SONAS DV Refuge

Kilcross Road,
Sandyford,
Dublin 18.

Civil Works Design Report

February 2024

REPORT CONTROL

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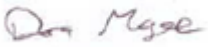
Primary Author:	Dara Magee	Signed:	
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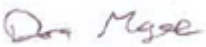
28.02.2024	Dara Magee		28.02.2024

TABLE OF CONTENTS

TABLE OF FIGURES

1 Introduction

AOCA Engineering Consultants have prepared this Civil Works Design Report on behalf of SONAS for the proposed emergency accommodation development on lands at Kilcross, Sandyford, Dublin 18. The proposed development is exempt from the Part 8 planning process.

This report has been prepared to outline the Civil Works planning submission component of the proposed residential development. The report details the foul and storm drainage design, connection specifics, water main design, and the road layout for the development. It should be perused in tandem with the water main, road, foul, and storm design drawings, as referenced and detailed herein.

The site is situated and accessed from Kilcross Road and is bordered to the west by a boundary wall of a residential development and to the north and east by open green space.

The residential institution comprises 12 short-term stay residential units within 2 blocks and a separate communal building on a developable site area of 0.25 ha, of which 0.2 ha will be owned by SONAS and 0.05 ha is obtained from DLRCC by a grant of wayleave.

Refer to Figure 1 for the site location and RDF architects' drawing '010 - Site Layout Plan' for the proposed site layout.

Figure 1: Site Location

2 Wastewater Drainage Design

Uisce Éireann issued a Confirmation of Feasibility which noted the development is feasible without upgrade works. The submitted Pre-Connection Enquiry form and the received Confirmation of Feasibility can be found in Appendix A of this report.

It is proposed to discharge from the site via a 150 mm pipe to a new manhole on the existing 225 mm foul line which traverses the site within the western boundary. A wayleave is in place, 3 m from the face of the existing 225 mm wastewater pipe, Similarly, for a 300 mm surface water sewer beside the wastewater sewer. The wastewater drainage system's pipework is designed for six times the dry weather flow, following the Irish Water Code of Practice and standard details. A utility survey was carried out and is included in Appendix B.

There is a development under construction (planning reference: D17A/1003) for which the foul connection is within the SONAS site boundary, as indicated in the pre-planning meeting.

The 'Further Information' application shows the route within Kilcross Road before turning north to connect to the existing sewer. The consultant engineer for the detailed design (Lohan Donnelly Consulting Engineers) has confirmed the route is as per the 'Further Information' drawing, an extract of which is below.

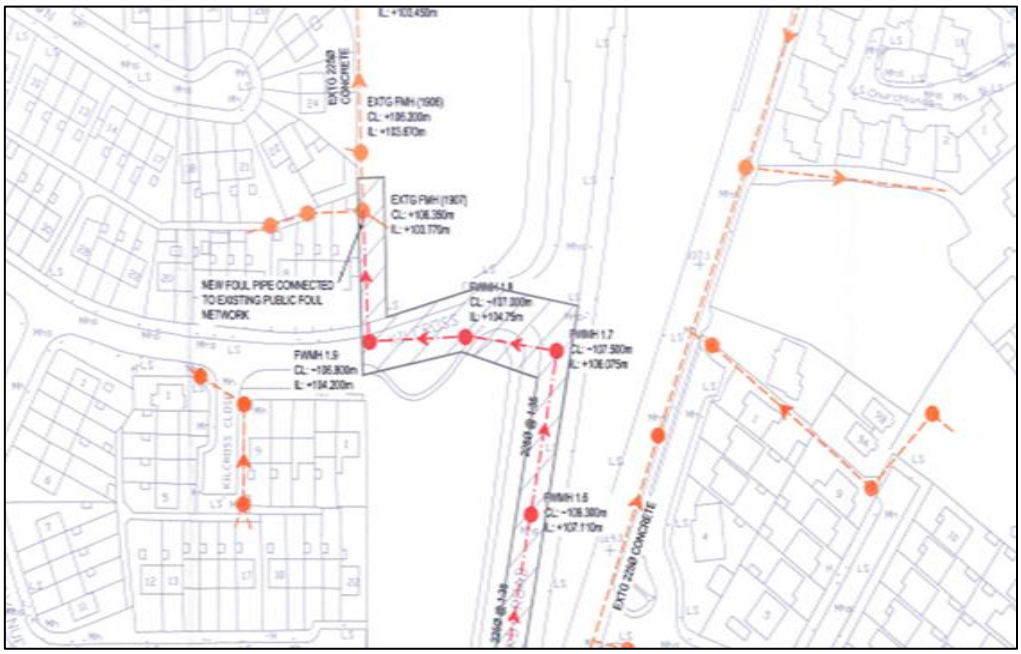


Figure 2: New Wastewater Connection within site boundary to facilitate upstream development

The proposed foul sewer network is depicted graphically on drawing number '23-OCF-023-P-201'. Outputs from the foul sewer design can be found in Appendix C of this report.

It is proposed that all pipes will be thermoplastic structured wall pipes. The maximum and minimum gradients will be 1/60 and 1/120, respectively. All velocities at these gradients fall within the limits of 0.75m/sec and 2.5m/sec as established in the Uisce Éireann Code of Practice for Wastewater Infrastructure.

3 Storm Water Drainage Design

The proposed stormwater network is illustrated graphically on drawing number '23-OCF-023-P-201'. The proposed stormwater drainage system has been designed to accommodate surface water runoff from impermeable surfaces in the development, including roadways, roofs, and parking areas. The proposed permeable paving and permeable playground surface are designed to allow infiltration, thereby maximising the amount of rainwater being restored to groundwater. The green roof and soft landscaping also offer reduction of runoff at source via evapotranspiration.

It is proposed to discharge stormwater from the site to the existing 300 mm concrete surface water pipe which traverses the site within the western boundary. The existing surface water pipe is shown in the Utility Survey (Appendix B) and the 3 m wayleave is shown on the drainage layout drawing '23-OCF-023-P-201'.

The stormwater entering the network will include runoff from roadways and parking areas throughout the site and may contain hydrocarbons that require removal. Stormwater is treated by a proposed Class 2 Bypass Petrol Interceptor, the separator has been sized based on the restricted flow rate discharging from the site.

Gradients are designed so all velocities will be minimum 1 m/s at full pipe conditions as per the GDSDS (Greater Dublin Strategic Drainage Study) and maximum 3 m/s, as outlined in the "Recommendations for Site Development Works" published by the Department of Environment.

The discharge rate for the site was calculated using the HR Wallingford greenfield runoff estimation tool, refer to Appendix D. The site's 'developable area' was used along with the Met Éireann data, also included in Appendix D. Soil Class 4 is used given the description of soil and trial pit logs provided from the site investigation. Refer to extract of relevant pages of the site investigation in Appendix E of this report. The calculated Qbar is 1.62 l/s.

Included in Appendix E is the result of an infiltration test carried out in the centre of the site, in trial pit 3, which recorded an infiltration rate of $2.7x10^{-6}$ m/s (or 0.0097 m/hr). This test was carried out a depth of 2.4 m, corresponding to an elevation of 104.46 mOD. However, it is noted the permeable paving will infiltrate to clay and less infiltration will take place through this clay layer.

The stormwater drainage design was modelled using InfoDrainage, to a 100-year return period plus an additional 20% to accommodate the effects of climate change. An urban creep value of 10% is included within the rainfall data in the model also, as per DLRCC requirements. The surface water drainage system is designed to handle runoff from this development phase exclusively. Drawing no. '23-TD-001-P-101' shows the proposed drainage layout. Appendix F of this report presents the design inputs, results, and outputs from the calculations.

A typical drainage maintenance checklist is included in Appendix G.

3.1 SuDS Features

The document 'The SuDS Manual' published by CIRIA Document No. C753, promotes the use of a variety of alternative measures in the design of sustainable drainage systems, which take into account quantity, quality and amenity aspects of the urban drainage system. SuDS encourage the use of soft systems that replicate as far as possible the natural treatment of surface water and attenuation storage to manage surface water runoff.

3.1.1 Green Roof

The DLR County Development Plan requires developments with a total building footprint greater than 300 m^2 to accommodate green roof with a minimum coverage of 70% if extensive green roof is provided (minimum 80 mm substrate depth) or 50% coverage if intensive green roof is provided (minimum 200 mm substrate depth).

Intensive green roof is proposed and 55% coverage is provided. Refer to drawing '23-OCF-023-P-201' for the green roof proposal and coverage table.

Green roofs offer multiple benefits including; reducing the volume of rainwater runoff via evapotranspiration, replicating natural characteristics of runoff by retaining rainwater on the site for longer, additional insultation, reducing the heat island effect, biodiversity habitat, improved quality of rainwater runoff, amenity value.

The green roofs will be accessed via external ladders and harness attachment points provided to allow maintenance to be carried out. Roof edge protection is provided in the form of a parapet. Maintenance will depend on the type of planting and seasonal affects and should be maintained as per recommendations from the supplier, typically twice a year. Inspections should take place annually and after large storms.

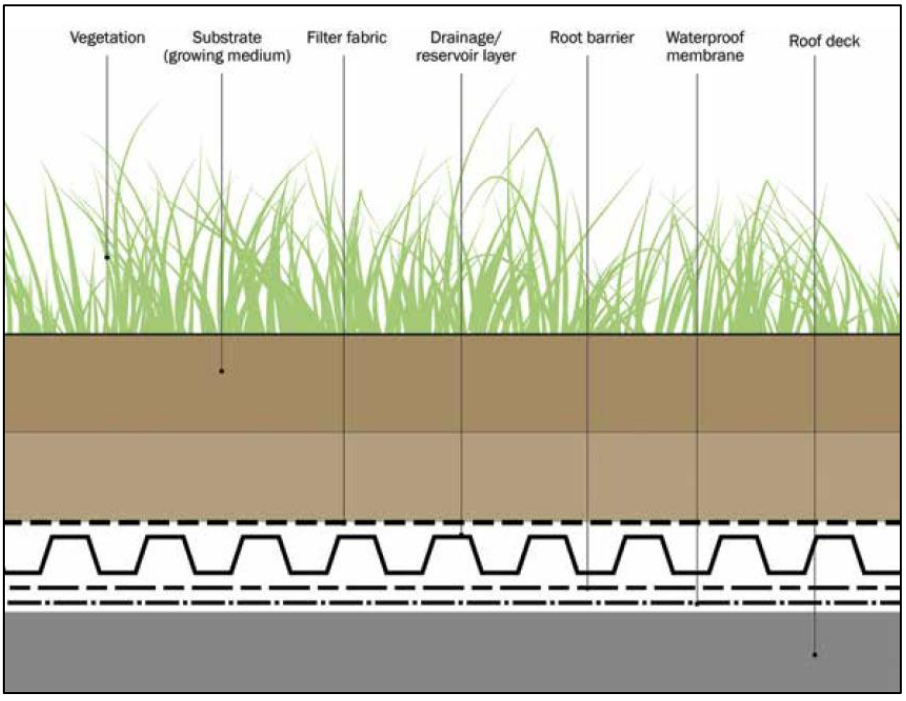


Figure 3: Green Roof Layers (Extract from Ciria C753 SuDS Manual)

3.1.2 Permeable Paving

Permeable paving is proposed on all external ground level hard surfaces within the site ownership line as per DLRCC requirements. Footways below covered walkways are not proposed as permeable paving. The footpath within the DLR 'grant of wayleave' is proposed as permeable paving but the roadway is not given it will be trafficked by a refuse vehicle. A portion of the turning head is proposed as permeable paving.

Permeable paving allows reduction of runoff at source via infiltration. Given the ground characteristics a connection to the drainage network is required. Permeable paving also provides treatment at source through filtration, biodegradation, pollutant adsorption and settlement and retention of solids. The paving should be swept annually with a brush and suction cleaner, or as per suppliers recommendations.

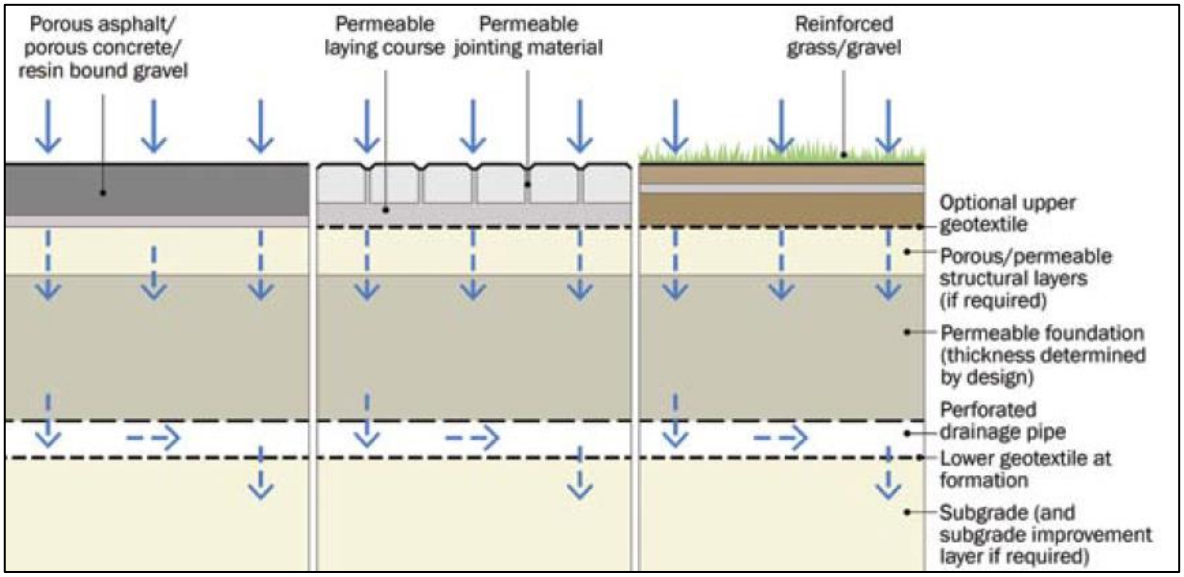


Figure 4: Permeable Paving System Type B - Partial Infiltration (Extract from Ciria C753 SuDS Manual)

The playground is proposed to be a permeable surface also which will allow infiltration and excess water will be drained to the proposed stormwater network.

3.1.3 Stormtech Attenuation Storage

An SC-740 Stormtech attenuation system is proposed which provides 122 m^3 storage. Infiltration is not permitted given proximity to building foundations. The tank is inline, meaning all rainwater from the site passes through the attenuation tank, allowing opportunity for treatment for the entire site area.

600 mm sumps are typically provided on the inlet and outlet manholes of the tank to allow silt settle out. Isolator rows should be provided on each inlet row, with the outlet on a different row, to ensure larger debris/sediment is retained within the tank until removed during maintenance. Maintenance should take place twice a year and after large rainfall events, or as per the suppliers recommendations. Refer to the typical maintenance procedure of the isolator row in Appendix H.

3.1.4 Class 2 Petrol Interceptor

A class 2 petrol interceptor is proposed before discharging to the existing surface water network, to capture any residual oil or hydrocarbons before discharging from the site. The petrol interceptor is positioned after the hydrobrake manhole.

3.2 Compliance with Greater Dublin Strategic Drainage Study

Table 6.3 of the GDSDS sets out the design criteria for drainage networks, the table is provided below along with the proposed design approach.

Criteria	Sub-Criterion	Return Period (Years)	Design Objective	Design Proposals
Criterion 1: River Water Quality Protection	1.1	<1	Interception storage of at least 5mm, and preferably 10mm, of rainfall where runoff to the receiving water can be prevented.	The intensive green roof, infiltration through permeable paving, permeable play surface and soft landscaping provide the required interception.
	1.2	<1	Where initial runoff from at least 5mm of rainfall cannot be intercepted, treatment of runoff (treatment volume) is required. Retention pond (if used) to have minimum pool volume equivalent to 15mm rainfall.	Sub-criterion 1.1 is satisfied.
Criterion 2: River Regime Protection	2.1	1	Discharge rate equal to 1 year greenfield site peak runoff rate or 2 l/s/ha, whichever is the greater. Site critical duration storm to be used to assess attenuation storage volume.	While discharge from the site is restricted to a maximum of 1.62 l/s via a flow control device, the head discharge relationship will allow a discharge rate similar to the return period event.
	2.2	100	Discharge rate equal to 1 in 100 year greenfield site peak runoff rate. Site critical duration storm to be used to assess attenuation storage volume.	The 1:100 year discharge rate is 1.62 l/s and the attenuation volume is based on this, with 20% climate change allowance.
Criterion 3: Level of Service (flooding) for the site	3.1	30	No flooding on site except where specifically planned flooding is approved. Summer design storm of 15 or 30 minutes are normally critical.	It is proposed that the Critical Duration Storm 100 Year Return Period event is fully contained within the attenuation tank. No flooding occurs on site for any event up to and including the 100 Year event + 20% climate change.
	3.2	100	No internal property flooding. Planned flood routing and temporary flood storage accommodated on site for short high intensity storms. Site critical duration events.	It is proposed that the Critical Duration Storm 100 Year Return Period event is fully contained within the attenuation tank. No flooding occurs on site for any event up to the 100 Year event + 20% climate change. Site levels have been proposed to ensure that in the highly unlikely event that ponding occurs, it will be situated away from the building access points.
	3.3	100	No internal property flooding. Floor levels at least 500 mm above maximum river level and adjacent on-site storage retention.	No flooding occurs on site for any event up to the 100 Year event + 20% climate change. 530 mm freeboard is achieved from the top of the attenuation tank to Finished Floor Level.

	3.4	100	No flooding of adjacent urban areas. Overland flooding managed within the development.	No flooding occurs on site for any event up to the 100 Year event + 20% climate change. Refer to drawing no. 23-OCF-023-P-104 for the overland flood routing.
Criterion 4: River Flood Protection (Criterion 4.1, or 4.2 or 4.3 to be applied)	4.1	100	"Long-term" floodwater accommodated on site for development runoff volume which is in excess of the greenfield runoff volume. Temporary flood storage drained by infiltration on a designated flooding area brought into operation by extreme events only. 100 year, 6 hour duration storm to be used for assessment of the additional volume of runoff.	This sub-criterion is not applied. Only one of the three sub-criteria is required to be applied.
	4.2	100	Infiltration storage provided equal in volume to "long term" storage. Usually designed to operate for all events. 100year, 6 hour duration storm to be used for assessment of the additional volume of runoff.	This sub-criterion is not applied. Only one of the three sub-criteria is required to be applied.
	4.3	100	Maximum discharge rate of Qbar or 2 l/s/ha, whichever is the greater, for all attenuation storage where separate "long term" storage cannot be provided.	A simulation for the surface water network was undertaken to ensure that all runoff from the site will be limited to 1.62 l/s. The attenuation tank proposed provides sufficient capacity within the site to ensure that no flooding occurs on site for the critical duration storm of the 1 in 100 year event plus 20% climate change allowance.

3.3 Interception & Treatment

As per Table 6.3 of the GDSDS, interception of 5 mm should be provided at a minimum and preferably 10 mm if achievable. The requirements based on site area and provision based on the SuDS measured as summarised below.

Overall Site - Interception & Treatment Provision				
Site Area (m^2)	Interception		Treatment	
	Required (m^3) *	Provided (m^3)	Required (m^3) **	Provided (m^3)
2500	10.0	11.1	30.0	113.7

* Based on the first 5mm of rainfall, over 80% of the impermeable area.
** Based on the first 15mm of rainfall, over 80% of the impermeable area.

Proposed Interception & Treatment							
SuDS Type (m^2)	SuDS Area (m^2)	Contributing Area (m^2)	Depth: Substrate/Sub-base (mm)	Porosity (%)	Interception (mm/m^2)	Interception Provided (m^3)	Treatment Provided (m^3)
Intensive Green Roof *	390	460	300	30%	15	6.9	41.4
Permeable Paving **	800	650	300	30%	5	3.3	58.5
Permeable Playground	120	100	300	30%	5	0.5	9.0
Soft landscaping	400	80	200	30%	5	0.4	4.8
Total Provision:						**11.1**	**113.7**

* 15 mm of interception is assumed, based on the various case studies of Section 12.4.2 of The CIRIA SuDS Manual (C753), where interception depths range from 10 - 20 mm, notably 12 - 15 mm for the UK study, which would be most relevant. These case studies are of a significantly lower substrate depth than the substrate depth proposed in this scenario. Treatment volume is calculated based on assumed porosity and substrate depth.
** Based on 5 mm interception for the area of permeable paving, as per Table 24.6 of The CIRIA SuDS Manual (C753), provided sufficient maintenance is carried out. Refer to Appendix G for the SuDS maintenance inspection checklist. Treatment volume is calculated based on assumed porosity and sub-base depth.

3.4 Surcharge Analysis & Flood Exceedance Route

The Flood Exceedance Route for the case of 50% blockage at the Hydrobrake was examined. In the event of a blockage during a major rainfall event, the Hydrobrake manhole will surcharge first, when the network has surpassed capacity, as it is the lowest proposed manhole on the site.

The excess water would then flood at the lowest gullies/linear drains. Due to the proposed levels, excess flood water as a result of a Hydrobrake blockage associated flooding will first be contained within the roadway (a portion of which will drain via permeable paving) before overtopping the kerb and entering the greenspace at the lowest point of the site, in the northwest corner of the site, adjacent to the Hydrobrake. Approximately 13 m^3 floods from the network in the case of a 50% blockage at the Hydrobrake. Approximately 200 mm of freeboard to the building floor levels is maintained from the maximum water level in the network/flooding location.

Refer to the flow exceedance route shown on drawing no. 23-OCF-023-P-104. Levels are designed to fall away from buildings. Refer to the Surcharge Analysis in Appendix I for further detail.

4 Watermain Network

Details of the watermain configuration for the proposed development are presented in this report and associated drawings. The watermain layout has been designed in accordance with the Uisce Éireann Code of Practice for Watermain Infrastructure IW-CDS-5020-03. The watermain layout is presented in drawing no. '23-OCF-023-P-401'. The Pre-Connection Enquiry form submitted to Uisce Éireann and the received Confirmation of Feasibility are included in Appendix A, confirming no upgrade works are required to facilitate the development.

The water supply required for the proposed development will be provided through a 100mm diameter spine, via a proposed connection to the existing 6" watermain in Kilrcross Road.

The development will be metered as a commercial development. A fire hydrant is proposed within the development.

5 Road Network

Vehicular access to the site will be provided from Kilcross Road. A footpath is proposed on the eastern side of the vehicular entrance.

All internal roads have been designed in line with the requirements of the DMURS and the Recommendations for Site Development Works for Housing Areas. Autotrack vehicle swept path analyses have been carried out for the proposed site layout, taking into account large cars, refuse trucks, and fire tenders, ensuring safe manoeuvrability throughout the site. Road levels are proposed with due consideration for the existing topography and ground conditions.

A 1:40 camber from the centre of the road will be included, and longitudinal gradients of road sections will range between 1:21 and 1:200, ensuring effective surface water drainage.

Road gullies will be strategically placed at a minimum of every 200m^2, with local low points allowing for double gullies, as per Recommendations for Site Development Works for Housing Areas, to prevent surface water drainage blockages.

A Transport Assessment & Cycle Audit will be provided as a separate document within the planning application. Furthermore, a Road Safety/Quality Audit has been completed for the proposed development, with the final report accompanying this application as an additional separate document.

Appendix A – Uisce Éireann Confirmation of Feasibility

Pre-connection enquiry form

Business developments, mixed use developments, housing developments

This form is to be filled out by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure. If completing this form by hand, please use BLOCK CAPITALS and black ink.
Please note that this is a digital PDF form and can be filled in electronically

Please refer to the **Guide to completing the pre-connection enquiry form** on page 14 of this document when completing the form.

*** Denotes mandatory/ required field. Please note, if mandatory fields are not completed the application will be returned.**

Section A | Applicant details

1 *Applicant details:

Registered company name (if applicable): SONAS

Trading name (if applicable):

Company registration number (if applicable):

Parent company registered company name (if applicable):

Parent company registration number (if applicable):

If you are not a registered company/business, please provide the applicant's name:

*Contact name: Siobhan Ferguson

*Postal address: 3 Killester Court, Dublin 5

*Eircode: D05XW40

Please provide either a landline or a mobile number

Landline:

*Mobile: 087 6468923

*Email: sferguson@sonasdomesticabuse.ie

2 Agent details (if applicable):

The fields marked with * in this section are mandatory if using an agent

*Contact name: Dara Magee

Company name (if applicable):

*Postal address: Unit E6

Centrepoint Business Park

Oak Drive, Dublin 12

*Eircode: D12TF25

Please provide either a landline or a mobile number

Landline: 0142430035

*Mobile 0035387064123 9

*Email: dara@aoca.ie

3 *Please indicate whether it is the applicant or agent who should receive future correspondence in relation to the enquiry:

Applicant ○ Agent ◉

Section B | Site details

4 *Site address 1 (include Site name/Building name/Building number):

Kilcross,

***Address 2** Sandyford,

***Address 3** Dublin 18.

***City/Town** Sandyford

***County** Dublin **Eircode**

5 *Irish Grid co-ordinates (proposed connection point):

Eastings (X) 318170 Northings (Y) 225939

Note: Values for Eastings must be between 015,900 and 340,000. Northings, between 029,000 and 362,000
Eg. co-ordinates of GPO, O'Connell St., Dublin: E(X) 315,878 N(Y) 234,619

6 *Local Authority where proposed development is located:

Dun Laoghaire Rathdown

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

If 'Yes', please provide the current or previous planning reference number:

8 ***Is this development affiliated with a government body/agency?** Yes ☐ No ☐

If 'Yes', please specify the body/agency:

SONAS

Eg. IDA, HSE, LDA, etc.

Section C | Development details

9 ***Please outline the domestic and/or industry/business use proposed:**

Domestic:

Property type	Number of units	Property type	Number of units
House		Apartments	12
Duplex		Number of Apartment Blocks	2

Industry/business:

Property type	Number of units	Property type	Number of units
Agricultural		Brewery / Distillery	
Restaurant / Café / Pub		Car Wash / Valeting	
Creche		Data Centre	
Fire Hydrant		Fire Station	
Food Processing		Hotel Accommodation	
Industrial / Manufacturing		Laundry / Laundrette	
Office		Primary Care Centre	
Residential / Nursing Care Home		Retail	
School		Sports Facility	
Student Accommodation		Warehouse	

Other (please specify type)	Communal Block	No. of Units	

9.1 Please provide additional details if your proposed business use are in the Food Processing, Industrial unit/ Manufacturing, Sports Facility or Other Categories.

Communal Block for staff and
for extra cooking facilities
There are 12 refuge apartments

9.2 Please provide the maximum expected occupancy in number of people, according to the proposed development you selected, e.g. Number of office workers, number of nursing home residents, maximum pub occupancy, number of hotel beds, number of retail workers:

1	0	0			

10 ***Approximate start date of proposed development:**

0	1	/	1	1	/	2	0	2	4

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

If 'Yes', application must include a master-plan identifying the development phases and the current phase number.

If 'Yes', please provide details of variations in water demand volumes and wastewater discharge loads due to phasing requirements.

12 ***Please indicate the type of connection required by ticking the appropriate box below:**

Both Water and Wastewater ◉ Please complete both Sections D and E

Water only ○ Please go to Section D

Wastewater only ○ Please go to Section E

Reason for only applying for one service (if applicable):

Section D | Water connection and demand details

13 ***Is there an existing connection to public water mains at the site?** Yes ☐ No ☑

13.1 If yes, is this enquiry for an additional connection to one already installed? Yes ☐ No ☐

13.2 If yes, is this enquiry to increase the size of an existing connection? Yes ☐ No ☐

14 **Approximate date water connection is required:** 0 1 / 0 4 / 2 0 2 5

15 ***What diameter of water connection is required to service the development?** 1 0 0 mm

16 ***Is more than one connection required to the public infrastructure to service this development?** Yes ☐ No ☑

If 'Yes', how many? ☐☐

17 **Please indicate the business water demand (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak hour water demand	1.11	**l/s**
Post-development average hour water demand	0.22	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

18 **Please indicate the industrial water demand (industry-specific water requirements):**

Post-development peak hour water demand		**l/s**
Post-development average hour water demand		**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

19 **What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?**

1 0 6 . 9 m

20 **What is the highest finished floor level of the proposed development above Malin Head Ordnance Datum?**

☐☐☐☐☐ m

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

Please include calculations on the attached sheet provided.

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

Additional fire flow requirements over and above those identified in Q17-18		**l/s**

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

23 **Do you propose to supplement your potable water supply from other sources?** Yes ☐ No ☑

If 'Yes', please indicate how you propose to supplement your potable water supply from other sources (see **Guide to completing the application form** on page 15 of this document for further details):

Section E | Wastewater connection and discharge details

24 ***Is there an existing connection to a public sewer at the site?** Yes ☐ No ☑

24.1 If yes, is this enquiry for an additional connection to the one already installed? Yes ☐ No ☐

24.2 If yes, is this enquiry to increase the size of an existing connection? Yes ☐ No ☐

25 ***Approximate date that wastewater connection is required:** 0 1 / 0 4 / 2 0 2 5

26 ***What diameter of wastewater connection is required to service the development?** 2 2 5 mm

27 ***Is more than one connection required to the public infrastructure to service this development?** Yes ☐ No ☑

If 'Yes', how many?

28 **Please indicate the commercial wastewater hydraulic load (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak discharge	1.17	**l/s**
Post-development average discharge	0.19	**l/s**

Please include calculations on the attached sheet provided.

29 **Please indicate the industrial wastewater hydraulic load (industry-specific discharge requirements):**

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

Please include calculations on the attached sheet provided.

30 Wastewater organic load:

Characteristic	Max concentration (mg/l)	Average concentration (mg/l)	Maximum daily load (kg/day)
Biochemical oxygen demand (BOD)			
Chemical oxygen demand (COD)			
Suspended solids (SS)			
Total nitrogen (N)			
Total phosphorus (P)			
Other			

Temperature range	
pH range	

31 *Storm water run-off will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer. In the case of such brownfield sites, please indicate if the development intends discharging surface water to the combined wastewater collection system:

Yes ☐ No ☑

If 'Yes', please give reason for discharge and comment on adequacy of SUDS/attenuation measures proposed.

Please submit detailed calculations on discharge volumes, peak flows and attenuation volumes with this application

32 *Do you propose to pump the wastewater? Yes ☐ No ☑

If 'Yes', please include justification for your pumped solution with this application.

33 What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?

1 0 5 . 7 m

34 What is the lowest finished floor level on site above Malin Head Ordnance Datum? m

35 What is the proposed invert level of the pipe exiting the property to the public road?

m

Section F | Supporting documentation

Please provide the following additional information (all mandatory):

> Site location map: A site location map to a scale of 1:1000, which clearly identifies the land or structure to which the enquiry relates. The map shall include the following details: ☐

i. The scale shall be clearly indicated on the map.

ii. The boundaries shall be delineated in red.

iii. The site co-ordinates shall be marked on the site location map.

> Details of planning and development exemptions (if applicable). ☐

> Calculations (calculation sheets provided below). ☐

> Site layout map to a scale of 1:500 showing layout of proposed development, water network and wastewater network layouts, additional water/wastewater infrastructure if proposed, connection points to Irish Water infrastructure. ☐

> Conceptual design of the connection asset from the proposed development to the existing Irish Water infrastructure, including service conflicts, gradients, pipe sizes and invert levels. ☐

> Any other information that might help Irish Water assess this pre-connection enquiry. ☐

Section G | Declaration

I/We hereby make this application to Irish Water for a water and/or wastewater connection as detailed on this form.

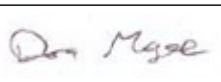
I/We understand that any alterations made to this application must be declared to Irish Water.

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

I/We have enclosed all the necessary supporting documentation.

Any personal data you provide will be stored and processed by Irish Water and may be transferred to third parties for the purposes of the water and/or wastewater connection process. I hereby give consent to Irish Water to store and process my personal data and to transfer my personal data to third parties, if required, for the purposes of the connection process.

If you wish to revoke consent at any time or wish to see Irish Water's full Data Protection Notice, please see **https://www.water.ie/privacy-notice/**

Signature: 

Date: 15 / 01 / 2024

Your full name (in BLOCK CAPITALS):

DARA MAGEE

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

Please submit the completed form to **newconnections@water.ie** or alternatively, post to:

Irish Water
PO Box 860
South City Delivery Office
Cork City

Please note that if you are sending us your application form and any associated documentation by email, the maximum file size that we can receive in any one email is 35MB.

Please note, if mandatory fields are not completed the application will be returned.

Irish Water is subject to the provisions of the Freedom of Information Act 2014 ("FOIA") and the codes of practice issued under FOIA as may be amended, updated or replaced from time to time. The FOIA enables members of the public to obtain access to records held by public bodies subject to certain exemptions such as where the requested records may not be released, for example to protect another individual's privacy rights or to protect commercially sensitive information. Please clearly label any document or part thereof which contains commercially sensitive information. Irish Water accepts no responsibility for any loss or damage arising as a result of its processing of freedom of information requests.

Calculations

Water demand

The development will be treated as a commercial development and metered as such. A 100 mm watermain is proposed off the existing 6" watermain.

Maximum water demand is calculated below.

6 no. units for up to 7 people (one parent and up to 6 children) = 42 people
6 no. units for up to 5 people (one parent and up to 6 children) = 30 people
Administration Building: 30 staff over 24 hours

72 residents x 150 l/p/d = 10,800 liters/d
30 staff x 150 l/p/d = 4,500 l/d
Total = 15,300 l/d

Average Day/Peak Week Demand = 15,300 x 1.25 = 19,125 l/d = 0.22 l/s

Peak Demand = 0.22 l/s x 5 = 1.11 l/s

On-site storage

Fire flow requirements

Maximum wastewater discharge is calculated below.

6 no. units for up to 7 people (one parent and up to 6 children) = 42 people
6 no. units for up to 5 people (one parent and up to 6 children) = 30 people
Administration Building: 30 staff over 24 hours

72 residents x 150 l/p/d = 10,800 liters/d
30 staff x 150 l/p/d = 4,500 l/d
Total = 15,300 l/d

Average Discharge = 15,300 x 1.1 (infiltration) = 16,830 l/d = 0.19 l/s

Peak Demand = 0.22 l/s x 6 (peaking factor) = 1.17 l/s

Guide to completing the pre-connection enquiry form

This form should be completed by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure.

The Irish Water Codes of Practice are available at **www.water.ie** for reference.

Section A | Applicant Details

Question 1: This question requires the applicant or company enquiring about the feasibility of a connection to identify themselves, their postal address, and to provide their contact details.

Question 2: If the applicant has employed a consulting engineer or an agent to manage the enquiry on their behalf, the agent's address and contact details should be recorded here.

Question 3: Please indicate whether it is the applicant or the agent who should receive future correspondence in relation to the enquiry.

Section B | Site details

Question 4: This is the address of the site requiring the water/wastewater service connection and for which this enquiry is being made.

Question 5: Please provide the Irish Grid co-ordinates of the proposed site. Irish grid positions on maps are expressed in two dimensions as Eastings (E or X) and Northings (N or Y) relative to an origin. You will find these coordinates on your Ordnance Survey map which is required to be submitted with an application.

Question 6: Please identify the Local Authority that is or will be dealing with your planning application, for example Cork City Council.

Question 7: Please indicate if planning permission has been granted for this application, and if so, please provide the planning permission reference number.

Question 8: Please indicate if this development is affiliated with a government body/agency, and if so, specify

Section C | Development details

Question 9: Please specify the number of different property/premises types by filling in the tables provided.

Question 9.1: Please provide additional details if your proposed business use are in the Food Processing, Industrial unit/ Manufacturing, Sports Facility or Other Categories.

Question 9.2: Please indicate the maximum expected occupancy in numbers of people according to the proposed development you selected.

Question 10: Please indicate the approximate commencement date of works on the development.

Question 11: Please indicate if a phased building approach is to be adopted when developing the site. If so, please provide details of the phase master-plan and the proposed variation in water demand/wastewater discharge as a result of the phasing of the development.

Question 12: Please indicate the type of connection required by ticking the appropriate box and proceed to complete the appropriate section or sections.

Section D | Water connection and demand details

Question 13: Please indicate if a water connection already exists for this site.

Question 13.1: Please indicate if this enquiry concerns an additional connection to one already installed on the site.

Question 13.2: Please indicate if you are proposing to upgrade the water connection to facilitate an increase in water demand. Irish Water will determine what impact this will have on our infrastructure.

Question 14: Please indicate the approximate date that the proposed connection to the water infrastructure will be required.

Question 15: Please indicate what diameter of water connection is required to service this development.

Question 16: Please indicate if more than one connection is required to service this development. Please note that the connection size provided may be used to determine the connection charge.

Question 17: If this connection enquiry concerns a business premises, please provide calculations for the water demand and include your calculations on the calculation sheet provided. Business premises include shops, offices, hotels, schools, etc. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 18: If this connection enquiry is for an industrial premises, please calculate the water demand and include your calculations on the calculation sheet provided. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). The peak demand for sizing of the pipe network will be as per the specific business production requirements. For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 19: Please specify the ground level at the location where connection to the public water mains will be made. This is required in order to determine if there is sufficient pressure in the existing water infrastructure to serve your proposed development. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 20: Please specify the highest finished floor level on site. This is required in order to determine if there is sufficient pressure in the existing water infrastructure to serve your proposed development. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 21: If storage is required, water storage capacity of 24-hour water demand must usually be provided at the proposed site. In some cases, 24-hour storage capacity may not be required, for example 24-hour storage for a domestic house would be provided in an attic storage tank. Please calculate the 24-hour water storage requirements and include your calculations on the attached sheet provided. Please also confirm that on-site storage is being provided by ticking the appropriate box.

Question 22: The water supply system shall be designed and constructed to reliably convey the water flows that are required of the development including fire flow requirements by the Fire Authority. The Fire Authority will provide the requirement for fire flow rates that the water supply system will have to carry. Please note that while flows in excess of your required demand may be achieved in the Irish Water network and could be utilised in the event of a fire, Irish Water cannot guarantee a flow rate to meet your fire flow requirement. To guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development. Please include your calculations on the attached sheet provided, and further provide confirmation of the Fire Authority requirements.

Question 23: Please identify proposed additional water supply sources, that is, do you intend to connect to the public water mains or the public mains and supplement from other sources? If supplementing public water supply with a supply from another source, please provide details as to how the potable water supply is to be protected from cross contamination at the premises.

Section E | Wastewater connection and discharge details

Question 24: Please indicate if a wastewater connection to a public sewer already exists for this site.

Question 24.1: Please indicate if this enquiry relates to an additional wastewater connection to one already installed.

Question 24.2: Please indicate if you are proposing to upgrade the wastewater connection to facilitate an increased discharge. Irish Water will determine what impact this will have on our infrastructure.

Question 25: Please specify the approximate date that the proposed connection to the wastewater infrastructure will be required.

Question 26: Please indicate what diameter of wastewater connection is required to service this development.

Question 27: Please indicate if more than one connection is required to service this development. Please indicate number required.

Question 28: If this enquiry relates to a business premises, please provide calculations for the wastewater discharge and include your calculations on the attached sheet provided. Business premises include shops, offices, hotels, schools, etc. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 29: If this enquiry relates to an industrial premises, please provide calculations for the wastewater discharge and include your calculations on the calculation sheet provided. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). The peak discharge for sizing of the pipe network will be as per the specific business production requirements. For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 30: Please specify the maximum and average concentrations and the maximum daily load of each of the wastewater characteristics listed in the wastewater organic load table (if not domestic effluent), and also specify if any other significant concentrations are expected in the effluent. Please complete the table and provide additional supporting documentation if relevant. Note that the concentration shall be in mg/l and the load shall be in kg/day. Note that for business premises (shops, offices, schools, hotels, etc.) for which only domestic effluent will be discharged (excluding discharge from canteens/ restaurants which would require a Trade Effluent Discharge licence), there is no need to complete this question.

Question 31: In exceptional circumstances, such as brownfield sites, where the only practical outlet for storm/ surface water is to a combined sewer, Irish Water will consider permitting a restricted attenuated flow to the combined sewer. Storm/surface water will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer and the applicant must demonstrate how the storm/surface water flow from the proposed site is minimised using sustainable urban drainage system (SUDS). This type of connection will only be considered on a case by case basis. Please advise if the proposed development intends discharging surface water to the combined wastewater collection system.

Question 32: Please specify if the development needs to pump its wastewater discharge to gain access to Irish Water infrastructure.

Question 33: Please specify the ground level at the location where connection to the public sewer will be made. This is required to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 34: Please specify the lowest floor level of the proposed development. This is required in order to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 35: Please specify the proposed invert level of the pipe exiting the property to the public road.

Section F | Supporting documentation

Please provide additional information as listed.

Section G | Declaration

Please review the declaration, sign, and return the completed application form to Irish Water by email or by post using the contact details provided in Section G.

Notes

The development will be metered as a commercial development. The development is exempt from the Part 8 planning process, under Section 179A.

https://www.irishstatutebook.ie/eli/2023/si/101/made/en/

Notes

CONFIRMATION OF FEASIBILITY

Dara Magee

AOCA
Unit E6
Centrepoint Business Park
Oak Drive, Dublin 12
Dublin
D12TF25

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

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

6 February 2024

Our Ref: CDS24000410 Pre-Connection Enquiry
Kilcross, Sandyford, Dublin

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 12 unit(s) at Kilcross, Sandyford, Sandyford, Dublin, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Irish Water

- **Wastewater Connection** - Feasible without infrastructure upgrade by Irish Water

- The proposed Development indicates that Uisce Éireann assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. A wayleave in favour of Uisce Éireann will be required over the assets that are not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact UÉ Diversion Team via email address diversions@water.ie

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

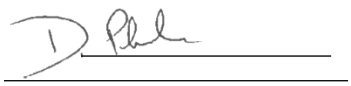
Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

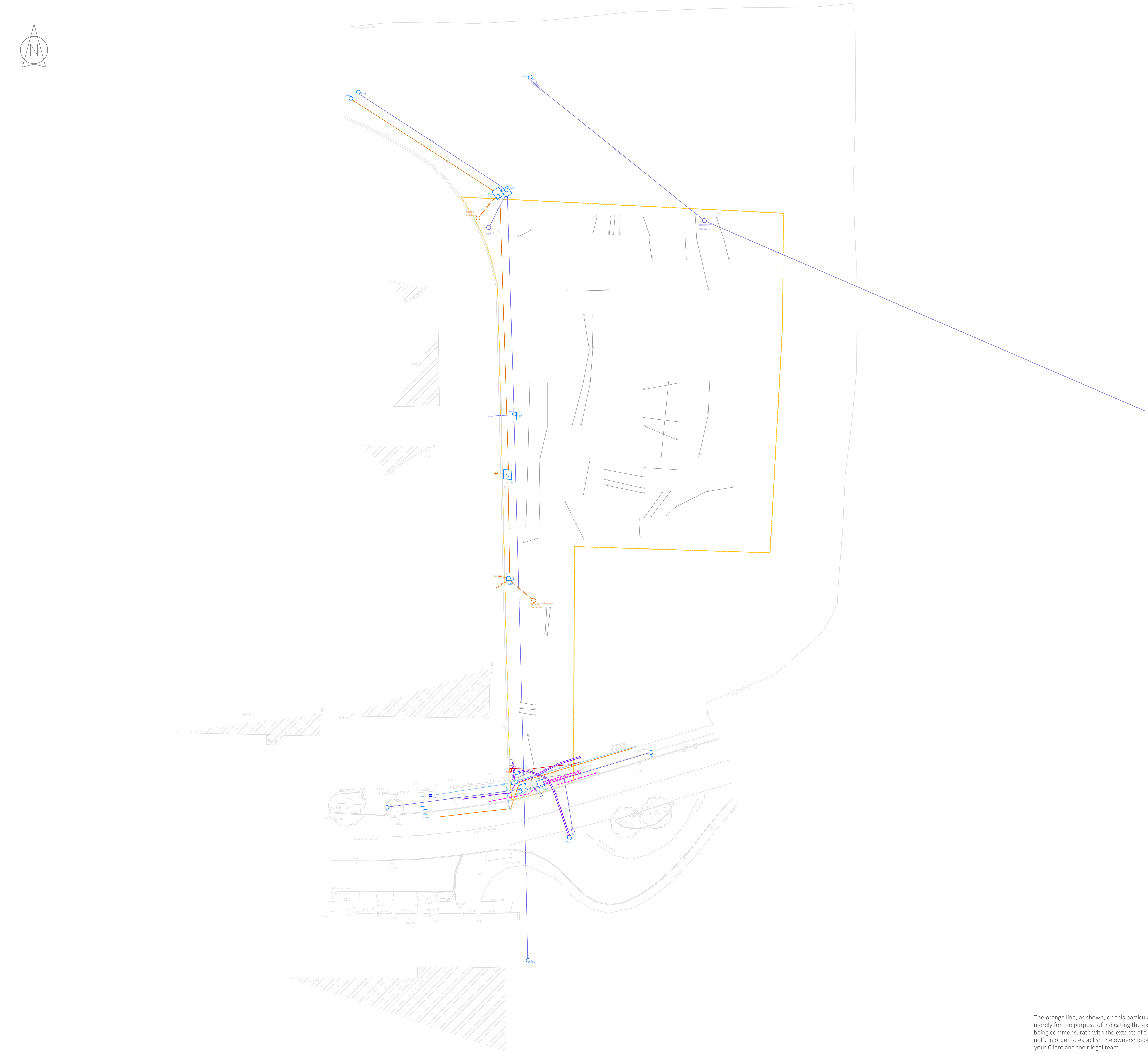
Section B – Details of Uisce Éireann's Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email datarequests@water.ie

Note: The information provided on the included maps as to the position of Uisce Éireann's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

Appendix B – Utility Survey



LEGEND
Underground Utilities

WM	Water Main	Gas	Gas
FW	Fire Water	Hydgn	Hydrogen Pipe
PW	Process Water	Oil	Oil Pipe
SW	Storm Water Drainage	Mag	Magnet
FS	Foul Sewer	Ad	Adshel
CS	Combined Sewer	Trf	Traffic
	Manhole Chamber	Heat	Heating Pipe
Eir	Eircom	Elec	Electrical
Vir	NTL/Virgin	PL	Public Lighting
Enet	ENET/OCEAN		GPR Anomaly
BT	BT/ESAT	Unk Cbl	Unknown Cable Duct
Colt	Colt	ED	Unknown Empty Duct
Aurora	Aurora	Nitrogen	Nitrogen Pipe
	Bend / Weld	Unk Serv	Unidentified Service
Oxy	Oxygen Pipe	URS	Unidentified Radio Signal
WELD	Weld Point	UPS	Unidentified Power Signal
			Photo point

Reinforced Concrete (GPR) — Possible Slab (GPR)

Other observations - see description (GPR)

DP0.55 Depth from ground level to Top of Pipe/GPR Target (m)
UTO Unable to Open
NPV No pipes visible
WL Water Level
Ø150 PE Pipe/Duct diameter (mm) and material

S/L	Signal Lost	UTT	Unable to trace	FO	Fibre Optic
T/L	Trace Lost	UTS	Unable to sonde	Unk	Unknown
N/S	No Signal	Blkd	Blocked	Ab.	Abandoned
Exp	Exposed	CD	Closed Duct	(AS)	Assumed
O/S	Off-site				

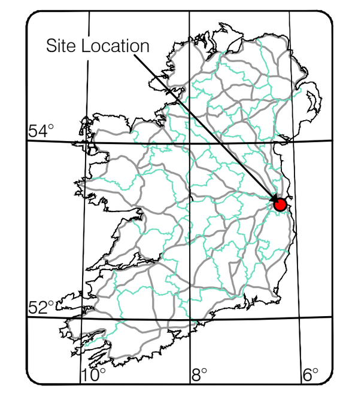
(Records) Utility taken from records — Poss./Prob. Possible/Probable

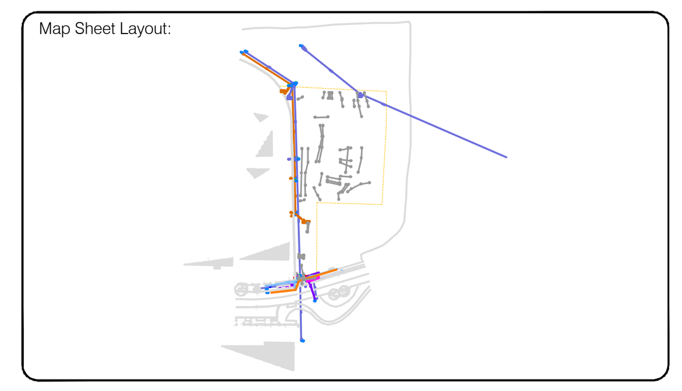
CC	Concrete	CI	Cast Iron	AC	Asbestos Concrete
VC	Vitrified Clay	DI	Ductile Iron	PE	Polyethylene
BR	Brick	ST	Steel		

S1 E:1000.000 N:1000.000 H:100.00 Survey Station

The orange line, as shown, on this particular drawing and bounding the entire of the utility survey area is merely for the purpose of indicating the extent of the area that was surveyed. It must not be taken as being commensurate with the extents of the entire of the plot of ground that the Client may own [or not]. In order to establish the ownership of the survey area Murphy Geospatial do advise consulting with your Client and their legal team.

North





Surveyed by : MGS	Date: 25.04.2023	Datum : Malin Head
Drawn by : IC	Date: 17.05.2023	Grid System:
Checked by : DS	Date: 18.05.2023	Irish National Grid ☐ ITM ☒

Revisions

No.	Date	Description
0	18.05.23	First Drawing

Murphy GEOSPATIAL

Topographic surveys, Measured Building Surveys, Setting-Out, As-Built Surveys, Hydrographic Surveys, Legal Mapping, Pipeline Surveys, Services Location, Ground Penetrating Radar, Laser Scanning, Rectified Photography

Kildare Cork Dublin Belfast Glasgow Manchester London

Head Office

Global House — **Phone:** (+353) 045 484040
Kilcullen Business Campus — **Fax:** (+353) 045 484004
Kilcullen Co. Kildare, Ireland — **Email:** info@murphygs.ie

Client : Kavanagh Mansfield & Partners

Project : Kilcross Dublin

Date : 18.05.2023 **Scale :** NTS@A1

Description : Utility Survey

Drawing Number : MGS52214_U

Appendix C – Wastewater Drainage Calculations

SONAS DV Refuge :	Date:		
Kilcross, Sandyford, Dublin 18,	28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Junctions Sanitary Phase: Phase (1)	AOCA Engineering Consultants:		

Name	Junction Type	Easting (m)	Northing (m)	Cover Elevation (m)	Depth (m)	Invert Elevation (m)	Chamber Shape	Diameter (m)
F1	Manhole	718101.388	725941.439	106.150	0.600	105.550	Circular	0.600
F2	Manhole	718124.442	725941.410	106.150	0.984	105.166	Circular	0.600
F3	Manhole	718124.548	725974.033	106.150	1.637	104.513	Circular	1.200
F4	Manhole	718084.483	725974.010	106.000	2.418	103.582	Circular	1.200

Name	Lock
F1	None
F2	None
F3	None
F4	None

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Connections Sanitary Phase: Phase (1)	AOCA Engineering Consultants:		

Name	Length (m)	Connection Type	Slope (1:x)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Elevation (m)	Upstream Invert Elevation (m)
F1.000	23.055	Pipe	60.00		1.5	150	106.150	105.550
F1.001	32.623	Pipe	50.00		1.5	150	106.150	105.166
F1.002	40.065	Pipe	43.00		1.5	150	106.150	104.513

Name	Downstream Cover Elevation (m)	Downstream Invert Elevation (m)	Part Family	Lock
F1.000	106.150	105.166		None
F1.001	106.150	104.513		None
F1.002	106.000	103.582		None

Appendix D – HR Wallingford & Met Éireann Data

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Dara Magee
Site name:	Kilcross
Site location:	Sandyford, Dublin 18.

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.27070° N
Longitude:	6.22935° W
Reference:	2929327743
Date:	Feb 01 2024 10:30

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.24

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1004	934
Hydrological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Growth curve factor 200 years:	2.86	2.86

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	0.67	1.62
1 in 1 year (l/s):	0.57	1.38
1 in 30 years (l/s):	1.42	3.46
1 in 100 year (l/s):	1.74	4.24
1 in 200 years (l/s):	1.91	4.64

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 318165, Northing: 225938,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.6,	3.8,	4.5,	5.5,	6.2,	6.8,	8.6,	10.7,	12.2,	14.2,	16.1,	17.5,	19.8,	21.5,	23.0,	N/A ,
10 mins	3.6,	5.3,	6.2,	7.7,	8.6,	9.4,	12.0,	14.9,	16.9,	19.8,	22.4,	24.4,	27.5,	30.0,	32.1,	N/A ,
15 mins	4.3,	6.2,	7.3,	9.0,	10.2,	11.1,	14.1,	17.6,	19.9,	23.3,	26.3,	28.7,	32.4,	35.3,	37.7,	N/A ,
30 mins	5.6,	8.1,	9.5,	11.6,	13.1,	14.2,	18.0,	22.3,	25.3,	29.4,	33.1,	36.0,	40.6,	44.1,	47.1,	N/A ,
1 hours	7.3,	10.6,	12.3,	15.0,	16.8,	18.3,	23.0,	28.4,	32.0,	37.1,	41.7,	45.3,	50.8,	55.2,	58.8,	N/A ,
2 hours	9.7,	13.8,	16.0,	19.4,	21.7,	23.5,	29.3,	36.1,	40.5,	46.8,	52.5,	56.9,	63.6,	68.9,	73.3,	N/A ,
3 hours	11.3,	16.1,	18.6,	22.5,	25.1,	27.2,	33.9,	41.5,	46.5,	53.7,	60.0,	65.0,	72.6,	78.5,	83.5,	N/A ,
4 hours	12.7,	17.9,	20.8,	25.0,	27.9,	30.1,	37.5,	45.8,	51.3,	59.1,	66.0,	71.4,	79.7,	86.1,	91.5,	N/A ,
6 hours	14.9,	20.9,	24.2,	29.0,	32.3,	34.9,	43.2,	52.7,	58.9,	67.7,	75.5,	81.6,	90.9,	98.2,	104.2,	N/A ,
9 hours	17.4,	24.4,	28.1,	33.7,	37.5,	40.4,	49.9,	60.6,	67.7,	77.6,	86.4,	93.2,	103.7,	111.8,	118.6,	N/A ,
12 hours	19.5,	27.2,	31.3,	37.5,	41.6,	44.8,	55.2,	66.9,	74.7,	85.5,	95.1,	102.5,	113.9,	122.7,	130.0,	N/A ,
18 hours	22.9,	31.8,	36.5,	43.5,	48.2,	51.9,	63.7,	77.0,	85.7,	97.9,	108.7,	117.1,	129.9,	139.8,	147.9,	N/A ,
24 hours	25.7,	35.4,	40.6,	48.4,	53.5,	57.5,	70.5,	85.1,	94.6,	107.9,	119.6,	128.7,	142.6,	153.3,	162.2,	193.1,
2 days	32.1,	43.3,	49.1,	57.7,	63.4,	67.8,	81.8,	97.3,	107.3,	121.2,	133.4,	142.7,	156.9,	167.8,	176.8,	207.8,
3 days	37.3,	49.6,	56.0,	65.3,	71.4,	76.1,	91.0,	107.4,	117.9,	132.4,	145.1,	154.7,	169.3,	180.5,	189.7,	221.3,
4 days	41.9,	55.2,	62.0,	71.9,	78.4,	83.3,	99.1,	116.2,	127.2,	142.2,	155.3,	165.3,	180.4,	191.8,	201.2,	233.4,
6 days	50.0,	64.9,	72.5,	83.4,	90.5,	95.9,	113.1,	131.5,	143.3,	159.4,	173.2,	183.7,	199.6,	211.7,	221.5,	255.0,
8 days	57.2,	73.5,	81.7,	93.5,	101.2,	107.0,	125.3,	144.9,	157.4,	174.3,	188.9,	199.9,	216.4,	229.0,	239.2,	273.9,
10 days	63.7,	81.3,	90.1,	102.7,	110.8,	117.0,	136.4,	157.0,	170.1,	187.8,	203.0,	214.4,	231.6,	244.6,	255.2,	291.0,
12 days	69.9,	88.6,	97.9,	111.2,	119.8,	126.3,	146.7,	168.2,	181.8,	200.3,	216.0,	227.9,	245.7,	259.1,	270.0,	306.8,
16 days	81.4,	102.1,	112.4,	127.0,	136.4,	143.5,	165.5,	188.7,	203.3,	223.0,	239.8,	252.4,	271.2,	285.4,	296.9,	335.5,
20 days	92.0,	114.6,	125.7,	141.4,	151.5,	159.1,	182.6,	207.4,	222.8,	243.6,	261.3,	274.6,	294.3,	309.2,	321.2,	361.5,
25 days	104.6,	129.2,	141.2,	158.2,	169.1,	177.3,	202.5,	228.9,	245.3,	267.4,	286.1,	300.1,	320.9,	336.5,	349.1,	391.2,

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

M5-60: 18.3
Ratio, r: 0.270

SAAR Value from Met Eireann data: 934 mm

Appendix E – Site Investigation Extracts

II Fieldwork

The new development is to be located on a grassed area located at the junction of Kilcross Road and Sandyford Road in Dublin.

The site plan enclosed in Appendix VI show the location of the new development and the position of the Trial Pits and Dynamic Probes. All locations have been referenced to National Grid and OD levels have been established.

The various elements of the investigation are detailed in the following paragraphs. All field works were supervised by an experienced geotechnical engineer who carefully recorded stratification, recovered samples and prepared detailed records.

Close liaison was maintained throughout with the consulting engineers. All appropriate documentation was submitted and approved prior to site commencement. Each location was scanned electronically (CAT) to ensure that existing services were not damaged.

Statutory HSE precautions relating to site safety and COVID 19 were strictly observed, with working areas restricted to IGSL personnel only, to ensure safety of the general public.

Trial Pits

Trial Pits were completed at four locations and referenced TP 1 to TP 4.
A JCB excavator was used under engineering supervision. Detailed records for each location are presented in Appendix I. These records note the soil stratification and record sampling and ground water details.

The records indicate significant variations in soil composition and excavation depth.

At TP1 and TP2 topsoil overlies a thin stratum of soft to firm brown sandy gravelly CLAY, containing some granite cobbles. Obstructions were noted at 0.70 metres in TP 1 and at 1.30 metres in TP 2 resulting in excavator refusal.

Firm Grey brown gravelly CLAY (probably MADE GROUND) was penetrated to about 1.50 metres at TP 3 and TP 4 with a thin underlying layer of soft gravelly CLAY.

Granite SAND (possibly residual GRANITE) was noted at the base of TP 3 and TP 4 with refusal in both locations on presumed granite at 2.40 metres BGL.

All four trial pits were dry and remained reasonably stable during the course of investigation.

The findings are summarised as follows:

Chemical

Two samples were sent for analysis to BRE Chemical Suite parameters. Sulphate concentrations (SO4 2:1 extract) of < 0.010 g/l were established with pH values of 8.4 and 6.5 . Low Chloride concentrations (< 0.010 to 0.015 g/l) were also determined.

RILTA Environmental Suite

Two samples of the soil were sent to specialist environmental laboratory and testing was carried out in accordance with RILTA requirements to establish Landfill Waste Acceptance Criteria (WAC). Both samples are classified as INERT and material excavated from this site can be safely disposed of either on site or to a suitably licensed landfill facility.

No ASBESTOS was identified during routine screening of the samples.

IV. Discussion

The geotechnical investigation carried out on this site included Trial Pit excavation under engineering supervision and Heavy Duty Dynamic Probing at nine locations.

The results reflect a pattern of REFUSAL of both excavator and probe apparatus at relatively shallow depths generally between 0.70 and 3.00 metres.

The trial pitting operation suggests that the gravelly clay (boulder clay) identified during excavation may represent FILL material, possibly related to earlier adjacent road construction. Soft organic soil (probably original Topsoil) was noted in two trial pits and in two probes below stiff upper material.

The granite sand noted in TP03 and TP04 probably represents highly weathered GRANITE and would be fairly typical of the area.

Some shallow refusal has also been recorded, possibly on solid GRANITE rock or possibly granite boulders.

We would suggest that foundation loads for this development are transferred to the GRANITE bedrock where an allowable bearing pressure of at least 300 kPa can be assumed.

TRIAL PIT RECORD

REPORT NUMBER 24722

CONTRACT	Kilcross Development Site at Sandyford , Dublin 18	TRIAL PIT NO.	TP1
		SHEET	Sheet 1 of 1
LOGGED BY	JC	CO-ORDINATES	718,094.58 E 725,992.56 N
CLIENT	Sonas/D.L.R Co.Co.	GROUND LEVEL (m)	106.53
ENGINEER	Kavanagh Mansfield & Ptnrs		
		DATE STARTED	25/05/2023
		DATE COMPLETED	25/05/2023
		EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 Topsoil		0.20	106.33						
Firm to stiff grey brown sandy gravelly CLAY with occasional granite cobbles									
Obstruction End of Trial Pit at 0.70m		0.70	105.83		207209	B	0.70		

1.0
2.0
3.0
4.0

Groundwater Conditions
No groundwater encountered

Stability
Trial pit remained stable

General Remarks

IGSL TP LOG 24722.GPJ IGSL.GDT 31/5/23

TRIAL PIT RECORD

REPORT NUMBER 24722

CONTRACT	Kilcross Development Site at Sandyford , Dublin 18	**TRIAL PIT NO.**	**TP2**
		SHEET	Sheet 1 of 1
LOGGED BY	JC	**CO-ORDINATES**	718,121.11 E 725,992.33 N
		DATE STARTED	25/05/2023
		DATE COMPLETED	25/05/2023
CLIENT	Sonas/D.L.R Co.Co.	**GROUND LEVEL (m)**	106.97
ENGINEER	Kavanagh Mansfield & Ptnrs	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
Topsoil		0.15	106.82						
Firm grey brown sandy gravelly CLAY with occasional granite cobbles					207210	B	0.50		
Stiff grey very sandy gravelly CLAY with frequent granite boulders		1.10	105.87		207211	B	1.00		
Obstruction End of Trial Pit at 1.30m		1.30	105.67						

0.0
1.0
2.0
3.0
4.0

Groundwater Conditions
No groundwater encountered

Stability
Trial pit remained stable

General Remarks

IGSL_TP LOG 24722.GPJ IGSL.GDT 31/5/23

TRIAL PIT RECORD

REPORT NUMBER 24722

CONTRACT	Kilcross Development Site at Sandyford , Dublin 18	**TRIAL PIT NO.**	**TP3**
		SHEET	Sheet 1 of 1
LOGGED BY	JC	**CO-ORDINATES**	718,102.71 E 725,967.88 N
		DATE STARTED	25/05/2023
		DATE COMPLETED	25/05/2023
CLIENT	Sonas/D.L.R Co.Co.	**GROUND LEVEL (m)**	106.86
ENGINEER	Kavanagh Mansfield & Ptnrs	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 Topsoil		0.10	106.76						
Grey brown sandy gravelly CLAY with occasional granite cobbles (Possibly Made Ground)					207216	B	0.30		
					207217	B	1.00		
Soft brown sandy gravelly CLAY with roots and fibres - possible old topsoil/grass		1.40	105.46		207218	B	1.50		
Medium dense to dense fine to coarse grey clayey SAND - possible highly weathered granite		1.70	105.16		207219	B	2.00		
Obstruction End of Trial Pit at 2.40m		2.40	104.46						

Groundwater Conditions
No groundwater encountered

Stability
Trial pit remained stable

General Remarks

IGSL TP LOG 24722.GPJ IGSL.GDT 31/5/23

TRIAL PIT RECORD

REPORT NUMBER 24722

CONTRACT	Kilcross Development Site at Sandyford , Dublin 18	TRIAL PIT NO.	TP4
		SHEET	Sheet 1 of 1
LOGGED BY	JC	CO-ORDINATES	718,116.68 E 725,945.60 N
			DATE STARTED 25/05/2023
			DATE COMPLETED 25/05/2023
CLIENT	Sonas/D.L.R Co.Co.	GROUND LEVEL (m)	107.17
ENGINEER	Kavanagh Mansfield & Ptnrs	EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 Topsoil		0.10	107.07						
Firm brown sandy gravelly CLAY		0.30	106.87						
Firm grey brown sandy gravelly CLAY with occasional granite cobbles (Possibly Made Ground)					207212	B	0.30		
1.0					207213	B	1.00		
Soft grey sandy organic silty CLAY with roots and fibres		1.50	105.67						
					207214	B	1.70		
Medium dense to dense fine to coarse grey clayey SAND - possible highly weathered granite		1.90	105.27						
2.0					207215	B	2.00		
Obstruction End of Trial Pit at 2.30m		2.30	104.87						
3.0									
4.0									

Groundwater Conditions
No groundwater encountered

Stability
Trial pit remained stable

General Remarks

Soakaway Design f -value from field tests IGSL

Contract:	Kilcross Road	Contract No.	24722
Test No.	SK1 / TP3		
Client	KMP Consulting Engineers		
Date:	25/05/2023		

Summary of ground conditions

from	to	Description	Ground water
0.00	0.10	Topsoil	
0.10	0.40	Firm brown sandy gravelly CLAY	
0.40	1.40	Firm to stiff grey brown sandy gravelly CLAY with occasional cobbles	
1.40	1.70	Firm brown sandy gravelly CLAY with roots / fibres - possible old topsoil	
1.70	2.40	Fine to coarse grey clayey SAND - possible highly weathered granite	
2.40	2.40	Obstruction	

Field Data

Depth to Water (m)	Elapsed Time (min)
1.35	0.00
1.35	1.00
1.36	2.00
1.36	3.00
1.37	4.00
1.38	5.00
1.40	10.00
1.40	15.00
1.41	20.00
1.41	25.00
1.41	30.00
1.42	40.00
1.42	50.00
1.42	60.00
1.42	70.00
1.42	80.00

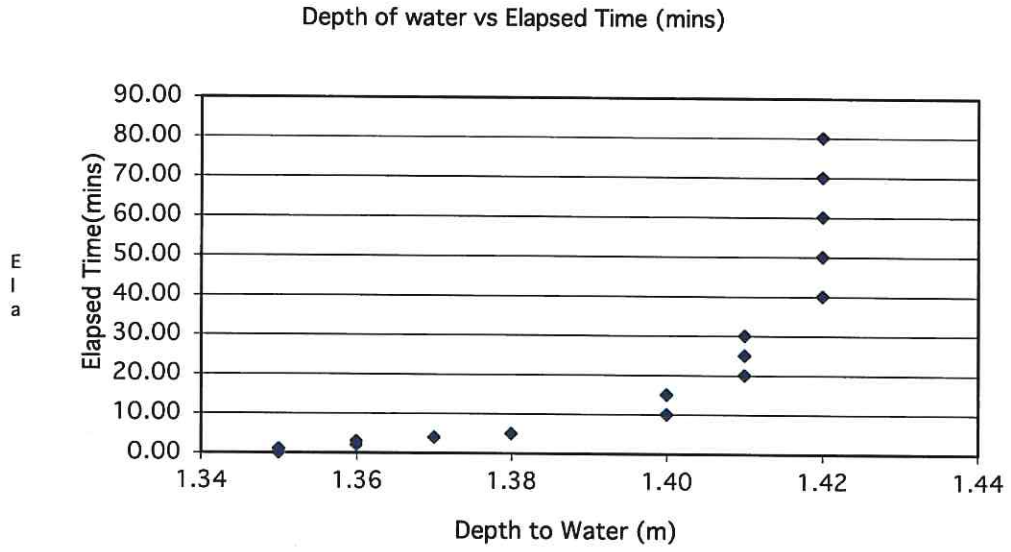
Field Test

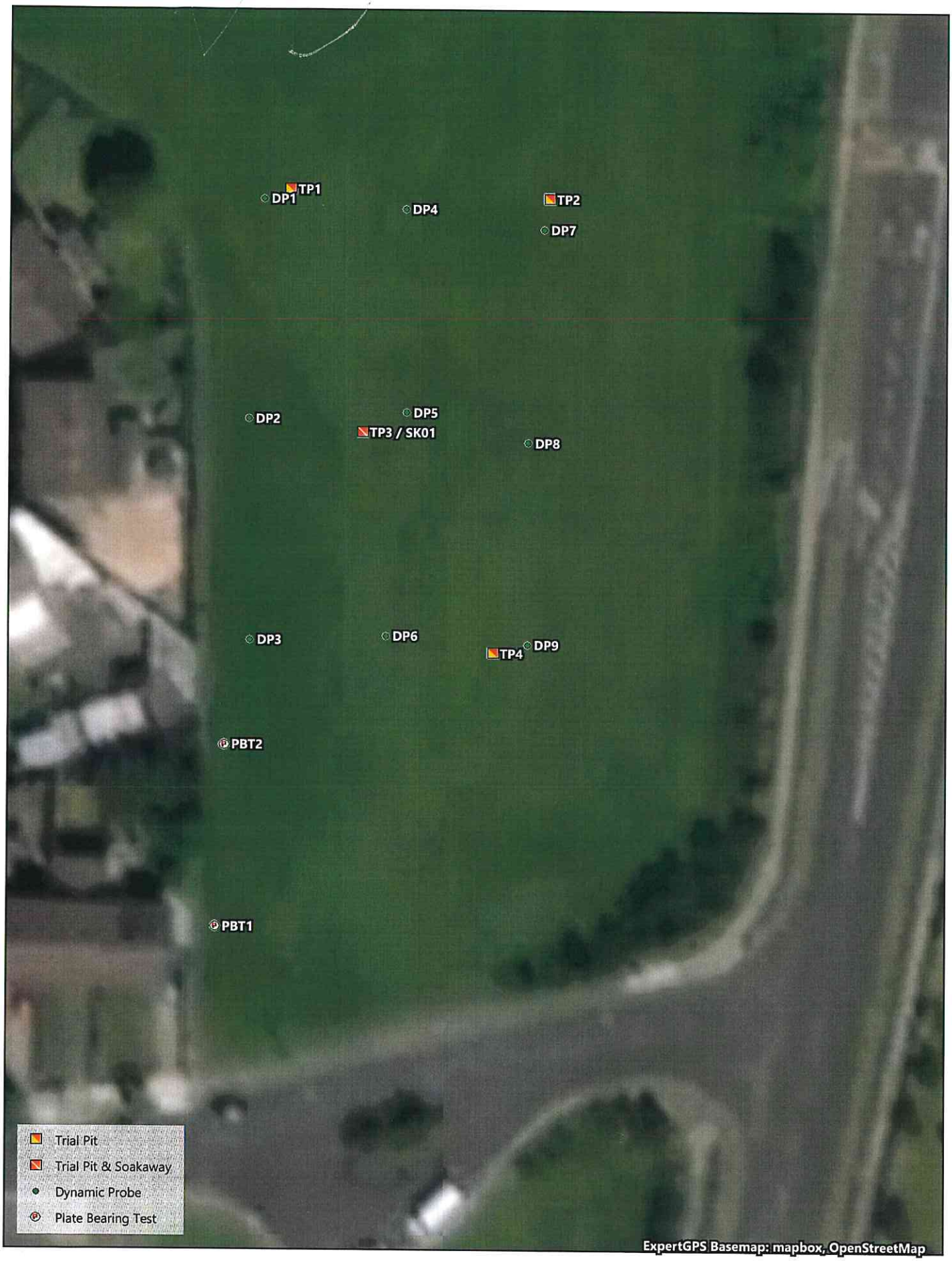
Depth of Pit (D)	2.40	m
Width of Pit (B)	0.60	m
Length of Pit (L)	2.00	m
Initial depth to Water =	1.35	m
Final depth to water =	1.42	m
Elapsed time (mins)=	80.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	1.2	m2
*Av. side area of permeable stratum over test perio	5.278	m2
Total Exposed area =	6.478	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00016 m/min or 2.701E-06 m/sec

Note: no fall in water level after 20 minutes





ExpertGPS

24722 Kilcross Sandyford

5 0 5 10 15 20 25 30 35 40 45 m

Scale: 1 : 500.

MN

1°44'

Appendix F – Stormwater Model Results

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Junctions Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

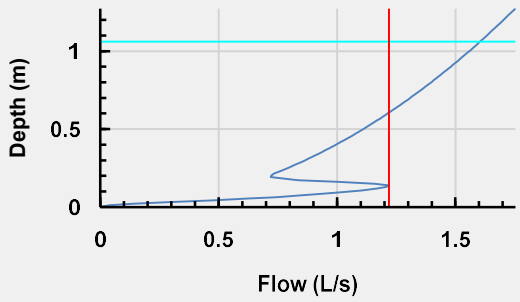
Name	Junction Type	Easting (m)	Northing (m)	Cover Elevation (m)	Depth (m)	Invert Elevation (m)	Chamber Shape	Diameter (m)
S1	Manhole	718090.083	725908.843	106.850	1.850	105.000	Circular	1.200
S2	Manhole	718090.606	725941.043	106.050	1.407	104.643	Circular	1.200
S4	Manhole	718092.164	725971.903	106.000	1.532	104.468	Circular	1.200
S5	Manhole	718085.585	725972.668	106.000	1.575	104.425	Circular	1.200
S6	Manhole	718124.181	725950.587	106.150	0.650	105.500	Circular	0.450
S7	Manhole	718114.574	725950.738	106.150	0.864	105.286	Circular	0.450
S8	Manhole	718114.486	725956.231	106.150	0.996	105.154	Circular	0.600
S3	Manhole	718090.971	725956.234	106.000	1.450	104.550	Circular	1.200
S10	Manhole	718111.939	725986.279	106.150	0.500	105.650	Circular	0.450
S11	Manhole	718087.486	725986.279	106.150	0.745	105.405	Circular	0.450
S12	Manhole	718087.451	725974.654	106.000	0.720	105.280	Circular	0.450
S13	Manhole	718097.408	725974.647	106.180	1.041	105.139	Circular	0.450
S15	Manhole	718121.410	725974.553	106.150	0.730	105.420	Circular	0.450
S9	Manhole	718114.477	725972.167	106.150	0.650	105.500	Circular	0.450
S16	Manhole	718119.763	725940.858	106.150	0.950	105.200	Circular	0.450
S14	Manhole	718097.862	725972.631	106.000	1.450	104.550	Circular	1.200

Name	Lock
S1	None
S2	None
S4	None
S5	None
S6	None
S7	None
S8	None
S3	None
S10	None
S11	None
S12	None
S13	None
S15	None
S9	None
S16	None
S14	None

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
S1	Outlet	S1.000	Free Discharge
S2	Outlet	S1.001	Free Discharge
S4	Outlet	S1.004	Hydro-Brake®

Invert Elevation (m)	104.500
Design Depth (m)	1.060
Design Flow (L/s)	1.6
Objective	Minimize Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐
Unit Reference	CHE-0057-1600-1060-1600



Junction	Outlet Name	Outgoing Connection	Outlet Type
S6	Outlet	S2.000	Free Discharge
S7	Outlet	S2.001	Free Discharge
S8	Outlet	S2.002	Free Discharge
S3	Outlet	S1.002	Free Discharge
S10	Outlet	S4.000	Free Discharge
S11	Outlet	S4.001	Free Discharge
S12	Outlet	S4.002	Free Discharge
S13	Outlet	S4.003	Free Discharge
S15	Outlet	S5.000	Free Discharge
S9	Outlet	S3.000	Free Discharge
S16	Outlet	S6.000	Free Discharge
S14	Outlet	S4.004	Free Discharge

Chamber

Type : Chamber

Dimensions

Exceedance Elevation (m)	105.900
Depth (m)	1.160
Base Elevation (m)	104.500
Number of Chambers	47
Number of Rows	8
Distance Between Rows (mm)	150
Total Volume (m³)	121.942

Chamber Shape

Type	Parabolic Arch Chamber
Chamber Length (m)	2.169
Wall Thickness (mm)	100
Diameter / Base Width (mm)	1295
Height (mm)	760

Embedded Parameters

Porosity (%)	40
Height Above (m)	0.150
Height Below (m)	0.150
Sides (m)	0.300
Ends (m)	0.300

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	S1.002
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (2)

Inlet Type	Point Inflow
Incoming Item(s)	S4.004
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	S1.003
Outlet Type	Free Discharge

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Connections Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Name	Length (m)	Connection Type	Slope (1:x)	Manning's n	Diameter / Base Width (mm)	Upstream Cover Elevation (m)	Upstream Invert Elevation (m)	Downstream Cover Elevation (m)
S1.000	32.204	Pipe	90.178	0.013	225	106.850	105.000	106.050
S1.003	8.162	Pipe	255.415	0.013	225	105.900	104.500	106.000
S1.004	6.623	Pipe	152.641	0.013	225	106.000	104.468	106.000
S2.000	9.609	Pipe	44.901	0.013	150	106.150	105.500	106.150
S2.001	5.494	Pipe	41.601	0.013	150	106.150	105.286	106.150
S2.002	23.515	Pipe	38.936	0.013	225	106.150	105.154	106.000
S1.002	7.652	Pipe	153.043	0.013	225	106.000	104.550	105.900
S4.000	24.453	Pipe	99.808	0.013	150	106.150	105.650	106.150
S4.001	11.625	Pipe	92.997	0.013	150	106.150	105.405	106.000
S4.002	9.957	Pipe	100.000	0.013	150	106.000	105.289	106.180
S3.000	15.936	Pipe	46.050	0.013	150	106.150	105.500	106.150
S6.000	29.157	Pipe	52.336	0.013	150	106.150	105.200	106.050
S4.003	2.067	Pipe	20.000	0.013	150	106.180	105.139	106.000
S4.004	1.556	Pipe	31.115	0.013	225	106.000	104.550	105.900
S1.001	15.195	Pipe	163.602	0.013	225	106.050	104.643	106.000
S5.000	24.002	Pipe	100.000	0.013	150	106.150	105.420	106.180

Name	Downstream Invert Elevation (m)	Part Family	Lock	Flow Restriction (L/s)
S1.000	104.643		None	
S1.003	104.468		None	
S1.004	104.425		None	1.6
S2.000	105.286		None	
S2.001	105.154		None	
S2.002	104.550		None	
S1.002	104.500		None	
S4.000	105.405		None	
S4.001	105.280		None	
S4.002	105.189		None	
S3.000	105.154		None	
S6.000	104.643		None	
S4.003	105.036		None	
S4.004	104.500		None	
S1.001	104.550		None	
S5.000	105.180		None	

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Inflow Summary Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (km²)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analyzed (km²)
Catchment Area	S1		Time of Concentration	0.00037	100	10	110	0.00041
Catchment Area (1)	S6		Time of Concentration	0.00004	100	10	110	0.00004
Catchment Area (2)	S6		Time of Concentration	0.00005	100	10	110	0.00005
Catchment Area (3)	S16		Time of Concentration	0.00007	100	10	110	0.00008
Catchment Area (4)	S7		Time of Concentration	0.00008	100	10	110	0.00009
Catchment Area (5)	S16		Time of Concentration	0.00014	100	10	110	0.00015
Catchment Area (6)	S8		Time of Concentration	0.00002	100	10	110	0.00002
Catchment Area (7)	S9		Time of Concentration	0.00015	100	10	110	0.00016
Catchment Area (8)	S15		Time of Concentration	0.00009	100	10	110	0.00009
Catchment Area (9)	S10		Time of Concentration	0.00009	100	10	110	0.00010
Catchment Area (10)	S11		Time of Concentration	0.00004	100	10	110	0.00004
Catchment Area (11)	S13		Time of Concentration	0.00008	100	10	110	0.00009
Catchment Area (12)	S15		Time of Concentration	0.00030	100	10	110	0.00034
Catchment Area (13)	S9		Time of Concentration	0.00004	100	10	110	0.00004
Catchment Area (14)	S8		Time of Concentration	0.00013	100	10	110	0.00015
Catchment Area (15)	S2		Time of Concentration	0.00042	100	10	110	0.00046
TOTAL		**0.0**		**0.00211**				**0.00232**

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Network Design Criteria Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	4
Max. Travel Time (mins)	30

FSR

Type: FSR

Return Period (years)	100.0
Region	Scotland and Ireland
M5-60 (mm)	18.3
Ratio R	0.270

Pipe Options

Lock Slope Options	None
Design Options	Minimize Excavation
Design Level	Level Crowns
Min. Cover Depth (m)	0.900
Min. Slope (1:x)	245.00
Max. Slope (1:x)	20.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☑
Reduce Channel Depths	☑

Pipe Size Library

Default

Add. Increment (mm)	75
Max. Diameter (mm)	0

Diameter (mm)	Min. Slope (1:x)	Max. Slope (1:x)
100	0.00	0.00
150	0.00	0.00

Manhole Options

Apply Offset	☐

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	10
Junction Flood Risk Margin (mm)	300
Perform First Flush Analysis	☐

Rainfall

FSR

Type: FSR

Region	Scotland and Ireland
M5-60 (mm)	18.3
Ratio R	0.270
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	20.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Junctions Summary Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
S1	FSR: 100 years: +20 %: 960 mins: Winter	106.850	105.000	105.652	0.652	1.6	0.737	0.000	1.5	35.294	Surcharged
S2	FSR: 100 years: +20 %: 960 mins: Winter	106.050	104.643	105.652	1.009	4.1	1.141	0.000	4.0	92.846	Surcharged
S4	FSR: 100 years: +20 %: 960 mins: Winter	106.000	104.468	105.652	1.184	1.6	1.339	0.000	1.6	141.357	Surcharged
S5	FSR: 100 years: +20 %: 960 mins: Winter	106.000	104.425	104.453	0.029	1.6	0.000	0.000	1.6	141.329	OK
S6	FSR: 100 years: +20 %: 960 mins: Winter	106.150	105.500	105.652	0.152	0.3	0.024	0.000	0.3	7.963	Surcharged
S7	FSR: 100 years: +20 %: 960 mins: Winter	106.150	105.286	105.652	0.366	0.7	0.058	0.000	0.7	15.937	Surcharged
S8	FSR: 100 years: +20 %: 960 mins: Winter	106.150	105.154	105.652	0.498	2.1	0.141	0.000	2.1	47.678	Surcharged
S3	FSR: 100 years: +20 %: 960 mins: Winter	106.000	104.550	105.652	1.102	6.0	1.246	0.000	5.9	138.900	Surcharged
S10	FSR: 100 years: +20 %: 15 mins: Winter	106.150	105.650	105.705	0.055	4.5	0.009	0.000	4.3	2.056	OK
S11	FSR: 100 years: +20 %: 960 mins: Winter	106.150	105.405	105.652	0.247	0.5	0.039	0.000	0.5	12.136	Surcharged
S12	FSR: 100 years: +20 %: 960 mins: Winter	106.000	105.280	105.652	0.372	0.5	0.059	0.000	0.5	12.120	Surcharged
S13	FSR: 100 years: +20 %: 960 mins: Winter	106.180	105.139	105.652	0.513	2.5	0.082	0.000	2.5	56.535	Surcharged
S15	FSR: 100 years: +20 %: 960 mins: Winter	106.150	105.420	105.652	0.232	1.6	0.037	0.000	1.6	36.673	Surcharged
S9	FSR: 100 years: +20 %: 960 mins: Winter	106.150	105.500	105.652	0.152	0.8	0.024	0.000	0.8	17.587	Surcharged
S16	FSR: 100 years: +20 %: 960 mins: Winter	106.150	105.200	105.652	0.452	0.9	0.072	0.000	0.9	20.006	Surcharged
S14	FSR: 100 years: +20 %: 960 mins: Winter	106.000	104.550	105.652	1.102	2.5	1.246	0.000	2.4	56.181	Surcharged

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Critical Storm Per Item: Rank By: Max. Resident Volume

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Total Lost Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Half Drain Down Time (mins)	Percentage Available (%)
Chamber	FSR: 100 years: +20 %: 960 mins: Winter	105.652	105.652	1.152	1.152	8.3	121.848	0.000	0.000	1.6	142.079	750	0.077

Status
OK

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Connections Summary Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
S1.000	FSR: 100 years: +20 %: 15 mins: Summer	Pipe	S1	S2	106.850	105.092	0.225	7.417	0.4	0.35	16.6	OK
S1.003	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	Chamber	S4	105.900	104.866	0.225	1.917	0.4	0.08	2.3	Surcharged
S1.004	FSR: 100 years: +20 %: 960 mins: Winter	Pipe	S4	S5	106.000	105.652	0.029	141.329	0.6	0.05	1.6	Surcharged
S2.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S6	S7	106.150	105.543	0.054	1.870	0.7	0.18	4.0	OK
S2.001	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S7	S8	106.150	105.351	0.077	3.751	0.9	0.34	7.9	OK
S2.002	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S8	S3	106.150	105.243	0.225	11.209	0.6	0.33	23.6	OK
S1.002	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S3	Chamber	106.000	104.924	0.225	30.522	1.6	1.73	62.8	Surcharged
S4.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S10	S11	106.150	105.705	0.060	2.056	0.7	0.28	4.3	OK
S4.001	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S11	S12	106.150	105.470	0.070	2.842	0.7	0.36	5.7	OK
S4.002	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S12	S13	106.000	105.354	0.071	2.829	0.7	0.37	5.6	OK
S3.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S9	S8	106.150	105.565	0.077	4.128	1.0	0.39	8.8	OK
S6.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S16	S2	106.150	105.273	0.150	4.690	0.6	0.48	10.1	OK
S4.003	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S13	S14	106.180	105.266	0.113	13.291	1.8	0.76	26.0	OK
S4.004	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S14	Chamber	106.000	104.865	0.225	12.905	1.5	0.32	25.5	Surcharged
S1.001	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S2	S3	106.050	105.084	0.225	20.758	1.1	1.2	42.0	Surcharged
S5.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S15	S13	106.150	105.602	0.150	8.648	0.9	1.08	16.5	Surcharged

Appendix G – Drainage Maintenance Checklist

TABLE B.25 SuDS maintenance inspection checklist

General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference(s)	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (eg biodiversity, wildlife and visual aspects)	

Inspection date								
	Details	**Y/N**	**Action required**	**Date completed**	**Details**	**Y/N**	**Action required**	**Date Completed**
General inspection items								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								
Silt/sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								

continued...

continued from...

TABLE B.25 SuDS maintenance inspection checklist

Inspection date								
	Details	**Y/N**	**Action required**	**Date completed**	**Details**	**Y/N**	**Action required**	**Date Completed**
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?								
Does permeable or porous surfacing require sweeping to remove silt?								
System blockages and litter build-up								
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Vegetation								
Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (Check against approved planting regime.)								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming established? If yes, state action required								
Infrastructure								
Are any check dams or weirs in good condition?								
Is there evidence of any accidental damage to the system (eg wheel ruts?)								
Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow controls?								

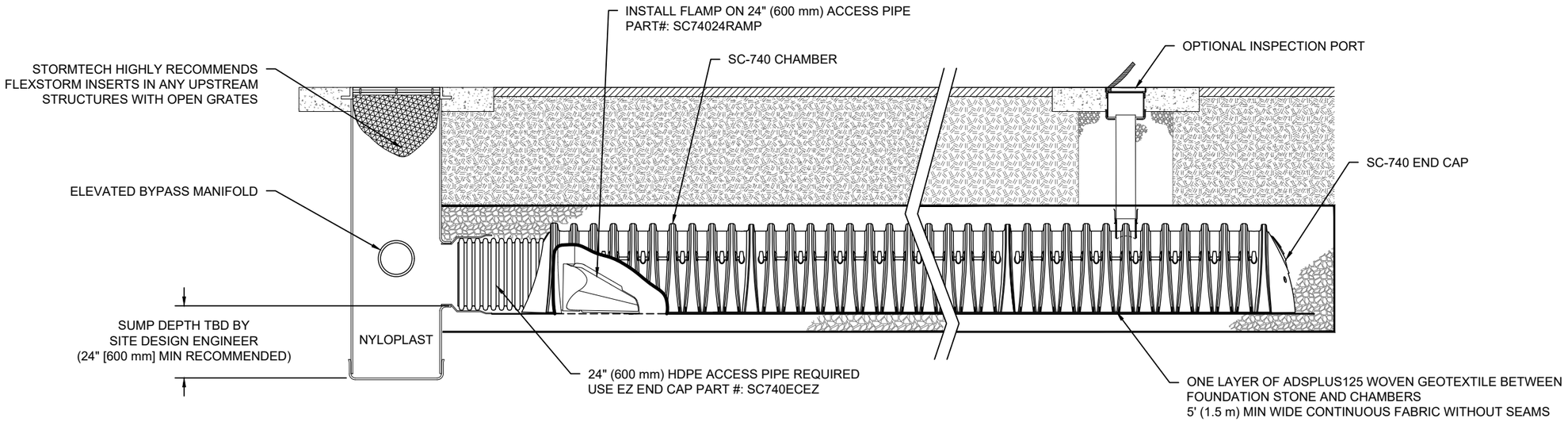
continued...

continued from...

TABLE B.25 SuDS maintenance inspection checklist

Inspection date								
	Details	**Y/N**	**Action required**	**Date completed**	**Details**	**Y/N**	**Action required**	**Date Completed**
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								
Other observations								
Information appended (eg photos)								
Suitability of current maintenance regime								
Continue as current Increase maintenance Decrease maintenance								
Next inspection								
Proposed date for next inspection								

Appendix H – Stormtech Attenuation Tank Maintenance



SC-740 ISOLATOR ROW PLUS DETAIL

NTS

ISOLATOR ROW PLUS COMPONENTS SHOWN ON THIS DESIGN MAY NOT BE AVAILABLE IN THE SPECIFIED PROJECT REGION. PLEASE CONTACT YOUR LOCAL ADS REPRESENTATIVE OR E-MAIL ADSINTERNATIONAL@ADS-PIPE.COM FOR FURTHER INFORMATION

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH-WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

TEST
TEST, EUROPE, EUROPE
DATE:
DRAWN: DM
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

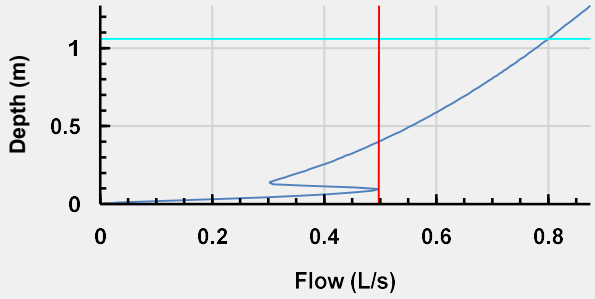
Appendix I – Surcharge Analysis

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Junctions Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
S1	Outlet	S1.000	Free Discharge
S2	Outlet	S1.001	Free Discharge
S4	Outlet	S1.004	Hydro-Brake®
S6	Outlet	S2.000	Free Discharge
S7	Outlet	S2.001	Free Discharge
S8	Outlet	S2.002	Free Discharge
S3	Outlet	S1.002	Free Discharge
S10	Outlet	S4.000	Free Discharge
S11	Outlet	S4.001	Free Discharge
S12	Outlet	S4.002	Free Discharge
S13	Outlet	S4.003	Free Discharge
S15	Outlet	S5.000	Free Discharge
S9	Outlet	S3.000	Free Discharge
S16	Outlet	S6.000	Free Discharge
S14	Outlet	S4.004	Free Discharge

Invert Elevation (m)	104.500
Design Depth (m)	1.060
Design Flow (L/s)	0.8
Objective	Minimize Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐
Unit Reference	CHE-0040-8000-1060-8000



SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Junctions Summary Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Critical Storm Per Item: Rank By: Max. Flooded Volume

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Status
S1	FSR: 100 years: +20 %: 15 mins: Summer	106.850	105.000	105.092	0.092	17.1	0.104	0.000	16.6	7.417	OK
S2	FSR: 100 years: +20 %: 15 mins: Summer	106.050	104.643	105.003	0.360	45.2	0.407	0.000	37.2	18.557	Surcharged
S4	FSR: 100 years: +20 %: 2160 mins: Winter	106.000	104.468	106.003	1.535	2.0	4.914	3.181	0.9	178.082	Flood
S5	FSR: 100 years: +20 %: 15 mins: Summer	106.000	104.425	104.440	0.015	0.4	0.000	0.000	0.4	0.580	OK
S6	FSR: 100 years: +20 %: 15 mins: Summer	106.150	105.500	105.541	0.041	3.9	0.007	0.000	3.8	1.672	OK
S7	FSR: 100 years: +20 %: 15 mins: Summer	106.150	105.286	105.349	0.063	7.7	0.010	0.000	7.5	3.349	OK
S8	FSR: 100 years: +20 %: 15 mins: Summer	106.150	105.154	105.240	0.086	22.8	0.024	0.000	22.3	10.017	OK
S3	FSR: 100 years: +20 %: 2160 mins: Winter	106.000	104.550	106.003	1.453	3.3	4.849	3.209	3.3	177.682	Flood
S10	FSR: 100 years: +20 %: 15 mins: Summer	106.150	105.650	105.703	0.053	4.2	0.008	0.000	4.1	1.834	OK
S11	FSR: 100 years: +20 %: 15 mins: Summer	106.150	105.405	105.468	0.063	5.7	0.010	0.000	5.4	2.536	OK
S12	FSR: 100 years: +20 %: 2160 mins: Winter	106.000	105.280	106.003	0.723	0.5	3.326	3.212	0.4	19.222	Flood
S13	FSR: 100 years: +20 %: 15 mins: Summer	106.180	105.139	105.261	0.121	24.9	0.019	0.000	24.7	11.851	OK
S15	FSR: 100 years: +20 %: 15 mins: Summer	106.150	105.420	105.573	0.153	17.8	0.024	0.000	15.9	7.712	Surcharged
S9	FSR: 100 years: +20 %: 15 mins: Summer	106.150	105.500	105.563	0.063	8.5	0.010	0.000	8.4	3.684	OK
S16	FSR: 100 years: +20 %: 15 mins: Summer	106.150	105.200	105.271	0.071	9.7	0.011	0.000	9.6	4.194	OK
S14	FSR: 100 years: +20 %: 2160 mins: Winter	106.000	104.550	106.003	1.453	3.2	4.837	3.197	2.9	71.996	Flood

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Critical Storm Per Item: Rank By: Max. Resident Volume

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Total Lost Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Half Drain Down Time (mins)	Percentage Available (%)
Chamber	FSR: 100 years: +20 %: 2160 mins: Winter	106.003	106.003	1.503	1.503	4.6	141.731	19.007	0.000	2.0	180.591	923	-16.228

Status
Flood

SONAS DV Refuge : Kilcross, Sandyford, Dublin 18,	Date: 28/02/2024		
	Designed by: DM	Checked by: BB	Approved By: BB
Report Details: Type: Connections Summary Storm Phase: Phase	AOCA Engineering Consultants: Unit E6, Centrepoint Business Park, Oak Drive, Dublin 12.		

Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Elevation (m)	Max. US Water Elevation (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
S1.000	FSR: 100 years: +20 %: 15 mins: Summer	Pipe	S1	S2	106.850	105.092	0.225	7.417	0.4	0.35	16.6	OK
S1.003	FSR: 100 years: +20 %: 2880 mins: Winter	Pipe	Chamber	S4	105.900	106.000	0.225	233.433	0.1	0.08	2.2	Flood
S1.004	FSR: 100 years: +20 %: 480 mins: Winter	Pipe	S4	S5	106.000	105.922	0.021	39.905	0.5	0.02	0.9	Flood Risk
S2.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S6	S7	106.150	105.543	0.054	1.870	0.7	0.18	4.0	OK
S2.001	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S7	S8	106.150	105.351	0.077	3.751	0.9	0.34	7.9	OK
S2.002	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S8	S3	106.150	105.243	0.225	11.208	0.6	0.33	23.6	OK
S1.002	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S3	Chamber	106.000	104.924	0.225	30.492	1.6	1.73	62.8	Surcharged
S4.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S10	S11	106.150	105.705	0.060	2.056	0.7	0.28	4.3	OK
S4.001	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S11	S12	106.150	105.470	0.070	2.842	0.7	0.36	5.7	OK
S4.002	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S12	S13	106.000	105.354	0.071	2.829	0.7	0.37	5.6	OK
S3.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S9	S8	106.150	105.565	0.077	4.128	1.0	0.39	8.8	OK
S6.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S16	S2	106.150	105.273	0.150	4.690	0.6	0.48	10.1	OK
S4.003	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S13	S14	106.180	105.266	0.113	13.291	1.8	0.76	26.0	OK
S4.004	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S14	Chamber	106.000	104.869	0.225	12.900	1.5	0.32	25.4	Surcharged
S1.001	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S2	S3	106.050	105.084	0.225	20.739	1.1	1.2	42.0	Surcharged
S5.000	FSR: 100 years: +20 %: 15 mins: Winter	Pipe	S15	S13	106.150	105.602	0.150	8.648	0.9	1.08	16.5	Surcharged