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Engineering Services Report

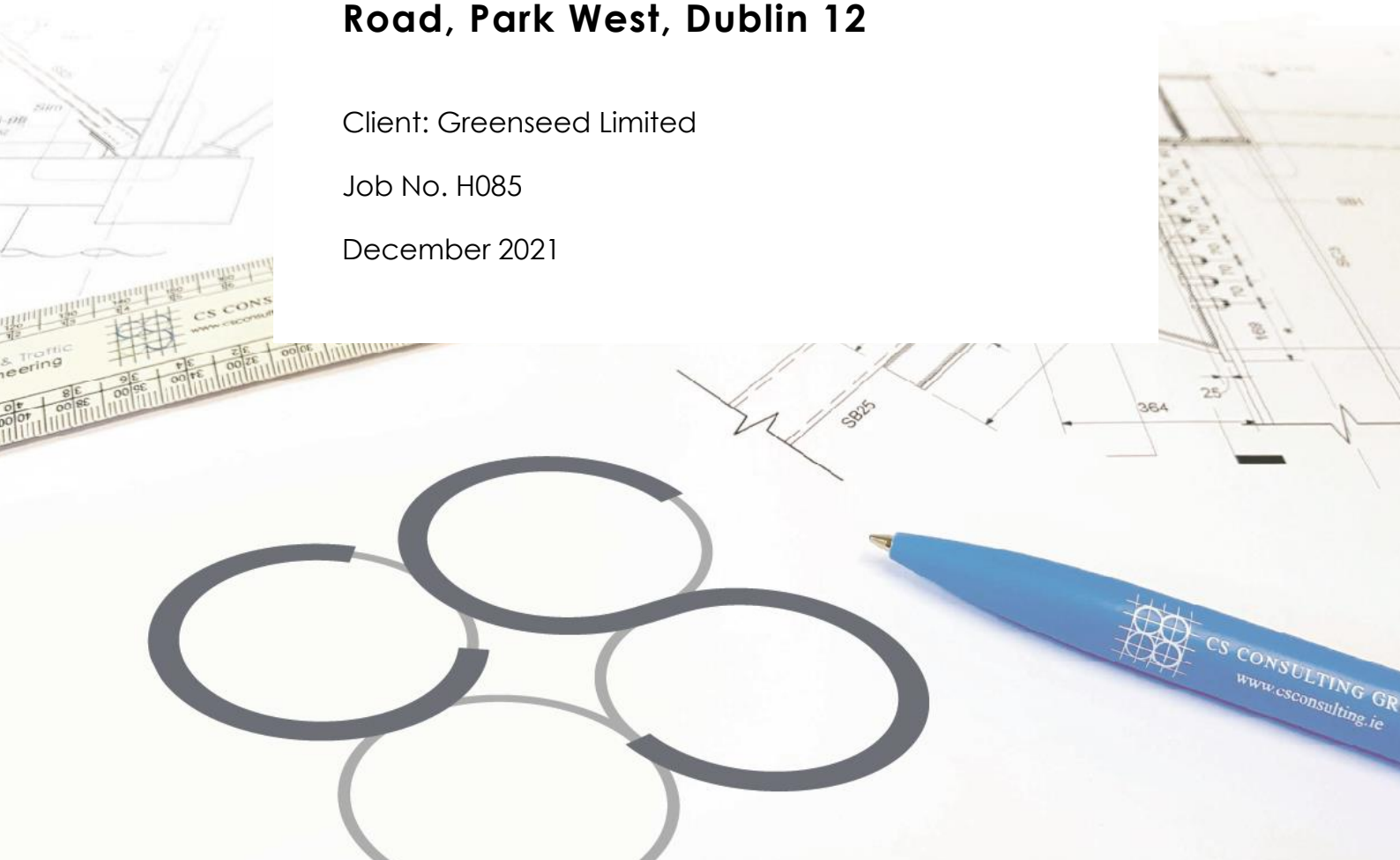
Park West SHD

Park West Avenue and Park West Road, Park West, Dublin 12

Client: Greenseed Limited

Job No. H085

December 2021



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ENGINEERING SERVICES REPORT

PARK WEST SHD, PARK WEST AVENUE AND PARK WEST ROAD, PARK WEST, DUBLIN 12

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BS 1192 FIELD	**PWT-CSC-XX-ZZ-RP-C-0003-P4**

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H085	AB	NB	OS	16.12.2020	P1

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1.0 INTRODUCTION

Cronin & Sutton Consulting Engineers (CS Consulting) have been commissioned by Greenseed Ltd, to prepare an Engineering Services Report (ESR) to accompany a proposed Strategic Housing Development (SHD) at Park West Avenue & Park West Road, Park West, Dublin 12.

This report describes the proposed civil engineering infrastructure for the development and how it connects to the public infrastructure serving the area including drainage and water supply. In preparing this report, CS Consulting has referred to the following:

- Dublin City Development Plan 2016–2022
- Regional Code of Practice for Drainage Works
- The Greater Dublin Strategic Drainage Study
- Irish Water Code of Practice for Water
- Irish Water Code of Practice for Wastewater
- Local Authority Drainage and Watermain Records
- Local Area Plan for Park West – Cherry Orchard

This ESR is to be read in conjunction with the engineering drawings and documents submitted by CS Consulting and relevant additional information submitted by others, as part of the Planning Submission.

2.0 SITE LOCATION AND PROPOSED DEVELOPMENT

2.1 Site Location

The proposed development is located 500m east of the Motorway M50, between junction 7 and 9. The site is bounded to the north by a railway line, to the east by an industrial estate and O'Casey Avenue, to the south by Park West Road and to the West by Park West Avenue.

The site has a total area of approximately 5.50ha and is in the administrative jurisdiction of Dublin City Council (DCC).

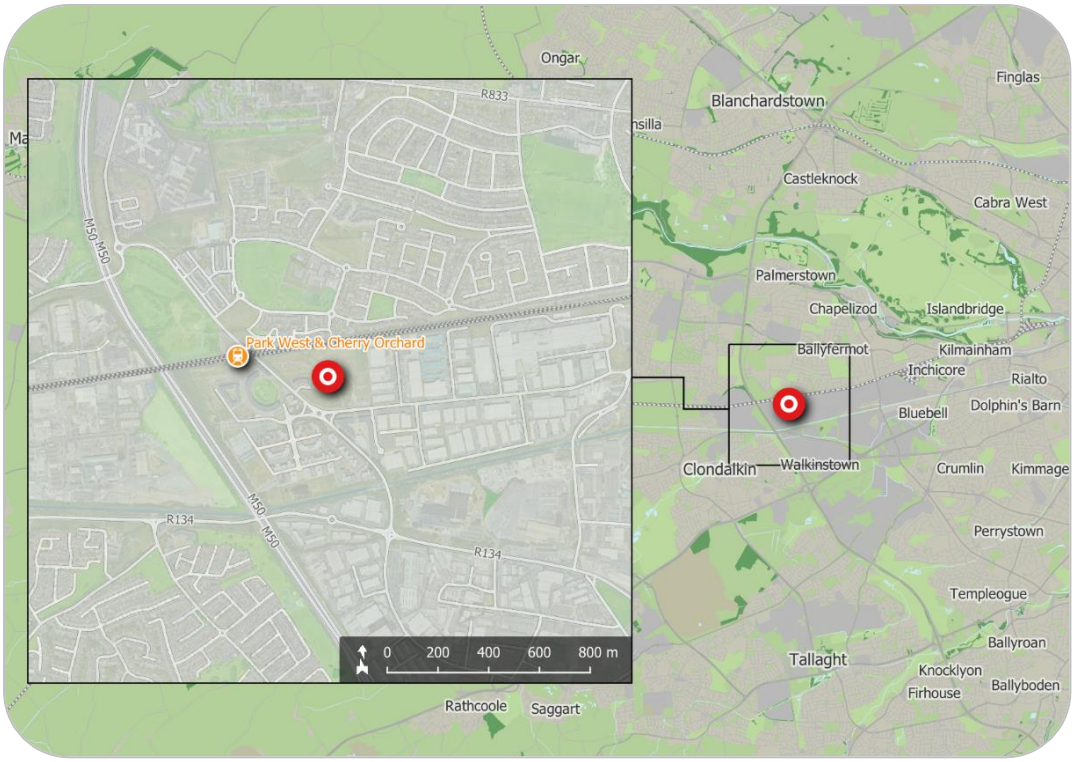

Figure 1 – Location of proposed development site
(map data and imagery: EPA, OSi, OSM Contributors, Google)

The location of the proposed development site is shown in Figure 1 above; the indicative extents of the development site, as well as relevant elements surrounding the site, are shown in more detail in Figure 2.

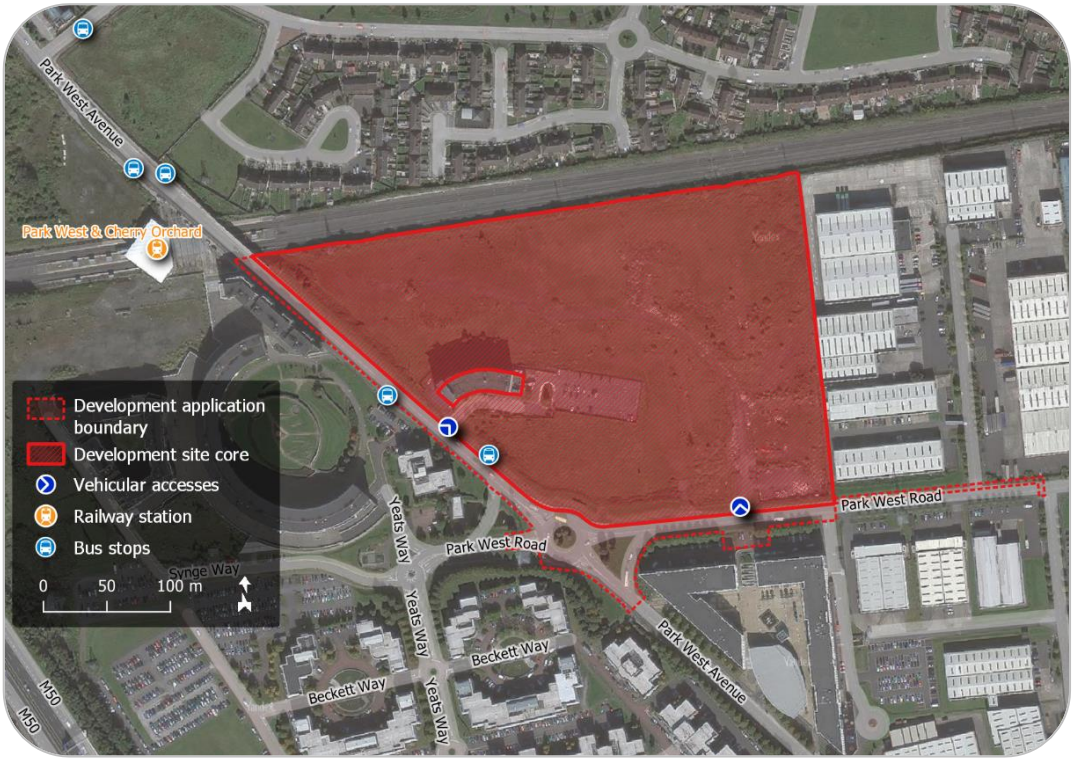

Figure 2 – Site extents
(map data and imagery: NTA, OSi, OSM Contributors, Yandex)

The existing site is mainly greenfield with over 80% of the site area covered in grass. There is an existing hotel, vehicular access and a car park within the site boundary. The site forms part of key development areas and is included in the 2019 DCC Park West- Cherry Orchard Local Area Plan. The subject site is called up as Park West Avenue/Road Site (formerly 'Sector 3') in the Local Area Plan.

2.2 Description of Proposed Development

The proposed development (70,649 sqm gross floor area - GFA) shall consist of:

- 750no. residential units (Blocks A to G) comprising a mix of one, two and three bed apartments and all associated ancillary accommodation (69,989sqm GFA)

- Non-residential uses 705sqm GFA) including a retail unit, a creche community space, café/ bar.

The proposed development is described below on a block-by-block basis.

- Block A (11,563sq.m GFA): - A 2 to 15 storey with 109no. residential units and 1no. retail/ commercial unit of 156sq.m.
- Block B (4,180sq.m GFA): - A 2 to 8 storey block with 44no. residential units and resident services and amenities of 84sq.m.
- Block C (8,865sq.m GFA): - A 2 to 8 storey block with 100no. residential units.
- Block D (16,403sq.m GFA): - A 2 to 8 storey block with 179no. residential units in. Residential services and amenities of 403sq.m are proposed at ground, first and second floor levels.
- Block E (15,995sq.m GFA): - A 2 to 8 storey block with 179no. residential units.
- Block F (9,629sq.m): - A 2 to 8 storey block with 99no. residential units.
- Block G (4,059sq.m): - A 1 to 8 storey block with 40no. apartments, a creche of 410sq.m with associated external play area, a café/ bar unit of 91sq.m and a community space of 48sq.m.
- Public Open Space: - c.1.3ha (16%) of public open space is provided and comprises a linear park orientated west to east and functioning as a link to the established residential areas to the west of Park West Avenue and a public plaza/ square including Multi-Use Games Area (MUGA) located centrally within the site.
- Communal Amenity Space: - Communal amenity spaces totalling 6,175sq.m are provided at podium level within each of the proposed Blocks A to F and at roof levels within Block G and include passive open spaces that are visually and functionally accessible to the future residents of the development.

- Private Open Spaces: - Shall be in the form of balconies for the apartments and duplexes and terraces for ground floor units.

Vehicular access to serve the proposed development shall be provided via access roads off Park West Road and Park West Avenue. Tie-in works are required to Park West Avenue and Park West Road to provide for suitable junctions and pedestrian crossings at the proposed access points.

In addition to pedestrian and cycle access at the above two locations there shall be a pedestrian and cycle access at the north western corner of the site adjoining Park West Avenue and providing access to the proposed west to east street along the northern boundary of the site. This access to Park West Avenue shall facilitate safe and efficient access for pedestrians and cyclists to Park West and Park West - Cherry Orchard Train Station located directly to the north west across Park West Avenue.

Car parking is provided at ground floor/ under croft level beneath Blocks A, B, C, D, E and F and at street level. A total of 487no. car parking spaces are proposed including 482no. residential car parking spaces at ratio of 0.64 per residential unit. The remaining 5no. car parking spaces shall serve the proposed non-residential uses.

An additional 70no. car parking relating to the existing Aspect Hotel are included within the current application site. The Aspect Hotel is a pre-existing building located centrally within the site. Permission was granted for an extension to this hotel in February 2019 (Reg. Reg. 3436/18). Condition 3 attached to Reg. Ref. 3436/18 addresses a legacy issue relating to the Aspect Hotel car park which is located on the site of the proposed Block G. The current application provides for the relocation of the hotel car park to facilitate the development of Block G. It is proposed that the car parking (totalling 70no. spaces) to serve the hotel shall be located beneath Blocks A-B-C (36no. spaces) and at street level to the south of the existing Aspect Hotel (34no. spaces).

A total of 1,276 cycle parking spaces are proposed. The cycle parking is provided at ground floor/ under croft level beneath Blocks A to F to serve the proposed residential units and integrated into the public realm at street level for visitors.

The residual lands within Site 6, identified as development Stages 2 and 3, are sites for future development and shall be seeded/ grassed and fenced until such time as development proposals for those sites are advanced. The Stage 2 lands include a site for a proposed school as identified within the LAP and to be brought forward by the Department of Education and Skills.

Permission is also sought for associated hard and soft landscaping, boundary treatments and all associated site and development works.

3.0 EXISTING DRAINAGE NETWORK

Drainage records received from Irish Water indicate that there is an existing 225mm foul sewer on Park West Road, south of the subject site location, which discharges in easterly direction and connects to the 300mm diameter foul sewer on Heaney Avenue. There is also a 300mm diameter surface water sewer which changes to a 600mm and onto a 750mm diameter on Park West Road. This surface water sewer discharges in easterly direction and connects to the 750mm diameter surface water sewer on Heaney Avenue. The existing sewerage network in the vicinity of the site eventually discharges into the municipal wastewater treatment at Ringsend.

See **Appendix A** for a copy of the drainage records in the vicinity provided by Irish Water.

4.0 PROPOSED DRAINAGE SYSTEMS

Drainage from the proposed development shall be drained on the basis of a completely separate system. The foul system shall connect to the existing 300mm diameter foul sewer on Heaney Avenue, as directed by Irish Water. The surface water system shall be attenuated prior to discharge into the existing 600mm diameter surface water sewer on Park West Road, or as directed by DCC Drainage Division.

Sustainable drainage systems (SuDS) shall be incorporated into the design with surface water runoff from the development discharging through a minimum of a two-stage treatment train process prior to discharge by gravity into the surface water sewer on Park West Road as set out in section 4.10.1 of the Park West-Cherry Orchard Local Area Plan.

The drainage systems shall be designed in accordance with Part H of the Building Regulations, EN 752 Drain and Sewer Systems outside Buildings, The Greater Dublin Regional Code of Practice for Drainage Works, Irish Water Code of Practice for Wastewater, DCC Drainage Division and Irish Water requirements.

4.1 Proposed Foul Drainage System

The proposed foul drainage system shall be designed to take discharges from the new residential units, retail units and creche. Drainage from kitchen/canteen facilities in retail units shall discharge through a grease separator designed in accordance with IS EN 1825 Part 1 and Part 2 and / or to Irish Water requirements.

The foul system shall connect to the existing 300mm diameter foul sewer on Heaney Avenue, as directed by Irish Water. Refer to CS Consulting drawing PWT-CSC-XX-XX-DR-C-0012 for the proposed foul drainage layout.

It is calculated that the proposed development shall have a total hydraulic loading of 308m^3 per day of foul effluent generated during the operational phase of the development. This equates to an average flow of 3.56 litres/second (over a 24-hour period) and a peak flow of 10.75 litres/second. A breakdown of the foul loading calculations is included in **Appendix B**.

A Pre-connection Enquiry application was submitted to Irish Water to confirm capacity in the receiving network and a favourable confirmation of feasibility was obtained. See **Appendix C** for a copy of the Irish Water Confirmation of Feasibility letter and subsequent Statement of Design Acceptance.

One item raised as part of the confirmation of feasibility was for the developer to undertake CCTV surveys of existing sewers downstream of the development site.

CS Consulting and the developer engaged McBreen Environmental Ltd to carry out the CCTV survey of the sewers requested by Irish Water. Very high silt levels were encountered during this survey, and some manholes could not be identified.

McBreen Environmental Ltd advised that works to clear the line and to identify all manholes and their conditions would be very expensive to undertake. Bearing this in mind, CS Consulting reverted to IW stating that these works would be carried out following a grant of planning permission, and IW indicated acceptance of this approach.

4.2 Proposed Surface Water Drainage System

Surface water runoff from the proposed development shall drain by gravity and shall be attenuated prior to discharge into the existing 600mm diameter surface water sewer on Park West Road. Peak surface water runoff shall be restricted to 10.8 litres per second, equivalent to 2.0 litres per

second per hectare or as directed by DCC Drainage Division. SuDS shall be incorporated into the development and shall include green roofs, permeable pavement, bioretention systems and shallow infiltration systems. Surface water runoff shall go through a minimum of two-stage treatment prior to discharge by gravity into the receiving systems as outlined in chapter 4.10 of the Park West-Cherry Orchard Local Area Plan. Refer to CS Consulting drawing PWT-CSC-XX-XX-DR-C-0012 for the proposed surface water drainage layout included with this submission.

The proposed SuDS measures shall reduce the quantity and improve the quality of water discharging into the receiving systems, see Section 4.3 for further information on the proposed sustainable measures.

The proposed surface water drainage system shall be designed in accordance with DCC Drainage Division requirements.

4.3 Proposed Surface Water Management Plan

The proposed Surface Water Management Plan is in line with the key requirements of the Dublin City Council Drainage Division Planning & Development Control Section. The proposed surface water drainage system takes cognisance of the Dublin City Development Plan 2016 – 2022 with respect to SuDS Section 9.5.4 and the Park West-Cherry Orchard Local Area Plan section 4.10 Physical Infrastructure & Services. The proposed SuDS measures provide a minimum of two stage treatment train approach including interception and primary treatment of surface water runoff. This treatment approach is in line with The CIRIA SuDS Manual C753 and is outlined below.

This section of the report should be read in conjunction CS Consulting drawing PWT-CSC-XX-XX-DR-C-0039 SuDS layout for ease of reference.

The proposed surface water system uses a number of SuDS components in series to provide a minimum of two stage treatment prior to discharge into the receiving systems. Rainfall runoff shall be intercepted and treated at roof levels using green roofs. Pavement runoff shall be intercepted and treated using a range of SuDS components including permeable pavement, bioretention systems shallow infiltration systems and catchpits.

Green roof

The proposed green roofs shall consist of sedum roofing. The proposed green roofs shall cover 70% of new roof areas. The limitations in providing full green roof coverage is due to plant enclosures. The green roof shall provide interception of rainfall, filtration through the medium, and storage within the voids whilst facilitating evapotranspiration.

The green roofs shall intercept and absorb the first 5 – 10mm of rainfall, thereby reducing the volume of runoff into the receiving systems. Rainfall runoff that is not absorbed by the green roof shall filtrate through the substrate and geotextile filter fabric. A limited attenuation volume shall be provided by the green roof crate layer system below the geotextile filter fabric, which shall provide a time delay between the rainfall event and discharge into the system thereby reducing peak discharge rates. According to the leading green roof supplier/manufacturer Bauder, up to 40% of average annual rainfall can be absorbed and released back into the atmosphere by transpiration and evaporation.

Therefore, rainfall runoff from roof areas covered by the proposed green roofs shall go through a two-stage treatment train including interception and primary treatment in line with SuDS Manual C753 Table 26.7, replicated in Table 4.3.

Permeable Pavement

The proposed permeable pavement shall be located at parking bays throughout the development. The proposed permeable paving structures shall be filled with suitable granular material with a minimum void porosity of 30% and wrapped in a geotextile filter membrane. The granular material shall provide interception within the voids and by raising the invert of the outlet pipe to 100mm above the base. The geotextile filter material can offer secondary treatment of rainfall runoff by preventing ingress of fine material from paved areas through filtration prior to discharge into surface water drainage system.

Therefore, rainfall runoff from localised access road shall go through a two-stage treatment train including interception and primary treatment in line with SuDS Manual C753 Table 26.7 replicated in Table 4.3.

Bioretention Systems

The proposed bioretention systems include shallow landscaped depressions around the site, a pond and series of tree pits. The proposed pond shall be a shallow landscaped depression. The proposed tree pits shall be engineered soil filled tree boxes. The proposed bioretention systems shall provide interception and treat pollution through the use of engineered soils and vegetation. Runoff collected from adjacent impermeable surfaces shall pond temporarily on the surface before filtering through the vegetation and underlying soils. Interception shall be provided by installing a weir / outfall pipe at an invert level above the required volume of interception. Part of the runoff volume shall be removed through evaporation and plant transpiration.

Therefore, rainfall runoff that shall discharge into the proposed bioretention system shall go through a three-stage treatment train including

interception, primary and secondary treatment in line with SuDS Manual C753 Table 26.7, replicated in Table 4.3.

Shallow Infiltration Systems

The proposed shallow infiltration system shall be linear excavations filled with suitable granular material with a minimum void porosity of 30% and wrapped in a geotextile filter membrane to a depth of 300mm. A perforated pipe shall be installed at the bottom of the granular fill to collect any runoff that did not infiltrate to ground. The filter drains shall intercept footpath pavement runoff in gardens and landscaped areas. Catchpits shall be provided downstream of the filter drains to offer additional surface water treatment including retention.

The proposed filter drains shall provide interception and reduce peak runoff rates prior to discharge into the surface water drainage system. The granular material and geotextile filter material shall provide interception and act as a secondary treatment in preventing ingress of fine material from paved areas prior to discharge into surface water drainage system.

Therefore, rainfall runoff that shall discharge into the filter drains / catchpits shall go through a three-stage treatment train including interception, primary and secondary treatment in line with SuDS Manual C753 Table 26.7, replicated in Table 4.3.

Rainwater Harvesting

Runoff from terraces open to the element and above ground shall be collected via pipework system to discharge into a proposed rainwater harvesting system for irrigation purposes. Rainwater harvesting shall serve as interception and reduce the volume of water discharging into the receiving system. Therefore, the proposed rainwater harvesting shall improve surface

water runoff quality and reduce the quantity by using stored water for irrigation.

4.3.1 The Greater Dublin Strategic Drainage Study

The Greater Dublin Strategic Drainage Study (GDSDS) addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanisation, by replicating the runoff characteristics of the greenfield site. The criteria provide a consistent approach to addressing the increase in both rate and volume of runoff, as well as ensuring the environment is protected from any pollution from roads and buildings. These drainage design criteria are as follows:

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

Criterion 1 GDSDS – River Water Quality Protection

Runoff from natural greenfield areas contributes very little pollution and sediment to rivers and for most rainfall events direct runoff from greenfield sites to rivers does not take place as rainfall percolates into the ground. By contrast, urban runoff, when drained by pipe systems, results in runoff from virtually every rainfall event with high levels of pollution, particularly in the first phase of runoff, with little rainfall percolating to the ground. To prevent this happening, Criterion 1 requires that interception storage and/or treatment storage is provided, thereby replicating the runoff characteristics of the pre-development greenfield site.

In the context of the proposed development, it is proposed that all surface water runoff shall go through a two stage treatment train via green roofs, permeable paving, bioretention systems and shallow infiltration systems

Refer to Section 4.3 and CS Consulting drawing PWT-CSC-XX-XX-DR-C-0039 for further information.

Interception Storage

Interception storage where required, should ensure that at least, the first 5mm of rainfall runoff is intercepted on site and does not find its way to the receiving water, in line with the GDSDS.

The proposed interception facilities for the site provide well the minimum of 10mm rainfall runoff interception storage which equates to a volume of 848 m^3. The required volume of interception is 190 m^3. Refer Tables 4.1 & 4.2 for a breakdown of the interception storage calculations. Interception storage for the new development shall be provided as follows:

- Green Roof / Drainage Board shall be provided over the new roof areas. A proprietary drainage underlay mat shall be provided to permanently store a volume of water. A "Bauder DSE60" board or similar, designed to retain 10-12 litres/m^2 of rainwater shall be used.
- Permeable Pavement and bioretention systems shall be provided throughout the development. Using the granular fill in the porous structure a permanent volume of storage shall be created within the voids to intercept the first 10mm of rainfall by raising outlets above the base.

Table 4.1 Required Volume of Interception Under Criterion 1

Required Volume of Interception		
Total Impermeable Area (m^2)	Rainfall Depth (m)	Required Volume of Interception (m^3)
37970	0.010	**190**

Table 4.2 Volume of Interception Provided

Volume of Interception Provided			
Storage Structure	Area (m^2)	Storage	Volume of Interception Provided (m^3)
Green Roof	9163	10 litres / m^2	92
Permeable Pavement	7210	100 mm / m^2	721
Pond			35
		Total	**848**

As outlined above, GDSDS Criterion 1 is complied with.

Treatment Storage

In accordance with the GDSDS, interception storage & treatment storage are interchangeable. Since full interception storage has been provided, treatment storage is not required.

Criterion 2 GDSDS – River Regime Protection

Regardless of the rainfall event, unchecked runoff from a developed site through traditional pipe networks shall discharge into receiving waters at rates that are an order of magnitude greater than that pre-development scenario. This can cause flash flow in the outfall river / stream that can cause scour and erosion. Attenuation storage is provided to prevent this occurring by limiting the rate of runoff to the pre-development greenfield site.

peak runoff discharge from the proposed development shall be restricted to 10.8 l/s into the 600mm surface water sewer on Park West Road, in line with the GDSDS requirement of 2.0 l/s/ha. Attenuation facilities shall be

provided throughout the site for storm events up to and including the 1 in 100 year plus 20% for climate change. Therefore, GDSDS Criterion 2 is complied with.

Criterion 3 GDSDS – Level of Service for the Site

The GDSDS requires that no flooding should occur on site for storms up to and including the 1 in 30 year event. The pipe network and the attenuation storage volumes should, therefore, be checked for such storms to ensure that no site flooding occurs although partial surcharging of the system is allowed as long as it does not threaten to flood.

For the 1 in 100 year event, the pipe network can fully surcharge and cause site flooding, but the top water level due to any such flooding must be at least 500mm below any vulnerable internal floor levels, and the flood waters should be contained within the site. In addition, the top water level in any attenuation device during the 100 year storm must be at least 500mm below any vulnerable internal floor levels.

Refer to Appendix D for a copy of the MicroDrainage simulation, which demonstrates a level of service as described above and ensures no surface water flooding to any part of the site for storms up to and including the 1 in 100 year plus 20% extra for climate change. Therefore, GDSDS Criterion 3 is complied with.

Criterion 4 GDSDS – River Flood Protection

Criterion 4 is intended to prevent flooding of the receiving system / watercourse by either limiting the volume of runoff to the pre-development greenfield volume using 'long-term storage' (Option 1) or by limiting the rate of runoff for the 1 in 100 year storm to QBAR or 2.0l/s/ha without applying growth factors using 'extended attenuation storage' (Option 2).

The proposed surface water system complies with Option 2. the proposed development shall limit discharge rate to 10.8 l/s in line with GDSDS requirement of 2.0 l/s/ha.

4.3.2 Summary of SuDS Measures

The proposed Surface Water Management Plan for the development is in line with the key requirements of the Dublin City Drainage Division and the Dublin City Development Plan 2016-2022 with respect to Sustainable Drainage Systems.

Rainfall runoff from the proposed site development shall go through at least a two-stage treatment train prior to discharge into the surface water sewer network on Park West Road. The proposed SuDS measures shall reduce the quantity and improve the quality of water discharging into the receiving system. Table 4.3 is a summary of the proposed SuDS measures for the development and the management train in line with The CIRIA SuDS Manual C753.

Table 4.3 SuDS Component and Treatment Train (Source CIRIA C753)

SuDS Component	**Interception**	**Close to source / primary treatment**	**Secondary treatment**	**Tertiary treatment**
Green roof	Yes	Yes		
Shallow Infiltration System	Yes		Yes	
Permeable pavement	Yes	Yes		
Bioretention Systems (shallow depressions, Pond, Tree Pits)	Yes	Yes	Yes	
Rainwater harvesting	Yes			

5.0 POTABLE WATER SUPPLY

5.1 Existing Potable Water System

Records obtained from Irish Water indicate a number of public mains in the vicinity of the site including:

- Two number of 450mm watermains and a 150mm watermain on Park West Avenue, west of the proposed development.
- A 250mm watermain on Park West Road, south of the proposed development.

The existing 450mm asbestos cement public main enters the subject site and is capped north of the existing hotel. Prior to commencement of works, this 450mm public main shall be surveyed by means of non-destructive tests, to identify the location of the main. The 450mm asbestos cement public main shall be broken out and removed from the site, to allow the construction of the new development. The public main shall be capped at the site entrance, subject to agreement with Irish Water.

5.2 Proposed Potable Water System

The proposed water supply connection to the new development shall be from a sluiced connection to the existing 250mm public main adjacent to the site on Park West Road with a cross-connection to the existing 450mm public main on Park West Avenue, as directed by Irish Water. The proposed development shall be serviced by a new 250mm ring main. Refer to CS Consulting drawing PWT-CSC-XX-XX-DR-C-0014 for a copy of the proposed watermain layout included with this submission.

We expect the peak flow demand to be in the region of 22.25 litres/second during the operational phase of the development equivalent to an average daily demand of 384.5 m^3. The installation of low flow fittings and a rainwater harvesting

system for the development shall reduce the demand on the existing water supply network.

We would recommend that flow tests be carried out on the existing mains/hydrants to confirm both the pressure and flow from the existing network, to confirm adequacy of supply and compliance with the Local Fire Officer's requirements.

Pre-connection Enquiry application was submitted to Irish Water to confirm capacity in the network and a favourable confirmation of feasibility was obtained. See **Appendix C** for a copy of the Irish Water Confirmation of the Feasibility letter and subsequent Statement of Design Acceptance.

6.0 RESPONSE TO PLANNING BODIES' OPINIONS

6.1 RESPONSE TO DUBLIN CITY COUNCIL OPINION

CS has incorporated a response to the Opinion received from DCC Addendum B – Report from Drainage.

- *"The Engineering Services Report shall be developed further to reference Local Area Plan for Park West-Cherry Orchard where the surface management strategy for proposed development in this area is set out".*

  Numerous references to the LAP Park West-Cherry Orchard have been made in this document. Additionally, CS has reviewed the proposed drainage strategy against the guidelines set out in the LAP to confirm that the engineering proposal is fully aligned with the requirements stated in the Local Area Plan.

- "Detail of the 2-stage surface water management strategy, using SuDS, shall be applied for each hardstanding area proposed".

  Refer to chapter 4 of this document where further details of the 2-stage surface water management strategy has been outlined and addressed.

- *"DCC drainage construction standards in accordance to the Greater Dublin Regional Code of Practice shall be applied to all external public spaces, to ensure they are constructed to the required standard, to accommodate any future needs for surface water to be 'taken in charge' by DCC".*

Please refer to note 14 of CS drawing PWT-CSC-XX-XX-DR-C-0014 which states that all drainage construction standards shall be in accordance with the Greater Dublin regional Code of Practice.

Appendix A

Irish Water Drainage and Watermain Records

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UISCE ÉIREANN : IRISH WATER

Legend

- Boundary Meter
- Unknown Meter ; Other Meter
- PRV
- Sluice Valve Open
- Sluice Valve Closed
- Double Air Control Valve

Water Hydrants

Hydrant Function

- Fire Hydrant
- Water Kiosk
- Cap
- Other Fittings
- Reducer

Water Distribution Mains

Owned By

- Irish Water
- Private
- Irish Water

Sewer Manholes

Manhole Type

- Standard
- Gravity - Foul

Storm Manholes

Manhole Type

- Standard
- Other; Unknown
- Surface Gravity Mains

Storm Inlets

Inlet Type

- Standard

1:1,000 at A0

Last edited: 30/10/2020

Metres

0 25 50 100

Appendix B

Foul Loading and Water Demand Calculations

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H085 Park West SHD

Park West Avenue & Park West Road, Park West, Dublin 12

Foul Loading & Discharge Rates

Residential Units

Blocks	Units Number	Density (Persons / Unit)	Number of Persons	Flow Rates for Design (Litres / Day)	Average Discharge Rate (Litres / Seconds)	Peaking Factor	Peak Discharge Rate (Litres / Seconds)
A	109	2.7	294	150	0.51		
B	44	2.7	119	150	0.21		
C	100	2.7	270	150	0.47		
D	179	2.7	483	150	0.84		
E	179	2.7	483	150	0.84		
F	99	2.7	267	150	0.46		
G	40	2.7	108	150	0.19		
		Total	**2025**		**3.52**	**3.0**	**10.55**

Commercial Elements

Unit Type	Gross Floor Area (m^2)	Density (Person / m^2)	Number of Persons	Flow Rates for Design (Litres / Day)	Average Discharge Rate (Litres / Seconds)	Peaking Factor	Peak Discharge Rate (Litres / Seconds)
Retail	156	40	3.9	50	0.002		
Creche	410	10	41	90	0.043		
		Total			**0.045**	4.5	**0.20**

Average Discharge Rate into the Irish Water Network (l/s) **3.56**

Peak Discharge Rate into the Irish Water Network (l/s) **10.75**

H085 Park West SHD

Park West Avenue & Park West Road, Park West, Dublin 12

Water Demand Rates

Residential Units

Blocks	Units Number	Density (Persons / Unit)	Number of Persons	Daily Demand Rate (Litres / Day)	Average Daily Demand Factor	Average Demand Rate (Litres / Seconds)	Peak Demand Factor	Peak Demand Rate (Litres / Seconds)
A	109	2.7	294	150		0.51		
B	44	2.7	119	150		0.21		
C	100	2.7	270	150		0.47		
D	179	2.7	483	150		0.84		
E	179	2.7	483	150		0.84		
F	99	2.7	267	150		0.46		
G	40	2.7	108	150		0.19		
		Total	**2025**		**1.25**	**4.39**	**5.0**	**21.97**

Commercial Elements

Unit Type	Gross Floor Area (m^2)	Density (Person / m^2)	Number of Persons	Flow Rates for Design (Litres / Day)	Average Daily Demand Factor	Average Demand Rate (Litres / Seconds)	Peak Demand Factor	Peak Demand Rate (Litres / Seconds)
Retail	156	40	3.9	50		0.002		
Creche	410	10	41	90		0.043		
		Total			**1.25**	**0.056**	5	**0.28**

Average Water Demand Rate from the Irish Water Network (l/s) **4.45**

Peak Demand Rate from the Irish Water Network (l/s) **22.25**

Appendix C

Irish Water Confirmation of Feasibility and Statement of Design Acceptance

CS CONSULTING
GROUP

Gessica Silva
CS Consulting
19-22 Dame Street
Dublin 2
Dublin
D02E267

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

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

www.water.ie

27 March 2020

Dear Gessica Silva,

Re: Connection Reference No CDS19005840 pre-connection enquiry -
Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 922 unit(s) at Lands at park west road, Park West Business Campus, Co. Dublin.

Irish Water has reviewed your pre-connection enquiry in relation to a water connection at Lands at park west road, Park West Business Campus, Co. Dublin.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated.

Water

New connection to the existing network is feasible without upgrades. A new bulk meter and a new pressure reducing valve at the extreme of the existing 450 mm AC (1980) main would be required.

Wastewater

New connection to the existing network is considered feasible to the manhole shown on attached figure bellow (approx. 165m from the development).

Also, the developer will have to survey a section of the sewer for possible sediments (survey has to be done in accordance with Irish Water standards). If sediments are found they have to be removed to create the required capacity. Proof of sewer condition before and after will be required at Connection application stage.

Strategic Housing Development

Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details. A design proposal for the water and/or wastewater infrastructure should be

submitted to Irish Water for assessment. Prior to submitting your planning application, you are required to submit these detailed design proposals to Irish Water for review.

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

A connection agreement can be applied for by completing the connection application form available at **www.water.ie/connections**. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities.

If you have any further questions, please contact Marko Komso from the design team on (022) 54611 or email mkomso@water.ie. For further information, visit **www.water.ie/connections.**

Yours sincerely,

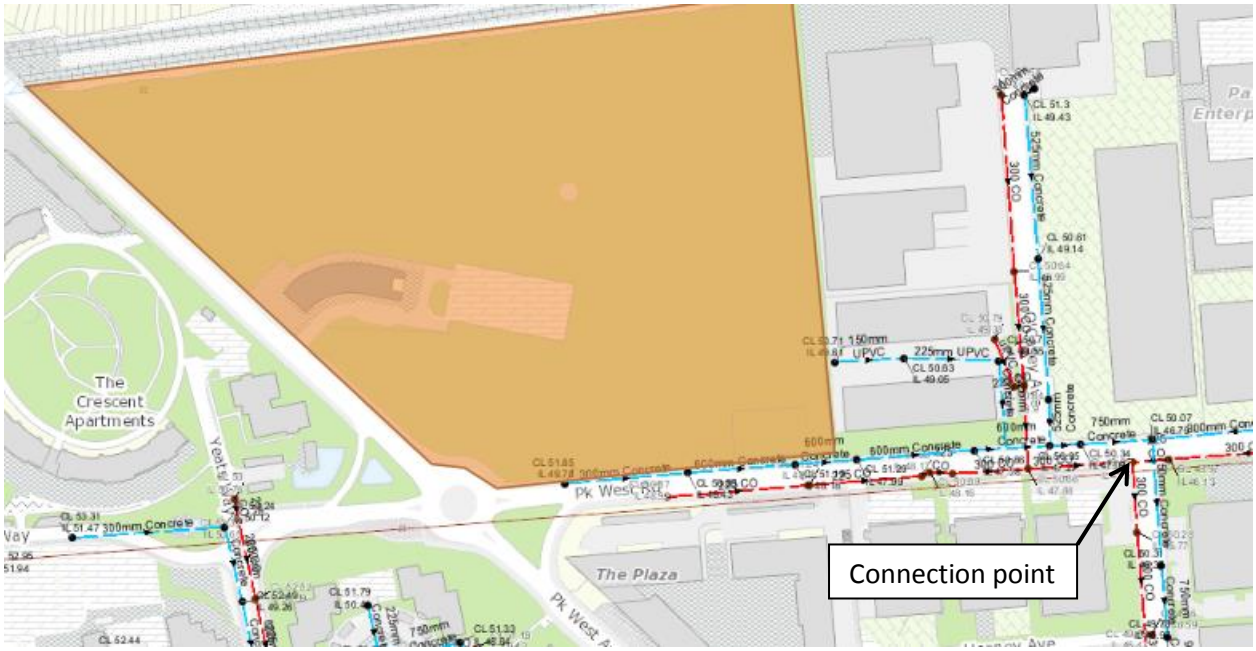
Maria O'Dwyer

Connections and Developer Services

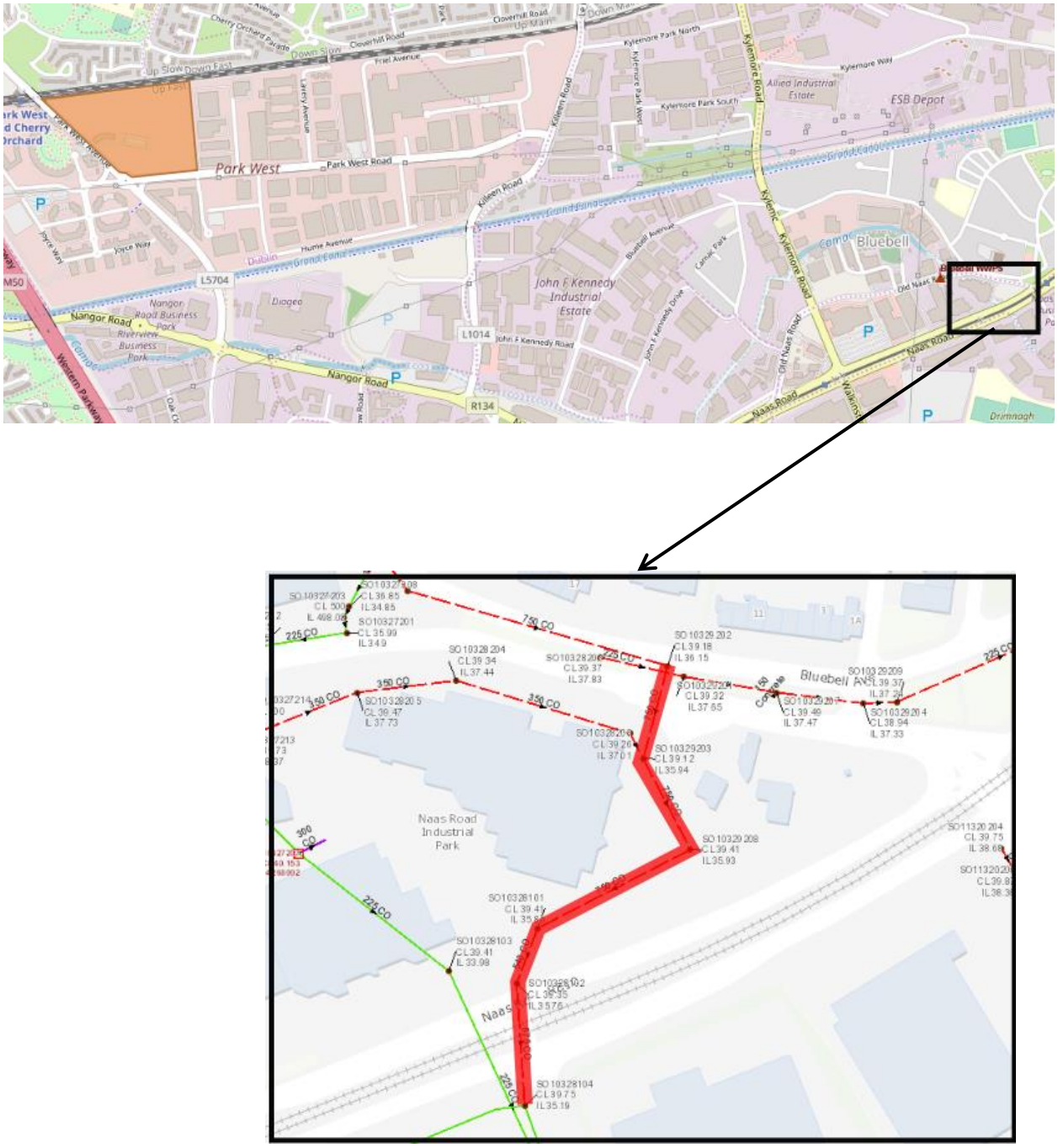
Water:

Connection point to existing watermain (Alternative B) –Supply from the existing 250 mm DI (1998) fed from the existing 450mm DI (2003)

Wastewater:



Scope of CCTV Survey to be done:



Marc Montrull
Cronin & Sutton Consulting
19 – 22 Dame Street
Dublin

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

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

www.water.ie

25 November 2021

Re: Design Submission for Lands at park west road, Park West Business Campus, Co. Dublin (the "Development")
(the "Design Submission") / Connection Reference No: CDS19005840

Dear Marc Montrull,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative:
Name: Dario Alvarez
Email: dalvarez@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- [PWT-CSC-XX-XX-DR-C-0014_Proposed Watermain Layout]
- [PWT-CSC-XX-XX-DR-C-0012_Proposed Drainage Plan Layout.]
- [PWT-CSC-XX-XX-DR-C-0020_Proposed Foul Sewer Long Sections]
- [PWT-CSC-XX-XX-DR-C-0017_Drainage Details Sheet 2 of 3]

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

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

GENERAL NOTES:

1. ALL PIPE WORK, VALVES, CHAMBERS, NETWORK ARRANGEMENTS AND ALL ASSOCIATED WATERMAIN WORKS TO BE IN ACCORDANCE WITH IRISH WATER CODES OF PRACTICE AND STANDARD DETAILS.
2. ALL NEW WATERMAIN MATERIAL SHALL BE IN ACCORDANCE WITH SECTION 3.9 OF THE IRISH WATER CODE OF PRACTICE.
3. ALL MANHOLES IN GRASSED AREAS TO HAVE 200MM WIDE X 100MM DEEP CONCRETE PLINTH/KERB CAST TO THEIR PERIMETER TO ENSURE THEY ARE NOT OVERGROWN. CONCRETE TO BE GRADE C20/25.
4. METERS FOR APARTMENTS AND SIMILAR PROPERTIES SHALL BE INSTALLED INTERNALLY WITHIN THE PREMISES IN ACCORDANCE WITH THE BUILDING CONTROL AUTHORITY'S REQUIREMENTS AND SUBJECT TO REVIEW BY IRISH WATER AS PER SECTION 3.15.2 OF THE CODE OF PRACTICE.
5. PROPOSED WATERMAINS TO BE LOCATED A MINIMUM OF 300MM FROm THE WASTEWATER INFRASTRUCTURE IN ACCORDANCE WITH SECTION 3.5.18 OF THE 3.15.18 OF THE IRISH WATER WASTEWATER CODE OF PRACTICE.
6. THE LOCATION OF THE BULK METER, VALVES AND HYDRANTS SHALL BE DESIGNED IN ACCORDANCE WITH SECTION 3.15.4 OF THE IRISH WATER CODE OF PRACTICE.
7. NOTE THE FIRE SAFETY CERTIFICATE HAS NOT BEEN COMLETED YET, BUT AS PART OF THIS DEVELOPMENT, IT IS CONFIRMED THAT HYDRANTS SHALL NOT BE LOCATED ANY MORE THAN 46M FROM ANY PART OF THE DEVELOPMENT.
8. ALL WATERMAIN WORKS TO BE TAKEN IN CHARGE TO BE AIR PRESSURE TESTED IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE SECTION 4.10.
9. PROPOSED WATERMAINS TO BE WRAPPED IN TREE PROTECTION BARRIER WHEN REQUIREMENTS STATED IN 3.26 OF THE WATER CODE OF PRACTICE CANNOT BE MET.
10. WHERE MANHOLE COVERS ARE TO BE LOCATED IN SOFT LANDSCAPED/GRASS AREAS; TO ENSURE THAT MANHOLE COVERS ARE IDENTIFIABLE, ACCESSIBLE AND WILL NOT BECOME OVERGROWN, COVERS ARE TO BE SURROUNDED BY A CONCRETE PLINTH, 200MM ALL ROUND AND 100MM DEEP FORMED WITH C20/25 CONCRETE, 20MM AGGREGATE SIZE, BEDDED IN CLAUSE 804 MATERIAL.
11. AIR VALVE AND HYDRANTS COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH, 200MM ALL ROUND AND 100MM DEEP, FORMED WITH C20/25 CONCRETE, 20MM AGGREGATE SIZE, AND BEDDED IN CLAUSE 804 MATERIAL. THE PLINTH SHALL INCORPORATE MILD STEEL REINFORCEMENT LINKS AND SHALL HAVE A BULL-NOSE FINISH AROUND ITS EXTERNAL PERIMETER. SEE SECTION 3.18 OF WATER CODE OF PRACTICE.

LEGEND:

- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- DECOMMISSION WATERMAIN
- PROPOSED SLUICE VALVE (SV)
- PROPOSED AIR VALVE (AV)
- PROPOSED HYDRANT
- PROPOSED BULK METER

NEW 1000 METERED WATER SUPPLY CONNECTION TO BLOCK A. WATER METER TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–26.

NEW 1000 METERED WATER SUPPLY CONNECTION TO BLOCK B. WATER METER TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–26.

NEW 1000 METERED WATER SUPPLY CONNECTION TO BLOCKS C & D. WATER METER TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–26.

NEW 1000 METERED WATER SUPPLY CONNECTION TO BLOCK D. WATER METER TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–26.

NEW 1000 METERED WATER SUPPLY CONNECTION TO BLOCK E. WATER METER TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–26.

NEW 1000 METERED WATER SUPPLY CONNECTION TO BLOCK F. WATER METER TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–26.

NEW ON–LINE HYDRANT TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–18

NEW OFF–LINE HYDRANT TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–19

BLOCK A 130 UNITS

BLOCK B 44 UNITS

BLOCK C 92 UNITS

BLOCK D 174 UNITS

BLOCK E 174 UNITS

BLOCK F 99 UNITS

BLOCK G 40 UNITS

PROPOSED ON–LINE AIR VALVE TO BE LOCATED AT HIGH POINTS. TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–22.

SURVEY WORKS TO BE CARRIED OUT TO IDENTIFY THE LOCATION OF THE EXISTING PUBLIC MAIN. EXISTING 450Ø ASBESTOS CONCRETE PUBLIC MAIN TO BE BROKEN OUT AND REMOVED FROM SITE TO ALLOW THE CONSTRUCTION OF NEW DEVELOPMENT, IN AGREEMENT WITH IRISH WATER.

EXISTING 450Ø ASBESTOS CONCRETE PUBLIC MAIN TO BE BROKEN OUT AND REMOVED FROM SITE TO ALLOW THE CONSTRUCTION OF NEW DEVELOPMENT, IN AGREEMENT WITH IRISH WATER.

NEW 150Ø WATERMAIN CROSS CONNECTION TO THE EXISTING 450Ø PUBLIC MAIN ON PARK WEST AVENUE IN AGREEMENT WITH IRISH WATER. CLOSED VALVE CONNECTION DURING NORMAL OPERATIONS.

NEW PRESSURE REDUCING MAIN TO BE INSTALLED ON EXISTING 450mm ASBESTOS WATERMAIN AS PER SECTION 3.5.33 OF CODE OF PRACTICE

PROPOSED CONNECTION TO BE AGREED BY THE LOCAL AUTHORITY OPERATIONS DIVISION AS THE STATUS AND INTEGRITY OF THE EXISTING WATERMAIN IS UNKNOWN

OFF–LINE HYDRANT TO CALIBRATE METER TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–17

NEW BULK METER AND PRESSURE REDUCING VALVE TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–26

NEW 500 METERED WATER SUPPLY CONNECTION TO BLOCK G. WATER METER TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–26. ALL COMMERCIAL PREMISES EQUIPPED WITH AN INDIVIDUAL SERVICE CONNECTION AND EXTERNAL BULK FLOW METER IN ACCORDANCE WITH STD–W–26 AND SECTION 3.15 OF THE WATER CODE OF PRACTICE

PROPOSED OFF–LINE SCOUR VALVE AND SCOUR CHAMBER TO BE LOCATED AT LOW POINTS WITH CONNECTION TO THE SURFACE WATER SYSTEM. TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–30.

NEW BULK METER TO BE CONSTRUCTED TO IRISH WATER STANDARD DETAIL STD–W–26

NEW 250Ø WATERMAIN CONNECTION TO THE EXISTING 250Ø PUBLIC MAIN ON PARK WEST ROAD IN AGREEMENT WITH IRISH WATER. CLOSED VALVE CONNECTION UNTIL SURROUNDING AREA GETS DEVELOPED.

EXISTING 250mmØ DUCTILE IRON WATERMAIN

EXISTING 300mmØ DUCTILE IRON WATERMAIN

EXISTING 300mmØ DUCTILE IRON WATERMAIN

PARK WEST ROAD

Raised Car Park

Steps

NOTES:

1. WATERMAIN SYSTEM TO BE CONSTRUCTED TO IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS FOR WATER INFRASTRUCTURE.

H085

DRAFT

PLANNING DRAWING.
NOT FOR CONSTRUCTION.
ALL LEVELS GIVEN ARE RELATIVE TO ORDNANCE DATUM.
THIS DRAWING HAS BEEN ISSUED FOR INFORMATION PURPOSES ONLY AND MUST NOT BE USED FOR CONSTRUCTION UNDER ANY CIRCUMSTANCES

NOTES
1. For setting out refer to Architect's drawings.
2. This drawing to be read in conjunction with all other Architectural and Engineering drawings and all other relevant drawings and Specifications.
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Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By
P1	10.12.2020	REVISED SITE LAYOUT	AB	NB
P2	15.12.2020	REVISED DRAWING	AB	NB
P3	17.09.2021	ISSUED FOR PLANNING STAGE 3	JS	NB

Architect	Darmody Architecture
Project	Park West SHD, Park West Avenue and Park West Road, Park West, Dublin 12
Title	Proposed Watermain Layout
Dwg. No.	PWT-CSC-XX-XX-DR-C-0014

Date	Drn by	Chkd by	Aprvd by	Scale	Revision
Nov 2020	AB	AB	NB	1:500@A0	P3

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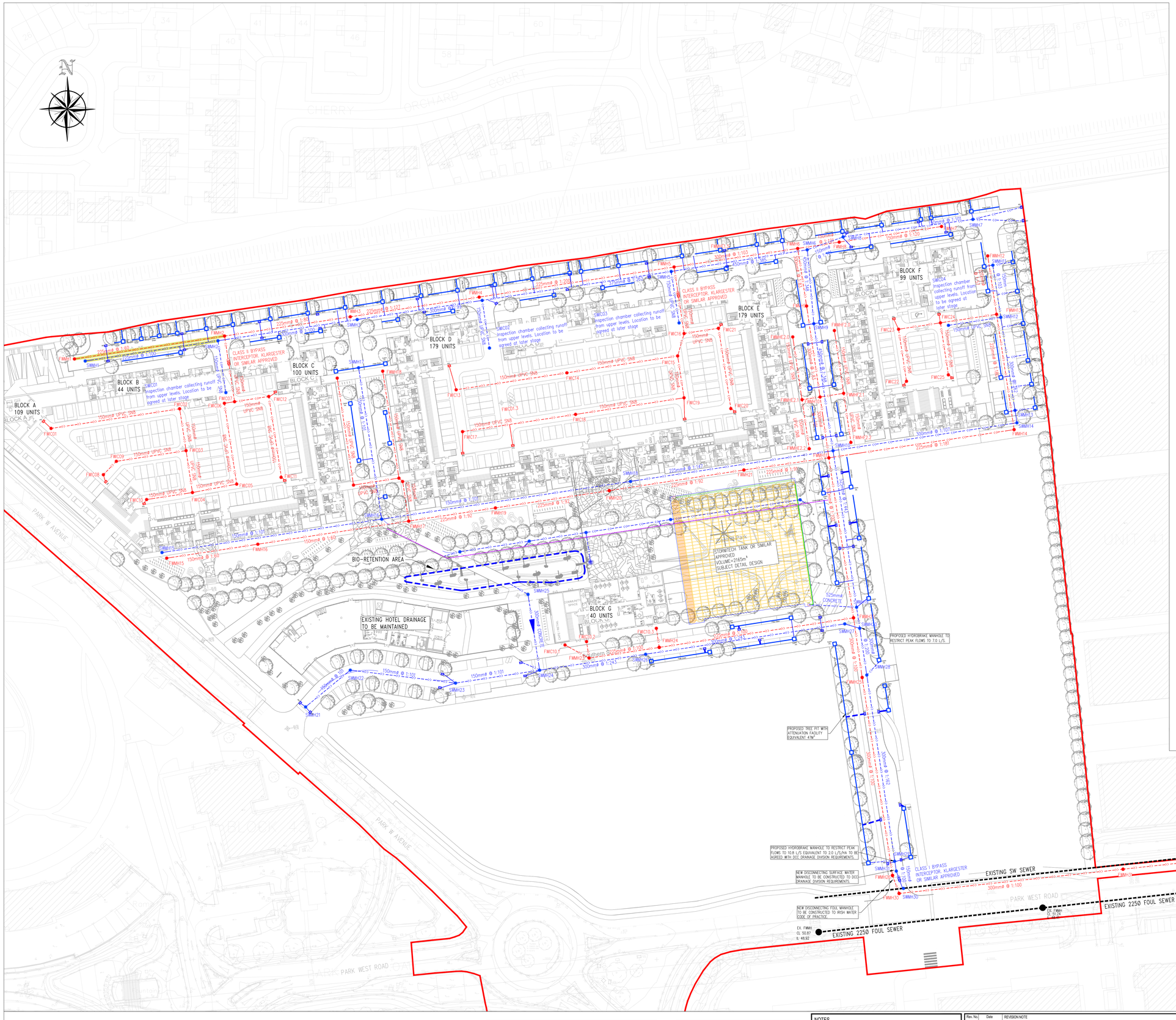
Environment I.S. EN ISO 14001:2004
Energy I.S. EN ISO 50001:2011
Health & Safety OHSAS 18001:2007



LEGEND:

- EXISTING SURFACE WATER SEWER — EX. SWMH
- PROPOSED SURFACE WATER SEWER — SWMH
- PROPOSED SURFACE WATER SEWER CONCRETE SURROUNDED — SWMH
- EXISTING FOUL WATER SEWER — EX. FWMH
- PROPOSED FOUL WATER SEWER — FWMH
- PROPOSED FOUL WATER SEWER CONCRETE SURROUNDED — FWMH
- PROPOSED STORMTECH ATTENUATION TANK TO ACCOMMODATE FOR INFILTRATION SUBJECT TO CONFIRMATION OF SITE INVESTIGATION WORKS
- PROPOSED TREE PIT

SuDS NOTES:

1. ROOF LEVEL GREEN ROOF SYSTEM TO BE MINIMUM 60% OF OVERALL ROOF LEVELS
2. FOR EXTENT OF SOFTSCAPE AREAS TO PODIUM SLAB PLEASE REFER TO LANDSCAPE ARCHITECT DRAWINGS
3. SURFACE WATER RUNOFF FROM THE ROOF AREAS TO PASS THROUGH GREEN ROOF AND RAIN GARDEN AT PODIUM LEVEL AND TO MAIN DRAINAGE NETWORK. EXACT FINISHES TO BE CONFIRMED BY LANDSCAPE ARCHITECT
4. STORMTECH TANKS, SWALES AND BASIN TO ALLOW FOR INFILTRATION.

GENERAL NOTES:

1. SETTING OUT AND COORDINATION OF SERVICE POP UPS AND DRAINAGE LOCATIONS TO BE CONFIRMED AND SET OUT BY M&E CONSULTANT AND ARCHITECT.
2. CSC ARE NOT RESPONSIBLE FOR EITHER FOUL OR STORM WATER DRAINAGE ABOVE GROUND LEVEL.
3. THE CONTRACTOR TO CONFIRM ALL INVERT LEVELS TO EXISTING DRAINAGE AND CONFIRM WITH THE ENGINEER PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS ON SITE.
4. ALL DRAINAGE WORKS TO BE CONSTRUCTED IN STRICT ACCORDANCE WITH PART H OF THE BUILDING REG'S, IRISH WATER AND DUN LAOGHAIRE, RATHDOWN Co Co SPECIFICATIONS/REQUIREMENTS.
5. THE CONTRACTOR SHALL AIR TEST ALL PIPES UPON COMPLETION IS ACCORDANCE WITH PART H OF THE BUILDING REGULATIONS.
6. THE CONTRACTOR SHALL CONDUCT A CCTV SURVEY OF ALL DRAINS UPON COMPLETION OF THE WORKS TO ENSURE THE INTEGRITY OF THE DRAINS.
7. BUILDING MATERIALS (BLOCKS ETC.) SHOULD NOT BE STOCKPILED ABOVE PIPES OR WATERMAINS.
8. THE CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF ALL PIPES (PROPOSED AND EXISTING) DURING CONSTRUCTION. GIVEN THE TIGHT NATURE OF THIS SITE, THE CONSTRUCTION TRAFFIC MANAGEMENT PLAN SHOULD MAKE SPECIFIC REFERENCE TO THE PROTECTION MEASURES (CONCRETE ENCASEMENT AND STEEL PLATES ETC.) TO BE APPROVED TO THE PIPES TO PROTECT THEM FROM OVERLOADING DUE TO DELIVERY TRUCKS OR OTHER HEAVY PLANT.
9. THE CONTRACTOR SHOULD MAKE REFERENCE TO THE PREVIOUSLY COMPLETED UTILITIES SURVEY AND SITE INVESTIGATION REPORT FOR THE LOCATION OF KNOWN SERVICES ON SITE. HOWEVER, THE CONTRACTOR IS RESPONSIBLE FOR COMPLETING HIS OWN SURVEY AND DUE DILIGENCE PRIOR TO UNDERTAKING ANY EXCAVATIONS ON SITE.
10. SOIL VENT PIPE'S SUBSTACKS AND RAINWATER LOCATIONS TO BE CONFIRMED BY ARCHITECT/M&E.
11. CONNECTION TO DCC MAIN DRAINAGE NETWORK SUBJECT TO AGREEMENT.
12. PRIOR TO THE COMMENCEMENT OF THE WORKS, A CCTV SURVEY MUST BE CARRIED OUT IN ORDER TO DETERMINE THE CAPACITY OF THE RECEIVING SEWERS. IF SEDIMENTS ARE FOUND THIS WILL BE REMOVED TO CREATE THE REQUIRED CAPACITY.
13. A PRE-DEVELOPMENT AND POST-DEVELOPMENT PROOF OF SEWER IS REQUIRED PRIOR TO CONNECTION APPLICATION STAGE WITH IRISH WATER.
14. WORKS IN ALL EXTERNAL PUBLIC AREAS MUST BE IN ACCORDANCE TO THE GREATER DUBLIN REGIONAL CODE OF PRACTICE.
15. ALL INTERNAL BUILDING DRAINAGE ELEMENTS WILL REMAIN PRIVATE POST CONSTRUCTION AND WILL NOT TO BE VESTED TO IRISH WATER.
16. WHERE MANHOLE COVERS ARE TO BE LOCATED IN SOFT LANDSCAPED/GRASS AREAS, TO ENSURE THAT MANHOLE COVERS ARE IDENTIFIABLE, ACCESSIBLE AND WILL NOT BECOME OVERGROWN, COVERS ARE TO BE SURROUNDED BY A CONCRETE PLINTH, 200MM ALL ROUND AND 100MM DEEP FORMED WITH C20/25 CONCRETE, 20MM AGGREGATE SIZE, BEDDED IN CLAUSE 804 MATERIAL.

FOUL WATER MANHOLES

MANHOLE NAME	DETAILS
FWMH 15	COVER = 55.220 F 4.000 INV OUT = 53.565
FWMH 1	COVER = 55.067 F 1.000 INV OUT = 53.890
FWMH 16	COVER = 54.640 F 4.000 INV IN = 52.985 F 4.001 INV OUT = 52.985
FWMH 2	COVER = 54.458 F 1.000 INV IN = 52.834 F 1.001 INV OUT = 52.934
FWMH 3	COVER = 54.013 F 1.001 INV IN = 52.133 F 1.002 INV OUT = 52.333
FWMH 21	COVER = 53.950 F 4.004 INV IN = 50.553 F 4.005 INV OUT = 50.553
FWMH 11	COVER = 53.740 F 1.007 INV IN = 50.125 F 3.002 INV IN = 50.200 F 4.005 INV IN = 50.200 F 1.008 INV OUT = 50.125
FWMH 10	COVER = 53.724 F 1.006 INV IN = 50.357 F 1.007 INV OUT = 50.357
FWMH 17	COVER = 53.680 F 4.001 INV IN = 52.023 F 4.002 INV OUT = 51.948
FWMH 6	COVER = 53.652 F 1.004 INV IN = 51.039 F 2.001 INV IN = 51.189 F 1.005 INV OUT = 51.039
FWMH 20	COVER = 53.580 F 4.003 INV IN = 51.113 F 4.004 INV OUT = 51.113
FWMH 19	COVER = 53.580 F 4.002 INV IN = 51.587 F 4.003 INV OUT = 51.587
FWMH 8	COVER = 53.492 F 2.000 INV IN = 51.321 F 2.001 INV OUT = 51.321
FWMH 26	COVER = 51.052 F 1.010 INV IN = 48.530 F 1.011 INV OUT = 48.530

FOUL WATER MANHOLES

MANHOLE NAME	DETAILS
FWMH 30	COVER = 50.996 F 1.011 INV IN = 48.457 F 1.012 INV OUT = 48.457
FWMH 32	COVER = 50.800 F 1.013 INV IN = 46.757 F 1.014 INV OUT = 46.757
FWMH 33	COVER = 49.950 F 1.014 INV IN = 46.073 F 1.015 INV OUT = 46.073
EXFWMH	COVER = 49.940 F 1.015 INV IN = 45.960
FWMH 24	COVER = 53.489 F 5.000 INV IN = 50.331 F 5.001 INV OUT = 50.331
FWMH 5	COVER = 53.482 F 1.003 INV IN = 51.498 F 1.004 INV OUT = 51.498
FWMH 4	COVER = 53.472 F 1.002 INV IN = 52.945 F 1.003 INV OUT = 51.870
FWMH 23	COVER = 53.367 F 5.000 INV OUT = 50.599
FWMH 9	COVER = 53.316 F 1.005 INV IN = 50.775 F 1.006 INV OUT = 50.775
FWMH 7	COVER = 53.097 F 2.000 INV OUT = 51.647
FWMH 13	COVER = 52.930 F 3.000 INV IN = 50.845 F 3.001 INV OUT = 50.845
FWMH 14	COVER = 52.900 F 3.000 INV IN = 50.593 F 3.002 INV OUT = 50.593
FWMH 12	COVER = 52.740 F 3.000 INV OUT = 51.215
FWMH 22	COVER = 52.712 F 1.008 INV IN = 49.514 F 5.001 INV IN = 49.589 F 1.009 INV OUT = 49.514
FWMH 25	COVER = 52.325 F 1.009 INV IN = 49.286 F 1.010 INV OUT = 49.286
FWMH 31	COVER = 51.350 F 1.012 INV IN = 47.607 F 1.013 INV OUT = 47.607

SURFACE WATER MANHOLES

MANHOLE NAME	DETAILS
SWMH15	COVER = 55.220 S 4.000 INV OUT = 53.050
SWMH1	COVER = 54.994 S 1.000 INV OUT = 53.569
SWMH2	COVER = 54.473 S 1.000 INV IN = 53.061 S 1.001 INV OUT = 53.024
SWMH3	COVER = 53.954 S 1.001 INV IN = 52.492 S 1.002 INV OUT = 52.492
SWMH18	COVER = 53.900 S 4.001 INV IN = 51.278 S 4.002 INV OUT = 51.201
SWMH10	COVER = 53.798 S 1.006 INV IN = 50.450 S 3.003 INV IN = 50.600 S 4.002 INV IN = 50.675 S 1.007 INV IN = 50.375
SWMH17	COVER = 53.772 S 5.000 INV OUT = 53.000
SWMH16	COVER = 53.761 S 4.000 INV IN = 52.217 S 5.000 INV IN = 52.623 S 4.001 INV OUT = 52.217
SWMH6	COVER = 53.591 S 1.004 INV IN = 51.414 S 2.001 INV IN = 50.970 S 1.005 INV OUT = 50.670
SWMH21	COVER = 53.543 S 6.000 INV OUT = 52.193
SWMH22	COVER = 53.530 S 6.000 INV IN = 51.979 S 6.001 INV OUT = 51.979
SWMH5	COVER = 53.524 S 1.003 INV IN = 51.625 S 1.004 INV OUT = 51.550
SWMH26	COVER = 53.518 S 6.003 INV IN = 50.945 S 6.004 INV OUT = 50.945
SWMH4	COVER = 53.505 S 1.002 INV IN = 52.014 S 1.003 INV OUT = 51.902
SWMH25	COVER = 53.500 S 7.000 INV OUT = 51.725

SURFACE WATER MANHOLES

MANHOLE NAME	DETAILS
SWMH23	COVER = 53.474 S 6.001 INV IN = 51.578 S 6.002 INV OUT = 51.578
SWMH8	COVER = 53.438 S 2.000 INV IN = 51.114 S 2.001 INV OUT = 51.114
SWMH9	COVER = 53.347 S 1.005 INV IN = 50.596 S 1.006 INV OUT = 50.596
SWMH24	COVER = 53.155 S 6.002 INV IN = 51.261 S 7.000 INV IN = 51.513 S 6.003 INV OUT = 51.111
SWMH7	COVER = 52.980 S 2.000 INV OUT = 51.610
SWMH13	COVER = 52.956 S 3.001 INV IN = 51.242 S 3.002 INV OUT = 51.242
SWMH14	COVER = 52.900 S 3.002 INV IN = 51.178 S 3.003 INV OUT = 51.178
SWMH12	COVER = 52.878 S 3.000 INV IN = 51.608 S 3.001 INV OUT = 51.458
SWMH19	COVER = 52.795 S 1.008 INV IN = 50.239 S 1.007 INV OUT = 50.239
SWMH11	COVER = 52.754 S 3.000 INV OUT = 51.805
SWMH27	COVER = 52.752 S 6.004 INV IN = 50.632 S 6.005 INV OUT = 50.520
SWMH20	COVER = 52.660 S 6.005 INV IN = 50.494 S 1.009 INV OUT = 50.222 S 1.008 INV IN = 50.222
SWMH28	COVER = 52.340 S 1.009 INV IN = 50.132 S 1.010 INV OUT = 50.132
SWMH29	COVER = 51.171 S 1.010 INV IN = 49.693 S 1.010(1) INV OUT = 49.693
SWMH31	COVER = 51.106 S 1.010(1) INV IN = 49.670 S 1.011 INV OUT = 49.671
SWMH30	COVER = 50.952 S 1.011 INV IN = 49.600

H085

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NOTES:

1. FOUL WATER DRAINAGE SYSTEM TO BE CONSTRUCTED TO IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS FOR WASTEWATER INFRASTRUCTURE.
2. SURFACE WATER DRAINAGE SYSTEM TO BE CONSTRUCTED TO THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS

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Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By
P1	10.12.2020	REVISED SITE LAYOUT	AB	NB
P2	15.12.2020	REVISED DRAWING	AB	NB
P3	17.06.2021	ISSUED FOR PLANNING STAGE 3	JS	NB

Architect	Darmody Architecture
Project	Park West SHD, Park West Avenue and Park West Road, Park West, Dublin 12
Title	Proposed Drainage Layout
Dwg. No.	PWT-CSC-XX-XX-DR-C-0012
Date	Nov 2020
Drn by	AB
Chkd by	AB
Apvd by	NB
Scale	1:500@A0
Revision	P3

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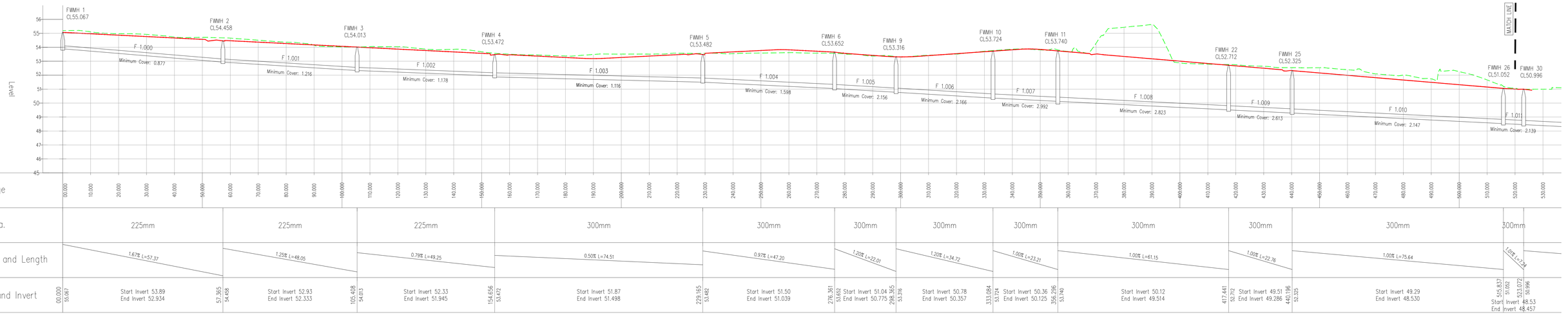
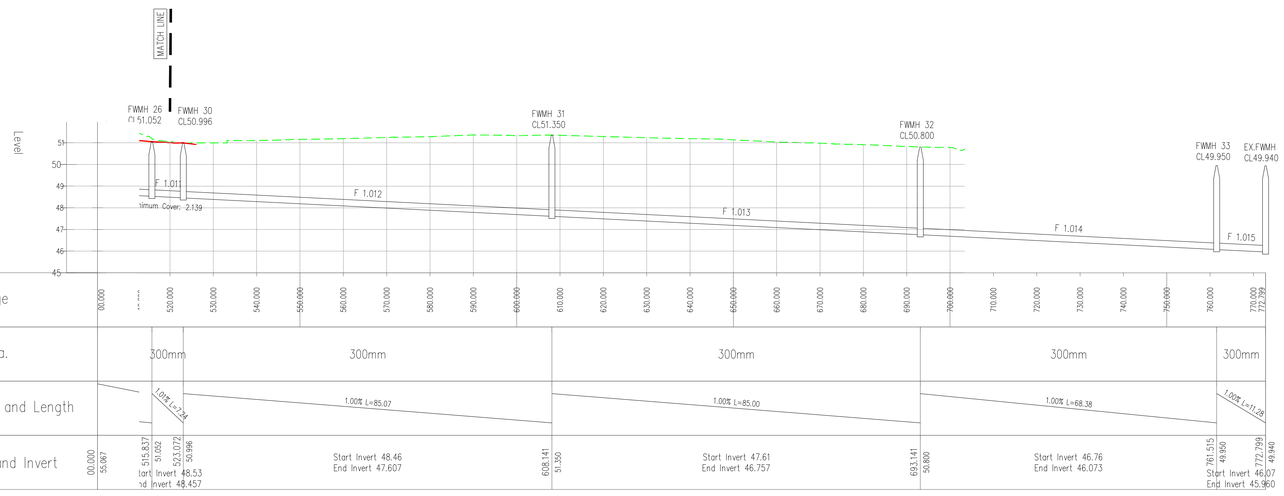


FWMH1 – EXFWMH – LONGSECTION

SCALE: H 1:500,V 1:100. DATUM: 45.000



FWMH1 – EXFWMH – LONGSECTION

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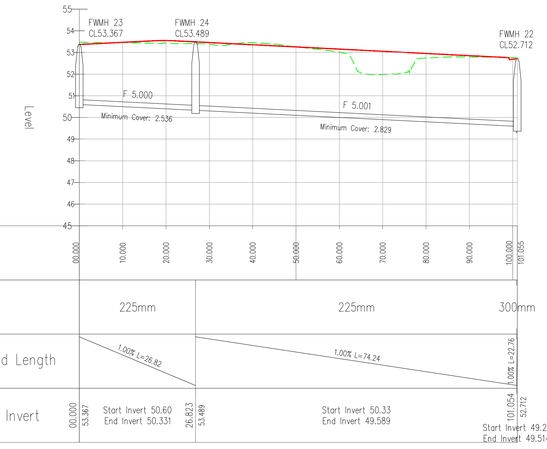

FWMH23 – FWMH22 – LONGSECTION

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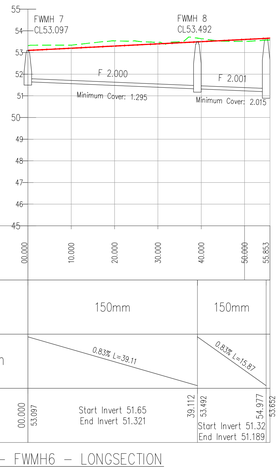

FWMH7 – FWMH6 – LONGSECTION

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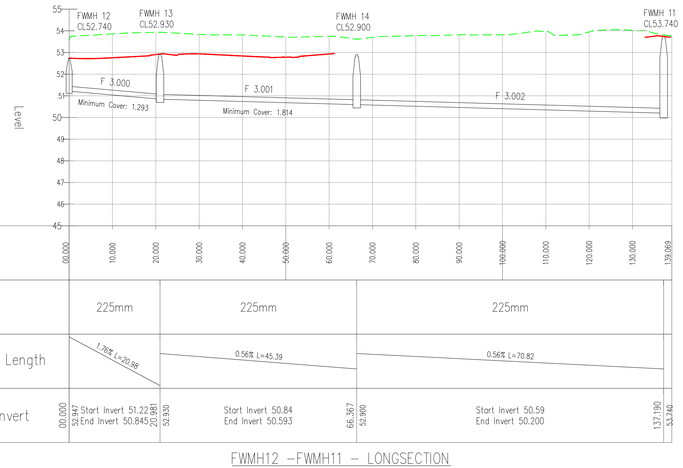
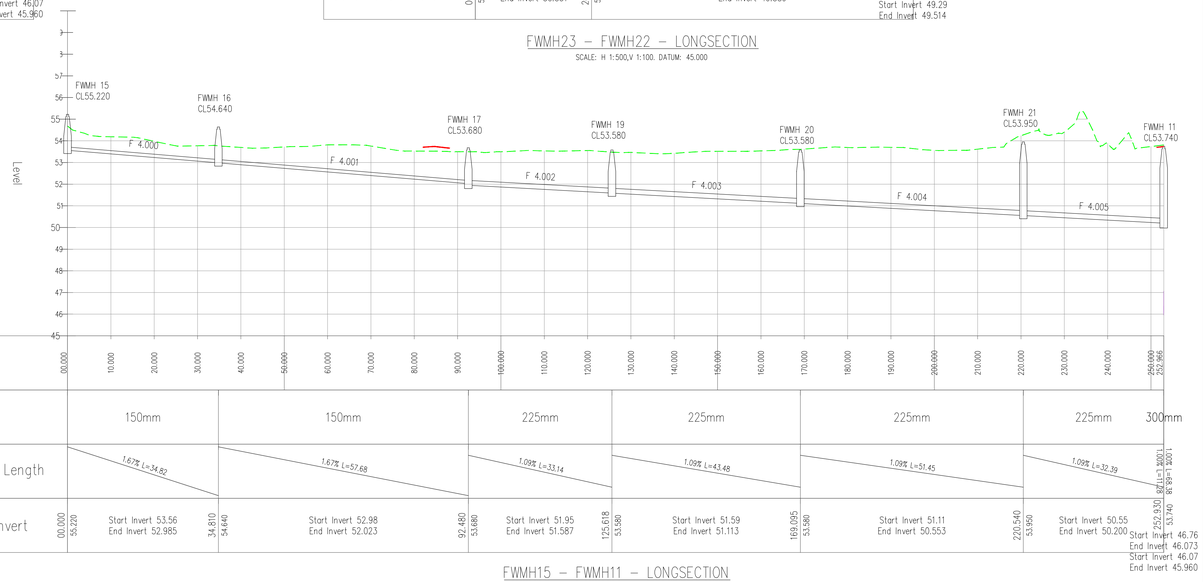


FWMH12 –FWMH11 – LONGSECTION

SCALE: H 1:500,V 1:100. DATUM: 45.000



FWMH15 – FWMH11 – LONGSECTION

SCALE: H 1:500,V 1:100. DATUM: 45.000

H085

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Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By

Architect	Darmody Architecture
Project	Park West SHD, Park West Avenue and Park West Road, Park West, Dublin 12
Title	Proposed Foul Sewer Long Sections
Dwg. No.	PWT-CSC-XX-XX-DR-C-0020
Date	Nov 2021
Drn by	JS
Chkd by	MM
Aprvd by	NB
Scale	AS SHOWN @A0
Revision	

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Health & Safety OHSAS 18001:2007

NOTES:

1 ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.

2 THE MINIMUM DEPTH OF COVER FROM THE FINISHED SURFACE TO THE CROWN OF GRAVITY PIPES WITHOUT PROTECTION SHOULD BE AS FOLLOWS:

A. GARDENS AND PATHWAYS WITHOUT ANY POSSIBILITY OF VEHICULAR ACCESS – DEPTH NOT LESS THAN 0.5M (THIS WOULD NORMALLY RELATE TO DRAINS IN PRIVATE PROPERTY, SHALLOW PIPES OF THIS NATURE ARE UNDESIRABLE AND SHOULD BE INSTALLED IN ACCORDANCE WITH THE CURRENT BUILDING REGULATIONS).

B. DRIVEWAYS, PARKING AREAS AND YARDS WITH HEIGHT RESTRICTIONS TO PREVENT ENTRY BY VEHICLES WITH A GROSS VEHICLE WEIGHT IN EXCESS OF 7.5 TONNES – DEPTH NOT LESS THAN 0.75m.

C. DRIVEWAYS, PARKING AREAS AND NARROW STREETS WITHOUT FOOTWAYS (EG MEWS DEVELOPMENTS) WITH LIMITED ACCESS FOR VEHICLES WITH A GROSS VEHICLE WEIGHT IN EXCESS OF 7.5 TONNES – DEPTH NOT LESS THAN 0.9m.

D. DEPTHS OF SEWERS IN GATED ESTATES SHALL BE SIMILAR TO THAT OUTLINED ABOVE.

E. AGRICULTURAL LAND AND PUBLIC OPEN SPACE – DEPTH NOT LESS THAN 0.9m.

F. OTHER HIGHWAYS AND PARKING AREAS WITH UNRESTRICTED ACCESS TO VEHICLES WITH A GROSS VEHICLE WEIGHT IN EXCESS OF 7.5 TONNES – DEPTH NOT LESS THAN 1.2m.

3 CLAUSE 808 MATERIAL IN ACCORDANCE WITH THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS IS TO BE USED AS BACKFILL MATERIAL WHERE THE SEWER MAIN IS LOCATED IN ROADS, FOOTPATHS OR WHEN THE NEAREST PART OF THE TRENCH IS WITHIN 1M OF THE PAVED EDGE OF THE ROADWAY, CLAUSE 808 IS TO BE COMPACTED AS PER CLAUSE 802 OF THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS.

4 SELECTED EXCAVATED MATERIAL MAY BE USED IN GREEN-FIELD AREAS ABOVE GRANULAR PIPE SURROUND MATERIAL SUBJECT TO THE APPROVAL OF IRISH WATER.

5 PIPE BEDDING SHALL COMPLY WITH WIS 4-08-02 AND IGN 4-08-01 GRANULAR MATERIAL SHALL BE 14mm TO 5MM GRADED AGGREGATE OR 10MM SINGLE SIZED AGGREGATE IS EN 13242. CONCRETE BED, HAUNCH & SURROUND, WHERE REQUIRED, SHALL BE TO STD-WW-08.

6 IN SOFT GROUND CONDITIONS (CBR < 5) THE MATERIAL SHOULD BE EXCAVATED AND DISPOSED OF IN ACCORDANCE WITH THE WASTE MANAGEMENT ACT AND CLAUSE 808 MATERIAL IN ACCORDANCE WITH THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS SHALL REPLACE THE EXCAVATED MATERIAL, WRAPPED IN GEO-TEXTILE WRAPPING, ALTERNATIVELY, SPECIAL PIPE SUPPORT ARRANGEMENTS, INCLUDING PILING ETC. MAY BE REQUIRED WHERE THE DEPTH OF SOFT MATERIAL IS EXCESSIVE. SUCH ARRANGEMENTS SHALL BE SUBJECT TO ASSESSMENT BY IRISH WATER BEFORE ADVANCING WITH THE WORK.

7 IN GREEN FIELD AREAS, TYPE B BACKFILL (SELECTED EXCAVATED MATERIAL) WILL BE ALLOWED ABOVE THE SIDE HAUNCH GRANULAR MATERIAL IN THE CASE OF RIGID PIPES. A GRANULAR SURROUND OF A MINIMUM DEPTH OF 150mm ABOVE THE CROWN OF THE PIPE IS REQUIRED FOR FLEXIBLE PIPES, AND TYPE B MATERIAL MAY BE USED AS BACKFILL ABOVE THIS. ALL RISING MAINS IN GREENFIELD AREAS SHALL HAVE A MINIMUM COVER OF 300mm OF GRANULAR MATERIAL ABOVE THE EXTERNAL CROWN OF THE PIPE.

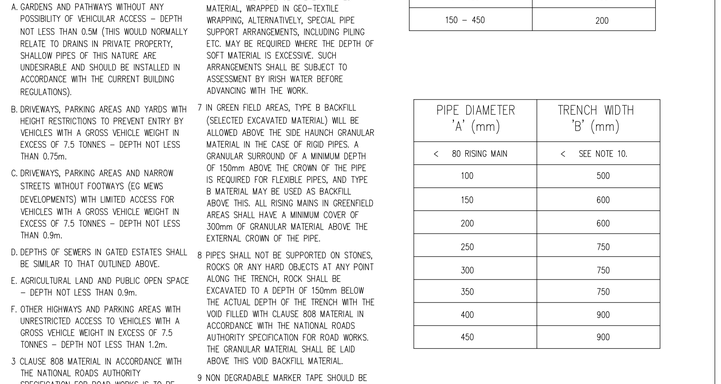
8 PIPES SHALL NOT BE SUPPORTED ON STONES, ROCKS OR ANY HARD OBJECTS AT ANY POINT ALONG THE TRENCH, ROCK SHALL BE EXCAVATED TO A DEPTH OF 150mm BELOW THE ACTUAL DEPTH OF THE TRENCH WITH THE VOID FILLED WITH CLAUSE 808 MATERIAL IN ACCORDANCE WITH THE NATIONAL ROADS AUTHORITY SPECIFICATION FOR ROAD WORKS. THE GRANULAR MATERIAL SHALL BE LAID ABOVE THIS VOID BACKFILL MATERIAL.

9 NON DEGRADABLE MARKER TAPE SHOULD BE INSTALLED AT TOP OF PIPE BEDDING LAYER. IN THE CASE OF NON-METAL PIPE MATERIAL, THE MARKER TAPE SHOULD INCORPORATE A TRACE WIRE WHICH IS LINKED TO FITTINGS AND TERMINATED AT THE WASTE WATER PUMPING STATION AND THE DISCHARGE MANHOLE.

10 TRENCH WIDTHS FOR PIPE SIZES ≤80mm MAY BE <500mm, SUBJECT TO CONSIDERATION BEING GIVEN TO THE TRENCH DEPTH, HEALTH & SAFETY & CONSTRUCTION ACCESS REQUIREMENTS.

PIPE DIAMETER 'A' (mm)	DEPTH OF BEDDING 'C' (mm)
< 80 RISING MAIN	< SEE NOTE 10.
< 100	100
150 – 450	200

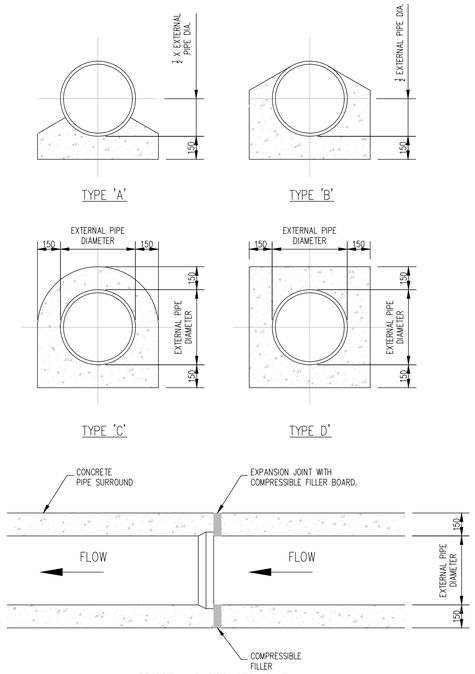
PIPE DIAMETER 'A' (mm)	TRENCH WIDTH 'B' (mm)
< 80 RISING MAIN	< SEE NOTE 10.
100	500
150	600
200	600
250	750
300	750
350	750
400	900
450	900



CROSS SECTION IN GRASSED AREAS

CROSS SECTION IN ROADS

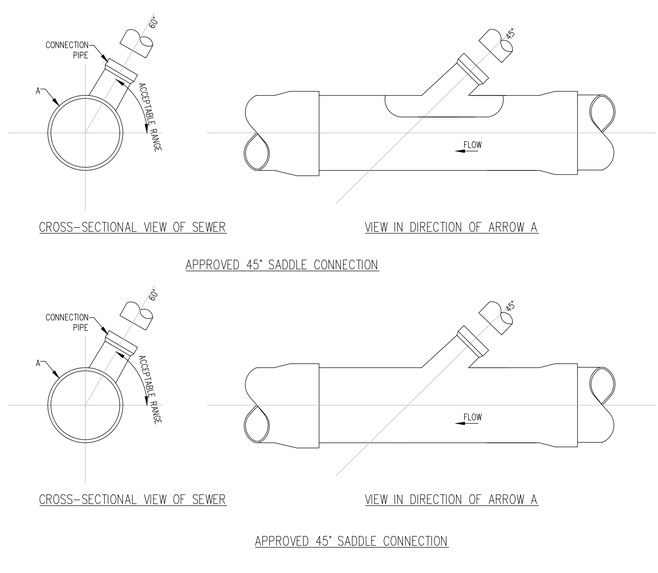
TRENCH BACKFILL AND BEDDING (STD – WW – 07)
SCALE 1:20



NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE.
2. CONCRETE PIPELINE BEDS AND HAUNCHES MAY BE REQUIRED TO ADDRESS MINIMUM COVER SITUATIONS, AND SHALL BE SUBJECT TO SUBMISSION AND ASSESSMENT BY IRISH WATER BEFORE ADVANCING WITH THE WORKS.
3. CONCRETE PIPE BEDS AND HAUNCHES SHALL HAVE A MINIMUM THICKNESS OF 150MM WITH AN ABSOLUTE MINIM DEPTH OF COVER ABOVE THE EXTERNAL CROWN OF THE PIPE OF 750MM.
4. CONCRETE TO BE IN ACCORDANCE WITH IS EN 206 AND TO BE CLASSED C16/20 .
5. THE HAUNCHES AND SURROUNDINGS TO BE FORMED USING FORM WORK TO PROVIDE A ROUGH CAST FINISH.
6. EXPANSION JOINTS IN THE CONCRETE SHALL BE PROVIDED AT ALL PIPE JOINTS TO ALLOW FOR PIPE FLEXIBILITY, COMPRESSIBILITY FILLER BOARD TO BE IN ACCORDANCE WITH BS EN 622-1 AND BS EN 622-4, AND TO BE 18mm THICK.
7. POLYETHYLENE PIPES SHALL BE WRAPPED IN PLASTIC SHEETING HAVING A COMPETITION WITH ACCORDANCE WITH BS6076 BEFORE BEING CAST INTO CONCRETE.
8. BITUMINOUS MATERIAL SHALL NOT BE PUT IN CONTACT WITH PE OR PVC PIPES.

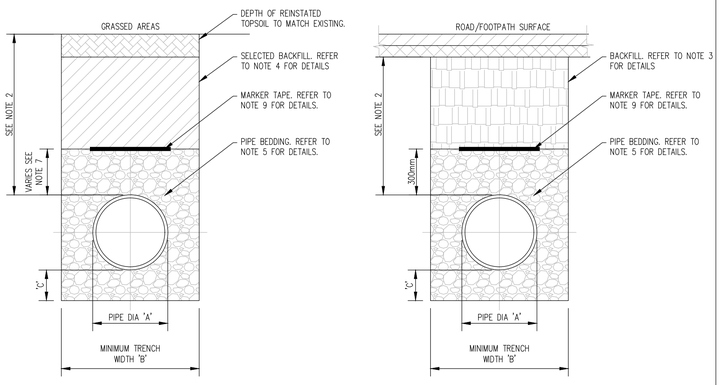
CONCRETE BED, HAUNCH AND SURROUND TO WASTEWATER PIPES. (STD-WW-08)
SCALE 1:20



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE.
2. AS FAR AS PERFECTIBLE, JUNCTION AND SERVICE CONNECTION SHALL BE BUILT IN FOR ALL PLANED USERS WHEN THE SEWER IS BEING CONSTRUCTED. WHETHER IT IS NECESSARY TO MAKE A POST-CONSTRUCTION CONNECTION THE DEVELOPER SHALL BRING THE SEWER TO THE INSPECTION CHAMBER, INSTALL THE INSPECTION CHAMBER AND SEAL THE UPSTREAM END UNTIL THE CONNECTION IS REQUIRED.
3. THE VERTICAL ANGLE BETWEEN THE SERVICE CONNECTING PIPE AND THE HORIZONTAL SHALL BE GREATER THAN 0° AND NOT MORE THAN 60°.
4. WHERE THE CONNECTION IS BEING MADE TO A SEWER WITH A NORMAL INTERNAL DIAMETER OF 300mm DIAMETER OF LESS, CONNECTIONS SHALL BE MADE USING 45° ANGLE JUNCTION.
5. WHERE THE CONNECTION IS BEING MADE TO A SEWER WITH NORMAL INTERNAL DIAMETER GREATER THAN 300mm;
   A) IF THE DIAMETER OF THE CONNECTION PIPE IS GREATER THAN HALF THE DIAMETER OF THE SEWER, AN ACCESS MANHOLE SHALL BE CONSTRUCTED TO FORM THE CONNECTION POINT; OR
   B) IF THE DIAMETER OF THE CONNECTION PIPE IS LESS THAN OR EQUAL TO HALF DIAMETER OF THE SEWER, THAN THE CONNECTION SHALL BE MADE USING A PREFORMED SADDLE FITTING WITH A SLOW BEND BETWEEN THE SADDLE AND THE CONNECTION SEWER/DRAIN.
6. CONNECTIONS MADE WITH THE SADDLE FITTINGS SHALL BE MADE BY CUTTING AND SAFELY REMOVING A CORE FROM THE PIPE AND JOINTING THE SADDLE FITTING TO THE PIPE IN ACCORDANCE WITH THE MANUFACTORIES INSTRUCTIONS TO ENSURE A WATER TIGHT JOINT. THE CONNECTING PIPE SHALL NOT PROTRUDE INTO THE SEWERS.

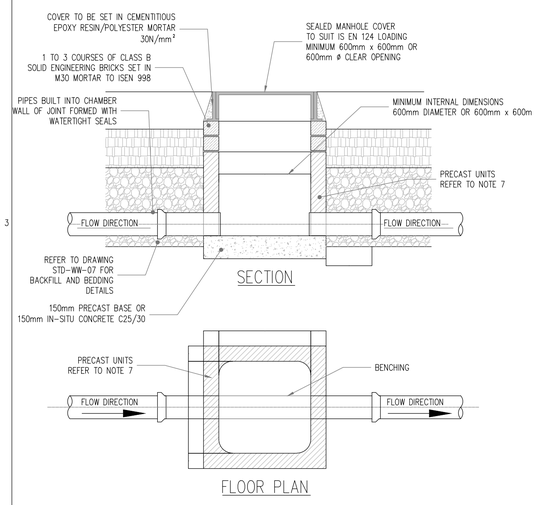
TYPICAL SEWER/SERVICE PIPE (STD-WW-04)
SCALE 1:20



CROSS SECTION IN GRASSED AREAS

CROSS SECTION IN ROADS

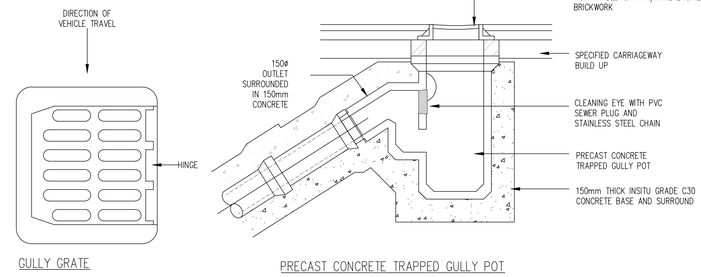
TRENCH BACKFILL AND BEDDING (STD – WW – 07)
SCALE 1:20

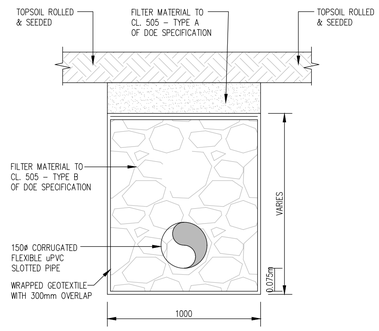


INSPECTION CHAMBER (PRECAST CONCRETE CONSTRUCTION) (STD-WW-13).
SCALE 1:20

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. AN INSPECTION CHAMBER SHOULD BE LOCATED AT OR WITHIN 1m OF THE PROPERTY BOUNDARY AT THE UPSTREAM END OF EACH SERVICE CONNECTION ON THE PRIVATE SIDE OF THE CURTILAGE, IF PRACTICABLE, CONSULT WITH IRISH WATER ON ALTERNATIVE LOCATIONS.
3. SERVICE CONNECTION FROM PUBLIC SEWER TO PROPERTY BOUNDARY IS A PUBLIC ASSET. PIPE UPSTREAM OF THE PROPERTY BOUNDARY IS A PRIVATE DRAIN AND SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE BUILDING.
4. ACCESS POINTS SHOULD BE LOCATED SO THAT THEY ARE ACCESSIBLE AND APPARENT TO THE MAINTAINER AT ALL TIMES FOR USE. THEY SHOULD AVOID REAR GARDENS OR ENCLOSED LOCATIONS AND SHOULD NEVER BE OVERLAIN WITH SURFACE DRESSING, TOPSOIL, ETC.
5. COVERS AND FRAMES SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS SUBJECT TO REVIEW BY IRISH WATER.
6. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH AROUND COVER IN GREEN AREAS.
7. PROPRIETARY PREFABRICATED CHAMBER UNITS MAY ALSO BE USED, SUBJECT TO REVIEW BY IRISH WATER – SEE DETAILS BELOW.
8. CHAMBERS SHALL BE SURROUNDED BY A MINIMUM OF 150MM COMPACTED CLAUSE 804 OR CLAUSE 808 MATERIAL AS PER STD-WW-07.
9. MAXIMUM DEPTH FROM COVER LEVEL TO INVERT OF PIPE = 1.2m. INTERNAL DIMENSIONS GREATER THAN 600mm X 600mm OR 600mm⌀ REQUIRED WHERE DEPTH EXCEEDS 1.2M, – CONSULT WITH IRISH WATER.
10. SMALLER INSTRUCTION CHAMBERS WITH INTERNAL DIMENSIONS OF 450mm⌀ OR 450mm X 450mm MAY BE PERMITTED SUBJECT TO APPROVAL BY IRISH WATER WHERE CONFINED PHYSICAL CONDITIONS EXIST.
11. PREFABRICATED UNITS SHOULD HAVE WATER TIGHT JOINTS AND SHOULD BE INTERLOCKING TO PREVENT LATER MOVEMENT OF INDIVIDUAL SECTIONS OF THE UNIT.





FILTER TRENCH IN REAR GARDENS
SCALE : 1/10

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Rev. No.	Date	REVISION NOTE	Dm. By	Chkd. By
P1	10.12.2020	REVISED DETAILS	AB	NB
P2	17.09.2021	ISSUED FOR PLANNING STAGE 3	JS	NB

Architect	Darmody Architecture
Project	Park West SHD, Park West Avenue and Park West Road, Park West, Dublin 12
Title	Drainage Details Sheet 2 of 3
Dwg. No.	PWT-CSC-XX-XX-DR-C-0017

Date	Drn by	Chkd by	Aprvd by	Scale	Revision
Nov 2020	AB	AB	NB	AS SHOWN	P2

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Health & Safety	OHSAS 18001:2007

Appendix D

Surface Water System Simulation

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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	PIMP (%)	100
M5-60 (mm)	16.800	Add Flow / Climate Change (%)	0
Ratio R	0.277	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	500	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	300	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)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.239	4-8	1.765	8-12	0.895	12-16	0.119	16-20	0.056

Total Area Contributing (ha) = 3.074

Total Pipe Volume (m³) = 85.579

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	53.789	0.278	193.5	0.362	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	50.385	0.277	181.9	0.300	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	49.703	0.277	179.4	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	70.822	0.440	161.0	0.370	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.004	51.279	0.162	316.5	0.427	0.00	0.0	0.600	o	450	Pipe/Conduit	
S2.000	49.220	0.488	100.9	0.054	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	14.962	0.148	100.9	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	25.299	0.071	354.6	0.057	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.006	50.767	0.143	354.6	0.059	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	47.92	5.80	53.617	0.362	0.0	0.0	0.0	1.13	79.6	46.9
S1.001	45.71	6.52	53.339	0.662	0.0	0.0	0.0	1.16	82.2	82.0
S1.002	43.77	7.23	53.062	0.679	0.0	0.0	0.0	1.17	82.7	82.0
S1.003	41.75	8.05	52.710	1.049	0.0	0.0	0.0	1.43	157.4	118.6
S1.004	40.11	8.81	52.195	1.476	0.0	0.0	0.0	1.14	180.9	160.3
S2.000	47.84	5.82	51.940	0.054	0.0	0.0	0.0	1.00	17.7	7.0
S2.001	47.05	6.07	51.452	0.066	0.0	0.0	0.0	1.00	17.7	8.5
S1.005	39.31	9.20	51.004	1.599	0.0	0.0	0.0	1.07	170.8	170.2
S1.006	37.83	9.99	50.933	1.657	0.0	0.0	0.0	1.07	170.8	170.2

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
S3.000	19.918	0.197	100.9	0.042	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	34.004	0.216	157.6	0.278	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.002	10.052	0.064	157.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.003	61.899	0.512	120.9	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	84.018	0.833	100.9	0.058	5.00	0.0	0.600	o	150	Pipe/Conduit	
S5.000	55.226	0.547	100.9	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	95.007	0.941	100.9	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.002	77.355	0.460	168.2	0.108	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.007	60.240	0.133	452.5	0.064	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.008	7.586	0.038	200.0	0.014	0.00	0.0	0.600	o	525	Pipe/Conduit	
S6.000	21.563	0.214	100.9	0.033	5.00	0.0	0.600	o	150	Pipe/Conduit	
S6.001	40.473	0.401	100.9	0.069	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.002	32.217	0.319	100.9	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.000	14.483	0.152	95.3	0.301	15.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	14.483	0.227	63.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.003	40.192	0.166	241.9	0.026	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.004	76.090	0.315	241.9	0.066	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.005	5.912	0.024	241.9	0.113	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)
S3.000	49.49	5.33	51.805	0.042	0.0	0.0	0.0	1.00	17.7	5.6
S3.001	47.66	5.88	51.533	0.319	0.0	0.0	0.0	1.04	41.3	41.2
S3.002	47.15	6.04	51.317	0.319	0.0	0.0	0.0	1.04	41.3	41.2
S3.003	44.62	6.91	51.253	0.358	0.0	0.0	0.0	1.19	47.2	43.2
S4.000	46.05	6.40	53.050	0.058	0.0	0.0	0.0	1.00	17.7	7.3
S5.000	47.52	5.92	53.170	0.028	0.0	0.0	0.0	1.00	17.7	3.6
S4.001	41.92	7.98	52.217	0.106	0.0	0.0	0.0	1.00	17.7	12.0
S4.002	39.18	9.27	51.201	0.214	0.0	0.0	0.0	1.01	40.0	22.7
S1.007	36.20	10.95	50.441	2.292	0.0	0.0	0.0	1.05	226.5	224.7
S1.008	36.07	11.03	50.308	2.306	0.0	0.0	0.0	1.58	342.1	225.3
S6.000	49.39	5.36	52.430	0.033	0.0	0.0	0.0	1.00	17.7	4.4
S6.001	47.16	6.03	52.216	0.101	0.0	0.0	0.0	1.00	17.7	12.9
S6.002	45.56	6.57	51.815	0.126	0.0	0.0	0.0	1.00	17.7	15.6
S7.000	30.70	15.15	51.725	0.301	0.0	0.0	0.0	1.61	113.9	25.0
S7.001	30.57	15.27	51.573	0.301	0.0	0.0	0.0	1.97	139.4	25.0
S6.003	29.89	15.94	51.346	0.453	0.0	0.0	0.0	1.01	71.1	36.7
S6.004	28.70	17.20	51.180	0.520	0.0	0.0	0.0	1.01	71.1	40.4
S6.005	28.61	17.30	50.665	0.633	0.0	0.0	0.0	1.01	71.1	49.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.009	17.870	0.089	200.0	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.010	74.850	0.374	200.0	0.103	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.011	7.081	0.071	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.009	49.71	5.27	50.270	0.000	6.5	0.0	0.0	1.11	78.3	6.5
S1.010	46.07	6.39	50.181	0.103	6.5	0.0	0.0	1.11	78.3	19.4
S1.011	50.26	5.12	49.806	0.000	10.8	0.0	0.0	1.00	17.8	10.8

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)
SWMH1	55.117	1.500	Open Manhole	1200	S1.000	53.617	300				
SWMH2	54.839	1.500	Open Manhole	1200	S1.001	53.339	300	S1.000	53.339	300	
SWMH3	54.562	1.500	Open Manhole	1200	S1.002	53.062	300	S1.001	53.062	300	
SWMH4	54.285	1.575	Open Manhole	1350	S1.003	52.710	375	S1.002	52.785	300	
SWMH5	53.845	1.650	Open Manhole	1350	S1.004	52.195	450	S1.003	52.270	375	
SWMH7	53.290	1.350	Open Manhole	1200	S2.000	51.940	150				
SWMH8	53.507	2.055	Open Manhole	1200	S2.001	51.452	150	S2.000	51.452	150	
SWMH6	53.683	2.679	Open Manhole	1350	S1.005	51.004	450	S1.004	52.033	450	1029
								S2.001	51.304	150	
SWMH9	53.510	2.577	Open Manhole	1350	S1.006	50.933	450	S1.005	50.933	450	
SWMH11	53.155	1.350	Open Manhole	1200	S3.000	51.805	150				
SWMH12	53.101	1.568	Open Manhole	1200	S3.001	51.533	225	S3.000	51.608	150	
SWMH13	53.940	2.623	Open Manhole	1200	S3.002	51.317	225	S3.001	51.317	225	
SWMH14	52.900	1.647	Open Manhole	1200	S3.003	51.253	225	S3.002	51.253	225	
SWMH15	54.400	1.350	Open Manhole	1200	S4.000	53.050	150				
SWMH17	54.520	1.350	Open Manhole	1200	S5.000	53.170	150				
SWMH16	54.197	1.980	Open Manhole	1200	S4.001	52.217	150	S4.000	52.217	150	
								S5.000	52.623	150	405
SWMH18	53.765	2.564	Open Manhole	1200	S4.002	51.201	225	S4.001	51.276	150	
SWMH10	53.248	2.807	Open Manhole	1500	S1.007	50.441	525	S1.006	50.789	450	274
								S3.003	50.741	225	
								S4.002	50.741	225	
SWMH19	52.906	2.598	Open Manhole	1500	S1.008	50.308	525	S1.007	50.308	525	
SWMH21	53.780	1.350	Open Manhole	1200	S6.000	52.430	150				
SWMH22	53.658	1.442	Open Manhole	1200	S6.001	52.216	150	S6.000	52.216	150	
SWMH23	53.457	1.642	Open Manhole	1200	S6.002	51.815	150	S6.001	51.815	150	
SWMH25	53.500	1.775	Open Manhole	1200	S7.000	51.725	300				
S24	53.370	1.797	Open Manhole	1200	S7.001	51.573	300	S7.000	51.573	300	
SWMH24	53.590	2.244	Open Manhole	1200	S6.003	51.346	300	S6.002	51.496	150	
								S7.001	51.346	300	
SWMH26	53.867	2.687	Open Manhole	1200	S6.004	51.180	300	S6.003	51.180	300	
SWMH27	53.067	2.402	Open Manhole	1200	S6.005	50.665	300	S6.004	50.865	300	200
SWMH20	52.870	2.600	Open Manhole	1500	S1.009	50.270	300	S1.008	50.270	525	
								S6.005	50.641	300	371
SWMH28	52.584	2.403	Open Manhole	1200	S1.010	50.181	300	S1.009	50.181	300	
SWMH29	51.198	1.392	Open Manhole	1200	S1.011	49.806	150	S1.010	49.806	300	
S	50.909	1.174	Open Manhole	0		OUTFALL		S1.011	49.735	150	

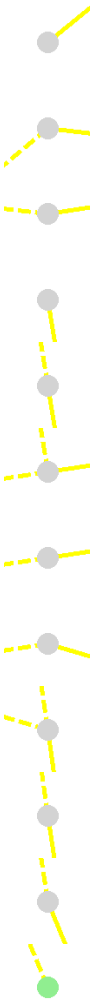
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWMH1	708133.905	732750.875	708133.905	732750.875	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWMH2	708187.113	732758.763	708187.113	732758.763	Required	
SWMH3	708236.917	732766.386	708236.917	732766.386	Required	
SWMH4	708286.047	732773.913	708286.047	732773.913	Required	
SWMH5	708356.056	732784.613	708356.056	732784.613	Required	
SWMH7	708469.417	732804.501	708469.417	732804.501	Required	
SWMH8	708420.619	732798.070	708420.619	732798.070	Required	
SWMH6	708406.719	732792.533	708406.719	732792.533	Required	
SWMH9	708409.003	732767.337	708409.003	732767.337	Required	
SWMH11	708476.458	732787.118	708476.458	732787.118	Required	
SWMH12	708479.473	732767.430	708479.473	732767.430	Required	
SWMH13	708484.621	732733.817	708484.621	732733.817	Required	
SWMH14	708477.812	732726.422	708477.812	732726.422	Required	
SWMH15	708163.134	732678.690	708163.134	732678.690	Required	
SWMH17	708237.786	732745.882	708237.786	732745.882	Required	
SWMH16	708246.200	732691.301	708246.200	732691.301	Required	
SWMH18	708340.132	732705.548	708340.132	732705.548	Required	
SWMH10	708416.613	732717.144	708416.613	732717.144	Required	
SWMH19	708425.567	732657.573	708425.567	732657.573	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWMH21	708217.371	732620.380	708217.371	732620.380	Required	
SWMH22	708234.013	732634.092	708234.013	732634.092	Required	
SWMH23	708274.216	732629.419	708274.216	732629.419	Required	
SWMH25	708301.384	732662.882	708301.384	732662.882	Required	
S24	708303.722	732648.589	708303.722	732648.589	Required	
SWMH24	708306.061	732634.295	708306.061	732634.295	Required	
SWMH26	708345.805	732640.278	708345.805	732640.278	Required	
SWMH27	708421.026	732651.745	708421.026	732651.745	Required	
SWMH20	708426.696	732650.071	708426.696	732650.071	Required	
SWMH28	708429.176	732632.374	708429.176	732632.374	Required	
SWMH29	708440.494	732558.385	708440.494	732558.385	Required	
S	708443.194	732551.839			No Entry	



Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Roof	100	0.161	0.161	0.161
	Classification	Roof	100	0.087	0.087	0.248
	Classification	Permeable Paving	50	0.148	0.074	0.321
	Classification	Road	100	0.040	0.040	0.362
1.001	Classification	Roof	100	0.064	0.064	0.064
	Classification	Roof	100	0.124	0.124	0.188
	Classification	Permeable Paving	50	0.133	0.067	0.254
	Classification	Permeable Paving	50	0.015	0.007	0.262
	Classification	Road	100	0.034	0.034	0.296
	Classification	Permeable Paving	50	0.010	0.005	0.300
1.002	Classification	Permeable Paving	50	0.026	0.013	0.013
	Classification	Permeable Paving	50	0.008	0.004	0.017
1.003	Classification	Road	100	0.031	0.031	0.031
	Classification	Permeable Paving	50	0.008	0.004	0.035
	Classification	Permeable Paving	50	0.024	0.012	0.047
	Classification	Roof	100	0.267	0.267	0.314
	Classification	Permeable Paving	50	0.111	0.055	0.370
1.004	Classification	Road	100	0.043	0.043	0.043
	Classification	Permeable Paving	50	0.034	0.017	0.061
	Classification	Permeable Paving	50	0.013	0.006	0.067
	Classification	Roof	100	0.307	0.307	0.375
	Classification	Permeable Paving	50	0.105	0.052	0.427
2.000	Classification	Road	100	0.044	0.044	0.044
	Classification	Permeable Paving	50	0.021	0.010	0.054
2.001	Classification	Road	100	0.006	0.006	0.006
	Classification	Permeable Paving	50	0.008	0.004	0.010
	Classification	Permeable Paving	50	0.004	0.002	0.012
1.005	Classification	Road	100	0.036	0.036	0.036
	Classification	Permeable Paving	50	0.032	0.016	0.052
	Classification	Permeable Paving	50	0.008	0.004	0.057
1.006	Classification	Road	100	0.014	0.014	0.014
	Classification	Permeable Paving	50	0.005	0.002	0.017
	Classification	Permeable Paving	50	0.004	0.002	0.019
	Classification	Road	100	0.028	0.028	0.047
	Classification	Permeable Paving	50	0.011	0.006	0.053
	Classification	Permeable Paving	50	0.012	0.006	0.059
3.000	Classification	Road	100	0.029	0.029	0.029
	Classification	Permeable Paving	50	0.015	0.007	0.036
	Classification	Permeable Paving	50	0.011	0.005	0.042
3.001	Classification	Roof	100	0.195	0.195	0.195
	Classification	Permeable Paving	50	0.089	0.045	0.240
	Classification	Permeable Paving	50	0.008	0.004	0.244
	Classification	Permeable Paving	50	0.015	0.008	0.252
	Classification	Road	100	0.026	0.026	0.278
3.002	-	-	100	0.000	0.000	0.000
3.003	Classification	Footpath	100	0.038	0.038	0.038
4.000	Classification	Footpath	100	0.043	0.043	0.043
	Classification	Footpath	100	0.016	0.016	0.058
5.000	Classification	Permeable Paving	50	0.056	0.028	0.028
4.001	Classification	Footpath	100	0.019	0.019	0.019
4.002	Classification	Roof	100	0.019	0.019	0.019
	Classification	Footpath	100	0.018	0.018	0.037
	Classification	Footpath	100	0.018	0.018	0.055
	Classification	Permeable Paving	50	0.106	0.053	0.108
1.007	Classification	Footpath	100	0.028	0.028	0.028
	Classification	Road	100	0.036	0.036	0.064
1.008	Classification	Footpath	100	0.014	0.014	0.014
6.000	Classification	Road	100	0.012	0.012	0.012
	Classification	Footpath	100	0.013	0.013	0.024
	Classification	Footpath	100	0.008	0.008	0.033

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
6.001	Classification	Road	100	0.025	0.025	0.025
	Classification	Footpath	100	0.019	0.019	0.043
	Classification	Footpath	100	0.025	0.025	0.069
6.002	Classification	Road	100	0.025	0.025	0.025
7.000	Classification	Permeable Paving	50	0.112	0.056	0.056
	Classification	Roof	100	0.085	0.085	0.141
	Classification	Permeable Paving	50	0.203	0.102	0.243
	Classification	Permeable Paving	50	0.073	0.036	0.279
	Classification	Permeable Paving	50	0.018	0.009	0.288
	Classification	Footpath	100	0.013	0.013	0.301
7.001	-	-	100	0.000	0.000	0.000
6.003	Classification	Footpath	100	0.009	0.009	0.009
	Classification	Footpath	100	0.017	0.017	0.026
6.004	Classification	Road	100	0.030	0.030	0.030
	Classification	Footpath	100	0.024	0.024	0.054
	Classification	Footpath	100	0.012	0.012	0.066
6.005	Classification	Footpath	100	0.035	0.035	0.035
	Classification	Footpath	100	0.026	0.026	0.061
	Classification	Road	100	0.053	0.053	0.113
1.009	Classification	Footpath	100	0.008	0.008	0.008
	Classification	Road	100	0.023	0.023	0.031
1.010	Classification	Footpath	100	0.004	0.004	0.004
	Classification	Road	100	0.046	0.046	0.050
	Classification	Footpath	100	0.037	0.037	0.087
	Classification	Footpath	100	0.016	0.016	0.103
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				3.797	3.074	3.074

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.011	S	50.909	49.735	48.760	0	0

Simulation Criteria for Storm

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 4 Number of Storage Structures 19 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.800	Storm Duration (mins)	30
Ratio R	0.277		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SWMH19, DS/PN: S1.008, Volume (m³): 17.3

Unit Reference	MD-SHE-0087-4500-2000-4500
Design Head (m)	2.000
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	87
Invert Level (m)	50.308
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	4.5	Kick-Flo®	0.775	2.9
Flush-Flo™	0.379	3.6	Mean Flow over Head Range	-	3.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.6	0.800	2.9	2.000	4.5	4.000	6.2	7.000	8.1
0.200	3.4	1.000	3.3	2.200	4.7	4.500	6.6	7.500	8.4
0.300	3.6	1.200	3.6	2.400	4.9	5.000	6.9	8.000	8.6
0.400	3.6	1.400	3.8	2.600	5.1	5.500	7.2	8.500	8.9
0.500	3.6	1.600	4.1	3.000	5.4	6.000	7.5	9.000	9.1
0.600	3.5	1.800	4.3	3.500	5.8	6.500	7.8	9.500	9.4

Orifice Manhole: S24, DS/PN: S7.001, Volume (m³): 3.0

Diameter (m) 0.090 Discharge Coefficient 0.600 Invert Level (m) 51.573

Hydro-Brake® Optimum Manhole: SWMH27, DS/PN: S6.005, Volume (m³): 8.0

Unit Reference	MD-SHE-0068-2500-1500-2500
Design Head (m)	1.500
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	68
Invert Level (m)	50.865
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	2.5	Kick-Flo®	0.609	1.7
Flush-Flo™	0.300	2.0	Mean Flow over Head Range	-	2.0

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

Hydro-Brake® Optimum Manhole: SWMH27, DS/PN: S6.005, Volume (m³): 8.0

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.7	0.800	1.9	2.000	2.9	4.000	3.9	7.000	5.1
0.200	2.0	1.000	2.1	2.200	3.0	4.500	4.2	7.500	5.3
0.300	2.0	1.200	2.3	2.400	3.1	5.000	4.4	8.000	5.4
0.400	2.0	1.400	2.4	2.600	3.2	5.500	4.6	8.500	5.6
0.500	1.9	1.600	2.6	3.000	3.4	6.000	4.8	9.000	5.8
0.600	1.7	1.800	2.7	3.500	3.7	6.500	4.9	9.500	5.9

Hydro-Brake® Optimum Manhole: SWMH29, DS/PN: S1.011, Volume (m³): 6.8

Unit Reference	MD-SHE-0143-1080-1500-1080
Design Head (m)	1.500
Design Flow (l/s)	10.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	143
Invert Level (m)	49.806
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	10.8	Kick-Flo®	0.933	8.6
Flush-Flo™	0.437	10.8	Mean Flow over Head Range	-	9.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.2	0.800	9.9	2.000	12.4	4.000	17.2	7.000	22.5
0.200	9.8	1.000	8.9	2.200	12.9	4.500	18.2	7.500	23.2
0.300	10.5	1.200	9.7	2.400	13.5	5.000	19.1	8.000	24.0
0.400	10.8	1.400	10.5	2.600	14.0	5.500	20.0	8.500	24.7
0.500	10.8	1.600	11.1	3.000	15.0	6.000	20.9	9.000	25.4
0.600	10.6	1.800	11.8	3.500	16.1	6.500	21.7	9.500	26.1

Storage Structures for Storm

Porous Car Park Manhole: SWMH1, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	38.4
Membrane Percolation (mm/hr)	1000	Length (m)	38.4
Max Percolation (l/s)	409.6	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	53.617	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH2, DS/PN: S1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	39.7
Membrane Percolation (mm/hr)	1000	Length (m)	39.7
Max Percolation (l/s)	437.8	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	53.339	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH3, DS/PN: S1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.4
Membrane Percolation (mm/hr)	1000	Length (m)	18.4
Max Percolation (l/s)	94.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	53.062	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH4, DS/PN: S1.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	37.8
Membrane Percolation (mm/hr)	1000	Length (m)	37.8
Max Percolation (l/s)	396.9	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	52.710	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH5, DS/PN: S1.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	39.0
Membrane Percolation (mm/hr)	1000	Length (m)	39.0
Max Percolation (l/s)	422.5	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	52.195	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH7, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.0
Membrane Percolation (mm/hr)	1000	Length (m)	14.4
Max Percolation (l/s)	56.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	51.940	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH8, DS/PN: S2.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.2
Membrane Percolation (mm/hr)	1000	Length (m)	11.2
Max Percolation (l/s)	34.8	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	51.452	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH6, DS/PN: S1.005

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	20.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	111.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	51.004	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH9, DS/PN: S1.006

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.6
Membrane Percolation (mm/hr)	1000	Length (m)	9.6
Max Percolation (l/s)	25.6	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	50.933	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH11, DS/PN: S3.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	16.0
Membrane Percolation (mm/hr)	1000	Length (m)	16.0
Max Percolation (l/s)	71.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	51.805	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH12, DS/PN: S3.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	33.6
Membrane Percolation (mm/hr)	1000	Length (m)	33.6
Max Percolation (l/s)	313.6	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	51.533	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH13, DS/PN: S3.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.4
Membrane Percolation (mm/hr)	1000	Length (m)	12.4
Max Percolation (l/s)	42.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	51.317	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH17, DS/PN: S5.000

Infiltration Coefficient Base (m/hr)	0.00000	Invert Level (m)	53.170
Membrane Percolation (mm/hr)	1000	Width (m)	22.4
Max Percolation (l/s)	139.4	Length (m)	22.4
Safety Factor	2.0	Slope (1:X)	200.0
Porosity	0.30	Depression Storage (mm)	5

Porous Car Park Manhole: SWMH17, DS/PN: S5.000

Evaporation (mm/day) 3 Cap Volume Depth (m) 0.350

Porous Car Park Manhole: SWMH18, DS/PN: S4.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	23.0
Membrane Percolation (mm/hr)	1000	Length (m)	23.0
Max Percolation (l/s)	146.9	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	51.201	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SWMH10, DS/PN: S1.007

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	13.9
Membrane Percolation (mm/hr)	1000	Length (m)	14.0
Max Percolation (l/s)	54.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	50.441	Cap Volume Depth (m)	0.350

Tank or Pond Manhole: SWMH19, DS/PN: S1.008

Invert Level (m) 50.308

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	992.5	1.200	992.5	2.400	0.0	3.600	0.0	4.800	0.0
0.200	992.5	1.400	992.5	2.600	0.0	3.800	0.0	5.000	0.0
0.400	992.5	1.600	992.5	2.800	0.0	4.000	0.0		
0.600	992.5	1.800	992.5	3.000	0.0	4.200	0.0		
0.800	992.5	2.000	992.5	3.200	0.0	4.400	0.0		
1.000	992.5	2.001	0.0	3.400	0.0	4.600	0.0		

Porous Car Park Manhole: SWMH25, DS/PN: S7.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	43.0
Membrane Percolation (mm/hr)	1000	Length (m)	43.0
Max Percolation (l/s)	513.6	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	51.725	Cap Volume Depth (m)	0.350

Tank or Pond Manhole: SWMH27, DS/PN: S6.005

Invert Level (m) 50.865

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	118.6	0.600	118.6	1.200	118.6	1.800	0.0	2.400	0.0
0.100	118.6	0.700	118.6	1.300	118.6	1.900	0.0	2.500	0.0
0.200	118.6	0.800	118.6	1.400	118.6	2.000	0.0		
0.300	118.6	0.900	118.6	1.500	118.6	2.100	0.0		
0.400	118.6	1.000	118.6	1.501	0.0	2.200	0.0		
0.500	118.6	1.100	118.6	1.700	0.0	2.300	0.0		

Tank or Pond Manhole: SWMH29, DS/PN: S1.011

Invert Level (m) 49.827

Tank or Pond Manhole: SWMH29, DS/PN: S1.011

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	47.0	0.600	47.0	1.200	0.0	1.800	0.0	2.400	0.0
0.100	47.0	0.700	47.0	1.300	0.0	1.900	0.0	2.500	0.0
0.200	47.0	0.800	47.0	1.400	0.0	2.000	0.0		
0.300	47.0	0.900	47.0	1.500	0.0	2.100	0.0		
0.400	47.0	1.000	47.0	1.600	0.0	2.200	0.0		
0.500	47.0	1.001	0.0	1.700	0.0	2.300	0.0		

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 4 Number of Storage Structures 19 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	16.800
Region	Scotland and Ireland	Ratio R	0.277
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	SWMH1	60 Winter	1	+20%					53.720	-0.197
S1.001	SWMH2	60 Winter	1	+20%					53.462	-0.177
S1.002	SWMH3	60 Winter	1	+20%					53.181	-0.181
S1.003	SWMH4	120 Winter	1	+20%					52.834	-0.251
S1.004	SWMH5	120 Winter	1	+20%					52.354	-0.291
S2.000	SWMH7	30 Winter	1	+20%					51.992	-0.098
S2.001	SWMH8	30 Winter	1	+20%	30/2160 Winter				51.504	-0.098
S1.005	SWMH6	120 Winter	1	+20%	30/1440 Winter				51.186	-0.268
S1.006	SWMH9	120 Winter	1	+20%	30/960 Winter				51.106	-0.277
S3.000	SWMH11	60 Summer	1	+20%	100/4320 Winter				51.847	-0.108
S3.001	SWMH12	60 Winter	1	+20%	100/1440 Winter				51.634	-0.124
S3.002	SWMH13	60 Winter	1	+20%	30/2160 Winter				51.422	-0.119
S3.003	SWMH14	60 Winter	1	+20%	30/1440 Winter				51.347	-0.131
S4.000	SWMH15	15 Winter	1	+20%	30/15 Winter				53.122	-0.078
S5.000	SWMH17	120 Winter	1	+20%					53.192	-0.128
S4.001	SWMH16	15 Winter	1	+20%	30/15 Summer				52.297	-0.070
S4.002	SWMH18	30 Winter	1	+20%	30/960 Winter				51.287	-0.139
S1.007	SWMH10	4320 Winter	1	+20%	1/2880 Winter				50.980	0.014
S1.008	SWMH19	4320 Winter	1	+20%	1/960 Winter				50.979	0.146
S6.000	SWMH21	15 Winter	1	+20%	30/15 Summer				52.483	-0.097
S6.001	SWMH22	15 Winter	1	+20%	30/15 Summer				52.312	-0.054
S6.002	SWMH23	15 Winter	1	+20%	30/15 Summer				51.925	-0.040
S7.000	SWMH25	120 Winter	1	+20%	30/480 Winter				51.826	-0.199
S7.001	S24	120 Winter	1	+20%	30/30 Winter				51.819	-0.054
S6.003	SWMH24	1440 Winter	1	+20%	1/360 Winter				51.760	0.114
S6.004	SWMH26	1440 Winter	1	+20%	1/180 Winter				51.758	0.278
S6.005	SWMH27	1440 Winter	1	+20%	1/15 Summer				51.755	0.790
S1.009	SWMH20	480 Winter	1	+20%					50.330	-0.240
S1.010	SWMH28	15 Winter	1	+20%					50.274	-0.206
S1.011	SWMH29	60 Winter	1	+20%	30/15 Summer				49.954	-0.002

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SWMH1	0.000	0.26		19	19.3	OK	
S1.001	SWMH2	0.000	0.35		23	27.3	OK	
S1.002	SWMH3	0.000	0.33		25	25.9	OK	
S1.003	SWMH4	0.000	0.24		38	35.5	OK	
S1.004	SWMH5	0.000	0.27		43	45.0	OK	
S2.000	SWMH7	0.000	0.26		10	4.5	OK	
S2.001	SWMH8	0.000	0.26		11	4.3	OK	
S1.005	SWMH6	0.000	0.33		50	48.0	OK	
S1.006	SWMH9	0.000	0.32		54	49.0	OK	
S3.000	SWMH11	0.000	0.17		11	2.9	OK	
S3.001	SWMH12	0.000	0.42		19	16.2	OK	
S3.002	SWMH13	0.000	0.45		23	15.5	OK	
S3.003	SWMH14	0.000	0.37			16.8	OK	
S4.000	SWMH15	0.000	0.42			7.4	OK	
S5.000	SWMH17	0.000	0.05		22	0.9	OK	
S4.001	SWMH16	0.000	0.55			9.6	OK	
S4.002	SWMH18	0.000	0.31		12	12.1	OK	
S1.007	SWMH10	0.000	0.06		2146	12.2	SURCHARGED	
S1.008	SWMH19	0.000	0.02			3.6	SURCHARGED	
S6.000	SWMH21	0.000	0.26			4.4	OK	
S6.001	SWMH22	0.000	0.71			12.2	OK	
S6.002	SWMH23	0.000	0.88			15.0	OK	
S7.000	SWMH25	0.000	0.08		35	7.6	OK	
S7.001	S24	0.000	0.07			7.6	OK	
S6.003	SWMH24	0.000	0.08			5.1	SURCHARGED	
S6.004	SWMH26	0.000	0.08			5.5	SURCHARGED	
S6.005	SWMH27	0.000	0.04			2.0	SURCHARGED	
S1.009	SWMH20	0.000	0.09			5.9	OK	
S1.010	SWMH28	0.000	0.20			15.3	OK	
S1.011	SWMH29	0.000	0.56			8.4	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 4 Number of Storage Structures 19 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	16.800
Region	Scotland and Ireland	Ratio R	0.277
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	SWMH1	30 Winter	30	+20%					53.782	-0.135
S1.001	SWMH2	60 Winter	30	+20%					53.533	-0.106
S1.002	SWMH3	60 Winter	30	+20%					53.253	-0.109
S1.003	SWMH4	120 Winter	30	+20%					52.899	-0.186
S1.004	SWMH5	120 Winter	30	+20%					52.443	-0.202
S2.000	SWMH7	30 Winter	30	+20%					52.023	-0.067
S2.001	SWMH8	4320 Winter	30	+20%	30/2160 Winter				51.657	0.055
S1.005	SWMH6	4320 Winter	30	+20%	30/1440 Winter				51.657	0.203
S1.006	SWMH9	4320 Winter	30	+20%	30/960 Winter				51.656	0.273
S3.000	SWMH11	30 Winter	30	+20%	100/4320 Winter				51.874	-0.081
S3.001	SWMH12	30 Winter	30	+20%	100/1440 Winter				51.697	-0.061
S3.002	SWMH13	4320 Winter	30	+20%	30/2160 Winter				51.657	0.115
S3.003	SWMH14	4320 Winter	30	+20%	30/1440 Winter				51.657	0.179
S4.000	SWMH15	15 Winter	30	+20%	30/15 Winter				53.212	0.012
S5.000	SWMH17	60 Winter	30	+20%					53.214	-0.106
S4.001	SWMH16	15 Winter	30	+20%	30/15 Summer				52.507	0.140
S4.002	SWMH18	4320 Winter	30	+20%	30/960 Winter				51.655	0.229
S1.007	SWMH10	4320 Winter	30	+20%	1/2880 Winter				51.655	0.689
S1.008	SWMH19	4320 Winter	30	+20%	1/960 Winter				51.653	0.820
S6.000	SWMH21	15 Winter	30	+20%	30/15 Summer				53.007	0.427
S6.001	SWMH22	15 Winter	30	+20%	30/15 Summer				52.964	0.598
S6.002	SWMH23	15 Winter	30	+20%	30/15 Summer				52.366	0.401
S7.000	SWMH25	1440 Winter	30	+20%	30/480 Winter				52.073	0.048
S7.001	S24	720 Winter	30	+20%	30/30 Winter				52.084	0.211
S6.003	SWMH24	1440 Winter	30	+20%	1/360 Winter				52.058	0.412
S6.004	SWMH26	960 Winter	30	+20%	1/180 Winter				52.056	0.576
S6.005	SWMH27	960 Winter	30	+20%	1/15 Summer				52.054	1.089
S1.009	SWMH20	15 Winter	30	+20%					50.371	-0.199
S1.010	SWMH28	15 Winter	30	+20%					50.347	-0.134
S1.011	SWMH29	120 Winter	30	+20%	30/15 Summer				50.146	0.190

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SWMH1	0.000	0.58		15	43.7	OK	
S1.001	SWMH2	0.000	0.75		25	57.8	OK	
S1.002	SWMH3	0.000	0.73		30	57.0	OK	
S1.003	SWMH4	0.000	0.51		40	75.3	OK	
S1.004	SWMH5	0.000	0.59		46	96.9	OK	
S2.000	SWMH7	0.000	0.58		10	10.1	OK	
S2.001	SWMH8	0.000	0.04		747	0.6	SURCHARGED	
S1.005	SWMH6	0.000	0.10		2766	14.9	SURCHARGED	
S1.006	SWMH9	0.000	0.10		3201	15.4	SURCHARGED	
S3.000	SWMH11	0.000	0.44		10	7.3	OK	
S3.001	SWMH12	0.000	0.88		15	34.3	OK	
S3.002	SWMH13	0.000	0.09		1102	3.1	SURCHARGED	
S3.003	SWMH14	0.000	0.08			3.5	SURCHARGED	
S4.000	SWMH15	0.000	0.92			16.0	SURCHARGED	
S5.000	SWMH17	0.000	0.19		14	3.3	OK	
S4.001	SWMH16	0.000	1.06			18.4	SURCHARGED	
S4.002	SWMH18	0.000	0.05		1510	2.1	SURCHARGED	
S1.007	SWMH10	0.000	0.10			21.4	SURCHARGED	
S1.008	SWMH19	0.000	0.02			3.7	SURCHARGED	
S6.000	SWMH21	0.000	0.48			8.0	SURCHARGED	
S6.001	SWMH22	0.000	1.23			21.1	SURCHARGED	
S6.002	SWMH23	0.000	1.50			25.5	SURCHARGED	
S7.000	SWMH25	0.000	0.06		718	5.2	SURCHARGED	
S7.001	S24	0.000	0.06			6.8	SURCHARGED	
S6.003	SWMH24	0.000	0.11			7.4	SURCHARGED	
S6.004	SWMH26	0.000	0.15			10.3	SURCHARGED	
S6.005	SWMH27	0.000	0.05			2.2	SURCHARGED	
S1.009	SWMH20	0.000	0.16			10.6	OK	
S1.010	SWMH28	0.000	0.55			41.3	OK	
S1.011	SWMH29	0.000	0.70			10.7	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 4 Number of Storage Structures 19 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	16.800
Region	Scotland and Ireland	Ratio R	0.277
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	SWMH1	30 Winter	100	+20%					53.809	-0.108
S1.001	SWMH2	60 Winter	100	+20%					53.567	-0.072
S1.002	SWMH3	60 Winter	100	+20%					53.287	-0.075
S1.003	SWMH4	60 Winter	100	+20%					52.928	-0.157
S1.004	SWMH5	120 Winter	100	+20%					52.487	-0.158
S2.000	SWMH7	30 Winter	100	+20%					52.039	-0.051
S2.001	SWMH8	4320 Winter	100	+20%	30/2160 Winter				51.957	0.355
S1.005	SWMH6	4320 Winter	100	+20%	30/1440 Winter				51.957	0.503
S1.006	SWMH9	4320 Winter	100	+20%	30/960 Winter				51.955	0.573
S3.000	SWMH11	4320 Winter	100	+20%	100/4320 Winter				51.958	0.003
S3.001	SWMH12	4320 Winter	100	+20%	100/1440 Winter				51.958	0.200
S3.002	SWMH13	4320 Winter	100	+20%	30/2160 Winter				51.956	0.415
S3.003	SWMH14	4320 Winter	100	+20%	30/1440 Winter				51.956	0.478
S4.000	SWMH15	15 Winter	100	+20%	30/15 Winter				53.585	0.385
S5.000	SWMH17	30 Winter	100	+20%					53.224	-0.096
S4.001	SWMH16	30 Winter	100	+20%	30/15 Summer				52.817	0.449
S4.002	SWMH18	4320 Winter	100	+20%	30/960 Winter				51.955	0.529
S1.007	SWMH10	4320 Winter	100	+20%	1/2880 Winter				51.954	0.988
S1.008	SWMH19	4320 Winter	100	+20%	1/960 Winter				51.952	1.119
S6.000	SWMH21	15 Winter	100	+20%	30/15 Summer				53.551	0.971
S6.001	SWMH22	15 Winter	100	+20%	30/15 Summer				53.492	1.125
S6.002	SWMH23	15 Winter	100	+20%	30/15 Summer				52.658	0.693
S7.000	SWMH25	1440 Winter	100	+20%	30/480 Winter				52.324	0.299
S7.001	S24	1440 Winter	100	+20%	30/30 Winter				52.323	0.450
S6.003	SWMH24	1440 Winter	100	+20%	1/360 Winter				52.296	0.650
S6.004	SWMH26	1440 Winter	100	+20%	1/180 Winter				52.293	0.813
S6.005	SWMH27	1440 Winter	100	+20%	1/15 Summer				52.289	1.324
S1.009	SWMH20	15 Winter	100	+20%					50.395	-0.175
S1.010	SWMH28	15 Winter	100	+20%					50.377	-0.103
S1.011	SWMH29	120 Winter	100	+20%	30/15 Summer				50.299	0.343

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SWMH1	0.000	0.73		14	55.3	OK	
S1.001	SWMH2	0.000	0.93		26	72.3	OK	
S1.002	SWMH3	0.000	0.92		31	71.4	OK	
S1.003	SWMH4	0.000	0.64		36	95.1	OK	
S1.004	SWMH5	0.000	0.75		48	123.7	OK	
S2.000	SWMH7	0.000	0.76		10	13.1	OK	
S2.001	SWMH8	0.000	0.05		1906	0.8	SURCHARGED	
S1.005	SWMH6	0.000	0.13		4487	18.6	SURCHARGED	
S1.006	SWMH9	0.000	0.12			19.3	SURCHARGED	
S3.000	SWMH11	0.000	0.03		466	0.5	SURCHARGED	
S3.001	SWMH12	0.000	0.10		1182	3.8	SURCHARGED	
S3.002	SWMH13	0.000	0.11		2688	3.8	SURCHARGED	
S3.003	SWMH14	0.000	0.09			4.2	SURCHARGED	
S4.000	SWMH15	0.000	1.02			17.7	SURCHARGED	
S5.000	SWMH17	0.000	0.27		12	4.7	OK	
S4.001	SWMH16	0.000	1.21			21.1	SURCHARGED	
S4.002	SWMH18	0.000	0.06		3282	2.5	SURCHARGED	
S1.007	SWMH10	0.000	0.11			23.1	SURCHARGED	
S1.008	SWMH19	0.000	0.02			4.1	SURCHARGED	
S6.000	SWMH21	0.000	0.57			9.6	FLOOD RISK	
S6.001	SWMH22	0.000	1.43			24.4	FLOOD RISK	
S6.002	SWMH23	0.000	1.77			30.1	SURCHARGED	
S7.000	SWMH25	0.000	0.06		1121	5.4	SURCHARGED	
S7.001	S24	0.000	0.05			5.3	SURCHARGED	
S6.003	SWMH24	0.000	0.12			7.7	SURCHARGED	
S6.004	SWMH26	0.000	0.13			8.7	SURCHARGED	
S6.005	SWMH27	0.000	0.05			2.4	SURCHARGED	
S1.009	SWMH20	0.000	0.20			13.2	OK	
S1.010	SWMH28	0.000	0.71			53.1	OK	
S1.011	SWMH29	0.000	0.71			10.8	SURCHARGED	