Client:

Estuary View Enterprises 2020 Ltd.

Project:

Bessborough SHD Development

Report:

Services Infrastructure Report

BARRY & PARTNERS

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SECTION 1: INTRODUCTION

1.1 Scope of the Report

This Services Infrastructure Report outlines the proposed means of servicing the development with wastewater collection and disposal, stormwater management and disposal and water supply infrastructure. A Flood Risk Assessment is provided with this submission under a separate cover. Roads and traffic issues are dealt with separately by MHL Consulting Engineers on behalf of the Applicant and their submission should be consulted for such details.

The following should be read in conjunction with the engineering drawings which illustrate the servicing proposals and with the submissions by other members of the Applicant's design team

1.2 Site Location

The proposed development is located at Phase 2 'The Farm', Bessborough, Ballinure, Blackrock, Cork, on a circa 5.13-hectare site, with a developable area of 4.28-hectares, see Figure 1.1. This proposed development will form Phase 2 of a larger development on a circa 16.59-hectare site, see Figure 1.2 for outline phasing proposals.

The South Ring Road (N40) is located approximately 250m from the southern boundary of the proposed development. The boundaries of the site are formed by the buildings, outbuildings, roads and open spaces of the overall Bessborough complex. The site slopes gently from north to south, with ground levels falling from approximately 18.00 m OD in the north-east of the site to 10.50 m OD in the south-west of the site.

1.3 Proposed Development Brief

This report is prepared in support of a Strategic Housing Development (SHD) planning application by Estuary View Enterprises 2020 Ltd.

The proposed development provides for the demolition of 10 no. existing agricultural buildings /sheds and log cabin residential structure and the construction of a residential development of 140 no. residential apartment units over 2 no. retained and repurposed farmyard buildings (A & B) with single storey extension and 3 no. new blocks of 3-5 storeys in height, with supporting resident amenity facilities, crèche, and all ancillary site development works. The proposed development includes 140 no. apartments to be provided as follows: Block C (9 no. 1-bedroom and 25 no. 2-bedroom over 3 storeys), Block D (34 no. 1-bedroom & 24 no. 2-bedroom over 3-4 storeys), Block E (27 no. 1-bedroom, 20 no. 2-bedroom & 1 no. 3-bedroom over 4-5 storeys). It is proposed to use retained Block A and Block B for resident amenities which include home workspace, library, lounge and function space.

The proposal includes a new pedestrian/cycle bridge over the adjoining Passage West Greenway to the east, connecting into the existing down ramp from Mahon providing direct access to the greenway and wider areas, as well as new pedestrian access to Bessborough Estate to the north including upgrades to an existing pedestrian crossing on Bessboro Road.

The proposed development provides for outdoor amenity areas including publicly accessible parkland, landscaping, surface car parking, bicycle parking, bin stores, substation, public lighting, roof mounted solar panels, wastewater infrastructure including new inlet sewer to the Bessborough Wastewater Pumping Station to the west, surface water attenuation, water utility services and all ancillary site development works. Vehicular access to the proposed development will be provided via the existing access road off the Bessboro Road. See Appendix 1 for proposed site layout plan.

Figure 1-1: Location of Proposed Development

Figure 1-2: Phasing of Proposed Development

SECTION 2: WASTEWATER COLLECTION & DISPOSAL

2.1 Existing Wastewater Network

Cork City Council / Irish Water drainage records show that there is an existing 375/450mmØ foul sewer located to the west of the Phase 3 lands, outside of the boundary of the Applicant's lands, which runs north to south and discharges to the Bessborough Wastewater Pumping Station (WWPS). From the WWPS a 350mmØ rising main heads east crossing through the greenfield area in the ownership of the Applicant before turning north along the Passage West Greenway, see Appendix 2.

A feasibility study of the local area has revealed that there is an existing a 150mmØ foul sewer in the road adjacent to the eastern boundary of the Phase 2 site which runs north to south before turning in a westerly direction and connecting to the WWPS described above, see as-built drawing in Appendix 3. This sewer was constructed under planning reference 03/27028.

2.2 Pre-Connection Enquiry Stage

Following a Pre-Connection Enquiry, Irish Water (IW) issued a Confirmation of Feasibility (COF) stating that the site can be serviced by its wastewater infrastructure network. This COF is included in Appendix 4.

IW have advised that the proposed connection should be made directly to the WWPS, via a new inlet sewer. The WWPS is almost at design loading capacity. However, Irish Water has a project underway to replace the existing pumps which will increase the pump rate and provide sufficient capacity to accommodate this development and subsequent phases of this development. This upgrade project is scheduled to be completed by Q4 2022 and the proposed connection could be completed as soon as possibly practicable after this date.

2.3 Design Acceptance Stage

The proposed designs were progressed in accordance with Irish Water's Code of Practice for Wastewater Infrastructure and were submitted to Irish Water for review and consideration for design acceptance as per the requirement of the SHD process. A Statement of Design Acceptance was issued by Irish Water and is included in Appendix 4.

The wastewater collection within the development will be via a network of gravity sewers. The wastewater flows will be collected and conveyed in in a westerly direction, from the western boundary of the proposed development site and will connect directly to the WWPS.

The final connection from the western edge of the lands to the existing WWPS will be undertaken using directional-drilling techniques to ensure that the existing western boundary wall to the lands will remain undisturbed during construction.

The wastewater collection system is designed and will be constructed in accordance with Irish Water's Code of Practice for Wastewater Infrastructure to ensure self-cleansing velocities will be achieved on all pipe runs. The pipes proposed as part of this design have been sized in accordance with Table 2.1, an extract from IW-CDS-5030-03 (Revision 2 2020).

Manholes will be constructed on all pipe-runs at changes in sewer direction, changes in gradients, at significant sewer connections and at a maximum spacing of 90m on all straight sections of pipework. The gravity wastewater sewers have been designed using MicroDrainage design software and the outputs are included in Appendix 5 of this report. The foul sewer layout plans are attached on Drawing No's. 21207-JBB-PH1-XX-DR-C-04000 & 04001.

No. of Dwellings	Pipe Diameter	Minimum Gradient
2 to 9	150mm (or 225mm)	1:60
10 to 20		1:150
21 to 210	225mm	1:200
211 to 250		1:150
250 to 330		1:100
331 to 450	300mm	1:300
451 to 565		1:200
566 to 655		1:150
656 to 830		1:100

Table 2-1: Foul Sewer Size/Gradient Criteria

2.4 Loading Calculations

The design flows are calculated using the Irish Water Code of Practice for Wastewater Infrastructure Appendix B which is summarised in tables 2.2 and 2.3 below.

Use	No. of Units	Occupancy Rate	Population (P)	Loading (G) (l/day/person)	Daily Loading (PxG) (l/day)	Daily Loading (l/s)
Residential	140	2.7/ Unit	378	150	56,700	
				Infiltration (I) 10% (COP Appendix B – Table 2.4)	5,670	
				Dry Weather Flow (PG +I)	62,370	
				Residential Peaking Factor (Pf_{Dom}) (COP Appendix B – Table 2.5)	6	
				Design Foul Flow [(Pf_{Dom} x PG + I]	345,870	4.003
				Misconnection Allowance (SW) 3% (COP Appendix B - Section 2.2.10)		0.338
				Design Flow		4.341

Table 2-2: Foul Flow Calculations for Residential Development

Use	Floor Area (m^2)	Occupancy Rate	Population (P)	Loading (G) (l/day/person)	Daily Loading (PxG) (l/day)	Daily Loading (l/s)
Creche	242	31*	31	90	2,790	
Café	65	1 per 20m^2	3	50	150	
		1 per 5m^2	13	12	156	
Communal Workspace	180	24**	24	100	2,400	
Gym	108	1 per 5m^2	22	50	1,100	
Lounge	85	30**	30	15	450	
Function Room	70	30**	30	60	1,800	
				Total	8,846	
				Total (Based on 12 Hour Day)	4,423	
				Infiltration (I) 10% (COP Appendix B – Table 2.4)	442	
				Dry Weather Flow (l/s) PG +I	4,865	
				Commercial Peaking Factor ($Pf_{Dom, Ind}$) (COP Appendix B – Table 2.7)	4.5	
				Design Foul Flow ($Pf_{Dom, Ind}$ x PG) + I (l/s)	20,346	0.235
				Misconnection Allowance (SW) 2% (COP Appendix B – Table 2.10)		0.233
				Design Flow (l/s)		0.468

Table 2-3: Foul Flow Calculations for Commercial Development

The combined residential and commercial design flow is 4.8l/s. This figure has been proportionally applied as a base flow to the heads of the wastewater sewer runs within the MicroDrainage design model, see Appendix 5 for the results.

SECTION 3: STORMWATER COLLECTION & DISPOSAL

3.1 Existing Hydrology

The proposed development site does not contain any mapped watercourse. The nearest watercourse to the proposed Phase 2 development site is the Douglas Estuary which is located approximately 250m to the south of the site. The Douglas Estuary flows in an easterly direction and discharges to transitional water body Lough Mahon to the south of the site. The main hydrological features associated with the site are presented in Figure 3.1 below.

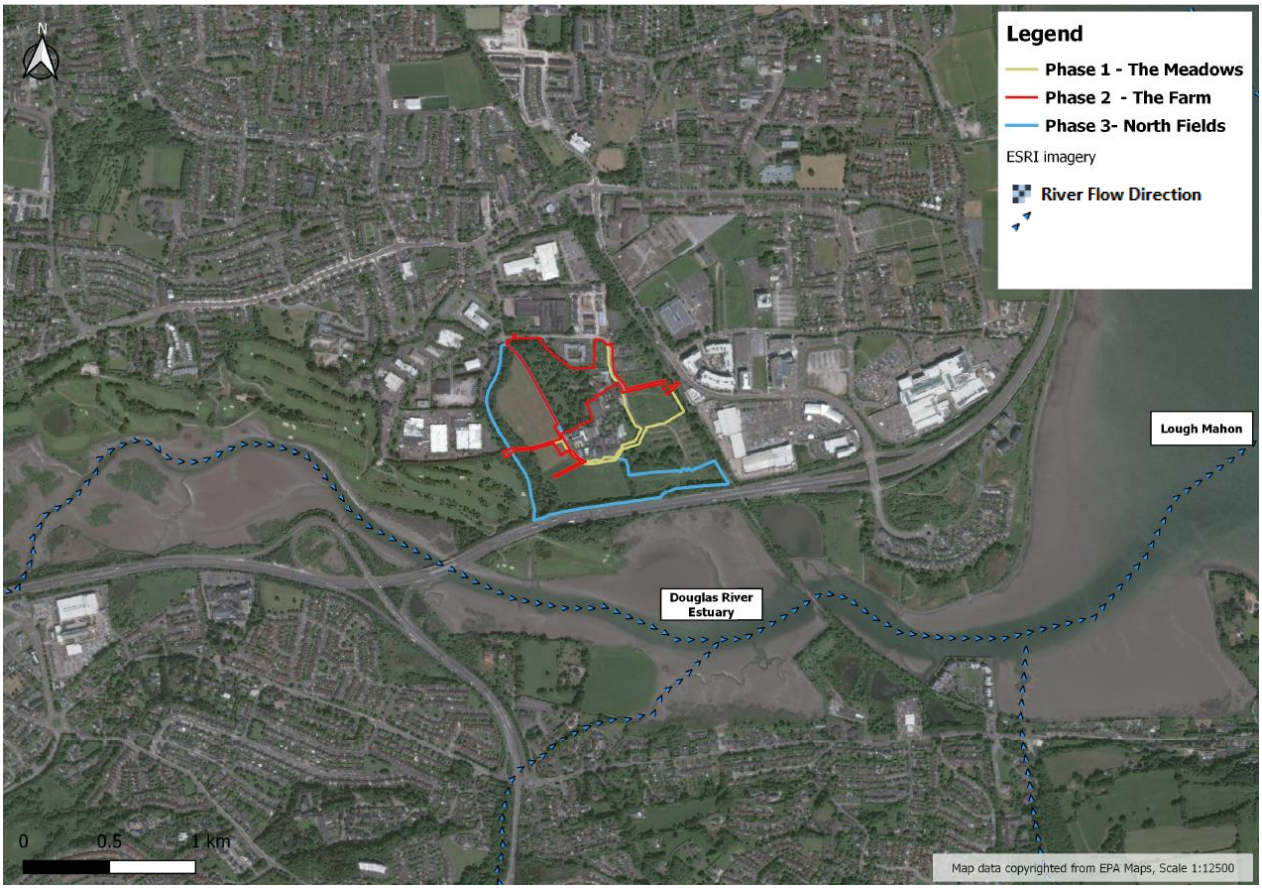


Figure 3-1: Hydrological Features of the Area

A geological desk study was conducted to gain an initial understanding of the existing ground conditions. Figure 3.2 is an extract from the Geological Survey of Ireland (GSI), where the soil permeability at the site is categorised as 'Moderate'. Further to this the groundwater vulnerability is categorised as 'High', see Figure 3.3. Groundwater vulnerability of an area is determined by the permeability and thickness of the subsoils overlying the groundwater, and the type of recharge sources (diffuse or point source). Therefore, areas where the infiltrating water and contaminants move faster from land to groundwater with high permeability are more vulnerable. Both sources of information would suggest that the site should have reasonable rates of permeability.

A ground investigation was undertaken by Priority Geotechnical Ltd. in January 2022 to establish subsurface conditions at the proposed project site. An infiltration test was conducted in one of the boreholes (BH03), see Appendix 6, which resulted in an infiltration rate of 1.12×10^{-3} m/s. An infiltration test was also conducted in one of the boreholes (BH05), on the Phase 1 site which saw no drop in water level after 60 minutes. Due to the inconsistency of results, we have conservatively assumed there will be no reduction in runoff volumes applied for the various SuDS measures. However, it has been assumed that the first flush, 5mm of rainfall

can be infiltrated to ground in specific areas designated for interception purpose, which is explained in greater detail below. Further infiltration testing in accordance with BRE 365 will be conducted in due course to determine accurate results.

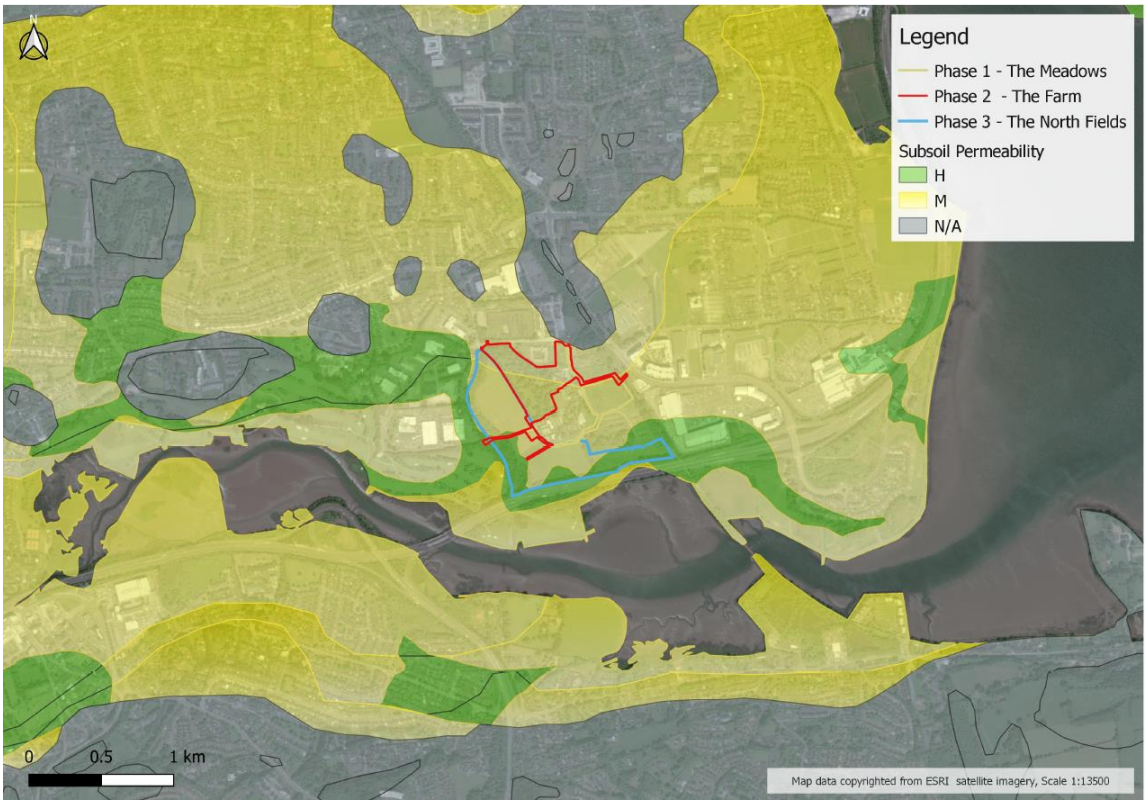


Figure 3-2: Soil Permeability

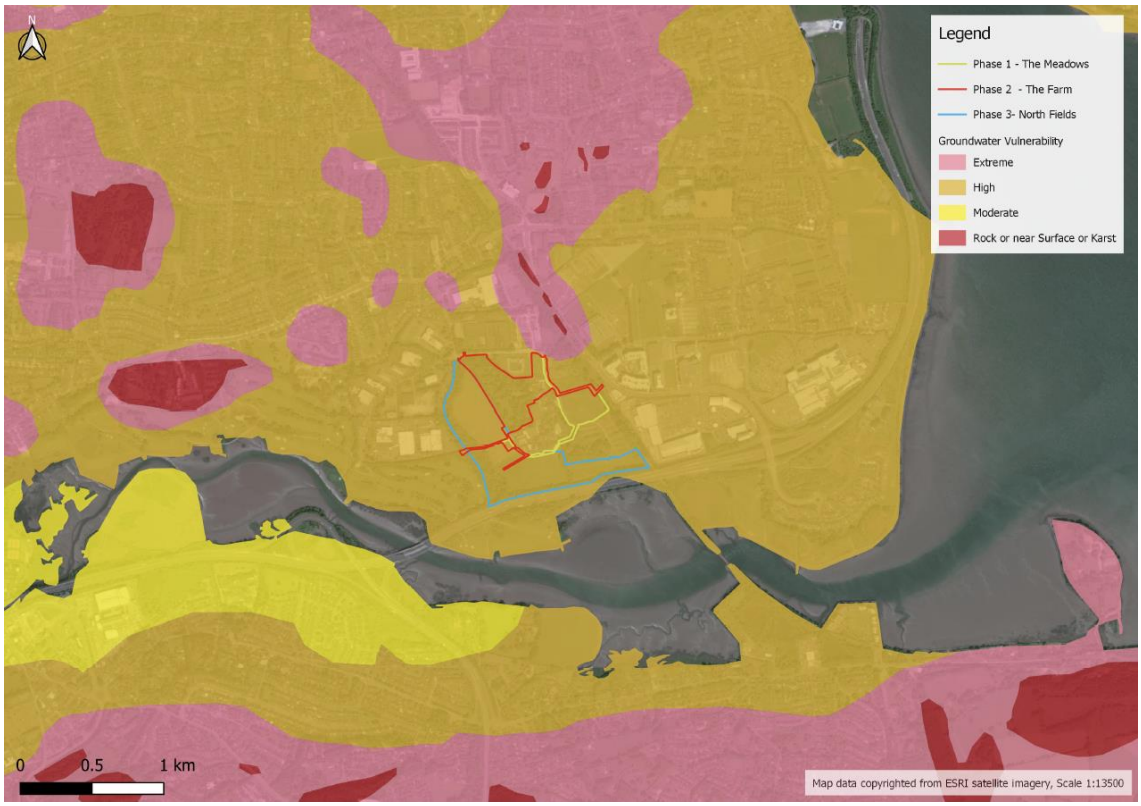


Figure 3-3: Groundwater Vulnerability

3.2 Existing Stormwater Network

Cork City Council drainage records indicate there is an existing 1350mmØ trunk storm sewer located approximately 200m to the west of the Phase 2 site, outside the boundary of the Applicant's lands, which runs in a north-south direction before crossing under the South Ring Road (N40) and discharging to the Douglas Estuary, see Appendix 7.

A feasibility study of the local area has revealed that there is an existing 225mmØ storm sewer in the road adjacent to the eastern boundary of the site (increasing downstream to a 450mm/750mmØ), which runs north to south before turning in a westerly direction and connecting to the 1350mmØ storm sewer described above, see as-built drawing in Appendix 3. This sewer was constructed under planning reference 03/27028.

3.3 Greenfield Runoff

The total developable site area is 4.28-hectares however this includes large open space and treed areas along the western and northern boundaries which will remain undeveloped and therefore will not be positively drained to the development surface water drainage system, and these areas are excluded from the surface water calculations of Qbar. In this context a figure of 1.48ha is used for the site area.

The greenfield runoff rate has been estimated using the HR Wallingford Greenfield runoff estimation online tool (report attached in Appendix 8). The online tool calculated a Qbar figure of 12.2 l/s (equivalent to 8.24 l/sec/ha). A summary of the design values output by the HR Wallingford Greenfield runoff estimation online tool is shown below:

Design Criteria	Value
Site Area (ha)	1.48
Soil Type	4
SPR	0.47
SAAR (mm)	1106
1 year factor	0.85
30-year factor	1.65
100-year factor	1.95

Table 3-1: HR Wallingford Design Value Outputs

Given the proximity of the site to the Douglas Estuary the controlled outflow from the development has been set to the Q100 figure (the flow from the site in its greenfield condition in a 100-year storm event). This approach was proposed to Cork City Council Drainage Department and they were satisfied with the approach. See correspondence from Cork City Council in Appendix 9.

The growth factor to be applied when calculating Q100 from Qbar is 1.95 giving an upper limit to the discharge from the site at 23.79 l/sec. This is the value that will be used in later detailed design as the upper limit of surface water discharge from the development.

3.4 Proposed Development Surface Water Management System

The proposed surface water management system will, as far as is feasible, be designed in accordance with the principles of Sustainable Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS).

The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimise the impact of urbanisation by replicating the runoff characteristics of a greenfield site. The criteria provide a consistent approach to addressing both rate and volume of runoff as well as ensuring the environment is protected from pollution that is washed off roads and buildings. These drainage design criteria are as follows:

- Criterion 1 - River Water Quality Protection
- Criterion 2 - River Regime Protection
- Criterion 3 - Flood Risk Assessment
- Criterion 4 - River Flood Protection

The requirements of SuDS are typically addressed by provision of the following:

- Interception storage
- Treatment storage (not required if interception storage is provided)
- Attenuation storage
- Long term storage (In discussion with Cork City Council there is no requirement for long term storage)

3.4.1 Layout of the Proposed Network

The proposed surface water network will include a storm drainage pipe network, attenuation storage structures and several SuDS features which will aid the reduction of runoff volumes by slowing surface water flows, providing the opportunity for evapotranspiration and providing the opportunity for infiltration to ground. Both the interception and attenuation storage requirements of GDSDS will be sufficiently met.

An assessment of the potential SuDS measures that could be incorporated within the site was conducted using the SuDS Manual, CIRIA 753 as guidance. The following SuDS features have been identified as applicable and will be provided within the proposed scheme:

- Green Roofs: will be provided throughout the site on flat roofs, where possible. The green roof will be an extensive type with sedum planting at the surface with a drainage layer beneath. The drainage layer will convey flows to discharge locations. It is not proposed to restrict the discharges from the roofs. Where possible discharges from roofs will be tied into planters or permeable paving substrata via diffusers.

- Permeable Paving: will be provided for all parking spaces and the creche play area. Permeable paving will be a Type B as per SuDS Manual, CIRIA 753, a combination of infiltration and piped drainage.

- Tree Pits/Bioretention Planters: will be provided in every feasible location where there is a proposed tree or planter. The tree pits will contain engineered soil filled tree boxes with drainage pipes beneath to link trees together and tie in with the proposed surface water sewer. The bioretention planters will consist of a shallow landscaped depression at the surface with a drainage layer beneath.

- StormTech Attenuation Tank: will be provided at the natural low point, at the southwest of the site for final storage of runoff volumes before discharging to the existing surface water network at a controlled rate.

The SuDS features will be designed to work in sequence thereby creating a treatment train. The proposed SuDS layout is shown on see Drawing No. 21207-JBB-PH2-XX-DR-C-04005 and the overall drainage arrangement is shown on Drawing No. 21207-JBB-PH2-XX-DR-C-04002, both included with this submission.

Manholes will be constructed on all pipe-runs at changes in sewer direction, changes in gradients, at significant sewer connections and at a maximum spacing of 90m on all straight sections of pipework The gravity surface water sewers have been designed using MicroDrainage design software and the outputs are included in Appendix 10 of this report.

The contributing surface areas of the development has been split up and tabulated below:

Area Type	Units (ha)
Total Site Area	4.28
Catchment Area	1.48
Green Roof	0.13
Permeable Paving	0.01
Tree Pits/Bioretention Planters	0.05
Impermeable Area	1.17
Open Space Without Formal Drainage	0.12
Total Drained Area	1.36

Table 3-2: Surface Areas

3.4.2 Interception Storage

In accordance with the requirements of GDSGS, at least 5mm, and preferably 10mm, of interception storage should be provided on site, where runoff to the receiving water can be prevented.

In the case of this Phase 2 development the total drained area is 1.36ha (13,600m²) as per Table 3.2 above. This results in a required interception storage volume of 68.0m³ (13,600 X 0.005) The proposed interception storage will be provided by permeable paving, swales, tree pits and bioretention areas.

Green roofs are proposed throughout the development. These areas cover a total area of 1,300m². The build-up in the green roof system will provide a minimum of 5mm of interception storage per 1m², allowing for a total interception storage volume of 6.50m³.

Permeable surfaces including permeable paving, tree pits and bioretention planters are proposed throughout the development, for a total area is 600m². The drainage pipe within the gravel bed for these areas will be set at 50mm above the bed formation giving (assumed 30% voids) interception stage equivalent to 15mm storage depth. Total interception volume provided in the permeable paving equals 9m³.

The proposed StormTech attenuation tank has a surface area of 420m². Interception storage will be provided within the base of the tanks for a depth of 300mm depth of stone below the StormTech Chambers. Assuming the tanks have a void ratio of 43% (which is conservative), the total interception storage volume provided is 54.18m³.

The overall interception storage volume provided is therefore 69.68m³ which represents approximately 5.1mm of interception storage which is above the required minimum provision as detailed above.

3.4.3 Attenuation Storage

The proposed rate of surface water discharge from the development will be limited to that of the greenfield runoff for a 100-year storm event, as described in Section 4.2. Attenuation will be provided by StormTech attenuation chambers which will cater for the 100-year storm event with 10% climate change allowance added. The proposed surface water network will be contained in a single catchment, see Figure 3.4.

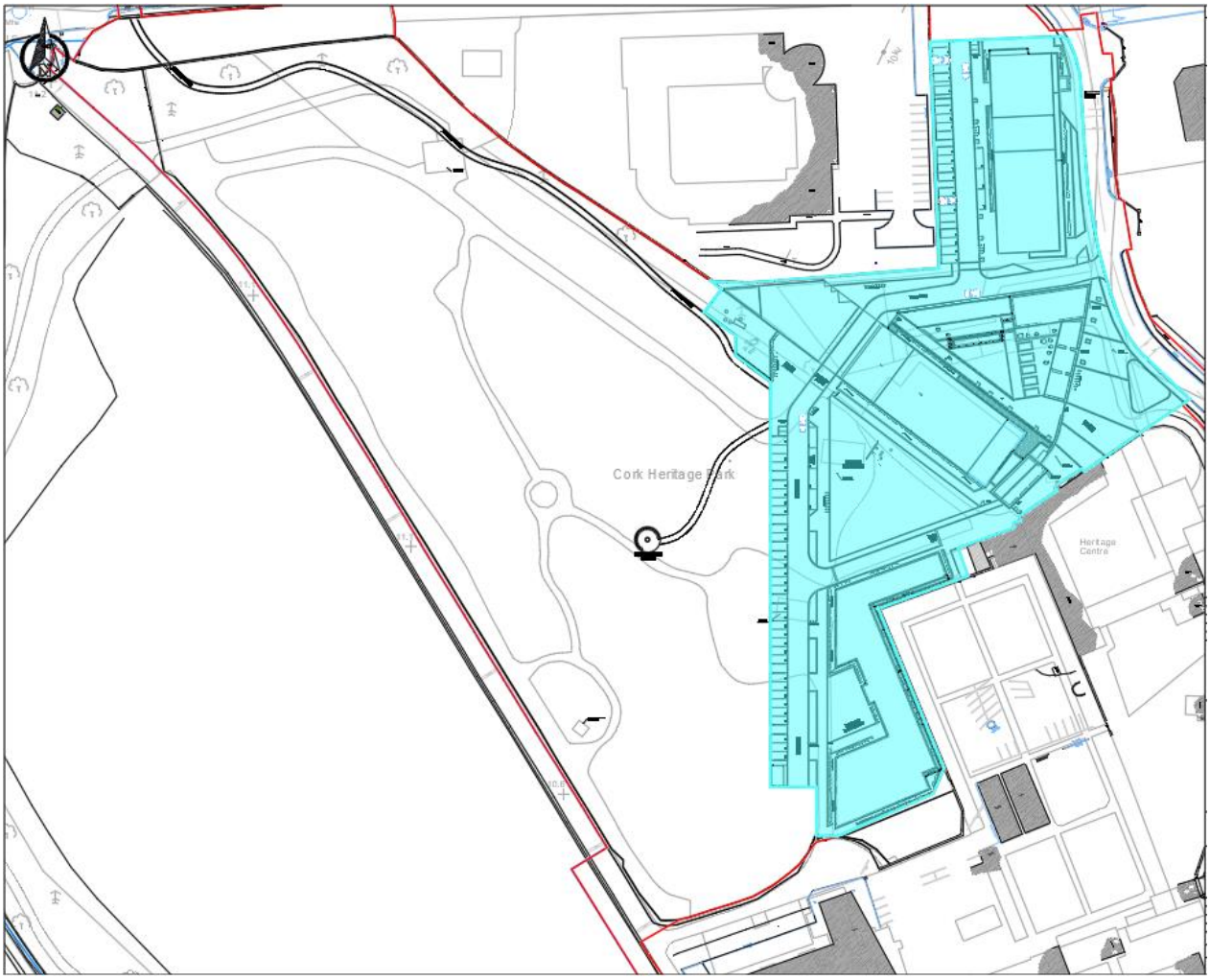


Figure 3-4: Surface Water Catchment Areas

The various SuDS components being proposed as part of the development will provide some attenuation, reduce flow rates and will disperse surface water via evapotranspiration and infiltration. However, at this stage of the design process, and to ensure a robust design, we are designing for the worst case and have not assumed a reduction in runoff volume from the various SuDS features and permeable surfaces in the attenuation storage calculations. This will be revisited closer to construction stage, subject to a granted planning permission.

Preliminary attenuation volume calculations, based on the above criteria, are summarised in Table 3.3. (See Appendix 11 for detailed calculations)

Ref.	Catchment Area (ha)	Q100 (l/s)	Required Storage Volume 100yr +10% C.C. (m^3)	Provided Attenuation Volume (m^3)	Attenuation Storage Type
A	1.48	23.79	501	501	StormTech Chambers

Table 3-3: Summary of Attenuation Requirements and Proposals

3.4.4 Water Quality

The proposed development is residential and therefore is considered a low-level pollution hazard. Surface water runoff will be directed to the SuDS features as mentioned above and will therefore benefit from their pollutant removal qualities. However, to ensure water quality standards are met, we are proposing a hydrocarbon interceptor upstream of the StormTech attenuation tank.

Simple Index Approach

The effectiveness of the chosen SuDS components to achieve water quality can be assessed using the 'simple index approach' as described in CIRIA C753.

The simple index approach designates risk indices to the various areas of development to determine their possible pollutant contribution. Similarly, the SuDS features are designated mitigation indices and if the mitigation indices are larger than the risk indices the water quality objectives are considered satisfied.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Driveways, car parks, low traffic roads	Low	0.5	0.4	0.4

Table 3-4: Pollution Hazard Indices for Different Land Uses

As can be seen in Table 3.5 below the total mitigation potential of the SuDS features far outweigh the contamination risks. Secondary (or further) stages in the treatment train are assigned 50% of the stated treatment indices value.

SuDS Component	TSS	Metals	Hydrocarbons
Permeable paving	0.7	0.6	0.6
Bioretention/Tree pits	0.8	0.8	0.8
Petrol Interceptor	0.4	0.4	0.4

Table 3-5: Indicative SuDS Mitigation Indices for Discharges to Surface Waters

3.4.5 Amenity and Biodiversity

Meeting amenity and biodiversity standards is all about creating attractive, pleasant, and liveable urban areas for both people and for nature.

The proposed SuDS features within this development will not only be aesthetically pleasing, but they will also assist the creation of liveable habitats for nature by retaining rainfall at the source. The final details of these features will be drawn-up in consultation with the landscape design and ecological consultants on the design team.

3.5 Conveyance of Surface Water Outflow to Final Discharge Location

A new 225mmØ surface water outfall pipe will convey the restricted flows from the site in a south-westerly direction connecting to the existing 750mmØ surface water sewer upstream of its connection to the existing 1350mmØ surface water pipe which in turn discharges to the Douglas Estuary further to the south.

The controlled discharge from the proposed development (a maximum of 23.79 l/sec) will be minimal relative of the capacity of the existing 750mmØ and 1350mmØ pipes and given that this controlled outflow matches existing greenfield runoff from the site in a 100-year storm event these flows will not create a significant increase in the flow to the Douglas Estuary.

The proposed route of this sewer is shown on Drawing No. 21207-JBB-PH2-XX-DR-C-04006.

SECTION 4: WATER SUPPLY

4.1 Existing Watermain Network

Cork City Council watermain records show there is an existing 150mmØ watermain in the roadway adjacent to the eastern boundary of the site, an existing 300mmØ watermain in the roadway to the north of the site and a 200mmØ watermain to the south. There is also an existing 1200mmØ trunk watermain running through the greenfield area in the ownership of the Applicant to the south of development site, see Appendix 12.

4.2 Pre-Connection Enquiry Stage

Following a Pre-Connection Enquiry, Irish Water (IW) have issued a Confirmation of Feasibility (COF) that the site can be serviced by its water infrastructure network. This COF is included in Appendix 4.

IW have advised that the connection is to be made to the existing 300mmØ ductile iron watermain in the roadway to the north of the site.

4.3 Design Acceptance Stage

The proposed design for water supply infrastructure within the development was progressed in accordance with Irish Water's Code of Practice for Water Infrastructure and was submitted to Irish Water for review and consideration for design acceptance as per the requirement of the SHD process. A Statement of Design Acceptance was issued by Irish Water and is included in Appendix 4.

To serve the development a 150mmØ watermain will be connected to the existing 300mmØ ductile iron watermain in the roadway to the north of the site. 40mmØ spurs will be taken off the proposed 150mmØ watermain and will feed a local cold water storage tank / booster station within the plant room of each apartment block. A bulk flow meter will be provided on each of the apartment block supply lines. From the plant rooms each of the residential and commercial units will be fed and metered individually.

Fire hydrants will be provided such that each building will be within 46m of a hydrant and these hydrants will be fully accessible to the fire service. Apartment buildings will be subject to Fire Safety Certificate applications and the provision of appropriate water supply for firefighting will be addressed in these applications.

The proposed water supply layout plans are shown on Drawing No. 21207-JBB-PH2-XX-DR-C-03002.

4.4 Loading Calculations

Water demand for the development is determined in accordance with Irish Water Code of Practice for Water Infrastructure.

Per-capita consumption = 150 litres/person/day

Average day / peak week demand (ADPWD) = 1.25 x ADDD

Peak Water Demand = 5.00 x ADPWD

Use	Floor Area (m^2)	Occupancy Rate	Population (P)	Average Daily Demand (l/day)	Average Daily Demand (l/s)	Average Day/Peak Week Demand (l/s)	Peak Hour Water Demand (l/s)
Residential	140	2.7	378	56,700	0.656	0.82	4.1
						Total	4.1

Table 4-1: Water Demand for Residential Development

Use	Floor Area (m^2)	Occupancy Rate	Population (P)	Average Daily Demand (l/day)	Average Daily Demand (l/s)	Average Day/Peak Week Demand (l/s)	Peak Hour Water Demand (l/s)
Creche	242	31	31	4,650	0.054	0.068	0.340
Café	65	1 per $20m^2$	3	450	0.027	0.035	0.175
		1 per $5m^2$	13	1,950			
Communal Workspace	180	24	24	3,600	0.042	0.053	0.265
Gym	108	1 per 5m2	22	3,300	0.038	0.048	0.240
Lounge	85	30	30	4,500	0.052	0.065	0.325
Function Room	70	30	30	4,500	0.052	0.065	0.325
						Total	1.67
						Total (Based on 12 Hour Day)	0.835

Table 4-2: Water Demand for Commercial development

Appendix 1

PROPOSED SITE LAYOUT PLAN

FARM SCHEME BUILDINGS:A,B,C,D,E		
140 APARTMENTS	NO.	%
1 BEDROOM AP.	70	50 %
2 BEDROOMS AP. 3P	12	8.6 %
2 BEDROOM AP. 4P	57	40.7%
3 BEDROOMS AP.	1	0.7 %
TOTAL NO.	140	100 %
DUAL ASPECT	57	40.7%
NO. OF UNITS WITH AREA 10% GREATER THAN REQUIRED	78	55.0%
TOTAL RESIDENT'S PRIVATE AMENITY AREA	2,563 sqm	
PUBLIC OPEN SPACE	27,136 sqm	63,3 %
STREETS AND SQUARES	1,072 sqm	
PUBLIC PARK	24,520 sqm	
PUBLIC LINK TO GREENWAY	1,544 sqm	
PARKING SPACES	54	38.0%
CRECHE DROP OFF	4	
MOTORBIKE SPACES	5	
RESIDENT'S BIKE SPACES	230	
VISITOR'S BIKE SPACES	100	

LEGEND

- SITE BOUNDARY
  SITE AREA: 51.250 sqm
  DEVELOPABLE AREA: 42 842 sqm
- OTHER LANDS UNDER APPLICANT'S CONTROL
- RESIDENT'S AMENITY AREA
- EXISTING STRUCTURE TO BE DEMOLISHED
- PROPOSED TREES
- EXISTING TREES TO BE RETAINED
- ROOT PROTECTION ZONE
- EXISTING TREES TO BE REMOVED

NORTH POINT

1 PROPOSED SITE LAYOUT PLAN
1:500 @ A0

SITE LAYOUT PLAN

1:500@A0

SHiPSEYBARRY
CHTD. ENGINEERS

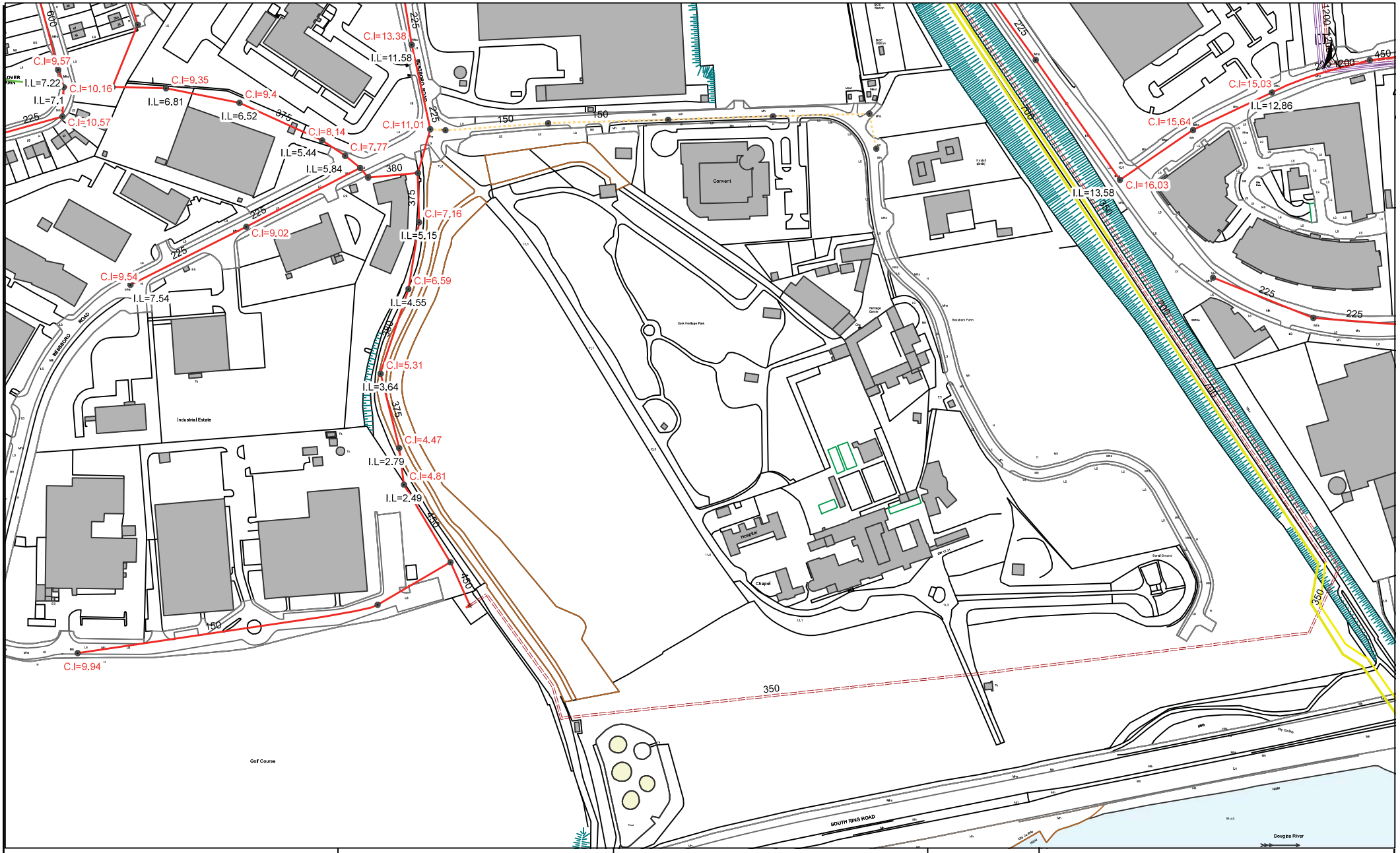
PROJECT :	PHASE 2- THE FARM-BESSBOROUGH
SCALE :	1:500 @ A0
DATE :	04.2021
DRAWING DESCRIPTION:	SITE LAYOUT PLAN
OVERSEEN BY :	AH
APPROVED BY :	GB
CLIENT :	ESTUARY VIEW ENT. 2020 LTD.
DRAWING NO :	SB-2020-107-200

D 1st Submission 09.2021
C 2nd submission 13.07.2021
B 3rd submission 30.06.2021
A 4th submission 21.06.2021

28,Richmond Hill , Belfield , Cork, Ireland t : + 353 (0)21 2398855 f : + 353 (0)21 2398827 e: info@shipseybarry.com www.shipseybarry.com

Appendix 2

CORK CITY COUNCIL - EXISTING WASTEWATER NETWORK



Drainage Records

Legend

IW_FoulNetwork
PIPE_FUNCT
- LOCAL COMBINED
- LOCAL FOUL
- RISING MAIN
- County Co
- CoCo Rising Main
- PRIVATE FOUL
- PRESSURE PIPE
- PUMP OVERFLOW
- UNPROCESSED

IW_FoulManholes
MANHOLE_
- Manhole
- Pumphouse

THE SEWERS SHOWN ON THIS MAP ARE FOR REFERENCE ONLY. THE LOCATION AND PROPERTIES OF ALL SEWERS, LEVELS, PIPESIZES, etc, MUST BE CONFIRMED ON SITE.

1:2,500

N

CORK CITY COUNCIL ENVIRONMENT DIRECTORATE
(As agents of Irish Water)

Drawn By: A. Homan

Checked by: G.R.

Date: 25/07/2018

Appendix 3

AS-BUILT LOCAL DRAINAGE NETWORK

NOTES.

1.	To be read in conjunction with all relevant drawings and specification.
2.	Do not scale if in doubt ask.
3.	All dimensions to be checked on site.

Legend

Foul & Storm
150mm Ø Site Connections

Existing Services Connected

MAHON GOLF COURSE

CONVENT

Tank

Tank

1.	AS CONSTRUCTED	A.T.	0.0'D	06.09.'06
0.	ISSUED FOR CONSTRUCTION	M.M.	0.0'D	11.04.'06
REV.	DETAILS	REV.	CHKD.	DATE

CORK CITY COUNCIL
Scanned
PLANNING DIRECTORATE

John O'Donovan & Associates
Civil, Structural, Mechanical & Electrical Engineers
Model Farm Road, Cork 4, Ireland.
telephone: 021 454 4244 facsimile: 021 454 4277
e-mail: firstnames.surname@joda.ie web: www.joda.ie

jodo ENGINEERING CONSULTANTS

Bessborough Site Development Works
Bessborough, Blackrock, Cork

3699–103

DWG TITLE: As Built Site Services – Foul & Storm Water Drainage
DN: A.T.
CHKD: 0'D.D
STATUS: CONSTRUCTION
SCALE: Not To Scale
DATE: APRIL 2006

Appendix 4

IRISH WATER – CONFIRMATION OF FEASIBILITY

IRISH WATER – STATEMENT OF DESIGN ACCEPTANCE

Tim Finn

JB Barry & Partners
3 Eastgate, Eastgate Business Park
Little Island
Co. Cork
T45KH74

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

9 February 2022

Re: CDS21001326 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 140 unit(s) and creche at Bessboro, Blackrock, Co. Cork

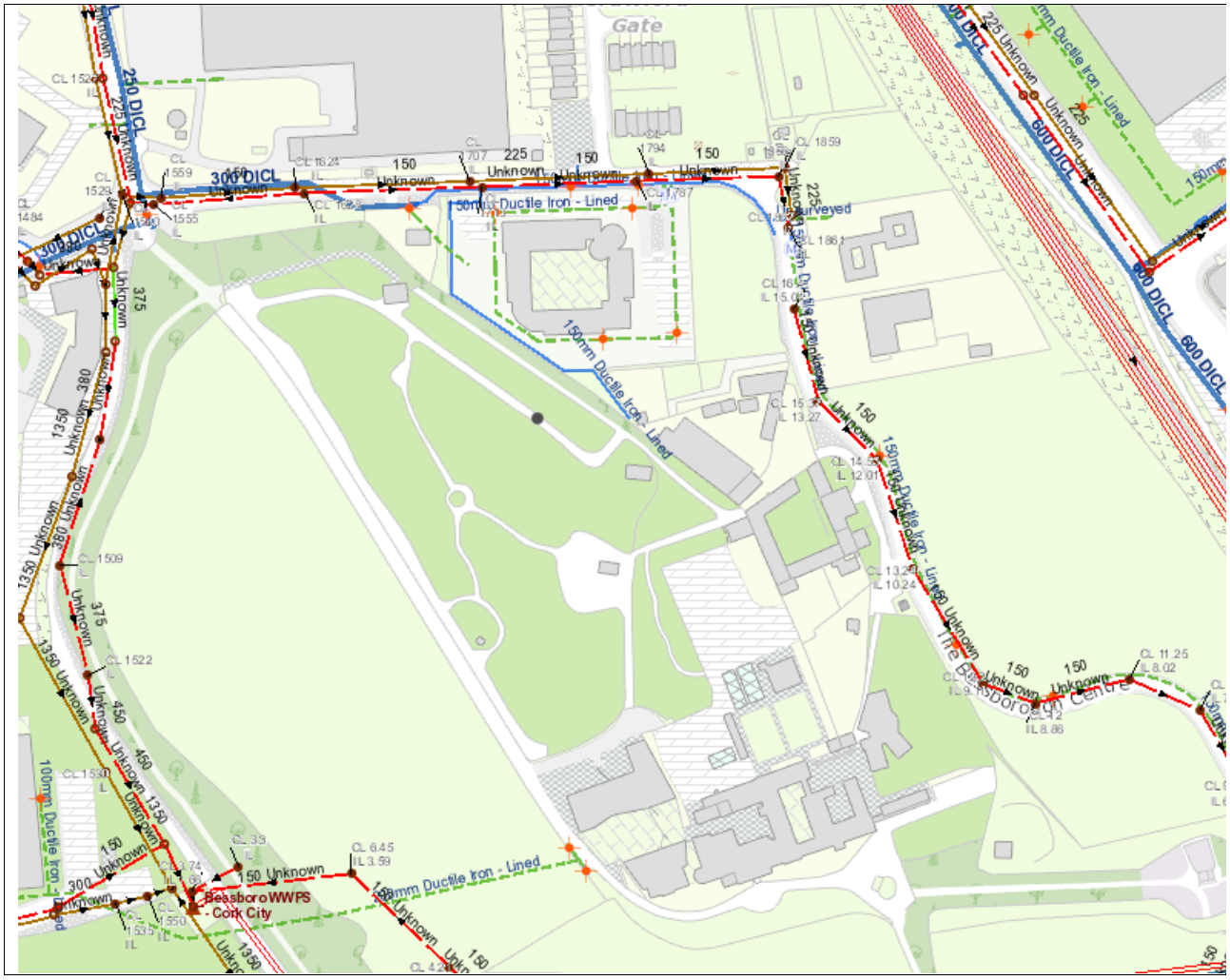
Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Bessboro, Blackrock, Co. Cork (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	Connection to be made to the existing 300mm DI adjacent to site on Bessboro Rd. No works to interfere with existing 1200mm trunk main. No diversions of this main shall be permitted.
Wastewater Connection	Bessborough WWPS is almost at design loading capacity. Irish Water has a project underway to replace the existing pumps which will increase the pump rate and provide sufficient capacity to accommodate this development. This upgrade project is scheduled to be completed by Q4 2022 (this may be subject to change) and the proposed connection could be completed as soon as possibly practicable after this date.

	New development to discharge directly to Bessborough WWPS via a new inlet sewer.
Strategic Housing Development	Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.
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

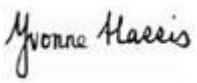
information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising 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 Marko Komso from the design team on 022 54611 or email mkomso@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

Diarmuid O' Brien
JB Barry & Partners
3 Eastgate, Eastgate Business Park
Little Island, Co. Cork T45KH74

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

25 February 2022

Re: Design Submission for Bessboro, Blackrock, Co. Cork (the "Development") (the "Design Submission") / Connection Reference No: CDS21001328

Dear Diarmuid O' Brien,

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: Kyle Jackson
Email: Kyle.jackson@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix 5

FOUL SEWER - MICRODRAINAGE CALCULATIONS

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200
Flow Per Person (l/per/day)	150.00	Maximum Backdrop Height (m)	4.000
Persons per House	2.70	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	67.499	2.120	31.8	0.000	0	1.6	1.500	o	225	Pipe/Conduit	
F2.000	25.192	0.420	60.0	0.000	0	0.1	1.500	o	225	Pipe/Conduit	
F1.001	27.040	0.588	46.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.002	28.445	0.603	47.2	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F3.000	30.656	0.511	60.0	0.000	0	0.1	1.500	o	255	Pipe/Conduit	
F1.003	64.774	0.432	149.9	0.000	0	2.0	1.500	o	255	Pipe/Conduit	
F1.004	59.191	0.423	139.9	0.000	0	0.0	1.500	o	255	Pipe/Conduit	
F1.005	24.505	0.164	149.4	0.000	0	1.0	1.500	o	255	Pipe/Conduit	
F1.006	23.563	0.195	120.8	0.000	0	0.0	1.500	o	255	Pipe/Conduit	
F4.000	17.403	0.290	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.001	12.128	0.243	50.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.002	9.495	0.462	20.5	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	15.500	0.000	1.6	0	0.0	22	0.79	2.04	81.0	1.6
F2.000	13.800	0.000	0.1	0	0.0	7	0.26	1.48	59.0	0.1
F1.001	13.380	0.000	1.7	0	0.0	25	0.71	1.69	67.4	1.7
F1.002	12.792	0.000	1.7	0	0.0	25	0.71	1.67	66.5	1.7
F3.000	12.700	0.000	0.1	0	0.0	7	0.25	1.61	82.3	0.1
F1.003	12.159	0.000	3.8	0	0.0	47	0.59	1.02	51.9	3.8
F1.004	11.727	0.000	3.8	0	0.0	46	0.61	1.05	53.8	3.8
F1.005	11.304	0.000	4.8	0	0.0	52	0.64	1.02	52.0	4.8
F1.006	11.140	0.000	4.8	0	0.0	50	0.69	1.13	57.9	4.8
F4.000	11.970	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F4.001	11.680	0.000	0.0	0	0.0	0	0.00	1.63	64.6	0.0
F4.002	11.437	0.000	0.0	0	0.0	0	0.00	2.54	101.0	0.0

Network Design Table for Foul - Main

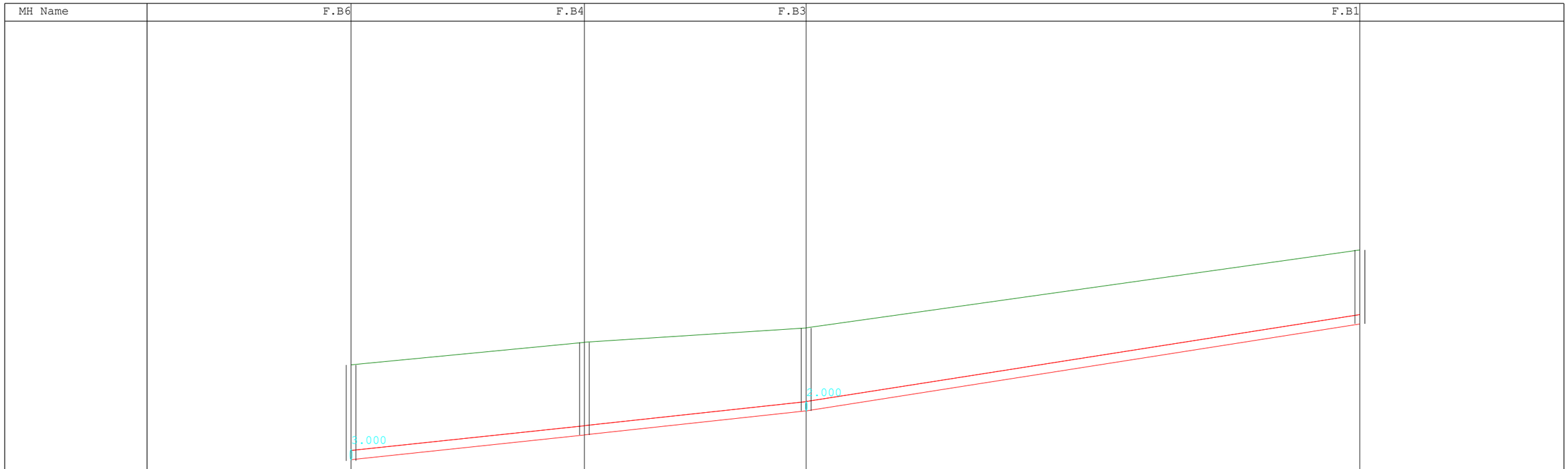
PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.007	7.397	0.200	37.0	0.000	0	0.0	1.500	o	255	Pipe/Conduit	
F1.008	12.727	0.350	36.4	0.000	0	0.0	1.500	o	255	Pipe/Conduit	
F1.009	26.235	1.251	21.0	0.000	0	0.0	1.500	o	255	Pipe/Conduit	
F1.010	36.829	1.632	22.6	0.000	0	0.0	1.500	o	255	Pipe/Conduit	
F1.011	38.614	1.464	26.4	0.000	0	0.0	1.500	o	255	Pipe/Conduit	
F1.012	43.328	1.478	29.3	0.000	0	8.8	1.500	o	255	Pipe/Conduit	
F1.013	45.563	0.455	100.1	0.000	0	0.0	1.500	o	255	Pipe/Conduit	
F1.014	62.433	2.044	30.5	0.000	0	6.1	1.500	o	255	Pipe/Conduit	
F1.015	19.092	0.475	40.2	0.000	0	0.0	1.500	o	255	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.007	10.945	0.000	4.8	0	0.0	37	1.04	2.05	104.9	4.8
F1.008	10.745	0.000	4.8	0	0.0	37	1.04	2.07	105.8	4.8
F1.009	10.395	0.000	4.8	0	0.0	32	1.27	2.73	139.4	4.8
F1.010	9.144	0.000	4.8	0	0.0	33	1.23	2.63	134.3	4.8
F1.011	7.512	0.000	4.8	0	0.0	34	1.17	2.43	124.2	4.8
F1.012	6.048	0.000	13.6	0	0.0	58	1.54	2.31	117.8	13.6
F1.013	4.570	0.000	13.6	0	0.0	80	0.99	1.25	63.6	13.6
F1.014	4.115	0.000	19.7	0	0.0	71	1.69	2.26	115.4	19.7
F1.015	2.071	0.000	19.7	0	0.0	77	1.53	1.97	100.6	19.7

Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.015	F.A33	3.800	1.596	0.000	0	0

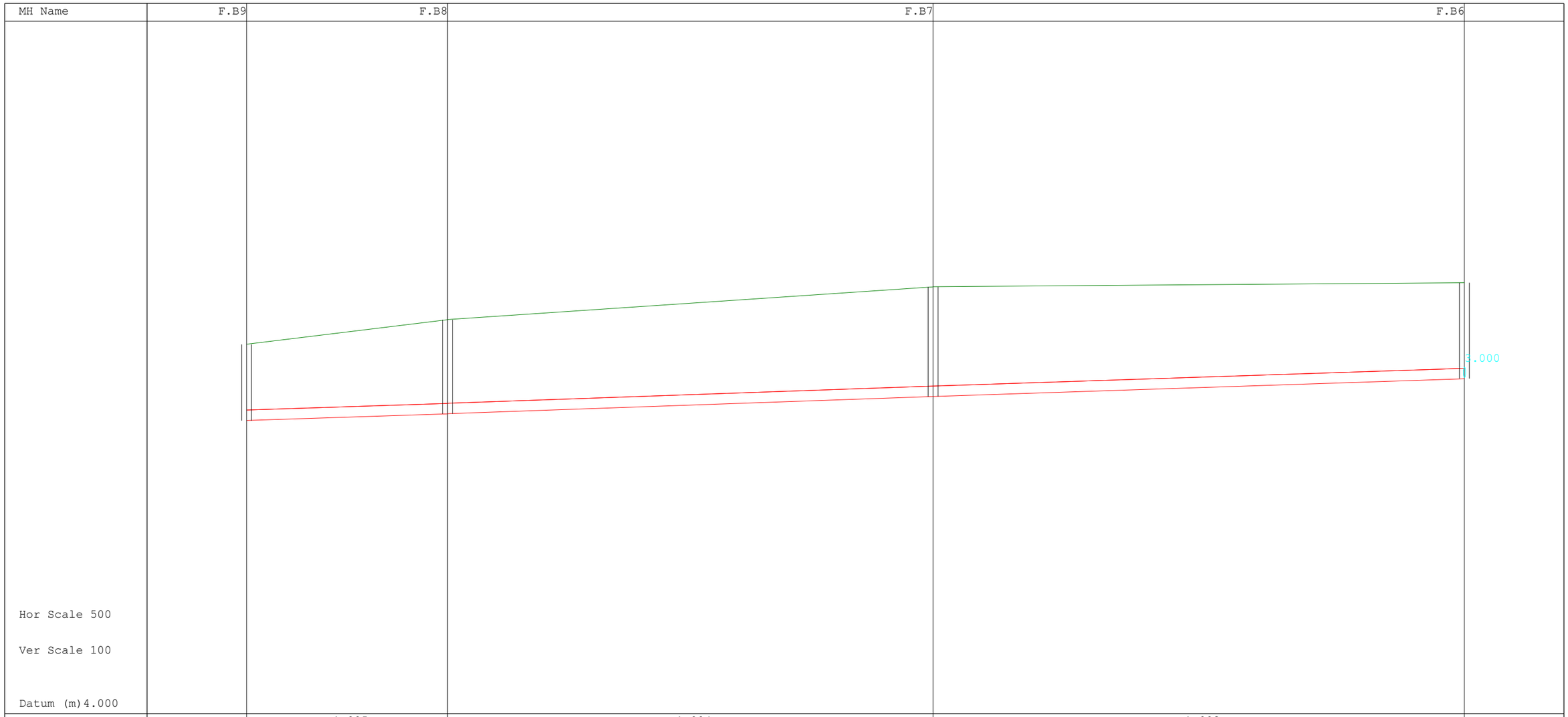


Hor Scale 500

Ver Scale 100

Datum (m) 6.000

PN		F1.002	F1.001	F1.000	
Dia (mm)		225	225	225	
Slope (1:X)		47.2	46.0	31.8	
Cover Level (m)	14.500	15.050	15.400	17.300	
Invert Level (m)	12.189	12.792 / 12.792	13.380 / 13.380	15.500	
Length (m)		28.445	27.040	67.499	

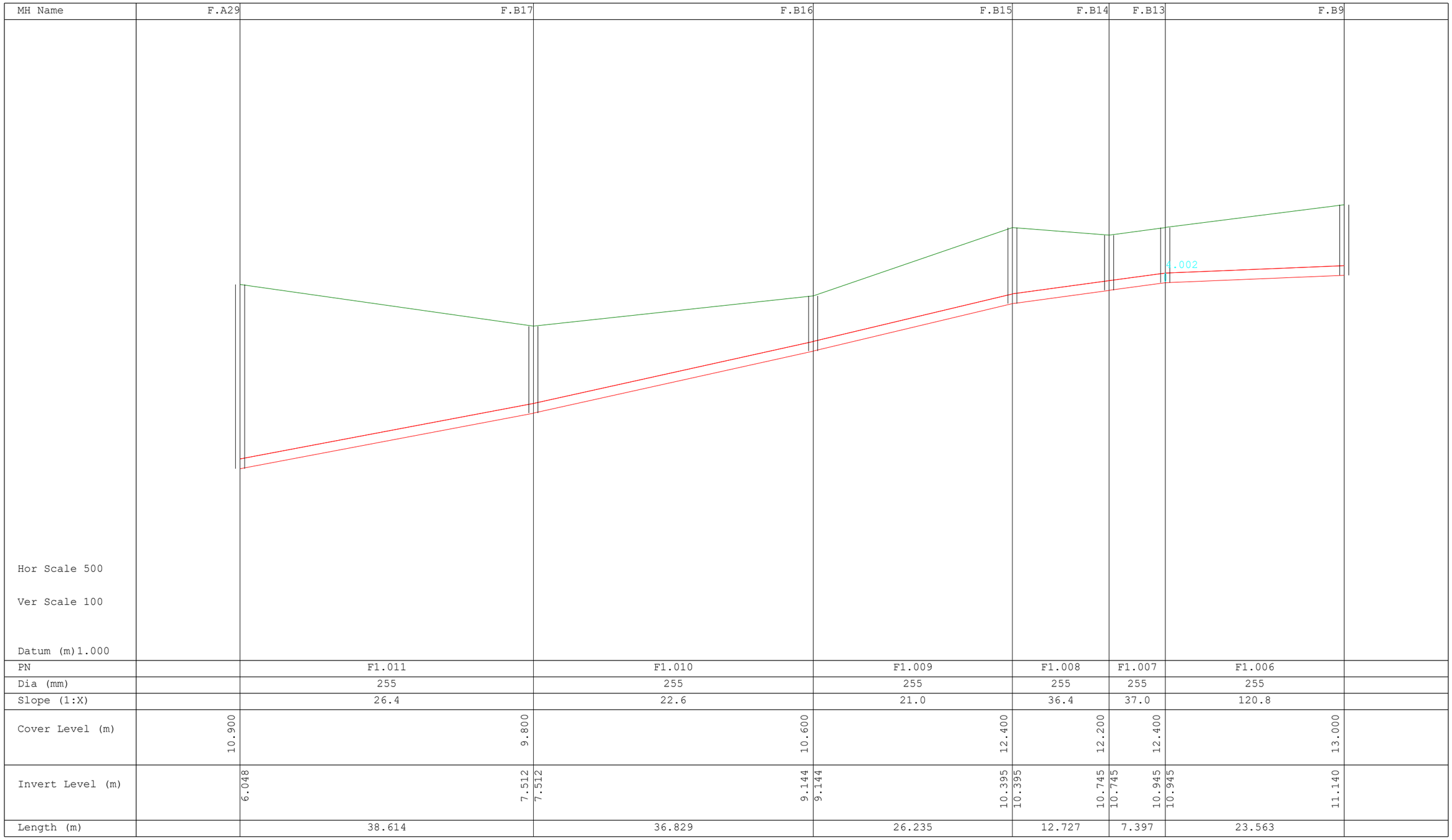


Hor Scale 500

Ver Scale 100

Datum (m) 4.000

MH Name		F.B9	F.B8	F.B7	F.B6	
PN		F1.005	F1.004	F1.003		
Dia (mm)		255	255	255		
Slope (1:X)		149.4	139.9	149.9		
Cover Level (m)	13.000	13.600	14.400	14.500		
Invert Level (m)		11.140	11.304	11.304	11.727	11.727	12.159	
Length (m)		24.505	59.191	64.774		

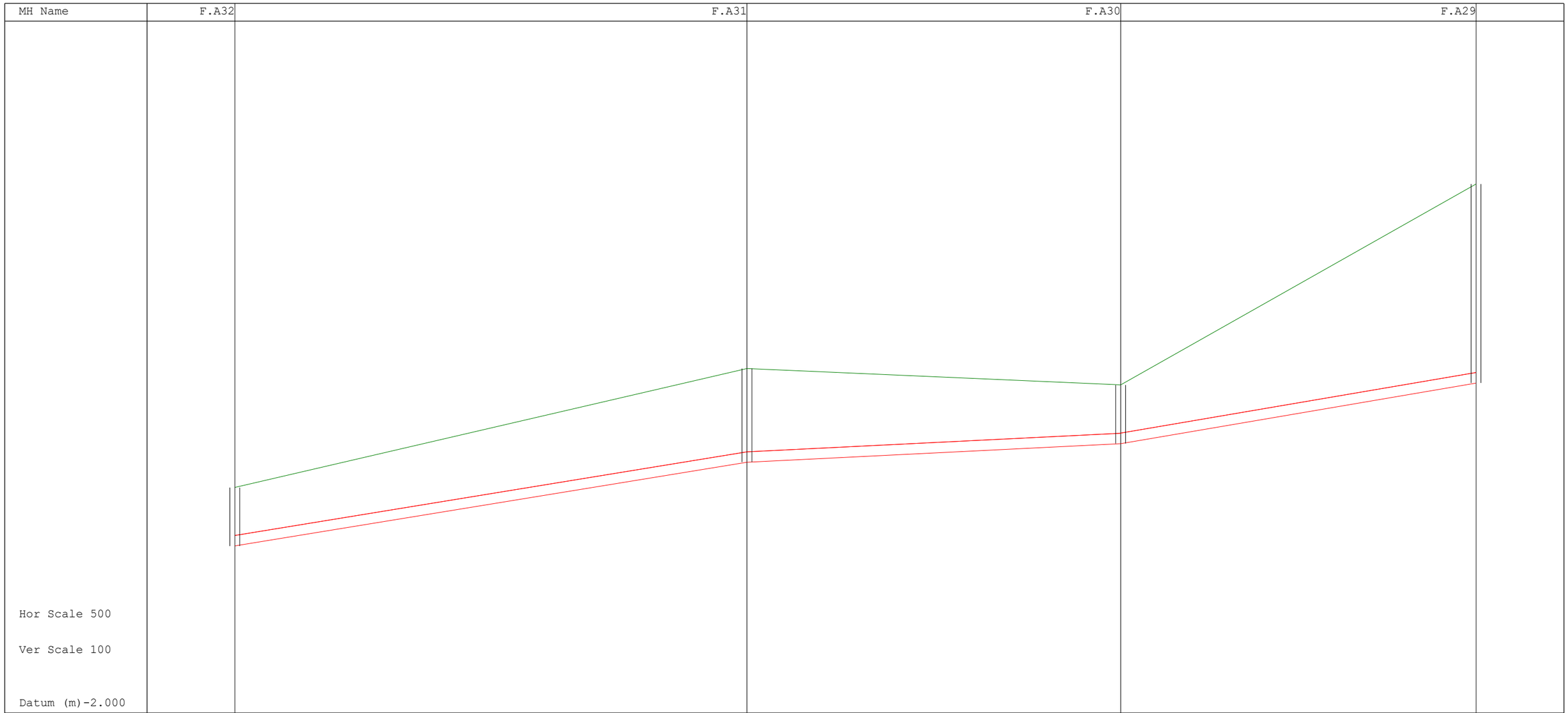


Hor Scale 500

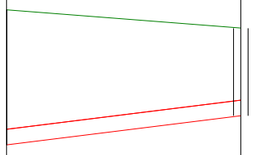
Ver Scale 100

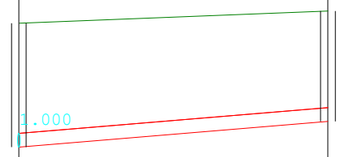
Datum (m) 1.000

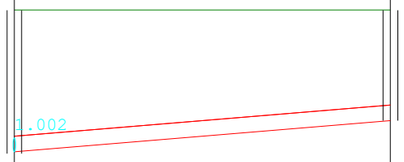
MH Name		F.A29	F.B17	F.B16	F.B15	F.B14	F.B13	F.B9	
PN			F1.011	F1.010	F1.009	F1.008	F1.007	F1.006	
Dia (mm)			255	255	255	255	255	255	
Slope (1:X)			26.4	22.6	21.0	36.4	37.0	120.8	
Cover Level (m)	10.900	9.800	10.600	12.400	12.200	12.400	13.000		
Invert Level (m)		6.048	7.512	7.512	9.144	9.144	10.395	10.395	10.745	10.745	10.945	10.945	11.140	
Length (m)			38.614	36.829	26.235	12.727	7.397	23.563	

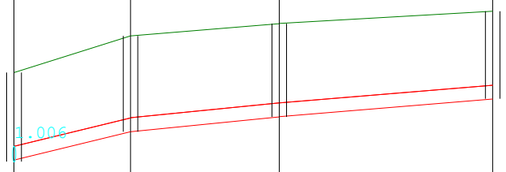


PN		F1.014	F1.013	F1.012	
Dia (mm)		255	255	255	
Slope (1:X)		30.5	100.1	29.3	
Cover Level (m)	3.500	6.400	6.000	10.900	
Invert Level (m)	2.071	4.115	4.115 4.570	4.570 6.048	
Length (m)		62.433	45.563	43.328	

MH Name	F.A33	F.A32	
Hor Scale 500 Ver Scale 100 Datum (m)-6.000			
PN		F1.015	
Dia (mm)		255	
Slope (1:X)		40.2	
Cover Level (m)	3.800	3.500	
Invert Level (m)	1.596	2.071	
Length (m)		19.092	

MH Name	F.B3	F.B2	
			
Hor Scale 500 Ver Scale 100 Datum (m) 6.000			
PN		F2.000	
Dia (mm)		225	
Slope (1:X)		60.0	
Cover Level (m)	15.400	15.600	
Invert Level (m)	13.380	13.800	
Length (m)		25.192	

MH Name	F.B6	F.B5	
			
Hor Scale 500 Ver Scale 100 Datum (m) 5.000			
PN		F3.000	
Dia (mm)		255	
Slope (1:X)		60.0	
Cover Level (m)	14.500	14.500	
Invert Level (m)	12.189	12.700	
Length (m)		30.656	

MH Name		F.B13	F.B12	F.B11	F.B10	
						
Hor Scale 500 Ver Scale 100 Datum (m) 4.000						
PN			F4.002	F4.001	F4.000	
Dia (mm)			225	225	225	
Slope (1:X)			20.5	50.0	60.0	
Cover Level (m)		12.400	13.000	13.200	13.400	
Invert Level (m)			10.975 11.437	11.437 11.680	11.680 11.970	
Length (m)			9.495	12.128	17.403	

Appendix 6

PRIORITY GEOTECHNICAL LTD - GROUND INVESTIAGTION

Our Ref: JMS/Rp/P21239 + attachments (*.pdf)

16th March, 2022

JB Barry & Partners Limited
3 Eastgate Road,
Eastgate Business Park,
Little Island,
Co. Cork,
T45 KH74.

Re: Bessborough SHD Sites, Site Investigation, Factual report.

Introduction

In November 2021, Priority Geotechnical (PGL) were requested by JB Barry & Partners Limited acting on behalf of their client Estuary View Enterprises to undertake a site investigation as part of the Bessborough SHD Sites project.

Objectives

The objective of the site investigation contract is to determine the ground and groundwater conditions in order to inform the engineering design solutions for the proposed development.

Scope

The original scope of the site investigation, which was specified by JB Barry & Partners, comprised of:

- 06Nr. Cable percussion boreholes;
- Trial pits;
- Surveying of 'as-built' levels and co-ordinates;
- All associated sampling;
- All associated laboratory works;
- Associated reporting;

The final site works as completed is outlined, herein. This geotechnical data report presents the fieldworks records with regard to the site investigation for the Bessborough SHD Sites Project. The report should be read in conjunction with the exploratory records, the photographic records and the laboratory test data accompanying this report.

Site Works

This investigation was carried out in accordance with Eurocode 7- Geotechnical Design Part 2, ground investigation and testing (BS EN 1997-2: 2007) and the relevant British Standards (BS 5930 (2015) Code of Practice for Site Investigation and BS 1377, Method of Tests for Soil for Civil Engineering Purposes, *in situ* Tests Parts 1 to 9).

The direct intrusive fieldworks were undertaken from the 10th and 17th January, 2022 to under the supervision of PGL, Engineering Geologist(s). Details of the plant and equipment used are detailed on the relevant exploratory records, accompanying this report.

Cable Percussion Boreholes

Six (06) cable percussion boreholes were drilled to depths 4.4m below existing ground level (bgl) to 9.1m bgl using PGL's Dando 2000 Rig and 200mm diameter casing. The logs are accompanying this factual report.

Location	Depth (m bgl)	Date (dd/mm/yyyy)
BH01	4.4	13/01/2022
BH02	9.1	10/01/2022
BH03	8.4	12/01/2022
BH04	7.3	14/01/2022
BH05	7.4	17/01/2022
BH06	7.0	13/01/2022

Chiselling				
Location	**Depth Top (m bgl)**	**Depth Base (m bgl)**	**Duration (hh:mm)**	**Tool**
BH01	1.20	1.30	01:00	Chisel.
	4.30	4.40	01:00	Chisel.
BH02	2.75	2.90	01:00	Chisel.
	8.90	9.10	01:00	Chisel.
BH03	4.90	5.00	01:00	Chisel.
	8.30	8.40	01:00	Chisel.
BH04	3.80	4.00	01:00	Chisel.
	7.20	7.30	01:00	Chisel.
BH05	6.70	6.90	01:00	Chisel.
	7.30	7.40	01:00	Chisel.
BH06	5.75	5.95	01:00	Chisel.
	6.90	7.00	01:00	Chisel.

Trial Pits

Seven (07) trial pits were excavated to depths 0.3m bgl to 4.6m bgl using a 14t tracked excavator. The exploratory logs and photographic records accompany this factual report.

Location	Depth (m bgl)	Date (dd/mm/yyyy)
TP01	3.9	11/01/2022
TP02	3.2	10/01/2022
TP03	4.5	11/01/2022
TP04	4.5	13/01/2022
TP05	4.5	14/01/2022
TP06	0.3	12/01/2022
TP06A	4.6	12/01/2022

Sampling

A total of sixty two (62) bulk disturbed samples (B) and twenty two (22) small disturbed samples (D) were recovered from the exploratory holes in accordance with Geotechnical Investigation and Sampling – Sampling Methods and Groundwater Measurements (EN ISO 22475-1:2006).

***In-Situ* Testing**

Standard Penetration Tests (SPT)

A total of thirty nine (39) standard penetration tests, were carried out in the cable percussion boreholes using the 60^{o} solid cone (CPT) in place of the standard split barrel sampler. The data was presented on the relevant logs accompanying this factual report.

Falling Head Tests

Two (02) *in situ* falling head permeability tests were carried out in boreholes; in accordance with BS5930: 1999, Section 4: Cl. 25.4, within the superficial deposits over duration of one (1) hour. The processed test data was presented on the relevant borehole log presented accompanying this factual report. The shape or intake factor, f was derived from the condition at the base of the borehole at the test depth and test geometry as per Hvorslev (1951).

$$k = \frac{A}{fd} \frac{\log_e (H_0 / H_t)}{t}$$

Generally for all tests the specific depth range of the test was the deposits below the depth of casing. A mean k measured ($k_H = k_V$), permeability in the soil was assumed equal in both horizontal and vertical direction, ($k_H / k_V = 1.$). The test geometry provided a shape factor, f for the test undertaken in the standpipe well.

Dynamic Probing

PGL's Competitor dynamic probing rig was used to undertake dynamic probing (DP(H); 50kg drop weight, 500mm drop height) in general accordance with Geotechnical Investigation and Testing, Part 2, Dynamic probing, BS EN ISO 22476-2:2005. The blows per 100mm ($N_{100\ H}$) were recorded to refusal being 25blows without progress over 100mm. Six (06) number dynamic probes progressed to refusal at depths 2.7m bgl to 8.8m bgl. The exploratory logs accompany this factual report.

Location	Refusal depth, m bgl
DP01	3.7
DP02	8.8
DP03	2.7
DP04	5.0
DP05	3.0
DP06	3.5

Survey and Drawings

The ‘as built’ exploration locations were surveyed to the Ordinance Survey Irish Transverse Mercator system of co-ordinates (ITM) and elevations to Malin Head datum and shown on the relevant exploratory logs and the Exploratory Location Plans (P21239-SI-A, P21239-SI-01) accompanying this report.

Location	Easting	Northing	Ground Level (mOD)	Final Depth (m bgl)	Date Start (dd/mm/yyyy)
BH01	171820.78	70468.88	16.64	4.40	13/01/2022
BH02	171741.94	70395.18	13.07	9.10	10/01/2022
BH03	171738.42	70311.70	11.49	8.40	12/01/2022
BH04	172026.44	70364.45	12.50	7.30	14/01/2022
BH05	172034.00	70300.87	12.21	7.40	17/01/2022
BH06	171946.00	70338.05	13.57	7.00	13/01/2022
DP01	171821.58	70465.48	16.54	3.70	13/01/2022
DP02	171742.31	70392.88	12.93	8.80	13/01/2022
DP03	171735.89	70311.95	11.53	2.70	13/01/2022
DP04	172027.93	70363.86	12.40	5.00	13/01/2022
DP05	172033.97	70304.80	12.21	3.00	14/01/2022
DP06	171944.50	70343.17	13.61	3.50	13/01/2022
TP01	171822.48	70466.73	16.60	3.90	11/01/2022
TP02	171742.96	70394.13	13.04	3.20	10/01/2022
TP03	171736.67	70314.17	11.80	4.50	11/01/2022
TP04	172026.89	70362.36	12.35	4.50	13/01/2022
TP05	172033.99	70303.02	12.21	4.50	14/01/2022
TP06	171940.73	70337.93	13.69	0.30	12/01/2022
TP06A	171944.88	70339.22	13.61	4.60	12/01/2022

Laboratory Testing

Laboratory testing was ongoing at the time of reporting.

Published Geology

A search of the Geological Survey data base and 1:100,000 mapping (Sheet 25) identified two (02) major lithological units defining the area. The majority of the site is underlain by Waulsortian Limestones (WA) described as massive unbedded Lime-Mudstones. The Little Island Formation (LI) is mapped to the north and defined by massive and crinoidal fine Limestone.

Teagasc subsoil mapping indicates that the area is underlain by Made Ground deposits. The National Groundwater Vulnerability mapping indicates the area mostly has a rating of high vulnerability.

Ground and Groundwater Conditions

The full details of the ground conditions encountered are provided for on the exploratory records accompanying this report. The records provide descriptions, in accordance with BS 5930 (2015) and Eurocode 7, Geotechnical Investigation and Testing, Identification and classification of soils, Part 1, Identification and description (EN ISO 14688-1: 2002),– Identification and Classification of Soil, Part 2: Classification Principles (EN ISO 14688-2:2004) and Identification and Classification of Rock, Part 1: Identification & Description (EN ISO 14689-1:2004) of the materials encountered, *in situ* testing and details of the samples taken, together with any observations made during the ground investigation.

Groundwater levels may be subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc. Low volume groundwater flow may be cut-off by borehole casing as it progresses in stiff glacial deposits. The duration trial pit excavations remain open may not be sufficient to allow for low volume flow to present. The groundwater regime should be assessed from standpipe well installations.

Groundwater was encountered at depths 3.10m bgl to 3.90m bgl during the period of fieldworks within the extent of the borehole and pit excavations, summarised below. The exploratory locations were backfilled with grout, gravel and arisings.

SUMMARY OF GROUNDWATER

Location	Depth Strike (m bgl)	Remarks	Standpipe (Y/N)
BH01	-	None encountered.	N
BH02	-	None encountered.	Y
BH03	-	None encountered.	N
BH04	-	None encountered.	N
BH05	-	None encountered.	N
BH06	-	None encountered.	Y
TP01	-	None encountered.	N
TP02	-	None encountered.	N
TP03	-	None encountered.	N
TP04	3.9	Trickle rate of flow	N
TP05	3.9	Slow rate of flow	N
TP06	-	None encountered.	N
TP06A	3.1	Trickle rate of flow	N

Two (02) number 50mm dia. HDPE standpipe wells were constructed to allow for groundwater monitoring. The construction details are summarised below.

SUMMARY OF STANDPIPE CONSTRUCTION

Location	Depth Top (m bgl)	Depth Base (bgl)	Diameter (mm)	Pipe Type	Pipe Details
BH02	0.00	2.00	50	PLAIN	Plain.
	2.00	8.50	50	SLOTTED	Slotted.
BH06	0.00	3.50	50	PLAIN	Plain.
	3.50	7.00	50	SLOTTED	Slotted.

Exploratory locations were backfilled with their arisings or gravel and bentonite for locations with monitoring wells. Backfill details are displayed graphically on the accompanying logs and summarised below.

SUMMARY OF STANDPIPE DIPS

Location	08/02/2022
	Depth (m bgl)
BH02	Dry
BH06	4.4

SUMMARY OF BACKFILL

 GRAVEL Backfill to installation/borehole

 ARISINGS Backfill

 uPVC slotted pipe

 BENTONITE Backfill to installation

Should you have any queries in relation to the data collected and presented herein, please do not hesitate to contact our office.

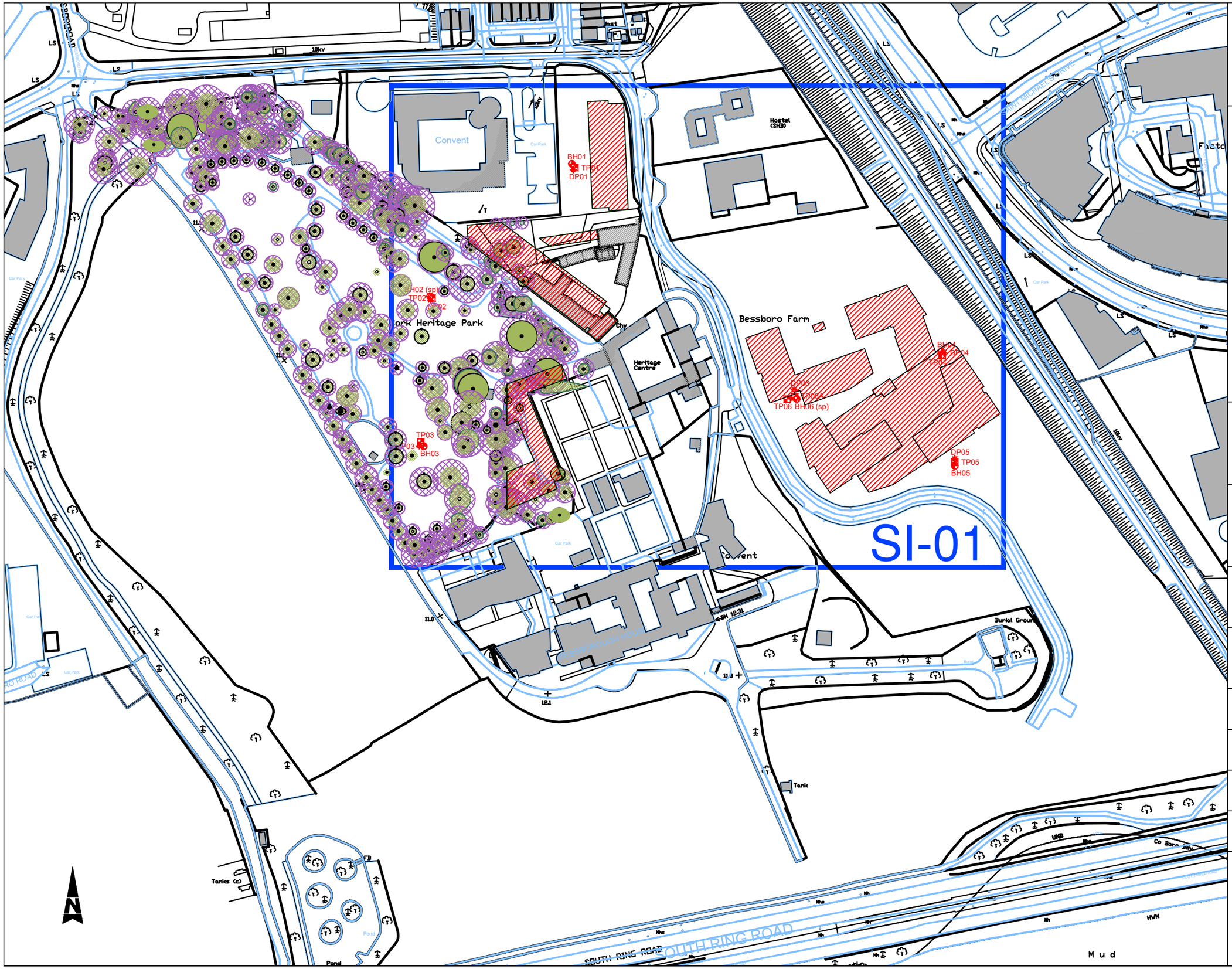
Yours sincerely,
For **Priority Geotechnical,**

James McSweeney BSc
Engineering Geologist

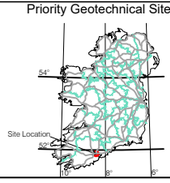
No responsibility can be held by PGL for ground conditions between exploratory locations. The exploratory logs provide for ground profiles and configuration of strata relevant to the investigation depths achieved during the fieldworks. Caution shall be taken when extrapolating between such exploratory locations. No liability is accepted for ground conditions extraneous to the exploratory locations.

No account has been taken of potential subsidence or ground movement due to mineral extraction, mining works or karstification below or in proximity to the site, unless specifically addressed.

This report has been prepared for Employer and their Representative as outline, herein. The information should not be used without their prior written permission. PGL accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.



Priority Geotechnical Site



JOB NAME:

Bessborough SHD

Sheet Title:

EXPLORATORY LOCATION LAYOUT

JOB NUMBER:

P21239

DRAWING NUMBER:

P21239-SI-A

DRAWN BY:

Gary Curtin

DATE:

08/12/2021

SCALE:	APPROVED:
1:2000 ON A3	GH

REVISION:

D01

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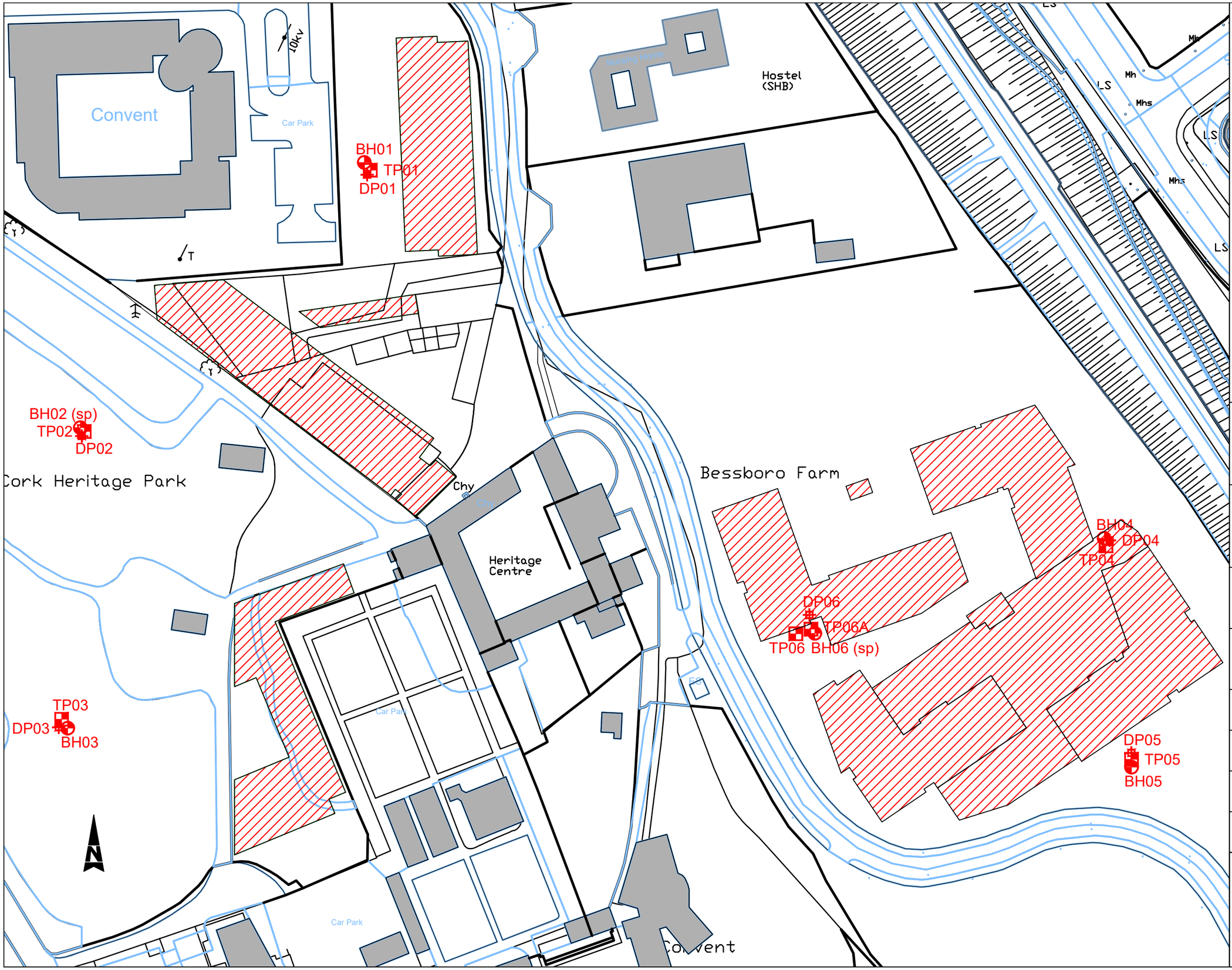

KEY:

- TP00 Denotes Trial Pit location
- BH00 Denotes Borehole location
- DP00 Denotes Dynamic Probe location

Coordinates shown on ING.

TP01	171822.5	70466.7	16.6
TP02	171743	70394.1	13.04
TP03	171736.7	70314.2	11.8
TP04	172026.9	70362.4	12.35
TP05	172034	70303	12.213
TP06	171940.7	70337.9	13.69
TP06A	171944.9	70339.2	13.61
BH01	171820.8	70468.9	16.64
BH02 (sp)	171741.9	70395.2	13.07 stand pipe
BH03	171738.4	70311.7	11.49
BH04	172026.4	70364.5	12.5
BH05	172034	70300.9	12.21
BH06 (sp)	171946	70338.1	13.57 stand pipe
DP01	171821.6	70465.5	16.54
DP02	171742.3	70392.9	12.93
DP03	171735.9	70312	11.53
DP04	172027.9	70363.9	12.4
DP05	172034	70304.8	12.21
DP06	171944.5	70343.2	13.61

JOB NAME:

Bessborough SHD

Sheet Title:

EXPLORATION LOCATION PLAN

JOB NUMBER:

P21239

DRAWING NUMBER:

P21239-SI-01

DRAWN BY:

Gary Curtin

DATE:

05/12/2021

SCALE:

1:1000 ON A3

APPROVED:

GH

REVISION:

D01

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KEY TO SYMBOLS ON EXPLORATORY HOLE RECORDS

All linear dimensions are in metres or millimetres

DESCRIPTIONS

**	Drillers Description
Friable	Easily crumbled

SAMPLES

U( )	Undisturbed 102mm diameter sample, ( ) denotes number of blows to drive sampler
U( )F, U( )P	F- not recovered, P-partially recovered
U38	Undisturbed 38mm diameter sample
P(F), (P)	Piston sample - disturbed
B	Bulk sample - disturbed
D	Jar Sample - disturbed
W	Water Sample
CBR	California Bearing Ratio mould sample
ES	Chemical Sample for Contamination Analysis
SPTLS	Standard Penetration Test S lump sample from split sampler

CORE RECOVERY AND ROCK QUALITY

TCR	Total Core Recovery (% of Core Run)
SCR	Solid Core Recovery (length of core having at least one full diameter as % of core run)
RQD	Rock Quality Designation (length of solid core greater than 100mm as % of core run)

Where there is insufficient space for the TCR, SCR and RQD, the results may be found in the remarks column

If	Fracture Spacing in mm (Minimum/Average/Maximum) NI - non intact, NR - no recovery
AZCL	Assumed Zone of Core Loss
NI	Non intact

GROUNDWATER

▽	Groundwater strike
▼	Groundwater level after standing period
Date/Water	Date of shift (day/month)/Depth to water at end of previous shift shown above the date and depth to water at beginning of shift given below the date

INSITU TESTING

S	Standard Penetration Test - split barrel sampler
C	Standard Penetration Test - solid 60^o cone
SW	Self Weight Penetration
Ivp, HVp (R)	In Situ Vane Test, Hand Vane Test (R) demonstrates remoulded strength
K(F), (C), (R), (P)	Permeability Test
HP	Hand Penetrometer Test

MEASURED PROPERTIES

N	Standard Penetration Test - blows required to drive 300mm after seating drive
x/y	Denotes x blows for y mm within the Standard Penetration Test
x*/y	Denotes x blows for y mm within the seating drive
c_u	Undrained Shear Strength (kN/m^2)
CBR	California Bearing Ratio

ROTARY DRILLING SIZES

Index Letter	Nominal Diameter (mm)	
	Borehole	Core
N	75	54
H	99	76
P	120	92
S	146	113

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	**Drilled By** PC **Logged By** CS	Borehole No. **BH01** Sheet 1 of 1

Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	171821E - 70469N	**Hole Type** CP
Location:	Mahon, Cork		**Level:**	16.64 m OD	**Scale** 1:50
Client:	Estuary View Ent. Ltd		**Date:**	13/01/2022 - 14/01/2022	

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing: Depth (m bgl)	Type	Results	Depth (m bgl)	Level (mOD)	Legend	Stratum Description
		0.00 - 1.00	B					Brown red, slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Driller describes: Fill clay with limestone boulders.
		1.00 - 2.00 1.00	B SPT (C)	65 (5,10/65 for 150mm)	1.00	15.64		Firm, brown red, slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-angular, limestone with dia 63-80mm. *1.20m - 1.30m: Driller noted: Boulders. Increased SPT blow counts locally.*
		2.00 - 3.00 2.00	B SPT (C)	N=15 (3,3/4,4,3,4)				
		3.00 - 4.00 3.00	B SPT (C)	N=15 (3,3/4,4,3,4)	3.00	13.64		Firm, brown red, slightly sandy slightly gravelly CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-rounded, limestone with dia 63-120mm. Driller describes: Hard gravelly clay with boulders.
		4.00	SPT (C)	90 (9,10/90 for 225mm)				
					4.40	12.24		End of Borehole at 4.400m

Groundwater:

Struck (m bgl)	Rose to (m bgl)	After (mins)	Sealed (m bgl)	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
4.40	200	200

Equipment: Dando 2000

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
1.20	1.30	01:00	Chisel.
4.30	4.40	01:00	Chisel.

Remarks:

Cable percussion borehole terminated at 4.40m bgl.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	13/01/2022 08:00	0.00	Start of shift.
Dry	13/01/2022 18:00	2.00	End of shift.
Dry	14/01/2022 08:00	2.00	Start of shift.
Dry	14/01/2022 18:00	4.40	End of borehole.

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Drilled By	Borehole No.
PC	**BH02**
Logged By	Sheet 1 of 1
CS	

Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	171742E - 70395N	**Hole Type** CP
Location:	Mahon, Cork		**Level:**	13.07 m OD	**Scale** 1:50
Client:	Estuary View Ent. Ltd		**Date:**	10/01/2022 - 11/01/2022	

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing: Depth (m bgl)	Type	Results	Depth (m bgl)	Level (mOD)	Legend	Stratum Description
		0.00 - 1.00	B					Brown red, slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Driller describes: Gravel clay.
		1.00 - 2.00 1.00	B SPT (C)	N=6 (1,1/1,1,2,2)	1.00	12.07		Soft, brown red, slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Driller describes: Gravelly clay.
		2.00 - 3.00 2.00	B SPT (C)	N=7 (1,1/1,2,2,2)				*2.00m - 3.00m: Driller noted: Boulders.*
		3.00 - 4.00 3.00	B SPT (C)	N=12 (3,3/2,3,3,4)	3.00	10.07		Firm to stiff, brown red, slightly sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-rounded, Limestone with dia 63-170mm dia.
		4.00 - 5.00 4.00	B SPT (C)	N=21 (4,4/5,5,6,5)				
		5.00 - 6.00 5.00	B SPT (C)	N=24 (5,6/5,6,7,6)	5.00	8.07		Stiff, brown red, slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-rounded, limestone with dia 63-170. Driller describes: boulders.
		6.00 - 7.00 6.00	B SPT (C)	N=29 (6,6/7,7,8,7)				
		7.00 - 8.00 7.00	B SPT (C)	N=33 (7,7/8,8,9,8)				
		8.00	SPT (C)	N=32 (7,8/9,5,9,9)				
					9.10	3.97		End of Borehole at 9.100m

Groundwater:

Struck (m bgl)	Rose to (m bgl)	After (mins)	Sealed (m bgl)	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
9.10	200	200

Equipment: Dando 2000.

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
2.75	2.90	01:00	Chisel.
8.90	9.10	01:00	Chisel.

Remarks:

Cable percussion borehole terminated at 9.10m bgl.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	10/01/2022 08:00	0.00	Start of shift.
	10/01/2022 18:00	0.00	End of shift.
	11/01/2022 08:00	0.00	Start of shift.
Dry	11/01/2022 18:00	9.10	End of borehole.

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: PC Logged By: CS	Borehole No. **BH03** Sheet 1 of 1

Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	171738E - 70312N	**Hole Type** CP
Location:	Mahon, Cork		**Level:**	11.49 m OD	**Scale** 1:50
Client:	Estuary View Ent. Ltd		**Date:**	12/01/2022 - 12/01/2022	

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing: Depth (m bgl)	Type	Results	Depth (m bgl)	Level (mOD)	Legend	Stratum Description
		0.00 - 1.00	B					Soft becoming firm, brown red, slightly sandy slightly gravelly CLAY.
		1.00 - 2.00 1.00	B SPT (C)	N=7 (1,1/1,2,2,2)				
		2.00 - 3.00 2.00	B SPT (C)	N=7 (1,1/2,2,1,2)				
		3.00 - 4.00 3.00	B SPT (C)	N=10 (2,3/3,2,3,2)				
		4.00 - 5.00 4.00	B SPT (C)	N=20 (3,4/4,5,5,6)	4.00	7.49		Stiff, brown red, slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse.
		5.00 - 6.00 5.00	B SPT (C)	N=26 (6,7/6,6,7,7)	5.00	6.49		Stiff, brown red, slightly sandy slightly gravelly CLAY with low cobble content. Cobbles are sub-angular to sub-rounded, Limestone with dia 63-80mm.
		6.00 - 7.00 6.00	B SPT (C)	N=28 (7,6/6,8,7,7)	6.00	5.49		Stiff, brown red, slightly sandy slightly gravelly CLAY with low cobble content. Cobbles are sub-angular to sub-rounded, Limestone with dia 63-80mm. *6.00m - 8.40m: Driller noted Boulder content.*
		7.00 - 8.00 7.00	B SPT (C)	N=34 (7,8/8,9,8,9)				
		8.00 - 8.40 8.00	B SPT (C)	40 (9,10/40 for 150mm)	8.40	3.09		End of Borehole at 8.400m

Groundwater:

Struck (m bgl)	Rose to (m bgl)	After (mins)	Sealed (m bgl)	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
8.40	200	200

Equipment: Dando 2000.

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
4.90	5.00	01:00	Chisel.
8.30	8.40	01:00	Chisel.

Remarks:

Cable percussion borehole terminated at 8.40m bgl.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	12/01/2022 08:00	0.00	Start of shift.
Dry	12/01/2022 18:00	8.40	End of borehole.

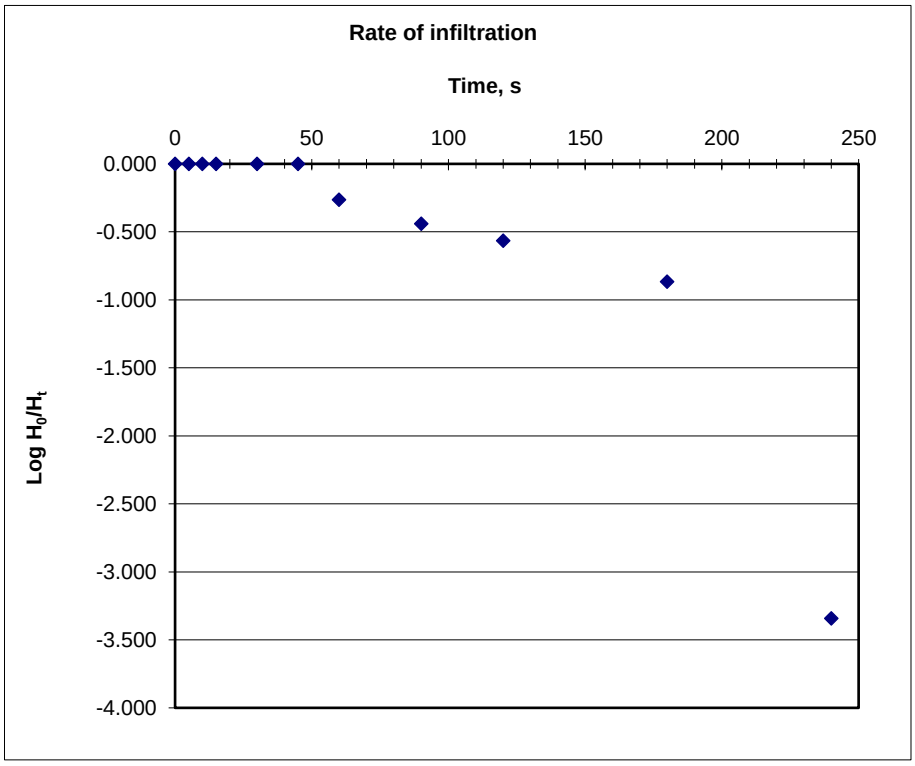
P21239 Falling head permeability test

Location	**Bessborough SHD**			
BH ID	**BH03**		H_w / H_o	**2.20**
Test	**1**			
Casing diameter	**200**	mm		
Casing depth	**2.00**	m		
Borehole depth	**2.20**	m		
GW Influence	**2.20**	m bgl		
Date	**12/01/2022**			

Min	Sec	depth, m bgl	vol, cu.m	H_t	log H_0/H_t
0	0	0.000	0.00000	2.200	0.000
0.083	5	0.000	0.00000	2.200	0.000
0.17	10	0.000	0.00000	2.200	0.000
0.25	15	0.000	0.00000	2.200	0.000
0.5	30	0.000	0.00000	2.200	0.000
0.75	45	0.000	0.00000	2.200	0.000
1	60	1.000	0.03140	1.200	-0.263
1.5	90	1.400	0.04396	0.800	-0.439
2	120	1.600	0.05024	0.600	-0.564
3	180	1.900	0.05966	0.300	-0.865
4	240	2.199	0.06905	0.001	-3.342

k_{mean} 1.12E-03 ms^{-1}

$k_H = k_V$



pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	**Drilled By** PC **Logged By** CS	Borehole No. **BH04** Sheet 1 of 1

Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	172026E - 70364N	**Hole Type** CP
Location:	Mahon, Cork		**Level:**	12.50 m OD	**Scale** 1:50
Client:	Estuary View Ent. Ltd		**Date:**	14/01/2022 - 14/01/2022	

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing: Depth (m bgl)	Type	Results	Depth (m bgl)	Level (mOD)	Legend	Stratum Description
								Dark brown, slightly sandy slightly gravelly SILT with plant material.
		1.00 - 2.00 1.00	B SPT (C)	N=9 (1,1/2,2,3,2)	1.00	11.50		Firm, dark brown, slightly sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is fine to coarse.
		2.00 - 3.00 2.00	B SPT (C)	N=9 (2,2/2,3,2,2)	2.00	10.50		Firm, brown, slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-angular to sub-rounded, Limestone with dia 63-120mm.
		3.00 - 4.00 3.00	B SPT (C)	N=14 (2,3/3,4,3,4)	3.00	9.50		Firm to stiff, brown, slightly sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-angular to sub-rounded, Limestone with dia 63-120mm. Driller describes: boulders.
		4.00 - 5.00 4.00	B SPT (C)	N=22 (4,4/5,6,5,6)				
		5.00 - 6.00 5.00	B SPT (C)	N=29 (6,5/7,7,8,7)	5.00	7.50		Stiff, brown, slightly sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-angular to sub-rounded, Limestone with dia 63-70mm. Boulders are sub-rounded, Limestone with dia 200.
		6.00 - 7.00 6.00	B SPT (C)	N=37 (7,8/8,9,9,11)	6.00	6.50		Stiff, brown, slightly sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-angular to sub-rounded, Limestone with dia 63-90mm.
		7.00	SPT (C)	75 (10,15/75 for 150mm)				
					7.30	5.20		End of Borehole at 7.300m

Groundwater:

Struck (m bgl)	Rose to (m bgl)	After (mins)	Sealed (m bgl)	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
7.30	200	200

Equipment: Dando 2000.

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
3.80	4.00	01:00	Chisel.
7.20	7.30	01:00	Chisel.

Remarks:

Cable percussion borehole terminated at 7.30m bgl.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	14/01/2022 08:00	0.00	Start of shift.
Dry	14/01/2022 18:00	7.30	End of borehole.

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Drilled By	Borehole No.
PC	**BH05**
Logged By	Sheet 1 of 1
CS	

Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	172034E - 70301N	**Hole Type** CP
Location:	Mahon, Cork		**Level:**	12.21 m OD	**Scale** 1:50
Client:	Estuary View Ent. Ltd		**Date:**	17/01/2022 - 17/01/2022	

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description
		Depth (m bgl)	Type	Results				
		0.00 - 1.00	B					Firm becoming stiff, brown red, slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded.
		1.00 - 2.00 1.00	B SPT (C)	N=8 (1,1/2,2,2,2)				
		2.00 - 3.00	B					
		3.00	SPT (C)	N=13 (2,3/3,4,3,3)				
		4.00 - 5.00 4.00	B SPT (C)	N=16 (3,4/3,4,4,5)				
		5.00 - 6.00 5.00	B SPT (C)	N=30 (5,6/7,7,8,8)	5.00	7.21		Stiff, brown red, slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-angular to sub-rounded, 63-120mm dia., Limestone lithology.
		6.00 - 7.00 6.00	B SPT (C)	N=38 (7,8/9,9,10,10)	6.00	6.21		Stiff, brown red, slightly sandy slightly gravelly CLAY with low cobble content and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub--rounded. Cobbles are sub-angular to sub-rounded, 63-120mm dia., Limestone lithology. Boulders are sub-angular, 200-250mm dia., Limestone lithology.
		7.00	SPT (C)	90 (9,10/90 for 225mm)				
					7.40	4.81		End of Borehole at 7.400m

Groundwater:

Struck (m bgl)	Rose to (m bgl)	After (mins)	Sealed (m bgl)	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
7.40	200	200

Equipment: Dando 2000

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
6.70	6.90	01:00	Chisel.
7.30	7.40	01:00	Chisel.

Remarks:

Cable percussion borehole terminated at 7.40m bgl, obstruction.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	17/01/2022 08:00	0.00	Start of shift.
Dry	17/01/2022 18:00	7.40	End of borehole.

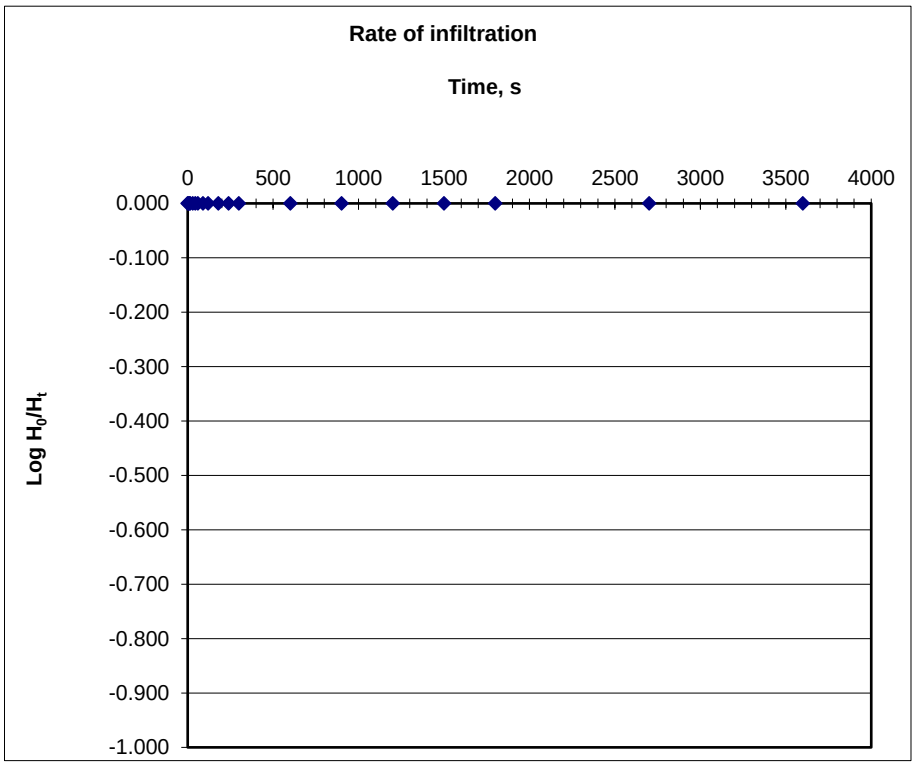
P21239 Falling head permeability test

Location	**Bessborough SHD**			
BH ID	**BH05**		H_w / H_o	**2.00**
Test	**1**			
Casing diameter	**200**	mm		
Casing depth	**1.50**	m		
Borehole depth	**2.00**	m		
GW Influence	**2.00**	m bgl		
Date	**17/01/2022**			

Min	Sec	depth, m bgl	vol, cu.m	H_t	log H_0/H_t
0	0	0.000	0.00000	2.000	0.000
0.083	5	0.000	0.00000	2.000	0.000
0.17	10	0.000	0.00000	2.000	0.000
0.25	15	0.000	0.00000	2.000	0.000
0.5	30	0.000	0.00000	2.000	0.000
0.75	45	0.000	0.00000	2.000	0.000
1	60	0.000	0.00000	2.000	0.000
1.5	90	0.000	0.00000	2.000	0.000
2	120	0.000	0.00000	2.000	0.000
3	180	0.000	0.00000	2.000	0.000
4	240	0.000	0.00000	2.000	0.000
5	300	0.000	0.00000	2.000	0.000
10	600	0.000	0.00000	2.000	0.000
15	900	0.000	0.00000	2.000	0.000
20	1200	0.000	0.00000	2.000	0.000
25	1500	0.000	0.00000	2.000	0.000
30	1800	0.000	0.00000	2.000	0.000
45	2700	0.000	0.00000	2.000	0.000
60	3600	0.000	0.00000	2.000	0.000

k_{mean} - ms^{-1}

$k_H = k_V$



Notes:
No Change in groundwater level observed after 60 mins. Infiltration rate mot determined.

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Drilled By	Borehole No.
PC	**BH06**
Logged By	Sheet 1 of 1
CS	

Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	171946E - 70338N	**Hole Type** CP
Location:	Mahon, Cork		**Level:**	13.57 m OD	**Scale** 1:50
Client:	Estuary View Ent. Ltd		**Date:**	13/01/2022 - 13/01/2022	

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing: Depth (m bgl)	Type	Results	Depth (m bgl)	Level (mOD)	Legend	Stratum Description
		0.00 - 1.00	B					Brown, CLAY.
		1.00 - 2.00 1.00	B SPT (C)	N=6 (1,1/2,2,1,1)	1.00	12.57		Soft becoming stiff, brown red, slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded.
		2.00 - 3.00 2.00	B SPT (C)	N=8 (1,1/2,2,2,2)				
		3.00 - 4.00 3.00	B SPT (C)	N=9 (2,2/3,2,2,2)				
		4.00 - 5.00 4.00	B SPT (C)	N=13 (3,2/3,3,4,3)				*4.00m - 6.00m: Driller described: 'wet' soils.*
		5.00 - 6.00 5.00	B SPT (C)	N=28 (4,6/6,7,7,8)				
		6.00 - 7.00 6.00	B SPT (C)	N=33 (7,7/8,8,9,8)	6.00	7.57		Stiff, brown red, slightly sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded. Cobbles are sub-angular, limestone with dia 63-130mm.
					7.00	6.57		End of Borehole at 7.000m

Groundwater:

Struck (m bgl)	Rose to (m bgl)	After (mins)	Sealed (m bgl)	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
7.00	200	200

Equipment: Dando 2000.

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
5.75	5.95	01:00	Chisel.
6.90	7.00	01:00	Chisel.

Remarks:

Cable percussion borehole terminated at 7.0m bgl.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	13/01/2022 08:00	0.00	Start of shift.
Dry	13/01/2022 18:00	7.00	End of borehole.

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Trial Pit No
TP01
Sheet 1 of 1

Project Name: Bessboro SHD	**Project No.** P21239	**Co-ords:** 171822E - 70467N **Level:** 16.60m OD	**Date** 11/01/2022
Location: Mahon, Cork		**Dimensions (m):** 3.60 x 1.10	**Scale** 1:25
Client: Estuary View Ent. Ltd		**Depth:** 3.90m BGL	**Logged** OD

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.20	16.40		(TOPSOIL) Soft to firm, brown, slightly sandy slightly gravelly SILT with grass and rootlets. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded.
				0.65	15.95		(MADE GROUND) Soft to firm, brown, slightly sandy slightly gravelly CLAY with pottery fragments, blocks, timber and plastics. Sand is fine to coarse, Gravel is fine to coarse, sub-rounded to rounded.
	0.70 - 1.50 0.70 - 1.50	B D					Soft to firm becoming stiff from 2.80m, brown, slightly sandy slightly gravelly CLAY with medium cobble content and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded. Cobbles are sub-rounded to rounded. Boulders sub-rounded to rounded. (Assumed Natural).
	1.50 - 2.50 1.50 - 2.50	B D					
	2.50 - 3.50 2.50 - 3.50	B D					
				3.90	12.70		End of Pit at 3.900m

1
2
3
4
5

Stability: Good
Plant: 14T track machine
Backfill: Arisings.

Groundwater: None encountered.

Remarks: Trial pit terminated at 3.90m bgl on rock/ large boulders.

Photographic Record

Number:	**TP01**	**Project**	Bessborough SHD	
		Project No	P21239	
		Engineer	J.B. Barry & Partners	

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Trial Pit No
TP02
Sheet 1 of 1

Project Name: Bessboro SHD	**Project No.** P21239	**Co-ords:** 171743E - 70394N **Level:** 13.04m OD	**Date** 10/01/2022
Location: Mahon, Cork		**Dimensions (m):** 3.20 x 1.00	**Scale** 1:25
Client: Estuary View Ent. Ltd		**Depth:** 3.20m BGL	**Logged** OD

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.30	12.74		(TOPSOIL) Soft to firm, brown, slightly sandy slightly gravelly SILT with grass and rootlets. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded.
	0.50 - 1.00 0.50 - 1.00	B D					(MADE GROUND) Soft to firm, light brown, slightly sandy slightly gravelly SILT with medium cobble content, medium boulder content and pottery fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to rounded. Cobbles are angular to sub-rounded. Boulders are angular to sub-rounded.
	1.20 - 2.30 1.20 - 2.30	B D		1.20	11.84		Soft, light purple brown, slightly gravelly silty SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to rounded.
	2.30 - 3.20 2.30 - 3.20	B D		2.30	10.74		Soft to firm, purple brown, slightly sandy gravelly CLAY with medium cobble content and medium boulder content. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded. Cobbles are sub-rounded to rounded. Boulders are sub-rounded to rounded.
				3.20	9.84		End of Pit at 3.200m

Stability: Poor
Plant: 14T track machine
Backfill: Arisings.

Groundwater: None encountered.

Remarks: Trial pit terminated at 3.20m bgl due to collapsing walls.

Photographic Record

Number:	**TP02**	**Project**	Bessborough SHD	
		Project No	P21239	
		Engineer	J.B. Barry & Partners	

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Trial Pit No
TP03
Sheet 1 of 1

Project Name: Bessboro SHD	**Project No.** P21239	**Co-ords:** 171737E - 70314N **Level:** 11.80m OD	**Date** 11/01/2022
Location: Mahon, Cork		**Dimensions (m):** 3.80 x 1.20	**Scale** 1:25
Client: Estuary View Ent. Ltd		**Depth:** 4.50m BGL	**Logged** OD

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.35	11.45		(TOPSOIL) Soft, dark brown, slightly sandy slightly gravelly SILT with grass and rootlets. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to rounded.
	0.50 - 1.50 0.50 - 1.50	B D					(MADE GROUND) Soft to firm, purple brown, slightly sandy gravelly CLAY with medium cobble content and rare pottery and glass fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded. Cobbles are sub-rounded to rounded.
				1.10	10.70		(ASSUMED NATURAL) Soft to firm, purple brown, slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded. Cobbles are sub-rounded to rounded.
	1.50 - 2.50 1.50 - 2.50	B D					
	2.50 - 3.50 2.50 - 3.50	B D					
	3.50 - 4.50 3.50 - 4.50	B D					
				4.50	7.30		End of Pit at 4.500m

1
2
3
4
5

Stability: Moderate
Plant: 14T track machine
Backfill: Arisings.

Groundwater: None encountered.

Remarks: Trial pit terminated 4.50m bgl, scheduled depth.

Photographic Record

Number:	**TP03**	**Project**	Bessborough SHD	
		Project No	P21239	
		Engineer	J.B. Barry & Partners	

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Trial Pit No
TP04
Sheet 1 of 1

Project Name: Bessboro SHD	**Project No.** P21239	**Co-ords:** 172027E - 70362N **Level:** 12.35m OD	**Date** 13/01/2022
Location: Mahon, Cork		**Dimensions (m):** 3.60 x 1.10	**Scale** 1:25
Client: Estuary View Ent. Ltd		**Depth:** 4.50m BGL	**Logged** OD

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.30	12.05		(TOPSOIL) Soft to firm, brown, slightly sandy slightly gravelly SILT with grass and rootlets. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded.
	0.50 - 1.50 0.50 - 1.50	B D		0.70	11.65		(MADE GROUND): Soft, brown slightly silty slightly gravelly SAND with plastic waste. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded.
	1.50 - 2.50 1.50 - 2.50	B D		1.50	10.85		(ASSUMED NATURAL): Soft, brown, slightly silty slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded.
	2.50 - 3.50 2.50 - 3.50	B D					Soft to firm, slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded. Cobbles are sub-rounded to rounded.
	3.50 - 4.50 3.50 - 4.50	B D		4.50	7.85		End of Pit at 4.500m

Stability: Moderate
Plant: 14T track machine
Backfill: Arisings.

Groundwater: 3.90m: Trickle rate of flow

Remarks: Trial pit terminated at 4.50m bgl, scheduled depth.

Photographic Record

Number:	**TP04**	**Project**	Bessborough SHD	
		Project No	P21239	
		Engineer	J.B. Barry & Partners	

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Trial Pit No
TP05
Sheet 1 of 1

Project Name: Bessboro SHD	**Project No.** P21239	**Co-ords:** 172034E - 70303N **Level:** 12.21m OD	**Date** 14/01/2022
Location: Mahon, Cork		**Dimensions (m):** 4.10 x 1.20	**Scale** 1:25
Client: Estuary View Ent. Ltd		**Depth:** 4.50m BGL	**Logged** OD

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.30	11.91		(TOPSOIL) Soft to firm, brown, slightly sandy slightly gravelly SILT with grass and rootlets. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded.
	0.70 - 1.50 0.70 - 1.50	B D		0.70	11.51		(MADE GROUND) Soft to firm, brown orange, slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded.
	1.50 - 2.50 1.50 - 2.50	B D					Firm to stiff, purple brown, slightly sandy slightly gravelly CLAY with medium cobble content and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded. Cobbles are sub-rounded to rounded. Boulders are sub-rounded to rounded. (Assumed Natural).
	2.50 - 3.50 2.50 - 3.50	B D					
▼	3.50 - 4.50 3.50 - 4.50	B D					
				4.50	7.71		End of Pit at 4.500m

1 2 3 4 5

Stability: Good
Plant: 14T track machine
Backfill: Arisings.

Groundwater: 3.90m: Slow rate of flow

Remarks: Trial pit terminated at 4.50m bgl, scheduled depth.

Photographic Record

Number:	**TP05**	**Project**	Bessborough SHD	
		Project No	P21239	
		Engineer	J.B. Barry & Partners	

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Trial Pit No
TP06
Sheet 1 of 1

Project Name: Bessboro SHD	**Project No.** P21239	**Co-ords:** 171941E - 70338N **Level:** 13.69m OD	**Date** 12/01/2022
Location: Mahon, Cork	**Dimensions (m):** 3.40 x 1.10		**Scale** 1:25
Client: Estuary View Ent. Ltd	**Depth:** 0.30m BGL		**Logged** OD

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.15	13.54		(TOPSOIL) Soft to firm, slightly sandy slightly gravelly SILT with grass and rootlets.
				0.30	13.39		(MADE GROUND) Firm to stiff, light blue grey, slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular.
							Concrete Slab - drain/sewer access cover.
							End of Pit at 0.300m

1
2
3
4
5

Stability: Good
Plant: 14T track machine
Backfill: Arisings.

Groundwater: None encountered.

Remarks: Trial pit terminated at 0.30m bgl, due to encountering a concrete slab covering an apparent un-used drain. Pit relocated.

Photographic Record

Number:	**TP06**	**Project**	Bessborough SHD	
		Project No	P21239	
		Engineer	J.B. Barry & Partners	

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Trial Pit No
TP06A
Sheet 1 of 1

Project Name: Bessboro SHD	**Project No.** P21239	**Co-ords:** 171945E - 70339N **Level:** 13.61m OD	**Date** 12/01/2022
Location: Mahon, Cork		**Dimensions (m):** 3.80 x 1.10	**Scale** 1:25
Client: Estuary View Ent. Ltd		**Depth:** 4.60m BGL	**Logged** OD

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.10	13.51		(TOPSOIL) Soft to firm, slightly sandy slightly gravelly SILT with grass and rootlets.
	0.50 - 1.45 0.50 - 1.45	B D					(MADE GROUND) Soft to firm, slightly sandy slightly gravelly CLAY with low cobble content and waste (pottery fragments, glass, plastics). Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded. Cobbles are sub-rounded to rounded.
	1.50 - 2.50 1.50 - 2.50	B D		1.45	12.16		Soft to firm, slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded. Cobbles are sub-rounded to rounded.
	2.50 - 3.50 2.50 - 3.50	B D					
	3.50 - 4.50 3.50 - 4.50	B D					
				4.60	9.01		End of Pit at 4.600m

1 2 3 4 5

Stability: Good
Plant: 14T track machine
Backfill: Arisings.

Groundwater: 3.10m: Trickle rate of flow

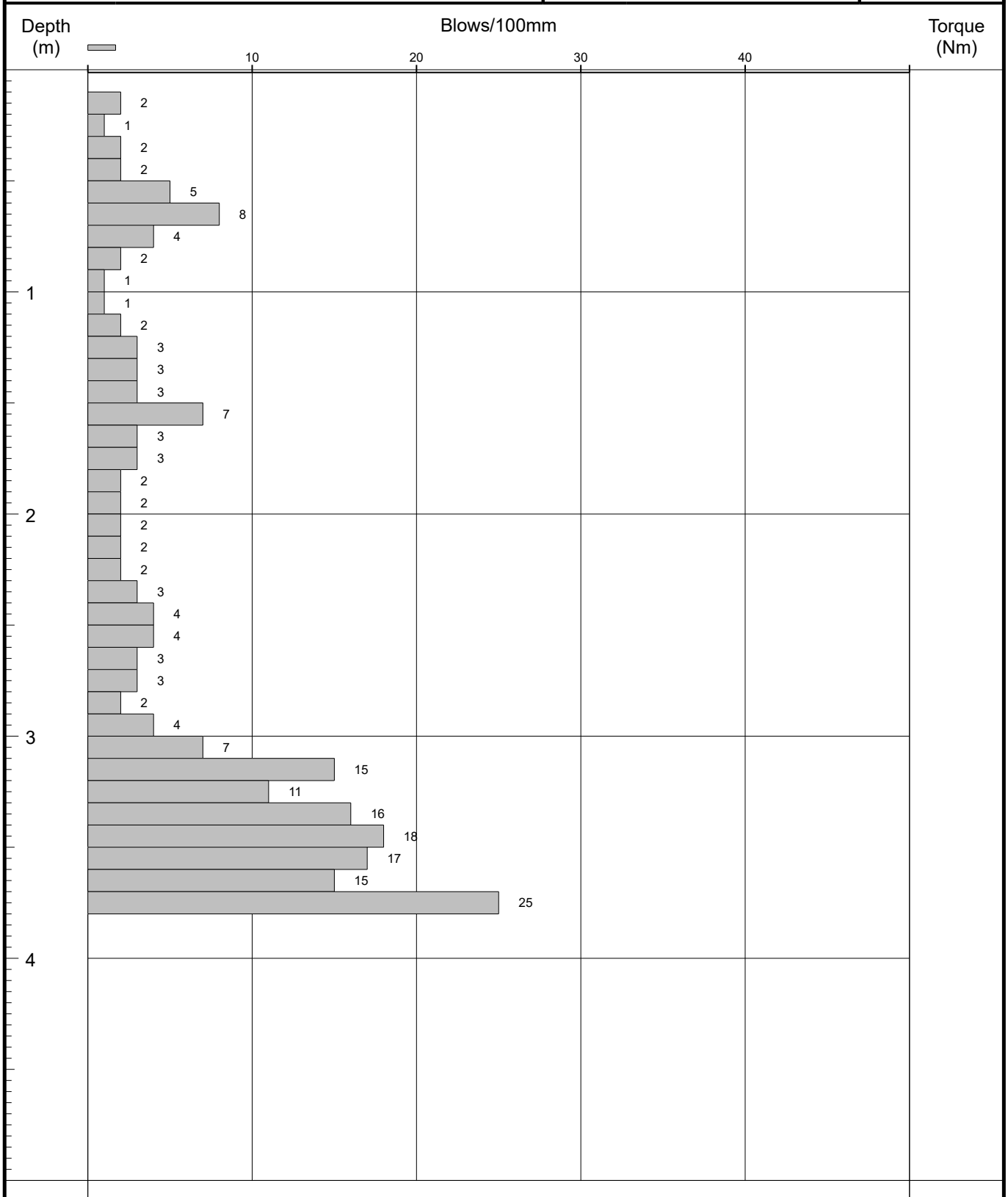
Remarks: Trial pit terminated at 4.60m bgl, scheduled depth.

Photographic Record

Number:	**TP06A**	**Project**	Bessborough SHD	
		Project No	P21239	
		Engineer	J.B. Barry & Partners	

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	Probe No **DP01** Sheet 1 of 1

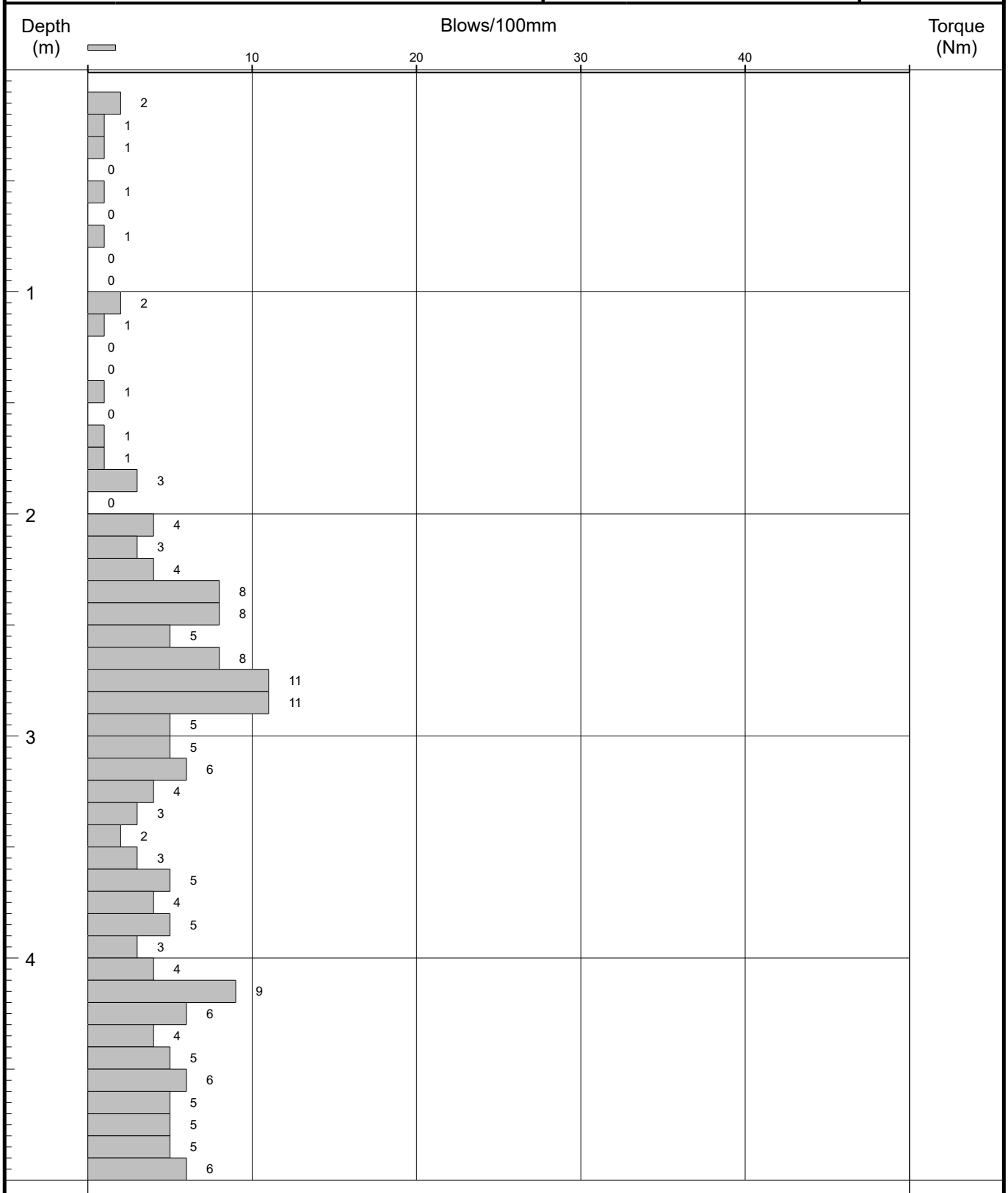
Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	171822E - 70465N	**Hole Type** DP
Location:	Mahon, Cork		**Level:**	16.54m OD	**Scale** 1:25
Client:	Estuary View Ent. Ltd		**Dates:**	13/01/2022	**Logged By** LM



Remarks: Dynamic probe terminated at 3.70m bgl, refusal.		**Fall Height (mm):**	500	**Cone Base Dia. (mm):**	45
		Hammer Mass (Kg):	50.0	**Cone Angle (Deg):**	90
		Probe Type:	DPH	**Final Depth (m bgl):**	3.70

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	Probe No **DP02** Sheet 1 of 2

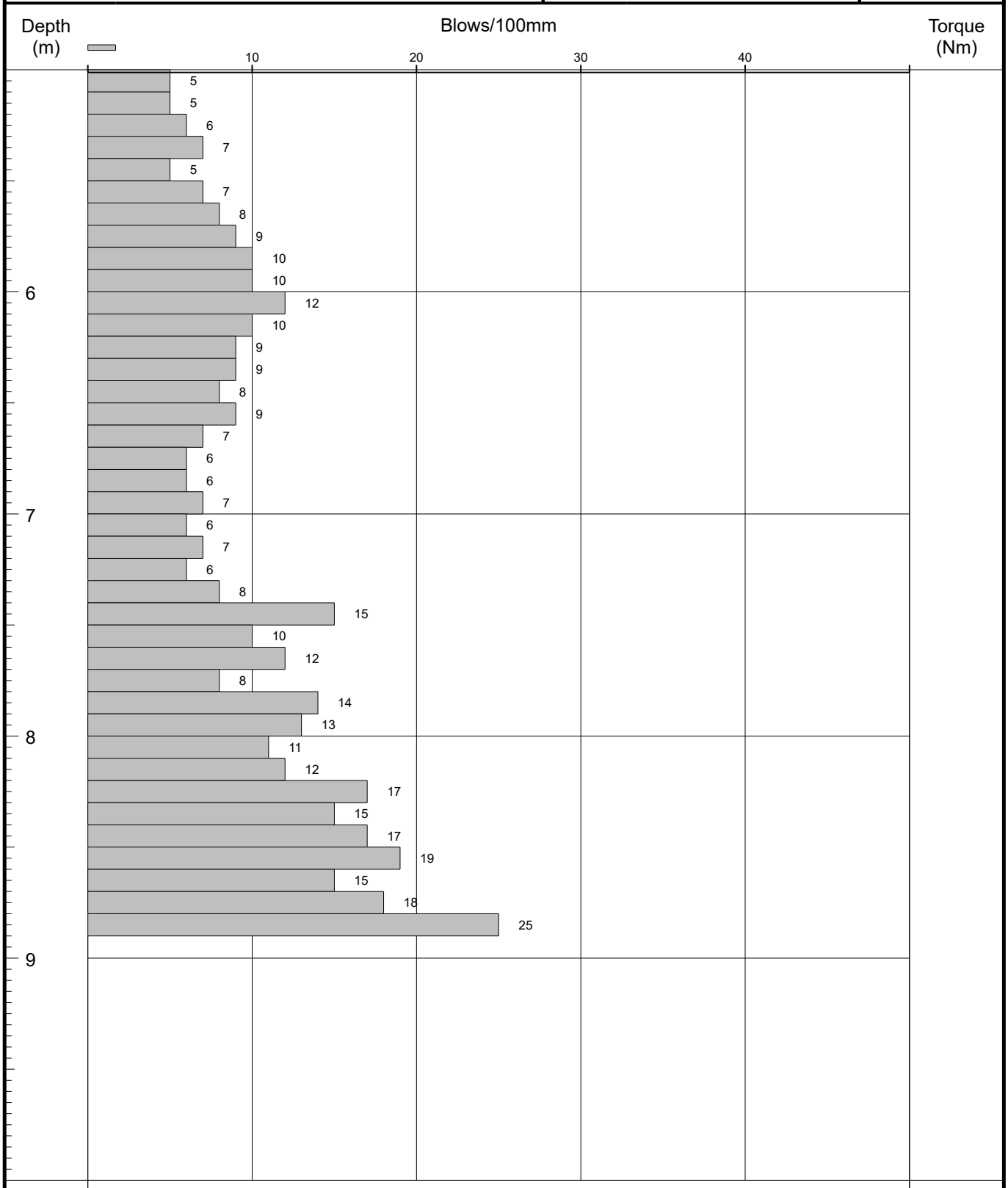
Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	171742E - 70393N	**Hole Type** DP
Location:	Mahon, Cork		**Level:**	12.93m OD	**Scale** 1:25
Client:	Estuary View Ent. Ltd		**Dates:**	13/01/2022	**Logged By** LM



Remarks: Dynamic probe terminated at 8.80m bgl, refusal.	**Fall Height (mm):**	500	**Cone Base Dia. (mm):**	45	
	Hammer Mass (Kg):	50.0	**Cone Angle (Deg):**	90	
	Probe Type:	DPH	**Final Depth (m bgl):**	8.80	

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	Probe No **DP02** Sheet 2 of 2

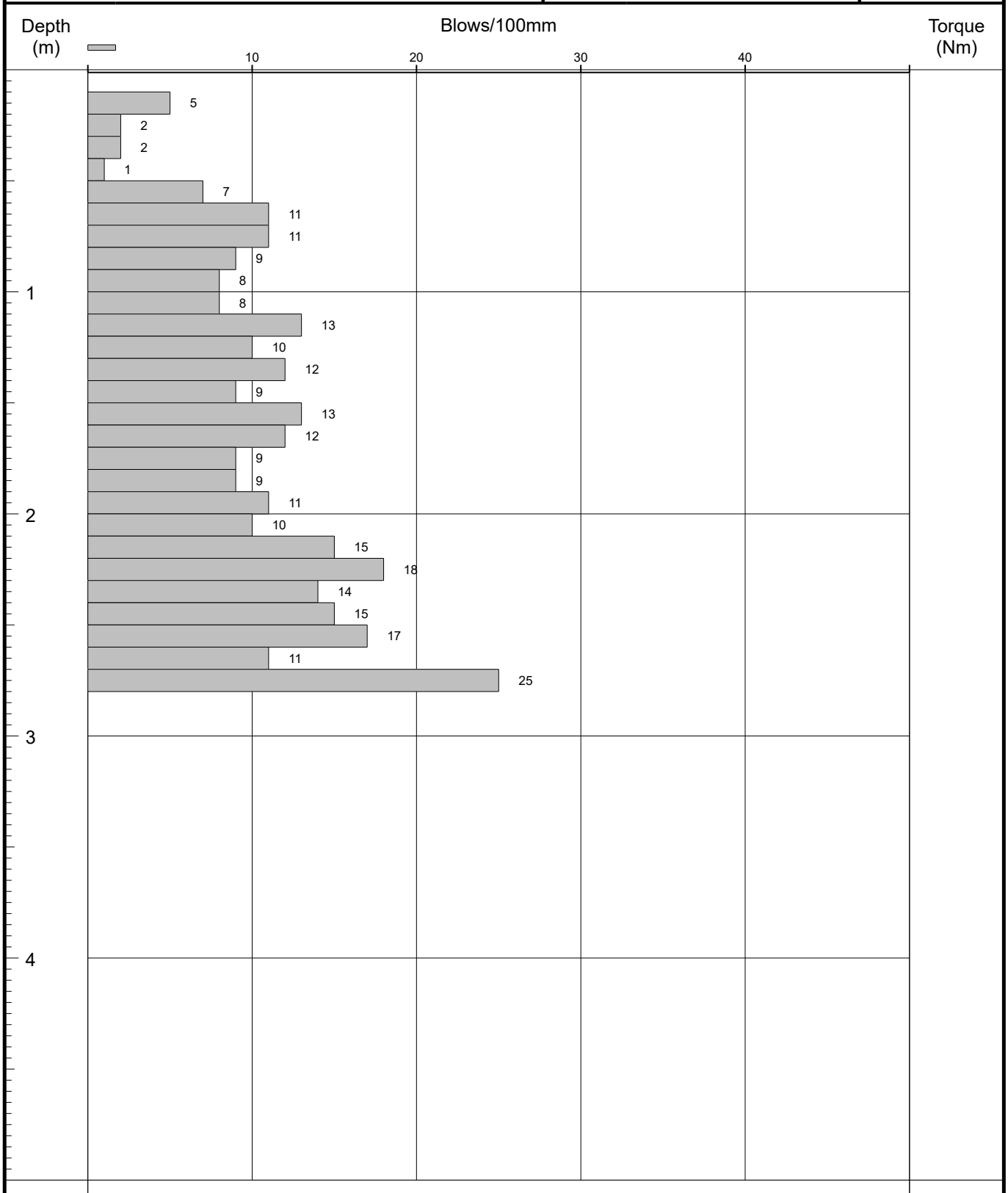
Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	171742E - 70393N	**Hole Type** DP
Location:	Mahon, Cork		**Level:**	12.93m OD	**Scale** 1:25
Client:	Estuary View Ent. Ltd		**Dates:**	13/01/2022	**Logged By** LM



Remarks: Dynamic probe terminated at 8.80m bgl, refusal.		**Fall Height (mm):**	500	**Cone Base Dia. (mm):**	45
		Hammer Mass (Kg):	50.0	**Cone Angle (Deg):**	90
		Probe Type:	DPH	**Final Depth (m bgl):**	8.80

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	Probe No **DP03** Sheet 1 of 1

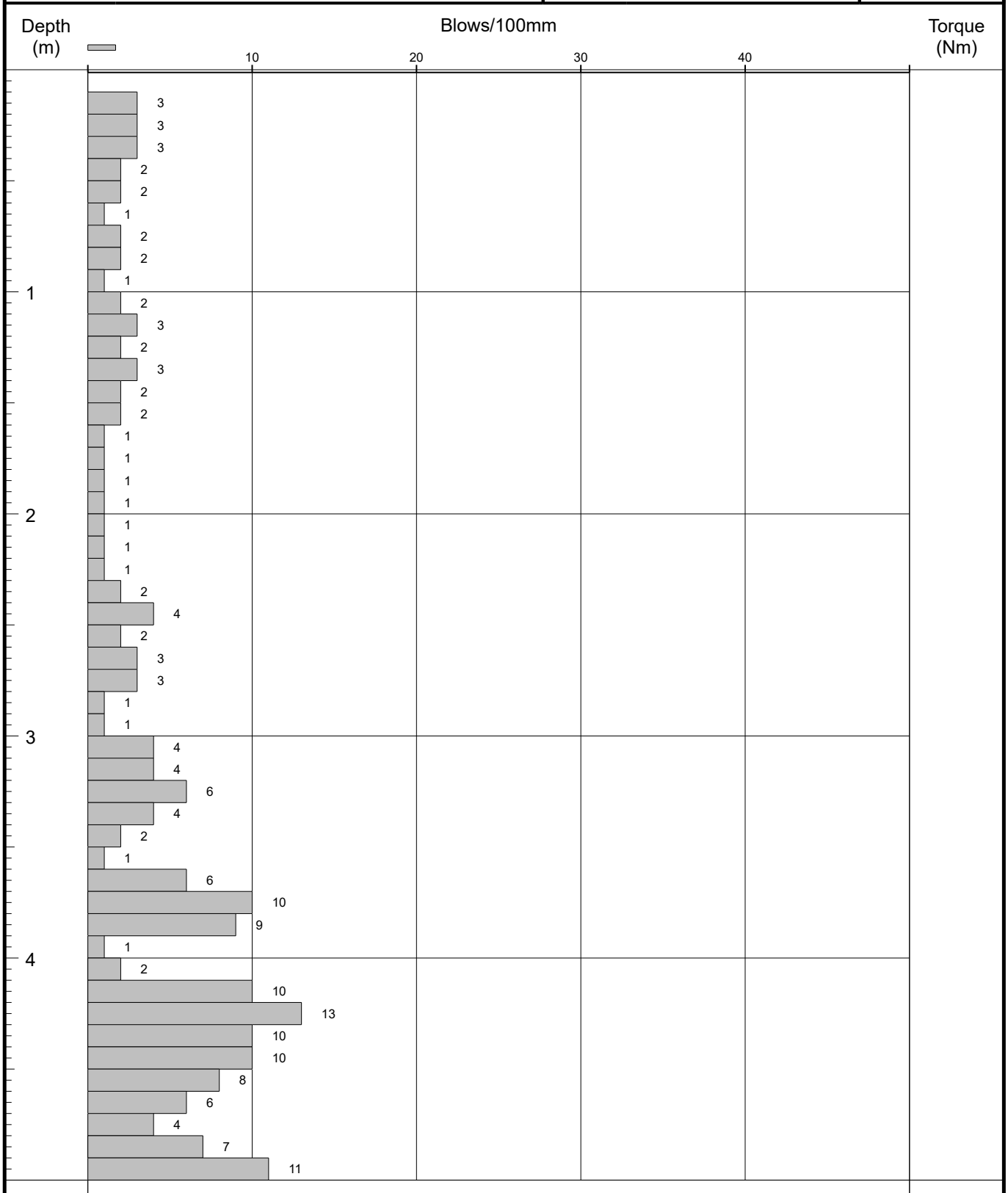
Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	171736E - 70312N	**Hole Type** DP
Location:	Mahon, Cork		**Level:**	11.53m OD	**Scale** 1:25
Client:	Estuary View Ent. Ltd		**Dates:**	13/01/2022	**Logged By** LM



Remarks: Dynamic probe terminated at 2.70m bgl, refusal.		**Fall Height (mm):**	500	**Cone Base Dia. (mm):**	45
		Hammer Mass (Kg):	50.0	**Cone Angle (Deg):**	90
		Probe Type:	DPH	**Final Depth (m bgl):**	2.70

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	Probe No **DP04** Sheet 1 of 2

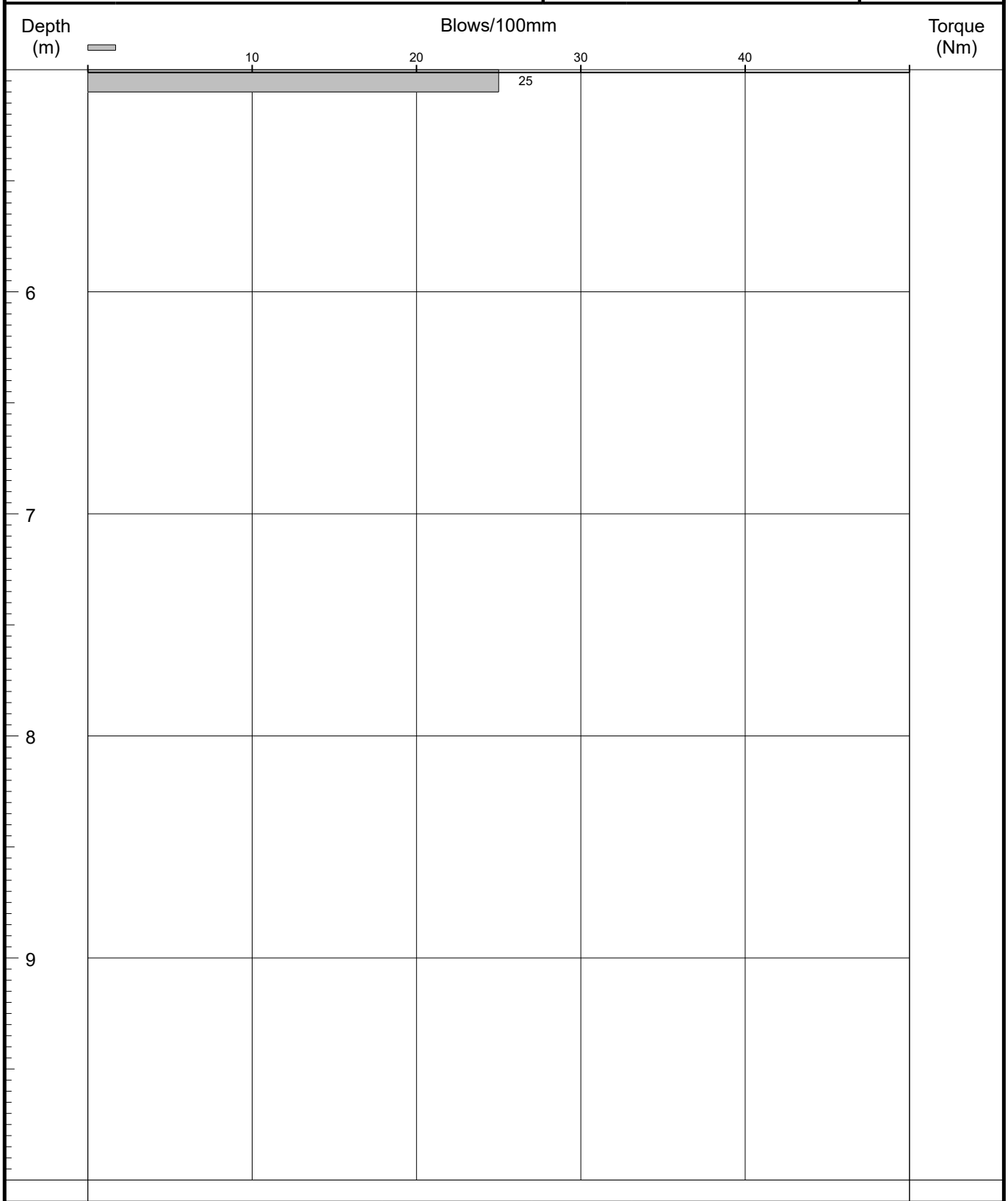
Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	172028E - 70364N	**Hole Type** DP
Location:	Mahon, Cork		**Level:**	12.40m OD	**Scale** 1:25
Client:	Estuary View Ent. Ltd		**Dates:**	13/01/2022	**Logged By** LM



Remarks: Dynamic probe terminated at 5.00m bgl, refusal.		**Fall Height (mm):**	500	**Cone Base Dia. (mm):**	45
		Hammer Mass (Kg):	50.0	**Cone Angle (Deg):**	90
		Probe Type:	DPH	**Final Depth (m bgl):**	5.00

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	Probe No **DP04** Sheet 2 of 2

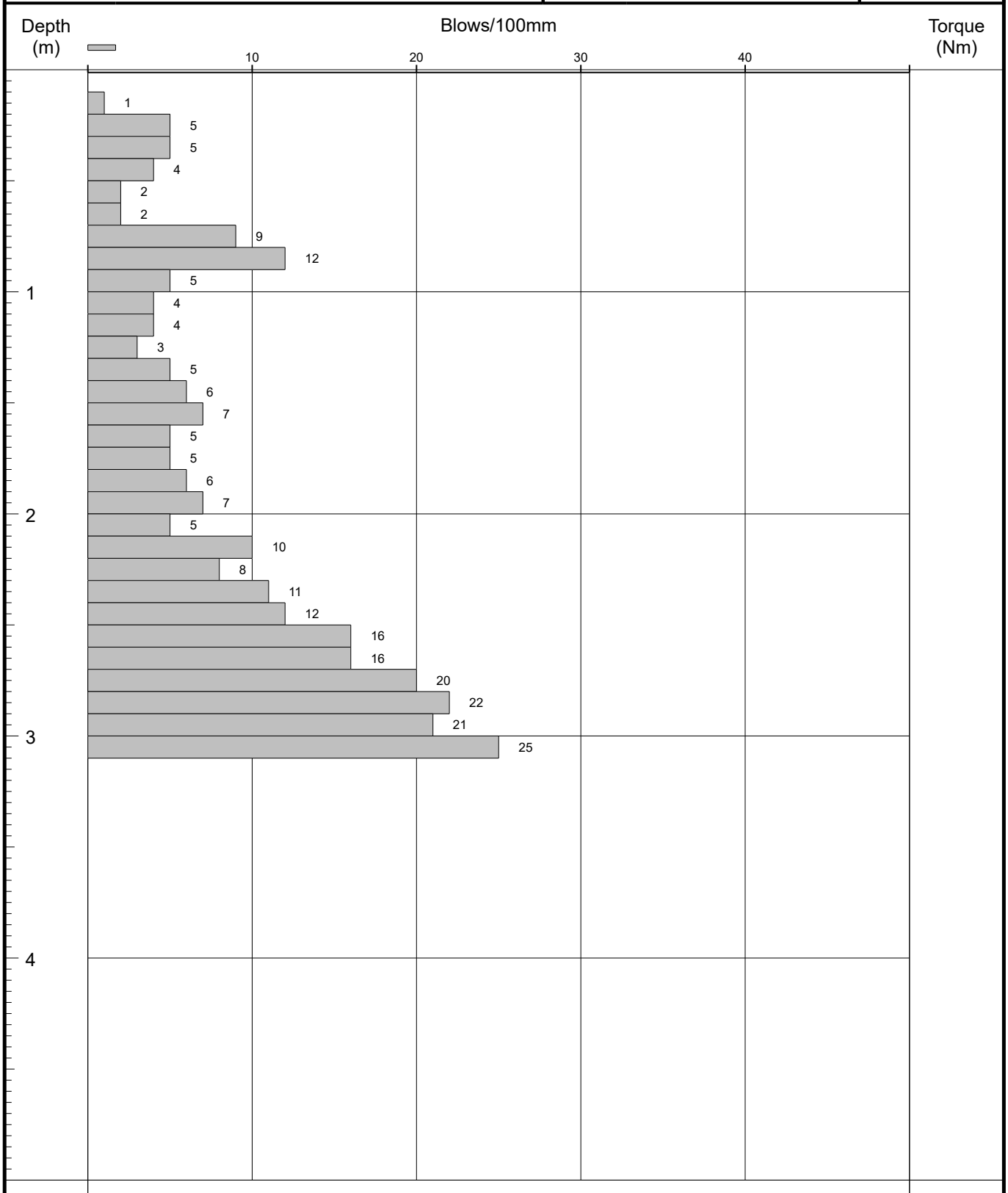
Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	172028E - 70364N	**Hole Type** DP
Location:	Mahon, Cork		**Level:**	12.40m OD	**Scale** 1:25
Client:	Estuary View Ent. Ltd		**Dates:**	13/01/2022	**Logged By** LM



Remarks: Dynamic probe terminated at 5.00m bgl, refusal.		**Fall Height (mm):**	500	**Cone Base Dia. (mm):**	45
		Hammer Mass (Kg):	50.0	**Cone Angle (Deg):**	90
		Probe Type:	DPH	**Final Depth (m bgl):**	5.00

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	Probe No **DP05** Sheet 1 of 1

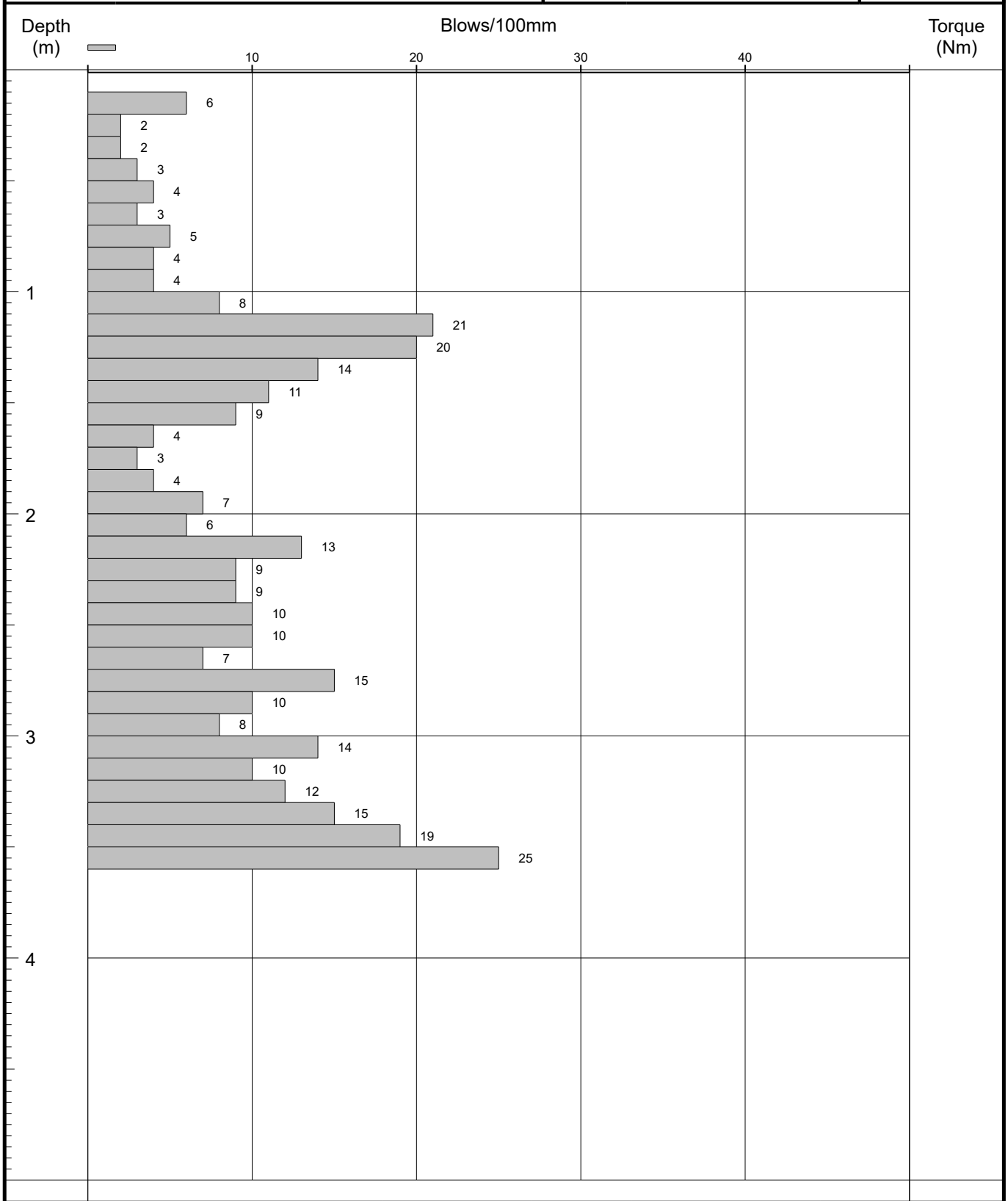
Project Name:	Bessboro SHD	**Project No.** P21239	**Co-ords:**	172034E - 70305N	**Hole Type** DP
Location:	Mahon, Cork		**Level:**	12.21m OD	**Scale** 1:25
Client:	Estuary View Ent. Ltd		**Dates:**	14/01/2022	**Logged By** LM



Remarks: Dynamic probe terminated at 3.00m bgl, refusal.		**Fall Height (mm):**	500	**Cone Base Dia. (mm):**	45
		Hammer Mass (Kg):	50.0	**Cone Angle (Deg):**	90
		Probe Type:	DPH	**Final Depth (m bgl):**	3.00

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	Probe No **DP06** Sheet 1 of 1

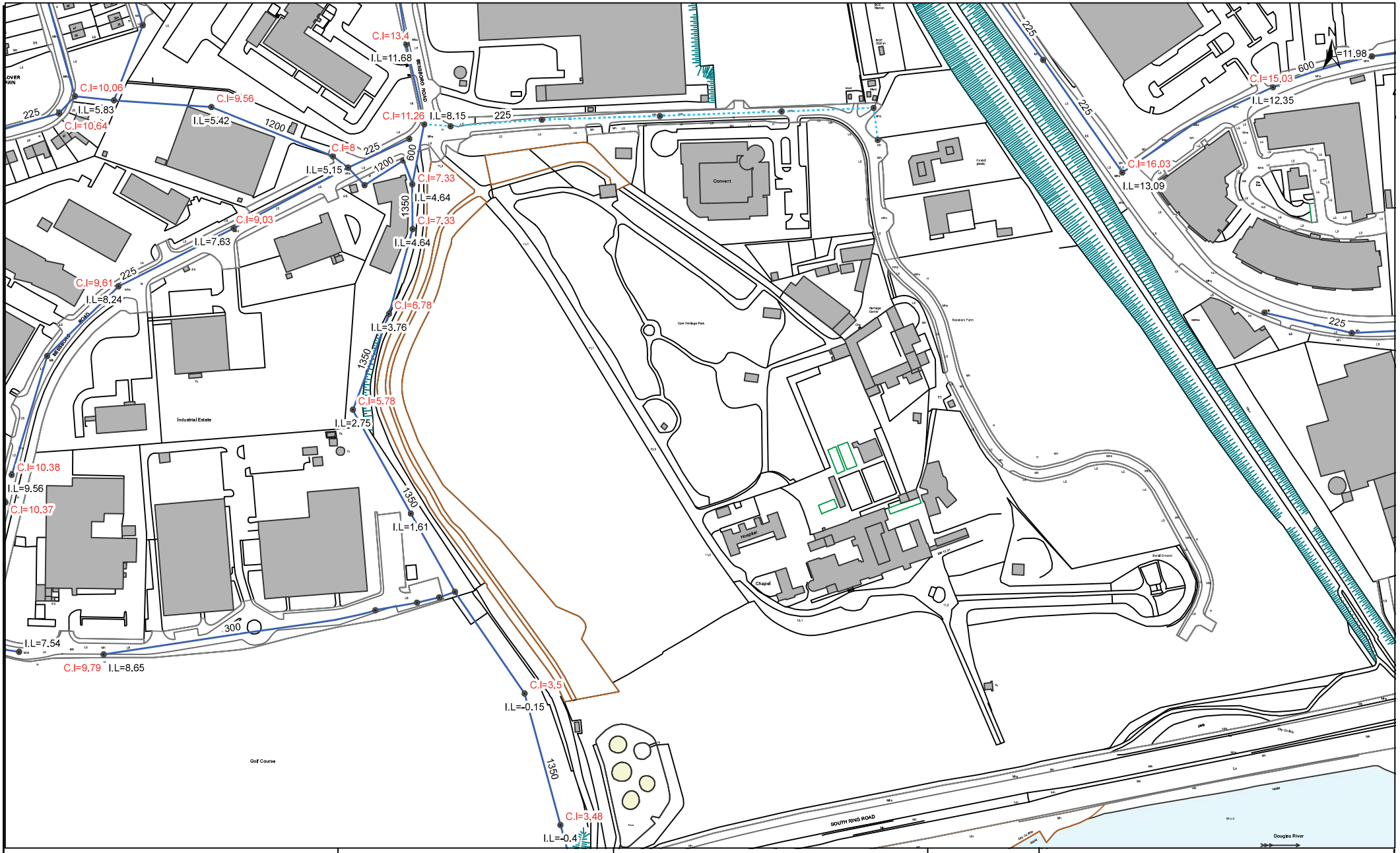
Project Name:	Bessboro SHD	**Project No.**	P21239	**Co-ords:** 171944E - 70343N	**Hole Type** DP
Location:	Mahon, Cork			**Level:** 13.61m OD	**Scale** 1:25
Client:	Estuary View Ent. Ltd			**Dates:** 13/01/2022	**Logged By** LM



Remarks: Dynamic probe terminated at 3.50m bgl, refusal.		**Fall Height (mm):**	500	**Cone Base Dia. (mm):**	45
		Hammer Mass (Kg):	50.0	**Cone Angle (Deg):**	90
		Probe Type:	DPH	**Final Depth (m bgl):**	3.50

Appendix 7

CORK CITY COUNCIL - EXISTING STORMWATER NETWORK



Drainage Records

Legend

CCC_StormManholes
MANHOLE_
Manhole

CCC_StormNetwork
PIPE_FUNCT
LOCAL STORM
PRIVATE STORM

THE SEWERS SHOWN ON THIS MAP ARE FOR REFERENCE ONLY. THE LOCATION AND PROPERTIES OF ALL SEWERS, LEVELS, PIPESIZES, etc, MUST BE CONFIRMED ON SITE.

1:2,500

N

CORK CITY COUNCIL ENVIRONMENT DIRECTORATE
Storm Network

Drawn By: A. Homan

Checked by: G.R.

Date: 25/07/2018

Appendix 8:

HR WALLINGFORD - GREENFIELD RUNOFF ESTIMATION

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Diarmuid O'Brien
Site name:	Phase 2 - Bessboro SHD
Site location:	Bessboro, Blackrock, Cork.

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

Site Details

Latitude:	51.88555° N
Longitude:	8.41036° W
Reference:	1797377310
Date:	Feb 14 2022 11:01

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1.48

Methodology

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

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	1106	1106
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	12.2	12.2
1 in 1 year (l/s):	10.37	10.37
1 in 30 years (l/s):	20.13	20.13
1 in 100 year (l/s):	23.79	23.79
1 in 200 years (l/s):	26.24	26.24

Appendix 9

CORK CITY COUNCIL CORRESPONDENCE

Figure 3. – Status of Taken in Charge / Not in Charge Roads in the Vicinity of the Bessboro SHD Site.

3.4.14.2 Sustainable Urban Drainage Systems (SuDS) & Stormwater:

The report of the Senior Executive Engineer from the Drainage Section states that:

"*I note the applicant's proposal to use Q100 instead of Qbar as the greenfield run-off rate. This is acceptable, considering the proximity of the development to outfall to the estuary and the size of the existing outfall pipe at 1350mm. This approach is in line with that taken on other previously proposed developments within the Bessboro site. I have checked the Q100 estimate against my own estimate from the uksuds.com website and I am satisfied it is accurate.*

I am pleased to see interception storage being provided for up to 5mm of rainfall…this will have a positive impact on downstream water quality, avoiding the "first flush" which would otherwise be reliant solely on an oil interceptor.

I am pleased to see the number of SuDS measures proposed and would request that design / drawing details are submitted as part of the application for each of the measures proposed. I would request in particular details of how the bio-retention areas are intention to function.

I note from Section 4.3.4 of the Infrastructure Report that it is proposed to discharge surface water from the car park via an interceptor to the storm line (as shown on drawing 21207-JBB-PH1-XX-DR-C-04001). However, based on a review of drawing SB-2020-107-404 it is apparent that this is effectively a "basement carpark", insofar as it is enclosed. As such, in accordance with Section 3.18 of the Greater Dublin Regional Code of Practice for Drainage Works, all drainage from basement areas shall be pumped to ground level prior to discharging by gravity to the public foul sewerage system. Basement car parks must be discharged to the foul system via a petrol/oil interceptor. Access to basement car parks shall be designed such that surface water run-off from the surrounding paved areas cannot flow down the ramp".

3.4.14.3 Flooding:

The report of the Senior Executive Engineer from the Drainage Section states that "*I am satisfied with the Applicant's conclusion that the site is located in Flood Zone 'C' and hence, does not merit further assessment*".

Appendix 10

SURFACE WATER - MICRODRAINAGE CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.800	Add Flow / Climate Change (%)	0
Ratio R	0.250	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	4.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	67.342	2.245	30.0	0.200	4.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	25.606	0.512	50.0	0.141	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	28.275	0.690	41.0	0.048	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	25.583	0.627	40.8	0.025	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	33.931	1.131	30.0	0.092	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	65.946	0.824	80.0	0.154	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	33.667	0.168	200.0	0.081	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	25.332	0.127	200.0	0.020	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	26.330	0.132	200.0	0.092	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.002	35.923	0.180	200.0	0.053	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.47	15.500	0.200	0.0	0.0	0.0	2.40	95.3	27.1
S2.000	50.00	4.23	13.800	0.141	0.0	0.0	0.0	1.85	73.7	19.1
S1.001	50.00	4.66	13.180	0.389	0.0	0.0	0.0	2.46	174.1	52.6
S1.002	50.00	4.83	12.491	0.413	0.0	0.0	0.0	2.47	174.5	56.0
S3.000	50.00	4.24	13.070	0.092	0.0	0.0	0.0	2.40	95.3	12.4
S1.003	50.00	5.46	11.864	0.659	0.0	0.0	0.0	1.76	124.4	89.2
S4.000	50.00	4.61	12.776	0.081	0.0	0.0	0.0	0.92	36.6	11.0
S4.001	50.00	5.07	12.608	0.102	0.0	0.0	0.0	0.92	36.6	13.8
S5.000	50.00	4.48	13.000	0.092	0.0	0.0	0.0	0.92	36.6	12.5
S4.002	50.00	5.72	12.481	0.247	0.0	0.0	0.0	0.92	36.6	33.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	60.260	0.753	80.0	0.075	0.00	0.0	0.600	o	375	Pipe/Conduit	
S6.000	42.571	0.213	200.0	0.078	4.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	9.779	0.049	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	22.648	0.283	80.0	0.016	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.006	33.709	0.674	50.0	0.210	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.007	12.673	0.253	50.0	0.048	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.008	26.281	0.526	50.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	35.823	0.716	50.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	37.725	0.843	44.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.011	6.145	0.079	78.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.012	25.039	0.063	397.4	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.013	35.011	0.026	1356.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.014	27.061	0.135	200.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.015	94.491	3.780	25.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	49.64	6.21	10.965	0.981	0.0	0.0	0.0	2.03	223.9	131.9
S6.000	50.00	4.77	12.320	0.078	0.0	0.0	0.0	0.92	36.6	10.6
S6.001	50.00	4.95	12.107	0.078	0.0	0.0	0.0	0.92	36.6	10.6
S1.005	49.07	6.40	10.211	1.075	0.0	0.0	0.0	2.03	223.9	142.9
S1.006	48.43	6.62	9.928	1.285	0.0	0.0	0.0	2.57	283.6	168.5
S1.007	48.19	6.70	9.254	1.332	0.0	0.0	0.0	2.57	283.6	173.9
S1.008	47.71	6.87	9.001	1.332	0.0	0.0	0.0	2.57	283.6	173.9
S1.009	47.07	7.10	8.475	1.332	0.0	0.0	0.0	2.57	283.6	173.9
S1.010	46.34	7.38	7.759	1.332	0.0	0.0	0.0	2.57	283.6	173.9
S1.011	46.11	7.47	6.916	1.332	0.0	0.0	0.0	1.68	185.5	173.9
S1.012	44.92	7.95	6.687	1.332	0.0	0.0	0.0	1.03	222.4	173.9
S1.013	50.00	4.10	6.624	0.000	23.8	0.0	0.0	0.89	35.4	23.8
S1.014	50.00	4.59	6.598	0.000	23.8	0.0	0.0	0.92	36.6	23.8
S1.015	50.00	5.19	6.463	0.000	23.8	0.0	0.0	2.63	104.5	23.8

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.015	S.A28	4.390	2.683	0.000	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S.B22, DS/PN: S1.013, Volume (m³): 10.0

Unit Reference	MD-SHE-0205-2380-1680-2380
Design Head (m)	1.680
Design Flow (l/s)	23.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	205
Invert Level (m)	6.624
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.680	23.8	Kick-Flo®	1.081	19.3
Flush-Flo™	0.498	23.7	Mean Flow over Head Range	-	20.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.0	0.800	22.8	2.000	25.9	4.000	36.1	7.000	47.3
0.200	19.5	1.000	20.9	2.200	27.1	4.500	38.2	7.500	48.9
0.300	22.7	1.200	20.3	2.400	28.2	5.000	40.2	8.000	50.4
0.400	23.5	1.400	21.8	2.600	29.3	5.500	42.1	8.500	51.9
0.500	23.7	1.600	23.2	3.000	31.4	6.000	43.9	9.000	53.4
0.600	23.5	1.800	24.6	3.500	33.8	6.500	45.6	9.500	54.8

Storage Structures for Storm

Cellular Storage Manhole: S.B22, DS/PN: S1.013

Invert Level (m) 6.624 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.67
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	420.0	0.0	0.900	420.0	0.0	1.681	0.0	0.0
0.100	420.0	0.0	1.000	420.0	0.0	1.900	0.0	0.0
0.200	420.0	0.0	1.100	420.0	0.0	2.000	0.0	0.0
0.300	420.0	0.0	1.200	420.0	0.0	2.100	0.0	0.0
0.400	420.0	0.0	1.300	420.0	0.0	2.200	0.0	0.0
0.500	420.0	0.0	1.400	420.0	0.0	2.300	0.0	0.0
0.600	420.0	0.0	1.500	420.0	0.0	2.400	0.0	0.0
0.700	420.0	0.0	1.600	420.0	0.0	2.500	0.0	0.0
0.800	420.0	0.0	1.680	420.0	0.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.800
Region	Scotland and Ireland	Ratio R	0.250
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S.B1	15 Winter	1	+10%	100/15 Summer				15.587	-0.138
S2.000	S.B2	15 Winter	1	+10%	100/15 Summer				13.884	-0.141
S1.001	S.B3	15 Winter	1	+10%	30/15 Summer				13.303	-0.177
S1.002	S.B4	15 Winter	1	+10%	30/15 Summer				12.617	-0.173
S3.000	S.B5	15 Winter	1	+10%	100/15 Summer				13.128	-0.167
S1.003	S.B6	15 Winter	1	+10%	30/15 Summer				12.060	-0.104
S4.000	S.B7	15 Winter	1	+10%	30/15 Summer				12.867	-0.134
S4.001	S.B8	15 Winter	1	+10%	30/15 Summer				12.709	-0.124
S5.000	S.B9	15 Winter	1	+10%	100/15 Summer				13.099	-0.126
S4.002	S.B10	15 Winter	1	+10%	30/15 Summer				12.655	-0.051
S1.004	S.B11	15 Winter	1	+10%	30/15 Summer				11.177	-0.163
S6.000	S.B12	15 Winter	1	+10%					12.409	-0.136
S6.001	S.B13	15 Winter	1	+10%					12.202	-0.131
S1.005	S.B14	15 Winter	1	+10%	30/15 Summer				10.451	-0.136
S1.006	S.B15	15 Winter	1	+10%	30/15 Summer				10.147	-0.156
S1.007	S.B16	15 Winter	1	+10%	30/15 Summer				9.519	-0.111
S1.008	S.B17	15 Winter	1	+10%	30/15 Summer				9.226	-0.149
S1.009	S.B18	15 Winter	1	+10%	30/15 Summer				8.696	-0.154
S1.010	S.B19	15 Winter	1	+10%	30/15 Summer				7.972	-0.162
S1.011	S.B20	15 Winter	1	+10%	1/15 Summer				7.372	0.081
S1.012	S.B21	180 Winter	1	+10%	30/15 Summer				7.111	-0.101
S1.013	S.B22	180 Winter	1	+10%	1/15 Summer				7.105	0.256
S1.014	S.B23	180 Winter	1	+10%					6.732	-0.091
S1.015	S.B24	180 Winter	1	+10%					6.534	-0.154

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S.B1	0.000	0.31			29.0	OK	
S2.000	S.B2	0.000	0.30			20.7	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.001	S.B3	0.000	0.35			55.2	OK	
S1.002	S.B4	0.000	0.37			57.8	OK	
S3.000	S.B5	0.000	0.15			13.4	OK	
S1.003	S.B6	0.000	0.74			87.7	OK	
S4.000	S.B7	0.000	0.34			11.6	OK	
S4.001	S.B8	0.000	0.41			13.9	OK	
S5.000	S.B9	0.000	0.40			13.6	OK	
S4.002	S.B10	0.000	0.95			32.7	OK	
S1.004	S.B11	0.000	0.60			126.1	OK	
S6.000	S.B12	0.000	0.32			11.0	OK	
S6.001	S.B13	0.000	0.37			11.1	OK	
S1.005	S.B14	0.000	0.73			139.1	OK	
S1.006	S.B15	0.000	0.64			161.3	OK	
S1.007	S.B16	0.000	0.84			165.9	OK	
S1.008	S.B17	0.000	0.67			164.8	OK	
S1.009	S.B18	0.000	0.65			165.1	OK	
S1.010	S.B19	0.000	0.61			166.0	OK	
S1.011	S.B20	0.000	1.51			165.7	SURCHARGED	
S1.012	S.B21	0.000	0.30			58.4	OK	
S1.013	S.B22	0.000	1.76		99	22.4	SURCHARGED	
S1.014	S.B23	0.000	0.66			22.4	OK	
S1.015	S.B24	0.000	0.22			22.4	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.800
Region	Scotland and Ireland	Ratio R	0.250
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S.B1	15 Winter	30	+10%	100/15 Summer				15.640	-0.085
S2.000	S.B2	15 Winter	30	+10%	100/15 Summer				13.936	-0.089
S1.001	S.B3	15 Winter	30	+10%	30/15 Summer				13.794	0.313
S1.002	S.B4	15 Winter	30	+10%	30/15 Summer				13.514	0.723
S3.000	S.B5	15 Winter	30	+10%	100/15 Summer				13.286	-0.009
S1.003	S.B6	15 Winter	30	+10%	30/15 Summer				13.237	1.073
S4.000	S.B7	15 Winter	30	+10%	30/15 Summer				13.256	0.255
S4.001	S.B8	15 Winter	30	+10%	30/15 Summer				13.192	0.360
S5.000	S.B9	15 Winter	30	+10%	100/15 Summer				13.188	-0.037
S4.002	S.B10	15 Winter	30	+10%	30/15 Summer				13.119	0.413
S1.004	S.B11	15 Winter	30	+10%	30/15 Summer				11.944	0.604
S6.000	S.B12	15 Winter	30	+10%					12.464	-0.081
S6.001	S.B13	15 Winter	30	+10%					12.261	-0.071
S1.005	S.B14	15 Winter	30	+10%	30/15 Summer				11.141	0.554
S1.006	S.B15	15 Winter	30	+10%	30/15 Summer				10.724	0.420
S1.007	S.B16	15 Winter	30	+10%	30/15 Summer				10.046	0.417
S1.008	S.B17	15 Winter	30	+10%	30/15 Summer				9.619	0.243
S1.009	S.B18	15 Winter	30	+10%	30/15 Summer				9.069	0.219
S1.010	S.B19	30 Winter	30	+10%	30/15 Summer				8.370	0.236
S1.011	S.B20	240 Winter	30	+10%	1/15 Summer				7.856	0.565
S1.012	S.B21	240 Winter	30	+10%	30/15 Summer				7.849	0.637
S1.013	S.B22	240 Winter	30	+10%	1/15 Summer				7.843	0.994
S1.014	S.B23	360 Summer	30	+10%					6.737	-0.086
S1.015	S.B24	360 Summer	30	+10%					6.536	-0.152

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S.B1	0.000	0.70			64.6	OK	
S2.000	S.B2	0.000	0.68			46.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.001	S.B3	0.000	0.73			115.2	SURCHARGED	
S1.002	S.B4	0.000	0.67			104.9	SURCHARGED	
S3.000	S.B5	0.000	0.33			29.8	OK	
S1.003	S.B6	0.000	1.35			160.2	SURCHARGED	
S4.000	S.B7	0.000	0.61			20.9	SURCHARGED	
S4.001	S.B8	0.000	0.75			25.5	SURCHARGED	
S5.000	S.B9	0.000	0.89			30.1	OK	
S4.002	S.B10	0.000	1.82			62.9	SURCHARGED	
S1.004	S.B11	0.000	1.04			218.5	SURCHARGED	
S6.000	S.B12	0.000	0.70			24.5	OK	
S6.001	S.B13	0.000	0.81			24.6	OK	
S1.005	S.B14	0.000	1.22			233.6	SURCHARGED	
S1.006	S.B15	0.000	1.02			259.4	SURCHARGED	
S1.007	S.B16	0.000	1.32			259.8	SURCHARGED	
S1.008	S.B17	0.000	1.04			256.8	SURCHARGED	
S1.009	S.B18	0.000	0.99			253.2	SURCHARGED	
S1.010	S.B19	0.000	0.92			248.9	SURCHARGED	
S1.011	S.B20	0.000	0.89			98.1	SURCHARGED	
S1.012	S.B21	0.000	0.50			97.5	SURCHARGED	
S1.013	S.B22	0.000	1.86		176	23.6	SURCHARGED	
S1.014	S.B23	0.000	0.70			23.6	OK	
S1.015	S.B24	0.000	0.23			23.6	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.800
Region	Scotland and Ireland	Ratio R	0.250
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

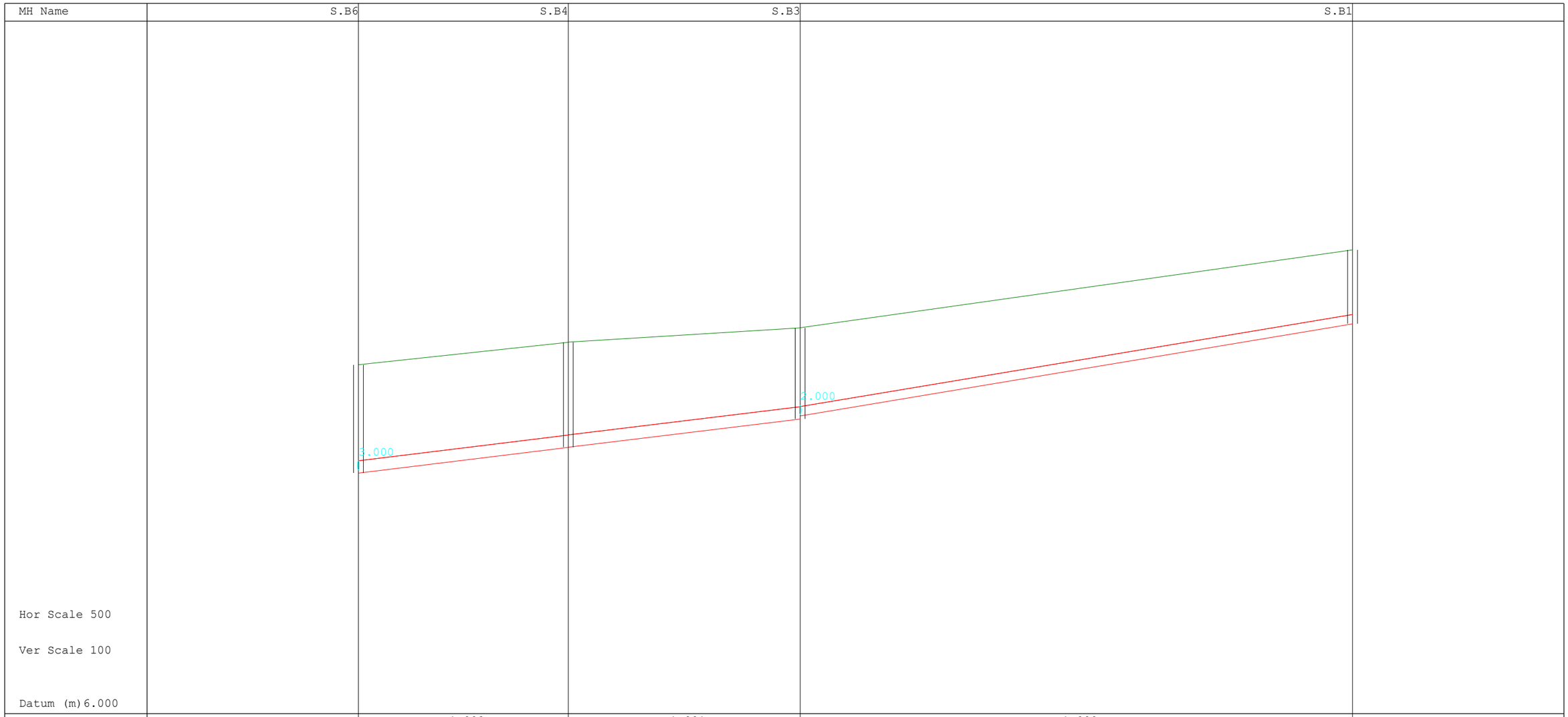
Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S.B1	15 Winter	100	+10%	100/15 Summer				15.870	0.145
S2.000	S.B2	15 Winter	100	+10%	100/15 Summer				14.999	0.974
S1.001	S.B3	15 Winter	100	+10%	30/15 Summer				14.893	1.412
S1.002	S.B4	15 Winter	100	+10%	30/15 Summer				14.625	1.834
S3.000	S.B5	15 Winter	100	+10%	100/15 Summer				14.396	1.101
S1.003	S.B6	15 Winter	100	+10%	30/15 Summer				14.355	2.191
S4.000	S.B7	15 Winter	100	+10%	30/15 Summer				13.693	0.692
S4.001	S.B8	15 Winter	100	+10%	30/15 Summer				13.643	0.810
S5.000	S.B9	15 Winter	100	+10%	100/15 Summer				13.626	0.401
S4.002	S.B10	15 Winter	100	+10%	30/15 Summer				13.575	0.869
S1.004	S.B11	15 Winter	100	+10%	30/15 Summer				13.026	1.686
S6.000	S.B12	15 Winter	100	+10%					12.494	-0.051
S6.001	S.B13	15 Winter	100	+10%					12.308	-0.024
S1.005	S.B14	15 Winter	100	+10%	30/15 Summer				12.148	1.562
S1.006	S.B15	15 Winter	100	+10%	30/15 Summer				11.658	1.355
S1.007	S.B16	30 Winter	100	+10%	30/15 Summer				10.801	1.172
S1.008	S.B17	15 Winter	100	+10%	30/15 Summer				10.277	0.901
S1.009	S.B18	30 Winter	100	+10%	30/15 Summer				9.582	0.732
S1.010	S.B19	30 Winter	100	+10%	30/15 Summer				8.725	0.592
S1.011	S.B20	360 Winter	100	+10%	1/15 Summer				8.297	1.006
S1.012	S.B21	360 Winter	100	+10%	30/15 Summer				8.290	1.078
S1.013	S.B22	360 Winter	100	+10%	1/15 Summer				8.283	1.434
S1.014	S.B23	1440 Winter	100	+10%					6.737	-0.086
S1.015	S.B24	1440 Winter	100	+10%					6.536	-0.152

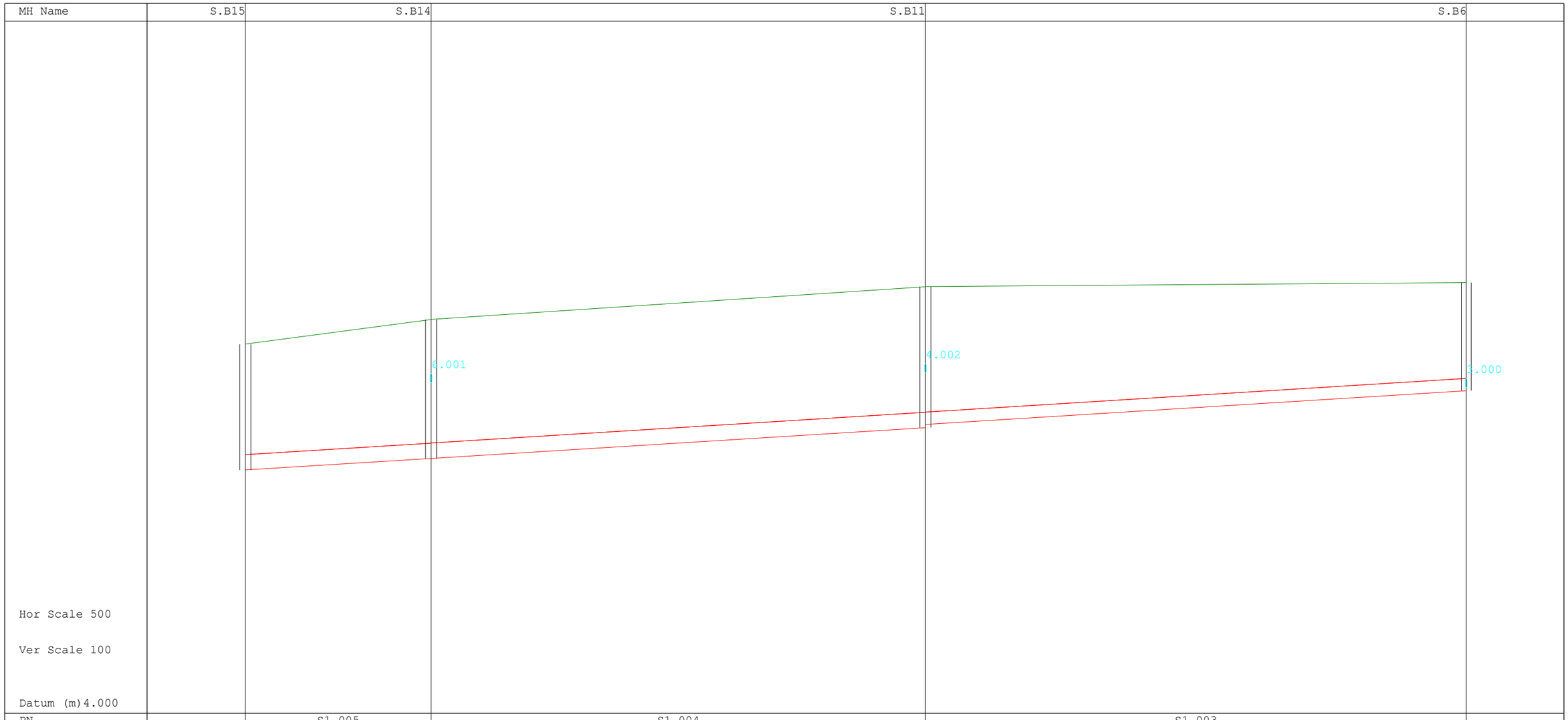
PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S.B1	0.000	0.86			79.3	SURCHARGED	
S2.000	S.B2	0.000	0.78			53.1	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

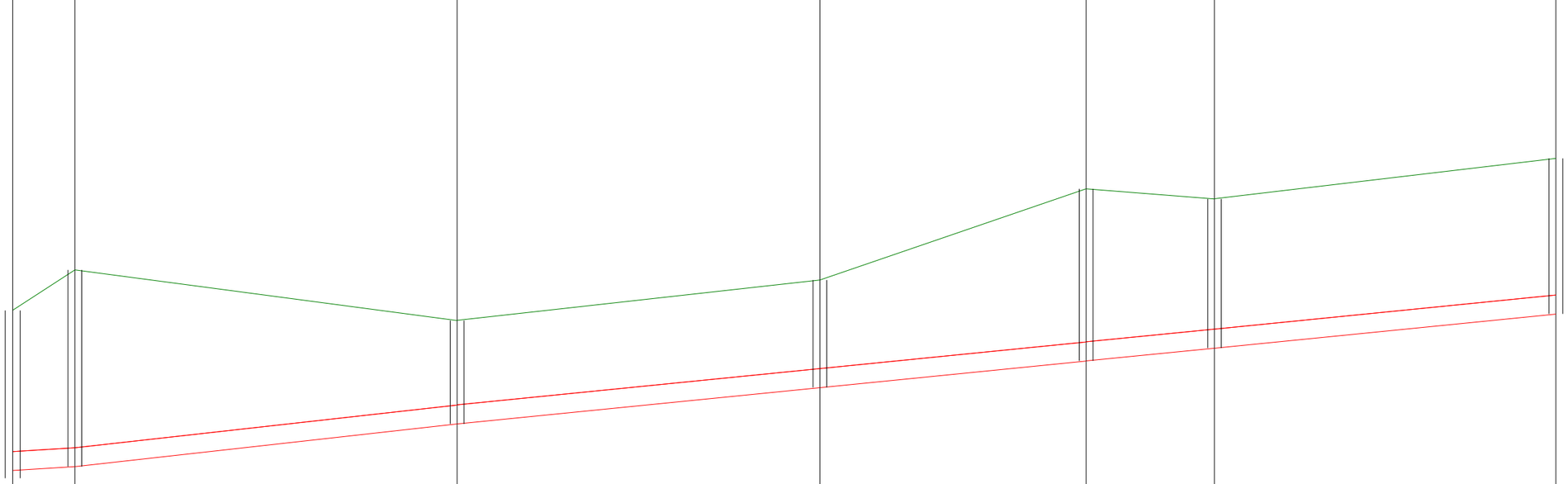
PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.001	S.B3	0.000	0.75			117.2	SURCHARGED	
S1.002	S.B4	0.000	0.71			110.9	SURCHARGED	
S3.000	S.B5	0.000	0.36			32.2	FLOOD RISK	
S1.003	S.B6	0.000	1.43			169.7	FLOOD RISK	
S4.000	S.B7	0.000	0.73			25.1	SURCHARGED	
S4.001	S.B8	0.000	0.86			29.1	SURCHARGED	
S5.000	S.B9	0.000	1.01			34.3	SURCHARGED	
S4.002	S.B10	0.000	2.17			75.1	SURCHARGED	
S1.004	S.B11	0.000	1.11			233.8	SURCHARGED	
S6.000	S.B12	0.000	0.92			31.9	OK	
S6.001	S.B13	0.000	1.00			30.4	OK	
S1.005	S.B14	0.000	1.36			259.4	SURCHARGED	
S1.006	S.B15	0.000	1.16			294.5	SURCHARGED	
S1.007	S.B16	0.000	1.48			292.0	SURCHARGED	
S1.008	S.B17	0.000	1.18			291.5	SURCHARGED	
S1.009	S.B18	0.000	1.12			285.2	SURCHARGED	
S1.010	S.B19	0.000	1.04			281.4	SURCHARGED	
S1.011	S.B20	0.000	0.86			94.4	SURCHARGED	
S1.012	S.B21	0.000	0.48			93.9	SURCHARGED	
S1.013	S.B22	0.000	1.86		252	23.6	SURCHARGED	
S1.014	S.B23	0.000	0.70			23.6	OK	
S1.015	S.B24	0.000	0.23			23.6	OK	



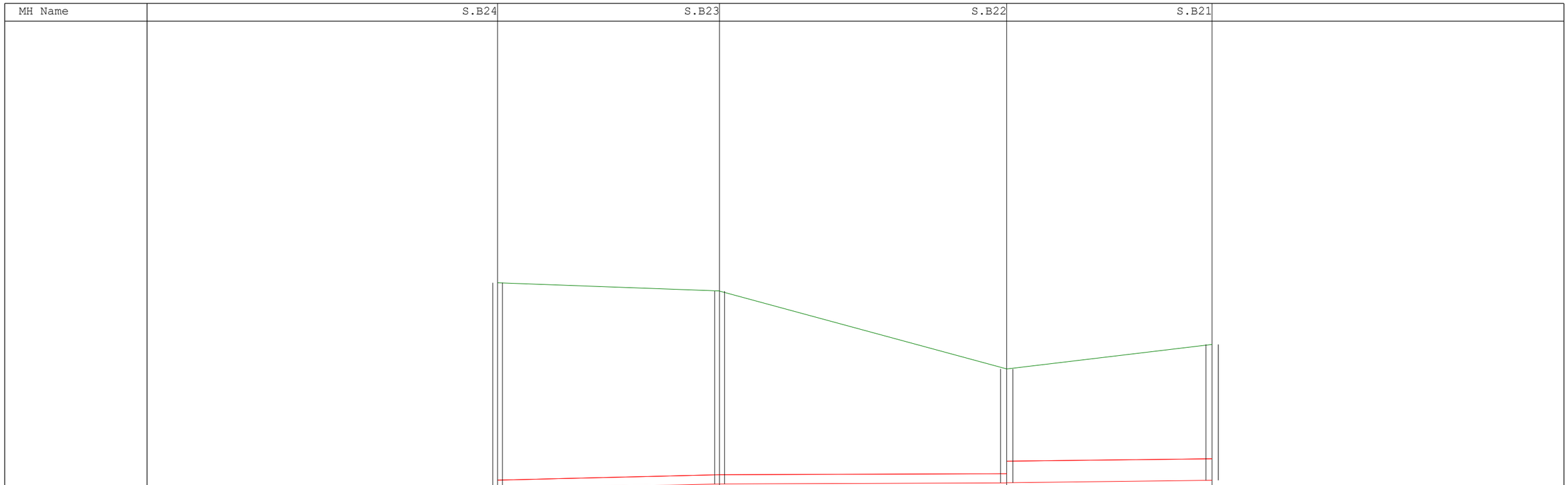
PN		S1.002	S1.001	S1.000	
Dia (mm)		300	300	225	
Slope (1:X)		40.8	41.0	30.0	
Cover Level (m)	14.500	15.050	15.400	17.300	
Invert Level (m)		11.864 / 12.491	12.491 / 13.180	13.255 / 15.500	
Length (m)		25.583	28.275	67.342	



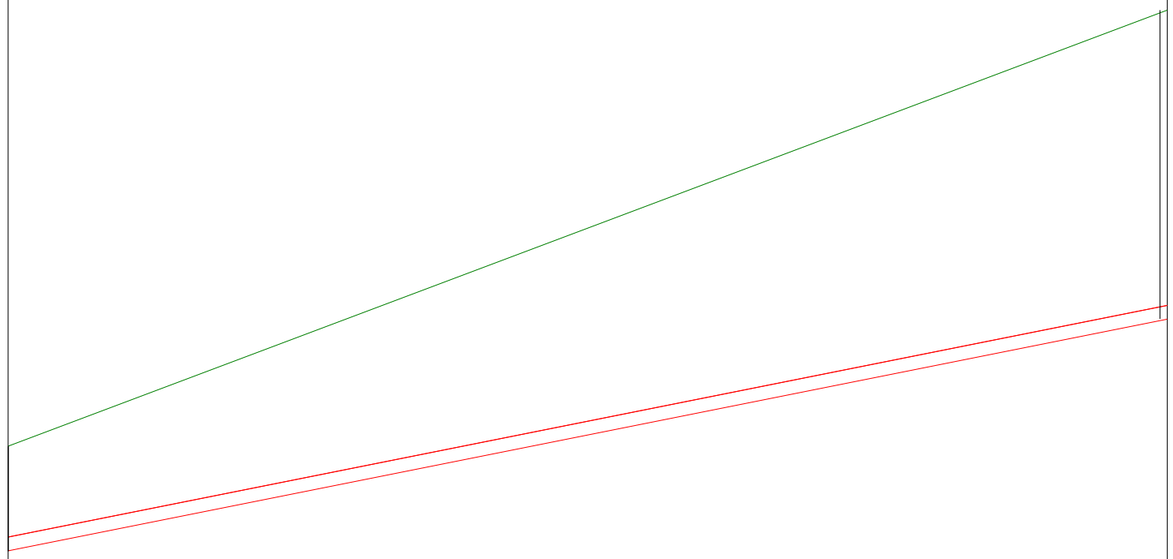
PN		S1.005	S1.004	S1.003	
Dia (mm)		375	375	300	
Slope (1:X)		80.0	80.0	80.0	
Cover Level (m)	13.000	13.600	14.400	14.500	
Invert Level (m)		9.928 / 10.211	10.211 / 10.965	11.040 / 11.864	
Length (m)		22.648	60.260	65.946	

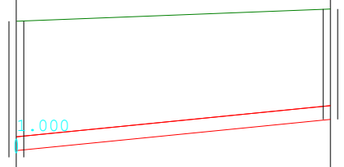


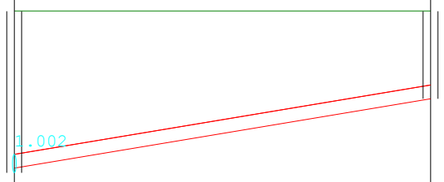
MH Name		S.B21	S.B20	S.B19	S.B18	S.B17	S.B16	S.B15	
Hor Scale 500 Ver Scale 100 Datum (m)1.000									
PN			S1.011	S1.010	S1.009	S1.008	S1.007	S1.006	
Dia (mm)			375	375	375	375	375	375	
Slope (1:X)			78.0	44.8	50.0	50.0	50.0	50.0	
Cover Level (m)		10.000	10.800	9.800	10.600	12.400	12.200	13.000	
Invert Level (m)			6.837	6.916 / 6.916	7.759 / 7.759	8.475 / 8.475	9.001 / 9.001	9.254 / 9.254	9.928	
Length (m)			6.145	37.725	35.823	26.281	12.673	33.709	

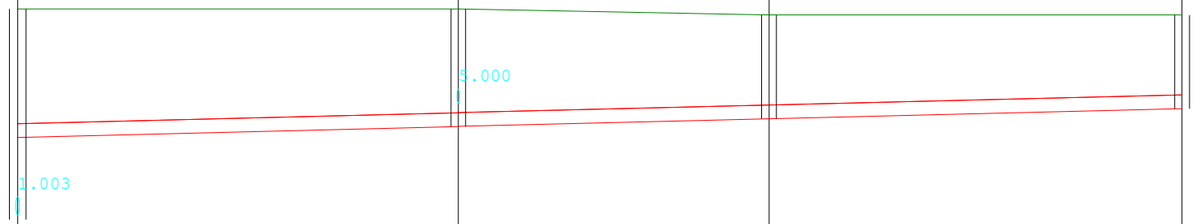


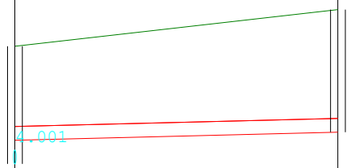
MH Name		S.B24	S.B23	S.B22	S.B21	
Hor Scale 500 Ver Scale 100 Datum (m) 1.000						
PN			S1.014	S1.013	S1.012	
Dia (mm)			225	225	525	
Slope (1:X)			200.5	1356.0	397.4	
Cover Level (m)		11.500	11.300	9.400	10.000	
Invert Level (m)		6.463	6.598 / 6.598	6.624 / 6.624	6.687	
Length (m)			27.061	35.011	25.039	

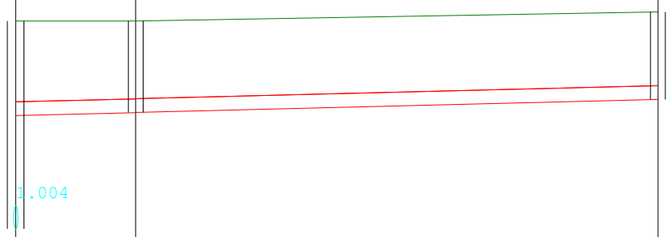
MH Name	S.A28	S.B24	
Hor Scale 500 Ver Scale 100 Datum (m)-1.000			
PN		S1.015	
Dia (mm)		225	
Slope (1:X)		25.0	
Cover Level (m)	4.390	11.500	
Invert Level (m)	2.683	6.463	
Length (m)		94.491	

MH Name	S.B3	S.B2	
			
Hor Scale 500 Ver Scale 100 Datum (m) 6.000			
PN		S2.000	
Dia (mm)		225	
Slope (1:X)		50.0	
Cover Level (m)	15.400	15.600	
Invert Level (m)	13.288	13.800	
Length (m)		25.606	

MH Name	S.B6	S.B5	
			
Hor Scale 500 Ver Scale 100 Datum (m) 5.000			
PN		S3.000	
Dia (mm)		225	
Slope (1:X)		30.0	
Cover Level (m)	14.500	14.500	
Invert Level (m)	11.939	13.070	
Length (m)		33.931	

MH Name	S.B11	S.B10	S.B8	S.B7	
					
Hor Scale 500 Ver Scale 100 Datum (m) 4.000					
PN		S4.002	S4.001	S4.000	
Dia (mm)		225	225	225	
Slope (1:X)		200.0	200.0	200.0	
Cover Level (m)	14.400	14.400	14.300	14.300	
Invert Level (m)	12.301	12.481	12.481 12.608	12.608 12.776	
Length (m)		35.923	25.332	33.667	

MH Name	S.B10	S.B9	
Hor Scale 500 Ver Scale 100 Datum (m) 5.000			
PN		S5.000	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	14.400	15.000	
Invert Level (m)	12.868	13.000	
Length (m)		26.330	



MH Name	S.B14	S.B13	S.B12	
Hor Scale 500 Ver Scale 100 Datum (m) 4.000				
PN		S6.001	S6.000	
Dia (mm)		225	225	
Slope (1:X)		200.0	200.0	
Cover Level (m)	13.600	13.600	13.750	
Invert Level (m)		12.058 12.107	12.107 12.320	
Length (m)		9.779	42.571	

Appendix 11

ATTENUATION ESTIMATES, STORAGE TANK SIZING

PROJECT: **Bessborough SHD Development**

DESCRIPTION: **21207-JBB-PH2-XX-CA-C-04406_Attenuation_Assessment_(Phase_2)**

DATE: 17/02/2022 **SHEET** 100 Year +10%

BARRY & PARTNERS consulting engineers

Sheet 1

Catchment Characteristics

Site Area			1.480	ha
SAAR			1106	mm
Soil Category	4	SOIL =	**0.47**	
M5-60			16.3	mm
M5-2D			76.6	mm
r = M5-60 / M5-2d =			0.21	

Permissible flow (Q100) = **23.79** l/s

Developent Area = 1.480 ha
Impervious Area = 1.480 ha

Rainfall duration hrs	Rainfall depth (R100) mm	Including CCF (R100)*1.1 mm	Total volume of runoff m3	Average flow m3/s	Permsble Flow m3/s	Flow to be stored m3/s	Storage Volume m3
0.25	16.1	17.7	262.11	0.291	0.0238	0.267	241
0.5	21.6	23.8	351.65	0.195	0.0238	0.172	309
1	28.9	31.8	470.49	0.131	0.0238	0.107	385
2	38.7	42.6	630.04	0.088	0.0238	0.064	459
4	51.8	57.0	843.30	0.059	0.0238	0.035	501
6	61.5	67.7	1001.22	0.046	0.0238	0.023	487
12	82.3	90.5	1339.84	0.031	0.0238	0.007	312
24	110.3	121.3	1795.68	0.021	0.0238	-0.003	-260
48	128.3	141.1	2088.72	0.012	0.0238	-0.012	-2023
Required Volume = Maxum of storage volume, V100 =							**501** m3

Total attenuation storage required (m3) = **501** m3

STORMTECH Stormwater Management System Design Tool

ver: Aug15

PROJECT REF:	Bessborough SHD Development
LOCATION:	
DATE:	17-Feb-22
CREATED BY:	DOB

SYSTEM PARAMETERS

Required Total Storage	**501**	m^3
Stormtech chamber model	**MC3500**	
Filtration Permeable Geo or Impermeable Geo	Filter geo	
Number of Isolator Rows (IR)	1	

SITE PARAMETERS

Stone Porosity	43%		
Excavation Batter Angle (degrees)	60	°	*Minimum Requirement*
Stone Above Chambers	0.3	m	*0.30*
Stone Below Chambers	0.3	m	*0.23*
In-between Row Spacing	0.23	m	*0.23*
Additional Storage outside Excavation. E.g manholes, Header Pipe	0	m^3	

HEADER PIPE

Is Header pipe required within excavation	No	
Orientation of Header Pipe	Parrallel to IR	
Diameter of Header Pipe	0.6	m
Length of Header Pipe	0	m

CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows		8	ea
Number of units per Row		10	ea
System Installed Storage Depth (effective storage depth)	1.745		m
Tank overall installed Width at base	17.85	18.00	m
Tank overall installed Length at Base	23.54	23.7	m
Total Effective System Storage	**496.2**	**501.2**	m^3

STORMTECH SYSTEM DETAIL

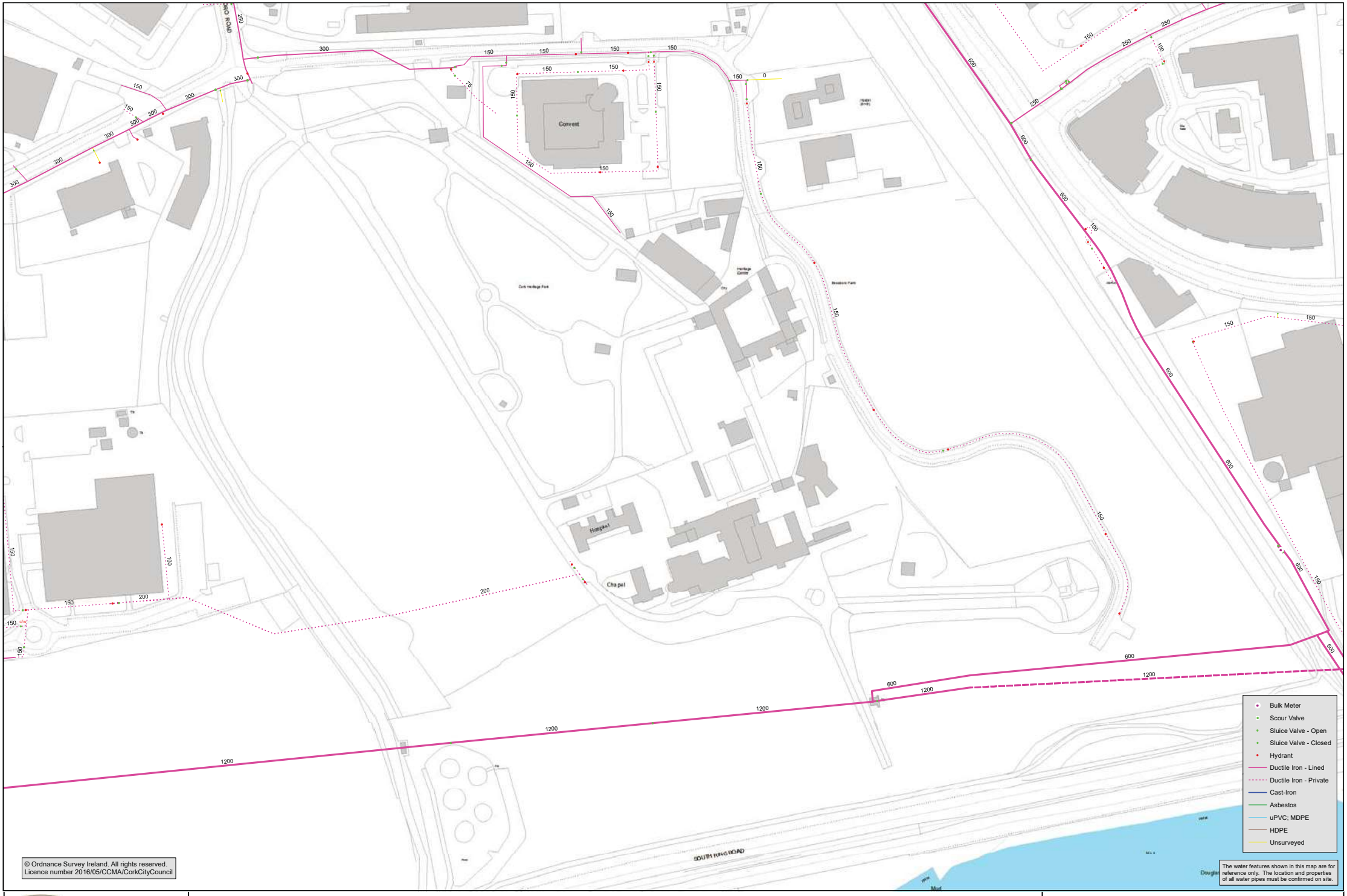
StormTech Chamber Model	MC3500	
Unit Width	1.955	m
Unit Length	2.18	m
Unit Height	1.145	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.4	m
Chamber Internal Storage Vol.	3.11	m^3
Header Pipe Internal Storage Vol in Excavation	0.0	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	821	m^3
Width at base	18.00	m
Width at top	20.01	m
Length at base	23.70	m
Length at top	25.71	m
Depth Of System	1.75	m
Area of Dig at Base of System	427	m^2
Area of Dig at Top of System	515	m^2
Void Ratio	61%	
Stone Requirement - m3	564	m^3
Stone Requirement - tonne	924	tonne

Appendix 12

CORK CITY COUNCIL - EXISTING WATERMAIN RECORDS



The water features shown in this map are for reference only. The location and properties of all water pipes must be confirmed on site.

Comhairle Cathrach Chorcai
Cork City Council
Environment Directorate
Water Services (Distribution) Section
Tel: 021-4924228
Fax: 021-4924006
Web: www.corkcity.ie

Bessboro, Mahon
Public Watermain Records

Scale: 1:1000 Date: Jul 2018 DrgNo.
Drawn: LG Checked: