Comhairle Contae
Átha Cliath Theas
South Dublin County Council

DOCUMENT LEAD SHEET

ENGINEERING SERVICES REPORT

DOC. NO: P2012-C-001

PROJECT: SILVER GRANITE, PALMERSTOWN

STATUS: PLANNING PERMISSION

CLIENT: HOLLYVILLE INVESTMENTS LTD

ARCHITECT: DOWNEY PLANNING & ARCHITECTURE

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Where this document has been revised it is recorded as indicated below. Please replace all superseded pages of this document with current version.

Rev	Date	Description	By	Checked	Approvals	
P	02 Sep 21	Planning Submission	SJ	GD/CP		

☑	Entire Document Issued this Revision	

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APPENDICES

1.0 INTRODUCTION

This Engineering Services Report (ESR) has been prepared by GDCL Consulting Engineers on behalf of Hollyville Investments Ltd. which relates to the proposed mixed-use development located at Silver Granite public house, Kennelsfort Road Upper, Johnstown, Dublin 20. The site location is shown in Figure 1 below:

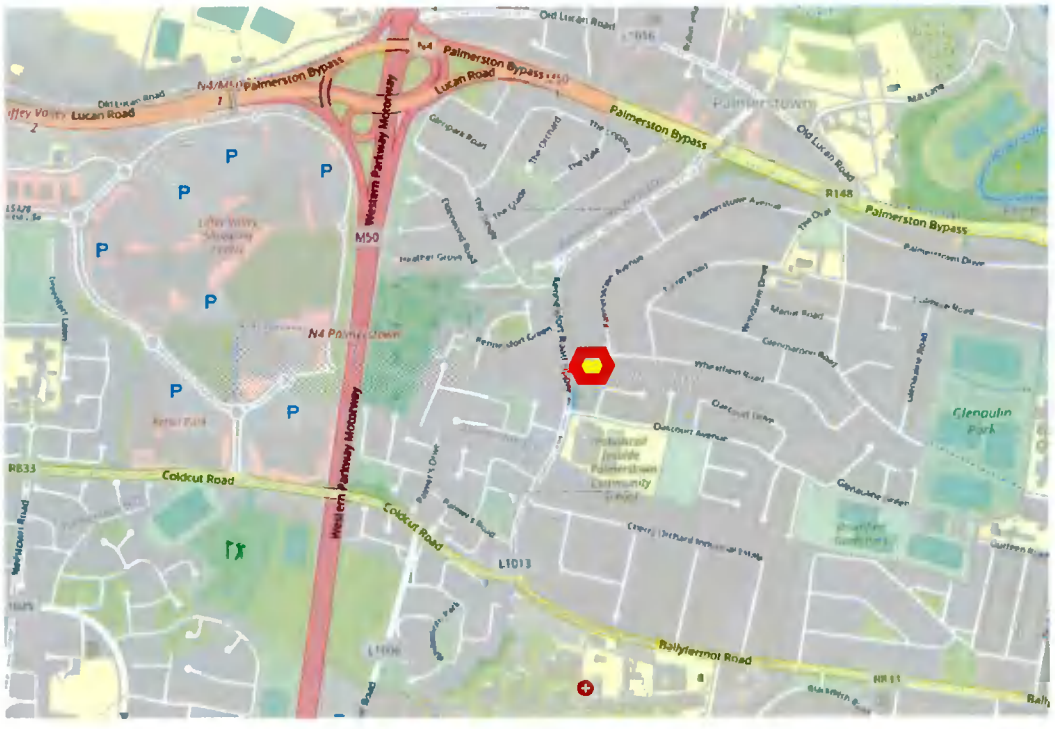


Figure 1 – Site Location Map

The site is approximately 0.3ha in area and is bordered to the west by the Walkinstown Kennelsfort Road, Wheatfield Road to the north, a petrol service station to the south and Oakcourt Grove residential estate to the east. The site currently houses a two-storey public house, bookmakers and barbers with off road surface parking. The surrounding area comprises a mix of retail/commercial enterprises and residential development.

The proposed development will involve the demolition of the existing two storey building and infill of the existing basement and the construction of a multistorey mixed-use development consisting of :-

- 50 no. apartments, comprising of 25 no. one-bed apartments and 25 no. two-bed apartments;

- Internal Basement, Gastropub, Retail Unit, Pharmacy and Off-License at Ground Floor Level;
- Commercial parking fronting the development
- Resident parking located within the existing adjacent shopping centre carpark

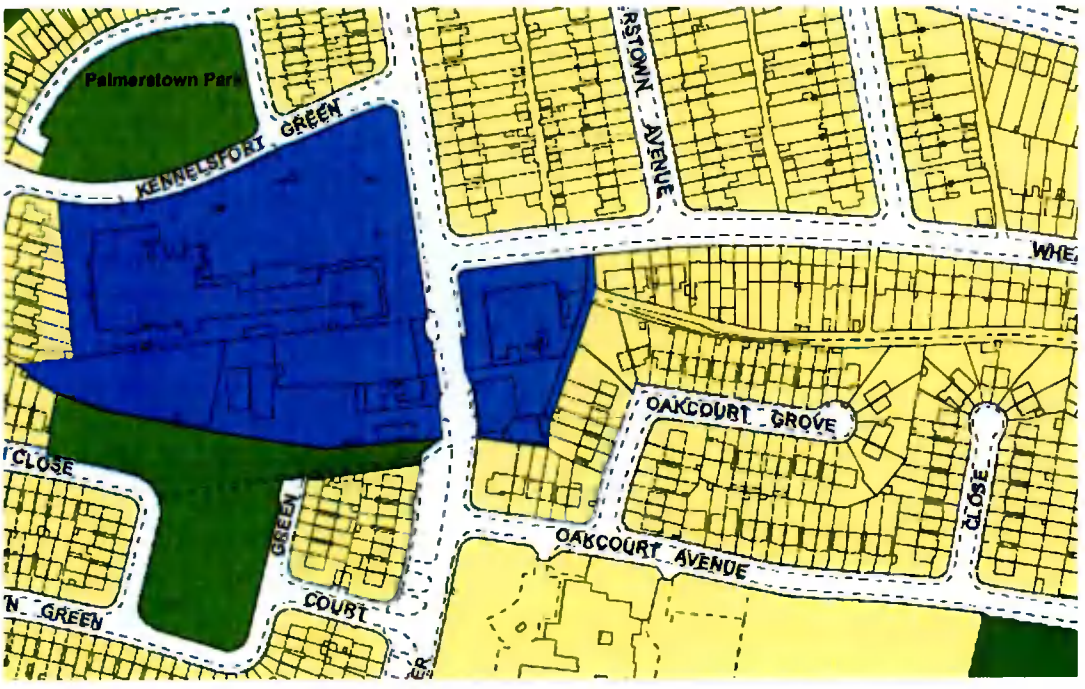
The schedule of areas breakdown for the commercial units are as follows:

Table 1 - Schedule of Commercial Areas

	Floor Area (m^2)
Gastropub	558
Spar	226
Pharmacy	157
Bar/Off License	147
Total	1088

The proposed development will include upgrading of the existing public parking, landscaping and footpaths currently adjoining the existing building.

The site is located within South Dublin County Council Development Plan 2016 - 2022 Map 2 boundary and zoned as Objective DC - *'To protect, improve and provide for the future development of District Centres'*



Use Zoning Objectives

Objective RES	To protect and/or improve residential amenity
Objective RES-N	To provide for new residential communities in accordance with approved area plans
Objective SDZ	To provide for strategic development in accordance with approved planning schemes
Objective REGEN	To facilitate enterprise and/or residential-led regeneration
Objective TC	To protect, improve and provide for the future development of Town Centres
Objective MRC	To protect, improve and provide for the future development of a Major Retail Centre
Objective DC	To protect, improve and provide for the future development of District Centres

Figure 2 – South Dublin County Council Development Plan 2016 - 2022 Map 2 Excerpt

The aim of this report is to provide information on the calculations, estimates and assumptions used to design the foul drains, surface water drains, SuDS systems, surface water attenuation and water supply for the proposed development.

Foul and surface water systems for the site will be separate and are designed in accordance with the requirements of South Dublin County Council, the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS), the Building Regulations and the recommendations of the DOE Recommendations for Site development works for Housing areas. In addition,

sewers have been designed with reference to the 'The Planning System and Flood Risk Management Guidelines', the Greater Dublin Regional Code of Practice for drainage works and Irish Water Standards Details for water and wastewater as applicable.

2.0 SURFACE WATER DRAINAGE

2.1 Introduction

It is proposed that the surface water from the development will drain via gravity and discharge at a restricted rate to an existing surface water sewer to the east of the subject site.

Sustainable Urban Drainage systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban storm water drainage practice that typically consisted of piping runoff of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as sustainable urban drainage systems; they are typically made up of one or more structures built to manage surface water runoff.

The proposed surface water drainage system for this development has been designed as a sustainable urban drainage system and uses permeable paving, a petrol interceptor and blue/green roofs to:

- Treat runoff and remove pollutants to improve quality.
- Restrict outflow and to control quantity.
- Increase amenity value.

Surface water local drains will be 225mm diameter and generally will consist of concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS), the Requirement of the Building Regulations 2010, in accordance with the recommendations contained in the Technical Guidance Documents, Section H, and in accordance with South Dublin County Council requirements.

The surface water drainage system was designed with reference to the Sustainable Urban Drainage Systems 'SuDS' published by the Construction Industry Research and Information Association.

2.2 Surface Water Drainage Strategy

Surface water throughout the site will collected by downpipes from the roof, and yard gullies within the paved areas, draining to the surface water pipe network before discharging into the existing surface water sewer located to the east of the development.

Surface water attenuation has been split into two no. catchments. The flat roof areas, comprising green roofs, decking and roof paving will be attenuated via a 'Blue Roof'

attenuation facility. The remaining pitched roofs and external paved and landscaped areas at ground level will be attenuated using an Stormtech SC740 geocellular attenuation system.

The flow will be restricted to a rate of 1 l/s which is achieved by means of a Hydro-brake, or similar approved flow control device, installed downstream of the attenuation system which will store excess water during storm periods of up to 1 in 100 years. This is in accordance with the requirements of the Greater Dublin Strategic Drainage Study. Additionally, flows from the roof will be attenuated by means of the proposed Blue Roof system.
Surface water drains were designed using the Rational Method to size the pipes for a 1-year storm event. The following parameters applied:

- Return period 1 year
- Time of entry 4 minutes
- Pipe Ks 0.6mm (concrete)
- Minimum velocity 1.0 m/s
- Maximum velocity 3.0 m/s

2.3 Attenuation Calculations

The existing roof surface area of circa 750m^2 comprises a traditional impermeable roof system draining to the existing surface water collection network via a system of rainwater downpipes. No attenuation is currently provided for the subject site.

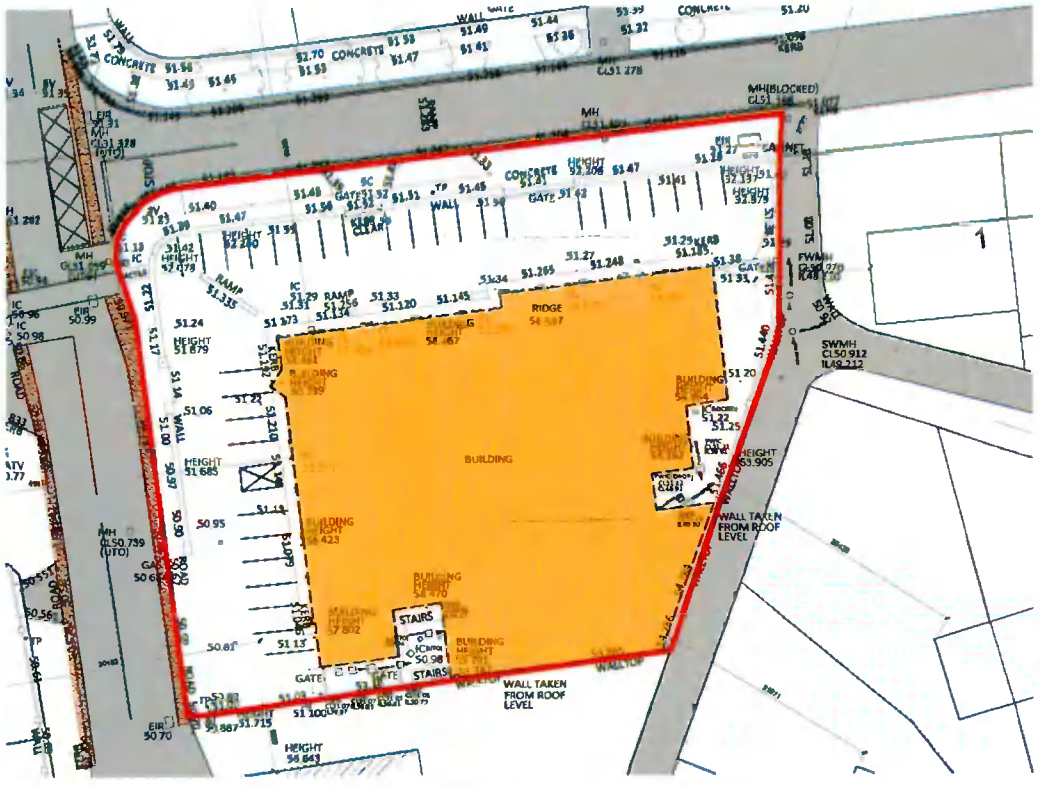


Figure 3 – Existing Site Plan (Roof shown hatched in orange)

The proposed development entails demolishing the existing building and associated impermeable roof system and replacing it with a new multistorey building comprising a combination of low maintenance paving, timber walkways, decorative low maintenance hedging and a combination of an extensive green system.

The hydraulic modelling software system 'WinDes' was used to calculate the attenuation volumes required. Maximum rainfall data from Extreme Rainfall Return Period values produced by Met Eireann (Rainfall Return Periods Table website) was used to input into WinDes to determine maximum flood volume. For Silver Granite, Palmerstown (308000, 235000 ING):

SAAR = 774mm

Ratio $M5_{60}/M5^{2d}$ = 0.277

$M5_{60}$ = 16.7mm

As per current practice a 20% increase to rainfall figures within WinDes was applied to allow for climate change.

The attenuation calculations for the respective catchment areas are as follows:

Catchment 1: External Hardstanding & Landscaping:

Catchment Characteristics			
Silver Granite External Works	**Area (m^2)**	**Runoff Coeff.**	**Effective Area (m^2)**
Roofs - Type 1 (Draining to gullies)	320	1.00	320.0
Roofs - Type 2 (Draining to SUDS features)	-	0.70	0.0
Roofs - Type 3 (Draining to Back Gardens)	-	0.00	0.0
Green Roofs	-	0.70	0.0
Grass over Basements/Podiums	-	0.70	0.0
Roads and Footpaths - Type 1 (Draining to gullies)	448	0.80	358.4
Roads and Footpaths - Type 2 (Draining to Suds features)	-	0.70	0.0
Permeable Paving	665	0.50	332.5
Gardens	-	0.15	0.0
Verges	220	0.15	33.0
Parks	-	0.15	0.0
Public Open Space	-	0.05	0.0

Impermeable Contributing Area	**0.104**	Hectares
Effective Catchment Runoff Coefficient	**0.63**	

The Stormtech SC-740 attenuation facility will be located within the paved plaza area of Catchment 1 to the north of the proposed building.

Surface water discharge from the site will be controlled using a hydrobrake at the outlet from the attenuation system. The Greater Dublin Strategic Drainage Study (GDSDS) recommends that surface water runoff from new developments is limited to 2l/s/ha or Qbar (calculated using the UK IH124 equation). As Catchment Area 1 is approximately 0.17ha, this results in a Qbar value of 0.3 l/s, however, given than orifices less that 50mm in diameter are prone to blockages, a 1.0l/sec flow control device with a 50mm diameter orifice has been specified, see appendix for calculation. For Catchment 1, a Stormtech Geo-cellular Attenuation system with a proposed volume of 44.7m^3 has been proposed.

Catchment 2: Flat Roof Areas:

Catchment Characteristics			
Silver Granite Flat Roof	**Area (m^2)**	**Runoff Coeff.**	**Effective Area (m^2)**
Roofs - Type 1 (Draining to gullies)	600	1.00	600.0
Roofs - Type 2 (Draining to SUDS features)	-	0.70	0.0
Roofs - Type 3 (Draining to Back Gardens)	-	0.00	0.0
Green Roofs	759	0.70	531.3
Grass over Basements/Podiums	-	0.70	0.0
Roads and Footpaths - Type 1 (Draining to gullies)	-	0.80	0.0
Roads and Footpaths - Type 2 (Draining to Suds features)	-	0.70	0.0
Permeable Paving	-	0.50	0.0
Gardens	-	0.15	0.0
Verges	-	0.15	0.0
Parks	-	0.15	0.0
Public Open Space	-	0.05	0.0

Impermeable Contributing Area	0.113	Hectares
Effective Catchment Runoff Coefficient	0.81	

A Blue Roof stormwater attenuation system is proposed at each of the three flat roof levels. Blue roofs can be utilised beneath many types of finish including green roofs and beneath paved surfaces. In this instance, it is proposed to utilise the blue roofs beneath the extensive green roof areas, paving and decking.

Blue roofing provides attenuation capacity within roof slab construction. Utilising this space in this way means that the attenuation capacity required to meet SuDS best practice can be met without the requirement for land-consuming ponds or retention basins, or the challenges of constructing large subterranean geo-cellular storage systems. These measures are unsuitable due to the urban setting of the development.

Blue roof comprises a combined drainage and attenuation void within the roof structure and a roof outlet system designed to release the attenuated water at a controlled discharge rate via a restrictor chamber. It is proposed to restrict runoff from each of the roofs using Bauder flow restrictor outlets or a similar approved flow control device, with a cumulative maximum outflow rate of 0.3l/s. The Figure below shows a section of a typical flow restrictor outlet, extracted from Bauder's Blue Roof Design Considerations manual.

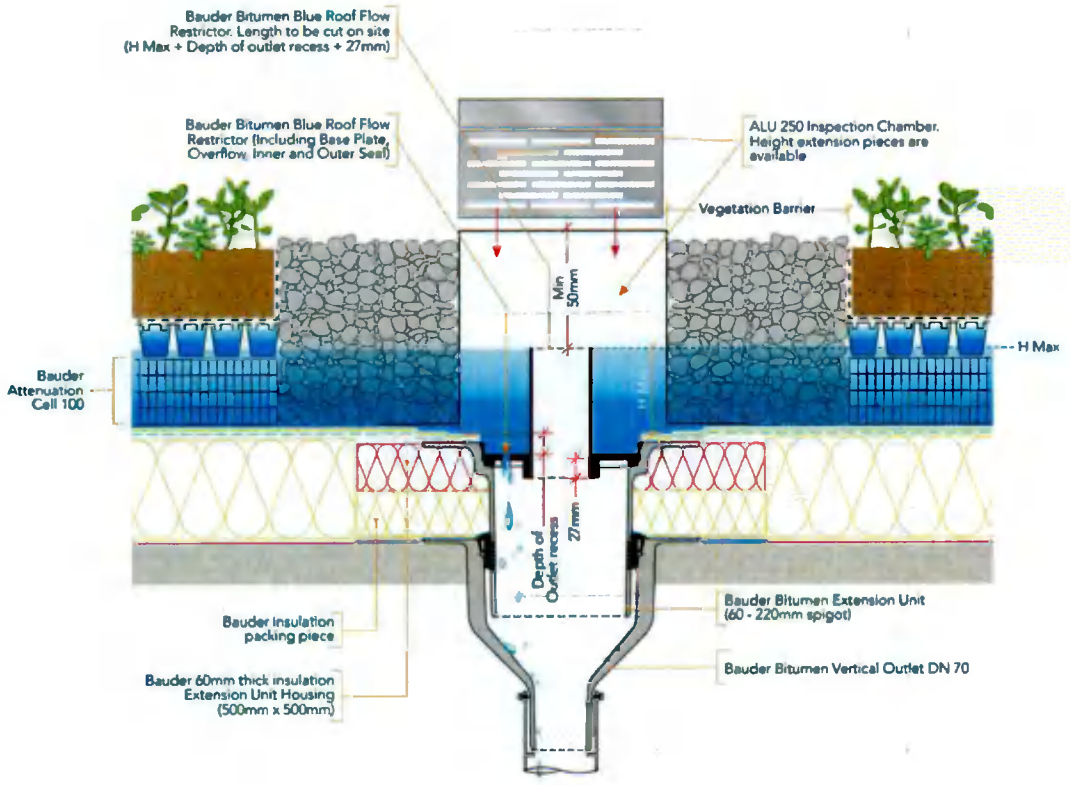


Figure 4 – Typical Blue Roof Detail

As stated previously, surface water attenuation system will be provided using the Bauder Attenuation Cell 100 attenuation system. The attenuation facility will be located within the blue roof system. Surface water discharge from the roofs will be controlled using a Bauder Restrictor Flow Hole at the outlet from the attenuated roof systems.

Catchment 2 Blue Roof Attenuation:

Volume provided = 1010.5m^2 x 0.1m x 0.95 = 96m^3.

It should be noted that the existing development is a brownfield site which currently does not provide any attenuation measures, therefore this reduction in flow would result in a significant benefit to the downstream system capacity.

A calculation sheet has been appended to this report which shows how the attenuation volume and discharge rate were calculated. Please refer to Appendices B and C for details.

2.4 INTERCEPTION STORAGE

It is current good practice in sustainable surface water drainage design that no run-off should directly pass to a receiving surface water system for rainfall depths of 5mm, therefore interception/infiltration storage should be provided at source where practicable. The volume of infiltration required is based on 5mm of rainfall depth from 80% of the runoff from impermeable areas and is calculated as follows:

Catchment 1:

Catchment 1 Interception storage required = $1040m^2 \times 0.8 \times 0.005 = 4.16m^3$

Interception storage will be provided within the 300mm deep stone layer at the base of the external permeable paving.

Catchment 1 Interception storage provided = $744m^2 \times 0.3 \times 0.35 = 78.1m^3$

Catchment 2:

Catchment 2 Interception storage required = $1100m^2 \times 0.8 \times 0.005 = 4.4m^3$

Interception storage will be provided within the green roof areas located on the building roof. The green roof will have a substrate/sub-base depth of 100mm with a void ratio of 35%.

Catchment 2 Interception storage provided = $759m^2 \times 0.1 \times 0.35 = 26.57m^3$

The benefit of providing interception storage is that it allows some form of storage for small rainfall events which results in water evaporation and adsorption in small quantities, therefore there will be less run-off from the system in small rainfall events thus mimicking the natural response for the catchment.

2.5 TREATMENT VOLUME

It is also current good practice in sustainable surface water drainage design that a "treatment volume" is provided in order to prevent any pollutants or sediments discharging into river systems, additionally a 'treatment train' stormwater runoff management system should be applied. According to CIRIA document C697 the following treatment train approach is necessary:

Roofs – 1 Treatment method
Paved Areas excluding Roads - 1 Treatment method
Roads - 2 Treatment Methods

The volume of treatment required is based on 15mm of rainfall depth from 80% of the runoff from impermeable areas and is calculated as follows:

Catchment 1:

Catchment 1 Treatment storage required = **1040m² x 0.8 x 0.015 = 12.48m³**

Catchment 1 Treatment storage provided = **744m² x 0.3 x 0.35 = 78.1m³**

Catchment 2:

Catchment 2 Treatment storage required = **1100m² x 0.8 x 0.015 = 13.2m³**

Catchment 2 Treatment storage provided = **759m² x 0.1 x 0.35 = 26.57m³**

As all runoff is routed through the petrol interceptor and silt trap manhole as part of the online attenuation system this also will provide treatment storage in the system.

2.6 SUDS FEATURES

The SuDS strategy adopted by South Dublin County Council aims to provide an effective system to mitigate the adverse effects of urban stormwater runoff on the environment by reducing runoff rates, volumes and frequency, reducing pollutant concentrations in stormwater, contributing to amenity, aesthetics and biodiversity enhancement where possible. In addition,

SuDS features aim to replicate the natural characteristics of rainfall runoff for any site by providing control of run-off at source.

In terms of compliance with the principles outlined in the GDSDS (Greater Dublin Strategic Drainage Study) Regional Drainage Policies Volume 2 New Development and Sustainable Drainage Systems (SuDS), the introduction proposed extensive green roof system would provide ecological, aesthetic and amenity benefits and intercept and retain rainfall, at source, reducing the volume of runoff and attenuating peak flows. A breakdown of the various sustainable drainage systems is provided below:

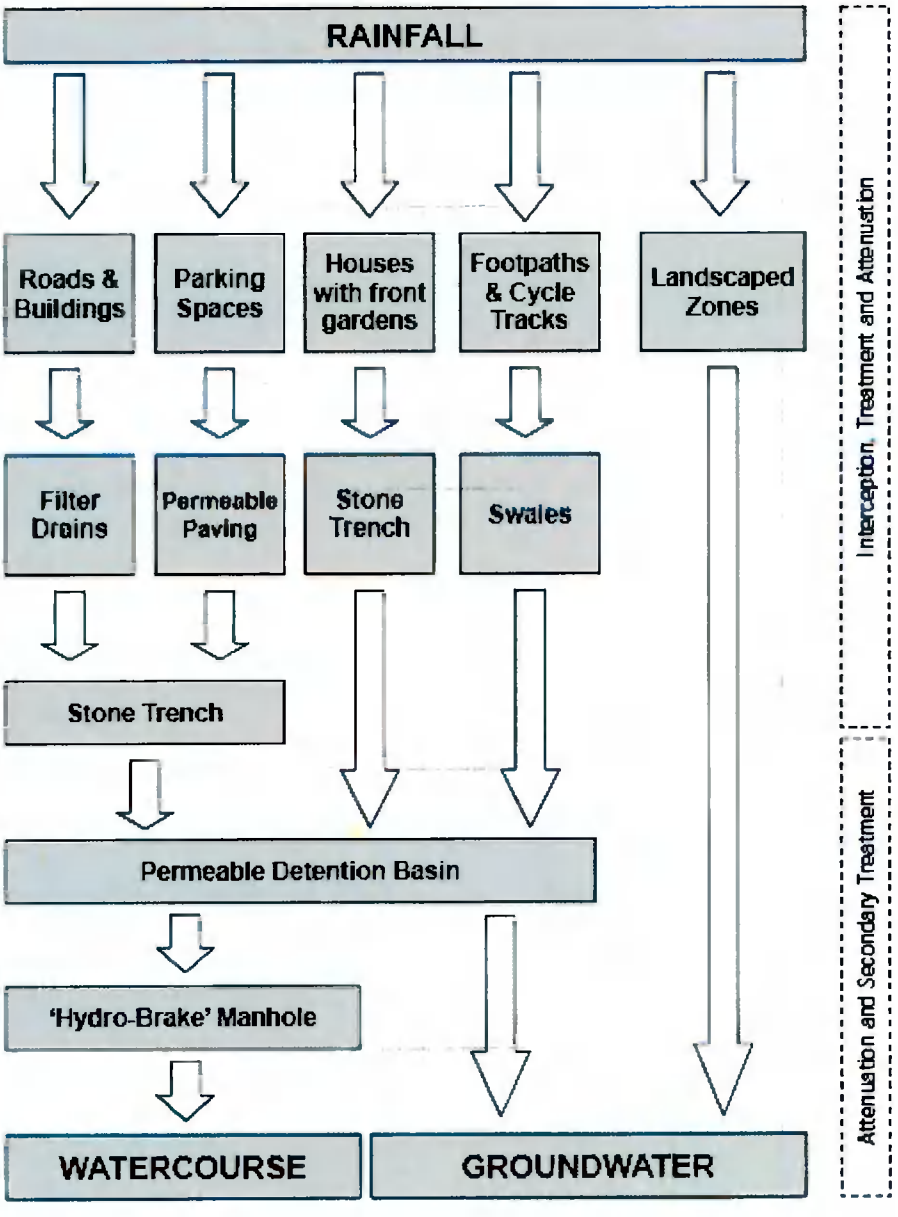


Figure 5 – SUDS Treatment Train

- Green Roof: Green roofs provide ecological, aesthetic and amenity benefits and intercept and retain rainfall, at source, reducing the volume of runoff and attenuating peak flows. Green roofs absorb most of the rainfall that they receive during ordinary events although they will only contribute to attenuation of flows for larger events. Additionally, green roofs treat surface water through removal of atmospherically deposited urban pollutants. A typical extensive green roof will comprise a plant layer, extensive substrate layer (typically 100mm deep), laid on a filter layer, water retention and drainage layer, protection layer and a separation layer. The expected service life of typical green roof systems is 50 years.

The proposed development entails demolishing the existing building and associated impermeable roof system and replacing it with a new multistorey building comprising a combination of low maintenance paving, timber walkways, decorative low maintenance hedging and a combination of an extensive green system. The new roof area of circa 1635m^2 will comprise of 45% green roofs.

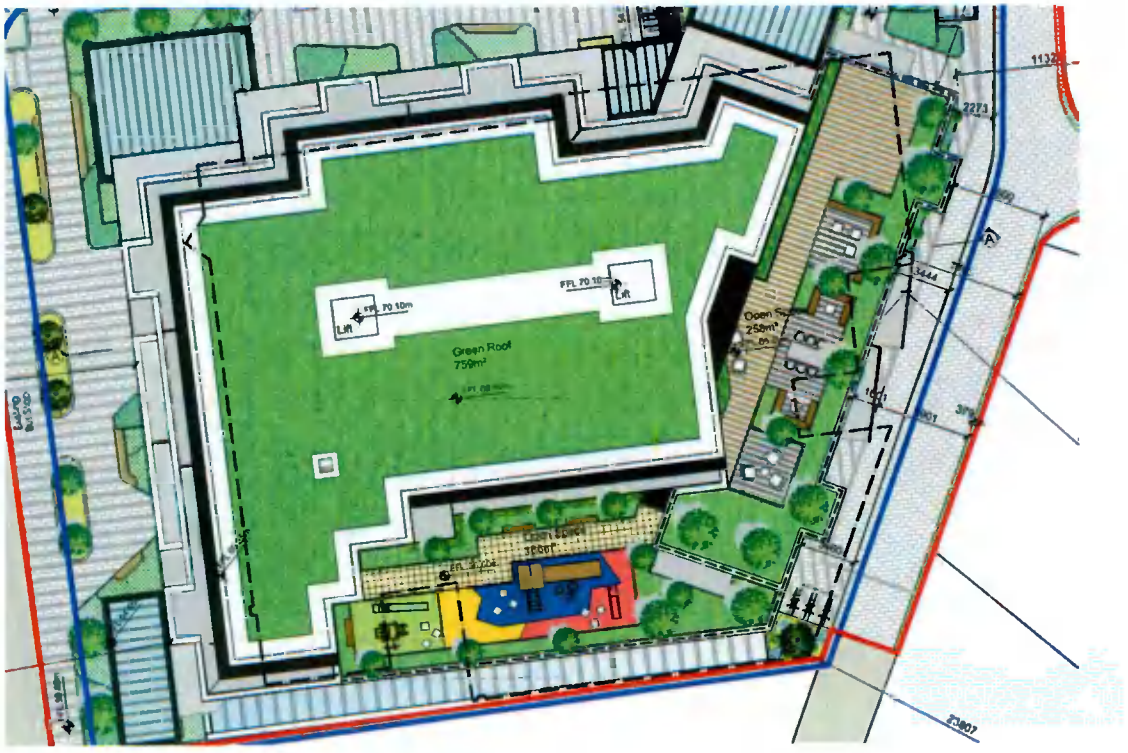


Figure 6 – Proposed Roof Plan

The substrate and the plant layers in a green roof absorb large amounts of rainwater and release it back into the atmosphere by transpiration and evaporation. They also filter water as it passes through the layers, so the run-off. when it is produced, has

fewer pollutants. Rainfall not retained by green roofs is detained, effectively increasing the time to peak and slowing peak flows.

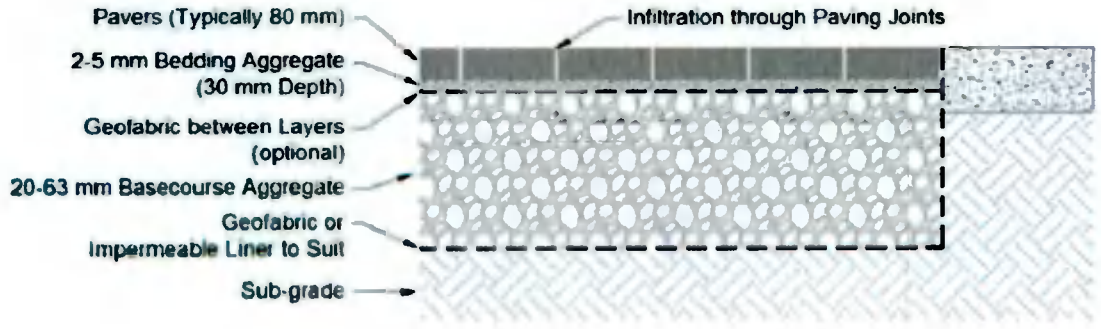
A sedum roof can reduce annual percentage runoff by between 40% and 80% through this retention and evapotranspiration, with the impact dependent on a range of factors including the depth of substrate, the saturation of substrate at the onset of a rain event, the angle of the roof, the range of vegetation growing, intensity of rainfall and the time of year.

Typical Extensive Green Roof

- Petrol Interceptor: A proprietary oil/water separator which prevents hazardous chemical and petroleum products from entering watercourses and public sewers. This is proposed at the outfall from the site. For the subject site, it is proposed to use a NSBD003 bypass interceptor. The expected service life of a NSBD003 petrol interceptor is 50 years.

- Permeable Paving: Run-off from these permeable areas is allowed to infiltrate to the sub-soil and provide attenuation, storage and soakage for run-off generated by adjacent impermeable surfaces. The site currently comprises a mix of tarmacadam and concrete surfacing around the existing building. The current proposals include

replacing the existing paving within the landholder ownership with permeable paving. Given that the site is currently brownfield in nature and provides no attenuation, the introduction of permeable paving will reduce surface water runoff. The expected service life of permeable paving is 30 years, after which the paviours become impermeable and would need to be replaced.

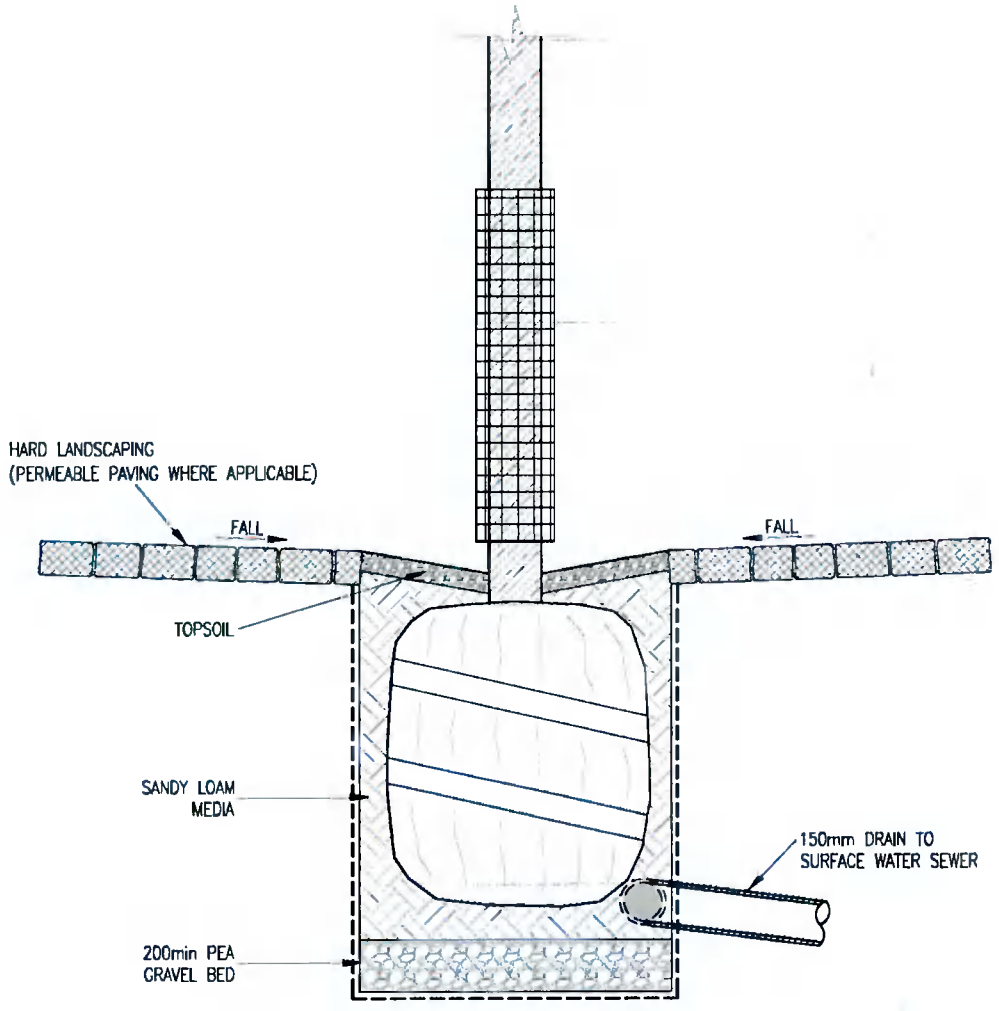


Typical Permeable Paving Detail

Cellular Attenuation System (Stormtech): A proprietary modular block or arch structure with a maintenance/inspection tunnel for providing underground surface water attenuation storage and can infiltrate runoff to the ground where the subgrade is suitable. The expected service life of the Stormtech MC3500 attenuation tank proposed for this development is 50-75 years.

Typical Cellular Storage (Stormtech) Installation

- Tree Pits: Tree pits provide storage of storm water runoff through the use of structural soils or proprietary crate systems. Soils and geotextiles that make up the construction of tree pits remove silts and particulates that may be present in runoff water. The expected service life of a typical tree pit is 30 years.



Typical Tree Pit Installation

2.7 SUDS Maintenance

For the SUDS strategy to work as designed it is important that the entire drainage system is well maintained. It will be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and cleaning of the SUDS features will ensure adequate performance. The recommended program is outlined in the tables below:

Table 2 - Permeable Paving Maintenance Schedule

SUDS Element	Maintenance		
Permeable Paving	Maintenance period	Maintenance Task	Frequency
	Regular	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or as required, based on site specific observations of clogging or manufacturer's recommendations.
	Occasional	Removal of weeds	As required
	Remedial work	Remediation work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required
	Monitoring	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor inspection chambers	Annually

Table 3 – Attenuation Systems Maintenance Schedule

SUDS Element	Maintenance		
Blue Roof Attenuation/Cellular Attenuation System	Maintenance Issues	Failure of components, blockage from debris	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect and identify any elements that are not operating correctly. If required, take remedial action.	Monthly for three months, then annually
		Remove sediment/debris from catchment surface that may lead to blockage of structures.	Monthly or as required
		Remove sediment/debris from catch pits/ gullies and control structures.	Annually, after severe storms or as required

	Remedial Work	Repair inlets, outlets, vents, overflows and control structures.	As required
	Monitoring	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are in good condition and operating as designed.	Annually or after severe storms
		Survey inside of system for sediment build-up and remove if necessary	Every year or as required

Table 4 - Green Roof Maintenance Schedule

SUDS Element	Maintenance		
Green Roof	Maintenance Issues	Vegetation becoming either overgrown or dying	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
		Inspect soil substrate for evidence of erosion channels and identify any sediment source	Annually and after severe storms
		Inspect drain inlets to ensure unrestricted run-off from the drainage layer to conveyance or roof drain system.	Annually and after severe storms
		Inspect underside of roof for evidence of leakage.	Annually and after severe storms
		Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.	Six monthly and annually or as required
		During establishment (i.e. year one), replace dead plants as required.	Monthly
		Post-establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
		Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as required

Table 5 – Tree Pit Maintenance Schedule

SUDS Element	Maintenance		
Permeable Paving	Maintenance period	Maintenance Task	Frequency
	Occasional	Removal of weeds	As required
	Remedial work	Remediation work to any depressions or rutting in the soil	As required
	Monitoring	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor downstream inspection chambers	Annually

Table 6 - Petrol Interceptor Maintenance Schedule

SUDS Element	Maintenance		
Petrol Interceptor	Maintenance period	Maintenance Task	Frequency
	Regular inspections	Inspect upstream and downstream manholes visually and assess silt build-up	Quarterly
		Measure the thickness of oil and aassess the level of sludge/silt	Biannually
		Level of sludge/silt to be assessed	Biannually
	Regular maintenance	Servicing of petrol interceptor by manufacturer	Biannually
		Integrity of interceptor to be assessed by manufacturer	Biannually
		Interceptor to be cleared of possible blockages by means if inspections	Quarterly
	Remedial work	Removal and replacing of interceptor to be carried out by manufacturer	As required
		Inspector to produce written interceptor inspection report	Post-inspection

3.0 FOUL DRAINAGE

There is an existing 225mm diameter foul sewer located in the laneway to the east of the development. Proposed foul drainage will discharge to this foul sewer. Foul sewage within the site will be drained via gravity by a separate system and outfall via a 225mm diameter pipe.

A Pre-Connection Enquiry Form was submitted to Irish Water, and a response was received on the 26th of November 2020 stating that a foul connection to the public network can be facilitated. Please refer to Appendix A for details.

Drains generally will consist of thermoplastic structured wall pipes (IS EN 13476) pipes. Foul sewers have been designed in accordance with the Building Regulations and in accordance with the EPA Treatment Systems for Small Communities, Business, Leisure and Hotel, DOE 'Recommendations for Site Development Works' and the recommendations of the 'Greater Dublin Strategic Drainage Study' (GDSDS) and Irish Water requirements.

The following design criteria have been applied in the design of foul sewers:

(i) Pipe Ks 0.6 mm (uPVC)

(ii) Minimum velocity 0.75 m/s (self-cleansing velocity)

(iii) Maximum velocity 3 m/s

(v) Minimum gradients:

Table 7 – Foul Sewer Gradients

No. of Connections	Minimum Pipe Gradient
1	100mm dia. @ 1:60 or self-cleansing gradient
2-8	150mm dia. @ 1:80 or self-cleansing gradient
>8	Min 150mm dia.; 1: DN or self-cleansing gradient

The foul water drainage for the proposed development has been designed so that minimum cleansing velocities outlined in the "Irish Water Code of Practice for Wastewater Infrastructure" are achieved for all foul sewers. The peak foul flow is based on Irish Water recommended peak demand/flow factors which are provided in the Irish Water 'Code of

Practice for Wastewater Infrastructure', Wastewater Flow Rates for Design. Please refer to Appendix D for the foul sewer loading calculations.

The peak flow from the proposed development is estimated at 1.81l/s. The proposed foul water outfall from the development is a 225mm diameter pipe laid at a gradient of 1:150, giving a capacity of 37.20 l/s, which is deemed appropriate for this development.

Sewers and drains shall be laid to comply with the requirements of the Building Regulations 1997 in accordance with the recommendations contained in the Technical Guidance Documents, Section H (revised 2005) and Irish Water.

4.0 WATER SUPPLY

The development will be serviced by a proposed 150mm diameter watermain which connects to the existing watermain located to the south east of the subject site.

A Pre-Connection Enquiry Form was submitted to Irish Water, and a response was received on the 26th of November 2020 stating that a foul connection to the public network can be facilitated. Please refer to Appendix A for details.

The external areas of the development will be served by existing fire hydrants together with additional hydrants to be located on the new 150mm diameter watermain.

A bulk water meter will be provided at the connection to the site from the existing watermain. This electromagnetic flow meter will include a remote telemetry unit and associated mini kiosk, to the requirements of SDCC Water Management Section and Irish Water.

The supply arrangements will be carried out to the requirements of Irish Water. The Peak Hour Water demand for the proposed development is estimated at 1.76l/s.

Please refer to Appendix E for the watermain and water supply calculations.

5.0 FLOOD RISK ASSESSMENT

The subject site is located more 10km from the coast and is therefore not prone to coastal flooding. The site is located more than 300m from the Walkinstown Stream and 1.4km from the River Liffey and has therefore been included in the ECFRAMS Flood Study Mapping. The mapping indicates that the site is outside of the 0.1% Fluvial AEP Event and the site is therefore deemed to be within **Flood Zone C**, i.e. outside the 1000 year flood events.

A Site-Specific Flood Risk Assessment has been carried out and is enclosed under a separate cover of this submission.

APPENDIX A

Confirmation of Feasibility (Irish Water)

Greg Daly

Scope House Whitehall Rd West
Perrystown
Kildare

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

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

www.water.ie

26 November 2020

Re: CDS20007516 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 68 unit(s) at The Silver Granite, Kennelsfort Rd Upper, Co. Dublin

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at The Silver Granite, Kennelsfort Rd Upper, Co. Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY THIS IS NOT A CONNECTION OFFER, YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible without infrastructure upgrade by Irish Water
SITE SPECIFIC COMMENTS	
Water Connection	This Confirmation of Feasibility to connect to the Irish Water infrastructure does not extend to your fire flow requirements. Please note that Irish Water can not guarantee a flow rate to meet fire flow requirements and in order to guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development.
Wastewater Connection	N/A
The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.	

Stiúrthóirí / Directors: Cathal Marley (Chairman), Niall Gleeson, Eamon Gallen, Yvonne Harris, Brendan Murphy, Maria O'Dwyer
Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin 1, D01 NP86
Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Irish Water is a designated activity company, limited by shares.
Uimhir Chláraithe in Éirinn / Registered in Ireland No.: 530363

The map included below outlines the current Irish Water infrastructure adjacent to your site:

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Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

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

Yours sincerely,

Yvonne Harris

Yvonne Harris

Head of Customer Operations

APPENDIX B

Catchment 1 Surface Water Attenuation Calculations

STORMTECH Stormwater Management System Design Tool

PROJECT REF:	Silver Granite
LOCATION:	Palmerstown
DATE:	15/03/2021
CREATED BY:	Peter Clarke

Instructions:
- Fill in blue highlighted cells
- Set width to maximum allowance
- Adjust site parameters and system dimension until volume achieved
- For Rectangular systems only, for irregular shape dig contact Microstrain

SYSTEM PARAMETERS

Required Total Storage	44.7	m^3
Stormtech chamber model	SC740	
Number of Isolator Rows for TSS Removal	1	

SITE PARAMETERS

			Minimum Requirement
Maximum Width at Excavation Base	1.9	m	
Stone Porosity	40%		
Excavation Batter Angle (degrees)	60	°	
Stone Below Chambers	0.15	m	0.15
Stone Above Chambers	0.15	m	0.15
Additional Storage. E.g manholes, pipe	0	m^3	

CALCULATED CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows	1		no
Number of units per Row	14		no
Number of SC740 Chambers	14		no
Number of SC740 Endcaps	2		no
System Installed Storage Depth (effective storage depth)	1.060		m
Tank overall installed Width at base	1.90	1.9	m
Tank overall installed Length at Base	31.08	31.08	m
Total Effective System Storage	**44.7**	**44.8**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	SC740	
Unit Width	1.295	m
Unit Length	2.17	m
Unit Height	0.76	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Internal Storage Vol. (Chamber only)	1.3	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	85	
Area of Dig at Base of System	59	m^2
Area of Dig at Top of System	101	m^2
Void Ratio	53%	
Stone Requirement - tonne	108	tonne

StormTech
Subsurface Stormwater Management

Date 15/04/2021 19:00	Designed by
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Innovyze	Source Control 2020.1

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 427 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.785	0.385	0.0	0.8	0.8	16.4	O K
30 min Summer	49.924	0.524	0.0	0.8	0.8	22.3	O K
60 min Summer	50.057	0.657	0.0	0.8	0.8	28.0	O K
120 min Summer	50.180	0.780	0.0	0.9	0.9	33.2	O K
180 min Summer	50.236	0.836	0.0	0.9	0.9	35.6	O K
240 min Summer	50.265	0.865	0.0	0.9	0.9	36.8	O K
360 min Summer	50.282	0.882	0.0	0.9	0.9	37.5	O K
480 min Summer	50.285	0.885	0.0	0.9	0.9	37.6	O K
600 min Summer	50.281	0.881	0.0	0.9	0.9	37.5	O K
720 min Summer	50.275	0.875	0.0	0.9	0.9	37.2	O K
960 min Summer	50.259	0.859	0.0	0.9	0.9	36.5	O K
1440 min Summer	50.219	0.819	0.0	0.9	0.9	34.9	O K
2160 min Summer	50.151	0.751	0.0	0.9	0.9	32.0	O K
2880 min Summer	50.081	0.681	0.0	0.8	0.8	29.0	O K
4320 min Summer	49.948	0.548	0.0	0.8	0.8	23.3	O K
5760 min Summer	49.822	0.422	0.0	0.8	0.8	17.9	O K
7200 min Summer	49.666	0.266	0.0	0.8	0.8	11.3	O K
8640 min Summer	49.574	0.174	0.0	0.8	0.8	7.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	87.814	0.0	17.1	19
30 min Summer	60.672	0.0	23.6	33
60 min Summer	39.339	0.0	30.6	62
120 min Summer	24.816	0.0	38.7	122
180 min Summer	18.788	0.0	43.9	182
240 min Summer	15.400	0.0	48.0	240
360 min Summer	11.598	0.0	54.3	328
480 min Summer	9.473	0.0	59.1	388
600 min Summer	8.091	0.0	63.1	452
720 min Summer	7.111	0.0	66.5	520
960 min Summer	5.799	0.0	72.3	656
1440 min Summer	4.349	0.0	81.4	938
2160 min Summer	3.259	0.0	91.5	1360
2880 min Summer	2.653	0.0	99.3	1760
4320 min Summer	1.983	0.0	111.3	2552
5760 min Summer	1.612	0.0	120.6	3344
7200 min Summer	1.372	0.0	128.4	3968
8640 min Summer	1.202	0.0	135.0	4664

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	49.516	0.116	0.0	0.8	0.8	4.9	O K
15 min Winter	49.834	0.434	0.0	0.8	0.8	18.5	O K
30 min Winter	49.991	0.591	0.0	0.8	0.8	25.1	O K
60 min Winter	50.143	0.743	0.0	0.9	0.9	31.6	O K
120 min Winter	50.289	0.889	0.0	0.9	0.9	37.8	O K
180 min Winter	50.360	0.960	0.0	1.0	1.0	40.8	O K
240 min Winter	50.400	1.000	0.0	1.0	1.0	42.5	O K
360 min Winter	50.432	1.032	0.0	1.0	1.0	43.9	O K
480 min Winter	50.433	1.033	0.0	1.0	1.0	43.9	O K
600 min Winter	50.428	1.028	0.0	1.0	1.0	43.7	O K
720 min Winter	50.420	1.020	0.0	1.0	1.0	43.4	O K
960 min Winter	50.392	0.992	0.0	1.0	1.0	42.2	O K
1440 min Winter	50.323	0.923	0.0	0.9	0.9	39.3	O K
2160 min Winter	50.210	0.810	0.0	0.9	0.9	34.5	O K
2880 min Winter	50.099	0.699	0.0	0.8	0.8	29.7	O K
4320 min Winter	49.893	0.493	0.0	0.8	0.8	21.0	O K
5760 min Winter	49.637	0.237	0.0	0.8	0.8	10.1	O K
7200 min Winter	49.508	0.108	0.0	0.8	0.8	4.6	O K
8640 min Winter	49.454	0.054	0.0	0.7	0.7	2.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.075	0.0	140.9	5248
15 min Winter	87.814	0.0	19.2	18
30 min Winter	60.672	0.0	26.5	33
60 min Winter	39.339	0.0	34.3	62
120 min Winter	24.816	0.0	43.3	120
180 min Winter	18.788	0.0	49.2	178
240 min Winter	15.400	0.0	53.8	234
360 min Winter	11.598	0.0	60.8	344
480 min Winter	9.473	0.0	65.2	448
600 min Winter	8.091	0.0	70.7	476
720 min Winter	7.111	0.0	74.5	552
960 min Winter	5.799	0.0	81.0	710
1440 min Winter	4.349	0.0	91.2	1012
2160 min Winter	3.259	0.0	102.4	1452
2880 min Winter	2.653	0.0	111.3	1876
4320 min Winter	1.983	0.0	124.7	2724
5760 min Winter	1.612	0.0	135.1	3400
7200 min Winter	1.372	0.0	143.8	3960
8640 min Winter	1.203	0.0	151.3	4576

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	49.430	0.030	0.0	0.7	0.7	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.075	0.0	197.8	5136

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.700	Shortest Storm (mins)	15
Ratio R	0.277	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.104

Time (mins) From:	To:	Area (ha)
0	4	0.104

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Model Details

Storage is Online Cover Level (m) 51.500

Cellular Storage Structure

Invert Level (m) 49.430 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.72
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	59.1	59.1	1.200	0.0	131.7
1.100	59.1	131.7			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0046-1000-1100-1000
Design Head (m)	1.100
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	46
Invert Level (m)	49.360
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	1.0	Kick-Flo®	0.408	0.6
Flush-Flo™	0.200	0.8	Mean Flow over Head Range	-	0.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.7	1.200	1.0	3.000	1.6	7.000	2.3
0.200	0.8	1.400	1.1	3.500	1.7	7.500	2.4
0.300	0.8	1.600	1.2	4.000	1.8	8.000	2.5
0.400	0.7	1.800	1.2	4.500	1.9	8.500	2.5
0.500	0.7	2.000	1.3	5.000	2.0	9.000	2.6
0.600	0.8	2.200	1.4	5.500	2.1	9.500	2.7
0.800	0.9	2.400	1.4	6.000	2.2		
1.000	1.0	2.600	1.5	6.500	2.2		

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APPENDIX C

Catchment 2 Surface Water Attenuation Calculations

Date 15/04/2021 18:46	Designed by
File Attenuation Roof.SRCX	Checked by
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Summary of Results for 100 Year Return Period (+20%)

Half Drain Time : 3448 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	61.619	0.019	0.0	0.1	0.1	18.1	O K
30 min Summer	61.627	0.027	0.0	0.1	0.1	24.9	O K
60 min Summer	61.634	0.034	0.0	0.1	0.1	32.2	O K
120 min Summer	61.643	0.043	0.0	0.2	0.2	40.3	O K
180 min Summer	61.648	0.048	0.0	0.2	0.2	45.5	O K
240 min Summer	61.653	0.053	0.0	0.2	0.2	49.4	O K
360 min Summer	61.659	0.059	0.0	0.2	0.2	55.1	O K
480 min Summer	61.663	0.063	0.0	0.2	0.2	59.3	O K
600 min Summer	61.667	0.067	0.0	0.2	0.2	62.6	O K
720 min Summer	61.669	0.069	0.0	0.2	0.2	65.3	O K
960 min Summer	61.674	0.074	0.0	0.2	0.2	69.3	O K
1440 min Summer	61.679	0.079	0.0	0.2	0.2	74.6	O K
2160 min Summer	61.684	0.084	0.0	0.2	0.2	78.5	O K
2880 min Summer	61.686	0.086	0.0	0.3	0.3	80.8	O K
4320 min Summer	61.689	0.089	0.0	0.3	0.3	83.5	O K
5760 min Summer	61.690	0.090	0.0	0.3	0.3	84.7	O K
7200 min Summer	61.690	0.090	0.0	0.3	0.3	85.0	O K
8640 min Summer	61.690	0.090	0.0	0.3	0.3	84.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	87.814	0.0	4.5	19
30 min Summer	60.672	0.0	7.2	34
60 min Summer	39.339	0.0	16.2	64
120 min Summer	24.816	0.0	21.1	124
180 min Summer	18.788	0.0	23.7	184
240 min Summer	15.400	0.0	25.5	244
360 min Summer	11.598	0.0	27.6	364
480 min Summer	9.473	0.0	28.9	482
600 min Summer	8.091	0.0	29.7	602
720 min Summer	7.111	0.0	30.3	722
960 min Summer	5.799	0.0	30.9	962
1440 min Summer	4.349	0.0	30.7	1440
2160 min Summer	3.259	0.0	61.5	2100
2880 min Summer	2.653	0.0	61.9	2420
4320 min Summer	1.983	0.0	58.9	3156
5760 min Summer	1.612	0.0	108.5	3976
7200 min Summer	1.372	0.0	110.8	4824
8640 min Summer	1.202	0.0	109.9	5624

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	61.689	0.089	0.0	0.3	0.3	84.1	O K
15 min Winter	61.622	0.022	0.0	0.1	0.1	20.2	O K
30 min Winter	61.630	0.030	0.0	0.1	0.1	27.9	O K
60 min Winter	61.638	0.038	0.0	0.2	0.2	36.1	O K
120 min Winter	61.648	0.048	0.0	0.2	0.2	45.2	O K
180 min Winter	61.654	0.054	0.0	0.2	0.2	51.0	O K
240 min Winter	61.659	0.059	0.0	0.2	0.2	55.4	O K
360 min Winter	61.666	0.066	0.0	0.2	0.2	61.9	O K
480 min Winter	61.671	0.071	0.0	0.2	0.2	66.6	O K
600 min Winter	61.675	0.075	0.0	0.2	0.2	70.3	O K
720 min Winter	61.678	0.078	0.0	0.2	0.2	73.3	O K
960 min Winter	61.683	0.083	0.0	0.2	0.2	78.0	O K
1440 min Winter	61.689	0.089	0.0	0.3	0.3	84.2	O K
2160 min Winter	61.695	0.095	0.0	0.3	0.3	89.1	O K
2880 min Winter	61.697	0.097	0.0	0.3	0.3	91.4	O K
4320 min Winter	61.700	0.100	0.0	0.3	0.3	93.7	O K
5760 min Winter	61.700	0.100	0.0	0.3	0.3	94.3	O K
7200 min Winter	61.700	0.100	0.0	0.3	0.3	93.8	O K
8640 min Winter	61.698	0.098	0.0	0.3	0.3	92.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.075	0.0	106.7	6456
15 min Winter	87.814	0.0	5.3	19
30 min Winter	60.672	0.0	8.4	34
60 min Winter	39.339	0.0	18.6	64
120 min Winter	24.816	0.0	23.6	122
180 min Winter	18.788	0.0	26.3	182
240 min Winter	15.400	0.0	27.9	240
360 min Winter	11.598	0.0	30.0	358
480 min Winter	9.473	0.0	31.3	476
600 min Winter	8.091	0.0	32.2	594
720 min Winter	7.111	0.0	32.8	710
960 min Winter	5.799	0.0	33.4	942
1440 min Winter	4.349	0.0	33.2	1400
2160 min Winter	3.259	0.0	66.9	2072
2880 min Winter	2.653	0.0	67.2	2684
4320 min Winter	1.983	0.0	64.0	3332
5760 min Winter	1.612	0.0	120.4	4272
7200 min Winter	1.372	0.0	121.9	5192
8640 min Winter	1.202	0.0	120.5	6056

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	61.697	0.097	0.0	0.3	0.3	90.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.075	0.0	116.8	6960

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.700	Shortest Storm (mins)	15
Ratio R	0.277	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.110

Time (mins) From:	To:	Area (ha)
0	4	0.110

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Innovyze	Source Control 2020.1

Model Details

Storage is Online Cover Level (m) 62.100

Cellular Storage Structure

Invert Level (m) 61.600 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	990.0	990.0	0.200	0.0	1002.6
0.100	990.0	1002.6			

Orifice Outflow Control

Diameter (m) 0.021 Discharge Coefficient 0.600 Invert Level (m) 61.600

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APPENDIX D

Foul Sewer Loading Calculations

PROJECT TITLE: Silver Granite, Palmerstown JOB REFERENCE: P2012

SUBJECT
Wastewater Load for Irish Water

gdcl CONSULTING ENGINEERS

DRAWING NO	CALCULATIONS BY	CHECKED BY	DATE
P2012-C-101	PTC	GD	13/05/2021

POST DEVELOPMENT DEMAND

Wastewater flow per head[1] 150 litres — Unit Consumption Allowance[3] 10 %

Average Occupancy Ratio[2] 2.7 person/3 bed unit — DWF Peak Factor[4] 6

Residential Unit Type	5 Bed	4 Bed	3 Bed	2 Bed	1 Bed	Studio
Average Occupancy(persons)	4	3	4	3	1.5	1
Number of Units	0	0	0	25	25	0
Average Occupancy[5] (PE)	0	0	0	75	37.5	0

Residential Dry Weather Flow(DWF) Volume[6] 18,563 litres

Commercial Unit Type	Commercial	Office	Pub/ Restaurant	Leisure/ Gym	Medical/ Care Home	Creche
Average Occupancy (per m2)	1/7	1/7	1/2	1/5	1/20	1/20
Area(m2)	550	0	556	0	0	0
Average Occupancy[5] (PE)	29	0	112	0	0	0
Average Usage(litres per person/day)[7]	25	100	60	50	350	60
Daily Usage(l)	736	0	6696	0	0	0

Commercial Dry Weather Flow(DWF) Volume[6] 7,432 litres

WASTEWATER LOADING SUMMARY

	Residential	Commercial	Total
Average Daily Discharge	0.21 l/s	0.09 l/s	0.30 l/s
Peak Discharge[8]	1.29 l/s	0.52 l/s	1.81 l/s

ORGANIC LOADING

EPA Wastewater Parameters Loading Concentrations		Residential Organic Loading		Commercial Organic Loading		Total Organic Loading	
Average Concentration[7]	Max Concentration[8]	Average Conc[7]	Max Conc[8]	Average Conc[7]	Max Conc[8]	Average Conc[7]	Max Conc[8]
BOD(mg/l)		BOD(kg/day)		BOD(kg/day)		BOD(kg/day)	
168.0	422.0	3.12	7.83	1.25	3.14	4.37	10.97
SS (mg/l)		SS (kg/day)		SS (kg/day)		SS (kg/day)	
163.0	435.0	3.03	8.07	1.21	3.23	4.24	11.31
N (mg/l)		N (kg/day)		N (kg/day)		N (kg/day)	
40.5	78.5	0.75	1.46	0.30	0.58	1.06	2.04
P (mg/l)		P (kg/day)		P (kg/day)		P (kg/day)	
7.1	15.5	0.13	0.29	0.05	0.12	0.18	0.40

Notes:

1. Waste Water Flow = 150 l/head as per Irish Water Code of Practice (3.5)
2. Average Occupancy ratio of 2.7 persons per dwelling from Irish Water Code of Practice (3.6)
3. 10% Unit Consumption Allowance as per Irish Water Code of Practice (3.6.3)
4. DWF Peak Factor = 6 as per Irish Water Code of Practice (3.6)
5. Dry Weather Flow = No. of Residential Units X Average Occupancy Ratio X Waste Water Flow X (1/CA)
6. Peak Discharge = Average Daily Discharge X DWF Peak Factor
7. The average concentrations of wastewater parameters taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels"
8. Assumed Maximum concentration is equal to the average concentration plus 2 times the standard deviation (for the 95%ile) taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels"

APPENDIX E

Water Demand Calculations

PROJECT TITLE: Silver Granite, Palmerstown **JOB REFERENCE:** P2012

SUBJECT
Water Demand for Irish Water

gdcl CONSULTING ENGINEERS

DRAWING NO.	CALCULATIONS BY	CHECKED BY	DATE
P2012-C-101	PTC	GD	13/05/2021

POST DEVELOPMENT DEMAND

Per-Capita Consumption[1] 150 litres/person/day

Average Occupancy Ratio[2] 2.7 person/3 bed unit

Residential Unit Type	5 Bed	4 Bed	3 Bed	2 Bed	1 Bed	Studio
Average Occupancy(persons)	5	4	3	2	1.5	1
Number of Units	0	0	0	25	25	0
Average Occupancy[5] (PE)	0	0	0	75	37.5	0

Average Residential Demand[6] 16,875 l/day

Commercial Unit Type	Commercial	Office	Pub/ Restaurant	Leisure/ Gym	Medical/ Care Home	Creche
Average Occupancy (per m2)	10	20	10	4	20	20
Area(m2)	840	0	550	0	0	0
Average Occupancy[5] (PE)	84	0	112	0	0	0
Average Usage(litres per person/day)	25	100	60	50	350	60
Daily Usage(/)	2100	0	6600	0	0	0

Average Commercial Demand[6] 7,432 l/day

Average Day/Week Demand Factor[3] 1.25

Peak Demand Factor[4] 5

WATER DEMAND SUMMARY

	Residential	Commercial	Total
Average Daily Demand	0.20 l/s	0.09 l/s	0.29 l/s
Average Day/Peak Week Demand[7]	0.24 l/s	0.11 l/s	0.35 l/s
Peak Hour Water Demand[8]	1.221 l/s	0.538 l/s	1.758 l/s

Notes:

1. Per-Capita Consumption 150l/person/day as per Irish Water Code of Practice - (3.7.2)
2. Average Occupancy ratio of 2.7 persons per dwelling from Irish Water Code of Practice - (3.7.2)
3. Average Day/Week Demand Factor is 1.25 as per Irish Water Code of Practice - (3.7.2)
4. Peak Demand Factor is 5 as per Irish Water Code of Practice - (3.7.2)
5. Average Occupancy(or PE Population Equivalent) = No. of Residential Units X Average Occupancy Ratio
6. Average Domestic Demand = Average Occupancy X Per-Capita Consumption
7. Average Day/Peak Week Demand = Average Daily Domestic Demand X Average Day/Week Demand Factor
8. Peak Hour Water Demand = Average Occupancy X Per Capita Consumption X Average Day/Week Demand Factor X Peak Demand Factor

APPENDIX F

South Dublin County Council Development Plan 2016 - 2022 Zoning Objectives Map 2

South Dublin County Council

Development Plan 2016 - 2022

Map includes Variations 1 & 2

Map 2