LOHAN & DONNELLY
Consulting Engineers

13 Gardiner Place, Mountjoy Square, Dublin 1. T: 01 8787770
W: www.lohan-donnelly.com E: info@lohan-donnelly.com

Project Title: Proposed Strategic Housing Development at Dolcain House, Clondalkin, Dublin 22

Report Title: Engineering Services Report

Report Ref: 2148-LDE-ZZ-ZZ-RP-0003_ESR

Project Ref: 2148

Client: Randelswood Holdings LTD

Revision:	Status:	Author:	Date:	Approved By:	Date:
Rev 0	Issued for Stage 1 Submission	SR	26/03/21	FW	26/03/21
Rev 1	Issued for Stage 2 Submission	SR	01/06/21	FW	02/06/21
Rev 2	Issued for Stage 3 Submission	SR	13/01/22	FW	17/01/22

Contents:

1.0 Introduction:

Lohan & Donnelly Consulting Engineers (L&D) have been appointed by Randelswood Holdings LTD to prepare proposals for drainage and watermain arrangements for a proposed Strategic Housing Development at Dolcain House, Clondalkin, Dublin 22. The proposed scope of works is generally the development of an existing brownfield office development to incorporate new residential development in the form of four 5-6 storey apartment blocks with a total of 130 No. apartment units above existing single storey undercroft carpark.

1.1 Site Location:

The site is located to the southeast of Clondalkin Village as per map extract shown in Figure 1 with national grid coordinates of E307867, N231076. Vehicular site access is via the roundabout at Monastery Road and Woodford Hill, with pedestrian access to the site from a signal-controlled pedestrian crossing on Monastery Road.

Figure 1: Site Location

1.2 Existing Site Usage:

The site currently contains three existing office blocks, two of which are currently vacant. The three blocks were built at different times, with westernmost Block B being constructed in the 1970s, block A and central atrium built in 2000 and block C in the southern part of the site being constructed in 2006. The existing structure is surrounded by bitmac paving, which is partially above a car park undercroft and partially on grade. The site includes a number of planted areas along the site boundary as per Figure 2. Bedrock is also known to be very close to the ground floor level towards the southern part of the site, with considerable rock excavation having been undertaken previously as part of forming the current ground level and undercroft structure.

Figure 2: Existing site

1.3 Proposed Redevelopment of Site:

The proposed scope of works is generally the development of a new 6 storey Block in the Eastern part of the site, above the basement carpark entrance, and the change of use of the existing blocks from office to residential. The works will also include the removal and replacement of the external perimeter cladding fabrics of the existing blocks as well as the addition of an extra floor on each existing block; blocks A and C to become 6 storeys, and block B to become 5 storeys. The existing undercroft carpark shall remain as it currently is. Limited structural alterations will also take place to the interior of the existing blocks to change them to better suit residential use.

2.0 Surface Water Drainage & SUDS:

2.1 Existing Surface Water Drainage Arrangements

The existing surface water sewers onsite drain to the public sewer in the north west of the site by gravity flow. The drainage is currently a combination of both underslung & underground drainage. Drainage for block C includes an attenuation system due to its time of design and construction in 2006. Blocks A and B predate the inclusion of stormwater attenuation as part of development requirements and so runoff from these areas currently discharges to sewers without any restriction on flow rate.

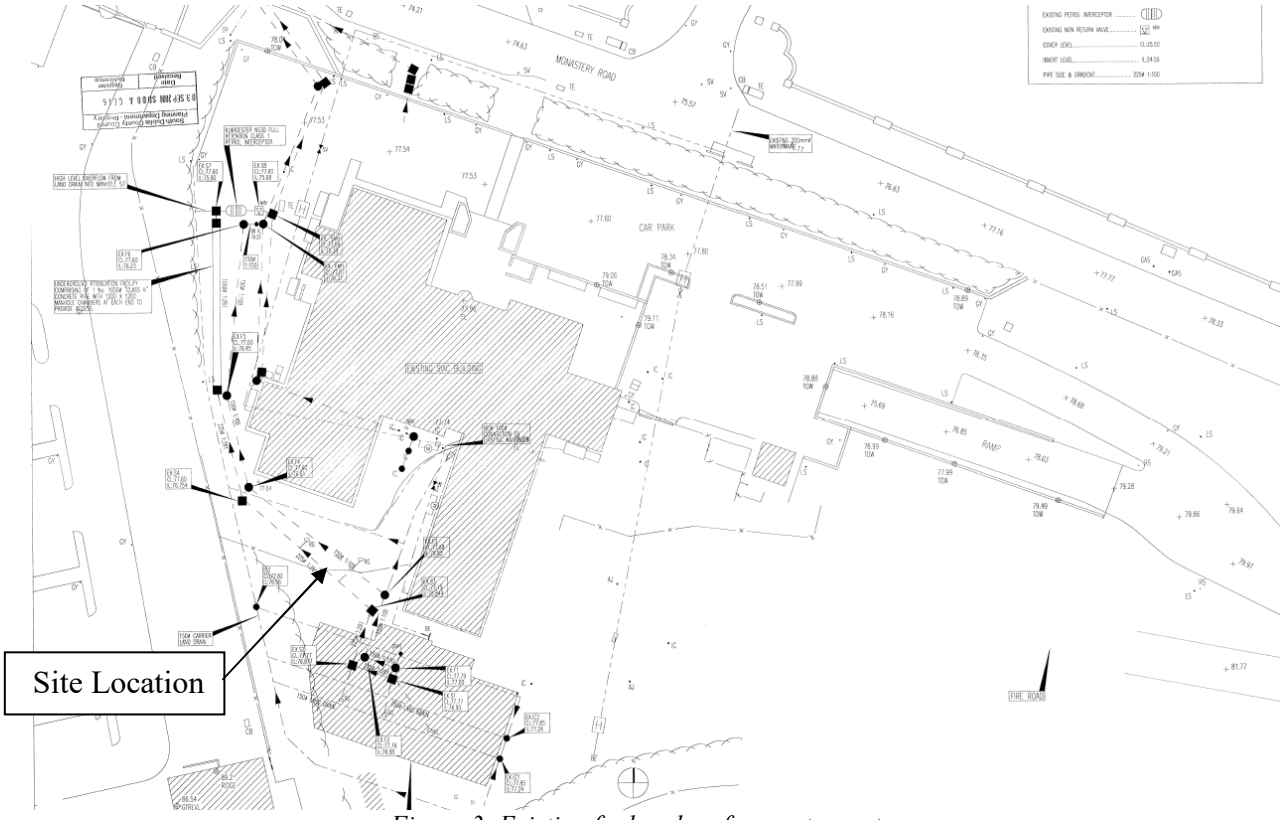


Figure 3: Existing foul and surfcae water systems

The site is currently served by a 225mm diameter surface water sewer spur which discharges to the existing 225mm diameter public surface water sewer on the south side of the Monastery Road via an existing connection to an existing manhole. There is also an existing oversized pipe system servicing block C which functions as an attenuation holding chamber.

2.2 Site Characteristics & Design Parameters

2.2.1 Topography

The topography of the site location is such that the site falls from south to north. The southern site boundary abuts the existing SIAC quarry at an approximate level of +82.000mOD. The northern site boundary abuts Monastery Road at an approximate level of +74.500mOD. Thus there is an approximate level difference of 7.500m across the 102m width of the site, indicating an approximate average gradient of 1/13.6. It is noted that much of the existing site was previously excavated as part of the 2000 construction of the undercroft carpark and 2006 construction of block C, and this excavation resulted in steep rock faces being left exposed throughout the southern site boundary.

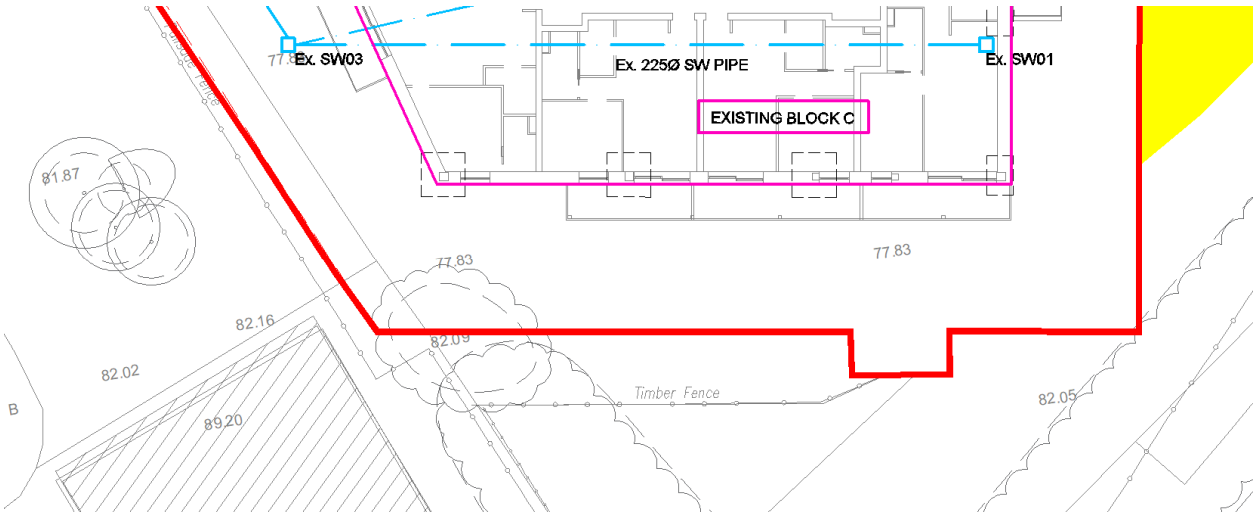


Figure 4: existing site levels approximately 82.000mOD at southern site boundary and 77.83m at south edge of Block C

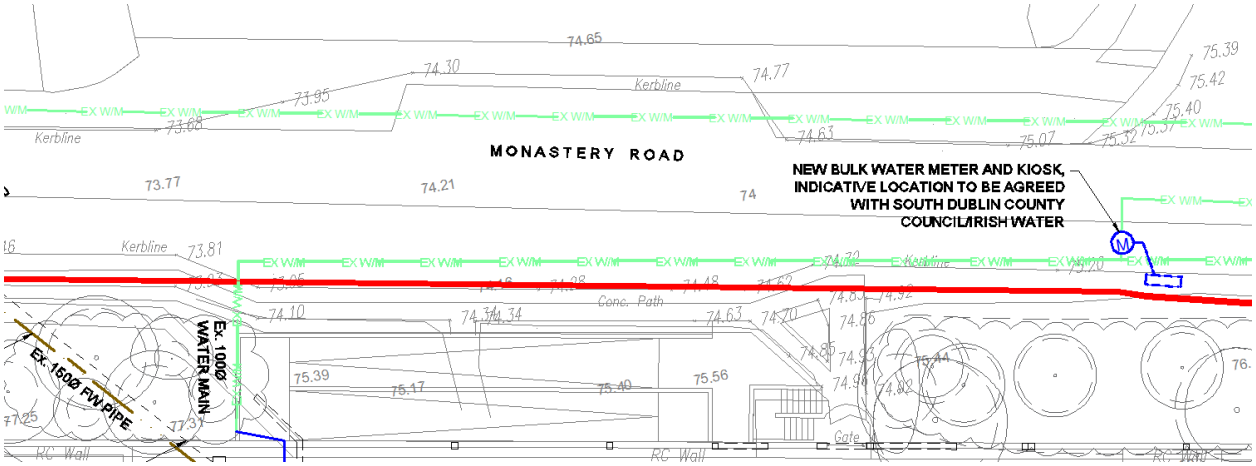


Figure 5: existing site levels approximately 74.500mOD at northern site boundary with footpath on Monastery Road

Figure 6: Site photo, west side of block C with bedrock from 2006 excavations visible and site boundary occuring at the pallisade fence visible at the top of the rock embankment (approx. 4.17m above bitmac level)

2.2.2 Soil

L&D review of FSSR Soil maps indicates that the site location would be within an area anticipated to be of Soil type 2, which would have an associated SOIL value of 0.3.

Figure 7: Extract from FSSR map showing site location within soil type 2 zone, site location shown by X

However, site inspections indicate the presence of extensive bedrock outcrops throughout the site. From review of the boundary conditions it is apparent that previous development of the site included significant amounts of rock removal in order to achieve the ground levels currently onsite, such that the existing buildings and paved areas are founded directly on bedrock.

Figure 8: Site photo showing exposed rock face – existing bedrock is weathered limestone overlaid by 300mm of topsoil

Figure 9: Site photo, west side of block B with bedrock from 1970s excavations visible. Several metres of rock have been removed in order to form the bitmac car park area in front. The floor of block B is bearing directly onto rock.

Review of the 1888-1913 historic 25 maps for the area indicates that the site historically contained a small quarry at its eastern boundary, while the areas to the immediate southeast and southwest of the subject site were the location of much large quarries, illustrating that this particular location has historically been a noted rock outcrop in the region.

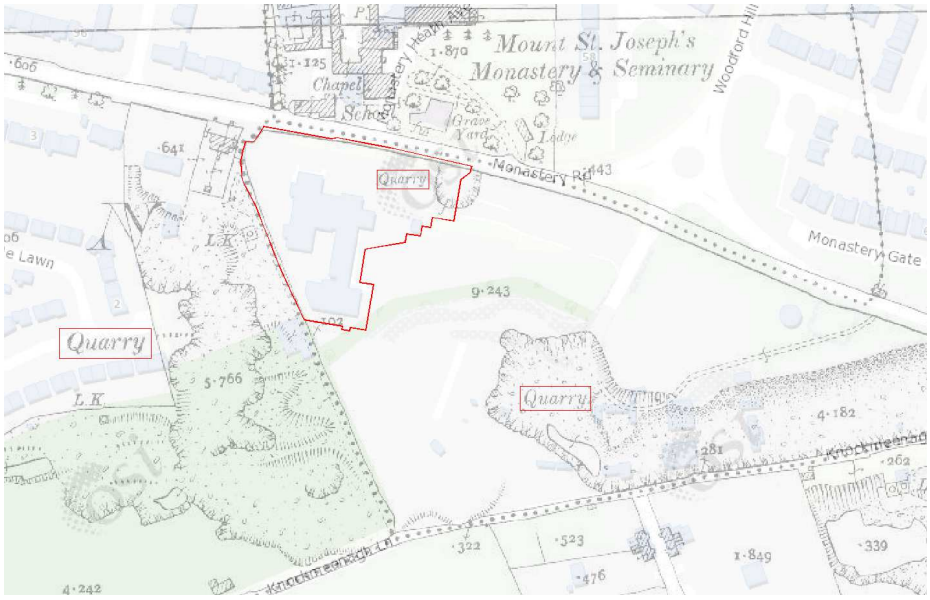


Figure 10: Geohive overlay of current OS map with historic 1888-1913 25 inch mapping, site boundary in red and local quarries noted in red

Current aerial imagery showns the large SIAC facility to the immediate south of the subject site where the current processing facility resides in the recessed area wherethe historical quarry had removed substantial rock.

Figure 11: Google aerial imagery showing SIAC processing facility in foreground sitting within recessed old quarry with existing Dolcain House offices just beyond, playing pitches to the west were also a historical quarry

As the site topography is noted to fall from south to north at a steep fall and there is substantial evidence to state that the site is primarily underlain by rock rather than clays or sands, the site-specific soil type at this site would be characterised as steep and rocky. Making reference to Table D1 of the GDSDS Appendix D, this would equate to a soil type 5.

SOIL

The soil index SOIL is based on the Winter Rain Acceptance Parameter (WRAP) included in the Flood Studies Report. The index broadly describes infiltration potential and was derived by a consideration of soil permeability, topographic slope, and the likelihood of impermeable layers. Five classes of soils are recognised as shown in Table D1 below and Figure D2.

SOIL	WRAP	Runoff	SOIL Value	Soil Characteristics
1	Very high	Very low	0.15	Sandy, well drained
2	High	Low	0.30	Intermediate soils (sandy)
3	Moderate	Moderate	0.40	Intermediate soils (silty)
4	Low	High	0.45	Clayey, poorly drained
5	Very low	Very high	0.50	Steep, rocky areas

Table D1 Different Classes of Soil

Figure 12: Table D1 from GDSDS Appendix D

Making reference to Table 6.7 of the GDSDS for the FSR procedure indicates an SPR value for soil type 5 of 0.53.

SOIL	SPR value (% runoff)
1	0.1
2	0.3
3	0.37
4	0.47
5	0.53

Table 6.7 SPR Values for SOIL (pervious surface runoff factor)

Figure 13: Table 6.7 from GDSDS showing SPR values for different soil types

On the basis of this, a SOIL value of 0.53 is adopted for the purposes of calculating greenfield runoff rates and runoff from open space areas.

2.2.3 Rainfall

Site-specific rainfall data has been obtained by L&D from Met Eireann for the purposes of surface water sewer design, which indicates a M5-60 value of 17.0mm and ratio (R) of 0.283

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 307867, Northing: 231076,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.4,	3.5,	4.1,	5.1,	5.8,	6.3,	8.1,	10.2,	11.6,	13.6,	15.4,	16.8,	19.1,	20.8,	22.3,	N/A ,
10 mins	3.3,	4.9,	5.8,	7.1,	8.1,	8.8,	11.3,	14.2,	16.1,	18.9,	21.5,	23.5,	26.6,	29.0,	31.1,	N/A ,
15 mins	3.9,	5.7,	6.8,	8.4,	9.5,	10.3,	13.3,	16.7,	19.0,	22.3,	25.3,	27.6,	31.3,	34.2,	36.6,	N/A ,
30 mins	5.1,	7.5,	8.8,	10.8,	12.2,	13.3,	16.9,	21.1,	23.9,	27.9,	31.5,	34.4,	38.8,	42.3,	45.2,	N/A ,
1 hours	6.7,	9.7,	11.4,	13.9,	15.6,	17.0,	21.4,	26.6,	30.0,	34.9,	39.3,	42.8,	48.1,	52.3,	55.8,	N/A ,
2 hours	8.9,	12.7,	14.8,	17.9,	20.1,	21.8,	27.3,	33.6,	37.8,	43.8,	49.1,	53.3,	59.7,	64.7,	68.9,	N/A ,
3 hours	10.4,	14.8,	17.2,	20.8,	23.2,	25.1,	31.4,	38.5,	43.3,	49.9,	55.9,	60.5,	67.7,	73.3,	77.9,	N/A ,
4 hours	11.7,	16.5,	19.2,	23.1,	25.8,	27.9,	34.7,	42.5,	47.6,	54.8,	61.3,	66.3,	74.1,	80.1,	85.1,	N/A ,
6 hours	13.7,	19.3,	22.3,	26.8,	29.8,	32.2,	39.9,	48.7,	54.4,	62.6,	69.8,	75.4,	84.0,	90.7,	96.2,	N/A ,
9 hours	16.1,	22.5,	26.0,	31.1,	34.5,	37.2,	46.0,	55.8,	62.3,	71.4,	79.4,	85.7,	95.3,	102.7,	108.9,	N/A ,
12 hours	18.1,	25.2,	28.9,	34.5,	38.3,	41.3,	50.8,	61.5,	68.5,	78.4,	87.1,	93.8,	104.2,	112.2,	118.8,	N/A ,
18 hours	21.3,	29.4,	33.7,	40.1,	44.4,	47.7,	58.4,	70.5,	78.4,	89.4,	99.2,	106.7,	118.2,	127.1,	134.4,	N/A ,
24 hours	23.8,	32.8,	37.5,	44.5,	49.2,	52.8,	64.6,	77.7,	86.2,	98.2,	108.7,	116.8,	129.2,	138.8,	146.7,	174.3,
2 days	29.8,	40.0,	45.2,	53.0,	58.1,	62.0,	74.5,	88.3,	97.3,	109.6,	120.3,	128.6,	141.1,	150.7,	158.5,	185.7,
3 days	34.7,	45.7,	51.4,	59.7,	65.2,	69.4,	82.6,	97.1,	106.4,	119.1,	130.2,	138.6,	151.4,	161.1,	169.1,	196.4,
4 days	38.9,	50.8,	56.8,	65.6,	71.4,	75.8,	89.7,	104.7,	114.3,	127.4,	138.8,	147.4,	160.5,	170.4,	178.5,	206.2,
6 days	46.3,	59.5,	66.2,	75.9,	82.1,	86.9,	101.8,	117.9,	128.0,	141.9,	153.8,	162.8,	176.4,	186.7,	195.1,	223.5,
8 days	52.8,	67.2,	74.5,	84.8,	91.5,	96.6,	112.4,	129.3,	140.0,	154.5,	166.9,	176.2,	190.3,	200.9,	209.5,	238.7,
10 days	58.8,	74.2,	81.9,	92.9,	100.0,	105.3,	122.0,	139.6,	150.8,	165.8,	178.6,	188.3,	202.8,	213.7,	222.5,	252.4,
12 days	64.4,	80.8,	88.9,	100.4,	107.8,	113.4,	130.8,	149.2,	160.7,	176.2,	189.5,	199.4,	214.3,	225.5,	234.5,	265.0,
16 days	74.8,	92.8,	101.6,	114.2,	122.2,	128.2,	146.9,	166.5,	178.7,	195.1,	209.1,	219.5,	235.1,	246.8,	256.2,	287.9,
20 days	84.3,	103.8,	113.3,	126.7,	135.3,	141.7,	161.5,	182.2,	195.0,	212.2,	226.8,	237.7,	253.9,	266.0,	275.8,	308.5,
25 days	95.6,	116.7,	126.9,	141.3,	150.4,	157.3,	178.3,	200.2,	213.7,	231.8,	247.1,	258.5,	275.4,	288.0,	298.2,	332.0,

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

Figure 14: Return period rainfall depths for site location from Met Eireann

A site-specific Standard Average Annual Rainfall (SAAR) figure of 755mm from Met Eireann datasets has been adopted by L&D for detailed design with regard to determination of greenfield runoff and stormwater storage volumes.

2.2.4 Sewer Design

According to IS EN 752 a 2-year return period should be used for calculations regarding residential areas whereas, a 5-year return period would only apply to city centre areas. However, the BS EN 752 table NA.6 shows that a 5-year return period can be used in situations where the consequences of flooding could be severe. This would be the case on the subject site as the undercroft carpark would be at high risk should flooding occur, therefore a 5 year return period is adopted for hydraulic design.

Table NA.6 — Recommended design rainfall frequencies for use with simple design methods on new developments

Type of site	Design rainfall frequency	
	Return period (1 in "n" years)	Probability of exceedance in any one year
Sites with average ground slopes greater than 1 %	1	1
Sites with average ground slopes 1 % or less	2	0,5
Sites where the consequences of flooding are severe (e.g. adjacent basement properties)	5	0,2

Figure 15: Table NA.6 from BS EN 752

2.2.5 Climate Change

L&D stormwater designs include for 20% increase in rainfall rates due to climate change and urban expansion as set out in the GDSDS.

2.2.6 *Greenfield Runoff Rate (Q_{BAR})*

A Greenfield run off rate for the site has been calculated in Figure 8 based on a standard average annual rainfall of 755mm, a soil index value taken as 0.53 and a linear interpolation from a 50 Hectare catchment to the actual impermeable site area of 8056m^2. The resulting QBAR calculated for the site is 5.518 litres/second.

QBAR Calc for 50ha			*QBAR Calc interpolated for*	*0.00806*	ha
AREA in sq km	0.5		AREA in sq km	0.00806	
SAAR in mm	755				
SOIL	0.53				
QBARrural	342.2816602	l/s	QBARrural	5.51758	l/s

Figure 16: QBAR calculation

2.2.7 *Flow Control*

Flow from the site shall be restricted by a proprietary flow control device located downstream of the attenuation system. A site-specific design for a hydrobrake flow control device is included below.

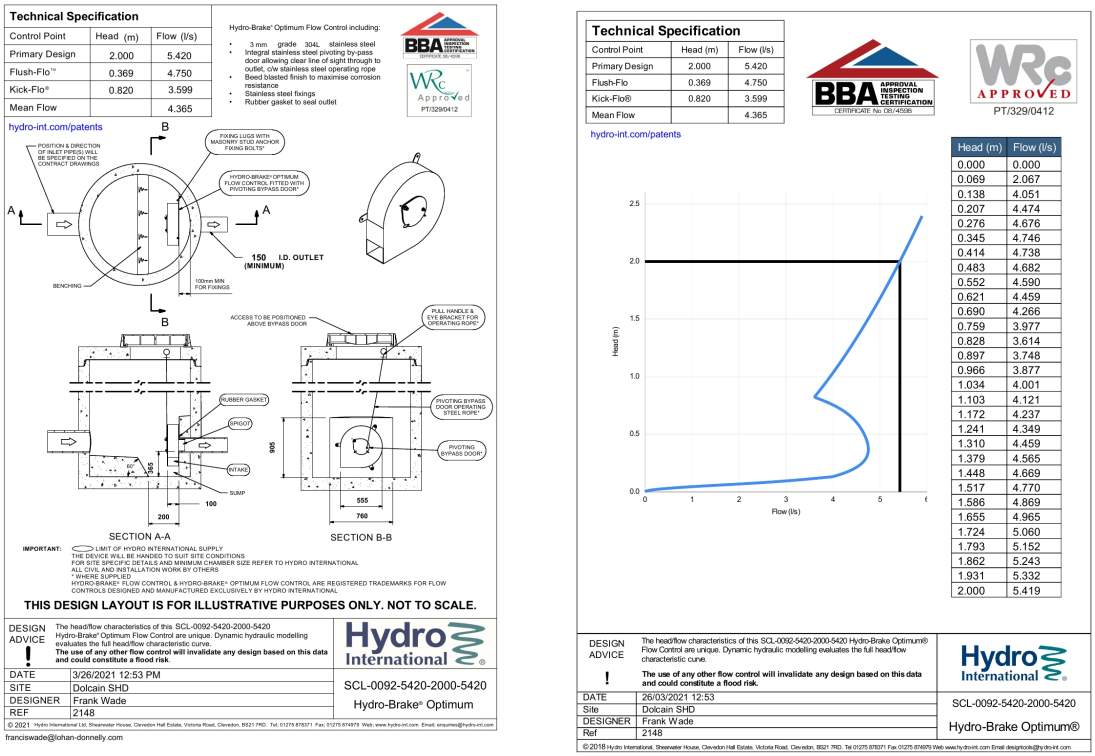


Figure 17: Proprietary flow control device design data

2.2.8 *Surface Water Outfall*

L&D propose to discharge surface water to the existing surface water sewer on Monastery Road. A new outfall manhole shall be constructed within the ownership boundary which shall be in compliance with SDCC requirements.

2.2.9 SuDS Measures Considered

L&D have reviewed and considered what SuDS measures are feasible for incorporation into the proposed development. The below table presents the SuDS options considered and why certain design features are chosen over others.

SuDS Measure	Incorporated within Design?	Comments
Extensive Green Roof	Y	Each of the four apartment blocks has a green roof, proposed as lightweight extensive sedum green roofs
Intensive Green Roof	N	Existing structures have insufficient structural capacity to accommodate loading of intensive system
Swales, Filter Drains, Infiltration trenches	Y	A line of Filter Drains is to be incorporated along the southern boundary of the site to promote infiltration and evapotranspiration
Permeable Paving	Y	Permeable paving and Grasscrete is incorporated into the surface level design as a form of source control, which promotes evapotranspiration and improves water quality
Petrol Interceptor	Y	It is proposed to route all surface water runoff through a new class 1 petrol interceptor prior to entering the attenuation chamber and reaching flow control device
Surface Water Attenuation	Y	Attenuation storage is achieved through use of a MC-3500 Stormtech Attenuation Tank at below ground level.
Site Run-off Rates	Y	L&D Design follows approach 2 outlined in Section 3.3.1 *Ciria SuDS Manual 2015*, which indicates that where controlling runoff to greenfield volumes is considered unachievable then calculations should utilize a set discharge rate of 2 litres/second/hectare or $Q_{bar(rural)}$, whichever is greater, is adopted for determination of attenuation storage. As Q_{BAR} is greater than 2.0 litres/second/hectare, this is adopted for use in L&D Designs.
Rainwater Harvesting	N	No rainwater harvesting proposed within development due to complexity of plumbing required
Detention Basins, Retention Ponds, Stormwater Wetlands	N	Not suitable due to space constraints and lack of infiltration arising from high bedrock levels
Bio-retention Systems	N	Not suitable due to space constraints in open space area
Tree pits	Y	Treepits with overflow connections to surface water sewers are included, which promotes evapotranspiration and improves water quality

Figure 18: SuDS table

2.2.10 *SuDS Measures Applied*

- Extensive Green Roof:

  A lightweight extensive green roof has been chosen for each apartment block of the proposed development. It is proposed to include a 20mm dimpled drainage sheet below the level of the drainage outlets on the roof in order to retain the water, achieving interception storage and facilitating evapotranspiration.

- Permeable Paving:

  It is proposed to incorporate permeable paving and grasscrete surfaces into the upper ground floor level site design. These systems allow for the capturing of surface water and storage of same within the sub-base buildup, promoting interception storage and facilitating evapotranspiration. The filtering process of surface water through the paving and sub-base also improves water quality and filters out hydrocarbons and suspended solids.

- Petrol Interceptor:

  It is proposed to incorporate 2 class 1 Klargester petrol interceptor at upper ground floor level, located upstream of the new attenuation tank. This shall facilitate removal of oils and silts prior to their entering the attenuation system and flow control device manhole.

  It is proposed to incorporate a separate class 1 Klargester petrol interceptor at lower ground floor level which may achieve a concentration of less than 5 mg/l of oil under standard test condition and will also facilitate silt removal.

- Surface Water Attenuation:

  It is proposed to attenuate surface water on-site through the use of a Stormtech attenuation tank at below ground level. The proposed attenuation tank shall achieve a storage capacity of 360.7m^3 and shall also be positioned to achieve in excess of the minimum 500mm freeboard to the lowest FFL as required by GDSDS. The attenuation system shall incorporate a Stormtech isolator row which is lined internally with a geotextile membrane and through which all incoming surface water must pass through. This allows for the removal of silts and suspended solids, thus improving water quality, and also protects the granular voids stone surrounding the attenuation system from being clogged with silt over time. The isolator row contains a manhole at the start of the run to facilitate jetting and clearing of the isolator row.

- Tree Pits:

  Tree pit systems will also be incorporated through the use of recessed pockets of granular voids stone beneath the root ball of trees at podium level. The tree pits shall incorporate an overflow drainage system at their base which connects to the surface water drainage system. This permits intercepted rainfall to permeate through the strata of the planter system and being captured for natural irrigation of the tree and facilitating evapotranspiration, but allowing for overflow of surface water into sewers and to the attenuation tank during extreme rainfall event.

2.2.11 *Volume Runoff*

L&D assessment indicates that post-development runoff volumes exceed pre-development runoff volumes. Therefore, approach 2 outlined in Section 3.3.1 Ciria SuDS Manual 2015, which indicates that where controlling runoff to greenfield volumes is considered unachievable then calculations should utilise a set discharge rate of 2 litres/second/hectare or $Q_{bar(rural)}$, whichever is greater, is adopted for determination of attenuation storage.

2.2.12 *Volume Storage*

The overall area of the site is 8060m^2 and consists of different surfaces as outlined in figure 11 below. For long term storage, GDSDS Appendix E advises a runoff coefficient of 0.8 for impervious surfaces, however, SDCC has advised a value of 0.9 be taken for impervious paved areas. Therefore, a value of 0.9 is given to hardstanding areas and a value of 0.8 given to green roofs and raised tree pits. For landscaped areas, a runoff coefficient of 0.53 is adopted to align with the soil type 5 SPR value.

Area ref	Type	Quantity	Plan Area	Runoff Coefficient	Total area for long term storage
			sqm		sqm
Extensive Green Roof	Sedum	1	1873.8	0.8	1499.04
Impermeable Paving	Bitmac/Concrete	1	3193.6	0.9	2874.24
Tree Pits	Sunken	1	65.25	0.53	34.5825
Tree Pits	Raised	1	44.1	0.8	35.28
Grasscrete Areas	Grasscrete	1	318.3	0.6	190.98
Grass/Landscaping Areas	Grass/Privacy Planters/Hedges	1	2565.6	0.53	1359.768
			8060.65		5993.8905

Figure 19: Site Area Summary

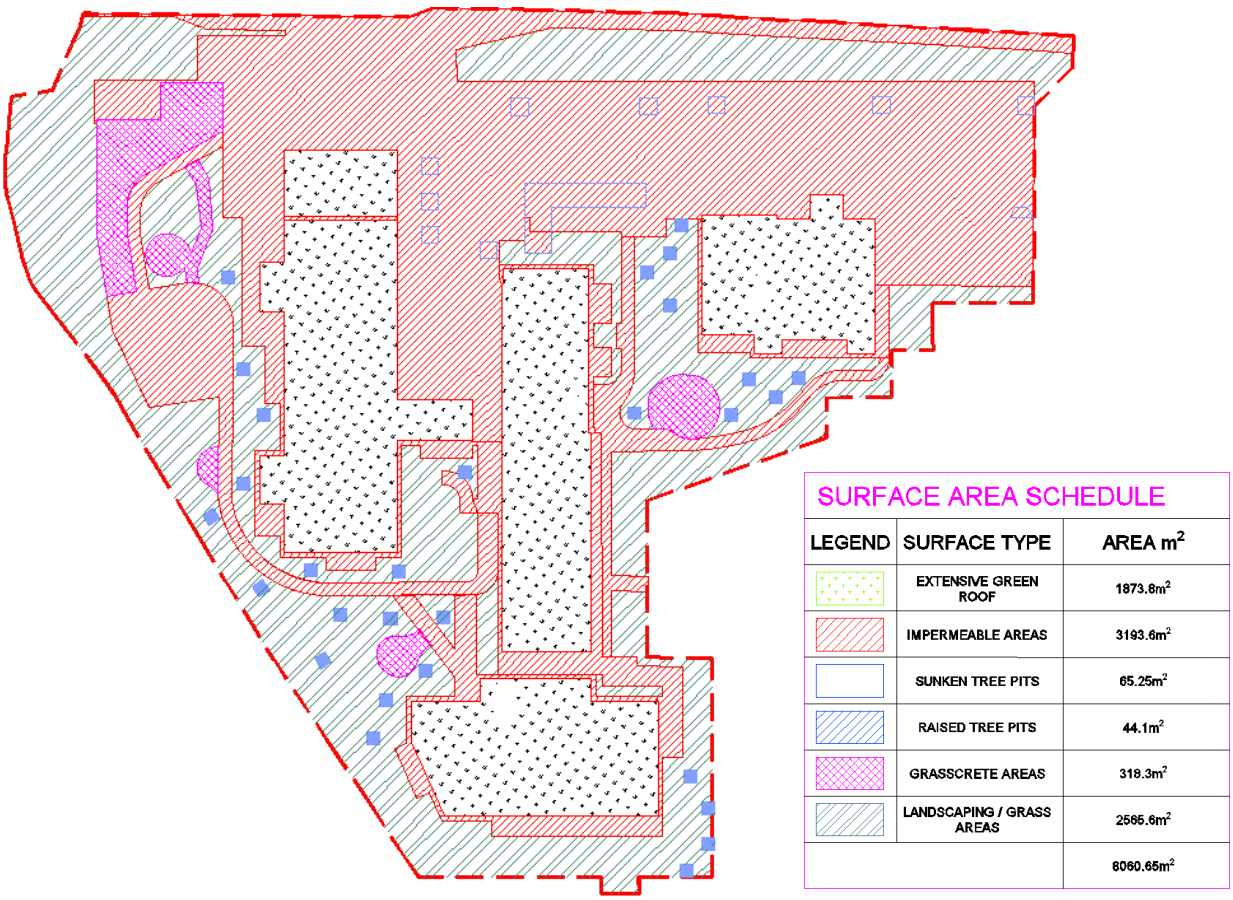


Figure 20: Site Area Summary Plan

Adopting the resulting areas and runoff coefficients, and accounting for 20% increase for climate change and urban expansion as well as a 25% increase for flow control head / discharge increase factor, a total required attenuation volume of 356.8m^3 is calculated for the proposed development based on a 100 year return period.

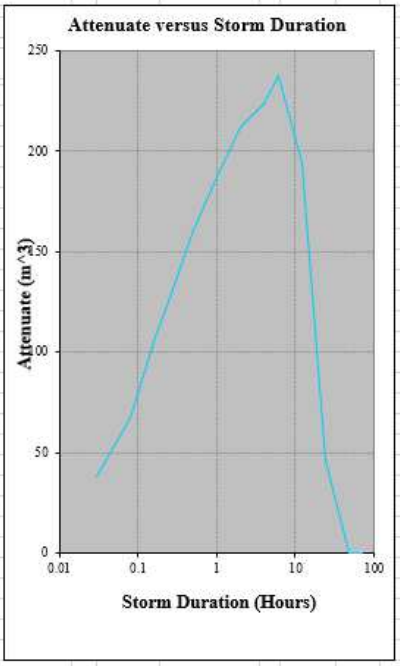
It is proposed to attenuate surface water on-site through the use of a Stormtech attenuation tank at lower ground floor level. The proposed attenuation tank shall achieve a storage capacity of 360.7m^3 and shall also be positioned to achieve in excess of the minimum 500mm freeboard to the lowest FFL as required by GDSDS. The attenuation system shall incorporate a Stormtech isolator row which is lined internally with a geotextile membrane and through which all incoming surface water must pass through. This allows for the removal of silts and suspended solids, thus improving water quality, and also protects the granular voids stone surrounding the attenuation system from being clogged with silt over time. The isolator row contains a manhole at the start of the run to facilitate jetting and clearing of the isolator row.

LOHAN & DONNELLY Consulting Engineers
13 Gardiner Place, Mountjoy Square, Dublin 1. T: 01 8787770
W: www.lohan-donnelly.com E: info@lohan-donnelly.com

Project:	Strategic Housing Development at Dolcain House, Clondalkin, Dublin 22			Job No:	2148
				Page No:	1
Date:	Nov' 21	Calc'd by:	SR	Checked by:	FW

Impervious I. Factor:	4409 m^2 1.00	Permeable I. Factor:	318.3 m^2 0.60	Other: I. Factor:	2631 m^2 0.53	Equivalent Impermeable Area:	5993.891 m^2	Attenuated Flow Rate:	5.5 l/s

Storm Duration (Hours)	Rainfall (mm)	Total Surface Water (m^3)	Allowable Discharge (m^3)	Attenuate (m^3)
0.03	6.50	38.96	0.594	38.37
0.08	11.50	68.93	1.584	67.35
0.166	18.50	110.89	3.2868	107.60
0.25	22.00	131.87	4.95	126.92
0.50	28.50	170.83	9.9	160.93
1.00	34.50	206.79	19.8	186.99
2.00	42.00	251.74	39.6	212.14
4.00	50.50	302.69	79.2	223.49
6.00	59.50	356.64	118.8	237.84
12.00	72.00	431.56	237.6	193.96
24.00	87.00	521.47	475.2	46.27
48.00	101.00	605.38	950.4	0
72.00	111.00	665.32	1425.6	0



Maximum Volume of Attenuate:	237.84 m^3	Climate Change & Urban Expansion Increase Factor =	1.2	Required Attenuation Volume =	356.8 m^3
		Flow Control Head/Discharge Increase Factor =	1.25		

Figure 21: Stormwater attenuation volume calculation for 100 year event

2.2.13 Treatment Volume, Water Quality Improvement & Treatment Train

Interception storage requirements as set out in the GDSDS (interception of the first 5mm of rainfall on at least 80% of the site) are achieved through the use of green roof and bio-retention areas around the site.

For the total paved area of the site considered as an impermeable area of 8060m^2, a maximum interception volume is calculated as:

8060 x 0.005 = 40.3m^3

The plan area for the proposed sedum green roof is 1873m^2. It is proposed to include a 20mm dimpled drainage sheet below the sedum substrate with a 95% voids ratio, which shall be positioned below the level of the drainage outlets on the roof in order to retain the water and facilitate evapotranspiration. The volume of interception storage provided by the roof drainage sheet would be equivalent to:

1873 x 0.02 x 0.95 = 35.59m^3

An amount of interception will also occur in the tree pits due to the presence of a drainage substrate at the bottom of each tree pit location. In the sunken tree pits located off the podium slab there will be a 300mm drainage layer with a 30% voids ratio. The total area for sunken tree pits amasses to 65.25m^2.

65.25 x 0.3 x 0.3 = 5.87m^3

The provision of green roofs, permeable paving and tree pits will also improve the water quality through a treatment train of filtration through the sedum in conjunction with a similar filtration process in the permeable paving and tree pit areas, following which all surface water runoff shall also pass through a new class 1 petrol interceptor and Stormtech isolator row, which will further separate oils and silt from the water before it discharges to the public sewers.

2.2.14 Health & Safety and Maintenance Issues

It is recommended that maintenance of SuDS systems should be carried out at in 6 month intervals. L&D recommend that a bi-annual maintenance regime be put in place for all elements of the stormwater drainage system, inclusive of all SuDS devices.

L&D notes that the proposed stormwater drainage system comprises green roof systems, tree pit systems, proprietary below-ground attenuation system and flow control device, underground manholes and underground pipes. These elements are generally considered acceptable from a Health & Safety perspective once supplier/manufacturers guides are followed and complied with during the detailed design, construction and operation.

All manholes and underground pipes shall be designed in accordance with the recommendations of the GDSDS and IS EN 752 to ensure safe means of access to all chambers.

For the design of the stormwater attenuation system, it is proposed to construct a below-ground proprietary Stormtech tunnel system with isolator row. The access manholes into the chamber will include a ground level access hatch for inspection and maintenance of the storage chamber and jetting of the isolator row to remove silts.

The flow control device chamber immediately downstream of the tank shall include a penstock gate valve and a flow control device. Regular maintenance of the flow control device is required to remove any blockages, particularly in the wake of heavy rainfall events or local floods. The flow control chamber penstock valve can be used to prevent water ingress during maintenance

and the manhole benching includes a local silt trap to facilitate removal of silt from the flow control chamber.

The petrol interceptors shall be fitted with monitoring telemetry linked to the building management system to alert management of high levels of silt or oil in the interceptor requiring removal. All silts and oils removed from the stormwater system must be disposed of at an appropriately licensed recovery and landfill facility.

Green roofs require bi-annual inspection for removal of unwanted vegetation such as weeds. All green roof areas shall incorporate fall-arrest systems for safe access by maintenance personnel.

3.0 Foul Water Drainage

3.1 Existing Foul Water Drainage Arrangements

The existing foul water sewer on site drain to the public foul sewer on the north west of the site. The drainage is currently a combination of both underslung & underground drainage.

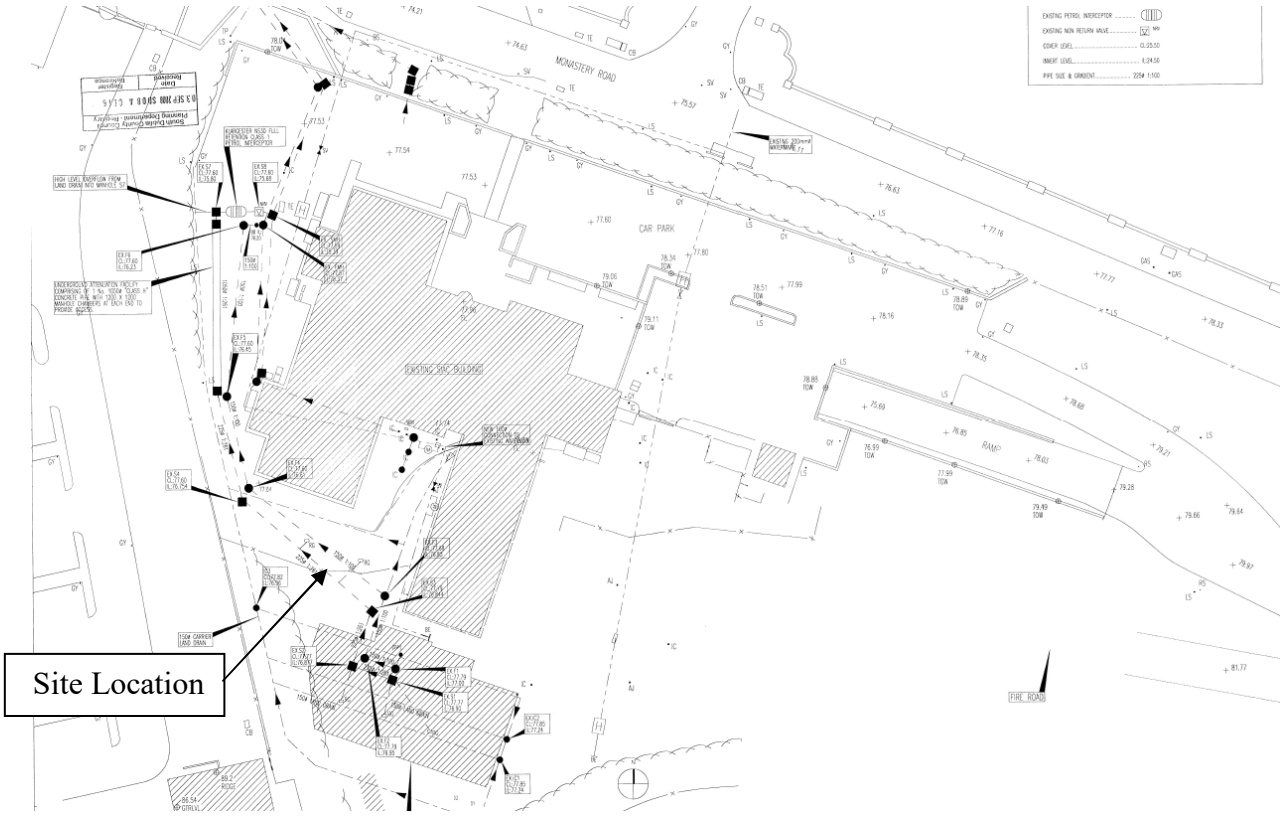


Figure 22: Existing drainage plan

3.2 Proposed Foul Water Drainage Arrangements

3.2.1 Foul Sewer Design

All sewers are designed in accordance with IS 752: 2008 and Building Regulations TGD Part H. All drainage works shall be in accordance with the requirements of Irish Water and SDCC County Council.

Wastewater generated from the 3 existing blocks shall enter an underground foul sewer system, while the wastewater generated from the new block shall enter an underslung foul sewer system, suspended below ground floor slab and exit the site via gravity flow.

3.2.2 Daily Wastewater Discharge

A pre-connection enquiry application has been made to Irish Water detailing the proposed wastewater discharges. Reference number CDS21001936 has been allocated for the application and a confirmation of feasibility letter has been issued by Irish Water in relation to the proposed development as included in Appendix A. In the confirmation of feasibility letter Irish Water have stated that the foul water connection can be made without infrastructure upgrades by Irish Water.

A statement of design acceptance has also been requested from Irish Water in regards to the final drainage design. L&D will provide the statement of design acceptance upon receipt from Irish Water.

3.2.3 Foul Sewer Outfall

The site is currently served by a 150mm diameter foul water sewer spur which discharges to the existing 225mm diameter public foul water sewer on the near side of the main road via an existing connection to an existing manhole. This outfall manhole will be retained with additional drainage from a new block added to the drainage system on site. It is proposed to keep the existing 150mm diameter foul sewer at a gradient of 1/100 to serve the new development, which provides a flow capacity of 16.5 litres/second exceeding the 6DWF of 3.928 litres/second. The number of units discharging into the sewer would be sufficient for the sewer to achieve self-cleansing velocity at the proposed gradient.

4.0 Water Supply

4.1 Existing Water Usage and Watermain Arrangement

There is currently a 100mm Ø uPVC line servicing the site from Monastery Road. As shown in Figure 14 below.

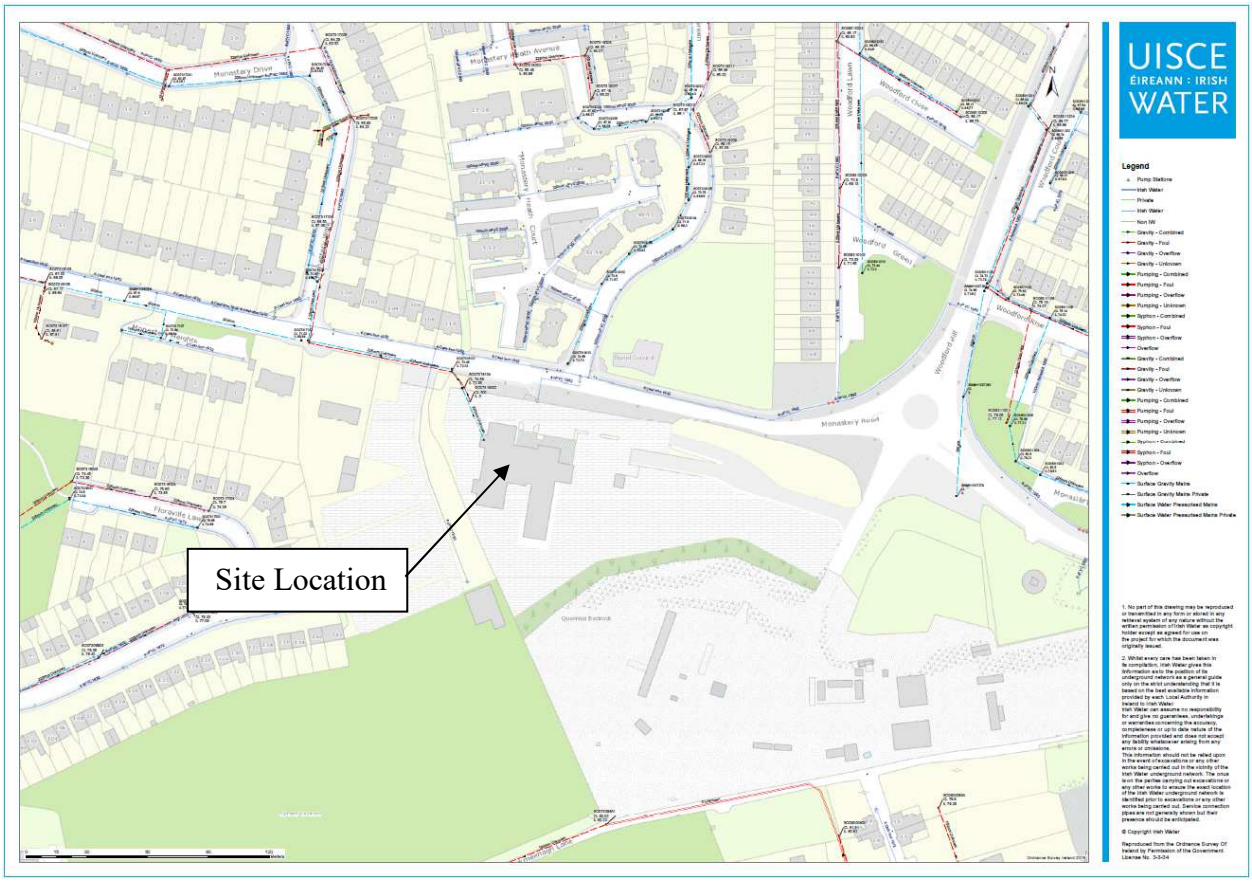


Figure 23: Existing public watermains and sewer system, Irish Water Records

4.2 Proposed Water Usage and Watermain Arrangement

4.2.1 Watermain Connection

A pre-connection enquiry application has been made to Irish Water detailing the proposed water usages. Reference number CDS21001936 has been allocated for the application and a confirmation of feasibility letter has been issued by Irish Water in relation to the proposed development as included in Appendix A. Irish water have stated that to make a connection it is necessary to upgrade the public watermains on monastery road by adding 130m of new 150mm ID pipe to connect the site to the existing 8" uPVC mains in Woodford Hill as opposed to using the existing connection. A statement of design acceptance has also been requested from Irish Water in regards to the final drainage design. L&D will provide the statement of design acceptance upon receipt from Irish Water.

4.2.2 Hydrants

There are a number of hydrants currently located onsite. Additional hydrants shall be installed on the site as required by the local Fire Officer.

4.2.3 Watermeters

The existing site is understood to have a single Watermeter for the current development. It is proposed to replace this with a new bulk water meter and control kiosk, positioned in accordance with the requirements of SDCC and Irish Water. A new water meter shall be installed within the site for each of the four apartment blocks.

Frank Wade

Date: 17th January 2022

Frank Wade B.E., C.Eng., M.I.E.I.
Director

For Lohan & Donnelly Civil & Structural Consulting Engineers

Appendix A

Frank Wade

13 Gardiner Place
Mountjoy Square
Dublin 1
Co. Dublin
D01VOT8

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

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

www.water.ie

19 May 2021

Re: CDS21001936 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 127 units at Dolcain House, Clondalkin, Co. Dublin

Dear Sir/Madam,

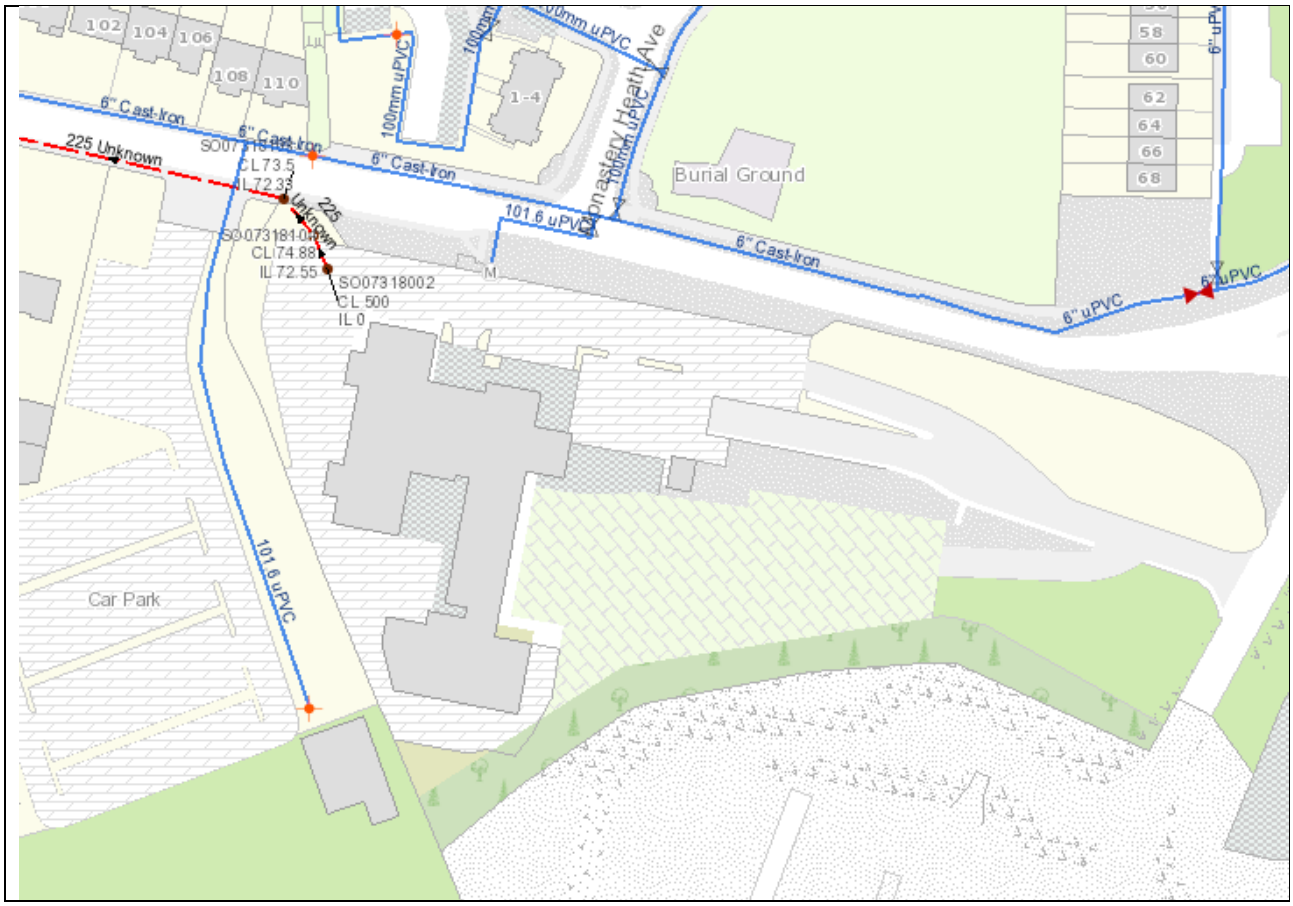
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Dolcain House, Clondalkin, Co. Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in 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 Subject to upgrades
Wastewater Connection	Feasible without infrastructure upgrade by Irish Water
SITE SPECIFIC COMMENTS	
Water Connection	Approx. 130m of a new 150mm ID pipe main is required in Monastery Road to connect the Development to the existing 8''uPVC main in Woodford Hill. 

	Should you wish to progress with the connection, you have to fund the works and the fee will be calculated at a connection application stage.

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.

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



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

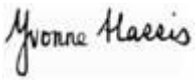
Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish 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 Marina Byrne from the design team via email mzbyrne@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations