Clifton Scannell Emerson Associates

Engineering Planning Report - Drainage & Water Services

CRUISERATH 220 kV SUBSTATION & TRANSMISSION LINE

Client: ADSIL

Date: 19th November 2019

Job Number: 17_014

CONSULTING ENGINEERS

Civil Engineering | Structural Engineering | Transport Engineering | Environmental Engineering | Project Management | Health and Safety

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Document Control Sheet

Project Name:	CRUISERATH 220 kV SUBSTATION & TRANSMISSION LINE
Project Number:	17_014
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1.2	For Planning	19/11/2019	CD	HF

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1 Introduction

1.1 Overview

The following report is being submitted as part of the Strategic Infrastructure Development (SID) Application for the proposed development that comprises of a 220kV Gas Insulated Switchgear (GIS) Substation, 4 Transformers, an underground double circuit 220kV cable installation, an underground 49kVA cable installation, and 2 cable bays.

The proposed 220kV cable installation will provide a connection from the existing ESBN Corduff 220kV Substation to the proposed Cruiserath GIS 220kV Substation.

The proposed 49kVA cable installation will provide a connection from an existing unit substation at the Tyrellstown Cross roundabout to the proposed Cruiserath GIS 220kV Substation.

1.2 Existing Land Use

The existing site is currently a greenfield site which was previously used as agricultural land.

1.3 Permitted Devlopment on Landholding

The substation site is located on lands in Cruiserath, Blanchardstown, Dublin 15 adjacent to the R121 Regional Road. The lands in question have been subject to two planning applications which are outlined below

- Development permitted under An Bord Pleanala Reg Ref. PL06F.248544F / Fingal County Council Reg. Ref. FW17A/0025 which consists of for the development of data storage facilities containing data halls and associated electrical and AHU rooms, an electrical transformer/substation compound area with a 220Kv permanent Gas Insulated Switchgear (GIS) substation, 4 no. transformer bays and a permanent control building and other ancillary services.
- Development permitted under Fingal County Council Reg. Ref. FW19A/0087 which consists of two data storage facilities with office space, associated electrical and AHU rooms and other ancillary services.

1.4 Permitted Infrastructure on Landholding

The infrastructure permitted under Reg Ref: PL06F.248544 / Fingal County Council Reg Ref FW 17A/0025 includes connections to external Irish Water water supply main and foul sewer, Fingal County Council surface water drainage network (all in R121 Regional Road), site entrance, gate house and site wide security fencing and gate in addition to infrastructure associated with the permitted data storage facility.

The services for the proposed development connect to the infrastructure described above which have been designed to facilitate the proposed development.

The Engineering and Water Services Report (Document No. RPT-16_177-001) submitted in support of this planning application is included in Appendix A to this report.

2 Surface Water Drainage

The proposed development will connect to surface water pipe network permitted under Reg Ref: PL06F.248544 / Fingal County Council Reg Ref FW 17A/0025. This pipe network discharges to a permitted attenuation basin to the east of the site which has been designed to facilitate the proposed development.

The catchment area for the proposed attenuation basin is indicated on Drawing No. Proj_G-CSE-00-ZZ-DR-C-4110 – Overall Proposed and Existing Surface Water Drainage Layout included in Appendix B.

Proposed post-development discharge from the permitted development is outlined in Section 3.4 of RPT-16-177-001 Project G Engineering and Water Services Report included in Appendix A.

The proposed Surface Water Drainage Network is indicated on Drawing No. Proj_G -CSE-00-DR-C-2220 – Proposed Site Layout and Services.

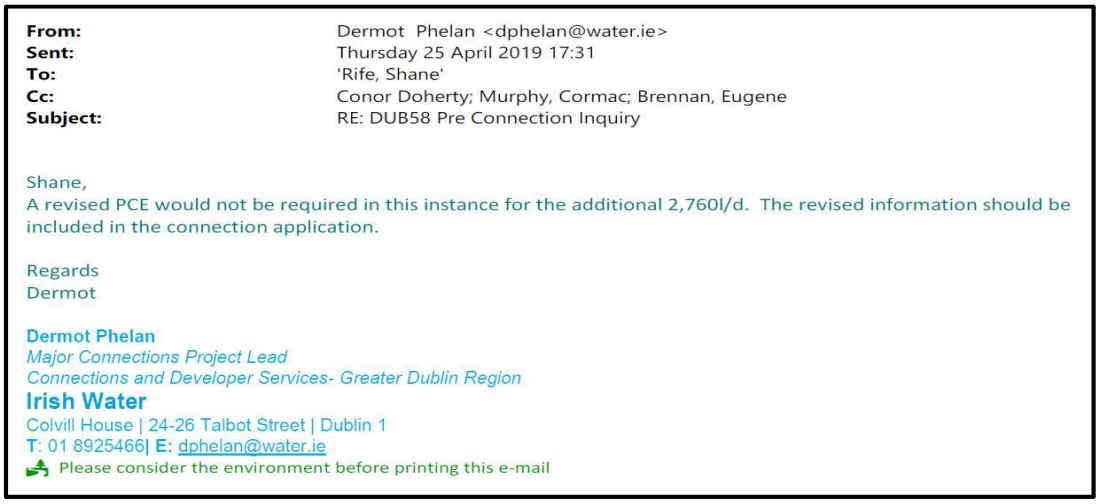
3 Foul Water Drainage

The proposed development will connect to a foul water pumping station permitted under Reg Ref: PL06F.248544 / Fingal County Council Reg Ref FW 17A/0025. This pumping station outfalls to the permitted gravity pipe network which in turns outfalls to the 375mmø Irish Water foul sewer in the R121 to the south east of the site.

Refer to Drawing No. Proj_G-CSE-00-ZZ-DR-C-4210 – Overall Proposed and Existing Surface Water Drainage Layout included in Appendix B which indicates permitted foul water network.

A pre-connection enquiry (PCE) form was submitted to Irish Water on 21st November 2016 which addressed water and wastewater demand for the development of the masterplan for the entire 26 ha landholding on a multi-phase basis. Irish Water provided a confirmation of feasibility (CoF) for the development on 14th February 2017 (IW Reference Number: CUST16622) included in Appendix C.

The estimated Dry Weather Flow (DWF) for the entire 26 ha landholding was initially 6,240 litres per day. This was revised upwards for the development permitted under Fingal County Council Reg. Ref. FW19A/0087 by 2,760 litres per day to 9,000 litres per day. Mr. Dermot Phelan confirmed that a revised PCE would not be required for this increase (see Fig 1 below).



From: Dermot Phelan <dphelan@water.ie>
Sent: Thursday 25 April 2019 17:31
To: 'Rife, Shane'
Cc: Conor Doherty; Murphy, Cormac; Brennan, Eugene
Subject: RE: DUB58 Pre Connection Inquiry

Shane,
A revised PCE would not be required in this instance for the additional 2,760l/d. The revised information should be included in the connection application.

Regards
Dermot

Dermot Phelan
Major Connections Project Lead
Connections and Developer Services- Greater Dublin Region
Irish Water
Colvill House | 24-26 Talbot Street | Dublin 1
T: 01 8925466| **E:** dphelan@water.ie
Please consider the environment before printing this e-mail

Fig 1 – Correspondence from Dermot Phelan of Irish Water

The proposed foul water flows from the development are outlined in Table 1 below:-

Appliance	Flow per use (litres)	Average use per week	Weekly Flow (litres)	Average Daily Flow (litres)
WC	6	1	6	0.85
WHB	1	1	1	0.15
Total			**7**	**1**

Table 1 – Average Foul Water Daily Demand

As can be seen in Table 1 the average daily foul water demand of 1 litre per day represents a negligible volume in terms of the volume permitted by IW for the entire landholding.

Due to the severe consequences of a spillage entering the surface water system it is proposed to connect the discharge from the electrical substation transformer bunds to the foul system. This drainage is to pass through a Class 1 Full Retention Oil Separator.

The proposed Foul Water Drainage Network is indicated on Drawing No. Proj_G-CSE-00-DR-C-2220 – Proposed Site Layout and Services.

4 Water Supply

4.1 Potable Water Supply

The proposed development will connect to a watermain permitted under Reg Ref: PL06F.248544 / Fingal County Council Reg Ref FW 17A/0025. This watermain is connected to the 500mmø Irish Water foul sewer in the R121 to the south east of the site.

Refer to Drawing No. Proj_G-CSE-00-ZZ-DR-C-4310 – Overall Proposed and Existing Watermain Layout included in Appendix B which indicates permitted foul water network.

A pre-connection enquiry (PCE) form was submitted to Irish Water on 21st November 2016 which addressed water and wastewater demand for the development of the masterplan for the entire 26 ha landholding on a multi-phase basis. Irish Water provided a confirmation of feasibility (CoF) for the development on 14th February 2017 (IW Reference Number: CUST16622) included in Appendix D.

The estimated average water demand for the entire 26 ha landholding is 1 litre per second or 450 m^3 per day as outlined in the PCE provide in Appendix C.

The proposed water supply demand from the development are outlined in Table 2 below:-

Appliance	Flow per use (litres)	Average use per week	Weekly Flow (litres)	Average Daily Flow (litres)
WC	6	1	6	0.85
WHB	1	1	1	0.15
Total			**7**	**1**

Table 2 – Average Water Daily Demand

As can be seen in Table 1 the average daily foul water demand of 1 litre per day represents a negligible volume in terms of the volume permitted by IW for the entire landholding.

The proposed Water Supply Network is indicated on Drawing No. Proj_G -CSE-00-DR-C-2220 – Proposed Site Layout and Services included in Appendix B.

4.2 Fire Flow Requirements

The proposed development will be served by hydrants connected to the permitted watermain network which are connected to a permitted 400 m^3 fire sprinkler tank.

5 Flood Risk Assessment

A site specific Stage 1 Flood Risk Assessment was carried out by AWN Consulting and is a part of EIAR, Chapter 6, Appendix 6.2.

Appendix A – Project G Engineering Planning Report Drainage and Water Services

Clifton Scannell Emerson Associates

Project G

Engineering Planning Report – Drainage & Water

Client: ADSIL

Date: February 2017

Job Number: 16_177

CONSULTING ENGINEERS

Civil Engineering | Structural Engineering | Transport Engineering | Environmental Engineering | Project Management | Health and Safety

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Document Control Sheet

Project Name:	Project G
Project Number:	16_177
Report Title:	Engineering Planning Report – Drainage & Water
Filename:	RPT-16_177_001 Engineering Planning Report – Drainage & Water

Issue No.	Issue Status	Date	Prepared by	Checked by
1st	Draft	25/10/16	NM	HF
2nd	Draft	08/12/16	NM	HF
3rd	Planning	27/02/17	NM	HF

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1.0 Introduction

The following report is being submitted as part of the planning application for ADSIL for the proposed Project G Campus in North County Dublin. The report outlines the proposals for drainage services and potable water for the development. Note that this report should be read in conjunction with CSEA Drawings 16_177_4110 “Proposed Surface Water Layout”, 16_156_4210 “Proposed Foul Sewer Layout” and 16_156_4310 “Proposed Water Main Layout”.

1.1 Site Description

The site is located to the north of Blanchardstown within County Dublin along the R121. The site is approximately 26Ha in size and is relatively flat. The site is approximately 85.5m in elevation with the topographical survey indicating that the land falls from south to north. The southern and western boundaries of the site are formed by the R121. While the Carlton Hotel and the Bristol Myers Squibb facility are located to the north and west of the site respectively. Site investigations identified rock at a reasonable high level varying between 0.7m and 2.0m below ground level. The water table was encountered at between 1.3m and 3.2m below ground level. Examination of the Geological Survey of Ireland’s mapping indicates that the under lying aquifer is categorised as locally important and of high vulnerability.

1.2 Nature of Proposed Development

The development will consist of the following elements:

- A data storage facility, containing data halls and associated electrical and AHU rooms.
- 2No. emergency generator enclosures.
- An electrical transformer/substation compound area with a 220Kv permanent Gas Insulated Switchgear (GIS) substation, 4 no. transformer bays and a permanent control building.
- A bunded fuel storage tank and delivery point, 2No. humidifier tanks and water sprinkler tank and pump room
- 2No. surface water attenuation basins, one in the west of the site and one in the south of the site.
- 2No. new entrances off the R121 and all associated internal circulation routes and footpaths.

2.0 Foul Sewerage

2.1 Existing infrastructure

There is an existing 375mm diameter connection to the IDA foul water system under the R121 in the south eastern corner of the site. See **Appendix I** for details of the connection agreement. The invert level of this pipe is 80.185m. It should be noted that from examination of record drawings this pipe's gradient is approximately 1 in 365. See CSEA Drawing 16_177_4200 for details.

2.2 Proposed Foul Drainage Network

The estimated daily discharge for the development has been calculated in accordance with Table 3 of the EPA's "Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels" as per Section 5.2.3 of Volume 2 of the GDSDS. Assuming a maximum daily occupancy of 18Nr staff and 8Nr security and a per capita wastewater flow of 30l/day for industrial developments without canteen facilities, the daily Dry Weather Flow (DWF) associated with the first phase of the development is 780l/day. The estimated DWF flow for the completed future development is 6,240l/day.

Due to the topography of the site it will not be possible to cater for all the foul discharge by means of gravity sewers alone. It is proposed to discharge the foul from each of the buildings to foul pumping manholes with 24 hours of storage volume. The foul will be pumped from these manholes to a gravity trunk line along the eastern boundary that will discharge to the IDA's foul system.

The network has been designed to ensure that the foul discharge maintains a self-cleansing velocity. The proposed network adheres to the minimum pipe gradients set out in Table 6 of the "Building Regulations Technical Guidance Document H". It is proposed to take all foul drainage from the buildings to the pumping manholes by means of 100mm pipes with minimum gradients of 1:60 and 150mm pipes with minimum gradients of 1:150. The trunk line along the eastern boundary sewers will consist of 150mm pipes with minimum gradients of 1:150. From Diagram 6 of the "Building Regulations Technical Guidance Document H" the capacity of a 150mm diameter pipe when flowing at 0.75 proportional depth is approximately 18.0l/s.

It should be noted that as there are no areas for food preparation within the buildings there is no requirement for grease traps to prevent excessive amounts of grease entering the foul system.

It is not proposed to discharge any trade effluent from the facility to the IDA's foul sewer.

Due to the severe consequences of a spillage entering the surface water system it is proposed to connect the discharge from the electrical substation transformer bunds to the foul system. This drainage is to pass through a Class 2 Full Retention Oil Separator. The total area of the 4Nr proposed bunds is 600m^2. A CNS15s/11 separator or similar will provide the required treatment capacity for this area. Similarly a CNS04s/11 separator or similar will be provided at the diesel storage bund. See **Appendix A** for details of the proposed units.

3.0 Surface Water Drainage

The proposed development will provide attenuation in compliance with the requirements of the Greater Dublin Strategic Drainage Study (GDSDS) The following section outlines the surface water drainage proposals for the development. All SUDS elements have been designed as per the recommendation of the SuDS Manual 2015.

All surface water works including connections will be carried out in accordance with the Code of Practice for Development Works – Drainage.

3.1 Existing infrastructure

There is an existing 900mm diameter connection to the IDA surface water system under the R121 in the south eastern corner of the site. See **Appendix I** for details of the connection agreement. The invert level of this pipe is 78.632m. See CSEA Drawing 16_177_4100 for details.

3.2 Cooling Water Discharge

It should be noted that the residual cooling water from the air handling units is to be discharged to the surface water.

The peak rate of demand for Phase 1 is 79,000l/day, see **Appendix J** for details. This results in a demand of 0.914l/s. Allowing for a 10% margin this increases to 1.0l/s which results in a peak daily demand of 86.40m^3. Of the water supplied only 40% will be discharged to the surface water system as the remainder will be lost to evaporation in the cooling process. This results in a peak discharge of 34.56m^3/day. The average rate of demand for Phase 1 during typical climatic conditions is one eighth of that required for peak cooling resulting in a daily demand of 10.80m^3. As with the peak discharge only 40% of the water supplied will be discharged to the surface water system due to evaporation losses. This results in an average discharge of 4.32m^3/day.

See the table 3.1 below for the expected average and peak daily potable water demand for each phase of the development:

Project Phasing	Estimated Year Complete	Expected Cooling Water Discharge	
		Average Daily Discharge (m^3)	Peak Daily Discharge (m^3)
Phase 1	2017	4.32	34.56
Phase 2	2018	8.64	51.84
Phase 3	2019	12.96	76.03
Phase 4	2020	17.28	96.77
Phase 5	2021	21.60	117.50
Phase 6	2022	25.92	138.24
Phase 7	2023	30.24	172.80
Phase 8	2024	34.56	207.36

It should be noted that the cooling water will only be required during periods of hot dry weather and therefore the discharge to the surface water network will not coincide with any rainfall events.

3.3 Proposed Surface Drainage Network

The surface water network has been designed to provide sufficient capacity to convey all surface water runoff associated with the 1 in 100 year event to the attenuation basins without any overland flooding. This is in compliance with Criterion 3 of Table 6.3 of Volume 2 the GDSDS. There are to be 2No. drainage networks for the first phase of the development. A larger one with an offline attenuation

basin in the south to serve the data storage facility and a smaller one with an offline attenuation basin in the west to serve electrical substation and security building. To reduce the extent of the earthworks required to create the southern basin the dock leveller for the data storage facility is to be drained via pumping to the gravity system. Details of the proposed attenuation basin are provided below.

All calculations have allowed for an additional allowance of 10% in rainfall intensities to allow for climate change as per Table 6.1 of Volume 2 of the GDSDS.

It should be noted that the surface water network has been sized to allow for the future development of the site. See CSEA Drawing 16_177_4110 for details of the area which the proposed networks and attenuation systems have been designed to serve. See **Appendix B & C** for details of the Windes surface water network.

Analysis of the Windes results for the data storage facility's drainage network identified the 30 minute, 120 minute summer storms and 360 minute winter storms as the critical storms governing the various pipe sizes. Similarly the Windes results indicate that the 30 minute summer storm and the 180 minute winter storm are the critical storms for the substation and security building's' drainage network. See **Appendix B & C** for details of the Windes calculations.

As noted in Section 1.1 above the site is relatively flat across its length. Due to this it will not be possible to maintain a minimum longitudinal fall of 0.5% on the proposed roads within the site without extensive earthworks. Consequently it will not be feasible to cater for the site's road drainage by means of road gullies. As a result of this it is proposed to allow the sheet run off arising from the 2.5% cross falls on the roads to discharge directly to a series of roadside swales.

To allow the runoff to flow from the road surface to the swale the kerbs adjacent to the swales will be dropped throughout their length. A 1.5m wide reinforced grass margin will be located between the road the swales to act as a hard shoulder to prevent accidental damage to the grassed areas by vehicles. The edges of the margins have been detailed as 50mm below the adjacent hardstanding to prevent the formation of sediment lips that would impede the flow of water into the swale. Due to the shallow gradients the swales will be constructed as dry swales to avoid prolonged periods of waterlogging. This will provide the added benefit of increased interception and pollutant removal. It should be noted that as the water table in the area of the first phase of the development is between 2.1m and 3.2m below ground level there will be no need to line the swales. The side slopes are to be limited to a slope of 33% to prevent erosion and to facilitate mowing. Details of the proposed swale cross section and kerb details can be found in CSEA Drawings 16_177_4801-4807. In areas where the use of swales is not possible due to limited space it is proposed to use a proprietary combined drain and kerb system.

The swales have been designed as open channels using Manning's formula to ensure optimum runoff filtration during the 1:1 year event and adequate conveyance capacity during the 1:100 year event. The Manning's coefficient has been taken as 0.35 where the water is in contact with the vegetated sides and base of the channel. During the 1:1 year event the depth of the flow is not to exceed 100m so as to prevent frequent flattening of the vegetation. Additionally the flow velocity has been limited to less than 0.3m/s to allow adequate time for filtration to occur. The maximum flow velocity for the 1:100 year event has been limited to less than 1.0m/s to prevent issues with erosion within the channel. See **Appendix D** for details of the swale design calculations. The swales' filter drains will discharge to a number of catch pit manholes located within the swales which will be connected to the main drainage system. The lids of these catch pits will consist of 600mm x 600m gratings set at the level of the 1 in 1 year water level. These grating will double as assess points to the catch pits as well as outlets from the swales when the flows exceed the capacity of the filter drains. CSEA Drawings 16_177_4110 for details.

Prior to passing through the flow control devices the surface water will be passed through Class 1 Bypass Oil Separators. Due to the large site area associated with the data storage facility network it will not be possible to pass all of the discharge associated with an extreme event through a separator. It is therefore proposed to pass the initial runoff from frequent events through a CSB50s/21 separator with larger volumes bypassing the unit via a 1200mm diameter pipe directly to the attenuation basin.

As the area being served by the substation and security building's network is smaller it will be possible to pass all of the resulting discharge through the integral bypass mechanism within a CSB60s/21 separator. See **Appendix F** for details of the proposed units. As noted in Section 2.2 above areas where the consequences of an oil spillage are extremely severe, such as the electrical substation transformer bunds and diesel storage bunds, are to discharge to the foul system rather than the surface water network.

It is proposed to install proprietary "Surfsep" hydrodynamic separators upstream of the proposed flow control devices to reduce the likelihood of blockages occurring. As the unit for the data storage facility's network is to be placed downstream of the inlet/outlet of the off line attenuation storage and upstream of the flow control unit the flow through the device will be limited to that of the hydrobrake. The resulting flow rate will require the use of a CDS0806 model. Similarly to the oil separator the hydrodynamic separator for the substation and security building's network has been sized to allow all of the resulting discharge to pass through its integral bypass mechanism with the resulting flow rate requiring a CDS1012 model. See **Appendix E** for details of the proposed units.

It should be noted that the surface water line along the sites eastern boundary is to cater for discharge from the future attenuation basin as show on CSEA Drawing 16_177_4110. The line is to discharge into the 900mm diameter outfall from the south east corner of the site.

3.4 Proposed Flow Control

It is proposed to limit the surface water discharge from the first phase of the development to the Qbar value in compliance with Criteria 2 & 4 of Table 6.3 of Volume 2 the GDSDS. The area of the site occupied by Phase 1 is 12.3Ha, of which 8.5Ha and 3.8Ha are served by the south and west basin respectively. This results in an allowable discharge of 41.3l/s from the southern basin and 18.5l/s from the western basin. See **Appendix H** for details of the Qbar calculation. It is proposed to use 2No. "Hydrobrake Optimum" vortex flow control device to restrict the flows to these amounts. See **Appendix G** for typical details of the proposed units.

It is proposed to increase the discharge from the site as the area that is developed in the future expands. As the additional phase that is to be served by the southern and western attenuation systems is constructed the hydrobrakes will be replaced with units with larger orifice sizes. The total area to be catered for by the southern attenuation system in future is 9.4Ha with 5.0Ha being served by the western system. See CSEA Drawing 16_177_4100 for details of these areas. This will result in a future allowable discharge rates for the areas of 46l/s and 24/s. See **Appendix H** for details of the Qbar calculation.

It should be noted that at 26.0Ha the allowable discharge for the future fully developed site, including the lands to be served by the separate drainage network, is 126.3l/s. See **Appendix H** for details of the Qbar calculation.

3.5 Proposed Attenuation Basins

As noted in section 3.2 above the design has been carried out for the 1 in 100 year event with a 10% allowance for climate change

As noted in Section 3.3 above the attenuation systems have been sized to allow for future development of the area of the site indicated on CSEA Drawing 16_177_4110. The overall site area to be served by the attenuation system in future is 14.4Ha, with 9.4Ha for the southern basin and 5.0Ha for the western basin. The design has been carried out using an allowable discharges of 46l/s and 24l/s respectively. It is proposed to attenuate the remaining portion of the site in a separate attenuation system due to the site's topography.

The southern basin is to provide a 0.265m depth of storage during the 1 in 100 year event. This allows for a 235mm freeboard from the permitted flood level to the lowest point on the road network served by the basin, the level of which is 85.900m, and 0.585m to the lowest finished floor level on the network. This results in a proposed basin invert of 85.400m. Due to the site's topography this will result in a depth of dig at the proposed basin of approximately 1.0-1.5m. Site investigation works

determined that the water table in the vicinity of the basin is at a level of 84.400m. As a result of this the base of the basin will not encroach into the water table. Consequently it will not be necessary to the install an impervious liner as part of the basins construction. The side slopes are to be limited to a slope of 33% to facilitate mowing. CSEA Drawings 16_177_4802, 4803 & 4804 for details of the basin.

The western basin is to provide a 0.415m depth of storage during the 1 in 100 year event. This allows for a 200mm freeboard from the permitted flood level to the lowest point on the road network served by the basin, the level of which is 85.100m, and 0.500m to the finished floor level of the security building. This results in a proposed basin invert of 84.485m. Due to the site's topography this will result in a depth of dig at the proposed basin of approximately 0.1-0.6m. As the proposed top of water level is above the existing ground level in areas it will be necessary to build up the proposed ground level at the banks of the basin. Consequently it will be necessary to the install an impervious liner as part of the basins construction. The side slopes are to be limited to a slope of 33% to facilitate mowing. CSEA Drawing 16_177_4806 for details of the basin.

Due to the site's topography and the length of the proposed networks the inverts of the surface water sewers at the flow control devices will be below the inverts of the basins. As a result of this it will be necessary to surcharge portions of the drainage systems before water enters the basins.

See **Appendix B & C** for details of the attenuation storage and flow control within the Windes drainage network. Analysis of the Windes results identified the 360 minute winter storm as the critical storm governing the size of the southern attenuation basin with 180 minute winter storm being the critical storm for the western basin. The required storage volume for the southern basin is 1745m^3 while the western basin is to provide 380m^3 of storage. See **Appendix B & C** for details of the Windes calculations.

4.0 Potable Water Supply

4.1 Existing Infrastructure

The site is served by a 500mm diameter ductile iron water main that is located in the south east corner of the site. See CSEA Drawings 16_177_4300 for details.

4.2 Proposed Water Supply

It is proposed to take a 100mm connection from the IDA main in the south east corner of the site. This main is to feed a number of 80mm mains that will serve the proposed data storage facilities and security building with potable water. The 100mm main will also serve a 400m^3 sprinkle tank. The sprinkle tank and the associated pump house will serve a number of 250mm fire mains throughout the development.

It should be noted that the air handling units (AHUs) which constitute the primary water demand are to be provided with 24 hours of storage. The storage provided for Phase 1 of the development is to be 79m^3. The storage provided for the completed development is to be 450m^3. See **Appendix J** for the Irish Water "Pre-Connection Enquire Form" for details of the calculations.

Based on the above storage requirements being refilled over a 24 hour period the proposed peak water demand for the future completed development including all phases is 6l/s. The proposed average water demand during typical climatic conditions is 1l/s. As the water demand will be spread over 24 hours the normal demand is also 1l/s. See the calculation section of **Appendix J** for details.

See the table 4.1 below for the expected average and peak daily potable water demand for each phase of the development:

Project Phasing	Estimated Year Complete	Expected Water Usage	
		Average Daily Usage (m^3)	Peak Daily Demand (m^3)
Phase 1	2017	10.80	86.40
Phase 2	2018	21.60	129.60
Phase 3	2019	32.40	190.08
Phase 4	2020	43.20	241.92
Phase 5	2021	54.00	293.76
Phase 6	2022	64.80	345.60
Phase 7	2023	75.60	432.00
Phase 8	2024	86.40	518.40

Appendix A

Proposed Full Retention Oil Separator
(Or Similar)

The Conder Range of Full Retention Separators

The Conder Range of Full Retention Separators are designed to treat the full flow that can be delivered by a drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr. Full Retention Separators are used where there is a risk of regular contamination with oil and a foreseeable risk of significant spillages.

Typical Application

- Sites with hi-risk of oil contamination
- Fuel storage depots
- Refuelling facilities
- Petrol forecourts
- Vehicle maintenance areas/workshops
- Where discharge is to a sensitive environment

Features and Benefits

- All surface water is treated
- Automatic closure device (ACD) fitted as standard

Performance

All Conder Full Retention Separators have an automatic closure device (ACD) fitted as standard. This is compulsory for all PPG3 compliant Full Retention Separators and prevents accumulated pollutants flowing through the unit when maximum storage level is reached.

How it Works

Step 1

Contaminated water enters the separator where the liquid is retained for a sufficient period to ensure that the lighter than water pollutants (such as oil, petrol) separate and rise to the surface of the water.

Step 2

The decontaminated water then passes through the coalescing filter before it is safely discharged from the separator, with the remaining pollutants being retained in the separator.

Step 3

Retained pollutants must be emptied from the separator once the level of oil is reached, or the oil level alarm is activated. This waste should be removed from the separator under the terms of The Waste Management Code of Practice.

Specification Larger models available upon request.

Area Drained (m^2)	Tank code Incl. Silt	Length including Silt (mm)	Slit Capacity (L)	Oil Storage Capacity	Diameter (mm)	Height (mm)	Base to inlet Invert (mm)	Base to outlet Invert (mm)
222	CNS4s/11	2319	400	40	1026	1655	1295	1245
333	CNS6s/11	3414	600	60	1026	1655	1295	1245
444	CNS8s/11	3197	800	80	1210	1855	1480	1430
556	CNS10s/11	3957	1000	100	1210	1855	1480	1430
833	CNS15s/11	3870	1500	150	1510	2180	1780	1730
1111	CNS20s/11	5060	2000	200	1510	2180	1780	1730
1667	CNS30s/11	5369	3000	300	1880	2560	2030	1980
2222	CNS40s/11	7059	4000	400	1880	2560	2030	1980
2778	CNS50s/11	4080	5000	500	2600	3315	2730	2680
3333	CNS60s/11	4805	6000	600	2600	3315	2730	2680
3889	CNS70s/11	5529	7000	700	2600	3315	2730	2680
4444	CNS80s/11	6254	8000	800	2600	3315	2730	2680
5556	CNS100s/11	6751	10,000	1,000	2600	3315	2730	2680

Note: It is a requirement of PPG3 that you have a silt capacity either in your tank or in an upstream catch pit.

Appendix B

Surface Water Windes Network & Results for the Pipe Network's Critical Storms (South Basin)

Existing Network Details 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
S1.000	79.450	0.353	225.1	0.070	5.00	0.0	0.600	o	225	Pipe/Conduit
S2.000	68.200	0.227	300.4	0.201	5.00	0.0	0.600	o	300	Pipe/Conduit
S2.001	22.250	0.074	300.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
S1.001	79.850	0.213	374.9	0.062	0.00	0.0	0.600	o	375	Pipe/Conduit
S1.002	42.600	0.114	373.7	0.069	0.00	0.0	0.600	o	450	Pipe/Conduit
S1.003	74.350	0.165	450.6	0.068	0.00	0.0	0.600	o	450	Pipe/Conduit
S3.000	74.000	0.260	284.6	0.393	5.00	0.0	0.600	o	375	Pipe/Conduit
S3.001	22.040	0.078	282.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
S3.002	19.010	0.067	283.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
S1.004	74.050	0.148	500.3	0.076	0.00	0.0	0.600	o	600	Pipe/Conduit
S1.005	14.100	0.028	503.6	0.019	0.00	0.0	0.600	o	600	Pipe/Conduit
S4.000	83.075	0.286	290.5	0.389	5.00	0.0	0.600	o	375	Pipe/Conduit
S4.001	41.015	0.084	488.3	0.253	0.00	0.0	0.600	o	525	Pipe/Conduit
S1.006	43.450	0.087	499.4	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit
S5.000	40.000	0.249	160.6	0.137	5.00	0.0	0.600	o	225	Pipe/Conduit
S1.007	70.600	0.141	500.7	0.053	0.00	0.0	0.600	o	750	Pipe/Conduit
S6.000	68.900	0.228	302.2	0.384	5.00	0.0	0.600	o	375	Pipe/Conduit
S6.001	21.850	0.072	303.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
S6.002	19.280	0.064	301.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
S1.008	45.900	0.092	498.9	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit
S7.000	69.000	0.307	224.8	0.082	5.00	0.0	0.600	o	225	Pipe/Conduit
S8.000	71.150	0.295	241.2	0.230	5.00	0.0	0.600	o	300	Pipe/Conduit
S9.000	60.500	0.295	205.1	0.209	5.00	0.0	0.600	o	300	Pipe/Conduit
S8.001	11.150	0.027	413.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S1.000	84.475	0.070	0.0	0.87	34.5
S2.000	84.685	0.201	0.0	0.90	63.7
S2.001	84.458	0.201	0.0	0.90	63.7
S1.001	83.972	0.333	0.0	0.93	102.7
S1.002	83.684	0.402	0.0	1.05	166.3
S1.003	83.570	0.470	0.0	0.95	151.3
S3.000	84.675	0.393	0.0	1.07	118.1
S3.001	84.415	0.393	0.0	1.07	118.5
S3.002	84.337	0.393	0.0	1.07	118.2
S1.004	83.255	0.939	0.0	1.08	305.9
S1.005	83.107	0.958	0.0	1.08	304.9
S4.000	84.675	0.389	0.0	1.06	116.8
S4.001	84.239	0.642	0.0	1.01	218.0
S1.006	82.929	1.600	0.0	1.25	550.2
S5.000	84.825	0.137	0.0	1.03	40.9
S1.007	82.842	1.790	0.0	1.24	549.5
S6.000	84.675	0.384	0.0	1.04	114.5
S6.001	84.447	0.384	0.0	1.03	114.3
S6.002	84.375	0.384	0.0	1.04	114.7
S1.008	82.551	2.174	0.0	1.40	888.0
S7.000	84.475	0.082	0.0	0.87	34.5
S8.000	84.685	0.230	0.0	1.01	71.2
S9.000	84.685	0.209	0.0	1.09	77.3
S8.001	84.240	0.439	0.0	0.99	158.1

Existing Network Details 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
S7.001	69.500	0.139	500.0	0.076	0.00	0.0	0.600	o	525	Pipe/Conduit
S10.000	80.000	0.267	299.6	0.188	5.00	0.0	0.600	o	300	Pipe/Conduit
S7.002	74.500	0.149	500.0	0.074	0.00	0.0	0.600	o	600	Pipe/Conduit
S11.000	71.150	0.294	242.0	0.219	5.00	0.0	0.600	o	300	Pipe/Conduit
S12.000	60.500	0.294	205.8	0.191	5.00	0.0	0.600	o	300	Pipe/Conduit
S11.001	11.150	0.043	259.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
S7.003	70.740	0.141	501.7	0.429	0.00	0.0	0.600	o	750	Pipe/Conduit
S13.000	65.000	0.132	492.4	0.611	5.00	0.0	0.600	o	525	Pipe/Conduit
S13.001	61.815	0.126	490.6	0.053	0.00	0.0	0.600	o	525	Pipe/Conduit
S13.002	53.510	0.109	490.9	0.039	0.00	0.0	0.600	o	525	Pipe/Conduit
S7.004	76.250	0.153	498.4	0.087	0.00	0.0	0.600	o	900	Pipe/Conduit
S14.000	73.900	0.265	278.9	0.399	5.00	0.0	0.600	o	375	Pipe/Conduit
S14.001	6.450	0.017	379.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit
S7.005	40.900	0.081	504.9	0.043	0.00	0.0	0.600	o	900	Pipe/Conduit
S7.006	39.500	0.378	104.5	0.079	0.00	0.0	0.600	o	900	Pipe/Conduit
S1.009	11.600	0.023	504.3	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit
S1.010	46.000	0.092	500.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S7.001	83.868	0.597	0.0	0.99	215.4
S10.000	84.400	0.188	0.0	0.90	63.8
S7.002	83.654	0.859	0.0	1.08	306.0
S11.000	84.685	0.219	0.0	1.01	71.1
S12.000	84.685	0.191	0.0	1.09	77.2
S11.001	84.316	0.410	0.0	1.12	123.8
S7.003	83.355	1.698	0.0	1.24	548.9
S13.000	84.175	0.611	0.0	1.00	217.0
S13.001	84.043	0.664	0.0	1.00	217.4
S13.002	83.917	0.703	0.0	1.00	217.4
S7.004	83.064	2.488	0.0	1.40	888.5
S14.000	84.675	0.399	0.0	1.08	119.3
S14.001	84.335	0.399	0.0	1.04	165.0
S7.005	82.911	2.930	0.0	1.39	882.7
S7.006	82.830	3.009	0.0	3.07	1950.0
S1.009	82.152	5.183	0.0	1.66	1876.3
S1.010	82.129	5.183	0.0	1.67	1884.5

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S14	85.900	1.425	Open Manhole	1200	S1.000	84.475	225				
S13.2	86.185	1.500	Open Manhole	1200	S2.000	84.685	300				
S13.1	86.100	1.642	Open Manhole	1200	S2.001	84.458	300	S2.000	84.458	300	
S13	86.000	2.028	Open Manhole	1350	S1.001	83.972	375	S1.000	84.122	225	
								S2.001	84.384	300	337
S12	85.900	2.216	Open Manhole	1350	S1.002	83.684	450	S1.001	83.759	375	
S11	86.700	3.130	Open Manhole	1350	S1.003	83.570	450	S1.002	83.570	450	
S10.3	86.250	1.575	Open Manhole	1350	S3.000	84.675	375				
S10.2	86.250	1.835	Open Manhole	1350	S3.001	84.415	375	S3.000	84.415	375	
S10.1	86.525	2.188	Open Manhole	1350	S3.002	84.337	375	S3.001	84.337	375	
S10	86.700	3.445	Open Manhole	1500	S1.004	83.255	600	S1.003	83.405	450	
								S3.002	84.270	375	790
S9	86.700	3.593	Open Manhole	1500	S1.005	83.107	600	S1.004	83.107	600	
S8.2	86.250	1.575	Open Manhole	1350	S4.000	84.675	375				
S8.1	86.250	2.011	Open Manhole	1500	S4.001	84.239	525	S4.000	84.389	375	
S8	86.700	3.771	Open Manhole	1800	S1.006	82.929	750	S1.005	83.079	600	
								S4.001	84.155	525	1001
S7.1	86.250	1.425	Open Manhole	1200	S5.000	84.825	225				
S7	86.700	3.858	Open Manhole	1800	S1.007	82.842	750	S1.006	82.842	750	
								S5.000	84.576	225	1209
S6.2	86.250	1.575	Open Manhole	1350	S6.000	84.675	375				
S6.1	86.250	1.803	Open Manhole	1350	S6.001	84.447	375	S6.000	84.447	375	
S6.1.1	86.525	2.150	Open Manhole	1350	S6.002	84.375	375	S6.001	84.375	375	
S6	86.700	4.149	Open Manhole	1800	S1.008	82.551	900	S1.007	82.701	750	
								S6.002	84.311	375	1235
S106	85.900	1.425	Open Manhole	1200	S7.000	84.475	225				
S105.3	86.185	1.500	Open Manhole	1200	S8.000	84.685	300				
S105.2	86.185	1.500	Open Manhole	1200	S9.000	84.685	300				
S105.1	86.185	1.945	Open Manhole	1350	S8.001	84.240	450	S8.000	84.390	300	
								S9.000	84.390	300	
S105	85.950	2.082	Open Manhole	1500	S7.001	83.868	525	S7.000	84.168	225	
								S8.001	84.213	450	270
S104.1	85.900	1.500	Open Manhole	1200	S10.000	84.400	300				
S104	86.100	2.446	Open Manhole	1500	S7.002	83.654	600	S7.001	83.729	525	
								S10.000	84.133	300	179
S103.3	86.185	1.500	Open Manhole	1200	S11.000	84.685	300				
S103.2	86.185	1.500	Open Manhole	1200	S12.000	84.685	300				
S103.1	86.185	1.869	Open Manhole	1350	S11.001	84.316	375	S11.000	84.391	300	
								S12.000	84.391	300	
S103	86.100	2.745	Open Manhole	1800	S7.003	83.355	750	S7.002	83.505	600	
								S11.001	84.273	375	543
SFU3	85.900	1.725	Open Manhole	1500	S13.000	84.175	525				
SFU2	86.000	1.957	Open Manhole	1500	S13.001	84.043	525	S13.000	84.043	525	
SFU1	86.100	2.183	Open Manhole	1500	S13.002	83.917	525	S13.001	83.917	525	
S102	86.050	2.986	Open Manhole	1800	S7.004	83.064	900	S7.003	83.214	750	
								S13.002	83.808	525	369
S101.2	86.250	1.575	Open Manhole	1350	S14.000	84.675	375				
S101.1	86.250	1.915	Open Manhole	1350	S14.001	84.335	450	S14.000	84.410	375	
S101	86.150	3.239	Open Manhole	1800	S7.005	82.911	900	S7.004	82.911	900	
								S14.001	84.318	450	957
S100	86.400	3.570	Open Manhole	1800	S7.006	82.830	900	S7.005	82.830	900	
S5	86.700	4.548	Open Manhole	2100	S1.009	82.152	1200	S1.008	82.459	900	7
								S7.006	82.452	900	
S3	86.465	4.336	Open Manhole	2100	S1.010	82.129	1200	S1.009	82.129	1200	
S	85.650	3.613	Open Manhole	0		OUTFALL		S1.010	82.037	1200	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S14	85.900	84.475	1.200	Open Manhole	1200
S2.000	o	300	S13.2	86.185	84.685	1.200	Open Manhole	1200
S2.001	o	300	S13.1	86.100	84.458	1.342	Open Manhole	1200
S1.001	o	375	S13	86.000	83.972	1.653	Open Manhole	1350
S1.002	o	450	S12	85.900	83.684	1.766	Open Manhole	1350
S1.003	o	450	S11	86.700	83.570	2.680	Open Manhole	1350
S3.000	o	375	S10.3	86.250	84.675	1.200	Open Manhole	1350
S3.001	o	375	S10.2	86.250	84.415	1.460	Open Manhole	1350
S3.002	o	375	S10.1	86.525	84.337	1.813	Open Manhole	1350
S1.004	o	600	S10	86.700	83.255	2.845	Open Manhole	1500
S1.005	o	600	S9	86.700	83.107	2.993	Open Manhole	1500
S4.000	o	375	S8.2	86.250	84.675	1.200	Open Manhole	1350
S4.001	o	525	S8.1	86.250	84.239	1.486	Open Manhole	1500
S1.006	o	750	S8	86.700	82.929	3.021	Open Manhole	1800
S5.000	o	225	S7.1	86.250	84.825	1.200	Open Manhole	1200
S1.007	o	750	S7	86.700	82.842	3.108	Open Manhole	1800
S6.000	o	375	S6.2	86.250	84.675	1.200	Open Manhole	1350
S6.001	o	375	S6.1	86.250	84.447	1.428	Open Manhole	1350
S6.002	o	375	S6.1.1	86.525	84.375	1.775	Open Manhole	1350
S1.008	o	900	S6	86.700	82.551	3.249	Open Manhole	1800
S7.000	o	225	S106	85.900	84.475	1.200	Open Manhole	1200
S8.000	o	300	S105.3	86.185	84.685	1.200	Open Manhole	1200
S9.000	o	300	S105.2	86.185	84.685	1.200	Open Manhole	1200
S8.001	o	450	S105.1	86.185	84.240	1.495	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	79.450	225.1	S13	86.000	84.122	1.653	Open Manhole	1350
S2.000	68.200	300.4	S13.1	86.100	84.458	1.342	Open Manhole	1200
S2.001	22.250	300.7	S13	86.000	84.384	1.316	Open Manhole	1350
S1.001	79.850	374.9	S12	85.900	83.759	1.766	Open Manhole	1350
S1.002	42.600	373.7	S11	86.700	83.570	2.680	Open Manhole	1350
S1.003	74.350	450.6	S10	86.700	83.405	2.845	Open Manhole	1500
S3.000	74.000	284.6	S10.2	86.250	84.415	1.460	Open Manhole	1350
S3.001	22.040	282.6	S10.1	86.525	84.337	1.813	Open Manhole	1350
S3.002	19.010	283.7	S10	86.700	84.270	2.055	Open Manhole	1500
S1.004	74.050	500.3	S9	86.700	83.107	2.993	Open Manhole	1500
S1.005	14.100	503.6	S8	86.700	83.079	3.021	Open Manhole	1800
S4.000	83.075	290.5	S8.1	86.250	84.389	1.486	Open Manhole	1500
S4.001	41.015	488.3	S8	86.700	84.155	2.020	Open Manhole	1800
S1.006	43.450	499.4	S7	86.700	82.842	3.108	Open Manhole	1800
S5.000	40.000	160.6	S7	86.700	84.576	1.899	Open Manhole	1800
S1.007	70.600	500.7	S6	86.700	82.701	3.249	Open Manhole	1800
S6.000	68.900	302.2	S6.1	86.250	84.447	1.428	Open Manhole	1350
S6.001	21.850	303.5	S6.1.1	86.525	84.375	1.775	Open Manhole	1350
S6.002	19.280	301.3	S6	86.700	84.311	2.014	Open Manhole	1800
S1.008	45.900	498.9	S5	86.700	82.459	3.341	Open Manhole	2100
S7.000	69.000	224.8	S105	85.950	84.168	1.557	Open Manhole	1500
S8.000	71.150	241.2	S105.1	86.185	84.390	1.495	Open Manhole	1350
S9.000	60.500	205.1	S105.1	86.185	84.390	1.495	Open Manhole	1350
S8.001	11.150	413.0	S105	85.950	84.213	1.287	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S7.001	o	525	S105	85.950	83.868	1.557	Open Manhole	1500
S10.000	o	300	S104.1	85.900	84.400	1.200	Open Manhole	1200
S7.002	o	600	S104	86.100	83.654	1.846	Open Manhole	1500
S11.000	o	300	S103.3	86.185	84.685	1.200	Open Manhole	1200
S12.000	o	300	S103.2	86.185	84.685	1.200	Open Manhole	1200
S11.001	o	375	S103.1	86.185	84.316	1.494	Open Manhole	1350
S7.003	o	750	S103	86.100	83.355	1.995	Open Manhole	1800
S13.000	o	525	SFU3	85.900	84.175	1.200	Open Manhole	1500
S13.001	o	525	SFU2	86.000	84.043	1.432	Open Manhole	1500
S13.002	o	525	SFU1	86.100	83.917	1.658	Open Manhole	1500
S7.004	o	900	S102	86.050	83.064	2.086	Open Manhole	1800
S14.000	o	375	S101.2	86.250	84.675	1.200	Open Manhole	1350
S14.001	o	450	S101.1	86.250	84.335	1.465	Open Manhole	1350
S7.005	o	900	S101	86.150	82.911	2.339	Open Manhole	1800
S7.006	o	900	S100	86.400	82.830	2.670	Open Manhole	1800
S1.009	o	1200	S5	86.700	82.152	3.348	Open Manhole	2100
S1.010	o	1200	S3	86.465	82.129	3.136	Open Manhole	2100

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S7.001	69.500	500.0	S104	86.100	83.729	1.846	Open Manhole	1500
S10.000	80.000	299.6	S104	86.100	84.133	1.667	Open Manhole	1500
S7.002	74.500	500.0	S103	86.100	83.505	1.995	Open Manhole	1800
S11.000	71.150	242.0	S103.1	86.185	84.391	1.494	Open Manhole	1350
S12.000	60.500	205.8	S103.1	86.185	84.391	1.494	Open Manhole	1350
S11.001	11.150	259.3	S103	86.100	84.273	1.452	Open Manhole	1800
S7.003	70.740	501.7	S102	86.050	83.214	2.086	Open Manhole	1800
S13.000	65.000	492.4	SFU2	86.000	84.043	1.432	Open Manhole	1500
S13.001	61.815	490.6	SFU1	86.100	83.917	1.658	Open Manhole	1500
S13.002	53.510	490.9	S102	86.050	83.808	1.717	Open Manhole	1800
S7.004	76.250	498.4	S101	86.150	82.911	2.339	Open Manhole	1800
S14.000	73.900	278.9	S101.1	86.250	84.410	1.465	Open Manhole	1350
S14.001	6.450	379.4	S101	86.150	84.318	1.382	Open Manhole	1800
S7.005	40.900	504.9	S100	86.400	82.830	2.670	Open Manhole	1800
S7.006	39.500	104.5	S5	86.700	82.452	3.348	Open Manhole	2100
S1.009	11.600	504.3	S3	86.465	82.129	3.136	Open Manhole	2100
S1.010	46.000	500.0	S	85.650	82.037	2.413	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.070	0.070	0.070
2.000	-	-	100	0.201	0.201	0.201
2.001	-	-	100	0.000	0.000	0.000
1.001	-	-	100	0.062	0.062	0.062
1.002	-	-	100	0.069	0.069	0.069
1.003	-	-	100	0.068	0.068	0.068
3.000	-	-	100	0.393	0.393	0.393
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.076	0.076	0.076
1.005	-	-	100	0.019	0.019	0.019
4.000	-	-	100	0.389	0.389	0.389
4.001	-	-	100	0.253	0.253	0.253
1.006	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.137	0.137	0.137
1.007	-	-	100	0.053	0.053	0.053
6.000	-	-	100	0.384	0.384	0.384
6.001	-	-	100	0.000	0.000	0.000
6.002	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.082	0.082	0.082
8.000	-	-	100	0.230	0.230	0.230
9.000	-	-	100	0.209	0.209	0.209
8.001	-	-	100	0.000	0.000	0.000
7.001	-	-	100	0.076	0.076	0.076
10.000	-	-	100	0.188	0.188	0.188
7.002	-	-	100	0.074	0.074	0.074
11.000	-	-	100	0.219	0.219	0.219
12.000	-	-	100	0.191	0.191	0.191
11.001	-	-	100	0.000	0.000	0.000
7.003	-	-	100	0.429	0.429	0.429
13.000	-	-	100	0.611	0.611	0.611
13.001	-	-	100	0.053	0.053	0.053
13.002	-	-	100	0.039	0.039	0.039
7.004	-	-	100	0.087	0.087	0.087
14.000	-	-	100	0.399	0.399	0.399
14.001	-	-	100	0.000	0.000	0.000
7.005	-	-	100	0.043	0.043	0.043
7.006	-	-	100	0.079	0.079	0.079
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				5.183	5.183	5.183

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.010	S	85.650	82.037	78.632	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S3, DS/PN: S1.010, Volume (m³): 25.8

Unit Reference	MD-SHE-0245-4600-3775-4600
Design Head (m)	3.775
Design Flow (l/s)	46.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	245
Invert Level (m)	82.129
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.775	46.0	Kick-Flo®	2.182	35.3
Flush-Flo™	1.053	45.5	Mean Flow over Head Range	-	39.9

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)	Depth (m)	Flow (l/s)
0.100	8.0	0.600	43.0	1.600	43.6	2.600	38.4	5.000	52.7	7.500	64.1
0.200	24.9	0.800	44.9	1.800	41.9	3.000	41.2	5.500	55.2	8.000	66.2
0.300	35.7	1.000	45.5	2.000	39.2	3.500	44.3	6.000	57.5	8.500	68.1
0.400	39.1	1.200	45.3	2.200	35.5	4.000	47.3	6.500	59.8	9.000	70.1
0.500	41.4	1.400	44.7	2.400	37.0	4.500	50.1	7.000	62.0	9.500	71.9

Storage Structures for Storm

Tank or Pond Manhole: S3, DS/PN: S1.010

Invert Level (m) 82.129

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	290.0	1.200	290.0	1.205	7.8	3.270	7.8	3.272	5035.0	4.336	6555.0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.400 Cv (Summer) 1.000
Region Scotland and Ireland Ratio R 0.314 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 0.0 DVD Status OFF
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.000	S14	120 Summer	100	+10%	100/15 Summer				85.880	1.180	0.000	0.39		13.0
S2.000	S13.2	60 Summer	100	+10%	100/15 Summer				85.944	0.959	0.000	1.11		67.7
S2.001	S13.1	120 Summer	100	+10%	100/15 Summer				85.873	1.115	0.000	0.67		37.5
S1.001	S13	120 Summer	100	+10%	100/15 Summer				85.835	1.488	0.000	0.59		57.8
S1.002	S12	120 Summer	100	+10%	100/15 Summer				85.768	1.634	0.000	0.46		68.1
S1.003	S11	120 Summer	100	+10%	100/15 Summer				85.735	1.715	0.000	0.54		76.5
S3.000	S10.3	60 Summer	100	+10%	100/15 Summer				85.907	0.857	0.000	1.17		130.8
S3.001	S10.2	60 Summer	100	+10%	100/15 Summer				85.763	0.973	0.000	1.03		104.3
S3.002	S10.1	120 Summer	100	+10%	100/15 Summer				85.723	1.011	0.000	0.79		77.5
S1.004	S10	120 Summer	100	+10%	100/15 Summer				85.688	1.833	0.000	0.56		156.0
S1.005	S9	360 Winter	100	+10%	100/15 Summer				85.678	1.971	0.000	0.42		67.9
S4.000	S8.2	60 Summer	100	+10%	100/15 Summer				85.812	0.762	0.000	1.17		129.8
S4.001	S8.1	360 Winter	100	+10%	100/15 Summer				85.678	0.914	0.000	0.24		46.3
S1.006	S8	360 Winter	100	+10%	100/15 Summer				85.676	1.997	0.000	0.25		113.7
S5.000	S7.1	60 Summer	100	+10%	100/15 Summer				85.695	0.645	0.000	1.22		47.2
S1.007	S7	360 Winter	100	+10%	100/15 Summer				85.673	2.081	0.000	0.26		127.0
S6.000	S6.2	60 Summer	100	+10%	100/15 Summer				85.764	0.714	0.000	1.18		128.0
S6.001	S6.1	360 Winter	100	+10%	100/15 Summer				85.675	0.853	0.000	0.28		27.7
S6.002	S6.1.1	360 Winter	100	+10%	100/15 Summer				85.672	0.922	0.000	0.29		27.6
S1.008	S6	360 Winter	100	+10%	100/15 Summer				85.670	2.219	0.000	0.22		154.2
S7.000	S106	60 Summer	100	+10%	100/15 Summer				85.825	1.125	0.000	0.82		27.6
S8.000	S105.3	60 Summer	100	+10%	100/15 Summer				85.924	0.939	0.000	1.14		77.5
S9.000	S105.2	60 Summer	100	+10%	100/15 Summer				85.878	0.893	0.000	0.98		71.9
S8.001	S105.1	60 Summer	100	+10%	100/15 Summer				85.788	1.098	0.000	1.49		143.5
S7.001	S105	60 Summer	100	+10%	100/15 Summer				85.764	1.371	0.000	0.86		169.8
S10.000	S104.1	60 Summer	100	+10%	100/15 Summer				85.812	1.112	0.000	1.02		62.4
S7.002	S104	120 Summer	100	+10%	100/15 Summer				85.721	1.467	0.000	0.56		155.9
S11.000	S103.3	60 Summer	100	+10%	100/15 Summer				85.842	0.857	0.000	1.06		72.1
S12.000	S103.2	60 Summer	100	+10%	100/15 Summer				85.780	0.795	0.000	0.87		63.9
S11.001	S103.1	120 Summer	100	+10%	100/15 Summer				85.704	1.013	0.000	0.89		82.8
S7.003	S103	360 Winter	100	+10%	100/15 Summer				85.680	1.575	0.000	0.25		121.6
S13.000	SFU3	60 Summer	100	+10%	100/15 Summer				85.779	1.079	0.000	1.02		201.4
S13.001	SFU2	60 Summer	100	+10%	100/15 Summer				85.725	1.157	0.000	0.93		184.4
S13.002	SFU1	30 Summer	100	+10%	100/15 Summer				85.683	1.241	0.000	1.36		265.5
S7.004	S102	360 Winter	100	+10%	100/15 Summer				85.677	1.713	0.000	0.23		178.3
S14.000	S101.2	60 Summer	100	+10%	100/15 Summer				85.745	0.695	0.000	1.19		134.2
S14.001	S101.1	360 Winter	100	+10%	100/15 Summer				85.675	0.890	0.000	0.27		28.7
S7.005	S101	360 Winter	100	+10%	100/15 Summer				85.674	1.863	0.000	0.30		209.8
S7.006	S100	360 Winter	100	+10%	100/15 Summer				85.671	1.941	0.000	0.16		215.3
S1.009	S5	360 Winter	100	+10%	100/15 Summer				85.668	2.316	0.000	0.52		369.2
S1.010	S3	360 Winter	100	+10%	100/15 Summer				85.667	2.338	0.000	0.03		45.4

PN	US/MH Name	Status	Level Exceeded
S1.000	S14	SURCHARGED	
S2.000	S13.2	SURCHARGED	
S2.001	S13.1	SURCHARGED	
S1.001	S13	SURCHARGED	
S1.002	S12	SURCHARGED	
S1.003	S11	SURCHARGED	
S3.000	S10.3	SURCHARGED	
S3.001	S10.2	SURCHARGED	
S3.002	S10.1	SURCHARGED	
S1.004	S10	SURCHARGED	
S1.005	S9	SURCHARGED	
S4.000	S8.2	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
S4.001	S8.1	SURCHARGED	
S1.006	S8	SURCHARGED	
S5.000	S7.1	SURCHARGED	
S1.007	S7	SURCHARGED	
S6.000	S6.2	SURCHARGED	
S6.001	S6.1	SURCHARGED	
S6.002	S6.1.1	SURCHARGED	
S1.008	S6	SURCHARGED	
S7.000	S106	SURCHARGED	
S8.000	S105.3	SURCHARGED	
S9.000	S105.2	SURCHARGED	
S8.001	S105.1	SURCHARGED	
S7.001	S105	SURCHARGED	
S10.000	S104.1	SURCHARGED	
S7.002	S104	SURCHARGED	
S11.000	S103.3	SURCHARGED	
S12.000	S103.2	SURCHARGED	
S11.001	S103.1	SURCHARGED	
S7.003	S103	SURCHARGED	
S13.000	SFU3	SURCHARGED	
S13.001	SFU2	SURCHARGED	
S13.002	SFU1	SURCHARGED	
S7.004	S102	SURCHARGED	
S14.000	S101.2	SURCHARGED	
S14.001	S101.1	SURCHARGED	
S7.005	S101	SURCHARGED	
S7.006	S100	SURCHARGED	
S1.009	S5	SURCHARGED	
S1.010	S3	SURCHARGED	

Appendix C

Surface Water Windes Network & Results for the Pipe Network's Critical Storms (West Basin)

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	54.315	0.172	315.0	0.281	5.00	0.0	0.600	o	375	Pipe/Conduit	
S2.000	76.305	0.190	401.6	0.313	5.00	0.0	0.600	o	375	Pipe/Conduit	
S1.001	81.495	0.163	500.0	0.090	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.000	52.135	0.265	196.7	0.336	5.00	0.0	0.600	o	375	Pipe/Conduit	
S3.001	48.475	0.260	186.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.002	22.870	0.046	497.2	0.015	0.00	0.0	0.600	o	675	Pipe/Conduit	
S1.003	49.335	0.099	500.0	0.075	0.00	0.0	0.600	o	750	Pipe/Conduit	
S4.000	20.410	0.122	167.3	0.075	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	18.785	0.038	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S5.000	37.700	0.244	154.5	0.104	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	30.460	0.181	168.3	0.088	5.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	6.765	0.032	211.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	12.475	0.025	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.006	6.375	0.013	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.007	3.275	0.007	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.008	413.860	1.104	375.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	100.00	5.89	83.625	0.281	0.0	0.0	10.1	1.02	112.2	111.6
S2.000	100.00	6.42	84.375	0.313	0.0	0.0	11.3	0.90	99.2«	124.3
S1.001	100.00	7.67	83.228	0.684	0.0	0.0	24.7	1.08	306.0	271.7
S3.000	100.00	5.67	84.325	0.336	0.0	0.0	12.1	1.29	142.3	133.5
S3.001	100.00	6.28	84.060	0.336	0.0	0.0	12.1	1.32	146.2	133.5
S1.002	100.00	8.00	82.990	1.035	0.0	0.0	37.4	1.17	418.2	411.1
S1.003	100.00	8.66	82.869	1.110	0.0	0.0	40.1	1.24	549.9	440.9
S4.000	100.00	5.34	83.675	0.075	0.0	0.0	2.7	1.01	40.1	29.8
S1.004	100.00	8.91	82.770	1.185	0.0	0.0	42.8	1.24	549.9	470.7
S5.000	100.00	5.60	83.675	0.104	0.0	0.0	3.8	1.05	41.7	41.3
S6.000	100.00	5.51	83.840	0.088	0.0	0.0	3.2	1.01	40.0	35.0
S5.001	100.00	5.70	83.356	0.192	0.0	0.0	6.9	1.08	76.2«	76.3
S1.005	100.00	9.08	82.732	1.377	0.0	0.0	49.7	1.24	549.9	547.0
S1.006	100.00	9.16	82.707	1.377	0.0	0.0	49.7	1.24	549.9	547.0
S1.007	100.00	9.21	82.695	1.377	0.0	0.0	49.7	1.24	549.9	547.0
S1.008	75.61	16.63	82.688	1.377	0.0	0.0	49.7	0.93	102.7«	547.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S214	85.200	1.575	Open Manhole	1350	S1.000	83.625	375				
S213.1	86.025	1.650	Open Manhole	1350	S2.000	84.375	375				
S213	85.375	2.147	Open Manhole	1500	S1.001	83.228	600	S1.000	83.453	375	
								S2.000	84.185	375	732
S212.2	85.900	1.575	Open Manhole	1350	S3.000	84.325	375				
S212.1	85.635	1.575	Open Manhole	1350	S3.001	84.060	375	S3.000	84.060	375	
S212	85.375	2.385	Open Manhole	1500	S1.002	82.990	675	S1.001	83.065	600	
								S3.001	83.800	375	510
S211	85.305	2.436	Open Manhole	1800	S1.003	82.869	750	S1.002	82.944	675	
S210.1	85.100	1.425	Open Manhole	1200	S4.000	83.675	225				
S210	85.170	2.400	Open Manhole	1800	S1.004	82.770	750	S1.003	82.770	750	
								S4.000	83.553	225	258
S209.3	85.100	1.425	Open Manhole	1200	S5.000	83.675	225				
S209.2	85.265	1.425	Open Manhole	1200	S6.000	83.840	225				
S209.1	85.350	1.994	Open Manhole	1200	S5.001	83.356	300	S5.000	83.431	225	
								S6.000	83.659	225	228
S209	85.185	2.453	Open Manhole	1800	S1.005	82.732	750	S1.004	82.732	750	
								S5.001	83.324	300	142
S208	85.185	2.478	Open Manhole	1800	S1.006	82.707	750	S1.005	82.707	750	
S207	85.185	2.490	Open Manhole	1800	S1.007	82.695	750	S1.006	82.695	750	
S206	85.185	2.497	Open Manhole	1800	S1.008	82.688	375	S1.007	82.688	750	
S303	85.900	4.316	Open Manhole	0		OUTFALL		S1.008	81.584	375	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	375	S214	85.200	83.625	1.200	Open Manhole	1350
S2.000	o	375	S213.1	86.025	84.375	1.275	Open Manhole	1350
S1.001	o	600	S213	85.375	83.228	1.547	Open Manhole	1500
S3.000	o	375	S212.2	85.900	84.325	1.200	Open Manhole	1350
S3.001	o	375	S212.1	85.635	84.060	1.200	Open Manhole	1350
S1.002	o	675	S212	85.375	82.990	1.710	Open Manhole	1500
S1.003	o	750	S211	85.305	82.869	1.686	Open Manhole	1800
S4.000	o	225	S210.1	85.100	83.675	1.200	Open Manhole	1200
S1.004	o	750	S210	85.170	82.770	1.650	Open Manhole	1800
S5.000	o	225	S209.3	85.100	83.675	1.200	Open Manhole	1200
S6.000	o	225	S209.2	85.265	83.840	1.200	Open Manhole	1200
S5.001	o	300	S209.1	85.350	83.356	1.694	Open Manhole	1200
S1.005	o	750	S209	85.185	82.732	1.703	Open Manhole	1800
S1.006	o	750	S208	85.185	82.707	1.728	Open Manhole	1800
S1.007	o	750	S207	85.185	82.695	1.740	Open Manhole	1800
S1.008	o	375	S206	85.185	82.688	2.122	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	54.315	315.0	S213	85.375	83.453	1.547	Open Manhole	1500
S2.000	76.305	401.6	S213	85.375	84.185	0.815	Open Manhole	1500
S1.001	81.495	500.0	S212	85.375	83.065	1.710	Open Manhole	1500
S3.000	52.135	196.7	S212.1	85.635	84.060	1.200	Open Manhole	1350
S3.001	48.475	186.4	S212	85.375	83.800	1.200	Open Manhole	1500
S1.002	22.870	497.2	S211	85.305	82.944	1.686	Open Manhole	1800
S1.003	49.335	500.0	S210	85.170	82.770	1.650	Open Manhole	1800
S4.000	20.410	167.3	S210	85.170	83.553	1.392	Open Manhole	1800
S1.004	18.785	500.0	S209	85.185	82.732	1.703	Open Manhole	1800
S5.000	37.700	154.5	S209.1	85.350	83.431	1.694	Open Manhole	1200
S6.000	30.460	168.3	S209.1	85.350	83.659	1.466	Open Manhole	1200
S5.001	6.765	211.4	S209	85.185	83.324	1.561	Open Manhole	1800
S1.005	12.475	500.0	S208	85.185	82.707	1.728	Open Manhole	1800
S1.006	6.375	500.0	S207	85.185	82.695	1.740	Open Manhole	1800
S1.007	3.275	500.0	S206	85.185	82.688	1.747	Open Manhole	1800
S1.008	413.860	375.0	S303	85.900	81.584	3.941	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.281	0.281	0.281
2.000	-	-	100	0.313	0.313	0.313
1.001	-	-	100	0.090	0.090	0.090
3.000	-	-	100	0.336	0.336	0.336
3.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.015	0.015	0.015
1.003	-	-	100	0.075	0.075	0.075
4.000	-	-	100	0.075	0.075	0.075
1.004	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.104	0.104	0.104
6.000	-	-	100	0.088	0.088	0.088
5.001	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.377	1.377	1.377

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.008	S303	85.900	81.584	80.772	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S206, DS/PN: S1.008, Volume (m³): 7.0

Unit Reference	MD-SHE-0196-2400-2300-2400	Sump Available	Yes
Design Head (m)	2.300	Diameter (mm)	196
Design Flow (l/s)	24.0	Invert Level (m)	82.688
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1800
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	23.8	Kick-Flo®	1.406	18.9
Flush-Flo™	0.668	23.8	Mean Flow over Head Range	-	20.8

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)	Depth (m)	Flow (l/s)
0.100	6.8	0.600	23.8	1.600	20.1	2.600	25.3	5.000	34.6	7.500	42.1
0.200	18.3	0.800	23.7	1.800	21.2	3.000	27.1	5.500	36.2	8.000	43.4
0.300	21.4	1.000	23.1	2.000	22.3	3.500	29.2	6.000	37.8	8.500	44.7
0.400	22.8	1.200	21.8	2.200	23.3	4.000	31.1	6.500	39.3	9.000	46.0
0.500	23.5	1.400	19.0	2.400	24.3	4.500	32.9	7.000	40.7	9.500	47.2

Storage Structures for Storm

Tank or Pond Manhole: S206, DS/PN: S1.008

Invert Level (m) 82.688

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	7.5	0.750	7.5	0.755	7.5	1.790	7.5	1.797	665.0	2.497	1050.0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.400 Cv (Summer) 1.000
Region Scotland and Ireland Ratio R 0.314 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 0.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.000	S214	30 Summer	100	+10%	100/15 Summer				85.004	1.004	0.000	1.01		105.5
S2.000	S213.1	30 Summer	100	+10%	100/15 Summer				85.136	0.386	0.000	1.44		135.7
S1.001	S213	180 Winter	100	+10%	100/15 Summer				84.912	1.085	0.000	0.28		78.7
S3.000	S212.2	30 Summer	100	+10%	100/15 Summer				85.146	0.446	0.000	1.13		149.3
S3.001	S212.1	30 Summer	100	+10%	100/15 Summer				84.940	0.505	0.000	0.87		117.2
S1.002	S212	180 Winter	100	+10%	100/15 Summer				84.908	1.243	0.000	0.39		118.9
S1.003	S211	180 Winter	100	+10%	100/15 Summer				84.905	1.286	0.000	0.27		127.2
S4.000	S210.1	180 Winter	100	+10%	100/15 Summer				84.904	1.004	0.000	0.24		8.6
S1.004	S210	180 Winter	100	+10%	100/15 Summer				84.902	1.382	0.000	0.41		135.2
S5.000	S209.3	180 Winter	100	+10%	100/15 Summer				84.906	1.006	0.000	0.30		12.0
S6.000	S209.2	180 Winter	100	+10%	100/15 Summer				84.905	0.840	0.000	0.27		10.1
S5.001	S209.1	180 Winter	100	+10%	100/15 Summer				84.901	1.245	0.000	0.40		21.9
S1.005	S209	180 Winter	100	+10%	100/15 Summer				84.900	1.418	0.000	0.59		156.4
S1.006	S208	180 Winter	100	+10%	100/15 Summer				84.898	1.440	0.000	0.48		155.8
S1.007	S207	180 Winter	100	+10%	100/15 Summer				84.896	1.452	0.000	0.43		155.2
S1.008	S206	180 Winter	100	+10%	100/15 Summer				84.895	1.832	0.000	0.23		23.4

PN	US/MH Name	Status	Level Exceeded
S1.000	S214	SURCHARGED	
S2.000	S213.1	SURCHARGED	
S1.001	S213	SURCHARGED	
S3.000	S212.2	SURCHARGED	
S3.001	S212.1	SURCHARGED	
S1.002	S212	SURCHARGED	
S1.003	S211	SURCHARGED	
S4.000	S210.1	SURCHARGED	
S1.004	S210	SURCHARGED	
S5.000	S209.3	SURCHARGED	
S6.000	S209.2	SURCHARGED	
S5.001	S209.1	SURCHARGED	
S1.005	S209	SURCHARGED	
S1.006	S208	SURCHARGED	
S1.007	S207	SURCHARGED	
S1.008	S206	SURCHARGED	

Appendix D

Swale Design Calculations

	Project				Job no.	
					16_177	
	Calcs for				Start page no./Revision	
	15min 1yr Swale Design				1	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	NM	16/11/2016	HF	16/11/2016	PF	16/11/2016

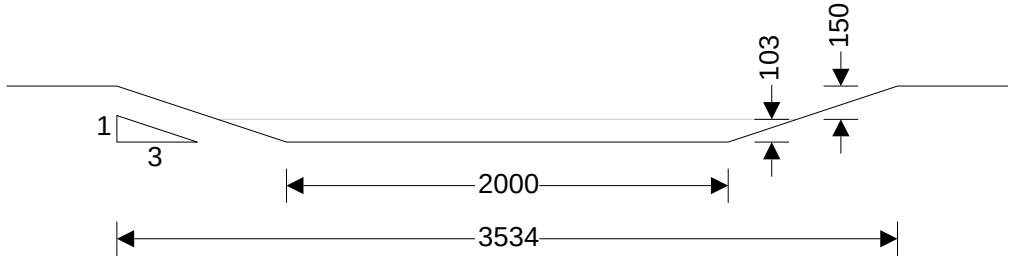
SWALE AND FILTER STRIP DESIGN

In accordance with CIRIA publication C697 - The SUDS Manual

Tedds calculation version 2.0.01

Swale details

Width of swale base	w = **2.000** m
Longitudinal gradient of swale	S = **0.001**
Side slope gradient of swale	s = **0.330**
Manning number	n = **0.35**
Length of swale	L = **50** m



Cross section of swale

Design rainfall intensity

Location of catchment area	Other
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.300**
5-year return period rainfall of 60 minutes duration	M5_60min = **17.4** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **10** %
Factor Z1 (Wallingford procedure)	Z1 = **0.59**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min \times (1 + p_{climate})$ = **11.3** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.68**
Rainfall for 15min storm with 1 year return period	$M1\_15min = Z2 \times M5\_15min_i$ = **7.7** mm
Design rainfall intensity	I_{max} = M1_15min / D = **30.8** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **1000** m^2
Percentage of area that is impermeable	p = **50** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **4.3** l/s

Calculate depth of flow using iteration of Manning's formula

Minimum depth of flow	x = **103** mm
	Warning - Depth of flow should be less than 100 mm for effective filtration
Area of flow	$A = (w + x / s) \times x$ = **0.238** m^2
Perimeter of flow	$P = w + 2 \times \sqrt{(x^2 + (x / s)^2)}$ = **2.658** m
Hydraulic radius	R = A / P = **0.090** m
Check flow using Manning equation	$Q_{check} = A \times (R / 1\ m)^{2/3} \times S^{1/2} \times 1$ m/s / n = **4.3** l/s
Maximum velocity of flow	$V_{max} = Q_{max} / A$ = **0.018** m/s
	PASS - velocity is small enough to encourage settlement and prevent erosion

Minimum width

Freeboard	d_{free} = **150** mm

	Project				Job no.	
					16_177	
	Calcs for				Start page no./Revision	
	15min 1yr Swale Design				2	
	Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
	NM	16/11/2016	HF	16/11/2016	PF	16/11/2016

Minimum required swale width $w_{total,min} = 2 \times (x + d_{free}) / s + w = \mathbf{3.534}$ m

TEKLA Tedds	Project				Job no. 16_177	
	Calcs for 15min 100yr Swale Design				Start page no./Revision 1	
	Calcs by NM	Calcs date 16/11/2016	Checked by HF	Checked date 16/11/2016	Approved by PF	Approved date 16/11/2016

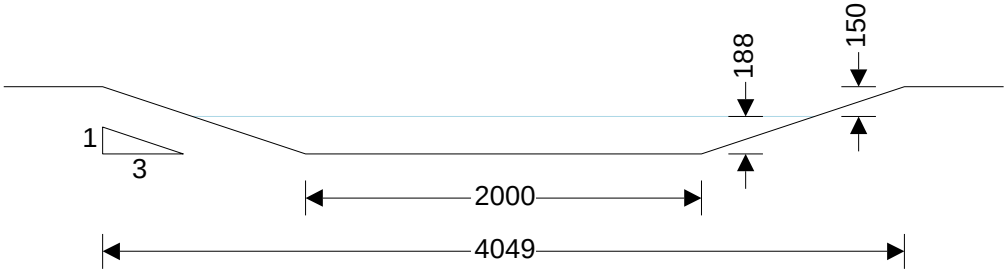
SWALE AND FILTER STRIP DESIGN

In accordance with CIRIA publication C697 - The SUDS Manual

Tedds calculation version 2.0.01

Swale details

Width of swale base	w = **2.000** m
Longitudinal gradient of swale	S = **0.001**
Side slope gradient of swale	s = **0.330**
Manning number	n = **0.35**
Length of swale	L = **50** m



Cross section of swale

Design rainfall intensity

Location of catchment area	Other
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.300**
5-year return period rainfall of 60 minutes duration	M5_60min = **17.4** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **10** %
Factor Z1 (Wallingford procedure)	Z1 = **0.59**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i = Z1 \times M5\_60min \times (1 + p_{climate})$ = **11.3** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.97**
Rainfall for 15min storm with 100 year return period	$M100\_15min = Z2 \times M5\_15min_i$ = **22.3** mm
Design rainfall intensity	I_{max} = M100_15min / D = **89.1** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **1000** m^2
Percentage of area that is impermeable	p = **50** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **12.4** l/s

Calculate depth of flow using iteration of Manning's formula

Minimum depth of flow	x = **188** mm
	Warning - Depth of flow should be less than 100 mm for effective filtration
Area of flow	$A = (w + x / s) \times x$ = **0.483** m^2
Perimeter of flow	$P = w + 2 \times \sqrt{(x^2 + (x / s)^2)}$ = **3.201** m
Hydraulic radius	R = A / P = **0.151** m
Check flow using Manning equation	$Q_{check} = A \times (R / 1\ m)^{2/3} \times S^{1/2} \times 1$ m/s / n = **12.4** l/s
Maximum velocity of flow	$V_{max} = Q_{max}$ / A = **0.026** m/s
	PASS - velocity is small enough to encourage settlement and prevent erosion

Minimum width

Freeboard	d_{free} = **150** mm

Minimum required swale width $w_{total,min} = 2 \times (x + d_{free}) / s + w =$ **4.049** m

Appendix E

Proposed Hydrodynamic Separator
(Or Similar)

CDS Dimensions (mm)

	CDS10404	CDS0604	CDS0606	CDS0804	CDS0806	CDS0808	CDS1010	CDS1012	CDS1015
A	370	370	370	370	370	370	500	500	500
B	444	815	615	810	830	810	800	800	830
C	1250	1985	1985	2080	2300	2460	2800	3000	3330
D	800	1200	200	1500	1500	1500	2000	2000	2000
E	1112	1665	1665	1966	1966	1966	2475	2475	2475
F	400	700	700	700	700	800	1000	1000	1000
G (dia)	400	600	600	800	800	800	1000	1000	1000
H	400	400	600	400	600	800	1000	1200	1500

Selection Table — CDS Polypropylene Manhole Units

Model Reference	Hydraulic Peak Flow Rate l/s	Treatment Flow Rate l/s	Drainage Area — Impermeable m²	Chamber Diameter (mm)	Internal Pipe Diameter (mm)
CDS 0404	30	12.5	2,000	900	150/225
CDS 0604	70	23	5,000	1200	225
CDS 0606/01	140	38	10,000	1200	225-375
CDS 0606/02	200	38	15,000	1200	225-375
CDS 0806	350	49	25,000	1500	450
CDS 0808	400	72	30,000	1500	450
CDS 1010	480	116	35,000	2000	450
CDS 1012	550	152	40,000	2000	450/750
CDS 1015	700	211	50,000	2000	450/750
CDS 0804	275	31	20,000	1500	300

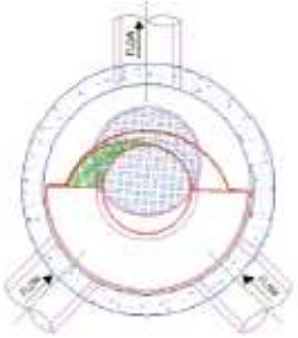
Proposed Peak Flow Rate for each model calculated using Rational Lloyd Davis with a rainfall intensity of 50mm/hr. For greater flows — special design/ construction required.

In-Line CDS

For small catchment, these units are used within the drainage system in-line and are supplied as BBA Approved* complete manhole polypropylene units from the selection table above.

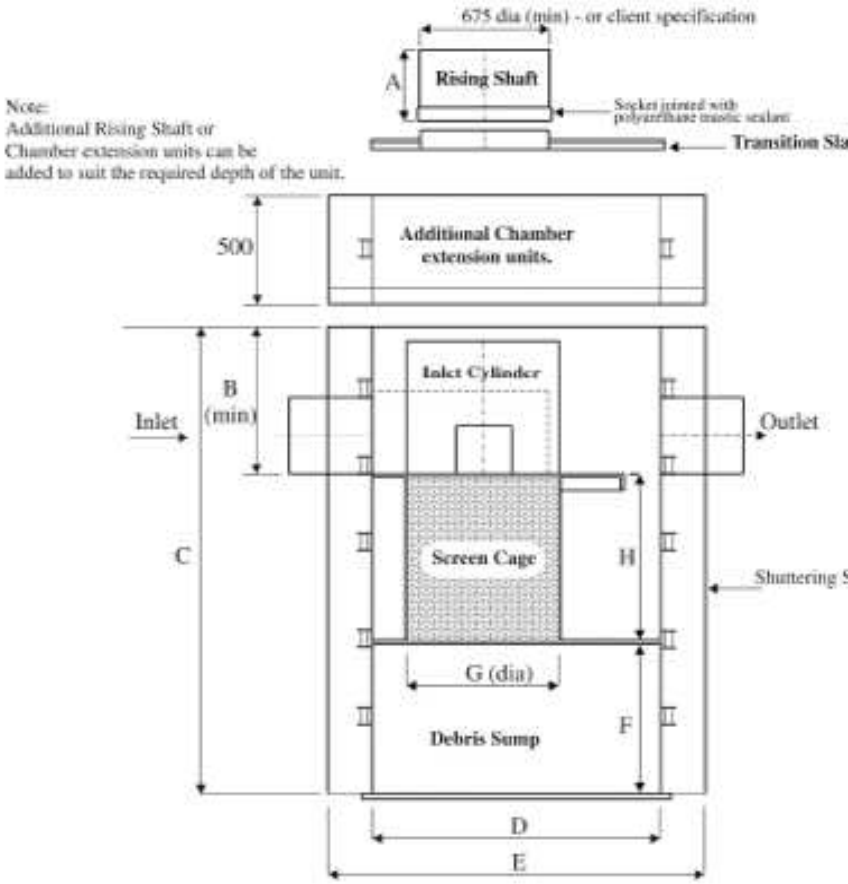
Off-Line CDS

Larger catchment areas and retrofit projects designed with larger surface runoff conveyance capacity can receive treatment using a CDS unit placed adjacent to the storm pipeline. Water is channeled to these offline CDS configurations using a diversion structure. The diversion structure and its weir send the water quality flow to the offline CDS unit and also ensure larger flow events from less frequent storm events properly bypass the offline unit without cause flooding upstream of the unit.



Model Designation

A four digit number representing the screen diameter and screen height then follows to give the standard model designation for a CDS screen for installation into standard commercially available pre-fabricated manhole chambers. Example: CDS 0806 designates a separation screen dia. 0.8 m and screen height of 0.6m.



Support

- Drawings and specifications are available at contechstormwater.com.
- Site-specific design support is available from our engineers.

800.338.1122
contechstormwater.com

CONTECH

Appendix F

Proposed Bypass Oil Separator
(Or Similar)

The Conder Range of Bypass Separators

The Conder Range of Bypass Separators are used to fully treat all flows generated by rainfall rates of up to 6.5mm/hr. Bypass Separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where only small spillages occur and the risk of spillage is small.

Typical Application

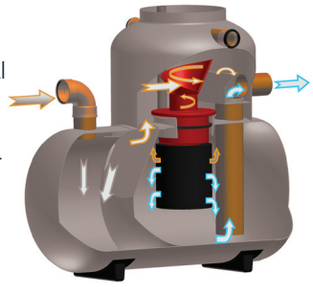
- Car parks
- Roadways and major trunk roads
- Light industrial and goods yards

Features and Benefits

- Innovative design
- Compact and easy to handle/install
- Fully compliant to the Environment Agency's PPG3 guidelines
- Low product and install costs
- Full BSI certification
- Exceeds industry standards
- Easy to service
- Fully tested and verified with a range from CNSB 3 to CNSB 1000 (Class 1)

Performance

Conder Bypass Separators have been designed to treat all flow up to the designed nominal size. Any flow in excess of the nominal size is allowed to bypass the separation chamber thereby keeping the separated and trapped oil safe.



How it Works

Step 1

During the early part of a rain storm, which is a time of high oil contamination, all of the contaminated water flow passes through the sediment collection chamber and enters the separation chamber through a patented oil skimming and filter device.

Step 2

All of the oil then proceeds to the separation chamber where it is separated to the Class 1 standard of 5 mg/l and safely trapped.

Step 3

As the rainstorm builds up to its maximum and the level of oil contamination reduces significantly, the nominal size flow continues to pass through the separation chamber and any excess flow of virtually clean water is allowed to bypass directly to the outlet.

Specification Larger models up to CNSB 1000 are available.

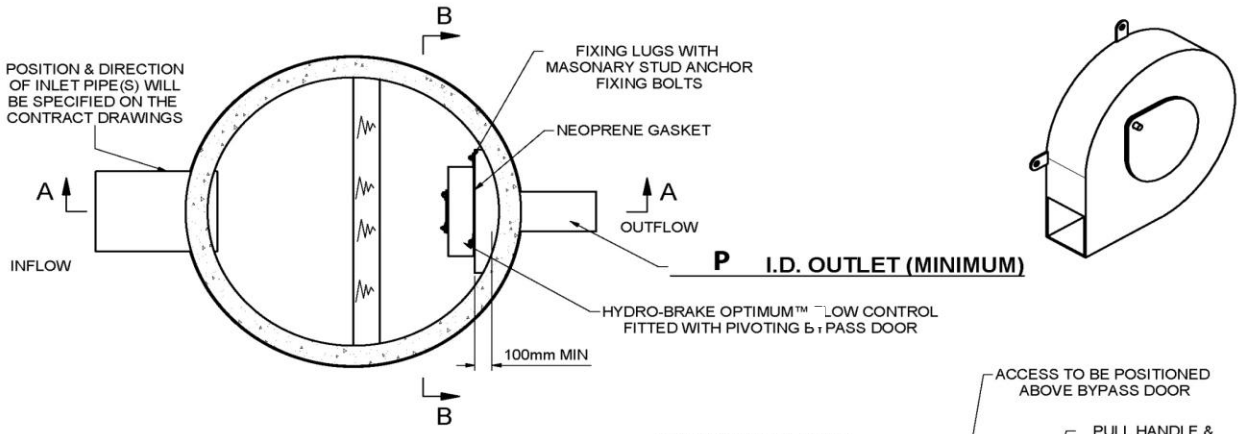
Area Drained (m^2)	Tank Code including Silt	Length including Silt (mm)	Silt Capacity (L)	Oil Storage Capacity (L)	Diameter (mm)	Height (mm)	Base to inlet Invert (mm)	Base to outlet Invert (mm)	Access (mm)
1667	CNSB3s/21	1400	300	45	1026	2200	1730	1680	750
2500	CNSB4.5s/21	1785	450	67.5	1026	1875	1270	1220	600
3333	CNSB6s/21	1975	600	90	1026	1875	1270	1220	600
4444	CNSB8s/21	2165	800	120	1026	1875	1270	1220	600
5555	CNSB10s/21	2485	1000	150	1026	1875	1270	1220	600
8333	CNSB15s/21	2670	1500	225	1210	2150	1450	1400	600
11111	CNSB20s/21	3115	2000	300	1210	2150	1450	1400	600
13889	CNSB25s/21	3555	2500	375	1210	2150	1450	1400	600
16667	CNSB30s/21	3470	3000	450	1510	2690	1770	1720	750
22222	CNSB40s/21	4040	4000	600	1510	2690	1770	1720	750
27778	CNSB50s/21	4655	5000	750	1510	2690	1770	1720	750
33333	CNSB60s/21	4415	6000	900	1880	3300	2025	1975	2 x 600
44444	CNSB80s/21	5225	8000	1200	1880	3300	2025	1975	2 x 600
55556	CNSB100s/21	6010	10,000	1500	1880	3300	2025	1975	2 x 600

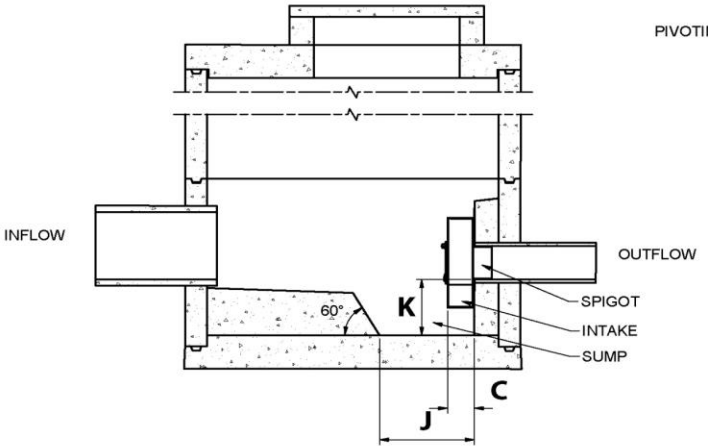
Note: It is a requirement of PPG3 that you have a silt capacity either in your tank or in an upstream catch pit.

Appendix G

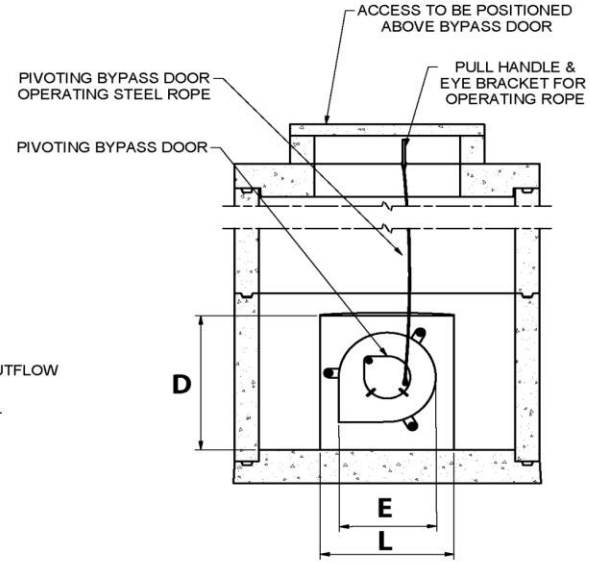
Typical Flow Control Device
(Or Similar)

DO NOT SCALE | THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE. | IF IN DOUBT ASK





SECTION A-A



SECTION B-B

NOTE: A pre-formed Hydro-Brake® Chamber Base with pre-fitted Hydro-Brake Optimum® is available from Hydro International

TECHNICAL SPECIFICATION		
CONTROL POINT	**HEAD (m)**	**FLOW (l/s)**
Design Point	5.20	35.01
Flush-Flo™	0.850	26.61
Kick-Flo®	1.758	20.83
Mean Flow over head range		26.56

DESIGN ADVICE

!

The head / flow characteristics of this Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head / flow characteristic curve.

The use of any other flow control will invalidate any design based on this unit and could constitute a flood risk.

KEY DIMENSIONS (mm)			
C	200	**J**	395
D	1535	**K**	600
E	1185	**L**	1385
P	225		
Internal Clearance (m²)			0.0310

Notes:
1. This drawing is an A3 sized original
2. This drawing shall be read in conjunction with all relevant general arrangement and layout drawings.
3. The Hydro-Brake Optimum® shall be handed to suit site conditions.
4. For site specific details and minimum chamber size refer to Hydro International.
5. All civil and installation work by others.
6. The Hydro-Brake Optimum® is also available with alternative mounting options (e.g. mounting plate, push fit, curved mounting plate)
7. Dimensions shown for flow control unit are maximum dimensions
8. Dimensions shown for flow control chamber are minimum dimensions

Title
HYDRO-BRAKE OPTIMUM® FOR SURFACE WATER

R6627 - Dublin

GENERAL ARRANGEMENT

Drawn By
Jackie McGovern

HRD Technologies Ltd

Unit B 10/11 Greenogue Square
Greenogue Business Park
Rathcoole
Co Dublin
Tel: +353 (0)1 4013964
Fax: +353 (0)1 4013978
E-mail: enquiries@hrdtec.com

Date
24-Nov-16

Product ID Code
SHE-0197-35.00-5200-

Job No.
16_21_5386

Revision
A

HR S Optimum Designer Release v4.2

Appendix H

Qbar Calculation

CLIFTON SCANNELL EMERSON ASSOCIATES		Job Ref No.	16_177
Project	PROJECT G	Rev	1st
Location	PROJECT G SITE	Date	25/11/2016
Calcs By	NM	Checked By	HF

Clifton Scannell Emerson Associates

Variables

AREA = 50Ha

Calculation of QBAR carried out for 50Ha site

SAAR = 763mm

Average historical annual rainfall at Phoenix Park

SOIL = 0.45

For soil type 4 from Table D1 from Volume 2 Appendix D (GDSDS)

Allowable Discharge Per 50Ha

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

6.3.1.2.1 (GDSDS)

$QBAR = 0.00108 \times (0.5)^{0.89} \times (763)^{1.17} \times (0.45)^{2.17}$

$QBAR = 0.00108 \times 0.53961 \times 2199.747343 \times 0.17680$

$QBAR = 0.242958\ m^3/s$

QBAR = 242.958 l/s

Allowable Discharge For Phase 1

AREA = 11.5Ha

Allowable Discharge = 55.4 l/s

Allowable Discharge For Future Development Served by South Pond

AREA = 13.7Ha

Allowable Discharge = 66.5 l/s

Allowable Discharge For Entire Site

AREA = 26.0Ha

Allowable Discharge = 126.3 l/s

Appendix I

IDA Connection Agreement

AN GHNÍOMHAIREACHT INFHEISTÍOCHTA AGUS FORBARTHA | INVESTMENT AND DEVELOPMENT AGENCY

PÁIRC GNÓ & TEICNEOLAÍOCHTA BHAILE ÁTHA LUAIN CARRAIG AN CHAISLEÁIN BÓTHAR BHAILE ÁTHA CLIATH BAILE ÁTHA LUAIN CO. NA HIARMHÍ ÉIRE
FÓN (090) 6471500
FACS (090) 6471550
SUÍOMH GRÉASÁIN www.idaireland.com

ATHLONE BUSINESS & TECHNOLOGY PARK GARRYCASTLE DUBLIN ROAD ATHLONE CO. WESTMEATH IRELAND
TEL (090) 6471500
FAX (090) 6471550
WEBSITE www.idaireland.com

February 24th 2017

Re: IDA Ireland Consent to apply for Planning Permission - Proposed development at IDACruiserath, Blanchardstown, Dublin 15.

To whom it may concern,

I wish to confirm that IDA Ireland, as freehold registered owners of the c. 26.14 hectare site at IDA Cruiserath lands, Blanchardstown, Co. Dublin, has reviewed the proposed development drawings, namely drawing numbers: AWS-MCA-01-XX-DR-A-1000 to AWS-MCA-XX-DR-A-7902.

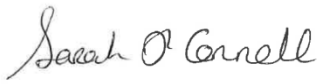
Furthermore, IDA Ireland has no objection to the proposal in principal, as set out within the above referenced drawings subject to **Amazon Data Services Ireland Ltd** complying with the following conditions:

1. Compliance with the regulations and obtaining approval of all public, local, and other authorities.
2. Receipt of planning permission and complying with conditions as required by the relevant Local Authority.
3. Obtaining fire certificate and complying with conditions.
4. Compliance with Building Regulations.
5. Compliance with the rights of lessees and occupiers of adjoining and surrounding properties.
6. The reinstatement, to the satisfaction of IDA Ireland, of any damaged areas/services adjoining the development.
7. IDA Ireland to be notified of proposed commencement and completion dates for the proposed development.

I hereby confirm IDA Ireland's consent in principal to Amazon Data Services Ireland Limited making a new surface water drainage and foul drainage connection to IDA Ireland's existing surface water and foul drainage network, located within the south east corner of the Property.This consent is subjet to the applicant agreeing a connection with the relevant third party utility infrastructure owners/providers where necessary..

This letter of consent is valid only for the purpose of Amazon Data Services Ireland Limited making an application to the appropriate planning authority for the above development.

Yours sincerely,



Sarah O'Connell
Property Division
IDA Ireland

Appendix J

Irish Water Pre-Connection Enquire Form

Pre-connection enquiry form

Large industrial & commercial, mixed use developments, housing developments, non domestic developments

This form is to be filled out by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure. Please complete this form in BLOCK letters using a black ink ballpoint pen.

Section A Applicant details

1 Applicant details:

Contact name: EUGENE BRENNAN

Company name (if relevant): AMAZON DATA SERVICES IRELAND LTD.

Postal address: BURLINGTON PLAZA

BURLINGTON ROAD

DUBLIN 4

Telephone: 087 950 1932 Email: EUGBREN@AMAZON.COM

2 **Correspondence address (if different from applicants above):**

Contact name: N/A

Company name (if relevant):

Postal address:

Telephone: Email:

3 **Engineering Consultant**

Contact name: PETER FAGAN / HUBERT FENERAN

Company name (if relevant): CLIFTON SCANNELL EMERSON ASSOCIATES

Postal address: SEAFORT LODGE,
CASTLEDAWSON AVENUE,
BLACKROCK, CO. DUBLIN

Telephone: 01 2885006 Email: PETER.FAGAN@CSEA.IE
HUBERT.FENERAN@CSEA.IE

Section B Site details

4 **Site address:** ADSIL,
CROISERATH ROAD,
DUBLIN 15

5 **Name of Local Authority:** FINGAL CO. CO.

6 **Has full planning permission been granted?** Yes ☐ No ☑

If 'Yes' please indicate the Planning reference number:

7 **Irish National Grid co-ordinates:** Eastings 707441 Northings 741593

8 **Previous use of site (if applicable):** FARMLAND

9 **Date previous development was last occupied (if applicable):**

10 **Are there poor ground condition issues?** Yes ☐ No ☑

If Yes please include site investigation report and a detailed site specific report on the approach being taken to deal with ground conditions specifically with regard to pipe support and trenching.

11 **Are there potential contaminated land issues?** Yes ☐ No ☑

If Yes please include a detailed site specific report on the approach being taken to deal with contaminated land and the measures to mitigate impact on the infrastructure.

12 **Is the development in accordance with the local area/development plan?** Yes ☑ No ☐

Section C Service details

13 **Request for connection** Water ☐ Wastewater ☐ Both ☑

14 **Is this application for an additional water connection to the one already installed?** Yes ☐ No ☑

15 **Is this application for an additional wastewater connection to the one already installed?** Yes ☐ No ☑

16 **Please provide WPRN No. (If there is an existing connection):** /

17 **Do you require an upgrade/increase in size to an existing water connection?** Yes ☐ No ☑

18 **Do you require an upgrade/increase in size to an existing wastewater connection?** Yes ☐ No ☑

19 **Please indicate water demand** (include calculations on attached calculation sheet)

Pre-development peak water demand	/	l/s
Pre-development average water demand	/	l/s
Post-development peak water demand	6.0	l/s *
Post-development average water demand	1.0	l/s
Normal demand	1.0	l/s

Pre-development refers to brownfield sites only. Demand rates (Peak & Average) are site specific. Average demand is the total daily volume divided by a 24 hour time period and expressed in litres per second l/s. However, this might not be the normal flow that would arise. Normal demand is the total daily demand during business hours (over say an 8-hour period with very little demand during the other 16 hours).

* PHASED DEPLOYMENT CONNECTION REQUIREMENTS:

PHASE 1: APRIL 17, 2017
PHASE 2: JUNE 17, 2018
PHASE 3: " ", 2019
PHASE 4: " ", 2020
PHASE 5: " ", 2021
PHASE 6: " ", 2022
PHASE 7: " ", 2023
PHASE 8: " ", 2024

20 **Wastewater Hydraulic Load** (include calculations on attached calculation sheet)

Pre-development peak discharge		*l/s*
Pre-development average discharge		*l/s*
Post-development peak discharge		*l/s*
Post-development average discharge		*l/s*

Pre -development refers to brownfield sites only. Demand rates (Peak & Average) are site specific. Average demand is the total daily volume divided by a 24 hour time period and expressed in litres per second l/s.

21 **Organic Load:**

Characteristic	Max concentration	Average concentration
Biochemical Oxygen Demand (BOD), mg/l		
Suspended Solids (SS), mg/l		
Total Nitrogen (N), mg/l		
Total Phosphorus (P), mg/l		
Other, mg/l		

22 **Storm/surface water will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer. In the case of such brownfield sites please indicate if it is proposed that the development intends discharging surface water to the combined wastewater collection system?**

Yes ☐ No ☐

If yes, give reason for discharge and comment on adequacy of SUDS/attenuation measures proposed

_____

_____

_____

23 **What is the reduced level at the property boundary at connection point above Malin Head ordnance datum?**

_____(m)

24 **What is the lowest finished floor level on site above Malin Head ordnance datum?**_____(m)

25 **Is on site water storage being provided?** Yes ☑ No ☐

Please include calculations on attached calculation sheet. Please note on site water storage may not be required. See guidance notes.

26 **Are there fire flow requirements?** Yes ☐ No ☑

Additional Fire Flow requirements over and above those identified in Q19	*l/s*

Please include calculations on attached calculation sheet and confirmation of requirements from the Fire Authority.

27 **Please identify if you propose to supplement your potable water supply from other sources?**

Yes ☐ No ☑

If yes please indicate how you propose to supplement your potable water supply from other sources:

Section D Development details

28 **Please indicate property types:**

Total Number of Properties for this application	Number
Property Type - Domestic	
Property Type - Non Domestic	11 → 8 NO. IT WAREHOUSE (DATA CENTRE)
office	1 NO. SECURITY OFFICE
residential care home	1 NO. ELEC. SUB STATION
Hotel	1 NO. SPRINKLER PUMP HOUSE
Factory	
School	
Institution	
Retail unit	
Commercial unit	
Industrial unit	
Other (please specify)	

29 **Approximate start date of proposed development:** APRIL 2017

30 **Approximate date water connection is required:** JUNE 2017

31 **Approximate date wastewater connection is required:** _____

32 **Is the development multi-phased?** Yes ☑ No ☐

If Yes please provide a master-plan with your application identifying the phases and current phase number.

If Yes please provide details of the variations in the water demand volumes due to the phasing requirements.

Section E Documentation to be submitted

A site location map to a scale of 1:1000, which identifies clearly the land or structure to which the application relates. The map shall include:

a) The **scale** shall be clearly indicated on the map.
b) The **boundaries** shall be delineated in red.
c) Adjacent **street names.**
d) The site **co-ordinates** shall be marked on the site location map.

Please provide the following additional information:

a) Calculations
b) Any other information that might help Irish Water assess this pre connection enquiry application.

Section F Declaration

The details I/we have given with this application are accurate.

I/We have enclosed all the necessary supporting documentation.

Your details

Signature: Eugene Brennan

Date: 21/11/16

Your full name

(In Block Capitals): EUGENE BRENNAN (ADSIL)

Irish Water will carry out a formal assessment based on the information provided in this form. Any future connection offer made by Irish Water will be based on the information provided.

Please submit a scanned copy (in pdf format) of the completed form and supporting information to your Regional New Connections Team for assessment.

Calculations

Water Demand

PEAK DEMAND (ADIABATIC COOLERS)	=	450,000 L/DAY
STORAGE REPLENISHMENT CRITERIA	=	24 HOURS
STORAGE REPLENISHMENT RATE	=	450,000 / 24 HOURS
	=	18,750 L/HR
	=	5.2 L/S
+0.2 L/S FOR OTHER SITE USES	=	5.4 L/S
+10% MARGIN	=	6.0 L/S

Foul Wastewater Discharge

On Site Storage (Water and Wastewater)

ON SITE STORAGE PROVIDED PER PHASE

PHASE	STORAGE (L)	CUMULATIVE STORAGE (L)
1	79,000	79,000
2	53,000	132,000
3	53,000	185,000
4	53,000	238,000
5	53,000	291,000
6	53,000	344,000
7	53,000	397,000
8	53,000	450,000

Fire Flow requirements

FIRE SPRINKER TANK STORAGE = 400,000 L.

FILLED ON BUILDING OCCUPATION, INFREQUENT TOP-OPS THEREAFTER

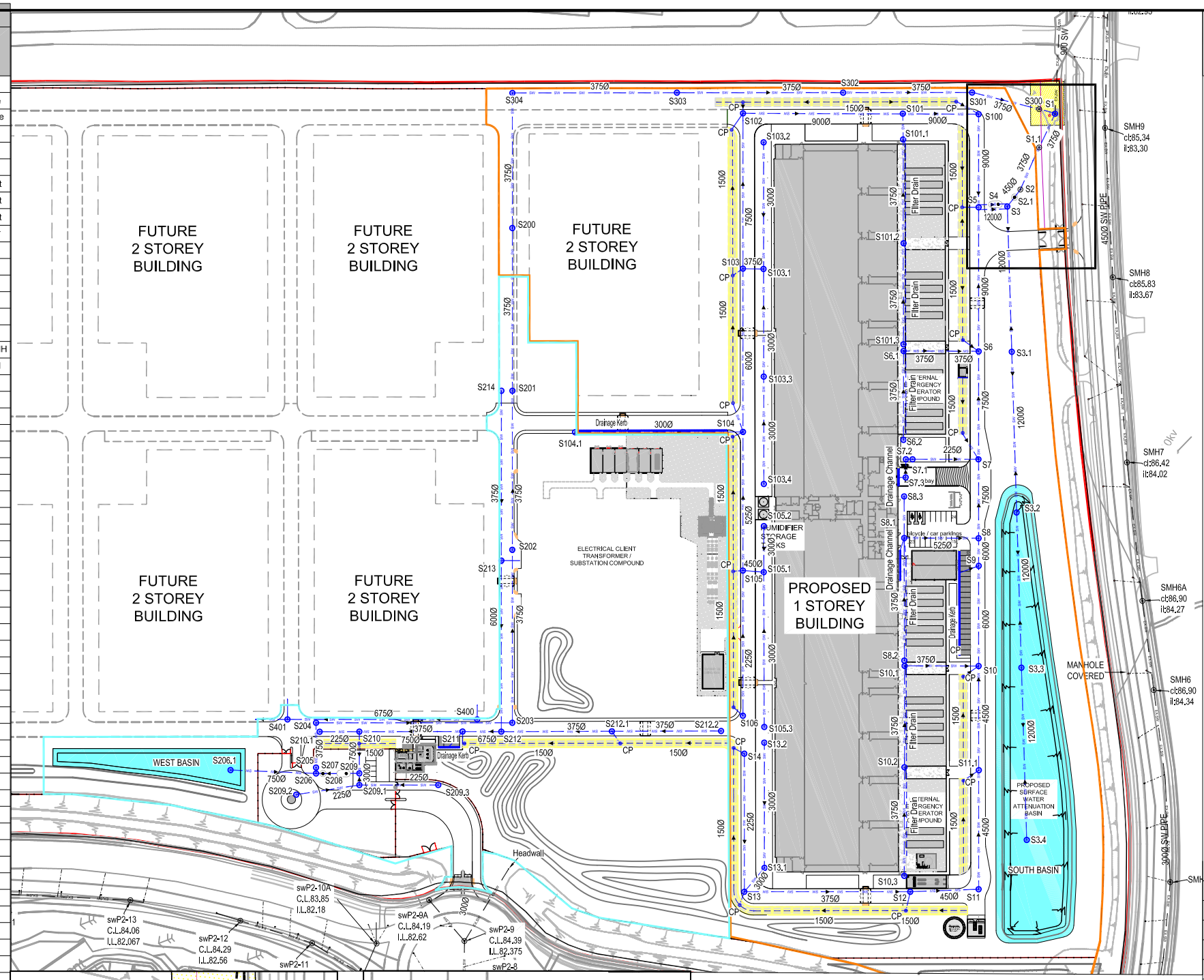
Clifton Scannell Emerson Associates Limited, Civil & Structural Consulting Engineers
Seafort Lodge, Castledawson Avenue, Blackrock, Co. Dublin, Ireland.

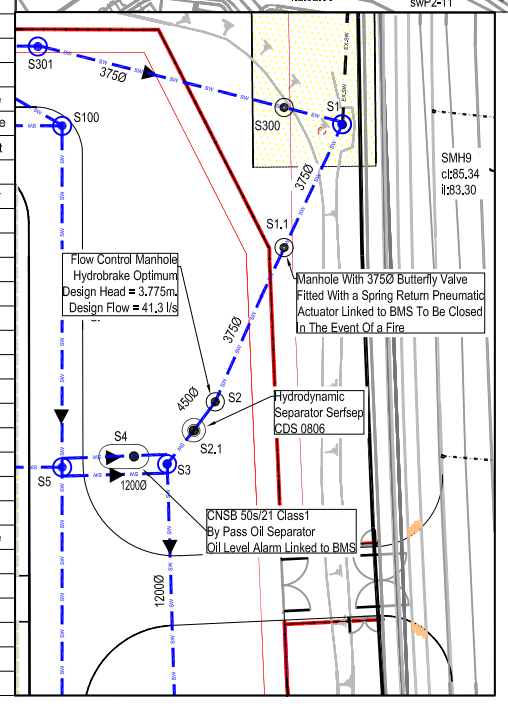
T. +353 1 288 5006 F. +353 1 283 3466 E. info@csea.ie W. www.csea.ie

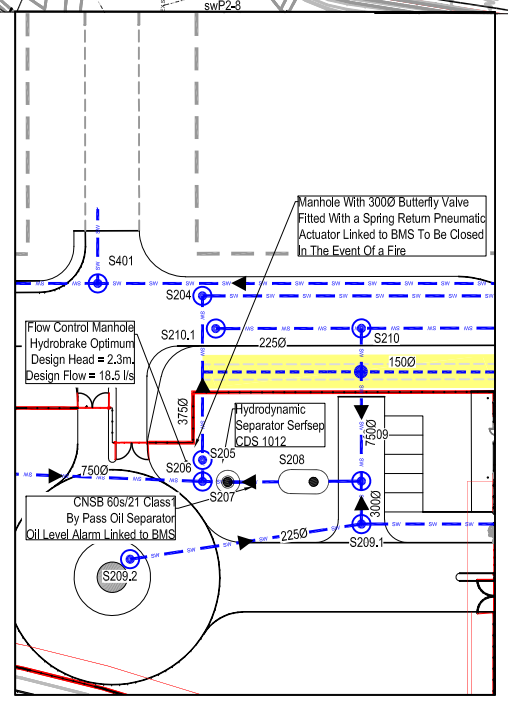
Appendix B – Permitted Site Drawings

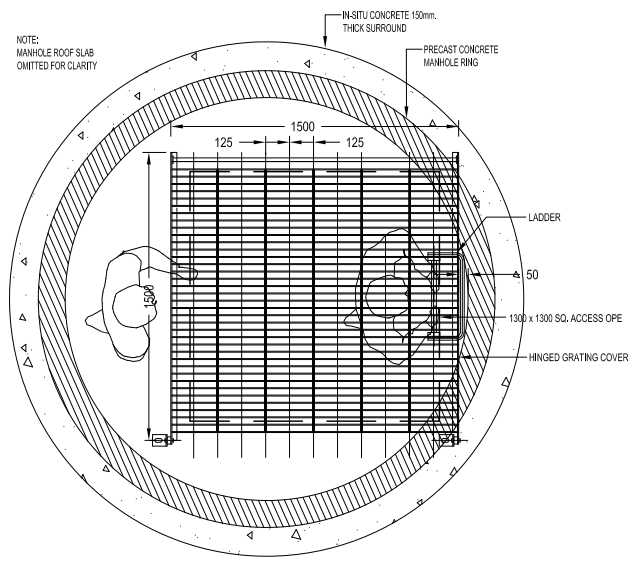
Surface Water Network Schedule

MH No.	Pipe Length D/S (m)	Fall (m)	Slope (1:X)	IL (m)	CL (m)	Pipe DIA (mm)	Manhole Depth to IL (m)	Manhole Type	Manhole Ring Size (mm)	Cover to Pipe	Notes
S1	N/A	N/A	N/A	78.632	85.650	900	7.02	N/A	N/A	4.01	Existing
S1.1	17.71	0.035	500	82.010	86.700	375	4.69	Type K	1350	4.31	Fire Valve
S2	22.00	0.044	500	82.054	86.700	375	4.65	Type K	1350	4.27	Hydrobrake
S2.1	4.61	0.009	500	82.064	86.700	450	4.64	Bespoke	N/A	4.19	Surfsep
S3	5.59	0.011	500	82.075	86.700	450	4.63	Bespoke	N/A	4.18	Bypass
S3.1	69.42	0.139	500	82.214	87.100	1200	4.89	Type K	2100	3.69	
S3.2	76.73	0.153	500	82.367	84.500	1200	2.13	Type J	2100	0.93	Basin Inlet
S3.3	74.16	0.148	500	82.515	84.500	1200	1.98	Type J	2100	0.78	Basin Inlet
S3.4	82.27	0.165	500	82.680	84.500	1200	1.82	Type J	2100	0.62	Basin Inlet
S4	4.32	0.009	500	82.083	86.700	750	4.62	Bespoke	N/A	3.87	Separator
S5	9.370	0.019	504	82.102	86.700	1200	4.60	Bespoke	N/A	3.40	Bypass
S6	68.740	0.138	499	82.547	86.700	900	4.15	Type K	1800	3.25	Backdrop
S6.1	35.880	0.118	304	84.535	86.250	375	1.72	Type J	1350	1.34	
S6.2	42.390	0.140	302	84.675	86.250	375	1.58	Type J	1350	1.20	
S7	51.530	0.103	500	82.800	86.700	750	3.90	Type K	1800	3.15	Backdrop
S7.1	31.520	0.196	161	84.805	86.250	225	1.44	Type J	1200	1.22	
S7.2	3.150	0.020	161	84.825	86.250	225	1.43	Type J	1200	1.20	Decomp. MH
S7.3	8.650	N/A	N/A	83.825	85.100	75	1.28	Bespoke	N/A	1.20	Pump MH
S8	37.310	0.075	499	82.875	86.700	750	3.83	Type K	1800	3.08	Backdrop
S8.1	35.560	0.073	488	84.324	86.250	525	1.93	Type J	2100	1.40	
S8.2	58.500	0.201	291	84.675	86.250	375	1.58	Type J	1350	1.20	
S8.3	19.850	0.422	47	84.750	86.250	300	1.50	Type J	1200	1.20	
S9	13.160	0.026	504	83.051	86.700	600	3.65	Type K	1500	3.05	
S10	47.840	0.096	500	83.146	86.700	600	3.55	Type J	1500	2.95	Backdrop
S10.1	35.380	0.125	284	84.247	86.525	450	2.28	Type J	2100	1.83	
S10.2	48.390	0.171	283	84.418	86.250	450	1.83	Type J	1350	1.38	
S10.3	51.820	0.182	285	84.600	86.250	450	1.65	Type J	1350	1.20	
S11.1	49.730	0.110	451	83.407	86.700	450	3.29	Type J	1350	2.84	
S11	56.840	0.126	451	83.533	86.700	450	3.17	Type J	2100	2.72	
S12	32.690	0.087	374	83.620	85.900	450	2.28	Type J	1350	1.83	
S13	79.260	0.211	375	83.907	86.000	375	2.09	Type J	2100	1.72	Backdrop
S13.1	14.830	0.049	301	84.486	86.100	300	1.61	Type J	1500	1.31	
S13.2	59.840	0.199	300	84.685	86.185	300	1.50	Type J	1200	1.20	
S14	65.870	0.293	225	84.349	85.900	225	1.55	Type J	1200	1.33	
S100	44.450	0.425	105	82.827	86.400	900	3.57	Type J	2400	2.67	
S101	36.250	0.072	505	82.899	86.150	900	3.25	Type J	1800	2.35	Backdrop
S101.1	12.300	0.033	378	84.296	86.250	450	1.95	Type J	1350	1.50	
S101.2	49.620	0.131	379	84.427	86.250	450	1.82	Type J	1350	1.37	
S101.3	48.190	0.173	279	84.600	86.250	450	1.65	Type J	1350	1.20	
S102	76.350	0.153	498	83.052	86.050	900	3.00	Type J	2400	2.10	Backdrop
S103	74.180	0.148	502	83.350	86.100	750	2.75	Type J	1800	2.00	Backdrop
S103.1	9.840	0.038	259	84.398	86.185	375	1.79	Type J	2100	1.41	
S103.2	60.470	0.423	143	84.685	86.185	300	1.50	Type J	1200	1.20	
S103.3	51.340	0.212	242	84.473	86.185	300	1.71	Type J	1200	1.41	
S103.4	51.300	0.212	242	84.685	86.185	300	1.50	Type J	1200	1.20	
S104	77.950	0.156	500	83.656	86.100	600	2.44	Type J	1500	1.84	Backdrop
S104.1	80.220	0.268	300	84.400	85.900	300	1.50	Type J	1200	1.20	
S105	66.140	0.132	500	83.863	85.950	525	2.09	Type J	1500	1.56	Backdrop
S105.1	9.980	0.024	413	84.229	86.185	450	1.96	Type J	2100	1.51	
S105.2	22.000	0.306	72	84.685	86.185	300	1.50	Type J	1200	1.20	
S105.3	73.890	0.306	241	84.685	86.185	300	1.50	Type J	1200	1.20	
S106	69.300	0.308	225	84.472	85.900	225	1.43	Type J	1200	1.20	
S200	64.470	0.172	375	81.664	85.900	375	4.24	Type K	1350	3.86	
S201	77.720	0.207	375	81.871	85.300	375	3.43	Type K	1350	3.05	
S202	75.900	0.202	375	82.073	85.375	375	3.30	Type J	1350	2.93	
S203	82.590	0.220	375	82.293	85.375	375	3.08	Type J	2100	2.71	
S204	93.790	0.250	375	82.544	85.100	375	2.56	Type J	2100	2.18	
S205	21.360	0.057	375	82.601	85.185	375	2.58	Type J	1350	2.21	Fire Valve
S206	2.800	0.007	375	82.608	85.185	375	2.58	Bespoke	2100	2.20	Hydrobrake
S206.1	40.900	0.082	500	82.690	84.485	750	1.80	Type J	1800	1.05	Basin Inlet
S207	3.275	0.007	500	82.615	85.185	750	2.57	Bespoke	1800	1.82	Surfsep
S208	11.180	0.022	500	82.637	85.185	750	2.55	Bespoke	1800	1.80	Separator
S209	6.220	0.012	500	82.649	85.185	750	2.54	Type J	2400	1.79	Backdrop
S209.1	5.590	0.026	211	83.356	85.350	300	1.99	Type J	1800	1.69	
S209.2	30.460	0.181	168	83.840	85.265	225	1.43	Type J	1200	1.20	
S209.3	37.700	0.244	155	83.675	85.100	225	1.43	Type J	1200	1.20	
S210	19.900	0.040	500	82.689	85.170	750	2.48	Type J	2400	1.73	Backdrop
S210.1	18.960	0.113	168	83.675	85.100	225	1.43	Type J	1200	1.20	
S211	49.330	0.099	500	82.788	85.305	750	2.52	Type J	1800	1.77	
S212	18.500	0.037	497	82.900	85.375	675	2.47	Type J	2100	1.80	Backdrop
S212.1	52.840	0.283	186	84.060	85.635	375	1.58	Type J	1350	1.20	
S212.2	52.130	0.265	197	84.325	85.900	375	1.58	Type J	1350	1.20	
S213	81.650	0.163	500	83.138	85.375	600	2.24	Type J	1500	1.64	Backdrop
S213.1	76.305	0.190	402	84.375	86.025	375	1.65	Type J	1350	1.28	
S214	81.050	0.257	315	83.621	85.200	375	1.58	Type J	1350	1.20	
S300	7.850	0.016	500	78.632	86.500	375	7.87	Type L	1350	7.49	Fire Valve
S301	33.04	0.066	500	78.698	86.300	375	7.60	Type L	1500	7.23	
S302	61.56	0.123	500	78.821	86.200	375	7.38	Type L	1350	7.00	
S303	79.43	0.159	500	78.980	86.050	375	7.07	Type L	1350	6.69	
S304	78.62	0.157	500	79.137	85.900	375	6.76	Type L	2100	6.39	Backdrop
S400				82.600	86.050	675	3.45	Type J	2100	2.78	
S401	90.65	0.181	500	82.419	85.900	675	3.48	Type J	2100	2.81	









BASIN INLET HINGED GRATING: ASSEMBLY PLAN

(PLAN DETAIL POSITIONED ON LANDING SLAB)

1:20

This drawing is produced using the :
Irish Transverse Mercator (ITM)

A1

NOTE:

1. STORM SEWER PIPES TO BE ADS HDPE TWINWALL IN ACCORDANCE WITH EN13476, FOR ALL STORMWATER DRAINAGE FOR PIPES < 450mm IN DIAMETER.
2. CONDRON CONCRETE PIPES TO BE SPECIFIED ON PIPE DIAMETERS OF 450mm. AND ABOVE.
3. ALL RWP's ARE 150mm. WELDED HDPE WITH 90° SLOW RADII BENDS SADDLED INTO MAIN SURFACE WATER DRAINAGE.
4. ALL INTERNAL GULLY CONNECTIONS ARE 150mm, WELDED HDPE WITH 90° SLOW RADII BENDS SADDLED INTO MAIN SURFACE WATER DRAINAGE.
5. ALL EXTERNAL GULLY CONNECTIONS ARE 150mm. ADS HDPE TWINWALL IN ACCORDANCE WITH EN13476 SADDLED INTO MAIN SURFACE WATER DRAINAGE.
6. ALL PIPEWORK TO HAVE WARNING TAPE LAID 300mm ABOVE TOP OF PIPE.
7. PROPRIETARY FLOOR GULLIES TO FORM SEALED DRAINAGE CONNECTIONS TO AHU'S. DETAILS TO BE SUBMITTED FOR APPROVAL.
8. FOR ALL MANHOLE DETAILS, PIPELINE DETAILS, BEDDING HAUNCHING & SURROUND DETAILS, MANHOLE COVERS & FRAMES, ROAD GULLIES, TESTING & CLEANING OF DRAINS AND SEWER DIVERSIONS, REFER TO THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS
9. THE DIAMETER OF THE MANHOLE RINGS GIVEN IN THE MANHOLE SCHEDULE ARE TO SUPERCEDE THE DIAMETERS GIVEN IN THE STANDARD MANHOLE DETAILS IN APPENDIX I OF THE THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS
10. ALL PUMPING MANHOLES TO BE SIZED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE PUMP SUPPLIER AND SUBMITTED TO THE ENGINEER FOR APPROVAL. PUMPING MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH DRAWING No. STD-WW-28A FROM THE IRISH WATER WASTEWATER INFRASTRUCTURE STANDARD DETAILS (IW-CDS-5030-01). PUMPING MANHOLES TO BE ACCOMPANIED BY VALVE CHAMBERS AS PER IRISH WATER DETAIL.
11. ALL PUMPS TO BE DESIGNED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL
12. RISING MAINS TO BE SIZED IN ACCORDANCE WITH PUMP MANUFACTURER'S REQUIREMENTS AND SUBMITTED TO THE ENGINEER FOR APPROVAL.

LEGEND:

- Proposed Surface Water Drainage
- Swale Drain with Perforated SW Pipe
- Existing Surface Water Drainage
- Tributary Area for South Basin
- Tributary Area for West Basin
- CP — Catch Pit

Revision	Description	Drw'n	Chk'd	Date
C00	Construction Issue	LT	HF	08/06/2017
T01	As per Revision Clouds	LT	HF	21/04/2017
T00	Tender Issue	LT	HF	22/03/2017
D00	Title block changed	LT	HF	14/03/2017
P00	PLANNING ISSUE	LT	HF	22/02/2017

Clifton Scannell Emerson Associates

Clifton Scannell Emerson Associates Limited
Consulting Engineers,
Seafort Lodge,
Castledawson Avenue,
Blackrock, Co. Dublin,
Ireland.

T: +353 1 288 5006
F: +353 1 283 3466
E: info@csea.ie
W: www.csea.ie

Client: ADSIL

Project: PROJECT 'G'

Dwg. Title: Overall Proposed and Existing Surface Water Drainage Layout

Drawn By: LT | Date: 24/10/2016

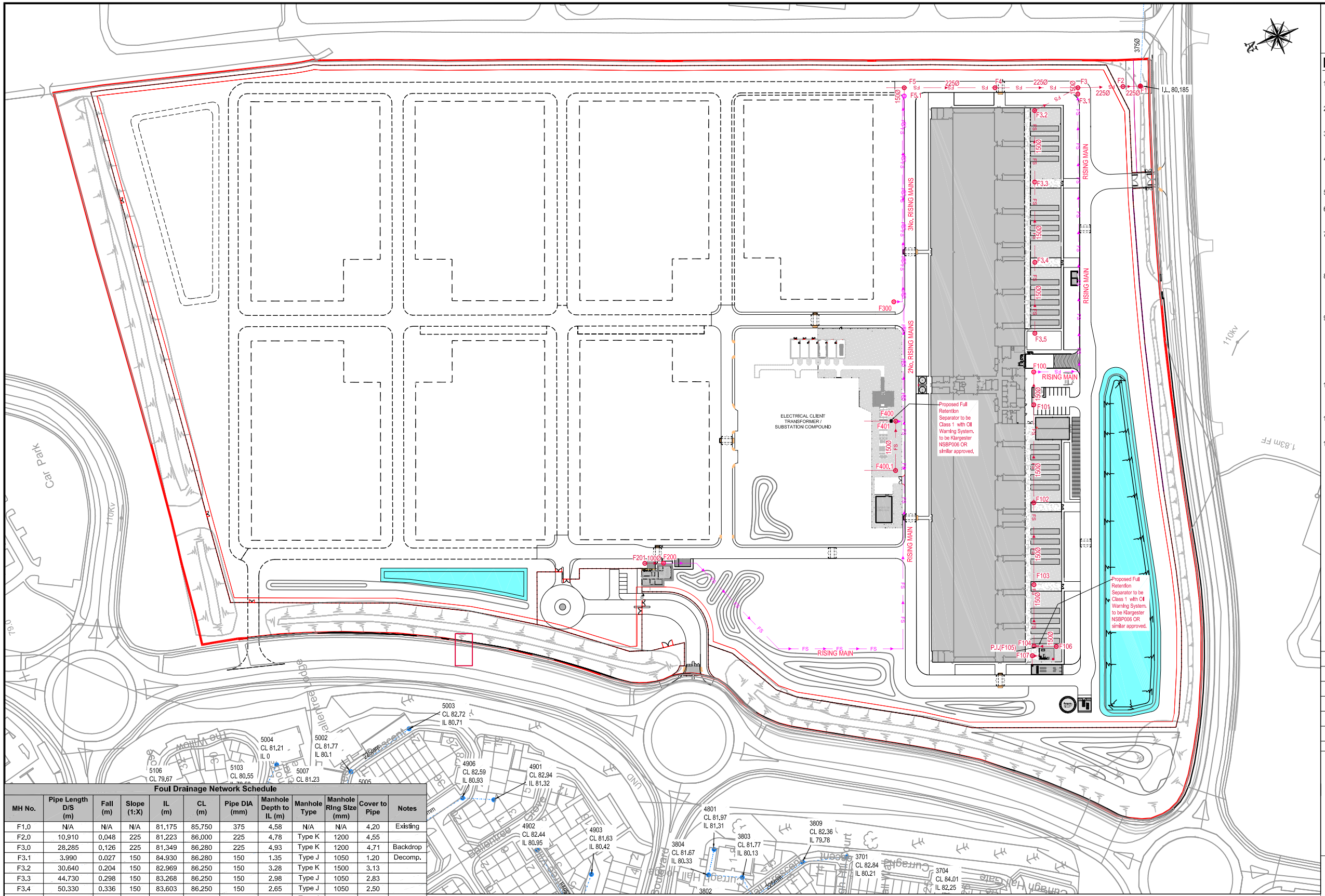
Checked by: HF | Scale: 1-1250 @ A1

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
Proj_G	CSE	00	ZZ	DR	C	4110

A — ISSUED FOR CONSTRUCTION (Status Code — Suitability Description)

C00 — Construction (Revision — Project Status)

16_177 — CSEA Job No.



Foul Drainage Network Schedule

MH No.	Pipe Length D/S (m)	Fall (m)	Slope (1:X)	IL (m)	CL (m)	Pipe DIA (mm)	Manhole Depth to IL (m)	Manhole Type	Manhole Rlng Size (mm)	Cover to Pipe	Notes
F1.0	N/A	N/A	N/A	81.175	85.750	375	4.58	N/A	N/A	4.20	Existing
F2.0	10.910	0.048	225	81.223	86.000	225	4.78	Type K	1200	4.55	
F3.0	28.285	0.126	225	81.349	86.280	225	4.93	Type K	1200	4.71	Backdrop
F3.1	3.990	0.027	150	84.930	86.280	150	1.35	Type J	1050	1.20	Decomp.
F3.2	30.640	0.204	150	82.969	86.250	150	3.28	Type K	1500	3.13	
F3.3	44.730	0.298	150	83.268	86.250	150	2.98	Type J	1050	2.83	
F3.4	50.330	0.336	150	83.603	86.250	150	2.65	Type J	1050	2.50	
F3.5	44.540	0.297	150	83.900	85.250	150	1.35	Type J	1050	1.20	
F4.0	51.920	0.231	225	81.580	86.100	225	4.52	Type K	1200	4.30	
F5.0	56.930	0.380	150	81.959	86.125	225	4.17	Type K	1200	3.94	Backdrop
F5.1	5.250	0.035	150	84.800	86.150	150	1.35	Type J	1050	1.20	Decomp.
F100	202.500	N/A	N/A	83.662	86.250	50	2.59	Bespoke	TBC	2.54	Pump MH
F101	20.580	0.137	150	83.799	86.250	150	2.45	Type J	1050	2.30	
F102	61.380	0.409	150	84.208	86.250	150	2.04	Type J	1050	1.89	
F103	51.350	0.342	150	84.550	86.250	150	1.70	Type J	1050	1.55	
F104	38.450	0.256	150	84.807	86.250	150	1.44	Type J	1050	1.29	
F105	3.500	0.023	150	84.830	86.250	150	1.42	Bespoke	1800	1.27	Interceptor
F106	10.500	0.070	150	84.900	86.250	150	1.35	Type J	1050	1.20	
F107	2.420	0.016	150	84.750	86.250	300	1.50	Type J	1800	1.20	
F200	519.390	N/A	N/A	84.005	85.500	50	1.50	Bespoke	TBC	1.45	Pump MH
F201	11.720	0.195	60	84.200	85.500	100	1.30	Type J	1050	1.20	
F300	134.530	N/A	N/A	84.025	86.275	50	2.25	TBC	TBC	2.20	Pump MH
F400	209.490	N/A	N/A	83.431	85.995	50	2.56	TBC	TBC	2.51	Pump MH
F400.1	30.880	0.206	150	84.120	85.850	150	1.73	Type J	1800	1.58	
F400.2	72.050	0.480	150	84.600	85.950	150	1.35	Type J	1050	1.20	
F401	2.870	0.019	150	83.450	85.995	150	2.54	Bespoke	TBC	2.39	Interceptor
F402	90.000	0.600	150	84.050	85.400	150	1.35	Type J	1050	1.20	

This drawing is produced using the :
Irish Transverse Mercator (ITM)

A1

NOTE:

1. STORM SEWER PIPES TO BE ADS HDPE TWINWALL IN ACCORDANCE WITH EN13476. FOR ALL STORMWATER DRAINAGE FOR PIPES < 450mm IN DIAMETER.
2. CONDRON CONCRETE PIPES TO BE SPECIFIED ON PIPE DIAMETERS OF 450mm. AND ABOVE.
3. ALL INTERNAL CONNECTIONS ARE 100mm ADS HDPE TWINWALL IN ACCORDANCE WITH EN13476, MINIMUM FALLS ARE TO BE 1:60.
4. ALL EXTERNAL GULLY CONNECTIONS ARE 100mm ADS HDPE TWINWALL IN ACCORDANCE WITH EN13476 SADDLED INTO MAIN FOUL WATER DRAINAGE. MINIMUM FALLS ARE TO BE 1:60.
5. ALL PIPEWORK TO HAVE WARNING TAPE LAID 300mm ABOVE TOP OF PIPE.
6. PROPRIETARY FLOOR GULLIES TO FORM SEALED DRAINAGE CONNECTIONS TO AHU'S, DETAILS TO BE SUBMITTED FOR APPROVAL.
7. FOR ALL MANHOLE DETAILS, PIPELINE DETAILS, BEDDING HAUNCHING & SURROUND DETAILS, MANHOLE COVERS & FRAMES, ROAD GULLIES, TESTING & CLEANING OF DRAINS AND SEWER DIVERSIONS, REFER TO THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS
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10. ALL RISING MAIN DECOMPRESSION MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH DRAWING No. STD-WW-29 FROM THE IRISH WATER WASTEWATER INFRASTRUCTURE STANDARD DETAILS (IW-CDS-5030-01).
11. ALL PUMPS TO BE DESIGNED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL
12. RISING MAINS TO BE SIZED IN ACCORDANCE WITH PUMP MANUFACTURER'S REQUIREMENTS AND SUBMITTED TO THE ENGINEER FOR APPROVAL.

NOTE:
THE CONTRACTOR IS RESPONSIBLE FOR CO-ORDINATION OF ALL THE EXISTING & PROPOSED SERVICES.

THE CONTRACTOR MUST INCLUDE FOR THE CO-ORDINATION & RISK ASSOCIATED, WITHIN THE CONTRACT SUM.

LEGEND:

- Proposed Foul Water Drainage
- Proposed Foul Rising Main
- Existing Foul Water Drainage
- Planning Boundary - Red

Revision	Description	Drw'n	Chk'd	Date
C00	Construction Issue	LT	HF	09/06/2017
T01	Changes by Revision Clouds	LT	HF	19/04/2017
T00	TENDER ISSUE	LT	HF	23/03/2017
D00	TITLE BLOCK UPDATED	LT	HF	14/03/2017
P00	PLANNING ISSUE	LT	HF	22/02/2017
A00	ISSUE FOR APPROVAL	LT	HF	17/01/2017

Clifton Scannell Emerson Associates

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E: info@csea.ie
W: www.csea.ie

Client: ADSIL

Project: PROJECT 'G'

Dwg. Title: Overall Proposed and Existing Foul Drainage Layout

Drawn By: LT | Date: 24/10/2016

Checked by: HF | Scale: 1-1250 @ A1

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
Proj_G	CSE	00	ZZ	DR	C	4210

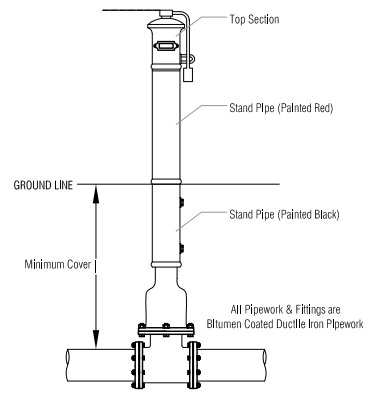
A — Status Code — ISSUED FOR CONSTRUCTION — Suitability Description

C00 — Revision — Construction — Project Status

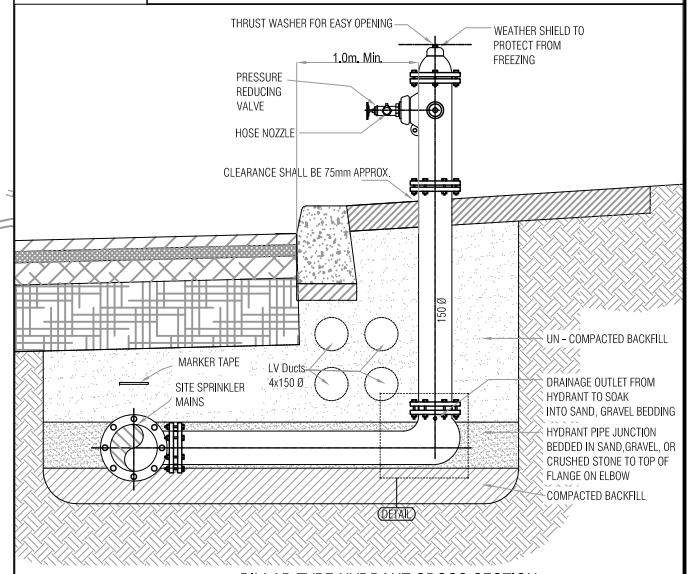
16_177 — CSEA Job No.

This drawing is produced using the :
Irish Transverse Mercator (ITM)

A1



POST INDICATOR VALVE CROSS SECTION
Scale NTS



PILLAR TYPE HYDRANT CROSS SECTION
Scale NTS

Revision	Description	Drw'n	Chk'd	Date
C00	Construction Issue	LT	HF	09/06/2017
T01	As per Revision Cloudes	LT	HF	19/04/2017
T00	Tender Issue	LT	HF	22/03/2017
D00	TITLE BLOCK UPDATED	LT	HF	14/03/2017
P00	PLANNING ISSUE	LT	HF	22/02/2017
A00	ISSUE FOR APPROVAL	LT	HF	17/01/2017

Clifton Scannell Emerson Associates

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W. www.csea.ie

ADSIL

Client

PROJECT 'G'

Project

Overall Proposed and Existing Watermain Drainage Layout

Dwg. Title

Drawn By LT — Date 24/10/2016

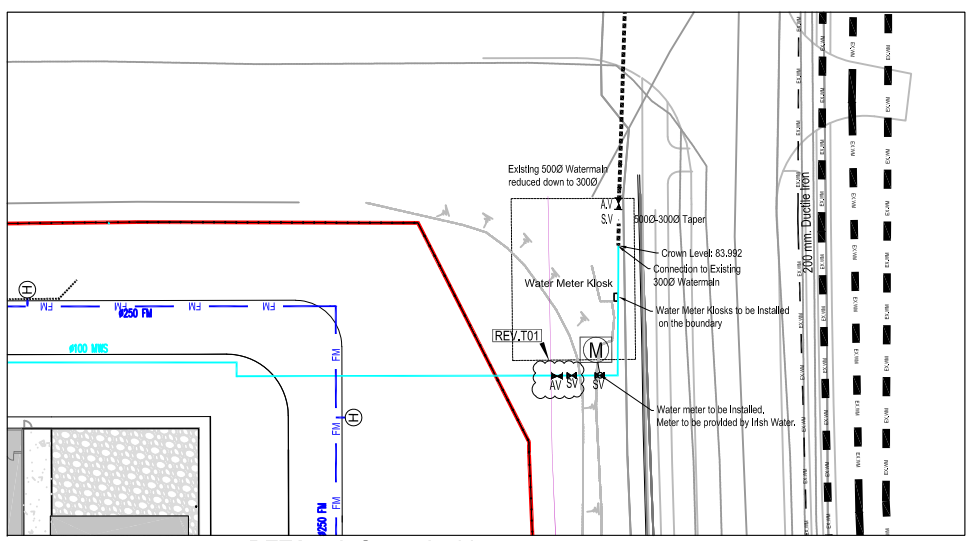
Checked by HF — Scale 1-1250 @ A1

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
Proj_G	CSE	00	ZZ	DR	C	4310

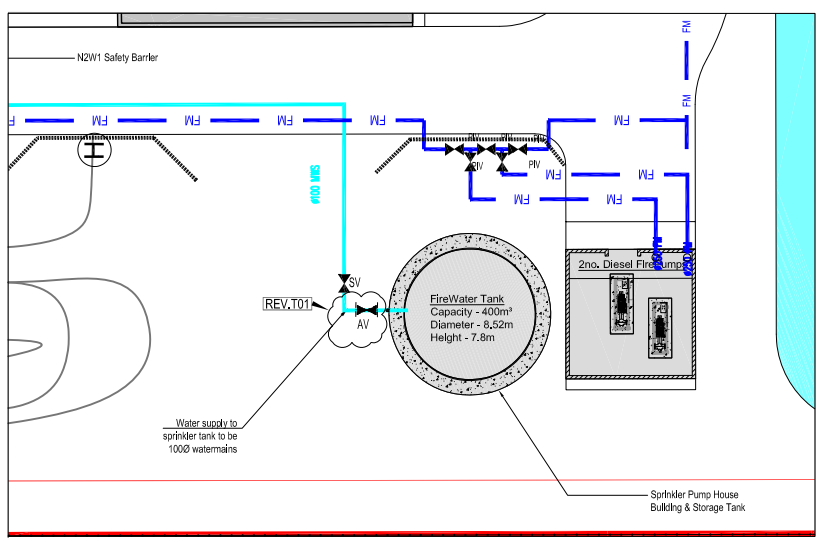
Status Code	Suitability Description	Job No.
A	ISSUED FOR CONSTRUCTION	16_177
Revision	Project Status	CSEA Job No.
C00	Construction	

DETAIL 1.

DETAIL 2.



DETAIL 1. Scale 1:500



DETAIL 2. Scale 1:250

NOTE:

1. Firemain pipes below ground to be Bitumen coated cement lined ductile iron to BS EN 545.

2. Above ground pipework to be non alloy steel tubes suitable for welding or threading. Painted Red RAL 3000. Work to EN 10255:2004.

3. All watermains shall be laid in accordance with Irish Water Specification for the laying of Distribution watermains and of Irish Water requirements.

4. All watermains shall comply with PAS 27:1999

5. Concrete thrust blocks to be installed at all bends, tees and cap end locations, As per Drawing No. STD-W-28 from the Irish Water water infrastructure standard details (IW-CDS-5020-01).

6. All New Watermains Supplies to be HDPE Pipelines.

7. All pipework to have warning tape laid 300mm above top of pipe.

8. Drawing to be read in conjunction with M&E layouts. Any discrepancies to be notified to C.S.E.A for clarification prior to proceeding with works.

9. Sluice valves manholes to be constructed in accordance with Drawing No. STD-W-15 from the Irish Water water infrastructure standard details (IW-CDS-5020-01).

LEGEND:

- Existing Watermain
- Proposed Firemain
- Proposed Watermain Supply
- Proposed Sluice Valve
- Proposed Water meter
- Proposed Air Valve
- Proposed Scour Valve
- Proposed Kiosk for Water Meter
- Proposed Hydrant
- Post Indicator Valve for Firemain
- Planning Boundary - Red

NOTE:

The GC to ensure that all PIV and HydranTs are with areas which will not impact of pedestrian routes or vehicular routes and min of 1m clearance from the kerbline will also need to be acheived for all PIVs and Hydrants.

Appendix C – Irish Water CoF and PCE

Eugene Brennan
Amazon Data Services Ireland Ltd.
Burlington Plaza
Burlington Road
Dublin 4

Letter Ref: CDSCOF1

Uisce Eireann
Bosca OP 860
Oifig Sheachadta
na Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 860
South City
Delivery Office
Cork City

www.water.ie

14th February 2017

Dear Sir/Madam,

Re: CUST16622 11 No. Data Centres at Cruiserath Road, Dublin 15 pre-connection enquiry – Subject to contract | Contract denied.

Irish Water has reviewed your pre-connection enquiry in relation to water and wastewater connections at Cruiserath Road, Dublin 15 (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on the capacity currently available 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 can be facilitated.

Wastewater:
If the wasterwater connection is to be via a private pumping station, the pumping station should have 24 hour storage capacity.

Water:
PRV to be included on the water connection.

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 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 Energy Regulation.

If you have any further questions, please contact us on **1850 278 278** or **+353 1 707 2828, 8.00am-4.30pm, Mon-Fri** or email **newconnections@water.ie**. For further information, visit **www.water.ie/connections**

Yours sincerely,

Maria O'Dwyer
Connections and Developer Services

Pre-connection enquiry form

Large industrial & commercial, mixed use developments, housing developments, non domestic developments

This form is to be filled out by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure. Please complete this form in BLOCK letters using a black ink ballpoint pen.

Section A Applicant details

1 Applicant details:

Contact name: EUGENE BRENNAN

Company name (if relevant): AMAZON DATA SERVICES IRELAND LTD.

Postal address: BURLINGTON PLAZA

BURLINGTON ROAD

DUBLIN 4

Telephone: 087 950 1932 Email: EUGBREN@AMAZON.COM

2 **Correspondence address (if different from applicants above):**

Contact name: N/A

Company name (if relevant):

Postal address:

Telephone: Email:

3 **Engineering Consultant**

Contact name: PETER FAGAN / HUBERT FENERAN

Company name (if relevant): CLIFTON SCANNELL EMERSON ASSOCIATES

Postal address: SEAFORT LODGE,
CASTLEDAWSON AVENUE,
BLACKROCK, CO. DUBLIN

Telephone: 01 2885006 Email: PETER.FAGAN@CSEA.IE
HUBERT.FENERAN@CSEA.IE

Section B Site details

4 **Site address:** ADSIL,
CROISERATH ROAD,
DUBLIN 15

5 **Name of Local Authority:** FINGAL CO. CO.

6 **Has full planning permission been granted?** Yes ☐ No ☑

If 'Yes' please indicate the Planning reference number:

7 **Irish National Grid co-ordinates:** Eastings 707441 Northings 741593

8 **Previous use of site (if applicable):** FARMLAND

9 **Date previous development was last occupied (if applicable):**

10 **Are there poor ground condition issues?** Yes ☐ No ☑

If Yes please include site investigation report and a detailed site specific report on the approach being taken to deal with ground conditions specifically with regard to pipe support and trenching.

11 **Are there potential contaminated land issues?** Yes ☐ No ☑

If Yes please include a detailed site specific report on the approach being taken to deal with contaminated land and the measures to mitigate impact on the infrastructure.

12 **Is the development in accordance with the local area/development plan?** Yes ☑ No ☐

Section C Service details

13 **Request for connection** Water ☐ Wastewater ☐ Both ☑

14 **Is this application for an additional water connection to the one already installed?** Yes ☐ No ☑

15 **Is this application for an additional wastewater connection to the one already installed?** Yes ☐ No ☑

16 **Please provide WPRN No. (If there is an existing connection):** /

17 **Do you require an upgrade/increase in size to an existing water connection?** Yes ☐ No ☑

18 **Do you require an upgrade/increase in size to an existing wastewater connection?** Yes ☐ No ☑

19 **Please indicate water demand** (include calculations on attached calculation sheet)

Pre-development peak water demand	/	l/s
Pre-development average water demand	/	l/s
Post-development peak water demand	6.0	l/s *
Post-development average water demand	1.0	l/s
Normal demand	1.0	l/s

Pre-development refers to brownfield sites only. Demand rates (Peak & Average) are site specific. Average demand is the total daily volume divided by a 24 hour time period and expressed in litres per second l/s. However, this might not be the normal flow that would arise. Normal demand is the total daily demand during business hours (over say an 8-hour period with very little demand during the other 16 hours).

* PHASED DEPLOYMENT CONNECTION REQUIREMENTS:

PHASE 1: APRIL 17, 2017
PHASE 2: JUNE 17, 2018
PHASE 3: " ", 2019
PHASE 4: " ", 2020
PHASE 5: " ", 2021
PHASE 6: " ", 2022
PHASE 7: " ", 2023
PHASE 8: " ", 2024

20 **Wastewater Hydraulic Load** (include calculations on attached calculation sheet)

Pre-development peak discharge	/	*l/s*
Pre-development average discharge	/	*l/s*
Post-development peak discharge	0.07	*l/s*
Post-development average discharge	/	*l/s*

Pre -development refers to brownfield sites only. Demand rates (Peak & Average) are site specific. Average demand is the total daily volume divided by a 24 hour time period and expressed in litres per second l/s.

21 **Organic Load:**

Characteristic	Max concentration	Average concentration
Biochemical Oxygen Demand (BOD), mg/l		
Suspended Solids (SS), mg/l		
Total Nitrogen (N), mg/l		
Total Phosphorus (P), mg/l		
Other, mg/l		

22 **Storm/surface water will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer. In the case of such brownfield sites please indicate if it is proposed that the development intends discharging surface water to the combined wastewater collection system?**

Yes ☐ No ☐

If yes, give reason for discharge and comment on adequacy of SUDS/attenuation measures proposed

N/A

23 **What is the reduced level at the property boundary at connection point above Malin Head ordnance datum?**

_____(m)

24 **What is the lowest finished floor level on site above Malin Head ordnance datum?**_____(m)

25 **Is on site water storage being provided?** Yes ☑ No ☐

Please include calculations on attached calculation sheet. Please note on site water storage may not be required. See guidance notes.

26 **Are there fire flow requirements?** Yes ☐ No ☑

Additional Fire Flow requirements over and above those identified in Q19	*l/s*

Please include calculations on attached calculation sheet and confirmation of requirements from the Fire Authority.

27 **Please identify if you propose to supplement your potable water supply from other sources?**

Yes ☐ No ☑

If yes please indicate how you propose to supplement your potable water supply from other sources:

Section D Development details

28 **Please indicate property types:**

Total Number of Properties for this application	Number
Property Type - Domestic	
Property Type - Non Domestic	11 → 8 NO. IT WAREHOUSE (DATA CENTRE)
office	1 NO. SECURITY OFFICE
residential care home	1 NO. ELEC. SUB STATION
Hotel	1 NO. SPRINKLER PUMP HOUSE
Factory	
School	
Institution	
Retail unit	
Commercial unit	
Industrial unit	
Other (please specify)	

29 **Approximate start date of proposed development:** APRIL 2017

30 **Approximate date water connection is required:** JUNE 2017

31 **Approximate date wastewater connection is required:** _____

32 **Is the development multi-phased?** Yes ☑ No ☐

If Yes please provide a master-plan with your application identifying the phases and current phase number.

If Yes please provide details of the variations in the water demand volumes due to the phasing requirements.

Section E Documentation to be submitted

A site location map to a scale of 1:1000, which identifies clearly the land or structure to which the application relates. The map shall include:

a) The **scale** shall be clearly indicated on the map.
b) The **boundaries** shall be delineated in red.
c) Adjacent **street names.**
d) The site **co-ordinates** shall be marked on the site location map.

Please provide the following additional information:

a) Calculations
b) Any other information that might help Irish Water assess this pre connection enquiry application.

Section F Declaration

The details I/we have given with this application are accurate.

I/We have enclosed all the necessary supporting documentation.

Your details

Signature: Eugene Brennan

Date: 21/11/16

Your full name

(In Block Capitals): EUGENE BRENNAN (ADSIL)

Irish Water will carry out a formal assessment based on the information provided in this form. Any future connection offer made by Irish Water will be based on the information provided.

Please submit a scanned copy (in pdf format) of the completed form and supporting information to your Regional New Connections Team for assessment.

Calculations

Water Demand

PEAK DEMAND (ADIABATIC COOLERS) = 450,000 L/DAY

STORAGE REPLENISHMENT CRITERIA = 24 HOURS

STORAGE REPLENISHMENT RATE = 450,000 / 24 HOURS

= 18,750 L/HR

= 5.2 L/...

+0.2 L/s FOR OTHER SITE USES = 5.4 L/s

+10% MARGIN = 6.0 L/s

Foul Wastewater Discharge

THE ESTIMATED DAILY DISCHARGE FOR THE DEVELOPMENT HAS BEEN CALCULATED IN ACCORDANCE WITH TABLE 3 OF THE EPA'S "WASTEWATER TREATMENT MANUALS: TREATMENT SYSTEMS FOR SMALL COMMUNITIES, BUSINESS, LEISURE CENTRES AND HOTELS" AS PER SECTION 5.2.3. OF VOLUME 2 OF THE GDSDS. ASSUMING A MAXIMUM DAILY OCCUPANCY OF 18 NO. STAFF AND 8 NO. SECURITY AND A PER CAPITA WASTEWATER FLOW OF 30L/DAY FOR INDUSTRIAL DEVELOPMENTS WITHOUT CANTEEN FACILITIES, THE DAILY DRY WEATHER FLOW (DWF) ASSOCIATED WITH THE FIRST PHASE OF THE DEVELOPMENT IS 780 L/DAY. THE ESTIMATED DWF FLOW FOR THE COMPLETED FUTURE DEVELOPMENT IS 6,240 L/DAY

On Site Storage (Water and Wastewater)

ON SITE STORAGE PROVIDED PER PHASE

PHASE	STORAGE (L)	CUMULATIVE STORAGE (L)
1	79,000	79,000
2	53,000	132,000
3	53,000	185,000
4	53,000	238,000
5	53,000	291,000
6	53,000	344,000
7	53,000	397,000
8	53,000	450,000

Fire Flow requirements

FIRE SPRINKLER TANK STORAGE = 400,000 L.

FILLED ON BUILDING OCCUPATION, INFREQUENT TOP-UPS THEREAFTER

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