Clifton Scannell Emerson Associates

Engineering Planning Report - Drainage & Water Services

ESSDUB98 KISHOGE 110 KV SUBSTATION

Client: EdgeConneX Ireland Limited

Date: 04th November 2021

Job Number: 21_100

CONSULTING ENGINEERS

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

Clifton Scannell Emerson Associates

Clifton Scannell Emerson Associates Limited
Consulting Engineers. Mentec House. Bakers Point. Dun Laoghaire. Co

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1 Introduction

1.1 Overview

The following report is being submitted as part of the Application for the proposed development that comprises amendment to a permitted 110kV Gas Insulated Switchgear Substation (GIS), 4 No. Transformers, Client Control Building, associated compounds, and site infrastructure to be located on Ballymakaily Lands to the West of the Newcastle Road (R120), Lucan, Co. Dublin.

The GIS compound is located on a landholding that extends to circa 54.59 acres (22.1 ha) and is currently greenfield site.

On the south side of the site under REG.REF. SD19A/0042 and ABP REF.: 305958-19 there has already been permitted data centre development that consists of 4 no. single storey data halls; 32 no. standby generators with associated flues; associated office and service areas; service road infrastructure and car parking; ESB sub-station / transformer yard with an overall gross floor area of 17,685sqm; as well as a temporary gas-powered generation plant within a walled yard containing 19 no. generator units with associated flues to be located to the west of the proposed data halls.

The new proposed GIS compound area extends to c. 1.12 ha and represents a revised layout of previously permitted GIS compound at the same location.

This report has been prepared to outline the existing, previously permitted, and proposed drainage, and water main infrastructure, in order to support the proposed development application.

1.2 Exisiting land use

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

1.3 Permitted and previously proposed development on landholding

The GIS substation site is located on Ballymakaily Lands to the West of the Newcastle Road (R120), Lucan, Co. Dublin.

The lands in question have been subject to two planning applications which are outlined below;

- The proposal comprises amendments to the Substation permitted under South Dublin County Council REG.REF. SD19A/0042 and An Bord Pleanála ABP REF.: 305958-19 which consists of 4 no. single storey data halls all with associated plant at roof level: 32 no. standby generators with associated flues (each 15m high); associated office and service areas; service road infrastructure and car parking; as well as ESB sub-station / transformer yard with an overall gross floor area of 17,685sqm. The development will also include a temporary gas-powered generation plant within a walled yard containing 19 no. generator units with associated flues (each 17m high) to be located to the west of the proposed data halls.
- Development under consideration under REG.REF. SD21A/0042 which consists of the construction of 2 no. single storey data centres with associated office and service areas; and 3 no. gas powered generation plant buildings with an overall gross floor area of 24,624sqm

1.4 Permitted infrastructure on landholding

The infrastructure permitted under South Dublin County Council REG.REF. SD19A/0042 and An Bord Pleanála ABP REF.: 305958-19 includes connections to external Irish Water water supply main and foul sewer. South Dublin County Council surface water drainage network, all located in the R120 (Newcastle Road), adjacent to the subject site.

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

The Engineering Planning Report (Document No. P181103, Jan 2019, by Pinnacle consulting engineers) submitted in support of this planning application is included in Appendix A of this report.

2 Surface water drainage

2.1 General

Storm water from the proposed development has been designed in accordance with Greater Dublin Strategic Drainage Study (GDSDS).

The following section outlines the surface water drainage proposals for the development.

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

2.2 Existing surface water drainage network

South Dublin County Council record drawings have identified a Ø 900mm drainage pipe road crossing within R120 (Newcastle Road), adjacent to the subject site. This pipe is then connected into a 900mm Ø pipe located along a section of road on the opposite side to the subject site.
This gravity sewer then runs in a northerly direction, prior to connecting into a ditch/stream network, which discharges through 3 No. aqueducts / culverts of varying sizes, and which are located beneath the Grand Canal to the east. This outfall is then drained via a tributary into the Griffeen River.
The aforementioned sewer / culvert. has been identified as having capacity to accommodate the proposed discharge from the subject site.

2.3 Proposed surface water drainage network

2.3.1 Overview

Storm water from the roof areas of the proposed amended building units. will be directed via rainwater pipes into an on-site pipe network system. The outflow from this system will be connected into the surface water drainage network collecting run-off from the roads and other hard standing areas in a sealed system of pipes and gullies and will be ultimately discharged into previously permitted data centre network (South Dublin County Council REG.REF. SD19A/0042) to the manhole SWMH18 south of the GIS substation.

The extent of catchment area of permitted data centre development is marked in blue, catchment of permitted substation hatched in grey, and the catchment of proposed development site is marked in red Figure 2.1 below

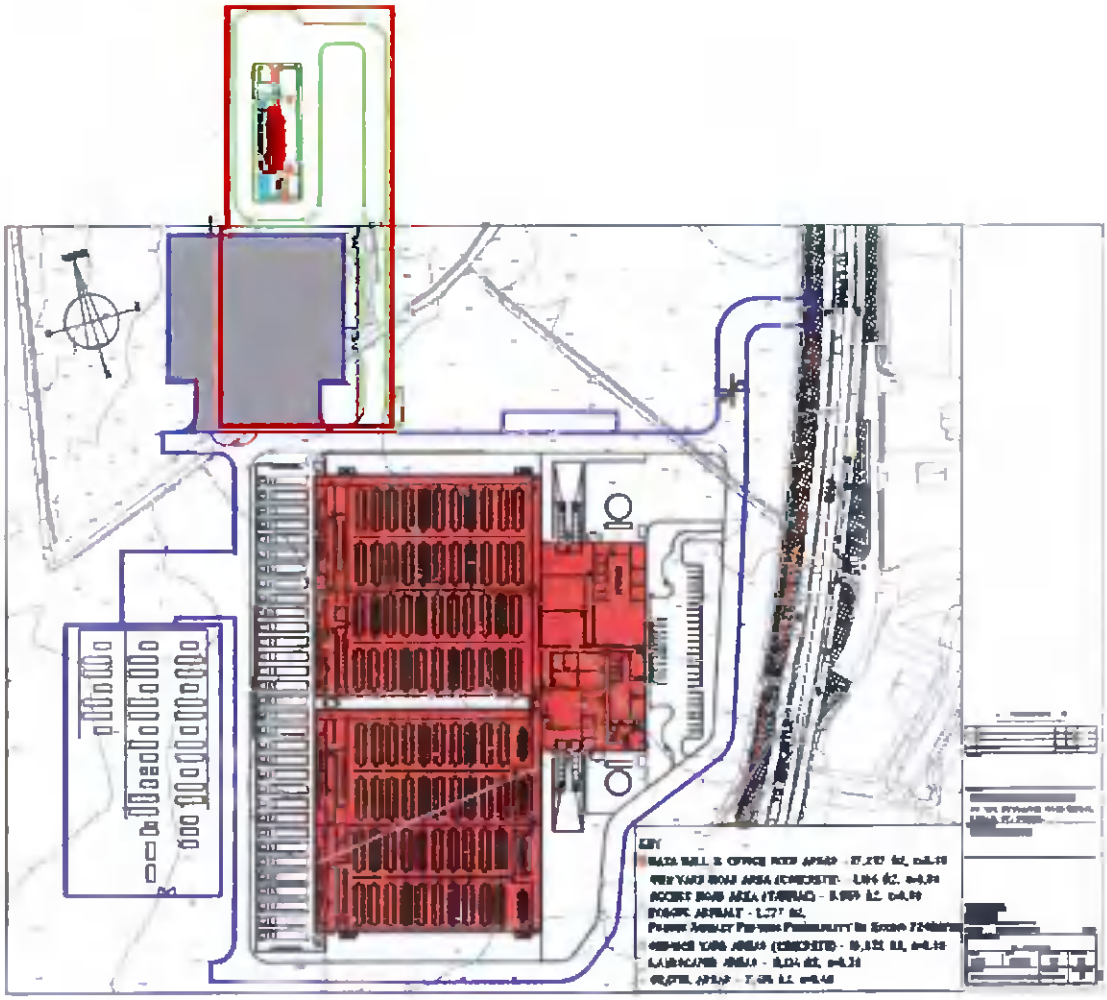


Fig 2.1 – Catchment are of permitted and proposed

The storm water drainage within the permitted development has been designed to accommodate a 1:2 year storm frequency. Catchment of the permitted data centre development is served by a stormwater storage pond / wetland area which has capacity to store the 1:100 year storm event + 10% climate change.
As a result of the proposed development there will be additional hard-standing areas draining to the permitted drainage network and thus increasing the total attenuating volume and discharge rate from the site.

2.3.2 Surface Water Network Design

The pipe network is designed in accordance with the requirement of Table 6.4 of the Greater Dublin Strategic Drainage Study (GDSDS) – See Fig 2.2 below.

Parameter	Surface Water Sewers
Minimum depth	1.2m cover under highways 0.9m elsewhere
Maximum depth	Normally 5m
Minimum sewer size	225mm
Runoff factors for pipe sizing	100% paved and roof surfaces 0% off pervious surfaces
Rainfall for initial pipe sizing	50mm/hr rainfall intensity
Minimum velocity (pipe full)	1.0m/s
Flooding	Checks made for adequate protection * No flooding for return period less than 30 years except where explicitly planned Simulation modelling is required for sites greater than 24ha**
Roughness – ks	0.6mm

Fig 2.2 – GDSDS Pipe Design Criteria

Manholes shall be provided at junctions in the network, at changes of direction and gradient and at no more than 90m centres.

The surface water pipe network has been modelled using Microdrainage Innovyze software.

Total calculated volume of the pond for permitted site for 1:100 year storm event is 2.582m3. with TOW= 63.575m.
The outflow from the permitted development, will be restricted by way of a Hydrobrake, which is to limit the discharge to 11/s, which is the calculated QBAR greenfield run-off rate for the permitted development.
The calculation of allowable discharge rate and required storage volumes associated with the permitted data centre development are addressed in detail in Section 3.2 & Appendix B of Engineering report Document No. P181103, Jan 2019, by Pinnacle consulting engineers and are included in Appendix A of this report.
The total required calculated volume of the attenuation including the proposed and permitted drainage network for 1:100 year storm event + 10% climate change is 2,818m3 with TOW=63.685m. Total available volume of the pond is 3.572m3 with TOP=64.000m

Outflow from both sites will be restricted with a Hydrobrake at a flow rate of 12.5 l/s, which represents the increased QBAR greenfield run-off rate -refer to Appendix C of this report for Surface Water Calculations.

Table 2.3 overleaf summarises the storage volumes associated with the permitted data centre development and substation (Scenario 1) and the permitted data centre and proposed substation development combined (Scenario 2).

Scenario	Wet Pond Invert Level (m OD)	Outlet Invert Level (m OD)	Ground Level (m OD)	Critical Storm Duration (mins)	High Water Level in 100 year event (m OD)	Attenuation Storage Volume (m^3)
Scenario 1 – Permitted data centre Development	62.075	61.910	64.000	2160	63.575	2,582
Scenario 2 – Permitted data centre and proposed substation and grid connection development combined	62.075	61.910	64.000	2160	63.685	2,818

Table 2.3 –Attenuation Volume Summary

As can be seen in Table 2.3 above Scenario 2 results in an increase in the volume of attenuation storage of 236m^3 and in an increase in the high water level in a 1 in 100 year storm event of 0.110m. Attenuation storage has adequate capacity to accommodate the proposed development as the pond will have 0.315m freeboard during the 1 in 100 year storm event during Scenario 2.

In summary the permitted attenuation pond has adequate storage capacity to accommodate flows from the proposed substation and grid connection development with an increase in discharge to 12.5 l/s into the existing pipe network located in R120 (Newcastle road), which corresponds with the QBAR greenfield run-off rate for entire catchment.

The permitted Surface Water Drainage Network is indicated on Drawing No. P181103-PIN-ZZ-ZZ-DR-C-200-S0-P01 and is included in Appendix B of this report.

3 Foul Water Drainage

3.1 Existing Infrastructure

South Dublin County Council record drawings have identified 2 No. 450mm Ø spur connections, located along the eastern boundary of the property, within the R120 (Newcastle Road), adjacent to the subject site. These spur connections were left out to facilitate development of these lands and for the lands further west, known as Grange Castle West. This 450mm Ø sewer then connects into the existing Grange Castle Business Park pumping station, as laid under Reg. Ref. SD16A/0214. The effluent from this pumping station is then pumped via 3 No. rising mains, i.e. 100mm Ø, 200mm Ø & 450mm Ø, into the local infrastructural network.
The existing foul sewer reticulation network has adequate capacity to cater for the proposed effluent discharge from the subject site and there are no known issues noted with the sewer reticulation network.

3.2 Proposed Foul Water Drainage Network

The proposed amended substation development will connect to a foul water manhole FWMH4 permitted under South Dublin County Council REG.REF. SD19A/0042 and An Bord Pleanála ABP REF.: 305958-19.
From this manhole wastewater flows by 225mmø gravity pipe network to the existing manhole FSA MH09, with invert level of 60.93m, prior to the ultimate outfall discharging into the Grange Castle Pumping Station, which has already been approved under the aforementioned planning grant.
The substation building will be unmanned and will not be occupied on a regular basis. A two man crew visiting site for two days per month is estimated to be the anticipated level of occupancy (Average of 1 persons on site per week). As a result this development is not covered by the types of activities listed in Appendix C of the Irish Water Code of Practice for Wastewater Infrastructure. Accordingly, proposed wastewater flows have been based on the assumed usage rates of the appliances in the building. The proposed foul water flows from the development are calculated in Table 3.1 below:-

Appliance	Flow per use (litres)	Average use per week	Weekly Flow (litres)	Average Daily Flow (litres)
WC and WHB*	45	1	45	6.43
Sink**	12	1	12	1.72
Total			**67**	**8.15**

*Based on Appendix D of the Irish Water Code of Practice for Wastewater Infrastructure for WC on an amenity site

** Based on water demand for 1 no. meal as per Section 3.28 of Irish Water Code of Practice for Water Infrastructure.

Table 3.1 – Average Foul Water Daily Demand

As can be seen in Table 3.1 the average daily foul water demand of 8 15 litre per day. The total average daily foul water demand for the permitted data centre development is 4.800 litres per day (Refer to Section 3.1 of Document No. P181103, Jan 2019, by Pinnacle consulting engineers Appendix A), thus the foul water demand for proposed substation development is equivalent to 0.17% of the overall foul water demand for the permitted data centre site.

All on-site foul sewers have been designed to a 150 & 225mm Ø diameter pipes, with gradients designed to achieve self-cleansing velocities of at least 0.75 m/s in accordance with the requirements of Irish Water Code of Practice for Wastewater Infrastructure (Document No. IW-CDS-5030-03).
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 before entering the foul water network. Details of the proposed full retention separator are provided in Appendix D of this report.

Refer to Drawing No. P181103-PIN-ZZ-ZZ-DR-C-200-S0-P01 included in Appendix B which indicates permitted foul water network.

4 Water main supply

4.1 Existing Infrastructure

South Dublin County Council record drawings have identified an existing 16" (400mm) Ø main located along the eastern boundary of the property, within the R120 (Newcastle Road), adjacent to the subject site. 2No. 300mm Ø capped connections with sluice valves, have been left off the aforementioned trunk water main, in order to facilitate development of these lands and for the lands further west, known as Grange Castle West.
The aforementioned existing watermain is ultimately fed off the existing infrastructure to the north of the 12th Lock Bridge.
There is adequate capacity within the existing watermain network to supply the permitted and proposed development.

4.2 Potable water supply

The amended substation will connect to the internal data centre site water supply network permitted under South Dublin County Council REG.REF. SD19A/0042 and An Bord Pleanála ABP REF.: 305958-19. The data centre site water supply network will be connected to the existing 300mm Ø capped connection that leads into 450mmø Irish Water watermain located in the R120 (Newcastle Road) to the east of the site.

The substation building will be unmanned and will not occupied on a regular basis. A two man crew visiting site for two days per months is estimated to be the anticipated level of occupancy (Average of 1 persons on site per week). As a result this development is not covered by the types of activities listed in Section 3.28 of the Irish Water Code of Practice for Water Infrastructure. Accordingly, proposed water demand have been based on the assumed usage rates of the appliances in the building. The proposed water flows from the development are calculated in Table 4.1 below:-

Appliance	Flow per use (litres)	Average use per week	Weekly Flow (litres)	Average Daily Flow (litres)
WC and WHB*	45	1	45	6.43
Sink**	12	1	12	1.72
Total			**67**	**8.15**
*Based on Appendix D of the Irish Water Code of Practice for Wastewater Infrastructure for WC on an amenity site ** Based on water demand for 1 no. meal as per Section 3.28 of Irish Water Code of Practice for Water Infrastructure.				

Table 4.1 – Average Water Daily Demand

As can be seen in Table 3.1 the average daily water demand of 8.15 litre per day. The total average daily water demand for the permitted data centre site is 6.000 litres per day (Refer to Section 3.1 of Document No. P181103, Jan 2019, by Pinnacle consulting engineers in Appendix A) thus the water demand for proposed substation development is equivalent to 0.136% of the overall water demand for the permitted data centre site.

The permitted Water Supply Network is indicated on Drawing No. P181103-PIN-ZZ-ZZ-DR-C-201-SO-P01 in Appendix B.

4.3 Fire main requirements

The proposed amended substation development will be served by a 150mmø fire hydrant main which is connected to the permitted 150mmø watermain network south of substation. The fire hydrants will be provided at appropriate locations in accordance with the recommendations contained in the Technical
Guidance Documents. Section B – Fire Safety, dated 2006 and the specialist fire protection contractor's design.

5 Flood risk assessment

A Flood Risk Assessment (FRA) was developed for South Dublin County Council in connection with the planning application for the permitted data centre and substation development and addresses the potential flood risk and mitigation measures proposed for the subject site, located to the south of the Grand Canal and to the west of the Newcastle Road (R120), Co. Dublin.2013-2019.
In this it is stated that the proposed amended development of the site will be carried out in a wholly sustainable manner and will not pose risk from any fluvial, pluvial, coastal or groundwater flooding event.
A review of available information has identified no flood hazards for the proposed development therefore, in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities, the site is deemed to be located within Flood Zone C, where the probability of flooding is low (i.e. less than 0.1% AEP or 1 in 1,000 years). Refer to Figure 5.1 below.

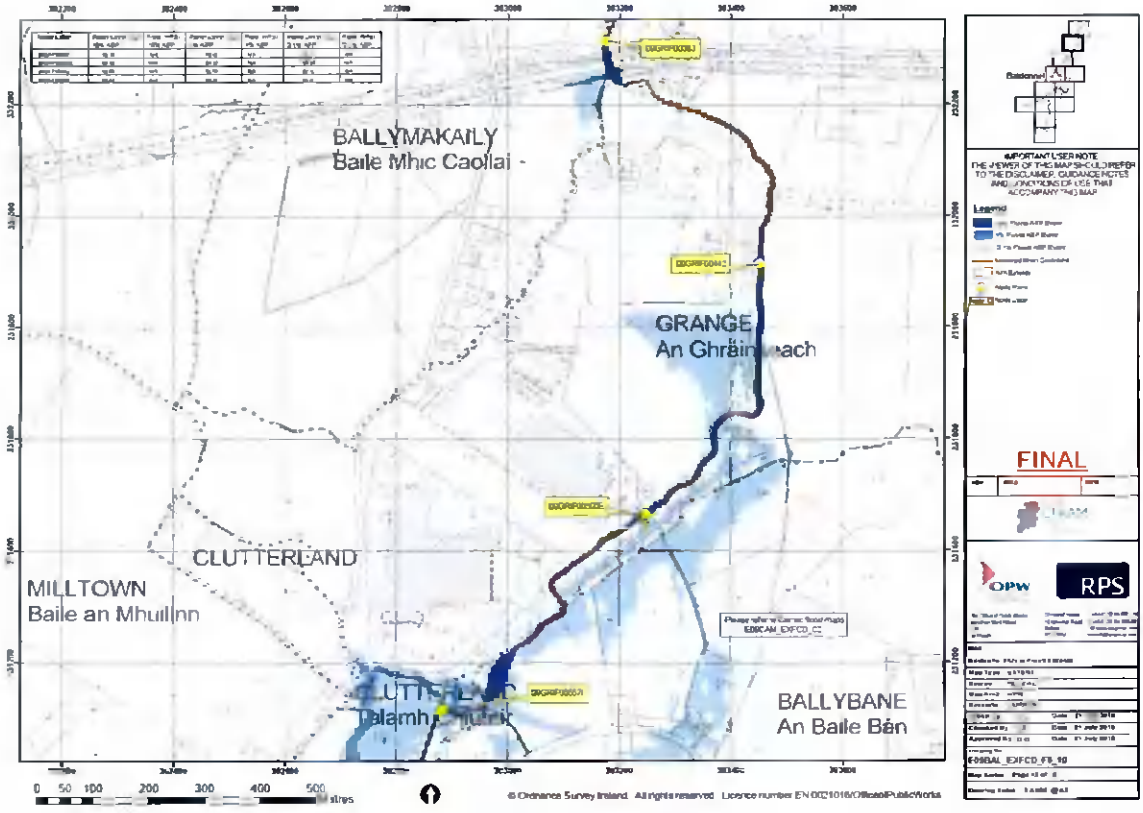


Figure 5.1 Flood Zone Map

There are also no historic flood events recorded on the subject site, as can be seen in Figure 5.2 below.

Past Flood Event Local Area Summary Report

OPW

Report Produced: 9/11/2021 11:53

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "Website"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.

2 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Griffeen November 2000 (ID-1237)	05/11/2000	Area
	Additional Information: Reports (16) Press Archive (6)		
2.	Peamount R134 R120 junction Nov 2000 (ID-3320)	05/11/2000	Approximate Point
	Additional Information: Reports (1) Press Archive (1)		

Figure 5.2 Flood Risk Map (source: OPW Flood Hazard Mapping)

The Flood risk assessment report for the permitted Ballymakaily Data Centre (EDCDUB04), document No. P181103 FRA , December 2018, by Pinnacle consulting engineers is included in Appendix E of this report.

Appendix A – Engineering planning report Ballymakaily to the West of the Newcastle Rd (R120), Lucan, Co. Dublin

PINNACLE
CONSULTING ENGINEERS

edgeconnex

Ballymakaily to the West of the Newcastle Rd (R120), Lucan, Co. Dublin

Engineering Planning Report

January 2019

P181103

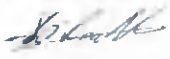
STRUCTURAL · CIVIL · DUE DILIGENCE · ENGINEERING MASTERPLANNING
FLOOD MANAGEMENT · INFRASTRUCTURE DESIGN
PRE-DEVELOPMENT ENGINEERING · BIM · TRANSPORTATION

PINNACLE
CONSULTING ENGINEERS

CONTACT DETAILS

Name	Position	Email	Telephone	Mobile
S. O'Reilly	Associate	shaun.o@iepinnacle.com	01-231 1044	087 6698575

APPROVALS

	Name	Signature	Position	Date
Prepared by	S. O'Reilly		Associate	17/01/2019
Reviewed by	J. Mayer		Director	21/01/2019
Approved by	J. Mayer		Director	22/01/2019

REVISIONS

Revision By	Date	Context

VERSIONS

Number	By	Date	Context
1	S. O'Reilly	23/01/2019	Planning Submission

SOURCES OF DATA

Gilligan Architects Ltd.	Land Survey Services Ltd.
Google	

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REPORT CONTENTS

Executive Summary

This report was prepared for South Dublin County Council in connection with the planning application for a data centre development and addresses the existing and proposed civil infrastructure, for the proposed development, located on the Ballymakaily Lands to the West of the Newcastle Road (R120), Lucan, Co. Dublin.

The proposal is to construct a phased data centre development that will include 4 no. single storey data halls all with associated plant at roof level; 32 no. standby generators with associated flues (each 15m high); associated office and service areas; service road infrastructure and car parking; as well as ESB sub-station / transformer yard with an overall gross floor area of 17,685sqm. The development will also include a temporary gas powered generation plant within a walled yard containing 19 no generator units with associated flues (each 17m high) to be located to the west of the proposed data halls. The development will be constructed across two distinct phases that will facilitate the future use and take up of space within the data halls. It is intended that Phase 1 will be complete and operational prior to the commencement of Phase 2 of the development.

Phase 1
2 no. single storey data halls (6,950sqm) with roof plant and 16 no. stand-by generators with associated flues (each 15m high) as well as associated water tower and pump room and other services; Single storey goods receiving area / store and single storey office area (1,522sqm) located attached and to the north-east of the data halls; Temporary gas powered generation plant with 15 generators (13 operating and 2 standby) with associated flues (each 17m high) to be located within a compound to the west of the proposed data halls; Attenuation pond; and Two storey ESB sub-station (494sqm) with associated transformer yard and single storey transformer building (247sqm) within compound.

Phase 2
2 no. single storey data halls (6,950sqm) with roof plant and 16 no. stand-by generators with associated flues (each 15m high) as well as associated water tower and pump room and other services; Single storey goods receiving area / store and single storey office area (1,522sqm) located attached and to the east of the data halls under this Phase and attached and to the north of the offices proposed under Phase 1; and 4 no. additional generators (all operating) with associated flues (each 17m high) to be constructed within the temporary gas powered generation plant.

The temporary gas generation plant is required as a result of the limited capacity available on the electrical utility network in the area. The development will also include ancillary site works, connections to existing infrastructural services as well as fencing, signage, and will include new vehicular access off the realigned R120 to provide a new vehicular access into the site as well as internal service roads and entrance gate, and a car park for 39 car parking spaces (including 4 disabled car parking spaces) and sheltered bicycle parking to serve the development. The development will be enclosed with landscaping to all boundaries of the overall site of 22.1ha.

An application for enabling works to facilitate this development has been made under Reg. Ref. SD19A/004. The applicant has responded in this EIAR to the aspects of the environment as well as specific issues raised in consultation with the Planning Authority.

Only a maximum of 24 of the 32 stand by generators will be in operation until such time as the temporary generator farm is decommissioned and the development is fully connected to the national grid. The proposed development on the connection to the national grid will see the removal of the temporary gas generation compound and the proposed development will have 4 data halls with 32 no. standby diesel generators.

The development is proposed to create a campus level of finish as opposed to an industrial form of development with heavy landscaping along all boundaries and particularly to the north of the overall site along the canal. External finishes will be primarily metal cladding. The overall development is being constructed using structural steel framing techniques to facilitate a rapid build programme requirement. Structural steelwork frames construction offers a variety of advantages in terms of design, performance and construction, when compared to other forms of construction and rapid build techniques.

It is proposed that the new facilities will operate 24 hours per day, 7 days per week, on a 3 shift cycle. It is intended that this application will form part one of the development of the overall site. Other future phases, if they occur, will be subject to a new application, and environmental impact assessment. The scheme has been designed so that it can be undertaken without further phases in terms of landscape mitigation, design and infrastructure. Its design and positioning has been undertaken to minimise impact on existing hedgerows with the vehicular access utilising an existing wide gap in the hedgerow, and the only hedgerow being required to be removed being that to facilitate the ESB substation and transformer compound. No works are proposed to the abandoned farm buildings under this application. This will be addressed under a future application to enable a full summertime bat and bird survey to be undertaken of all these structures.

The report should be read in conjunction with our engineering planning drawings, and deals with existing foul, surface water and water mains present within the surrounding area, and the proposals for the site with regards to these services.

The report also discusses the ground conditions present on the site, the current proposals for achieving the development plateau and sustainability measures incorporated with the development.

The following engineering drawings have been prepared for the proposed development:-

P181103-200-SO-PO1	Proposed Foul Sewer & Surface Water Layout
P181103-201-SO-PO1	Proposed Levels & Watermain Layout
P181103-202-SO-PO1	Standard Wastewater Infrastructure Details
P181103-203-SO-PO1	Standard Water Infrastructure Details
P181103-204-SO-PO1	Proposed Pond Details
P181103-210-SO-PO1	Areas Summary

1 Introduction

The applicant proposes to construct 4 no. new single storey data halls and associated office areas, which will be accessed off the R120 (Newcastle Road) to the east.. The purpose of this report is to address the civil infrastructural aspects of the proposed data centre development, located on the Ballymakaily Lands to the West of the Newcastle Road (R120), Lucan, Co. Dublin.

The total subject site area extends to circa 54.59 acres (22.1 ha) and is currently a greenfield site. The new proposed data halls will result in a portion of the southern area of the site being developed, comprising an area of circa 13.59 acres (5.51 ha), with associated landscaping elements.

There are no known public sewer drainage pipes or watermains, presently located on the subject site.

This report has been prepared to outline the existing and proposed drainage, pollution control measures and water main infrastructure, in order to support the proposed development application.

The location of the site is indicated on the map extract below - Figure 1.

FIGURE 1 - Site Location (Source Google Maps)

2 Existing Drainage & Watermain Services

2.1 Existing Foul Drainage Networks

South Dublin County Council record drawings have identified 2 No. 450mm Ø spur connections, located along the eastern boundary of the property, within the newly constructed R120 (Newcastle Road) upgrade, adjacent to the subject site. These spur connections were left out to facilitate development of these lands and for the lands further west, known as Grange Castle West. This 450mm Ø sewer then connects into the existing Grange Castle Business Park pumping station, as laid under Reg Ref. SD16A/0214. The effluent from this pumping station is then pumped via 3 No. rising mains, i.e. 100mm Ø, 200mm Ø & 450mm Ø, into the local infrastructural network.

The existing foul sewer reticulation network has adequate capacity to cater for the proposed effluent discharge from the subject site and there are no known issues noted with the sewer reticulation network.

2.2 Existing Surface Water Drainage Networks

South Dublin County Council record drawings have identified a 900mm Ø road crossing, which was installed as part of the newly constructed R120 (Newcastle Road) upgrade, adjacent to the subject site. This pipe is then connected into a 900mm Ø pipe located along a section of road on the opposite side to the subject site. This gravity sewer then runs in a northerly direction, prior to connecting into a ditch/stream network, which discharges through 3 No. aquaducts / culverts of varying sizes and which are located beneath the Grand Canal to the east. This outfall is then drained via a tributary into the Griffeen River.

The aforementioned sewer / culvert, has been identified as having capacity to accommodate the proposed discharge from the subject site.

2.3 Existing Water Main Network

South Dublin County Council record drawings have identified an existing 16" (400mm) Ø main located along the eastern boundary of the property, within the newly constructed R120 (Newcastle Road) upgrade, adjacent to the subject site. 2No. 300mm Ø capped connections with sluice valves, have been left off the aforementioned trunk water main, in order to facilitate development of these lands and for the lands further west, known as Grange Castle West.

The aforementioned existing watermain is ultimately fed off the existing infrastructure to the north of the 12th Lock Bridge.

From discussions with the South Dublin County Council, it is understood that there is adequate capacity within the existing watermain network to supply the proposed development.

3 Proposed Site Drainage & Water Supply

3.1 Proposed Foul Water Drainage

It is proposed to discharge foul water from the proposed development, via 2 No. 225mm Ø gravity foul sewer outfalls and discharge into the 2 No. aforementioned existing 450mm Ø spur connections, located along the eastern boundary of the subject site, adjacent to the R120 (Newcastle Road).

It is proposed that all foul condensate effluent from the proposed new data halls, will be connected into head manholes adjacent to the data halls. The office building contains 6 No. WC's, with a predicted maximum number of daily staff being in the region of circa 40 people, over a 24hr period. Based on Irish Water's Code of Practice of 200ltr/hd/day, the peak wastewater flow will not be in excess of circa 0.54l/s.

The proposed network connects into Existing Manholes FSA MH01 & FSA MH09, with invert levels of 63.93m & 60.93m respectively, prior to the ultimate outfall discharging into the Grange Castle Pumping Station, which has already been approved under the aforementioned planning grant - refer Drawing No. P181103 – 200-SO-P01.

All on-site foul sewers have been designed to be a minimum 225mm Ø diameter pipes, with gradients designed to achieve self-cleansing velocities.

3.2 Proposed Surface Water Drainage

Storm water from the proposed development has been designed in accordance with the GDSDS and ensures that Best Management Practice has been incorporated into the design.

It should be noted that the subject site currently comprises a greenfield site and the proposed surface water measures are aimed at improving the general surface water management of the site, by introducing interceptors, attenuation measures and by restricting the ultimate discharge, etc.

Storm water from the roof areas of the proposed building units, will be directed via rain water pipes into an on-site reticulation system. The outflow from this system will be connected into the surface water drainage network collecting run-off from the road areas and will be ultimately discharged into a stormwater storage pond / wetland area, located in a landscaped area to the northern end of the site adjacent to the canal - refer Drawing No. P181103 – 200-SO-PO1.

Based on the hardstanding area for this current application, i.e. circa 55,100m^2 (5.51Ha), the attenuation volume required has been calculated as being circa 2,580m^3, which will be provided for as mentioned above, in a storage pond. Refer Appendix B for Surface Water Calculations & Dwg. No. P181103-204-SO-PO1, for further details of the pond.

It should be further noted that thee is an additional 304m^3 of storage provided within the pipe network. This figure can be found within the Network Design calculations.

Storm water from all car park areas and access roads / delivery areas will be drained as follows:-

- A series of on-site gullies and channels draining into a separate system of below ground gravity storm water sewers
- A Duraflow (or similar approved), porous asphalt product

Prior to discharging into the proposed pond / wetland area, the storm water from the car park and access roads, which is drained via the methods as described above, will be directed through an appropriately sized Conder Separator (or similar approved) petrol interceptor - refer Appendix A for Interceptor Details.

Site investigations have been carried out and the results have shown that the existing sub-soil would provide inadequate soil infiltration rates and thus it is not practical to install a soakaway system.

The storm water drainage within the entire development has been designed to accommodate a 1:2 year storm frequency. The pond / wetland and porous asphalt, have been designed to accommodate a 1:100 year storm event + 10% climate change.

The outflow from the proposed development, will be restricted by way of a Hydrobrake facility, which will limit the discharge to 11/s. which is the calculated QBAR greenfield run-off rate - refer Appendix B for Surface Water Calculations.

The surface water discharge for this application will incorporate the road areas, parking, service yard area and the roof water from the proposed data halls, which then ultimately feeds into the existing network as previously mentioned. Refer Appendix C, Dwg. No. P181103-210-SO-PO1, for a drawing indicating the various surface areas of this application; all areas are hardstanding of various types, with the respective coefficients detailed below:-

- Access Road – Tarmac (6,633m^2) / c = 0.80
- Gravel Area (5,940m^2) / c = 0.40
- Data Hall Roof Area (5,823m^2) / c = 0.80
- Service Yard Slab Area – Concrete (1,106m^2) / c = 0.80
- Generator Yard Slab Area – Concrete (1,020m^2) / c = 0.80
- Porous Asphalt (Car Park Area) - (1,277m^2)

Further to the above, it should be noted that the porous asphalt provides permeability in excess of 720mm/hr – refer Appendix D.

3.3 Proposed Water Mains

It is intended to serve the proposed development via connection off the aforementioned 300mm end cap, which has been left off the existing 400mm Ø trunk main located along the R120 (Newcastle Road). Refer Drawing No. P181103 – 201-SO-PO1.

Hydrants will be installed in accordance with the Requirements of the Building Regulations and in accordance with the recommendations contained in the Technical Guidance Documents, Section B – Fire Safety, dated 2006, and these are detailed on our engineering drawings.

Water demand for the development has been based on Irish Water's criteria, i.e. 150 litres/hd/day = 6,000 litres/hd/day = 0.069 litres/second.

Avg. Demand = 0.069 l/s x 1.25 = 0.086 litres/second

Peak Demand = 0.086 l/s x 5 = 0.43 litres/second

Water meters, sluice valves and hydrants, in line with Irish Water requirements and specifications, will be installed at the connections onto the aforementioned existing water mains, as required.

3.4 Standard Drainage Details

All standard drainage details including manhole details, pipe bedding, channels, hydrants etc. are shown on Drawing No.'s P181103-201 and P181103-202. Details of the types and construction methods will be agreed with the local authority prior to construction.

Drains generally will consist of PVC (to IS 123) or concrete spigot and socket pipes to (IS 6).

Drains shall be laid to comply with the Requirements of the Building Regulations 1997 and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Strict separation of surface water and foul sewerage will be imposed on the development. Drains will be laid out to minimise the risk of inadvertent connections of sinks, dishwashers etc. to the surface water system.

In order to minimise the risk of floating contamination of the surface water system, road gullies will be precast trapped gullies to BS5911:Part2:1982.

Concrete bed and surround to the pipe runs will be used where the cover to the pipes is less than 900mm, where the pipes are sufficiently close to the building, or where the pipe runs are below the ground floor slab.

All works are to be carried out in accordance with Irish Water's Code of Practice for Wastewater Infrastructure, dated December 2016 : Document IW-CDS-5030-03 & with Irish Water's Code of Practice for Water Infrastructure, dated December 2016 : Document IW-CDS-5020-03 and any subsequent revisions thereof.

4 Surface & Groundwater Impacts

4.1 Construction Phase

Water pollution will be minimised by the implementation of good construction practices. Such practices will include adequate bunding for oil containers, wheel washers and dust suppression on site roads, and regular plant maintenance. The Construction Industry Research and Information Association provides guidance on the control and management of water pollution from construction sites in their publication Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors – C532 CIRIA Report (Masters-Williams *et al*, 2001), which provides information on these issues.

Pollutants can commonly include suspended solids, oil, chemicals, cement, cleaning materials and paints. These can enter controlled waters in various ways:

- directly into a watercourse
- via drains or public sewers
- via otherwise dry ditches
- in old field drains
- by seepage into groundwater systems
- through excavations into underlying aquifers
- by disturbance of an already contaminated site

The proximity of the site to streams, aquifers and water abstractions; potential sources, pathways and impacts of pollution; and the historical uses of the site and nearby areas should be examined early in project planning and design, to ensure that suitable redesign and mitigation measures are undertaken as necessary.

During construction, careful management and planning will help minimise water pollution. This may include adequate bunding of all oil tanks, wheel washers and dust suppression on haul roads, particular care to be taken near watercourses, and regular plant maintenance.

A contingency plan for pollution emergencies should also be developed and regularly updated, which would identify the actions to be taken in the event of a pollution incident.

The CIRIA document (2001), recommends that a contingency plan for pollution emergencies should address the following:

- containment measures
- emergency discharge routes
- list of appropriate equipment and clean-up materials
- maintenance schedule for equipment
- details of trained staff. location, and provision for 24-hour cover
- details of staff responsibilities
- notification procedures to inform the relevant environmental protection authority

- audit and review schedule
- telephone numbers of statutory water undertakers and local water company
- list of specialist pollution clean-up companies and their telephone numbers

4.2 Operational Phase

The sources of pollution that could potentially have an effect on surface or groundwater during the operational phase of the development will be oil and fuel leaks from parked cars, service vehicles, HGV delivery's etc. Hydrocarbon interceptors will be provided on storm water drainage sewers from car parking areas as required.

Storm water attenuation measures will be incorporated into the scheme as mentioned previously.

It is not anticipated that flooding of the site will occur. due to the fact that there is no historical data, which refers to any past flooding on this site.

4.3 Mitigation Measures

The construction management of the building project will incorporate protection measures to minimise as far as possible the risk of spillage that could lead to surface and groundwater contamination.

All appropriate methods will be utilised to ensure that surface water arising during the course of construction activities will contain minimum sediment, prior to the ultimate discharge to the proposed attenuation pond and existing 900mm Ø surface water pipe network.

Storm water attenuation measures will be incorporated into the scheme as mentioned previously. Hydrocarbon interceptors will be provided on storm water drainage sewers from service yard areas as necessary. Grease traps will be installed on foul sewers where necessary.

Best practice in design and construction will be employed for the installation of surface water and sanitary drainage.

5 Sustainability

5.1 Site Development

In order to minimize material export and import to the site and the impact of this on the surrounding road network, we are proposing to maintain existing on-site levels as far as is practical. Where this is not feasible, a terrain model has been produced, which will indicate the volumes of cut/fill material. based on the proposed levels and a levels balance will be struck across the site, thereby mitigating any import/export of material for site development.

5.2 Site Drainage

Storm water drainage proposals for the site have been designed in accordance with the GDSDS and incorporate on site storm water attenuation in order to limit discharge of storm water from the developed site to the equivalent Q-bar run-off rates.

The attenuation system proposed is in keeping with other developments within Grange Castle Business Park. The pond / wetland area not only provides flood storage, but also provides ecological benefits as well.

6 Conclusion

In conclusion, the proposed development of the site by the applicant, for use as a Data Centre development, is considered a suitable use of the site. Local infrastructure has the capacity to serve the proposed development.

The site will be developed in a sustainable manner, in order to minimise the impact of the development during construction and throughout the lifespan of the proposed store.

Accordingly, there are no reasons in relation to the drainage elements as to why this scheme should not be granted planning permission, and with this in mind, the Planning Authority is respectfully requested to recommend a grant of planning permission.

Appendix A

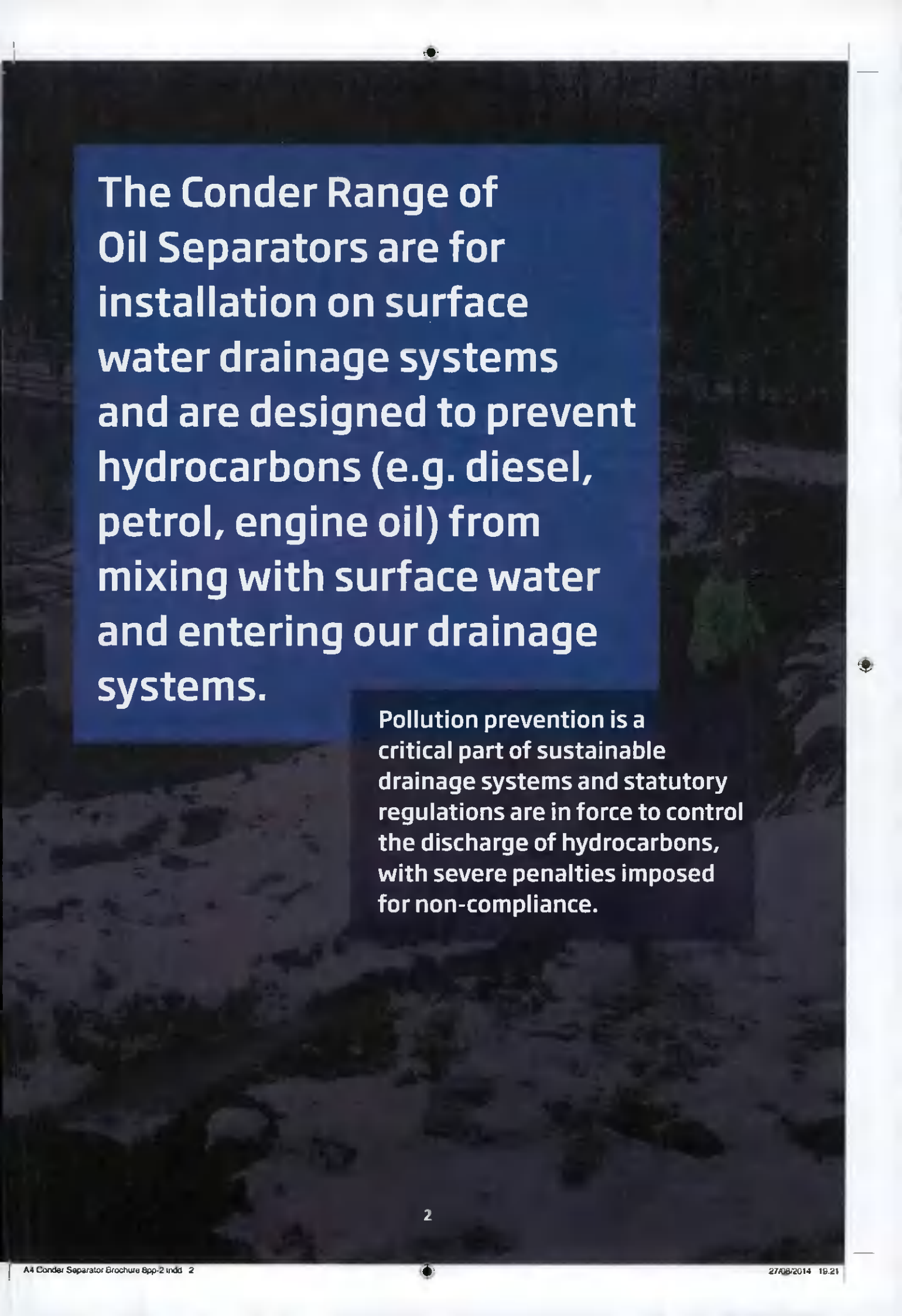
Conder Petrol Interceptor Details

Conder® OIL/WATER SEPARATORS

40 years OF PASSION

CONDER AQUA SOLUTIONS
A PREMIER TECH AND EPS JOINT COMPANY

THE PARTNER OF CHOICE



The Conder Range of Oil Separators are for installation on surface water drainage systems and are designed to prevent hydrocarbons (e.g. diesel, petrol, engine oil) from mixing with surface water and entering our drainage systems.

Pollution prevention is a critical part of sustainable drainage systems and statutory regulations are in force to control the discharge of hydrocarbons, with severe penalties imposed for non-compliance.

Compliance

The Conder Range of Oil Separators fully conform to both the Environment Agency's latest PPG guidelines and European standard BSEN-858-1-2 and are proven to effectively separate oil and water. Under test, the Conder Bypass performed to less than 1 mg/l and in doing so guarantees minimal environmental impact and ensures public safety.

Classes of Separator

There are two classes of separator which are defined by performance.

Class 1

Class 1 Separators are designed to achieve a concentration of less than 5mg/l of oil under standard test conditions. These conditions are required for discharges to surface water drains and the water environment.

Class 2*

Class 2 Separators are designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies such as discharges to the foul sewer.

*Class 2 available in forecourt separators only.

Selecting the Right Separator

Conder offers a full range of Separators for varying use and application:

- Bypass Separator
- Full Retention Separator
- Forecourt Separator
- Wash Down and Silt Separators

If you're unsure of what type of Conder Oil Separator you require please use the below chart to help you identify the most suitable product for your project.

The guidance given is for the use of separators in surface water drainage systems that discharge to rivers and soakways.

Is there a risk of oil contaminating the drainage from the site?

YES	YES	YES	YES	NO
Risk of infrequent light contamination and potential for small spills only e.g. car park.	Risk of regular contamination of surface water run off with oil and/ or risk of larger spills e.g. vehicle maintenance area, goods vehicle parking or vehicle manoeuvring.	Risk of regular Drainage will also contain dissolved oils, detergents or degreasers such as vehicle wash water and trade effluents e.g industrial sites.	Fuel oils are delivered to and dispensed on site e.g. retail fuel forecourts.	Very low risk of oil contamination e.g. roofwater.
YES				YES
Source control SUDS must be considered and incorporated where suitable.				Separator not required.
IF NOT SUITABLE	YES	YES	YES	
By-pass separator with alarm required. Class 1 if discharge to surface water. Class 2 if discharge to foul sewer.	Full retention separator with alarm required. Class 1 if discharge to surface water. Class 2 if discharge to foul sewer.	Trade effluents must be directed to the foul sewer. It may need to pass through a separator before discharge to sewer to remove.	Full retention 'forecourt' separator with alarm required. Class 1 if discharge to surface water. Class 2 if discharge to foul sewer.	Clean water should not be passed through the separator unless the size of the unit increased accordingly.

The use of SUDS should be considered at all sites and they should be incorporated where suitable. SUDS can be used to polish the effluent from these separators before it enters the environment.

Source control SUDS should be considered where possible.

Separator Alarms

All oil separators are required by legislation to be fitted with an oil level alarm system with recommendations that the alarm is installed, tested, commissioned and regularly serviced by a qualified technician.

The alarm indicates when the separator is in need of immediate maintenance in order for it to continue to work effectively. Conder Aqua Solutions can offer a full technical and service package for a variety of alarm options.

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

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)	Silt 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.

Conder Range of Forecourt Separators

Conder Forecourt Separators have been designed for specific use in petrol filling stations and other similar applications. The size of this separator has been specifically increased in order to retain the possible loss of the contents from one compartment of a road tanker, which could be up to 7,600 litres.

Forecourt separators are an essential infrastructure requirement for all forecourts so as to ensure compliance with both health and safety and environmental legislation.

Application Areas

- Petrol forecourts
- Refuelling facilities
- Fuel storage depot

Features and Benefits

- All surface water is treated
- Available in Class 1 and Class 2
- Automatic Closure Device (ACD) fitted as standard
- Includes 2000L silt capacity

Performance

All Conder Forecourt 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

Tank Code	Volume (L)	Length (mm)	Diameter (mm)	Height (mm)	Base to inlet (mm)	Base to outlet (mm)	Access (mm)
ANO/11*	10000	4250	1800	2100	1600	1550	750
ANT/12**	10000	4250	1800	2100	1600	1550	750
LNO/11***	10000	4250	1800	2100	1600	1550	750

*Class 1 Forecourt Separator suitable for discharging to surface water drains

**Class 2 Forecourt Separator suitable for discharging to foul drains only

*** Class 1 Forecourt Separator suitable for installation in granular materials

Conder Range of Washdown and Silt Separators

Conder Washdown and Silt Separators are for use in areas such as car washes, pressure wash facilities or other cleaning facilities and must be discharged to the foul water drainage system in accordance with PPG13.

Application Areas

- Car wash facilities
- Tool hire depots
- Pressure washer facilities

Features and Benefits

- Available in 1,2 and 3 stage options
- Efficient silt and hydrocarbon removal

Performance

The Environment Agency's PPG13 requires that discharge from pressure washers must discharge to a foul drainage system. Where there is no foul drainage available, the effluent must be contained within a sealed drainage system or catchpit for disposal by a licenced waste contractor.

Silt build-up is the primary concern with washdown facilities and so the Conder range of washdown and silt separators are used to remove the silt and will allow some separation of hydrocarbons.

Detergents that are used in wash down areas will break down and disperse hydrocarbons (hindering the separation process). Therefore it is important to remember the main function of wash down separators is to remove silt.

How it Works

Step 1

Contaminated wash down water enters the unit where the heavier solids, silts, settle to the bottom of the tank.

Step 2

The lighter liquids, hydrocarbons, will rise to the surface and be retained within the tank.

Step 3

Treated water will exit the separator via the dipped outlet.

Specification

Although it is recognised that single stage separators give the most efficient separation, 2 and 3 chamber Conder Washdown and Silt Separators are available on request.

Tank Code	Capacity (L)	Silt Storage	Diameter (mm)	Length (mm)	Access Diameter (mm)	Base to Inlet Invert (mm)	Base to Outlet Invert (mm)
CWS2/12	2000	1000	1000	2713	600	1290	1240
CWS3/12	3000	1500	1200	2853	600	1475	1425
CWS4/12	4000	2000	1200	3737	600	1475	1425
CWS6/12	6000	3000	1500	3636	600	1775	1725
CWS8/12	8000	4000	1800	3443	600	2030	1980
CWS10/12	10000	5000	1800	4250	600	2030	1980

FST Silt Trap

Large quantities of silt can be associated with washdown areas. The Conder FST silt trap is ideal for easy removal of silt either manually or by a waste disposal contractor.

The FST range of silt traps are available with varying grades of covers from B125 up to E600 to allow installation in all types of vehicle or plant washdown facilities

Conder Range of Alarm Systems

All separators must be fitted with an alarm in order to provide visual and audible warning when the level of oil reaches 90% of its storage volume, as required by The Environment Agency's PPG3.

The alarm system will then be triggered to indicate that the separator is in need of immediate emptying, in order to continue effective operation.

Features and Benefits

- Option for installation at a remote supervisory point
- Audible and visual
- Eliminates unnecessary waste management visits
- Easy installation
- Audible, visual and text message alert alarm systems available

Mains Powered System

Mains powered alarm systems are best suited to new build situations or sites where installation of the necessary cabling and ducting is straight forward and economical. The probe located in the separator will, when surrounded by floating hydrocarbons, activate an alarm condition on the remote panel to advise that the unit requires emptying.

Solar Powered System (Flashing Beacon)

This option requires no mains power supply or any significant cabling and ducting, making it extremely economical for large sites and retro fitting alarms to existing oil separators. A High Intensity Beacon will flash when a problem is detected.

Solar GSM Alarm

The Solar GSM alarm sends a status report on your separator to a mobile phone number of your choice. The status of the GSM alarm can also be tested at any time by simply sending a pre-recorded text message, via your directed mobile phone, for added peace of mind.

Peripherals

Coalescing Filters

The Conder Coalescing Filter is designed to separate residual oil in already separated oil/water and ensures a discharge quality of less than 5mg/litre of oil in water.

Features and Benefits

- Handle for easy removal and cleaning
- Flashing beacons (with option of siren kit)
- Kiosks
- Probe brackets
- Bas 1000 intrinsically safe junction box
- High level probe
- Silt level probe
- Oil level probe

Servicing

The Environmental Agency's PPG3 guidelines stipulate that every 6 months, and in accordance with manufacturer's instructions, experienced personnel should carry out maintenance to both the separator and alarm.

Conder and our service partners can offer a full technical and service package including separator and alarm installation, commissioning, oil and silt removal and route service contracts.

CONDER AQUA SOLUTIONS
A PREMIER TECH AND EPS JOINT COMPANY

2 Whitehouse Way, South West Industrial Estate, Peterlee, Co Durham, SR8 2RA UNITED KINGDOM.
+44 (0) 8702 640004 Email: sales@conderproducts.com **www.conderaqua.com**

Appendix B

Surface Water Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	5.510	Urban	0.750
SAAR (mm)	754	Region Number	Ireland Greater Dublin

Results	l/s
QBAR Rural	11.0
QBAR Urban	34.0
Q100 years	65.0
Q1 year	28.9
Q30 years	60.1
Q100 years	65.0

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

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 10

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%	30/15 Summer				
1.001	15 Winter	1	0%	100/15 Summer				
2.000	15 Winter	1	0%	100/15 Summer				
2.001	15 Winter	1	0%	30/15 Summer				
1.002	15 Winter	1	0%	30/15 Summer				
3.000	15 Winter	1	0%	30/15 Summer				
3.001	15 Winter	1	0%	30/15 Summer				
3.002	15 Winter	1	0%	30/15 Summer				
1.003	15 Winter	1	0%	30/15 Summer				
4.000	15 Winter	1	0%	30/15 Summer				
4.001	15 Winter	1	0%	30/15 Summer				
1.004	15 Winter	1	0%	30/15 Summer				
5.000	15 Winter	1	0%	100/15 Summer				
6.000	15 Winter	1	0%	100/15 Summer				
6.001	15 Winter	1	0%	100/15 Summer				
6.002	15 Winter	1	0%	100/15 Summer				
5.001	15 Winter	1	0%	30/15 Winter				
5.002	15 Winter	1	0%	30/15 Summer				
7.000	15 Winter	1	0%	30/15 Summer				
8.000	15 Winter	1	0%	30/15 Summer				
7.001	15 Winter	1	0%	30/15 Summer				
9.000	15 Winter	1	0%	100/15 Summer				
9.001	15 Winter	1	0%	100/15 Summer				
5.003	15 Winter	1	0%	30/15 Winter				
1.005	15 Winter	1	0%	30/15 Summer				
1.006	15 Winter	1	0%	30/15 Summer				
1.007	15 Winter	1	0%	30/15 Summer				
1.008	15 Winter	1	0%	100/15 Summer				

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	65.168	-0.132	0.000	0.55	0.0	41.3	OK
1.001	2	64.712	-0.188	0.000	0.30	0.0	41.6	OK
2.000	3	64.568	-0.272	0.000	0.02	0.0	1.4	OK
2.001	4	64.337	-0.243	0.000	0.02	0.0	1.5	OK
1.002	5	64.333	-0.130	0.000	0.61	0.0	44.8	OK
3.000	6	64.525	-0.110	0.000	0.51	0.0	20.0	OK
3.001	7	64.345	-0.096	0.000	0.62	0.0	23.5	OK
3.002	8	64.249	-0.079	0.000	0.74	0.0	23.3	OK
1.003	9	64.118	-0.162	0.000	0.60	0.0	70.1	OK
4.000	10	64.360	-0.118	0.000	0.45	0.0	20.1	OK
4.001	11	64.235	-0.123	0.000	0.42	0.0	20.0	OK
1.004	12	63.970	-0.118	0.000	0.77	0.0	86.7	OK
5.000	13	64.921	-0.439	0.000	0.16	0.0	69.1	OK
6.000	14	65.188	-0.412	0.000	0.21	0.0	94.9	OK
6.001	15	64.763	-0.384	0.000	0.27	0.0	92.5	OK
6.002	16	64.720	-0.353	0.000	0.27	0.0	92.4	OK
5.001	17	64.680	-0.280	0.000	0.53	0.0	196.3	OK
5.002	18	64.216	-0.192	0.000	0.73	0.0	227.6	OK
7.000	19	64.943	-0.157	0.000	0.44	0.0	47.3	OK
8.000	20	64.567	-0.108	0.000	0.52	0.0	28.1	OK
7.001	21	64.199	-0.101	0.000	0.78	0.0	75.3	OK
9.000	22	64.293	-0.197	0.000	0.26	0.0	20.3	OK
9.001	23	64.194	-0.196	0.000	0.26	0.0	24.2	OK
5.003	24	63.811	-0.288	0.000	0.53	0.0	289.5	OK
1.005	25	63.466	-0.241	0.000	0.76	0.0	373.5	OK
1.006	26	63.317	-0.282	0.000	0.69	0.0	362.7	OK
1.007	27	63.107	-0.296	0.000	0.66	0.0	347.3	OK
1.008	28	62.865	-0.343	0.000	0.56	0.0	335.8	OK

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

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 10

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%	30/15 Summer				
1.001	15 Winter	30	0%	100/15 Summer				
2.000	15 Winter	30	0%	100/15 Summer				
2.001	15 Winter	30	0%	30/15 Summer				
1.002	15 Winter	30	0%	30/15 Summer				
3.000	15 Winter	30	0%	30/15 Summer				
3.001	15 Winter	30	0%	30/15 Summer				
3.002	15 Winter	30	0%	30/15 Summer				
1.003	15 Winter	30	0%	30/15 Summer				
4.000	15 Winter	30	0%	30/15 Summer				
4.001	15 Winter	30	0%	30/15 Summer				
1.004	15 Winter	30	0%	30/15 Summer				
5.000	15 Winter	30	0%	100/15 Summer				
6.000	15 Winter	30	0%	100/15 Summer				
6.001	15 Winter	30	0%	100/15 Summer				
6.002	15 Winter	30	0%	100/15 Summer				
5.001	15 Winter	30	0%	30/15 Winter				
5.002	15 Winter	30	0%	30/15 Summer				
7.000	15 Winter	30	0%	30/15 Summer				
8.000	15 Winter	30	0%	30/15 Summer				
7.001	15 Winter	30	0%	30/15 Summer				
9.000	15 Winter	30	0%	100/15 Summer				
9.001	15 Winter	30	0%	100/15 Summer				
5.003	30 Winter	30	0%	30/15 Winter				
1.005	30 Winter	30	0%	30/15 Summer				
1.006	30 Winter	30	0%	30/15 Summer				
1.007	30 Winter	30	0%	30/15 Summer				
1.008	30 Winter	30	0%	100/15 Summer				

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	65.488	0.188	0.000	1.17	0.0	88.0	SURCHARGED
1.001	2	64.869	-0.031	0.000	0.58	0.0	80.6	OK
2.000	3	64.751	-0.089	0.000	0.04	0.0	3.1	OK
2.001	4	64.749	0.169	0.000	0.33	0.0	23.9	SURCHARGED
1.002	5	64.748	0.285	0.000	1.04	0.0	76.8	SURCHARGED
3.000	6	64.912	0.277	0.000	0.99	0.0	39.3	SURCHARGED
3.001	7	64.768	0.326	0.000	1.13	0.0	42.6	SURCHARGED
3.002	8	64.642	0.314	0.000	1.27	0.0	39.8	SURCHARGED
1.003	9	64.565	0.285	0.000	0.95	0.0	110.0	SURCHARGED
4.000	10	64.602	0.124	0.000	0.98	0.0	43.5	SURCHARGED
4.001	11	64.533	0.175	0.000	0.85	0.0	40.8	SURCHARGED
1.004	12	64.407	0.319	0.000	1.26	0.0	141.8	SURCHARGED
5.000	13	65.043	-0.317	0.000	0.34	0.0	150.2	OK
6.000	14	65.294	-0.306	0.000	0.46	0.0	211.6	OK
6.001	15	65.050	-0.097	0.000	0.52	0.0	178.4	OK
6.002	16	65.021	-0.052	0.000	0.51	0.0	178.6	OK
5.001	17	64.987	0.027	0.000	1.00	0.0	369.8	SURCHARGED
5.002	18	64.707	0.299	0.000	1.31	0.0	409.2	SURCHARGED
7.000	19	65.214	0.114	0.000	0.90	0.0	96.0	SURCHARGED
8.000	20	64.961	0.286	0.000	1.03	0.0	56.0	SURCHARGED
7.001	21	64.564	0.264	0.000	1.53	0.0	148.6	SURCHARGED
9.000	22	64.354	-0.136	0.000	0.57	0.0	45.1	OK
9.001	23	64.260	-0.130	0.000	0.59	0.0	55.0	OK
5.003	24	64.180	0.081	0.000	0.93	0.0	508.6	SURCHARGED
1.005	25	63.880	0.172	0.000	1.29	0.0	631.6	SURCHARGED
1.006	26	63.710	0.111	0.000	1.18	0.0	616.8	SURCHARGED
1.007	27	63.440	0.037	0.000	1.16	0.0	608.5	SURCHARGED
1.008	28	63.074	-0.134	0.000	1.00	0.0	598.3	OK

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

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 10

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+10%	30/15 Summer				
1.001	15 Winter	100	+10%	100/15 Summer				
2.000	30 Winter	100	+10%	100/15 Summer				
2.001	30 Winter	100	+10%	30/15 Summer				
1.002	30 Winter	100	+10%	30/15 Summer				
3.000	15 Winter	100	+10%	30/15 Summer				
3.001	30 Winter	100	+10%	30/15 Summer				
3.002	30 Winter	100	+10%	30/15 Summer				
1.003	30 Winter	100	+10%	30/15 Summer				
4.000	30 Winter	100	+10%	30/15 Summer				
4.001	30 Winter	100	+10%	30/15 Summer				
1.004	30 Winter	100	+10%	30/15 Summer				
5.000	30 Winter	100	+10%	100/15 Summer				
6.000	30 Winter	100	+10%	100/15 Summer				
6.001	30 Winter	100	+10%	100/15 Summer				
6.002	30 Winter	100	+10%	100/15 Summer				
5.001	30 Winter	100	+10%	30/15 Winter				
5.002	30 Winter	100	+10%	30/15 Summer				
7.000	15 Winter	100	+10%	30/15 Summer				
8.000	15 Winter	100	+10%	30/15 Summer				
7.001	30 Winter	100	+10%	30/15 Summer				
9.000	30 Winter	100	+10%	100/15 Summer				
9.001	30 Winter	100	+10%	100/15 Summer				
5.003	30 Winter	100	+10%	30/15 Winter				
1.005	30 Winter	100	+10%	30/15 Summer				
1.006	30 Winter	100	+10%	30/15 Summer				
1.007	30 Winter	100	+10%	30/15 Summer				
1.008	30 Winter	100	+10%	100/15 Summer				

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	66.128	0.828	0.000	1.47	0.0	111.0	FLOOD RISK
1.001	2	65.697	0.797	0.000	0.71	0.0	97.9	SURCHARGED
2.000	3	65.570	0.730	0.000	0.05	0.0	3.7	FLOOD RISK
2.001	4	65.569	0.989	0.000	0.39	0.0	28.1	SURCHARGED
1.002	5	65.570	1.107	0.000	1.08	0.0	79.8	SURCHARGED
3.000	6	65.662	1.027	0.000	1.25	0.0	49.2	SURCHARGED
3.001	7	65.530	1.088	0.000	1.30	0.0	49.1	SURCHARGED
3.002	8	65.433	1.105	0.000	1.47	0.0	46.1	SURCHARGED
1.003	9	65.373	1.093	0.000	1.05	0.0	122.0	SURCHARGED
4.000	10	65.297	0.819	0.000	1.00	0.0	44.6	SURCHARGED
4.001	11	65.252	0.894	0.000	0.88	0.0	42.6	SURCHARGED
1.004	12	65.173	1.085	0.000	1.46	0.0	164.8	SURCHARGED
5.000	13	65.987	0.627	0.000	0.37	0.0	165.4	FLOOD RISK
6.000	14	66.054	0.454	0.000	0.53	0.0	245.4	FLOOD RISK
6.001	15	66.008	0.861	0.000	0.47	0.0	163.8	FLOOD RISK
6.002	16	65.984	0.911	0.000	0.46	0.0	159.5	FLOOD RISK
5.001	17	65.955	0.995	0.000	1.02	0.0	377.8	FLOOD RISK
5.002	18	65.688	1.280	0.000	1.54	0.0	482.1	SURCHARGED
7.000	19	65.961	0.861	0.000	1.15	0.0	122.8	FLOOD RISK
8.000	20	65.593	0.918	0.000	1.39	0.0	75.6	SURCHARGED
7.001	21	65.303	1.003	0.000	1.63	0.0	157.8	SURCHARGED
9.000	22	65.039	0.549	0.000	0.66	0.0	52.5	SURCHARGED
9.001	23	65.015	0.625	0.000	0.69	0.0	64.4	SURCHARGED
5.003	24	64.977	0.878	0.000	1.22	0.0	668.0	SURCHARGED
1.005	25	64.506	0.799	0.000	1.70	0.0	829.8	SURCHARGED
1.006	26	64.231	0.633	0.000	1.55	0.0	810.7	SURCHARGED
1.007	27	63.811	0.408	0.000	1.51	0.0	790.5	SURCHARGED
1.008	28	63.361	0.153	0.000	1.29	0.0	771.2	SURCHARGED

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	Add Flow / Climate Change (%)	10
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.300	Maximum Backdrop Height (m)	3.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	4-8	0.587	8-12	2.436	12-16	0.949

Total Area Contributing (ha) = 3.972

Total Pipe Volume (m³) = 304.148

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	80.000	0.588	136.0	0.339	5.00	0.0	0.600	o	300
1.001	22.000	0.164	134.0	0.000	0.00	0.0	0.600	o	300
2.000	52.000	0.208	250.0	0.011	5.00	0.0	0.600	o	300
2.001	21.000	0.084	250.0	0.000	0.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	49.76	5.99	65.000	0.339	0.0	0.0	4.6	1.35	95.2	50.3
1.001	48.86	6.26	64.412	0.339	0.0	0.0	4.6	1.36	95.9	50.3
2.000	50.00	5.88	64.540	0.011	0.0	0.0	0.1	0.99	70.0	1.6
2.001	48.96	6.23	64.332	0.011	0.0	0.0	0.1	0.99	70.0	1.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.002	35.000	0.140	250.0	0.030	0.00	0.0	0.600	o	300
3.000	29.000	0.193	150.0	0.154	5.00	0.0	0.600	o	225
3.001	17.000	0.113	150.0	0.032	0.00	0.0	0.600	o	225
3.002	8.000	0.053	150.0	0.000	0.00	0.0	0.600	o	225
1.003	48.000	0.148	325.0	0.038	0.00	0.0	0.600	o	375
4.000	12.000	0.080	150.0	0.153	5.00	0.0	0.600	o	225
4.001	27.000	0.180	150.0	0.000	0.00	0.0	0.600	o	225
1.004	110.000	0.364	302.0	0.078	0.00	0.0	0.600	o	450
5.000	80.000	0.250	320.0	0.541	5.00	0.0	0.600	o	450
6.000	86.000	0.562	153.0	0.747	5.00	0.0	0.600	o	450
6.001	14.000	0.092	153.0	0.000	0.00	0.0	0.600	o	450
6.002	22.000	0.147	150.0	0.000	0.00	0.0	0.600	o	450
5.001	98.000	0.245	400.0	0.489	0.00	0.0	0.600	o	525

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.002	47.02	6.85	64.248	0.380	0.0	0.0	4.8	0.99	70.0	53.2
3.000	50.00	5.45	65.000	0.154	0.0	0.0	2.1	1.07	42.4	22.9
3.001	50.00	5.72	64.807	0.186	0.0	0.0	2.5	1.07	42.4	27.7
3.002	50.00	5.84	64.693	0.186	0.0	0.0	2.5	1.07	42.4	27.7
1.003	44.79	7.65	64.033	0.604	0.0	0.0	7.3	1.00	110.4	80.6
4.000	50.00	5.19	65.000	0.153	0.0	0.0	2.1	1.07	42.4	22.8
4.001	50.00	5.61	64.920	0.153	0.0	0.0	2.1	1.07	42.4	22.8
1.004	41.06	9.22	63.810	0.835	0.0	0.0	9.3	1.16	185.2	102.1
5.000	49.13	6.18	64.280	0.541	0.0	0.0	7.2	1.13	179.9	79.2
6.000	50.00	5.87	64.830	0.747	0.0	0.0	10.1	1.64	261.0	111.3
6.001	49.67	6.02	64.268	0.747	0.0	0.0	10.1	1.64	261.0	111.3
6.002	48.94	6.24	64.176	0.747	0.0	0.0	10.1	1.66	263.6	111.3
5.001	44.65	7.70	63.955	1.777	0.0	0.0	21.5	1.11	241.1	236.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
5.002	133.000	0.266	500.0	0.548	0.00	0.0	0.600	o	600
7.000	80.000	0.364	220.0	0.371	5.00	0.0	0.600	o	300
8.000	30.000	0.289	103.8	0.062	5.00	0.0	0.600	o	225
7.001	20.000	0.061	330.0	0.000	0.00	0.0	0.600	o	375
9.000	12.000	0.060	200.0	0.154	5.00	0.0	0.600	o	300
9.001	35.000	0.175	200.0	0.035	0.00	0.0	0.600	o	300
5.003	47.000	0.072	650.0	0.113	0.00	0.0	0.600	o	750
1.005	49.000	0.089	550.0	0.077	0.00	0.0	0.600	o	750
1.006	88.000	0.160	550.0	0.000	0.00	0.0	0.600	o	750
1.007	88.000	0.160	550.0	0.000	0.00	0.0	0.600	o	750
1.008	89.000	0.162	550.0	0.000	0.00	0.0	0.600	o	750

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.002	39.98	9.75	63.635	2.325	0.0	0.0	25.2	1.08	306.0	276.9
7.000	48.85	6.26	65.000	0.371	0.0	0.0	4.9	1.06	74.6	54.0
8.000	50.00	5.39	65.000	0.062	0.0	0.0	0.8	1.28	51.0	9.2
7.001	47.78	6.60	64.561	0.433	0.0	0.0	5.6	0.99	109.5	61.6
9.000	50.00	5.18	65.000	0.154	0.0	0.0	2.1	1.11	78.3	22.9
9.001	50.00	5.71	64.940	0.189	0.0	0.0	2.6	1.11	78.3	28.2
5.003	38.61	10.47	63.219	3.060	0.0	0.0	32.0	1.09	481.6	351.9
1.005	37.40	11.16	63.146	3.972	0.0	0.0	40.2	1.19	524.0	442.5
1.006	35.44	12.40	63.057	3.972	0.0	0.0	40.2	1.19	524.0	442.5
1.007	33.72	13.63	62.897	3.972	0.0	0.0	40.2	1.19	524.0	442.5
1.008	32.17	14.88	62.737	3.972	0.0	0.0	40.2	1.19	524.0	442.5

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	66.180	1.180	1200	1.000	65.000	300				
2	66.180	1.768	1200	1.001	64.412	300	1.000	64.412	300	
3	65.760	1.220	1200	2.000	64.540	300				
4	66.500	2.168	1200	2.001	64.332	300	2.000	64.332	300	
5	66.330	2.082	1200	1.002	64.248	300	1.001	64.248	300	
							2.001	64.248	300	
6	66.180	1.180	1200	3.000	65.000	225				
7	66.180	1.373	1200	3.001	64.807	225	3.000	64.807	225	
8	66.180	1.487	1200	3.002	64.693	225	3.001	64.693	225	
9	66.480	2.447	1200	1.003	64.033	375	1.002	64.108	300	
							3.002	64.640	225	457
10	66.180	1.180	1200	4.000	65.000	225				
11	66.180	1.260	1200	4.001	64.920	225	4.000	64.920	225	
12	66.050	2.240	1200	1.004	63.810	450	1.003	63.885	375	
							4.001	64.740	225	705
13	66.080	1.800	1200	5.000	64.280	450				
14	66.180	1.350	1200	6.000	64.830	450				
15	66.180	1.912	1200	6.001	64.268	450	6.000	64.268	450	
16	66.180	2.004	1200	6.002	64.176	450	6.001	64.176	450	
17	66.080	2.125	1200	5.001	63.955	525	5.000	64.030	450	
							6.002	64.030	450	
18	66.340	2.705	1200	5.002	63.635	600	5.001	63.710	525	
19	66.180	1.180	1200	7.000	65.000	300				
20	66.180	1.180	1200	8.000	65.000	225				
21	66.180	1.619	1200	7.001	64.561	375	7.000	64.636	300	
							8.000	64.711	225	
22	66.180	1.180	1200	9.000	65.000	300				
23	66.180	1.240	1200	9.001	64.940	300	9.000	64.940	300	
24	66.210	2.991	1200	5.003	63.219	750	5.002	63.369	600	
							7.001	64.500	375	907
							9.001	64.765	300	1096
25	65.670	2.524	1200	1.005	63.146	750	1.004	63.446	450	
							5.003	63.146	750	1
26	65.250	2.193	1200	1.006	63.057	750	1.005	63.057	750	
27	64.500	1.603	1200	1.007	62.897	750	1.006	62.897	750	
28	64.400	1.663	1200	1.008	62.737	750	1.007	62.737	750	
	64.400	1.825	0		OUTFALL		1.008	62.575	750	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.000	o	300	1	66.180	65.000	0.880	1200
1.001	o	300	2	66.180	64.412	1.468	1200
2.000	o	300	3	65.760	64.540	0.920	1200
2.001	o	300	4	66.500	64.332	1.868	1200
1.002	o	300	5	66.330	64.248	1.782	1200
3.000	o	225	6	66.180	65.000	0.955	1200
3.001	o	225	7	66.180	64.807	1.148	1200
3.002	o	225	8	66.180	64.693	1.262	1200
1.003	o	375	9	66.480	64.033	2.072	1200
4.000	o	225	10	66.180	65.000	0.955	1200
4.001	o	225	11	66.180	64.920	1.035	1200
1.004	o	450	12	66.050	63.810	1.790	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.000	80.000	136.0	2	66.180	64.412	1.468	1200
1.001	22.000	134.0	5	66.330	64.248	1.782	1200
2.000	52.000	250.0	4	66.500	64.332	1.868	1200
2.001	21.000	250.0	5	66.330	64.248	1.782	1200
1.002	35.000	250.0	9	66.480	64.108	2.072	1200
3.000	29.000	150.0	7	66.180	64.807	1.148	1200
3.001	17.000	150.0	8	66.180	64.693	1.262	1200
3.002	8.000	150.0	9	66.480	64.640	1.615	1200
1.003	48.000	325.0	12	66.050	63.885	1.790	1200
4.000	12.000	150.0	11	66.180	64.920	1.035	1200
4.001	27.000	150.0	12	66.050	64.740	1.085	1200
1.004	110.000	302.0	25	65.670	63.446	1.774	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
5.000	o	450	13	66.080	64.280	1.350	1200
6.000	o	450	14	66.180	64.830	0.900	1200
6.001	o	450	15	66.180	64.268	1.462	1200
6.002	o	450	16	66.180	64.176	1.554	1200
5.001	o	525	17	66.080	63.955	1.600	1200
5.002	o	600	18	66.340	63.635	2.105	1200
7.000	o	300	19	66.180	65.000	0.880	1200
8.000	o	225	20	66.180	65.000	0.955	1200
7.001	o	375	21	66.180	64.561	1.244	1200
9.000	o	300	22	66.180	65.000	0.880	1200
9.001	o	300	23	66.180	64.940	0.940	1200
5.003	o	750	24	66.210	63.219	2.241	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
5.000	80.000	320.0	17	66.080	64.030	1.600	1200
6.000	86.000	153.0	15	66.180	64.268	1.462	1200
6.001	14.000	153.0	16	66.180	64.176	1.554	1200
6.002	22.000	150.0	17	66.080	64.030	1.600	1200
5.001	98.000	400.0	18	66.340	63.710	2.105	1200
5.002	133.000	500.0	24	66.210	63.369	2.241	1200
7.000	80.000	220.0	21	66.180	64.636	1.244	1200
8.000	30.000	103.8	21	66.180	64.711	1.244	1200
7.001	20.000	330.0	24	66.210	64.500	1.335	1200
9.000	12.000	200.0	23	66.180	64.940	0.940	1200
9.001	35.000	200.0	24	66.210	64.765	1.145	1200
5.003	47.000	650.0	25	65.670	63.146	1.774	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.005	o	750	25	65.670	63.146	1.774	1200
1.006	o	750	26	65.250	63.057	1.443	1200
1.007	o	750	27	64.500	62.897	0.853	1200
1.008	o	750	28	64.400	62.737	0.913	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
1.005	49.000	550.0	26	65.250	63.057	1.443	1200
1.006	88.000	550.0	27	64.500	62.897	0.853	1200
1.007	88.000	550.0	28	64.400	62.737	0.913	1200
1.008	89.000	550.0		64.400	62.575	1.075	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I Level (m)	D,L (mm)	W (mm)
1.008		64.400	62.575	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.300
Return Period (years)		2	Profile Type Summer
Region	Scotland and Ireland		Cv (Summer) 0.750
M5-60 (mm)		17.000	Cv (Winter) 0.840

Synthetic Rainfall Details

Storm Duration (mins) 30

Manhole Headloss for Storm

PN	US/MH Name	US/MH Headloss
1.000	1	0.500
1.001	2	0.500
2.000	3	0.500
2.001	4	0.500
1.002	5	0.500
3.000	6	0.500
3.001	7	0.500
3.002	8	0.500
1.003	9	0.500
4.000	10	0.500
4.001	11	0.500
1.004	12	0.500
5.000	13	0.500
6.000	14	0.500
6.001	15	0.500
6.002	16	0.500
5.001	17	0.500
5.002	18	0.500
7.000	19	0.500
8.000	20	0.500
7.001	21	0.500
9.000	22	0.500
9.001	23	0.500
5.003	24	0.500
1.005	25	0.500
1.006	26	0.500
1.007	27	0.500
1.008	28	0.500

Summary of Results for 100 year Return Period (+10%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	62.447	0.372	7.5	641.0	O K
30 min Summer	62.581	0.506	7.5	871.1	O K
60 min Summer	62.717	0.642	7.5	1105.6	O K
120 min Summer	62.866	0.791	7.9	1361.0	O K
180 min Summer	62.956	0.881	8.4	1517.0	O K
240 min Summer	63.023	0.948	8.7	1631.6	O K
360 min Summer	63.116	1.041	9.1	1792.1	O K
480 min Summer	63.180	1.105	9.4	1902.8	O K
600 min Summer	63.228	1.153	9.6	1984.3	O K
720 min Summer	63.264	1.189	9.7	2046.3	O K
960 min Summer	63.313	1.238	9.9	2131.6	O K
1440 min Summer	63.360	1.285	10.1	2212.5	O K
2160 min Summer	63.381	1.306	10.2	2248.1	O K
2880 min Summer	63.385	1.310	10.2	2255.5	O K
4320 min Summer	63.369	1.294	10.1	2227.0	O K
5760 min Summer	63.336	1.261	10.0	2170.6	O K
7200 min Summer	63.298	1.223	9.9	2105.0	O K
8640 min Summer	63.258	1.183	9.7	2036.8	O K
10080 min Summer	63.218	1.143	9.5	1968.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	84.856	27
30 min Summer	57.758	42
60 min Summer	36.862	72
120 min Summer	22.950	130
180 min Summer	17.245	190
240 min Summer	14.063	250
360 min Summer	10.515	368
480 min Summer	8.544	488
600 min Summer	7.269	606
720 min Summer	6.369	726
960 min Summer	5.167	964
1440 min Summer	3.847	1440
2160 min Summer	2.863	1808
2880 min Summer	2.320	2188
4320 min Summer	1.722	2988
5760 min Summer	1.393	3816
7200 min Summer	1.182	4680
8640 min Summer	1.033	5464
10080 min Summer	0.921	6352

Summary of Results for 100 year Return Period (+10%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
15 min Winter	62.492	0.417	7.5	718.6	O K
30 min Winter	62.642	0.567	7.5	976.5	O K
60 min Winter	62.795	0.720	7.6	1239.7	O K
120 min Winter	62.962	0.887	8.4	1527.2	O K
180 min Winter	63.065	0.990	8.9	1703.8	O K
240 min Winter	63.141	1.066	9.2	1834.1	O K
360 min Winter	63.248	1.173	9.7	2018.2	O K
480 min Winter	63.322	1.247	10.0	2146.6	O K
600 min Winter	63.378	1.303	10.2	2242.4	O K
720 min Winter	63.421	1.346	10.3	2316.5	O K
960 min Winter	63.482	1.407	10.6	2422.0	O K
1440 min Winter	63.548	1.473	10.8	2534.5	O K
2160 min Winter	63.575	1.500	10.9	2581.9	O K
2880 min Winter	63.575	1.500	10.9	2581.1	O K
4320 min Winter	63.548	1.473	10.8	2535.9	O K
5760 min Winter	63.496	1.421	10.6	2446.2	O K
7200 min Winter	63.435	1.360	10.4	2341.2	O K
8640 min Winter	63.372	1.297	10.2	2232.2	O K
10080 min Winter	63.310	1.235	9.9	2124.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	84.856	27
30 min Winter	57.758	41
60 min Winter	36.862	70
120 min Winter	22.950	128
180 min Winter	17.245	186
240 min Winter	14.063	246
360 min Winter	10.515	362
480 min Winter	8.544	478
600 min Winter	7.269	596
720 min Winter	6.369	712
960 min Winter	5.167	940
1440 min Winter	3.847	1388
2160 min Winter	2.863	2016
2880 min Winter	2.320	2284
4320 min Winter	1.722	3204
5760 min Winter	1.393	4144
7200 min Winter	1.182	5048
8640 min Winter	1.033	5896
10080 min Winter	0.921	6768

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.100	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+10

Time / Area Diagram

Total Area (ha) 4.070

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.357	4-8	1.357	8-12	1.357

Model Details

Storage is Online Cover Level (m) 64.000

Tank or Pond Structure

Invert Level (m) 62.075

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1721.2	1.500	1721.2	1.501	0.0

Hydro-Brake® Outflow Control

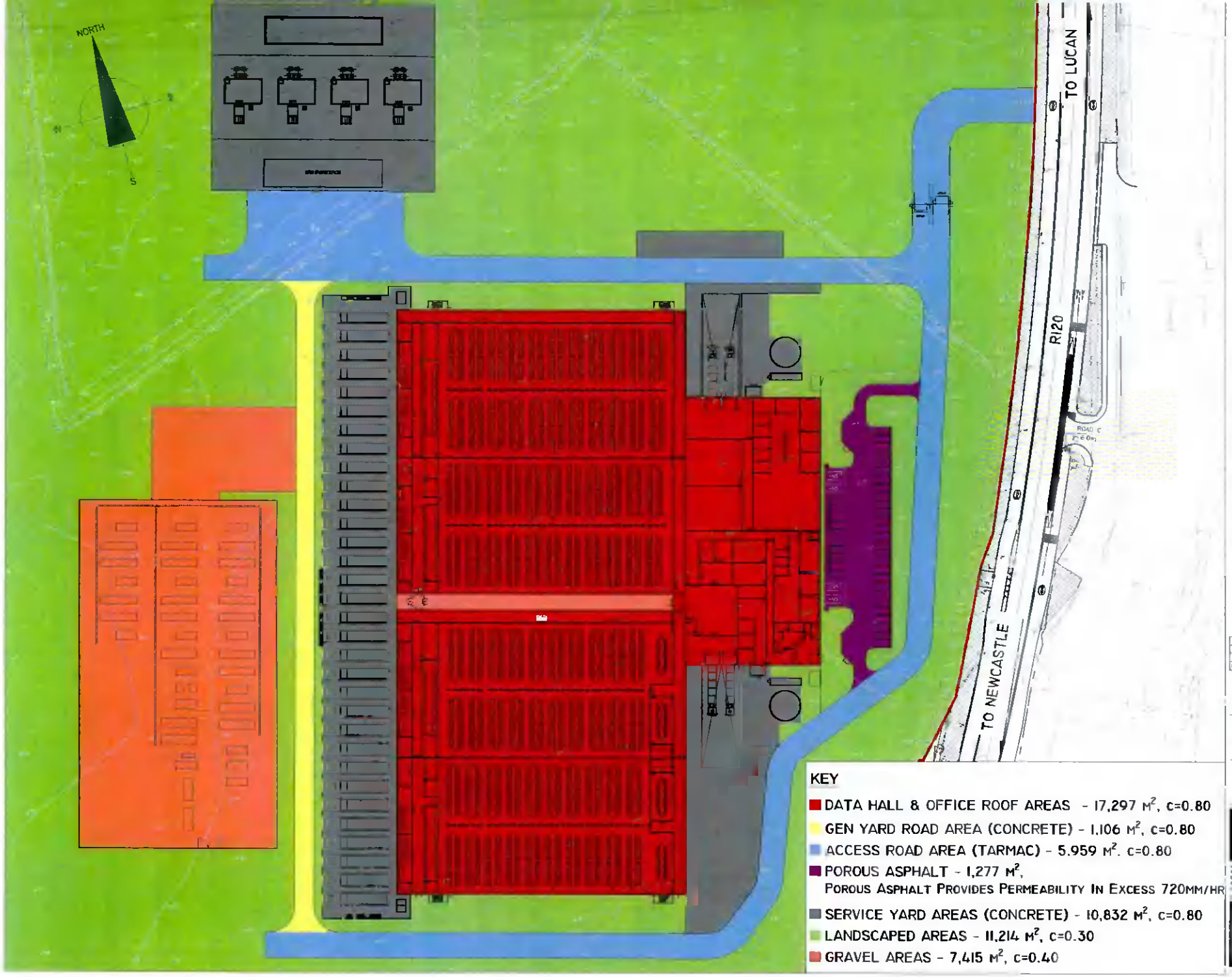
Design Head (m) 1.500 Hydro-Brake® Type Md4 Invert Level (m) 62.075
Design Flow (l/s) 11.0 Diameter (mm) 107

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	9.8	3.000	15.5	7.000	23.6
0.200	7.3	1.400	10.6	3.500	16.7	7.500	24.4
0.300	6.8	1.600	11.3	4.000	17.9	8.000	25.2
0.400	6.2	1.800	12.0	4.500	18.9	8.500	26.0
0.500	6.4	2.000	12.6	5.000	20.0	9.000	26.8
0.600	6.9	2.200	13.2	5.500	20.9	9.500	27.5
0.800	8.0	2.400	13.8	6.000	21.9		
1.000	8.9	2.600	14.4	6.500	22.8		

Appendix C

Dwg. No. P181103 – 210-SO-PO1

Areas Summary



REV	DESCRIPTION	BY	CHK	DATE

edgeconnex

PROJECT
BALLYMAKAILY TO THE WEST OF THE NEWCASTLE ROAD (R120) LUCAN CO. DUBLIN

DRAWING TITLE
AREAS SUMMARY

PINNACLE CONSULTING ENGINEERS

6TH PATRICK STREET
DUN LAOGHAIRE
COUNTY DUBLIN

PLANNING

SCALE	DATE	DRAWN BY	CHECKED
1:500	JAN '19	KR	

REVISION A1

Appendix D

Duraflow (Porous Asphalt)

roadstone

DURAFLOW POROUS ASPHALT

NOV 2017

SUSTAINABLE BITUMINOUS SURFACING SOLUTION

DURAFLOW™ SUSTAINABLE BITUMINOUS SURFACING SOLUTION

Description

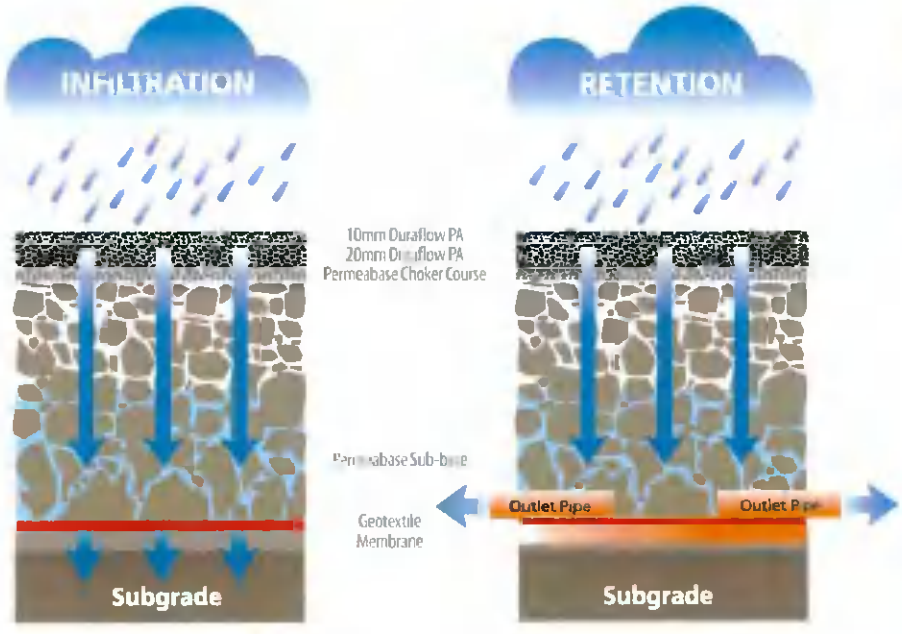
Duraflow™ porous asphalt has been designed by Roadstone for use as a surfacing solution for porous pavements and Sustainable Urban Drainage System (SUDS) applications. Duraflow™ has been designed to allow surface water to pass through it which then percolates into a stone subbase layer, PermeabaseT™. Water is discharged at a controlled rate into a water attenuation drainage system or infiltrates through other layers into the sub soil. Duraflow™ surface course has been designed by Roadstone using polymer modified bitumen and carefully selected high quality aggregates to maximise performance and durability. Roadstone can also supply Duraflow™ open graded base and binder course materials for complete porous pavement designs. The significant storage capacity of Porous asphalt pavement systems provides a cost-effective drainage solution for capturing and controlling the release of surface water.

PRODUCT SPECIFICATION

Duraflow™ porous asphalt is manufactured in accordance with the requirements of IS EN13108-7: Porous Asphalt and NSAI Standard Recommendation (SR) 28. This product is CE marked with conformity assessment operated in accordance with IS EN 13108-20: Type Testing and IS EN13108-21: Factory Production Control to a System 2+ certification.

DRAINAGE CAPACITY

The drainage capacity of Duraflow™ porous asphalt can be measured using the hydraulic conductivity test which shows how fast water drains away from the surface. The hydraulic conductivity of Duraflow™ is 0.2/s



Uses and Applications

Duraflow™ can be used for a wide range of applications including:

- Road Surfacing
- Car Parks
- Sports Surfaces
- Schools

DRAINAGE SYSTEM

Drainage System When selecting the type of drainage system (infiltration or retention) at the design stage, it is important that the sub soil permeability and California Bearing Ratio (CBR) is considered. It is possible to have a combined drainage system for porous pavement systems. An appropriate Geotextile/Geogrid must also be selected for the elected system.

MIX PERFORMANCE

Duraflow™ porous asphalt is designed in Roadstone's UKAS accredited R&D facility to provide a tough and durable surfacing solution.

PAVEMENT LAYERS (MIN THICKNESS)*

For car and light vehicle loadings:

- Duraflow™ surface course - 40mm
- Duraflow™ binder course - 80mm
- Permeabase™ choker course - 30mm
- Permeabase™ sub base - 220mm

The ultimate solution for porous pavements and SUDS applications

FEATURES AND BENEFITS

- Sustainable environmentally friendly solution for rainwater management
- A reduction in the need for permanent drainage, associated ironworks, piping, surface water sewers and balancing ponds
- Quick to install
- Facilitates re-use of rain water
- Drains the water quickly, eliminating standing water
- Reduced surface spray
- Less chance of ice forming
- Acts as a balancing pond/underground reservoir to reduce the risk of flooding
- Filters pollutants from the water
- Easy maintenance using appropriate cleaning plant, without the need for any reconstruction or disturbance to the pavement
- DuroflowTM is 100% Recyclable
- Specially designed using polymer modified bitumen and high quality aggregates

REDUCING OUR CARBON FOOTPRINT

Roadstone continuously strives to achieve reductions in the carbon footprint of our product range through our certified management systems, ISO50001: 2011 (Energy Management System) and ISO14001: 2004 (Environmental Management System). Reductions in our Carbon Footprint have been achieved through new product development, process and energy efficiencies, recycling and reductions in waste.

www.roadstone.ie

ROADSTONE LTD.
Contracts Division
Phone: +353 (0)1 4041200
Email: info@roadstone.ie

NORWICH
Pinnacle House
3 Meridian Way
Norwich
NR7 0TA

PHONE
01603 327 170

EMAIL
norwich@ukpinnacle.com

WELWYN GARDEN CITY
Mercury House
Broadwater Road
Welwyn Garden City
AL7 3BQ

PHONE
01707 527 630

EMAIL
welwyn@ukpinnacle.com

LONDON
Woolverstone House
61 Berners Street
London
W1T 3NJ

PHONE
0207 043 3410

EMAIL
london@ukpinnacle.com

BRISTOL
Prudential Buildings
11-19 Wine Street
Bristol
BS1 2PH

PHONE
0117 214 0860

EMAIL
bristol@ukpinnacle.com

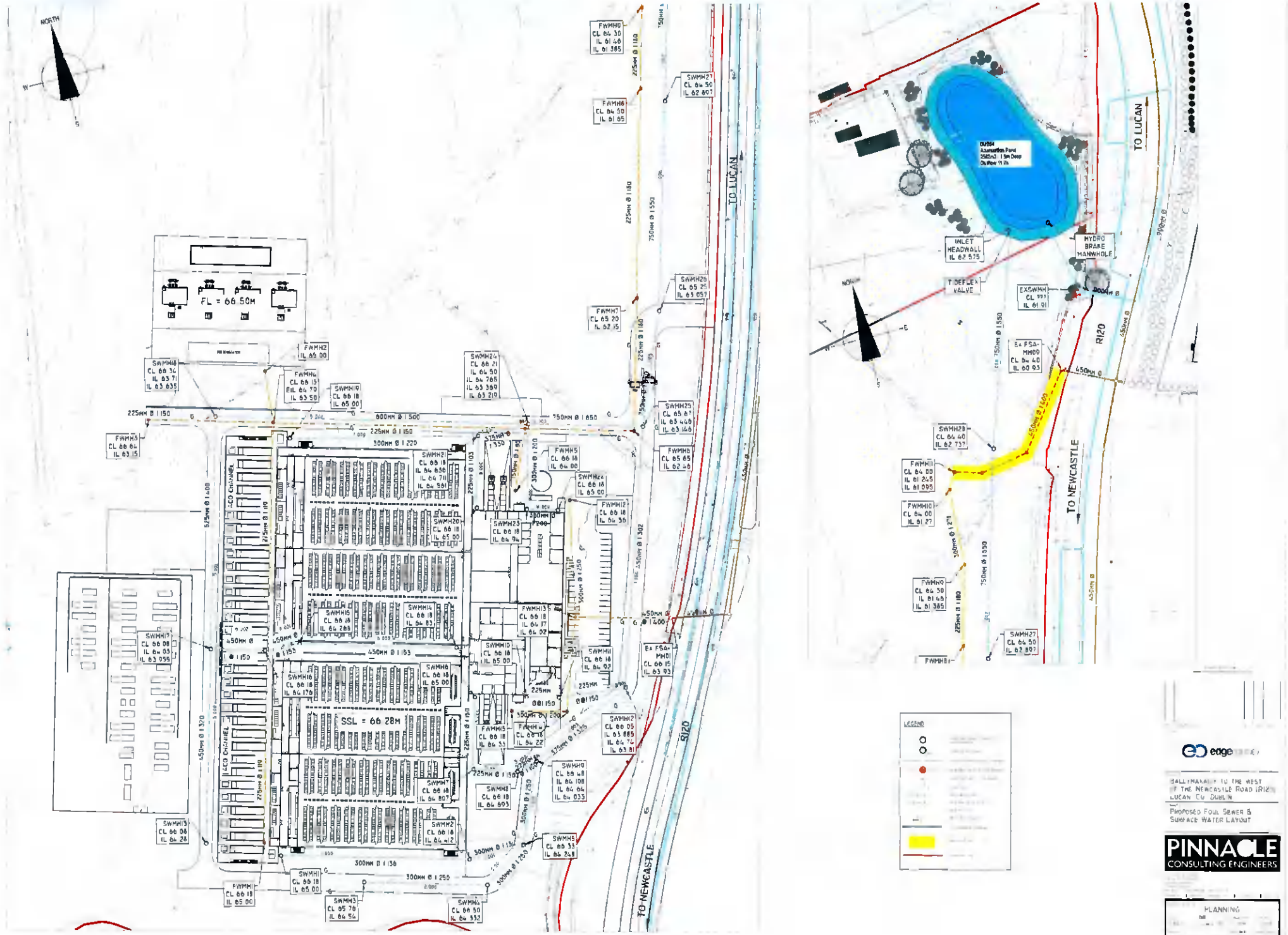
DUBLIN
Grosvenor Court
67a Patrick Street
Dun Laoghaire
Co Dublin

PHONE
+353 1231 1041

EMAIL
dublin@iepinnacle.com

www.pinnacleconsultingengineers.com

Appendix B – Permitted data centre site drawings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TO NEWCASTLE
R120
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HYDRO BRAKE MANHOLE
TIDEFLEX VALVE
EXSWMH CL 999 IL 61.91
SWMH28 CL 64.40 IL 62.737
SWMH27 CL 64.50 IL 62.897
FWMH9 CL 64.30 IL 61.48 IL 61.385
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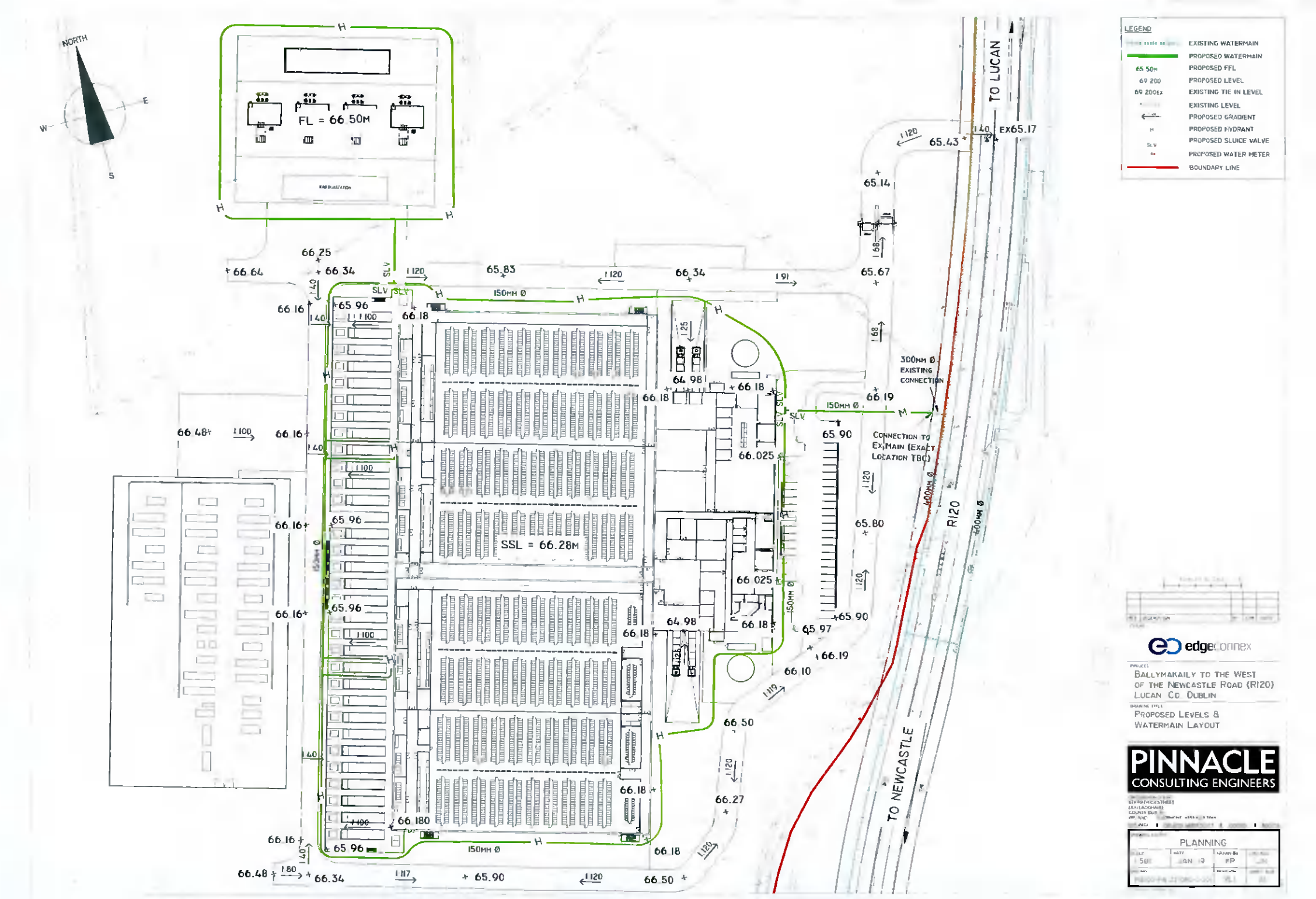
FWMH10 CL 64.00 IL 61.27
LEGEND
BALLYMANAGH TO THE WEST OF THE NEWCASTLE ROAD (R120) LUCAN CO. DUBLIN
PROPOSED FOUL SEWER & SURFACE WATER LAYOUT
PINNACLE CONSULTING ENGINEERS
PLANNING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SSL = 66.28M
TO LUCAN
TO NEWCASTLE
R120
150MM Ø
300MM Ø EXISTING CONNECTION
CONNECTION TO EX. MAIN (EXACT LOCATION TBC)
400MM Ø
Ex65.17
65.43
65.14
65.67
66.25
66.64
66.34
65.83
66.16
65.96
66.18
64.98
66.025
66.19
65.90
65.80
65.97
66.10
66.50
66.27
66.48
66.180
65.90
LEGEND
EXISTING WATERMAIN
PROPOSED WATERMAIN
65.50M PROPOSED FFL
69.200 PROPOSED LEVEL
69.200EX EXISTING TIE IN LEVEL
EXISTING LEVEL
PROPOSED GRADIENT
PROPOSED HYDRANT
SLV PROPOSED SLUICE VALVE
PROPOSED WATER METER
BOUNDARY LINE
edgeconnex
BALLYMAKAILY TO THE WEST OF THE NEWCASTLE ROAD (R120) LUCAN CO. DUBLIN
PROPOSED LEVELS & WATERMAIN LAYOUT
PINNACLE CONSULTING ENGINEERS
PLANNING

Appendix C – Surface water drainage calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	6.270	Urban	0.750
SAAR (mm)	754	Region Number	Ireland Greater Dublin

Results l/s

QBAR Rural	12.5
QBAR Urban	38.7
Q100 years	73.9
Q1 year	32.9
Q30 years	68.4
Q100 years	73.9

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes Default Manhole Sizes Default

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	10
Ratio R	0.300	Minimum Backdrop Height (m)	0.075
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.196	4-8	0.539	8-12	0.087

Total Area Contributing (ha) = 0.821

Total Pipe Volume (m³) = 43.912

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	64.279	0.257	250.0	0.106	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	26.750	0.107	250.0	0.057	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	14.122	0.071	200.0	0.027	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	64.592	0.258	250.0	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	21.672	0.090	240.0	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	49.45	6.08	64.961	0.106	0.0	0.0	1.4	0.99	70.0	15.7
1.001	47.99	6.53	64.704	0.164	0.0	0.0	2.1	0.99	70.0	23.4
2.000	50.00	5.26	65.001	0.027	0.0	0.0	0.4	0.92	36.6	4.1
2.001	48.59	6.34	64.855	0.128	0.0	0.0	1.7	0.99	70.0	18.5
1.002	46.90	6.89	64.597	0.341	0.0	0.0	4.3	1.01	71.4	47.7

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.003	81.747	0.204	400.0	0.094	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.000	53.126	0.213	250.0	0.061	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	42.395	0.121	350.0	0.063	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	53.126	0.213	250.0	0.158	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	18.349	0.061	300.0	0.030	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.000	11.103	0.044	250.0	0.017	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	29.640	0.099	300.0	0.024	0.00	0.0	0.600	o	375	Pipe/Conduit	
6.000	24.057	0.096	250.0	0.026	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.007	26.243	0.087	300.0	0.008	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)
1.003	42.90	8.40	64.432	0.436	0.0	0.0	5.1	0.90	99.4	55.7
3.000	50.00	5.89	64.516	0.061	0.0	0.0	0.8	0.99	70.0	9.0
1.004	41.25	9.14	64.228	0.559	0.0	0.0	6.2	0.96	106.3	68.7
4.000	50.00	5.89	64.395	0.158	0.0	0.0	2.1	0.99	70.0	23.5
1.005	40.63	9.43	64.107	0.747	0.0	0.0	8.2	1.04	115.0	90.4
5.000	50.00	5.23	64.164	0.017	0.0	0.0	0.2	0.82	32.7	2.5
1.006	39.67	9.91	64.045	0.788	0.0	0.0	8.5	1.04	115.0	93.1
6.000	50.00	5.49	64.193	0.026	0.0	0.0	0.3	0.82	32.7	3.8
1.007	38.87	10.33	63.947	0.821	0.0	0.0	8.6	1.04	115.0	95.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SW 1-1	66.141	1.180	Open Manhole	1200	1.000	64.961	300				
SW 1-2	66.481	1.777	Open Manhole	1200	1.001	64.704	300	1.000	64.704	300	
SW 1-4	66.145	1.144	Open Manhole	1200	2.000	65.001	225				
SW 1-5	66.126	1.271	Open Manhole	1200	2.001	64.855	300	2.000	64.930	225	
SW 1-3	66.324	1.727	Open Manhole	1200	1.002	64.597	300	1.001	64.597	300	
								2.001	64.597	300	
SW 1-6	66.092	1.660	Open Manhole	1350	1.003	64.432	375	1.002	64.507	300	
SW 1-8	66.037	1.521	Open Manhole	1200	3.000	64.516	300				
SW 1-7	65.953	1.726	Open Manhole	1350	1.004	64.228	375	1.003	64.228	375	
								3.000	64.303	300	1
SW 1-10	66.084	1.689	Open Manhole	1200	4.000	64.395	300				
SW 1-9	65.949	1.842	Open Manhole	1350	1.005	64.107	375	1.004	64.107	375	
								4.000	64.182	300	1
SW 1-12	66.186	2.022	Open Manhole	1200	5.000	64.164	225				
SW 1-11	66.096	2.051	Open Manhole	1350	1.006	64.045	375	1.005	64.045	375	
								5.000	64.120	225	
SW 1-14	66.853	2.660	Open Manhole	1200	6.000	64.193	225				
SWMH18	66.761	2.814	Open Manhole	1350	1.007	63.947	375	1.006	63.947	375	
								6.000	64.097	225	
SWMH18	66.106	2.246	Open Manhole	1200		OUTFALL		1.007	63.860	375	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW 1-1	702573.111	731983.951	702573.111	731983.951	Required	
SW 1-2	702591.019	732045.684	702591.019	732045.684	Required	
SW 1-4	702585.523	731971.130	702585.523	731971.130	Required	
SW 1-5	702598.703	731976.201	702598.703	731976.201	Required	
SW 1-3	702616.709	732038.232	702616.709	732038.232	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW 1-6	702637.536	732032.236	702637.536	732032.236	Required	
SW 1-8	702563.774	731968.544	702563.774	731968.544	Required	
SW 1-7	702614.790	731953.718	702614.790	731953.718	Required	
SW 1-10	702551.976	731927.797	702551.976	731927.797	Required	
SW 1-9	702602.998	731912.996	702602.998	731912.996	Required	
SW 1-12	702594.744	731884.725	702594.744	731884.725	Required	
SW 1-11	702597.866	731895.380	702597.866	731895.380	Required	
SW 1-14	702546.297	731910.345	702546.297	731910.345	Required	
SWMH18	702569.410	731903.673	702569.410	731903.673	Required	
SWMH18	702562.186	731878.444			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	SW 1-1	66.141	64.961	0.880	Open Manhole	1200
1.001	o	300	SW 1-2	66.481	64.704	1.477	Open Manhole	1200
2.000	o	225	SW 1-4	66.145	65.001	0.919	Open Manhole	1200
2.001	o	300	SW 1-5	66.126	64.855	0.971	Open Manhole	1200
1.002	o	300	SW 1-3	66.324	64.597	1.427	Open Manhole	1200
1.003	o	375	SW 1-6	66.092	64.432	1.285	Open Manhole	1350
3.000	o	300	SW 1-8	66.037	64.516	1.221	Open Manhole	1200
1.004	o	375	SW 1-7	65.953	64.228	1.351	Open Manhole	1350
4.000	o	300	SW 1-10	66.084	64.395	1.389	Open Manhole	1200
1.005	o	375	SW 1-9	65.949	64.107	1.467	Open Manhole	1350
5.000	o	225	SW 1-12	66.186	64.164	1.797	Open Manhole	1200
1.006	o	375	SW 1-11	66.096	64.045	1.676	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)
1.000	64.279	250.0	SW 1-2	66.481	64.704	1.477	Open Manhole	1200
1.001	26.750	250.0	SW 1-3	66.324	64.597	1.427	Open Manhole	1200
2.000	14.122	200.0	SW 1-5	66.126	64.930	0.971	Open Manhole	1200
2.001	64.592	250.0	SW 1-3	66.324	64.597	1.427	Open Manhole	1200
1.002	21.672	240.0	SW 1-6	66.092	64.507	1.285	Open Manhole	1350
1.003	81.747	400.0	SW 1-7	65.953	64.228	1.351	Open Manhole	1350
3.000	53.126	250.0	SW 1-7	65.953	64.303	1.350	Open Manhole	1350
1.004	42.395	350.0	SW 1-9	65.949	64.107	1.467	Open Manhole	1350
4.000	53.126	250.0	SW 1-9	65.949	64.182	1.466	Open Manhole	1350
1.005	18.349	300.0	SW 1-11	66.096	64.045	1.676	Open Manhole	1350
5.000	11.103	250.0	SW 1-11	66.096	64.120	1.752	Open Manhole	1350
1.006	29.640	300.0	SWMH18	66.761	63.947	2.439	Open Manhole	1350

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)
6.000	o	225	SW 1-14	66.853	64.193	2.435	Open Manhole	1200
1.007	o	375	SWMH18	66.761	63.947	2.439	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)
6.000	24.057	250.0	SWMH18	66.761	64.097	2.439	Open Manhole	1350
1.007	26.243	300.0	SWMH18	66.106	63.860	1.871	Open Manhole	1200

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.043	0.043	0.043
	User	-	50	0.022	0.011	0.053
	User	-	90	0.059	0.053	0.106
1.001	User	-	90	0.057	0.052	0.052
	User	-	50	0.012	0.006	0.057
2.000	User	-	90	0.021	0.019	0.019
	User	-	50	0.017	0.008	0.027
2.001	User	-	100	0.039	0.039	0.039
	User	-	90	0.046	0.041	0.080
	User	-	50	0.040	0.020	0.100
1.002	User	-	50	0.019	0.009	0.009
	User	-	90	0.037	0.033	0.042
	User	-	50	0.015	0.008	0.050
1.003	User	-	50	0.048	0.024	0.024
	User	-	90	0.063	0.057	0.081
	User	-	50	0.027	0.013	0.094
3.000	User	-	90	0.036	0.033	0.033
	User	-	50	0.013	0.007	0.039
	User	-	50	0.043	0.021	0.061
1.004	User	-	50	0.011	0.006	0.006
	User	-	70	0.021	0.015	0.021
	User	-	90	0.041	0.037	0.057
	User	-	50	0.010	0.005	0.063
4.000	User	-	50	0.055	0.027	0.027
	User	-	50	0.035	0.018	0.045
	User	-	90	0.069	0.062	0.107
	User	-	90	0.039	0.035	0.142
	User	-	100	0.016	0.016	0.158
1.005	User	-	50	0.009	0.004	0.004
	User	-	90	0.025	0.023	0.027
	User	-	50	0.006	0.003	0.030
5.000	User	-	90	0.017	0.015	0.015
	User	-	50	0.003	0.002	0.017
1.006	User	-	100	0.006	0.006	0.006
	User	-	50	0.035	0.018	0.024
6.000	User	-	100	0.004	0.004	0.004
	User	-	50	0.043	0.021	0.026
1.007	User	-	50	0.016	0.008	0.008
				Total	Total	Total
				1.118	0.821	0.821

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
1.000	SW 1-1	300	0.880	1.477	Unclassified	1200	0	0.880	Unclassified
1.001	SW 1-2	300	1.427	1.477	Unclassified	1200	0	1.477	Unclassified
2.000	SW 1-4	225	0.919	0.971	Unclassified	1200	0	0.919	Unclassified
2.001	SW 1-5	300	0.971	1.427	Unclassified	1200	0	0.971	Unclassified
1.002	SW 1-3	300	1.285	1.427	Unclassified	1200	0	1.427	Unclassified
1.003	SW 1-6	375	1.285	1.351	Unclassified	1350	0	1.285	Unclassified
3.000	SW 1-8	300	1.221	1.350	Unclassified	1200	0	1.221	Unclassified
1.004	SW 1-7	375	1.351	1.467	Unclassified	1350	0	1.351	Unclassified
4.000	SW 1-10	300	1.389	1.466	Unclassified	1200	0	1.389	Unclassified
1.005	SW 1-9	375	1.467	1.676	Unclassified	1350	0	1.467	Unclassified
5.000	SW 1-12	225	1.752	1.797	Unclassified	1200	0	1.797	Unclassified
1.006	SW 1-11	375	1.676	2.439	Unclassified	1350	0	1.676	Unclassified
6.000	SW 1-14	225	2.435	2.439	Unclassified	1200	0	2.435	Unclassified
1.007	SWMH18	375	1.871	2.439	Unclassified	1350	0	2.439	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SWMH18	66.106	63.860	0.000	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	15
Ratio R	0.300		

Manhole Headloss for Storm

PN	US/MH Name	US/MH Headloss
1.000	SW 1-1	0.500
1.001	SW 1-2	0.500
2.000	SW 1-4	0.500
2.001	SW 1-5	0.500
1.002	SW 1-3	0.500
1.003	SW 1-6	0.500
3.000	SW 1-8	0.500
1.004	SW 1-7	0.500
4.000	SW 1-10	0.500
1.005	SW 1-9	0.500
5.000	SW 1-12	0.500
1.006	SW 1-11	0.500
6.000	SW 1-14	0.500
1.007	SWMH18	0.500

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.300
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	150.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW 1-1	15 Winter	1	+0%	100/15 Winter				65.050
1.001	SW 1-2	15 Winter	1	+0%	100/15 Summer				64.812
2.000	SW 1-4	15 Winter	1	+0%	100/15 Winter				65.049
2.001	SW 1-5	15 Winter	1	+0%	100/15 Winter				64.946
1.002	SW 1-3	15 Winter	1	+0%	30/15 Winter				64.754
1.003	SW 1-6	15 Winter	1	+0%	100/15 Summer				64.606
3.000	SW 1-8	15 Winter	1	+0%	100/15 Summer				64.582
1.004	SW 1-7	15 Winter	1	+0%	30/15 Winter				64.413
4.000	SW 1-10	15 Winter	1	+0%	100/15 Summer				64.504
1.005	SW 1-9	15 Winter	1	+0%	30/15 Summer				64.321
5.000	SW 1-12	15 Winter	1	+0%	30/15 Summer				64.257
1.006	SW 1-11	15 Winter	1	+0%	30/15 Winter				64.255
6.000	SW 1-14	15 Winter	1	+0%	100/15 Winter				64.241
1.007	SWMH18	15 Winter	1	+0%	30/15 Winter				64.161

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW 1-1	-0.211	0.000	0.18			12.0	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SW 1-2	-0.192	0.000	0.27			17.1	OK	
2.000	SW 1-4	-0.177	0.000	0.10			3.2	OK	
2.001	SW 1-5	-0.209	0.000	0.19			12.7	OK	
1.002	SW 1-3	-0.143	0.000	0.53			33.6	OK	
1.003	SW 1-6	-0.201	0.000	0.41			39.0	OK	
3.000	SW 1-8	-0.234	0.000	0.11			7.0	OK	
1.004	SW 1-7	-0.190	0.000	0.48			46.9	OK	
4.000	SW 1-10	-0.191	0.000	0.27			18.1	OK	
1.005	SW 1-9	-0.161	0.000	0.62			58.9	OK	
5.000	SW 1-12	-0.132	0.000	0.07			1.8	OK	
1.006	SW 1-11	-0.165	0.000	0.60			60.7	OK	
6.000	SW 1-14	-0.177	0.000	0.10			3.0	OK	
1.007	SWMH18	-0.161	0.000	0.62			61.9	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.300
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	150.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW 1-1	15 Winter	30	+0%	100/15 Winter				65.098
1.001	SW 1-2	15 Winter	30	+0%	100/15 Summer				64.951
2.000	SW 1-4	15 Winter	30	+0%	100/15 Winter				65.074
2.001	SW 1-5	15 Winter	30	+0%	100/15 Winter				65.011
1.002	SW 1-3	15 Winter	30	+0%	30/15 Winter				64.910
1.003	SW 1-6	15 Winter	30	+0%	100/15 Summer				64.744
3.000	SW 1-8	30 Winter	30	+0%	100/15 Summer				64.628
1.004	SW 1-7	30 Winter	30	+0%	30/15 Winter				64.618
4.000	SW 1-10	15 Winter	30	+0%	100/15 Summer				64.570
1.005	SW 1-9	30 Winter	30	+0%	30/15 Summer				64.525
5.000	SW 1-12	30 Winter	30	+0%	30/15 Summer				64.451
1.006	SW 1-11	30 Winter	30	+0%	30/15 Winter				64.448
6.000	SW 1-14	30 Winter	30	+0%	100/15 Winter				64.337
1.007	SWMH18	30 Winter	30	+0%	30/15 Winter				64.330

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW 1-1	-0.163	0.000	0.40			26.7	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SW 1-2	-0.053	0.000	0.55			34.4	OK	
2.000	SW 1-4	-0.152	0.000	0.22			7.2	OK	
2.001	SW 1-5	-0.144	0.000	0.50			33.2	OK	
1.002	SW 1-3	0.013	0.000	1.13			71.0	SURCHARGED	
1.003	SW 1-6	-0.063	0.000	0.86			81.0	OK	
3.000	SW 1-8	-0.188	0.000	0.19			12.7	OK	
1.004	SW 1-7	0.015	0.000	0.88			85.7	SURCHARGED	
4.000	SW 1-10	-0.125	0.000	0.61			40.2	OK	
1.005	SW 1-9	0.044	0.000	1.12			106.8	SURCHARGED	
5.000	SW 1-12	0.062	0.000	0.12			3.2	SURCHARGED	
1.006	SW 1-11	0.028	0.000	1.09			110.9	SURCHARGED	
6.000	SW 1-14	-0.081	0.000	0.18			5.3	OK	
1.007	SWMH18	0.008	0.000	1.14			114.1	SURCHARGED	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.300
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	150.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW 1-1	15 Winter	100	+10%	100/15 Winter				65.344
1.001	SW 1-2	15 Winter	100	+10%	100/15 Summer				65.305
2.000	SW 1-4	15 Winter	100	+10%	100/15 Winter				65.312
2.001	SW 1-5	15 Winter	100	+10%	100/15 Winter				65.302
1.002	SW 1-3	15 Winter	100	+10%	30/15 Winter				65.264
1.003	SW 1-6	15 Winter	100	+10%	100/15 Summer				65.156
3.000	SW 1-8	15 Winter	100	+10%	100/15 Summer				65.005
1.004	SW 1-7	15 Winter	100	+10%	30/15 Winter				64.987
4.000	SW 1-10	30 Winter	100	+10%	100/15 Summer				64.887
1.005	SW 1-9	30 Winter	100	+10%	30/15 Summer				64.831
5.000	SW 1-12	30 Winter	100	+10%	30/15 Summer				64.686
1.006	SW 1-11	30 Winter	100	+10%	30/15 Winter				64.681
6.000	SW 1-14	30 Winter	100	+10%	100/15 Winter				64.456
1.007	SWMH18	30 Winter	100	+10%	30/15 Winter				64.445

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW 1-1	0.083	0.000	0.55			36.7	SURCHARGED	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SW 1-2	0.301	0.000	0.58			36.5	SURCHARGED	
2.000	SW 1-4	0.086	0.000	0.30			9.7	SURCHARGED	
2.001	SW 1-5	0.147	0.000	0.65			43.6	SURCHARGED	
1.002	SW 1-3	0.368	0.000	1.28			80.6	SURCHARGED	
1.003	SW 1-6	0.349	0.000	1.03			97.4	SURCHARGED	
3.000	SW 1-8	0.189	0.000	0.32			21.0	SURCHARGED	
1.004	SW 1-7	0.384	0.000	1.15			111.7	SURCHARGED	
4.000	SW 1-10	0.192	0.000	0.68			44.7	SURCHARGED	
1.005	SW 1-9	0.350	0.000	1.57			149.2	SURCHARGED	
5.000	SW 1-12	0.297	0.000	0.15			4.0	SURCHARGED	
1.006	SW 1-11	0.260	0.000	1.54			155.8	SURCHARGED	
6.000	SW 1-14	0.038	0.000	0.23			7.1	SURCHARGED	
1.007	SWMH18	0.123	0.000	1.61			160.9	SURCHARGED	

Summary of Results for 100 year Return Period (+10%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	62.313	0.238	11.5	0.0	11.5	341.1	O K
30 min Summer	62.464	0.389	12.4	0.0	12.4	568.9	O K
60 min Summer	62.606	0.531	12.5	0.0	12.5	794.7	O K
120 min Summer	62.842	0.767	12.5	0.0	12.5	1187.0	O K
180 min Summer	63.054	0.979	12.5	0.0	12.5	1563.5	O K
240 min Summer	63.140	1.065	12.5	0.0	12.5	1722.0	O K
360 min Summer	63.256	1.181	12.5	0.0	12.5	1942.4	O K
480 min Summer	63.296	1.221	12.5	0.0	12.5	2020.2	O K
600 min Summer	63.350	1.275	12.5	0.0	12.5	2126.3	O K
720 min Summer	63.411	1.336	12.5	0.0	12.5	2246.7	O K
960 min Summer	63.436	1.361	12.5	0.0	12.5	2297.5	O K
1440 min Summer	63.494	1.419	12.5	0.0	12.5	2415.5	O K
2160 min Summer	63.492	1.417	12.5	0.0	12.5	2410.5	O K
2880 min Summer	63.484	1.409	12.5	0.0	12.5	2393.4	O K
4320 min Summer	63.443	1.368	12.5	0.0	12.5	2311.8	O K
5760 min Summer	63.392	1.317	12.5	0.0	12.5	2209.5	O K
7200 min Summer	63.338	1.263	12.5	0.0	12.5	2101.1	O K
8640 min Summer	63.281	1.206	12.5	0.0	12.5	1990.0	O K
10080 min Summer	63.221	1.146	12.5	0.0	12.5	1875.9	O K
15 min Winter	62.338	0.263	11.8	0.0	11.8	377.1	O K
30 min Winter	62.512	0.437	12.5	0.0	12.5	644.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	84.324	0.0	313.4	0.0	27
30 min Summer	57.437	0.0	536.7	0.0	41
60 min Summer	36.662	0.0	801.1	0.0	70
120 min Summer	22.829	0.0	1209.3	0.0	130
180 min Summer	17.157	0.0	1736.5	0.0	328
240 min Summer	13.990	0.0	1858.5	0.0	384
360 min Summer	10.461	0.0	1885.4	0.0	480
480 min Summer	8.501	0.0	1855.8	0.0	580
600 min Summer	7.233	0.0	1822.2	0.0	684
720 min Summer	6.337	0.0	1790.9	0.0	794
960 min Summer	5.141	0.0	1752.3	0.0	1008
1440 min Summer	3.827	0.0	1711.5	0.0	1458
2160 min Summer	2.849	0.0	3554.0	0.0	1920
2880 min Summer	2.308	0.0	3570.1	0.0	2304
4320 min Summer	1.714	0.0	3274.1	0.0	3116
5760 min Summer	1.386	0.0	4764.8	0.0	3944
7200 min Summer	1.176	0.0	5047.6	0.0	4784
8640 min Summer	1.028	0.0	5286.5	0.0	5616
10080 min Summer	0.917	0.0	5486.1	0.0	6456
15 min Winter	84.324	0.0	348.2	0.0	26
30 min Winter	57.437	0.0	607.9	0.0	41

Summary of Results for 100 year Return Period (+10%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	62.846	0.771	12.5	0.0	12.5	1195.2	O K
120 min Winter	63.053	0.978	12.5	0.0	12.5	1561.4	O K
180 min Winter	63.024	0.949	12.5	0.0	12.5	1509.1	O K
240 min Winter	63.257	1.182	12.5	0.0	12.5	1944.5	O K
360 min Winter	63.376	1.301	12.5	0.0	12.5	2177.9	O K
480 min Winter	63.438	1.363	12.5	0.0	12.5	2300.4	O K
600 min Winter	63.463	1.388	12.5	0.0	12.5	2352.0	O K
720 min Winter	63.538	1.463	12.5	0.0	12.5	2505.1	O K
960 min Winter	63.593	1.518	12.5	0.0	12.5	2620.4	O K
1440 min Winter	63.666	1.591	12.5	0.0	12.5	2777.3	O K
2160 min Winter	63.685	1.610	12.5	0.0	12.5	2818.3	O K
2880 min Winter	63.665	1.590	12.5	0.0	12.5	2774.0	O K
4320 min Winter	63.607	1.532	12.5	0.0	12.5	2649.7	O K
5760 min Winter	63.531	1.456	12.5	0.0	12.5	2490.3	O K
7200 min Winter	63.447	1.372	12.5	0.0	12.5	2318.6	O K
8640 min Winter	63.358	1.283	12.5	0.0	12.5	2141.3	O K
10080 min Winter	63.265	1.190	12.5	0.0	12.5	1958.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	36.662	0.0	1367.2	0.0	202
120 min Winter	22.829	0.0	1717.2	0.0	270
180 min Winter	17.157	0.0	1542.4	0.0	186
240 min Winter	13.990	0.0	1913.8	0.0	382
360 min Winter	10.461	0.0	1874.5	0.0	480
480 min Winter	8.501	0.0	1843.2	0.0	582
600 min Winter	7.233	0.0	1820.2	0.0	684
720 min Winter	6.337	0.0	1802.6	0.0	788
960 min Winter	5.141	0.0	1786.0	0.0	1002
1440 min Winter	3.827	0.0	1803.4	0.0	1442
2160 min Winter	2.849	0.0	3748.4	0.0	2080
2880 min Winter	2.308	0.0	3646.0	0.0	2432
4320 min Winter	1.714	0.0	3428.6	0.0	3332
5760 min Winter	1.386	0.0	5335.8	0.0	4264
7200 min Winter	1.176	0.0	5651.2	0.0	5168
8640 min Winter	1.028	0.0	5913.4	0.0	6072
10080 min Winter	0.917	0.0	6113.9	0.0	6976

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+10

Pipe Network

Volume in Pipe Network (m³)	350	Dia of Outfall Pipe (m)	0.3
Slope of Outfall Pipe (1:X)	300	Roughness of Outfall Pipe (mm)	0.600

Time Area Diagram

Total Area (ha) 4.786

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.595	4	8	1.595	8	12	1.595

Model Details

Storage is Online Cover Level (m) 64.000

Tank or Pond Structure

Invert Level (m) 62.075

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1380.0	1.500	2087.0	1.925	2580.3

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0152-1250-1625-1250
Design Head (m)	1.625
Design Flow (l/s)	12.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	152
Invert Level (m)	62.075
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.625	12.5
Flush-Flo™	0.478	12.5
Kick-Flo®	1.012	10.0
Mean Flow over Head Range	-	10.9

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)
0.100	5.5	1.200	10.8	3.000	16.7	7.000	25.1
0.200	11.1	1.400	11.7	3.500	18.0	7.500	25.9
0.300	12.0	1.600	12.4	4.000	19.2	8.000	26.8
0.400	12.4	1.800	13.1	4.500	20.3	8.500	27.6
0.500	12.5	2.000	13.8	5.000	21.3	9.000	28.3
0.600	12.4	2.200	14.4	5.500	22.3	9.500	29.1
0.800	11.8	2.400	15.0	6.000	23.3		
1.000	10.2	2.600	15.6	6.500	24.2		

Pipe Overflow Control

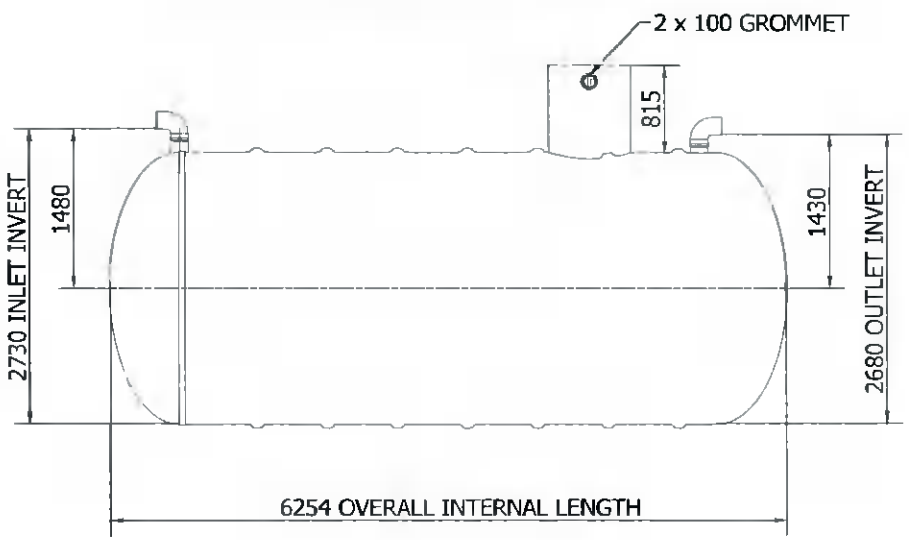
Diameter (m)	0.150	Roughness k (mm)	0.600
Slope (1:X)	150.0	Entry Loss Coefficient	0.500
Length (m)	10.000	Coefficient of Contraction	0.600

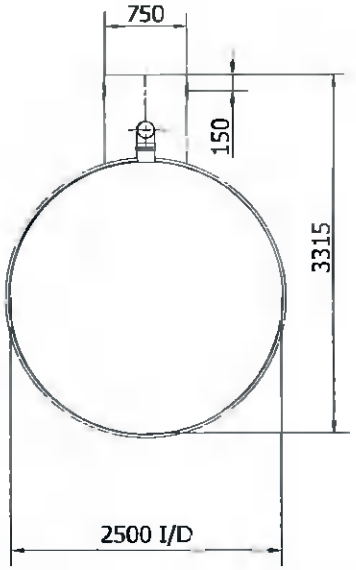
Pipe Overflow Control

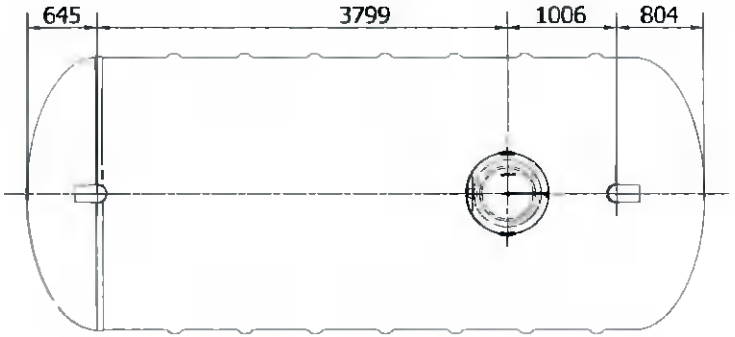
Upstream Invert Level (m) 63.850

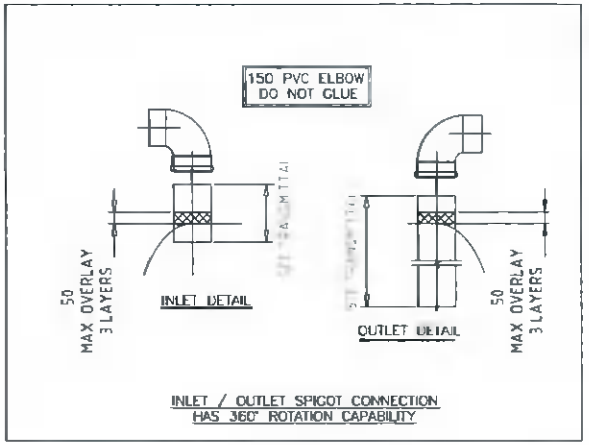
Appendix D – Petrol Interceptor Details

MODEL SHOWN WITH 150 OSMA PIPEWORK









1. PRODUCT INFORMATION
The Conder range of light liquid separators is produced from high grade GRP. Inlets and outlets are provided as spigots, Connections may be made by steel-banded flexible couplings, nitrile seal joints, rope-seal and mortar or any other appropriate jointing method
Ventilation specifications should be in accordance with Local Authority requirements. Vent pipework from multiple chambers must never be manifolded below ground level

2. PERFORMANCE CHARACTERISTICS
Separators are based on the requirements stated in Draft European Standard prEN858-1 and Environment Agency guideline PPG3, in particular:-
a. The nominal size has been established from performance tests where the residual oil at the outlet is less than 5mg/l for class 1 separators and less than 100mg/l for class 2 separators

3. MAINTENANCE AND USE
It is important to recognise that light liquid separators require regular maintenance. The period between maintenance operations can vary depending on the location and use of the separator, therefore routine inspections shall be undertaken at least every six months and a log maintained of inspection date, depth of oil, depth of silt and any cleaning that is undertaken.
A Conder Alarm should be fitted to every separator to give automatic warning that the light liquid capacity has been reached.
Access to the separator should be kept clear and not used for storage.

4. PRODUCT DEVELOPMENT
In line with our policy of constant improvement and development, we reserve the right to change specification without prior notice.

PIPE SIZE VARIANT:

100, 150, 225 PVC
300, 375 GRP

REV	DATE	BY	CHKD	APPD	DESCRIPTION
3	11/04/13	DG	KB	RP	PIPE SIZE VARIANT ADDED

DO NOT SCALE
IF IN DOUBT ASK
ALL DIMENSIONS IN MM

TOLERANCES (unless noted otherwise)
GENERAL LINEAR DIMS : +/- 5mm
ANGULAR DIMENSIONS : +/- 1/2~

Designed by	Checked by	Approved by
DG 20/05/2011	DG 20/05/2011	RU 20/05/2011

PREMIER TECH AQUA

SEPARATOR - FULL RETENTION - CNS80S

CNS80S-11-SALES

Appendix E – Flood risk assessment report

PINNACLE
CONSULTING ENGINEERS

edgeconnex

Ballymakaily Data Centre (EDCDUB04)

FLOOD RISK ASSESSMENT

December 2018

P181103

STRUCTURAL · CIVIL · DUE DILIGENCE · ENGINEERING MASTERPLANNING
FLOOD MANAGEMENT · INFRASTRUCTURE DESIGN
PRE-DEVELOPMENT ENGINEERING · BIM · TRANSPORTATION

PINNACLE
CONSULTING ENGINEERS

CONTACT DETAILS

Name	Position	Email	Telephone	Mobile
S. O'Reilly	Associate	shaun.o@iepinnacle.com	01-231 1044	087 6698575

APPROVALS

	Name	Signature	Position	Date
Prepared by	S. O'Reilly		Associate	07/12/2018
Reviewed by	J. Mayer		Director	10/12/2018
Approved by	J. Mayer		Director	11/12/2018

REVISIONS

Revision By	Date	Context

VERSIONS

Number	By	Date	Context
1	S. O'Reilly	11/12/2018	Planning Submission

SOURCES OF DATA

Office of Public Works (OPW)	
Met Eireann	
Land Survey Services Ltd.	
Google	

REPORT CONTENTS

Executive Summary

This report was prepared for South Dublin County Council in connection with the planning application for a data centre development and addresses the potential flood risk and mitigation measures proposed for the subject site, located to the south of the Grand Canal and to the west of the Newcastle Road (R120), Co. Dublin.

The proposal is to construct a phased data centre development that will include 4 no. single storey data halls all with associated plant at roof level; 32 no. standby generators with associated flues (each 15m high); associated office and service areas; service road infrastructure and car parking; as well as ESB sub-station / transformer yard with an overall gross floor area of 17,685sqm. The development will also include a temporary gas powered generation plant within a walled yard containing 19 no. generator units with associated flues (each 17m high) to be located to the west of the proposed data halls. The development will be constructed across two distinct phases that will facilitate the future use and take up of space within the data halls. It is intended that Phase 1 will be complete and operational prior to the commencement of Phase 2 of the development.

Phase 1

2 no. single storey data halls (6,950sqm) with roof plant and 16 no. stand-by generators with associated flues (each 15m high) as well as associated water tower and pump room and other services;

Single storey goods receiving area / store and single storey office area (1,522sqm) located attached and to the north-east of the data halls;

Temporary gas powered generation plant with 15 generators (13 operating and 2 standby) with associated flues (each 17m high) to be located within a compound to the west of the proposed data halls;

Attenuation pond: and

Two storey ESB sub-station (494sqm) with associated transformer yard and single storey transformer building (247sqm) within compound.

Phase 2

2 no. single storey data halls (6,950sqm) with roof plant and 16 no. stand-by generators with associated flues (each 15m high) as well as associated water tower and pump room and other services;

Single storey goods receiving area / store and single storey office area (1,522sqm) located attached and to the east of the data halls under this Phase and attached and to the north of the offices proposed under Phase 1; and

4 no. additional generators (all operating) with associated flues (each 17m high) to be constructed within the temporary gas powered generation plant.

The temporary gas generation plant is required as a result of the limited capacity available on the electrical utility network in the area. The development will also include ancillary site works, connections to existing infrastructural services as well as fencing, signage, and will include new vehicular access off the realigned R120 to provide a new vehicular access into the site as well as internal service roads and entrance gate, and a car park for 39 car parking spaces (including 4 disabled car parking spaces) and sheltered bicycle parking to serve the development. The development will be enclosed with landscaping to all boundaries of the overall site of 22.1ha.

An application for enabling works to facilitate this development has been made under Reg. Ref. SD19A/004. The applicant has responded in this EIAR to the aspects of the environment as well as specific issues raised in consultation with the Planning Authority.

Only a maximum of 24 of the 32 stand by generators will be in operation until such time as the temporary generator farm is decommissioned and the development is fully connected to the national grid. The proposed development on the connection to the national grid will see the removal of the temporary gas generation compound and the proposed development will have 4 data halls with 32 no. standby diesel generators.

The development is proposed to create a campus level of finish as opposed to an industrial form of development with heavy landscaping along all boundaries and particularly to the north of the overall site along the canal. External finishes will be primarily metal cladding. The overall development is being constructed using structural steel framing techniques to facilitate a rapid build programme requirement. Structural steelwork frames construction offers a variety of advantages in terms of design, performance and construction, when compared to other forms of construction and rapid build techniques.

It is proposed that the new facilities will operate 24 hours per day, 7 days per week, on a 3 shift cycle.

It is intended that this application will form part one of the development of the overall site. Other future phases, if they occur, will be subject to a new application, and environmental impact assessment. The scheme has been designed so that it can be undertaken without further phases in terms of landscape mitigation, design and infrastructure. Its design and positioning has been undertaken to minimise impact on existing hedgerows with the vehicular access utilising an existing wide gap in the hedgerow, and the only hedgerow being required to be removed being that to facilitate the ESB substation and transformer compound. No works are proposed to the abandoned farm buildings under this application. This will be addressed under a future application to enable a full summertime bat and bird survey to be undertaken of all these structures.

The proposed development is bounded to the north by the Grand Canal; the east by the Newcastle Road (R120); the western and southern boundaries are formed by existing greenfield lands.

The document should be read in conjunction with all associated Planning Drawings and Reports.

1 Introduction

The applicant proposes to construct 2 no. pairs of new single storey data halls and associated office areas adjacent and to the west of the Newcastle Road (R120). It is intended to access the proposed development off the existing Newcastle Road (R120) adjacent to the eastern boundary of the site. The purpose of this report is to address any potential flooding aspects of the proposed data centre development, on lands situated to the west of the Newcastle Road (R120), Co. Dublin.

The total subject site area extends to circa 59.20 acres (23.96 ha) and is currently a greenfield site. The new proposed data halls will result in portions of the south-east area of the site being developed, circa 30% of the total site area, with associated landscaping elements.

The location of the site is indicated on the map extract below - Figure 1.

FIGURE 1 - Site Location (Source Google Maps)

2 Flood Risk Assessment

The Planning System & Flood Risk Management Guidelines for Planning Authorities, dated November 2009, as published by the OPW, sets out the process to be followed in assessing proposed developments relating to flood risk.

These guidelines introduce comprehensive mechanisms incorporating flood risk identification, assessment and management into the planning process.

Planning authorities, in implementing these guidelines, are to ensure that where relevant, flood risk is a key consideration in the preparation of development and local area plans and also in the assessment of planning applications.

The guidelines will also serve to assist county and local authorities in preparing planning guidelines which should be utilised by developers and the general public in assessing flood risk when submitting development proposals / planning applications. Flood risk is summarised through various levels of the planning system in Figure 1.1. below.

Policy Documents / Instruments	Flood Risk Assessment Technique	Decision-making Tools	Key Chapters
National Spatial Strategy National Planning Guidelines	Flood Risk Management Guidelines	n/a	1 2
Regional planning guidelines	Regional Flood Risk Appraisal Catchment Flood Risk Management Plans	Sequential approach, Strategic Environmental Assessment	3 4
City / county development plan	Strategic Flood Risk Assessment Catchment Flood Risk Management Plans	Sequential approach dev plan Justification Test, SEA	3 4
Local area plan	Strategic Flood Risk Assessment	Sequential approach, dev plan Justification Test, SEA	3 4
Master plan non-statutory plan site brief	Site-specific Flood Risk Assessment	Sequential approach, dev plan Justification Test SEA / Env Impact Assessment	3 5
Planning application	Site-specific Flood Risk Assessment	Sequential approach dev management Justification Test EIA	3 5

Fig. 1.1 Flood risk management and the planning system

Using the sequential approach as described in Chapter 3 of the aforementioned guideline document, including confirmation that the site is classified as "Less Vulnerable" and therefore classified as appropriate and in conjunction with assessing available flood data, i.e. OPW, PFRA & CFRAMS mapping etc., it has been determined that the site has been categorised as falling into Zone C, (see Flood Zone definitions below), from a flooding perspective. It is proposed to apply the Source-Pathway-Receptor Model in providing the necessary mitigating measures.

Flood zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning There are three types or levels of flood zones defined for the purposes of these Guidelines

Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0 5% or 1 in 200 for coastal flooding)

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0 1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0 1% or 1 in 1000 year and 0 5% or 1 in 200 for coastal flooding) and

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0 1% or 1 in 1000 for both river and coastal flooding) Flood Zone C covers all areas of the plan which are not in zones A or B

Fig 2 3 Indicative flood zone map extract

3 Source-Pathway-Receptor Model

In assessing the potential flood risk to the site, the above model, as described in The Planning System & Flood Risk Management Guidelines for Planning Authorities, was used. The following flood sources were considered and necessary mitigating measures proposed, where required:-

- Coastal Flooding
- Fluvial Flooding
- Pluvial Flooding
- Ground Water Flooding

3.1 Coastal Flooding

In considering the risk from coastal flooding, it is necessary to relate the location of the site relative to the coast and the associated height above sea level. The subject site is located circa 16km from the nearest point on the Irish coast (Dublin Bay) and the average elevation of the site above sea level is circa 66m O.D. Malin Head.

Further to the above, coastal flooding is not considered a risk to the subject site.

3.2 Fluvial Flooding

Fluvial flooding is defined as flooding from a river or other watercourse. Further to site inspections and topographical surveys, there are no rivers flowing through the site. The nearest stream in the proximity of the site, is the Griffeen River, circa 500m from the mid-point of the eastern boundary of the site and on the opposite side of the Newcastle Road (R120). The Griffeen River then crosses beneath the Grand Canal to the north-east of the site.

Further to the above, the records of fluvial flooding on the site or environs, i.e. 0.1% AEP Extreme Event (1:1000yr), as indicated on the attached CFRAMS Mapping, i.e. E09BAL_EXFD_F0_10 (refer Appendix B), confirm that there are no locations of Pluvial Flooding indicated on the subject site.

In addition, the 1:1000yr flood level at the above location, is indicated as being at 59.81m OD, which is 6.47m lower than the Finished Floor Level of the nearest proposed data hall facility, i.e. 66.28m, which is located circa 750m to the south-west.

3.3 Pluvial Flooding

This type of flooding is applicable to all sites and is caused by summer thunderstorms or high intensity rainfall during longer duration events. This flooding is then generated by overland flows prior to the run-off entering watercourses / sewers (pipe networks).

As indicated on the attached PFRA Mapping, i.e. 2019 / MAP / 237 / A (refer Appendix C), there are no locations of Pluvial Flooding indicated on the subject site.

Further to the above, any future occurrence of this form of flooding taking place, will be mitigated by the fact that the proposed development has been designed in accordance with the relevant guidelines and specifications of the time, with a surface water attenuation pond / wetland area and below ground attenuation structures being provided, together with a hydrobrake flow control mechanism, limiting the outflow to the Q-bar run-off rate of 11l/s.

These measures have been utilised in the sites overall network drainage system in order to mitigate pluvial flooding and provide for a wholly sustainable development.

3.4 Ground Water Flooding

This form of flooding is not considered to be of any risk to the site. This is borne out by the fact that trial holes had previously been dug on the site and the results gathered from this excavation work have indicated that minimal groundwater was encountered.

Additionally, the OPW Preliminary Flood Risk Assessments Groundwater Flooding Report concludes that ground water flooding is largely confined to the West Coast of Ireland, due to the hydrogeology of the area.

Refer Appendix D for the Groundwater Flood Hazard map, clearly indicating that ground water flooding is not considered a risk in this area of County Dublin.

4 Impact on Downstream Network

There are no impacts on the downstream network based on the following:-

- The site has been sustainably managed in accordance with the relevant guidelines and specifications of the time
- SuDS measures have been incorporated in the form of a surface water attenuation pond / wetland area and below ground attenuation structures
- Surface water attenuation has been provided and sized based on a Q-bar run-off rate of 11l/s
- A Hydrobrake mechanism has been installed to restrict the outflow into the existing network accordingly, i.e. 11l/s
- Water quality is maintained as the outflow passes through approved Petrol / Oil Interceptors

The above methods will ensure that all surface water on-site will be sustainably managed and discharged off-site via approved run-off rates into the Local Authority sewer network.

5 Conclusion

In conclusion, the proposed development of the site will be carried out in a wholly sustainable manner, as described and will not pose any flooding issues. This holds true for the developable site itself or for any lands / properties downstream of the proposed development.

The site will be positively drained and surface water will be contained within the overall sites drainage network and managed in a sustainable manner, in accordance with all relevant guidelines and specifications.

Further to the above, based on the indicative flood mapping, the development site is located within Flood Zone C "Low Probability". Additionally, as mentioned, the site is classified as "Less Vulnerable" and therefore the development is classified as appropriate.

Appendix A

OPW - National Flood Hazard Mapping

OPW *National Flood Hazard Mapping*

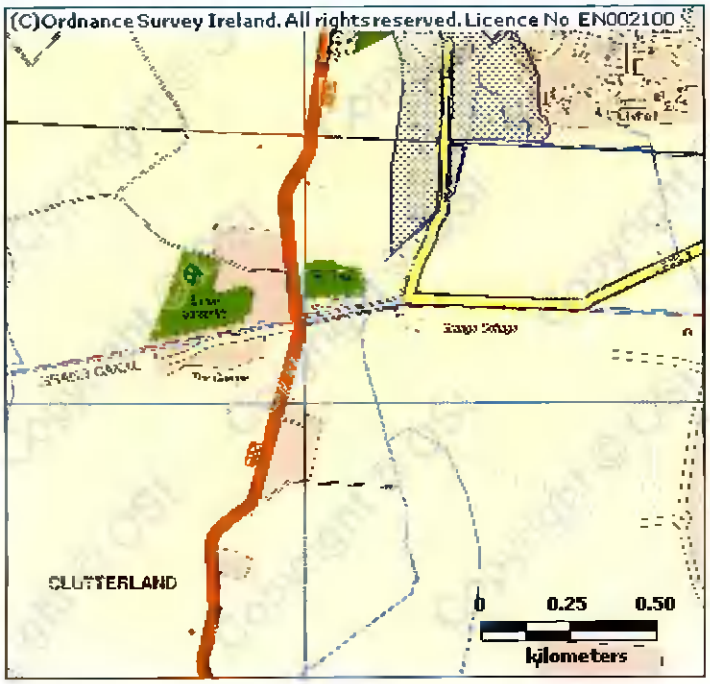
Summary Local Area Report

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Dublin

NGR: O 031 321



Map Scale 1:20,917

Map Legend
Flood Points
Multiple / Recurring Flood Points
Areas Flooded
Hydrometric Stations
Rivers
Lakes
River Catchment Areas
Land Commission *
Drainage Districts *
Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Thier purpose and scope is explained in the Glossary.

2 Results

1. Griffeen November 2000
County: Dublin
Start Date: 05/Nov/2000
Flood Quality Code: 1

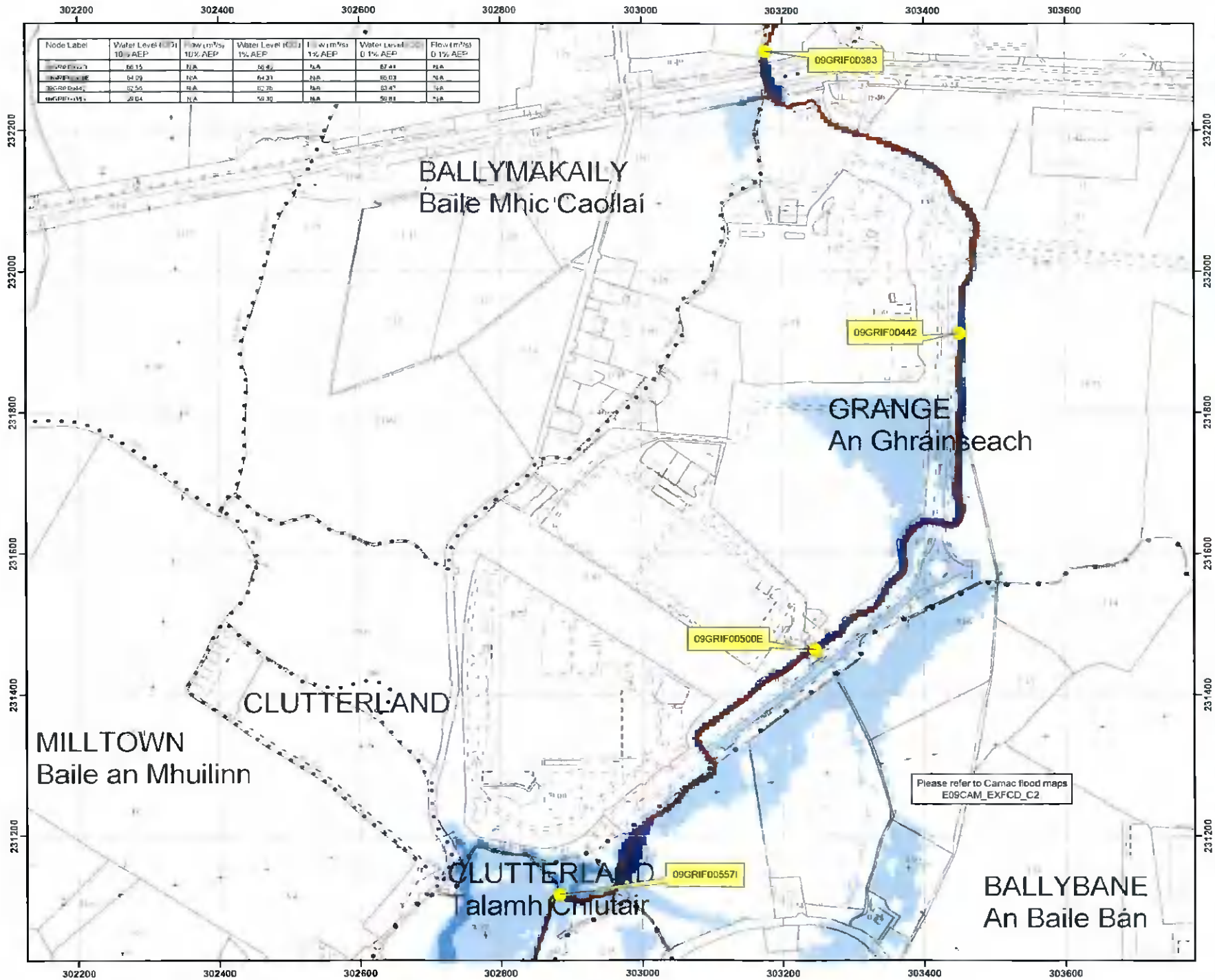
Additional Information: Photos (6) Reports (9) Press Archive (6) More Mapped Information

2. Peamount R134 R120 junction Nov 2000
County: Dublin
Start Date: 05/Nov/2000
Flood Quality Code 3

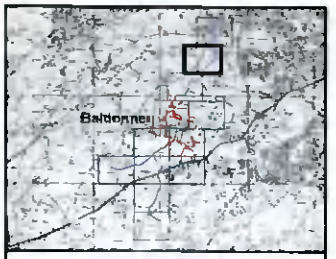
Additional Information: Reports (1) Press Archive (1) More Mapped Information

Appendix B

OPW - CFRAMS Mapping



Node Label	Water Level (mOD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (mOD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (mOD) 0.1% AEP	Flow (m³/s) 0.1% AEP
[illegible]	66.15	N/A	66.4[illegible]	N/A	67.41	N/A
09GRIF[illegible]E	64.09	N/A	64.31	N/A	65.03	N/A
09GRIF00442	62.56	N/A	62.76	N/A	63.47	N/A
09GRIF[illegible]	59.04	N/A	59.30	N/A	59.81	N/A



IMPORTANT USER NOTE
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP

Legend

- Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node Label

FINAL

REV	NOTE	DATE

CFRAM

OPW

RPS

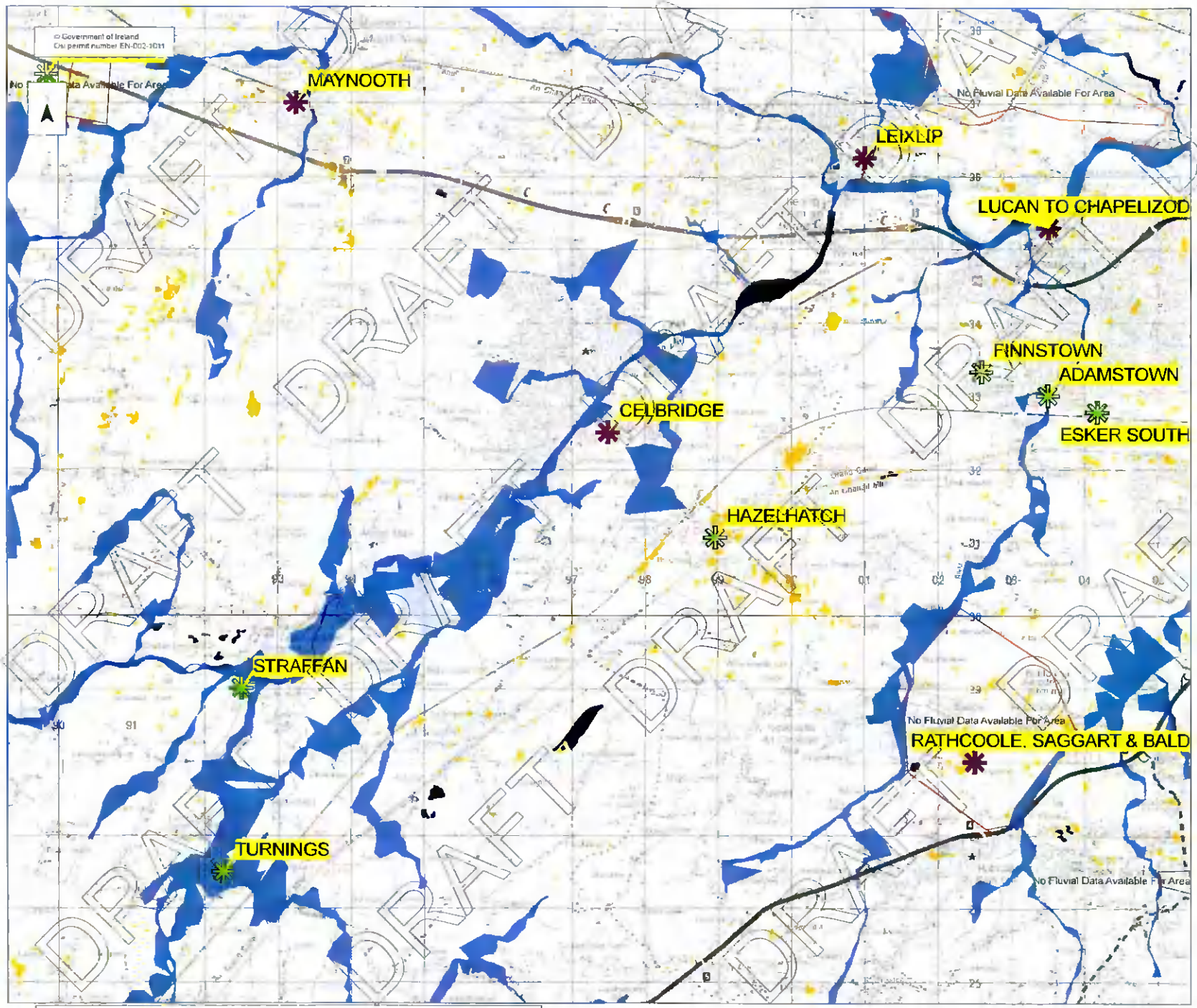
Office of Public Works
[illegible] Stephen Street

[illegible] House
74 Boucher Road

Map	Baldonnel Fluvial Flood Extents
Map Type	EXTENT
Source	FLUVIAL
Map Area	HPW
Scenario	CURRENT
Drawn By	C C Date 21 July 2016
Checked By	D F Date 21 July 2016
Approved By	G G Date 21 July 2016
Drawing No.	E09BAL_EXFCD_F0_10
Map Series	Page 10 of 12
Drawing Scale	1:5,000 @ A3

Appendix C

OPW - PFRA Mapping



Location Plan :

Legend:

Flood Extents

- Fluvial - Indicative 1% AEP (100-yr) Event
- Fluvial - Extreme Event
- Coastal - Indicative 0.5% AEP (200-yr) Event
- Coastal - Extreme Event
- Pluvial - Indicative 1% AEP (100-yr) Event
- Pluvial - Extreme Event
- Groundwater Flood Extents
- Lakes / Turloughs

PFRA Outcomes

- Probable Area for Further Assesment
- Possible Area for Further Assesment

Important User Note

The flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location. Information on the purpose, development and limitations of these maps is available in the relevant reports (see www.cfram.ie). Users should seek professional advice if they intend to rely on the maps in any way.

If you believe that the maps are inaccurate in some way please forward full details by contacting the OPW (refer to PFRA information leaflets or 'Have Your Say' on www.cfram.ie).

Office of Public Works
Jonathon Swift Street
Trim
Co Meath
Ireland

OPW

Project
PRELIMINARY FLOOD RISK ASSESMENT (PFRA)

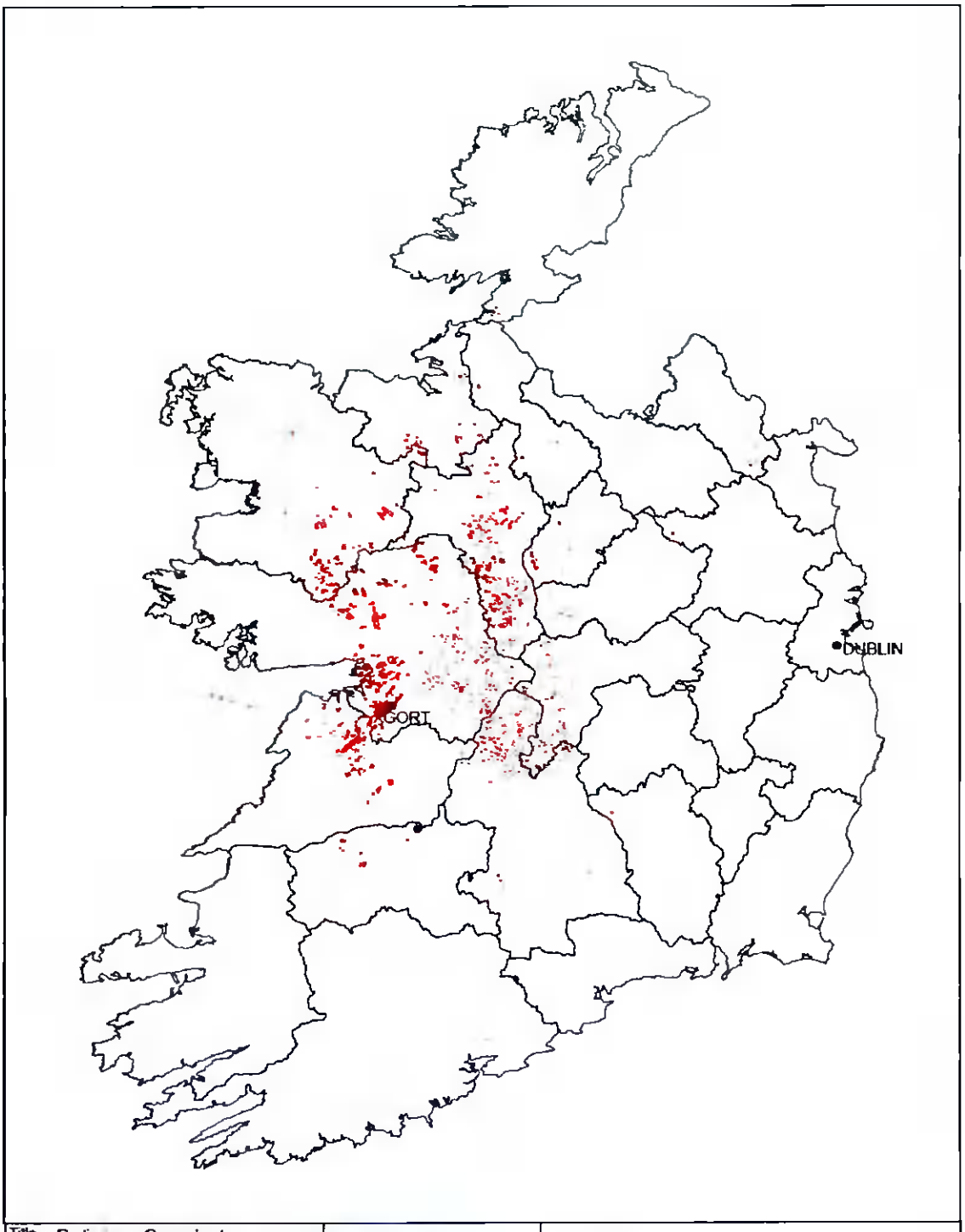
Map
PFRA Indicative extents and outcomes
Draft for Consultation

Figure By	PJW	Date	July 2011
Checked By	MA	Date	July 2011

Figure No: 2019 / MAP / 237 / A
Revision: 0
Drawing Scale: 1:50,000
Plot Scale: 1:1 @ A3

Appendix D

OPW – Preliminary Groundwater Flood Hazard Map



Title	Preliminary Groundwater Flood Hazard Map		
Figure 6.6	Size A4	Drawn	RAH
		Checked	SB
Drawing No	262128BA/2 1	Approved	SB
Date	24/06/2010	Rev No	01

Mott MacDonald
Water & Environment
Demeter House, Station Road
Cambridge CB1 2RS
Tel +44 (0) 1223 463500
Fax +44 (0) 1223 461007
www.mottmac.com

Legend

- County boundary
- Location
- Area at risk of groundwater flooding