Cosgrave Developments

Blackwood Square, Northwood, Santry Demesne, Dublin 9

Planning Application to An Bord Pleanala

Water Services Report

November 2019

BARRY & PARTNERS consulting engineers

CIVIL • STRUCTURAL • ENVIRONMENTAL • TRANSPORTATION

Document Control Sheet

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Project Title:	Blackwood Square, Northwood, Dublin 9
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Table of Contents *(incl. Y/N)*	**List of Tables** *(incl. Y/N)*	**List of Figures** *(incl. Y/N)*	**Pages of Text** *(No.)*	**Appendices** *(No.)*
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15/11/2019	P05	A1	DMOD	SW	GF	GF	N/A

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SECTION 1: INTRODUCTION

1.1 Cosgrave Developments are applying for Planning Permission to An Bord Pleanala (ABP) for a residential development at Northwood, Santry, Dublin 9. The proposed development will consist of 331 apartments in four separate blocks, with mixed use commercial units and a childcare facility at ground floor level over basement car parking, and all associated site works including roads, footpaths, landscaping, site services, SuDS measures and sundry related works. This report has been prepared in support of the Planning Application. It takes account of the requirements of the Fingal County Development Plan (2017-2023).

1.2 This Report addresses the following:

- Pre-planning Meetings with Fingal County Council and An Bord Pleanala.
- Water Supply.
- Foul Sewer Design.
- Surface Water Design
- Operation and Maintenance of SUDS measures.

1.3 A legal easement is in place between the Northwood Management Company Limited and Cosgrave Property Group to permit surface water discharge to the Santry River and to allow for maintenance access whenever required. This will be relied upon until the services are taken in charge by Fingal County Council.

SECTION 2: PRE-PLANNING MEETINGS

2.1 Pre-planning meetings were held to discuss the proposed development with personnel from Fingal County Council on the following dates:

- Water Services (Planning Dept): 5th March 2019 & 2nd May 2019
- An Bord Pleanala: 2nd September 2019

SECTION 3: WATER SUPPLY

3.1 The proposed development will be supplied via the existing 200mm watermain in the Access Road as shown on Drawing 19205-JBB-00-XX-DR-C-01004 Rev P1. This 200mm main is supplied from the existing 600mm North Fringe Watermain in Northwood Avenue.

3.2 The daily water demand for the proposed development is estimated as follows:

- Apartments

Daily Demand: 331units*2.7persons/unit*150l/head/day = 134,460l/day

Average Demand: 134,460/24*3600 = 1.56l/sec

Average Day/Peak Week (ADPW) Demand: 1.56l/sec*1.25 = 1.95l/sec

Peak Demand: ADPW Demand*5 1.95l/sec*5 = 9.75l/sec

Retail: 25no staff*60l/head/day = 1,500l/day

Average Demand: 1,500l/day/8*3600 = 0.05l/sec

ADPW Demand: 0.05l/sec*1.25 = 0.063l/sec

Peak Demand: 0.063l/sec*5 = 0.31l/sec

- Creche: 90no children + 20no staff*60l/head/day = 6,600l/day

Average Demand: 6,600l/day/8*3600 = 0.23l/sec

ADPW Demand: 0.23l/sec*1.25 = 0.29l/sec

Peak Demand: 0.29l/sec*5 = 1.45l/sec

- Accumulated Average Demand: 1.56l/sec+0.05l/sec+0.23l/sec = 1.84l/sec

Accumulated ADPW Demand: 1.84l/sec*1.25 = 2.30l/sec

Accumulated Peak Demand: 2.30l/sec*5 = 11.50l/sec

3.3 Irish Water, in their Confirmation of Feasibility Statement (a copy of which is contained in Appendix 1), has confirmed that water supply to the proposed development is feasible without upgrades.

3.4 Watermain works, Water Conservation Measures, Metering and Pressure Control will be strictly in accordance with Irish Water and Fingal County Council requirements, specifications and standard details.

3.5 A Statement of Design Acceptance has been received from Irish Water, a copy of which is included in Appendix A.

SECTION 4: FOUL SEWER DESIGN

4.1 The development will be connected to the existing 222mm diameter foul in the access road as shown on drawing 19205-JBB-00-XX-DR-C-01003 Rev P5. This sewer is connected to the North Fringe Sewer at the roundabout on Northwood Avenue.

4.2 The estimated Dry Weather Flows (DWF's) from this development are as follows:

331Units*446l/unit/day = 148,072l/day

1DWF (146,288l/day/24*3600) = 1.71l/sec

6DWF (6*1.71l/sec) = 10.26l/sec

4.3 Within the development, it is proposed to lay the 225mm diameter foul sewers at the minimum gradient of 1 in 200 to achieve self-cleansing velocities.

4.4 Sewers 150mm dia or less will be uPVC to B.S 4660. Sewers 225mm diameter greater will be spigot and socket pipes Class S to I.S. 6.

4.5 Irish Water, in their Confirmation of Feasibility Statement (a copy of which is included in Appendix 1), has confirmed that there is capacity in their wastewater infrastructure to cater for this development without upgrades.

4.6 Foul sewer construction will comply with Fingal County Council and Irish Water's requirements, specification and standard details.

4.7 A Statement of Design Acceptance has been received from Irish Water, a copy of which is included in Appendix A.

SECTION 5: SURFACE WATER DESIGN

5.1 The foul and storm sewer networks will be on the separate systems. No foul effluent will discharge to the storm water system.

5.2 Details of the proposed surface water network and the proposed SuDS measures for this development are shown on drawings 19205-JBB-00-XX-DR-C-01001 Rev P2, 19205-JBB-00-XX-DR-C-01002 Rev P5 and 19205-JBB-00-XX-DR-C-01007 Rev P3.

5.2 At the Pre-Planning meeting with An Bord Pleanala, Fingal County Council noted that the previous proposal to infill the existing ditch with a Stormtech attenuation/infiltration system was not acceptable. It was therefore agreed that the existing ditch will be infilled with single sized stone to act as a natural watercourse.

5.3 SuDS (Sustainable Urban Drainage Systems) are described in CIRIA 753, SuDS Manual as '*Drainage systems that are considered to be environmentally friendly, causing minimal or no long-term detrimental impact'.*

A similar definition of SuDS is included in Appendix A, Glossary, Volume 3, Environmental Management, Greater Dublin Strategic Drainage Study.

The SuDS strategy for the Development provides a comprehensive approach to the management of surface water on the site including: water quality and water quantity. The treatment train approach has been adopted for the design of the surface water system for the Development. This approach uses suitable SuDS measures in providing source control and site control. The stormwater treatment train in defined in Appendix A, Glossary, Volume 3, Environmental Management, Greater Dublin Strategic Drainage Study as follows:

'A series of SuDS, each designated to treat a different aspect of runoff that are implemented together to maximise their effectiveness'.

The SuDS measures proposed for this Development are discussed under the following headings:

- Source Control
- Site Control

Source Control

Source Control measures can be defined as "*the control of runoff at or near its source"* (in the case of this development the individual buildings, roads, footpaths, hard standings, carparks, podium).

Source controls proposed for this development include the following as shown in Table 1 below:

Source Control Measures	Location / Treatment Area
Green Roofs	Roofs (Blocks A-D)
Permeable paving	Footpaths/Hardstanding and podium
Hydrocarbon Interceptor	Roofs/Hardstanding

Table 1-Source Control Measures

An extensive green roof is proposed for Blocks A, B, C & D. A typical cross section of the roof makeup is shown on Drawing 19205-JBB-00-XX-DR-C-01007 Rev P3. The green roof details will be in accordance with the SUDS Manual, CIRIA 753, 2015 and relevant Fingal County Council Guidelines. This extensive green roof could reduce the annual run-off by 40 to 70%.

The proposed permeable paving has provision for outflows(overflows) from the permeable paving to the surface water infrastructure (including the existing Attenuation Tank) which discharges to the Santry River in the North-West corner of the existing development.

The permeable paving has storage (attenuation) capacity to cater for the 1:100-year critical storm event plus 20% for climate change with restricted outflows limited to 2l/sec to the proposed surface water infrastructure if necessary.

There is capacity in the existing Attenuation Tank to cater for the peak flow of 368.5l/sec generated from the 1 in 100 year + 20% for climate change from the proposed development. A Micro-Drainage analysis of the system was carried out and is attached in Appendix 2.

Site Control
Site Control is defined as: *'a control which is designed to control storm water quality and/or quantity for a small development or site'.*

Site control proposed for this development includes the existing Attenuation Tank located in the North-West of the existing development. Surface water from the existing development (3.5 ha's) plus the proposed development (1.49 ha's) will pass through this tank prior to discharge to the Santry River. The maximum restricted runoff rate of 14.6l/sec from the existing tank equates to the 1 in 100year greenfield rate for the existing development plus the proposed development and will not have any significant impact on the Santry River.

The surface water runoff from all hardstanding areas including the roof, podium, private roads, hardstanding's and associated footpaths has the potential of passing through a minimum of two SuDS measures.

5.4 All SuDS measures under Source and Site Controls will be agreed with Fingal County Council.

5.5 The storm water run-off from the Development will pass through a minimum of 2 SuDS Devices. This treatment train approach complies with Volume 2, New Development, GDSDS.

5.6 The storm water system will be in accordance with "The Regional Code of Practice for Drainage Works".

SECTION 6: OPERATION/MAINTENANCE OF SUDS DEVICES

6.1 The SuDS components proposed for this development will be operated and maintained strictly in accordance with the requirements of the SuDS Manual, CIRIA 753, 2015 to ensure that "water quality standards are maintained".

6.2 Each SuDS component proposed is referenced below to the relevant operation and maintenance sections of CIRIA 753, 2015 where appropriate:

- Permeable pavements will be operated and maintained in accordance with Part D, Sub-Section 20.14 including Table 20.15 and Section 32 of CIRIA 753

- The hydrocarbon interceptor shall be operated and maintained in accordance with Part D, Sub-Section 14.12 including Table 14.2, Section 32 of CIRIA 753 and the Manufacturer's requirements.
- The existing Attenuation Tank shall be operated and maintained in accordance with Section D, Sub-Section 21.12 including Table 21.3, Section 32 of CIRIA 753 and the Manufacturer's requirements where appropriate.
- Waste management of the various SuDS components proposed for the proposed development will be carried out strictly in accordance with Section 33 of CIRIA 753.

SECTION 7: RELATED REPORTS

7.1 A Flood Risk Assessment has been prepared as a separate document.

SECTION 8: RELEVANT DRAWINGS

8.1

Drawing No	Title
19205-JBB-00-XX-DR-C-01001 Rev P3	Foul & Storm Water Sewers Outfall Locations
19205-JBB-00-XX-DR-C-01002 Rev P5	Proposed Storm Sewers Layout
19205-JBB-00-XX-DR-C-01003 Rev P8	Proposed Foul Sewers Layout
19205-JBB-00-XX-DR-C-01004 Rev P6	Proposed Watermain Layout
19205-JBB-00-XX-DR-C-01005 Rev P3	Typical Foul Sewer Drainage Details
19205-JBB-00-XX-DR-C-01006 Rev P1	Typical Surface Water Sewer Drainage Details
19205-JBB-00-XX-DR-C-01007 Rev P3	Proposed SuDS Devices Details
19205-JBB-00-XX-DR-C-01008 Rev P2	Typical Watermain Details (Sheet 1)
19205-JBB-00-XX-DR-C-01009 Rev P2	Typical Watermain Details (Sheet 2)
19205-JBB-00-XX-DR-C-01014 Rev P1	Proposed Basement Storm Sewer Layout
19205-JBB-00-XX-DR-C-01015 Rev P6	Combined Foul & Storm Sewers Layout

Appendix 1

Irish Water

Confirmation of Feasibility Statement

Uisce Éireann
Bosca OP 6000
Baile Átha Cliath 1
Éire

Irish Water
PO Box 6000
Dublin 1
Ireland

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

Dan O Donoghue
Classon House
Dundrum Business Park
Dundrum Road, Dublin 14

8 March 2019

Dear Dan O Donoghue,

Re: Connection Reference No CDS19000341 pre-connection enquiry - Subject to contract | Contract denied

Connection for Mixed Use Development of 333 units at Northwood, Santry, Co. Dublin.

Irish Water has reviewed your pre-connection enquiry in relation to a water connection at Northwood, Santry, 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.

This Confirmation of Feasibility to connect to the Irish Water infrastructure also does not extend to your fire flow requirements. Please note that Irish Water can not guarantee a flow rate to meet fire flow requirements and in order to guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development.

New connections to Irish water and wastewater networks in Northwood Avenue are feasible without upgrade subject to following:

The proposed water and wastewater connections for this development connect to the Irish Water network via infrastructure that has not been taken in charge by Irish Water (Third Party Infrastructure). Please be advised that at connection application stage and prior to the commencement of any Self-Lay Works, you have to:

• identify and procure transfer to Irish Water of the arterial water and wastewater Infrastructure within the Third Party Infrastructure

• demonstrate that the arterial infrastructure are in compliance with requirements of Irish Water Code of Practice and Standard Details and in adequate condition and capacity to cater for additional load from the Development.

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

Strategic Housing Development

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

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

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

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

If you have any further questions, please contact Marina Zivanovic Byrne from the design team on 01 89 25991 or email mzbyrne@water.ie. For further information, visit www.water.ie/connections.

Yours sincerely,

M. O'Dwyer

Maria O'Dwyer

Connections and Developer Services

Dan O Donoghue
Classon House
Dundrum Business Park
Dundrum Road
Dublin 14

29 October 2019

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

Re: Design Submission for Northwood, Santry, Co. Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS19000341

Dear Dan O Donoghue,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative:
Name: Marina Zivanovic Byrne
Phone: 01 89 25991
Email: mzbyrne@water.ie

Yours sincerely,

Maria O'Dwyer
Connections and Developer Services

Appendix A

Document Title & Revision

- [19205-JBB-00-XX-DR-C-01003_Foul_Sewer_P7]
- [19205-JBB-00-XX-DR-C-01004_Watermain_Layout_P6]
- [19205-JBB-00-XX-DR-C-01015_Combined SW_FS_P4]
- [191022 -Foul Long Sections]
- [191022 -Foul Report]

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

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

Appendix 2

Surface Water Calculations

(Micro-Drainage Analysis)

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	16.500	Add Flow / Climate Change (%)	0
Ratio R	0.300	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

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	50.313	0.252	200.0	0.327	5.00	0.0	0.600	o	375	Pipe/Conduit	
S1.001	72.562	0.363	200.0	0.249	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.002	31.453	0.184	170.9	0.064	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.003	10.752	0.064	168.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.000	52.565	0.263	199.9	0.293	5.00	0.0	0.600	o	375	Pipe/Conduit	
S2.001	66.591	0.333	200.0	0.268	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.002	6.069	0.042	144.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.003	39.198	0.236	166.1	0.132	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.004	12.111	0.072	168.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.004	6.513	0.039	167.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

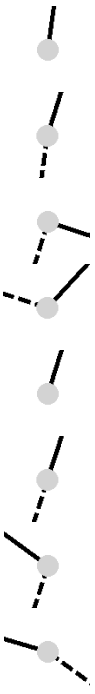
Network Results Table

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	50.00	5.66	57.105	0.327	0.0	0.0	0.0	1.28	141.1	44.3
S1.001	50.00	6.60	56.853	0.576	0.0	0.0	0.0	1.28	141.1	78.1
S1.002	50.00	6.98	56.491	0.640	0.0	0.0	0.0	1.38	152.7	86.7
S1.003	50.00	7.11	56.307	0.640	0.0	0.0	0.0	1.40	154.1	86.7
S2.000	50.00	5.69	56.705	0.293	0.0	0.0	0.0	1.28	141.1	39.6
S2.001	50.00	6.55	56.368	0.560	0.0	0.0	0.0	1.28	141.1	75.9
S2.002	50.00	6.62	56.034	0.560	0.0	0.0	0.0	1.51	166.2	75.9
S2.003	50.00	7.09	55.992	0.692	0.0	0.0	0.0	1.40	155.0	93.7
S2.004	50.00	7.23	55.756	0.692	0.0	0.0	0.0	1.39	154.0	93.7
S1.004	50.00	7.29	55.610	1.332	0.0	0.0	0.0	1.88	532.0	180.4

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)
S5	58.000	0.895	Open Manhole	1350	S1.000	57.105	375				
S4	58.000	1.147	Open Manhole	1350	S1.001	56.853	375	S1.000	56.853	375	
S3	58.200	1.709	Open Manhole	1350	S1.002	56.491	375	S1.001	56.491	375	
S2	58.000	1.693	Open Manhole	1350	S1.003	56.307	375	S1.002	56.307	375	
S1.5	58.000	1.295	Open Manhole	1800	S2.000	56.705	375				
S1.4	58.000	1.632	Open Manhole	1500	S2.001	56.368	375	S2.000	56.442	375	74
S1.3	57.600	1.566	Open Manhole	1350	S2.002	56.034	375	S2.001	56.035	375	1
S1.2	57.650	1.658	Open Manhole	1350	S2.003	55.992	375	S2.002	55.992	375	
S1.1	58.000	2.244	Open Manhole	1350	S2.004	55.756	375	S2.003	55.756	375	
S1	58.300	2.690	Open Manhole	1500	S1.004	55.610	600	S1.003	56.243	375	408
								S2.004	55.684	375	
SMHEX	57.700	2.129	Open Manhole	0		OUTFALL		S1.004	55.571	600	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5	315769.214	240753.117	315769.214	240753.117	Required	
S4	315776.085	240802.959	315776.085	240802.959	Required	
S3	315797.533	240872.278	315797.533	240872.278	Required	
S2	315827.441	240862.543	315827.441	240862.543	Required	
S1.5	315848.917	240733.241	315848.917	240733.241	Required	
S1.4	315864.637	240783.400	315864.637	240783.400	Required	
S1.3	315885.186	240846.741	315885.186	240846.741	Required	
S1.2	315880.284	240850.319	315880.284	240850.319	Required	



Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1.1	315842.702	240861.457	315842.702	240861.457	Required	
S1	315834.659	240870.512	315834.659	240870.512	Required	
SMHEX	315836.615	240876.725			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

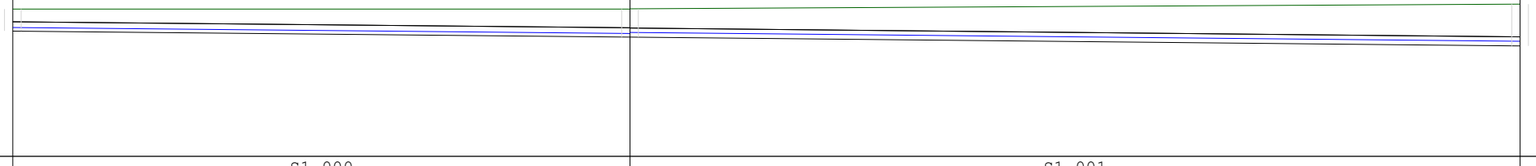
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	375	S5	58.000	57.105	0.520	Open Manhole	1350
S1.001	o	375	S4	58.000	56.853	0.772	Open Manhole	1350
S1.002	o	375	S3	58.200	56.491	1.334	Open Manhole	1350
S1.003	o	375	S2	58.000	56.307	1.318	Open Manhole	1350
S2.000	o	375	S1.5	58.000	56.705	0.920	Open Manhole	1800
S2.001	o	375	S1.4	58.000	56.368	1.257	Open Manhole	1500
S2.002	o	375	S1.3	57.600	56.034	1.191	Open Manhole	1350
S2.003	o	375	S1.2	57.650	55.992	1.283	Open Manhole	1350
S2.004	o	375	S1.1	58.000	55.756	1.869	Open Manhole	1350
S1.004	o	600	S1	58.300	55.610	2.090	Open Manhole	1500

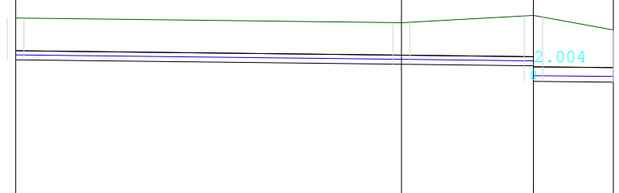
Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	50.313	200.0	S4	58.000	56.853	0.772	Open Manhole	1350
S1.001	72.562	200.0	S3	58.200	56.491	1.334	Open Manhole	1350
S1.002	31.453	170.9	S2	58.000	56.307	1.318	Open Manhole	1350
S1.003	10.752	168.0	S1	58.300	56.243	1.682	Open Manhole	1500
S2.000	52.565	199.9	S1.4	58.000	56.442	1.183	Open Manhole	1500
S2.001	66.591	200.0	S1.3	57.600	56.035	1.190	Open Manhole	1350
S2.002	6.069	144.5	S1.2	57.650	55.992	1.283	Open Manhole	1350
S2.003	39.198	166.1	S1.1	58.000	55.756	1.869	Open Manhole	1350
S2.004	12.111	168.2	S1	58.300	55.684	2.241	Open Manhole	1500
S1.004	6.513	167.0	SMHEX	57.700	55.571	1.529	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.004	SMHEX	57.700	55.571	0.000	0	0

MH Name		S5	S4	S3
Hor Scale 500 Ver Scale 250 Datum (m) 52.000				
PN		S1.000	S1.001	
Dia (mm)		375	375	
Slope (1:X)		200.0	200.0	
Cover Level (m)		58.000	58.000	58.200
Invert Level (m)		57.105 / 56.853	56.853	56.491
Length (m)		50.313	72.562	

MH Name		S3	S2	S1	SMHEX
Hor Scale 500 Ver Scale 250 Datum (m) 51.000					
PN		S1.002	S1.003	S1.004	
Dia (mm)		375	375	600	
Slope (1:X)		170.9	168.0	167.0	
Cover Level (m)		58.200	58.000	58.300	57.700
Invert Level (m)		56.491 / 56.307	56.307 / 56.243	55.610 / 55.571	
Length (m)		31.453	10.752	6.513	

MH Name		S1.5	S1.4		S1.2
Hor Scale 500 Ver Scale 250 Datum (m) 51.000					
PN		S2.000	S2.001		
Dia (mm)		375	375		
Slope (1:X)		199.9	200.0		
Cover Level (m)		58.000	58.000	57.600	57.650
Invert Level (m)		56.705	56.442 / 56.368	56.035 / 56.034	55.992
Length (m)		52.565	66.591		

MH Name		S1.2	S1.1	S1
Hor Scale 500 Ver Scale 250 Datum (m) 51.000				1.003 0
PN		S2.003	S2.004	
Dia (mm)		375	375	
Slope (1:X)		166.1	168.2	
Cover Level (m)		57.650	58.000	58.300
Invert Level (m)		55.992 / 55.756	55.756 / 55.684	
Length (m)		39.198	12.111	