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# Engineering Services Report

**Project:**

Residential Development at Greenhills Road, Walkinstown, Dublin 12.

Green Vale
Greenhills

**Client:**

STEEPLEFIELD LTD.

**Project Reference No.:**

20189

**Report Reference No.:**

20189-LDE-ZZ-ZZ-RP-0001

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# 1.0 Introduction

This report has been prepared by Lohan & Donnelly Consulting Engineers and relates to the proposed residential development located at Greenhills Road, Walkinstown, Dublin 12. The Engineering Services Report is to be read in conjunction with all of the accompanying documentation, calculations & Engineering drawings. The purpose of this report is to capture and address the following areas relating to the required drainage network system to service the development:

- Foul Water Network
- Surface Water Network
- Water main
- Roads

# 2.0 Project Overview

## 2.1 Site Location

The site is located at Greenhills Road, Walkinstown, Dublin 12, as shown in Figure 1 of map below.


Figure 1: Site Location.
(Source: Google Earth 2020)

## 2.2 Description of Existing Site

The site is approximately 2.79 hectares in area, located within an industrially surrounded zone and comprises of existing low-rise disused industrial units which are to be demolished as part of the subject proposal. The site currently has 3 vehicular accesses all of which are located along the southern part of the site boundary. The existing development does not have any SuDS measures in place.

Topographical survey of existing site indicates that the site is gradually sloping down from west to east and north to south with a very steep, in places almost vertical ascent/decent transition from the site to the Greenhills Road neighboring the northern site boundary. The western site boundary, abutted to the boundary of the neighboring development is separated via a retaining wall, with a level difference between the site in question and neighboring development of approximately 6 meters.

## 2.3 Description of Existing Ground Conditions

A ground investigation survey was conducted for the proposed development by Ground Investigations Ireland in-between January and February of 2021 with the following purpose and scope.

- Visit project site to observe existing conditions
- Carry out 14 No. Window Sample Boreholes to recover soil samples
- Carry out 10 No. Cable percussion Boreholes to a maximum depth of 4.50m BGL
- Installation of 3 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

The ground conditions encountered during the investigations are summarized below:

- Tarmacadam or concrete surfacing course to a max. depth of 0.3m BGL
- Brown clayey sandy sub-angular to sub-rounded fire to course gravel or a grayish brown sandy gravelly clay with rage fragment of red brick have been found beneath the surfacing course to a depth of between 0.4m and 2.4m BGL.
- Cohesive deposits described as dark brown/grey sandy gravelly clay with occasional cobbles were encountered beneath the made ground and/or surfacing course.
- Granular deposits described as grey/brown clayey sub-angular to sub-rounded fine to course gravel with occasional cobblers and brown clayey gravelly fine

to course sand were encountered beneath the made ground and/or cohesive deposits.

Based on the three groundwater monitoring wells, installed in the boreholes where groundwater was struck, ground investigation report concludes that groundwater was encountered at 2.45m for borehole 'BH04', 1.65m for 'BH06' and 2.7m for 'BH08'. The monitoring wells have been revisited twice after the initial measurements were recorded, 8 and 11 days later. On The 11th day it was noted that for borehole 'BH04' the groundwater level dropped by 13% to 2.76m BGL, for borehole 'BH06' groundwater level dropped by 18% to 1.94m BGL and no results were recorded for borehole 'BH08'.

Ground level for 'BH06' was measured at 55.97 meters above Ordnance Datum (mOD) and 55.36m (mOD) for 'BH08'. The difference in ground level of 0.61m explain the discrepancy in the groundwater table levels between the two boreholes. It is therefore, based on the results of the survey, safe to assume an average water table of 2.35m BGL, which is the average groundwater level between 'BH06' and 'BH08'.

A copy of the ground investigations report including borehole logs, recommendations & conclusions is included in Appendix G of this document.

## 2.4 Description of Proposed Development

(i) The demolition of the former Chadwicks Builders Merchant development comprising 1 no. two storey office building and 9 no. storage/warehouse buildings ranging in height from 3 m – 9.9 m as follows: Building A (8,764 sq.m.), Building B (1,293 sq.m.), Building C (two-storey office building) (527 sq.m.), Building D (47 sq.m.), Building E (29 sq.m.), Building F (207 sq.m.), Building G (101 sq.m.), Building H (80 sq.m.), Building I (28 sq.m.), and Building J (44 sq.m.), in total comprising 11,120 sq.m.;

(ii) the construction of a mixed-use Build-to-Rent residential and commercial development comprising 633 no. build-to-rent apartment units (292 no. one-beds, 280 no. two-beds and 61 no. three-beds), 1 no. childcare facility and 10 no. commercial units in 4 no. blocks (A-D) ranging in height from 5 to 12 storeys as follows:

(a) Block A comprises 209 no. apartments (102 no. 1 bed-units, 106 no. 2 bed-units and 1 no. 3-bed units) measuring 5 - 10 storeys in height. (b) Block B comprises 121 no. apartments (53 no. 1 bed-units, 45 no. 2 bed-units and 23 no. 3 bed-units) measuring 8 - 10 storeys in height. (c) Block C comprises 130 no. apartments (38 no. 1-bed units, 71 no. 2-bed units and 21 no. 3-bed units) measuring 8 - 12 storeys in height. (d) Block D comprises 173 no. apartments (99 no. 1 bed-units, 58 no. 2 bed-units and 16 no. 3 bed-units) measuring 6 - 10 storeys in height. All apartments will be provided with private balconies/terraces;

(iii) provision of indoor communal residential amenity/management facilities including a co-working space, communal meeting room/ work space, foyer, toilets at ground floor of Block A; gym, changing rooms, toilets, resident's lounge, studio, laundry room, communal meeting room/ work space, multi-function space with kitchen at ground floor of Block B; games room with kitchenette, media room, co-working space, resident's lounge, communal meeting room/ work space, reception area, management office with ancillary staff room and toilets, toilets, parcel room at ground floor of Block C;

(iv) the construction of 1 no. childcare facility with dedicated outdoor play area located at ground floor of Block A;

(v) the construction of 8 no. commercial units at ground floor level of Blocks A, B and D, and 2 no. commercial units at second floor level (fronting Greenhills Road) of Block C as follows: Block A has 3 no. units at ground floor comprising 79.46 sq.m., 90.23 sq.m., and 121.39 sq.m., Block B has 1 no. unit at ground floor comprising 127.03 sq.m., Block C has two units at second floor comprising 120.85 sq.m. and 125.45 sq.m., and Block D has 4 no. units at ground floor comprising 84.45 sq.m., 149.77 sq.m., 155.48 sq.m. and 275.59 sq.m.;

(vi) the construction of 3 no. vehicular entrances; a primary entrance via vehicular ramp from the north (access from Greenhills Road) and 2 no. secondary entrances from the south for emergency access and services (access from existing road to the south of the site) with additional pedestrian accesses proposed along Greenhills Road;

(vii) provision of 424 no. car parking spaces comprising 398 no. standard spaces, 21 no. mobility spaces and 5 no. car club spaces located at ground floor level car park located within Block A and accessed via the proposed entrance at Greenhills Road, a two-storey car park located within Blocks C and D also accessed from the proposed entrance at Greenhills Road and on-street parking at ground floor level adjacent to Blocks A and C. Provision of an additional 15 no. commercial/ unloading/ drop-off on-street parking spaces at ground floor level (providing for an overall total of 439 car parking spaces). Provision of 4 no. dedicated motorcycle spaces at ground floor level parking area within Blocks C and D;

(viii) provision of 1363 no. bicycle parking spaces comprising 1035 no. residents' bicycle spaces, 5 no. accessible bicycle spaces and 7 no. cargo bicycle spaces in 9 no. bicycle storerooms in ground and first floor parking areas within Blocks A, C and D, and 316 no. visitors' bicycle spaces located externally at ground floor level throughout the development;

(ix) provision of outdoor communal amenity space (5,020 sq.m.) comprising landscaped courtyards that include play areas, seating areas, grass areas, planting, and scented gardens located on podiums at first and second floor levels; provision of a communal amenity roof garden in Block C with seating area and planting (176 sq.m.); and inclusion of centrally located public open space (3,380 sq.m.) adjacent to Blocks B and C comprising grassed areas, planting, seating areas, play areas, water feature, flexible use space; and incidental open space/public realm;

(x) development also includes landscaping and infrastructural works, foul and surface water drainage, bin storage, ESB substations, plant rooms, boundary treatments, internal roads, cycle paths and footpaths and all associated site works to facilitate the development.

This application is accompanied by an Environmental Impact Assessment Report (EIAR).

# 3.0 Foul Water Network

## 3.1 Existing Foul Water Drainage Infrastructure

Irish Water drainage record map shows an existing 225mm diameter foul water sewer located in close vicinity to the proposed development. The sewer originates from south-eastern direction, wraps around the outside of the southern and eastern site boundary and turns north-east, continuing towards the Walkinstown roundabout. Irish Water drainage record map enclosed in Appendix A of this document.

## 3.2 Proposed Foul Water Drainage Infrastructure

The foul water drainage infrastructure for the proposed development has been designed and is to be constructed in accordance to Irish Water's "Code of Practice for Wastewater Infrastructure (Document IW-CDS-5030-03)", "Wastewater Infrastructure Standard Details (Document IW-CDS-5030-01)" and the Building Regulation requirements.

To service the development, a 225/300mm diameter foul water pipe will be provided, commencing from the south-west corner of the site, extending to the last foul water manhole of site 'FW01'. The foul water will then flow towards the existing foul water manhole 'EX.FW01' located south-east of the site, on the access road parallel to the southern site boundary, discharging all the foul water generated from the proposed development. For connection details, refer to drawing "20189-LDE-07-00-DR-SC-1C01a".

Foul water flow rates for the proposed development are tabulated in table 3.1 below. For full flow rate calculations refer to wastewater calculation sheet in Appendix C of this document.

| | No. of Units | Occupancy | Flow per person, per day (Liters) | Daily Discharge (l/day) | 10% Infiltration Allowance | Dry Weather Flow (DWF) (l/s) | Peak Dry Weather Flow (6DWF) (l/s) |
|---|---|---|---|---|---|---|---|
| Apartments | 633 | 1710 | 150 | 256500 | 282150 | 3.266 | 19.594 |
| Commercial | - | 60 | 50 | 3000 | 3300 | 0.038 | 0.229 |
| Residential Amenity | - | 695 | 40 | 27800 | 30580 | 0.353 | 2.124 |
| Creche | - | 74 | 50 | 3700 | 4070 | 0.047 | 0.283 |
| Total | - | - | - | 291000 | 320100 | 3.704 | 22.229 |

Table 3.1: Wastewater flow rates for Proposed Development.

Table 3.1 above is generated in accordance with "Code of Practice for Wastewater Infrastructure (Document IW-CDS-5030-03)" Section 3.6, Appendix C, and Section 2.2.5 of Appendix B. For full foul water drainage infrastructure scheme for the proposed development refer to drawing "20189-LDE-07-00-DR-SC-1C01a".

Pre-connection enquiry form (Reference No. CDS20007999) was submitted on the 08th of December, 2020 to new connections department within Irish Water to determine whether a connection for the proposed development is feasible and could be established. Confirmation of feasibility from Irish Water has been received on the 18th of March, 2021 stating that a foul water connection for the proposed development is feasible, subject to upgrade works.

The confirmation of feasibility letter, with regards to the feasibility of a wastewater connection states the following:

*"It will be necessary to carry out further detailed study and investigations to confirm the available capacity and to determine the full extent of any upgrades which may be required to be completed to Irish Water Infrastructure, prior to agreeing to the proposed connection. Should you wish to have such studies and investigations*

*progressed by Irish Water, you will be required to enter into Project Works Service Agreement."*

We have since liaised with a Design Engineer from Irish Water, with the intent of entering the Project Works Service Agreement (PWSA). Irish Water are currently gathering information on the scope of works which will be implemented to determine the upgrades which may or may not be required.

Based on the existing size of wastewater sewer, Irish Water estimated that the likelihood of upgrades not being required are very slim, however this will only be fully known pending the results of the surveys and detailed studies which are going to be carried out over an average time period of 18 months. The timeline is extensive however necessary to adequately check the capacity of the existing wastewater sewer. The design intent of the required (if any at all) upgrade works will be known at an earlier stage, the 18 month time period covers the full extent of (PWSA) detailed studies and investigations from start to closure. Upgrades, if required will likely be in the form of replacing the existing sewer with a larger diameter pipe capable of facilitating higher flow rates. Confirmation of feasibility letter from Irish Water enclosed in Appendix B within this document.

<u>Update - Irish Water (24/05/2021)</u>

Irish Water have contacted us on the 24th of May, 2021 to inform that the Project Works Services Agreement (PWSA) will no longer be required. Irish Water will be undertaking upgrade works for the existing public wastewater infrastructure system in the area of where the proposed development is located. The extent of required upgrades is yet to be determined by Irish Water however, it is likely to be in the form of replacing the existing 225mm diameter public wastewater sewer (which we are currently proposing to connect to, as can be seen on our drawing "20189-LDE-07-00-DR-SC-1C01a") to a larger diameter sewer. The wastewater connection location for our proposed development into the upgraded public wastewater sewer will be identified by Irish Water post a New Connection Application form has been submitted to & reviewed by Irish Water.

Update - Irish Water (24/02/2022)

Statement of Design Acceptance was received from Irish Water on the 24th of February, 2022. The letter of design acceptance states that Irish Water are satisfied with the drainage infrastructure scheme for the proposed development and have no objections.

Two recommendations were made by Irish Water with regards to the proposed foul water sewer which reads as follows:

1. "*It is recommended a minimum clearance of 3m of an existing or proposed structure for sewer pipes*"
2. "*It is recommended that the foul sewer network is located deeper, depth of cover is less than 500mm in some areas*"

The comments made have been adhered to. All existing and proposed foul water sewers have a minimum seperational distance from the proposed structure of 3 meters throughout the development.

Furthermore, there are only two foul water pipes located under the footpath which do not meet the minimum cover requirement of 500mm. These pipes will have adequate protection measures in place in accordance with paragraph 1.7.3.2 of Building Regulations Technical Guidance Document H - Drainage and Waste Water Disposal. Concrete paving slabs will be laid to act as bridging above the pipes with 75mm of granular material between the top of pipe and underside of paving slab. Refer to Appendix I of this document. Statement of Design Acceptance letter from Irish Water enclosed in Appendix I within this document.

# 4.0 Surface Water Network

## 4.1 Existing Surface Water Drainage Infrastructure

Irish Water drainage record map shows an existing 225mm diameter surface water sewer located on the access road east of the development, parallel to the Chadwicks Plumb Centre. The sewer commences near the junction of the access road and Greenhills Road and continuous towards the south-east direction. Irish Water drainage record map enclosed in Appendix A of this document.

## 4.2 Proposed Surface Water Drainage Infrastructure

The surface water drainage infrastructure for the proposed development has been designed and is to be constructed in accordance to "Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Technical Document – Volume 2, New Developments, 2005, "Greater Dublin Regional Code of Practice Works" and the Building Regulation requirements.

It is proposed to provide a 225, 300 & 450mm diameter surface water pipes to service the development. Surface water collected from within the site boundary will flow into the last manhole on site "SW02", from there the surface water will flow into an intermediate manhole "SW01" in-between the last manhole on site and the existing surface water sewer. Finally the surface water will discharge into the existing 225mm surface water sewer located on the access road parallel to Chadwicks Plumb Centre, south of the proposed development via a saddle connection. For connection details, refer to drawing "20189-LDE-07-00-DR-SC-1C01a".

## 4.3 SuDS Measures Considered

As a requirement outlined in the "Greater Dublin Regional Code of Practice for Drainage Works" document, Version 6.0, enforced in collaboration with several different councils within Ireland, including South Dublin City Council (where the proposed development will be located), all new developments must incorporate

sustainable urban drainage system (SuDS). Therefore, the proposed development will implement (SuDS) as an approach to manage the surface water within the site, reducing, delaying and purifying the run-off from the site, hence lowering the strain and the pollution content on the existing public sewer. The following SuDS measures have been considered by L&D to determine which measures are feasible and can be incorporated into the proposed development.

| SuDS Measure Considered | Incorporated within Design? | Comments |
|---|---|---|
| **Extensive Green Roof** | Y | Both extensive and intensive green roof systems will be incorporated at podium level serving block A, C & D. |
| **Intensive Green Roof** | Y | Both extensive and intensive green roof systems will be incorporated at podium level serving block A, C & D. |
| **Swales** | N | Insufficient space within the site. |
| **Filter Drains** | N | Insufficient space within the site. |
| **Permeable Paving** | Y | Permeable paving is proposed throughout all paved areas throughout the full extent of the development. |
| **Porous (Permeable) Asphalt** | Y | Porous Asphalt is proposed to be used on the main external 6.0m wide service road within the development. |
| **Petrol Interceptor** | Y | Class 2 Petrol interceptors are proposed in both undercroft car parks serving block A and blocks C & D. Petrol interceptors are connected to the surface water sewer prior to surface water discharging into the external foul water manhole outside the car park. |
| **Attenuation Tank** | Y | Stormtech MC-3500 stormwater attenuation tank is proposed to be used, located under the courtyard area, adjacent to block B. |
| **Rain Gardens** | Y | Rain Gardens are proposed to be used on both sides along the internal 6.0m wide service road, in-between block A & B. |
| **Tree Pitts** | Y | Tree Pitts are proposed to be used along the full extent of the southern site frontage. |
| **Detension Basins, Retention Ponds,** | N | Insufficient space within the site. |

| | | |
|---|---|---|
| **Stormwater Wetlands** | | |
| **Rainwater Harvesting** | N | No Rainwater harvesting is proposed within the development. |
| **Hydrobrake (Site Run-off Control)** | Y | Hydrobrake is proposed to be used, installed on the last surface water manhole within the site to limit the outfall rate leaving the development to 8.021 l/s. |

### 4.3.1 Permeable Paving

It is proposed to incorporate a permeable paving system into the paved areas surrounding the development, with the aim of reducing run-off from the site in times of precipitation and improving the quality of run-off generally. A minimum of 300mm depth of 63mm-10mm sub base with approximately 30% voids is to be used to provide additional sub-ground storage volume for rainfall events. The intention is to provide a sustainable form of storm water source control within the site that will reduce the total runoff from the site by temporarily retaining the runoff within the pavers/bedding, promoting evaporation and facilitating infiltration into the sub-soil. The quality of run-off from the site shall also be improved due to the filtering process of the paving, which retains silts and degrades hydrocarbons.

### 4.3.2 Blue Roof

It is proposed to provide an extensive blue roofing system by Bauder, covering 60% of the total roof area with the aim, similarly to a green roof to reduce runoff from the site in times of precipitation and remove the atmospherically deposited urban pollutants. A blue roof will act as a roof level attenuation tank, minimizing the in-ground attenuation tanks at ground level. Rainwater on the blue roof will be absorbed by the vegetation layer, for heavier storm events, when the vegetation layer is no longer capable of retaining any more water. The water will then be deposited into a 100mm deep "Bauder attenuation cell 100" and used by the vegetation layer once it has recovered. In heavy 1 in a 100 year storm event, when the water can no longer be held within the vegetation layer or attenuation cells it will discharge into the surface water sewer

located at ground level at a controlled rate via flow restrictors of 2 l/s. In a 1:100yr storm event, with 20% increase in storage volume to allow for climate change and total blue roof area of 5058m$^2$, the total required attenuation volume equates to 228.45m$^3$. Refer to page 1 of Appendix D for attenuation calculations. The total provided attenuation by the blue roofs is 505.8m$^3$.

### 4.3.3 Tree Pits

It is proposed to provide a total of 21 tree pits along the southern boundary as can be seen on drawing "20189-LDE-07-00-DR-SC-1C01a". The tree pits will provide a natural source of surface water infiltration & attenuation with the intent of attenuating the adjacent grass verge and cycle path, thus minimizing the in ground attenuation storage requirements. To enable infiltration into the sub-soil, the tree pits will be interlinked together via a 150mm perforated pipe. As a secondary measure of precaution and to prevent damage to trees from too much water ingress, the 150mm perforated pipe will be connected to the last surface water manhole on site SW02. In a 1:100yr storm event, with 20% increase in storage volume to allow for climate change and total area to be attenuated of 1185m$^2$, the total required attenuation volume equates to 31.668m$^3$. Refer to page 2 of Appendix D for attenuation calculations. The total provided attenuation by the tree pits is 54.337m$^3$.

### 4.3.4 Green Podium

Similarly to a green roof, it is proposed to incorporate a combination of a soft and a hard landscaping system into the design to form an accessible, intensive green podium. For hard & soft options to be considered as a green roof/podium system, both have to be permeable, capable of filtering the water through into the water storage and drainage layers. The top layers of soft landscaping will consist of an intensive vegetation layer on an intensive substrate layer, while hard landscaping will be consisting of paving blocks on granite chipping/gravel base. The intention is to provide an additional natural and sustainable form of attenuation within the site that will reduce the total runoff from the site by temporarily retaining the runoff within the sedum layer and promoting evaporation. Additionally, green roof/podium surface water treatment

process removes atmospherically deposited urban pollutants. Refer to Figure 4.1 below for typical build-up layers of soft & hard landscaped green roofs.

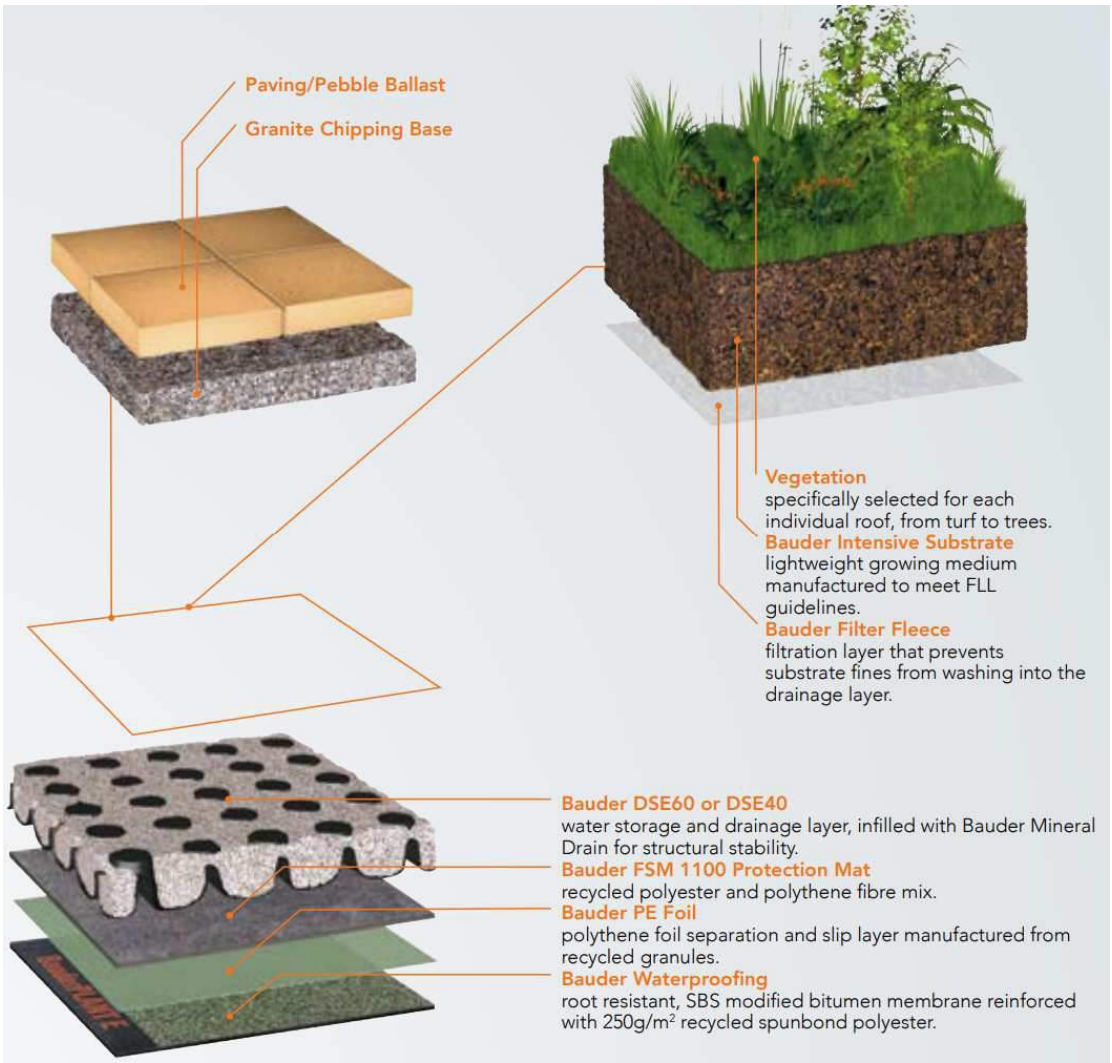



Figure 2: Build-up for soft & hard landscaped Green Roof systems.
(Source: Bauder Green Roof technical design guide 2020).

### 4.3.5 Attenuation Chambers

It is proposed to provide Stormtech MC-3500 attenuation chambers for the 1:100yr storm event and a 20% increase in storage volume to allow for climate change, equating to a total required attenuation volume of 895.74m$^3$. Refer to page 3 of Appendix D for attenuation calculations. The podium slab over the car parking areas is taken as a green podium area and is approximately 8500m$^2$. This area, the proposed permeable paving areas (6526m$^2$) and grassed areas (3621m$^2$) equal to a total area of

18647m$^2$. For all of the listed areas above, the following impermeability factors have been applied:

- Green podium – 60%
- Permeable paving – 60%
- Grassed areas – 15%

Applying the impermeability factors to the total area (excluding blue roof, tree pits and their associated areas which are not attenuated by an in ground attenuation system) of 18972m$^2$, a total required impermeable attenuation area of 11984m$^2$ is generated. For a return period of 2 years, the maximum anticipated run-off is approximately 187.77 l/s. Additionally, the proposed attenuation chambers allow for the removal of total suspended solids and provides easy access for inspection and maintenance. To increase the process of percolation, the attenuation chambers are to be surrounded with a permeable geotextile to promote infiltration.

### 4.3.6 Rain Gardens

It is proposed to provide rain gardens at both sides of the 6.0m internal access road servicing the development, in-between blocks A and B. The rain gardens will be enclosed within a raised kerb system. To allow rainwater surrounding the rain gardens to enter, the continuous kerb around the perimeter of the rain gardens will be dropped to achieve level access between the rain gardens and the adjacent pavement. Rain gardens be composed of a landscaped area with high permeability soil. Rain gardens will provide treatment to the collected rainwater and promote evaporation. For a heavy rainfall event, to mitigate any potential over flooding of the rain gardens, a 150mm diameter perforated pipe will be provided to drain any excess surface water to the surface water drainage network servicing the development.

### 4.3.7 Hydro-brake

The maximum run-off for the site has been calculated to be 187.77 l/s. To ensure that the existing surface water sewer is not over capacitated, the flow of surface water leaving the last manhole "SW02" on site (as per Greater Dublin Regional Code of Practice for Drainage Works, Rev 6) will be limited to 8.021 l/s via a hydro-brake, a flow control device capable of managing the flow rate of water. Refer to Appendix E & F for Q-Bar and run-off calculations.

### 4.3.8 Petrol Interceptor

All surface water from the car parks will go through a petrol interceptor to separate any hazardous chemicals and petroleum prior to joining the externally situated surface water sewer.

## 4.4 Interception Storage

Interception storage refers to precipitation which will be stored and intercepted by certain alleviation measures, preventing the rain water from contacting and being absorbed by the subgrade. The Greater Dublin Strategic Drainage Study (GDSDS) document states that a minimum of 5mm, and preferably 10mm of interception storage must be provided. The development comprises of blue roofs, green podiums, permeable paving/asphalt and grassed areas. The total impermeable area for the development amounts to 15793m$^2$. To successfully intercept 10mm of rain water leaving the development the interception volume has to equate to:

15793 x 0.01 = 157.93m$^3$

### 4.4.1 Blue Roofs

The area of blue roofs provided for the development amounts to 5058m2. The blue roof system will have 100mm deep attenuation cells with 95% void space, which equals to a total rain water interception volume of:

5058 x 0.1 x 0.95 = 480.51m$^3$

### 4.4.2 Green Podium

The area of green podium provide for the development amounts to 8500m$^2$. It is proposed to incorporate a 20mm dimple drainage sheet below the substrate of the green roof with 90% void space. The 20mm sheet will be positioned below the level of drainage outlets on the roof in order to retain the water and facilitate evapotranspiration. The volume of interception storage provided by the green roof areas would be equivalent to:

8500 x 0.02 x 0.90 = 153m$^3$

### 4.4.3 Permeable Paving/Asphalt

The area of permeable paving/asphalt amounts to 7561m$^2$. The a 63 – 10mm coarse aggregate 250mm sub-base, forming the permeable paving system has a 30% void ratio. This void ratio will be utilized as interception storage. The interception storage volume provided within the 250mm sub-base equates to the following:

7561 x 0.25 x 0.3 = 567m$^3$

The total interception storage provided for the entire development amounts to 1200.51m$^3$, more than both the minimum 5mm storage requirement and the recommended 10mm storage capacity, as denoted within the GDSDS code of practice document.

# 5.0 Water Main

## 5.1 Existing Water Main (Outside Site Boundary)

Irish Water drainage record map shows an existing 101.6mm diameter uPVC water main located on the service road, parallel to the southern boundary with several extensions to service other nearby developments. Another 101.6mm diameter Cast-Iron water main can be seen on Greenhills Road, parallel to the northern site boundary, continuing towards the Walkinstown roundabout. Irish Water drainage record map enclosed in Appendix A of this document.

## 5.2 Existing Water Main (Inside Site Boundary)

Irish Water drainage record maps indicates a 101.6mm uPVC water main inside the site boundary, situated within the western part of the development. The water main is shown to have two separate extensions, one extension connected perpendicularly to the existing water main parallel to the southern site boundary, the other connected to the existing water main south-west of the development.

The existing water main was serving the previous development which is to be demolished for the following reasons:

1. Existing water main layout is not compliant with Irish Water's code of practice or the structural layout of the proposed development (i.e. existing water main is currently located under the proposed structures).
2. Existing water main does not have sufficient capacity to service the new proposed development.

Furthermore, another existing water main is present in the northern part of the development. This water main is 1200mm in diameter and traverses the site, entering from middle-north and exiting in the north-east corner of the development. Within the

confirmation of feasibility letter, Irish Water have stated the following instructions with regards to the existing 1200mm diameter water main.

*"Irish Water records indicate the presence of an Irish Water asset on the Site which will have to be diverted as part of the Development. It will not be permitted to build over any Irish Water infrastructure. The layout of the development must ensure that this pipe is protected, and adequate separation distances are provided between Irish Water infrastructure and any structures on site. Alternatively, you may enter into a diversion agreement with Irish Water and divert the pipe to accommodate your development. If you wish to proceed with this option, please contact Irish Water at Diversions@water.ie and submit detailed design drawings before submitting your planning application. It will be necessary to provide a wayleave over this pipe to the benefit of Irish Water and ensure that it is accessible for maintenance."*

It is intended to retain the existing water main using the method outlined within Irish Water's instructions above, rather than diverting & removing it from the premises. To achieve this a 7.5m, unobstructed wayleave either side of the pipe will be provided, to ensure that the existing water main is accessible for any potential future maintenance. For details, refer to drawing "20189-LDE-07-00-DR-SC-1C01a".

### 5.3 Proposed Water main

The water main infrastructure for the proposed development has been designed and is to be constructed in accordance to Irish Water's "Code of Practice for Water Infrastructure (Document IW-CDS-5020-01)", "Water Infrastructure Standard Details (Document IW-CDS-5020-03)" and the Building Regulation requirements.

To service the development, it is proposed to provide a 200mm MDPE (medium density polyethylene) type PE-80 water main. The water main will be connected to the plant rooms where the water distribution system is located, distributing the water to the residing residents of the apartment complexes. To comply with guidance specification for fire hydrants, offline & on-line fire hydrants will be provided along the water main

to provide full coverage of the proposed development in the event of a fire. The water main will exit the proposed development in the north-east corner and connect to the newly laid 200mm diameter water main as per the conditions set out in Irish Water's confirmation of feasibility letter. Prior to exiting the site, a boundary box and telemetry kiosk will be installed to measure the water usage for the development.

Pre-connection enquiry form (Reference No. CDS20007999) was submitted on the 08th of December, 2020 to new connections department within Irish Water to determine whether a connection for the proposed development is feasible and could be established. Confirmation of feasibility from Irish Water has been received on the 18th of March, 2021 stating that a water main connection for the proposed development is feasible, subject to upgrade works.

The confirmation of feasibility letter, with regards to the feasibility of a water main connection states the following:

*"In order to accommodate the proposed connection at the Premises, upgrade works are required to increase the capacity of the Irish Water network. A new main of 200mm ID is required to be laid for approximately 280m in parallel with the existing 6" uPVC in Greenhills Road, and connected to: the connection main, the existing 4" uPVC and the existing 6" uPVC. This should include closed existing valve upstream of the 6" uPVC*

*The connection point for the proposed development should be made to the newly laid 200mm DI main."*

In order to comply with the condition above and achieve a feasible water main connection for the development, a new 200mm ID ductile iron water main is to be laid for approximately 280 meters. The new water main is to be parallel to the existing 150mm uPVC water main located on Greenhills road. The newly laid water main will be used as a connection point for the proposed development. Confirmation of feasibility letter from Irish Water enclosed in Appendix B within this document.

Update - Irish Water (24/02/2022)

Statement of Design Acceptance was received from Irish Water on the 24th of February, 2022. The letter of design acceptance states that Irish Water are satisfied with the drainage infrastructure scheme for the proposed development and have no objections.

One recommendation was made by Irish Water with regards to the water main which reads as follows:

- "*It is recommended a minimum clearance of 5m of an existing or proposed structure for watermain between 200mm and 600mm in diameter*"

The comment made was adhered to. The proposed 200mm water main has a minimum seperational distance from the proposed structure of 5 meters throughout the development. Statement of Design Acceptance letter from Irish Water enclosed in Appendix I within this document.

# 6.0 Flood Risk

As per the Flood Risk Assessment, report ref. (20189-LDE-ZZ-ZZ-RP-0002), the site is located in a flood zone type C and therefore has a low probability of experiencing a flood event. It is therefore our opinion that the risk of flooding at this site and the risk of flooding due to the development of this site is minimal and within acceptable limits.

# 7.0 Roads

## 7.1 Existing Road Network

The existing site has three access points, all located and accessible through the industrial access road along the full extent of the southern boundary of the site. The site is vacant and the existing access roads within the site comprise of concrete or tarmacadam surface courses, both of which are in poor condition and overgrown with vegetation.

## 7.2 Proposed Road Network

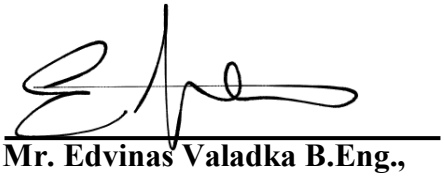
It is proposed to provide a 6m wide vehicular access road to service the development. The primary point of access will be provided in the north-east corner of the proposed development, linking the internal access road into the existing Greenhills Road. Additionally, the development will have secondary access points used for emergency scenarios, a total of two emergency access points located along the southern site boundary of the proposed development.

Following the S247 pre-planning consultation meeting, South Dublin County Council (SDCC) have expressed their concern regarding the potential level difference of the proposed north-east access point servicing the development and the future Greenhills Junction/Calmount Road extension.

To comply with the levels for the future Calmount Road extension, we have since liaised with SDCC and confirmed that the level at which we are proposing to connect

into the existing Greenhills Road is compliant with the future Calmount Road extension.

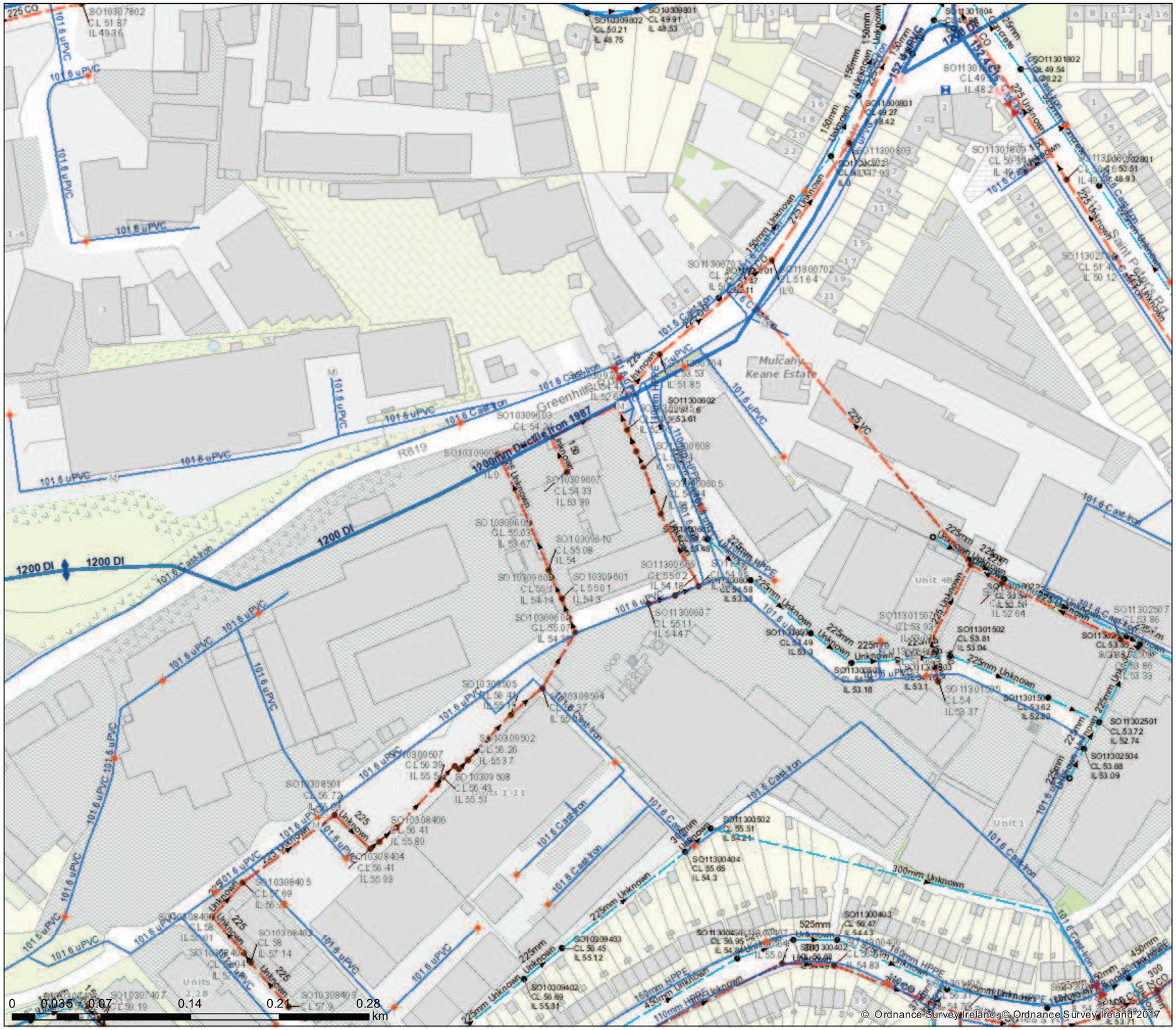
The development will introduce a total of five GoCar cars and will be used as a sharing service. By allowing multiple people to use the same vehicle at different times it promotes a more environmentally friendly driving system. It has been proven that most car share users tend to use the sharing service only when necessary and rather walk, cycle or use the public transport more often than car owners. Refer to Appendix H in which a Letter of Intent from GoCar car sharing company can be found, acknowledging that five vehicles will be provided upon completion of the development.



**Mr. Edvinas Valadka B.Eng.,** **Date: 8th March. 2022**
Engineer,
For Lohan & Donnelly Consulting Engineers.

# Appendix A – Dublin City Council Drainage Records

# Irish Water Web Map




UISCE ÉIREANN : IRISH WATER

Print Date: 16/12/2020

Printed by:Irish Water



**Water Distribution Network**
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

**Reservoir**
- Potable
- Raw Water

**Water Distribution Mains**
- Irish Water
- Private

**Trunk Water Mains**
- Irish Water
- Private

**Water Lateral Lines**
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

**Water Fittings**
- Cap
- Reducer
- Tap
- Other Fittings

**Sewer Foul Combined Network**
- Waste Water Treatment Plant
- Waste Water Pump station

**Sewer Mains Irish Water**
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

**Sewer Mains Private**
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

**Sewer Manholes**
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

**Discharge Type**
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

**Cleanout Type**
- Rodding Eye
- Flushing Structure
- Other; Unknown

**Sewer Inlets**
- Catchpit
- Gully
- Standard
- Other; Unknown

**Sewer Fittings**
- Vent/Col
- Other; Unknown

**Storm Water Network**

**Surface Water Mains**
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

**Inlet Type**
- Gully
- Standard
- Other; Unknown

**Storm Manholes**
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

**Storm Culverts**
- Storm Clean Outs
- Stormwater Chambers

**Discharge Type**
- Outfall
- Overflow
- Soakaway
- Other; Unknown

**Gas Networks Ireland**
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

**ESB Networks**

**ESB HV Lines**
- HV Underground
- HV Overhead
- HV Abandoned

**ESB MVLV Lines**
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

**Non Service Categories**
- Proposed
- Under Construction
- Out of Service
- Decommissioned

**Water Non Service Assets**
- Water Point Feature
- Water Pipe
- Water Structure

**Waste Non Service Assets**
- Waste Point Feature
- Sewer
- Waste Structure

# Appendix B – Confirmation of Feasibility (Irish Water)

Edvinas Valadka

13 Gardiner Place
Mountjoy Square
Dublin 1
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**

18 March 2021

**Re: CDS20007999 pre-connection enquiry - Subject to contract | Contract denied**

**Connection for Multi/Mixed Use Development of 780 unit(s) at Greenhills Road, Walkinstown, Dublin 12, Co.Dublin**

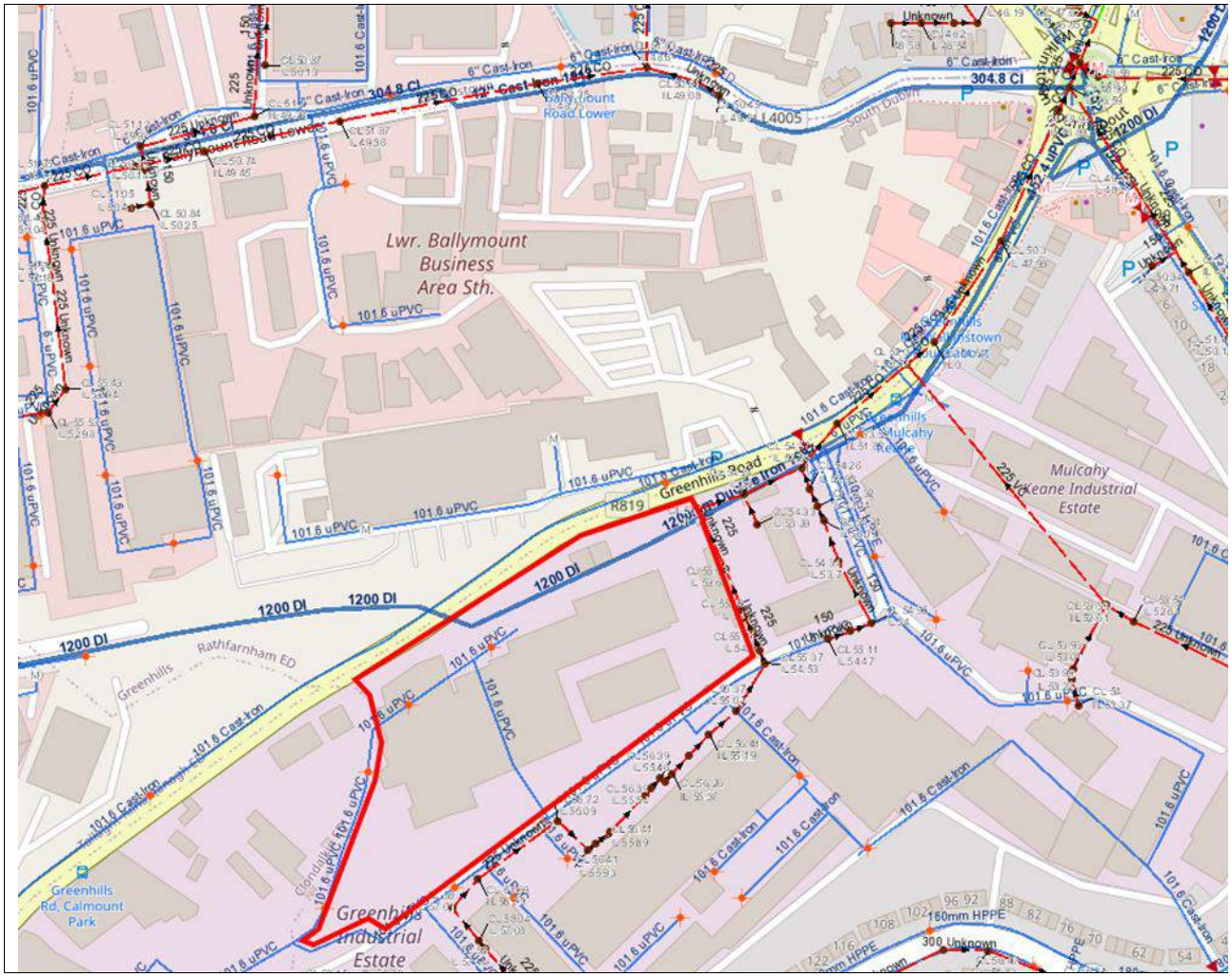
Dear Sir/Madam,

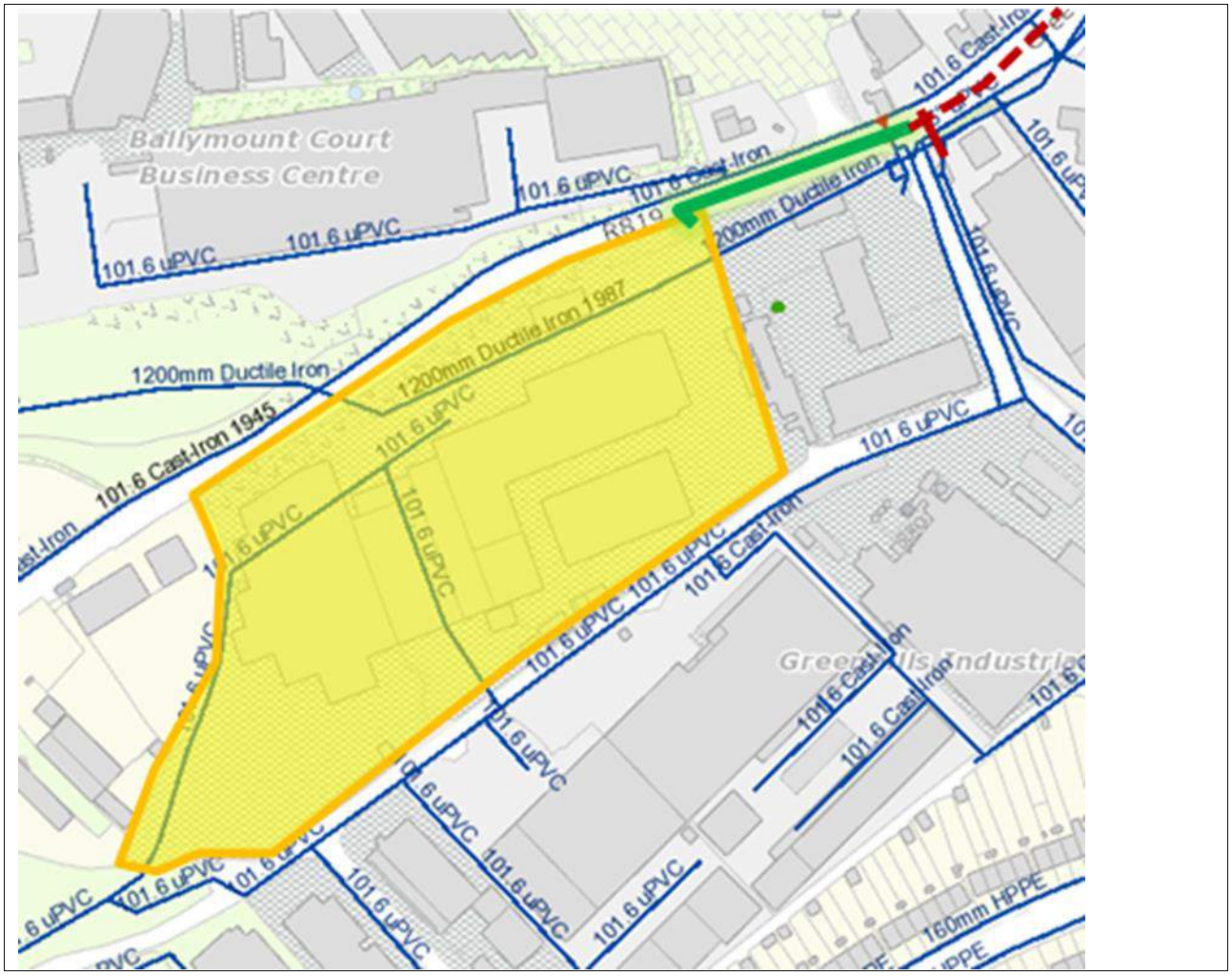
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Greenhills Road, Walkinstown, Dublin 12, Co.Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently 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**<br>**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 Subject to upgrades |
| **SITE SPECIFIC COMMENTS** | |
| Water Connection | In order to accommodate the proposed connection at the Premises, upgrade works are required to increase the capacity of the Irish Water network. A new main of 200mm ID is required to be laid for approximately 280m in parallel with the existing 6" uPVC in Greenhills Road, and connected to: the connection main, the existing 4" uPVC and the existing 6" uPVC .This should include closed existing valve upstream of the 6" uPVC.<br>The connection point for the proposed development should be made to the newly laid 200mm DI main.<br>Irish Water currently does not have any plans to extend or commence upgrade works to its network in this area. |

| | |
|---|---|
| | Should you wish to progress with the connection, the extension works fee will be calculated and be a part of Irish Water connection offer for the Development.<br><br>Irish Water records indicate the presence of an Irish Water asset on the Site which will have to be diverted as part of the Development. It will not be permitted to build over any Irish Water infrastructure. The layout of the development must ensure that this pipe is protected, and adequate separation distances are provided between Irish Water infrastructure and any structures on site. Alternatively, you may enter into a diversion agreement with Irish Water and divert the pipe to accommodate your development. If you wish to proceed with this option, please contact Irish Water at Diversions@water.ie and submit detailed design drawings before submitting your planning application.<br><br>It will be necessary to provide a wayleave over this pipe to the benefit of Irish Water and ensure that it is accessible for maintenance.<br><br>It is required to provide a storage for the average day peak week demand rate of the commercial section for 24-hour period. The supply will have a re-fill time of 12 hours.<br><br>Please note that the connection main should have a bulk meter installed along it; this meter will be linked with telemetry. |
| Wastewater Connection | It will be necessary to carry out further detailed study and investigations to confirm the available capacity and to determine the full extent of any upgrades which may be required to be completed to Irish Water Infrastructure, prior to agreeing to the proposed connection. Should you wish to have such studies and investigations progressed by Irish Water, you will be required to enter into Project Works Service Agreement. |
| 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:**


Lwr. Ballymount Business Area Sth.
Greenhills Industrial Estate
Mulcahy Keane Industrial Estate
Greenhills Road
R819
Ballymount Road Lower
Rathfarnham ED
Greenhills
Greenhills Rd, Calmount Park
1200 DI
304.8 CI
225 CO
101.6 uPVC
101.6 Cast-iron
6" Cast-iron
160mm HPPE
300 Unknown




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.

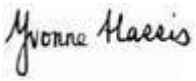
**General Notes:**

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 Lara Nagle from the design team on email lanagle@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



**Yvonne Harris**

**Head of Customer Operations**

# Appendix C – Foul Water Calculations

LOHAN & DONNELLY
Consulting Civil & Structural Engineers
13 Gardiner Place, Mountjoy Square, Dublin 1

| | | | | | |
|---|---|---|---|---|---|
| Project: | BTR Residential Development, at Greenhills Road, Walkinstown, Dublin 12 | | | Project No.: | 20189 |
| Element: | Foul Water Drainage | | | Calc'd: | E.V |
| Checked: | G.P | Date: | 08/03/22 | Page: | 1 |

**Outfall Manhole: FW01** **To Existing Manhole: EX.FW01**

Assume: 300 dia. pipe @ 1: 225
flow capacity: 69.80 l/sec.)

Length of Run: 160 m.

**Residential** (Appartments)

| | | |
|---|---|---|
| Occupancy: | 1710 | persons. |
| Daily Flow (DWF): | 282150 | l/day. |
| 6 x DWF: | 1692900 | l/day. |
| Flow per second: DWF | 3.265625 | l/sec. |
| Flow per Second: 6 DWF | 19.594 | l/sec. |

**Commercial** (1326.47m2)

| | | |
|---|---|---|
| Occupancy: | 60 | persons. |
| Daily Flow (DWF): | 3300 | l/day. |
| 6 x DWF: | 19800 | l/day. |
| Flow per second: DWF | 0.0381944 | l/sec. |
| Flow per Second: 6 DWF | 0.229 | l/sec. |

**Residential Amenity** (1359.6m2)

| | | |
|---|---|---|
| Occupancy: | 695 | persons. |
| Daily Flow (DWF): | 30580 | l/day. |
| 6 x DWF: | 183480 | l/day. |
| Flow per second: DWF | 0.3539352 | l/sec. |
| Flow per Second: 6 DWF | 2.124 | l/sec. |

**Creche**

| | | |
|---|---|---|
| Occupancy: | 74 | persons. |
| Daily Flow (DWF): | 4070 | l/day. |
| 6 x DWF: | 24420 | l/day. |
| Flow per second: DWF | 0.0471065 | l/sec. |
| Flow per Second: 6 DWF | 0.283 | l/sec. |

**Total**

| | | |
|---|---|---|
| Flow per Second: DWF | 3.7048611 | l/sec. |
| Flow per Second: 6 DWF | 22.229 | l/sec. |

**Therefore** **300 Dia. Pipe @ 1:225** **O.K.**

**Note:** 10% extra for infiltration allowance to be included, as per section 3.6.3 and section 2.2.4 of Appendix B within Irish Water "Code of practice for wastewater infrastructure (IW-CDS-5030-03)" document

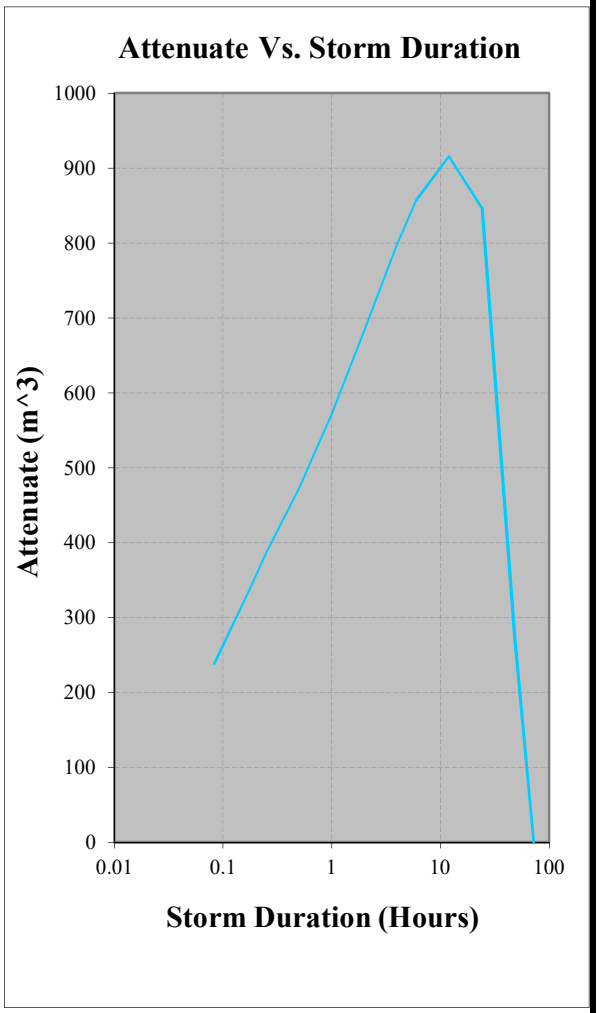
# Appendix D – Attenuation Calculations

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

| | | | |
|---|---|---|---|
| Blue Roof Attenuation | Project: BTR Residential Development, at Greenhills Road, Walkinstown, Dublin 12 | Job No: | 20189 |
| | | Page No: | 1 |
| Page: 1 | Date: 08/03/2022 Calc'd by: E.V | Checked by: | G.P |

Hard Area: 0 $m^2$ I. Factor: 0.80
Permeable: 0 $m^2$ I. Factor: 0.60
Grassed: 0 $m^2$ I. Factor: 0.15
Blue Roof 5058 $m^2$ I. Factor: 0.6
Green Podium: 0 $m^2$ I. Factor: 0.6
Tree Pits: 0 $m^2$ I. Factor: 0.6
Equivalent Impermeable Area: 3035 $m^2$
Attenuated Flow Rate: 2 l/s

| Storm Duration (Hours) | Rainfall (mm) | Total Surface Water ($m^3$) | Allowable Discharge ($m^3$) | Attenuate ($m^3$) |
|---|---|---|---|---|
| 0.083 | 17.00 | 51.59 | 0.5976 | 50.99 |
| 0.166 | 23.70 | 71.92 | 1.1952 | 70.73 |
| 0.25 | 27.90 | 84.67 | 1.8 | 82.87 |
| 0.50 | 34.50 | 104.70 | 3.6 | 101.10 |
| 1.00 | 42.60 | 129.28 | 7.2 | 122.08 |
| 2.00 | 52.70 | 159.93 | 14.4 | 145.53 |
| 3.00 | 59.70 | 181.18 | 21.6 | 159.58 |
| 4.00 | 65.20 | 197.87 | 28.8 | 169.07 |
| 6.00 | 73.80 | 223.97 | 43.2 | 180.77 |
| 12.00 | 91.20 | 276.77 | 86.4 | 190.37 |
| 24.00 | 112.80 | 342.33 | 172.8 | 169.53 |
| 48.00 | 125.30 | 380.26 | 345.6 | 34.66 |
| 72.00 | 135.90 | 412.43 | 518.4 | 0 |




Maximum Volume of Attenuate: 190.37 $m^3$ Climate Change/Urban Expansion: 1.2 Required Attenuation Volume = 228.45 $m^3$

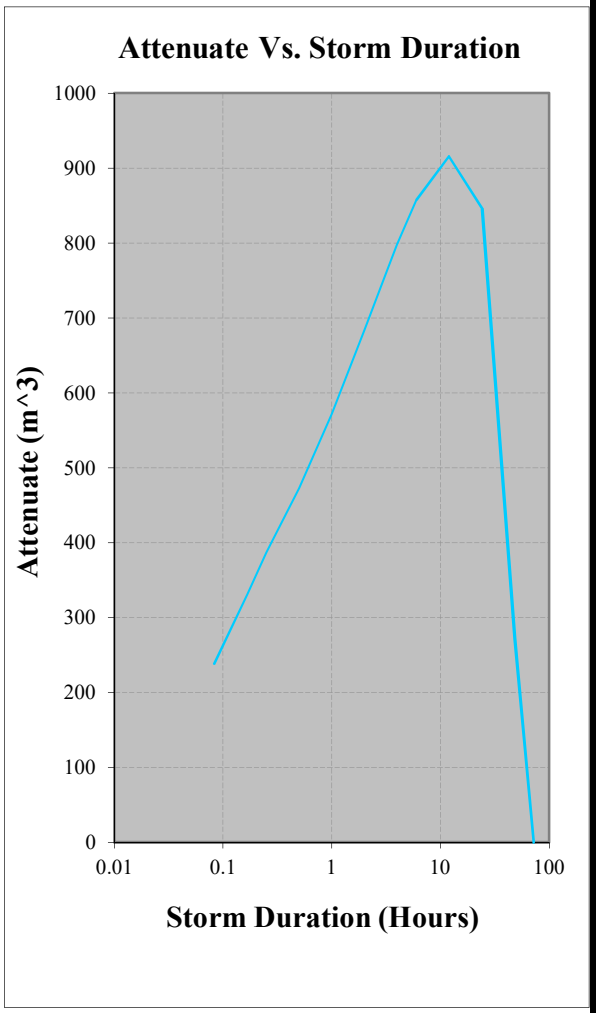
**Note: This spreadsheet calculates the Volume of Attenuate based on a Return Period of: 100 years.**

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

| | | | |
|---|---|---|---|
| Stormtech Attenuation | Project: BTR Residential Development, at Greenhills Road, Walkinstown, Dublin 12 | Job No: | 20189 |
| | | Page No: | 1 |
| Page: 3 | Date: 08/03/2022 Calc'd by: E.V | Checked by: | G.P |

Hard Area: ### $m^2$ I. Factor: 0.80 Tree Pits: 0 $m^2$
Permeable: 6526 I. Factor: 0.60 I. Factor: 0.6
Grassed: 3621 $m^2$ I. Factor: 0.15
Blue Roof 0 $m^2$ I. Factor: 0.6
Green Podium: 8500 $m^2$ I. Factor: 0.6
Equivalent Impermeable Area: 11984 $m^2$
Attenuated Flow Rate: 8.02 l/s

| Storm Duration (Hours) | Rainfall (mm) | Total Surface Water ($m^3$) | Allowable Discharge ($m^3$) | Attenuate ($m^3$) |
|---|---|---|---|---|
| 0.083 | 17.00 | 203.73 | 2.396771429 | 201.34 |
| 0.166 | 23.70 | 284.03 | 4.793542858 | 279.24 |
| 0.25 | 27.90 | 334.36 | 7.219191051 | 327.14 |
| 0.50 | 34.50 | 413.46 | 14.4383821 | 399.02 |
| 1.00 | 42.60 | 510.53 | 28.8767642 | 481.66 |
| 2.00 | 52.70 | 631.58 | 57.7535284 | 573.82 |
| 3.00 | 59.70 | 715.47 | 86.63029261 | 628.84 |
| 4.00 | 65.20 | 781.38 | 115.5070568 | 665.87 |
| 6.00 | 73.80 | 884.45 | 173.2605852 | 711.18 |
| 12.00 | 91.20 | 1092.97 | 346.5211704 | 746.45 |
| 24.00 | 112.80 | 1351.83 | 693.0423409 | 658.79 |
| 48.00 | 125.30 | 1501.64 | 1386.084682 | 115.55 |
| 72.00 | 135.90 | 1628.67 | 2079.127023 | 0 |




Maximum Volume of Attenuate: 746.45 $m^3$ Climate Change/Urban Expansion: 1.2 Required Attenuation Volume = 895.74 $m^3$

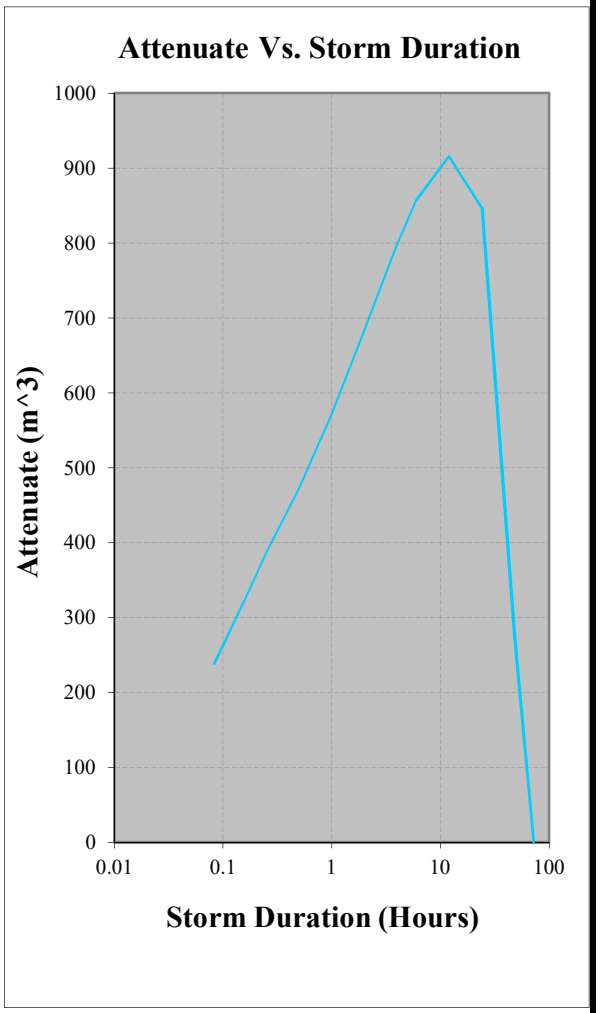
**Note: This spreadsheet calculates the Volume of Attenuate based on a Return Period of: 100 years.**

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

| | | | |
|---|---|---|---|
| Tree Pit Attenuation | Project: BTR Residential Development, at Greenhills Road, Walkinstown, Dublin 12 | Job No: | 20189 |
| | | Page No: | 1 |
| Page: 2 | Date: 08/03/2022 Calc'd by: E.V | Checked by: | G.P |

Hard Area: 0 $m^2$ I. Factor: 0.80
Permeable: 1035 $m^2$ I. Factor: 0.60
Grassed: 150 $m^2$ I. Factor: 0.15
Blue Roof 0 $m^2$ I. Factor: 0.6
Green Podium: 0 $m^2$ I. Factor: 0.6
Tree Pits: 218 $m^2$ I. Factor: 0.6
Equivalent Impermeable Area: 774 $m^2$
Attenuated Flow Rate: 2 l/s

| Storm Duration (Hours) | Rainfall (mm) | Total Surface Water ($m^3$) | Allowable Discharge ($m^3$) | Attenuate ($m^3$) |
|---|---|---|---|---|
| 0.083 | 17.00 | 13.16 | 0.5976 | 12.56 |
| 0.166 | 23.70 | 18.34 | 1.1952 | 17.15 |
| 0.25 | 27.90 | 21.59 | 1.8 | 19.79 |
| 0.50 | 34.50 | 26.70 | 3.6 | 23.10 |
| 1.00 | 42.60 | 32.97 | 7.2 | 25.77 |
| 2.00 | 52.70 | 40.79 | 14.4 | 26.39 |
| 3.00 | 59.70 | 46.21 | 21.6 | 24.61 |
| 4.00 | 65.20 | 50.46 | 28.8 | 21.66 |
| 6.00 | 73.80 | 57.12 | 43.2 | 13.92 |
| 12.00 | 91.20 | 70.59 | 86.4 | 0 |
| 24.00 | 112.80 | 87.31 | 172.8 | 0 |
| 48.00 | 125.30 | 96.98 | 345.6 | 0 |
| 72.00 | 135.90 | 105.19 | 518.4 | 0 |




Maximum Volume of Attenuate: 26.39 $m^3$ Climate Change/Urban Expansion: 1.2 Required Attenuation Volume = 31.668 $m^3$

**Note: This spreadsheet calculates the Volume of Attenuate based on a Return Period of: 100 years.**

# Appendix E – Q-Bar Calculations

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 | BTR Residential Development, at Greenhills Road, Walkinstown, Dublin 12 | | |
| Element | Q-Bar Calculation | | |
| By: E.V. | Date: 08/03/2022 | Proj. No.: 20189 | |
| Chk' d: G.P | Date: 08/03/2022 | Sht. No.: 1 | of: 1 |

| Ref. | Calculations | Output |
|---|---|---|

The site is greater than 1 hectare and less than 50 hectares, linear interpolation will therefore be used to determine the surface water discharge rate (Qbar).

**Qbar for for 50 hectare site:**

| | | |
|---|---|---|
| Area (sq km) | 0.5 | |
| SAAR (mm) | 700 | Typical for Dublin |
| Soil value | 0.37 | Based on site specific ground investigation report |
| 100 year return growth curve for Dublin Rivers | 2.6 | |
| QBARrural | 143 2/3 | l/s |

**Qbar for for 2.7922 hectare site (Proposed Development):**

| | | |
|---|---|---|
| Area (sq km) | 0.027922 | |
| SAAR (mm) | 700 | Typical for Dublin |
| Soil value | 0.37 | Based on site specific ground investigation report |
| 100 year return growth curve for Dublin Rivers | 2.6 | |
| QBARrural | 8.0213234 | l/s |

# Appendix F – Run-Off Calculations

LOHAN & DONNELLY
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W: www.lohan-donnelly.com E: info@lohan-donnelly.com

Project: BTR Residential Development, at Greenhills Road, Walkinstown, Dublin 12

Job No: 20189

Page No: 2

Date: 08/03/2022 Calc'd by: E.V Checked by: GP

| Remarks | From | To | Area ($m^2$) | Previous Area ($m^2$) | Total Area ($m^2$) | Length of Pipe (m) | Gradient | Size (mm) | Velocity (m/s) | Capacity (l/s) | Time of Entry (min) | Time of Flow (min) | Time of Concentration (min) | Rainfall Intensity (mm/hr) | Total Run-Off (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SW43 | SW45 | 80 | 0 | 80 | 9.7 | 1: 100 | 225 | 1.22 | 48.6 | 4 | 0.13 | 4.1 | 68.60 | 1.52 |
| | SW45 | SW44 | 410 | 80 | 490 | 28.9 | 1: 100 | 225 | 1.22 | 48.6 | 4 | 0.39 | 4.4 | 66.80 | 9.09 |
| | SW44 | SW20 | 130 | 490 | 620 | 10.5 | 1: 225 | 225 | 0.82 | 32.4 | 4 | 0.21 | 4.2 | 68.10 | 11.73 |
| | SW20 | SW19 | 585 | 620 | 1205 | 90 | 1: 100 | 225 | 1.22 | 48.6 | 4 | 1.23 | 5.2 | 62.50 | 20.92 |
| | SW19 | SW18 | 960 | 1205 | 2165 | 87 | 1: 100 | 225 | 1.22 | 48.6 | 4 | 1.19 | 5.2 | 62.50 | 37.59 |
| | SW49 | SW48 | 115 | 0 | 115 | 11.1 | 1: 50 | 225 | 1.73 | 68.8 | 4 | 0.11 | 4.1 | 68.60 | 2.19 |
| | SW48 | SW47 | 180 | 115 | 295 | 35.5 | 1: 50 | 225 | 1.73 | 68.8 | 4 | 0.34 | 4.3 | 67.30 | 5.51 |
| | SW47 | SW46 | 400 | 295 | 695 | 36 | 1: 30 | 225 | 2.23 | 88.8 | 4 | 0.27 | 4.3 | 67.30 | 12.99 |
| | SW46 | SW09 | 580 | 695 | 1275 | 18.7 | 1: 225 | 225 | 0.82 | 32.4 | 4 | 0.38 | 4.4 | 66.80 | 23.66 |
| | SW09 | SW10 | 540 | 1275 | 1815 | 41.2 | 1: 225 | 300 | 0.99 | 69.8 | 4 | 0.70 | 4.7 | 65.00 | 32.77 |
| | SW14 | SW13 | 270 | 0 | 270 | 28 | 1: 100 | 225 | 1.22 | 48.6 | 4 | 0.38 | 4.4 | 66.80 | 5.01 |
| | SW13 | SW12 | 342 | 270 | 612 | 41.5 | 1: 225 | 225 | 0.82 | 32.4 | 4 | 0.85 | 4.8 | 64.50 | 10.97 |
| | SW12 | SW10 | 750 | 612 | 1362 | 10.7 | 1: 225 | 225 | 0.82 | 32.4 | 4 | 0.22 | 4.2 | 68.10 | 25.76 |
| | SW10 | SW11 | 357 | 3177 | 3534 | 4.6 | 1: 50 | 225 | 1.73 | 68.8 | 4 | 0.04 | 4.0 | 69.30 | 68.03 |
| | SW11 | Att. Tank | 0 | 3534 | 3534 | | | | | | 4 | | | | |
| | Att. Tank | SW15 | 0 | 3534 | 3534 | | | | | | 4 | | | | |
| | SW15 | SW16 | 0 | 3534 | 3534 | 15.4 | 1: 225 | 300 | 0.99 | 69.8 | 4 | 0.26 | 4.3 | 67.30 | 66.07 |
| | SW17 | SW16 | 360 | 0 | 360 | 29.2 | 1: 225 | 225 | 0.82 | 32.4 | 4 | 0.60 | 4.6 | 65.50 | 6.55 |
| | SW16 | SW18 | 355 | 3894 | 4249 | 18 | 1: 225 | 450 | 1.29 | 205.9 | 4 | 0.23 | 4.2 | 68.10 | 80.38 |
| | SW18 | SW31 | 345 | 6414 | 6759 | 6.9 | 1: 225 | 450 | 1.29 | 205.9 | 4 | 0.09 | 4.1 | 68.60 | 128.80 |
| | SW31 | SW03 | 560 | 6759 | 7319 | 55 | 1: 225 | 450 | 1.29 | 205.9 | 4 | 0.71 | 4.7 | 65.00 | 132.15 |
| | SW08 | SW07 | 180 | 0 | 180 | 30.6 | 1: 225 | 225 | 0.82 | 32.4 | 4 | 0.63 | 4.6 | 65.50 | 3.28 |
| | SW07 | SW06 | 520 | 180 | 700 | 44.8 | 1: 225 | 225 | 0.82 | 32.4 | 4 | 0.92 | 4.9 | 64.00 | 12.44 |
| | SW06 | SW05 | 840 | 700 | 1540 | 41 | 1: 225 | 225 | 0.82 | 32.4 | 4 | 0.84 | 4.8 | 64.50 | 27.59 |
| | SW05 | SW04 | 565 | 1540 | 2105 | 21.3 | 1: 225 | 300 | 0.99 | 69.8 | 4 | 0.36 | 4.4 | 66.80 | 39.06 |
| | SW04 | SW03 | 115 | 2105 | 2220 | 12.5 | 1: 225 | 300 | 0.99 | 69.8 | 4 | 0.21 | 4.2 | 68.10 | 42.00 |
| | SW03 | SW02 | 315 | 9539 | 9854 | 6.5 | 1: 225 | 450 | 1.29 | 205.9 | 4 | 0.08 | 4.1 | 68.60 | 187.77 |
| Flow Limited to 8.021/s | SW02 | SW01 | 40 | 9854 | 9894 | | | | | | 4 | | | | 8.021 |
| Flow Limited to 8.021/s | SW01 | EX. SEWER | 0 | 9894 | 9894 | | | | | | 4 | | | | 8.021 |

**Note: This spreadsheet calculates the flow in pipes based on the Modified Rational Method and a Return Period of: 2 years.**

# Appendix G – Ground Investigations Report

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
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# Ground Investigations Ireland

# Greenhills Road

# Lohan & Donnelly

# Ground Investigation Report

# February 2021

## 1.0 Preamble

On the instructions of Lohan & Donnelly Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd. in January 2021 at the site of the proposed residential development on the Greenhills Road, Dublin 12.

## 2.0 Overview

### 2.1. Background

It is proposed to construct new residential development with associated services, access roads and car parking at the proposed site. The site was historically used as a gravel quarry, with a large retaining wall structure marking the southwestern boundary of the site. The site is currently occupied by several derelict industrial/commercial buildings and is situated near the Walkinstown Roundabout, on the southern side of Greenhills Road (R918), Dublin 12. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

### 2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 14 No. Window Sample Boreholes to recover soil samples
- Carry out 10 No. Cable Percussion boreholes to a maximum depth of 4.50m BGL
- Installation of 3 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

## 3.0 Subsurface Exploration

### 3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

### 3.2. Window Sampling

The window sampling was carried out at the locations shown in Figure 2 in Appendix 1 using a Tecopsa SPT Tec 10 percussion drilling rig. The window sampling consists of a 1m long steel tube with a cutting edge and an internal plastic liner which is mechanically driven into the ground utilising a 50kg weight falling a height of 500mm. Upon completion of the 1m sample, the tube is withdrawn and the plastic liner removed and sealed for logging and sub sampling by a Geotechnical Engineer/Engineering Geologist. The tube is replaced in the borehole and a subsequent 1m sample can be recovered. Occasionally outer casing or a reduced diameter tube is utilised to enable the window sample to progress in difficult drilling conditions. Geotechnical or environmental soil samples can be recovered from each of the liners following logging. The window sample records are provided in Appendix 2 of this Report.

### 3.3. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.
The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.
Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60º cone. The Standard Penetration Test number referred to as the ‘N’ value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 3 of this Report.

### 3.4. Surveying

The exploratory hole locations have been recorded using a Trimble R10 GNSS System which records the coordinates and elevation of the locations to ITM, as required by the project specification. In areas where the Trimble R10 GNSS System was unable to record the data due to building interference, observation

methods were used to estimate the exploratory hole location. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

### 3.5. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Environmental & Chemical testing as required by the specification, including the Rilta Suite, pH and sulphate testing was carried out by Element Materials Technology Laboratory in the UK. The Rilta suite testing includes both Solid Waste and Leachate Waste Acceptance Criteria.
Geotechnical testing consisting of moisture content, Atterberg limits and, Particle Size Distribution (PSD), tests were carried out in NMTL's Geotechnical Laboratory in Carlow.
The results of the completed laboratory are included in Appendix 4 of this Report.

## 4.0 Ground Conditions

### 4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were variable across the site but generally comprised;

- Surfacing
- Made Ground
- Cohesive Deposits
- Granular Deposits

**SURFACING:** Tarmacadam or Concrete surfacing was present in all exploratory holes and was present to a maximum depth of 0.30m BGL.

**MADE GROUND:** Made Ground and suspected Made Ground deposits were encountered beneath the surfacing and were present to a depth of between 0.40m and 2.40m BGL, with the full extent of these deposits not determined at BH02, BH02A, BH03, WS02, WS02A, WS02B, WS08, and WS08A. These deposits varied across the site but were generally were described as either a *brown clayey sandy subangular to subrounded fine to coarse Gravel* or a *greyish brown sandy gravelly Clay,* and contained *rare fragments of red brick.*

**COHESIVE DEPOSITS:** Cohesive deposits were encountered beneath the made ground and/or surfacing at BH03A, BH04, BH05, BH06, WS03, WS04, WS05, WS09, WS10, and WS11. These deposits were described typically as *dark brown/grey slightly sandy gravelly CLAY with occasional cobbles.* The

secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. These deposits had occasional, some or many cobble and boulder content were noted on the exploratory hole logs.

**GRANULAR DEPOSITS:** Granular deposits were encountered beneath the made ground and/or cohesive deposits at BH01, BH04, BH05, BH06, BH07, BH08, WS01, WS06, and WS07. These deposits were generally described as *grey/brown clayey subangular to subrounded fine to coarse GRAVEL with occasional cobbl*es and *brown clayey gravelly fine to coarse SAND*. The secondary sand/gravel and silt/clay constituents varied across the site and with depth while occasional, some or many cobble and boulder content also present where noted on the exploratory hole logs.
Based on the SPT N values the deposits are typically medium dense and become dense with depth.

### 4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH04, BH06 and BH08 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 5 of this Report.

### 4.3. Laboratory Testing

#### 4.3.1. Geotechnical Laboratory Testing

Will be included in the final report.

#### 4.3.2. Chemical Laboratory Testing

Will be included in the final report.

#### 4.3.3. Environmental Laboratory Testing

A number of samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous*. The suite also allows for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.). The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.
The suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are total

organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

As part of the suite a leachate is generated from the solid sample, which is analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS).

While the laboratory report provides a comparison with the waste acceptance criteria limits it does not provide a waste classification of the material sampled nor does it comment on any potentially hazardous properties of the materials tested. The possibility for contamination, not revealed by the testing undertaken should be borne in mind particularly where Made Ground deposits are present or the previous site use or location indicate a risk of environmental variation. The environmental assessment report is included under the cover of a sperate report by Ground Investigations Ireland.

The results of the completed laboratory are included in Appendix 4 of this Report.

## 5.0 Recommendations & Conclusions

### 5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

### 5.2. Foundations

The allowable bearing capacities are outlined in Table 1 below and are recommended for conventional strip or pad foundations to permit the foundation assessment. The possibility for variation in the depth of the made ground in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete. Where granular deposits and cohesive deposits are encountered at foundation level, we would recommend that all the foundations of the unit in question be lowered to the same stratum to avoid differential settlement. Where shallow refusal is noted, rotary core drilling is recommended to confirm the type and condition of the stratum below the refusal depth.

**Table 1.**

| Allowable Bearing Capacities (ABC) – Borehole Locations | | | | | | | |
|---|---|---|---|---|---|---|---|
| Shallowest Practical Depth | | | | Depth to 250 kN/m$^2$ | | | |
| Probe No. | ABC kN/m2 | Depth m BGL | Comment | Probe No. | ABC kN/m2 | Depth m BGL | Comment |
| BH01 | 100 | 1.20 | Granular | BH01 | 250 | 2.00 | Granular |
| BH02 | - | - | Shallow Refusal | BH02 | - | - | |
| BH02A | - | - | Shallow Refusal | BH02A | - | - | |
| BH03 | - | - | Shallow Refusal | BH03 | - | - | |
| BH03A | 125 | 1.20 | Shallow Refusal | BH03A | - | - | |
| BH04 | 125 | 2.20 | Cohesive | BH04 | 250 | 3.00 | Granular |
| BH05 | 125 | 2.00 | Cohesive | BH05 | 250 | 3.00 | Granular |
| BH06 | 125 | 2.00 | Cohesive | BH06 | 250 | 3.00 | Granular |
| BH07 | 100 | 1.50 | Granular | BH07 | 250 | 2.00 | Granular |
| BH08 | 100 | 1.20 | Granular | BH08 | 250 | 3.00 | Cohesive |

A ground bearing floor slab is recommended to be based on the stiff cohesive deposits or medium dense granular deposits with an appropriate depth of compacted hardcore specified by the consulting engineer and in accordance with the limits and guidelines in SR21:2014+A1:2016 and/or NRA SRW CL808 Type E granular stone fill. Where the depth of Made Ground/Soft deposits exceeds 0.90m then suspended floor slabs should be considered.

Due to the high loading anticipated, piled foundations may be more economically advantageous for the proposed building. The type, size and depth of the pile foundations should be confirmed by a specialist piling contractor based on the loading from the proposed building. The floor slab is recommended be suspended and also supported on the building piles.

### 5.3. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

Excavations in the Made Ground or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.

Any excavations which penetrate the granular deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs in the Appendices of this Report.

Any waste material to be removed off site should be disposed of to a suitably licenced landfill.

The environmental testing completed during the ground investigation is reported under the cover of a separate GII Environmental Assessment Report.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

# **APPENDIX 3** – Cable Percussion Borehole Records

# Ground Investigations Ireland Ltd
www.gii.ie

| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-01 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 4.50m | **Ground Level (mOD)** 58.84 | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** (dGPS) 710668.2 E 730490.5 N | **Dates** 20/01/2021-25/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 58.74 | 0.10 | TARMACADAM | | |
| 0.10<br>0.20 | B01<br>ES01 | | | | 58.64<br>58.54 | 0.20<br>0.30 | MADE GROUND: Brown slightly silty slightly gravelly fine to coarse Sand | | |
| | | | | | | (0.50) | Drillers note: MADE GROUND: 804 fill | | |
| | | | | | 58.04 | 0.80 | Drillers Note: Brown clayey fine Sand | | |
| 1.00-1.21<br>1.00 | SPT(C) 50/60<br>B02 | | | 7,9/50 | | | Dense grey very sandy subangular to subrounded fine to coarse GRAVEL | | |
| | | | | | | (2.20) | | | |
| 2.00-2.45<br>2.00 | SPT(C) N=41<br>B03 | | | 7,7/9,10,10,12 | | | | | |
| 3.00-3.45<br>3.00 | SPT(C) N=49<br>B04 | | | 7,10/19,9,9,12 | 55.84 | 3.00 | Dense grey sandy subangular to subrounded fine to coarse GRAVEL with occasional subrounded cobbles and some bands of brown slightly sandy slightly gravelly Clay | | ▼1 |
| | | | | | | (1.00) | | | |
| 4.00-4.06<br>4.00 | SPT(C) 25*/20<br>50/40<br>B05 | | | 25/50 | 54.84 | 4.00 | Dense grey slightly sandy subangular fine to coarse GRAVEL with some subangular to subrounded cobbles | | |
| | | | | | | (0.50) | | | |
| | | | | Water strike(1) at 4.50m, rose to 3.00m in 20 mins. | 54.34 | 4.50 | Complete at 4.50m | | ▽1 |

**Remarks**
BH-01 terminated at 4.50m BGL due to obstruction.
Chiselling from 4.50m to 4.50m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | SG |

**Figure No.** 10299-12-20.BH-01

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| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-02 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 0.70m | **Ground Level (mOD)** 58.02 | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** (dGPS) 710724.1 E 730510.2 N | **Dates** 25/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 57.89 | (0.13) 0.13 | TARMACADAM | | |
| | | | | | | (0.57) | MADE GROUND: Brown slightly clayey very sandy subangular to subrounded fine to coarse GRAVEL with occasional subangular to subrounded cobbles | | |
| 0.50 | B01 | | | | 57.32 | 0.70 | Complete at 0.70m | | |

**Remarks**
BH-02 terminated at 0.70m BGL due to obstruction.
Offset location and re-drill BH-02a
Chiselling from 0.70m to 0.70m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | SG |

**Figure No.** 10299-12-20.BH-02

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| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-02A |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 0.80m | **Ground Level (mOD)** 58.00 | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** | **Dates** 28/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 0.00-0.50 | ES01 | | | | 57.90 | 0.10 | TARMACADAM | | |
| 0.50 | B01 | | | | | (0.70) | MADE GROUND: Light brown slightly sandy gravelly Clay with occasional subangular to suborunded cobbles | | |
| | | | | | 57.20 | 0.80 | Complete at 0.80m | | |

**Remarks**
BH-02A terminated at 1.20m BGL due to obstruction.
Chiselling from 0.80m to 0.80m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | PM |

**Figure No.** 10299-12-20.BH-02A

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| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-03 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 1.80m | **Ground Level (mOD)** 56.81 | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** (dGPS) 710761.6 E 730546.6 N | **Dates** 25/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 56.65 | (0.16) 0.16 | CONCRETE | | |
| 0.50 | B01 | | | | | (1.04) | MADE GROUND: Brown clayey gravelly fine to coarse Sand with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse | | |
| 1.00-1.29<br>1.00<br>1.00 | SPT(C) 50/135<br>B02<br>ES01 | | | 1,2/19,31 | 55.61 | 1.20 | Drillers note: Pushing cobble in front of casing. No recovery | | |
| | | | | | 55.01 | (0.60) 1.80 | Complete at 1.80m | | |

**Remarks**
BH-03 terminated at 1.80m BGL due to obstruction.
Offset location and re-drill BH-03a
Chiselling from 1.20m to 1.80m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | SG |

**Figure No.** 10299-12-20.BH-03

# Ground Investigations Ireland Ltd
www.gii.ie

| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-03A |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 1.20m | **Ground Level (mOD)** | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** | **Dates** 28/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 0.00-1.20 | ES01 | | | | | 0.10 | TARMACADAM | | |
| 0.50<br>0.50 | B01<br>ES02 | | | | | (0.90) | Possible MADE GROUND: Light brown slightly sandy slightly gravelly silty CLAY with occasional subangular to suborunded cobbles. Gravel is subangular to subrounded fine to coarse | | |
| 1.00-1.45<br>1.00 | SPT(C) N=50<br>B02 | | | 6,7/14,22,14 | | 1.00<br>(0.20)<br>1.20 | Very stiff light brown slightly sandy slightly gravelly silty CLAY with occasional subangular to suborunded cobbles. Gravel is subangular to subrounded fine to coarse | | |
| | | | | | | | Complete at 1.20m | | |

**Remarks**
BH-03A terminated at 1.20m BGL due to obstruction.
Chiselling from 1.20m to 1.20m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | PM |

**Figure No.** 10299-12-20.BH-03A

# Ground Investigations Ireland Ltd
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| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-04 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 3.30m | **Ground Level (mOD)** 56.50 | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** 710728.4 E 730621.4 N | **Dates** 27/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.00-1.70 | ES01 | | | | 56.30 | (0.20) 0.20 | TARMACADAM | | | |
| 0.50 | B01 | | | | | | Soft to firm light brown slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse | | | |
| 1.00-1.45<br>1.00 | SPT(C) N=8<br>B02 | | | 1,1/1,2,2,3 | | (1.50) | | | | |
| 1.70-3.00 | ES02 | | | | 54.80 | 1.70 | Medium dense dark brown slightly clayey slightly gravelly SAND. Gravel is subangular to subrounded fine to coarse | | | |
| 2.00-2.45<br>2.00 | SPT(C) N=32<br>B03 | | | 3,3/6,7,10,9 | | (0.50) | | | | |
| | | | | | 54.30 | 2.20 | Very stiff dark brown gravelly very sandy CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse | | ▼1 | |
| | | | | | | (0.80) | | | | |
| 3.00-3.45<br>3.00<br>3.30 | SPT(C) N=50<br>B04<br>B05 | | | 17,9/19,31<br><br>Water strike(1) at 3.20m, rose to 2.50m in 20 mins. | 53.50 | 3.00 | Dense grey slightly clayey slightly sandy subangular to subrounded fine to coarse GRAVEL | | ▽1 | |
| | | | | | 53.20 | (0.30) 3.30 | Complete at 3.30m | | | |

**Remarks**
BH-04 terminated at 3.30m BGL due to obstruction.
50mm slotted standpipe installed from 3.80m to 1.00m BGL with pea gravel surrond, plain pipe installed from 1.00m to ground level with bentonite seal and flush cover
Chiselling from 3.30m to 3.30m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | PM |

**Figure No.** 10299-12-20.BH-04

# Ground Investigations Ireland Ltd
www.gii.ie

| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-05 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 3.20m | **Ground Level (mOD)** 56.30 | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** 710790.6 E 730600.4 N | **Dates** 27/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 0.00-0.50 | ES01 | | | | 56.10 | (0.20) 0.20 | CONCRETE | | |
| | | | | | | (0.30) | POSSIBLE MADE GROUND: Dark brown slightly silty slightly sandy slightly gravelly Clay | | |
| 0.50 | B01 | | | | 55.80 | 0.50 | | | |
| 0.50-2.40 | ES02 | | | | | | Soft dark brown mottled grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse | | |
| 1.00-1.45 | SPT(C) N=5 | | | 1,0/1,1,1,2 | | | | | |
| 1.00 | B02 | | | | | (1.50) | | | |
| 2.00-2.45 | SPT(C) N=17 | | | 1,2/3,4,4,6 | 54.30 | 2.00 | | | |
| 2.00 | B03 | | | | | (0.40) | Stiff dark brown mottled grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse | | ▼1 |
| 2.40-3.00 | ES03 | | | | 53.90 | 2.40 | | | |
| | | | | | | (0.60) | Stiff dark grey mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse | | |
| 3.00-3.40 | SPT(C) 50*/100 N=50 | | | 50/50 | 53.30 | 3.00 | | | |
| 3.00 | B04 | | | Water strike(1) at 3.20m, rose to 2.20m in 20 mins. | 53.10 | (0.20) 3.20 | Dense grey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles | | ▼1 |
| | | | | | | | Complete at 3.20m | | |

**Remarks**
BH-05 terminated at 3.20m BGL due to obstruction.
Chiselling from 3.00m to 3.20m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | PM |

**Figure No.** 10299-12-20.BH-05

# Ground Investigations Ireland Ltd
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| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-06 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 3.30m | **Ground Level (mOD)** 55.97 | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** 710836.6 E 730597.5 N | **Dates** 27/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.00-0.30 | ES01 | | | | 55.87 | 0.10 (0.20) | TARMACADAM | | | |
| 0.30-0.80 | ES02 | | | | 55.67 | 0.30 (0.50) | MADE GROUND: Dark brown slightly silty sandy fine to coarse subangular to subrounded Gravel | | | |
| 0.50 | B01 | | | | | | | | | |
| 0.80-3.00 | ES03 | | | | 55.17 | 0.80 (1.20) | POSSIBLE MADE GROUND: Greyish brown slightly silty slightly gravelly sandy Clay with occasional subangular to subrounded cobbles. (reworked) | | | |
| 1.00-1.45<br>1.00 | SPT(C) N=5<br>B02 | | | 1,0/1,1,1,2 | | | Soft dark brown slightly sandy slightly gravelly silty CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse | | | |
| 2.00-2.45<br>2.00 | SPT(C) N=17<br>B03 | | | 1,2/3,4,4,6 | 53.97 | 2.00 (0.70) | Stiff dark brown slightly sandy slightly gravelly silty CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse | | | |
| | | | | Water strike(1) at 2.70m, fell to 3.20m in 20 mins. | 53.27 | 2.70 (0.60) | Dense grey slightly sandy silty subangular to subrounded fine to coarse GRAVEL | | ▽1 | |
| 3.00<br>3.00-3.40 | B04<br>SPT(C) 50*/100 N=50 | | | 50/50 | | | Strong hydrocarbon odour odour noted at 3.30m BGL | | ▼1 | |
| 3.00-3.30 | ES04 | | | | 52.67 | 3.30 | Complete at 3.30m | | | |

**Remarks**
Strong hydrocarbon odour noted at 3.30m BGL.
BH-06 terminated at 3.30m BGL due to obstruction.
50mm slotted standpipe installed from 3.30m to 1.00m BGL with pea gravel surrond, plain pipe installed from 1.00m to ground level with bentonite seal and flush cover
Chiselling from 1.20m to 1.20m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | PM |

**Figure No.** 10299-12-20.BH-06

# Ground Investigations Ireland Ltd

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| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-07 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 3.10m | **Ground Level (mOD)** 55.57 | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** (dGPS) 710845.7 E 730676.7 N | **Dates** 26/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 55.52 | 0.05 | TARMACADAM | | |
| 0.50 | B01 | | | | | (1.25) | Possible MADE GROUND: Brown gravelly very clayey fine to coarse Sand | | |
| 1.00-1.45 | SPT(C) N=15 | | | 3,3/4,3,4,4 | | | | | |
| 1.00 | B02 | | | | | | | | |
| 1.00 | ES01 | | | | 54.27 | 1.30 | Medium dense grey sandy subangular to subrounded fine to coarse GRAVEL | | |
| | | | | | | (0.70) | | | |
| 2.00-2.44 | SPT(C) 50/285 | | | 6,9/10,12,14,14 | 53.57 | 2.00 | Dense grey sandy subangular to subrounded fine to coarse GRAVEL | | |
| 2.00 | B03 | | | | | (0.60) | | | |
| | | | | | 52.97 | 2.60 | Dense grey subangular to subrounded coarse GRAVEL with some to many subangular to subrounded cobbles | | |
| | | | | | | (0.50) | | | |
| 3.00-3.12 | SPT(C) 25*/100 50/20 | | | 17,8/50 | 52.47 | 3.10 | Complete at 3.10m | | |
| 3.00 | B04 | | | | | | | | |

**Remarks**
BH-07 terminated at 3.10m BGL due to obstruction.
Chiselling from 3.10m to 3.10m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | SG |

**Figure No.** 10299-12-20.BH-07

# Ground Investigations Ireland Ltd

www.gii.ie

| | | | |
|---|---|---|---|
| **Site** Greenhills Road | | | **Borehole Number** BH-08 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 3.80m | **Ground Level (mOD)** 55.36 | **Client** Lohan and Donnelly | **Job Number** 10299-12-20 |
| | **Location** (dGPS) 710867.4 E 730633.6 N | **Dates** 26/01/2021 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 55.26 | 0.10 | TARMACADAM | | | |
| | | | | | | (0.20) | | | | |
| | | | | | 55.06 | 0.30 | Drillers Note: MADE GROUND: Gravel | | | |
| 0.50 | B01 | | | | | (0.60) | MADE GROUND: Orangish brown slightly sandy slightly gravelly CLAY with organic odour | | | |
| | | | | | 54.46 | 0.90 | | | | |
| 1.00-1.45<br>1.00 | SPT(C) N=20<br>B02 | | | 2,2/3,5,6,6 | | (0.70) | Medium dense dark brown clayey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse | | | |
| | | | | | 53.76 | 1.60 | | | | |
| | | | | | | (0.50) | Medium dense brown slightly gravelly very silty fine to coarse SAND. Gravel is subrounded fine to coarse | | | |
| 2.00-2.45<br>2.00<br>2.00 | SPT(C) N=14<br>B03<br>ES01 | | | 2,2/3,3,4,4 | 53.26 | 2.10 | Drillers note: Brown sandy gravelly Clay (stiff) | | | |
| | | | | | | (0.40) | | | | |
| | | | | | 52.86 | 2.50 | Drillers note: pushing cobble in front of casing. No recovery | | | |
| | | | | | | (0.20) | | | | |
| | | | | | 52.66 | 2.70 | | | ▼1 | |
| 3.00 | B04 | | | Water strike(1) at 3.00m, rose to 2.90m in 20 mins, sealed at 3.20m. | | (1.10) | Very stiff grey slightly sandy slightly gravelly CLAY. Gravely is subangular to subrounded fine to coarse | | | |
| 3.00-3.29 | SPT(C) 50/135 | | | 6,9/17,33 | | | | | | |
| 3.80<br>3.80 | B05<br>ES02 | | | | 51.56 | 3.80 | Complete at 3.80m | | | |

**Remarks**

50mm slotted standpipe installed from 3.80m to 1.00m BGL with pea gravel surrond, plain pipe installed from 1.00m to ground level with bentonite seal and flush cover
BH-08 terminated at 3.80m BGL due to obstruction.
Chiselling from 3.80m to 3.80m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | SG |

**Figure No.** 10299-12-20.BH-08

# Appendix H – GoCar Letter of Intent

Steeplefield Limited,
32 Molesworth Street,
Dublin 2,
D02 Y512

13/01/2022

To Whom It May Concern,

This is a letter to confirm that GoCar intends to provide a service of up to 5no. shared car club vehicles, 1no. of the vehicles provided will be a BEV (Battery Electric Vehicle) with a standalone electric vehicle charge point provided by the developer within the proposed Strategic Housing Development (SHD) located south of the Walkinstown Roundabout on Greenhills Road. GoCar representatives have discussed the project with representatives of Lohan & Donnelly, who are the Consulting Engineers for the development, and are excited to provide a car sharing service at this location. While it is the intention for most of these vehicles to be used exclusively by the residents of the development, GoCar may agree with the eventual managers of the site to allow some vehicles to be open for access to other GoCar members nearby. This will depend on usership levels and will be reviewed at various periods to ensure adequate supply for the residents of the development.

GoCar is Ireland's leading car sharing service with over 60,000 members and over 800 cars and vans on fleet.
Each GoCar which is placed in a community has the potential to replace the journeys of up to 15 private cars.
The Department of Housing's Design Standards for New Apartments - Guidelines for Planning Authorities 2018 outline:
"For all types of location, where it is sought to eliminate or reduce car parking provision, it is necessary to ensure... provision is also to be made for alternative mobility solutions including facilities for car sharing club vehicles."

Carsharing is a sustainable service. By allowing multiple people to use the same vehicle at different times, car sharing reduces car ownership, car dependency, congestion, noise, and air pollution. It frees up land which would otherwise be used for additional parking spaces. Most GoCar users only use a car when necessary, and walk and use public transport more often than car owners.

By having GoCar car sharing vehicles in a development such as this, the residents therein will have access to pay-asyou-go driving, in close proximity to their homes, which will increase usership of the service.

I trust that this information is satisfactory. For any queries, please do not hesitate to contact me.

Rob Montgomery
Revenue and Growth Manager
GoCar Carsharing Ltd
Mobile: 086 609 7096
E: robert.montgomery@gocar.ie

# Appendix I – Statement of Design Acceptance (Irish Water)

Edvinas Valadka
13 Gardiner Place
Mountjoy Square
Dublin 1, 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

23 February 2022

**Re: Design Submission for Greenhills Road, Walkinstown, Dublin 12, Co.Dublin (the "Development")**
**(the "Design Submission") / Connection Reference No: CDS20007999**

Dear Edvinas Valadka,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative:
Name: Dario Alvarez
Email: dalvarez@water.ie

Yours sincerely,

Yvonne Harris

**Yvonne Harris**
**Head of Customer Operations**

**Appendix A**

**Document Title & Revision**

- [20189-LDE-07-00-DR-SC-1C01a]
- [20189-LDE-07-00-DR-SC-1C01b]
- [20189-LDE-07-00-DR-SC-1C01c]
- [20189-LDE-07-00-DR-SC-1C01d]
- [20189-LDE-07-00-DR-SC-1C01e]
- [20189-LDE-07-00-DR-SC-1C01f]

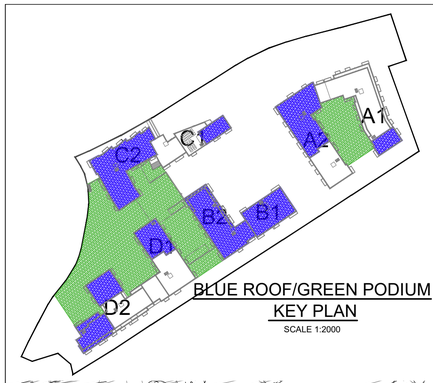
**Standard Details/Code of Practice Exemption:**

*While Irish Water notes that the water and wastewater services infrastructure will remain private and not be vested, we have the following comments:*

- *It is recommended that the foul sewer network is located deeper, depth of cover is less than 500mm in some areas.*
- *It is recommended a minimum clearance of 5m of an existing or proposed structure for watermains between 200mm and 600mm in diameter.*
- *It is recommended a minimum clearance of 3m of an existing or proposed structure for sewer pipes.*

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

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




BLUE ROOF/GREEN PODIUM
KEY PLAN
SCALE 1:2000

## LEGEND

- EX. SURFACE WATER SEWER — EX. SW03
- EX. FOUL WATER SEWER — EX. FW03
- NEW FOUL WATER SEWER — FW03
- NEW SURFACE WATER SEWER — SW03
- ROAD GULLY — RG
- EXISTING WATERMAIN
- NEW 200 MDPE TYPE PE-80 WATERMAIN
- NEW 150 MDPE TYPE PE-80 SERVICE MAIN
- NEW 150 MDPE TYPE PE-80 DISTRIBUTION MAIN
- EXISTING GROUND LEVELS /CONTOURS — 00.00
- METER/BOUNDARY BOX
- SLUICE VALVE
- SCOUR VALVE/SCOUR VALVE CHAMBER — SCV
- (CLASS 2) PETROL INTERCEPTOR
- NEW HYDRANT — H
- NEW WASHOUT HYDRANT — WH
- NEW ONLINE HYDRANT — H
- EXISTING FIRE HYDRANT — FI
- FLOW METER KIOSK
- EXISTING FIRE HYDRANT — AV
- OUTLINE OF STRUCTURES ABOVE
- SITE BOUNDARY

## NOTES:

NO EXTERNAL SURFACE WATER IS PERMITTED TO BE COLLECTED BY THE SURFACE WATER SEWERS WITHIN THE TWO UNDERCROFT CAR PARKS OF THE DEVELOPMENT.

## HYDRANTS, AIR VALVES, SLUICE VALVES & SCOUR VALVES:

ALL AIR VALVES, HYDRANTS, SLUICE VALVES, SCOUR VALVES & SCOUR VALVE CHAMBERS SHALL BE BUILT IN ACCORDANCE TO SECTION 3.18 OF IRISH WATER CODE OF PRACTICE DOCUMENT (IW-CDS-5020-03)

## EXISTING 225mm FOUL WATER SEWER:

IRISH WATER ARE CURRENTLY ASSESSING THE REQUIRED UPGRADES WITHIN THE AREA OF THE PROPOSED DEVELOPMENT. CONNECTION LOCATION MAY BE SUBJECTED TO CHANGE, PENDING IRISH WATER'S REVIEW. CONNECTION LOCATION WILL BE KNOWN AND IDENTIFIED ON THIS DRAWING POST APPLICATION FOR A NEW WATER/WASTE WATER CONNECTION.

## STORMTECH ATTENUATION:

TOTAL SITE AREA (EXCLUDING BLUE ROOF, TREE PITS AND THEIR ASSOCIATED ATTENUATION AREAS ) = 21679m²

FOR CALCULATION OF ATTENUATION VOLUME, THE FOLLOWING AREAS HAVE BEEN PARTIALLY DISCOUNTED:
- GREEN PODIUM = 8500m²
- PERMEABILITY COEFFICIENT = 40%
- PERMEABLE PAVING & GRASSED AREAS = 10147m²
- PERMEABILITY COEFFICIENT;
- PERMEABLE PAVING = 40%
- GRASSED AREAS = 85%

IMPERMEABLE AREAS TO BE ATTENUATED = 11984m²

FOR 100 YEAR RETURN EVENT, MAXIMUM SURFACE WATER OUTFALL RATE WILL BE LIMITED TO 8.021 l/s

ATTENUATION VOLUME REQUIRED, WITH 20% EXTRA INCREASE TO ACCOUNT FOR CLIMATE CHANGE = 895.75m³

TOTAL STORAGE PROVIDED BY STORMTECH MC-3500 = 975m³

## BLUE ROOF ATTENUATION:

TOTAL BLUE ROOF AREA = 5058m²

FOR 100 YEAR RETURN EVENT, MAXIMUM RAIN WATER OUTFALL RATE FROM THE ROOFS WILL BE LIMITED TO 2.0 l/s

ATTENUATION VOLUME REQUIRED, WITH 20% EXTRA INCREASE TO ACCOUNT FOR CLIMATE CHANGE = 228.45m³

STORAGE PROVIDED BY BAUDER BLUE ROOF SYSTEM:

5058m² (BLUE ROOF AREA) x 0.1m (ATTENUATION CELLS) = 505.8m³

## TREE PIT ATTENUATION:

TOTAL TREE PIT AREA, GRASS IN-BETWEEN AND ADJACENT CYCLE TRACK = 1185m²

VOLUME
ATTENUATION VOLUME REQUIRED, WITH 20% EXTRA INCREASE TO ACCOUNT FOR CLIMATE CHANGE = 31.668m³

STORAGE PROVIDED BY TREE PITS:

362.25m² x 0.5m dp. x 0.3 (void ratio)= 54.3375m³

## NOTES:

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEER'S DETAIL DRAWINGS AND SPECIFICATIONS.

DO NOT SCALE DIMENSIONS, REFER TO ARCHITECTS DRAWINGS FOR ALL SETTING OUT DIMENSIONS. WORK TO FIGURED DIMENSIONS ONLY.

THE ENGINEER IS TO BE AFFORDED SUFFICIENT TIME TO CARRY OUT INSPECTIONS OF THE WORKS IN ACCORDANCE WITH THE PROJECT INSPECTION PLAN AND INSPECTION NOTIFICATION FRAMEWORK.

ALL CONSTRUCTION PRODUCTS TO HAVE RELEVANT CE MARKING WHERE APPLICABLE.

ALL DEMOLITION WORKS TO BE IN ACCORDANCE WITH BS 6187: 2011.

ALL CONTRACTORS OR SUB-CONTRACTORS RESPONSIBLE FOR SPECIALIST DESIGN MUST PROVIDE PROFESSIONAL INDEMNITY INSURANCES, ANCILLARY CERTIFICATES FOR DESIGN AND ANCILLARY CERTIFICATES FOR INSPECTION IN ACCORDANCE WITH BCAR 2014.

## DRAINAGE

ALL DRAINAGE WORK TO BE CARRIED OUT IN ACCORDANCE WITH IS EN 752: 2008, TGD PART H, GDR CODE OF PRACTICE FOR DRAINAGE WORKS V6.0 AND IRISH WATER SPECIFICATIONS.

MIN. 150mm C16/20 CONCRETE BED & SURROUND TO BE PROVIDED TO SEWER PIPELINES WHERE THE COVER IS LESS THAN 1.200m UNDER ROADS, VERGES AND FOOTPATHS.

BACKFILL FOR ALL uPVC PIPES TO BE FREE FROM STONE EXCEEDING 50mm FOR 300mm ABOVE GRANULAR SURROUND.

ALL REINSTATEMENT WORKS TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY.

ALL MANHOLES COVERS AND FRAME ARE TO BE CLASS D400 TO BS EN 124 U.N.O.

SEWER PIPE LINES TO BE uPVC PIPES UP TO AND INCLUDING 300Ø TO IS 123 ON GRANULAR BED AND SURROUND LAID STRICTLY TO MANUFACTURERS INSTRUCTIONS.

ALL VERTICAL STACK CONNECTIONS TO FOUL SEWER CHAMBERS TO INCORPORATE LONG RADIUS BENDS AND MUST JOIN MAIN SEWER LINE AT 45° TO DIRECTION OF FLOW.

## SURFACE & FOUL WATER LAYOUT

SCALE 1:500

## FLOW METER & TELEMETRY NOTES:

BULK FLOW METER AND TELEMTRY SYSTEM TO BE IN ACCORDANCE WITH IRISH WATER DETAIL STD-W-26A AND SECTION 3.15.3 OF THE WATER CODE OF PRACTICE. TELEMETRY SYSTEM & BULK FLOW METER TO BE SELECTED, SUPPLIED & INSTALLED BY IRISH WATER AT THE CUSTOMER'S COST.

## MANHOLE NOTES:

MANHOLES WHICH ARE LOCATED IN SOFT LANDSCAPED/GRASSED AREAS HAVE TO BE SURROUNDED BY A CONCRETE PLINTH, 200mm ALL ROUND AND 100mm DEEP FORMED WITH C20/C25 CONCRETE, 20mm AGGREGATE SIZE, BEDDED IN CLAUSE 804 MATERIAL.

## PROPOSED/EXISTING PLANTING NOTES:

**WATERMAIN** - ALL SERVICES TO HAVE SUFFICIENT CLEARENCE AWAY FROM EXISTING/NEW PLANTING AND APPROPRIATE PREVENTION MEASURES IN PLACE AS PER IRISH WATER RECOMMENDATIONS SET OUT IN THE "WATER INFRASTRUCTURE STANDARD DETAILS ", DRAWINGS "STD-W-12 & STD-W-12A".

**FOUL WATER** - ALL FOUL SEWERS TO HAVE SUFFICIENT CLEARENCE AWAY FROM EXISTING/NEW PLANTING AND APPROPRIATE PREVENTION MEASURES IN PLACE AS PER IRISH WATER RECOMMENDATIONS SET OUT IN THE "WASTEWATER INFRASTRUCTURE STANDARD DETAILS ", DRAWINGS "STD-WW-06 & STD-WW-06A".

## PAVING LEGEND

- PERMEABLE PAVING
- GREEN PODIUM
- BLUE ROOF
- RAIN GARDEN
- TREE PIT (5000 x 3450)
- GRASS
- REINFORCED GRASSED AREAS
- HARSTANDING/NON PERMEABLE SURFACE

SURFACE WATER MANHOLE SCHEDULE

| MH. REF. | COVER LEVEL | INVERT LEVEL | DEPTH TO INVERT | MANHOLE TYPE | MH. COVER | COMMENTS |
|---|---|---|---|---|---|---|
| SW01 | 54.930 | 53.704 | 1.226 | MANHOLE TYPE B | CLASS D400 | |
| SW02 | 55.450 | 53.968 | 1.482 | MANHOLE TYPE G | CLASS B125 | FLOW CONTROL DEVICE |
| SW03 | 55.450 | 53.986 | 1.464 | MANHOLE TYPE J | CLASS B125 | |
| SW04 | 55.450 | 54.041 | 1.409 | MANHOLE TYPE J | CLASS B125 | |
| SW05 | 55.500 | 54.136 | 1.364 | MANHOLE TYPE J | CLASS B125 | |
| SW06 | 55.450 | 54.318 | 1.132 | MANHOLE TYPE J | CLASS B125 | |
| SW07 | 55.500 | 54.517 | 0.983 | MANHOLE TYPE J | CLASS B125 | |
| SW08 | 56.500 | 54.653 | 1.847 | MANHOLE TYPE J | CLASS B125 | |
| SW09 | 56.375 | 54.920 | 1.455 | MANHOLE TYPE J | CLASS D400 | |
| SW10 | 56.200 | 54.737 | 1.463 | MANHOLE TYPE J | CLASS B125 | |
| SW11 | 56.200 | 54.645/54.41 | 1.555/1.790 | STORMTECH ATTENUATION MANHOLE | CLASS B125 | 500mm dp. SUMP |
| SW12 | 56.200 | 54.785 | 1.415 | MANHOLE TYPE J | CLASS B125 | |
| SW13 | 56.050 | 54.970 | 1.080 | MANHOLE TYPE J | CLASS B125 | |
| SW14 | 56.050 | 55.250 | 0.800 | MANHOLE TYPE J | CLASS B125 | |
| SW15 | 56.050 | 54.410 | 1.640 | STORMTECH ATTENUATION MANHOLE | CLASS B125 | 500mm dp. SUMP |
| SW16 | 55.875 | 54.341 | 1.534 | MANHOLE TYPE J | CLASS B125 | |
| SW17 | 55.870 | 54.211 | 1.659 | MANHOLE TYPE J | CLASS D400 | |
| SW18 | 55.875 | 54.261 | 1.614 | MANHOLE TYPE J | CLASS D400 | |
| SW19 | 57.250 | 55.131 | 2.119 | MANHOLE TYPE J | CLASS D400 | |
| SW20 | 57.850 | 56.031 | 1.819 | MANHOLE TYPE J | CLASS D400 | |
| SW21 | 56.350 | 55.420 | 0.930 | MANHOLE TYPE J | CLASS D400 | |
| SW22 | 56.350 | 55.620 | 0.730 | MANHOLE TYPE J | CLASS D400 | |
| SW23 | 56.710 | 55.763 | 0.947 | MANHOLE TYPE J | CLASS D400 | |
| SW24 | 56.710 | 55.819 | 0.891 | MANHOLE TYPE J | CLASS D400 | |
| SW25 | 56.500 | 55.887 | 0.613 | MANHOLE TYPE J | CLASS D400 | |
| SW26 | 57.400 | 55.901 | 1.499 | MANHOLE TYPE J | CLASS D400 | |
| SW27 | 57.400 | 56.039 | 1.361 | MANHOLE TYPE J | CLASS D400 | |
| SW28 | 57.400 | 55.972 | 1.428 | MANHOLE TYPE J | CLASS D400 | |
| SW29 | 56.050 | 55.212 | 0.838 | MANHOLE TYPE J | CLASS D400 | |
| SW30 | 56.050 | 55.350 | 0.700 | MANHOLE TYPE J | CLASS D400 | |
| SW31 | 55.875 | 54.230 | 1.645 | MANHOLE TYPE J | CLASS D400 | |
| SW32 | 57.400 | 55.963 | 1.437 | MANHOLE TYPE J | CLASS D400 | |
| SW33 | 57.400 | 56.043 | 1.357 | MANHOLE TYPE J | CLASS D400 | |
| SW34 | 57.400 | 56.069 | 1.331 | MANHOLE TYPE J | CLASS D400 | |
| SW35 | 57.400 | 56.031 | 1.369 | MANHOLE TYPE J | CLASS D400 | |
| SW36 | 57.400 | 56.098 | 1.302 | MANHOLE TYPE J | CLASS D400 | |
| SW37 | 57.400 | 56.119 | 1.281 | MANHOLE TYPE J | CLASS D400 | |
| SW38 | 58.000 | 56.102 | 1.898 | MANHOLE TYPE J | CLASS D400 | |
| SW39 | 58.000 | 56.6350 | 1.3650 | MANHOLE TYPE J | CLASS D400 | |
| SW40 | 58.000 | 56.8220 | 1.1780 | MANHOLE TYPE J | CLASS D400 | |
| SW41 | 58.000 | 56.1880 | 1.8120 | MANHOLE TYPE J | CLASS D400 | |
| SW42 | 58.000 | 56.2590 | 1.741 | MANHOLE TYPE J | CLASS D400 | |
| SW43 | 58.000 | 56.4660 | 1.5340 | MANHOLE TYPE J | CLASS D400 | |
| SW44 | 58.000 | 56.0770 | 1.9230 | MANHOLE TYPE J | CLASS D400 | |
| SW45 | 58.000 | 56.3660 | 1.6340 | MANHOLE TYPE J | CLASS D400 | |
| SW46 | 55.875 | 54.875 | 1.000 | MANHOLE TYPE J | CLASS D400 | |
| SW47 | 57.250 | 56.308 | 0.942 | MANHOLE TYPE J | CLASS D400 | |
| SW48 | 58.200 | 57.048 | 1.152 | MANHOLE TYPE J | CLASS D400 | |
| SW49 | 58.600 | 57.2780 | 1.3220 | MANHOLE TYPE J | CLASS D400 | |
| EX.SW01 | 54.580 | 53.380 | 1.200 | N/A | N/A | |
| EX.SW02 | 54.480 | 53.480 | 1.000 | N/A | N/A | |

Note: ALL MANHOLE TYPES AS PER GDS CODE OF PRACTICE

FOUL WATER MANHOLE SCHEDULE

| MH. REF. | COVER LEVEL | INVERT LEVEL | DEPTH TO INVERT | MANHOLE TYPE | MH. COVER | COMMENTS |
|---|---|---|---|---|---|---|
| FW01 | 55.450 | 54.498 | 0.952 | I.W. STD-WW-10 | CLASS B125 | |
| FW02 | 55.450 | 54.522 | 0.928 | I.W. STD-WW-10 | CLASS B125 | |
| FW03 | 55.875 | 54.665 | 1.210 | I.W. STD-WW-10 | CLASS B125 | |
| FW04 | 55.450 | 54.576 | 0.874 | I.W. STD-WW-10 | CLASS D400 | |
| FW05 | 55.450 | 54.641 | 0.809 | I.W. STD-WW-10 | CLASS B125 | |
| FW06 | 55.450 | 54.778 | 0.672 | I.W. STD-WW-10 | CLASS B125 | |
| FW07 | 55.500 | 54.922 | 0.578 | I.W. STD-WW-10 | CLASS B125 | |
| FW08 | 56.500 | 55.471 | 1.029 | I.W. STD-WW-10 | CLASS B125 | |
| FW09 | 56.200 | 55.276 | 0.924 | I.W. STD-WW-10 | CLASS B125 | |
| FW10 | 56.500 | 55.151 | 1.349 | I.W. STD-WW-10 | CLASS B125 | |
| FW11 | 56.350 | 55.092 | 1.258 | I.W. STD-WW-10 | CLASS B125 | |
| FW12 | 56.050 | 54.947 | 1.103 | I.W. STD-WW-10 | CLASS B125 | |
| FW13 | 56.050 | 54.847 | 1.203 | I.W. STD-WW-10 | CLASS B125 | |
| FW14 | 55.875 | 55.005 | 0.870 | I.W. STD-WW-10 | CLASS D400 | |
| FW15 | 55.875 | 54.706 | 1.169 | I.W. STD-WW-10 | CLASS D400 | |
| FW16 | 57.250 | 55.576 | 1.674 | I.W. STD-WW-10 | CLASS B125 | |
| FW17 | 57.850 | 56.701 | 1.149 | I.W. STD-WW-10 | CLASS B125 | |
| FW18 | 55.875 | 54.776 | 1.099 | I.W. STD-WW-10 | CLASS B125 | |
| FW19 | 56.350 | 55.211 | 1.139 | I.W. STD-WW-10 | CLASS B125 | |
| EX.FW01 | 55.070 | 54.380 | 0.690 | N/A | N/A | |

Note: ALL MANHOLE TYPES AS PER GDS CODE OF PRACTICE

| Rev | Date | Drn | Chk'd | Description |
|---|---|---|---|---|
| D | 31/01/2022 | E.V | G.P | Issued to Irish Water for Statement of Design Acceptance. |
| P | 28/05/2021 | E.V | G.P | Issued for Stage 2 SHD Planning. |


LOHAN & DONNELLY
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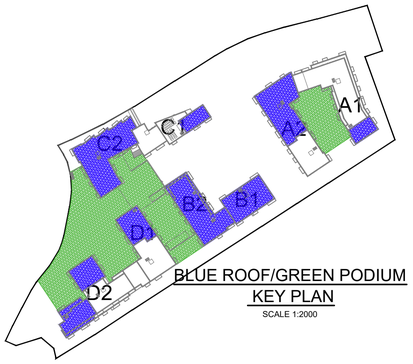
W: www.lohan-donnelly.com E: info@lohan-donnelly.com


| | |
|---|---|
| Project: | Residential Development at Greenhills Road, Walkinstown, Dublin 12 |
| Drawing: | Proposed Surface & Foul Water Layout |

| | |
|---|---|
| Project No. | 20189 |
| Drg. No. | C01a |
| Scale | @A1 |
| Date | Feb. 2021 |
| Drawn | E.V |
| Rev. | D |
| Model Reference: | 20189-LDE-ZZ-ZZ-M2-SC-0001 |
| Drawing Reference: | 20189-LDE-07-00-DR-SC-1C01a |
| Model Rev: | P01 |
| Suitability: | S01 |




BLUE ROOF/GREEN PODIUM
KEY PLAN
SCALE 1:2000

## EXISTING 1200mm D.I WATER MAIN:

DENOTES 16.2m WIDE REQUIRED WAYLEAVE WIDTH IN ACCORDANCE WITH IRISH WATER'S REQUIREMENTS.

NOTE: IT WILL NOT BE PERMITTED TO BUILD OVER ANY IRISH WATER INFRASTRUCTURE.

## NEW 200mm ID WATER MAIN:

IN ORDER TO FACILITATE THE PROPOSED WATER MAIN CONNECTION FOR THE DEVELOPMENT, A NEW 200mm ID DUCTILE IRON WATER MAIN IS TO BE LAID FOR APPROXIMATELY 280m. THE NEW WATER MAIN IS TO BE PARALLEL TO THE EXISTING 150mm uPVC WATER MAIN LOCATED ON GREENHILLS ROAD AS PER THE IRISH WATER WATER CONNECTION CONDITIONS OUTLINED WITHIN THE CONFIRMATION OF FEASIBILITY LETTER FROM IRISH WATER. FOR FULL EXTENT OF NEW 200mm DUCTILE IRON WATER MAIN REFER TO DRAWING "20189-LDE-07-00-DR-SC-1C01c".

## EXISTING 101.5mm uPVC WATER MAIN:

DENOTES EXISTING WATER MAIN SERVING THE EXISTING DEVELOPMENT TO BE REMOVED.

**REASON:**

1. EXISTING WATER MAIN LAYOUT IS NOT COMPLIANT WITH IRISH WATER'S CODE OF PRACTICE OR THE STRUCTURAL LAYOUT OF THE PROPOSED DEVELOPMENT (I.E. EXISTING WATER MAIN IS CURRENTLY LOCATED UNDER PROPOSED STRUCTURES).
2. EXISTING WATER MAIN DOES NOT HAVE SUFFICIENT CAPACITY TO SERVICE THE NEW PROPOSED DEVELOPMENT.

## WATERMAIN LAYOUT

SCALE 1:500

## LEGEND

- EX. SURFACE WATER SEWER — EX. SW03
- EX. FOUL WATER SEWER — EX. FW03
- NEW FOUL WATER SEWER — FW03
- NEW SURFACE WATER SEWER — SW03
- ROAD GULLY — RG
- EXISTING WATERMAIN
- NEW 200 MDPE TYPE PE-80 WATERMAIN — NEW 200 MDPE TYPE PE-80 WATERMAIN
- NEW 150 MDPE TYPE PE-80 SERVICE MAIN — NEW 150 MDPE TYPE PE-80 SERVICE MAIN
- NEW 150 MDPE TYPE PE-80 DISTRIBUTION MAIN — NEW 150 MDPE TYPE PE-80 DISTRIBUTION MAIN
- EXISTING GROUND LEVELS /CONTOURS — 00.00
- METER/BOUNDARY BOX
- SLUICE VALVE
- SCOUR VALVE/SCOUR VALVE CHAMBER — SCV
- (CLASS 2) PETROL INTERCEPTOR
- NEW HYDRANT — H
- NEW WASHOUT HYDRANT — WH
- NEW ONLINE HYDRANT — H
- EXISTING FIRE HYDRANT — H
- FLOW METER KIOSK
- EXISTING FIRE HYDRANT — AV
- OUTLINE OF STRUCTURES ABOVE
- SITE BOUNDARY

## NOTES:

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## DRAINAGE

ALL DRAINAGE WORK TO BE CARRIED OUT IN ACCORDANCE WITH IS EN 752: 2008, TGD PART H, GDR CODE OF PRACTICE FOR DRAINAGE WORKS V6.0 AND IRISH WATER SPECIFICATIONS.

MIN. 150mm C16/20 CONCRETE BED & SURROUND TO BE PROVIDED TO SEWER PIPELINES WHERE THE COVER IS LESS THAN 1.200m UNDER ROADS, VERGES AND FOOTPATHS.

BACKFILL FOR ALL uPVC PIPES TO BE FREE FROM STONE EXCEEDING 50mm FOR 300mm ABOVE GRANULAR SURROUND.

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SEWER PIPE LINES TO BE uPVC PIPES UP TO AND INCLUDING 300Ø TO IS 123 ON GRANULAR BED AND SURROUND LAID STRICTLY TO MANUFACTURERS INSTRUCTIONS.

ALL VERTICAL STACK CONNECTIONS TO FOUL SEWER CHAMBERS TO INCORPORATE LONG RADIUS BENDS AND MUST JOIN MAIN SEWER LINE AT 45° TO DIRECTION OF FLOW.

## HYDRANTS, AIR VALVES, SLUICE VALVES & SCOUR VALVES:

ALL AIR VALVES, HYDRANTS, SLUICE VALVES, SCOUR VALVES & SCOUR VALVE CHAMBERS SHALL BE BUILT IN ACCORDANCE TO SECTION 3.18 OF IRISH WATER CODE OF PRACTICE DOCUMENT (IW-CDS-5020-03)

## MANHOLE NOTES:

MANHOLES WHICH ARE LOCATED IN SOFT LANDSCAPED/GRASSED AREAS HAVE TO BE SURROUNDED BY A CONCRETE PLINTH, 200mm ALL ROUND AND 100mm DEEP FORMED WITH C20/C25 CONCRETE, 20mm AGGREGATE SIZE, BEDDED IN CLAUSE 804 MATERIAL.

## FLOW METER KIOSK NOTES:

TELEMETRY SYSTEM SHALL BE PROVIDED TO MEASURE THE DEMAND OF DEVELOPMENTS WITH A DAILY DEMAND EXCEEDING 200m3 PER DAY. THE METER AND THE TELEMETRY SYSTEM WILL BE CHOSEN AND SUPPLIED BY IRISH WATER TO ITS REQUIREMENTS.

## PROPOSED/EXISTING PLANTING NOTES:

ALL SERVICES TO HAVE SUFFICIENT CLEARENCE AWAY FROM EXISTING/NEW PLANTING AND APPROPRIATE PREVENTION MEASURES IN PLACE AS PER IRISH WATER RECOMMENDATIONS SET OUT IN THE "WATER INFRASTRUCTURE STANDARD DETAILS ". DRAWINGS "STD-W-12 & STD-W-12A".

## PAVING LEGEND

- PERMEABLE PAVING
- GREEN PODIUM
- BLUE ROOF
- RAIN GARDEN
- TREE PIT (5000 / 3450)
- GRASS
- REINFORCED GRASSED AREAS
- HARSTANDING/NON PERMEABLE SURFACE

| Rev | Date | Drn | Chk'd | Description |
|---|---|---|---|---|
| P | 28/05/2021 | E.V | G.P | Issued for Stage 2 SHD Planning. |

ISSUED FOR COORDINATION 14-05-2021


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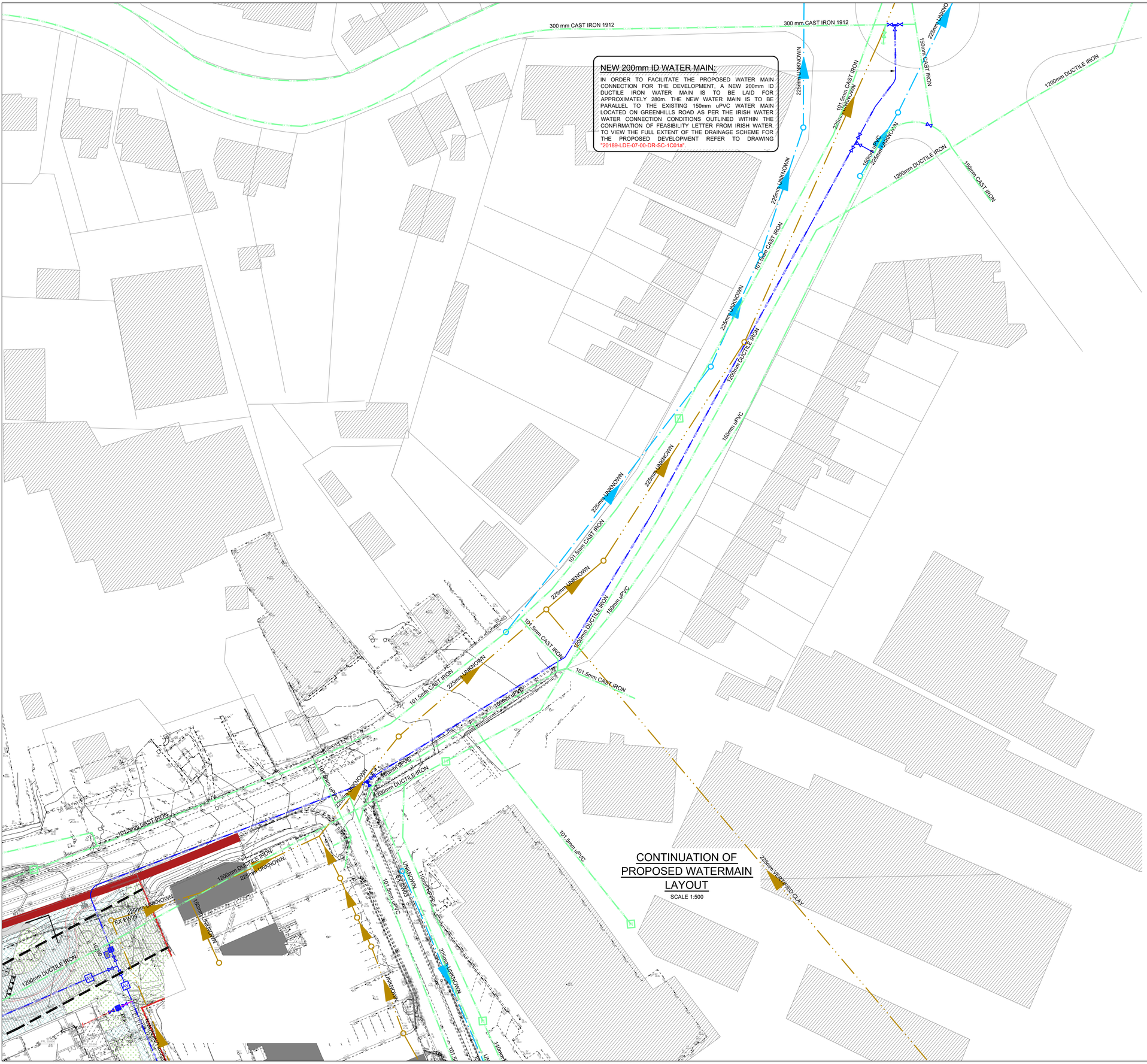
Consulting Engineers
13 Carlton Place, Mountjoy Square, Dublin 1. T: 01 8787770
W: www.lohan-donnelly.com E: info@lohan-donnelly.com


| | |
|---|---|
| Project: | Residential Development at Greenhills Road, Walkinstown, Dublin 12 |
| Drawing: | Proposed Watermain Layout (1 of 2) |
| Model Reference: | 20189-LDE-ZZ-ZZ-M2-SC-0001 |
| Drawing Reference: | 20189-LDE-07-00-DR-SC-1C01b |

| | |
|---|---|
| Project No. | 20189 |
| Drg. No. | C01b |
| Scale | @A1 |
| Date | Feb. 2021 |
| Drawn | E.V |
| Rev. | P |
| Model Rev: | P01 |
| Suitability: | S01 |




## LEGEND

- EX. SURFACE WATER SEWER — EX. SW03
- EX. FOUL WATER SEWER — EX. FW03
- NEW FOUL WATER SEWER — FW03
- NEW SURFACE WATER SEWER — SW03
- ROAD GULLY — RG
- EXISTING WATERMAIN
- NEW 200 MDPE TYPE PE-80 WATERMAIN — WM
- NEW 150 MDPE TYPE PE-80 SERVICE MAIN — SER DTR
- NEW 150 MDPE TYPE PE-80 DISTRIBUTION MAIN — SER DTR
- EXISTING GROUND LEVELS /CONTOURS — 00.00
- METER/BOUNDARY BOX
- SLUICE VALVE
- SCOUR VALVE/SCOUR VALVE CHAMBER — SCV
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- NEW ONLINE HYDRANT — H
- EXISTING FIRE HYDRANT — H
- FLOW METER KIOSK
- EXISTING FIRE HYDRANT — AV
- OUTLINE OF STRUCTURES ABOVE
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BACKFILL FOR ALL uPVC PIPES TO BE FREE FROM STONE EXCEEDING 50mm FOR 300mm ABOVE GRANULAR SURROUND.

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ALL VERTICAL STACK CONNECTIONS TO FOUL SEWER CHAMBERS TO INCORPORATE LONG RADIUS BENDS AND MUST JOIN MAIN SEWER LINE AT 45° TO DIRECTION OF FLOW.

| Rev | Date | Drn | Chk'd | Description |
|---|---|---|---|---|
| P | 28/05/2021 | E.V | G.P | Issued for Stage 2 SHD Planning. |

ISSUED FOR CO-ORDINATION 14.01.2021

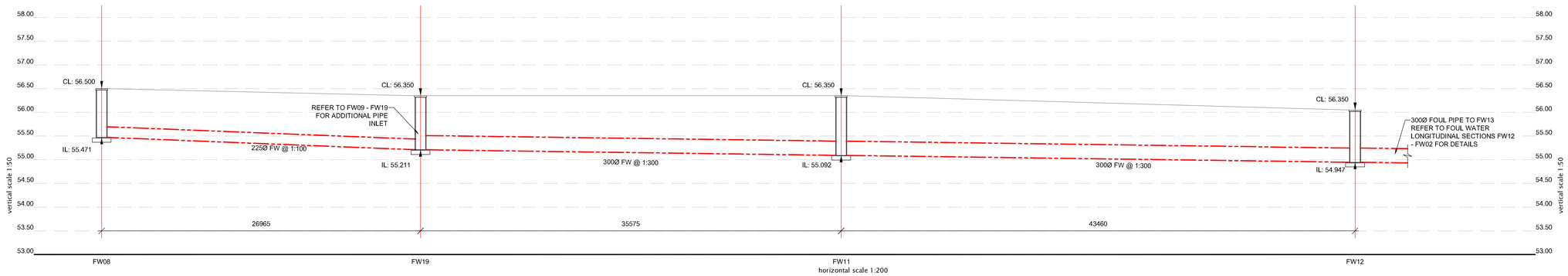

Lohan & Donnelly Consulting Engineers
13 Gardiner Place, Mountjoy Square, Dublin 1. T: 01 8787770
W: www.lohan-donnelly.com E: info@lohan-donnelly.com


| | |
|---|---|
| Project: | Residential Development at Greenhills Road, Walkinstown, Dublin 12 |
| Drawing: | Proposed Watermain Layout (2 of 2) |

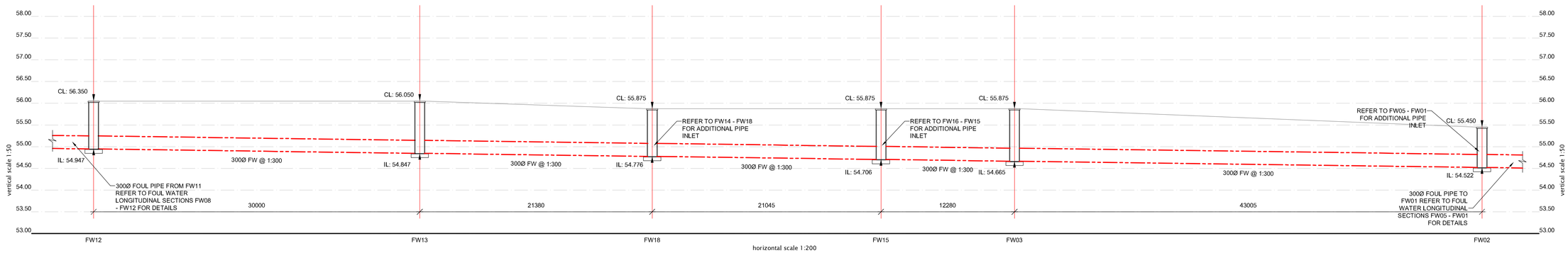
| | |
|---|---|
| Project No. | 20189 |
| Drg. No. | C01c |
| Scale | @A1 |
| Date | Feb. 2021 |
| Drawn | E.V |
| Rev. | P |

| | |
|---|---|
| Model Reference: | 20189-LDE-ZZ-ZZ-M2-SC-0001 |
| Drawing Reference: | 20189-LDE-07-00-DR-SC-1C01c |

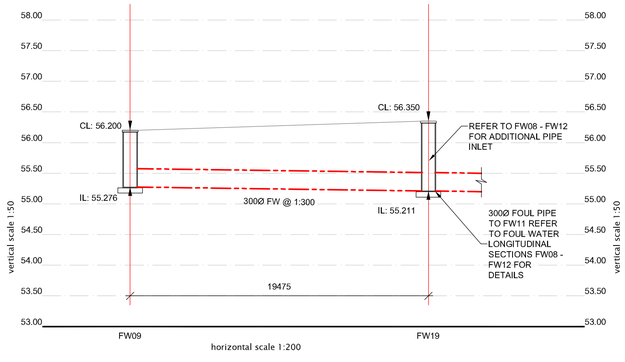
| | |
|---|---|
| Model Rev: | P01 |
| Suitability: | S01 |



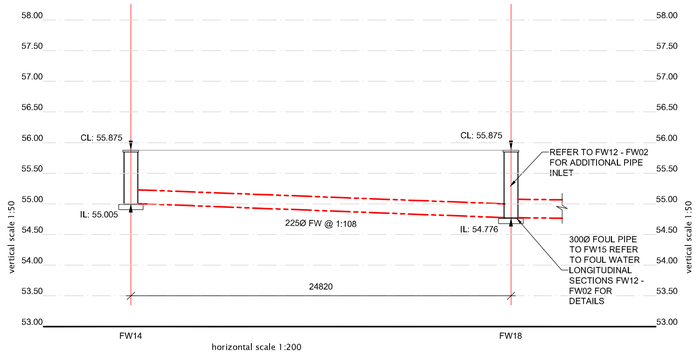

## FOUL WATER LONGITUDINAL SECTIONS
## FW08 - FW12
SCALE 1:200




## FOUL WATER LONGITUDINAL SECTIONS
## FW12 - FW02
SCALE 1:200




## FOUL WATER LONGITUDINAL SECTIONS
## FW09 - FW19
SCALE 1:200




## FOUL WATER LONGITUDINAL SECTIONS
## FW14 - FW18
SCALE 1:200

| Rev | Date | Drn | Chk'd | Description |
|---|---|---|---|---|
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| | | | | |
| D | 31/01/2021 | E.V | G.P | Issued to Irish Water for Statement of Design Acceptance. |


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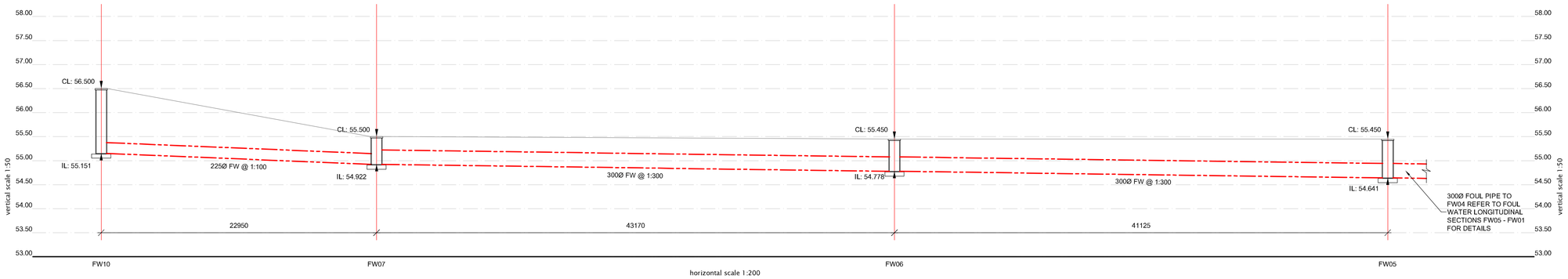
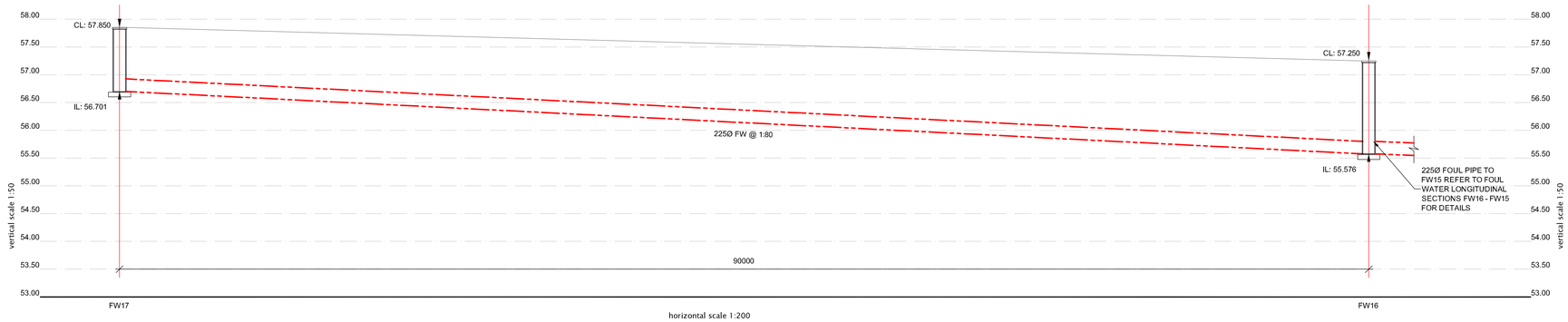
| | |
|---|---|
| Project: | Residential Development at Greenhills Road, Walkinstown, Dublin 12 |
| Drawing: | Foul Sewer Longitudinal Sections (1 of 3) |
| Model Reference: | 20189-LDE-ZZ-ZZ-M2-SC-0001 |
| Drawing Reference: | 20189-LDE-07-00-DR-SC-1C01d |

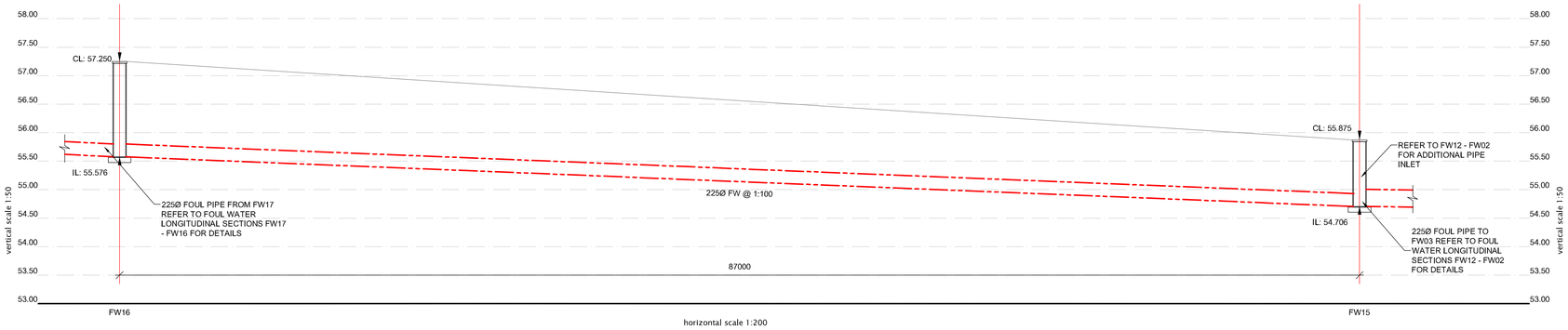
| | | | |
|---|---|---|---|
| Project No. | 20189 | Drg. No. | C01d |
| Scale | @A1 | Date | Feb. 2021 |
| Drawn | D.M | Rev. | D |
| Model Rev: | P01 | | |
| Suitability: | S01 | | |




## FOUL WATER LONGITUDINAL SECTIONS
## FW10 - FW05
SCALE 1:200




## FOUL WATER LONGITUDINAL SECTIONS
## FW17 - FW16
SCALE 1:200




## FOUL WATER LONGITUDINAL SECTIONS
## FW16 - FW15
SCALE 1:200

| Rev | Date | Drn | Chk'd | Description |
|---|---|---|---|---|
| D | 31/01/2022 | D.M | G.P | Issued to Irish Water for Statement of Design Acceptance. |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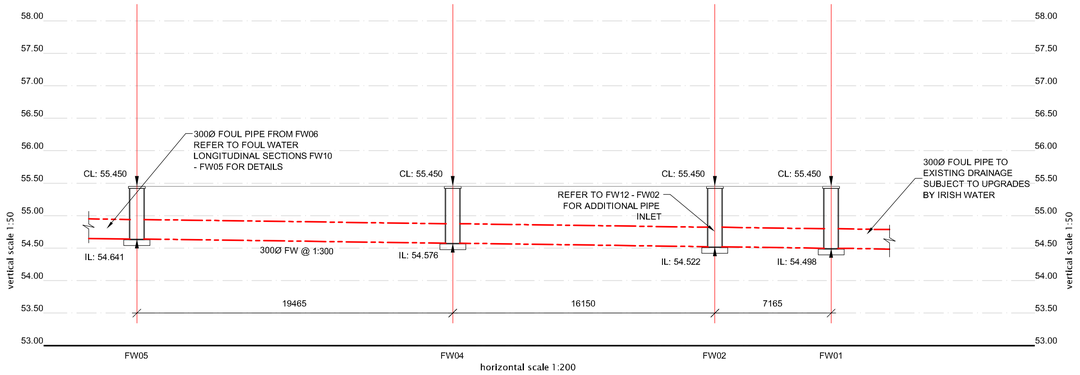
| | |
|---|---|
| Project: | Residential Development at Greenhills Road, Walkinstown, Dublin 12 |
| Drawing: | Foul Sewer Longitudinal Sections (2 of 3) |
| Model Reference: | 20189-LDE-ZZ-ZZ-M2-SC-0001 |
| Drawing Reference: | 20189-LDE-07-00-DR-SC-1C01e |

| | |
|---|---|
| Project No. | 20189 |
| Drg. No. | C01e |
| Scale | @A1 |
| Date | Feb. 2021 |
| Drawn | D.M |
| Rev. | D |
| Model Rev: | P01 |
| Suitability: | S01 |




## FOUL WATER LONGITUDINAL SECTIONS
## FW05 - FW01

SCALE 1:200

| Section | Area of Site (m2) | Number of residential units | Number of commercial units | Residential Amenity Area | Creche Unit | Q actual (m3/sec) | Q actual (l/sec) | Q actual (6DWF) (l/sec) | Diameter (m) | Pipe Falls | Radius (m) | Area (m2) | Length (m) | V actual (m/sec) | V design (m/sec) | Q design (m3/sec) | Q design (l/sec) | Spare % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | |
| FW17 - FW16 | 3911.0 | 88.7 | 1 | 0.0 | 0 | 0.000495 | 0.495 | 2.972430 | 0.225 | 80 | 0.1125 | 0.0298 | 90.0 | 0.01662 | 1.37 | 0.040833 | 40.833 | 92.72 |
| FW16 - FW15 | 7415.2 | 168.1 | 4 | 138.9 | 0 | 0.001058 | 1.058 | 6.347243 | 0.225 | 100 | 0.1125 | 0.0298 | 87.0 | 0.03549 | 1.22 | 0.036363 | 36.363 | 82.54 |
| FW08 - FW19 | 730.4 | 16.6 | 0 | 0.0 | 0 | 0.000085 | 0.085 | 0.512319 | 0.225 | 100 | 0.1125 | 0.0298 | 27.0 | 0.00286 | 1.22 | 0.036363 | 36.363 | 98.59 |
| FW09 - FW19 | 813.8 | 18.5 | 0 | 0.0 | 0 | 0.000095 | 0.095 | 0.570818 | 0.300 | 300 | 0.1500 | 0.0530 | 19.5 | 0.00180 | 0.86 | 0.045569 | 45.569 | 98.75 |
| FW19 - FW11 | 2428.5 | 55.1 | 0 | 261.7 | 0 | 0.000356 | 0.356 | 2.135592 | 0.300 | 300 | 0.1500 | 0.0530 | 35.6 | 0.00672 | 0.86 | 0.045569 | 45.569 | 95.31 |
| FW11 - FW12 | 8062.8 | 182.8 | 0 | 551.2 | 0 | 0.001094 | 1.094 | 6.565714 | 0.300 | 300 | 0.1500 | 0.0530 | 43.5 | 0.02065 | 0.86 | 0.045569 | 45.569 | 85.59 |
| FW12 - FW13 | 9571.4 | 217.0 | 0 | 767.4 | 0 | 0.001330 | 1.330 | 7.980926 | 0.300 | 300 | 0.1500 | 0.0530 | 30.0 | 0.02510 | 0.86 | 0.045569 | 45.569 | 82.49 |
| FW13 - FW18 | 10442.7 | 236.8 | 0 | 986.3 | 0 | 0.001492 | 1.492 | 8.953579 | 0.300 | 300 | 0.1500 | 0.0530 | 21.4 | 0.02816 | 0.86 | 0.045569 | 45.569 | 80.35 |
| FW14 - FW18 | 614.4 | 13.9 | 0 | 0.0 | 0 | 0.000072 | 0.072 | 0.430954 | 0.225 | 108 | 0.1125 | 0.0298 | 24.8 | 0.00241 | 1.22 | 0.036363 | 36.363 | 98.81 |
| FW18 - FW15 | 11587.3 | 262.7 | 0 | 986.3 | 0 | 0.001626 | 1.626 | 9.756428 | 0.300 | 300 | 0.1500 | 0.0530 | 21.1 | 0.03069 | 0.86 | 0.045569 | 45.569 | 78.59 |
| FW15 - FW03 | 19959.1 | 452.5 | 5 | 1125.2 | 0 | 0.002834 | 2.834 | 17.003818 | 0.300 | 300 | 0.1500 | 0.0530 | 12.3 | 0.05348 | 0.86 | 0.045569 | 45.569 | 62.69 |
| FW03 - FW02 | 21072.2 | 477.8 | 7 | 1125.2 | 1 | 0.003088 | 3.088 | 18.525544 | 0.300 | 300 | 0.1500 | 0.0530 | 43.0 | 0.05827 | 0.86 | 0.045569 | 45.569 | 59.35 |
| FW10 - FW07 | 976.5 | 22.1 | 1 | 160.7 | 0 | 0.000197 | 0.197 | 1.179495 | 0.225 | 100 | 0.1125 | 0.0298 | 30.0 | 0.00660 | 1.22 | 0.036363 | 36.363 | 96.76 |
| FW07 - FW06 | 2914.1 | 66.1 | 1 | 160.7 | 0 | 0.000423 | 0.423 | 2.538572 | 0.300 | 300 | 0.1500 | 0.0530 | 43.2 | 0.00798 | 0.86 | 0.045569 | 45.569 | 94.43 |
| FW06 - FW05 | 4660.9 | 105.7 | 1 | 160.7 | 0 | 0.000627 | 0.627 | 3.763817 | 0.300 | 300 | 0.1500 | 0.0530 | 41.1 | 0.01184 | 0.86 | 0.045569 | 45.569 | 91.74 |
| FW05 - FW04 | 5561.9 | 126.1 | 1 | 160.7 | 0 | 0.000733 | 0.733 | 4.395798 | 0.300 | 300 | 0.1500 | 0.0530 | 19.5 | 0.01383 | 0.86 | 0.045569 | 45.569 | 90.35 |
| FW04 - FW02 | 5794.1 | 131.4 | 1 | 160.7 | 0 | 0.000760 | 0.760 | 4.558669 | 0.300 | 300 | 0.1500 | 0.0530 | 16.2 | 0.01434 | 0.86 | 0.045569 | 45.569 | 90.00 |
| FW02 - FW01 | 27768.0 | 629.6 | 8 | 1285.9 | 1 | 0.003953 | 3.953 | 23.716685 | 0.300 | 300 | 0.1500 | 0.0530 | 7.2 | 0.07460 | 0.86 | 0.045569 | 45.569 | 47.95 |
| FW01 - PUBLIC | 27919.6 | 633.0 | 8 | 1285.9 | 1 | 0.003971 | 3.971 | 23.823021 | 0.300 | 300 | 0.1500 | 0.0530 | 18.0 | 0.07493 | 0.86 | 0.045569 | 45.569 | 47.72 |

## FOUL WATER PIPE FLOW CAPACITIES & VELOCITIES

SCALE 1:100

| Rev | Date | Drn | Chk'd | Description |
|---|---|---|---|---|
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| D | 31/01/2022 | D.M | G.P | Issued to Irish Water for Statement of Design Acceptance. |


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| Project: | Residential Development at Greenhills Road, Walkinstown, Dublin 12 |
| Drawing: | Foul Sewer Longitudinal Sections (3 of 3) |
| Model Reference: | 20189-LDE-ZZ-ZZ-M2-SC-0001 |
| Drawing Reference: | 20189-LDE-07-00-DR-SC-1C01f |

| | | | |
|---|---|---|---|
| Project No. | 20189 | Dng. No. | C01f |
| Scale | @A1 | Date | Feb. 2021 |
| Drawn | D.M | Rev. | D |
| Model Rev: | P01 | | |
| Suitability: | S01 | | |