PROPOSED STRATEGIC HOUSING DEVELOPMENT 'THE CONNOLLY QUARTER'



PROJECT NO. 0635

7TH OCTOBER 2019





Multidisciplinary Consulting Engineers PROPOSED STRATEGIC HOUSING DEVELOPMENT 'THE CONNOLLY QUARTER'

ENGINEERING SERVICES REPORT

PROJECT NO. 0635

7TH OCTOBER 2019

ENGINEERING SERVICES REPORT



Multidisciplinary Consulting Engineers

NOTICE

This document has been produced by O'Connor Sutton Cronin & Associates for its client Oxley Holdings Limited. It may not be used for any purpose other than that specified by any other person without the written permission of the authors.



DOCUMENT CONTROL & HISTORY

OCSC Job No. O635	:	Project Code	0 Originator	X Zone Volume	Level	B File Type	C Role Type	Number 0003		Code	C02
Rev.	Rev. Status		Authors 0		Che	cked	Authorised			Issue Date	
C02	C02 A1		NMM		TH			TH		07/10/2019	
C01		A1 NMM			TH			TH		16/04/2019	
P01		S3 NMM			TH			TH		14/0	03/2019
Rev		itability Code	Author		Che	Checker Aut		uthorised		Issu	ue Date

ENGINEERING SERVICES REPORT

PROPOSED STRATEGIC HOUSING DEVELOPMENT 'THE CONNOLLY QUARTER'

PROJECT NO. 0635

CONTENTS

SECTION TITLE

PAGE

1 . 1.1 1.2 1.3 1.4 1.5	INTRODUCTION 1 Appointment 1 Site Location 1 Administrative Jurisdiction 2 Scope of Report 2 Site Overview 3
1.6 2. 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 2.10	Development Proposals4STORM WATER MANAGEMENT PLAN9Overview9Flood Risk Zone9Pluvial Flooding and Overland Flow9Existing Drainage11Proposed Drainage12Specific SuDS Measures Proposed14Piped Network15Outfall Locations16GDSDS Storm Water Review17
3. 3.1 3.2 3.3 3.4 3.5 3.6	WASTEWATER DRAINAGE21Overview21Existing Drainage21Proposed Drainage22Outfall Locations22Calculations22Pre-Connection EnquiryError! Bookmark not defined.
4 .1 4.2 4.3 4.4 4.5 4.6 4.7	POTABLE WATER SUPPLY24Overview24Existing Watermains24Connection to the Existing Network24Proposed Watermains24Water Saving Devices25Domestic Water Meters25Pre-Connection EnquiryError! Bookmark not defined.

APPENDICES

- APPENDIX A: TOPOGRAPHICAL SURVEY
- APPENDIX B: IRISH WATER RECORD PLANS
- APPENDIX C: DETAILS OF PERMAVOID
- APPENDIX D: DETAILS OF SAMPLE RWO FLOW CONTROL
- APPENDIX E: IRISH WATER CONFIRMATION OF FEASIBILITY
- APPENDIX F: IRISH WATER STATEMENT OF DESIGN ACCEPTANCE
- APPENDIX G: MET ÉIREANN RAINFALL DATA
- APPENDIX H: SURFACE WATER DRAINAGE CALCULATIONS
- APPENDIX I: WASTEWATER GENERATION CALCULATIONS
- APPENDIX J: WATER DEMAND CALCULATIONS

1. INTRODUCTION

1.1 Appointment

O'Connor Sutton Cronin (OCSC) was appointed by Oxley Holdings Limited to prepare an Engineering Services Report for the proposed redevelopment of the car-park site at Connolly Station, Dublin 1. The site is currently occupied by surface car-parking and low rise office and storage buildings associated with Connolly Station. The overall proposed masterplan will comprise mixed residential, commercial, amenity and community use with basement level car parking and associated infrastructure. Permission for this will be sought under separate applications. The first will be a Section 247 Strategic Housing Development (SHD) application to ABP for the mainly residential elements of the scheme along with the basement. The second will be a standard Section 34 application to DCC for the non-residential elements.

1.2 Site Location

The subject site is located immediately to the east of Connolly Station, Dublin 1. The site is bounded by Sherriff Street Lower and Commons Street to the south, Oriel Street Upper and Oriel Hall to the east and existing CIÉ development to the north and west – see *Figure 1*. The total site comprises approximately 2.9 hectares.

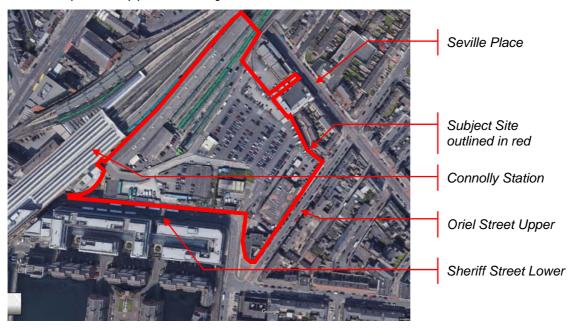


Figure 1: Site Location



1.3 Administrative Jurisdiction

The site is located within the administrative jurisdiction of Dublin City Council, whose offices are located at Civic Offices, Wood Quay, Dublin 8.

1.4 Scope of Report

This report was prepared as part of a planning application and addresses:

- Storm Water Drainage;
- Wastewater Drainage and;
- Potable Water Supply.

Traffic Impact Assessment and Site-Specific Flood Risk Assessment are provided under separate cover.

This report was compiled following a review of available data from the Office of Public Works (OPW), Ordnance Survey Ireland, Irish Water and Dublin City Council (DCC). The drainage strategy and design calculations were prepared taking cognisance of the following:

- DCC Requirements;
- BS EN 752 Drainage Outside Buildings;
- BS EN 12056-2:2000 Gravity Drainage Systems Inside Buildings;
- Department of Housing, Planning, Community and Local Government – Technical Guidance Document 'H';
- Irish Water's Code of Practice for Wastewater Infrastructure;
- Irish Water's Code of Practice for Water Infrastructure;
- Greater Dublin Strategic Drainage Study (GDSDS);
- The Greater Dublin Region Code of Practice for Drainage Works;
- Dublin City Development Plan (2016-2022);
- Strategic Flood Risk Assessment (DCDP 2016-2022);
- The SuDS Manual (CIRA C753);
- Infiltration Manual of Good Practice (CIRIA 156) and;
- The Planning System and Flood Risk Management, Office of Public Works, December 2009.

OCSC carried out a site inspection in February 2019. The inspection consisted of a walkover and visual inspection outside the site and in the general area.



1.5 Site Overview

The site is some 2.9 hectares in area and is currently occupied by surface car-parking and low rise office and storage buildings. The site is currently accessed from Sherriff Street Lower. A topographical survey of the existing site (see *Appendix A*) shows that the footpath levels around the site vary; 1.5-1.9mAOD on Sherriff Street Lower and 1.0-1.7mAOD on Oriel Street Upper.

In the Dublin City Development Plan 2016-2022 (DCDP), the site is zoned Z5 "to consolidate and facilitate the development of the central area, and to identify, reinforce, strengthen and protect its civic design character and dignity" – see *Figure 2*. Furthermore, the site is located within Strategic Development and Regeneration Area 6 – Docklands.

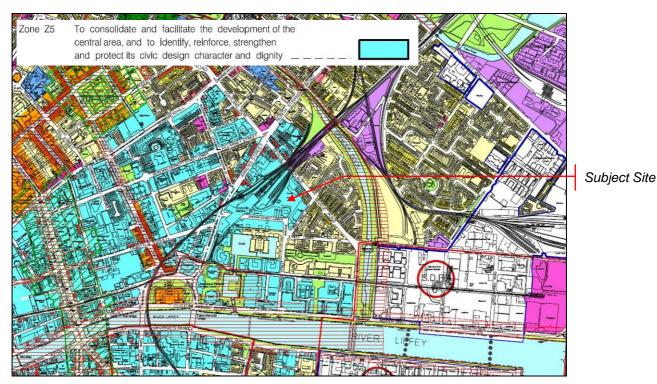


Figure 2: Extract from DCDP 2016-2022



1.6 Development Proposals

The site is currently occupied by surface car-parking and low rise office and storage buildings associated with Connolly Station. The proposed development comprises 741nr residential units, residential support amenities of 1,444m² and other uses (retail, commercial and community use) of 3,142m².



Figure 3: View of Masterplan Proposals

Existing track sidings are located in the northwest of the site; it is proposed to build over these sidings at high level, but the tracks will remain in the control of Irish Rail. Existing vaults with arches facing Sherriff Street Lower are located in the southwest of the site; these vaults are to be retained and renovated in part. It is proposed to construct a basement over much of the remaining areas of the site – see *Figure 4 over*.



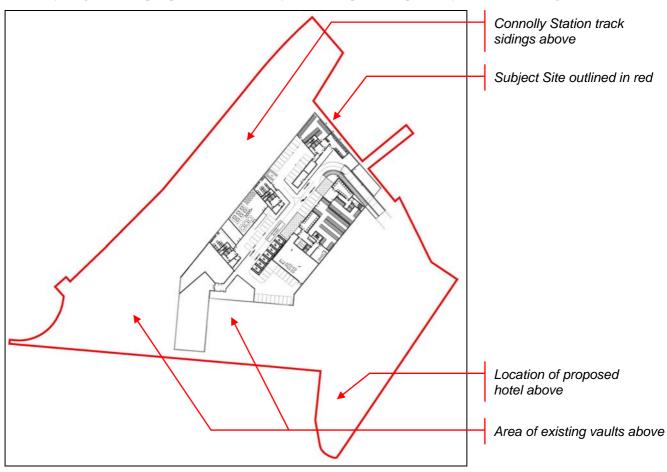


Figure 4: Proposed basement layout

At ground floor level, it is proposed to provide a thoroughfare through the development with Finished Floor Level (FFL) at 1.85m AOD; the thoroughfare will slope down to meet Oriel Street Upper on the eastern boundary of the site. The thoroughfare, which includes pockets of softstand landscaping, will be partially on the roof of the basement below – see *Figure 5* over.





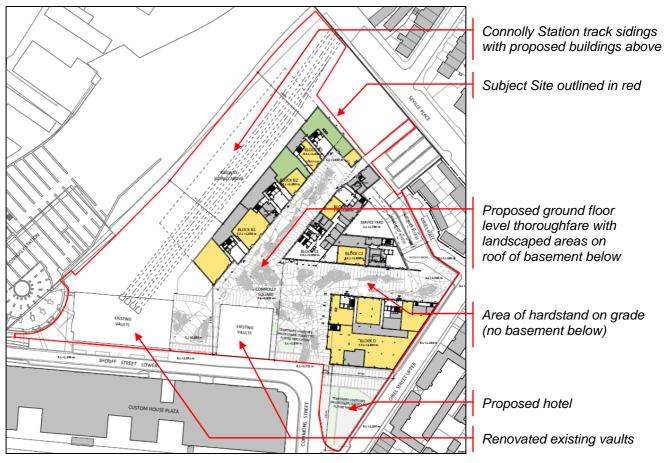


Figure 5: Proposed ground floor layout

At first floor level, it is proposed to provide a walkway linking all the proposed blocks; this walkway will link to Connolly Station and provide an alternative route for access/egress to residential areas – see *Figure 6* over. The walkway will also link landscaped amenity spaces provided over ground floor units.





Engineering Services Report Proposed Strategic Housing Development 'The Connolly Quarter'

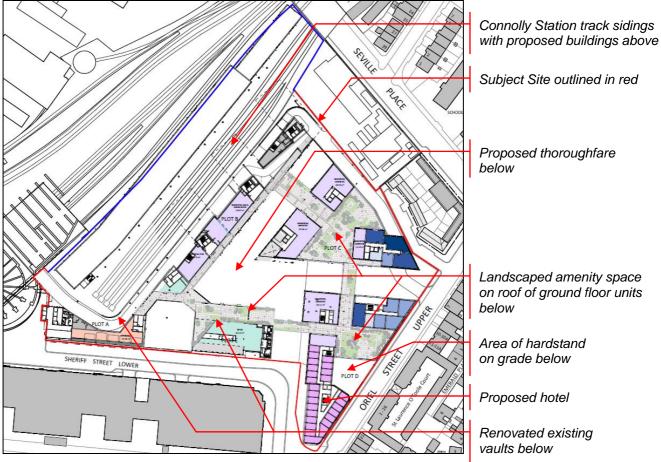


Figure 6: Proposed first floor layout

Additional landscaped amenity spaces will be provided at fourth floor level – see *Figure 7* over. Furthermore, the roofs of each individual block (multiple levels) will include green roofs.



O'Connor Sutton Cronin & Associates Multidisciplinary Consulting Engineers Engineering Services Report Proposed Strategic Housing Development 'The Connolly Quarter'

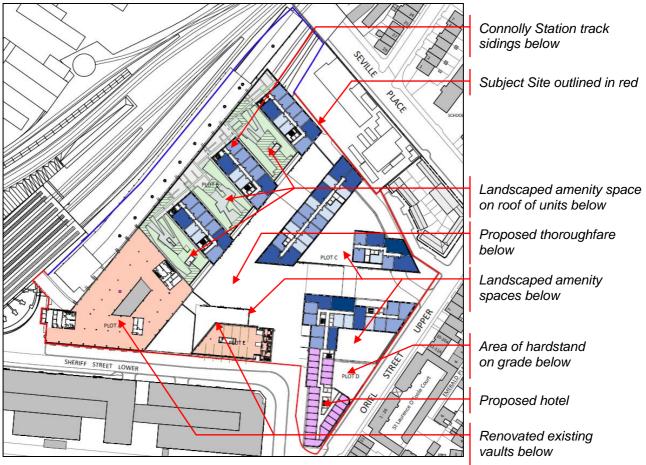


Figure 7: Proposed fourth floor layout



2. STORM WATER MANAGEMENT PLAN

2.1 Overview

The surface water drainage system for any development of the subject lands will be required to adhere to the requirements of Dublin City Council and the Greater Dublin Strategic Drainage Study (GDSDS, 2005). The City Development Plan states that applications for development must "demonstrate methods of controlling and limiting surface water run-off consistent with sustainable development". Surface water discharge from developed areas must be controlled and managed to mitigate potential impacts on the receiving environment.

The subject site is almost entirely covered by proposed buildings; the surface level across the site consists of roof or podium over habitable space below. Only a small area in the southeast of the site will be hardstand landscaped on grade. The development will incorporate a Sustainable Drainage System (SuDS) that controls runoff as close as possible to source through a management train of SuDS features such as green roofs, blue roofs, petrol interceptor, flow control and attenuation storage. It is acknowledged that landscaping can improve sustainability by assisting with surface water management; podium level amenity landscape areas will be utilised as green/blue roof to reduce the volume and rate of surface water runoff.

2.2 Flood Risk Zone

A Site-Specific Flood Risk Assessment (SSFRA) Report is submitted under separate cover. The SSFRA concludes that the subject site is in Flood Zone A/B and is in a defended area.

2.3 Pluvial Flooding and Overland Flow

The Strategic Flood Risk Assessment included in the DCDP contains a Pluvial Flood Depth and Flood Hazard Maps – extracts are reproduced in *Figure 8* and *Figure 9* over.



O'Connor Sutton Cronin & Associates Multidisciplinary Consulting Engineers

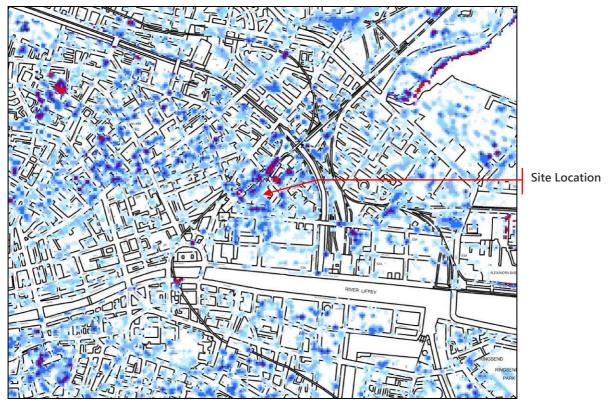


Figure 8: Extract from Flood ResilienCity Type 1 Pluvial Flood

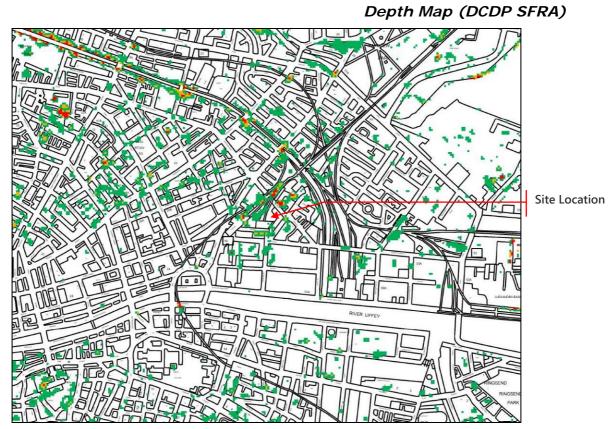


Figure 9: Extract from Flood ResilienCity Type 1 Pluvial Flood Hazard Map (DCDP SFRA)



The maps show small pockets of moderate pluvial flood risk present on the subject site; this corresponds to minor undulations in the ground level within the existing site. In developing the site, the ground levels will be re-profiled, removing these undulations. The maps also show pockets of pluvial flooding on existing public roads around the subject site. The development proposals provide building thresholds above adjacent road levels, thus mitigating the pluvial flood risk to proposed development.

The site is currently occupied by surface car-parking and low rise office and storage buildings; the site is largely in hardstand and is provided with no attenuation facility or flow control mechanism. The proposed drainage system will be designed to modern design standards and will collect surface water runoff from the site and attenuate to equivalent greenfield runoff rates; this will mitigate the potential pluvial flood risk arising from the subject site.

2.4 Existing Drainage

There is an existing sewerage network in place serving the area around the proposed development. Irish Water records (see *Appendix B*) show the location of the existing drainage within the vicinity of the site. The Records show that the sewers in the wider area are combined (collecting both foul sewage and surface water runoff).

There is a brick arched sewer in Sherriff Street Lower that ranges in size from 1310mm to 1470mm; this sewer drains to a 1200mm-diameter concrete pipe that drains south towards Commons Street. The sewer in Oriel Street Upper drains northwards and begins as a 450mm-diameter vitrified clay pipe before changing to a 1000mm brick arched sewer; this sewer discharges to a 1590mm brick arched sewer in Seville Place.

All the sewers in the vicinity of the site drain to the Irish Water pumping station on Mayor Street Lower. The rising main from this pumping station runs north along Commons Street and west along Sherriff Street Lower (immediately to the southwest of the site) before discharging to a sewer in Amiens Street; following discussions with Irish Water, OCSC



understands that Irish Water are assessing plans to divert this rising main eastward to the pumping station at Spencer Dock.

There is an existing surface water drainage system serving the current development on the site (primarily surface car-parking). The existing drainage system provides no attenuation and no treatment of runoff. The existing drainage system on the site discharges un-attenuated surface water runoff to the existing sewerage network at Sherriff Street Lower.

2.5 Proposed Drainage

Due to the nature of the proposed development, most of the extent of the site will be covered in roof; the remainder of the site comprises some of the ground-level thoroughfare where there is no basement below. It is therefore proposed to provide green and blue roofs to collect, treat, convey and store surface water runoff. Where the thoroughfare is on ground (i.e. no basement below), it is proposed to provide Type C pervious paving to collect, treat, convey and store surface water runoff. Note that the sub-strata of the pervious paving will include high voids stone with perforated pipes whereas the surface layer will comprise a mix of permeable and non-permeable surfacing.

The roofs of each individual block (multiple levels) will include green roofs; the rainwater outlets (RWOs) from these roofs will be fitted with flow control devices to utilise the green roof for attenuation (i.e. a blue roof). The roof over the basement will also to utilised as a blue roof. It is proposed that the rainwater from all upper roof levels discharge to the blue roof over the basement and the pervious paving sub-strata.

It is proposed that roofs with green/blue roofs will be provided with a high-voids drainage layer, such as Polypipe's Permavoid 85 system – sample product details are provided in *Appendix C*. The Permavoid system provides at least 92% voids, which allow for conveyance and storage across the system. The Permavoid system is available for trafficked and non-trafficked applications and is consistent with the use of roof areas as amenity space – see *Figure 10 over*.



It is proposed that rainwater outlets (RWOs) from all upper level blue roofs be fitted with a flow control device; details of a sample RWO flow control device are provided in *Appendix D*.



Figure 10: Example of roof-level amenity space with Permavoid drainage layer (from Polypipe Permavoid)

While it is intended that only a small portion of the surface area of the site is trafficked (at the entrance to the basement car-park), the thoroughfare at ground floor level is designed to allow occasional vehicular access, including fire tender access. It is therefore proposed that all runoff from the site will pass through Class 1 petrol interceptors prior to discharge off site.

All runoff will be limited to equivalent greenfield runoff rates (2 l/s/ha) using flow control devices (e.g. vortex flow control, orifice plate) prior to discharge to the receiving sewers.

The proposed surface water drainage layout is shown on O'Connor Sutton Cronin drawing O635-OCSC-XX-XX-DR-C-0500.



2.6 Specific SuDS Measures Proposed

It is proposed to provide a Sustainable Drainage System (SuDS) in accordance with the Greater Dublin Strategic Drainage Study Regional Drainage Policy Volume 2 - New Development (GDSDS-RDP Volume 2). Specific design requirements for SuDS components are established by the Construction Industry Research and Information Association's publication The SuDS Manual (C753). It is proposed that the following systems will be used:

 <u>Green Roofs</u> will be provided in within the subject site where large flat roof areas are provided. Amenity spaces at roof level will comprise a combination of paving and planted areas but will include a drainage layer throughout for the collection and storage of surface water runoff.



Figure 11: Example green roof

 <u>Pervious Paving</u> will be provided to the thoroughfare where there is no basement below. Pervious paving will be Type C to The SuDS Manual CIRIA C753. Note that the sub-strata of the pervious paving will include high voids stone with perforated pipes whereas the surface layer will comprise a mix of permeable and nonpermeable surfacing.



- <u>Attenuation Storage</u> will be provided for runoff from all surfaces to allow for the restriction of discharge rates to equivalent greenfield runoff rates. Proposed attenuation storage volumes accommodate the design 100-year return period rainfall event within the designated storage area. All attenuation storage on the site will be provided in blue roof drainage layers and in pervious paving substrata.
- <u>Limiting Discharge</u> to ensure that the discharge rate is maintained at equivalent greenfield runoff rates. A discharge rate of 2 l/s/ha is proposed, resulting in a total discharge rate from the site of 5.8l/s.
- <u>Interception Storage</u> will be provided in green roofs and infiltration trenches (where ground conditions allow). Due to the extent of the proposed building and basement footprint, scope for infiltration is limited to a small area in the southeast of the site.
- <u>Infiltration</u> of runoff to groundwater can occur only in the southeast corner of the site, due to the extent of the building and basement footprint. Infiltration to groundwater will occur where ground conditions allow.
- <u>Class 1 oil separators</u> will be provided at all outfalls from the proposed drainage system. Class 1 by-pass oil separators in accordance with Pollution Prevention Guideline PPG3 be used at all locations.
- <u>Rainwater Harvesting</u> will be assessed for use in the proposed development.

2.7 Piped Network

As the proposal for surface water drainage for the development primarily comprises a blue roof over the basement, there is relatively little belowground surface water piped drainage included in the development proposal. Below-ground piped drainage comprises: RWP connections in



the existing retained vaults; gully connections in the area of hardstand in the southeast corner and; RWP connections from the hotel block in the southeast corner. The proposed drainage network will include new piped gravity drainage designed in accordance with I.S. EN752: 2017 "Drain & Sewer Systems outside Buildings", the DOE 'Recommendations for Site Development Works for Housing Areas', 'The Greater Dublin Region Code of Practice for Drainage Works' and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS). Full bore self-cleansing velocities of 1.0m/s will be achieved throughout the network.

2.8 Outfall Locations

The proposed surface water drainage system includes three separate outfalls to existing combined sewers: the 1470mm brick arched sewer in Sherriff Street Lower; the 1200mm-diameter concrete pipe sewer in Sherriff Street Lower and; the 1000mm brick arched sewer in Oriel Street Upper. Details of the proposed surface water discharge to Irish Water combined sewers was included in a Pre-Connection Enquiry submitted to Irish Water in August 2018; the Confirmation of Feasibility was received in October 2018 (see *Appendix E*) and the Statement of Design Acceptance was received in June 2019 (see *Appendix F*).

As there are no extant surface water sewers in the vicinity and discharge will be made to the combined sewers, the last private surface water manhole will be constructed with two outfall pipes: one pipe will be capped at site boundary and; one pipe will discharge to the last private wastewater drainage manhole, in accordance with DCC requirements.

2.9 Calculations

A computer model of the drainage systems has been developed using the MicroDrainage design software. Calculations for the design of storm drains have been compiled using the Modified Rational Method in accordance with EN752. The rainfall intensity levels have been obtained from Met Éireann – see *Appendix G*. Rainfall levels have been increased by 20% for climate change factors. The performance of the proposed drainage systems will be assessed for 30-year and 100-year return period



storm events at a later detailed design stage. Calculations generated by the MicroDrainage SourceControl software are included in *Appendix H*.

2.10 GDSDS Storm Water Review

The Greater Dublin Strategic Drainage Study (GDSDS) requires that storm water is reviewed under four Criteria as follows:

- (i) Criterion 1 River Water Quality Protection;
- (ii) Criterion 2 River Regime Protection;
- (iii) Criterion 3 Level of Service (Flooding) site;
- (iv) Criterion 4 River Flood Protection.

Criterion 1 – River Water Quality Protection

The drainage system for this development will contain a range of treatment methods for surface water as outlined earlier. Low rainfall events and the first flush of higher rainfall events will be intercepted by green roof and infiltration trenches where provided. This volume will not be discharged off site.

All runoff from the site will be passed through Class 1 oil separators in accordance with Pollution Prevention Guideline PPG3.

Criterion 2 – River Regime Protection

Discharge will be made via the proposed attenuation facilities and flow control devices. Discharge will be limited to equivalent greenfield runoff rates, providing a total maximum discharge rate of 5.8 l/s, based on a greenfield runoff rate of 2l/s/ha. The GDSDS-RDP Volume 2, Appendix E Section E2.4 states that this ensures "that sufficient stormwater runoff retention is achieved to protect the river during extreme events". Therefore, the proposals satisfy Criterion 2.

Criterion 3 – Level of Service (Flooding) Site

There are 4 sub-criteria for Level of Service, as set out in the GDSDS-RDP Volume 2, Section 6.3.4 (Table 6.3):

No flooding on site except where planned (30-year high intensity rainfall event);



- (ii) No internal property flooding (100-year high intensity rainfall event);
- (iii) No internal property flooding (100-year river event and critical duration for site) and;
- (iv) No flood routing off site except where specifically planned (100-year high intensity rainfall event).

Sub-Criterion 3.1

The performance of the proposed drainage system in the 30-year return period storm event has been analysed. The analysis shows that no flooding is expected in the 30-year return period storm event. Therefore, the proposals satisfy Sub-Criterion 3.1.

Sub-Criterion 3.2

The performance of the proposed drainage system in 100-year return period storm event has been analysed. The analysis show that no flooding is expected in the 100-year return period storm event. Therefore, the proposals satisfy Sub-Criterion 3.2.

Sub-Criterion 3.3

Fluvial flood risk is assessed in the Site-Specific Flood Risk Assessment provided under separate cover. That report concludes that the site is in Flood Risk Zones A/B and in a defended area and that the proposed development mitigates the residual flood risk.

In accordance with the requirements of Sub-Criterion 3.3, the attenuation storage facilities proposed have been designed to provide at least 500mm freeboard to the expected FFLs within the subject site. Therefore, the proposals satisfy Sub-Criterion 3.3.

Sub-Criterion 3.4

The performance of the proposed drainage system in the 100-year return period storm events has been analysed. The analysis shows that no flooding is expected in the 100-year return period storm event. Notwithstanding this, all surfaces within the proposed development have been designed to provide overland flow routes through the development



to avoid ponding within the subject site. Therefore, the proposals satisfy Sub-Criterion 3.4.

Criterion 4 – River Flood Protection

In accordance with Criterion 4, runoff from the site will be limited to the greenfield runoff rate of 2 l/s/ha. By limiting the runoff to this flow rate, the GDSDS-RDP Volume 2, Appendix E Section E2.4 states that this ensures "that sufficient storm water runoff retention is achieved to protect the river during extreme events." Attenuation storage is provided for the 100-year return period storm event in the proposed attenuation facilities. Control of runoff rates will be achieved through the use of a flow control devices (e.g. vortex control device, orifice plate). Therefore, the proposals satisfy Criterion 4.



Table	1:	Catchment	Summary
-------	----	-----------	---------

Site Location	Dublin City				
Design Storm Return Period:	years	100			
Climate Change Factor:	%	20			
Soil Type:		2			
Total Site Area:	ha	2.9			
Hardstand Area:	ha	2.9			
Softstand Area:	ha	0.0			
Percentage Impervious (PIMP)	%	100			
Allowable Outflow:					
IH124: QBAR = 0.00108 x AREA ^{0.89} x SAAR ^{1.17} x SOIL ^{2.17}					
AREA:	km ²	0.029			
SAAR:	mm	750			
SOIL:		0.3			
QBAR	l/s/ha	1.98			
Greenfield Runoff (as per GDSDS)	l/s/ha	2.0			
Proposed outflow	l/s	5.8			



3. WASTEWATER DRAINAGE

3.1 Overview

The wastewater drainage system for any development of the subject lands will be required to adhere to the requirements of the Building Regulations Part H and Irish Water's *Code of Practice for Wastewater Infrastructure* (IW-CDS-5030-03 Revision 1, IW, 2017).

As described earlier in Section 1.5, ground levels across the site generally fall from west to east, with levels varying between 1.9mAOD in the southwest to 1.0mAOD in the east.

3.2 Existing Drainage

There is an existing drainage network in place serving the area around the proposed development. Irish Water records (see *Appendix B*) show the location of the existing drainage within the vicinity of the site. The Records show that the sewers in the wider area are combined (collecting both foul sewage and surface water runoff).

There is a brick arched sewer in Sherriff Street Lower that ranges in size from 1310mm to 1470mm; this sewer drains to a 1200mm-diameter concrete pipe that drains south towards Commons Street. The sewer in Oriel Street Upper drains northwards and begins as a 450mm-diameter vitrified clay pipe before changing to a 1000mm brick arched sewer; this sewer discharges to a 1590mm brick arched sewer in Seville Place.

All the sewers in the vicinity of the site drain to the Irish Water pumping station on Mayor Street Lower. The rising main from this pumping station runs north along Commons Street and west along Sherriff Street Lower (immediately to the southwest of the site) before discharging to a sewer in Amiens Street; following discussions with Irish Water, OCSC understands that Irish Water are assessing plans to divert this rising main eastward to the pumping station at Spencer Dock.



3.3 Proposed Drainage

Due to the nature of the proposed development, almost the entire extent of the site will be covered in proposed basement; it is therefore proposed that all wastewater from the development be collected in pipes suspended at high level within the basement. The suspended drainage will drain to last private manholes at three locations.

The proposed basement provides accommodation for car-parking and plant rooms. It is proposed to provide a pipe gravity system below basement level draining to a Class 2 oil separator and sump pump; a rising main will discharge to a stand-off manhole at ground level prior to gravity connection to the last private manhole within the site.

The proposed wastewater drainage layout is shown on O'Connor Sutton Cronin drawing O635-OCSC-XX-XX-DR-C-0520.

3.4 Outfall Locations

The proposed wastewater drainage system includes three separate outfalls to existing combined sewers: the 1470mm brick arched sewer in Sherriff Street Lower; the 1200mm-diameter concrete pipe sewer in Sherriff Street Lower and; the 1000mm brick arched sewer in Oriel Street Upper.

3.5 Calculations

Calculations for volumetric wastewater generation for the proposed development are included in *Appendix I*. Calculations have been compiled in accordance with the requirements of Irish Water.

3.6 Irish Water Confirmation of Feasibility

Details of the proposed discharge to Irish Water combined sewers was included in a Pre-Connection Enquiry submitted to Irish Water in August 2018 and a Confirmation of Feasibility was received in October 2018. Following a meeting with Irish Water in November 2018 and further assessment by Irish Water, a revised Confirmation of Feasibility as received in April 2019 – see *Appendix E*.



3.7 Irish Water Statement of Design Acceptance

Details of the proposed drainage was submitted to Irish Water and a Statement of Design Acceptance was received in June 2019 – see *Appendix F*.



4. POTABLE WATER SUPPLY

4.1 Overview

The water supply system for any development of the subject lands will be required to adhere to the requirements of the Building Regulations Part G and Irish Water's *Code of Practice for Water Infrastructure* (IW-CDS-5020-03 Revision 1, IW, 2017).

As described earlier in Section 1.5, ground levels across the site generally fall from west to east, with levels varying between 1.9mAOD in the southwest to 1.0mAOD in the east.

4.2 Existing Watermains

There is an existing watermain network in place serving the area around the proposed development. Irish Water records (see *Appendix B*) show the location of the existing watermains within the vicinity of the site. There is a 9-inch cast iron watermain in Sherriff Street Lower and a 6-inch cast iron watermain in Oriel Street Upper.

4.3 Calculations

Calculations for volumetric water demand for the proposed development are included in *Appendix I*. Calculations have been compiled in accordance with the requirements of Irish Water.

4.4 Connection to the Existing Network

It is proposed to provide a connection to the existing 9-inch watermain on Sherriff Street Lower; this connection will be used as the primary supply point. Due to the size of the proposed development, it is also proposed to provide a secondary connection to the existing 6-inch watermain in Oriel Street Upper. The proposed network connections will be metered using a bulk non-mechanical meter, as per Irish Water requirements.

4.5 Proposed Watermains

The proposed connections will supply a water tank room in the basement, from where the proposed development will be provided with a boosted



supply. Details of the internal watermains and water tank room are provided by other members of the design team.

The proposed watermain layout is shown on O'Connor Sutton Cronin drawing O635-OCSC-XX-XX-DR-C-0540.

4.6 Water Saving Devices

In accordance with best practice, new water saving devices (low water usage appliances and aerated taps etc.) will be fitted as standard in future development within the subject site (subject to future planning applications).

4.7 Domestic Water Meters

Meters for apartments and similar properties will be installed internally within the Premises in accordance with the Building Control Authority's requirements and subject to review by Irish Water.

4.8 Irish Water Confirmation of Feasibility

Details of the proposed connections to Irish Water watermains was included in a Pre-Connection Enquiry submitted to Irish Water in August 2018 and a Confirmation of Feasibility was received in October 2018. Following a meeting with Irish Water in November 2018 and further assessment by Irish Water, a revised Confirmation of Feasibility as received in April 2019 – see *Appendix E*. Irish Water advised that a watermain upgrade is required. The new watermain should be 300mm in diameter and extend for approximately 430m between an existing 600mm-diameter watermain on the North Quays and the proposed development site – see *Figure 12* over. The watermain upgrade includes a crossing of the Luas light rail line.



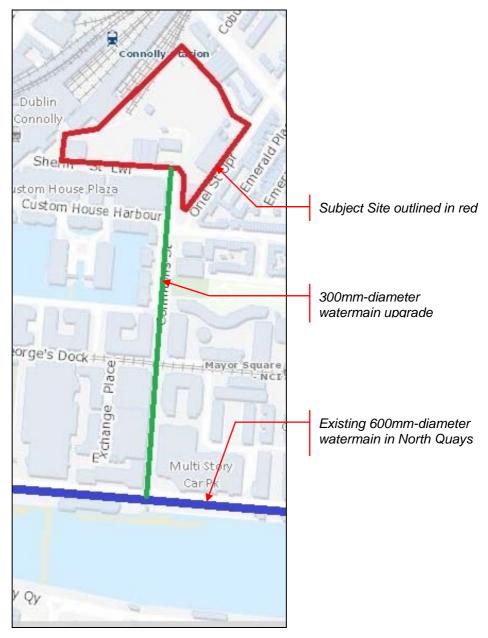


Figure 12: Scope of watermains upgrades advised by Irish Water

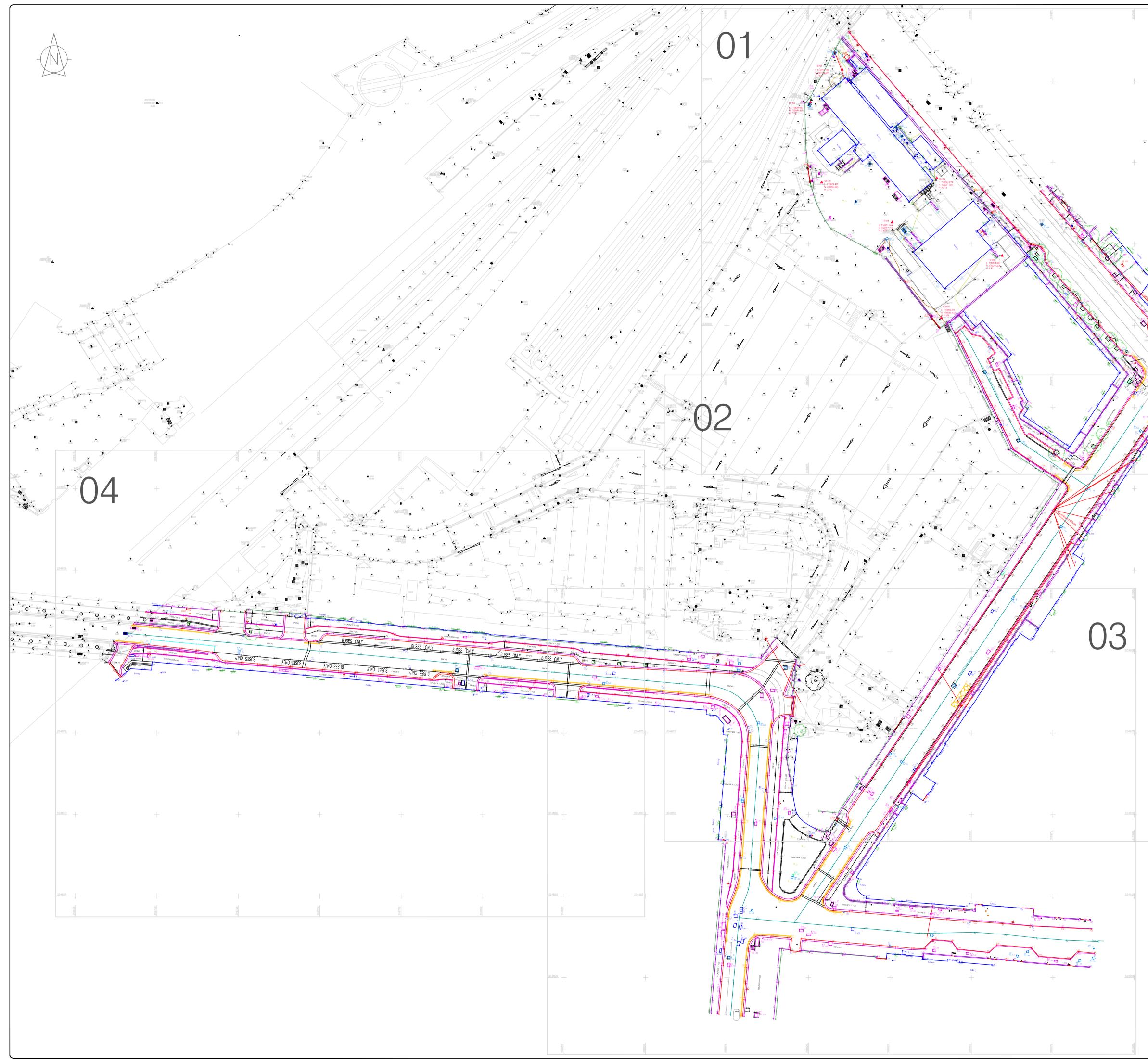
4.9 Irish Water Statement of Design Acceptance

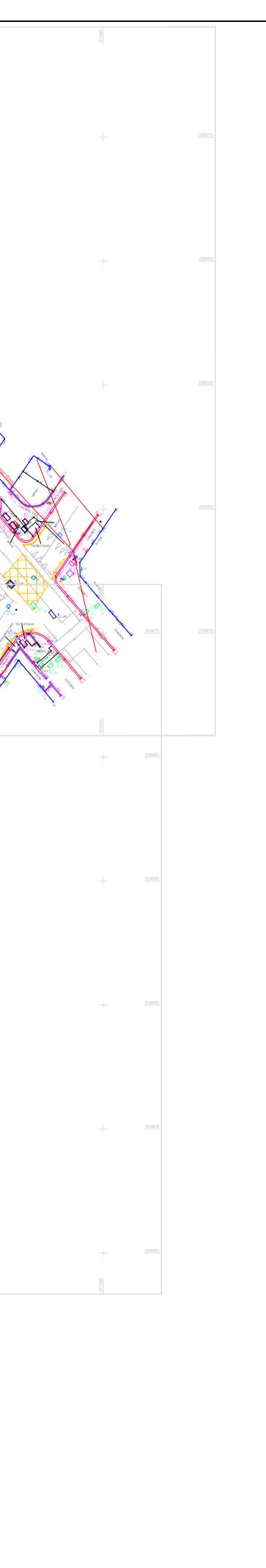
Details of the proposed watermains were submitted to Irish Water and a Statement of Design Acceptance was received in June 2019 – see *Appendix F*.



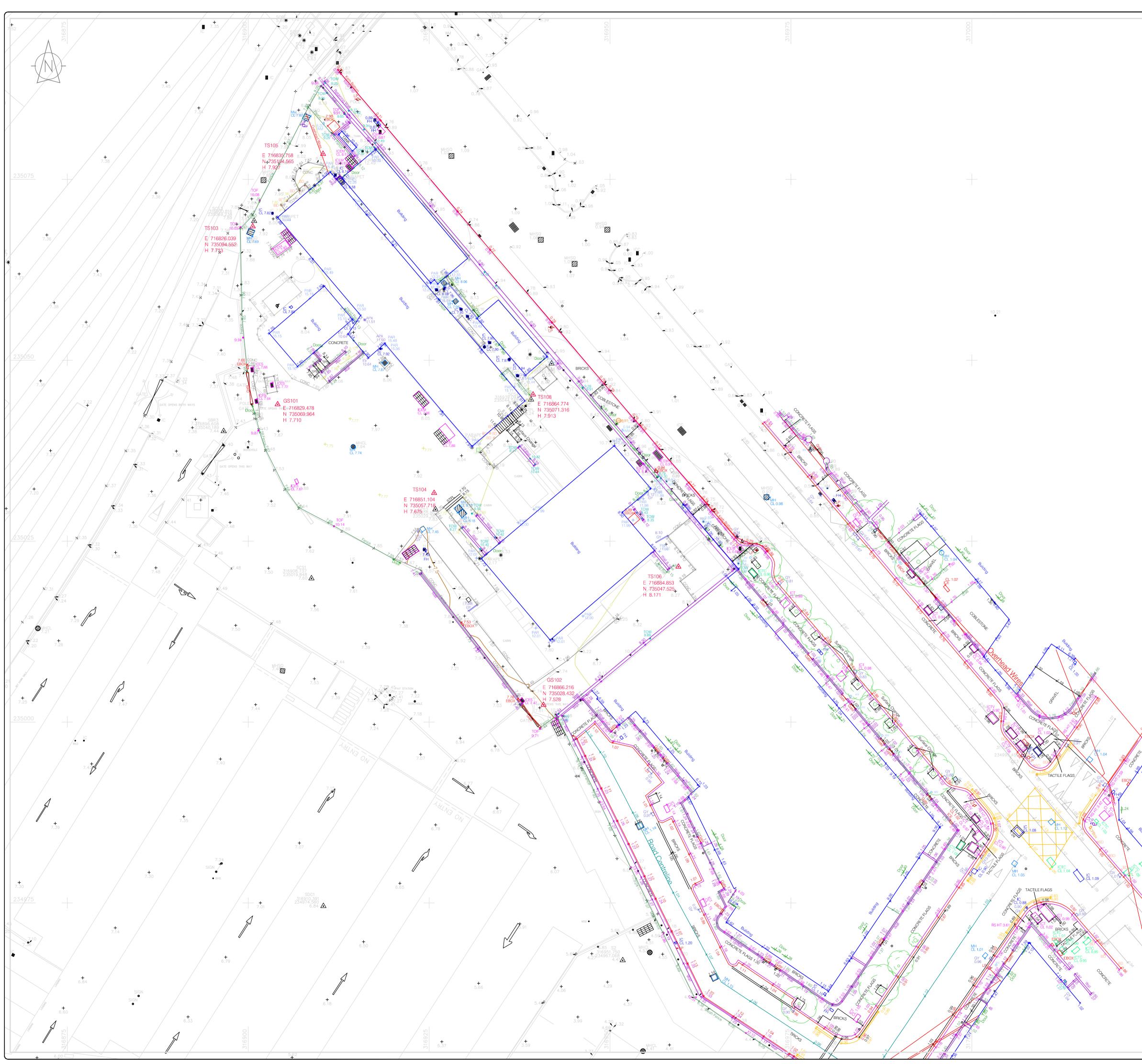
TOPOGRAPHICAL SURVEY

APPENDIX A

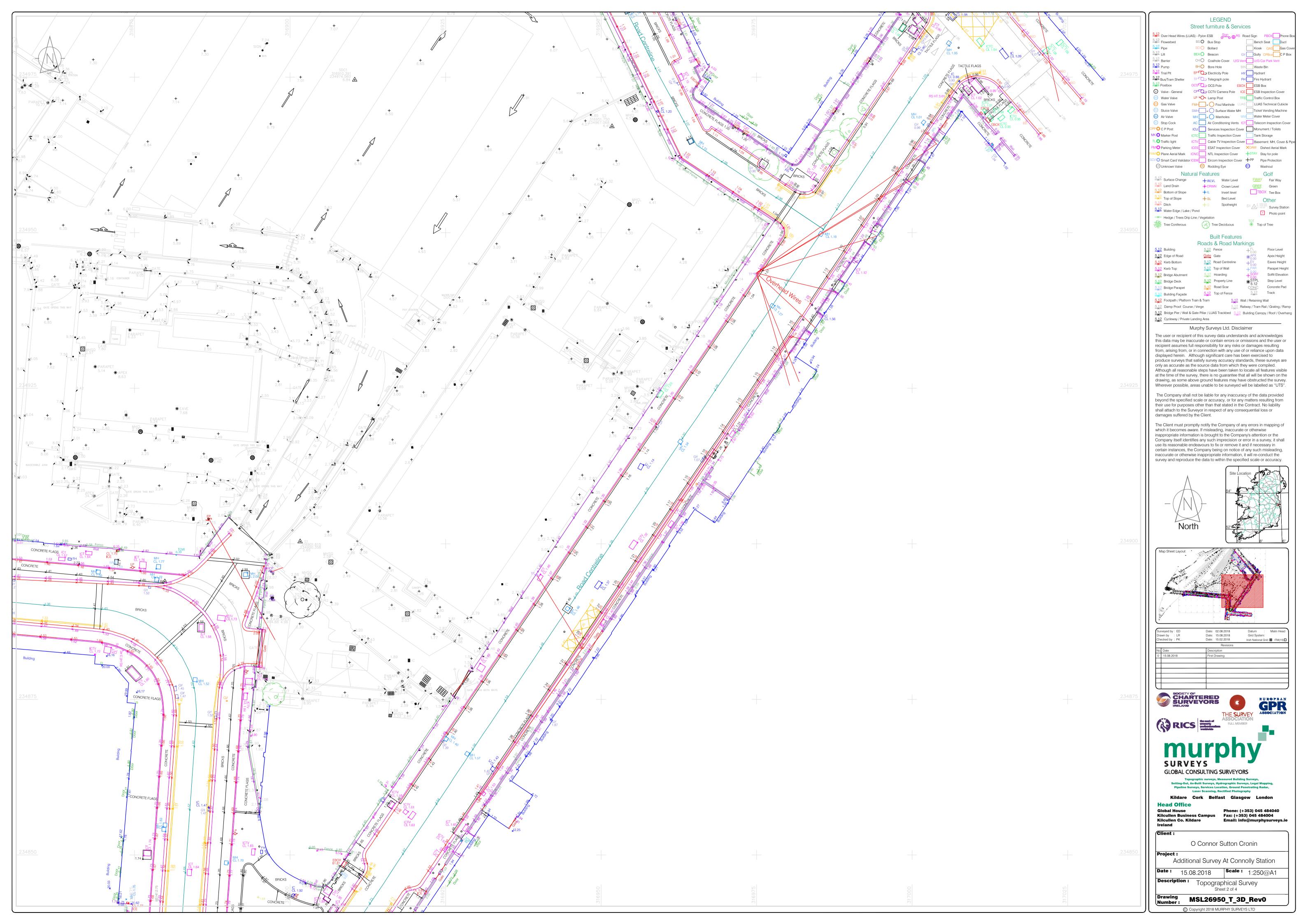


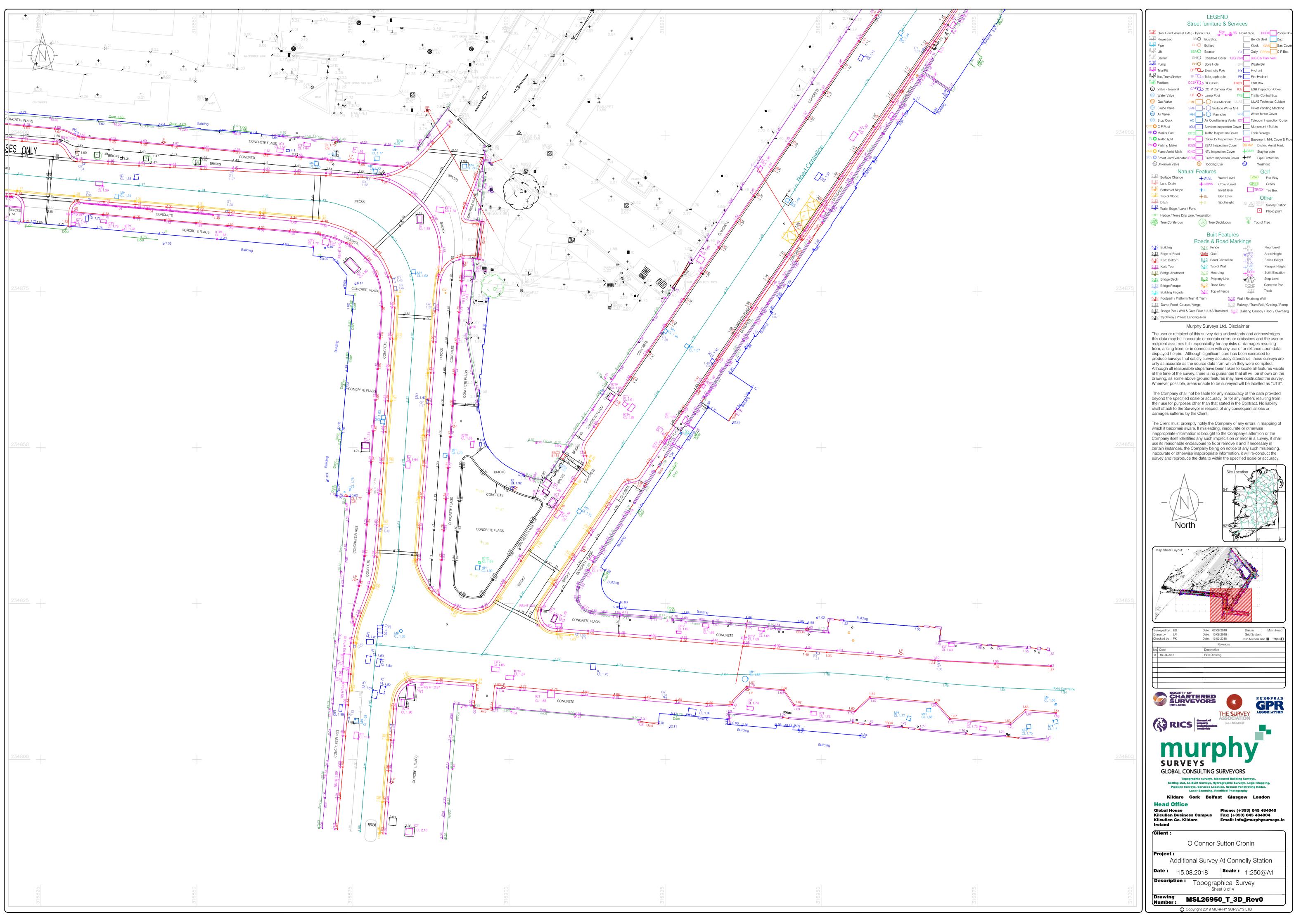


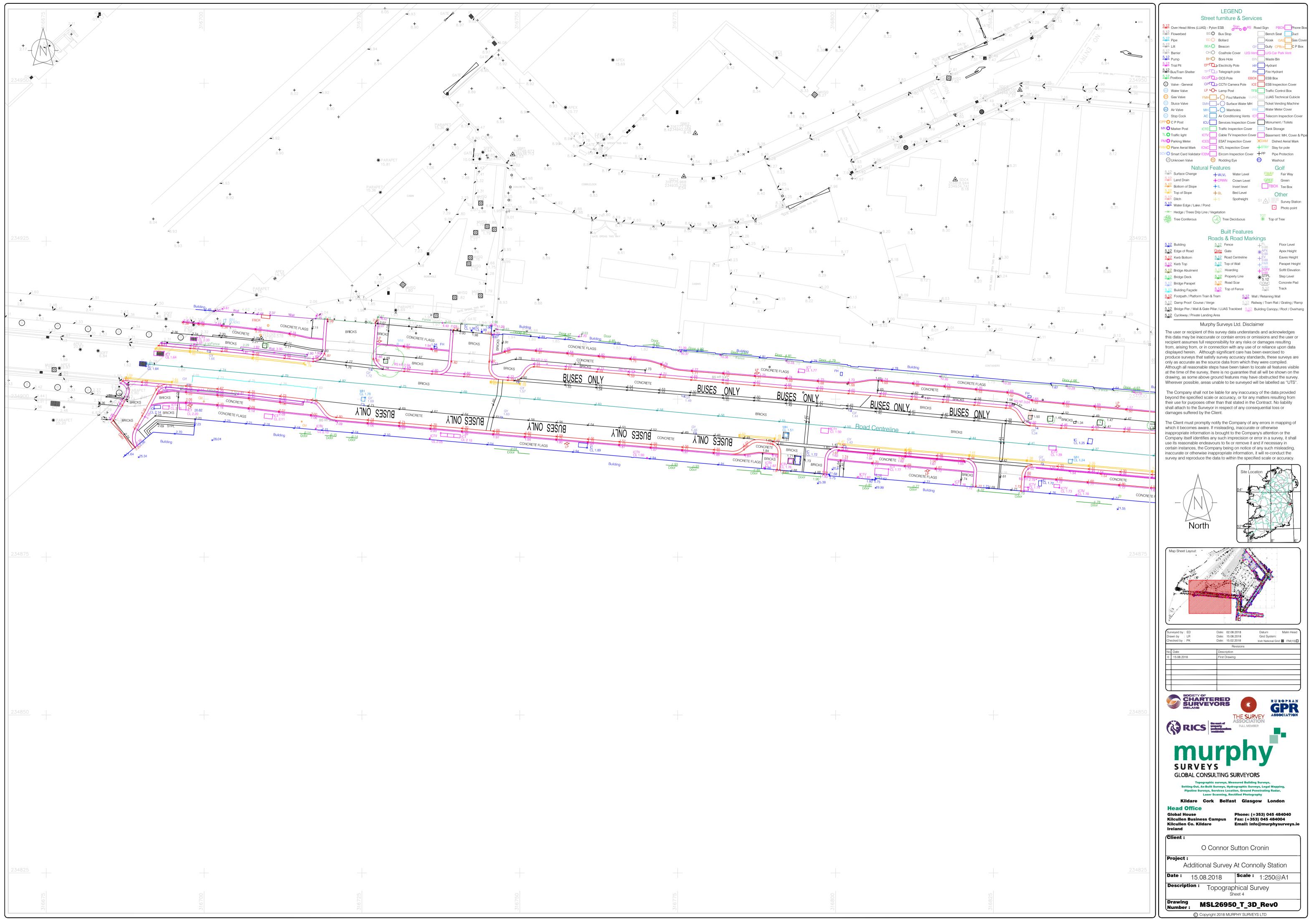
		Street	LEGEND furniture &	Service	S	
5 <u>12</u>	Over Head Wires (LL Flowerbed	JAS) - Pylon BS 🔘		⊕ ^{RS} Roa	ad Sign PBOX	Phone Box
5 <u>12</u> 5 <u>12</u>	Pipe Lift	BD O BEA O	Bollard Beacon	GY	Kiosk GAS	
5 <u>1</u> 2	Barrier Pump Trial Pit	внО	Coalhole Cover Bore Hole	U/G Vent BIN	U/G Car Park Waste Bin	Vent
5 <u>1</u> 2	Bus/Tram Shelter Postbox	TP	 Electricity Pole Telegraph pole OCS Pole 	HY FH EBOX	Hydrant Fire Hydrant ESB Box	
\sim	Valve - General Water Valve	CP	CCTV Camera Po Lamp Post		ESB Inspectic	
Ä	Gas Valve Sluice Valve		or O Foul Manho or O Surface Wa		LUAS Technic	cal Cubicle
60	Air Valve Stop Cock	MH AC	or O Manholes Air Conditioning	WM Vents ICT	Water Meter C	
IK O	C P Post Marker Post		Services Inspection		Monument / T Tank Storage	
мО	Traffic light Parking Meter		Cable TV Inspect	Cover >	CDAM Dished A	H, Cover & Pipe erial Mark
	Plane Aerial Mark Smart Card Validator Unknown Valve		NTL Inspection C Eircom Inspectio Rodding Eye	n Cover –	STAY Stay for p PP Pipe Prot Washout	ection
		ural Fea		_evel	Golf	
5 <u>1</u> 5 <u>1</u>	Land Drain Bottom of Slope	+	-CRWN Crown	Level		een
5 <u>1</u> 5 <u>1</u>	² Top of Slope ² Ditch		BL Bed Le		Othe	P r rvey Station
	 Water Edge / Lake Hedge / Trees Drip 		etation			oto point
遊	Tree Coniferous	(u	Tree Deciduor		✤ Top of Tree	
E 1			Built Feat ds & Road		0	
<u>51</u>	2 Building 2 Edge of Road	G	12 Fence ate Gate	-	↓ 0.00 ★APX Ape	or Level ex Height es Height
51	 <u>2</u> Kerb Bottom <u>2</u> Kerb Top <u>2</u> Bridge Abutment 	5	 Road Centre Top of Wall Hoarding 	-	0.00 PAR Para 0.00	apet Height it Elevation
51	 2 Bridge Deck 2 Bridge Parapet 	5	12 Property Line	e ÷	₩0.00 ★STPL Step 5.12	o Level crete Pad
51	 2 Building Façade 2 Footpath / Platform 	5	12 Top of Fence		5 <u>1</u> 2 Trac	
5 <u>1</u> 5 <u>1</u>	2 Damp Proof Cours 2 Bridge Pier / Wall &	se / Verge & Gate Pillar	/ LUAS Trackbed	5 <u>1</u> 2 Railw	ay / Tram Rail / Gr	
<u>5</u> 1	2 Cycleway / Private		^{ea} Surveys Ltd.	Disclaim	ner	
thi	e user or recipien s data may be ina	accurate	or contain erro	rs or omi	ssions and the	user or
fro	cipient assumes f m, arising from, c splayed herein.	or in conr	ection with an	y use of c	or reliance upor	n data
on	oduce surveys tha ly as accurate as hough all reason	the source	ce data from w	hich they	were compiled	d.
at dra	the time of the su awing, as some a	irvey, thei Ibove gro	re is no guarar und features n	ntee that a nay have	all will be shown obstructed the	n on the survey.
Th be the	nerever possible, ne Company shal yond the specifie eir use for purpos all attach to the S	l not be li d scale o es other f	able for any in r accuracy, or han that state	accuracy for any m d in the C	of the data pro natters resulting contract. No lial	ovided g from
da	mages suffered b	by the Clie	ent.			aing of
wh ina	e Client must pro nich it becomes a appropriate inform	ware. If m nation is t	nisleading, inac	ccurate of Company	r otherwise 's attention or t	the
us	e its reasonable e ts reasonable e rtain instances, th	endeavou	rs to fix or rem	ove it and	d if necessary i	n
	accurate or otherv		proprieto inform			
Su	ivey and reprodu	ce the da	•			
30		ce the da	ta to within the		will re-conduct d scale or accu	
30		ce the da	ta to within the	e specifie	will re-conduct d scale or accu	
30		ce the da	ta to within the	e specifie	will re-conduct d scale or accu	
30		ce the da	ta to within the	e specifie	will re-conduct d scale or accu	
30			ta to within the	Site Location	will re-conduct d scale or accu	
34	-		ta to within the	Site Location	will re-conduct d scale or accu	
	-		ta to within the	Site Location	will re-conduct d scale or accu	Jracy.
			ta to within the	Site Location	will re-conduct d scale or accu	Jracy.
			ta to within the	Site Location	will re-conduct d scale or accu	Jracy.
			ta to within the	Site Location	will re-conduct d scale or accu	Jracy.
			ta to within the	Site Location	will re-conduct d scale or accu	Jracy.
			ta to within the	Site Location	will re-conduct d scale or accu	Jracy.
		rth	ta to within the	e specifier	will re-conduct d scale or accu	alin Head
	Map Sheet Layout:	rth	Date: 02.08.2018 Date: 15.08.2018 Date: 15.08.2018 Date: 15.02.2018 Revisior Description	e specifier	Datum : M Grid System:	alin Head
	Map Sheet Layout:	rth	Date: 02.08.2018 Date: 15.08.2018 Date: 15.08.2018 Date: 15.02.2018	e specifier	Datum : M Grid System:	alin Head
	Map Sheet Layout:	rth	Date: 02.08.2018 Date: 15.08.2018 Date: 15.08.2018 Date: 15.02.2018 Revisior Description	e specifier	Datum : M Grid System:	alin Head
	Ap Sheet Layout:	rth	Date: 02.08.2018 Date: 15.02.2018 Date: 15.02.2018 Date: 15.02.2018 Revisior Description First Drawing	e specifier	Datum : M Grid System:	alin Head
	Ap Sheet Layout:	rth	Date: 02.08.2018 Date: 15.02.2018 Date: 15.02.2018 Date: 15.02.2018 Revisior Description First Drawing	e specifier	Datum : M Grid System:	alin Head
	Arveyed by : ED awn by : LR tecked by : PK		Date: 02.08.2018 Date: 15.08.2018 Date: 15.08.2018 Date: 15.02.2018 Date: 15.02.2018 Revision First Drawing	is SURV	Datum : M Grid System: rish National Grid 2	
	Arveyed by : ED awn by : LR tecked by : PK		Date: 02.08.2018 Date: 15.08.2018 Date: 15.08.2018 Date: 15.02.2018 Date: 15.02.2018 Revision First Drawing	e specified	Datum : M Grid System: rish National Grid 2	
	Arveyed by : ED awn by : LR tecked by : PK		Date: 02.08.2018 Date: 15.08.2018 Date: 15.08.2018 Date: 15.02.2018 Date: 15.02.2018 Revision First Drawing	is SURV	Datum : M Grid System: rish National Grid 2	
	Arreved by : ED awn by : LR aecked by : PK		Date: 02.08.2018 54° 52° 52° 52° 52° 52° 52° 52° 52° 52° 52	is SURV	Datum : M Grid System: rish National Grid 2	
	Arveyed by : ED awn by : LR tecked by : PK		ta to within the	e specifier	Datum : M Grid System: rish National Grid 2 Solutional Grid 3 Solutional Grid 3 Soluti	
	Arveyed by: ED awn by: EP awn by: ER awn by: PK Date 15.08.2018	rth	Date: 02.08.2018 54 52 52 52 52 52 52 52 52 52 52 52 52 52	e specified Site Location Site Site Location Site Site Location Site Site Site Site Site Site Site Site	Datum : M Grid System rish National Grid 2 Surveys, s, Legal Mapping, strating Radar,	
	Arreyed by: ED awn by : LR tecked by: PK Date 15.08.2018 Date 15.08.2018 Date 15.08.2018 Date CONSCRETE CONSCRET	rth	Date: 02.08.2018 54 54 52 52 52 52 52 52 52 52 52 52 52 52 52	e specified Site Location Site Site Location Site Site Location Site Site Site Site Site Site Site Site	Datum : M Grid System: rish National Grid 2 B Sarveys, st.Legal Mapping, estrating Radar, hy	
	Arreyed by : ED awn by : EP awn by : ER ecked by : PK Date 15.08.2018 Date 15.08.2018 Date 15.08.2018 Date 15.08.2018 Construction C	rth S S S S S S S S S S S S S S S S S S S	Date: 02.08.2018 54 54 54 54 54 54 54 54 54 54	e specified Site Location Site Site Location Site Site Location Site Site Site Site Site Site Site Site	Datum : M Grid System: irish National Grid 2	
	Ap Sheet Layout:	rth	Date: 02.08.2018 54 54 54 54 52 52 52 52 52 52 52 52 52 52	e specified Site Location Site Site Location Site Location Site Site Site Site Site Site Site Site	Datum : M Grid System inh National Grid System ish National Grid System	
	Arveyed by : ED awn by : ER awn by : ER aw	rth	Date: 02.08.2018 54 54 54 54 52 52 52 52 52 52 52 52 52 52	e specified Site Location Site	Datum : M Grid System: rish National Grid 2 Surveys, s, Legal Mapping, strating Radar, hy W London 53) 045 484004 @murphysur	
	Arveyed by: ED awn by: EP awn by: ER hecked by: PK Date 15.08.2018 Date 15.08.20	rth	Date: 02.08.2018 54 54 54 54 52 52 52 52 52 52 52 52 52 52	e specified Site Location Site	Datum : M Grid System: rish National Grid 2 Surveys, s, Legal Mapping, strating Radar, hy W London 53) 045 484004 @murphysur	
	Arreved by : ED awn by : ER awn by : ER aw	rth S S S S S S S S S S S S S S S S S S S	Date: 02.08.2018 54 54 54 54 54 52 52 52 52 52 52 52 52 52 52	e specified Site Location Site Site Location Site Site Location Site Site Location Site Site Location Site Site Location Site Site Site Site Site Site Site Site	Datum : M Grid System: rish National Grid 2 Surveys, s, Legal Mapping, strating Radar, hy W London 53) 045 484004 @murphysur	
	And the second s	rth S S S S S S S S S S S S S S S S S S S	Date: 02.08.2018 54 54 54 54 54 54 54 54 54 54	e specified Site Location Site Loc	Datum : M Grid System: rish National Grid B Subsection	
	Arreved by : ED awn by : ER awn by : ER aw	rth S S S S S S S S S S S S S S S S S S S	Date: 02.08.2018 54 54 54 54 54 52 52 52 52 52 52 52 52 52 52	e specified Site Location Site Loc	Datum : M Grid System: rish National Grid B Subsection	



125		LEGEND Street furniture & Services
317025		$5,12$ Over Head Wires (LUAS) - Pylon ESB Sign \bigcirc RS Road Sign PBOX Phone Box $5,12$ Flowerbed BS \bigcirc Bus Stop Bench Seat Duct $5,12$ Pipe BD \bigcirc Bollard Kiosk GAS Gas Cover
		5,12 Lift BEA O Beacon GY Gully CPBox C P Box 5,12 Barrier CH O Coalhole Cover U/G Vent U/G Car Park Vent
		512 Pump BHO Bore Hole BIN Waste Bin 512 Trial Pit EP C Electricity Pole HY Hydrant 512 Bus/Tram Shelter TP C Telegraph pole FH Fire Hydrant
		512 Postbox OCS O OCS Pole EBOX ESB Box Valve - General CPO CCTV Camera Pole ICE ESB Inspection Cover
		Image: Water Valve LP Lamp Post TFB Traffic Control Box Image: State St
		Sluice Valve SMH α Surface Water MH Ticket Vending Machine Image: White Water Valve MH α Manholes WM Water Meter Cover Image: Valve AC Air Conditioning Vents ICT Telecom Inspection Cover
		CPP O C P Post ICU Services Inspection Cover Monument / Toilets MK O Marker Post ICTC Traffic Inspection Cover Tank Storage
	235075	TLO Traffic light ICTV Cable TV Inspection Cover Basement: MH, Cover & Pipe PMO Parking Meter ICES ESAT Inspection Cover XDAM Dished Aerial Mark PAMO Plane Aerial Mark ICNC NTL Inspection Cover STAY Stay for pole
		SCV Smart Card Validator ICEM Eircom Inspection Cover + PP Pipe Protection Image: SCV Smart Card Validator ICEM Eircom Inspection Cover + PP Pipe Protection Image: SCV Smart Card Validator ICEM Eircom Inspection Cover + PP Pipe Protection Image: SCV Smart Card Validator ICEM Eircom Inspection Cover + PP Pipe Protection Image: SCV Smart Card Validator ICEM Image: Scv Smart Card Validator ICEM Eircom Inspection Cover + PP Image: Scv Smart Card Validator ICEM Image: Scv Smart Card Validator ICEM Eircom Inspection Cover + PP Image: Scv Smart Card Validator ICEM Image: Scv Smart Card Validator ICEM Image: Scv Smart Card Validator ICEM Eircom Inspection Cover Image: Scv Smart Card Validator ICEM Image: Scv Smart Card Validator ICEM Eircom Inspection Cover + PP Image: Scv Smart Card Validator ICEM Image: Scv Smart Card Validator ICEM Eircom Inspection Cover + PP Pipe Protection Image: Scv Smart Card Validator ICEM Image: Scv Smart Card Validator ICEM Eircom Inspection Cover + PP Pipe Protection Image: Scv Smart Card Validator ICEM Image: Scv Smart Card Validator ICEM Eircom Inspection Cover + PP Image: Scv Sm
		Natural Features Golf 512 Surface Change +WLVL Water Level FWAY Fair Way 512 Land Drain +CRWN Crown Level GREE Green
		5,12 Bottom of Slope IL Invert level TBOX Tee Box 5,12 Top of Slope HBL Bed Level Other
		Survey Station 512 Water Edge / Lake / Pond
		Hedge / Trees Drip Line / Vegetation
		Built Features Roads & Road Markings
		512 Building 512 Fence +FL 0.00 Floor Level 512 Edge of Road Gate 512 Gate Kerb Bottom Gate 512 Road Centreline Apex Height
		512 Kerb Boltom 512 Top of Wall PAR Parapet Height 512 Bridge Abutment 512 Hoarding + SOFF Soffit Elevation
		512 Bridge Deck 512 Property Line STPL Step Level 512 Bridge Parapet 512 Road Scar CONC Concrete Pad
	075050	512 Building Façade 512 Top of Fence 512 Track 512 Footpath / Platform Train & Tram 512 Wall / Retaining Wall 512 Damp Proof Course / Verge 512 Railway / Tram Rail / Grating / Ramp
	235050	512 Bridge Pier / Wall & Gate Pillar / LUAS Trackbed 512 Building Canopy / Roof / Overhang 512 Cycleway / Private Landing Area
		Murphy Surveys Ltd. Disclaimer The user or recipient of this survey data understands and acknowledges
		this data may be inaccurate or contain errors or omissions and the user or recipient assumes full responsibility for any risks or damages resulting from, arising from, or in connection with any use of or reliance upon data
		displayed herein. Although significant care has been exercised to produce surveys that satisfy survey accuracy standards, these surveys are only as accurate as the source data from which they were compiled.
		Although all reasonable steps have been taken to locate all features visible at the time of the survey, there is no guarantee that all will be shown on the drawing, as some above ground features may have obstructed the survey.
		Wherever possible, areas unable to be surveyed will be labelled as "UTS". The Company shall not be liable for any inaccuracy of the data provided beyond the specified scale or accuracy, or for any matters resulting from
		their use for purposes other than that stated in the Contract. No liability shall attach to the Surveyor in respect of any consequential loss or damages suffered by the Client.
		The Client must promptly notify the Company of any errors in mapping of which it becomes aware. If misleading, inaccurate or otherwise
		inappropriate information is brought to the Company's attention or the Company itself identifies any such imprecision or error in a survey, it shall use its reasonable endeavours to fix or remove it and if necessary in
	075005	certain instances, the Company being on notice of any such misleading, inaccurate or otherwise inappropriate information, it will re-conduct the survey and reproduce the data to within the specified scale or accuracy.
	235025	Site Location
		North
		Map Sheet Layout:
x	235000	
		Surveyed by : ED Date: 02.08.2018 Datum : Malin Head Drawn by : LR Date: 15.08.2018 Grid System:
* *		Checked by : PK Date: 15.02.2018 Irish National Grid ITM(15) Revisions No Date Description
Contraction of the second seco		0 15.08.2018 First Drawing
Que a la companya de		
™ ₩œ		
Class to a		murnhy
		SURVEYS
Courter to the second s	234975	GLOBAL CONSULTING SURVEYORS Topographic surveys, Measured Building Surveys, Setting-Out, As-Built Surveys, Hydrographic Surveys, Legal Mapping,
CONTRACTOR OF CO		Pipeline Surveys, Services Location, Ground Penetrating Radar, Laser Scanning, Rectified Photography Kildare Cork Belfast Glasgow London
× 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		Head Office Global House Phone: (+353) 045 484040
×~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Kilcullen Business Campus Fax: (+353) 045 484004 Kilcullen Co. Kildare Email: info@murphysurveys.ie Ireland
		Client : O Connor Sutton Cronin
		Project : Additional Survey At Connolly Station
		Date: 15.08.2018 Scale: 1:250@A1
7025		Description: Topographical Survey Sheet 1 of 4
27		Drawing Number : MSL26950_T_3D_Rev0 © Copyright 2018 MURPHY SURVEYS LTD

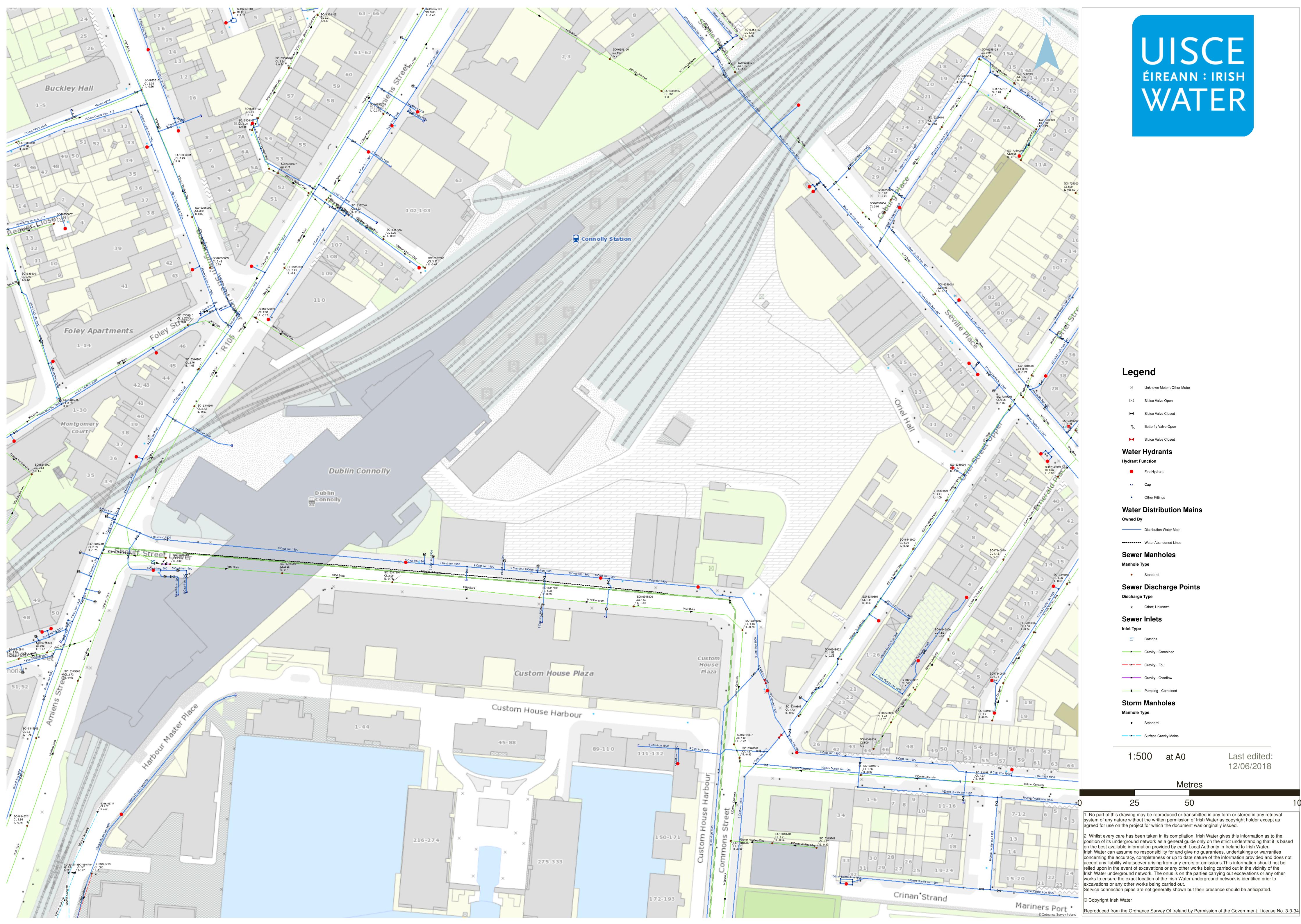






APPENDIX B

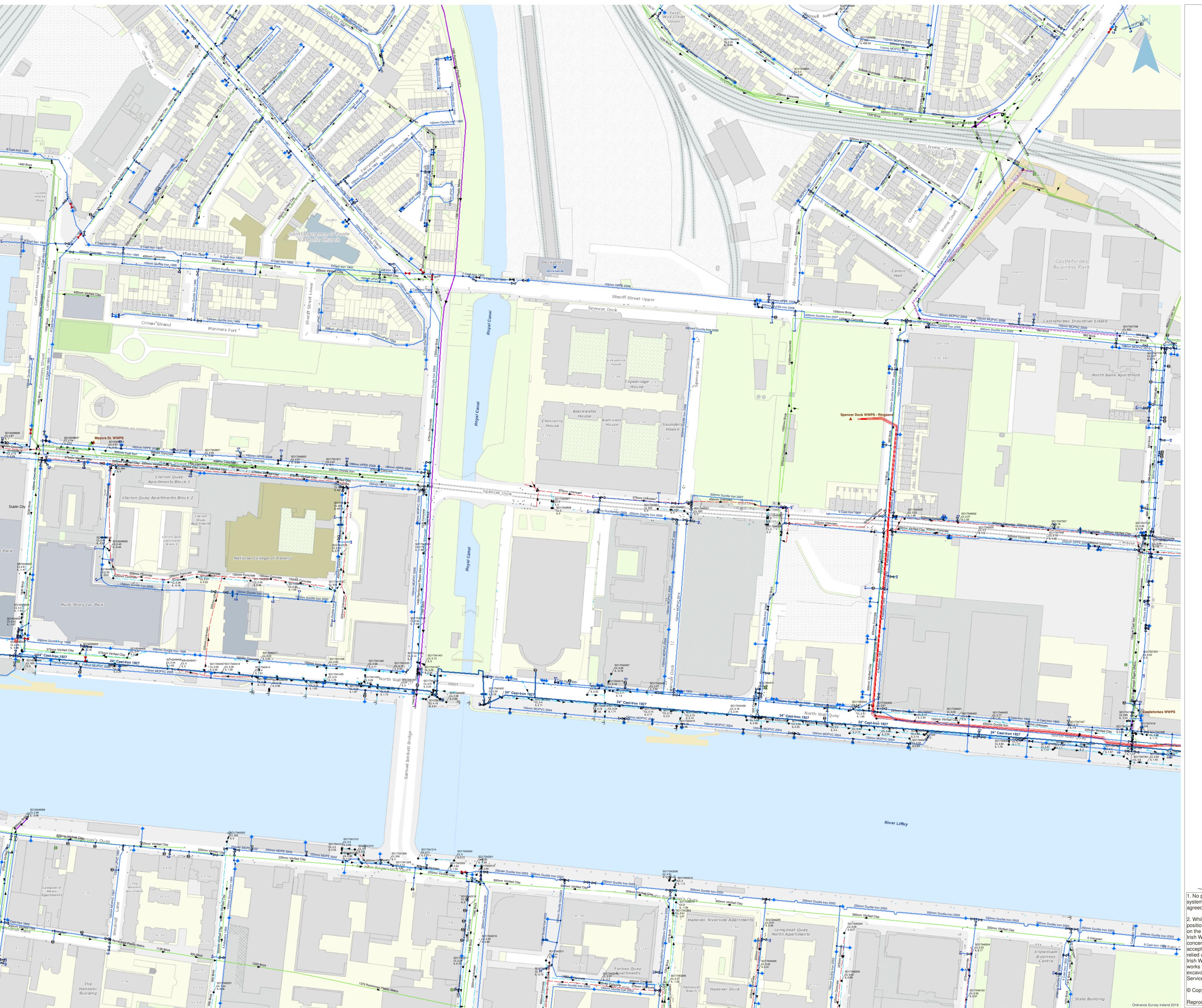
IRISH WATER RECORD PLANS





Legend

9-				
M	Unknown Meter	; Other Meter		
\bowtie	Sluice Valve Op	ben		
M	Sluice Valve Clo	osed		
Z	Butterfly Valve	Open		
M	Sluice Valve Clo	osed		
Water Hydrant Fu		S		
•	Fire Hydrant			
L	Сар			
•	Other Fittings			
Water Owned By		tion Mains	5	
	Distribution Wat	ter Main		
	Water Abandon	ed Lines		
Sewer	Manhol	es		
Manhole T	уре			
•	Standard			
Sewer	Dischar	ge Points		
Discharge	Туре			
0	Other; Unknown	1		
Sewer	Inlets			
Inlet Type	Catchpit			
	Gravity - Combi	ned		
_	Gravity - Foul			
	Gravity - Overflo			
Storm	Pumping - Com			
Manhole T		5		
•	Standard			
►	Surface Gravity	Mains		
1:50	00 a	at A0	Last edited: 12/06/2018	
		Metres	6	
25		50		100
ure without	the written p	permission of Iris	ted in any form or stored in any retrieval sh Water as copyright holder except as s originally issued.	
are has been derground no able informa ssume no re ccuracy, cor cy whatsoeve e event of ex ground network the exact loo ny other wor	n taken in its etwork as a g ation provided esponsibility mpleteness of er arising fro cavations or work. The on cation of the rks being car	compilation, Iris general guide or d by each Local for and give no or up to date nat m any errors or any other work us is on the part Irish Water unde ried out.	sh Water gives this information as to the hly on the strict understanding that it is based Authority in Ireland to Irish Water. guarantees, undertakings or warranties ure of the information provided and does not omissions. This information should not be s being carried out in the vicinity of the ties carrying out excavations or any other erground network is identified prior to eir presence should be anticipated.	
Watar	, not general		processo onoura de anticipatea.	





l eaend

N 10	Lege	nd		
	M	Boundary Meter		
5	M	Unknown Meter ; Other M	eter	
	≯	PRV		
		Sluice Valve Open		
	M	Sluice Valve Closed		
/	Z	Butterfly Valve Open		
1		Sluice Valve Closed		
	**	Double Air Control Valve		
2	Water I	Hydrants		
	Hydrant Fu	nction		
	+	Fire Hydrant		
		Telemetry Kiosk		
		Сар		
		Other Fittings		
	Water I Owned By	Distribution I	Mains	
		Irish Water		
		Irish Water		
	Sewer	Discharge P	oints	
	Discharge	Туре		
	OF	Overflow		
	0	Other; Unknown		
		Pump Station		
	Sewer Inlet Type	Inlets		
	СР	Catchpit		
	_	Gravity - Combined		
	 →	Gravity - Foul		
		Gravity - Overflow		
	_	Pumping - Combined		
	_	Pumping - Foul		
		Syphon - Overflow		
		Manholes		
	Manhole Ty	ype Standard		
		Cascade		
	LH	Lamphole		
	0	Other; Unknown		
	Storm	Discharge P	oints	
	Discharge ⁻	•		
Æ	-)	Outfall		
		Surface Gravity Mains		
		Surface Gravity Mains Priv	vate	
	Storm Inlet Type	iniets		
	•	Gully		
	4.4			
	I.I,	000 at A0)	Last edited: 05/10/2018
			letres	
	0	25	50	100
	1. No part of this drawing may system of any nature without			
	agreed for use on the project	for which the docur	nent was originally is	ssued.
	2. Whilst every care has been position of its underground ne on the best available information	etwork as a general	guide only on the st	rict understanding that it is based
	Irish Water can assume no re concerning the accuracy, com	esponsibility for and appleteness or up to	give no guarantees, date nature of the in	undertakings or warranties formation provided and does not
	relied upon in the event of ex	cavations or any oth	ner works being carr	This information should not be ied out in the vicinity of the out excavations or any other

excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to

© Copyright Irish Water

Ordnance Survey Ireland 2018 Reproduced from the Ordnance Survey Of Ireland by Permission of the Government. License No. 3-3-34

DETAILS OF PERMAVOID

APPENDIX C

Permavoid Modular Cell 85

PRODUCT INFORMATION

Product code: PVPP85

Permavoid is a geocellular interlocking system designed for shallow ground water storage or infiltration, to be used in place of traditional aggregate sub-base or can provide source control at both roof and podium level, removing the need for heavier and less efficient systems. The system has an exceptionally high compressive and tensile strength and bending resistance with a proprietary jointing system to create a horizontal structural 'raft' within the pavement that is ideal for the shallow attenuation of surface water. The system can also be combined in layers using interlocking shear connectors to increase depth in 85mm and 150mm increments. This is particularly useful in designing infiltration systems, allowing flexibility in balancing the soil permeability/infiltration area of the Permavoid storage units and residual temporary attenuation.

Applications

The Permavoid units are suitable for use as a stormwater attenuation and/or infiltration system. The system comprises of single, interconnected cells which can be installed in the ground as part of sub-base formation, or above ground as part of roof or podium attenuation systems for source control. Permavoid is suitable for use in a range of applications including residential, industrial estates, car parks, sports pitches, roofs, basements, pedestrian areas and rainwater harvesting.

Key Benefits

- High strength, high capacity, shallow, sub-base replacement system
- Stormwater attenuation and/or infiltration system
- Used as part of a sustainable drainage system (SuDS) scheme to offer stormwater storage at shallow construction depth
- 100% recyclable
- Units are manufactured from 90% recycled polypropylene (PP)

Performance

The structural load bearing capacity of the Permavoid units have been tested in accordance with the following European Standard: BS 7533-13:2009. The system's structural design life expectancy, based upon creep test data (tested in accordance with CIRIA guidelines) is as follows; for lightly loaded areas such as car parks a design life of 50 years is achievable. For areas with prolonged HGV loading a typical design life may only be 25 years, depending on the design of the pavement surfacing and structural layers over the tank.

Installation

All calculations for Permavoid units are based upon site-specific load cases, pavement construction types and thicknesses, soil cover and ground conditions and the suitability must therefore be approved for each project.

Technical Support

Detailed guidance and assistance is available. For further information, please contact our Technical Team on +44 (0) 1509 615100 or email civils@polypipe.com or visit www.polypipe.com/civils-technical-hub

ELEMENT	VALUE
PHYSICAL PROPERTIES	
Weight per unit	2.25kg
Weight per square metre	9kg
Length	708mm
Width	354mm
Depth	85mm
SHORT TERM COMPRESSIVE STRENGTH	
Vertical	715kN/m²
Lateral	156kN/m²
SHORT TERM DEFLECTION	
Vertical	1mm per 126kN/m ²
Lateral	1mm per 15kN/m ²
TENSILE STRENGTH	
Of a single joint	42.4kN/m ²
Of a single joint at (1% secant modulus)	18.8kN/m²
Bending resistance of unit	0.71kN/m
Bending resistance of single joint	0.16kN/m
OTHER PROPERTIES	
Volumetric void ratio	92%
Average effective perforated surface area	52%
Intrinsic permeability (k)	Minimum 1.0 x 10 ⁻⁵
	Permavoid Permatie
Ancillary	Permavoid Shear Connector
Material	Polypropylene (PP)

HYDRAULIC PERFORMANCE

3 units wide, 1 unit deep (1.06m x 0.15m)

FREE DISCHARGE

Gradient (%)	0	1	2
Flow Rate (l/m/s)	4	6	7

Polypipe Civils,

Charnwood Business Park, Loughborough, Leicestershire LE11 1LE Tel: +44 (0) 1509 615100 Fax: +44 (0) 1509 610215 Email: civils@polypipe.com

www.polypipe.com/wms

Ρ1

Data Sheet



Permavoid Modular Cell 85

Data Sheet ISSUE 4 - JUNE 2018

P2

PRODUCT INFORMATION

Permavoid Modular Cell 85 can be utilised in these SuDS techniques

						TECHN	IQUES						
Blue-Green roofs	Podium Decks	Trees	Sports Pitches	Cycle Paths	Permeable Paving (sub base & podium)	Bioretention & Rain Gardens	Attenuation Storage Tanks	Infiltration	Swales	Filter Drains	Detention Basins	Ponds & Wetlands	Filter Strips
\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark				

Visit www.polypipe.com/greeninfrastructure

All descriptions and illustrations in this publication are intended for guidance only and shall not constitute a 'sale by description'. All dimensions and weights given are nominal and Polypipe may modify and change the information, products and specifications from time to time for a variety of reasons, without prior notice. The information in this publication is provided 'as is' on June 2018. Updates will not be issued automatically. This information is not intended to have any legal effect, whether by way of advice, representation or warranty (express or implied). We accept no liability whatsoever (to the extent permitted by law) if you place any reliance on this publication you must do so at your own risk. All rights reserved. Copyright may not be used, sold, copied or reproduced in whole or part in any manner in any media to any person without prior consent. **Polypipe** is a registered trademark of Polypipe. All Polypipe products are protected by Design Right under CDPA 1988. Copyright © 2018 Polypipe. All rights reserved.

Polypipe Civils,

Charnwood Business Park, Loughborough, Leicestershire LE11 1LE Tel: +44 (0) 1509 615100 Fax: +44 (0) 1509 610215 Email: civils@polypipe.com



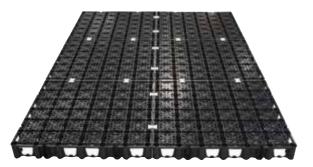
www.polypipe.com/wms

Permavoid² 85

PRODUCT INFORMATION

Product Code: PVPP85RX6

The Permavoid² 85 comprises of six pre-connected units and is designed to provide attenuation for shallow non-loaded applications. Ideal for use in the most diverse roof and podium deck applications, alongside hard-landscaping. It is 85mm high, manufactured from recycled polypropylene and minimises installation time.



Ρ1

Key Benefits

- Provides surface water management and makes space for water in urban environments
- Supports numerous surface activities
- High capacity, shallow, sub-base replacement system for non-trafficked applications
- 93% void ratio provides excellent storage capacity
- Plan area of 3m² maximises unit coverage, increasing laying efficiency
- Manufactured from recycled material
- Design life in excess of 50 years
- 100% recyclable at the end of its service life

Applications

The Permavoid² 85 is designed for use in applications that will not be exposed to traffic loading, including:

- Green Roofs
- Blue Roofs
- Podium Decks
- Sports Pitches
- Hardscaped and Landscaped SuDS

Installation

All calculations for Permavoid units are based upon site-specific load cases, pavement construction types and thicknesses, soil cover and ground conditions and the suitability must therefore be approved for each project.

For irrigation applications, please see our Permavoid² 85 Irrigation with capillary cone technology.

ELEMENT	VALUE
PHYSICAL PROPERTIES	
Weight per panel	17.4kg
Length	2136mm
Width	1424mm
Depth	85mm
Storage volume (litres per panel)	242.41
Volumetric void ratio	93%
Vertical compressive strength	600kN/m ²
OTHER PROPERTIES	
Ancillary	Permavoid Permatie
Material	Polypropylene (PP)

All values stated above are nominal and may vary within manufacturing tolerances.

Technical Support

Detailed guidance and assistance is available. For further information, please contact our Technical Team on +44 (0) 1509 615100 or email civils@polypipe.com or visit www.polypipe.com/civils-technical-hub

Polypipe Civils,

www.polypipe.com/wms

Charnwood Business Park, Loughborough, Leicestershire LE11 1LE Tel: +44 (0)1509 615100 Fax: +44(0)1509 610215 Email: civils@polypipe.com



ISSUE 2 - SEPT 2018

Permavoid² 85

PRODUCT INFORMATION

Permavoid² 85 can be utilised in these SuDS techniques

						TECHN	IQUES						
Blue-Green roofs	Podium Decks	Trees	Sports Pitches	Cycle Paths	Permeable Paving (sub base & podium)	Bioretention & Rain Gardens	Attenuation Storage Tanks	Infiltration	Swales	Filter Drains	Detention Basins	Ponds & Wetlands	Filter Strips
\checkmark	\checkmark		\checkmark		\checkmark		\checkmark						

Visit www.polypipe.com/greeninfrastructure

All descriptions and illustrations in this publication are intended for guidance only and shall not constitute a 'sale by description'. All dimensions and weights given are nominal and Polypipe may modify and change the information, products and specifications from time to time for a variety of reasons, without prior notice. The information in this publication is provided 'as is' on September 2018. Updates will not be issued automatically. This information is not intended to have any legal effect, whether by way of advice, representation or warranty (express or implied). We accept no liability whatsoever (to the extent permitted by law) if you place any reliance on this publication you must do so at your own risk. All rights reserved. Copyright in this publication belongs to Polypipe and all such copyright may not be used, sold, copied or reproduced in whole or part in any manner in any media to any person without prior consent. **Polypipe** is a registered trademark of Polypipe. All Polypipe products are protected by Design Right under CDPA 1988. Copyright © 2018 Polypipe. All rights reserved.

Polypipe Civils,

Charnwood Business Park, Loughborough, Leicestershire LE11 1LE Tel: +44 (0)1509 615100 Fax: +44(0)1509 610215 Email: civils@polypipe.com www.polypipe.com/wms



Data Sheet

P2 ISSUE 2 - SEPT 2018

Permavoid 85mm Podium Deck **Roof Diffuser Chamber**

PRODUCT INFORMATION

Application 2 - minimum cover approximately 180mm

PVOD01401 - PERMAVOID 85mm PODIUM DECK ROOF DIFFUSER CHAMBER

CONCRETE APRON TO STRUCTURAL -ENGINEERS SPECIFICATION

none

GULLY COVER & FRAME TO ARCHITECT/ ENGINEER SPECIFICATION

Product code: PVOD01401

APPRO MAX COVER

MIN COVER

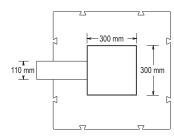
Designed for use in shallow Permavoid podium deck constructions, the Permavoid 85mm Podium Deck Roof Diffuser Chamber collects rainwater via the 110mm Ø inlet pipe, filters through the perforated walls and dispersed into the surrounding 85mm Permavoid storage system. It is compatible with standard 110mm Ø push fit couplings.

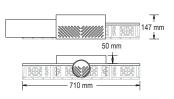
Key Benefits	ELEMENT	VALUE			
8l/s controlled inlet water flow	PHYSICAL PROPERTIES				
Passive flow control	Length	800mm			
Easy access for routine maintenance	Width	710mm			
Effective water dispersal	Depth	147mm			
Integrates with surrounding Permavoid	Sump depth	10mm			
Compatible with 110mm Ø standard couplings	Inlet spigot Ø OD	110mm			
• 100% recyclable	Inlet spigot length	90mm			
	Maximum flow	8l/s			
 Effective water dispersal Integrates with surrounding Permavoid Compatible with 110mm Ø standard couplings 100% recyclable Application 1 - maximum cover approximately 500mm CONCRETE APPRON TO STRUCTURAL ENGINEERS SPECIFICATION	Unit weight	11.8kg			
	Material	HDPE/P			
SURFACE FINISHES 10 ARCHITECT / ENGINEER SPECIFICATION	PACKAGING DETAILS				
	Packaging unit type	Double wall ca			
- 85mm THICK PERMAVOID	Packaging unit dimension	832/L) v 732/\//) v			

P1

Packaging unit type
Packaging unit dimension
Packaging unit weight
Number of units per pallet
Pallet dimensions
Pallet weight

Double wall cardboard
832(L) x 732(W) x 169(H) mm
11.8kg
16
1200(L) x 1200(W) x 1626(H) mm
214kg





Polypipe

Technical Support

Detailed guidance and assistance is available. For further information, please contact our Technical Team on +44 (0)1509 615 100 or email: civils@polypipe.com or visit www.polypipe.com/civils-technical-hub

Polypipe Civils,

Charnwood Business Park, Loughborough, Leicestershire LE11 1LE Tel: +44 (0)1509 615100 Fax: +44(0)1509 610215 Email: civils@polypipe.com

www.polypipe.com/wms

85mm THICK PERMAVOID SUBBASE REPLACEMENT

SURFACE FINISHES TO ARCHITECT / ENGINEER SPECIFICATION

PERMAVOID SEPARATION / FILTRATION GEOTEXTILE

85mm THICK PERMAVOID SUBBASE REPLACEMENT

PVOD01401 - PERMAVOID 85mm PODIUM DECK ROOF DIFFUSER CHAMBER

EMENT	VALUE
YSICAL PROPERTIES	
ngth	800mm
dth	710mm
pth	147mm
mp depth	10mm
et spigot Ø OD	110mm
et spigot length	90mm
aximum flow	8l/s
it weight	11.8kg
iterial	HDPE/PP
CKAGING DETAILS	
kaging unit type	Double wall cardboard
kaging unit dimonsion	922/L) x 722/M/ x 160/H) mm

Packaging unit type
Packaging unit dimension
Packaging unit weight
Number of units per pallet
Pallet dimensions
Pallet weight

Data Sheet **ISSUE 2 - JULY 2018**



Permavoid 85mm Podium Deck Roof Diffuser Chamber

Data Sheet

PRODUCT INFORMATION

ISSUE 2 - JULY 2018

P2

Permavoid 85mm Podium Deck Roof Diffuser Chamber can be utilised in these SuDS techniques

						TECHN	IQUES						
Blue-Green roofs	Podium Decks	Trees	Sports Pitches	Cycle Paths	Permeable Paving (sub base & podium)	Bioretention & Rain Gardens	Attenuation Storage Tanks	Infiltration	Swales	Filter Drains	Detention Basins	Ponds & Wetlands	Filter Strips
\checkmark	\checkmark												

Visit www.polypipe.com/greeninfrastructure

All descriptions and illustrations in this publication are intended for guidance only and shall not constitute a 'sale by description'. All dimensions and weights given are nominal and Polypipe may modify and change the information, products and specifications from time to time for a variety of reasons, without prior notice. The information in this publication is provided 'as is' on July 2018. Updates will not be issued automatically. This information is not intended to have any legal effect, whether by way of advice, representation or warranty (express or implied). We accept no liability whatsoever (to the extent permitted by law) if you place any reliance on this publication you must do so at your own risk. All rights reserved. Copyright may not be used, sold, copied or reproduced in whole or part in any manner in any media to any person without prior consent. **Polypipe** is a registered trademark of Polypipe. All Polypipe products are protected by Design Right under CDPA 1988. Copyright © 2018 Polypipe. All rights reserved.

Polypipe Civils,

Charnwood Business Park, Loughborough, Leicestershire LE11 1LE Tel: +44 (0)1509 615100 Fax: +44(0)1509 610215 Email: civils@polypipe.com www.polypipe.com/wms



DETAILS OF SAMPLE RWO FLOW CONTROL

APPENDIX D

OverFlow & FlowControl

PRODUCT DATA SPECIFICATIONS

PRODUCT DESCRIPTION

The **OMG OverFlow** accessory is a spun aluminum round drain attachment. The product is designed to be used with all OlyFlow[®] retrofit and new connection drains that are supplied with a clamping ring assembly. The purpose of the overflow drain assembly is to provide additional water drainage, if necessary, when water level on the roof exceeds 4-in. in height. 2-in. OverFlow is also available.

The **OMG FlowControl** is a spun aluminum round drain attachment with two specially designed weirs that provide a specific limited water flow rate under different water pressures (water head) on the roof. This product is designed and tested for application with all OlyFlow retrofit drains that are supplied with a clamping ring assembly. If the water level on the roof exceeds 4-in. in height, the FlowControl drain assembly will perform as an overflow drain.

The FlowControl offers the following performance:

Under a 4-in. head of water **20 GPM** Under a 3-in. head of water **15 GPM** Under a 2-in. head of water **10 GPM** Under a 1-in. head of water **5 GPM**

FEATURES & BENEFITS

OverFlow

- Fits all OlyFlow RetroDrains that come with a clamping ring.
- Constructed of .050-in. spun aluminum.
- Provides additional drainage when water level exceeds 4-in. (also available in 2-in.)
- Simple and easy to install.

FlowControl

- Fits all OlyFlow RetroDrains that come with a clamping ring.
- Controls the flow rate under different water pressures.
- Constructed of .050-in. spun aluminum.
- Provides additional drainage when water level exceeds 4-in.
- Simple and easy to install.





PHYSICAL DATA

The data below is constant for each OMG OverFlow and OMG FlowControl.

OVERFLOW	FLOWCONTROL
SIZE: 4" Height 2" Height MATERIAL: .050" aluminum	SIZE: 4" Height MATERIAL: .050" aluminum

ORDERING INFORMATION

CAT. NO.	DESCRIPTION	HEIGHT	PKG.	DIMENSIONAL WEIGHT
OVFLOW4	OverFlow	4"	Each	1 lb.
OVFLOW2	OverFlow	2"	Each	1 lb.
RAFLCN	FlowControl	4"	Each	1 lb.



Superior productivity. Superior performance.

153 BOWLES ROAD, AGAWAM, MA 01001 USA 800-633-3800 413-789-0252 OMGROOFING.COM OlyFlow® is a registered trademark of OMG, Inc. Copyright © 2017 OMG, Inc. All rights reserved.



APPENDIX E

IRISH WATER CONFIRMATION OF FEASIBILITY

Ballymore Group c/o Niall McMenamin 9 Prussia Street Dublin 7



Uisce Éireann Bosca OP 6000 Baile Átha Cliath

Irish Water PO Box 6000 Dublin 1 Ireland

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

11 April 2019

Dear Sir/Madam,

Re: Customer Reference No 825727485 pre-connection enquiry - Subject to contract | Contract denied [Connection for 700 domestic units, 208 bedroom hotel and 6000sqm retail unit]

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

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

Water:

In order to accommodate the proposed connection at the Premises, upgrade works are required to increase the capacity of the Irish Water network. The existing 6" CI main on Commons Street requires an upgrade to a 300mmID for approximately 430m from the existing 600mm Trunk main on the North Quays to the boundary of the site. A new bulk meter and associated telemetry system may also be required. Note: laying this main will include a Luas rail track crossing.

Irish Water does not currently have any plans to carry out the works required to provide the necessary upgrade and capacity.

Wastewater:

Irish Water has carried out investigations for this development by data capture in the surrounding area and modelled the results including the outfalls from this development, IW can confirm that upgrades are not required to the wastewater network to allow connection to the network at this time.

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

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 Paul Lowry from the design team on 018230377 or email paullowr@water.ie. For further information, visit **www.water.ie/connections**

dH-MI

Yours sincerely,

Maria O'Dwyer Connections and Developer Services

Stürhbölr / Directors: Mike Quinn (Chairman), Carbal Marley, Brendan Murphy, Michael G. O'Sullivan Offig Chilarible / Registered Office: Teach Colvil, 2-45 Skid Thabidd, Balle Aha Claich 1, DOI NP86 / Colvill House, 24-26 Taibot Street, Dublin 1, DOI NP86 is cuideachat ghromhadhcha aimmthe ada foo thercarina scatarana è Usce Ereann / Irish Water is a designated activity company, limited by shares. Ulimhir Chliarible in Éirinn / Registered in Ireland No: 550363 **APPENDIX F**

IRISH WATER STATEMENT OF DESIGN ACCEPTANCE

Ballymore Group c/o Niall McMenamin, OCSC, 9 Prussia Street, Dublin

28 June 2019

Re: Design Submission for Development at Connolly Station, Sheriff Street Lower/Oriel Street Upper/Seville Place, Dublin (the "Development") (the "Design Submission") / 825727485.

Dear Niall,

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 <u>www.water.ie/connections</u>. 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) (<u>https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/</u>).

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: Paul Lowry Phone: 01 8230377 Email: paullowr@water.ie

Yours sincerely,

M Duge

Maria O'Dwyer Connections and Developer Services



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

Appendix A

Document Title & Revision

- O635-OCSC-XX-XX-DR-C-0520-S3-P02
- O635-OCSC-XX-XX-DR-C-0521-S3-P01
- O635-OCSC-XX-XX-DR-C-0530-S3-P01
- O635-OCSC-XX-XX-DR-C-0531-S3-P01
- O635-OCSC-XX-XX-DR-C-0532-S3-P01
- O635-OCSC-XX-XX-DR-C-0533-S3-P01
- O635-OCSC-XX-XX-DR-C-0540-S3-P02
- O635-OCSC-XX-XX-DR-C-0550-S3-P01
- O635-OCSC-XX-XX-DR-C-0551-S3-P01

Proposed Wastewater Drainage Layout Plan

Proposed Wastewater Drainage Longitudinal Sections

Wastewater Standard Details Sheet 1 of 4

Wastewater Standard Details Sheet 2 of 4

Wastewater Standard Details Sheet 3 of 4

Wastewater Standard Details Sheet 4 of 4

Proposed Water Supply Layout Plan

Water Main Standard Details Sheet 1 of 2

Water Main Standard Details Sheet 2 of 2

Standard Details/Code of Practice Exemption: N/A

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

<u>Notwithstanding any matters listed above, the Customer (including any appointed</u> <u>designers/contractors, etc.) is entirely responsible for the design and construction of the</u> <u>Self-Lay Works.</u> 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 G

MET ÉIREANN RAINFALL DATA

Met Eireann Return Period Rainfall Depths for sliding Durations Irish Grid: Easting: 316900, Northing: 235000,

	Interva	al						Years								
DURATION	6months, 1	year,	2,	З,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.6,	4.2,	5.0,	5.6,	6.0,	7.5,	9.2,	10.4,	11.9,	13.3,	14.4,	16.1,	17.5,	18.5,	N/A ,
10 mins	3.5,	5.0,	5.8,	7.0,	7.8,	8.4,	10.5,	12.9,	14.4,	16.6,	18.6,	20.1,	22.5,	24.3,	25.8,	N/A ,
15 mins	4.1,	5.9,	6.8,	8.2,	9.2,	9.9,	12.4,	15.1,	17.0,	19.6,	21.9,	23.7,	26.5,	28.6,	30.4,	N/A ,
30 mins	5.5,	7.7,	8.8,	10.6,	11.8,	12.7,	15.7,	19.0,	21.3,	24.4,	27.1,	29.3,	32.6,	35.1,	37.2,	N/A ,
1 hours	7.2,	10.0,	11.5,	13.6,	15.1,	16.2,	19.9,	23.9,	26.6,	30.3,	33.6,	36.2,	40.1,	43.1,	45.6,	N/A ,
2 hours	9.6,	13.0,	14.9,	17.5,	19.3,	20.7,	25.2,	30.1,	33.3,	37.8,	41.7,	44.7,	49.4,	52.9,	55.8,	N/A ,
3 hours	11.3,	15.2,	17.3,	20.3,	22.4,	23.9,	28.9,	34.4,	38.0,	43.0,	47.3,	50.7,	55.7,	59.6,	62.8,	N/A ,
4 hours	12.6,	17.0,	19.3,	22.6,	24.8,	26.5,	31.9,	37.9,	41.7,	47.1,	51.7,	55.3,	60.8,	64.9,	68.4,	N/A ,
6 hours	14.9,	19.9,	22.4,	26.2,	28.7,	30.6,	36.6,	43.3,	47.6,	53.5,	58.7,	62.6,	68.6,	73.2,	77.0,	N/A ,
9 hours	17.5,	23.2,	26.1,	30.4,	33.2,	35.3,	42.1,	49.5,	54.3,	60.8,	66.6,	70.9,	77.5,	82.5,	86.6,	N/A ,
12 hours	19.7,	25.9,	29.1,	33.7,	36.8,	39.1,	46.4,	54.5,	59.6,	66.6,	72.8,	77.4,	84.5,	89.8,	94.2,	N/A ,
18 hours	23.2,	30.2,	33.9,	39.1,	42.5,	45.1,	53.4,	62.3,	68.0,	75.8,	82.5,	87.7,	95.4,	101.3,	106.1,	N/A ,
24 hours	26.0,	33.8,	37.7,	43.4,	47.1,	50.0,	58.9,	68.5,	74.6,	83.0,	90.2,	95.7,	104.0,	110.3,	115.4,	132.9,
2 days	31.7,	40.4,	44.7,	51.0,	55.1,	58.1,	67.8,	78.0,	84.5,	93.3,	100.9,	106.5,	115.1,	121.6,	126.8,	144.6,
3 days	36.2,	45.7,	50.4,	57.2,	61.5,	64.8,	75.0,	85.9,	92.7,	101.9,	109.8,	115.7,	124.6,	131.3,	136.7,	155.0,
4 days	40.2,	50.4,	55.4,	62.6,	67.2,	70.6,	81.4,	92.7,	99.9,	109.5,	117.6,	123.8,	133.0,	139.9,	145.5,	164.3,
6 days	47.2,	58.5,	64.1,	71.9,	76.9,	80.7,	92.4,	104.7,	112.3,	122.6,	131.3,	137.8,	147.6,	154.9,	160.8,	180.5,
8 days	53.3,	65.6,	71.6,	80.1,	85.5,	89.5,	102.0,	115.1,	123.2,	134.0,	143.2,	150.1,	160.3,	167.9,	174.1,	194.7,
10 days	58.9,	72.1,	78.5,	87.5,	93.2,	97.5,	110.7,	124.5,	133.0,	144.4,	154.0,	161.2,	171.8,	179.8,	186.2,	207.6,
12 days	64.1,	78.1,	84.9,	94.4,	100.4,	104.9,	118.8,	133.1,	142.0,	153.9,	163.9,	171.4,	182.4,	190.7,	197.3,	219.4,
16 days	73.8,	89.2,	96.6,	107.0,	113.6,	118.5,	133.5,	149.0,	158.5,	171.3,	182.0,	189.9,	201.7,	210.5,	217.5,	241.0,
20 days	82.7,	99.3,	107.4,	118.5,	125.6,	130.8,	146.9,	163.4,	173.5,	187.0,	198.4,	206.8,	219.2,	228.4,	235.8,	260.4,
25 days	93.0, 1	11.1,	119.8,	131.9,	139.5,	145.1,	162.3,	180.0,	190.8,	205.2,	217.2,	226.1,	239.2,	249.0,	256.8,	282.7,
NOTES:																

N/A Data not available

These values are derived from a Depth Duration Frequency (DDF) Model

For details refer to:

'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin', Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf **APPENDIX H**

SURFACE WATER DRAINAGE CALCULATIONS

Connor S	utton (Cron	in							Page 1
Prussia :	Street									
Dublin 7										
Ireland										_ Micro
Date 14/03,	/2019 3	14:5	4		Des	igned b	y niall.	mcmenam	in	
File Catch	mentWe	st C	ascade	.casx	Cheo	cked by	,			Draina
XP Solution						rce Con	trol 201	8.1		
<u>Ca</u>	scade	Summ	<u>nary of</u>	Resu	lts f	or Cat	<u>chmentWe</u>	st_Roof	Level.	srcx
		Upst	ream		Out	flow To		Overflow	То	
		-	tures							
		(1	None) Ca	atchme	ntWest_	_GroundL	evel.srcx	(No	ne)	
			Ha	alf Dra	ain Tir	me : 346	9 minutes.			
	Storm		Max	Max	м	ax	Max	Max	Max	Status
	Event			-			Control E			
			(m)	(m)	(1	/s)	(l/s)	(l/s)	(m³)	
15	min Sur	mmer	40.012	0.012		0.0	0.0	0.0	38.3	O K
	min Sur					0.0	0.1		60.0	
	min Sur					0.0	0.2		83.1	
	min Sur					0.0	0.3		109.0	
	min Sur min Sur					0.0	0.4		125.5 137.9	
	min Sur					0.0	0.4 0.5		155.8	
	min Sur					0.0	0.6		168.8	
	min Sur					0.0	0.6		178.7	
720	min Sur	mmer	40.058	0.058		0.0	0.7	0.7	186.6	ОК
960	min Sur	mmer	40.062	0.062		0.0	0.7	0.7	198.4	ΟK
1440	min Sur	mmer	40.066	0.066		0.0	0.8	0.8	213.1	O K
	min Sur					0.0	0.8		223.7	
	min Sur					0.0	0.8		230.6	
	min Sur					0.0	0.8		238.6	
	min Sur min Sur					0.0 0.0	0.8 0.8		241.8 242.1	ОК
			Storm		Rain	Flooded	Discharge	e Time-Pe	ak	
			Event			Volume	Volume	(mins		
						(m³)	(m³)			
		15	min Sun	mer 8	35.194	0.0	3.	4 1	.21	
			min Sun		58.879	0.0			.28	
			min Sun		38.241	0.0			44	
			min Sun		24.118	0.0			.82	
			min Sun min Sun		.8.261	0.0			28 80	
			min Sun		1.264	0.0			80 890	
			min Sun		9.197	0.0			504 504	
			min Sun		7.854	0.0			520	
			min Sun		6.901	0.0			36	
		960	min Sun	mer	5.625	0.0	82.	8 9	70	
			min Cun	mer	4.216	0.0	86.	5 14	44	
		1440	III Sui			0.0	162.	4 19	20	
			min Sun	mer	3.158	0.0				
		2160 2880	min Sun min Sun	mer	2.570	0.0	168.3		80	
		2160 2880 4320	min Sun min Sun min Sun	mer mer	2.570 1.920	0.0	168.1 163.	6 30	52	
		2160 2880 4320 5760	min Sun min Sun min Sun min Sun	mer mer mer	2.570 1.920 1.560	0.0 0.0 0.0	168.1 163. 268.9	6 30 9 38	52 80	
		2160 2880 4320 5760	min Sun min Sun min Sun	mer mer mer	2.570 1.920	0.0	168.1 163. 268.9	6 30 9 38	52	

'Connor Sutton Croni	n						Page 2
Prussia Street							
ublin 7							
reland							
ate 14/03/2019 14:54	1		signed by	v niall ~		in	Micro
				y nitait.I	Cinenaill	-11	Drainag
ile CatchmentWest_Ca	iscade.c		ecked by				
P Solutions		So	ource Con	trol 2018	.1		
Cascade Summ	ary of R	<u>esults</u>	for Cato	chmentWes	t_RoofI	evel.s	<u>srcx</u>
Storm		lax	Max	Max	Max	Max	Status
Event		-	iltration				
	(m)	(m)	(1/s)	(1/s)	(1/s)	(m³)	
8640 min Summer	40.075 0	.075	0.0	0.8	0.8	240.8	ОК
10080 min Summer			0.0	0.8	0.8		
15 min Winter			0.0	0.0		45.2	
30 min Winter			0.0	0.1		43.2 69.3	
60 min Winter			0.0	0.2		95.2	
120 min Winter			0.0	0.2		124.2	
180 min Winter			0.0	0.4		142.8	
240 min Winter						142.8	
			0.0	0.5			
360 min Winter			0.0	0.6		176.9	
480 min Winter			0.0	0.7		191.5	
600 min Winter			0.0	0.7	0.7		
720 min Winter			0.0	0.8	0.8		0 K
960 min Winter			0.0	0.8		226.0	
1440 min Winter			0.0	0.8	0.8		0 K
2160 min Winter			0.0	0.9		256.7	
2880 min Winter	40.082 0.	.082	0.0	0.9	0.9	262.5	0 K
4320 min Winter	40.084 0.	.084	0.0	0.9	0.9	269.4	O K
5760 min Winter	40.084 0.	.084	0.0	0.9	0.9	270.0	O K
7200 min Winter	40.083 0.	.083	0.0	0.9	0.9	267.1	O K
8640 min Winter	40.082 0.	.082	0.0	0.9	0.9	262.5	O K
10080 min Winter	40.080 0.	.080	0.0	0.9	0.9	256.8	O K
	Storm	Rair	n Flooded	Discharge	Time-Pe	ak	
	Storm Event	Rair (mm/h		Discharge Volume	Time-Pe (mins)		
				2			
:		(mm/h	r) Volume (m³)	Volume (m ³)	(mins)		
8640	Event	(mm/h er 1.1	r) Volume (m ³) 64 0.0	Volume (m ³) 271.3	(mins) 55) 36	
8640 10080	Event min Summe	(mm/h er 1.1 er 1.0	r) Volume (m ³) 64 0.0 41 0.0	Volume (m ³) 271.3 264.6	(mins) 55 63) 36 52	
8640 10080 15	min Summe min Summe min Winte	(mm/h er 1.1 er 1.0 er 85.1	r) Volume (m ³) 64 0.0 41 0.0 94 0.0	Volume (m ³) 271.3 264.6 4.6	(mins) 55 63 1) 36 52 21	
8640 10080 15 30	min Summe min Summe min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8	r) Volume (m ³) 64 0.0 41 0.0 94 0.0 79 0.0	Volume (m ³) 271.3 264.6 4.6 10.0	(mins) 55 63 1 1	36 52 21 27	
8640 10080 15 30 60	min Summe min Summe min Winte min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2	r) Volume (m ³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9	(mins 55 63 1 1 1	36 52 21 27 42	
8640 10080 15 30 60 120	min Summe min Summe min Winte min Winte min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1	r) Volume (m ³) 64 0.0 94 0.0 94 0.0 79 0.0 41 0.0 18 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8	(mins) 55 63 1 1 1 1	36 52 21 27 42 80	
8640 10080 15 30 60 120 180	min Summe min Summe min Winte min Winte min Winte min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2	volume (m ³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 18 0.0 61 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1	(mins) 55 63 1 1 1 2	36 52 21 27 42 80 26	
8640 10080 15 30 60 120 180 240	min Summe min Summe min Winte min Winte min Winte min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9	r) Volume (m ³) 64 0.0 94 0.0 94 0.0 79 0.0 41 0.0 18 0.0 61 0.0 61 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5	(mins) 55 63 1 1 1 1 2 2 2	36 52 21 27 42 80 26 76	
8640 10080 15 30 60 120 180 240 360	min Summe min Summe min Winte min Winte min Winte min Winte min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2	r) Volume (m ³) 64 0.0 94 0.0 94 0.0 79 0.0 41 0.0 18 0.0 61 0.0 61 0.0 64 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5	(mins) 55 63 1 1 1 1 2 2 2 3	36 52 21 27 42 80 26 76 84	
8640 10080 15 30 60 120 180 240 360 480	min Summe min Summe min Winte min Winte min Winte min Winte min Winte min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1	volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 18 0.0 61 0.0 64 0.0 97 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5	(mins) 55 63 1 1 1 1 2 2 2 3 4	36 52 21 27 42 80 26 76 84 96	
8640 10080 15 30 60 120 180 240 360 480 600	min Summe min Summe min Winte min Winte min Winte min Winte min Winte min Winte min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8	volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 18 0.0 61 0.0 64 0.0 97 0.0 54 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3	(mins) 55 63 1 1 1 1 1 2 2 2 3 4 6	36 52 21 27 42 80 26 76 84 96 10	
8640 10080 15 30 60 120 180 240 360 480 600 720	min Summe min Summe min Winte min Winte min Winte min Winte min Winte min Winte min Winte min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8 er 6.9	Volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 61 0.0 61 0.0 64 0.0 97 0.0 54 0.0 01 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3 90.5	(mins) 55 63 1 1 1 1 1 2 2 3 4 6 7	36 52 21 27 42 80 26 76 84 96 10 24	
8640 10080 15 30 60 120 180 240 360 480 600 720 960	min Summe min Summe min Winte min Winte min Winte min Winte min Winte min Winte min Winte min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8 er 6.9 er 5.6	volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 61 0.0 61 0.0 64 0.0 97 0.0 54 0.0 01 0.0 25 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3 90.5 95.6	(mins) 55 63 1 1 1 1 2 2 3 4 4 6 7 7 9	36 52 21 27 42 80 26 76 84 96 10 24 54	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440	min Summe min Summe min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8 er 6.9 er 5.6 er 4.2	volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 61 0.0 61 0.0 64 0.0 97 0.0 54 0.0 01 0.0 25 0.0 16 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3 90.5 95.6 97.7	(mins) 55 63 1 1 1 1 1 2 2 3 4 4 6 7 9 9 1 4	36 52 21 27 42 80 26 76 84 96 10 24 54 08	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160	min Summe min Summe min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8 er 6.9 er 5.6 er 4.2 er 3.1	volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 61 0.0 61 0.0 64 0.0 97 0.0 54 0.0 01 0.0 25 0.0 58 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3 90.5 95.6 97.7 186.8	(mins) 55 63 1 1 1 1 1 2 2 3 4 6 7 9 9 14 20	36 52 21 27 42 80 26 76 84 96 10 24 54 08 56	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880	min Summe min Summe min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8 er 6.9 er 5.6 er 4.2 er 3.1 er 2.5	volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 79 0.0 41 0.0 64 0.0 79 0.0 61 0.0 64 0.0 97 0.0 54 0.0 01 0.0 25 0.0 16 0.0 58 0.0 70 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3 90.5 95.6 97.7 186.8 192.2	(mins) 55 63 1 1 1 1 1 2 2 3 4 6 7 9 14 20 23	36 52 21 27 42 80 26 76 84 96 10 24 54 08 56 68	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320	min Summe min Summe min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8 er 6.9 er 5.6 er 4.2 er 3.1 er 2.5 er 1.9	Volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 79 0.0 41 0.0 64 0.0 79 0.0 61 0.0 64 0.0 97 0.0 54 0.0 01 0.0 25 0.0 70 0.0 20 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3 90.5 95.6 97.7 186.8 192.2 184.4	(mins) 55 63 1 1 1 1 1 2 2 3 4 6 7 7 9 14 20 23 32	36 52 21 27 42 80 26 76 84 96 10 24 54 08 56 68 60	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760	min Summe min Summe min Summe min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8 er 6.9 er 5.6 er 4.2 er 3.1 er 2.5 er 1.9 er 1.5	Volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 79 0.0 41 0.0 64 0.0 79 0.0 61 0.0 64 0.0 97 0.0 54 0.0 01 0.0 25 0.0 70 0.0 20 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3 90.5 95.6 97.7 186.8 192.2 184.4 310.7	(mins) 55 63 1 1 1 1 2 2 2 3 4 4 6 7 7 9 14 20 23 32 32 32 41	36 52 21 27 42 80 26 76 84 96 10 24 54 08 56 68	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760 7200	min Summe min Summe min Summe min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8 er 6.9 er 5.6 er 4.2 er 3.1 er 2.5 er 1.9 er 1.5 er 1.3	volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 79 0.0 41 0.0 64 0.0 79 0.0 61 0.0 64 0.0 97 0.0 54 0.0 01 0.0 25 0.0 70 0.0 20 0.0 20 0.0 28 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3 90.5 95.6 97.7 186.8 192.2 184.4 310.7 315.9	(mins) 55 63 1 1 1 1 2 2 2 3 4 4 6 7 7 9 14 20 23 32 4 1 4 20 23 32 4 1 50	36 52 21 27 42 80 26 76 84 96 10 24 54 08 56 68 60 76 64	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760 7200 8640	min Summe min Summe min Summe min Winte min Winte	(mm/h er 1.1 er 1.0 er 85.1 er 58.8 er 38.2 er 24.1 er 18.2 er 14.9 er 11.2 er 9.1 er 7.8 er 6.9 er 5.6 er 4.2 er 3.1 er 2.5 er 1.9 er 1.3 er 1.3 er 1.1	volume (m³) 64 0.0 41 0.0 94 0.0 79 0.0 41 0.0 79 0.0 41 0.0 64 0.0 79 0.0 61 0.0 64 0.0 97 0.0 54 0.0 01 0.0 25 0.0 70 0.0 20 0.0 20 0.0 28 0.0	Volume (m ³) 271.3 264.6 4.6 10.0 30.9 44.8 54.1 61.5 72.5 80.5 86.3 90.5 95.6 97.7 186.8 192.2 184.4 310.7 315.9	(mins) 55 63 1 1 1 1 2 2 2 3 4 4 6 7 7 9 14 20 23 32 4 1 4 20 23 32 4 1 50	36 52 21 27 42 80 26 76 84 96 10 24 54 08 56 68 60 76	

©1982-2018 Innovyze

O'Connor Sutton	n Cronin							Pag	re 3
9 Prussia Stree	et								
Dublin 7									
Ireland								Mi	cro
Date 14/03/2019	9 14:54		Desig	ned by	y nial	L.mcmena	min		
File CatchmentW	Vest Cascad	de.casx	Check	ed by					ainage
XP Solutions			Source	e Cont	crol 20	018.1			
<u>Cascac</u> F	de Rainfal Rainfall Mod Period (year Regi M5-60 (m Ratio Summer Stor	el s) on Scotla m) R	ls for	Catch FSI 100 Ireland 16.200 0.279 Yes	mentWe R D d D Short D Short	est_Roofl Winter Cv (S	Storms Summer) Vinter) (mins) (mins)	Yes 0.750 0.840 15 10080	
	Depression S					(mm/day) efficient	3 0.050		
• •	rea Time ha) From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0 4 0.06	65419 32	36 0	.013208	64	68	0.002667	96	100	0.000538
4 8 0.05			.010814	68		0.002183			0.00044
8 12 0.04 12 16 0.03			.008854	72 76	76	0.001787			0.00036
12 10 0.03 16 20 0.02			.005935			0.001403			0.00029
20 24 0.02			.004859			0.000981			0.00019
24 28 0.01	19704 56	60 0	.003978	88	92	0.000803			
28 32 0.01	16132 60	64 0	.003257	92	96	0.000658			
		<u></u> 1 QS	32-2018	3 Inno	WW7A				

O'Connor Sutton Cronin				Page 4
9 Prussia Street				
Dublin 7				
Ireland				Micco
Date 14/03/2019 14:54	Designe	ed by nial	l.mcmenamin	
File CatchmentWest_Cascade.cas>	k Checked	d by		° Drainage
XP Solutions	Source	Control 2	018.1	
<u>Cascade Model Detail</u>	ls for Ca	tchmentWes	t_RoofLeve	l.srcx
Storage is (Online Cove	er Level (m)	40.500	
Cellul	lar Stora	<u>ge Structu</u>	ire	
Inv Infiltration Coefficien Infiltration Coefficien	t Base (m/	hr) 0.00000	Safety Facto Porosit	
Depth (m) Area (m²) Inf. A	area (m²) D	epth (m) Ar	ea (m²) Inf.	Area (m²)
0.000 3450.0 0.085 3450.0	0.0	0.086	0.0	0.0
Orif	ice Outfl	ow Contro	1	
			_	
01	982-2018	Innovvze		

 Summa. Catch m t Summer Summer Summer Summer Summer Summer	ny of Up Str mentWes H. Max	Resu pstrea cuctur st_Roc alf D Max Depth (m) 0.021	x Check Sour lts for mm ces ofLevel. rain Ti Ma Infilt	or Cato or Cato or Cato or or or or ax ration	htrol 20 hmentWe htflow To (None) 8 minutes Max	18.1 st_Grour Overflow (No Max	ndLeve To ne)	
Catch m t Summer Summer Summer Summer Summer Summer Summer	mascade ry of Up Str mentWes H Max Level I (m) 1.286 (1.293 (1.301 (Resu pstrea cuctur st_Roc alf D Max Depth (m) 0.021	x Check Sour lts for mm ces ofLevel. rain Ti Ma Infilt	or Cato or Cato or Cato or or or or ax ration	y htrol 20 hmentWe itflow To (None) 8 minutes Max	18.1 st_Grour Overflow (No Max	ndLeve To ne)	Draina 1.srcx
Catch m t Summer Summer Summer Summer Summer Summer Summer	mascade ry of Up Str mentWes H Max Level I (m) 1.286 (1.293 (1.301 (Resu pstrea cuctur st_Roc alf D Max Depth (m) 0.021	x Check Sour lts for mm ces ofLevel. rain Ti Ma Infilt	or Cato or Cato or Cato or or or or ax ration	y htrol 20 hmentWe itflow To (None) 8 minutes Max	18.1 st_Grour Overflow (No Max	ndLeve To ne)	Draina 1.srcx
Catch m t Summer Summer Summer Summer Summer Summer Summer	mascade ry of Up Str mentWes H Max Level I (m) 1.286 (1.293 (1.301 (Resu pstrea cuctur st_Roc alf D Max Depth (m) 0.021	x Check Sour lts for mm ces ofLevel. rain Ti Ma Infilt	or Cato or Cato or Cato or or or or ax ration	y htrol 20 hmentWe itflow To (None) 8 minutes Max	18.1 st_Grour Overflow (No Max	ndLeve To ne)	Draina 1.srcx
Catch m t Summer Summer Summer Summer Summer Summer Summer	mascade ry of Up Str mentWes H Max Level I (m) 1.286 (1.293 (1.301 (Resu pstrea cuctur st_Roc alf D Max Depth (m) 0.021	x Check Sour lts for mm ces ofLevel. rain Ti Ma Infilt	or Cato or Cato or Cato or or or or ax ration	y htrol 20 hmentWe itflow To (None) 8 minutes Max	18.1 st_Grour Overflow (No Max	ndLeve To ne)	l.srcx
 Summa. Catch m t Summer Summer Summer Summer Summer Summer	ry of Up Str mentWes H Max Level I (m) 1.286 (1.293 (1.301 (Resu pstrea cuctur st_Roc alf D Max Depth (m) 0.021	Soun Soun Ses ofLevel. rain Ti Ma Infilt	or Cato or Cato or or or or or or ax ration	htrol 20 hmentWe htflow To (None) 8 minutes Max	<u>st_Grour</u> Overflow (No Max	To ne)	
Catch m t Summer Summer Summer Summer Summer Summer	Up Str mentWes H Level I (m) 1.286 (1.293 (1.301 (ostrea cuctur alf D Max Depth (m)	lts fc m res ofLevel. rain Ti Ma Infilt	or Catc Ou .srcx me : 77 ax ration	thmentWe tflow To (None) 8 minutes Max	<u>st_Grour</u> Overflow (No Max	To ne)	
Catch m t Summer Summer Summer Summer Summer Summer	Up Str mentWes H Level I (m) 1.286 (1.293 (1.301 (ostrea cuctur alf D Max Depth (m)	m es ofLevel. rain Ti Ma Infilt	Ou srcx me : 77 ax ration	(None) 8 minutes Max	- Overflow (No Max	To ne)	
Catch m t Summer Summer Summer Summer Summer Summer	Up Str mentWes H Level I (m) 1.286 (1.293 (1.301 (ostrea cuctur alf D Max Depth (m)	m es ofLevel. rain Ti Ma Infilt	Ou srcx me : 77 ax ration	(None) 8 minutes Max	- Overflow (No Max	To ne)	
m t Summer Summer Summer Summer Summer	Str mentWes H Max Level I (m) 1.286 (1.293 (1.301 (cuctur st_Roc alf D Max Depth (m) 0.021	rain Ti Ma Infilt	srcx me : 77	(None) 8 minutes Max	(No Max	ne)	
m t Summer Summer Summer Summer Summer	Max Level I (m) 1.286 (1.293 (1.301 (st_Roc alf D Max Depth (m) 0.021	ofLevel. rain Ti Ma Infilt	me : 77	8 minutes Max	Max		
t Summer Summer Summer Summer Summer	Max Level I (m) 1.286 (1.293 (1.301 (Max Depth (m)	Ma Infilt	ax ration	Max	Max	\/	
t Summer Summer Summer Summer Summer	Level I (m) 1.286 (1.293 (1.301 (Depth (m) 0.021	Infilt	ration			¥	
t Summer Summer Summer Summer Summer	Level I (m) 1.286 (1.293 (1.301 (Depth (m) 0.021	Infilt	ration				~
Summer Summer Summer Summer Summer Summer	(m) 1.286 (1.293 (1.301 ((m) 0.021				0 + f = 0	Max	Status
Summer Summer Summer Summer	1.286 (1.293 (1.301 (0.021		/s)	(1/s)		(m ³)	
Summer Summer Summer Summer	1.293 (1.301 (= /		
Summer Summer Summer Summer	1.301 (0.0	1.0	1.0		
Summer Summer Summer				0.0 0.0	1.0 1.0	1.0		
Summer Summer	T. 200 (0.0	1.0	1.0		
Summer	1.312 (0.0	1.0	1.0		
Summer	1.315 (0.0	1.0	1.0		
	1.318 (0.053		0.0	1.0	1.0	59.0	O K
Summer	1.320 (0.055		0.0	1.0	1.0	61.2	O K
	1.322 (0.0	1.0	1.0		
	1.323 (0.0	1.0	1.0		
	1.325 (0.0	1.0	1.0		
	1.328 (0.0 0.0	1.0	1.0		
	1.332 (0.0	1.0	1.0		
	1.331 (0.0	1.0			
Summer	1.329 (0.064		0.0	1.0			ОК
Summer	1.326 (0.061		0.0	1.0	1.0	67.7	0 K
	Storm		Rain	Flooder	1 Dischar	re Time-D	oak	
		(-		
				(m³)	(m³)			
15	min cum	mer	85 101	0 0	ר כ	З	22	
			38.241				66	
120 :	min Sum	mer	24.118			.0	124	
			18.261					
			14.961					
			5.625				964	
1440	min Sum	mer				.2 1	442	
2160	min Sum	mer	3.158	0.0	289	.7 2	160	
			2.570					
			1.920					
1200	mili Sum	uuer	1.320	0.0	J 401	• 1 3	500	
	15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760	30 min Sum 60 min Sum 120 min Sum 240 min Sum 360 min Sum 480 min Sum 600 min Sum 720 min Sum 960 min Sum 1440 min Sum 2160 min Sum 2880 min Sum 5760 min Sum	Event 15 min Summer 30 min Summer 60 min Summer 120 min Summer 120 min Summer 140 min Summer 480 min Summer 480 min Summer 720 min Summer 1440 min Summer	Event(mm/hr)15minSummer85.19430minSummer58.87960minSummer38.241120minSummer24.118180minSummer14.961240minSummer14.961360minSummer9.197600minSummer7.854720minSummer5.6251440minSummer5.6251440minSummer3.1582880minSummer1.9205760minSummer1.5607200minSummer1.328	Event (mm/hr.) Volume (m³) 15 min Summer 85.194 0.0 30 min Summer 58.879 0.0 60 min Summer 38.241 0.0 120 min Summer 24.118 0.0 180 min Summer 18.261 0.0 240 min Summer 14.961 0.0 360 min Summer 11.264 0.0 360 min Summer 9.197 0.0 600 min Summer 7.854 0.0 720 min Summer 5.625 0.0 960 min Summer 3.158 0.0 2160 min Summer 3.158 0.0 2880 min Summer 1.920 0.0 5760 min Summer 1.328 0.0	Event(mm/hr)Volume (m³)Volume (m³)15minSummer85.1940.02730minSummer58.8790.04060minSummer38.2410.067120minSummer24.1180.091180minSummer18.2610.0106240minSummer14.9610.0118360minSummer11.2640.0136480minSummer9.1970.0149600minSummer7.8540.0160720minSummer5.6250.01651440minSummer3.1580.0289280minSummer2.5700.03034320minSummer1.9200.02755760minSummer1.3280.0451	Event(mm/hr)Volume (m³)Volume (m³)(m³)(minstand)15 min Summer85.1940.027.330 min Summer58.8790.040.160 min Summer38.2410.067.0120 min Summer24.1180.091.0180 min Summer18.2610.0106.2240 min Summer14.9610.0118.1360 min Summer11.2640.0136.2480 min Summer9.1970.0149.9600 min Summer7.8540.0160.9720 min Summer5.6250.0165.61440 min Summer3.1580.0289.72880 min Summer2.5700.0303.624320 min Summer1.9200.0275.545760 min Summer1.5600.0436.947200 min Summer1.3280.0451.7	Event(nm/hr)Volume (m³)Volume (m³)(mins)15 min Summer85.1940.027.32230 min Summer58.8790.040.13660 min Summer38.2410.067.066120 min Summer24.1180.091.0124180 min Summer18.2610.0106.2184240 min Summer14.9610.0118.1244360 min Summer11.2640.0136.2364480 min Summer9.1970.0149.9484600 min Summer7.8540.0160.9604720 min Summer5.6250.0165.69641440 min Summer3.1580.0289.721602880 min Summer2.5700.0303.628804320 min Summer1.9200.0275.540205760 min Summer1.5600.0436.94792

O'Connor Sut	ton Croni	n						Page 2
9 Prussia St	reet							
Dublin 7								
Ireland								Micco
Date 14/03/2	2019 14.53	3	Desi	aned h	y niall.	ncmenam	in	- Micro
				ked by	_	licilicitali	± 11	Drainad
File Catchme		iscaue.cas				<u> </u>		
XP Solutions	5		Sour	ce Con	trol 201	8.1		
Cass	ada Cumma	ry of Resu	lta fo	r Catal	amontWoat	Crown		aray
<u>Casca</u>	ade Sullilla	<u>ry or rest</u>	<u>iits io</u>	I Calli	Illentwest		лечет	<u>.SICX</u>
	Storm	Max Max	Ma	ax	Max	Max	Max	Status
:	Event	Level Dept	h Infilt	ration (Control E	Outflow	Volume	
		(m) (m)	(1,	/s)	(1/s)	(l/s)	(m³)	
0.640		1 204 0 05	0	0.0	1 0	1 0	64.0	0.77
		1.324 0.05		0.0	1.0	1.0	64.8	ОК
		1.321 0.05		0.0	1.0	1.0	61.8 25.6	ок ок
		1.288 0.02		0.0	1.0	1.0	25.6 35.0	0 K
		1.305 0.04		0.0	1.0	1.0	35.0 44.6	0 K
		1.314 0.04		0.0	1.0	1.0	44.0 54.3	0 K
		1.314 0.04		0.0	1.0	1.0	54.3 60.0	0 K
		1.323 0.05		0.0	1.0	1.0	60.0 64.0	0 K
		1.328 0.06		0.0	1.0	1.0	69.4	0 K
		1.331 0.06		0.0	1.0	1.0	72.9	0 K
		1.333 0.06		0.0	1.0	1.0	75.4	0 K
		1.335 0.07		0.0	1.0	1.0	77.2	O K
		1.337 0.07		0.0	1.0	1.0	80.0	0 K
		1.342 0.07		0.0	1.0	1.0	84.6	0 K
		1.345 0.08		0.0	1.0	1.0	88.8	ОК
		1.348 0.08		0.0	1.0	1.0	91.2	ОК
		1.349 0.08		0.0	1.0	1.0	92.5	
		1.347 0.08		0.0	1.0	1.0	90.7	O K
		1.343 0.07		0.0	1.0	1.0	86.4	O K
		1.339 0.07		0.0				0 K
	IUTII MTHCET	1.000 0.07	4	0.0	1.0	1.0		
		1.335 0.07		0.0	1.0 1.0	1.0 1.0	77.1	ОК
	min Winter			0.0		1.0	77.1	
	min Winter	1.335 0.07	0	0.0 Flooded	1.0	1.0	77.1 eak	
	min Winter	1.335 0.07 Storm	0 Rain	0.0 Flooded	1.0 Discharge	1.0 • Time-Pe	77.1 eak	
	min Winter	1.335 0.07 Storm Event	O Rain (mm/hr)	0.0 Flooded Volume (m ³)	1.0 Discharge Volume (m³)	1.0 • Time-Pa (mins	77.1 Sak)	
	min Winter	1.335 0.07 Storm Event min Summer	0 Rain (mm/hr) 1.164	0.0 Flooded Volume (m ³) 0.0	<pre>1.0 Discharge Volume (m³) 459.2</pre>	1.0 • Time-Po (mins 2 6:	77.1	
	min Winter 8640 10080	1.335 0.07 Storm Event min Summer min Summer	0 Rain (mm/hr) 1.164 1.041	0.0 Flooded Volume (m ³) 0.0 0.0	1.0 Discharge Volume (m ³) 459.2 460.	1.0 • Time-Po (mins 2 6: 7 7:	77.1 eak) 3884 160	
	min Winter 8640 10080 15	1.335 0.07 Storm Event min Summer min Summer min Winter	0 Rain (mm/hr) 1.164 1.041 85.194	0.0 Flooded Volume (m ³) 0.0 0.0 0.0	1.0 Discharge Volume (m ³) 459.2 460. 31.4	1.0 Time-Pa (mins 2 6: 7 7: 4	77.1	
	min Winter 8640 10080 15 30	1.335 0.07 Storm Event min Summer min Summer min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0	1.0 Discharge Volume (m ³) 459.2 460. 31.4 46.6	1.0 Time-Pa (mins 2 6: 7 7: 4 6	77.1 ak) 384 160 22 36	
	min Winter 8640 10080 15 30 60	1.335 0.07 Storm Event min Summer min Summer min Winter min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0	1.0 Discharge Volume (m ³) 459.2 460. 31.4 46.6 78.5	1.0 Time-Pa (mins 2 6: 7 7: 4 5	77.1 Sak) 3884 160 22 36 64	
	min Winter 8640 10080 15 30 60 120	1.335 0.07 Storm Event min Summer min Winter min Winter min Winter min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 46.6 78.5 105.0	1.0 Time-Pa (mins 2 6: 7 7: 4 5 0 :	77.1 ak) 384 160 22 36 64 122	
	min Winter 8640 10080 15 30 60 120 180	1.335 0.07 Storm Event min Summer min Winter min Winter min Winter min Winter min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 46.6 78.5 105.0 122.6	1.0 Time-Pa (mins 2 6: 7 7: 4 5 5 6 5 6 5 5 5 5 5 5 5 5 5 5 5 5 5	77.1 ak) 384 160 22 36 64 122 182	
	min Winter 8640 10080 15 30 60 120 180 240	1.335 0.07 Storm Event min Summer min Winter min Winter min Winter min Winter min Winter min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 46.6 78.5 105.6 122.6 136.3	1.0 Time-Pa (mins 2 6. 7 7: 4 5 5 8 8 8 1.0	77.1 Sak) 3884 160 22 36 64 122 182 240	
	min Winter 8640 10080 15 30 60 120 180 240 360	1.335 0.07 Storm Event min Summer min Winter min Winter min Winter min Winter min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 46.6 78.5 105.6 122.6 136.2 157.2	1.0 Time-Pa (mins 2 6. 7 7: 4 5 5 2 . 2 . 3 . 2 . 3 . 2 . 4 . 5 . 5 . 5 . 6 . 7 . 7 . 4 . 5 . 5 . 6 . 7 . 7 . 4 . 5 . 6 . 7 . 7 . 4 . 5 . 6 . 7 . 7 . 4 . 5 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7	77.1 Sak) 384 160 22 36 64 122 182 240 360	
	min Winter 8640 10080 15 30 60 120 180 240 360 480	1.335 0.07 Storm Event min Summer min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 31.4 46.6 78.5 105.0 122.6 136.2 157.2 169.0	1.0 Time-Pa (mins 2 6. 7 7: 4 5 5 5 2 5 5 5 5 5 5 5 5 5 5 5 5 5	77.1 Sak) 3884 160 22 36 64 122 182 240 360 478	
	min Winter 8640 10080 15 30 60 120 180 240 360 480 600	1.335 0.07 Storm Event min Summer min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 31.4 46.6 78.5 105.6 122.6 136.2 157.2 169.6	1.0 Time-Pa (mins 2 6. 7 7: 4 5 5 5 2 5 5 5 5 5 5 5 5 5 5 5 5 5	77.1 Sak) 384 160 22 36 64 122 182 240 360	
	min Winter 8640 10080 15 30 60 120 180 240 360 480 600 720	1.335 0.07 Storm Event min Summer min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 78.5 105.0 122.6 136.2 157.2 169.0 168.5	1.0 Time-Pa (mins 2 6. 7 7: 4 5 5 5 2 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	77.1 Sak) 3884 160 22 36 64 122 182 240 360 478 596	
	min Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960	1.335 0.07 Storm Event min Summer min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 78.5 105.0 122.6 136.2 157.2 169.0 169.0 168.5 167.6	1.0 Time-Pa (mins 2 6. 7 7: 4 5 5 5 5 5 5 5 5 5 5 5 5 5	77.1 ak) 384 160 22 36 64 122 182 240 360 478 596 714	
	min Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440	1.335 0.07 Storm Event min Summer min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 78.5 105.0 122.6 136.5 157.2 169.0 169.0 168.5 167.6	1.0 Time-Pa (mins 2 6. 7 7 4 5 5 2 2 5 1 5 1 5 1	77.1 ak) 384 160 22 36 64 122 182 240 360 478 596 714 952	
	min Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160	1.335 0.07 Storm Event min Summer min Summer min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 78.5 105.0 122.6 136.5 157.2 169.0 169.0 168.5 167.6 162.5 322.5	1.0 Time-Pa (mins 2 6. 7 7 4 5 5 2 2 5 1 7 2 5 1 7 2 5 1 7 2 5 1 7 2 5 1 7 2 5 1 7 2 5 1 7 2 5 5 1 7 2 5 5 1 7 1 5 5 5 1 7 1 5 5 5 1 7 1 5 5 5 5 5 5 5 5 5 5 5 5 5	77.1 ak) 384 160 22 36 64 122 182 240 360 478 596 714 352 426	
	min Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880	1.335 0.07 Storm Event min Summer min Summer min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216 3.158	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 78.5 105.0 122.6 136.5 157.2 169.0 169.0 168.5 167.6 162.5 322.3	1.0 Time-Pa (mins 2 6. 7 72 4 5 5 2 5 1 7 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3	77.1 ak) 384 160 22 36 64 122 182 240 360 478 596 714 352 426 128	
	min Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320	1.335 0.07 Storm Event min Summer min Summer min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 78.5 105.0 122.6 136.5 157.2 169.0 169.0 168.5 167.6 162.5 322.3 312.2	1.0 Time-Pa (mins 2 6. 7 7: 4 5 5 1.0 2 6 5 1.0 7 2 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	77.1 ak) 3884 160 22 36 64 122 182 240 360 478 596 714 952 426 128 328	
	min Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760	1.335 0.07 Storm Event min Summer min Summer min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 78.5 105.0 122.6 136.5 157.2 169.0 168.5 167.6 168.5 167.6 162.5 322.7 312.2 287.4 499.0	1.0 Time-P (mins (mins 2 6. 7 7: 4 5 5 5 5 5 5 5 5 5 5 5 5 5	77.1 Sak) 3884 160 22 36 64 122 182 240 360 478 596 714 952 426 128 328 196	
	min Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760 7200	1.335 0.07 Storm Event min Summer min Winter min Winter	Rain (mm/hr) 1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920 1.560	0.0 Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.0 Discharge Volume (m ³) 459.2 460. 31.4 460. 31.4 46.6 78.5 105.0 122.6 136.3 157.2 169.0 169.0 169.0 168.5 167.6 162.5 322.3 312.3 287.4 499.0	1.0 Time-P (mins (mins 2 6. 7 7: 4 5 5 5 5 5 5 5 5 5 5 5 5 5	77.1 ak) 384 160 22 36 64 122 182 240 360 478 596 714 952 426 128 328 196 520	

©1982-2018 Innovyze

Connor Sutton Cronin						Page 3
9 Prussia Street						
Dublin 7						
reland						— Micro
ate 14/03/2019 14:53		Desig	ned by	v nial	l.mcmenamin	Drainago
'ile CatchmentWest_Cascade.c	casx	Check	ed by			Diamag
IP Solutions		Sourc	e Cont	crol 20	018.1	I
<u>Cascade Rainfall De</u>	tails	for (Catchm	entWes	—	
Rainfall Model Return Period (years)			FSF 100	२)	Winter Storms Cv (Summer)	
-	Scotlar	nd and			Cv (Winter)	
M5-60 (mm)			16.200) Short	est Storm (mins)	15
Ratio R Summer Storms					est Storm (mins) Climate Change %	
	<u>Tim</u>	e Area	a Diag	ram		
			(ha) 0		_	
Time From:			Time From:	(mins) To:		
0	4	0.100	4	8	0.050	
	©198	2-2018	3 Inno	vyze		

'Connor Sutton Cr	onin				Pa	ge 4
Prussia Street					ſ	
ublin 7						
reland					N	
ate 14/03/2019 14	:53	Designe	d by nial	l.mcmenamin	1	licro
ile CatchmentWest		_	-			rainag
P Solutions			Control 2	2018 1		
	Model Detail				alercy	
				_	<u>CI.BICA</u>	
	-	3 Online Cove				
	<u>Cellı</u>	<u>ilar Storac</u>	ge Struct	<u>ure</u>		
	Ir tion Coefficie tion Coefficie	ent Base (m/h	nr) 0.00000			
Depth (m) A	rea (m²) Inf.	Area (m ²) De	epth (m) Ai	cea (m²) Inf.	Area (m²)	
0.000 0.085	1200.0 1200.0	0.0	0.086	0.0	0.0	1
	<u>Hydro-Brak</u>	<u>e® Optimun</u>	n Outflow	Control		
	U	nit Referenc	e MD-SHE-0	045-1000-1200	-1000	
	De	sign Head (m)		1.200	
	Desi	gn Flow (l/s		_	1.0	
		Flush-Flo		Calcu e upstream st		
		Applicatio		-	rface	
	S	ump Availabl		24	Yes	
		Diameter (mm)		45	
		ert Level (m			0.150	
	m Outlet Pipe ested Manhole				75 1200	
Sugg	ested Mannore	Diametei (mm	.)		1200	
	Control	Points	Head (m)	Flow (l/s)		
	Design Point			1.0		
		Flush-Flo ^T		0.7		
	Mean Flow ove	Kick-Flo		0.6 0.8		
	Mean FIOW OVE	er neau kange	-	0.0		
The hydrological ca						-
Hydro-Brake® Optimu Hydro-Brake Optimum invalidated	-					
Depth (m) Flow (1/	s) Depth (m) H	Flow (l/s) D	epth (m) Fl	low (l/s) Dep	th (m) Flo	ow (l/s)
0.100 0	.7 1.200	1.0	3.000	1.5	7.000	2.2
0.200 0	.7 1.400	1.1	3.500	1.6	7.500	2.3
	.7 1.600	1.1	4.000	1.7	8.000	2.4
	.6 1.800	1.2	4.500	1.8	8.500	2.4
	.7 2.000 .7 2.200	1.3	5.000 5.500	1.9	9.000 9.500	2.5 2.6
	.8 2.400	1.3	5.500 6.000	2.0	000.00	∠.0
	.9 2.600	1.4	6.500	2.2		

O'Connor Sutton Cron	in						Page 1	
9 Prussia Street								
Dublin 7								
Ireland							Micco	1
Date 14/03/2019 15:3	1	Des	igned h	y niall.	mcmenam	in	— Micro	
			-	-	memerian		Draina) [[
File CatchmentCentra			cked by		0 1			
XP Solutions		Sou	rce Con	trol 201	8.1			
<u>Cascade Summa</u>	-		<u>r Catch</u>	nmentCent	ral_Roc		l.srcx	
Upstre Structu		Out	IIOW TO		Overila	OT WC		
(No	ne) Catchme	entCentra	al_Ground	dLevel.src>	x (1	None)		
				7 minutes.				
Storm Event	Max Max Level Dept (m) (m)	th Infil	Max tration L/s)	Max Control Σ (l/s)	Max Outflow (1/s)	Max Volume (m³)	Status	
15 min Summer	40.012 0.02	12	0.0	0.1	0.1	75.6	ОК	
30 min Summer			0.0	0.1		118.2		
60 min Summer			0.0	0.2		164.0		
120 min Summer			0.0	0.4		215.3		
180 min Summer 240 min Summer			0.0	0.6 0.7		247.9 272.6		
360 min Summer			0.0	0.8		308.9		
480 min Summer			0.0	0.9		335.4		
600 min Summer	40.056 0.05	56	0.0	1.0	1.0	356.0	0 K	
720 min Summer			0.0	1.1		372.5		
960 min Summer			0.0	1.2		397.5		
1440 min Summer 2160 min Summer			0.0	1.3 1.5		428.2 449.3		
2880 min Summer			0.0	1.5		462.5		
4320 min Summer			0.0	1.6		479.0		
5760 min Summer	40.077 0.07	77	0.0	1.6	1.6	486.6	O K	
7200 min Summer	40.077 0.07	77	0.0	1.6	1.6	488.8	0 K	
	Storm	Rain	Flooded	Discharge	e Time-Pe	ak		
	Event	(mm/hr)	Volume	Volume	(mins)		
			(m³)	(m³)				
15	min Summer	85.194	0.0	4.4	. 1	.22		
	min Summer	58.879				.31		
	min Summer					46		
	min Summer					.84		
	min Summer					230		
	min Summer min Summer	14.961 11.264				84 94		
	min Summer	9.197				508		
	min Summer	7.854				522		
	min Summer	6.901				38		
	min Summer					72		
	min Summer	4.216				44		
	min Summer min Summer	3.158 2.570				84 804		
	min Summer min Summer	2.570				504 156		
	min Summer					372		
	min Summer	1.328				88		
	C	1982-20	018 Inn	ovyze				

onnor Sutt russia Str												
lin 7												
land									– Micr			
e 14/03/20				Desig	ned b	y niall.m	ncmenam	in	Drai			
e Catchmen	tCentra	l_Casc	ad	Check	Checked by							
KP Solutions					Source Control 2018.1							
<u>Cascad</u>	e Summa:	ry of I	Result	s for	Catch	mentCent:	ral_Roo	fLevel	.srcx			
Storm Max Max				Max	ĸ	Max	Max	Max	Status			
Eve	ent					Control S						
		(m)	(m)	(1/:		(1/s)	(1/s)	(m³)				
9640 mi		40 077	0 077		0 0	1 C	1 C	407 0	0 12			
	n Summer n Summer				0.0 0.0	1.6 1.6	1.6	487.9 484.9				
	n Winter				0.0	0.1		89.0				
	n Winter				0.0	0.1		89.0 136.8				
	n Winter				0.0			136.8				
	n Winter							245.2				
					0.0							
	n Winter				0.0 0.0	0.7	0.7					
	n Winter						0.8					
	n Winter				0.0			350.6				
	n Winter				0.0	1.1		380.3				
	n Winter				0.0	1.2	1.2					
	n Winter				0.0	1.3		422.1				
	n Winter				0.0			450.2				
	n Winter				0.0			485.1				
	n Winter				0.0			510.0				
	n Winter				0.0			522.0				
4320 mi	n Winter	40.085	0.085		0.0	1.9	1.9	536.7	O K			
5760 mi	n Winter	40.085	0.085		0.0		1.9	539.1	O K			
7200 mi	n Winter	40.085	0.085		0.0	1.9			ОК			
			0.000		0.0	1.9	1.9	535.4	0 10			
	n Winter	40.084			0.0			535.4 528.6				
8640 mi			0.084					528.6				
8640 mi	n Winter	40.082	0.084 0.082		0.0	1.8 1.8	1.8 1.8	528.6 520.2	ΟK			
8640 mi	n Winter	40.082 Storm	0.084 0.082		0.0 0.0	1.8 1.8 Discharge	1.8 1.8 • Time-Pe	528.6 520.2	ΟK			
8640 mi	n Winter	40.082	0.084 0.082		0.0	1.8 1.8	1.8 1.8	528.6 520.2	ΟK			
8640 mi	n Winter n Winter	40.082 Storm	0.084 0.082		0.0 0.0 Clooded Volume	1.8 1.8 Discharge Volume (m ³)	1.8 1.8 • Time-Pe (mins	528.6 520.2	ΟK			
8640 mi	n Winter n Winter 8640	40.082 Storm Event	0.084 0.082 (m	m/hr) v	0.0 0.0 Clooded Volume (m ³)	<pre>1.8 1.8 1.8 Discharge Volume (m³) 495.8</pre>	1.8 1.8 • Time-Pe (mins	528.6 520.2	ΟK			
8640 mi	n Winter n Winter 8640 10080	40.082 Storm Event min Sur	0.084 0.082 (m nmer nmer	nm/hr) v 1.164	0.0 0.0 Clooded Volume (m ³) 0.0	1.8 1.8 Discharge Volume (m ³) 495.8 480.3	1.8 1.8 • Time-Pe (mins 5 5 6 3	528.6 520.2	ΟK			
8640 mi	n Winter n Winter 8640 10080 15	40.082 Storm Event min Sur min Sur	0.084 0.082 (m nmer nmer ater 8	m/hr) v 1.164 1.041	0.0 0.0 Clooded Volume (m ³) 0.0 0.0	1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0	1.8 1.8 • Time-Pe (mins 5 5 63	528.6 520.2	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30	40.082 Storm Event min Sur min Sur min Wir min Wir	0.084 0.082 (m nmer nmer nter 8 nter 5	1.164 1.041 35.194 58.879	0.0 0.0 Volume (m ³) 0.0 0.0 0.0	1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4	1.8 1.8 Time-Pe (mins 55 63 1	528.6 520.2 eak	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30 60	40.082 Storm Event min Sur min Sur min Win min Win min Win	0.084 0.082 (m nmer nmer ater 8 ater 5 ater 3	m/hr) 1.164 1.041 35.194 58.879 88.241	0.0 0.0 Volume (m ³) 0.0 0.0 0.0 0.0 0.0	1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3	1.8 1.8 Time-Pe (mins 55 63 1 1 1	528.6 520.2 eak) 228 522 23 30 46	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30 60 120	40.082 Storm Event min Sur min Sur min Wir min Wir	0.084 0.082 (m nmer nmer ater 8 ater 5 ater 3 ater 2	1.164 1.041 35.194 58.879 58.241 24.118	0.0 0.0 Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0	1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3 69.3	1.8 1.8 Time-Pe (mins 55663 1 1 1 1 1	528.6 520.2 eak 528 522 23 30 46 84	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30 60 120 180	40.082 Storm Event min Sur min Wir min Wir min Wir min Wir min Wir	0.084 0.082 (m nmer nmer ater 8 ater 5 ater 3 ater 2 ater 1	1.164 1.041 85.194 88.879 88.241 24.118 .8.261	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.8 1.8 1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3 69.3 87.7	1.8 1.8 Time-Pe (mins 55663 1 1 1 1 2	528.6 520.2 eak 522 23 30 46 84 30	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30 60 120 180 240	40.082 Storm Event min Sur min Wir min Wir min Wir min Wir min Wir min Wir	0.084 0.082 (m nmer nmer ater 8 ater 5 ater 3 ater 2 ater 1 ater 1	1.164 1.041 35.194 38.241 24.118 24.118 24.261 4.961	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3 69.3 87.7 100.7	1.8 1.8 Time-Pe (mins 55 63 1 1 1 1 2 2 2	528.6 520.2 eak 522 23 30 46 84 30 80	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30 60 120 180 240 360	40.082 Storm Event min Sur min Wir min Wir min Wir min Wir min Wir min Wir min Wir min Wir	0.084 0.082 (m nmer nter 8 nter 5 nter 3 nter 2 nter 1 nter 1 nter 1	1.164 1.041 35.194 38.241 24.118 8.261 4.961 1.264	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3 69.3 87.7 100.7 118.6	1.8 1.8 Time-Pe (mins 55 63 1 1 1 2 2 3	528.6 520.2 eak 522 23 30 46 84 30 80 88	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30 60 120 180 240 360 480	40.082 Storm Event min Sur min Sur min Wir min Wir min Wir min Wir min Wir min Wir min Wir min Wir min Wir	0.084 0.082 (m nmer nter 8 nter 5 nter 3 nter 2 nter 1 nter 1 nter 1 nter 1	1.164 1.041 35.194 38.241 24.118 8.261 4.961 1.264 9.197	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3 69.3 87.7 100.7 118.6 131.6	1.8 1.8 Time-Pe (mins 55 63 1 1 1 2 2 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	528.6 520.2 eak 522 23 30 46 84 30 80 88 00	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30 60 120 180 240 360 480 600	40.082 Storm Event min Sur min Sur min Wir min Wir	0.084 0.082 (m nmer nter 8 nter 5 nter 3 nter 2 nter 1 nter 1 nter 1 nter 1 nter 1	1.164 1.041 35.194 38.241 24.118 8.261 4.961 1.264 9.197 7.854	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3 69.3 87.7 100.7 118.6 131.6 141.9	1.8 1.8 Time-Pe (mins 55 63 1 1 2 2 3 5 5 6 3 5 6 6 3 1 2 2 3 5 5 6 6 3 1 2 2 3 5 5 5 6 3 1 2 2 3 5 5 5 6 3 1 2 2 6 3 1 2 2 5 5 5 5 5 5 5 5 6 3 1 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	528.6 520.2 eak 522 23 30 46 84 30 88 80 88 900 12	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30 60 120 180 240 360 480 600 720	40.082 Storm Event min Sur min Sur min Wir min Wir	0.084 0.082 (m nmer nter 8 nter 5 nter 3 nter 1 nter 1 nter 1 nter 1 nter 1 nter nter	1.164 1.041 35.194 38.879 38.241 24.118 8.261 4.961 1.264 9.197 7.854 6.901	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.8 1.8 Time-Pe (mins 55 63 1 1 2 2 3 5 5 6 7	528.6 520.2 eak 522 23 30 46 84 30 88 900 12 26	ΟK			
8640 mi	n Winter n Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960	40.082 Storm Event min Sur min Sur min Wir min Wir	0.084 0.082 (m nmer nter 8 nter 5 nter 3 nter 1 nter 1 nter 1 nter 1 nter 1 nter nter nter	1.164 1.041 35.194 38.241 24.118 8.261 4.961 1.264 9.197 7.854 6.901 5.625	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3 69.3 87.7 100.7 118.6 131.6 141.9 150.2 162.5	1.8 1.8 Time-Pe (mins 55 63 1 1 2 2 3 5 6 7 9 6 7 9	528.6 520.2 eak 522 23 30 46 84 30 88 900 512 26 55	ΟK			
8640 mi	n Winter n Winter N Winter 10080 15 30 60 120 180 240 360 480 600 720 960 1440	40.082 Storm Event min Sur min Sur min Wir min Wir	0.084 0.082 (m nmer nter 8 nter 5 nter 3 nter 1 nter 1 nter 1 nter 1 nter 1 nter nter nter nter	1.164 1.041 35.194 88.879 88.241 24.118 8.261 1.264 9.197 7.854 6.901 5.625 4.216	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3 69.3 87.7 100.7 118.6 131.6 141.9 150.2 162.5 174.4	1.8 1.8 Time-Pe (mins 55 63 1 1 2 2 3 5 6 3 1 1 2 2 3 5 6 7 9 1 4	528.6 520.2 pak 528 52 23 30 46 84 30 88 900 12 26 556 908	ΟK			
8640 mi	n Winter n Winter N Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160	40.082 Storm Event min Sur min Sur min Wir min Wir	0.084 0.082 (m nmer nter 8 nter 3 nter 3 nter 1 nter 1 nter 1 nter 1 nter 1 nter nter nter nter nter nter	m/hr) 1.164 1.041 35.194 38.241 24.118 8.261 4.961 1.264 9.197 7.854 6.901 5.625 4.216 3.158	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 Discharge Volume (m ³) 495.8 480.3 6.0 13.4 43.3 69.3 87.7 100.7 118.6 131.6 141.9 150.2 162.5 174.4 335.9	1.8 1.8 Time-Pe (mins 55 63 1 1 2 2 3 5 6 3 1 1 2 2 3 5 6 7 9 9 1 4 2 0 2 1 2 2 3 5 5 1 4 2 2 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	528.6 520.2 pak 528 522 23 30 46 84 30 88 900 12 26 56 98 944	ΟK			
8640 mi	n Winter n Winter N Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880	40.082 Storm Event min Sur min Sur min Wir min Wir	0.084 0.082 (m nmer nter 8 nter 3 nter 3 nter 1 nter 1 nter 1 nter 1 nter 1 nter nter nter nter nter nter	1.164 1.041 35.194 38.879 38.241 24.118 38.261 4.961 1.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570	0.0 0.0 Plooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.8 1.8 Time-Pe (mins 55 63 1 1 2 2 3 5 6 3 1 1 2 2 3 5 6 3 1 1 2 2 3 5 5 6 3 1 1 2 2 3 5 5 5 6 3 1 1 2 2 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	528.6 520.2 pak 528 522 23 30 46 84 30 88 900 12 26 56 98 94 44 16	ΟK			
8640 mi	n Winter n Winter N Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320	40.082 Storm Event min Sur min Sur min Wir min Wir	0.084 0.082 (m nmer nter 8 nter 5 nter 3 nter 1 nter 1 nter 1 nter 1 nter 1 nter nter nter nter nter nter nter nter	1.164 1.041 3.041 3.194 3.879 3.8241 4.118 3.261 1.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920	0.0 0.0 2looded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.8 1.8 Time-Pe (mins 55 63 1 1 2 2 3 5 6 3 1 1 2 2 3 3 5 6 3 1 1 2 2 3 3 5 5 6 3 1 1 2 2 3 3 5 5 5 5 6 3 1 1 2 2 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	528.6 520.2 pak 528 522 23 30 46 84 30 88 900 12 26 556 908 944 916 16	ΟK			
8640 mi	n Winter n Winter N Winter 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760	40.082 Storm Event min Sur min Sur min Sur min Wir min Wir	0.084 0.082	1.164 1.041 3.041 3.194 3.879 3.241 4.118 3.261 4.961 1.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920 1.560	0.0 0.0 2looded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.8 1.8 1.8 Time-Pet (mins 55 63 1 1 2 2 3 5 6 6 7 9 1 4 2 2 3 5 6 6 7 9 1 4 2 2 3 2 4 1 1 1 1 1 1 1 1 1 1 1 1 1	528.6 520.2 pak 528 522 23 30 46 84 30 88 900 12 26 556 944 956 944 916 16 20	ΟK			
8640 mi	n Winter n Winter % 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760 7200	40.082 Storm Event min Sur min Sur min Sur min Wir min Wir	0.084 0.082	<pre>1.164 1.041 1.041 35.194 38.241 24.118 8.261 4.961 1.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920 1.560 1.328</pre>	0.0 0.0 2looded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.8 1.8 Time-Pet (mins 55 63 1 1 2 2 3 5 6 3 1 1 2 2 3 3 5 5 6 3 1 1 2 2 3 3 5 5 6 3 1 1 2 2 3 3 5 5 5 5 6 3 1 1 2 2 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	528.6 520.2 pak 528 522 23 30 46 84 30 88 900 12 26 556 944 16 16 20 900	ΟK			
8640 mi	n Winter n Winter % 8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760 7200 8640	40.082 Storm Event min Sur min Sur min Sur min Wir min Wir	0.084 0.082	1.164 1.041 3.041 3.194 3.879 3.241 4.118 3.261 4.961 1.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920 1.560	0.0 0.0 2looded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	1.8 1.8 1.8 Time-Pet (mins 55 63 1 1 1 2 2 3 5 6 7 9 1 4 2 2 3 5 6 7 9 1 4 2 2 3 5 5 6 3 1 1 1 1 1 1 1 1 1 1 1 1 1	528.6 520.2 pak 528 522 23 30 46 84 30 88 900 12 26 556 944 956 944 916 16 20	ΟK			

©1982-2018 Innovyze

O'Con	nor Su	tton Cro	nin							Pag	je 3
9 Pru	ssia S	treet									
Dubli											
Irela	-	0010 15	0.1							— Mi	icro
		2019 15:]	-	-	y nial	l.mcmena	min	Dr	ainago
	Catchm lution	entCentr	al_Ca	scad			trol 2	<u></u>			
AP 50		5			Sourc	e com	2101 2	JI0.I			
	Cas	<u>cade Rai</u>	nfall	Detai	<u>ls for C</u>	atchm	<u>entCen</u>	tral_Roo	fLeve	l.srcx	
	Date		all Mod			FS:		Winter			
	Ret	urn Perioo	-		land and	10 Irelan				0.750 0.840	
		M	5-60 (m	m)		16.20	0 Short	est Storm	(mins)	15	
		Summe	Ratio er Stor			0.27 Ye	-	est Storm Climate Ch			
					<u>Green</u>	<u>Roof</u>					
		Depre	ssion \$	Area Storage	(m ³) 708 (mm)			(mm/day) efficient	3 0.050		
Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0 4		0.128658 0.105336	32 36		0.025976	1		0.005244			0.001059
4		0.086242	40		0.021207			0.003515		108	0.00071
12		0.070609	44		0.014256	1		0.002878		112	0.00058
16 20		0.057810	48 52		0.011672 0.009556			0.002356		116	0.00047
24		0.038751	56		0.007824	88		0.001580			
28	32	0.031727	60	64	0.006405	92	96	0.001293			

O'Connor Sutton Cronin				Page 4
9 Prussia Street				
Dublin 7				
Ireland				Micco
Date 14/03/2019 15:31	Design	ed by nial	l.mcmenamir	
	Checke	-		[°] Drainage
 XP Solutions		Control 2	018.1	
Cascade Model Details	for Cat	chmentCent:	ral_RoofLev	vel.srcx
Storage is Or	line Cov	ver Level (m)	40.500	
		ige Structu		
Tatio	rt Ievel	(m) 40 000	Safety Facto	r 20
Infiltration Coefficient Infiltration Coefficient	Base (m/	'hr) 0.00000	-	
Depth (m) Area (m²) Inf. Ar	ea (m²)	Depth (m) Ar	ea (m²) Inf.	Area (m²)
0.000 6800.0 0.085 6800.0	0.0	0.086	0.0	0.0
Orifi	ce Outf	low Control	1	
Diameter (m) 0.064 Discharge	e Coeffic	ient 0.600 I	invert Level	(m) 40.000
@1 Q	92-2019	Innovyze		

Connor Suttor Prussia Stree		111							Page 1
	: L								
blin 7									
eland		_		ļ					— Micro
te 14/03/2019					-	y niall.	mcmenar	nin	Draina
le Catchment(Centra	1_Casc	ad						Втанк
Solutions				Sour	rce Con	trol 201	.8.1		
<u>Cascade</u> S	Summar	y of Re	esults	for	Catchm	entCent:	ral_Gro	undLev	el.srcx
		Մբ	ostream		с	outflow To	• Overflo	ом То	
		Str	ructures	8					
	Catchm	entCent	ral_Roo	fLeve	l.srcx	(None)	1)	lone)	
		Н	alf Dra	in Ti	me : 965	minutes.			
Stor	cm	Max	Max	Ма		Max	Max	Max	Status
Ever	nt		-			Control Σ			
		(m)	(m)	(1/	s)	(1/s)	(1/S)	(m³)	
15 min	Summer	1.288	0.023		0.0	3.0	3.0	97.0	O K
30 min	Summer	1.297	0.032		0.0	3.0	3.0	132.9	
		1.306				3.0		169.6	
120 min						3.1	3.1		
180 min					0.0	3.1 3.1	3.1	228.0	
240 min					0.0			242.5	
360 min					0.0	3.1	3.1	260.6	
480 min					0.0	3.1	3.1	270.9	
600 min					0.0	3.1	3.⊥	276.8	
720 min					0.0	3.1		279.8	
960 min					0.0	3.1	3.1	283.1	
1440 min					0.0	3.1 3.1	3.1	284.7	
2160 min 2880 min					0.0	3.1 3.1	3.1 2 1	282.1 277.8	
4320 min								265.4	
5760 min					0.0	3.1 3.1	3.1	250.4	
7200 min					0.0	3.1		233.9	
		Storm		ain		Discharg			
		Event	(mr	n/hr)	Volume (m³)	Volume (m³)	(mins	3)	
	1.5	min Sum	mer ⁸ '	5.194	0.0	105.	4	22	
		min Sum		3.879	0.0			36	
	60	min Sum		3.241	0.0			64	
	120	min Sum		4.118	0.0			124	
	180	min Sum	mer 18	3.261	0.0	327.	7	184	
	240	min Sum	mer 14	4.961	0.0	364.	1	244	
	360	min Sum	mer 11	1.264	0.0	417.	6	362	
		min Sum		9.197	0.0			482	
		min Sum		7.854	0.0			602	
		min Sum		5.901	0.0			722	
		min Sum		5.625	0.0			962	
		min Sum		4.216	0.0			440	
		min Sum		3.158	0.0			860	
		min Sum		2.570	0.0			284	
		min Sum		L.920	0.0			116	
		min Sum		L.560	0.0			976	
	1200	min Sum	uner 1	L.328	0.0	1252.	o 4	824	

'Connor Sutton Croni	ln	[Page 2
Prussia Street							
ublin 7							
reland							_ Micro
ate 14/03/2019 15:32	2	Desi	.gned b	y niall.m	ncmenam	iin	
ile CatchmentCentral	L_Cascad	. Chec	ked by				Drainag
XP Solutions		Sour	ce Con	trol 2018	.1		
Cascade Summary	<u>of Resul</u>	ts for	Catchm	<u>nentCentra</u>	al_Grou	undLeve	<u>el.srcx</u>
Storm	Max Max	М	ax	Max	Max	Max	Status
Event	Level Dept	h Infilt	ration	Control E (Outflow	Volume	
	(m) (m)	(1	/s)	(1/s)	(l/s)	(m³)	
SCAO min Cummon	1 217 0 05	2	0 0	2 1	2 1	216 6	O V
8640 min Summer 10080 min Summer			0.0 0.0	3.1 3.1		216.6 199.2	
15 min Winter			0.0	3.0		199.2	
30 min Winter			0.0	3.0		149.8	O K
60 min Winter			0.0	3.0		191.5	ОК
120 min Winter			0.0	3.1		234.8	ОК
180 min Winter			0.0	3.1		260.3	0 K
240 min Winter			0.0	3.1		278.1	0 K
360 min Winter			0.0	3.1		301.6	0 K
480 min Winter			0.0	3.1		316.6	0 K
600 min Winter			0.0	3.1		326.7	O K
720 min Winter	1.346 0.08	1	0.0	3.1	3.1	333.8	ΟK
960 min Winter			0.0	3.1	3.1	342.0	O K
1440 min Winter			0.0	3.1	3.1	348.2	ОК
2160 min Winter	1.350 0.08	5	0.0	3.1	3.1	351.5	ОК
2880 min Winter	1.349 0.08	4	0.0	3.1	3.1	346.4	O K
4320 min Winter	1.343 0.07	8	0.0	3.1	3.1	324.0	O K
5760 min Winter	1.338 0.07	3	0.0	3.1	3.1	301.5	O K
7200 min Winter			0.0	3.1	3.1	276.7	O K
8640 min Winter	1.326 0.06	1	0.0	3.1	3.1	250.5	O K
10080 min Winter	1.319 0.05	4	0.0	3.1	3.1	223.7	0 K
	Storm	Rain	Flooded	d Discharge	Time-P	eak	
				-			
:	Event	(mm/hr)	Volume (m³)		(mins	5)	
	Event		(m³)	(m³)	-	-	
8640	Event min Summer	1.164	(m³) 0.0	(m ³) 1287.7	5	624	
8640 10080	Event min Summer min Summer	1.164	(m³) 0.0 0.0	(m ³) 1287.7 1306.7	5	624 456	
8640 10080 15	Event min Summer min Summer min Winter	1.164 1.041 85.194	(m³) 0.0 0.0 0.0	(m ³) 1287.7 1306.7 119.0	5	624 456 21	
8640 10080 15 30	Event min Summer min Summer min Winter min Winter	1.164 1.041 85.194 58.879	(m³) 0.0 0.0 0.0	(m ³) 1287.7 1306.7 119.0 167.6	5	624 456 21 36	
8640 10080 15 30 60	Event min Summer min Summer min Winter min Winter min Winter	1.164 1.041 85.194 58.879 38.241	(m ³) 0.0 0.0 0.0 0.0	(m ³) 1287.7 1306.7 119.0 167.6 244.3	5	624 456 21 36 64	
8640 10080 15 30 60 120	Event min Summer min Summer min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0	(m ³) 1287.7 1306.7 119.0 167.6 244.3 2323.3	5	624 456 21 36	
8640 10080 15 30 60 120 180	Event min Summer min Summer min Winter min Winter min Winter min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6	5	624 456 21 36 64 122	
8640 10080 15 30 60 120 180 240	Event min Summer min Summer min Winter min Winter min Winter min Winter min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 0 416.4	5	624 456 21 36 64 122 182	
8640 10080 15 30 60 120 180 240 360	Event min Summer min Summer min Winter min Winter min Winter min Winter min Winter min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2	5	624 456 21 36 64 122 182 240	
8640 10080 15 30 60 120 180 240 360 480	Event min Summer min Summer min Winter min Winter min Winter min Winter min Winter min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2	5	624 456 21 36 64 122 182 240 358	
8640 10080 15 30 60 120 180 240 360 480 600	Event min Summer min Summer min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3	5	624 456 21 36 64 122 182 240 358 474	
8640 10080 15 30 60 120 180 240 360 480 600 720	Event min Summer min Summer min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3 524.3	5	624 456 21 36 64 122 182 240 358 474 590	
8640 10080 15 30 60 120 180 240 360 480 600 720 960	Event min Summer min Summer min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3 523.5	5	624 456 21 36 64 122 182 240 358 474 590 708	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440	Event min Summer min Summer min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3 524.3 524.3 523.5 516.4	5 6	624 456 21 36 64 122 182 240 358 474 590 708 942	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160	Event min Summer min Summer min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3 524.3 524.3 523.5 516.4 937.6	5 6 1 2	624 456 21 36 64 122 182 240 358 474 590 708 942 400	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880	Event min Summer min Summer min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3 524.3 524.3 523.5 516.4 937.6 987.9	5 6 1 2 2	624 456 21 36 64 122 182 240 358 474 590 708 942 400 076	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320	Event min Summer min Summer min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3 524.3 524.3 524.3 523.5 516.4 937.6 987.9 921.3	5 6 1 2 3	624 456 21 36 64 122 182 240 358 474 590 708 942 400 076 740	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760	Event min Summer min Summer min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920 1.560	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3 524.3 523.5 516.4 937.6 947.9 921.3 1370.8	5 6 1 2 3 4	624 456 21 36 64 122 182 240 358 474 590 708 942 400 076 740 648	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760 7200	Event min Summer min Summer min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920 1.560 1.328	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3 524.3 524.3 523.5 516.4 937.6 987.9 921.3 1370.8 1431.6	5 6 1 2 2 3 4 5	624 456 21 36 64 122 182 240 358 474 590 708 942 400 076 740 648 464	
8640 10080 15 30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760 7200 8640	Event min Summer min Summer min Winter min Winter	1.164 1.041 85.194 58.879 38.241 24.118 18.261 14.961 11.264 9.197 7.854 6.901 5.625 4.216 3.158 2.570 1.920 1.560 1.328	(m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(m ³) 1287.7 1306.7 119.0 167.6 244.3 323.3 376.6 416.4 475.2 520.2 524.3 524.3 523.5 516.4 937.6 947.9 921.3 1370.8 1431.6 1472.3	5 6 1 2 3 4 5 6	624 456 21 36 64 122 182 240 358 474 590 708 942 400 076 740 648 464 400	

O'Connor Sutton Cronin		Page 3
9 Prussia Street		
Dublin 7		
Ireland		Micco
Date 14/03/2019 15:32	Designed by niall.mcmenamin	- Micro
	Checked by	Drainage
—	Source Control 2018.1	
<u>Cascade Rainfall Details f</u>	or CatchmentCentral_GroundLeve	l.srcx
Rainfall Model Return Period (years) Region Scotlar M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms 100 Cv (Summer) ad and Ireland Cv (Winter) 16.200 Shortest Storm (mins) 0.279 Longest Storm (mins) Yes Climate Change %	0.750 0.840 15 10080
Tim	<u>e Area Diagram</u>	
Tota	l Area (ha) 0.632	
	Area Time (mins) Area (ha) From: To: (ha)	
0 4	0.500 4 8 0.132	
⊚1 α α	2-2018 Innovyze	

'Connor Sutton Cror	in				Pá	age 4
Prussia Street						
ublin 7						
reland					Ν	licro
ate 14/03/2019 15:3	32	Designe	d by nia	ll.mcmenami		
File CatchmentCentral Cascad Checked by						Irainag
P Solutions	_	Source	Control	2018.1		
<u>Cascade Mod</u>	el Details	for Catch	mentCent:	ral_GroundI	evel.src	<u>×</u>
	Storage is	Online Cove	er Level (m) 1.650		
	<u>Cellu</u>	lar Storac	<u>le Struct</u>	ure		
		nt Base (m/h	ir) 0.0000	5 Safety Fact) Porosi)		
Depth (m) Are	a (m²) Inf.	Area (m²) De	epth (m) A	rea (m²) Inf	. Area (m²))
	4500.0 4500.0	0.0	0.086	0.0	0.0)
	<u>Hydro-Brak</u>	<u>e® Optimum</u>	ı Outflow	Control		
	Uı	nit Referenc	e MD-SHE-(081-3100-120	0-3100	
		sign Head (m			1.200	
	Desig	gn Flow (l/s			3.1	
		Flush-Flo		Calc e upstream s	ulated	
		Applicatio		-	urface	
	St	ump Availabl		5	Yes	
		Diameter (mm			81	
	Inve	ert Level (m)		0.150	
	Outlet Pipe D				100	
Sugges	ted Manhole 1	Diameter (mm)		1200	
	Control	Points	Head (m)	Flow (l/s)		
D	esign Point					
		Flush-Flo ^m				
		Kick-Flo®				
M	ean Flow ove	r Head Kange	. –	2.7		
The hydrological calc Hydro-Brake® Optimum Hydro-Brake Optimum® invalidated	as specified	. Should an	other type	of control	device othe	er than a
Depth (m) Flow (1/s)	Depth (m) F	low (l/s) De	epth (m) F	low (l/s) De	pth (m) Fl	ow (l/s)
0.100 2.3		3.1	3.000	4.7	7.000	7.1
0.200 2.9		3.3	3.500	5.1	7.500	7.3
0.300 3.0 0.400 3.0	1.600	3.5 3.7	4.000 4.500	5.4 5.7	8.000 8.500	7.5 7.7
0.400 3.0		3.9	4.500 5.000	5.7	8.500 9.000	7.9
0.600 2.8		4.1	5.500	6.3	9.500	8.2
0.800 2.6		4.3	6.000	6.6		
1.000 2.8		4.4	6.500	6.8		

Connor Sutton Cron	in						Page 1
Prussia Street							
Dublin 7							
Ireland							Micco
Date 14/03/2019 15:2	27	Des	igned b	y niall.	mcmenam	in	- Micro
File CatchmentEast C			cked by	-	onorran		Drainad
XP Solutions	ascauc.ca.			trol 201	0 1		
XF SOLUCIONS		500.		201	0.1		
<u>Cascade Sumr</u>	<u>mary of Re</u>	sults f	for Cat	<u>chmentEa</u>	st_Roof	Level.	<u>srcx</u>
_	ream tures	Out	flow To		Overflow	То	
(None) Catchi	mentEast	_GroundL	evel.srcx	(No	ne)	
	Half 1	Drain Ti	me : 421	3 minutes.			
Storm	Max Max		lax	Max	Max	Max	Status
Event	Level Dept (m) (m)		tration ./s)	(1/s)	(1/s)	(m ³)	
15 min Summer	40 011 0 01	1	0.0	0.0	0 0	47.8	ΟK
30 min Summer			0.0	0.1		74.8	
60 min Summer			0.0	0.2		103.6	
120 min Summer			0.0	0.3		136.1	
180 min Summer			0.0	0.4		156.8	
240 min Summer	40.041 0.04	1	0.0	0.4	0.4	172.4	O K
360 min Summer	40.047 0.04	7	0.0	0.5	0.5	195.3	0 K
480 min Summer	40.051 0.05	51	0.0	0.6	0.6	212.0	0 K
600 min Summer	40.054 0.05	54	0.0	0.6	0.6	224.9	O K
720 min Summer			0.0	0.7	0.7	235.4	O K
960 min Summer	40.060 0.06	50	0.0	0.8	0.8	251.3	O K
1440 min Summer	40.065 0.06	55	0.0	0.8	0.8	271.4	O K
2160 min Summer			0.0	0.8		286.7	
2880 min Summer			0.0	0.9		295.5	
4320 min Summer			0.0	0.9		306.6	
5760 min Summer			0.0	0.9		312.1	
7200 min Summer	40.075 0.0	5	0.0	0.9	0.9	314.0	ОК
	Storm	Rain	Flooded	Discharge	a Time-Pe	ak	
	Event		Volume	-	(mins		
			(m³)	(m³)			
15	min Summer	85.194	0.0	3.2	2 1	.22	
30	min Summer	58.879	0.0	7.4	4 1	.30	
60	min Summer	38.241	0.0	24.0	6 1	46	
120	min Summer	24.118	0.0	38.8	3 1	.84	
180	min Summer	18.261	0.0	46.9	9 2	230	
	min Summer	14.961				84	
	min Summer	11.264		63.2	2 3	94	
	min Summer	9.197				08	
	min Summer	7.854	0.0			22	
	min Summer	6.901	0.0			38	
	min Summer	5.625	0.0			72	
960		4.216	0.0			46	
960 1440	min Summer			170 1	o 21	.04	
960 1440 2160	min Summer	3.158	0.0				
960 1440 2160 2880	min Summer min Summer	3.158 2.570	0.0	185.2	1 24	20	
960 1440 2160 2880 4320	min Summer min Summer min Summer	3.158 2.570 1.920	0.0	185.1 178.4	1 24 4 31	60	
960 1440 2160 2880 4320 5760	min Summer min Summer min Summer min Summer	3.158 2.570 1.920 1.560	0.0 0.0 0.0	185.1 178.4 310.3	1 24 4 31 3 39	.60 976	
960 1440 2160 2880 4320 5760	min Summer min Summer min Summer	3.158 2.570 1.920	0.0	185.1 178.4 310.3	1 24 4 31 3 39	60	

O'Connor Sutton Cror	nin						Page 2
9 Prussia Street							
Dublin 7							
Ireland							Micco
Date 14/03/2019 15:2	27	Desi	aned b	y niall.m		in	Micro
File CatchmentEast (cked by	-	ionicitani.		Drainago
_	Lascaue.co			trol 2018) 1		
XP Solutions		Sour			••⊥		
<u>Cascade</u> Sum	<u>mary of R</u>	<u>esults f</u>	or Cato	<u>chmentEas</u>	<u>t_Roof</u> I	<u>level.</u>	srcx
Storm	Max M	lax M	lax	Max	Max	Max	Status
Event		-		Control S			
	(m) ((m) (1	L/s)	(1/s)	(l/s)	(m³)	
8640 min Summer	40.075 0.	075	0.0	0.9	0.9	313.7	0 K
10080 min Summer			0.0	0.9		312.0	
15 min Winter			0.0	0.1		56.3	
30 min Winter	40.021 0.	021	0.0	0.1	0.1	86.5	O K
60 min Winter	40.028 0.	028	0.0	0.2	0.2	118.8	ОК
120 min Winter	40.037 0.	037	0.0	0.4	0.4	155.1	ОК
180 min Winter	40.043 0.	043	0.0	0.4	0.4	178.4	ОК
240 min Winter	40.047 0.	047	0.0	0.5	0.5	195.9	ОК
360 min Winter	40.053 0.	053	0.0	0.6	0.6	221.6	ОК
480 min Winter	40.057 0.	057	0.0	0.7	0.7	240.5	ОК
600 min Winter	40.061 0.	061	0.0	0.8	0.8	255.1	0 K
720 min Winter	40.064 0.	064	0.0	0.8	0.8	267.1	O K
960 min Winter	40.068 0.	068	0.0	0.8	0.8	285.5	O K
1440 min Winter			0.0	0.9	0.9	309.7	O K
2160 min Winter			0.0	0.9	0.9		
2880 min Winter	40.081 0.	081	0.0	0.9	0.9	338.2	ОК
4320 min Winter			0.0	1.0	1.0		
5760 min Winter			0.0	1.0	1.0		
7200 min Winter			0.0	1.0	1.0		
8640 min Winter			0.0	1.0		346.4	
10080 min Winter	: 40.081 O.	.081	0.0	0.9	0.9	341.1	ОК
	Storm	Rain	Flooded	Discharge	Time-De	ak	
	Event	(mm/hr)		Volume	(mins)		
		(,	(m ³)	(m ³)	、	•	
8640) min Summe	er 1.164	0.0	309.7	56	524	
) min Summe		0.0	299.6	64	156	
15	5 min Winte	er 85.194	0.0	4.3	1	.22	
30) min Winte	er 58.879	0.0	9.5	1	30	
) min Winte					44	
) min Winte					84	
) min Winte					230	
) min Winte					280	
) min Winte					888	
) min Winte					500	
) min Winte					512	
) min Winte					26	
) min Winte					958	
) min Winte					114	
) min Winte					080	
) min Winte					588	
) min Winte					340	
) min Winte					272	
7200) min Winte	er 1.328	0.0	363.3	51	.84	
~ ~ · ·	C		~ ~	00	~~		
) min Winte					064	
) min Winte) min Winte)64)60	

©1982-2018 Innovyze

O'Connor Sutton Cro	onin						Pag	re 3
9 Prussia Street								
Dublin 7								
Ireland							Mi	cro
Date 14/03/2019 15:	:27	Desig	ned by	y nial	l.mcmena	min	n	ainage
File CatchmentEast_	_Cascade.casx		ed by					
XP Solutions		Sourc	e Cont	crol 2	018.1			
Rainf Return Perio M	ainfall Detai all Model d (years) Region Scotl 5-60 (mm) Ratio R er Storms	and and	FSI 10 Ireland	R 0 d 0 Short 9 Long s	- Winter Cv (S	Storms Summer) Ninter) (mins) (mins)	s Yes 0.750 0.840 15 10080	
Depre	Area (ession Storage ((m³) 448	0 Evapo	oration	(mm/day) efficient	3 0.050		
Time (mins) Area From: To: (ha)	Time (mins) From: To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0 4 0.081410	32 36 0	.016436	64	68	0.003318	96	100	0.000670
4 8 0.066653		0.013457			0.002717			0.000549
8 12 0.054571 12 16 0.044679		0.011018	76		0.002224		108	0.000449
16 20 0.036580		.007385			0.001491			0.000301
20 24 0.029949 24 28 0.024520).006047).004951	84		0.001221		120	0.000246
24 28 0.024320 28 32 0.020076		0.004951	1		0.000818	1		
	©19	82-201	8 Innc	ovyze				

O'Connor Sutton Cronin					Page 4
9 Prussia Street					
Dublin 7					
Ireland					Micro
Date 14/03/2019 15:27				l.mcmenami	[°] Drainage
File CatchmentEast_Cascade	e.casx				Diginage
XP Solutions		Source (Control 2	018.1	
<u>Cascade Model D</u>	etails	for Cat	chmentEas	st_RoofLeve	l.srcx
Storag	re is Oni	line Cove:	r Level (m)	40.500	
<u>C</u>	ellula	<u>r Storag</u>	<u>e Structu</u>	ire	
Infiltration Coeff Infiltration Coeff	ficient	Base (m/h	r) 0.00000	Safety Facto Porosit	
Depth (m) Area (m²) :	Inf. Are	a (m²) De	pth (m) Ar	ea (m²) Inf.	Area (m²)
0.000 4500.0 0.085 4500.0		0.0	0.086	0.0	0.0
	Orific	e Outflo	w Contro	1	
	©198	2-2018 1	Innovyze		

O'Connor Sutton Cron	in						Page 1
9 Prussia Street							
Dublin 7							
Ireland							
	7	Des	· · · · · · · · · · · · · · · · · · ·				— Micro
Date 14/03/2019 15:2			2	y niall.	mcmenar	nın	Drainago
File CatchmentEast_Ca	ascade.cas		cked by				Drainacy
XP Solutions		Sour	rce Cor	trol 201	.8.1		
- 1 -	c -	1.	~ .			1-	_
<u>Cascade Summa</u>	ry of Resi	<u>ults fo</u>	or Catc	hmentEas	t_Grour	ndLeve.	l.srcx
	Upstre	a m	01	tflow To	Owerflow	Tо	
	Structu		00	10 10	overriow	10	
Catch	mentEast_Ro	ofLevel	.srcx	(None)	(No	ne)	
	Half [)rain Ti	me : 108	5 minutes	•		
Storm	Max Max	M	ax	Max	Max	Max	Status
Event	Level Depth						
	(m) (m)	(1,	/s)	(l/s)	(1/s)	(m³)	
15 min Summer	1 287 0 000	>	0.0	1.5	1 ⊑	49.5	ОК
30 min Summer			0.0	1.5	1.5	49.5 67.9	
60 min Summer			0.0	1.5	1.5	86.7	
120 min Summer			0.0	1.5	1.5	106.0	
180 min Summer	1.316 0.053	L	0.0	1.5		117.3	
240 min Summer	1.319 0.054	1	0.0	1.5	1.5	125.1	O K
360 min Summer			0.0	1.5	1.5	135.3	
480 min Summer			0.0	1.5		141.7	
600 min Summer 720 min Summer			0.0	1.5 1.5		145.8	
960 min Summer			0.0	1.5	1.5	148.5 151.8	
1440 min Summer			0.0	1.5	1.5	155.8	
2160 min Summer			0.0	1.5	1.5	157.0	
2880 min Summer	1.333 0.068	3	0.0	1.5	1.5	155.3	O K
4320 min Summer			0.0	1.5		150.4	
5760 min Summer			0.0	1.5		144.5	
7200 min Summer	1.325 0.060	J	0.0	1.5	1.5	137.9	0 K
	Storm	Rain	Floodod	l Discharg	o Mimo-D		
	Event	(mm/hr)		-	e iime-r (mins		
			(m³)	(m³)	·		
15	min Summer	85.194	0.0	54.	6	22	
30	min Summer	58.879	0.0	78.	5	37	
	min Summer	38.241	0.0			66	
	min Summer	24.118	0.0			126	
	min Summer min Summer	18.261	0.0			184	
	min Summer min Summer	14.961 11.264	0.0			244 364	
	min Summer	9.197	0.0			484	
	min Summer	7.854	0.0			602	
720	min Summer	6.901	0.0	254.	0	722	
	min Summer	5.625	0.0			962	
	min Summer	4.216	0.0			442	
	min Summer	3.158	0.0			160	
	min Summer min Summer	2.570 1.920	0.0			620 412	
	min Summer	1.560	0.0			208	
	min Summer	1.328	0.0			040	
	 	1982-20)18 Inn	00070			
			, 10 1111	~ Y <u>Y</u> <u>L</u> C			

Connor Sutton Cron	in						Page 2
Prussia Street							
ublin 7							
reland							_ Micro
ate 14/03/2019 15:2	7	Desi	gned b	y niall.	mcmenam	in	
ile CatchmentEast C	ascade.cas		ked by				Drainag
 P Solutions				trol 201	8 1		
			00 0011	0101 201	0.1		
<u>Cascade Summa</u>	arv of Resu	lts fo	r Catel	hmentEast	Groun	dLevel	srcx
Storm	Max Max	Ma	ax	Max	Max	Max	Status
Event	Level Depth					Volume	
	(m) (m)	(1,	/s)	(l/s)	(l/s)	(m³)	
8640 min Summer	1 222 0 05 ⁻	7	0.0	1 5	1 5	130.9	0 K
10080 min Summer			0.0	1.5 1.5		123.6	
15 min Winter			0.0	1.5	1.5		
30 min Winter			0.0	1.5	1.5		
60 min Winter			0.0	1.5		97.8	
120 min Winter			0.0	1.5		120.4	
180 min Winter			0.0	1.5		133.8	
240 min Winter			0.0	1.5		143.3	
360 min Winter			0.0	1.5		156.4	
480 min Winter	1.337 0.072	2	0.0	1.5	1.5	165.1	ОК
600 min Winter	1.339 0.074	1	0.0	1.5	1.5	171.3	O K
720 min Winter	1.342 0.07	7	0.0	1.5	1.5	176.0	O K
960 min Winter	1.344 0.079)	0.0	1.5	1.5	181.9	O K
1440 min Winter			0.0	1.5		187.1	
2160 min Winter			0.0	1.5		191.4	
2880 min Winter			0.0	1.5		191.4	
4320 min Winter			0.0	1.5		184.4	
5760 min Winter			0.0	1.5		173.7	
7200 min Winter 8640 min Winter			0.0 0.0	1.5 1.5		164.1 153.8	
10080 min Winter			0.0	1.5	1.5		
		-	0.0	110	1.0	110.0	0 11
	Storm	Rain	Flooded	l Discharge	e Time-P	eak	
	Event	(mm/hr)	Volume	Volume	(mins	5)	
			(m³)	(m³)			
8640) min Summer	1.164	0.0	713.2	2 5	880	
	min Summer	1.041				664	
	min Winter					22	
30) min Winter	58.879	0.0	88.	0	36	
60) min Winter	38.241	0.0	133.	9	66	
	min Winter		0.0			124	
		18.261				182	
		14.961	0.0			240	
	min Winter	11.264				358	
	min Winter	9.197				476	
) min Winter	7.854				594 712	
	min Winter	6.901 5.625	0.0			712	
) min Winter) min Winter	5.625 4.216				944 412	
) min Winter	4.216 3.158	0.0			412 100	
) min Winter) min Winter	2.570	0.0			768	
) min Winter	1.920	0.0			768 064	
) min Winter	1.560	0.0			712	
) min Winter	1.328				552	
) min Winter	1.164				488	
	min Winter	1.041	0.0			368	
10080			0.0) 797.			

O'Connor Sutton Cronin					Page 3
9 Prussia Street					
Dublin 7					
Ireland					Micro
Date 14/03/2019 15:27	Des	igned b	y nial	l.mcmenamin	Drainago
File CatchmentEast_Cascade.	casx Che	cked by			Diamada
KP Solutions	Sou	rce Con	trol 2	018.1	
<u>Cascade Rainfall De</u>	etails fo	r Catchr	nentEas	st_GroundLevel	<u>.srcx</u>
Rainfall Model Return Period (years) Region M5-60 (mm) Ratio R Summer Storms	Scotland a	10 nd Irelan 16.20 0.27	0 Short 9 Long	Winter Storms Cv (Summer) Cv (Winter) est Storm (mins) Climate Change %	0.750 0.840 15 10080
	<u>Time A</u>	rea Dia	gram		
	Total Ar	ea (ha)	0.322		
Time From:	(mins) Are To: (ha			Area (ha)	
0	4 0.2	22 4	8	0.100	
	©1982-2	010 -			

Connor Sutton Cron	iin				Pa	age 4
Prussia Street						
ublin 7						
reland					N	licco
ate 14/03/2019 15:2	.7	Designe	ed by nia	ll.mcmenami	n	
'ile CatchmentEast C	Cascade.cas		-			rainag
 XP Solutions			Control 3	2018.1		
<u>Cascade Mo</u>	del Detail	s for Cate	chmentEas	t_GroundLev	vel.srcx	
	Storage is	Online Cov	er Level (r	n) 1.650		
	<u>Cellu</u>	lar Storad	<u>ge Struct</u>	ure		
		nt Base (m/l	nr) 0.00000	5 Safety Fact) Porosi)		
Depth (m) Area						
	2500.0 2500.0	0.0	0.086	0.0	0.0)
	<u>Hydro-Brak</u>	e® Optimur	n Outflow	Control		
				055-1500-1200		
		sign Head (m			1.200	
	Desig	gn Flow (l/s Flush-Flo		Calcu	1.5 lated	
				e upstream st		
		Applicatio	on	- Si	irface	
		ump Availabl			Yes	
		Diameter (mn ert Level (m			55	
Minimum (utlet Pipe 1		,		0.150 75	
	ted Manhole I				1200	
	Control	Points	Head (m)	Flow (l/s)		
D	esign Point	(Calculated) 1.200	1.5		
		Flush-Flo ³	0.242	1.2		
	_	Kick-Flo				
М	ean Flow ove	r Head Rang	e -	1.2		
The hydrological calcu Hydro-Brake® Optimum a Hydro-Brake Optimum® } invalidated	as specified	. Should ar	nother type	of control c	levice othe	er than a
Depth (m) Flow (1/s)	Depth (m) F	'low (l/s) D	epth (m) F	low (l/s) Dep	oth (m) Flo	ow (l/s)
0.100 1.1	1.200	1.5	3.000	2.3	7.000	3.4
0.200 1.2	1.400	1.6	3.500	2.4	7.500	3.5
0.300 1.2 0.400 1.2		1.7	4.000 4.500	2.6	8.000 8.500	3.6 3.7
0.400 1.2		1.9	4.300 5.000	2.9	9.000	3.8
0.600 1.1		2.0	5.500	3.0	9.500	3.9
0.800 1.2	2.400	2.1	6.000	3.1		
1.000 1.4	2.600	2.1	6.500	3.3		

APPENDIX I

WASTEWATER GENERATION CALCULATIONS

JOB NAME:	JOB NO:	DATE:	
Project Connolly	O635	04/10/2019	
			ocsc
TITLE:	CALCS BY:	CHECK'D:	O'CONNOR SUTTON CROWN
Wastewater Flow	FS	NMM	Hutidisciplinary Consulting Engineers

Zone	Area	No. of Units	Area/person	Occupancy	Population	Flow	BOD	Infiltration	Total Flow	Total BOD	DWF	Peak Factor	Peak Flow
	(m²)	(nr)	(m²)	(nr/m²)		(l/unit/day)	(g/unit/day)	(% of flow)	(m ³ /day)	(kg/day)	(I/s)		
Residential													
Residential Units		741		2.7	2000.7	150	60	10%	330.1	120.04	3.82		
TOTAL Residential		741			2000.7				330.1	120.0	3.8	3.0	11.46
Non-Residential													
Retail, Commercial & Community ⁽¹⁾	3142		25	0.040	125.7	50	30	10%	6.9	3.77	0.08		
Residential Support Amenity ⁽¹⁾	1444		25	0.040	57.8	50	30	10%	3.2	1.73	0.04		
TOTAL Non-Residential					183.4				10.1	5.5	0.1	4.5	0.53
TOTAL					2184.14				340	126	3.9		11.99

(1) Flow rate for office without canteen

Residential Occupancy rates from Appendix C of IW Code of Practice for Wastewater Infrastructure, December 2017 (IW-CDS-5030-03)

Flow rates from Appendix D of IW Code of Practice for Wastewater Infrastructure, December 2017 (IW-CDS-5030-03)

Infiltration rates from Appendix C of IW Code of Practice for Wastewater Infrastructure, December 2017 (IW-CDS-5030-03)

BOD loading rates from EPA Wastewater Treatment Manual, For Small Communities..., Table 3

Peaking Factor from Appendix C of IW Code of Practice for Wastewater Infrastructure, December 2017 (IW-CDS-5030-03)

APPENDIX J

WATER DEMAND CALCULATIONS

JOB NAME:	JOB NO:	DATE:	
Project Connolly	O635	04/10/2019	S
TITLE:	CALCS BY:	CHECK'D:	OCSANGE SUFTON CROWN Milliblicitinary Consulting Engineers
Water Demand	FS	NMM	Consulting Engineers

Zone	Area	No. of Units	Area/person	Occupancy	Population	Flow	Total Flow	Average	AvDay/PkWeek	AvDay/PkWeek	Pipe Sizing	Pipe Sizing
	(m²)	(nr)	(m ²)	(nr/m²)		(l/unit/day)	(m ³ /day)	(l/s)	(Factor)	(I/s)	(Factor)	(l/s)
Residential												
Residential Units		741		2.7	2000.7	150	300.1	3.473	1.25	4.342		
TOTAL Residential		741			2000.7		300.1	3.47		4.34	3.0	13.03
Non-Residential												
Retail, Commercial & Community ⁽¹⁾	3142		25	0.040	125.7	50	6.3	0.073	1.25	0.091		
Residential Support Amenity ⁽¹⁾	1444		25	0.040	57.8	50	2.9	0.033	1.25	0.042		
TOTAL Non-Residential					183.4		9.2	0.11		0.13	5.0	0.66
TOTAL					2184.1		309.3	3.6		4.5		13.69

(1) Flow rate for office without canteen

Flow rates from Appendix D of IW Code of Practice for Wastewater Infrastructure, December 2017 (IW-CDS-5030-03)

Peaking Factors from IW Code of Practice for Water Infrastructure, December 2017 (IW-CDS-5020-03)

Proposal:	DN200 HDPE	
Diameter:	176.47 mm	(HDPE DN200 SDR17 PE100 PN10)
Cross Sectional Area:	0.02446 m ²	
Permissible Maximum Velocity:	1.50 m/s	(IW-CDS-5020-03 CI.3.2)
Permissible Minimum Velocity:	0.30 m/s	(IW-CDS-5020-03 CI.3.2)
Design Flow:	13.7 l/s	
Design Flow Velocity:	0.56 m/s	
Check:	OK	



Multidisciplinary Consulting Engineers

> 9 Prussia Street Dublin 7 Ireland

T | +353 (0)1 8682000 F | +353 (0)1 8682100 W | www.ocsc.ie