Waterman Moylan
Engineering Consultants

Engineering Assessment Report

Balscadden Development, Howth, Co. Dublin

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This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015 and BS EN ISO 14001: 2015)

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Comments

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1. Introduction

1.1 Background of Report

This Engineering Assessment Report has been prepared by Waterman Moylan as part of the documentation in support of a Strategic Housing Development (SHD) application for a proposed residential development in Howth, located between the Balscadden Road, Main Street and Abbey Street.

This report assesses wastewater and surface water drainage, water supply infrastructure and the road and transportation network in the vicinity of the site, and details the criteria used to design the proposed wastewater and surface water drainage, water supply and transport networks.

1.2 Site Location and Description

The proposed development relates to lands located to the south of the Martello Tower on Balscadden Road & the former Baily Court Hotel, Main Street, Howth, County Dublin.

The subject site is bounded to the east by the Balscadden Road and by residential properties, to the west by residential and commercial buildings fronting onto Main Street and Abbey Street, and to the north by lands around Martello Tower. The overall site is approximately 1.43 Hectares, with a former leisure centre building at the northern portion of the lands. The site location is shown on the Figure below:

Figure 1 | *Site Location (Source: Google Maps)*

A topographic survey was carried out to determine the existing topography at the site. The site has two relatively flat areas, at the north and at the south, with a steep slope between the two, and with steep slopes around the boundary of the site.

The northern portion of the site is at a level generally between c.20m and c.21m OD Malin, while the southern portion of the site is at a level generally between c.33m and c.34.5m OD Malin. Levels fall away at the east of the site towards the Balscadden Road, while levels at the south of the site continue to rise. The site is higher than the adjacent Main Street and Abbey Street to the west.

1.3 Proposed Development

The development will consist of the demolition of existing structures on the proposed site including the disused sports building and the former Baily Court Hotel buildings and the construction of a residential development set out in 4 no. residential blocks, ranging in height from 2 to 5 storeys to accommodate 180 no. apartments with associated internal residential tenant amenity and external courtyards and roof terraces, 1 no. retail unit and 2 no. café/retail units.

The site will accommodate car parking spaces at basement level and bicycle parking spaces at basement and surface level. Landscaping will include new linear plaza which will create a new pedestrian link between Main Street and Balscadden Road to include the creation of an additional 2 no. new public plazas and also maintains and upgrades the pedestrian link from Abbey Street to Balscadden Road below the Martello Tower. Please see the accompanying Statutory Notices for a more detailed description.

The residential schedule of accommodation is set out in the Table below:

Description	Studio	1-Bed	2-Bed	3-Bed	Total
Block A	-	-	2	-	2
Block B	-	51	57	18	126
Block C	-	8	28	7	43
Block D	4	3	2	-	9
Total	**4**	**62**	**89**	**25**	**180**

Table 1 | *Schedule of Accommodation*

The development will include a single level basement under Block B, containing 139 car spaces, cycle parking spaces, plant, storage areas, waste storage areas and other associated facilities. Additional visitor cycle spaces are provided for at ground level.

The development includes all other ancillary site development works to facilitate construction and the provision of the basement car park, site services, piped infrastructure, a sub-station, public lighting, plant, signage, bin stores, bike stores, boundary treatments and hard and soft landscaping.

2. Foul Water Network

2.1 Existing Foul Water Network

Irish Water records for the surrounding area have been consulted as part of this assessment, and are extracted below:

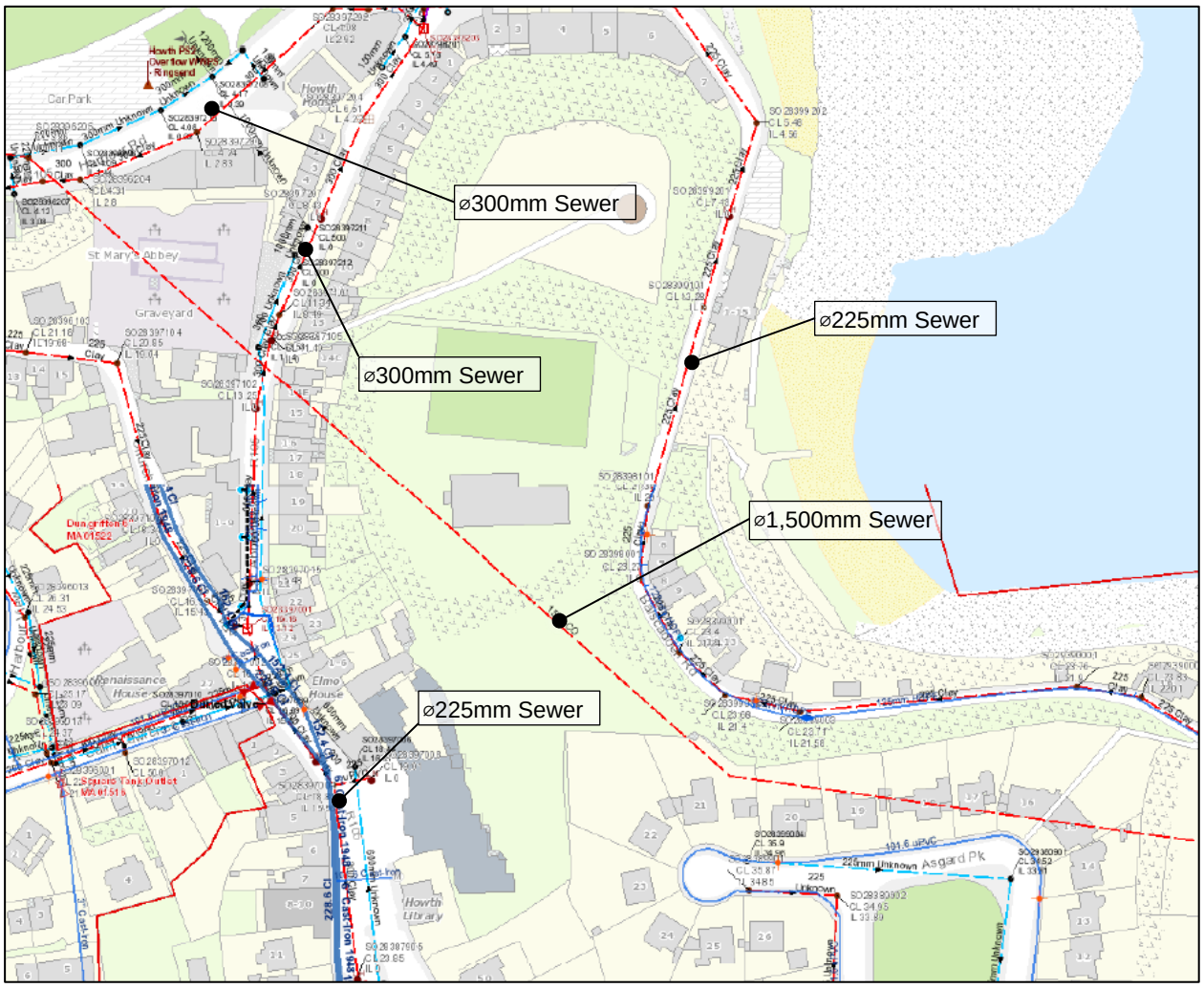


***Figure 2** | Extract of Irish Water's Wastewater Drainage Records*

There is an existing 225mm diameter foul water sewer in Main Street, continuing north along Abbey Street, to the west of the site, where it increases to 300mm. There is an existing 225mm diameter foul water sewer in Balscadden Road to the east of the site, also discharging in a northerly direction. Both sewers combine to discharge west along Harbour Road.

There is also a large 1,500mm diameter concrete wastewater sewer traversing the site.

2.2 Proposed Foul Water Network

It is proposed to discharge wastewater from the site by gravity to the existing foul water sewer in Main Street. Any internal drainage within basement areas will generally drain by gravity via slung drainage to be strapped to the underside of the ground floor slab within a dedicated service zone and by gravity below

ground to its outfall location in all other areas. The basements will not generate any foul water, and no pumping is proposed.

Irish Water issued a Confirmation of Feasibility letter for the proposal on 3 August 2021 (reference number CDS21002487), which is included in Appendix A. The letter notes that connection to the existing wastewater network is feasible subject to upgrade works. The required upgrades comprise approximately 100m of network extension, from the site to the existing 300mm sewer in Abbey Street. This upgrade is not currently on Irish Water's investment plan, and the applicant will therefore be required to fund the upgrade works.

A Statement of Design Acceptance has also been received from Irish Water for the proposed development and is included in Appendix B.

A Build-Over Agreement will be required for the 1,500mm diameter concrete wastewater sewer. Early engagement to proceed with such an agreement is recommended.

2.3 Foul Water Drainage Calculations

The calculated foul water flows at the subject development are set out in the Table below. Domestic wastewater loads have been calculated based on 2.7 persons per unit with a per capita wastewater flow of 150 litres per head per day along with a 10% unit consumption allowance, in line with Section 3.6 of the Irish Water Code of Practice for Wastewater Infrastructure. A peak flow multiplier of 6 has been used, as per Section 2.2.5 of Appendix B of the Code of Practice.

Description	Total Population	Load per Capita	Daily Load	Total DWF	Peak Flow
	No. People	*l/day*	*l/day*	*l/s*	*l/s*
Block A	5.4	150	891.0	0.010	0.062
Block B	340.2	150	56,133.0	0.650	3.898
Block C	116.1	150	19,156.5	0.222	1.330
Block D	24.3	150	4,009.5	0.046	0.278
Total	**486.0**	**-**	**80,190.0**	**0.928**	**5.569**

Table 2 | *Calculation of Total Foul Water Flow from the Development*

The total dry weather flow from the development is 0.928 l/s, with a peak flow of 5.569 l/s.

2.4 Foul Water Drainage – General

Foul water sewers will be constructed strictly in accordance with Irish Water requirements. No private drainage will be located within public areas.

Drains will be laid to comply with the requirements of the latest Building Regulations, and in accordance with the recommendations contained in the Technical Guidance Document H.

3. Surface Water Network

3.1 Existing Surface Water Network

The subject site is generally a vacant site with an abandoned former leisure centre building in the north and no natural watercourses running through the site. Surface water currently infiltrates the ground, and any excess surface water discharges to the adjacent roads and ultimately to the existing public drainage network.

The public drainage network comprises of an existing 600mm diameter sewer in Main Street, continuing north along Abbey Street.

3.2 Proposed Surface Water Network and SuDS Strategy

It is proposed to discharge surface water from the site by gravity to the existing surface water sewer in Main Street.

The proposed development will be designed to incorporate best drainage practice. Surface water discharging to the public network will be restricted to the greenfield equivalent runoff rate via a Hydrobrake or similar approved flow control device. The surface water network will be designed to accommodate the 1-in-5 year storm, with attenuation storage provided for the 1-in-100 year storm. Section 3.3, below, sets out the methodology used in determining the existing greenfield runoff rates and calculating attenuation storage requirements for the site. The relevant calculations are included in full in Appendix C.

It is proposed to incorporate a Storm Water Management Plan through the use of various SuDS techniques to treat and minimise surface water runoff from the site. The methodology involved in developing a Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual (Ciria C753). Based on three key elements – Water Quantity, Water Quality and Amenity – the targets of the SuDS train concept have been implemented in the design, providing SuDS devices for each of the following:

- Source Control
- Site Control
- Regional Control

3.2.1 Source Control

Source control measures seek to detain or infiltrate runoff as close as possible to the point of origin. The use of such source control devices reduces the peak runoff rate and attenuates flows, thus reducing stress on downstream facilities. Infiltration ensures that pollutants are treated where practicable. It is proposed to introduce several source control measures, including the following:

Green Roof:

Green roofing is proposed at portions of each block's roof area. The substrate and the plant layers in a sedum roof absorb large amounts of rainwater and release it back into the atmosphere by transpiration and evaporation. They also filter water as it passes through the layers, so the run-off, when it is produced, has fewer pollutants. Rainfall not retained by green roofs is detained, effectively increasing the time to peak and slowing peak flows.

Permeable Paving:

It is proposed to introduce permeable paving in courtyards and along pedestrian circulation paths to facilitate infiltration of surface water from paved areas. The goal of permeable paving is to control

stormwater at the source to reduce runoff. In addition to reducing surface runoff, permeable paving has the dual benefit of improving water quality by trapping suspended solids and filtering pollutants in the substrata layers.

Filter Drains:

Filter drains are proposed around the perimeter of buildings, consisting of perforated pipes surrounded in filter stone. The filter drains will provide infiltration, optimise the retention time and provide quality improvement to the storm water runoff, in particular the first flush from hardstanding areas.

Bioretention Gardens and Planters:

Intensive bioretention gardens and planters are proposed at some public open spaces. These planted areas can absorb large amounts of rainwater and release it back into the atmosphere by transpiration and evaporation. They can also filter water as it passes through the layers, helping to treat pollutants.

3.2.2 Site Control

Site control comprises runoff and treatment installations to serve individual developments.

Tree Pits:

At the subject site, it is proposed to introduce roadside tree pits. Trees can help control storm water runoff because their leaves, stems, and roots slow rain from reaching the ground and capture and store rainfall to be released later. Trees help to attenuate flows, trap silts and pollutants, promote infiltration and prevent erosion. Incorporating tree planting offers multiple benefits, including attractive planting features, improved air quality and increased biodiversity whilst helping to ensure adaptation to climate change.

3.2.3 Regional Control

Regional control deals with runoff on a catchment scale rather than at source level.

Attenuation Storage and Flow Control:

Attenuation storage for up to the 1-in-100 year storm will be provided in a privately managed and maintained underground attenuation tank.

A Hydrobrake or similar approved flow control device will be used to limit the discharge to the greenfield equivalent runoff rate.

3.3 Interception or Treatment Storage and Attenuation Storage

As noted above, the methodology involved in developing the Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual. Appendix E of the Greater Dublin Strategic Drainage Study (GDSDS) sets out criteria for determining the provision of interception or treatment storage, attenuation storage and long term storage at a development site. These calculations are summarised below:

3.3.1 Criterion 1: River Water Quality Protection

Criterion 1.1: Interception

The Greater Dublin Strategic Drainage Study (GDSDS) states that approximately 30% to 40% of rainfall events are sufficiently small that there is no measurable runoff from greenfield areas into the receiving waters. These events are generally considered as the first 5mm of rainfall. Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 5mm of rainfall yields the following:

Paved surfaces connected to drainage system	*14300m² x 0.6 x 1 =* 8,580.00m²	*14,300m² site area* *60% of the site is paved* *100% of the paved area*
Volume of Interception Storage	*8580m² x 5mm x 0.8 =* **34.32m³**	*Paved area directly drained* *5mm rainfall depth* *80% paved runoff factor*

Table 3 | *Interception Calculation*

The required interception volume for the site is approximately 34.32m³.

Criterion 1.2: Treatment Volume

For events larger than 5mm, and in situations where interception storage cannot be provided, surface water runoff treatment is provided in accordance with the CIRIA design manual C521.

Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 15mm of rainfall:

Paved surfaces draining to river	*14300m² x 0.6 x 1 =* 8,580.00m²	*14,300m² site area* *60% of the site is paved* *100% of the paved area*
Volume of Treatment Storage	*8580m² x 15mm x 0.8 =* **102.96m³**	*Paved area directly drained* *15mm rainfall depth* *80% runoff from paved surfaces*

Table 4 | *Treatment Volume Calculation – Northern Portion of Site 4*

The required treatment volume is approximately 102.96m³. The required interception and treatment volumes will be achieved through the use of source and site control SuDS devices as described in Section 3.2 above.

3.3.2 Criterion 2: River Regime Protection

Attenuation storage is provided to limit the discharge rate from the site into the public network. As per the GDSDS, the required attenuation volume is calculated assuming 100% runoff from paved areas, and has been calculated for the 1-year, 30-year and 100-year return periods, identifying the critical storm for each – refer to the calculations included in Appendix C.

Site Investigations have been carried out at the site by Site Investigations Ltd., and the Site Investigation Report is included in Appendix D. The fieldwork carried out comprised of 3 No. cable percussive boreholes and 3 No. trial pits, and laboratory testing included particle size analysis. The investigations revealed that the ground on the site primarily comprises silty, gravelly sand. Sandy ground allows for high groundwater permeability, and as such the attenuation calculations use a Soil Type 4 (SPR Index 0.47). The calculations use a Standard Average Annual Rainfall (SAAR) value of 902mm, taken from HR Wallingford's SuDS map.

Based on these calculations, the required attenuation storage volume for the site is approximately 424m³. This volume is sufficient for the 1-in-100 year storm, accounting for a 20% increase due to climate change.

The required attenuation storage is to be provided in two underground tanks, one located adjacent to Block B and the other adjacent to the portion of the building between Blocks C and D. Surface water runoff will be restricted via a hydro-brake or similar approved flow control device, with the cumulative discharge from the site limited to the greenfield equivalent rate of 9.3l/s, before discharging to the public combined network.

3.3.3 Criterion 3: Levels of Service

There are four criteria for levels of service. These are:

Criterion 3.1: No external flooding except where specifically planned (30-year high intensity rainfall event).

Criterion 3.2: No internal flooding (100-year high intensity rainfall event).

Criterion 3.3: No internal flooding (100-year river event and critical duration for site storage).

Criterion 3.4: No flood routing off site except where specifically planned (100-year high intensity rainfall event).

Both internal and external flooding have been assessed in the Flood Risk Assessment report which accompanies this Engineering Assessment report. The Flood Risk Assessment has been carried out in accordance with the *DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management* published in November 2009.

The assessment identifies the risk of both internal and external flooding at the site from various sources and sets out mitigation measures against the potential risks of flooding. The sources of possible flooding assessed in the report include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical errors.

As a result of the flood risk management and mitigation measures proposed, the residual risk of internal or external flooding for the 30-year and 100-year flood events is low, and accordingly all four of the above criteria have been met. Please refer to the accompanying Flood Risk Assessment report for the full analysis of the flood risk at the subject site.

3.3.4 Criterion 4: River Flood Protection

The long term storage volume is a comparison of pre- and post-development runoff volumes. The objective is to limit the runoff discharged after development to the same as that which occurred prior to development.

Of the three methods described in the GDSDS for establishing River Flood Protection by comparison of the pre- and post-development runoff volumes, (Criteria 4.1, 4.2 and 4.3 respectively), Criteria 4.3 is selected for use as the most practical criteria at this stage in the design.

The Criteria 4.3 approach is for all runoff to be limited to either Q_{BAR} or to 2 l/s/Ha, whichever is the greater. The proposed drainage system includes a flow control device to ensure that the discharge rate is limited to the greenfield equivalent and ample attenuation is provided for the 1-in-100 year storm, accounting for a 20% increase due to climate change.

The extra runoff volume of the development runoff over greenfield runoff, Vol_{xs}, as calculated in Appendix C is approximately 124m^3. Note that as stated in the GDSDS, this volume is not additional to the attenuation storage volume but is effectively an element of it.

3.4 Surface Water – General

Surface water sewers will generally consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6) and laid strictly in accordance with Fingal County Council requirements for taking in charge. It is intended that all sewers within the public domain will be handed over to Fingal County Council for taking in charge.

All private outfall manholes will be built in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. No private drainage will be located within public areas.

Drains will be laid in accordance with the requirements of the Building Regulations, Technical Guidance Document H.

3.5 Flood Risk Assessment

A site-specific Flood Risk Assessment has been carried out for the proposed development and accompanies this submission under separate cover.

4. Water Supply Network

4.1 Existing Water Supply Network

Irish Water records for the surrounding area have been consulted as part of this assessment, and are extracted below:

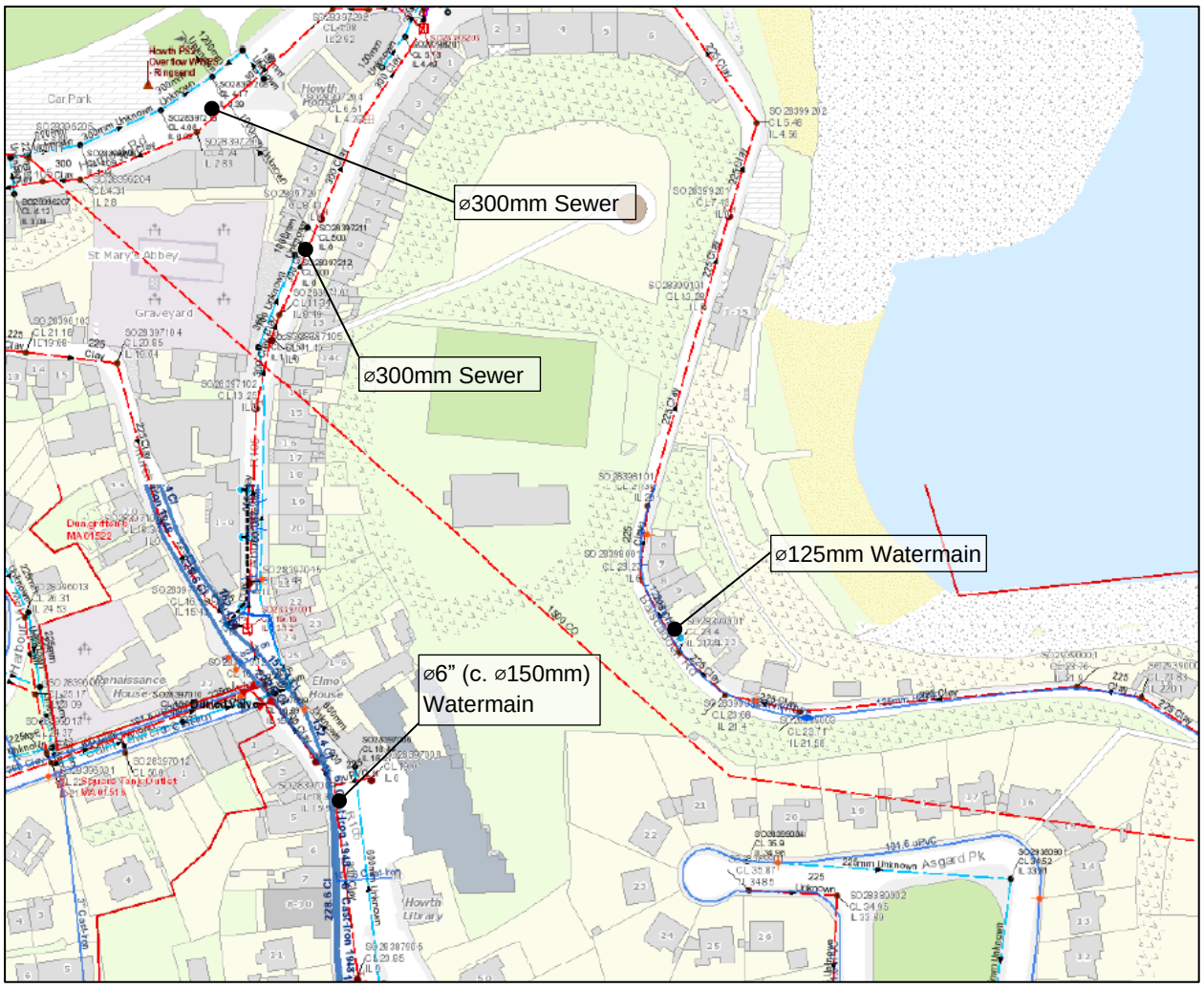


Figure 3 | *Extract of Irish Water's Water Supply Service Records*

There is an existing 6" diameter (approximately 150mm) watermain adjacent to the subject site in Main Street / Abbey Street. There is an existing 125mm diameter watermain on Balscadden Road, terminating near the mid-point of the subject site.

4.2 Proposed Water Supply Network

It is proposed to supply water to the site via a new connection to the existing watermain in Main Street adjacent to the proposed site entrance.

Irish Water issued a Confirmation of Feasibility letter for the proposal on 3 August 2021 (reference number CDS21002487), which is included in Appendix A. The letter notes that connection to the existing water supply network is feasible without any upgrades to the existing infrastructure.

A Statement of Design Acceptance has also been received from Irish Water for the proposed development and is included in Appendix B.

4.3 Water Supply Network Calculations

The calculated water demand at the subject development is set out in the below table. The average domestic demand has been established based on an average occupancy ratio of 2.7 persons per dwelling with a daily domestic per capita consumption of 150 litres per head per day and with a 10% allowance factor. The average day/peak week demand has been taken as 1.25 times the average daily domestic demand, while the peak demand has been taken as 5 times the average day/peak week demand, as per Section 3.7.2 of the Irish Water Code of Practice for Water Infrastructure.

Description	Total Population	Water Demand	Average Demand	Average Peak Demand	Peak Demand
	No. People	*l/day*	*l/s*	*l/s*	*l/s*
Block A	5.4	891.0	0.010	0.013	0.064
Block B	340.2	56,133.0	0.650	0.812	4.061
Block C	116.1	19,156.5	0.222	0.277	1.386
Block D	24.3	4,009.5	0.046	0.058	0.290
Total	**486.0**	**80,190.0**	**0.928**	**1.160**	**5.801**

Table 5 | *Calculation of Water Demand for the Development*

The average demand for the development is 0.928 l/s, with a peak demand of 5.801 l/s.

4.4 Water Supply – General

All watermains will be laid strictly in accordance with Irish Water requirements for taking in charge.

Valves, hydrants, scour and sluice valves and bulk water meters will be provided in accordance with the requirements of Irish Water.

5. Roads and Transport Network

5.1 Existing Road Layout

The site is bounded to the east by the Balscadden Road, to the west by residential and commercial buildings fronting onto Main Street and Abbey Street, and to the north and south by greenfield lands. The subject site can currently be accessed from the Balscadden Road, as shown in the figure below:

Figure 3 | *View of Site from Balscadden Road (Source: Google Maps)*

Balscadden Road is a 1-way south-east bound road, continuing east towards the Howth cliffs. It connects with the southbound Kilrock Road, which continues to the Nashville Road to connect back with the R105.

The main access to the site will be provided from the R105 (Main Street). This is the main road looping from Sutton Cross around the Howth peninsula.

5.2 Existing Public Transport Network

5.2.1 Rail

The entire site is within 1km of the Howth Railway Station. The walking distance from the proposed site entrance at the west of the development is approximately 800m, equivalent to a c. 10-minute walk.

The Howth Railway Station is served by DART and Dublin Commuter routes, and operates from 5:45am to 00:30am Monday to Saturday, and from 8:30am to 00:30am on Sundays. Service is provided from Howth to Greystones via Dublin City Centre.

5.2.2 Bus

The site is served by bus Routes 6 and H3, both operated by Dublin Bus. These routes were launched on 27 June 2021 as part of Phase 1 of the BusConnects scheme, replacing the old 31 and 31A bus route service to Howth.

The closest bus stops are southbound Stop ID 560 and northbound Stop ID 575, which are located on Main Street (R105) south-west of the site, just outside the proposed site access. Both of these stops are served by Routes 6 and H3.

Both routes operate from Howth to Abbey Street Lower in Dublin City Centre. Route 6 travels via Howth Station, Howth Summit, Sutton Cross, Killester and Fairview, whilst Route H3 travels via Howth Summit, Raheny, Killester and Fairview.

5.2.3 Bicycle Sharing

The Bleeper Bike scheme is Ireland's first stationless bike sharing scheme, and has been implemented widely in Dublin. Stationless bikes are equipped with a fixed smart lock that controls usage of the bike by communicating with the app. Bleeper Bikes do not require custom build docking bays; however, they must be parked at designated bike racks.

There are two Bleeper Bike racks in Howth, one at East Pier, approximately 400m (c. 5-minute walk) from the proposed site entrance on Main Street, and the other at Howth Railway Station, approximately 800m (C. 10-minute walk) from the proposed site entrance.

5.2.4 Car Sharing

Car Sharing contributes to sustainable travel modes by decreasing car ownership, limiting private car journeys to occasions when alternative modes of transport are unsuitable. The following outlines the benefits of car sharing:

- Each car can be accessed by multiple drivers, 24/7, and is bookable at a moment's notice;
- Reduces reliance on the private car;
- Reduce the need for car parking spaces;
- Helps reduce the number of cars on the road, traffic congestion, noise and air pollution, frees up land traditionally used for parking spaces, and increases use of public transport, walking and cycling; and
- The vehicles used are newer than the average car, and therefore are generally more environmentally friendly and safer.

Each car sharing vehicle that is placed in a community has the potential to replace the journeys of up to 15 private cars.

There is a GoCar Base located at the Howth Railway Station, approximately a 10-minute walk from the subject site.

5.3 Proposed Road Layout

vehicular access is proposed from west via Main Street (R105), which, via an internal road, will provide access to the Block B basement car park. Pedestrian and cycle access are from Main Street and from Balscadden Road, with an internal pedestrian/cycle route through the centre of the development, running south-west to north-east between the southern and northern portions of the site, connecting Main Street

with the Balscadden Road. While this proposed through-route is not intended for frequent vehicular use, it has been designed to facilitate emergency vehicles.

5.3.1 Servicing

The proposed development will be serviced from the entrance from Main Street. Sufficient turning space is provided to allow a refuse vehicle to turn around at the top of the basement ramp – refer to the accompanying drawing no. 21-032-P016 Swept Path Layout for Refuse Vehicle. The management company will arrange for bins to be brought to the top of the ramp prior to bin collection.

This turning area can also be utilised by other delivery vehicles. If large delivery vehicles are required, the through-route to Balscadden Road can be utilised. This requires the proposed bollard to be dropped, and as such will require advance notice and agreement with the management company. This is anticipated to be infrequent, with the majority of delivery and other service vehicles utilising the turning/set-down area provided.

5.3.2 DMURS Statement

Given that the proposed development is primarily an infill site with little new road infrastructure proposed, a standalone DMURS Statement was not deemed to be necessary, and the DMURS Statement is instead included below.

Waterman Moylan Consulting Engineers considers that the proposal is consistent with the principles and guidance outlined in the Design Manual for Urban Roads and Streets (DMURS). Public areas fronting and within the proposed development are designed by a multidisciplinary design team to accommodate pedestrians and cyclists in accordance with the appropriate principles and guidelines set out in DMURS. Outlined below are some of the specific design features that have been incorporated within the proposed scheme with the objective of delivering a design that is in full compliance with DMURS.

The proposed development has been designed with pedestrian and cyclist connections onto Main Street and Balscadden Road. In this regard, footpaths are provided throughout the development, including routes through the development connecting Main Street to Balscadden Road. Vehicular access is provided via the Main Street entrance only.

Active edges are recommended in DMURS to enliven the edges of the street, creating a more interesting and engaging environment. An active frontage is achieved along Main Street and Balscadden Road with access points and commercial units fronting the road that ensure the street is overlooked and generate pedestrian activity as people come and go from buildings.

The proposed access road will be designed as a Local Street in accordance with the classifications set out in Section 3.2.1 of the Design Manual for Urban Roads and Streets (DMURS).

Suitable sightlines are provided at the Main Street site entrance, which as noted above will be the main vehicular access point, ensuring that adequate unobscured visibility is provided as vehicles make turning manoeuvres. A Stopping Sight Distance of at least 23m is provided in both directions, in accordance with Section 4.4.4 of DMURS.

Suitable sightlines are also provided at the exit onto Balscadden Road, ensuring that cyclists, emergency vehicles and any occasional delivery vehicles that avail of this exit point can do so safely. Although Balscadden Road is a 1-way road, with traffic flowing in a southerly direction, adequate sightlines are provided in both directions. This exit onto Balscadden Road has been designed to accommodate large emergency vehicles, with a 6m radius corner.

Refer to the accompanying Sightlines Layout drawing no. 21-032-P018.

5.4 Car Parking

5.4.1 Fingal Development Plan

The Fingal Development Plan includes standards which limit the amount of car parking at new developments. These car parking standards are set out in Table 12.8 of the Development Plan, and the relevant standards for apartments are extracted below (note that no differentiation is made between 1-bed and studio apartments):

Description	Resident's Parking	Visitor Parking
1-Bed Apt.	1	1 space per 5 units
2-Bed Apt.	1.5	1 space per 5 units
3-Bed Apt.	2	1 space per 5 units

Table 6 | *Fingal Development Plan Car Parking Standards for Apartments*

Note that the car parking standards above are not maximum or minimum requirements, but are norms for typical apartment developments. Parking requirements will vary between developments and should be addressed on a case-by-case basis.

5.4.2 Sustainable Urban Housing: Design Standards for New Apartments

The Department of Housing, Local Government and Heritage published the document "*Sustainable Urban Housing: Design Standards for New Apartments*" in December 2020. This document states that planning authorities must consider a reduced overall car parking standard and apply an appropriate maximum car parking standard for intermediate urban locations, and that in larger-scale and higher-density developments, comprising wholly of apartments in more central locations that are well served by public transport, the default policy is for car parking provision to be minimised, substantially reduced or wholly eliminated in certain circumstances.

5.4.3 Proximity of Amenities

The proposed development is located in the centre of Howth, with the main access to the site from Main Street. In the immediate vicinity of the site entrance, within a 1-minute walk, there are convenience grocery stores, a post office, pharmacies, bars, restaurants and cafés, a hair studio, a church, and various other businesses and amenities. Along Harbour Road, a few minutes' walk from the development, are various more restaurants and bars. The site is also located in close proximity to popular cliff walks around Howth, to Deer Park Golf Club and to the Howth Yacht Club.

5.4.4 Proximity of Public Transport

As set out in Section 5.2, above, the proposed development is well served by public transport services:

- The Howth Railway Station is a c.10-minute walk from the site and is served by DART and Dublin Commuter routes, providing frequent service from Howth to Greystones via Dublin City Centre.
- Dublin Bus Routes 6 and H3, launched as part of Phase 1 of the BusConnects scheme, have stops located on Main Street (R105) south-west of the site, just outside the proposed site access, with both routes operating from Howth to Abbey Street Lower in Dublin City Centre. Route 6 travels via Howth Station, Howth Summit, Sutton Cross, Killester and Fairview, whilst Route H3 travels via Howth Summit, Raheny, Killester and Fairview.

- There are two Bleeper Bike racks in Howth, one at East Pier, approximately 400m (c. 5-minute walk) from the proposed site entrance on Main Street, and the other at Howth Railway Station, approximately 800m (C. 10-minute walk) from the proposed site entrance.
- There is a GoCar Base located at the Howth Railway Station, approximately a 10-minute walk from the subject site.

Residents have various options to travel by public transport to a range of destinations throughout Dublin, including local destinations in and around Howth and destinations in Dublin City Centre.

5.4.5 Proposed Car Parking

Given the density of the proposed residential development, the urban setting of the development, the proximity of amenities, and given the close proximity of the Howth Railway Station, the adjacent bus stops, Bleeper Bike stands and a GoCar car-sharing base, it is proposed to provide a reduce car parking ratio in accordance with the new national guidelines set out in *Sustainable Urban Housing: Design Standards for New Apartments*. It is proposed to provide 139 no. car parking spaces, including 7 no. accessible spaces, at a ratio of c.0.77 spaces per apartment. If there is sufficient demand, car parking spaces within the development can also be reallocated for a Car Sharing space with GoCar or a similar car sharing service.

5.5 Bicycle Parking

The Fingal Development Plan sets out bicycle parking standards for new developments. These bicycle parking standards are set out in Table 12.9 of the Development Plan, and the relevant standard for apartments is extracted below (note that no differentiation is made between 1-bed and studio apartments):

Description	Bicycle Parking Norm		No. of Units Proposed	Required Parking
	Resident's Parking	*Visitor Parking*		
1-Bed Apt.	1	1 space per 5 units	66	79
2-Bed Apt.	2	1 space per 5 units	89	196
3-Bed Apt.	3	1 space per 5 units	25	80
Total	**-**	**-**	**180**	**355**

Table 7 *| Fingal Development Plan Bicycle Parking Standards*

Sustainable Urban Housing: Design Standards for New Apartments states that planning authorities must ensure new development proposals in central urban and public transport accessible locations, which feature appropriate reductions in car parking provision, are at the same time comprehensively equipped with high quality cycle parking and storage facilities for residents and visitors.

This document recommends a general minimum standard of 1 cycle storage space per bedroom, which conforms with the Fingal Development Plan, but gives an increased visitor parking standard of 1 space per 2 residential units. Applying this higher standard yields a cycle parking requirement of 410 spaces, as set out in the table below:

Description	Bicycle Parking Norm		No. of Units Proposed	Required Parking
	Resident's Parking	*Visitor Parking*		
1-Bed Apt.	1	1 space per 2 units	66	99
2-Bed Apt.	2	1 space per 2 units	89	223
3-Bed Apt.	3	1 space per 2 units	25	88
Total			**180**	**410**

Table 8 | *Sustainable Urban Housing: Design Standards for New Apartments Bicycle Parking Standards*

The proposed development will include 410 no. bicycle spaces for residents and visitors, in accordance with *Sustainable Urban Housing: Design Standards for New Apartments.* Cycle storage will be provided in dedicated cycle parking rooms located at the ground floor and basement level, within the building footprint, with direct access from outdoor areas. In total, there are 290 bicycle parking spaces proposed at the basement level, and 120 spaces at ground level.

Appendices

A. Irish Water Confirmation of Feasibility Letter

Stephen Dent-Neville

Waterman Moylan,
Eastpoint Business Park,
Block S, Alfie Byrne Road
Dublin 3
Co. Dublin
D03H3F4

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

3 August 2021

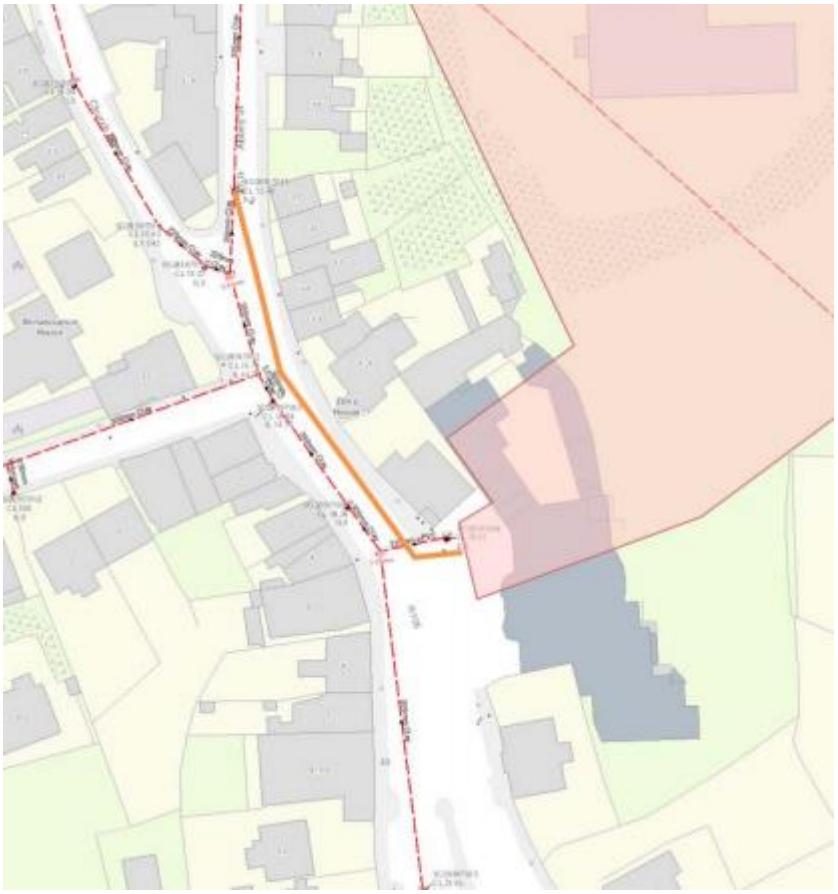
Re: CDS21002487 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 195 units at Balscadden, Howth, Dublin

Dear Sir/Madam,

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

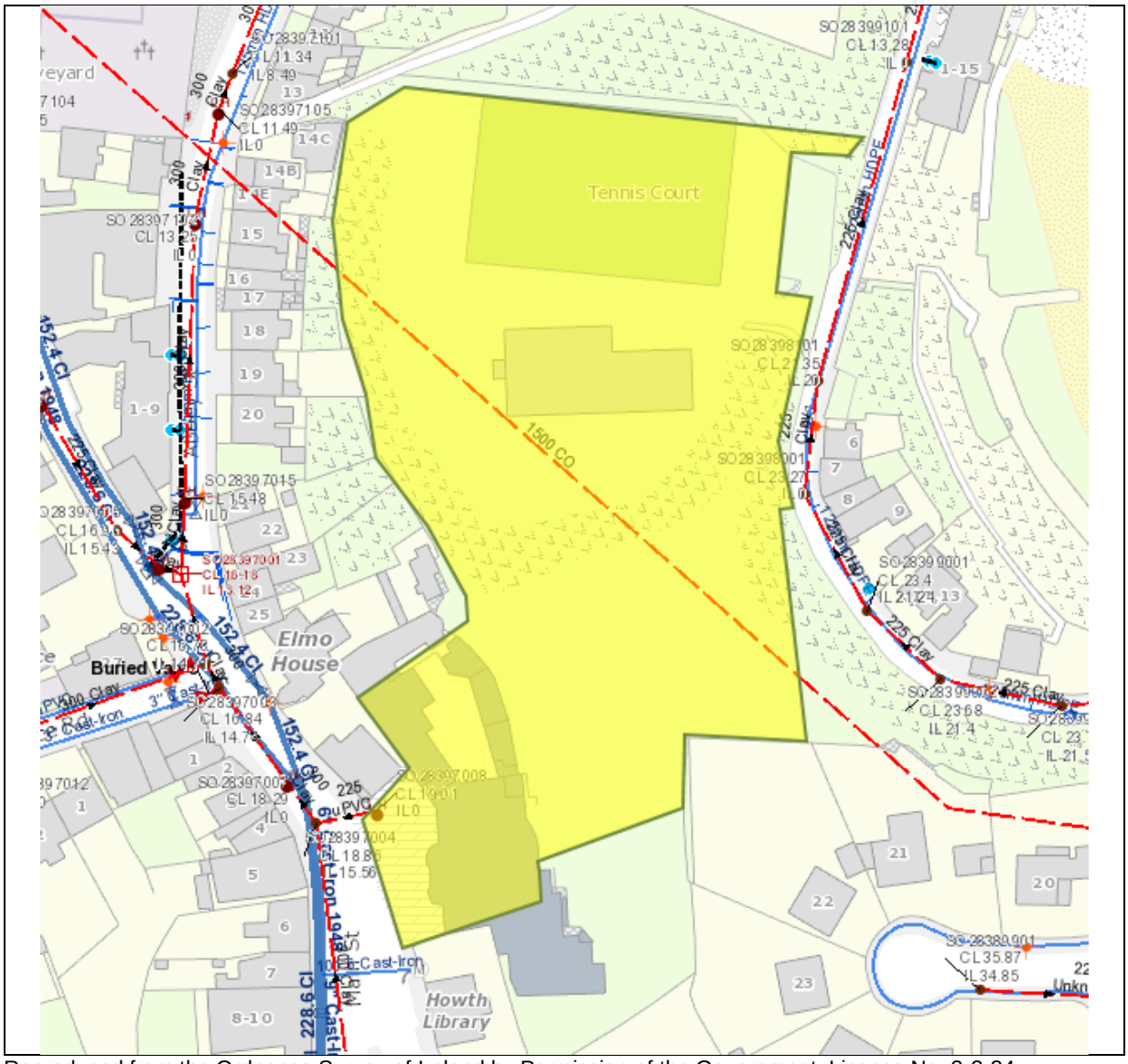
SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	The Development can be supplied from 9'' CI main in Main St.
Wastewater Connection	Approximately 100m network extension, from the site to the existing 300mm sewer in Abbey St. (amber line in the map below), will be required for the connection. These extension works are not currently on Irish Water investment plan therefore, the applicant will be required to fund these local upgrades.



The proposed Development indicates that Irish Water assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. For design submissions and queries related to build near or over, please contact IW Diversion Team via email address diversions@water.ie

The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.

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



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

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

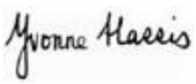
General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**

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

If you have any further questions, please contact Marina Byrne from the design team via email mzbyrne@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

B. Irish Water Statement of Design Acceptance

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

Stephen Dent-Neville
Eastpoint Business Park
Block S
Alfie Byrne Road
Dublin 3, Co. Dublin D03H3F4

14 February 2022

Re: Design Submission for Balscadden, Howth, Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS21002487

Dear Stephen Dent-Neville,

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: Marina Byrne
Phone: 01 89 25991/ 087619321
Email: mzbyrne@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- [21-032-P030 Proposed Watermain Layout]
- [21-032-P029 Proposed Foul Drainage Longitudinal Sections, 21-032-P020 Proposed Drainage Layout]

*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.

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEBSITE AT WWW.WATER.IE/CONNECTIONS/DEVELOPER-SERVICES/ WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE.

4. ALL PROPOSED PUBLIC STORM WATER DRAINAGE WORKS TO BE IN ACCORDANCE WITH FINGAL COUNTY COUNCIL'S REQUIREMENTS FOR TAKING IN CHARGE AND IN ACCORDANCE WITH THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS.

5. ALL PROPOSED PUBLIC FOUL WATER DRAINAGE WORKS TO BE IN ACCORDANCE WITH IRISH WATER REQUIREMENTS.

6. ALL PRIVATE DRAINAGE WORKS SHALL BE IN ACCORDANCE WITH THE BUILDING REGULATIONS PART H.

7. ALL COVER LEVELS ARE INDICATIVE ONLY AND SHOULD BE SET TO SUIT THE FINISHED ROAD OR PAVED LEVEL. LEVELS IN REAR GARDENS HAVE BEEN ASSUMED AS STRAIGHT GRADE TO ADJACENT BOUNDARY FROM FFL – 150mm. EXTERNAL LEVELS TO BE CONFIRMED BY ARCHITECT

GRAVITY SEWER PIPE MATERIAL TYPES

WASTEWATER PIPE MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 3.13 OF THE IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE.

THE TYPES AND FITTINGS OUTLINED HEREIN SHALL BE USED IN THE CONSTRUCTION OF THE GRAVITY SEWERS. PIPE MATERIAL SHOULD NOT CHANGE BETWEEN MANHOLES. THE LIST BELOW DOES NOT APPLY TO PIPES INSTALLED BY PIPE JACKING OR MICRO TUNNELLING.

CONCRETE: CONCRETE SEWER PIPES WITH SPIGOT AND SOCKET JOINTS AND RUBBER RING FITTINGS SHALL COMPLY WITH IS EN 1916 (2002), BS 5911, PART 1

(2002 –2010) AND IS 6 (2004) OR EQUIVALENT STANDARD, STRENGTH CLASS 120 WITH MINIMUM CRUSHING LOADS IN ACCORDANCE WITH TABLE 8 OF

BS 5911–1 (20022010).

ALL PIPES AND FITTINGS SHALL HAVE GASKET TYPE JOINTS OF SPIGOT AND SOCKET OR REBATED FORM (PIPE DIAMETERS 225MM AND ABOVE).

THERMOPLASTIC STRUCTURED WALL PIPES: THERMOPLASTIC STRUCTURED WALL PIPES SHALL COMPLY WITH THE PROVISIONS OF IS EN 13476 (2007/2009). PIPES TO BE OF STIFFNESS CLASS 8KN/M2 AND TO BE CAPABLE OF DEMONSTRATING A JETTING RESISTANCE OF 2,600 PSI (180 BAR) WITHOUT DAMAGE WHEN TESTED IN ACCORDANCE WITH SECTION 3.3 OF WIS 4–35–01 (2008). (SEWER DIAMETERS 150MM UP TO 450MM, SERVICE CONNECTIONS OF 100MM DIAMETER).

UNPLASTICISED PVC: UNPLASTICISED PVC PIPES AND FITTINGS SHALL COMPLY WITH THE PROVISIONS IS EN 1401 2009/2012. PIPES TO BE APPLICATION AREA CODE "UD", STIFFNESS CLASS 8KN/M2. PROVISION FOR JETTING SHALL BE BASED ON THE WRC SEWER JETTING CODE OF PRACTICE, JUNE 1997. PIPES TO BE CAPABLE OF RESISTING A MAXIMUM JETTING PUMP PRESSURE OF 2,600PSI (180 BAR) WITHOUT DAMAGE. (SEWER DIAMETERS 150MM UP TO 450MM, SERVICE CONNECTIONS OF

100MM DIAMETER);

NOTES: THE USE OF ALTERNATIVE PIPE TYPES AND MATERIALS WILL REQUIRE THE PRIOR WRITTEN AGREEMENT OF IRISH WATER.

WHERE 1.2m COVER TO FOUL WATER PIPE SOFFIT IS NOT ACHIEVABLE IN ROADWAYS, CONCRETE SURROUND SHALL BE PROVIDED IN ACCORDANCE WITH STD–WW–08 OF WASTEWATER INFRASTRUCTURE STANDARD DETAILS.

SERVICE LAYOUT DISTANCES:

HORIZONTAL AND VERTICAL SERVICE LAYOUT DISTANCES SHALL BE AS PER IRISH WATER STANDARD DETAIL STD–WW–05.

THE EXTERNAL FACE OF MANHOLES SHALL BE AT LEAST 0.5m FROM KERB LINE.

RESTRICTIONS ON PLANTING:

PLANTING ADJACENT TO WASTEWATER INFRASTRUCTURE SHALL BE IN COMPLIANCE WITH IRISH WATER STANDARD DETAILS STD–WW–06 AND STD–WW–06A.

LEGEND:

- EX SMH CL X.XX IL X.XX — EXISTING SURFACE WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
- EX FMH CL X.XX IL X.XX — EXISTING FOUL WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
- SMH CL X.XX IL X.XX — PROPOSED SURFACE WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
- FMH CL X.XX IL X.XX — PROPOSED FOUL WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
- 150ø SIC — PRIVATE STORM WATER DRAIN WITH INSPECTION CHAMBER INDIVIDUAL
- 150ø FIC — PRIVATE FOUL WATER DRAIN WITH INSPECTION CHAMBER
- 150ø SIC — PRIVATE BASEMENT SLUNG STORM WATER DRAINAGE
- 150ø SIC — PROPOSED FILTER DRAIN WITH ACCESS JUNCTION/ INSPECTION CHAMBER
- G — PROPOSED GULLY AND CONNECTION
- PROPOSED ATTENUATION TANK
- PROPOSED PERMEABLE PAVING
- PROPOSED GREEN ROOF
- PROPOSED TREE PIT

1:250 0 5.0 10.0 15.0 20.0 25.0m

1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **MARLET PROPERTY GROUP**

ARCHITECT **PLUS ARCHITECTURE**

PROJECT **BALSCADDEN, HOWTH**

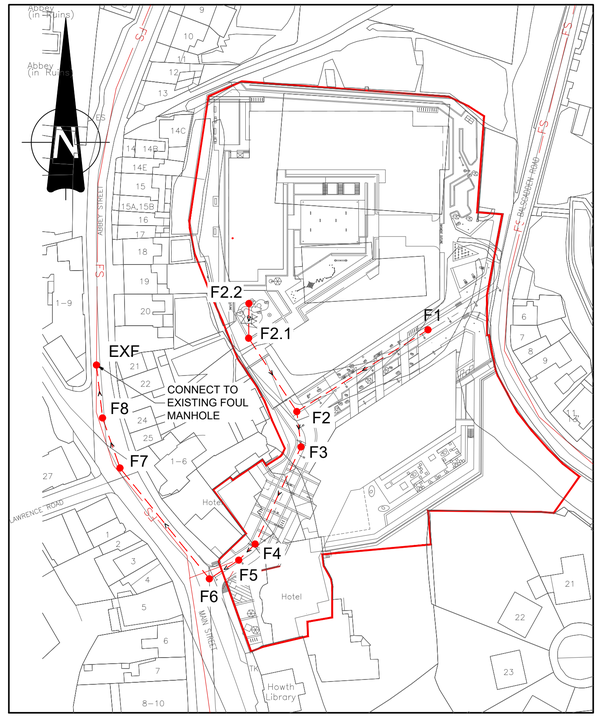
TITLE **PROPOSED DRAINAGE LAYOUT**

DRAWN	DESIGNED	APPROVED	DATE
PJD	SDN	MD	JULY 21'
SCALE 1:250 @ A1	JOB NO. 21–032	DRG. NO. P020	REVISION

Feb 08, 2022 - 9:39am Drawing Location: \\WMFILESVR\Moylan\Projects\21\21-032 - Balscadden Howth\Drawings\Waterman Moylan\Civil\Planning\Autocad Drawings\21-032-P020 Proposed Drainage Layout.dwg

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



FOUL DRAINAGE SCHEMATIC
SCALE 1:1000

	F1		F2	F3		F4	F5	F6		F7	F8	EXF
		−1.6%		−0.5%	−0.5%	−0.5%	−0.5%		−5%		−4%	−0.9%
DATUM RL 8.000												
PIPE SIZE (mm)	225		225	225		225	225	225		225	225	225	300
SURFACE LEVEL (M)	20.950		20.010	19.890		19.450	19.330	19.200		16.720	16.000	15.480
INVERT LEVEL (M)	17.340		16.540	16.480		16.300	16.260	16.200		13.900	13.200	13.040
CHAINAGE (M)	0.000		50.460	62.080		97.110	104.630	115.980		162.450	179.760	197.140

LONGITUDINAL SECTION FROM MANHOLE F1 TO EXF
SCALES - 1:1000 H
1:250 V

	F2.2	F2.1	F2
	−1.6%		
DATUM RL 8.000			
PIPE SIZE (mm)	225	225	225
SURFACE LEVEL (M)	18.000	18.660	20.010
INVERT LEVEL (M)	16.750	16.690	16.540
CHAINAGE (M)	0.000	11.330	37.980

LONGITUDINAL SECTION FROM MANHOLE F2.2 TO F2
SCALES - 1:1000 H
1:250 V

LEGEND

- INDICATES PROPOSED GROUND LEVEL
- INDICATES PROPOSED uPVC SN8 FOUL PIPE

NOTE:
REFER TO DRAWING 21−032, P20
FOR DRAINAGE LAYOUT

NOTE:
WHERE PIPE COVER IS LESS THAN 1.2m IN
ROAD PIPE TO BE ENCASED IN CONCRETE SURROUND

1:250 0 5.0 10.0 15.0 20.0 25.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

1:1000 0 20.0 40.0 60.0 80.0 100.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING**
NOT FOR CONSTRUCTION

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **MARLET PROPERTY GROUP**
ARCHITECT **PLUS ARCHITECTURE**
PROJECT **BALSCADDEN, HOWTH**
TITLE **PROPOSED FOUL DRAINAGE LONGITUDINAL SECTIONS**

DRAWN	DESIGNED	APPROVED	DATE
PJD	SDN	MD	FEB 22'
SCALE	JOB NO.	DRG. NO.	REVISION
1:1000H, 1:250V @ A1	21−032	P029	

BLOCK B
FFL 20.5

BLOCK B
FFL 20.5

BLOCK B
FFL 20.5

BLOCK B BASEMENT
FFL 18.00

BLOCK C
FFL 20.5

BLOCK D
FFL 19.50

BLOCK A
FFL 19.5

150ø SLUNG WATERMAIN

150ø HDPE SLUNG WATERMAIN

150ø HDPE WATERMAIN

EX 125ø WATERMAIN

EX 225ø CI WATERMAIN

Ø50mm (RETAIL)

Ø100mm

Ø80mm

PROPOSED CONNECTION TO THE EXISTING 225ø WATERMAIN

NOTE: METERS FOR BLOCKS A AND D TO BE INSTALLED INTERNALLY IN ACCORDANCE WITH IRISH WATER REQUIREMENTS AND IN ACCORDANCE WITH BUILDING CONTROLS AUTHORITY REQUIREMENTS

PEDESTRIAN WALKWAY

PALISADE FENCE

Retaining Wall

BASKIN LANE

BALSCADDEN ROAD

MAIN STREET

RETAINING WALL

GATE

STEPS TO BEACH

TOP BANK

Existing Sports Pitch

Hotel

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. ALL PIPE MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 3.9 OF THE IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE. WATERMAINS SHALL BE EITHER DUCTILE IRON (DI) OR POLYETHYLENE (PE), WITH PE80 OR PE100 RATING (MDPE, HDPEOR HPPE). ALL PLASTIC WATER PIPES SHALL BE BLUE IN COLOUR.
4. ALL SERVICE CONNECTIONS TO BE 25ø HDPE(SDR-17).
5. ALL WATERMAINS UNDER ROADS OR AT ROAD CROSSINGS TO BE HDPE OR DUCTILE IRON.
6. HDPE DISTRIBUTION PIPES TO BE PE-100(SDR-17).
7. DUCTILE IRON PIPES TO IS EN 545 WITH C40 POWER RATING.
8. AIR VALVE AND HYDRANTS COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH, 200mm ALL ROUND AND 100mm DEEP FORMED WITH C20/25 CONCRETE, 20mm AGGREGATE SIZE, BEDDED IN CLAUSE 804 MATERIAL. THE PLINTH SHALL INCORPORATE MILD STEEL REINFORCED LINKS AND SHALL HAVE BULL-NOSE FINISH AROUND ITS EXTERNAL PERIMETER.
9. THRUST BLOCKS SHALL BE PROVIDED AT EACH BEND ALONG THE COURSE OF THE WATERMAIN.
10. PLANTING ADJACENT TO WATER INFRASTRUCTURE SHALL COMPLY WITH IRISH WATER STANDARD DETAIL STD-W-12A.
11. HORIZONTAL AND VERTICAL SERVICE LAYOUT DISTANCES SHALL BE AS PER IRISH WATER STANDARD DETAIL STD-W-11.
12. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEB SITE AT WWW.WATER.IE/CONNECTIONS/DEVELOPER-SERVICES/ WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE.

LEGEND:

XXXmm ø WM	EXISTING WATERMAIN WITH PIPE SIZE
XXXmm ø	PROPOSED 150ø HDPE WATERMAIN
	PROPOSED 150ø HDPE SLUNG WATERMAIN
SV	PROPOSED SLUICE VALVE
H	PROPOSED HYDRANT
ScV	PROPOSED SCOUR VALVE
AV	PROPOSED AIR VALVE
NRV	PROPOSED NON-RETURN VALVE
WM M	PROPOSED WATER METER
SWMH	SURFACE WATER MANHOLE
WATERMAIN ScV NRV SWMH	TYPICAL SCHEMATIC CONNECTION OF OFFLINE SCOUR VALVE
BB	PROPOSED BOUNDARY BOX AND CONNECTION

1:250 0 5.0 10.0 15.0 20.0 25.0m

1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
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CLIENT **MARLET PROPERTY GROUP**

ARCHITECT **PLUS ARCHITECTURE**

PROJECT **BALSCADDEN, HOWTH**

TITLE **PROPOSED WATERMAIN LAYOUT**

DRAWN	DESIGNED	APPROVED	DATE
PJD	SDN	MD	JULY 21'
SCALE 1:250 @ A1	JOB NO. 21-032	DRG. NO. P030	REVISION

Feb 14, 2022 - 9:07am Drawing Location: M:\Projects\21\21-032 - Balscadden Howth\Drawings\Waterman Moylan\Civil\Planning\Autocad Drawings\21-032-P030 Proposed Watermain Layout.dwg

C. GDSDS Attenuation Calculations

Waterman Moylan
Engineering Consultants

Block S, EastPoint Business Park,
Alfie Byrne Road, Dublin D03 H3F4
t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie

Calculation By:	SDN
Approved by:	JG

Project Data

Project Name	Balscadden, Howth
Project Number	21-032
Client	Balscadden GP3 Ltd.
Architect	Plus Architecture
Status	Planning
Date	16/03/2022

Description		%	Area
Total Site Area		-	14,300m²
Paved Area	Total	60%	8,580m²
	Drained	100%	8,580m²
Soil Area	Total	40%	5,720m²
	Drained	0%	0m²

Soil Type:	Type 4
SPR Index (from FSR):	0.47
SAAR:	902mm
Rain Data:	Dublin Airport
Climate Change Factor:	20%

Greenfield Runoff:

$Q_{BARrural} = 0.00108 \times Area^{0.89} \times SAAR^{1.17} \times Soil^{2.17}$

Area = 0.0143km² … *Total site area in km²*
SAAR = 902mm … *Standard Average Annual Rainfall in mm*
SOIL = 0.47 … *The "SPR" index from FSR*

Note: Where a site is <0.5km², the $Q_{BARrural}$ formula should be applied for 0.5km² and the result factored based on the ratio of the actual site area and the applied area.

$Q_{BARrural}$ = 0.009m³/s
$Q_{BARrural}$ = 9.288 l/s
$Q_{BARrural}$ = 6.495 l/s/Ha

Return Period	1-year	30-year	100-year
Growth Factor	0.85	2.10	2.60
Q_{BAR} (l/s)	7.89	19.50	24.15
Q_{BAR} (l/s/Ha)	5.52	13.64	16.89
Allowable Discharge	9.29	9.29	9.29

Rainfall Data:

Rain Data From: Dublin Airport
Climate Change Factor: 20%

Duration	**Return Period** *(Years)*						
(Hours)	**1**	**5**	**10**	**20**	**30**	**50**	**100**
0.5	9.0	14.4	17.9	22.0	24.2	28.8	33.6
1	12.0	18.6	22.9	27.6	30.4	36.0	42.0
2	15.7	23.8	28.8	34.8	37.6	43.2	50.4
4	21.2	31.2	37.2	43.2	46.4	52.8	61.2
6	25.6	37.2	43.2	50.4	54.4	62.4	70.8
12	32.4	46.8	18.0	63.6	68.0	76.8	86.4

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Engineering Consultants

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Calculation By:	SDN
Approved by:	JG

Summary

Project Name	Balscadden, Howth
Project Number	21-032
Client	Balscadden GP3 Ltd.
Architect	Plus Architecture
Status	Planning
Date	16/03/2022

Summary of GDSDS Calculations:

Criterion 1: River Protection Volume

Interception Volume	**34.32m³**
Treatment Volume	**102.96m³**

Criterion 2: River Regime Protection

1-in-1-Year Storm	86.90m³
1-in-30-Year Storm	196.58m³
1-in-100-Year Storm	140.75m³
Reduction of Long-Term Storage	-124.33m³
Volume Required	**299.90m³**

… Includes head-loss correction

Criterion 4: River Flood Protection

Long Term Storage *(no interception provided)*	**124.33m³**
Long Term Storage *(Interception provided)*	**90.01m³**

Total Attenuation Volume Requirement:

1-in-100 Year Storm

1-in-1-Year Storm	86.90m³
1-in-30-Year Storm	196.58m³
1-in-100-Year Storm	140.75m³
Total	**424.23m³**

The maximum attenuation volume required is 424.23m³

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Calculation By:	SDN
Approved by:	JG

Criterion 1
River Protection Volume

Project Name	Balscadden, Howth
Project Number	21-032
Client	Balscadden GP3 Ltd.
Architect	Plus Architecture
Status	Planning
Date	16/03/2022

1.1 Interception

Paved surfaces connected to drainage system	*14300m² x 0.6 x 1 =* 8,580.00m²	*14,300m² site area* *60% of the site is paved* *100% of the paved area*
Volume of Interception Storage	*8580m² x 5mm x 0.8 =* **34.32m³**	*Paved area directly drained* *5mm rainfall depth* *80% paved runoff factor*

1.2 Treatment Volume

Paved surfaces draining to river	*14300m² x 0.6 x 1 =* 8,580.00m²	*14,300m² site area* *60% of the site is paved* *100% of the paved area*
Volume of Treatment Storage	*8580m² x 15mm x 0.8 =* **102.96m³**	*Paved area directly drained* *15mm rainfall depth* *80% runoff from paved surfaces*

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Calculation By:	SDN
Approved by:	JG

Criterion 2
River Regime Protection

Project Name	Balscadden, Howth
Project Number	21-032
Client	Balscadden GP3 Ltd.
Architect	Plus Architecture
Status	Planning
Date	16/03/2022

1-Year Return Period
(Climate Change Factor = 20%)

Duration	Rainfall Rate	Runoff = Rainfall Rate x Area x Soil Type				Discharge		Storage	
		Paved	Green	Total	Volume	Rate	Volume	Rate	Volume
Hours	*(l/s/Ha)*	l/s	l/s	l/s	m³	l/s	m³	l/s	m³
0.5	50.00	42.90	0.00	42.90	77.2	9.29	16.7	33.61	60.5
1	33.33	28.60	0.00	28.60	103.0	9.29	33.4	19.31	69.5
2	21.83	18.73	0.00	18.73	134.9	9.29	66.9	9.45	68.0
4	14.75	12.66	0.00	12.66	182.2	9.29	133.7	3.37	48.5
6	11.83	10.15	0.00	10.15	219.3	9.29	200.6	0.87	18.7
12	7.50	6.44	0.00	6.44	278.0	6.44	278.0	0.00	0.0

30-Year Return Period
(Climate Change Factor = 20%)

Duration	Rainfall Rate	Runoff = Rainfall Rate x Area x Soil Type				Discharge		Storage	
		Paved	Green	Total	Volume	Rate	Volume	Rate	Volume
Hours	*(l/s/Ha)*	l/s	l/s	l/s	m³	l/s	m³	l/s	m³
0.5	134.67	115.54	0.00	115.54	208.0	9.29	10.6	106.26	121.7
1	84.43	72.44	0.00	72.44	260.8	9.29	23.2	63.16	157.8
2	52.22	44.80	0.00	44.80	322.6	9.29	48.7	35.51	186.2
4	32.23	27.65	0.00	27.65	398.1	9.29	98.6	18.36	194.9
6	25.18	21.61	0.00	21.61	466.7	9.29	148.2	12.32	196.6
12	15.74	13.51	0.00	13.51	583.5	9.29	248.2	4.22	112.7

100-Year Return Period
(Climate Change Factor = 20%)

Duration	Rainfall Rate	Runoff = Rainfall Rate x Area x Soil Type				Discharge		Storage	
		Paved	Green	Total	Volume	Rate	Volume	Rate	Volume
Hours	*(l/s/Ha)*	l/s	l/s	l/s	m³	l/s	m³	l/s	m³
0.5	186.67	160.16	0.00	160.16	288.3	9.29	0.3	150.87	5.5
1	116.67	100.10	0.00	100.10	360.4	9.29	6.2	90.81	60.8
2	70.00	60.06	0.00	60.06	432.4	9.29	18.2	50.77	99.5
4	42.50	36.47	0.00	36.47	525.1	9.29	42.8	27.18	125.3
6	32.78	28.12	0.00	28.12	607.5	9.29	69.4	18.84	140.7
12	20.00	17.16	0.00	17.16	741.3	9.29	87.3	7.87	74.0

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Calculation By:	SDN
Approved by:	JG

Criterion 4
River Flood Protection

Project Name	Balscadden, Howth
Project Number	21-032
Client	Balscadden GP3 Ltd.
Architect	Plus Architecture
Status	Planning
Date	16/03/2022

Vol_{XS} = RD x A x 10 [(PIMP/100 x α0.8) + (1 - (PIMP/100))(β x Soil) - Soil]

Vol_{XS}			*… Extra runoff volume of development over Greenfield runoff*
RD	=	71 mm	*… Rainfall depth of the 100 year, 6 hour event mm*
A	=	1.430 Ha	*… Area of site*
PIMP	=	60%	*… Impermeable area of total site*
α0.8	=	100%	*… Proportion of paved area drained to drainage network or river with 80% runoff*
β	=	60%	*… Proportion of pervious area drained to the network or river*
Soil	=	0.47	*… SPR index*

Vol_{XS} = 124.33m³

D. Site Investigation Report

S.I. Ltd Contract No: 5836

Client:	Marlet
Engineer:	Waterman Moylan
Contractor:	Site Investigations Ltd

Balscadden,
Howth, Co. Dublin
Site Investigation Report

Prepared by:

.....

Stephen Letch

Issue Date:	13/07/2021
Status	Final
Revision	2

Contents:

Appendices:

1. Introduction

On the instructions of Waterman Moylan, Site Investigations Ltd (SIL) was appointed to complete a ground investigation at Balscadden, Howth, Co. Dublin. The investigation was completed for a residential development on the site and was completed on behalf of the Client, Marlet. The investigation was completed in June 2021.

2. Site Location

The site is located on the Balscadden Road, Howth, Co. Dublin, on the Howth peninsula to the east of Dublin city. The map of the Dublin (below left) shows the location of Howth and the second map shows the boundary of the site in Howth.

3. Fieldwork

The fieldworks comprised a programme of cable percussive boreholes and trial pits. All fieldwork was carried out in accordance with BS 5930:2015, Engineers Ireland GI Specification and Related Document 2nd Edition 2016 and Eurocode 7: Geotechnical Design.

The fieldworks comprised the following:

- 3 No. cable percussive boreholes
- 3 No. trial pits

3.1. Cable Percussion Boreholes with Rotary Coreholes

Cable percussion boring was undertaken at 3 No. locations using a Dando 150 rig and constructed 200mm diameter boreholes. The boreholes terminated at depths ranging from 13.00mbgl (BH03) to 17.20mbgl (BH02) when obstructions were encountered. It was not possible to collect undisturbed samples due to the granular soils encountered so bulk disturbed samples were recovered at regular intervals.

To test the strength of the stratum, Standard Penetration Tests (SPT's) were performed at 1.00m intervals in accordance with BS 1377 (1990). In soils with high gravel and cobble content it is appropriate to use a solid cone (60°) (CPT) instead of the split spoon and this was used throughout the testing. The test is completed over 450mm and the cone is driven 150mm into the stratum to ensure that the test is conducted over an undisturbed zone. The cone is then driven the remaining 300mm and the blows recorded to report the N-Value. The report shows the N-Value with the 75mm incremental blows listed in brackets (e.g., BH01 at 1.00mbgl where N=17(2,4/4,5,4,4). Where refusal of 50 blows across the test zone was encountered was achieved during testing, the penetration depth is also reported (e.g., BH01 at 13.00mbgl where N=50-(25 for 125mm/50 for 90mm)).

Groundwater monitoring standpipes were installed, upon instruction from Minerex Ltd, and consisted of slotted pipe surrounded by a gravel response zone with bentonite seals.

The cable percussive borehole logs are presented in Appendix 1.

3.2. Trial Pits

3 No. trial pits were excavated using a wheeled excavator. The strata were logged and photographed by SIL geotechnical engineer and groundwater ingresses and pit wall stability was also recorded. Representative disturbed bulk samples were recovered as the pits were excavated, which were returned to the laboratory for geotechnical testing.

The trial pit logs and photographs are presented in Appendix 2.

3.3. Surveying

Following completion of all the fieldworks, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is supplied on each individual log and along with a site plan in Appendix 4.

4. Laboratory Testing

Laboratory testing has been performed on representative soil samples, as scheduled by ByrneLooby,and these were completed in accordance of BS1377: 1990 or the relevant specification. Testing included:

- 2 No. Moisture contents
- 2 No. Atterberg limits
- 8 No. Particle size gradings
- 5 No. pH
- 5 No. Water soluble sulphate

Specialist geotechnical testing was completed on the samples by NMTL Ltd and consisted of the following:

- 1 No. Shear box

The soil laboratory test results are presented in Appendix 3.

Appendix 1

Cable Percussive Borehole Logs

Contract No: 5836	**Cable Percussion Borehole Log**	Borehole No: **BH01**

Contract:	Balscadden	Easting:	728766.929	Date Started:	16/06/2021
Location:	Howth, Co. Dublin	Northing:	739199.986	Date Completed:	18/06/2021
Client:	Marlet	Elevation:	19.98	Drilled By:	J. O'Toole
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	MADE GROUND: tarmacadam.			19.78					
		MADE GROUND: grey silty sandy gravel.								
0.5	0.50	Medium dense brown silty sandy GRAVEL with low cobble content.		19.5	19.48					
1.0				19.0		1.00	B	JOT01		
						1.00	C	N=17 (2,4/4,5,4,4)		
1.5				18.5						
2.0				18.0		2.00	B	JOT02		
						2.00	C	N=12 (1,2/2,3,3,4)		
2.5				17.5						
	2.80	Loose becoming medium dense light brown silty gravelly SAND.			17.18					
3.0				17.0		3.00	B	JOT03		
						3.00	C	N=7 (1,1/1,2,2,2)		
3.5				16.5						
4.0				16.0		4.00	B	JOT04		
						4.00	C	N=15 (1,2/3,3,4,5)		
4.5				15.5						
5.0				15.0		5.00	B	JOT05		
						5.00	C	N=20 (2,2/3,4,6,7)		
5.5	5.50	Light brown slightly silty gravelly SAND.		14.5	14.48					
6.0	6.00	Medium dense becoming dense light brown slightly silty gravelly SAND.		14.0	13.98	6.00	B	JOT06		
						6.00	C	N=21 (2,2/4,5,6,6)		
6.5				13.5						
7.0				13.0		7.00	B	JOT07		
						7.00	C	N=28 (2,4/5,7,7,9)		
7.5				12.5						
8.0				12.0		8.00	B	JOT08		
						8.00	C	N=30 (1,3/6,7,7,10)		
8.5				11.5						
9.0				11.0		9.00	B	JOT09		
						9.00	C	N=36 (2,4/7,9,9,11)		
9.5				10.5						
						10.00	B	JOT10		

Chiselling:

From:	To:	Time:
15.00	15.20	00:45
16.40	16.50	00:45
16.80	17.00	01:00

Water Strikes:

Strike:	Rose:	Depth Sealed

Water Details:

Date:	Hole Depth:	Water Depth:
16/06	9.30	Dry
17/06	12.30	Dry
18/06	17.00	Dry

Installation:

From:	To:	Pipe:
0.00	14.00	Solid
14.00	17.00	Slotted

Backfill:

From:	To:	Type:
0.00	0.70	Bentonite
0.70	12.00	Gravel
12.00	13.00	Bentonite
13.00	17.00	Gravel

Remarks:

Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5836	**Cable Percussion Borehole Log**	Borehole No: **BH01**

Contract:	Balscadden	Easting:	728766.929	Date Started:	16/06/2021
Location:	Howth, Co. Dublin	Northing:	739199.986	Date Completed:	18/06/2021
Client:	Marlet	Elevation:	19.98	Drilled By:	J. O'Toole
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m)		Stratum Description	Legend	Level (mOD)		Samples and Insitu Tests			Water Strike	Backfill
Scale	Depth			Scale	Depth	Depth	Type	Result		
		Medium dense becoming dense light brown slightly silty gravelly SAND.				10.00	C	N=18 (2,3/4,4,5,5)		
10.5	10.50	Very stiff brown slightly sandy gravelly silty CLAY with low cobble content and bands of gravelly sand.		9.5	9.48					
11.0				9.0		11.00	B	JOT11		
						11.00	C	N=24 (3,4/5,6,6,7)		
11.5				8.5						
12.0				8.0		12.00	B	JOT12		
						12.00	C	N=35 (4,5/7,9,9,10)		
12.5				7.5						
13.0				7.0		13.00	B	JOT13		
						13.00	C	50 (25 for 125mm/50 for 90mm)		
13.5				6.5						
14.0				6.0		14.00	B	JOT14		
						14.00	C	N=50 (4,9/50 for 235mm)		
14.5				5.5						
15.0				5.0		15.00	B	JOT15		
						15.00	C	50 (10,15/50 for 125mm)		
15.5				4.5						
16.0				4.0		16.00	B	JOT16		
						16.00	C	50 (11,14/50 for 100mm)		
16.5				3.5						
	16.80	Obstruction - possible boulders.			3.18					
17.0	17.00	End of Borehole at 17.00m		3.0	2.98	17.00	C	50 (25 for 5mm/50 for 5mm)		
17.5				2.5						
18.0				2.0						
18.5				1.5						
19.0				1.0						
19.5				0.5						

Chiselling:

From:	To:	Time:
15.00	15.20	00:45
16.40	16.50	00:45
16.80	17.00	01:00

Water Strikes:

Strike:	Rose:	Depth Sealed

Water Details:

Date:	Hole Depth:	Water Depth:

Installation:

From:	To:	Pipe:
0.00	14.00	Solid
14.00	17.00	Slotted

Backfill:

From:	To:	Type:
0.00	0.70	Bentonite
0.70	12.00	Gravel
12.00	13.00	Bentonite
13.00	17.00	Gravel

Remarks:

Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5836	**Cable Percussion Borehole Log**	Borehole No: **BH02**

Contract:	Balscadden	Easting:	728791.582	Date Started:	21/06/2021
Location:	Howth, Co. Dublin	Northing:	739163.531	Date Completed:	23/06/2021
Client:	Marlet	Elevation:	19.58	Drilled By:	J. O'Toole
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	MADE GROUND: tarmacadam.		19.5	19.38					
		Grey slightly silty very sandy GRAVEL.		19.0						
				18.5		1.00	B	JOT17		
						1.00	C	N=12 (1,2/2,3,3,4)		
				18.0						
				17.5		2.00	B	JOT18		
						2.00	C	N=15 (2,3/3,4,4,4)		
				17.0						
	3.00	Loose becoming medium dense brown silty very gravelly SAND.		16.5	16.58	3.00	B	JOT19		
						3.00	C	N=10 (1,1/2,2,3,3)		
				16.0						
				15.5		4.00	B	JOT20		
						4.00	C	N=8 (2,2/2,2,2,2)		
				15.0						
				14.5		5.00	B	JOT21		
						5.00	C	N=11 (2,2/3,3,2,3)		
				14.0						
				13.5		6.00	B	JOT22		
						6.00	C	N=8 (2,1/2,2,2,2)		
				13.0						
				12.5		7.00	B	JOT23		
						7.00	C	N=11 (3,3/2,3,3,3)		
				12.0						
				11.5		8.00	B	JOT24		
						8.00	C	N=15 (3,3/4,4,3,4)		
	8.50	Medium dense becoming dense light brown silty gravelly SAND.		11.0	11.08					
				10.5		9.00	B	JOT25		
						9.00	C	N=13 (2,2/3,3,3,4)		
	9.70	Very stiff brown slightly sandy gravelly silty CLAY with		10.0	9.88					
						10.00	B	JOT26		

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
17.10	17.20	01:00				21/06	3.00	Dry	0.00	9.00	Solid	0.00	1.00	Bentonite	Borehole terminated due to obstruction.
						22/06	12.00	Dry	9.00	17.20	Slotted	1.00	7.00	Gravel	
						23/06	17.20	Dry				7.00	8.00	Bentonite	
												8.00	17.20	Gravel	

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5836	**Cable Percussion Borehole Log**	Borehole No: **BH02**

Contract:	Balscadden	Easting:	728791.582	Date Started:	21/06/2021
Location:	Howth, Co. Dublin	Northing:	739163.531	Date Completed:	23/06/2021
Client:	Marlet	Elevation:	19.58	Drilled By:	J. O'Toole
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		low cobble content.		9.5		10.00	C	N=38 (6,7/7,9,11,11)		
10.5	10.50	Very stiff brown slightly sandy slightly gravelly silty CLAY.		9.0	9.08					
11.0				8.5		11.00 11.00	B C	JOT27 N=40 (7,8/9,9,10,12)		
11.5				8.0						
12.0				7.5		12.00 12.00	B C	JOT28 N=37 (5,7/9,9,9,10)		
12.5				7.0						
13.0				6.5		13.00 13.00	B C	JOT29 N=44 (4,6/10,11,11,12)		
13.5				6.0						
14.0				5.5		14.00 14.00	B C	JOT30 N=39 (3,5/7,11,10,11)		
14.5	14.60	Very stiff brown slightly sandy gravelly silty CLAY with low cobble content and bands of gravelly sand.		5.0	4.98					
15.0				4.5		15.00 15.00	B C	JOT31 50 (5,11/50 for 60mm)		
15.5				4.0						
16.0				3.5		16.00 16.00	B C	JOT32 50 (6,12/50 for 115mm)		
16.5				3.0						
17.0	17.10			2.5	2.48	17.00	C	50 (23 for 95mm/50 for 5mm) JOT33		
	17.20	Obstruction - possible boulders. End of Borehole at 17.20m			2.38	17.10	B			
17.5				2.0						
18.0				1.5						
18.5				1.0						
19.0				0.5						
19.5				0.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
17.10	17.20	01:00							0.00 9.00	9.00 17.20	Solid Slotted	0.00 1.00 7.00 8.00	1.00 7.00 8.00 17.20	Bentonite Gravel Bentonite Gravel	Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5836	**Cable Percussion Borehole Log**	Borehole No: **BH03**

Contract:	Balscadden	Easting:	728739.243	Date Started:	24/06/2021
Location:	Howth, Co. Dublin	Northing:	739069.592	Date Completed:	28/06/2021
Client:	Marlet	Elevation:	19.42	Drilled By:	J. O'Toole
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.10	MADE GROUND: tarmacadam.			19.32					
0.5	0.60	MADE GROUND: grey sandy gravel with medium cobble content and some red brick and concrete fragments.		19.0	18.82					
1.0		Medium dense light brown silty gravelly SAND.		18.5		1.00	B	JOT34		
						1.00	C	N=18 (2,3/4,4,5,5)		
1.5				18.0						
2.0				17.5		2.00	B	JOT35		
						2.00	C	N=21 (2,4/5,5,5,6)		
2.5				17.0						
	2.80	Medium dense yellow slightly silty SAND.			16.62					
3.0				16.5		3.00	B	JOT36		
						3.00	C	N=23 (4,5/5,6,6,6)		
3.5				16.0						
4.0				15.5		4.00	B	JOT37		
						4.00	C	N=19 (2,4/4,5,5,5)		
4.5				15.0						
	4.90	Medium dense light brown silty gravelly SAND.		14.5	14.52	5.00	B	JOT38		
5.0						5.00	C	N=15 (2,2/3,4,4,4)		
5.5				14.0						
6.0				13.5		6.00	B	JOT39		
						6.00	C	N=24 (2,4/5,6,6,7)		
6.5	6.40	Stiff brown slightly sandy gravelly silty CLAY with low cobble content.		13.0	13.02					
7.0				12.5		7.00	B	JOT40		
						7.00	C	N=30 (2,5/7,7,7,9)		
7.5	7.50	Very stiff black slightly sandy gravelly silty CLAY with low cobble content.		12.0	11.92					
8.0				11.5		8.00	B	JOT41		
						8.00	C	50 (25 for 135mm/50 for 10mm)		
8.5				11.0						
9.0				10.5		9.00	B	JOT42		
						9.00	C	50 (5,7/50 for 100mm)		
9.5				10.0						
				9.5		10.00	B	JOT43		

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
12.80	13.00	01:00	4.80	4.50	6.80	24/06	3.50	Dry	0.00	4.00	Solid	0.00	3.00	Bentonite	Borehole terminated due to obstruction.
						25/06	10.50	10.20	4.00	13.00	Slotted	3.00	13.00	Gravel	
						28/06	13.00	3.80							

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5836	**Cable Percussion Borehole Log**	Borehole No: **BH03**

Contract:	Balscadden	Easting:	728739.243	Date Started:	24/06/2021
Location:	Howth, Co. Dublin	Northing:	739069.592	Date Completed:	28/06/2021
Client:	Marlet	Elevation:	19.42	Drilled By:	J. O'Toole
Engineer:	Waterman Moylan	Borehole Diameter:	200mm	Status:	FINAL

Depth (m)		Stratum Description	Legend	Level (mOD)		Samples and Insitu Tests			Water Strike	Backfill
Scale	Depth			Scale	Depth	Depth	Type	Result		
10.5		Very stiff black slightly sandy gravelly silty CLAY with low cobble content.		9.0		10.00	C	50 (25 for 125mm/50 for 110mm)		
11.0				8.5		11.00	B	JOT44		
						11.00	C	50 (25 for 125mm/50 for 100mm)		
11.5				8.0						
12.0				7.5		12.00	B	JOT45		
						12.00	C	50 (25 for 115mm/50 for 25mm)		
12.5				7.0						
	12.80	Obstruction - possible boulders.			6.62	12.80	B	JOT46		
13.0	13.00	End of Borehole at 13.00m		6.5	6.42	13.00	C	50 (25 for 5mm/50 for 5mm)		
13.5				6.0						
14.0				5.5						
14.5				5.0						
15.0				4.5						
15.5				4.0						
16.0				3.5						
16.5				3.0						
17.0				2.5						
17.5				2.0						
18.0				1.5						
18.5				1.0						
19.0				0.5						
19.5				0.0						
				-0.5						

Chiselling:			Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:
From:	To:	Time:	Strike:	Rose:	Depth Sealed	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	
12.80	13.00	01:00	4.80	4.50	6.80				0.00	4.00	Solid	0.00	3.00	Bentonite	Borehole terminated due to obstruction.
									4.00	13.00	Slotted	3.00	13.00	Gravel	

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Appendix 2

Trial Pit Logs and Photographs

Contract No: 5836	**Trial Pit Log**				Trial Pit No: **TP01**
Contract:	Balscadden	Easting:	728786.136	Date:	15/06/2021
Location:	Howth, Co. Dublin	Northing:	739106.863	Excavator:	JCB 3CX
Client:	Marlet	Elevation:	29.92	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.50 x 1.10 x 2.50	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
	0.05	TOPSOIL.			29.87				
		Brown silty slightly gravelly fine to coarse SAND with low cobble content and some gravel laminas. Gravel is fine to coarse, subrounded to rounded of various lithologies. Cobbles are subrounded to rounded of various lithologies.		29.5					
0.5									
				29.0					
1.0						1.00	B	MK01	
				28.5					
1.5									
				28.0					
2.0									
				27.5					
2.5	2.50	**Pit terminated at 2.50m**			27.42	2.50	B	MK02	
				27.0					
3.0									

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5836	**Trial Pit Log**				Trial Pit No: **TP02**
Contract:	Balscadden	Easting:	728754.368	Date:	15/06/2021
Location:	Howth, Co. Dublin	Northing:	739110.303	Excavator:	JCB 3CX
Client:	Marlet	Elevation:	23.98	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.90 x 1.10 x 2.70	Status:	FINAL

Level (mbgl)		Stratum Description	Legend	Level (mOD)		Samples / Field Tests			Water Strike
Scale:	Depth			Scale:	Depth:	Depth	Type	Result	
		TOPSOIL.							
	0.20	Brown silty very gravelly fine to coarse SAND with low cobble content and some gravel laminas. Gravel is fine to coarse, subrounded to rounded of various lithologies. Cobbles are subrounded to rounded of various lithologies. (Possible MADE GROUND: traces of plastic identified in pit).			23.78				
0.5				23.5					
1.0				23.0		1.00	B	MK05	
1.5				22.5					
2.0				22.0		2.00	B	MK06	
2.5				21.5					
	2.70	**Pit terminated at 2.70m**			21.28				
3.0				21.0					

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5836	**Trial Pit Log**				Trial Pit No: **TP03**
Contract:	Balscadden	Easting:	728736.781	Date:	15/06/2021
Location:	Howth, Co. Dublin	Northing:	739134.128	Excavator:	JCB 3CX
Client:	Marlet	Elevation:	20.47	Logged By:	M. Kaliski
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.50 x 1.10 x 3.00	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
	0.05	TOPSOIL.			20.42				
		MADE GROUND: grey brown silty very gravelly sand with low cobble content and some plastic fragments.							
	0.20	Brown silty gravelly fine to coarse SAND with some gravel laminas. Gravel is fine to coarse, subrounded to rounded of various lithologies.			20.27				
0.5				20.0					
	0.90	Grey brown silty very gravelly fine to coarse SAND with medium cobble content. Gravel is fine to coarse, subrounded to rounded of various lithologies. Cobbles are subrounded to rounded of various lithologies.			19.57				
1.0				19.5		1.00	B	MK03	
1.5				19.0					
2.0				18.5		2.00	B	MK04	
2.5				18.0					
3.0	3.00	**Pit terminated at 3.00m**		17.5	17.47				

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

TP01 Sidewall

TP01 Spoil

TP02 Sidewall

TP02 Spoil

TP03 Sidewall

TP03 Spoil

Appendix 3

Geotechnical Laboratory Test Results

Classification Tests in accordance with BS1377: Part 4

Client	Marlet
Site	Balscadden, Howth
S.I. File No	5836 / 21
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie
Report Date	6th July 2021

Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plastic Index %	Min. Dry Density Mg/m^3	Particle Density Mg/m^3	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
BH01	12.00	JOT12	21/838	B	12.1	34	20	14			63.2		CL
BH02	16.00	JOT32	21/842	B	18.5	38	24	14			50.9		CI

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BS 1377 Particle Size Analysis

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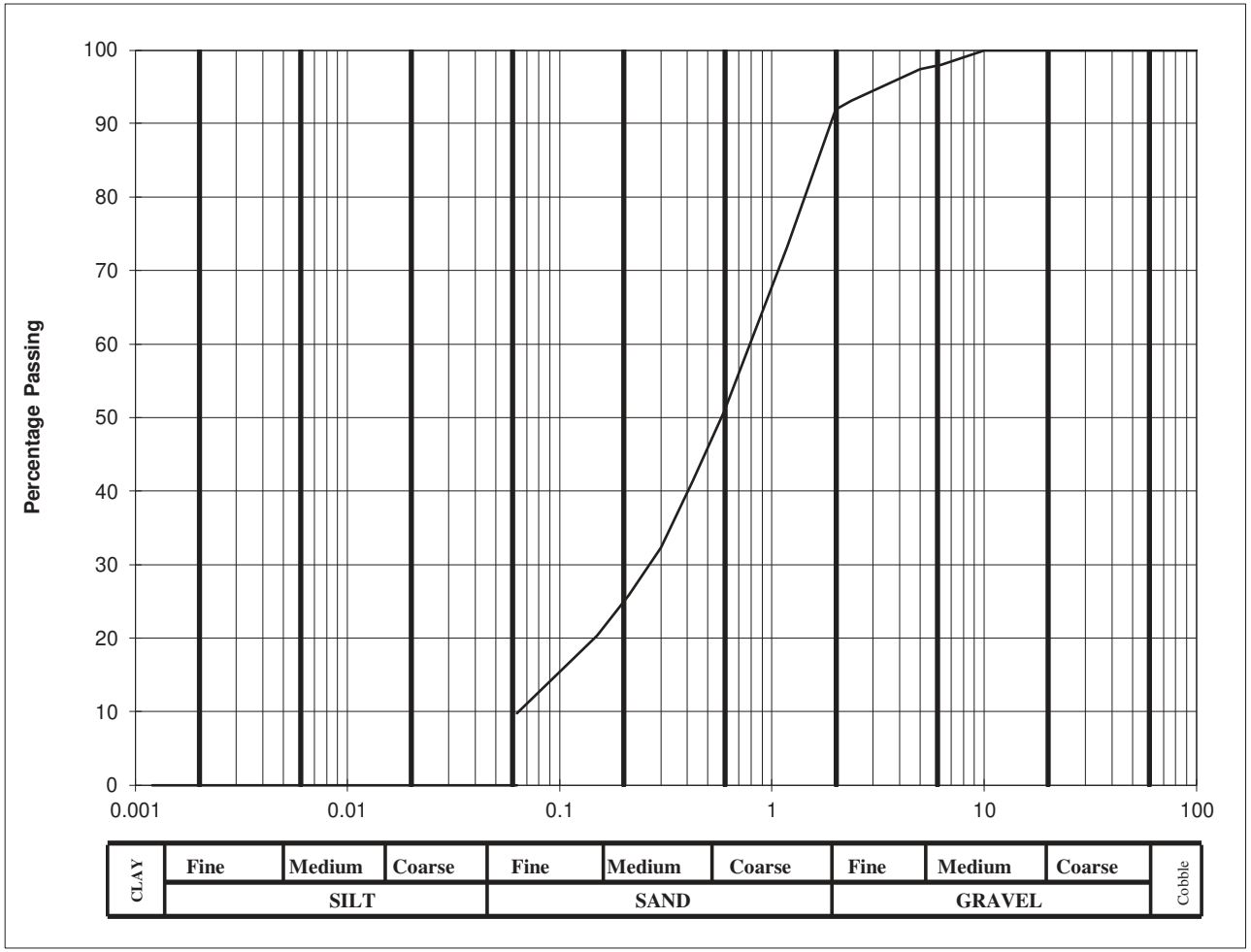
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	98		
5.0	97.4		
2.36	93.1		
2.00	91.9		
1.18	73.2		
0.600	50.9		
0.425	41.4		
0.300	32.3		
0.212	25.8		
0.150	20.3		
0.063	10		

Cobbles, %	0
Gravel, %	8
Sand, %	82
Clay / Silt, %	10



Client :	Marlet
Project :	Balscadden, Howth

Lab. No :	21/836
Sample No :	JOT04

Hole ID :	BH 01
Depth, m :	4.00

Material description :	silty gravelly SAND
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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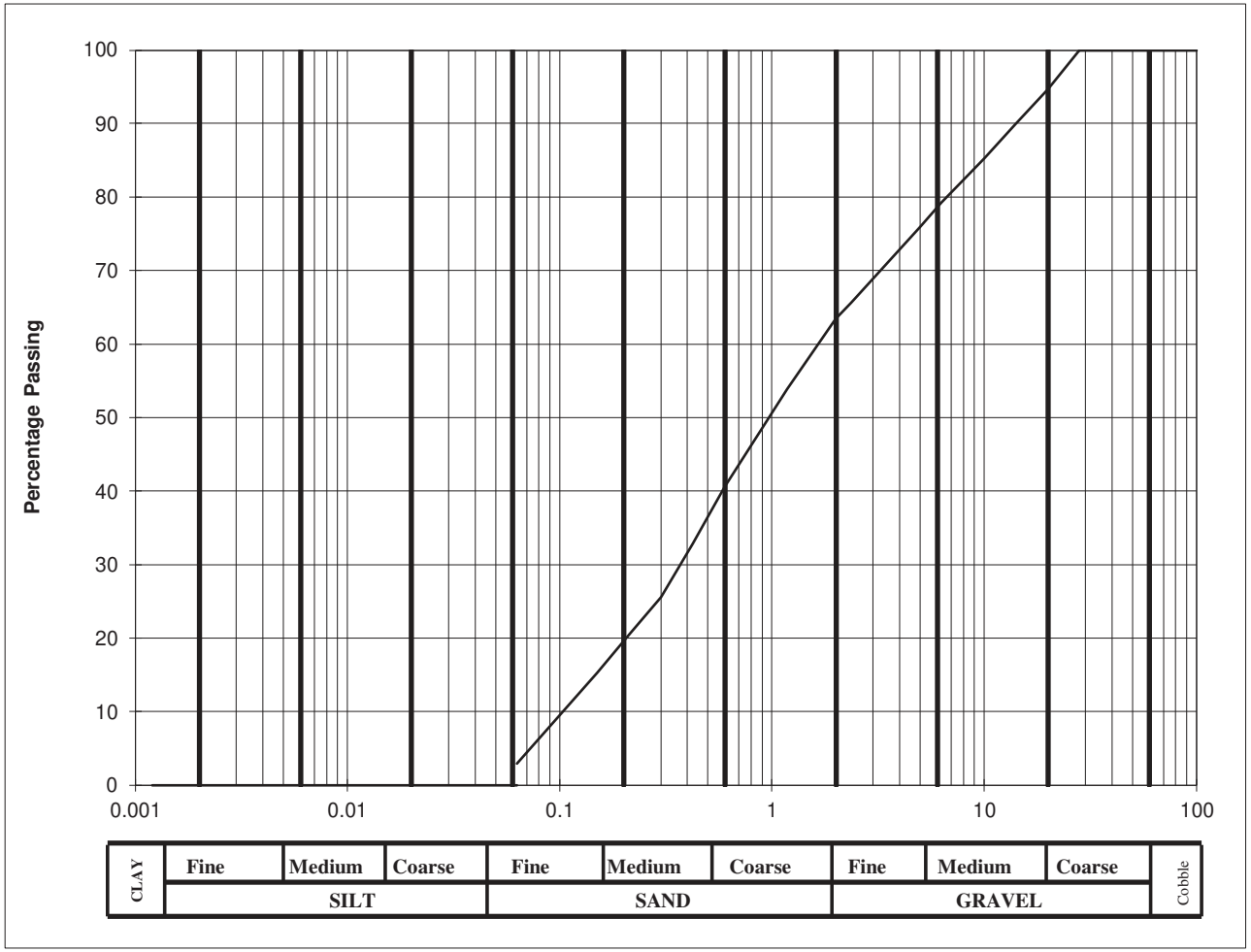
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	94.7		
14	89.9		
10	85.2		
6.3	79.2		
5.0	75.9		
2.36	65.6		
2.00	63.4		
1.18	53.9		
0.600	40.5		
0.425	32.8		
0.300	25.6		
0.212	20.4		
0.150	15.3		
0.063	3		

Cobbles, %	0
Gravel, %	37
Sand, %	60
Clay / Silt, %	3



Client :	Marlet
Project :	Balscadden, Howth

Lab. No :	21/837
Sample No :	JOT08

Hole ID :	BH 01
Depth, m :	8.00

Material description :	slightly silty gravelly SAND
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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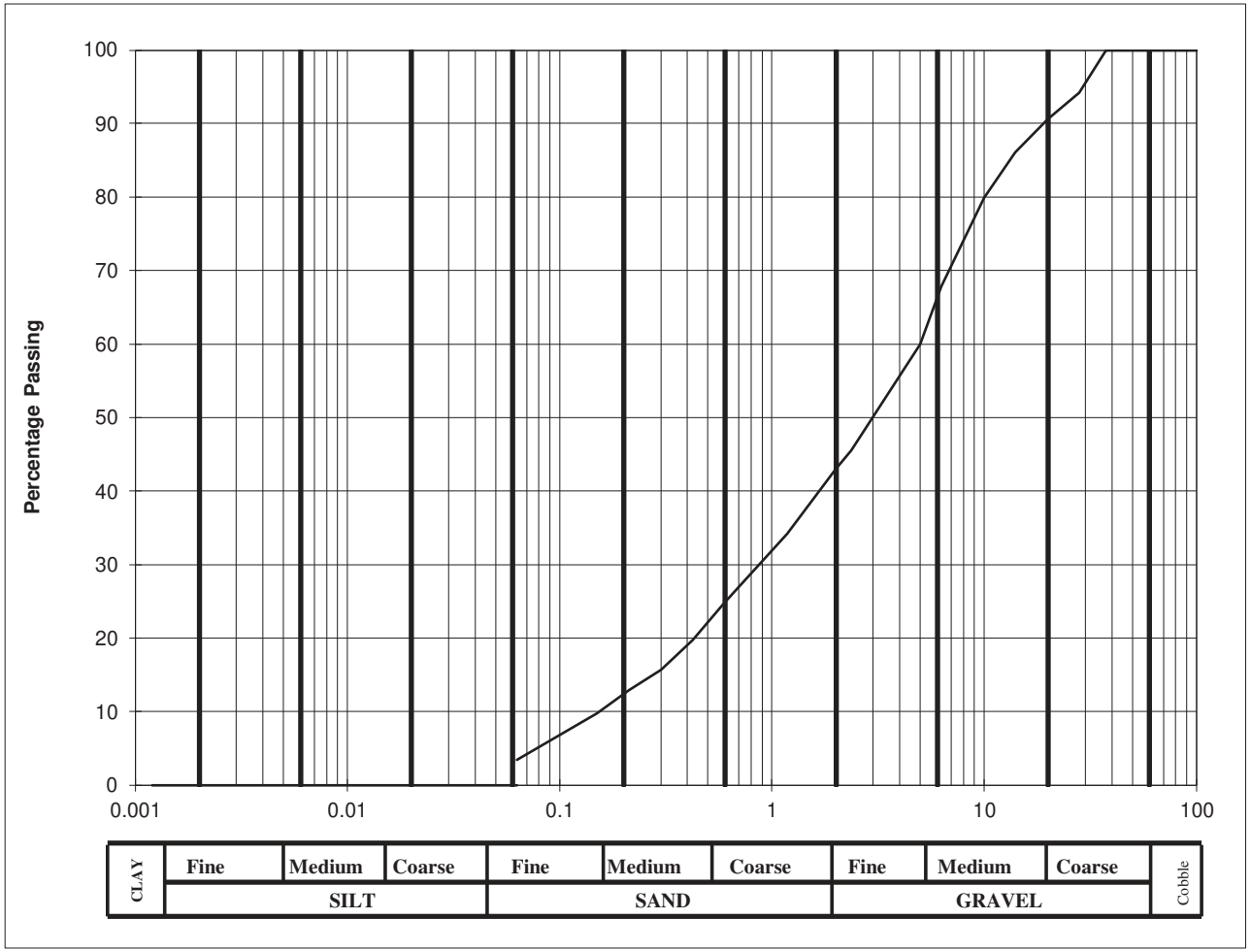
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	94.2		
20	90.6		
14	86.1		
10	79.9		
6.3	67.8		
5.0	60		
2.36	45.5		
2.00	43		
1.18	34.2		
0.600	24.8		
0.425	19.7		
0.300	15.7		
0.212	12.9		
0.150	9.8		
0.063	4		

Cobbles, %	0
Gravel, %	57
Sand, %	39
Clay / Silt, %	4



Client :	Marlet
Project :	Balscadden, Howth

Lab. No :	21/839
Sample No :	JOT18

Hole ID :	BH 02
Depth, m :	2.00

Material description :	slightly silty very sandy GRAVEL
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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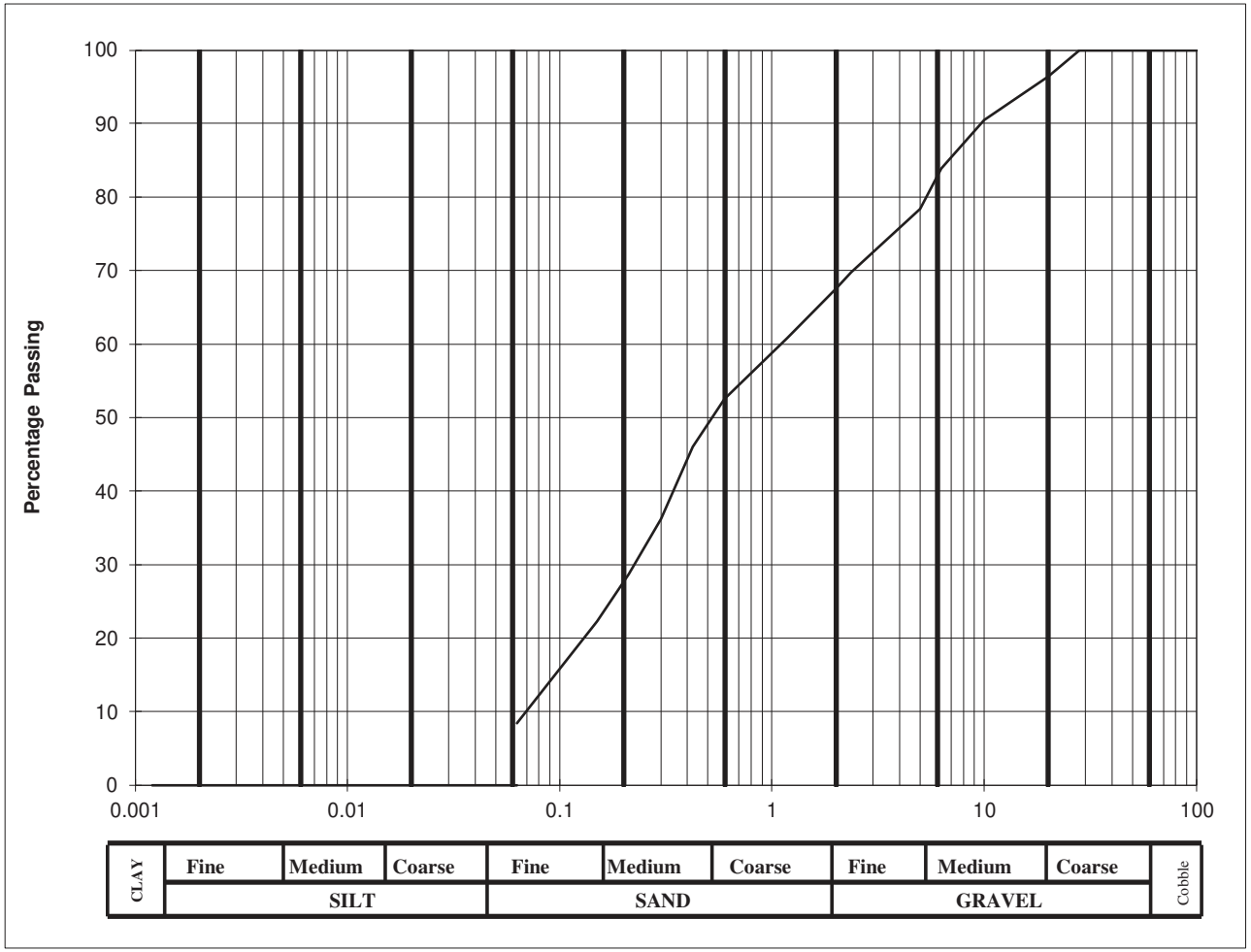
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	96.4		
14	93.3		
10	90.5		
6.3	83.9		
5.0	78.4		
2.36	69.8		
2.00	67.5		
1.18	60.8		
0.600	52.5		
0.425	46		
0.300	36.2		
0.212	28.7		
0.150	22.3		
0.063	9		

Cobbles, %	0
Gravel, %	33
Sand, %	59
Clay / Silt, %	9



Client :	Marlet
Project :	Balscadden, Howth

Lab. No :	21/840
Sample No :	JOT21

Hole ID :	BH 02
Depth, m :	5.00

Material description :	silty very gravelly SAND
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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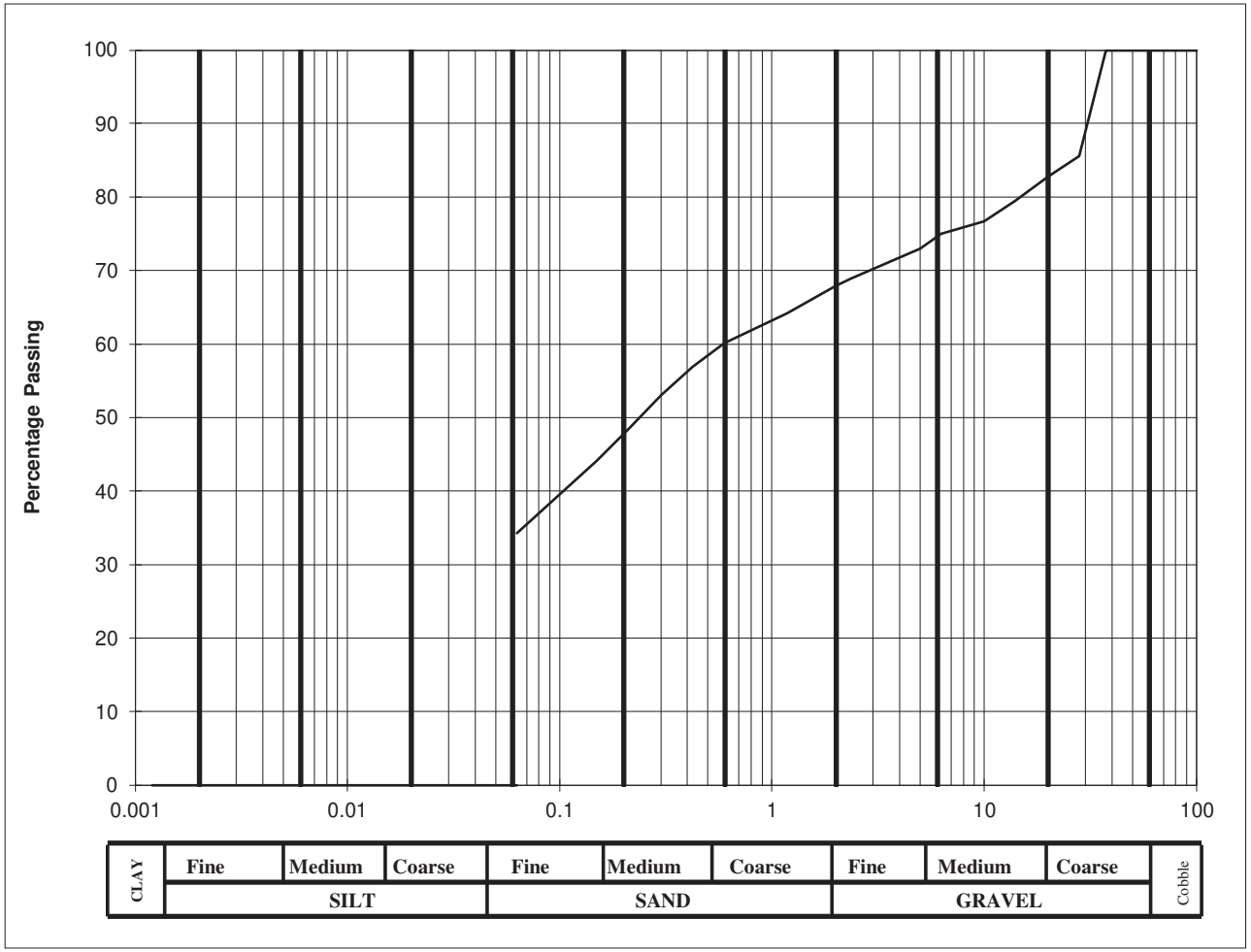
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	85.6		
20	82.8		
14	79.5		
10	76.7		
6.3	75		
5.0	73		
2.36	68.9		
2.00	67.9		
1.18	64.2		
0.600	60.1		
0.425	56.9		
0.300	53		
0.212	48.5		
0.150	44.2		
0.063	34		

Cobbles, %	0
Gravel, %	32
Sand, %	34
Clay / Silt, %	34



Client :	Marlet
Project :	Balscadden, Howth

Lab. No :	21/841
Sample No :	JOT29

Hole ID :	BH 02
Depth, m :	13.00

Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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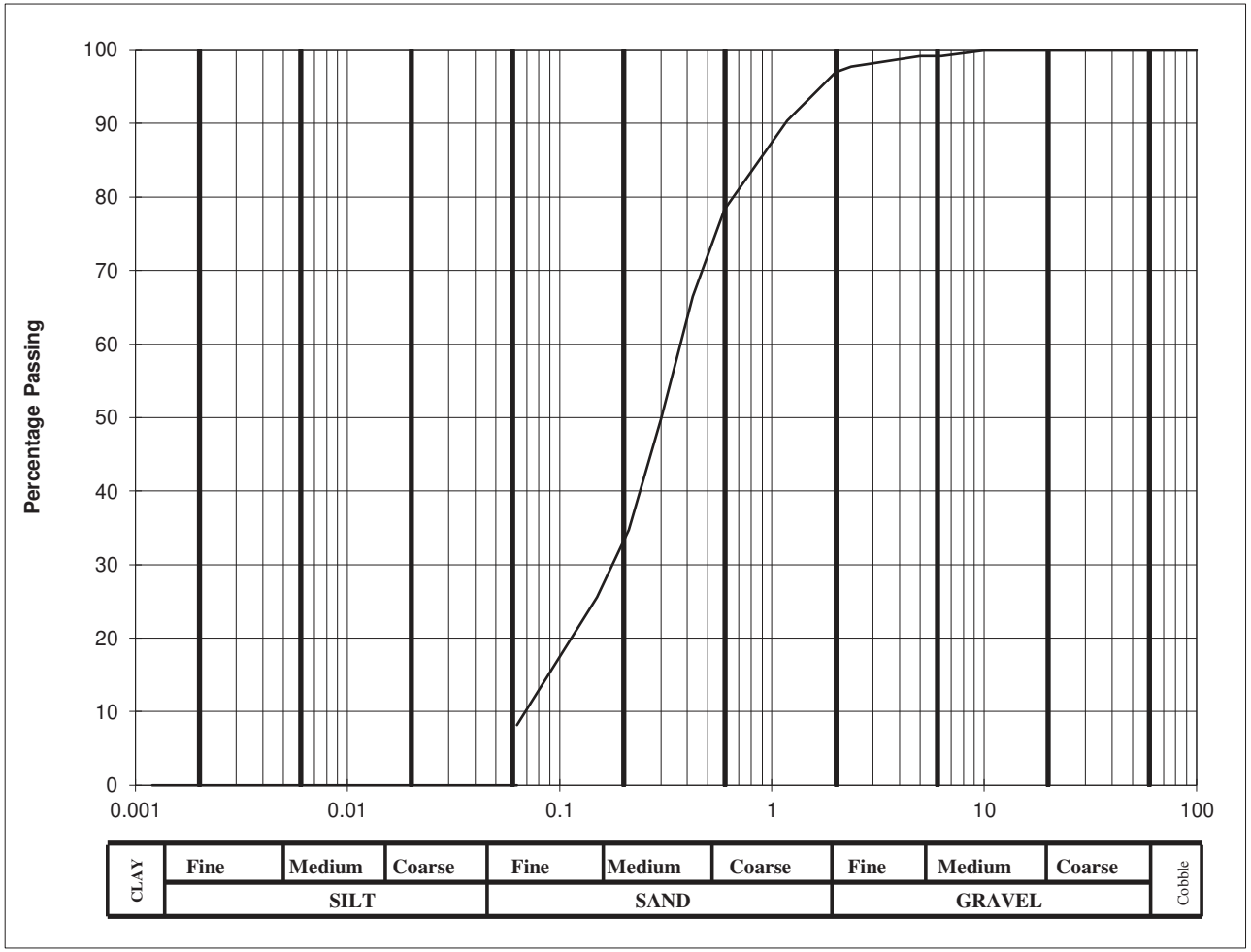
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99.2		
5.0	99.2		
2.36	97.7		
2.00	97		
1.18	90.4		
0.600	78.3		
0.425	66.5		
0.300	49.8		
0.212	34.7		
0.150	25.6		
0.063	8		

Cobbles, %	0
Gravel, %	3
Sand, %	89
Clay / Silt, %	8



Client :	Marlet
Project :	Balscadden, Howth

Lab. No :	21/833
Sample No :	MK01

Hole ID :	TP 01
Depth, m :	1.00

Material description :	silty slightly gravelly SAND
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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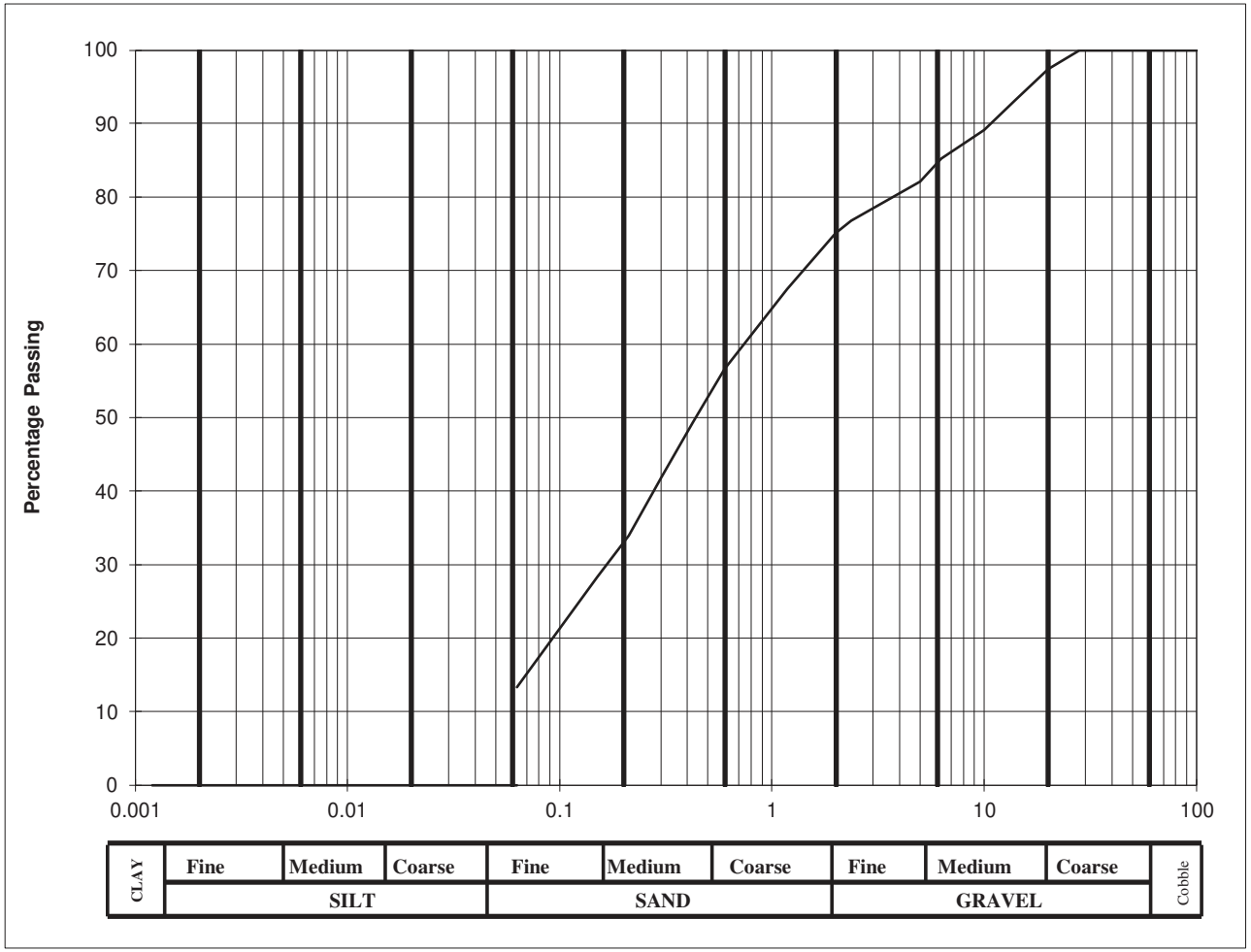
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	97.4		
14	93.2		
10	89.1		
6.3	85.2		
5.0	82.1		
2.36	76.8		
2.00	75.1		
1.18	67.5		
0.600	56.6		
0.425	49.3		
0.300	41.8		
0.212	33.9		
0.150	28.3		
0.063	13		

Cobbles, %	0
Gravel, %	25
Sand, %	62
Clay / Silt, %	13



Client :	Marlet
Project :	Balscadden, Howth

Lab. No :	21/834
Sample No :	MK06

Hole ID :	TP 02
Depth, m :	2.00

Material description :	silty very gravelly SAND
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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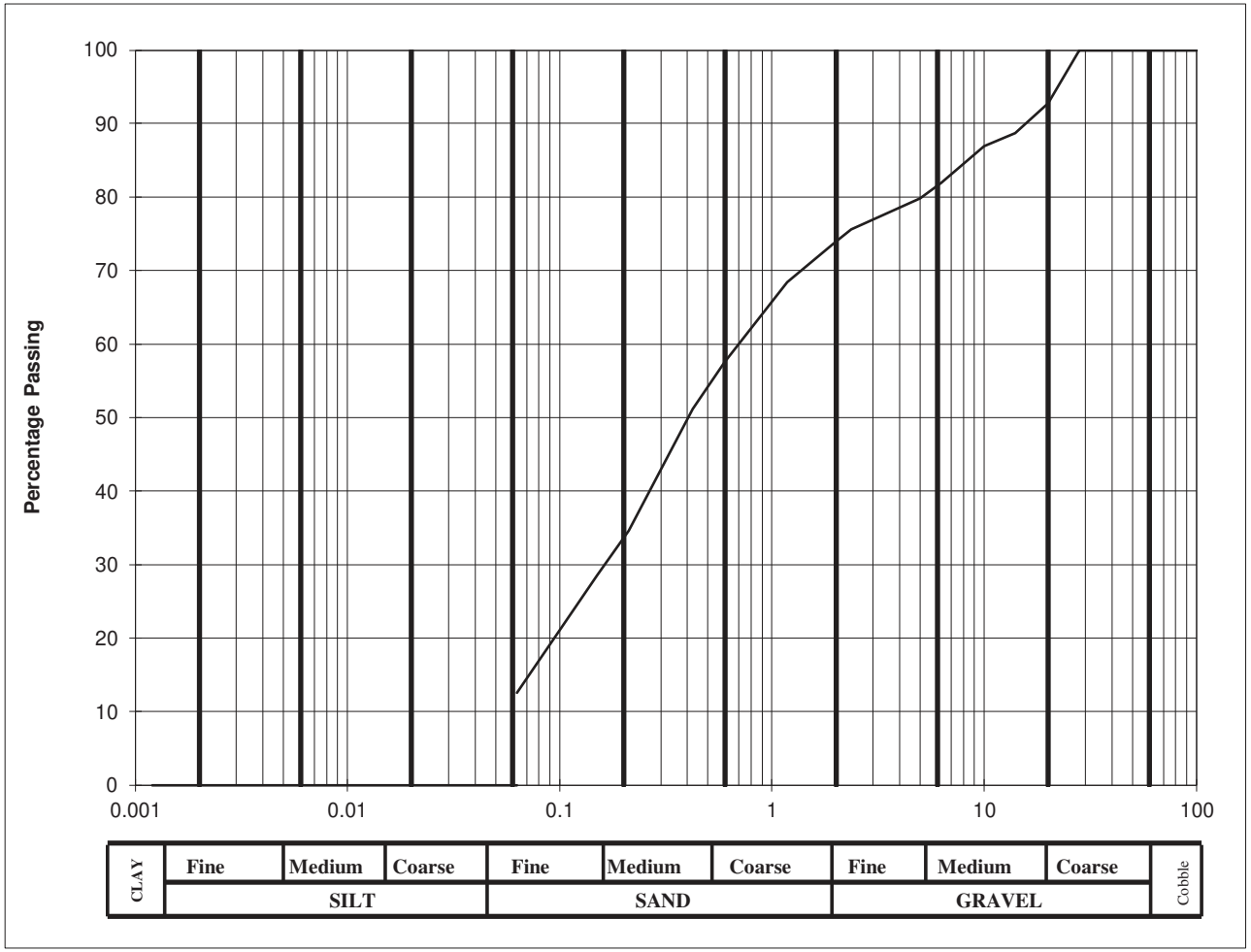
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	92.7		
14	88.7		
10	86.9		
6.3	81.9		
5.0	79.8		
2.36	75.6		
2.00	73.9		
1.18	68.4		
0.600	57.5		
0.425	51.2		
0.300	43		
0.212	34.6		
0.150	28.5		
0.063	13		

Cobbles, %	0
Gravel, %	26
Sand, %	61
Clay / Silt, %	13



Client :	Marlet
Project :	Balscadden, Howth

Lab. No :	21/835
Sample No :	MK04

Hole ID :	TP 03
Depth, m :	2.00

Material description :	silty very gravelly SAND
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

Printed 08/07/2021

_____Paddy McGonagle
Site Investigations Ltd

Chemical Testing
In accordance with BS 1377: Part 3

Client	Marlet
Site	Balscadden, Howth
S.I. File No	5836 / 21
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	6th July 2021

Hole Id	Depth (mBGL)	Sample No	Lab Ref	pH Value	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) g/L	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) %	Loss on Ignition (Organic Content) %	Chloride ion Content (water:soil ratio 2:1) %	% passing 2mm	Remarks
BH01	4.00	JOT04	21/836	8.57	0.119	0.109			91.9	
BH02	5.00	JOT21	21/840	8.57	0.120	0.081			67.5	
TP01	1.00	MK01	21/833	8.56	0.122	0.118			97.0	
TP02	2.00	MK06	21/834	8.49	0.117	0.088			75.1	
TP03	2.00	MK04	21/835	8.50	0.117	0.087			73.9	

Printed 08/07/2021

_____Paddy McGonagle
Site Investigations Ltd.

SHEAR BOX TEST

Test Method **BS 1377 : Part 7 : 1990 : Method 4**

Preparation procedure **Remoulded with 2.5 kg rammer at natural moisture content.**
Material screened on 2mm sieve

Description **Reb/brown slightly silty slightly gravelly fine to coarse SAND.**

Weighings		**Stage 1**	**Stage 2**	**Stage 3**
Wet soil	gms	345.2	344.5	344.9
Dry soil	gms	160.9	160.5	160.7
Wet soil	gms	190.5	189.9	190.4
Dry soil	gms	160.9	160.5	160.7
Water	gms	29.7	29.4	29.7
Moisture Content (%)		18.4	18.3	18.5
Bulk Density (Mg/m3)		2.12	2.11	2.12
Dry density (Mg/m3)		1.79	1.78	1.79
Voids ratio e		0.5104	0.5140	0.5121
Degree of saturation (%)		97.5	96.2	97.3

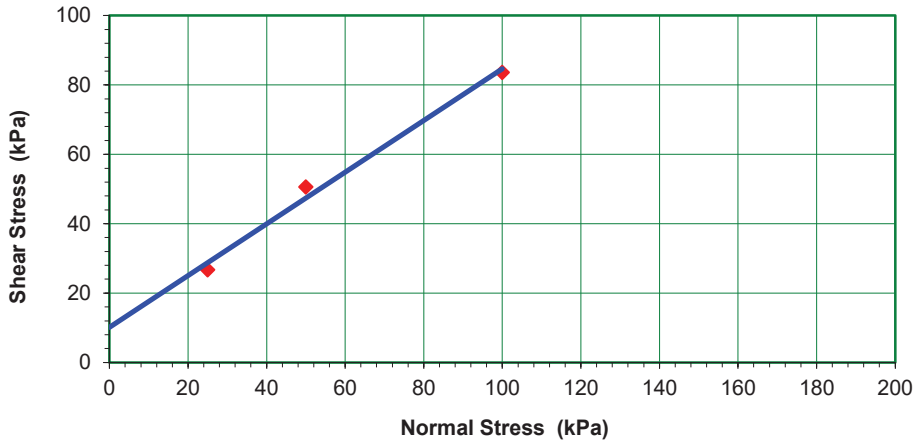
Nominal Dimensions		
Length	L1 mm	60
	L2 mm	60
Area	A mm2	3600
Height	H mm	25
Volume	V cm3	90
Particle density	Mg/m3	2.70

Final Details

	Stage 1	**Stage 2**	**Stage 3**
Normal Loads(kPa)	25	50	100
Shear stress (kPa)	26.7	50.6	83.6
Horizontal Displacement (mm)	1.743	2.227	2.039
Vertical displacement (mm)	-0.169	0.015	-0.040
Rate of displacement (mm/min)		0.5000	

			Peak
Date sampled	n/a		
Date received	25/06/2021	Cohesion c' (kPa)	10.2
Date tested	08/07/2021	Friction angle phi'	36.1°

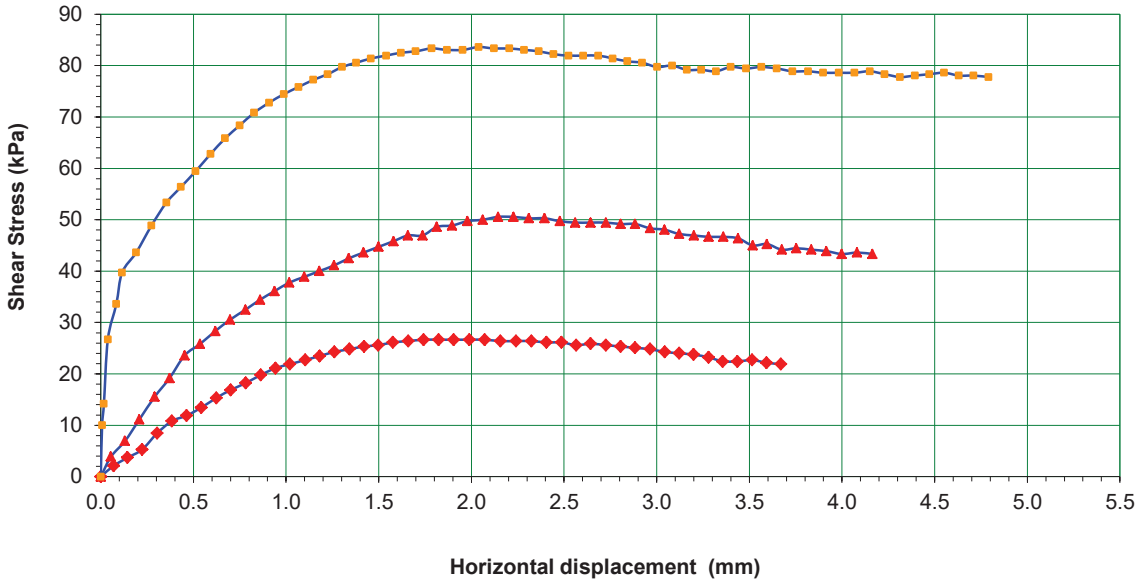
Mohr Envelope

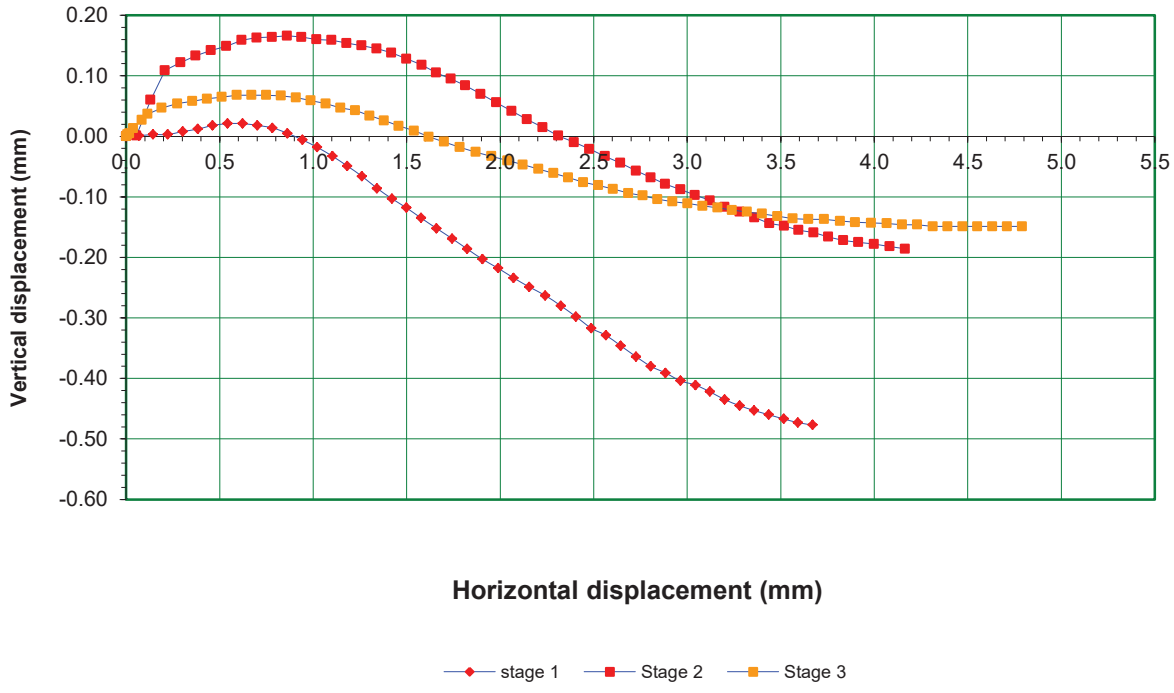


SIL PROJECT ID: 5836-21

NM T L Ltd	**Quick drained shear box in 60mm square shear box**		Job No.	NMTL_3403
			Borehole No.	TP01
	Project	Balscadden, Howth	Sample No.	MK02
Operator Sb	Checked Nc	Approved Bc	Depth.	2.50m

SHEAR STAGE





SIL PROJECT ID: 5836-21

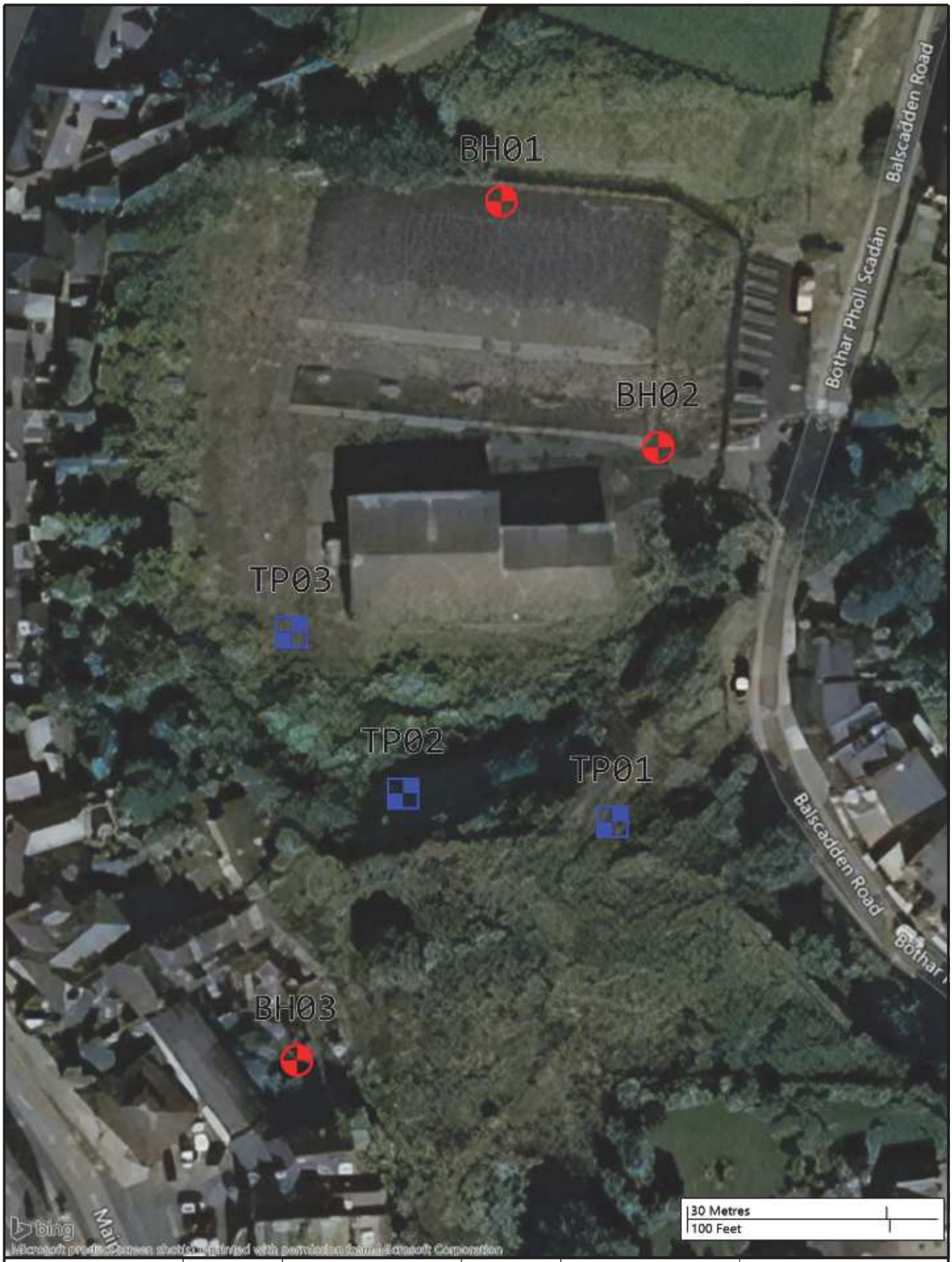
NM T L Ltd		Quick drained shear box in 60mm square shear box				Job No.	NMTL_3403
						Borehole No.	TP01
		Project	Balscadden, Howth			Sample No.	MK02
Operator	Sb	Checked	Nc	Approved	Bc	Depth.	2.50m

Appendix 4

Survey Data

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Boreholes					
BH01	728766.929	739199.986	19.98	328844.016	239174.894
BH02	728791.582	739163.531	19.58	328868.675	239138.431
BH03	728739.243	739069.592	19.42	328816.326	239044.471
Trial Pits					
TP01	728786.136	739106.863	29.92	328863.228	239081.751
TP02	728754.368	739110.303	23.98	328831.454	239085.191
TP03	728736.781	739134.128	20.47	328813.863	239109.021



Contract No:	5836	Client:	Marlet	Legend Key
Contract:	Balscadden	Engineer:	Waterman Moylan	Locations By Type - CP
Location:	Howth, Co. Dublin	Scale:	1:750	Locations By Type - TP
Title:	Site Plan	Drawn By:	SL	

UK and Ireland Office Locations