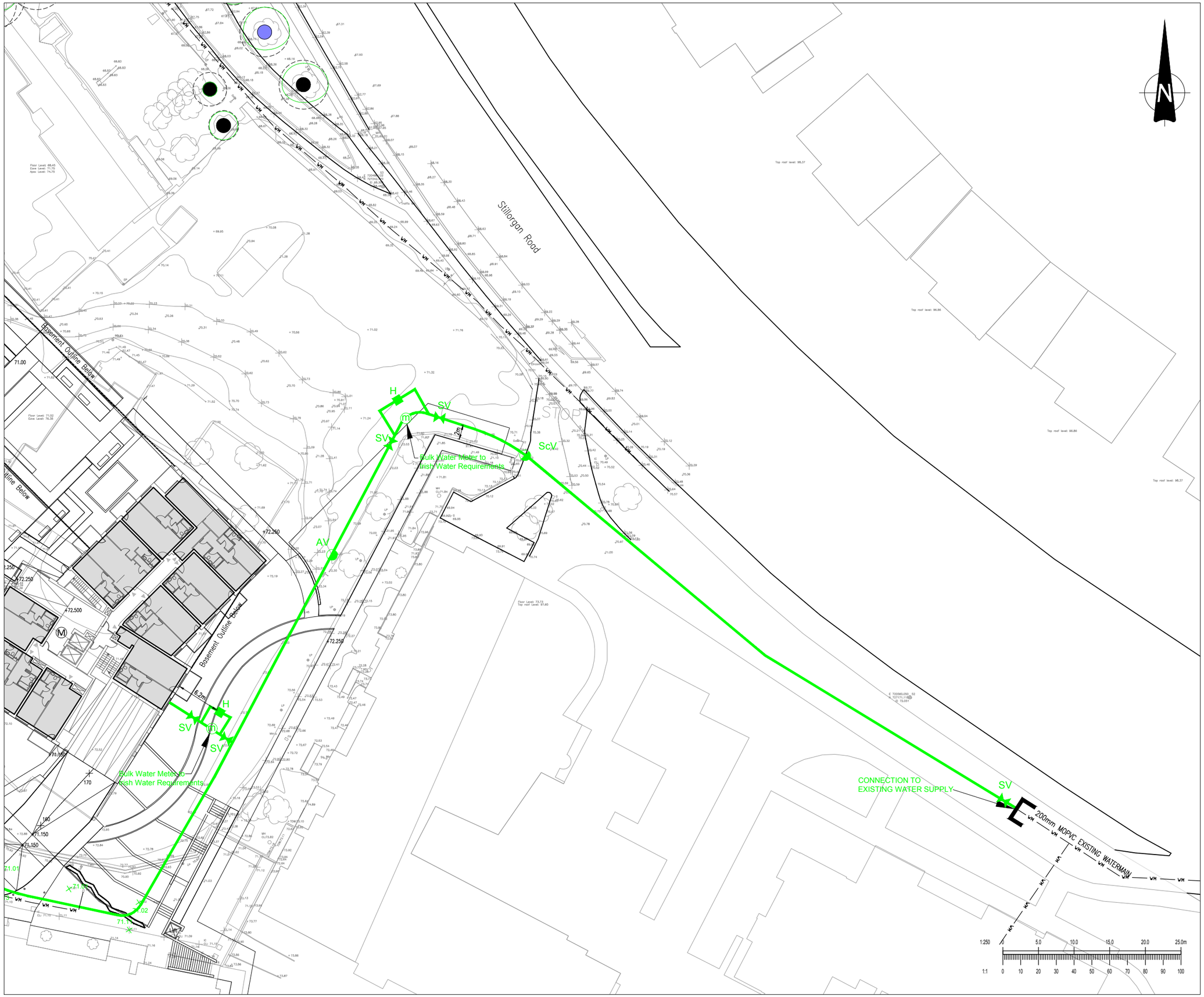
REV.	DATE	AMENDMENT	DRN	APPD
A	25/07/19	IRISH WATER SUBMISSION	GB	EC

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT	KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND
ARCHITECT	O'MAHONY PIKE ARCHITECTS
PROJECT	BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENTS, BLACKROCK, CO. DUBLIN
TITLE	ROAD LEVELS AND WATERMAIN LAYOUT SHEET 1 OF 2

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	18-093	P100	A



NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. WATERMAIN MATERIAL TO BE PE 100 (SDR 11 OR 17) IN COMPLIANCE WITH SECTION 3.9 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'.
4. AIR VALVE AND HYDRANTS COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH IN COMPLIANCE WITH SECTION 3.18 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'.
5. THRUST BLOCKS TO BE PROVIDED AT EACH BEND ALONG THE COURSE OF THE WATERMAIN IN COMPLIANCE WITH SECTION 4.6 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'.
6. ENSURE DEPTH OF COVER TO WATERMAIN CROWN IS ACHIEVED IN COMPLIANCE WITH SECTION 3.11 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'.
7. WHERE PLANTING OF TREES IS PROPOSED, APPROPRIATE PROTECTION MEASURES WILL BE PROVIDED TO PREVENT ROOT INGRESS
8. METERS FOR APARTMENTS AND SIMILAR PROPERTIES SHALL BE INSTALLED INTERNALLY WITHIN THE PREMISES IN ACCORDANCE WITH THE BUILDING CONTROL AUTHORITY'S REQUIREMENTS AND SUBJECT TO REVIEW BY IRISH WATER

LEGEND:

WM WM	EXISTING WATERMAIN
150mm ø	PROPOSED 150mmø HD PE WATERMAIN
150mm ø	PROPOSED 150mmø HD PE WATERMAIN (SLUNG)
SV	PROPOSED SLUICE VALVE
H	PROPOSED HYDRANT
AV	PROPOSED AIR VALUE
ScV	PROPOSED SCOUR VALVE
BWM	PROPOSED BULK WATER METER
BB	PROPOSED BOUNDARY BOX
70.23	PROPOSED ROAD LEVEL
68.12	EXISTING ROAD LEVEL
	EX TREE AND ROOT PROTECTION AREA
+40	PROPOSED CHAINAGE
1:23	PROPOSED FALLS

NOTE:
WATERMAIN MATERIAL TO BE PE 100 (SDR 11 OR 17) IN COMPLIANCE WITH SECTION 3.9 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'

NOTE:
AIR VALVE AND HYDRANTS COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH IN COMPLIANCE WITH SECTION 3.18 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'

NOTE:
THRUST BLOCKS TO BE PROVIDED AT EACH BEND ALONG THE COURSE OF THE WATERMAIN IN COMPLIANCE WITH SECTION 4.6 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'

NOTE:
ENSURE DEPTH OF COVER TO WATERMAIN CROWN IS ACHIEVED IN COMPLIANCE WITH SECTION 3.11 OF IRISH WATER, 'WATER SUPPLY INFRASTRUCTURE CODE OF PRACTICE'

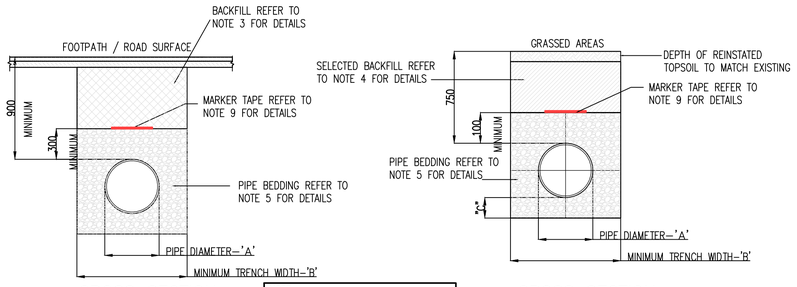
REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT	KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND
ARCHITECT	O'MAHONY PIKE ARCHITECTS
PROJECT	BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENTS, BLACKROCK, CO. DUBLIN
TITLE	ROAD LEVELS AND WATERMAIN LAYOUT SHEET 2 OF 2

DRAWN	DESIGNED	APPROVED	DATE
C.Byrne	EC	JG	APRIL '19
SCALE 1:250 @A1	JOB NO. 18-093	DRG. NO. P101	REVISION



CROSS SECTION IN ROADWAY

CROSS SECTION IN GRASS AREA

NOTE:
ALL ROAD JOINTS TO BE SAW CUT AND SEALED WITH BITUMEN

TRENCH BACKFILL AND BEDDING STD–W–13

PIPE DIAMETER 'A' (mm)	TRENCH WIDTH 'B' (mm)
< 80	SEE NOTE 10
100	500
150	600
200	600
250	750
300	750
350	750
400	900
450	900

PIPE DIAMETER 'A' (mm)	DEPTH OF BEDDING 'C' (mm)
< 200	150
> 250	200

PIPE BEDDING NOTES:

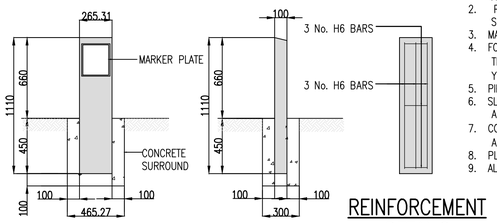
1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE
2. THE MINIMUM DEPTH OF COVER FROM THE FINISHED GROUND LEVEL TO THE EXTERNAL CROWN OF THE PIPE SHALL BE 750mm FOR SERVICE CONNECTIONS, 900mm FOR WATER MAINS. GREATER DEPTHS OF COVER AND/OR PIPE STRENGTH AND/OR A HIGHER CLASS OF BEDDING MATERIAL MAY BE REQUIRED WHERE HIGH TRAFFIC LOADING IS ANTICIPATED. THE MAXIMUM COVER SHOULD NOT EXCEED 1,200mm WHERE PRACTICABLE.
3. CLAUSE 808 MATERIAL IN ACCORDANCE WITH THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS IS TO BE USED AS BACKFILL MATERIAL WHERE THE WATER MAIN IS LOCATED IN ROADS, FOOTPATHS OR WHEN THE NEAREST PART OF THE TRENCH IS WITHIN 1m OF THE PAVED EDGE OF THE ROADWAY. CLAUSE 808 IS TO BE COMPACTED AS PER CLAUSE 802 OF THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS.
4. SELECTED EXCAVATED MATERIAL MAY BE USED IN GREEN–FIELD AREAS ABOVE GRANULAR PIPE SURROUND MATERIAL SUBJECT TO THE APPROVAL OF IRISH WATER.
5. PIPE BEDDING SHALL COMPLY WITH WIS 4–08–02 AND IGN 4–08–01 GRANULAR MATERIAL SHALL BE 14mm TO 5mm GRADED AGGREGATE OR 10mm SINGLE SIZED AGGREGATE TO IS EN 12620.
6. IN SOFT GROUND CONDITIONS (CBR < 5) THE MATERIAL SHOULD BE EXCAVATED OUT AND DISPOSED OF IN ACCORDANCE WITH THE WASTE MANAGEMENT ACT AND CLAUSE 804 MATERIAL IN ACCORDANCE WITH THE THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS SHALL REPLACE THE EXCAVATED MATERIAL, WRAPPED IN GEO–TEXTILE WRAPPING. ALTERNATIVELY, SPECIAL PIPE SUPPORT ARRANGEMENTS, INCLUDING PILING ETC. MAY BE REQUIRED WHERE THE DEPTH OF SOFT MATERIAL IS EXCESSIVE. SUCH ARRANGEMENTS SHALL BE SUBJECT TO ASSESSMENT BY IRISH WATER BEFORE ADVANCING WITH THE WORK.
7. PIPES SHALL NOT BE SUPPORTED ON STONES OR ROCKS, OR ANY HARD OBJECT AT ANY POINT ALONG THE TRENCH. ROCK SHALL BE EXCAVATED TO A DEPTH OF 150mm BELOW THE ACTUAL DEPTH OF THE TRENCH WITH THE VOID FILLED WITH CLAUSE 804 MATERIAL IN ACCORDANCE WITH THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS. THE GRANULAR MATERIAL SHALL BE LAID ABOVE THIS VOID BACKFILL MATERIAL.
8. SHOULD MINIMUM COVER NOT BE ACHIEVABLE, CONCRETE GRADE C8/10 SHALL BE USED AS BACKFILL MATERIAL.
9. MARKER TAPE TO BE 400mm WIDE BLUE POLYETHYLENE MATERIAL IN ACCORDANCE WITH EN 12163, PLASTIC PIPES SHALL HAVE WARNING TAPE INCORPORATED A REINFORCED BAND BRACING WIRE. SERVICE PIPES SHALL HAVE 200mm WIDE MESH TAPE. MARKER TAPE TO BE LAID AT A DISTANCE OF 350mm FROM SURFACE OF THE ROAD.
10. TRENCH WIDTHS FOR PIPE SIZES =< 80mm MY BE < 500mm, SUBJECT TO CONSIDERATION BEING GIVEN TO THE TRENCH DEPTH, HEALTH & SAFETY & CONSTRUCTION ACCESS REQUIREMENTS.
11. NEW ROAD CONSTRUCTION & SURFACE FINISH TO BE TO ROAD AUTHORITY REQUIREMENTS.
12. EXISTING ROAD REINSTATEMENT TO COMPLY WITH CURRENT VERSION OF "GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS" BY THE DEPT. OF TRANSPORT, TOURISM & SPORT, OR TRANSPORT INFRASTRUCTURE IRELAND REQUIREMENTS.

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. WATERMAINS SHALL BE LAID IN ACCORDANCE WITH THE LOCAL AUTHORITY SPECIFICATION FOR THE LAYING OF NEW WATERMAINS AND BYLAWS WHICH OVER–RIDE THESE NOTES. THE CONSTRUCTION OF THE WATERMAIN SHALL BE IN ACCORDANCE WITH THE BEST CURRENT PRACTICE AND THE LATEST EDITIONS OF THE RELEVANT STANDARDS AND CODES OF PRACTICE.
4. WATERMAINS SHALL NOT BE LAID UNDER WALLS OR AREAS DESIGNATED FOR TREES/SHRUBS/FLOWERS.
5. PIPES SHALL BE HDPE (BLUE PIPE) UNLESS NOTED OTHERWISE BY AGREEMENT WITH THE LOCAL AUTHORITY. DUCTILE IRON PIPES SHALL BE USED UNDER ROADS OF CLASSIFICATION "DISTRICT DISTRIBUTOR" UPWARDS UNLESS NOTED OTHERWISE.
6. PIPES SHALL CONFORM TO THE UK WATER INDUSTRY SPECIFICATION OR EQUIVALENT E.U. SPECIFICATION.
7. DUCTILE IRON PIPES SHALL CONFORM TO CLASS K9 OF EN 545. DUCTILE IRON FITTINGS SHALL BE EITHER K9 OR K12. DUCTILE IRON PIPEWORK SHALL BE COATED INTERNALLY WITH A CENTRIFUGAL APPLIED CEMENT MORTAR LINING CONTAINING A SULPHATE RESISTANT CEMENT AND SHALL BE SEALED WITH AN APPROVED BITUMEN OR EPOXY RESIN SEAL COAT IN ACCORDANCE WITH BS 4722:1988. EXTERNAL PROTECTION SHALL INCLUDE A ZINC COATING TO EN 545 UNDER BITUMEN BASED COATING TO BS 3416:1991.
8. ALL PIPEWORK SHALL HAVE A 400mm WIDE WATER WARNING MESH, (PLYAGE HR 40D BLUE OLYTHENE WARNING MESH OR SIMILAR) LAID DIRECTLY OVER THE CENTRELINE OF THE PIPELINE AND TIED TO VALVES AT A DEPTH OF 350mm BELOW THE FINISHED GROUND SURFACE. SUPPLY PIPES SHALL HAVE A 200mm WIDE MESH LAID AT THE SAME DEPTH.
9. WATERMAINS SHALL BE LAID UNDER FOOTPATHS PREFERABLY OR GRASS MARGINS WHERE APPROVED. NO PIPE, CONDUIT, CABLE OR OTHER SERVICE SHALL BE LAID LONGITUDINALLY OVER THE LINE OF A WATERMAIN. NO CABINET POLES, JUNCTION BOXES OR CHAMBERS SHALL BE CONSTRUCTED OVER A WATERMAIN.
10. THE MINIMUM COVER TO A WATERMAIN SHALL BE 750mm, THE MAXIMUM COVER SHALL BE 900mm UNLESS NOTED OTHERWISE.
11. CONNECTIONS TO THE MAINS WHICH ARE THE PROPERTY OF THE LOCAL AUTHORITY CAN BE MADE BY THE LOCAL AUTHORITY ONLY. NO OTHER PERSON MAY INTERFERE IN ANY WAY WITH THESE MAINS. SUCH CONNECTIONS WILL BE MADE BY THE COUNTY COUNCIL AT THE EXPENSE OF THE PERSONS REQUIRING THEM. THE ESTIMATED COST OF SUCH CONNECTIONS MUST BE LODGED WITH TO THE LOCAL AUTHORITY BEFORE THE WORK IS UNDERTAKEN.
12. WHERE VALVES ARE USED, THEY SHALL BE BOLTED TO FITTINGS (E.G. TEE–PIECES) DIRECTLY, WITHOUT THE INSERTION OF ANY INTERMEDIATE PIPE LENGTHS.
13. SLUICE VALVES SHALL COMPLY WITH THE THE LOCAL AUTHORITY SPECIFICATION FOR SLUICE VALVES. THEY SHALL BE DOUBLE FLANGED, DUCTILE IRON RESILIENT SEAL GATE VALVES FOR WATER DIVISION PURPOSES AND SHALL COMPLY WITH THE RELEVANT REQUIREMENTS OF BS 5163: 1986 TYPE B AND HAVE THE BS KITEMARK. ALL SLUICE VALVES SHALL BE OF THE METAL TONGUED VARIETY AND CONSTRUCTED WITH A RECESSED CHANNEL FOR RECEIVING THE METAL TONGUE ON CLOSING.
14. HYDRANTS, SLUICE VALVES, AIR VALVES CHAMBERS SHALL BE COVERED WITH APPROVED HEAVY DUTY SURFACE COVERS TO IS 261: 1984. THESE APPROVED METAL COVERS SHALL CONFORM TO THE LOCAL AUTHORITY SPECIFICATION FOR VALVE AND HYDRANT COVERS.
15. HYDRANT/SLUICE VALVE/FLOW METER INDICATOR PLATES AND BASEBOARDS SHALL COMPLY WITH THE RELEVANT LOCAL AUTHORITY SPECIFICATION. THEY SHALL BE MOUNTED AT THE BOUNDARY OF THE PUBLIC THOROUGHFARE NEAREST TO THE HYDRANT.

MARKER PLATES NOTES

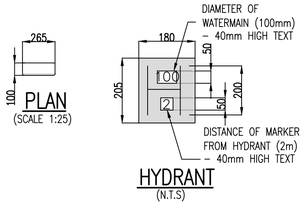
1. WHERE PRACTICAL MARKER PLATES SHALL BE FIXED TO ADJACENT WALLS OR ALTERNATIVELY ATTACHED TO MARKER POSTS.
2. PLATES TO BE FIXED IN POSITION USING WALL PLUGS AND STAINLESS STEEL SCREWS.
3. MARKER PLATES TO BE MANUFACTURED IN ACCORDANCE WITH BS 3251.
4. FOR HYDRANT PLATE ALL CHARACTERS SHOULD BE BLACK AND THE REMAINDER OF THE FRONT FACE SHOULD CONFORM TO COLOUR REFERENCE No. 309 (CANARY YELLOW) OF BS 381C.
5. PIPE DIAMETER ON HYDRANT PLATE TO REFER TO WATERMAIN NOT BRANCH.
6. SLUICE VALVE, AIR VALVE, SCOUR VALVE AND METER PLATES SHOULD BE CAST IRON. ALL CHARACTERS SHOULD BE BLACK ON WHITE PAINT BACKGROUND.
7. CONCRETE SURROUND TO MARKER POST TO BE GRADE C25 / 30 AND IN ACCORDANCE WITH IS EN 206/2013.
8. PLASTIC MARKER POSTS ARE NOT ACCEPTABLE.
9. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206.



ELEVATION
(SCALE 1:25)

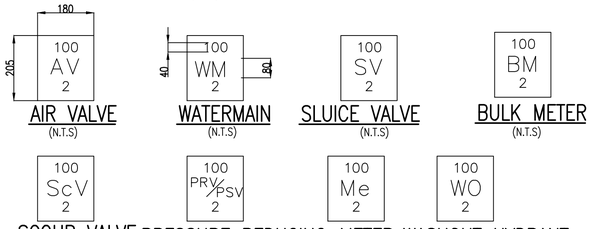
SECTION
(SCALE 1:25)

REINFORCEMENT DETAILS
(SCALE 1:25)



PLAN
(SCALE 1:25)

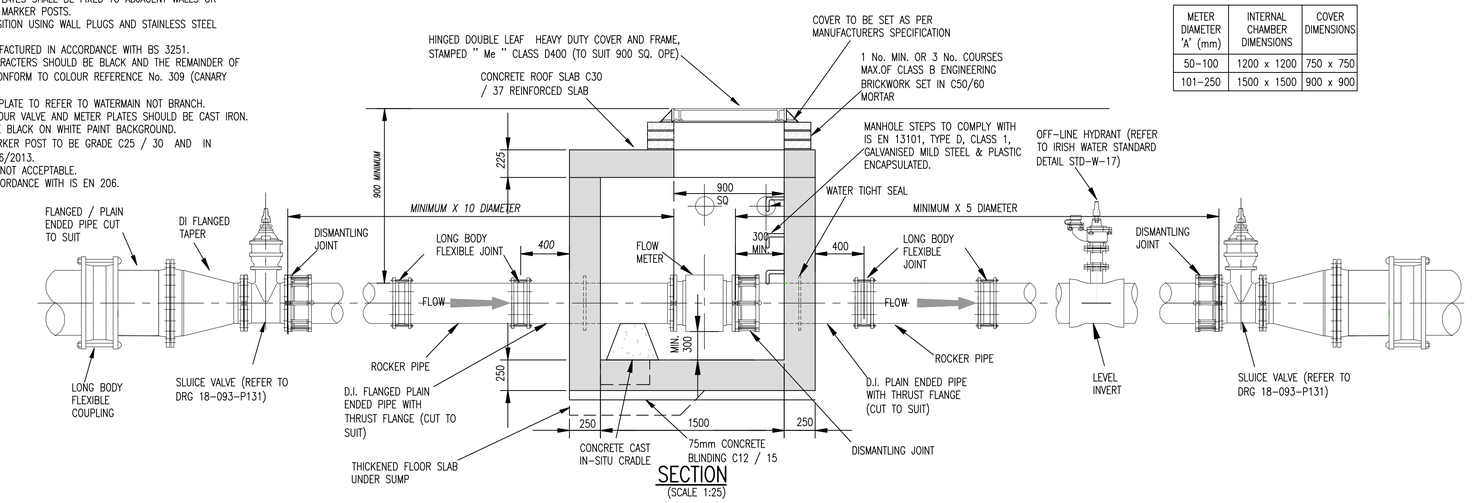
HYDRANT
(N.T.S)



AIR VALVE (N.T.S) | WATERMAIN (N.T.S) | SLUICE VALVE (N.T.S) | BULK METER (N.T.S)

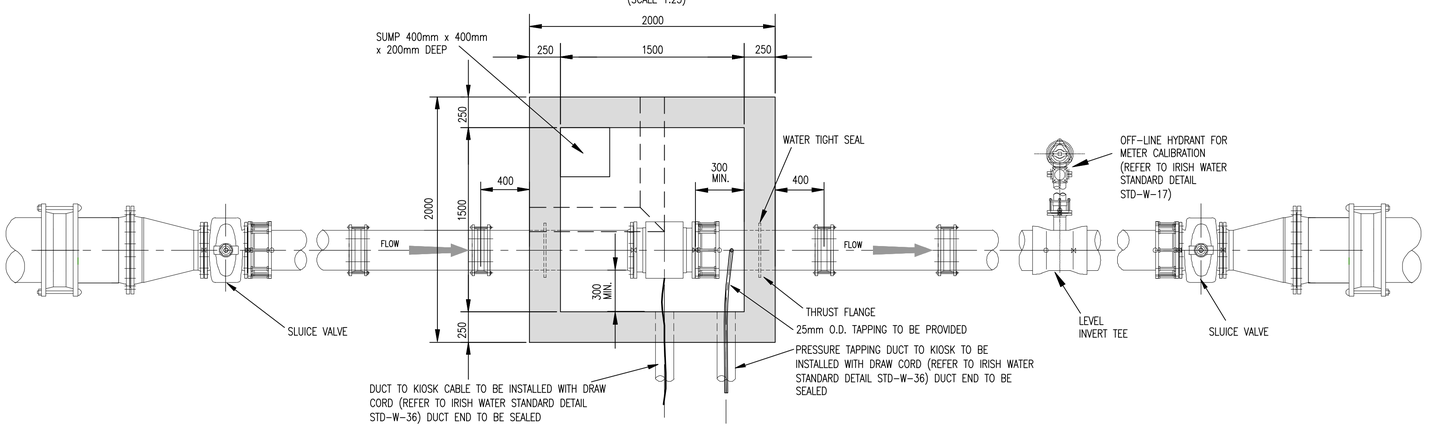
SCOUR VALVE (N.T.S) | PRESSURE REDUCING / SUSTAINING VALVE (N.T.S) | METER (N.T.S) | WASHOUT HYDRANT (N.T.S)

MARKER POST/PLATE DETAILS STD–W–27



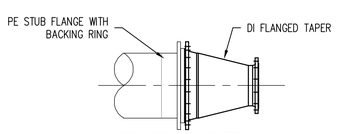
SECTION
(SCALE 1:25)

METER DIAMETER 'A' (mm)	INTERNAL CHAMBER DIMENSIONS	COVER DIMENSIONS
50–100	1200 x 1200	750 x 750
101–250	1500 x 1500	900 x 900

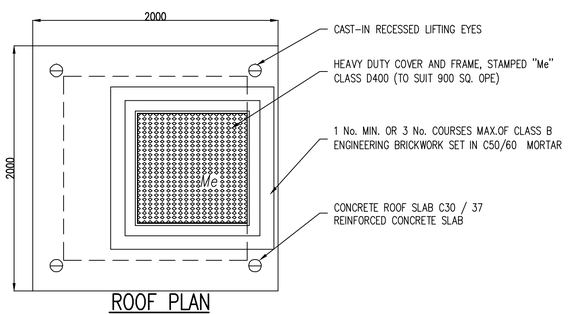


PROPOSED BULK WATER METER PLAN VIEW STD–W–26
(SCALE 1:25)

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. STRUCTURAL DESIGN AND REINFORCEMENT DETAIL TO BE PROVIDED BY THE DEVELOPER AND SUBMITTED TO IRISH WATER FOR REVIEW. ROOF SLABS SHALL BE DESIGNED TO CARRY ALL LIVE LOADS & DEAD LOADS, & CONSIST OF A REINFORCED CONCRETE SLAB OF IN–SITU CONCRETE, GRADE C30/37, WITH A MINIMUM THICKNESS OF 225mm. ALTERNATIVELY, PRE–CAST CONCRETE ROOFS MAY BE USED, SUBJECT TO IRISH WATER REVIEW, & COMPLIANCE WITH BS 5911, Part 4.
3. CONCRETE FOR FLOW METER CHAMBER TO BE C30/37.
4. PRECAST UNITS COMPLETED WITH RUBBER SEALING GASKET BETWEEN UNITS, COMPLYING WITH THE REQUIREMENTS OF IS EN 1917 AND BS 5911–PART 3, COMPLETE WITH 150mm CONCRETE SURROUND MAY BE USED AS AN ACCEPTABLE ALTERNATIVE. CONCRETE SURROUND TO BE GRADE C16/20 IN ACCORDANCE WITH IS EN 206.
5. METER CHAMBER SHALL BE COVERED WITH APPROVED HEAVY DUTY METAL COVERS TO IS EN 124: 1994 RATING D400. COVER AND FRAME SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS AND IS SUBJECT TO THE APPROVAL OF IRISH WATER.
6. 200mm ALL ROUND, 100mm DEEP CONCRETE PLINTH WITH PROTECTIVE STAINLESS STEEL METAL BAND AROUND COVER IN GRASS AREAS.
7. ANTI CORROSION TAPE TO BE PROVIDED AROUND BURIED FLANGES.
8. DUCTILE IRON PIPES AND FITTINGS TO BE IN ACCORDANCE WITH IS EN 545. PE PIPES AND FITTINGS TO BE IN ACCORDANCE WITH IS EN 12201:2011.
9. ALL CHAMBERS TO BE CHECKED FOR UPLIFT BY THE DEVELOPER BASED ON GROUND CONDITIONS WITHIN THE SITE. SHOULD ANTI FLOATATION MEASURES BE REQUIRED THEY SHALL BE SUBJECT TO APPROVAL FROM IRISH WATER.
10. PIPEWORK TO BE DOWNSIZED TO ACCOMMODATE THE REQUIRED RANGE OF THE FLOW METER. STRAIGHT PIPE LENGTHS UPSTREAM AND DOWNSTREAM OF THE METER TO BE PROVIDED. IF THE METER IS NOT CAPABLE OF ACCURATE NIGHT FLOW MEASUREMENTS A BY–PASS FLOW METER SHALL BE PROVIDED WITH APPROPRIATE VALVES, FITTINGS AND PIPEWORK.
11. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206.
12. ANY SPECIAL ROAD REINSTATEMENT AROUND COVER & FRAME SHALL BE TO ROAD AUTHORITY'S REQUIREMENTS.
13. NEW ROAD CONSTRUCTION & SURFACE FINISH TO BE TO ROAD AUTHORITY REQUIREMENTS.
14. EXISTING ROAD REINSTATEMENT TO COMPLY WITH CURRENT VERSION OF "GUIDELINES FOR MANAGING OPENING IN PUBLIC ROADS" BY THE DEPT. OF TRANSPORT, TOURISM & SPORT, OR TRANSPORT INFRASTRUCTURE IRELAND REQUIREMENTS.



PE TO DI DETAIL



ROOF PLAN

1:25 0 0.5 1.0 1.5 2.0 2.5m
1:1 0 10 20 30 40 50 60 70 80 90 100m

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 K7W7 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT: KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB–FUND KW PRS FUND

ARCHITECT: O'MAHONY PIKE ARCHITECTS

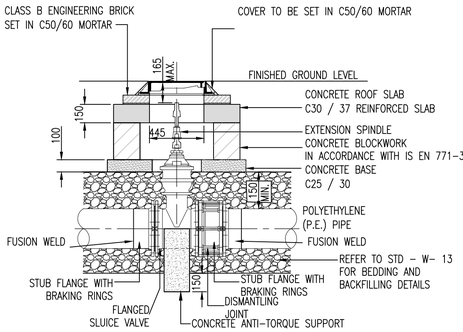
PROJECT: BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENTS, BLACKROCK, CO DUBLIN

TITLE: PROPOSED WATER SUPPLY DETAILS SHEET 1 OF 3

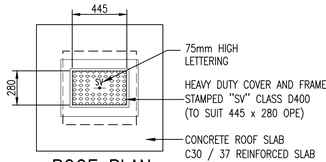
DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE 1:25 @A1	JOB NO. 18–093	DRG. NO. P130	REVISION

SLUICE VALVE NOTES:

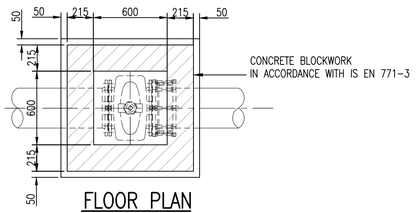
1. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. SLUICE VALVE CHAMBERS SHALL BE COVERED WITH APPROVED HEAVY DUTY METAL COVERS TO IS 261 OR BS 5834. COVER AND FRAME SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS AND IS SUBJECT TO REVIEW BY IRISH WATER.
3. SLUICE VALVES SHALL BE RESILIENT SEATED AND SHALL COMPLY WITH BS 5163–1, BS 5163–2, IS EN 1074–1, IS EN 1074–2, OR EQUIVALENT E.U. SPECIFICATIONS.
4. ALL SLUICE VALVES SHALL BE ANTI–CLOCKWISE CLOSING.
5. VALVE CHAMBER TO BE CONSTRUCTED OF PRECAST CONCRETE UNITS OR HIGH DENSITY BLOCKWORK. ALTERNATIVELY PROPRIETARY PREFABRICATED CHAMBER UNITS MAY ALSO BE USED, SUBJECT TO REVIEW BY IRISH WATER. LOADS & DEAD LOADS, & CONSIST OF A REINFORCED CONCRETE SLAB OF IN–SITU CONCRETE, GRADE C30/37, WITH A MINIMUM THICKNESS OF 150mm. ALTERNATIVELY, PRE–CAST CONCRETE ROOFS MAY BE USED, SUBJECT TO IRISH WATER REVIEW, & COMPLIANCE WITH BS 5911, Part 4.
6. CONCRETE CHAMBERS SHALL BE SURROUNDED BY A MINIMUM OF 150mm COMPACTED CLAUSE 808 MATERIAL AS PER STD–W–13.
7. DUCTILE IRON PIPES AND FITTINGS TO BE IN ACCORDANCE WITH IS EN 545. PE PIPES AND FITTINGS TO BE IN ACCORDANCE WITH IS EN 12201:2011.
8. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH AROUND COVERS IN GREEN AREAS.
9. THRUST BLOCKS (NOT SHOWN ON DRAWING), TO BE PROVIDED AS PER STANDARD DRAWING STD–W–28 AT ALL TEES, BENDS, TAPERS, DEAD ENDS AND PIPES AT STEEP SLOPES.
10. ANTI–CORROSION TAPE TO BE PROVIDED AROUND BURIED FLANGES.
11. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206.
12. 450 x 450mm INTERNAL DIMENSION CHAMBERS MAY BE PROVIDED SUBJECT TO REVIEW BY IW. SUCH CHAMBERS SHALL BE PROVIDED WITH GRADE "A" HEAVY DUTY COVER & FRAME & STAMPED "SV".
13. ANY SPECIAL ROAD REINSTATEMENT AROUND COVER & FRAME SHALL BE TO ROAD AUTHORITY'S REQUIREMENTS.
14. NEW ROAD CONSTRUCTION & SURFACE FINISH TO BE TO ROAD AUTHORITY REQUIREMENTS. 15. EXISTING ROAD REINSTATEMENT TO COMPLY WITH CURRENT VERSION OF "GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS" BY THE DEPT. OF TRANSPORT, TOURISM & SPORT, OR TRANSPORT INFRASTRUCTURE IRELAND REQUIREMENTS.



SECTION
(SCALE 1:25)



ROOF PLAN
(SCALE 1:25)



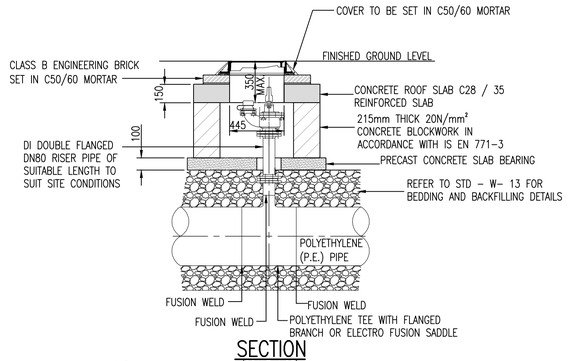
FLOOR PLAN
SLUICE VALVE CHAMBER FOR POLYETHYLENE (PE) PIPE (BLOCKWORK CONSTRUCTION)
STD–W–15
(SCALE 1:25)

AIR VALVE NOTES:

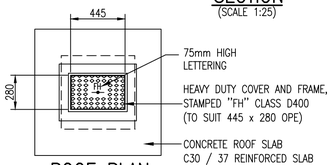
1. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. AIR VALVE CHAMBERS SHALL BE COVERED WITH APPROVED VENTILATED HEAVY DUTY METAL COVERS TO IS EN 124 RATING D400. COVER AND FRAME SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS AND IS SUBJECT TO THE APPROVAL OF IRISH WATER.
3. AIR VALVES SHALL COMPLY WITH THE REQUIREMENTS OF IS EN 1074–4. AIR VALVES SHALL BE DOUBLE ORIFICE TYPE AND SHALL INCLUDE AN ISOLATING VALVE. THE ISOLATING VALVE SHALL BE EITHER A GATE VALVE CONFORMING TO IS EN 1074–2 & SHALL BE OF A BOLTLESS BONNET DESIGN, OR A BUTTERFLY VALVE TO IS EN 1074–2.
4. SERVICE CONNECTIONS SHALL NOT BE PROVIDED WITHIN 2m OF THE AIR VALVE LOCATION.
5. AIRVALVE CHAMBERS TO BE OF PRECAST CONCRETE UNITS OR HIGH DENSITY BLOCKWORK. ALTERNATIVE PROPRIETARY PREFABRICATED CHAMBER UNITS MAY ALSO BE USED, SUBJECT TO APPROVAL FROM IRISH WATER.
6. PRECAST CONCRETE CHAMBERS SHALL BE SURROUNDED BY A MINIMUM OF 150mm COMPACTED CLAUSE 808 MATERIAL AS PER STD–W–13.
7. DUCTILE IRON PIPES / FITTINGS AND PE PIPES / FITTINGS TO BE IN ACCORDANCE WITH IS EN 545 AND IS EN 12201:2011.
8. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH WITH PROTECTIVE STAINLESS STEEL METAL BAND AROUND COVERS IN GREEN AREAS.
9. THRUST BLOCKS (NOT SHOWN ON DRAWING), TO BE PROVIDED AS PER STANDARD DRAWING STD–W–28 AT ALL TEES, BENDS, TAPERS, DEAD ENDS AND PIPES AT STEEP SLOPES.
10. ANTI CORROSION TAPE TO BE PROVIDED AROUND BURIED FLANGES.
11. THE LOCATION OF THE AIR VALVE SHALL BE THE SUBJECT OF PARTICULAR AGREEMENT WITH IRISH WATER TO ENSURE THAT THE RISK OF CONTAMINATION THROUGH THE VALVE IS ELIMINATED.
12. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206.
13. ANY SPECIAL ROAD REINSTATEMENT AROUND COVER & FRAME SHALL BE TO ROAD AUTHORITY'S REQUIREMENTS.
14. NEW ROAD CONSTRUCTION & SURFACE FINISH TO BE TO ROAD AUTHORITY REQUIREMENTS.
15. EXISTING ROAD REINSTATEMENT TO COMPLY WITH CURRENT VERSION OF "GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS" BY THE DEPT. OF TRANSPORT, TOURISM & SPORT, OR TRANSPORT INFRASTRUCTURE IRELAND REQUIREMENTS.

HYDRANT NOTES:

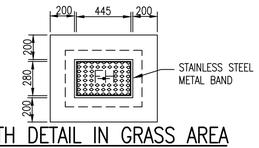
1. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. HYDRANT CHAMBERS SHALL BE COVERED WITH APPROVED HEAVY DUTY METAL COVERS TO IS 261 OR BS 5834 COVER AND FRAME SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS AND IS SUBJECT TO REVIEW BY IRISH WATER.
3. ALL HYDRANTS, SURFACE BOX FRAMES & COVERS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF IS EN 14339, IS EN 1074–6 & BS 750. FIRE HYDRANTS SHALL BE TYPE 2. THE HYDRANT INLET SHALL BE 80mm DIAMETER WITH PN16.
4. ALL HYDRANTS SHALL BE CLOCKWISE CLOSING.
5. HYDRANT CHAMBER TO BE CONSTRUCTED OF PRECAST CONCRETE UNITS OR HIGH DENSITY BLOCKWORK. ALTERNATIVELY PROPRIETARY PREFABRICATED ROOF SLABS SHALL BE DESIGNED TO CARRY ALL LIVE LOADS & DEAD LOADS, & CHAMBER UNITS MAY ALSO BE USED, SUBJECT TO REVIEW BY IRISH WATER. CONSIST OF A REINFORCED CONCRETE SLAB OF IN–SITU CONCRETE, GRADE C30/37, WITH A MINIMUM THICKNESS OF 150mm. ALTERNATIVELY, PRE–CAST CONCRETE ROOFS MAY BE USED, SUBJECT TO IRISH WATER REVIEW, & COMPLIANCE WITH BS 5911, Part 4.
6. CONCRETE CHAMBERS SHALL BE SURROUNDED BY A MINIMUM OF 150mm COMPACTED CLAUSE 808 MATERIAL AS PER STD–W–13.
7. DUCTILE IRON PIPES AND FITTINGS TO BE IN ACCORDANCE WITH IS EN 545. PE PIPES AND FITTINGS TO BE IN ACCORDANCE WITH IS EN 12201:2011.
8. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH AROUND COVERS IN GREEN AREAS.
9. THRUST BLOCKS (NOT SHOWN ON DRAWING), TO BE PROVIDED AS PER STANDARD DRAWING STD–W–28 AT ALL TEES, BENDS, TAPERS, DEAD ENDS AND PIPES AT STEEP SLOPES.
10. ANTI CORROSION TAPE TO BE PROVIDED AROUND BURIED FLANGES.
11. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206.
12. ANY SPECIAL ROAD REINSTATEMENT AROUND COVER & FRAME SHALL BE TO ROAD AUTHORITY'S REQUIREMENTS.
13. NEW ROAD CONSTRUCTION & SURFACE FINISH TO BE TO ROAD AUTHORITY REQUIREMENTS.
14. EXISTING ROAD REINSTATEMENT TO COMPLY WITH CURRENT VERSION OF "GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS" BY THE DEPT. OF TRANSPORT, TOURISM & SPORT, OR TRANSPORT INFRASTRUCTURE IRELAND REQUIREMENTS.



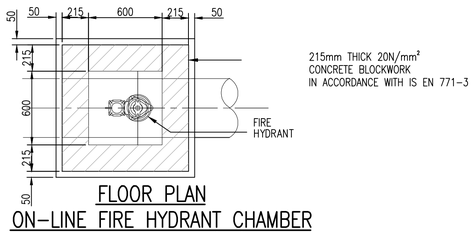
SECTION
(SCALE 1:25)



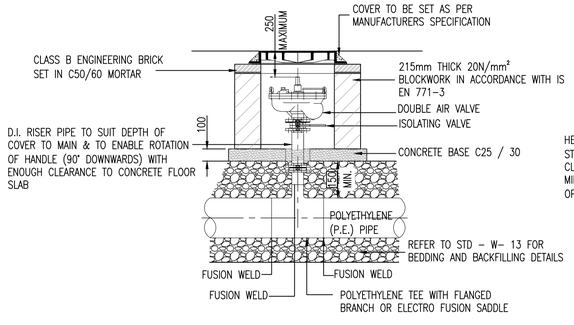
ROOF PLAN
(SCALE 1:25)



PLINTH DETAIL IN GRASS AREA
(SCALE 1:25)



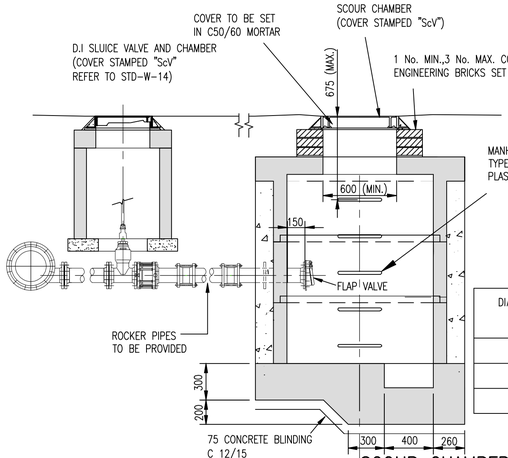
FLOOR PLAN
ON–LINE FIRE HYDRANT CHAMBER FOR POLYETHYLENE (PE) PIPE (BLOCKWORK CONSTRUCTION)
STD–W–18
(SCALE 1:25)



SECTION
(SCALE 1:25)

SCOUR VALVE NOTES:

1. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. STRUCTURAL REINFORCEMENT AND DESIGN DETAIL TO BE PROVIDED BY THE DEVELOPER AND SUBMITTED TO IRISH WATER FOR REVIEW. ROOF SLABS SHALL BE DESIGNED TO CARRY ALL LIVE LOADS & DEAD LOADS, & CONSIST OF A REINFORCED CONCRETE SLAB OF IN–SITU CONCRETE, GRADE C30/37, WITH A MINIMUM THICKNESS OF 225mm. ALTERNATIVELY, PRE–CAST CONCRETE ROOFS MAY BE USED, SUBJECT TO IRISH WATER REVIEW, & COMPLIANCE WITH BS 5911, Part 4.
3. CONCRETE FOR SCOUR CHAMBER AND HEADWALL TO BE C30/37.
4. PREFABRICATED CHAMBER AND HEADWALL MAY ALSO BE USED, SUBJECT TO REVIEW FROM IRISH WATER
5. SCOUR CHAMBER SHALL BE COVERED WITH APPROVED HEAVY DUTY METAL COVERS TO IS EN 124 RATING D400. COVER AND FRAME SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS AND IS SUBJECT TO REVIEW IRISH WATER.
6. 200mm ALL ROUND, 100mm DEEP CONCRETE PLINTH AROUND COVERS IN GRASS AREAS.
7. FINAL DETAIL TO BE REVIEWED BY IRISH WATER AND RELEVANT REGULATORY AUTHORITIES.
8. THRUST BLOCKS (NOT SHOWN ON DRAWING), TO BE PROVIDED AS PER STANDADRD DRAWING STD–W–28 AT ALL TEES, BENDS, TAPERS,
   DEAD ENDS AND PIPES AT STEEP SLOPES.
9. ANTI CORROSION TAPE TO BE PROVIDED AROUND BURIED FLANGES.
10. ALL PIPEWORK AND FITTINGS TO BE IN ACCORDANCE WITH IN EN 545. PE PIPES AND FITTINGS TO BE IN ACCORDANCE WITH IS EN 12201:2011
11. ALL CHAMBERS TO BE CHECKED FOR UPLIFT BY THE DEVELOPER BASED ON GROUND CONDITIONS WITHIN THE SITE. SHOULD ANTI FLOATATION MEASURES BE REQUIRED THEY SHALL BE SUBJECT TO AGREEMENT.
12. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206.
13. BACKFILL AND REINSTATEMENT OF RIVER BED AND BANK TO BE SUBJECT TO AGREEMENT WITH IRISH WATER & RELEVANT AUTHORITIES.



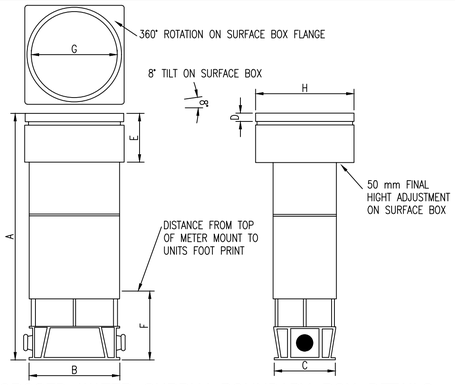
SCOUR CHAMBER SECTION
STD–W–30
(SCALE 1:25)

DIAMETER OF WATERMAIN (mm)	DIAMETER OF SCOUR (mm)
NOT EXCEEDING 75	50
100 TO 200	75
200 TO 350	100

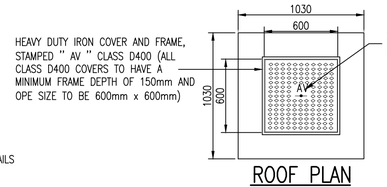
Dimensions and details

Box Type	A(min)	A(min)	B	C	D	E	F	G	H	Weight
Standard Unit (20mm, 25mm and 32mm connections)	499mm	870mm	208mm	151mm	20mm	112mm	170mm	173mm	225mm	4.5kg
Short Units	310mm	545mm	208mm	151mm	20mm	112mm	170mm	173mm	225mm	3.4kg

Matrix can be supplied to suit imperial pipes including Irish heavy gauge and normal gauge imperial pipes.

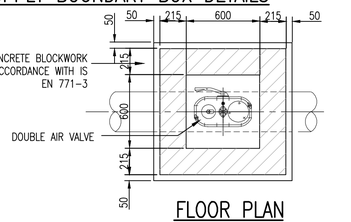


PROPOSED WATER SUPPLY BOUNDARY BOX DETAILS



ROOF PLAN
(SCALE 1:25)

DIAMETER OF MAIN	UP TO 250 (mm)	250 TO 350 (mm)
DIAMETER OF BRANCH	80mm	100mm
BORE OF VALVE INLET	80mm	100mm



FLOOR PLAN
ON–LINE AIR VALVE FOR POLYETHYLENE (PE) PIPE (BLOCKWORK CONSTRUCTION)
STD–W–22
(SCALE 1:25)

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. WATERMAINS SHALL BE LAID IN ACCORDANCE WITH THE LOCAL AUTHORITY / IRISH WATER SPECIFICATION FOR THE LAYING OF NEW WATERMAINS AND BYLAWS WHICH OVER–RIDE THESE NOTES. THE CONSTRUCTION OF THE WATERMAIN SHALL BE IN ACCORDANCE WITH THE BEST CURRENT PRACTICE AND THE LATEST EDITIONS OF THE RELEVANT STANDARDS AND CODES OF PRACTICE.
4. WATERMAINS SHALL NOT BE LAID UNDER WALLS OR AREAS DESIGNATED FOR TREES/SHRUBS/FLOWERS.
5. PIPES SHALL BE HDPE (BLUE PIPE) UNLESS NOTED OTHERWISE BY AGREEMENT WITH THE LOCAL AUTHORITY. DUCTILE IRON PIPES SHALL BE USED UNDER ROADS OF CLASSIFICATION "DISTRICT DISTRIBUTOR" UPWARDS UNLESS NOTED OTHERWISE.
6. PIPES SHALL CONFORM TO THE UK WATER INDUSTRY SPECIFICATION OR EQUIVALENT E.U. SPECIFICATION.
7. DUCTILE IRON (DI) PIPES SHALL CONFORM TO IS EN 545 AND SHALL HAVE MINIMUM C40 PRESSURE RATING. DUCTILE IRON FITTINGS SHALL HAVE 16 BAR RATING AT LEAST DI PIPEWORK SHALL BE COATED INTERNALLY WITH A BLAST FURNACE CEMENT LINING WHICH COMPRISES WITH THE REQUIREMENTS OF BS 6920. EXTERNAL PROTECTION SHALL INCLUDE AN ALLOY OF 70NC AND ALUMINUM WITH A MINIMUM 15% ALUMINUM WITH OR WITHOUT OTHER MATERIALS HAVING A MASS OF 400g/m² COMPETE WITH A FINISHING LAYER OF BLUE FUSION BONDED EPOXY IN ACCORDANCE WITH IS EN 14901.
8. WATERMAINS SHALL BE LAID UNDER FOOTPATHS PREFERABLY OR GRASS MARGINS WHERE APPROVED. NO PIPE, CONDUIT, CABLE OR OTHER SERVICE SHALL BE LAID LONGITUDINALLY OVER THE LINE OF A WATERMAIN. NO CABINET POLES, JUNCTION BOXES OR CHAMBERS SHALL BE CONSTRUCTED OVER A WATERMAIN.
9. THE MINIMUM COVER TO A WATERMAIN SHALL BE 750mm, THE MAXIMUM COVER SHALL BE 900mm UNLESS NOTED OTHERWISE.
10. CONNECTIONS TO THE MAINS WHICH ARE THE PROPERTY OF THE IRISH WATER CAN BE MADE BY THE IRISH WATER ONLY. NO OTHER PERSON MAY INTERFERE IN ANY WAY WITH THESE MAINS. SUCH CONNECTIONS WILL BE MADE BY IRISH WATER AT THE EXPENSE OF THE PERSONS REQUIRING THEM. THE ESTIMATED COST OF SUCH CONNECTIONS MUST BE LODGED WITH IRISH WATER BEFORE THE WORK IS UNDERTAKEN.
11. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEB SITE AT WWW.WATER.IE/CONNECTIONS/DEVELOPER–SERVICES/ WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE

1:25 0 0.5 1.0 1.5 2.0 2.5m
1:1 0 10 20 30 40 50 60 70 80 90 100m

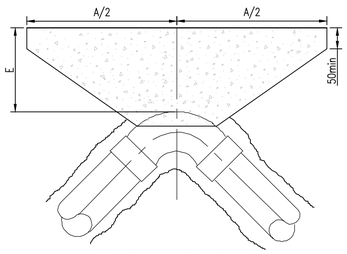
REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

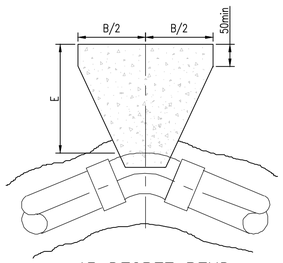
Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT	KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB–FUND KW PRS FUND
ARCHITECT	O'MAHONY PIKE ARCHITECTS
PROJECT	BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENTS, BLACKROCK, CO DUBLIN
TITLE	PROPOSED WATER SUPPLY DETAILS SHEET 2 OF 3

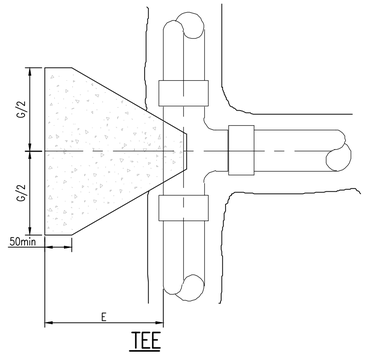
DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE AS SHOWN @A1	JOB NO. 18–093	DRG. NO. P131	REVISION



90 DEGREE BEND



45 DEGREE BEND



TEE

TABLE OF DIMENSIONS FOR STEEPLY INCLINED PIPELINES	
GRADIENT	SPACING
1 IN 2 & STEEPER	5.5m
BELOW 1 IN 2 TO 1 IN 4	11.0m
1 IN 4 TO 1 IN 5	16.6m
1 IN 5 TO 1 IN 6	22.0m

< 12 BAR TEST PRESSURE

NOM. DIA. (mm)	DIMENSIONS			
	A	B	E	G
100	600	330	200	390
150	950	510	225	660
200	1150	600	300	790
250	1350	750	300	970
300	1580	850	320	1110
350	2100	1150	450	1450
400	2550	1400	500	1800
450	3000	1630	680	2130
500	3590	1950	800	2540
600	4100	2200	850	2880

12 BAR TO 15 BAR TEST PRESSURE

NOM. DIA. (mm)	DIMENSIONS			
	A	B	E	G
100	700	380	200	510
150	1135	620	225	760
200	1400	750	300	980
250	1730	940	320	1210
300	2090	1130	380	1480
350	2600	1410	500	1840
400	2980	1610	750	2110
450	3400	1840	900	2330
500	4080	2210	1000	2880
600	5010*	2710*	1000	3550*

15 BAR TO 18 BAR TEST PRESSURE

NOM. DIA. (mm)	DIMENSIONS			
	A	B	E	G
100	750	400	220	530
150	1250	700	250	890
200	1650	890	320	1170
250	1960	1060	350	1370
300	2300	1200	500	1630
350	2930	1580	750	2070
400	3510	1900	1000	2490
450	3810	2270	1000	2970
500	4340*	2380	1000	3700
600	6370*	3450*	1000	4500*

WATERMAIN TRUST AND SUPPORT BLOCKS

1. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. CONCRETE THRUST BLOCKS (ANCHORAGE) SHALL BE POSITIONED SYMMETRICALLY WITH RESPECT TO THE CONNECTING PIPE & BENDS.
3. TRENCH DIMENSIONS : DRAWING No's. STD-W-13.
4. THRUST BLOCKS SHALL BEAR ON UNDISTURBED SOIL. IF FOR ANY REASON THEY CANNOT THEN THE DEVELOPER SHALL. NOTIFY IRISH WATER IMMEDIATELY WITH A PROPOSED SOLUTION.
5. THRUST BLOCK REINFORCEMENT REQUIRE SPECIFIC DESIGN.
6. FOR TEST PRESSURES GREATER THAN 18 BAR, THRUST BLOCK DESIGN IS TO BE SUBMITTED TO IRISH WATER FOR APPROVAL.
7. THRUST BLOCKS ARE DESIGNED FOR AN AVERAGE BEARING PRESSURE OF 100 KN/m (TYPICAL FOR SOFT CLAY) FOR OTHER CONDITIONS. ACTUAL DIMENSIONS MAY BE ALTERED ON INSTRUCTIONS FROM IRISH WATER.
8. CONCRETE IN THRUST BLOCKS SHALL BE GRADE C20/25.
9. COMPRESSIBLE FILLER FOR CONCRETE PROTECTION TO BE IN ACCORDANCE WITH BS EN 622-1 AND BS EN 622-4. BITUMINOUS MATERIAL SHALL NOT BE PUT IN CONTACT WITH PLASTIC PIPES. THE THICKNESS OF COMPRESSIBLE FILLER FOR MAINS < 450mm IN DIAMETER IS TO BE 18mm.
10. CONCRETE THRUST BLOCKS FOR POLYETHYLENE PIPE TO COMPLY WITH THE MANUFACTURES REQUIREMENTS.
11. POLYETHYLENE PIPES SHALL BE WRAPPED IN PLASTIC SHEETING HAVING A COMPOSITION IN ACCORDANCE WITH BS 6076 BEFORE BEING CAST INTO CONCRETE.
12. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206.

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. WATERMAINS SHALL BE LAID IN ACCORDANCE WITH THE LOCAL AUTHORITY / IRISH WATER SPECIFICATION FOR THE LAYING OF NEW WATERMAINS AND BYLAWS WHICH OVER-RIDE THESE NOTES. THE CONSTRUCTION OF THE WATERMAIN SHALL BE IN ACCORDANCE WITH THE BEST CURRENT PRACTICE AND THE LATEST EDITIONS OF THE RELEVANT STANDARDS AND CODES OF PRACTICE.
4. WATERMAINS SHALL NOT BE LAID UNDER WALLS OR AREAS DESIGNATED FOR TREES/SHRUBS/FLOWERS.
5. PIPES SHALL BE HDPE (BLUE PIPE) UNLESS NOTED OTHERWISE BY AGREEMENT WITH THE LOCAL AUTHORITY. DUCTILE IRON PIPES SHALL BE USED UNDER ROADS OF CLASSIFICATION "DISTRICT DISTRIBUTOR" UPWARDS UNLESS NOTED OTHERWISE.
6. PIPES SHALL CONFORM TO THE UK WATER INDUSTRY SPECIFICATION OR EQUIVALENT E.U. SPECIFICATION.
7. DUCTILE IRON (DI) PIPES SHALL CONFORM TO IS EN 545 AND SHALL HAVE MINIMUM C40 PRESSURE RATING. DUCTILE IRON FITTINGS SHALL HAVE 16 BAR RATING AT LEAST DI PIPEWORK SHALL BE COATED INTERNALLY WITH A BLAST FURNACE CEMENT LINING WHICH COMPRISES WITH THE REQUIREMENTS OF BS 6920. EXTERNAL PROTECTION SHALL INCLUDE AN ALLOY OF 70NC AND ALUMINUM WITH A MINIMUM 15% ALUMINUM WITH OR WITHOUT OTHER MATERIALS HAVING A MASS OF 400g/m² COMPETE WITH A FINISHING LAYER OF BLUE FUSION BONDED EPOXY IN ACCORDANCE WITH IS EN 14901.
8. WATERMAINS SHALL BE LAID UNDER FOOTPATHS PREFERABLY OR GRASS MARGINS WHERE APPROVED. NO PIPE, CONDUIT, CABLE OR OTHER SERVICE SHALL BE LAID LONGITUDINALLY OVER THE LINE OF A WATERMAIN. NO CABINET POLES, JUNCTION BOXES OR CHAMBERS SHALL BE CONSTRUCTED OVER A WATERMAIN.
9. THE MINIMUM COVER TO A WATERMAIN SHALL BE 750mm, THE MAXIMUM COVER SHALL BE 900mm UNLESS NOTED OTHERWISE.
10. CONNECTIONS TO THE MAINS WHICH ARE THE PROPERTY OF THE IRISH WATER CAN BE MADE BY THE IRISH WATER ONLY. NO OTHER PERSON MAY INTERFERE IN ANY WAY WITH THESE MAINS. SUCH CONNECTIONS WILL BE MADE BY IRISH WATER AT THE EXPENSE OF THE PERSONS REQUIRING THEM. THE ESTIMATED COST OF SUCH CONNECTIONS MUST BE LODGED WITH IRISH WATER BEFORE THE WORK IS UNDERTAKEN.
11. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEB SITE AT WWW.WATER.IE/CONNECTIONS/DEVELOPER-SERVICES/ WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE

1:25 0 0.5 1.0 1.5 2.0 2.5m
1:1 0 10 20 30 40 50 60 70 80 90 100m

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

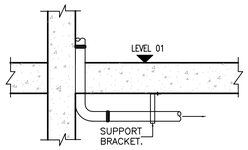
CLIENT KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND

ARCHITECT O'MAHONY PIKE ARCHITECTS

PROJECT
BREWERY ROAD APARTMENTS,
GRANGE DEVELOPMENTS,
BLACKROCK,
CO DUBLIN

TITLE
PROPOSED WATER SUPPLY DETAILS
SHEET 3 OF 3

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:25 @A1	18-093	P132	



TYPICAL SLUNG DRAINAGE DETAIL
SCALE 1:25

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. FOR EXTERNAL SURFACE WATER DRAINAGE LAYOUT REFER TO DRAWING LEVEL 02 (18-093-P200)

LEGEND

- FMH 4 CL 71.000 IL 69.560 — 225ø 1:21 22.48m — PROPOSED FOUL DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- 150mm ø 1/150 — PROPOSED FOUL WATER SLUNG DRAINAGE WITH RODDING EYE
- D.P. (T.B.) — PROPOSED FOUL WASTE WATER DOWN PIPE (TO BELOW)
- FWP — PROPOSED FOUL WASTE WATER DOWN PIPE (AT LEVEL 01)
- D.P. (T.B.) — PROPOSED SURFACE WATER DOWN PIPE (TO BELOW)
- SWP — PROPOSED SURFACE WATER DOWN PIPE (AT LEVEL 01)
- G — PROPOSED GULLY AND 100mmø CONNECTION
- 150mm ø 1/150 — PROPOSED SURFACE WATER SLUNG DRAINAGE WITH RODDING EYE
- SMH4 CL-3.700 IL-4.600 150mmø ø 1/150 — PROPOSED SURFACE WATER DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- ACO CHANNEL — PROPOSED ACO CHANNEL
- EX FMH 37 CL 66.92 IL 66.03 225mmø — EXISTING FOUL WATER DRAINAGE
- MH54 CL:66.23 IL:62.23 1500mmø — EXISTING SURFACE WATER DRAINAGE
- INDICATES PROPOSED SWALE
- INDICATES PROPOSED PERMEABLE PAVED AREA
- INDICATES PROPOSED TREE PIT

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD
A	22/08/19	IRISH WATER SUBMISSION	GB	EC

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT	KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND 10
ARCHITECT	O'MAHONY PIKE ARCHITECTS
PROJECT	BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.
TITLE	PROPOSED DRAINAGE LAYOUT LEVEL 01

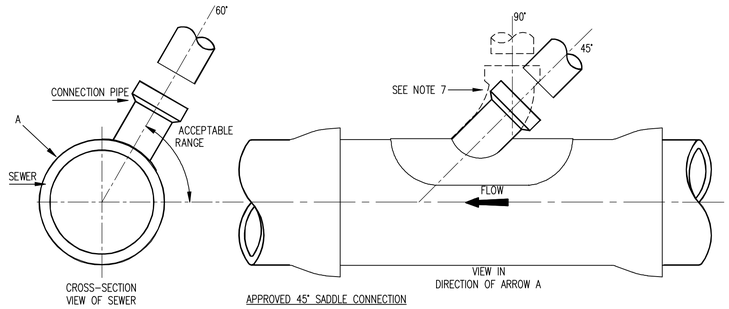
DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	18-093	P201	A

NOTE:
PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

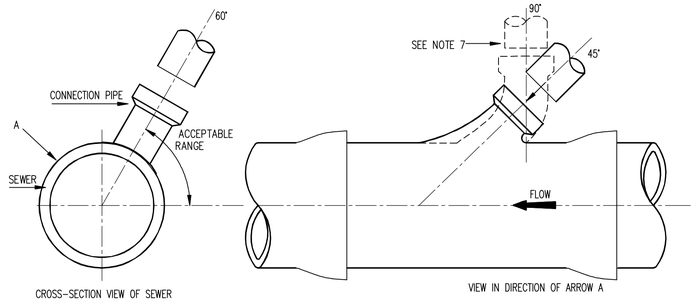
NOTE:
FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS(mm) UNLESS NOTED OTHERWISE
2. AS FAR AS PRACTICABLE, JUNCTIONS AND SERVICE CONNECTIONS SHALL BE BUILT IN FOR ALL PLANNED USERS WHEN THE SEWER IS BEING CONSTRUCTED. WHERE IT IS NECESSARY TO MAKE A POST-CONSTRUCTION CONNECTION THE DEVELOPER SHALL BRING THE SEWER TO THE INSPECTION CHAMBER, INSTALL THE INSPECTION CHAMBER AND SEAL THE UPSTREAM END UNTIL THE CONNECTION IS REQUIRED.
3. THE VERTICAL ANGLE BETWEEN THE SERVICE CONNECTING PIPE & THE HORIZONTAL SHALL BE GREATER THAN 0° AND NOT MORE THAN 60°
4. WHERE THE CONNECTION IS BEING MADE TO A SEWER WITH A NOMINAL INTERNAL DIAMETER OF 300mm DIAMETER OR LESS, CONNECTION SHALL BE MADE USING 45° ANGLE JUNCTIONS
5. WHERE THE CONNECTION IS BEING MADE TO A SEWER WITH A NOMINAL INTERNAL DIAMETER GREATER THAN 300mm
   A. IF THE DIAMETER OF THE CONNECTING PIPE IS GREATER THAN HALF THE DIAMETER OF THE SEWER, AN ACCESS MANHOLE SHALL BE CONSTRUCTED TO FORM THE CONNECTION POINT. OR
   B. IF THE DIAMETER OF THE CONNECTING PIPE IS LESS THAN OR EQUAL TO HALF THE DIAMETER OF THE SEWER, THEN THE CONNECTION SHALL BE MADE USING A PREFORMED SADDLE FITTING WITH A SLOW BEND BETWEEN THE SADDLE AND THE CONNECTING SEWER/DRAIN.
6. CONNECTIONS MADE WITH SADDLE FITTINGS SHALL BE MADE BY CUTTING AND SAFELY REMOVING A CORE FROM THE PIPE AND JOINTING THE SADDLE FITTING TO THE PIPE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS TO ENSURE A WATERTIGHT JOINT. THE CONNECTING PIPE SHALL NOT PROTRUDE INTO THE SEWERS.
7. TO IRISH WATER REVIEW, PROVIDED THE SADDLE OR BRANCH INCORPORATES A SWEPT TEE CONNECTION TOWARDS THE DIRECTION OF FLOW



APPROVED 45° SADDLE CONNECTION



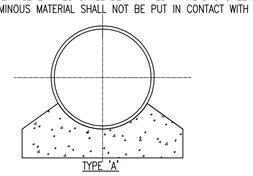
45° JUNCTION

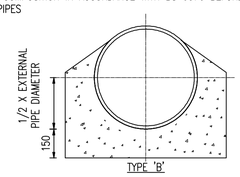
CRTYPICAL SEWER/SERVICE PIPE CONNECTION STD-WW-04

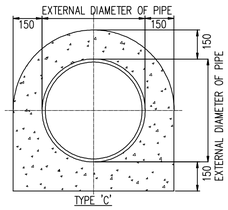
SCALE 1:25

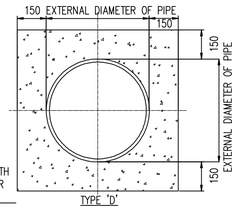
NOTES:

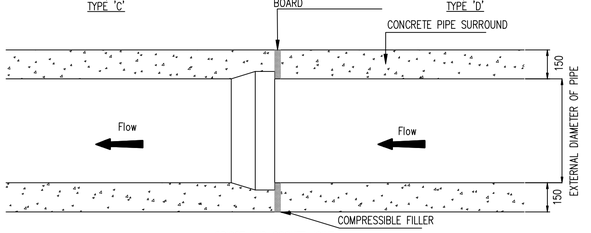
1. ALL DIMENSIONS ARE IN MILLIMETERS(mm) UNLESS NOTED OTHERWISE
2. CONCRETE PIPE BEDS AND HAUNCHES MAY BE REQUIRED TO ADDRESS MINIMUM COVER SITUATIONS, AND SHALL BE SUBJECT TO SUBMISSION AND ASSESSMENT BY IRISH WATER BEFORE ADVANCING WITH THE WORKS.
3. CONCRETE PIPE BEDS AND HAUNCHES SHALL HAVE A MINIMUM THICKNESS OF 150mm WITH AN ABSOLUTE MINIMUM DEPTH OF COVER ABOVE THE EXTERNAL CROWN OF THE PIPE OF 750mm.
4. CONCRETE TO BE IN ACCORDANCE WITH IS EN 206 AND TO BE CLASS C16/20.
5. THE HAUNCHES AND SURROUNDS TO BE FORMED USING FORM WORK TO PROVIDE A ROUGH CAST FINISH.
6. EXPANSION JOINTS IN THE CONCRETE SHALL BE PROVIDED AT ALL PIPE JOINTS TO ALLOW FOR PIPE FLEXIBILITY, COMPRESSIBLE FILLER BOARD TO BE IN ACCORDANCE WITH BS EN 622-1 AND BS EN 622-4, AND TO BE 18mm THICK.
7. POLYETHYLENE PIPES SHALL BE WRAPPED IN PLASTIC SHEETING HAVING A COMPOSITION IN ACCORDANCE WITH BS 6076 BEFORE BEING CAST INTO CONCRETE.
8. BITUMINOUS MATERIAL SHALL NOT BE PUT IN CONTACT WITH PE OR PVC PIPES







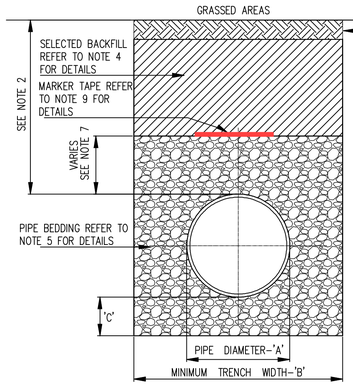




SPIGOT AND SOCKET JOINT

CONCRETE BED, HAUNCH AND SURROUND TO WASTEWATER PIPES STD-WW-08

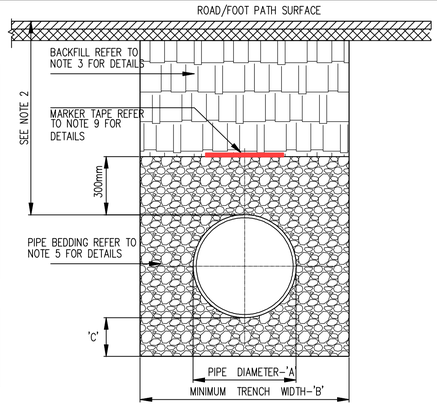
SCALE 1:25



CROSS SECTION IN GRASSED AREAS

PIPE DIAMETER 'A' (mm)	TRENCH WIDTH 'B' (mm)
< 80 RISING MAIN	SEE NOTE 10
100	500
150	600
200	600
250	750
300	750
350	750
400	900
450	900

PIPE DIAMETER 'A' (mm)	DEPTH OF BEDDING 'C' (mm)
< 100	100
150 - 450	200



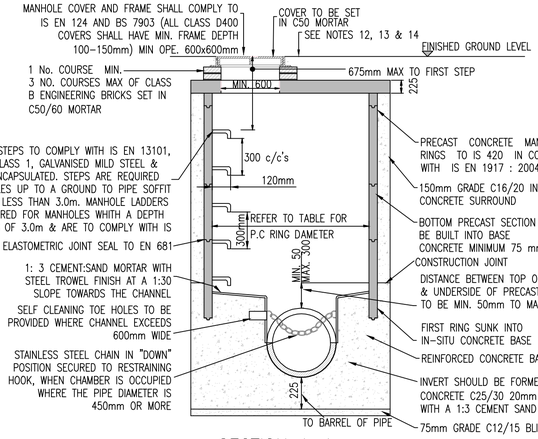
CROSS SECTION IN ROADS

TRENCH BACKFILL AND BEDDING STD-WW-07

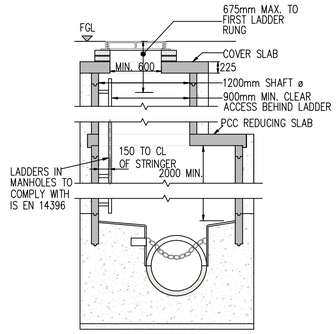
SCALE 1:25

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. PRE-CAST MANHOLES UNITS: COMPLYING WITH REQUIREMENTS OF IS EN 1917 AND BS 5911-PART 3.
3. THICKER MANHOLE BASES REQUIRED FOR SEWERS IN EXCESS OF 3m DEEP WHERE THE SIZE IS GREATER THAN THE STANDARD MINIMUM SIZE.
4. APPROVED PRE-CAST CONCRETE BASES MAY BE USED INCORPORATING CHANNELS, BENCHING ETC. SUBJECT TO IRISH WATER REVIEW AND COMPLYING WITH BS 5911-PART 4 2002.
5. STRUCTURAL DESIGN AND REINFORCEMENT DETAILS TO BE PROVIDED BY THE DEVELOPER AND SUBMITTED TO IRISH WATER FOR REVIEW.
6. MANHOLES GREATER THAN 3m IN DEPTH WILL REQUIRE A DETAILED STRUCTURAL DESIGN AND BE SUBJECT TO IRISH WATER REVIEW.
7. MANHOLE ROOFS SHALL CONSIST OF RE-INFORCED CONCRETE SLAB OF IN-SITU CONCRETE, C30/37, WITH A MINIMUM THICKNESS OF 225mm DESIGNED TO CARRY ALL LIVE AND DEAD LOADS, ALTERNATIVELY, APPROVED PRE-CAST CONCRETE ROOF SLABS MAY BE USED SUBJECT TO IRISH WATER REVIEW AND COMPLIANCE WITH BS 5911 PART 4: 2002.
8. COVERS AND FRAMES SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS SUBJECT TO APPROVAL FROM IRISH WATER.
9. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH WITH PROTECTIVE STAINLESS STEEL METAL BAND AROUND COVERS IN GREEN AREAS.
10. ALL CHAMBERS TO BE CHECKED FOR UPLIFT BY THE DEVELOPER BASED ON GROUND CONDITIONS WITHIN THE SITE. SHOULD ANTI FLOATATION MEASURES BE REQUIRED THEY SHALL BE SUBJECT TO REVIEW BY IRISH WATER.
11. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206 : 2013.
12. ANY SPECIAL ROAD REINSTATEMENT AROUND COVER & FRAME SHALL BE TO ROAD AUTHORITY'S REQUIREMENTS.
13. NEW ROAD CONSTRUCTION & SURFACE FINISH TO BE TO ROAD AUTHORITY REQUIREMENTS.
14. EXISTING ROAD REINSTATEMENT TO COMPLY WITH CURRENT VERSION OF "GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS" BY THE DEPT. OF TRANSPORT, TOURISM & SPORT, OR TRANSPORT INFRASTRUCTURE IRELAND REQUIREMENTS.
15. IF DEPTH FROM GROUND TO PIPE SOFFIT IS GREATER THAN 6m DEEP, A SITE SPECIFIC ENGINEERED SOLUTION FOR ACCESS SHALL BE PROVIDED.
16. PROPRIETARY WATERTIGHT PCC MANHOLE RING SYSTEMS WITH A WALL THICKNESS > 125mm, & A WATER TIGHT JOINT SEALING SYSTEM, MAY BE USED WITHOUT CONCRETE SURROUND, SUBJECT TO THE GROUND WATER LEVEL AT THE MANHOLE BEING LOW, & SUBJECT TO REVIEW BY IRISH WATER.

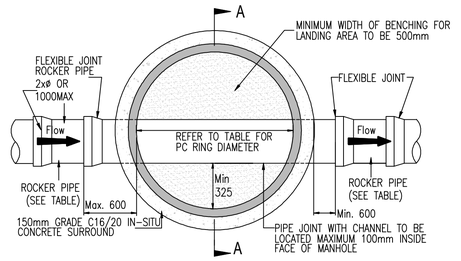


SECTION A-A



MANHOLE DETAIL > 3m & < 6m GROUND TO SOFFIT DEPTH

(NOTE: ON MANHOLES <1.5mø, REDUCING SLAB NOT TO BE USED & PCC RINGS TO CONTINUE UP TO COVER SLAB)

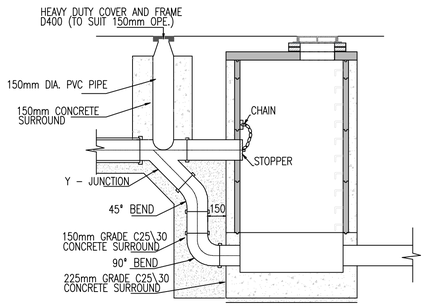


PLAN

MINIMUM MANHOLE DIAMETERS		ROCKER PIPE LENGTH	
DIAMETER OF LARGEST PIPE IN MANHOLE (mm)	INTERNAL DIAMETER OF MANHOLE (mm)	DIAMETER OF LARGEST PIPE IN MANHOLE (mm)	INTERNAL DIAMETER OF MANHOLE (mm)
LESS THAN 375	1200	150 TO 600	600
375 TO 450	1350	GREATER THAN 600 TO 750	1000
500 TO 750	1500	GREATER THAN 750	1250

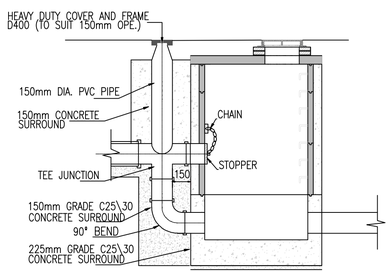
PRE-CAST CONCRETE MANHOLE STD-WW-10

SCALE 1:25



TYPE No. 1

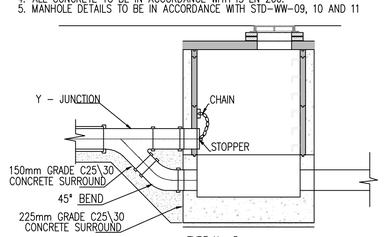
150mm - 450mm DIA. (INCL.) DROP GREATER THAN 1700mm
500mm - 900mm DIA. (INCL.) DROP GREATER THAN 2300mm



TYPE No. 2

150mm - 450mm DIA. (INCL.) DROP GREATER THAN 900 AND LESS THAN 1700mm
500mm - 900mm DIA. (INCL.) DROP GREATER THAN 1300mm AND LESS THAN 2300mm

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. RODDING EYE CHAMBER SHALL BE COVERED WITH APPROVED HEAVY DUTY METAL COVERS TO IS 261 AND BS 5834. COVER AND FRAME SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS AND IS SUBJECT TO REVIEW BY IRISH WATER.
3. ALL CHAMBERS TO BE CHECKED FOR UPLIFT BY THE DEVELOPER BASED ON GROUND CONDITIONS WITHIN THE SITE. SHOULD ANTI FLOATATION MEASURES BE REQUIRED THEY SHALL BE SUBJECT TO REVIEW BY IRISH WATER.
4. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206.
5. MANHOLE DETAILS TO BE IN ACCORDANCE WITH STD-WW-09, 10 AND 11



TYPE No. 3

150mm - 450mm DIA. (INCL.) DROP GREATER THAN 600mm AND LESS THAN 900m
500mm - 900mm DIA. (INCL.) DROP GREATER THAN 600mm AND LESS THAN 1300mm

BACKDROP MANHOLES STD-WW-12

SCALE 1:25

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. THE MINIMUM DEPTH OF COVER FROM THE FINISHED SURFACE TO THE CROWN OF GRAVITY PIPES WITHOUT PROTECTION SHOULD BE AS FOLLOWS:
   a. GARDENS AND PATHWAYS WITHOUT ANY POSSIBILITY OF VEHICULAR ACCESS - DEPTH NOT LESS THAN 0.5 M. (THIS WOULD NORMALLY RELATE TO DRAINS IN PRIVATE PROPERTY, SHALLOW PIPES OF THIS NATURE ARE UNDESIRABLE AND SHOULD BE INSTALLED IN ACCORDANCE WITH THE CURRENT BUILDING REGULATIONS).
   b. DRIVEWAYS, PARKING AREAS AND YARDS WITH HEIGHT RESTRICTIONS TO PREVENT ENTRY BY VEHICLES WITH A GROSS VEHICLE WEIGHT IN EXCESS OF 7.5 TONNES - DEPTH NOT LESS THAN 0.75 M.
   c. DRIVEWAYS, PARKING AREAS AND NARROW STREETS WITHOUT FOOTWAYS (E.G. MEWS DEVELOPMENTS) WITH LIMITED ACCESS FOR VEHICLES WITH A GROSS VEHICLE WEIGHT IN EXCESS OF 7.5 TONNES - DEPTH NOT LESS THAN 0.9 M.
   d. DEPTHS OF SEWERS IN GATED ESTATES SHALL BE SIMILAR TO THAT OUTLINED ABOVE.
   e. AGRICULTURAL LAND AND PUBLIC OPEN SPACE - DEPTH NOT LESS THAN 0.9 M.
   f. OTHER HIGHWAYS AND PARKING AREAS WITH UNRESTRICTED ACCESS TO VEHICLES WITH A GROSS VEHICLE WEIGHT IN EXCESS OF 7.5 TONNES - DEPTH NOT LESS THAN 1.2 M.
3. CLAUSE 804/808 MATERIAL IN ACCORDANCE WITH THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS IS TO BE USED AS BACKFILL MATERIAL WHERE THE SEWER MAIN IS LOCATED IN ROADS, FOOTPATHS OR WHEN THE NEAREST PART OF THE TRENCH IS WITHIN 1m OF THE PAVED EDGE OF THE ROADWAY. CLAUSE 804/808 IS TO BE COMPACTED AS PER CLAUSE 802 OF THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS. CLAUSE 808 IS TO BE USED WITHIN 500mm OF CEMENT BOUND MATERIALS, CONCRETE PAVEMENTS, CONCRETE STRUCTURES OR CONCRETE PRODUCTS. OTHERWISE CLAUSE 804 MAY BE USED. ALTERNATIVE BACKFILL MATERIAL TO THAT DESCRIBED ABOVE (CLAUSE 804 OR CLAUSE 808) OF THE PIPE TRENCH WILL ONLY BE ALLOWED BY IRISH WATER WHERE THE ROADS AUTHORITY IN WHOSE FUNCTIONAL AREA THE DEVELOPMENT IS LOCATED, PROVIDES WRITTEN APPROVAL TO THE DEVELOPER TO THE USE SUCH ALTERNATIVE MATERIAL.
4. SELECTED EXCAVATED MATERIAL MAY BE USED IN GREEN-FIELD AREAS ABOVE GRANULAR PIPE SURROUND MATERIAL SUBJECT TO THE APPROVAL OF IRISH WATER.
5. PIPE BEDDING SHALL COMPLY WITH WIS 4-08-02 AND IGN 4-08-01 GRANULAR MATERIAL SHALL BE 14mm TO 5mm GRADED AGGREGATE OR 10mm SINGLE SIZED AGGREGATE IS EN 13242 CONCRETE BED HAUNCH & SURROUND WHERE REQUIRED SHALL BE TO STD-WW-08.
6. IN SOFT GROUND CONDITIONS (CBR < 5) THE MATERIAL SHOULD BE EXCAVATED AND DISPOSED OF IN ACCORDANCE WITH THE WASTE MANAGEMENT ACT AND CLAUSE 808 MATERIAL IN ACCORDANCE WITH THE THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS SHALL REPLACE THE EXCAVATED MATERIAL, WRAPPED IN GEO-TEXTILE WRAPPING. ALTERNATIVELY, SPECIAL PIPE SUPPORT ARRANGEMENTS, INCLUDING PILING ETC. MAY BE REQUIRED WHERE THE DEPTH OF SOFT MATERIAL IS EXCESSIVE. SUCH ARRANGEMENTS SHALL BE SUBJECT TO ASSESSMENT BY IRISH WATER BEFORE ADVANCING WITH THE WORK.
7. IN GREEN FIELD AREAS, TYPE B BACKFILL (SELECTED EXCAVATED MATERIAL) WILL BE ALLOWED ABOVE THE SIDE HAUNCH GRANULAR MATERIAL IN THE CASE OF RIGID PIPES. A GRANULAR SURROUND OF A MINIMUM DEPTH OF 150mm ABOVE THE CROWN OF THE PIPE IS REQUIRED FOR FLEXIBLE PIPES , AND TYPE B MATERIAL MAY BE USED AS BACKFILL ABOVE THIS. ALL RISING MAINS IN GREENFIELD AREAS SHALL HAVE A MINIMUM COVER OF 300mm OF GRANULAR MATERIAL ABOVE THE EXTERNAL CROWN OF THE PIPE.
8. PIPES SHALL NOT BE SUPPORTED ON STONES, ROCKS OR ANY HARD OBJECTS AT ANY POINT ALONG THE TRENCH. ROCK SHALL BE EXCAVATED TO A DEPTH OF 150mm BELOW THE ACTUAL DEPTH OF THE TRENCH WITH THE VOID FILLED WITH CLAUSE 808 MATERIAL IN ACCORDANCE WITH THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS. THE GRANULAR MATERIAL SHALL BE LAID ABOVE THIS VOID BACKFILL MATERIAL.
9. NON DEGRADABLE MARKER TAPE SHOULD BE INSTALLED 350mm FROM THE SURFACE OF THE ROAD. IN THE CASE OF NON METAL PIPE MATERIAL, THE MARKER TAPE SHOULD INCORPORATE A TRACE WIRE WHICH IS LINKED TO FITTINGS AND TERMINATED AT THE WASTE WATER PUMPING STATION AND THE DISCHARGE MANHOLE.
10. TRENCH WIDTH FOR PIPE SIZE <80mm MAY BE <500mm SUBJECT TO CONSIDERATION BEING GIVEN TO THE TRENCH DEPTH, HEALTH & SAFETY, CONSTRUCTION ACCESS REQUIREMENTS.
11. NEW ROAD CONSTRUCTION & SURFACE FINISH TO BE TO ROAD AUTHORITY REQUIREMENTS.
12. EXISTING ROAD REINSTATEMENT TO COMPLY WITH CURRENT VERSION OF "GUIDELINES FOR MANAGING OPENING IN PUBLIC ROADS" BY THE DEPT. OF TRANSPORT, TOURISM & SPORT, OR TRANSPORT INFRASTRUCTURE IRELAND REQUIREMENTS.
13. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEB SITE AT WWW.WATER.IE/CONNECTIONS/DEVELOPER-SERVICES/ WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE

1:25 0 0.5 1.0 1.5 2.0 2.5m

1:1 0 10 20 30 40 50 60 70 80 90 100m

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 K7W7 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT	KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND
ARCHITECT	O'MAHONY PIKE ARCHITECTS
PROJECT	BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENTS, BLACKROCK, CO. DUBLIN
TITLE	PUBLIC FOUL WATER DRAINAGE DETAILS SHEET 1 OF 2

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
AS SHOWN @A1	18-093	P232	

1. THE SEPARATION DISTANCES OUTLINED ARE MINIMUM REQUIREMENTS.

2. SPECIFIC SEPARATION CLEARANCE DISTANCES IN EXCESS OF THESE MINIMA SHALL BE PROVIDED FOR SERVICES SUCH AS GAS, ELECTRICITY, FIBRE-OPTIC OR OIL FILLED CABLES AS THE CASE MAY BE. THE PARTICULAR UTILITY PROVIDERS SHALL BE CONSULTED TO DETERMINE THESE MINIMUM SEPARATION DISTANCES AND EVIDENCE OF THIS CONSULTATION, WITH THE SPECIFIED SEPARATION DISTANCES, SHALL BE PROVIDED TO IRISH WATER AT DESIGN STAGE.

3. NOTIFICATION IN WRITING IS REQUIRED SHOULD WORKS BE WITHIN THE FOLLOWING DISTANCES FROM AN EXISTING WATER MAIN OR WASTEWATER RISING MAIN:-HORIZONTAL 1m AT EITHER SIDE OF AN EXISTING MAIN LESS THAN 200mm IN DIAMETER. 2m AT EITHER SIDE OF AN EXISTING MAIN OF 200mm TO 350mm IN DIAMETER. 5m AT EITHER SIDE OF AN EXISTING MAIN OF 350mm OR GREATER IN DIAMETER. WHERE DUCTS OR PIPES ARE TO BE LAID CLOSE TO AN EXISTING WATERMAIN OR SEWER IN THE OWNERSHIP OF IRISH WATER, NOTIFICATION IN WRITING SHALL BE PROVIDED A MINIMUM OF 10 DAYS AHEAD OF ADVANCEMENT OF THE WORK. NOTIFICATION IN WRITING IS REQUIRED SHOULD WORKS BE WITHIN 1.5m DISTANCE OF A WASTEWATER SEWER. REQUIREMENTS SHALL ALSO APPLY TO TRIAL HOLES OR SLIT TRENCHES TO LOCATE THE MAIN OR GAIN GROUND INFO DATA. LARGER DIAMETERS >350mm DISTRIBUTION AND TRUNK MAINS, IRISH WATER MUST BE NOTIFIED AT LEAST 1 MONTH IN ADVANCE. DEVELOPERS SHALL ALSO COMPLY WITH ANY NOTIFICATION REQUIREMENTS OF OTHER UTILITY PROVIDERS (ESB, GAS MAIN, TELECOMMUNICATION ETC.).

4. DETAILED PROPOSALS, INCLUDING WORK METHOD STATEMENTS, INSURANCE CONFIRMATION AN DETAILS OF WORK COMPLETED OF A SIMILAR NATURE MUST BE SUBMITTED TO IRISH WATER FOR ITS CONSIDERATION BEFORE AGREEMENT WILL ISSUE.ALL SUCH WORKS IN THE VICINITY OF ARTERIAL WATER MAINS AND SEWERS (MAINS GREATER THAN 400mm) SHALL BE SUBJECT TO WRITTEN AGREEMENT WITH IRISH WATER BEFORE CONSTRUCTION COMMENCES ON SITE. THIS AGREEMENT SHALL ALSO INCLUDE ANY NECESSARY PROTECTION FOR WATER MAINS.

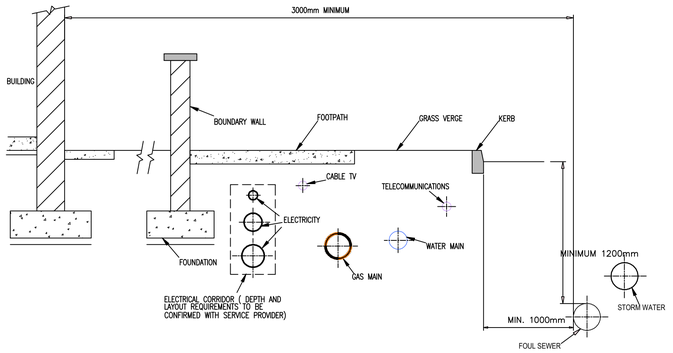
5. ANY DAMAGE SHALL BE NOTIFIED IMMEDIATELY TO IRISH WATER. THE PERSON WHO CAUSES THE DAMAGE TO A SEWER MAIN OR FITTING WILL BE DEEMED TO HAVE COMMITTED AN OFFENCE UNDER SECTION 45 OF THE WATER SERVICES ACT 2007.

6. UNDER NO CIRCUMSTANCES WILL IRISH WATER ACCEPT SEWER MAIN INSTALLATIONS UNDER STRUCTURES, EXISTING OR PROPOSED, OR IN CLOSE PROXIMITY TO ANY EXISTING STRUCTURES OR FEATURES THAT WILL INHIBIT ACCESS FOR POST INSTALLATION MAINTENANCE AND ACCESS.

7. THE MINIMUM CLEAR DISTANCE WILL BE INCREASED IF THE SEWER IS GREATER THAN 3m DEEP OR IF THE DIAMETER IS GREATER THAN 375mm. THE MINIMUM CLEAR DISTANCE IN THESE SITUATIONS SHALL BE > DEPTH TO INVERT OR 10 TIMES THE SEWER DIAMETER, WHICH EVER IS GREATER.

8. THE EXTERNAL FACES OF MANHOLE SHALL BE AT LEAST 0.5m FROM KERB LINE.

9. WHERE DESIGN DEVIATES FROM TYPICAL DETAILS, THE LAYOUT IS SUBJECT TO REVIEW BY IRISH WATER.



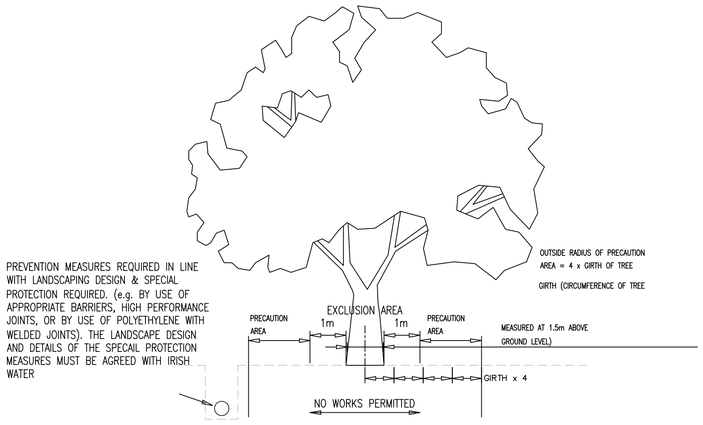
TYPICAL SERVICE LAYOUT INDICATING SEPARATION DISTANCE
STD-WW-05

NTS

METHOD STATEMENTS: ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH BS 5837 AND INFORMED BY NJUG VOLUME 4.

PRECAUTION AREA: EXCAVATIONS FOR PIPEWORK SHOULD NOT BE UNDERTAKEN WITHIN THIS AREA, UNLESS AGREED WITH IRISH WATER. WORKS WITHIN THE PRECAUTION ZONE MUST BE SUPERVISED BY A QUALIFIED ARBORIST. WORKS SHALL BE SUBJECT OF A CLEAR METHOD STATEMENT OUTLINING ALL WORKS ADJACENT TO THE TREES/SHRUBS WHICH IS TO BE PREPARED & AGREED IN ADVANCE OF THE WORKS. MATERIAL, PLANT & SPOIL SHALL NOT BE STORED WITHIN THIS ZONE.

EXCLUSION AREA: WORKS IN THIS AREA ARE TO BE AVOIDED, UNLESS ABSOLUTELY NECESSARY & AGREED WITH IRISH WATER. EXCAVATIONS FOR PIPEWORK SHOULD NOT BE UNDERTAKEN WITHIN THIS AREA, UNLESS NECESSARY AND NO OTHER OPTIONS AVAILABLE. WORKS WITHIN THE EXCLUSION ZONE MUST BE SUPERVISED BY A QUALIFIED ARBORIST AND AGREED WITH IRISH WATER. WORKS SHALL BE SUBJECT OF AN ARBORICULTURAL IMPACT ASSESSMENT AS PER BS 5837 & A CLEAR METHOD STATEMENT OUTLINING ALL WORKS ADJACENT TO THE TREES/SHRUBS IS TO BE PREPARED AND AGREED IN ADVANCE OF THE WORKS. MATERIAL, PLANT & SPOIL SHALL NOT BE STORED WITHIN THIS ZONE.



RESTRICTION ON WASTEWATER INFRASTRUCTURE WORKS ADJACENT TO TREES
STD-WW-06

NTS

THE DISTANCES GIVEN IN TABLE A.1. OF BS 5837 MUST BE FURTHER INFORMED BY THE SPECIES & IN DIAGRAM 2 BELOW. DIAGRAM 1 ABOVE PROVIDES A FLOW CHART TO THE DECISION PROCESS WHILST DIAGRAM 2 BELOW IS TO BE USED TO INFORM THE PLANTING REGIME.

PLEASE NOTE THAT TABLE A.1. OF BS 5837 (BELOW) IS TO BE USED TO CALCULATE THE ABSOLUTE MIMIMUM DISTANCE BETWEEN NEW TREE PLANTING FROM THE WASTEWATER INFRASTRUCTURE (THE SERVICES). THE DISTANCE IS REQUIRED TO AVOID DIRECT DAMAGE TO THE INFRASTRUCTURE FROM FUTURE GROWTH. THE DISTANCE IS A FUNCTION OF THE DEPTH OF THE SERVICES AND THE (FINAL EXPECTED) STEM DIAMETER OF THE TREE AT MATURITY (i.e. FINAL EXPECTED GROWTH).

TABLE A.1. BS 5837	Minimum distance between young trees or new planting & structures, in metres (m)		
	Final stem dia. < 300mm	Final stem dia. 300mm to 600mm	Final stem dia. > 600mm
Services			
< 1m deep	0.5	1.5	3.0
> 1m deep	--	1.0	2.0

THUS FOR EXAMPLE:
- FOR A SERVICE LESS THAN 1 METRE DEEP, THE MINIMUM DISTANCE IS TO BE 1.5m FOR A TREE BETWEEN 300 AND 600mm STEM DIAMETER AT MATURITY.
- FOR A SERVICE GREATER THAN 1 METRE DEEP, THE MINIMUM DISTANCE IS TO BE 1.0m FOR A TREE BETWEEN 300 AND 600mm STEM DIAMETER AT MATURITY.

NOTE: RESTRICTIONS RELATE TO INFRASTRUCTURE WITHOUT ROOT INTRUSION PROTECTION.

THE DESIGN OF LANDSCAPING SHALL BE UNDERTAKEN IN CONJUNCTION WITH THE DESIGN OF WASTEWATER INFRASTRUCTURE, ETC. THE TREE/BUSH/SHRUB SHALL NOT BE LOCATED CLOSER TO THE WASTEWATER INFRASTRUCTURE THAN INDICATED ABOVE, EXCEPT WHERE SPECIAL PROTECTION MEASURES ARE PROVIDED. WHERE THERE IS A RISK OF TREE/ROOT INTRUSION, THE WASTEWATER INFRASTRUCTURE SHALL BE RESISTANT TO TREE ROOT INGRESS (e.g. BY USE OF APPROPRIATE BARRIERS, HIGH PERFORMANCE JOINTS, OR BY USE OF POLYETHYLENE WITH WELDED JOINTS FOR RISING MAINS). THE LANDSCAPE DESIGN AND DETAILS OF THE SPECIAL PROTECTION MEASURES MUST BE AGREED WITH IRISH WATER

A TREE SHALL NOT BE PLANTED DIRECTLY OVER WASTEWATER PLANTING IS AGREED WITH IRISH WATER AND IN GENERAL ONLY SHALLOW ROOTING SHRUBS SHALL BE PLANTED CLOSE TO
PLEASE ENSURE THAT THESE DISTANCES ARE ADHERED TO IN ORDER TO PROTECT THE TREES FROM ANY FUTURE MAINTENANCE. REFERENCE SHOULD ALSO BE MADE TO BS 5837, BS 8545 AND THE NJUG GUIDELINES VOLUME 4 FOR FURTHER INFORMATION.

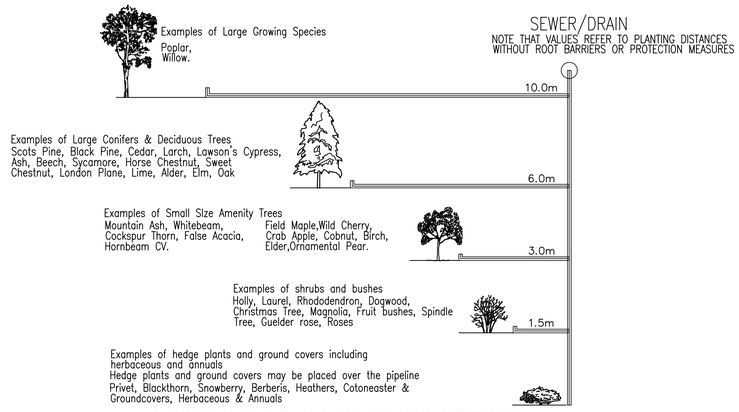


DIAGRAM 2: PLANTING DISTANCES FOR DIFFERENT SPECIES WITHOUT BARRIER PROTECTION

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. AN INSPECTION CHAMBER SHOULD BE LOCATED AT OR WITHIN 1m OF THE PROPERTY BOUNDARY AT THE UPSTREAM END OF EACH SERVICE CONNECTION ON THE PRIVATE SIDE OF THE CURTILAGE, IF PRACTICABLE. CONSULT WITH IRISH WATER ON ALTERNATIVE LOCATIONS
3. ANY PIPE AND ASSOCIATED ACCESS UPSTREAM OF THE POINT OF CONNECTION TO A PUBLIC SEWER IS A PRIVATE DRAIN AND SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE BUILDING REGULATIONS.
4. ACCESS POINTS SHOULD BE LOCATED SO THAT THEY ARE ACCESSIBLE AND APPARENT TO THE MAINTAINER AT ALL TIMES FOR USE. THEY SHOULD AVOID REAR GARDENS OR ENCLOSED LOCATIONS AND THEY SHOULD NEVER BE OVERLAIN WITH SURFACE DRESSING, TOPSOIL, ETC.
5. COVERS AND FRAMES SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS SUBJECT TO APPROVAL FROM IRISH WATER.
6. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH WITH PROTECTIVE STAINLESS STEEL METAL BAND AROUND COVERS IN GREEN AREAS.
7. PROPRIETARY PREFABRICATED CHAMBER UNITS MAY ALSO BE USED, SUBJECT TO APPROVAL FROM IRISH WATER.
8. CHAMBERS SHALL BE SURROUNDED BY A MINIMUM OF 150mm COMPACTED CLAUSE 804 OR CLAUSE 808 MATERIAL AS PER STD-WW-07.

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 K7W7 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

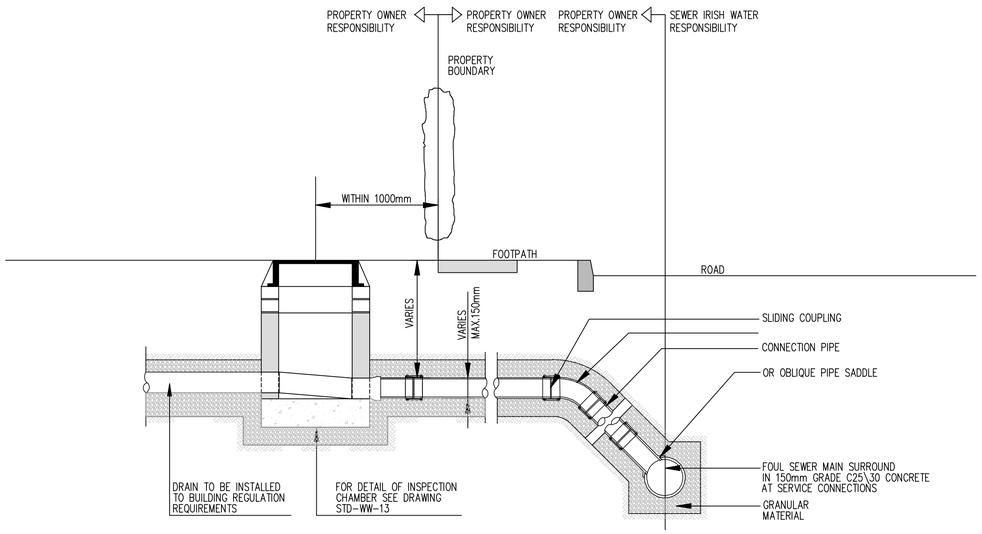
CLIENT: KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND

ARCHITECT: O'MAHONY PIKE ARCHITECTS

PROJECT: BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENTS, BLACKROCK, CO. DUBLIN

TITLE: PUBLIC FOUL WATER DRAINAGE DETAILS SHEET 2 OF 2

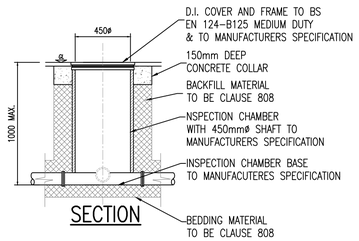
DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
AS SHOWN @A1	18-093	P233	



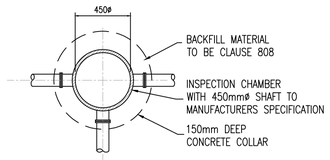
PIPE SIZE (mm)	GRADIENT
100	1 : 60
150 TO 225	1 : 150 MINIMUM

DRAIN AND SERVICE CONNECTION PIPEWORK

SCALE 1:25

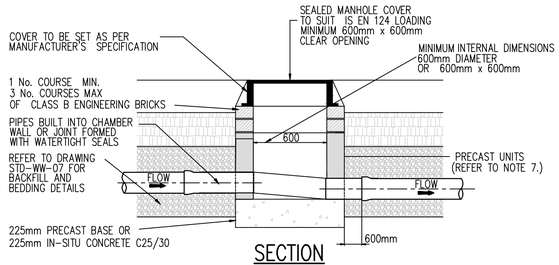


SECTION

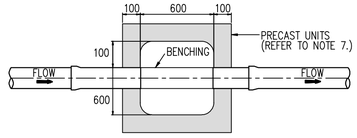


PLAN
CIRCULAR INSPECTION CHAMBER WHERE INVERT IS 1m OR LESS BUILDING REGULATIONS TGD SECTION H TABLE 9

SCALE 1:25

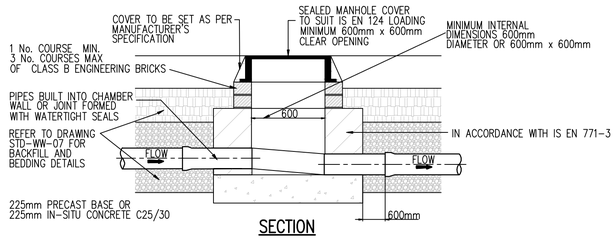


SECTION

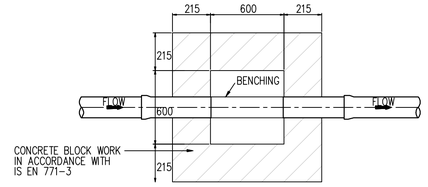


FLOOR PLAN
INSPECTION CHAMBER
(PRECAST CONCRETE CONSTRUCTION)

SCALE 1:25



SECTION



FLOOR PLAN
INSPECTION CHAMBER
(BLOCK WORK CONSTRUCTION)
PRIVATE SIDE INSPECTION CHAMBER

SCALE 1:25

TABLE 9 Minimum dimensions for access fitting and chambers					
Type	Depth to (m)	Internal Sizes		Cover Sizes	
		length x width (mm x mm)	Circular (mm)	length x width (mm x mm)	Circular (mm)
Rodding eye					
Access Fitting					
small	0.6 or less	150 x 100	150	150 x 100	150
large		300 x 100	-	300 x 100	-
Inspection Chamber	0.6 or less	300 x 300	190*	300 x 300	190*
	1.0 or less	450 x 450	450	450 x 450	450**
Manhole	1.5 or less	1200 x 750	1000	600 x 600	600
	over 1.5	1200 x 750	1200	600 x 600	600
	over 2.7	1200 x 840	1200	600 x 600	600
Shaft	over 2.7	900 x 840	900	600 x 600	600

Note:
* For clayware or plastics may be reduced to 430mm in order to provide support for cover and frame

** Drains up to 150mm

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. AN INSPECTION CHAMBER SHOULD BE LOCATED AT OR WITHIN 1m OF THE PROPERTY BOUNDARY AT THE UPSTREAM END OF EACH SERVICE CONNECTION ON THE PRIVATE SIDE OF THE CURTILAGE, IF PRACTICABLE. CONSULT WITH IRISH WATER ON ALTERNATIVE LOCATIONS
3. ANY PIPE AND ASSOCIATED ACCESS UPSTREAM OF THE POINT OF CONNECTION TO A PUBLIC SEWER IS A PRIVATE DRAIN AND SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE BUILDING REGULATIONS.
4. ACCESS POINTS SHOULD BE LOCATED SO THAT THEY ARE ACCESSIBLE AND APPARENT TO THE MAINTAINER AT ALL TIMES FOR USE. THEY SHOULD AVOID REAR GARDENS OR ENCLOSED LOCATIONS AND THEY SHOULD NEVER BE OVERLAIN WITH SURFACE DRESSING, TOPSOIL, ETC.
5. COVERS AND FRAMES SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS SUBJECT TO APPROVAL FROM IRISH WATER.
6. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH WITH PROTECTIVE STAINLESS STEEL METAL BAND AROUND COVERS IN GREEN AREAS.
7. PROPRIETARY PREFABRICATED CHAMBER UNITS MAY ALSO BE USED, SUBJECT TO APPROVAL FROM IRISH WATER.
8. CHAMBERS SHALL BE SURROUNDED BY A MINIMUM OF 150mm COMPACTED CLAUSE 804 OR CLAUSE 808 MATERIAL AS PER STD-WW-07.

1:25 0 0.5 1.0 1.5 2.0 2.5m

1:1 0 10 20 30 40 50 60 70 80 90 100m

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 K7W7 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND

ARCHITECT O'MAHONY PIKE ARCHITECTS

PROJECT BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENTS, BLACKROCK, CO. DUBLIN

TITLE PRIVATE FOUL WATER DRAINAGE DETAILS

DRAWN	DESIGNED	APPROVED	DATE
NG	MI	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
AS SHOWN @A1	18-093	P234	

UK and Ireland Office Locations