Engineering Services Report

Proposed Residential Development at Monacnapa, Blarney, Co. Cork

Applicant:- Mr. Eoin Sheehan

Date of Issue:- February 2022

Revision: D (SHD Final Submission)

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1.0 Introduction

1.1 General

OLS Consulting Engineers& Project Management Ltd. were commissioned by Mr. Eoin Sheehan to undertake the design and specification of the Engineering Services for a proposed residential development at Monacnapa, Blarney, Co. Cork.

The subject site comprises c7.79 hectares to the northwest of Blarney village. The site is currently in agricultural use and slopes in a southerly direction towards the village. The site is bounded to the east by existing residential housing estates and by similar agricultural lands to the north and west. There is mature forestry to the south.

The proposed development will consist of a strategic housing development of 143no. residential units (8no. 1-bed; 38no. 2-bed; 71no. 3-bed; and 26no. 4-bed units), comprising 105no. houses (3no. detached; 42no. semi-detached; and 60no. terraced units) and 38no. apartments.

The proposed development will also consist of the demolition of an existing garage and southern boundary wall, to be replaced with a new southern boundary wall, as well as the lowering of the existing eastern boundary wall and pier, at no. 1 Sunberry Drive; a crèche; all associated ancillary site development and landscaping works, to include bin stores, bicycle and car parking, ground works and retaining structures, foul drainage, stormwater drainage, water supply, service ducting and cabling, public lighting, relocation of existing ESB substation, and all boundary treatments.

The proposed development is to be accessed via the existing Sunberry Heights/Sunberry Drive off the Blarney Relief Road (R617). An upgrade is proposed to the existing Sunberry Heights/Sunberry Drive and the existing access to the proposed strategic housing development, including the widening of the footpath at the junction with the Blarney Relief Road (R617), raised platforms, security barriers and fencing as necessary, road markings, and road resurfacing to facilitate improved pedestrian/cycle connectivity.

The development will necessitate the construction/provision of new site infrastructure to service the proposed development. Such infrastructure will include foul and surface water drainage, water, electrical and telecommunication services, access roads and common areas.

1.2 Scope of this Report

This report outlines the proposed means of servicing the development with foul sewers, surface water sewers, storm water attenuation, water supply and other services required to service a housing development.

This Report should be read in conjunction with the engineering drawings which illustrate and detail the servicing proposals. It should be also read in conjunction with the submissions of other members of the Applicant's Design Team.

2.0 Foul Sewage Collection and Disposal

It is proposed to discharge foul effluent arising within the development to the Public Foul Sewer located on Sunberry Drive which is located to the southeast extremity of the site.

There has been consultation with Irish Water in this matter through the submission of a Pre-Connection Enquiry for the development which was submitted on the 25th January 2021. Irish Water subsequently issued Confirmation of Feasibility on the 24th March 2021 confirming the proposed connection to the Irish Water Network could be facilitated.

A Statement of Design Acceptance has also been issued by Irish Water on the 16th September 2021 in respect of the Wastewater Services proposed for the site confirming Irish Water has no objection to the submitted proposals.

Irish Water advised in their Confirmation of Feasibility Letter that it is likely that an upgrade of the foul sewer in Sunberry Drive will be necessary to facilitate the development and have advised that should the works proceed, Irish Water may seek a contribution towards the upgrade of the network. Irish Water advise the detail surrounding any such upgrades and possible contributions can be agreed as part of the putting in place of a valid connection agreement.

All houses on the site are served by 160/225mm diameter gravity foul sewers which collect foul effluent from each dwelling connection on the site. The new sewer shall be connected to the existing foul sewer network on Sunberry Drive.

The Foul Sewerage System shall be designed and installed in accordance with the guidance contained in the "Code of Practice for Wastewater Infrastructure" published by Irish Water in July 2020 (Revision 2).

The following key guidance criteria has been established from the above publication:-

- The sewers have been designed on the basis of 6 times Dry Weather Flow (6DWF). Dry weather flow (DWF) is taken as 446 litres per dwelling (2.7 persons per housing unit and a per capita wastewater flow of 150 litres per head per day with provision for a 10% consumption allowance).

- All sewers have been designed with gradients that ensure self-cleansing velocities are achieved. This is based on a minimum flow velocity of 0.75m/second at one third design flow or during average flow conditions (2 times DWF).

In addition to satisfying the criterion on self-cleansing velocity the following conditions shall also be satisfied:-

- 150mm nominal internal diameter gravity sewer shall be laid at gradients not flatter than 1:150 where there is at least ten dwelling units connected;

- 225mm nominal internal diameter gravity sewer shall be laid at gradients not flatter than 1:225 where there is at least twenty dwelling units connected;

- A service connection with a nominal internal diameter of 100mm laid to a gradient not flatter than 1:80, where there is at least one WC connected and 1:40 if there is no WC connected.

On the basis of the guidance above, sewer connections from individual houses shall be 100mm diameter pipes laid at a minimum gradient of 1 in 60. The design summary for the main foul sewer serving the proposed development is shown in the following Table.

Sewer Reference	Length (m)	No of Units	Design Dry Weather Flow – DWF (litres/unit/day)	Total Flow Litres/Day	6DWF Litres/Day (Litres/sec.)	Pipe Size & Gradient	Design Discharge (Litres/sec.)	Velocity
FWMH01 to FWMH02	66.0m	10	446	4,455	26,730 (0.31)	160@1/100	18.0l/sec	1.00m/sec
FWMH02 to FWMH03	78.0m	5	446	2,230 + 4,455 Flow from FWMH02 6,685 (Total)	40,110 (0.46)	160@1/100	18.0 l/sec	1.00m/sec
FWMH03 to FWMH04	60.0m	7	446	3,122 + 6,685 Flow from FWMH03 9,807 (Total)	58,842 (0.68)	225@1/100	44.0 l/sec	1.30m/sec
FWMH04 to FWMH05	23.0m	1	446	446 + 9,807 Flow from FWMH04 10,253 (Total)	61,158 (0.71)	225@1/100	44.0 l/sec	1.30m/sec

Sewer Reference	Length (m)	No of Units	Design Dry Weather Flow – DWF (litres/unit/day)	Total Flow Litres/Day	6DWF Litres/Day (Litres/sec.)	Pipe Size & Gradient	Design Discharge (Litres/sec.)	Velocity
FWMH05 to FWMH08	23.0m	2	446	892 + 10,253 Flow from FWMH05 11,145 (Total)	66,870 (0.77)	225@1/100	44.0 l/sec	1.30m/sec
FWMH06 to FWMH07	55.0m	9	446	4,014	24,084 (0.28)	160@1/50	26.0 l/sec	1.40m/sec
FWMH07 to FWMH08	43.0m	4	446	1,784 + 4,014 Flow from FWMH07 5,798 (Total)	34,788 (0.40)	160@1/100	26.0 l/sec	1.40m/sec
FWMH08 to FWMH09	21.0m	1	446	446 + 16,943 Flow from FWMH08 17,389 (Total)	104,334 (1.21)	225@1/50	62.0 l/sec	1.80m/sec

Sewer Reference	Length (m)	No of Units	Design Dry Weather Flow – DWF (litres/unit/day)	Total Flow Litres/Day	6DWF Litres/Day (Litres/sec.)	Pipe Size & Gradient	Design Discharge (Litres/sec.)	Velocity
FWMH09 to FWMH10	20.0m	1	446	446 + 17,389 Flow from FWMH09 17,835 (Total)	107,010 (1.23)	225@1/100	44.0 l/sec	1.30m/sec
FWMH10 to FWMH11	60.0m	7	446	3,122 + 17,835 Flow from FWMH10 20,957 (Total)	125,742 (1.46)	225@1/100	44.0 l/sec	1.30m/sec
FWMH13 to FWMH12	42.0m	5	446	2,230	13,380 (0.15)	160@1/40	29.0 l/sec	1.60m/sec
FWMH12 to FWMH11	46.0m	3	446	1,338+2,230 Flow from FWMH12 3,568 (Total)	21,408 (0.15)	160@1/40	29.0 l/sec	1.60m/sec

Sewer Reference	Length (m)	No of Units	Design Dry Weather Flow – DWF (litres/unit/day)	Total Flow Litres/Day	6DWF Litres/Day (Litres/sec.)	Pipe Size & Gradient	Design Discharge (Litres/sec.)	Velocity
FWMH11 to FWMH14	32.0m	3	446	1,338 + 24525 Flow from FWMH11 25,863 (Total)	155,178 (1.80)	225@1/60	56.0 l/sec	1.60m/sec
FWMH14 to FWMH15	33.0m	3	446	1,338 + 25,863 Flow from FWMH14 27,201 (Total)	163,206 (1.89)	225@1/60	56.0 l/sec	1.60m/sec
FWMH16 to FWMH17	42.0m	5	446	2,230	13,380 (0.15)	160@1/40	29.0 l/sec	1.60m/sec
FWMH17 to FWMH18	47.0m	4	446	1,784+2,230 Flow from FWMH17 4,014 (Total)	24,084 (0.28)	160@1/60	23.0 l/sec	1.25m/sec

Sewer Reference	Length (m)	No of Units	Design Dry Weather Flow – DWF (litres/unit/day)	Total Flow Litres/Day	6DWF Litres/Day (Litres/sec.)	Pipe Size & Gradient	Design Discharge (Litres/sec.)	Velocity
FWMH19 to FWMH18	20.0m	4	446	1,784	10,704 (0.12)	160@1/60	23.0 l/sec	1.25m/sec
FWMH18 to FWMH20	28.0m	5	446	2,230 + 5,798 Flow from FWMH18 8,028 (Total)	48,168 (0.56)	225@1/60	56.0 l/sec	1.60m/sec
FWMH20 to FWMH21	30.0m	7	446	3,122 + 8,028 Flow from FWMH20 11,150 (Total)	66,900 (0.77)	225@1/60	56.0 l/sec	1.60m/sec
FWMH21 to FWMH22	58.0m	1	446	446 + 11,150 Flow from FWMH21 11,596 (Total)	69,576 (0.81)	225@1/100	44.0 l/sec	1.30m/sec

Sewer Reference	Length (m)	No of Units	Design Dry Weather Flow – DWF (litres/unit/day)	Total Flow Litres/Day	6DWF Litres/Day (Litres/sec.)	Pipe Size & Gradient	Design Discharge (Litres/sec.)	Velocity
FWMH24 to FWMH23	20.0m	4	446	1,784	10,704 (0.12)	160@1/60	23.0 l/sec	1.25m/sec
FWMH23 to FWMH22	33.0m	2	446	892 + 1,784 Flow from FWMH23 2,676 (Total)	16,056 (0.19)	160@1/60	23.0 l/sec	1.25m/sec
FWMH22 to FWMH25	18.0m	-	446	14,272 Flow from FWMH22	85,632 (0.99)	225@1/100	44.0 l/sec	1.30m/sec
FWMH26 to FWMH27	40.0m	15	446	6,690	40,140 (0.46)	225@1/100	44.0 l/sec	1.30m/sec

Sewer Reference	Length (m)	No of Units	Design Dry Weather Flow – DWF (litres/unit/day)	Total Flow Litres/Day	6DWF Litres/Day (Litres/sec.)	Pipe Size & Gradient	Design Discharge (Litres/sec.)	Velocity
FWMH27 to FWMH28	35.0m	15	446	6,690 + 6,690 Flow from FWMH27 13,380 (Total)	80,280 (0.93)	225@1/100	44.0 l/sec	1.30m/sec
FWMH28 to FWMH25	6.0m	-	446	13,380 Flow from FWMH28	80,280 (0.93)	225@1/100	44.0 l/sec	1.30m/sec
FWMH25 to FWMH15	34.0m	2	446	892 + 27,652 Flow from FWMH25 28,544 (Total)	171,264 (1.98)	225@1/100	44.0 l/sec	1.30m/sec
FWMH15 to FWMH29	28.0m	3	446	1,338 + 55,745 Flow from FWMH15 57,083 (Total)	342,498 (3.96)	225@1/50	62.0 l/sec	1.80m/sec

Sewer Reference	Length (m)	No of Units	Design Dry Weather Flow – DWF (litres/unit/day)	Total Flow Litres/Day	6DWF Litres/Day (Litres/sec.)	Pipe Size & Gradient	Design Discharge (Litres/sec.)	Velocity
FWMH29 to FWMH30	35.0m	4	446	1,784 + 57,083 Flow from FWMH29 58,867 (Total)	353,202 (4.09)	225@1/50	62.0 l/sec	1.80m/sec
FWMH31 to FWMH32	35.0m	8	446	3,568	21,408 (0.24)	160@1/50	23.0 l/sec	1.25m/sec
FWMH32 to FWMH30	35.0m	4	446	1,784 + 3,568 Flow from FWMH32 5,352 (Total)	32,112 (0.37)	160@1/50	23.0 l/sec	1.25m/sec
FWMH30 to FWMH33	20.0m	1	446	446 + 64,219 Flow from FWMH30 64,665 (Total)	387,990 (4.49)	225@1/60	56.0 l/sec	1.60m/sec

Sewer Reference	Length (m)	No of Units	Design Dry Weather Flow – DWF (litres/unit/day)	Total Flow Litres/Day	6DWF Litres/Day (Litres/sec.)	Pipe Size & Gradient	Design Discharge (Litres/sec.)	Velocity
FWMH33 to FWMH34	28.0m	-	446	64,665 (Total)	387,990 (4.49)	225@1/50	62.0 l/sec	1.80m/sec
FWMH34 to FWMH35	33.0m	-	446	64,665 (Total)	387,990 (4.49)	225@1/100	44.0 l/sec	1.30m/sec
FWMH35 to Existing MH	11.0m	-	446	64,665 (Total)	387,990 (4.49)	225@1/60	56.0 l/sec	1.60m/sec

TABLE 2.1 - DESIGN SUMMARY FOR MAIN FOUL SEWER

3.0 Surface Water Disposal

The proposed surface water drainage system shall be in accordance with the relevant principles of Sustainable Urban Drainage Systems (SuDS). The site is divided into 3No. Drainage Catchments for the management of surface water on the site. The surface water management proposals for the site can be summarised as follows:-

- Surface water shall be collected in a series of stormwater drains that will be laid on the estate roads. The drains will collect stormwater arising from roofs and hard-standing areas within the individual properties and stormwater collected on the estate roads via the road gullies.

- The Surface water system shall include Attenuation designed for the 1/100 Year event. The Attenuation shall be provided for in three zones, constructed of Wavin Aquacell Plus Cells installed as per manufacturers' instructions in each zone.

- The principal point of discharge for surface water shall be to an existing unnamed stream/watercourse located to the west of the site. The existing stream/watercourse currently provides drainage from the development site. Discharge to the existing stream/watercourse shall be at a rate equal to the Greenfield Runoff Rate to ensure no significant changes in flow in the existing stream/watercourse.

- The second point of discharge for surface water shall be to the existing surface water sewer on Sunberry Drive. This discharge point shall only be used to serve the most south-easterly area of the site which can't be facilitated by the principal discharge due to levels. This point of discharge will accept circa 3.5% of the site runoff and this discharge will be limited to the greenfield runoff rate.

3.1 Local Authority Consultation

Pre-Planning Consultation has taken place with the Water and Drainage Services Department of Cork City Council through the Section 247 Consultation which was held on the 17th February 2021. The following matters were raised in relation to surface water drainage and have been considered in the overall design of the surface water drainage system for the site.

- There should be a survey of the drainage route from the site boundary, through third party lands, and down through the various culverted sections under the Kilowen Rd and the R617 to assess the impact on existing drainage routes and culverts.
- Estimation of the volumes of intercepted storm water run-off entering the siteôs network, coming via overland flow from the lands to the north.
- Site investigation to identify groundwater table levels and potential impacts on that. Prior to submission of the application the Applicant will need to complete trial pits and boreholes throughout the site and where groundwater is discovered, an assessment of the likely seepage that will occur and hence enter the storm water system will be required.
- Identify how seepage will be managed as it interacts with retaining structures (i.e. back of wall drainage) and embankments (i.e. cut-off drain / filter drain at the embankment toe).

- Further consideration of the SuDS based approach be given for the site.

Further consultation took place with Mr. Simon Lyons of the Water and Drainage Services Department of Cork City Council on the 18th October 2021 via an online Teams Meeting to discuss revised surface water proposals which sought to address the matters raised during the course of the Section 247 Consultation. The outstanding issue requiring further clarity at this juncture was as follows:-

- Demonstrate connectivity of the existing watercourse which crosses the Tower Road to the watercourse south of the Tower Road.

Cork City Council advised there was uncertainty surrounding the discharge point of the culverted road crossing on the Tower Road which forms part of the existing watercourse to which the proposed surface water discharge is to be made. Cork City Council sought clarity in this matter to ensure the existing watercourse was connected to the watercourse south of the Tower Road.

The culverted road crossing on the Tower Road was inspected by OLS Consulting Engineers on Tuesday 23rd November 2021. The crosssing comprised of a 600mm diameter concrete pipe. The crossing was dye traced on the day of the inspection and the outlet was located south of the Tower Road where it discharges to an open watercourse which runs in a southerly direction from the Tower Road. The 600mm diameter pipe was found to be heavily silted on the day of inspection and in need of cleaning.

The matter of the condition of the culverted road crossing was discussed with Mr. Simon Lyons of the Water and Drainage Services Department of Cork City Council. It was agreed that that piped crossing will need to be cleaned and CCTV surveyed to ascertain the condition of the pipe. Cork City Council intend to undertake the cleaning and CCTV works in due course, however, Mr. Simon Lyons has indicated that the Planning Application may be lodged on the basis that connectivity has been demonstrated.

Following the undertaking of the CCTV works on the piped crossing and at the point where the condition of the piped crossing has been established, it has been agreed that should remedial works be required to ensure the piped crossing is fit for purpose, the applicant shall enter into an agreement with Cork City Council to pay a contribution towards any remedial works to the crossing proportionate to the quantity of surface water discharging through the piped crossing from the proposed development.

For the purposes of this application and predominantly from an environmental perspective, a "worst case" approach has been taken in respect of the necessary remedial works. From an environmental perspective, it has been assumed that the road crossing may have to be replaced in its entirety and all environmental assessment and reporting is based on this "worst case" scenario although it is not envisaged that such extensive remedial works will be required.

3.2 Stormwater Attenuation Design

The management of surface water on the site has been considered in the context of the CIRIA SuDS Manual 2015. In this regard, OLS Consulting Engineers have prepared a SuDS Strategy Report to assess how best to implement stormwater management for the site to ensure compliance with best practice in terms of SuDS. This Report is included under separate cover as part of the Planning Application Documents.

In this regard, it is proposed to attenuate surface water generated on the site in a series of 3 attenuation zones designed in accordance with the guidelines set out in Chapter 21 of the SuDS Manual 2015.

Attenuation of surface water on site is considered to be the most effective means of controlling and managing surface water discharge from this site to ensure that surface water arising within the site is discharged at a controlled rate equal to the Greenfield Runoff Rate for the Site.

Design Flood Event

The attenuation volume for all zones is calculated on the basis of a 1 in 100 year return period.

Calculation of the Greenfield Runoff Rates

The greenfield runoff rate has been calculated using the HR Wallingford Procedure for estimating greenfield runoff rates. The greenfield runoff rate has been calculated for the 3 stormwater management zones and the results are summarised in Table 3.1 below. Full details of the greenfield runoff rate calculations are contained in Appendix 1 of this Report.

Table 3.1 – Greenfield Runoff Rates

Zone	Contributing Site Area (Hectares)	Greenfield Runoff Rate (litres/second) (Limited to Q_{BAR})
Zone 1	1.842	**6.18**
Zone 2	1.326	**4.45***
Zone 3	0.121	**0.41***

*In instances where the flow rate is less than 5.00 litres per second, the discharge rate shall be set at 5.00 litres per second to avoid blockage from vegetation and other material.

Calculation of the Attenuation Volumes

The attenuation volumes for each zone have been calculated using the HR Wallingford Procedure for calculating Surface Water Storage Requirements.

The attenuation volumes have been calculated for each stormwater management zone and the results are summarised in Table 3.2. Full details of the attenuation volume calculations are contained in Appendix 1 of this Report.

Table 3.2 – Calculated Stormwater Attenuation Volumes

Zone	Contributing Site Area Positively Drained (Hectares)	Attenuation Storage Volume (cubic metres)
Zone 1	1.842	**1,356.00**
Zone 2	1.316	**982.00**
Zone 3	0.134	**25.00**

Attenuation Storage Proposals

All attenuation chambers will be sited in green areas/soft landscaped areas within the site and at least 15m from any dwelling on the site.

It is proposed to install a Wavin Aquacell Underground Attenuation System on site. The system shall comprise of 3No. Attenuation Zones distributed throughout the site, each sized according to the required attenuation volumes in each zone. The proposed Wavin Aquacell systems are summarised in Table 3.3

Table 3.3 – Wavin Aquacell Attenuation Proposals

Zone	Storage Volume Required (m^3)	Storage Volume Provided (m^3)*
Zone 1	1,356.00	**1,425.00** 30m x 25m x 2m Zone 7,500 Aquacell Plus Units laid in 5 Layers 1,500 Units/Layer
Zone 2	982.00	**570.00** 35m x 15m x 2m Zone 5,250 Aquacell Plus Units laid in 5 Layers 1,050 Units/Layer
Zone 3	25.00	**28.50** 5.0m x 5.0m x 1.2m Zone 150 Aquacell Plus Units laid in 3 Layers 50 Units/Layer
***Note Volume Provided is calculated on 95% Void Ratio for Aquacell Plus Units which have a volume of 0.19m^3/Unit**		

The Aquacell Plus Cells are wrapped in a fully sealed & welded geomembrane and an outer protective layer to prevent damage to the geomembrane. This will give a fully sealed installation with no potential for groundwater infiltration.

The units shall be installed as per manufacturers' instructions. The outline method of construction as prescribed by the manufacturer is a s follows:-

a) Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the Aquacell units.
b) Lay 100mm bed of coarse sand, level and compact.
c) Lay the geotextile over the base and up the sides of the trench.
d) Lay the geomembrane on top of the geotextile over the base and up the sides of the trench.
e) Lay the Aquacell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a ôbrick bondedô formation (i.e. to overlap the joints.
f) Wrap the geomembrane around the Aquacell structure and seal to manufacturers recommendations.
g) If side connections into the Aquacell units is required, (other than the preformed socket), use the appropriate Flange Adaptor (6LB104 or 6LB106). Fix the flange adaptor to the unit using self-tapping screws. Drill a hole through the Flange Adaptor and connect the pipework. (6LB106 should not be used with Aquacell Eco).
h) In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or the standard Silt Trap (6LB600) is installed prior to the inlet pipework.
i) Wrap and overlap the geotextile covering the entire AquaCell structure, to protect the geomembrane.
j) Lay 100mm of coarse sand between the trench walls and the AquaCell units and compact.
k) Lay 100mm bed of coarse sand over the geotextile and compact. Backfill with suitable material.

The outfall manhole from each attenuation zone shall be fitted with a Vortex Flow Control Valve to limit the flow to the outfall discharge points to the Greenfield Runoff Rate.

The outfall discharge works by gravity as follows:-

- The Outfall Manhole which shall be constructed with a weir fills with water and continues to discharge normally for flows up the greenfield runoff rate.

- As flows increases, the outfall manhole fills with water up to the top of the weir wall.

- Water overflows the weir wall and enters the Aquacell Storage Chamber.

- The Aquacell Chamber fills with water for the duration of the rainfall event.

- After the rainfall event, water flows back out of the Aquacell storage chamber, finding its own level and through the non-return flap valve fitted at the bottom of the weir wall.

- The water discharges from the outfall manhole via the vortex flow control valve so that flow from the attenuation zones at all times is limited to the greenfield run-off rate

- In instances where the greenfield runoff rate is calculated to be less 5 litres/second, the rate of discharge shall be set at 5 litres/second to avoid blockages and fouling of the outlet.

Technical Literature for the Wavin Aquacell is contained in Appendix 2 of this Report.

3.3 Stormwater Sewer Design

Stormwater sewer design shall be based on the guidance contained in "Recommendations for Site Development Works for Housing Areas"

The sewers shall be designed using rainfall intensities of (i) 75mm/hour for roof surfaces and (ii) 50mm/hour for paved surfaces. The design of the stormwater sewers is summarised in Table 3.2.

Table 3.4 – Design Summary for Surface Water System

Pipe Run	Length	A_{roof}	A_{paved}	Cumulative Flow	Pipe Size	Hydraulic Gradient
Branch A						
SW MH01 - SW MH02	18	0.020	0.045	10.55	225	0.005
SW MH02 - SW MH03	67	0.048	0.116	36.74	225	0.010
SW MH03 - SW MH04	67	0.035	0.115	59.94	315	0.004
SW MH04 - SW MH05	58	0.048	0.081	81.20	355	0.005
SW MH05 - SW MH06	27	0.000	0.027	84.96	355	0.005
SW MH06 - SW MH10	17	0.011	0.024	90.59	355	0.010
Branch B						
SW MH07 - SW MH08	39	0.037	0.074	18.00	225	0.010
SW MH08 - SW MH09	39	0.037	0.070	35.45	225	0.010
SW MH09 - SW MH10	22	0.012	0.022	41.01	225	0.010
Branch C						
SW MH10 - SW MH11	24	0.012	0.038	139.38	355	0.020
SW MH11 - SW MH12	24	0.005	0.039	145.84	355	0.020
SW MH12 - SW MH13	55	0.042	0.113	170.30	355	0.020

Branch D						
SW MH15 - SW MH14	36	0.014	0.020	5.70	225	0.020
SW MH14 - SW MH13	42	0.018	0.082	20.85	225	0.010
Branch E						
SW MH16 - SW MH17	52	0.031	0.070	231.81	450	0.010
Branch F						
SW MH32 - SW MH33	50	0.062	0.132	31.28	225	0.030
SW MH33 - SW MH34	10	0.000	0.000	31.28	225	0.030
SW MH34 - SW MH35	28	0.021	0.044	41.77	315	0.005
SW MH35 - SW MH17	28	0.021	0.044	52.26	315	0.005
Branch G						
SW MH17 - SW MH18	35	0.010	0.066	295.34	450	0.015
Branch H						
SW MH24 - SW MH25	36	0.022	0.024	7.92	225	0.020
SW MH25 - SW MH26	42	0.026	0.085	25.16	225	0.010
SW MH27 - SW MH26	26	0.026	0.060	13.76	225	0.010
SW MH26 - SW MH28	23	0.036	0.047	52.96	315	0.020
SW MH28 - SW MH29	26	0.034	0.060	68.39	315	0.020
SW MH29 - SW MH31	55	0.000	0.011	69.92	315	0.010
SW MH30 - SW MH31	38	0.032	0.018	9.17	225	0.020
SW MH31 - SW MH18	17	0.000	0.000	79.09	315	0.010
SW MH19 - SW MH20	70	0.702	1.640	374.42	600	0.004
Branch I						
SW MH36 - SW MH37	17	0.030	0.057	14.18	225	0.010
SW MH37 - SW MH38	5	0.000	0.000	14.18	225	0.010
SW MH38 - SW MH39	17	0.000	0.019	16.82	225	0.010
SW MH39 - SW MH40	33	0.000	0.035	21.68	225	0.010
SW MH40 - EX SW MH	12	0.000	0.000	21.68	225	0.010

3.4 Oil & Silt Interception

A Hydrocarbon Interceptor shall be installed prior to each attenuation zone. The units to be installed shall be Kingspan Environmental Class1 Bypass Separators which shall be suitably sized to treat surface waters at generated in each attenuation zone.

All Attenuation Zones will be preceded by a Wavin Silt Trap (6LB600) to prevent excessive silt build up in the Aquacell Chambers.

Technical Literature for the Separators is contained in Appendix 3 of this Report.

3.5 Details of Existing Principal Stormwater Outfall at Western Boundary

A minor un-named stream/watercourse occurs to the southwest of the project site and this will be the principal point of discharge for treated surface water from the project site to this stream.

Discharge to this existing stream/watercourse shall be at a rate equal to the Greenfield Runoff Rate to ensure no significant changes in flow in the existing stream/watercourse. This un-named stream flows into the River Martin. The River Martin is a tributary of the River Shournagh, which finally drains into the River Lee to the east of Ballincollig.

The project site is located within the River Shournagh sub-basin district in Hydrometric Area No. 19 of the Irish River Network. It is within the River Lee and Cork Harbour catchment.

The unnamed stream/watercourse begins as an open land drain running in a north to south direction within the western boundary of the development site. At the southwest point of the development site, this open land drain joins with a similar land drain from the adjacent property to discharge into an existing unnamed stream/watercourse which descends through the wooded area towards the Kilowen Road and subsequently towards the R617 Regional Road. The watercourse crosses both roads via precast concrete culvert crossings.

Consultation has also taken place with the Water and Drainage Services Department of Cork City Council through the Section 247 Consultation whereby it was requested to assess the impact of the proposed development on the existing unnamed stream/watercourse and the associated culverted road crossings down stream of the discharge point from the proposed development.

OLS Consulting Engineers have engaged the services of Irish Hydrodata Ltd. to undertake a modelling assessment of the pre and post development scenarios on the existing unnamed stream/watercourse to understand the impact (if any) of the proposed development on the existing stream and ancillary culverted crossings. The Report prepared by Irish Hydrodata Ltd. is contained in Appendix 5 of this Report.

3.4.1 Irish Hydrodata Runoff Calculations

Irish Hyrdodata conducted runoff modelling for the existing and developed scenarios using the UKSuDS web tool.

The following parameters were used in the modelling exercise:

- SAAR: 1179mm
- Soil Type: 2
- 1:100 Growth Curve: 1.95

Figures 3.1 and 3.2 show the Catchment Delineation for both the existing and developed scenarios used in the modelling scenarios.

Figure 3.1 – Catchment Delineation – Existing Scenario

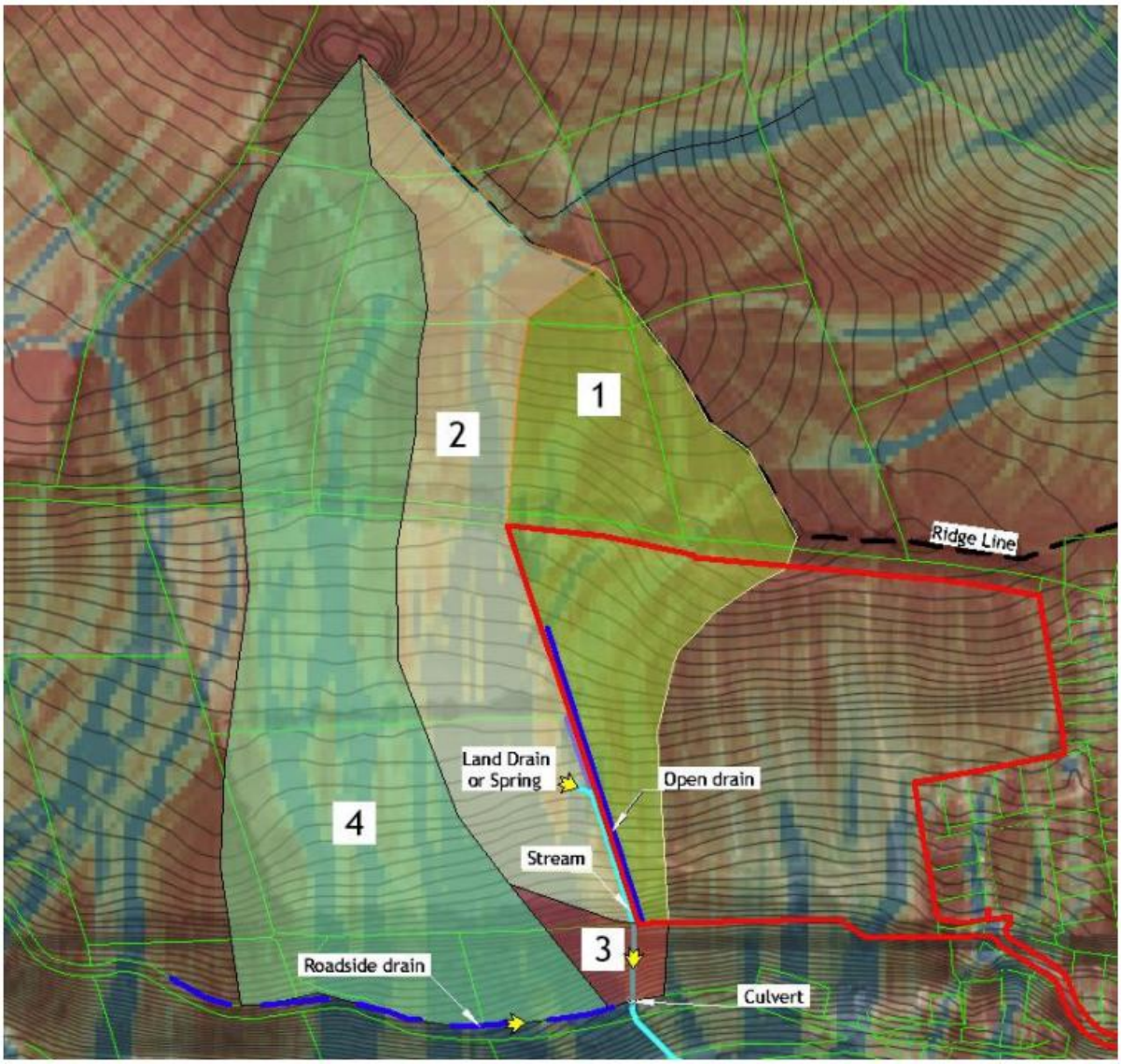
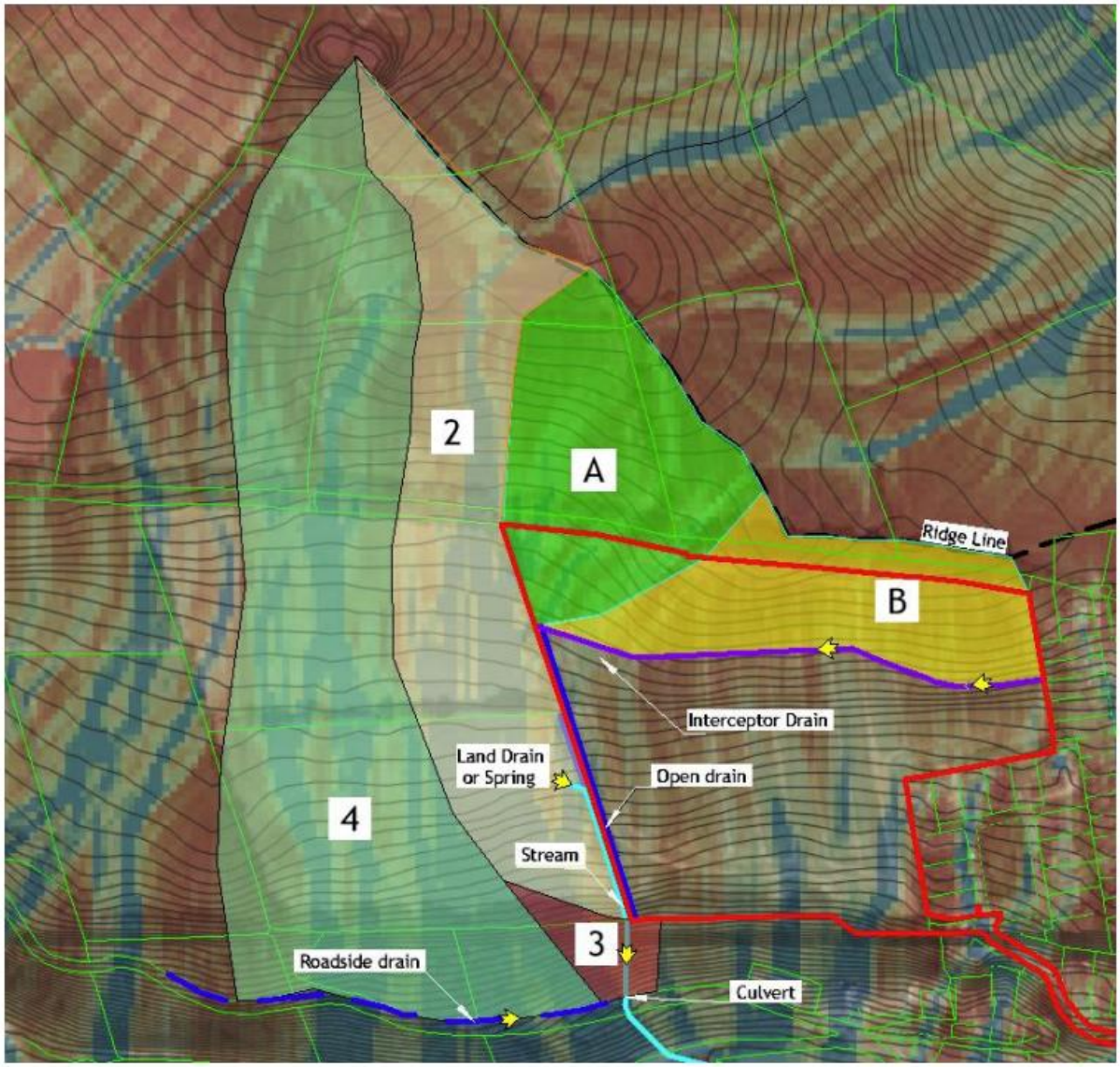


Figure 3.2 – Catchment Delineation – Developed Scenario



Based on the above catchment delineation for both the existing and developed scenarios, the catchment areas and computed flows are shown in Table 3.5.

The modelling assessment demonstrates that the proposed development will give a 16% (19.2 litres/second) increase in the 1/100-year rainfall event.

Irish Hydrodata Ltd. conclude that the post development flow of 142litres per second is well below the culvert capacities which are estimated to be circa 400litres/second.

Therefore, there will be no negative impact on the existing watercourse and associated road crossings which are deemed to have sufficient capacity.

Table 3.5 – Catchment Areas and Computed Flows

	Catchment Area (Ha)	Computed 1%AEP Flow
Existing Scenario		
East Catchment - Area 1	4.5	
West Catchment - Area 2	4.8	
Lower Catchment - Area 3	0.5	
Combined Areas to Stream Channel	9.8	64.1 l/s
Contributing to Roadside Drain - Area 4	8.9	58.2 l/s
Combined flow at culvert		122.3
Developed Scenario		
East Catchment - Area A	2.5	
East Catchment - Area B	2.9	
West Catchment - Area 2	4.8	
Lower Catchment - Area 3	0.5	
Combined Area to Stream Channel	10.7	70.0 l/s
Draining to stream from SW network	attenuated	13.8 l/s
Contributing to Roadside Drain - Area 4	8.9	58.2 l/s
		142.0 l/s

Further consultation took place with Mr. Simon Lyons of the Water and Drainage Services Department of Cork City Council on the 18th October 2021 via an online Teams Meeting to discuss the matter of demonstrating connectivity of the existing watercourse which crosses the Tower Road to the watercourse south of the R617 Tower Road.

Cork City Council advised there was uncertainty surrounding the discharge point of the culverted road crossing on the R617 Tower Road which forms part of the existing watercourse to which the proposed surface water discharge is to be made. Cork City Council sought clarity in this matter to ensure the existing watercourse was connected to the watercourse south of the Tower Road which ultimately discharges to the River Martin. The following actions were taken to demonstrate connectivity:-

- The culverted road crossing on the R617Tower Road was visually inspected by OLS Consulting Engineers on Tuesday 23rd November 2021. The crosssing comprised of a 600mm diameter concrete pipe which was clearly visible on the upstream side of the crossing.

- The crossing was dye traced on the day of the inspection and the outlet was located south of the R617 Tower Road where it discharges to an open watercourse which runs in a southerly direction from the R617 Tower Road. The 600mm diameter pipe was found to be heavily silted on the day of inspection and in need of cleaning.

- The dye tracing confirmed that the open land drain which decends through the woodland crossing the Killowen Road initially and subsequently the R617 Tower Road does connect to the open watercourse to the south of the R617 Tower Road which ultimately discharges to the River Martin.

- The matter of the condition of the culverted road crossing on the R617 Tower Road was subsequently discussed with Mr. Simon Lyons of the Water and Drainage Services Department of Cork City Council. It was agreed that that piped crossing will need to be cleaned and CCTV surveyed to ascertain the condition of the pipe. Cork City Council intend to undertake the cleaning and CCTV works in due course, however, Mr. Simon Lyons has indicated that the Planning Application may be lodged on the basis that connectivity has been demonstrated.

- Following the undetaking of the CCTV works on the piped crossing and at the point where the condition of the piped crossing has been established, it has been agreed that should remedial works be required to ensure the piped crossing is fit for purpose, the applicant shall enter into an agreement with Cork City Council to pay a contribution towards any remedial works to the crossing proportionate to the quantity of surface water discharging through the piped crossing from the proposed development.

- For the purposes of this application and predominantly from an environmental perspective, a "worst case" approach has been considered in respect of the necessary remedial works. From an environmental perspective, it has been assumed that the road crossing may have to be replaced in its entirety and all environmental assessment and reporting is based on this "worst case" scenario although it is not envisaged that such extensive remedial works will be required.

3.6 "Worst Case" Remedial Works to the R617 Tower Road Crossing

The culverted road crossing on the R617 Tower Road was inspected on the 23rd November 2021 where it was found to be heavily silted at the outfall of the culvert on the southern side of the R617 Tower Road.

The crossing will need to be fully cleaned and CCTV surveyed to ascertain the condition of the crossing which comprises of a 600mm diameter precast concrete pipe. There is an element of screening installed on the upstream side of the culvert to prevent large debris entering the pipe but this needs to be cleaned and maintained.

As outlined in the previous section a "worst case" approach has been considered in respect to the required remedial works for this crossing in the absence of information on the condition of the precast pipe. In this regard and for the purposes of comprehensive environmetal assessment, it is assumed that the entire precast pipe crossing may need to be replaced. The following is an outline scope of the works required to replace the crossing in its entirety:-

- Implement Traffic Management appropriate to the task and scope of the works in hand - this may necessitate a temporary road closure depending on how the contractor plans to undertake the works.

- Retain the existing culvert in operation for the duration of the laying of the new culvert crossing to prevent unnecessary contamination of surface water.

- Saw cut existing road surfacing, excavate trenching for new precast pipe and dispose of all waste materials to appropriate licensed facilities by licensed contractors.

- Lay new 600mm Precast Pipe Crossing, backfill with suitable fill material.
- Install new head wall at pipe outfall location.
- Divert surface water flow to new culvert and make good to inlet screen upstream of culvert.
- Decommission/remove old pipework.
- Backfill/reinstate road crossing in preparation for laying road surfacing.
- Lay road surfacing to match existing, seal all joints.
- Reinstate public footpath, hedgerows and existing boundaries .
- Reinstate road markings and signage where affected.
- Stand down traffic management procedures.

3.7 Surface Water Management on Upper Site Area (North of Net Developable Area)

The area of the development site north of the Net Developable Area shall be retained as existing Meadow. The site is sloping in a north to south direction towards the developable area of the site.

To prevent excess surface water entering the developable area, an open swale shall be constructed north of the net developable area/ on the southern extremity of the existing meadow. The open swale shall facilitate infiltration and shall also be connected to the existing open land drain located on the western boundary of the development site.

Surface water flow has been considered in the modelling assessment carried out by Irish Hyrdodata Ltd. and has therefore been considered in assessing the impact on the existing unnamed stream/watercourse.

4.0 Water Supply

There has been consultation with Irish Water in this matter through the submission of a Pre-Connection Enquiry for the development which was submitted on the 25th January 2021. Irish Water subsequently issued Confirmation of Feasibility on the 24th March 2021 confirming the proposed connection to the Irish Water Network could be facilitated.

A Statement of Design Acceptance has also been issued by Irish Water on the 16th September 2021 in respect of the Water Services proposed for the site confirming Irish Water has no objection to the submitted proposals.

Irish Water advised in their Confirmation of Feasibility that the preferred connection point for water is the 150mm water main running through the northeast of the site.

The proposed development will be served by a network of 150mm diameter watermain laid out as shown on the accompanying drawings.

Fire Hydrants will be provided such that each house will be within 46m of a Hydrant and these hydrants will be provided so as to be fully accessible to the fire service.

Sluice valves will be installed on all principal water main connections to ensure sections of the development or areas of the development can be isolated for maintenance and repair as required.

5.0 Electricity & Telecommunications

Electricity and telecommunications facilities are available on the Regional Road adjoining the Site.

5.1 ESB Networks

There is an existing ESB Networks Substation (Reference Figure 5.1) located in the proposed new entrance to the development site which will need to be relocated as part of the proposed development works.

Consultation has taken place with Mr. Barry O'Sullivan, Engineering Officer ESB Networks in relation to this matter. ESB Networks have confirmed that the substation can be relocated as part of the development works and the detailed design in relation to the relocation will be initiated once a development connection application is made to ESB Networks.

5.2 Public Lighting Design

A Public Lighting Design for the proposed development site has been completed by Molloy Consulting Engineers for the development and it is included with the with the Planning Submission under separate cover.

Figure 5.1 - Existing ESB Sub-Station (Sunberry Drive 02109/4)

6.0 Roads & Traffic

6.1 Roads and Traffic Impact

Access to the proposed development site is proposed via the existing and established vehicular access to the lands from the Public Road via the Sunberry Drive Estate Road.

A Transportation Assessment Report has been completed for the development by NRB Consulting Engineers and it is included with the Planning Submission under separate cover.

The Transportation Assessment Report includes assessment of the following:-

- Receiving Environment & Development Proposals.
- Trip Generation, Assignment & Distribution.
- Traffic Impact - Access Junction Capacity.
- Cyclist and Pedestrian Accessibility/Connectivity.
- Stage 1 Independent Road Safety Audit & Designer Feedback.
- DMURS Statement of Consistency.

6.2 Access/Egress Proposal to the Development Site

Access to the proposed development lands is established from the R617 Regional Road via the existing Sunberry Drive Estate Road. The current access/egress point from the Sunberry Drive Estate road is adequate for the current agricultural use of the lands, however, the access point will require further development to ensure the junction and access to the development lands is fit for purpose and appropriate for the traffic expected to use the junction and to ensure the junction does not adversely affect the current estate road network on Sunberry Heights.

Such further development works at this junction shall include:-

- Widening of the junction to ensure a minimum carriageway width of 6.0m and footpath widths of 2.0m are achieved at the junction and on the new estate road leading to the proposed development site.

- The widening of the junction will require moving/realignment of the boundary wall of No.1 Sunberry Heights (which is the ownership of the applicant) to ensure adequate road and footpath widths are achieved. The existing garage at this property will also be demolished as part of the works.

- The front boundary wall of No.1 Sunberry Heights will be lowered to ensure the minimum sightline requirements of 45m at a 2.4m setback is achieved at the junction.

6.3 Existing Sunberry Heights Estate Road & Junction with the R617

Access is proposed via the existing Sunberry Heights Estate Road and consequently via the junction with the R617 Regional Road. This is the only access to the development site and whilst there may be some concerns regarding the existing gradient of the Sunberry Heights estate road; there are little or no alternatives for accessing the subject lands and Sunberry Heights represents the only possible means of vehicular access.

On this basis and as a means of mitigating any concerns that present in relation to gradient, the following suite of works are proposed to improve the overall safety and functionality of Sunberry Heights for motorists, pedestrians and cyclists:-

- The existing footpath is to be cleared of all impinging vegetation to ensure the existing 1.2m wide footpath is clean and the full width of the path is available.

- There is an existing safety/crash barrier over a short stretch of the road approximately halfway between the R617 junction and the junction to the proposed works. It is proposed that a suitably designed security fence/crash barrier system be installed over the entire length of the estate road on the western side. The security/crash barrier would be the subject of a detailed risk assessment carried out at detailed design stage. This will greatly improve the level of safety to protect all road users using this stretch of the estate road.

- It is proposed to install a Speed Reduction Table at the mid-point on the estate road. This will help so reduce speed on the existing estate road. The Speed Reduction Table will be accompanied by appropriate advance warning signage.

- A raised platform shall be constructed at the junction with the R617. The platform which shall be constructed in accordance with DMURS will greatly improve the safety of the junction for all road users and pedestrians.

- The existing carriageway shall be designated as a shared street in accordance with the National Cycle Manual with new road markings laid down on the carriageway as required.

- The existing estate road carriageway shall be overlaid with a high friction surfacing. This coupled with ongoing maintenance including gritting and salting of the roads during poor weather conditions will improve the overall safety of the estate road.

- The surface water drainage system including drains and gully traps have been recently cleaned and de-sludged to ensure no surface water ponding or water flow on the surface of the carriageway.

All works associated with the existing Sunberry Heights Estate Road shall be carried out by the Applicant as part of the overall development of the site. Consent to carry out works on lands in the control of Cork City Council has been given in writing on the 15th February and a copy of same is contained in Appendix 8 of this Report.

6.4 Roads and Footpaths

The internal estate roads have been designed using guidance from the Design Manual for Urban Roads and Streets and the Recommendation for Site Development Works for Housing Areas.

A maximum gradient of 5% and a minimum gradient of 0.5% was used for all internal estate roads. At junctions the gradient of the side road shall not be greater than 2% for a distance of 7m from the junction.

Crossfalls of 2.5% shall be provided for a normal machine laid surface. This may be decreased to 2% for a high-quality surface finish or may be increased to 3% for hand laid surfaces.

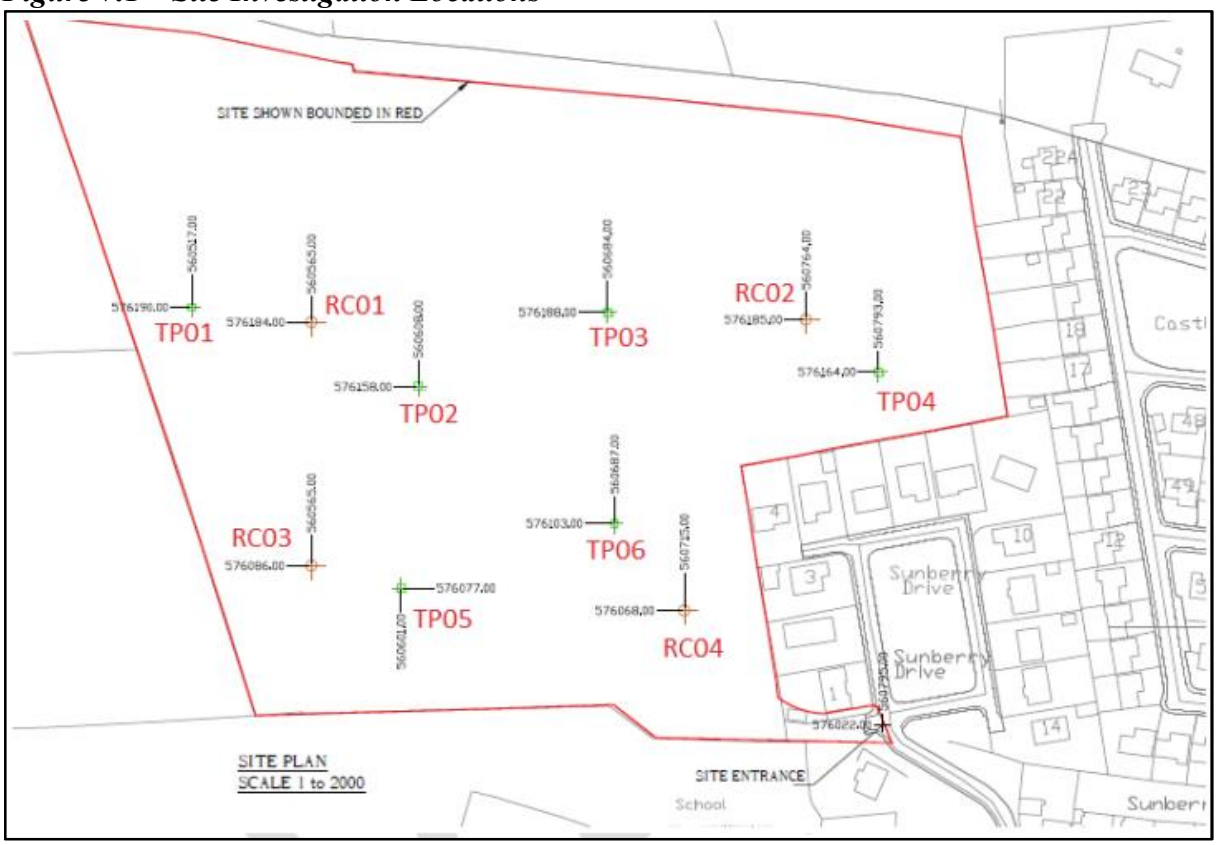
7.0 Site Investigation

As part of the design for the proposed development, site investigation works were carried out by Priority Geotechnical on the green field site in March and May 2021. The site investigation works undertaken comprised of:-

- 04Nr. Rotary boreholes;
- 06Nr. Trial pit excavations;
- 02Nr. BRE365 Soakaway tests;
- In situ standard penetration testing;
- Associated sampling;
- Laboratory testing; and
- Associated reporting.

Figure 7.1 below shows the locations for the site investigations conducted on site.

Figure 7.1 – Site Investigation Locations



The complete results and logs of the site investigation area included in the Site Investigation Factual and Interpretative Report prepared by Priority Geotechnical Ltd. and included in Appendix 6 of this Report.

7.1 Site Investigation – Ground Model

The site investigation boreholes and trial pits have provided information in relation to current conceptual ground model. The ground model can be described as: Topsoil 100mm to 400mm thick overlay soft to firm slightly sandy gravelly SILT to a depth 0.8m, below existing ground level to 1.8m bgl. Below this firm becoming stiff mixed glacial deposits slightly sandy gravelly CLAY with medium to high Cobble content were encountered to depths between 5.6m bgl (RC01) and 14.5m bgl (RC03). Stiffness increased with depth. Medium strong SILTSTONE was encountered below the CLAY deposits 5.6m bgl to 8.9m bgl (RC01 and RC02); medium strong SANDSTONE was encountered 14.5m bgl at RC03.

There was no bedrock encountered within 15.0m bgl at exploratory hole location, RC04.

7.2 Site Investigation – Groundwater & Storm Design

It was found that soil infiltration rates were of the order of $1.51 \times 10^{-6} ms^{-1}$ (TP05) and $1.32 \times 10^{-5} ms^{-1}$ (TP03). A particle size $d_{10} = 0.001$ was measured in the CLAY deposits, yielding an estimated permeability $1.0 \times 10^{-8} ms^{-1}$ (Hazen, 1911), describing low permeability CLAY, mixed glacial deposits

Infiltration viability may be given full consideration where an infiltration coefficient of magnitude 10^{-5} ms^{-1} or greater exists (SUDS Manual C753, 2015).

In this instance, the calculated infiltration rates are considered low and in this regard infiltration in the form of soakpits for the disposal of some surface water within the curtilage of individual house plots has not been considered.

Therefore, all surface water shall be positively drained to the attenuation zones within the site.

No groundwater was encountered within the boreholes or trial excavations during the period of works. Groundwater conditions observed are those relating to the period of the investigation.

7.3 Site Investigation - Cut & Fill Assessment

The site investigation boreholes and trial pits have provided information in relation to the depths and makeup of the subsoils and underlying rock stratum. From this information an approximate cut and fill assessment has been determined.

Given the depth of the rockmass, it is not expected to interact with same and on this basis, the cut and fill assessment is likely to consist of Topsoil and Subsoils only.

An overview assessment of the extent of cut and fill needed to construct the development has been undertaken and the summary findings are shown in Table 7.1.

Table 7.1 Summary Breakdown of Cut & Fill Assessment

Section Cut No.	Fill (m^3)	Cut (m^3)
1	0.00	4,305.00
2	1,085.00	7,175.00
3	5,005.00	8,680.00
4	5,390.00	8,085.00
5	3,360.00	10,535.00
6	2,695.00	9,205.00
7	2,975.00	9,030.00
8	315.00	1,085.00
9	280.00	1,785.00
10	0.00	3,955.00
Northern Area of Site (outside net developable area)	9,236.00	0.00
Totals	**30,341.00**	**63,840.00**

Cut Fill Difference		**+ 33,499.00**

In summary, it was found that the volume of cut is estimated at 63,840m^3 whilst the volume of fill is estimated at 30,341m^3. The cut predominantly occurs on the northern portion of the site and it is proposed to utilise some of cut material in the development of the open spaces and roads infrastructure on the site predominantly on the southern portion of the site. It is also proposed to use some of spread a layer (not exceeding 400mm) of the cut material over the northern portion of the site outside the net developable area.

The net volume of excess material, which is estimated to be circa 33,499m^3shall be disposed of off-site to a licensed facility by a licensed haulage contractor.

Details of the cut and fill assessment are presented on Engineering Drawings 1740-PL21 and 1740-PL22 which form part of the Planning Submission.

7.4 Site Investigation - Retaining Walls & Boundary Treatment

During the course of Pre-Planning Consultation with Cork City Council, the detail surrounding the engineering aspects of the southern boundary were discussed and the following matters were raised:-

- Clarity pertaining to the Engineering Detail surrounding the proposed Tobermore Retaining Wall on the southern boundary and its interaction with the building structure for the apartment blcoks.

The engineering detail has been examined and the following should be noted:-

- The Tobermore Retaining Wall Detail is considered an independent entity/structure which is designed to exist as part of the proposed boundary treatment on the southern boundary.

- It is proposed to use Tobermore "Secura Grand" Retaining Wall Blocks to retain the infill area between the boundary and the building interface.

- The Apartment Block Foundations will be founded separately and independently of the Tobermore Wall and will incorporate reinforced concrete retaining walls on the south, west and east elevations to compensate for the difference in level from foundation level to basement ground level. The reinforced concrete retaining walls will be used to retain back filling required to underside of the basement level.

- The retaining walls will act in tandem with the building foundations and will therefore have no interaction with the Tobermore Retaining Walls located on the site boundary.

Both the Tobermore Retaining Wall and the Reinforced Concrete Foundations and Retaining Walls for the Apartment Buildings will be the subject of detailed design pre-construction stage.

Details of the extent of the proposed reinforced retaining walls are shown on Drawing 21017-PL26.

Cork City Council sought clarity regarding the management of seepage in areas where retaining walls/embankments are proposed. It should be noted that interceptor drains shall be installed to the rear of all retaining wall structures to intercept any seepage that may arise from behind the retaining walls.

Similarly where open embankments are proposed, interceptor french drain shall be installed at the embankment toe to capture any runoff or seepage occurring with the vicinity of the embankment or cutting.

Appendix 1–HR Wallingford Calculations for Greenfield Runoff Rates and Stormwater Attenuation Volumes

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Fachtna Sheehy
Site name:	Monacnapa SHD - Zone 1
Site location:	Monacnapa, Blarney, Co. 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:	51.93627° N
Longitude:	8.57318° W
Reference:	911075894
Date:	Aug 31 2021 10:55

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.842

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1179	1179
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):	6.18	6.18
1 in 1 year (l/s):	5.25	5.25
1 in 30 years (l/s):	10.19	10.19
1 in 100 year (l/s):	12.05	12.05
1 in 200 years (l/s):	13.28	13.28

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Fachtna Sheehy
Site name:	Monacnapa SHD - Zone 2
Site location:	Monacnapa, Blarney, Co. 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:	51.93627° N
Longitude:	8.57318° W
Reference:	223484435
Date:	Aug 31 2021 10:56

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.326

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1179	1179
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):	4.45	4.45
1 in 1 year (l/s):	3.78	3.78
1 in 30 years (l/s):	7.34	7.34
1 in 100 year (l/s):	8.67	8.67
1 in 200 years (l/s):	9.56	9.56

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Fachtna Sheehy
Site name:	Monacnapa SHD - Zone 2
Site location:	Monacnapa, Blarney, Co. 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:	51.93627° N
Longitude:	8.57318° W
Reference:	3265473088
Date:	Aug 31 2021 10:57

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.121

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1179	1179
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):	0.41	0.41
1 in 1 year (l/s):	0.34	0.34
1 in 30 years (l/s):	0.67	0.67
1 in 100 year (l/s):	0.79	0.79
1 in 200 years (l/s):	0.87	0.87

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Fachtna Sheehy
Site name:	Monacnapa SHD - Zone 1
Site location:	Monacnapa, Blarney, Co. Cork

This is an estimation of the storage volume requirements that are needed 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). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	51.93624° N
Longitude:	8.57176° W
Reference:	4106814770
Date:	Aug 31 2021 15:09

Site characteristics

Total site area (ha):	4.360
Significant public open space (ha):	2.520
Area positively drained (ha):	1.8400000000000003
Impermeable area (ha):	1.360
Percentage of drained area that is impermeable (%):	74
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	1.84
Net impermable area for storage volume design (ha):	1.4
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	71
Rainfall 100 yrs 12 hrs:	--	91
FEH / FSR conversion factor:	1	1
SAAR (mm):	1179	1179
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.2	0.2
Hydological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.4	1.4
Growth curve factor 30 year:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Q_{BAR} for total site area (l/s):	14.62	14.62
Q_{BAR} for net site area (l/s):	6.17	6.17

Design criteria

Climate change allowance factor:	1.1
Urban creep allowance factor:	1.0
Volume control approach	Flow control to max of 2 l/s/ha or Qbar
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	5.2	5.2
1 in 30 years (l/s):	6.2	6.2
1 in 100 year (l/s):	6.2	6.2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	1356	1356
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	1356	1356

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Fachtna Sheehy
Site name:	Monacnapa SHD - Zone 2
Site location:	Monacnapa, Blarney, Co. Cork

This is an estimation of the storage volume requirements that are needed 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). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	51.93624° N
Longitude:	8.57176° W
Reference:	1368203784
Date:	Aug 31 2021 15:11

Site characteristics

Total site area (ha):	3.116
Significant public open space (ha):	1.800
Area positively drained (ha):	1.316
Impermeable area (ha):	0.982
Percentage of drained area that is impermeable (%):	75
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	1.32
Net impermable area for storage volume design (ha):	1.01
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	71
Rainfall 100 yrs 12 hrs:	--	91
FEH / FSR conversion factor:	1	1
SAAR (mm):	1179	1179
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.2	0.2
Hydological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.4	1.4
Growth curve factor 30 year:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Q_{BAR} for total site area (l/s):	10.45	10.45
Q_{BAR} for net site area (l/s):	4.41	4.41

Design criteria

Climate change allowance factor:	1.1
Urban creep allowance factor:	1.0
Volume control approach	Flow control to max of 2 l/s/ha or Qbar
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	3.8	3.8
1 in 30 years (l/s):	4.4	4.4
1 in 100 year (l/s):	4.4	4.4

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	982	982
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	982	982

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Fachtna Sheehy
Site name:	Monacnapa SHD - Zone 3
Site location:	Monacnapa, Blarney, Co. Cork

This is an estimation of the storage volume requirements that are needed 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). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	51.93624° N
Longitude:	8.57176° W
Reference:	2575512299
Date:	Aug 31 2021 15:12

Site characteristics

Total site area (ha):	0.314
Significant public open space (ha):	0.180
Area positively drained (ha):	0.134
Impermeable area (ha):	0.087
Percentage of drained area that is impermeable (%):	65
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.13
Net impermable area for storage volume design (ha):	0.09
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:	1.1
Urban creep allowance factor:	1.0
Volume control approach	Flow control to max of 2 l/s/ha or Qbar
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	71
Rainfall 100 yrs 12 hrs:	--	91
FEH / FSR conversion factor:	1	1
SAAR (mm):	1179	1179
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.2	0.2
Hydological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.4	1.4
Growth curve factor 30 year:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Q_{BAR} for total site area (l/s):	1.05	1.05
Q_{BAR} for net site area (l/s):	0.45	0.45

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 year (l/s):	2	2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	25	25
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	25	25

Appendix 2 - Wavin Aquacell Technical Literature

Uniclass
EPIC
JR12:L731/L71121/L2123
J3413:X721
CI/SfB
(52.5)
(H1)
October 2015 WM424

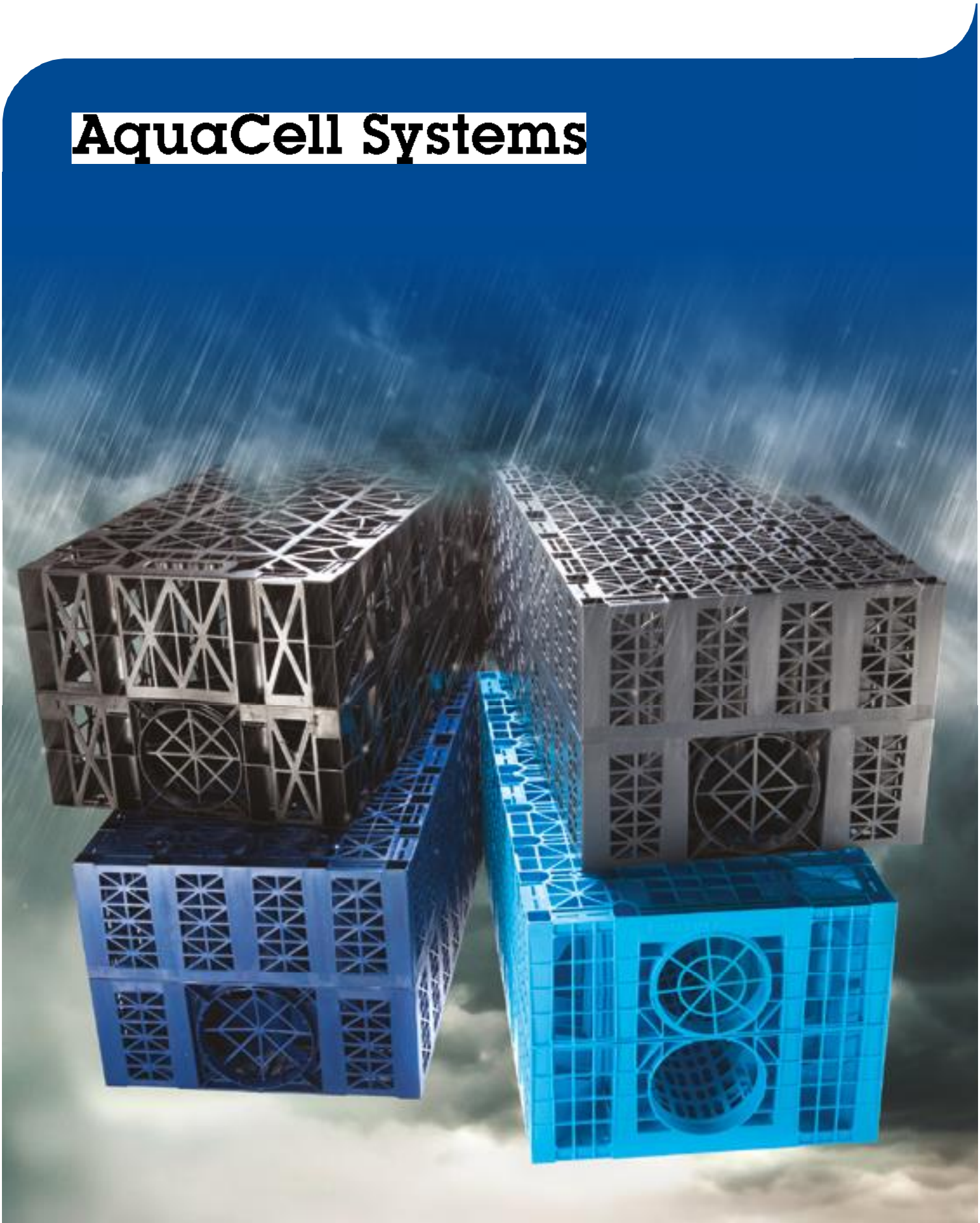
Water management

PRODUCT AND INSTALLATION MANUAL

wavin

CONNECT TO BETTER

AquaCell Systems



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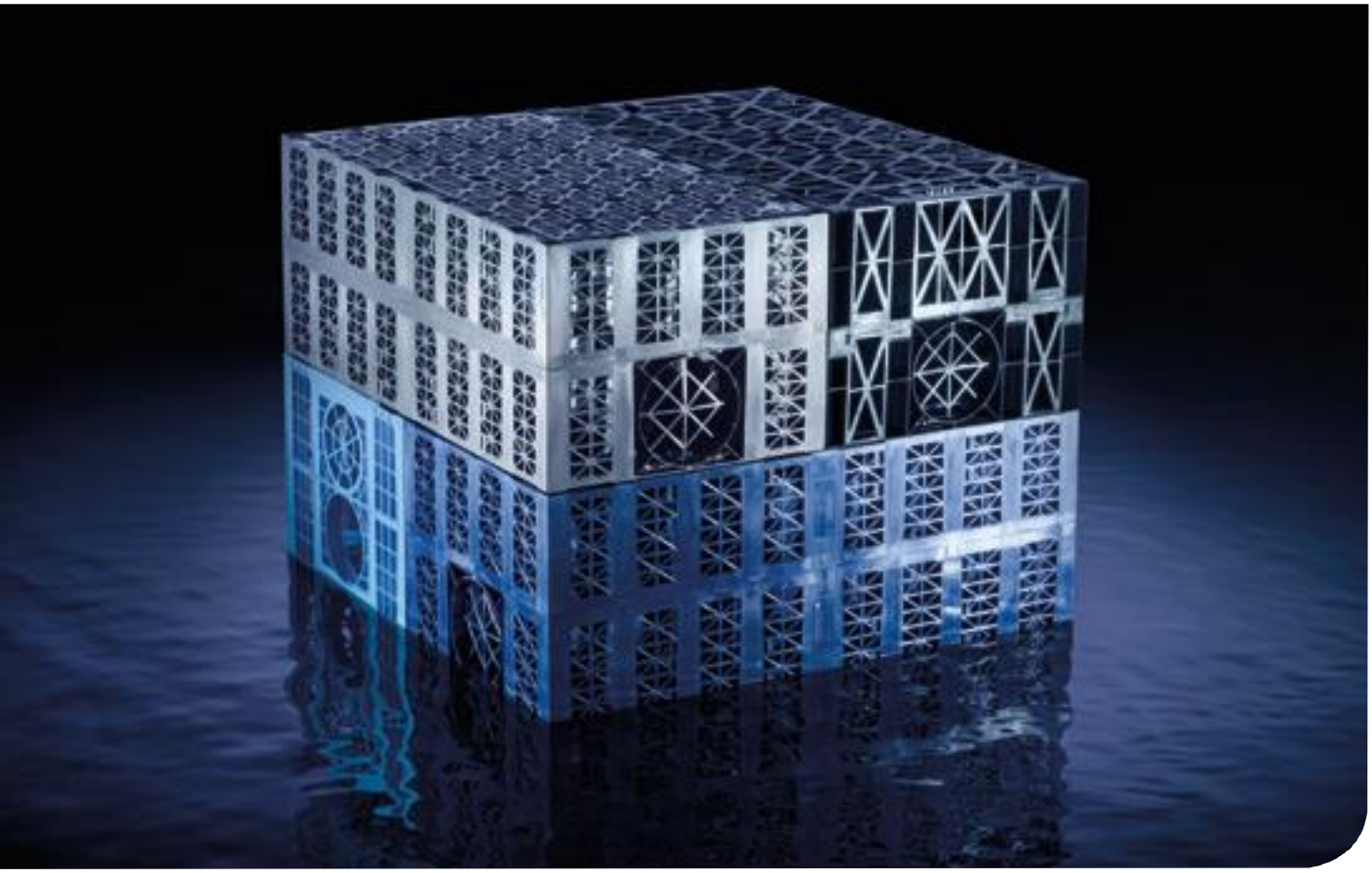
Contents
AquaCell Systems



Overview
AquaCell Systems

AquaCell units are a fully tried and tested modular technique for managing excessive rainfall. Units are assembled to create an underground structure as either a temporary storage tank or soakaway.

Continuing urban development, a changing climate and the consequences of intensified rainfall: all are increasingly prominent issues on the political and environmental agenda.

In combination, they represent a complex need for the most intelligent, effective Stormwater Management solutions possible.

There are 4 types of unit:

AquaCell Eco

AquaCell Eco is manufactured from specially reformulated, recycled material and has been designed for shallow, non-trafficked, landscaped applications (see page 6).

AquaCell Prime

AquaCell Prime is manufactured from specially reformulated, recycled material. It is ideal for use in both shallow and deep applications, subject to either regular traffic loading – such as car parks (for vehicles up to 12 tonnes) – or for landscaped areas (see page 7).

AquaCell Core

AquaCell Core has been designed for use in deep applications, subject to both regular and heavy traffic loadings, such as cars and HGV's (for vehicles up to 44 tonnes) – (see page 8).

AquaCell Plus

AquaCell Plus has been designed primarily for use in applications where inspectability is required, and is suitable for use in all applications from landscaped areas to heavily trafficked areas (for vehicles up to 44 tonnes) (see page 9).

For quick, versatile assembly

The lightweight polypropylene, high void units are securely linked together using special clips and shear connectors.

They can be assembled quickly on site into whatever configuration suits each specific location.

AquaCell geocellular systems also allow 'brick-bonding', which can give extra stability, without the need for additional connector pieces. See Installation Guidance page 12.

Wrapped for infiltration or storage

The complete assembly is wrapped in either geotextile sheet or a geomembrane:

For **pervious** soils, the geotextile option allows infiltration of stormwater into the surrounding ground.

For **impervious** ground (e.g. clay) or where infiltration is not desirable, the geomembrane holds stormwater in temporary storage until local drainage flows can accept it for normal disposal.

Benefiting community and environment

AquaCell units contribute the following benefits:

- Significantly reduced flooding risk
- Controlled, reduced-volume release of stormwater into existing sewer systems or watercourses
- Recharging of local groundwater (if infiltration/soakaway application)
- Aerobic purification to improve water run-off quality
- Sustainable, cost effective management of the water environment

Helping SUDS and planning approval

The proven qualities and performance of AquaCell systems not only support the achievement of SUDS, they can also help reinforce and enhance planning applications, and enable development to proceed.

Types of connections

There are a number of ways to provide a controlled feed into the AquaCell units to suit the required flow capacity.

These being:

1. Manifold Configuration – this configuration utilizes standard pipe and fittings (see page 20)
2. Box Configuration – this configuration utilizes the AquaCell units (see page 20)
3. Central Pipe Configuration – this configuration utilizes standard perforated TwinWall pipe and fittings (see page 20)

Box systems – select with care

Rising rainfall levels, and increased focus on SUDS compliance, have led to a sharp increase in the use of modular units to create underground structures for infiltration or, temporary storage of stormwater.

However, not all currently available systems have the proven performance characteristics necessary for the wide range of complex underground geocellular applications.

The Wavin range of AquaCell units however provide peace of mind since, all strength and hydraulic capabilities have been verified by independent testing.

Acceptance – British Board of Agrément

The AquaCell Infiltration and Attenuation units; Eco, Prime, Core and Plus have all been awarded British Board of Agrément approval under Certificate No. 03/4018.

The certificate covers the design data, technical specification, installation and maintenance aspects for each unit as follows:

AquaCell Eco

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 4

AquaCell Prime

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 5

AquaCell Core

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 1

AquaCell Plus

- Approved under BBA Agrément Certificate No. 03/4018, Product Sheet 3

AquaCell features

The following AquaCell features are applicable to all units:

- Suitable for use when constructing either a soakaway or storage tank
- Modular, lightweight and versatile
- 95% void: holds 190 litres of water per unit
- Safer option than open or above ground storage structures
- Easy to handle and install
- Proven clip and peg system to secure units
- Allows "brickbonding" assembly for extra stability
- Full range of ancillaries including, silt traps and adaptors
- AquaCell units can be "mixed and matched" together (see pages 11-14 for details)

Principal Components
AquaCell Systems

AquaCell Eco Unit
6LB025

AquaCell Prime Unit
6LB075

AquaCell Core Unit
6LB100

AquaCell Plus Unit
6LB200

NOTE: All AquaCell units (Eco, Prime, Core and Plus) have identical dimensions: 1m (L) x 0.4m (H) x 0.5 (W)

Ancillary Components

6UR141
UltraRib S/S Adaptor
(Fits into pre-formed socket to connect to 150mm UltraRib)

6TW141
TwinWall S/S Adaptor
(Fits into pre-formed socket to connect to 150mm TwinWall)

6D099
OsmaDrain S/S Reducer
160mm x 110mm (fits into pre-formed socket to connect to 110mm OsmaDrain)

6LB102
Shear Connector
(Used to hold units together vertically)

6LB105
Clip
(Used to hold units together horizontally)

6D916
160mm OsmaDrain P/E Adaptor
(Fits into pre-formed socket as an extension connection piece)

6D129
OsmaDrain S/S Adaptor – Thinwall Clay Spigot
(For use with 6D916 when connecting to a BS EN 295 Thinwall Clay Spigot)

SA15/2†
150mm SuperSleve Adaptor
(Fits into pre-formed socket to connect to 150mm SuperSleve)

TA/2†
150mm SuperSleve Adaptor
(For use with 6LB104 Flange Adaptor)

TA/4†
225mm SuperSleve Adaptor
(For use with 6LB106 Flange Adaptor)

6LB300
Domestic Silt Trap
(Bucket and extension piece available)

6LB600
Silt Trap
(Use extension kit if required)

6LB104*
150mm Flange Adaptor
(Adaptor to be used at points other than pre-formed socket to connect to 150mm UltraRib)

6LB106**
225mm Flange Adaptor
(To connect to 225mm UltraRib)

6SC205
Extension Kit

*6LB104 – Can only be used when constructing an air vent, on the top surface of the unit, when installed with AquaCell Eco (6LB025).

**6LB106 – Not suitable for use with AquaCell Eco (6LB025).

All ancillary components can be used with any AquaCell unit, except the 225mm Flange Adaptor (6LB106) which must only be used with AquaCell Core or AquaCell Plus.

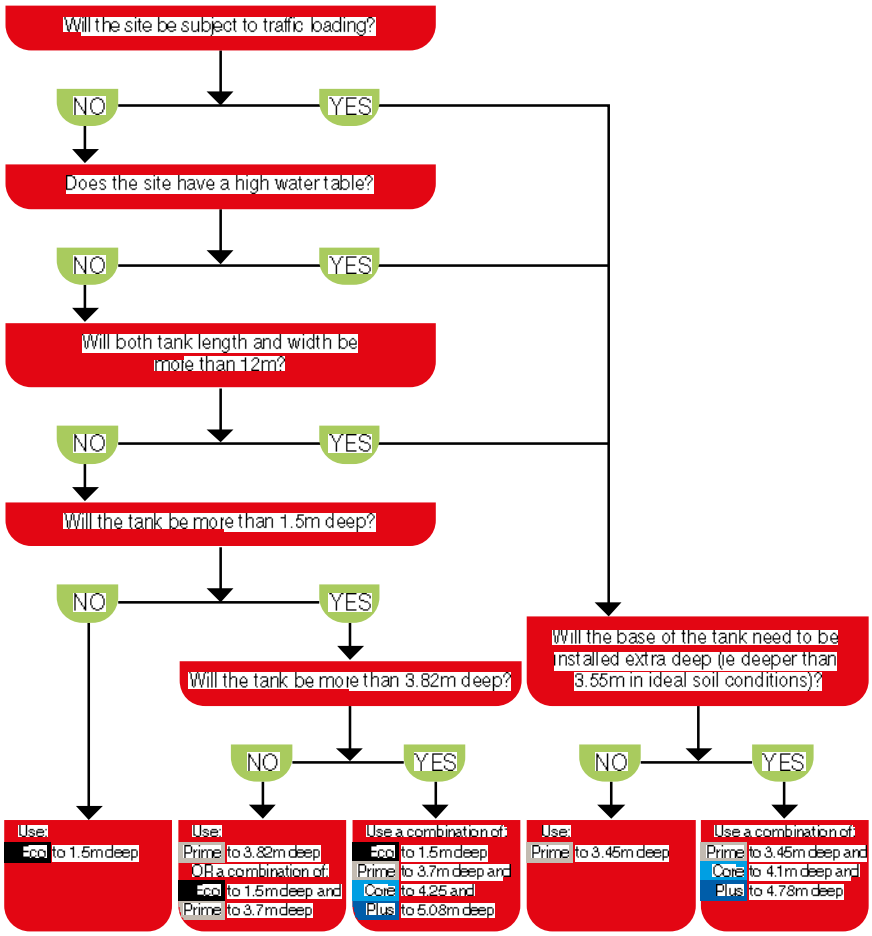
The 150mm Flange Adaptor (6LB104) should only be used when constructing an air vent on the top surface of an AquaCell Eco unit. The adaptor should not be used to connect inlet pipes to the side of the AquaCell Eco unit.

NOTE: All components on this page are not shown to scale
† Image not shown

CONNECT TO BETTER

Unit Selector
AquaCell Systems

The following selector will help you to determine which AquaCell unit, or combination of units, is the correct choice for a particular project.



Eco AquaCell Eco (6LB025) *See page 6*

Prime AquaCell Prime (6LB075) *See page 7*

Core AquaCell Core (6LB100) *See page 8*

Plus AquaCell Plus (6LB200) *See pages 9 – 10*

AquaCell Eco

AquaCell Prime

AquaCell Core

AquaCell Plus

Notes:

- AquaCell Eco cannot be used directly with AquaCell Plus
- If tank needs to be inspectable, contact Wavin Technical Design on 0844 856 5161
- Maximum height of tank = 2m (5 units). Any height greater than 2m, please contact Wavin Technical Design on 0844 856 5161
- Allowable maximum depth to base of units is dependent on soil type, angle of shearing resistance, loading and groundwater level
- The above depths are based on 38° angle of shearing resistance and no groundwater. For tanks in high water tables, please contact Wavin Technical Design.

For typical specification of geomembrane, see table on page 13.

Product Details
AquaCell Eco

Application

AquaCell Eco is manufactured from specially reformulated, recycled material and has been specifically designed for shallow, non-trafficked, landscaped applications. AquaCell Eco is **NOT** suitable for locations subject to high water tables.

AquaCell Eco is typically suitable for installations to a maximum depth of 1.5 metres, to the base of the units from ground level, with a minimum cover depth of 0.3 metres, (Wavin recommendation, is to allow a cover depth of 0.5 metres).

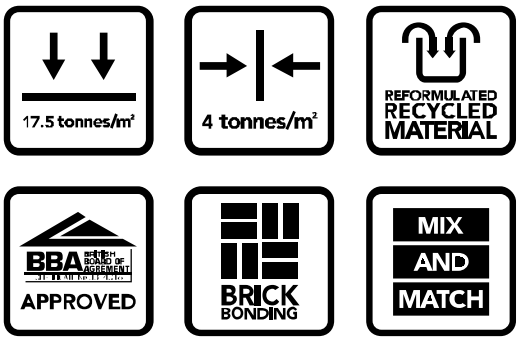
Any installation using AquaCell Eco must **NOT** be subjected to additional loading at any time. Trafficking by construction plant on site, including mechanical equipment, must be avoided.

If trafficking of the buried tank by construction plant or, other vehicles is unavoidable, the installation should be constructed using AquaCell Core units (see page 8).

The width of an AquaCell Eco installation should not exceed 12 metres to allow for mechanical backfilling without loading. There is no limit to the length of the installation.

Features and benefits

- Manufactured from specially reformulated, recycled material
- Suitable for both soakaway and attenuation applications
- Proven vertical loading capacity of: 17.5 tonnes/m²
- Proven lateral loading capacity of: 4.0 tonnes/m²
- Integral "hand holds" for ease of carrying/handling
- Black in colour, for ease of identification from other AquaCell units
- BBA approved – Certificate No 03/4018



AquaCell Eco

Maximum installation depths (to base units) and minimum cover depths (1)

Typical soil type	Typical angle of shearing	Maximum depth of installation (m)	Minimum cover depth (m)
Stiff over-consolidated clay (e.g. London clay)	24°	0.95	0.30
Normally consolidated silty, sandy clay (e.g. alluvium, made ground)	26°	1.05	0.30
Loose sand and gravel	29°	1.2	0.30
Medium dense sand and gravel	33°	1.5	0.30
Dense sand and gravel	38°	1.9	0.30

(1) These values relate to installations where the groundwater is a minimum of one metre below the base of the excavation. AquaCell Eco units should not be used where groundwater is present.

Source: BBA

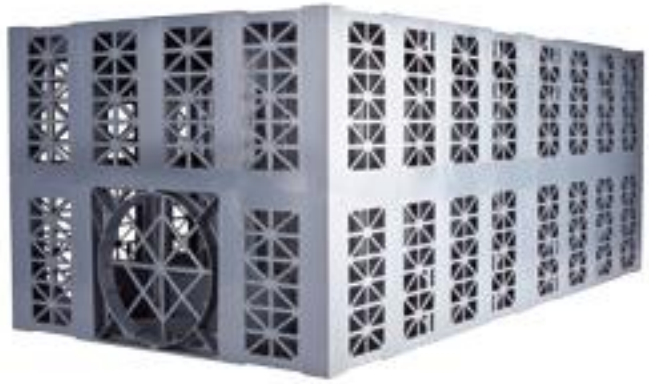
CONNECT TO BETTER

Product Details
AquaCell Prime

Application

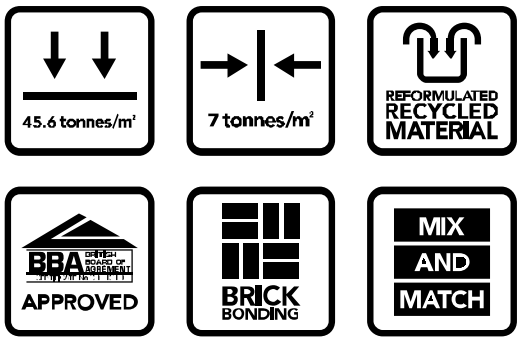
AquaCell Prime is manufactured from specially reformulated, recycled material. It is ideal for use in both shallow and deep applications, subject to either regular traffic loading – such as car parks (for vehicles up to 12 tonnes) or for landscape areas.

Typically AquaCell Prime is suitable for installations to a maximum depth of 3.70m (landscaped) and 3.45m (trafficked), to the base of the units from ground level, in best soil conditions.



Features and benefits

- Manufactured from specially reformulated, recycled material
- Suitable for both soakaway and attenuation applications
- Suitable for use in areas subject to regular traffic loading, i.e. car parks
- Proven vertical loading capacity of: 45.6 tonnes/m²
- Proven lateral loading capacity of: 7 tonnes/m²
- Grey in colour, for ease of identification from other AquaCell units
- BBA approved – Certificate No 03/4018
- Ideal for all types of projects including major attenuation and infiltration schemes



AquaCell Prime

Maximum installation depths (to base units)

Typical soil type	Typical angle of shearing resistance (1) (2) (φ)	Maximum depth of installation – to base of units (m)			
		With groundwater at 1m below ground level and units wrapped in geomembrane		Without groundwater below base of units (normal case)	
		Trafficked areas (cars only) (3)	Non-trafficked areas	Trafficked areas (cars only) (3)	Non-trafficked areas
Stiff over-consolidated clay (e.g. London clay)	24°	1.60	1.78	1.73	1.98
Normally consolidated silty, sandy clay (e.g. alluvium, made ground)	26°	1.75	1.78	2.01	2.27
Loose sand and gravel	30°	1.95	2.08	2.58	2.86
Medium dense sand and gravel	34°	2.04	2.16	2.98	3.24
Dense sand and gravel	38°	2.04	2.24	3.45	3.70

(1) Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of φ.

(2) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.

(3) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week).

Assumptions made are:

- ground surface is horizontal
- shear planes or other weaknesses are not present within the structure of the soil

Source: BBA

Product Details
AquaCell Core

Application

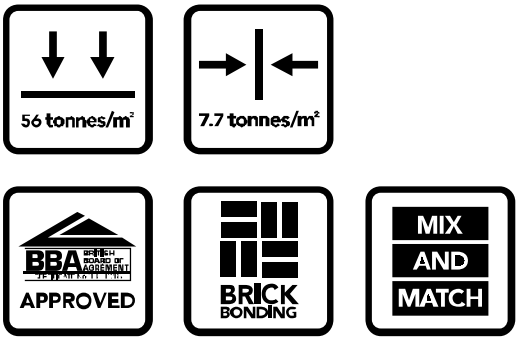
AquaCell Core has been designed for use in deep applications, subject to both regular and heavy traffic loadings, such as cars and HGV's (for vehicles up to 44 tonnes). In addition AquaCell Core can also be used for deep soakaways and landscaped applications.

Typically for use down to depths of 4.25m (landscaped), 4.1m (trafficked by cars) and 4m (trafficked by HGV's), to the base of the units from ground level, in best soil conditions.

Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum cover depth of 0.9 metres is in place.

Features and benefits

- Suitable for regular and heavy traffic loadings
- Proven vertical loading capacity of: 56 tonnes/m²
- Proven lateral loading capacity of: 7.7 tonnes/m²
- Dark blue in colour, for ease of identification from other AquaCell units
- BBA approved – Certificate No 03/4018
- Ideal for all types of shallow and deep projects including major attenuation and infiltration schemes



AquaCell Core

Maximum installation depths (to base units)

Typical soil type	Typical angle of shearing resistance (1) (2) (φ)	Maximum depth of installation – to base of units (m)			
		With groundwater at 1m below ground level and units wrapped in geomembrane		Without groundwater below base of units (normal case)	
		Trafficked areas (cars only) (3)	Non-trafficked areas	Trafficked areas (cars only) (3)	Non-trafficked areas
Stiff over-consolidated clay (e.g. London clay)	24°	1.65	1.75	2.35	2.50
Normally consolidated silty, sandy clay (e.g. alluvium, made ground)	26°	1.70	1.80	2.50	2.65
Loose sand and gravel	29°	1.80	1.90	2.85	2.95
Medium dense sand and gravel	33°	1.90	2.00	3.30	3.45
Dense sand and gravel	38°	2.05	2.15	4.10	4.25

(1) Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of φ.

(2) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.

(3) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week).
Assumptions made are:
- ground surface is horizontal
- shear planes or other weaknesses are not present within the structure of the soil

Source: BBA

CONNECT TO BETTER

Product Details
AquaCell Plus

Application

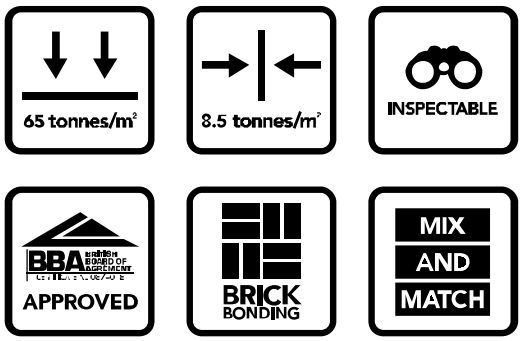
AquaCell Plus has been designed primarily for use in applications where inspectability is required, and is suitable for use in all applications from landscaped areas to heavily trafficked areas (for vehicles up to 44 tonnes) The units can be used in combination with AquaCell Prime and Core (and with Eco if there is at least one layer of AquaCell Prime or Core in between the Plus and Eco layer).

Extra lateral loading capacity allows installation at greater depths. Integral inspection channels in each unit combine to create viewing channels for the full length of the installed structure.

Typically for use down to depths of 5.08m (landscaped), 4.78m (trafficked by cars) and 4.48m (trafficked by HGV's), to the base of the units from ground level, in best soil conditions. Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum cover depth of 0.9 metres is in place.

Features and benefits

- Suitable for extra deep installations
- Inspectable (supplied with end cap for use when an inspection channel is not required
- Proven vertical loading capacity of: 65 tonnes/m²
- Proven lateral loading capacity of: 8.5 tonnes/m²
- Light blue in colour, for ease of identification from other AquaCell units
- BBA approved – Certificate No 03/4018



AquaCell Plus

Maximum installation depths (to base units)

Typical angle of shearing resistance [1] [2] (φ)	Maximum depth of installation – to base of units (m)		
	Non-trafficked areas	Trafficked areas	
		Cars [3]	HGV
24°	2.96	2.65	2.35
26°	3.18	2.88	2.57
28°	3.42	3.12	2.82
30°	3.69	3.39	3.08
32°	3.98	3.68	3.38
34°	4.31	4.01	3.71
36°	4.68	4.38	4.07
38°	5.08	4.78	4.48

(1) Loosening of dense sand or softening of clay by water can occur during installation. The designer should allow for any such likely effects when choosing an appropriate value of φ.

(2) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.

(3) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week).
Assumptions made are:
- ground surface is horizontal
- shear planes or other weaknesses are not present within the structure of the soil

Source: BBA

Product Details
AquaCell Plus

AquaCell Plus: for Inspectability

By aligning AquaCell Plus units end-to-end, full length viewing channels can be created – allowing for CCTV inspection if required. These are created in the bottom layer of an AquaCell tank installation.

The units can be used in combination with AquaCell Prime and Core (and with Eco if there is at least one layer of AquaCell Prime or Core in between the Plus and Eco layer).

NOTE: For any AquaCell Plus units on the perimeter of a structure that are NOT required for inspection access, the open ends of the integral inspection tunnels should be fitted with the end caps provided.

Inspection chambers

An inspection chamber should precede the inlet pipework for the AquaCell structure.

A silt trap or hydro-dynamic separator prior to the inspection chamber is also recommended.

For on-line installations the following Chambers are recommended:
- (down to 3m) Wavin Non-Entry Inspection Chambers
- (down to 5m) Wavin Range: 600 Non-Entry Inspection Chamber or, a traditional manhole*

**where inlet pipework is replaced by AquaCell units acting as flow conduit.*

For off-line installations:
– Manhole with in-built flow control

Recommendation: If installing any Wavin Non-Entry Inspection Chamber, deeper than 1.2 metres, ensure that the cover and frame includes a 350mm restrictor to prevent man entry.

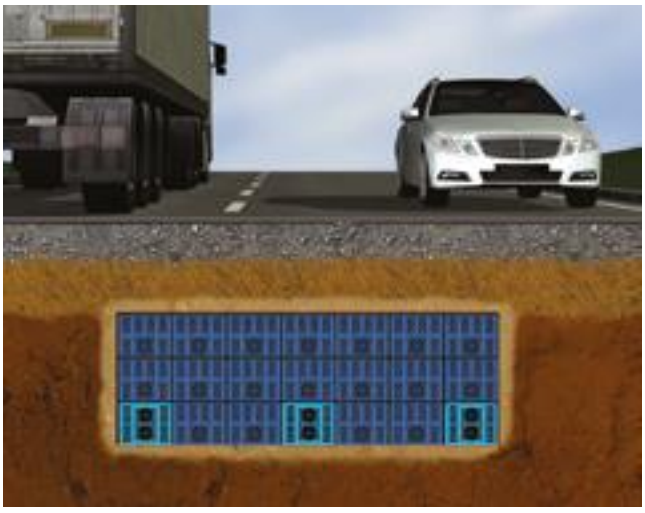
Inspection and maintenance

CCTV inspection at every inspection point is recommended:
- after every major storm
- at regular intervals according to the specific maintenance plan for the site

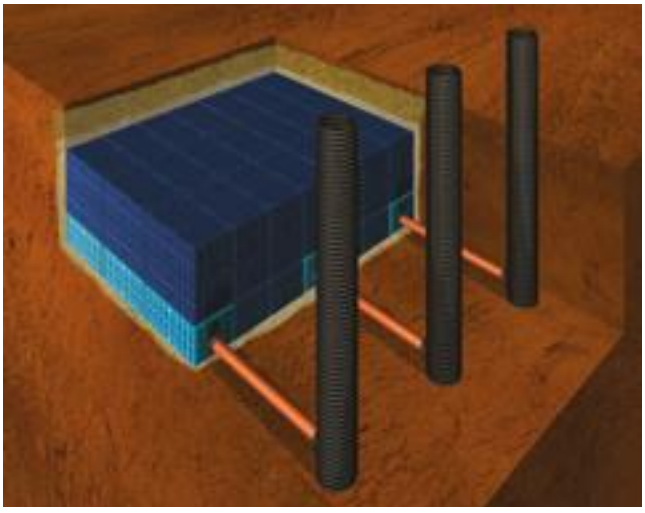
Silt traps prior to inlet pipework should be routinely inspected and cleaned out to minimise debris reaching the tank. It is important to prevent construction silt from entering the AquaCell structure.

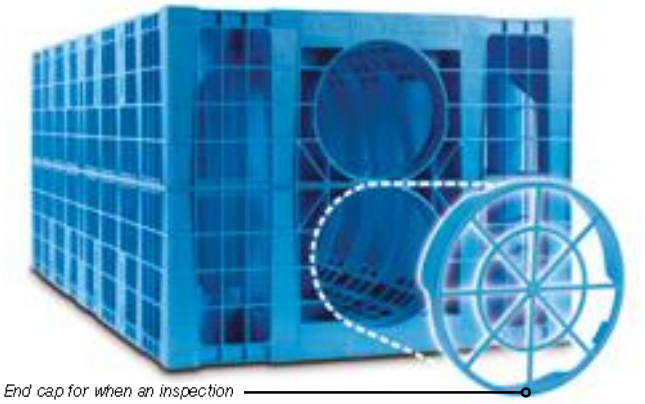
Inspectability scenarios

AquaCell Core and AquaCell Plus



Trafficked tank installation with inspection chambers





End cap for when an inspection channel is not required

AquaCell Plus 6LB200

CONNECT TO BETTER

Design Guidance
AquaCell Units

Hydraulic and structural design

All AquaCell units have identical dimensions: 1m x 0.4m x 0.5m, with a nominal void ratio of 95%. Hydraulic calculations are accordingly the same for AquaCell Eco, Prime, Core and Plus.

Structural design however, requires careful consideration of loading factors specific to each location – see CIRIA C680.

Location type	Minimum cover depth			
	AquaCell Eco	AquaCell Prime	AquaCell Core	AquaCell Plus
Landscaped/non-trafficked areas	0.3m[b]	0.3m[b]	0.3m[b]	0.3m[b]
Car parks, vehicle up to 12000 kg[a] gross mass	n/a	0.71m	0.75m	0.75m
HA/HGV loading [a]	n/a	n/a	1.2m	1.1m
Maximum depth to base of unit (Landscaped)	1.5m	3.7m	4.25m[c]	5.08m
Maximum depth to base of unit (Trafficked)	n/a	3.45m	4.1m	4.78m

(a) For specific advice on cover depths for heavier loadings/HGV applications, contact Wavin Technical Design on 0844 856 5161.

(b) 0.3 is minimum depth for AquaCell Eco, although 0.5m cover is recommended to prevent accidental damage. If construction plant is to be used on site, extra protection may be needed.

(c) Allowable maximum depth to base of bottom layer of units is dependent on soil type, angle of shearing resistance, loadings, and groundwater level. The above depths are based on 38° angle of shearing resistance and no groundwater.

Installation and cover depths

After deciding which AquaCell unit is correct for the project location (using the System Selector on page 5), see Table for the recommended maximum installation depths and minimum cover depths.

The diagram also shows the depth parameters for each unit, and so gives guidance on combining two or more of the AquaCell units.

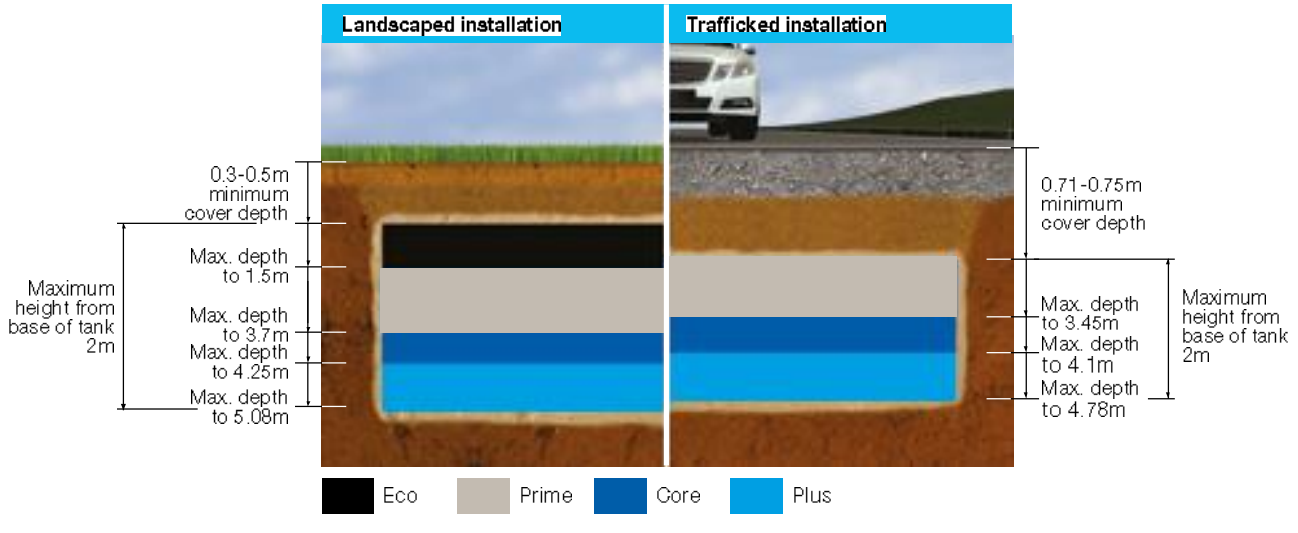
AquaCell systems: Installation depths

Each AquaCell unit has been designed to have specific loading capacities (see pages 6-10) that define the maximum depth parameters for which they are suitable.

Minimum depth of cover varies according to whether or not the installation will be subject to trafficking by cars/HGVs. In each case, the cover depths shown in the diagram include both absolute minimum and recommended minimum cover depths.

However, in some situations, installations may have to be located with greater cover depths. Reasons may include:

- Deep-running drainage network
- Other buried services running above tank location
- Installation into banked/ sloping ground
- Upper layer of clay preventing infiltration



Mixing AquaCell units together

Design Guidance
AquaCell Units

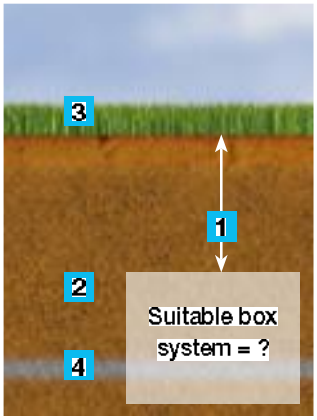
Geocellular structures

Important design considerations
To guarantee the structural integrity of an engineered drainage system, any underground structure must be strong enough to support the loads to which it will be subjected without any unacceptable deflection.

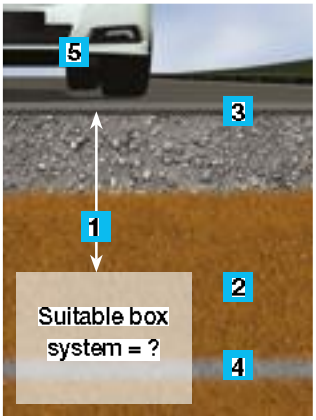
The correct choice of geocellular unit must have appropriate proven top (vertical) and side (lateral) load bearing capacity and deflection characteristics to suit site conditions.

The five key site considerations to be noted when designing a geocellular structure are:
1. Depth of cover (See page 11)
2. Soil type
3. Surface finishing
4. Presence of groundwater
5. Type of traffic/loading

Non-trafficked



Trafficked



The combination of these 5 factors effectively means that the required characteristics of a geocellular structure to be installed under a trafficked location (for example) will be very different from that under a landscaped/low-loaded location. Two typical examples are given below.

EXAMPLE A: Landscaped/non-trafficked location and 0.3m cover depth. Typically requires minimum vertical strength of 17.5 tonnes/m^2

EXAMPLE B: Car park with occasional light delivery traffic and between 0.71 – 0.75m cover depth. Typically requires minimum vertical strength of 40 tonnes/m^2

These factors have already been taken into consideration within the System Selector on page 5 for the four AquaCell units, and in the cover depth and installation depth guidance on page 11.

'Brick-bonding' unit assembly

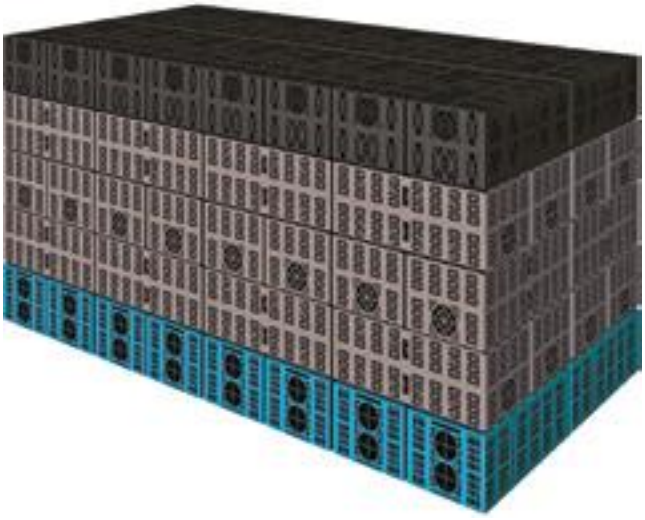
Recommended for extra stability
When assembling a geocellular structure that comprises two or more layers, it is recommended that AquaCell units are placed in a 'brick-bonded' configuration.

This helps minimise continuous vertical joints in the assembly, and gives the structure extra stability.

No extra connectors required with AquaCell
A significant advantage of AquaCell unit design is that brick-bonding placement does not require extra connectors.

All four AquaCell units may be placed in this way, unless inspection channels and cleaning access are required using AquaCell Plus.

AquaCell Plus units incorporate integral inspection channels. These are designed for combined alignment to create viewing tunnels at the base of an assembled structure (see page 10).



Soakaway or tank?

Checking site suitability

Infiltration criteria

A site is suitable for infiltration (soakaway) provided that BOTH of the following are confirmed:

- The underlying soil surrounding the proposed installation is sufficiently permeable
- The seasonally high water table is a minimum of 1 metre below the base of the proposed installation

If either of these criteria is not the case, or cannot be confirmed for any reason, a soakaway system may not be suitable for the application.

Storage tank

If infiltration is not possible, the system may be wrapped in an impermeable geomembrane to create a storage tank which would discharge at a fixed flow rate via a flow restriction device to a permissible outflow point.

This may be designed to be online or offline (see pages 22-28 for typical details).

However, if the site is subject to groundwater or a high water table, it is important to ensure that the tank is not vulnerable to flotation. Sufficient weight from soil, or other covering placed over the AquaCell units, must be sufficient to counter any buoyancy uplift force from the rising groundwater level.

Site assessment

Ground conditions may be established as part of a geotechnical assessment. This may include tests for infiltration and ground water level.

If there is no confirmation that such assessments have been conducted, or resulting conclusions are unavailable, a trial pit will be required in accordance with BRE 365.

For information and guidance, please contact the Wavin Technical Design Team.

Typical specification for a polypropylene geomembrane

Property	Value	Test method
Thickness +/- (mm)	1.0	ASTM D 751
Density (minimum) ($g \cdot cm^{-3}$)	0.9	ASTM D 792
Tensile stress at break (minimum) ($N \cdot mm^{-2}$)	18	ASTM D 638
Elongation break (%)	> 700	ASTM D 638
Puncture resistance (minimum) (N)	150	FTMS 101C, Method 2065
Tear resistance (minimum) (N)	60	ASTM D 1004
Dimensional stability (maximum) (% change)	+/- 2.0	ASTM D 1204, 1h at 100°C
Stress crack resistance (%)	100	ASTM D 5397
Volatile loss, 5% loss (maximum)	0.2	ASTM D 1203
Ozone resistance	No cracks	ASTM D 1149
Carbon black content (%)	2 to 3	ASTM D 1603
Moisture vapour ($g \, m^{-2} day^{-1}$)	< 0.1	ASTM E 96
Friction angle (non-woven geotextile)	21°	Shear box
Methane permeability ($g \, m^{-2} day^{-1} atm^{-1}$)	0.11	European Standard
Methane transmission rate ($m^3 m^{-2} s^{-1} atm^{-1}$)	0.8×10^{-9}	BRE
Permeability coefficient	1.8×10^{-12}	–
Application temperature (°C)	> 4	–

Source: BBA

Installation Guidance
AquaCell Units

AquaCell Prime, Core and Plus: Construction Loads

Construction plant such as excavators can impose significant loads on any AquaCell unit. The following guidelines should be observed:

- Tracked excavators (not exceeding 21 tonnes weight) should be used to place fill over the AquaCell units when the geotextile or geomembrane wrapping has been completed
- At least 300mm of fill should be placed before the excavators or trucks delivering the backfill are allowed to traffic over the installed units
- Compaction plant used over the AquaCell units should not exceed 2300kg/metre width. This will allow the compaction of Type 1 sub-base in 150mm layers over the units in accordance with the Specification for Highways Works
- All other construction plant should be prevented from trafficking over the system once it is installed and surfacing completed, unless a site specific assessment demonstrates that it is acceptable
- In particular cranes should not be used over, or place their outriggers over the system

AquaCell Eco: Construction Loads

As AquaCell Eco is designed for landscaped and non-loaded applications, certain precautions are recommended on site to prevent damage to the units through excess loading.

Manual assembly

Whilst assembling the tank, it may be necessary to walk on top of previously laid AquaCell units. Therefore care should be taken not to damage the edges of the units.

Backfilling

When backfilling AquaCell Eco installations:

- Machines placing the material must be located OFF the units
- Only light compaction should be applied to the material
- Backfill with suitable, stone-free, as-dug material
- First layer should be 300mm thick before using any compaction plant
- NO vibratory mechanism should be used for compacting this first layer
- Compaction plant must not exceed 2300kg per metre width

Construction traffic on site

If construction plant (e.g. excavators or loaders) are likely to run over the installation:

- MINIMUM protective cover should be 500mm well-compacted granular material
- Only tracked excavators can be used and MUST NOT weigh more than 14 tonnes.
- HGVs MUST NOT run over installed AquaCell Eco units

Manual assembly

All ancillaries and adaptors (see page 8) can be used with either the AquaCell Eco, Prime, Core or Plus units, except the 225mm Flange Adaptor (6LB106) which must only be used with AquaCell Prime, Core or Plus.

The 150mm Flange Adaptor (6LB104) should only be used when constructing an air vent on the top surface of an AquaCell Eco unit. The adaptor should not be used to connect inlet pipes to the side of an Eco unit.

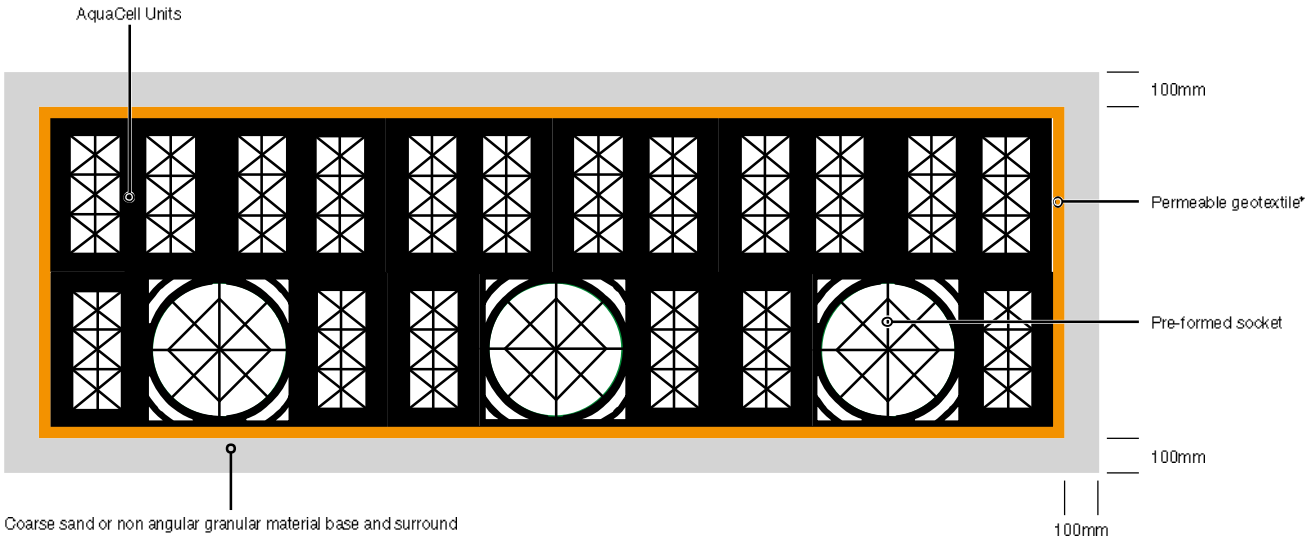
CONNECT TO BETTER

Installation
AquaCell Units

Typical Soakaway Installation Method

Typical installation procedure

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand or non angular granular material, level and compact.
3. Lay the geotextile* over the base and up the sides of the trench.
4. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below) – see page 12. For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
5. Fix the Adaptors to the AquaCell units as required and connect pipework.
6. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or the standard Silt Trap (6LB600) is installed prior to the inlet pipework – see page 17 for installation guidelines.
7. Wrap and overlap the geotextile covering the entire AquaCell structure.
8. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
9. Lay 100mm of coarse sand or non angular granular material over the geotextile and compact.
10. Backfill with suitable material.
11. Rainwater from roof areas may discharge directly into the soakaway but rainwater from carparks must discharge through a catchpit manhole and/or a petrol interceptor.



Example shows the use of AquaCell Eco. However, a soakaway can also be installed as shown using either of the other versions of AquaCell units (Prime, Core or Plus) as appropriate.

**The geotextile should be selected according to specific site conditions. Typically, however, a 300g non-woven material will be suitable. Specialist advice should be sought if surrounding soil characteristics exhibit a high degree of fines/low infiltration capacity and/or there is a high risk of damage from ground contaminants.*

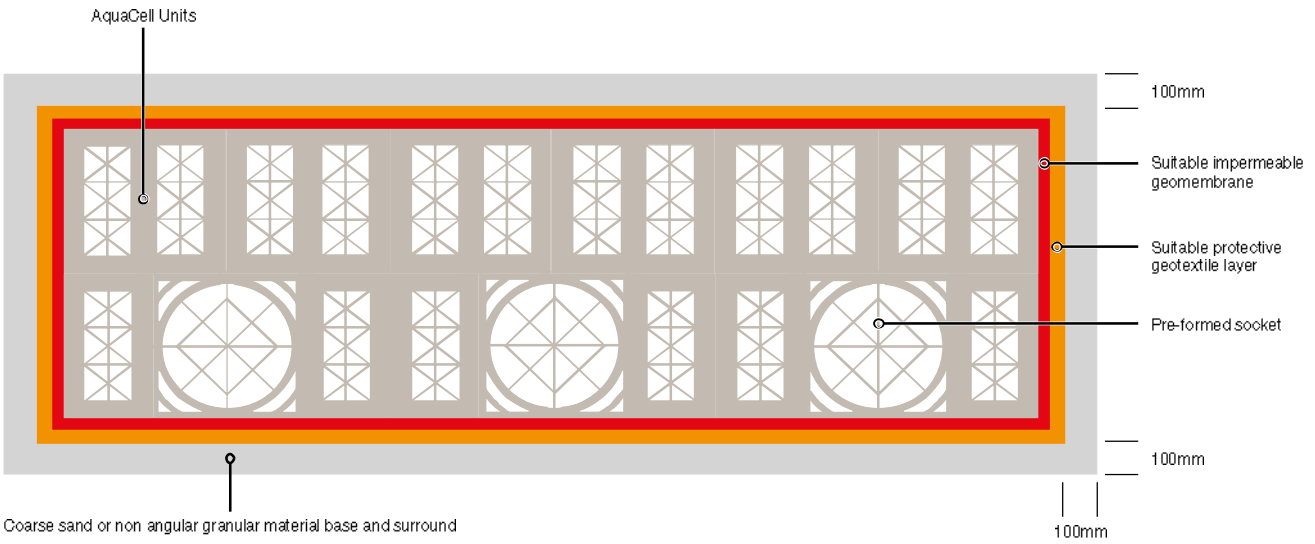
Installation
AquaCell Units

Typical Storage Tank Installation Method

Typical installation procedure

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand, level and compact.
3. Lay the geotextile over the base and up the sides of the trench.
4. Lay the geomembrane on top of the geotextile over the base and up the sides of the trench.
5. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below) – see page 12. For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
6. Wrap the geomembrane around the AquaCell structure and seal to manufacturers recommendations.*
7. If side connections into the AquaCell units is required, (other than the preformed socket), use the appropriate Flange Adaptor (6LB104 or 6LB106). Fix the flange adaptor to the unit using self-tapping screws. Drill a hole through the Flange Adaptor and connect the pipework. (6LB106 should not be used with AquaCell Eco).
8. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or the standard Silt Trap (6LB600) is installed prior to the inlet pipework – see page 17 for installation guidelines.
9. Wrap and overlap the geotextile covering the entire AquaCell structure, to protect the geomembrane.
10. Lay 100mm of coarse sand between the trench walls and the AquaCell units and compact.
11. Lay 100mm bed of coarse sand over the geotextile and compact. Backfill with suitable material.

NB: A storage tank must be vented, and it is recommended that one vent pipe, 110mm in diameter is provided per 7,500 square metres of impermeable catchment area on a site, see page 17 for design.

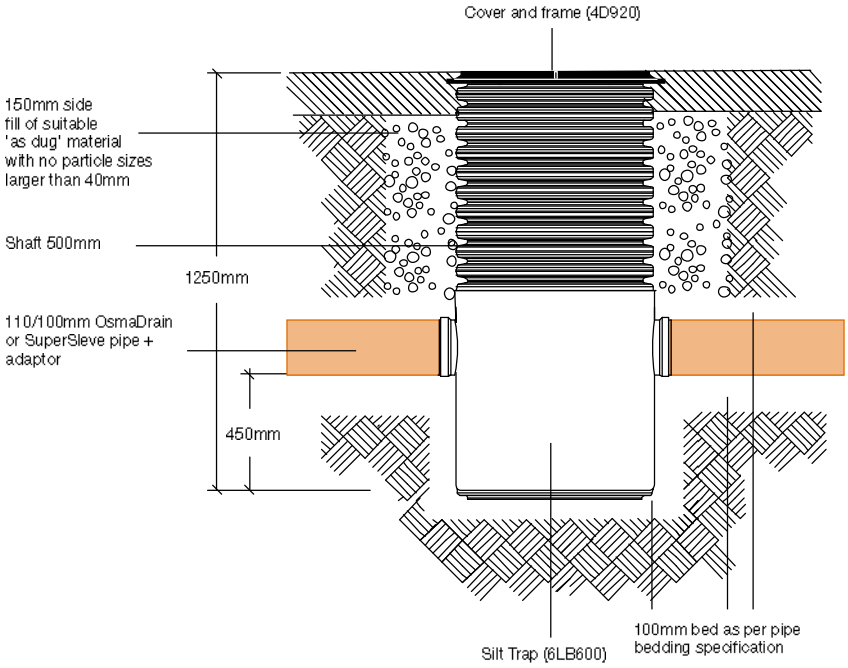


Example shows the use of AquaCell Prime. However, a storage tank can also be installed as shown using any of the other versions of AquaCell units (Eco, Core or Plus) as appropriate.

**For large scale, deep installations a 1mm thick geomembrane is recommended and joints should be sealed using proprietary welding techniques. For further details contact Wavin Technical Design.*

Silt Trap and Air Vent Termination

Silt Trap

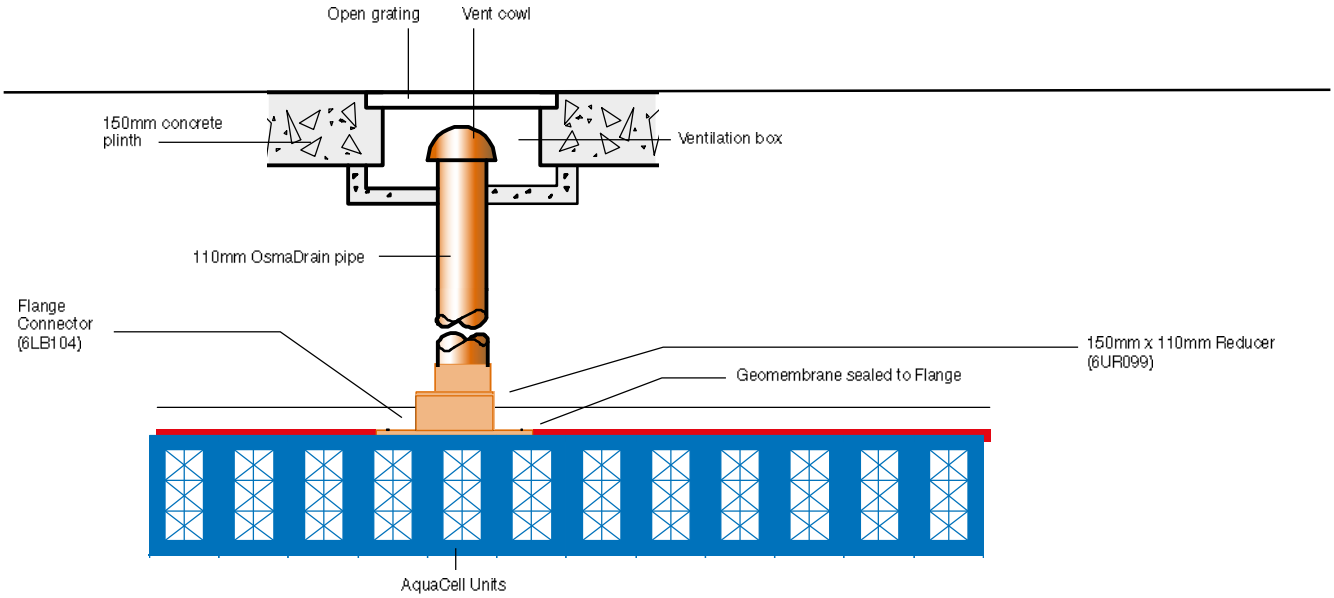


Typical Installation procedure

1. Place the Silt Trap (6LB600) on a minimum of 100mm bed as per pipe bedding specification. Ensure that the trap is as close to the AquaCell unit as possible and in a suitable position to allow pipework connection.
2. Connect the relevant pipework in accordance with standard pipe installation guidelines.
3. Surround the sides of the Silt Trap with 150mm of 'as dug' material, with no particle sizes larger than 40mm.
4. Fit relevant cover and frame.

NOTE: When surrounded by a concrete plinth (150mm x 150mm) the 4D920 Cover and Frame can be used in situations with a loading of up to 50kN (5 tonne).

Typical Air Vent design



NOTE: It is recommended that all connections and air vent installations in storage applications (using geomembrane) are made using a Flange Adaptor.

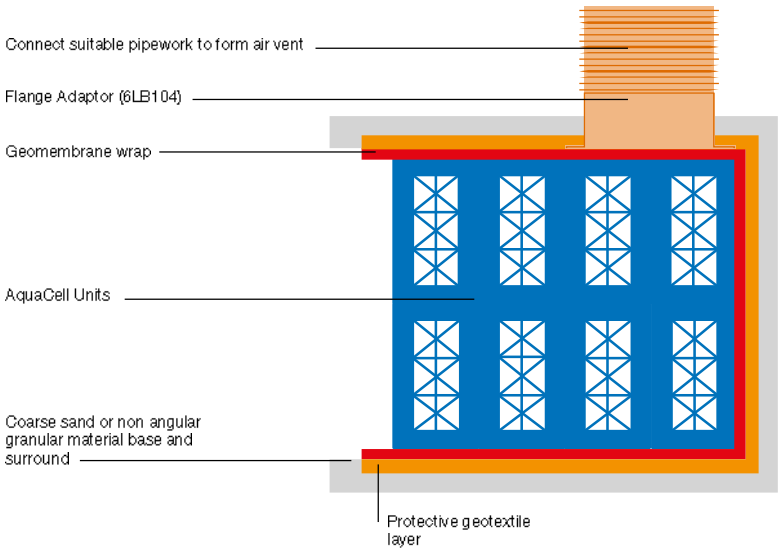
Adhesive or double sided tape should be used between the geomembrane and the flange plate to ensure a watertight seal.

NOTE: It is recommended that one vent pipe, 110mm in diameter, is provided per 7,500 square meters of impermeable catchment area on a site. Please contact Wavin Technical Design for further details.

Typical Details
AquaCell Units

Top Connection for Air Vent

Connect into the top of the AquaCell unit, using Flange Adaptor.



Typical Installation procedure

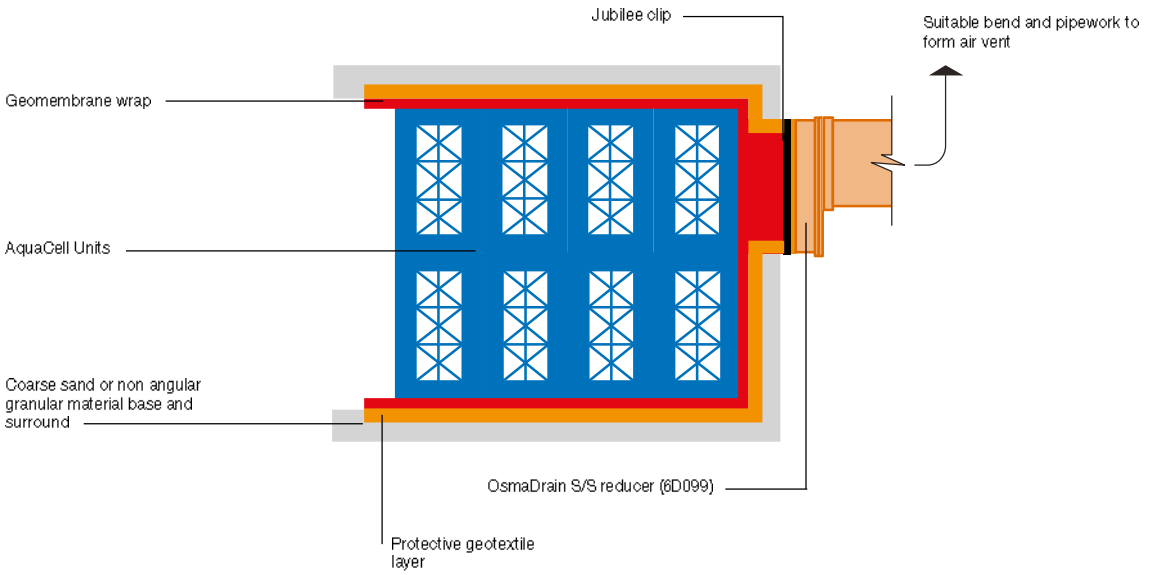
1. Fix Flange Adaptor to the AquaCell unit with self tapping screws.
2. Cut through the geomembrane.
3. Insert pipework into Flange Adaptor to form air vent.

Side Connection for Air Vent

Connect into the side of the AquaCell tank unit using standard Reducer.

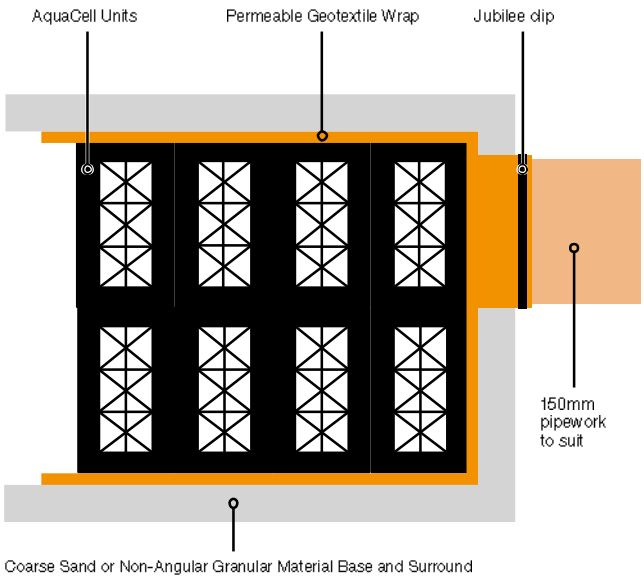
Typical Installation procedure

1. Fix OsmaDrain Reducer to the AquaCell tank.
2. Cut through the geomembrane.
3. Insert pipework into OsmaDrain Reducer to form air vent.

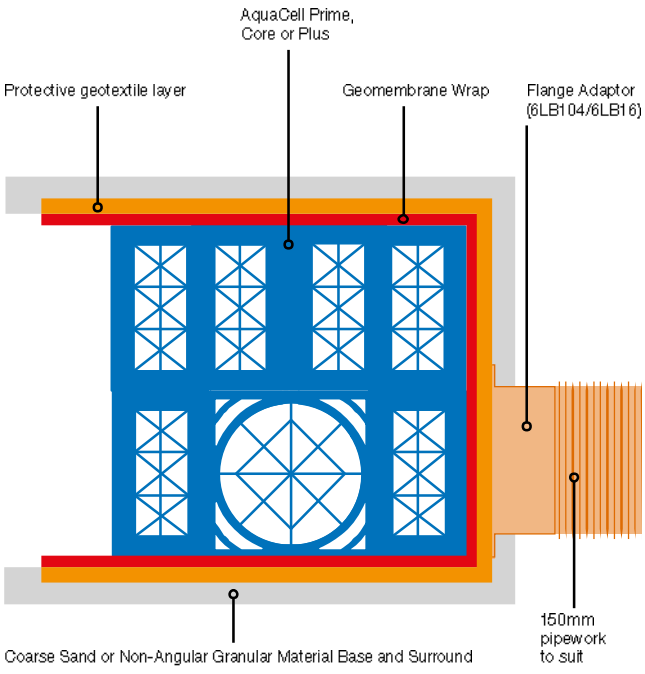


Connections to AquaCell Units

Connection for soakaway application using either the pre-formed socket (as shown below) or standard adaptors into pre-formed socket*.



Connection for storage application using Flange Adaptor at points other than pre-formed socket, (for AquaCell Prime, Core or Plus).



*NOTE: For pipework other than 160mm OsmaDrain, these adaptors can be used to connect to the following:

- 6TW141: TwinWall S/S Adaptor connects to 150mm TwinWall
- 6D099: OsmaDrain Adaptor connects to 110mm OsmaDrain
- 4D916: OsmaDrain PE Adaptor connects to 160mm OsmaDrain
- 6UR141: UltraRib S/S Adaptor connects to 150mm UltraRib
- 6D129: OsmaDrain S/S Adaptor connects to 150mm SuperSleve clay. (Use an appropriate reducer, as required, e.g. 6D099)

Installation procedure

1. Fix Flange Adaptor to the AquaCell unit with self tapping screws.
2. Cut through the geomembrane.
3. Insert pipework into Flange Adaptor.

*NOTE: AquaCell Eco is not suitable for side connection using a Flange Adaptor.

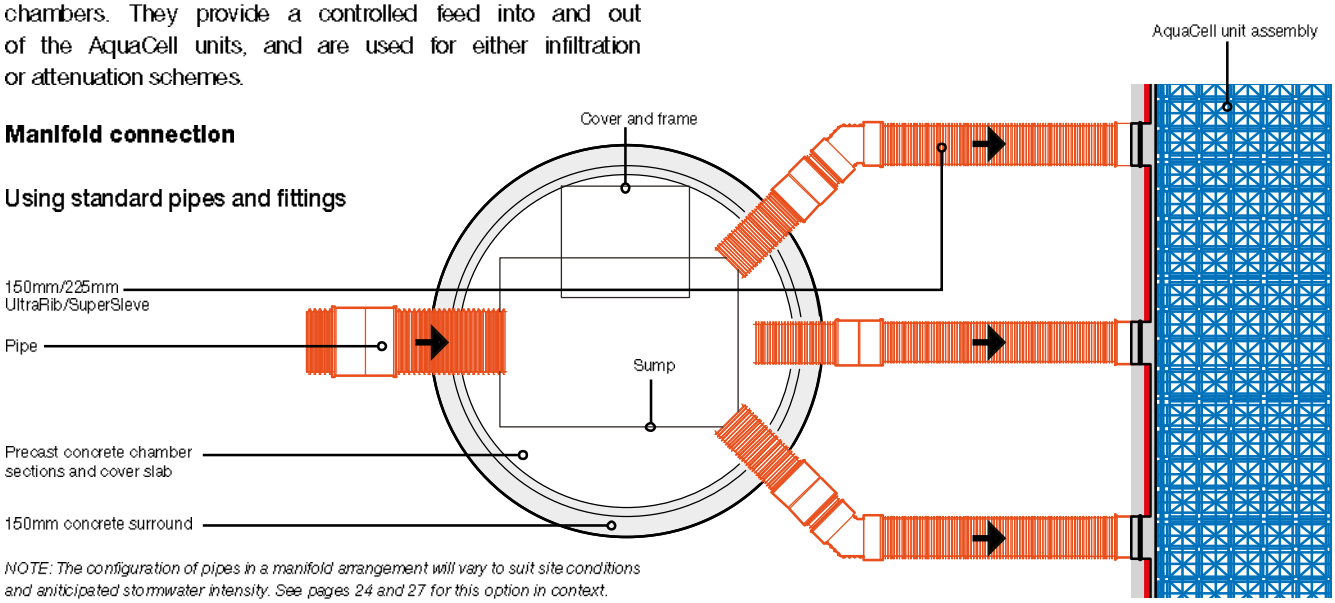
Typical Details
AquaCell Units

Connection Configurations

The connections shown here in schematic form, are the typical options used to connect AquaCell units to control chambers. They provide a controlled feed into and out of the AquaCell units, and are used for either infiltration or attenuation schemes.

Manifold connection

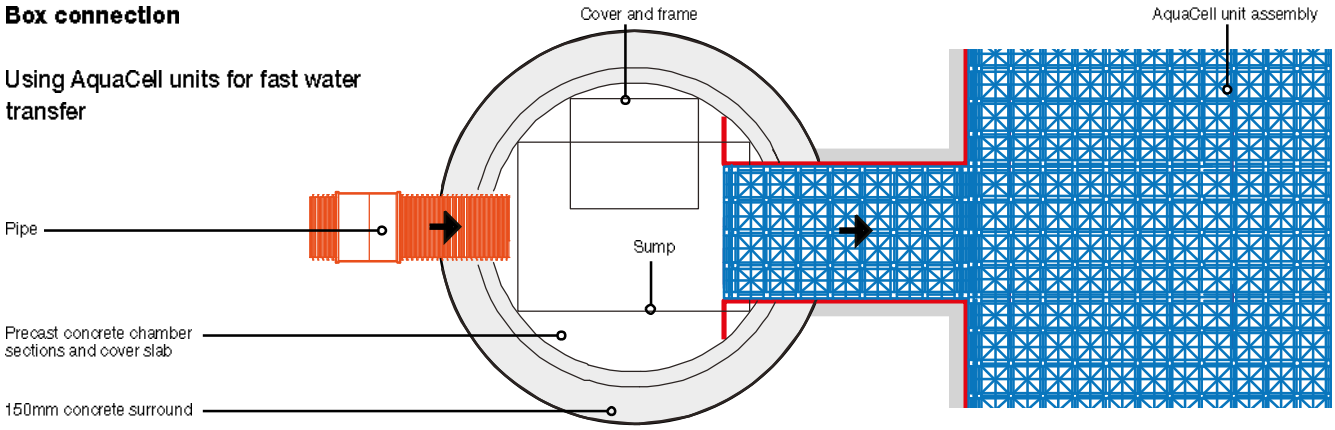
Using standard pipes and fittings



NOTE: The configuration of pipes in a manifold arrangement will vary to suit site conditions and aniticipated stormwater intensity. See pages 24 and 27 for this option in context.

Box connection

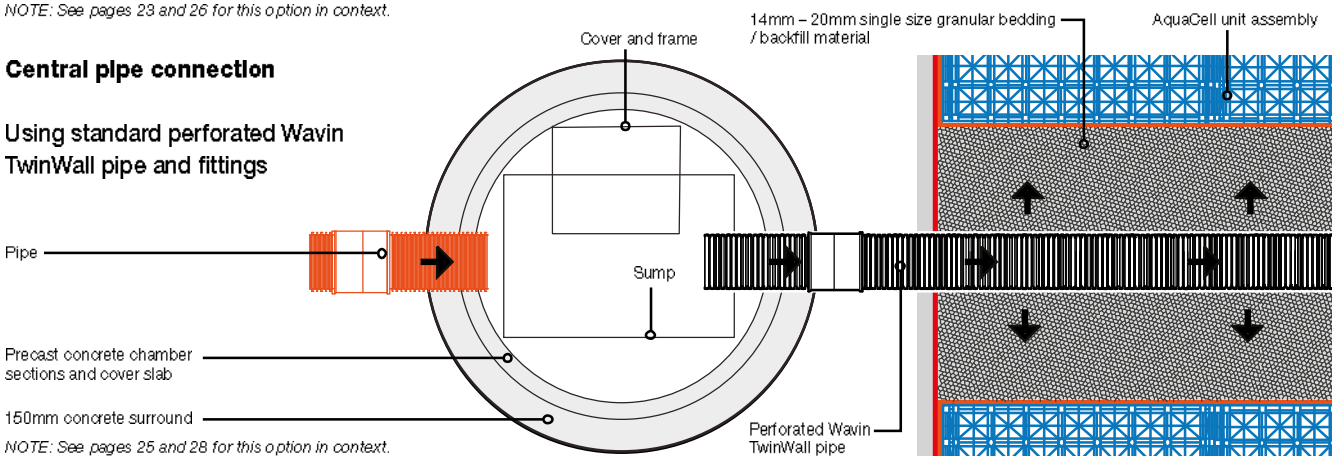
Using AquaCell units for fast water transfer



NOTE: See pages 23 and 26 for this option in context.

Central pipe connection

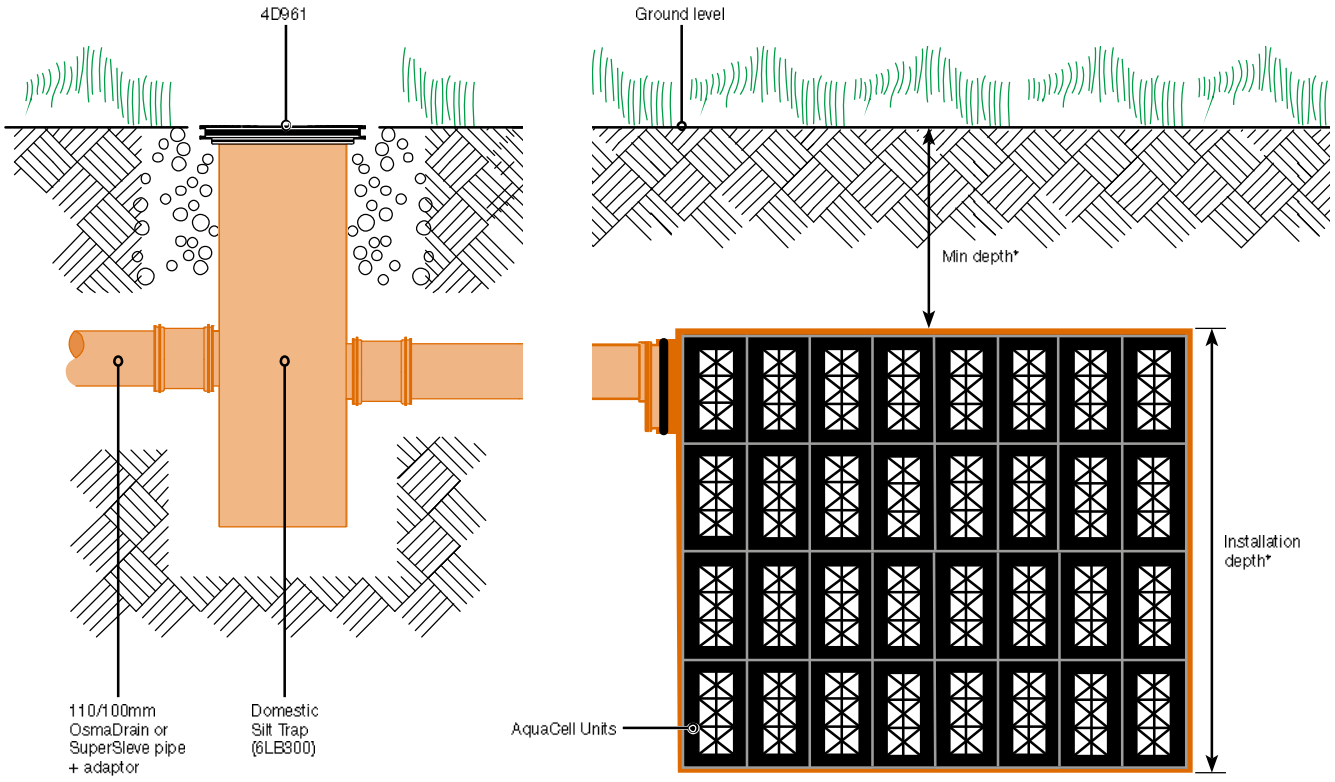
Using standard perforated Wavin TwinWall pipe and fittings



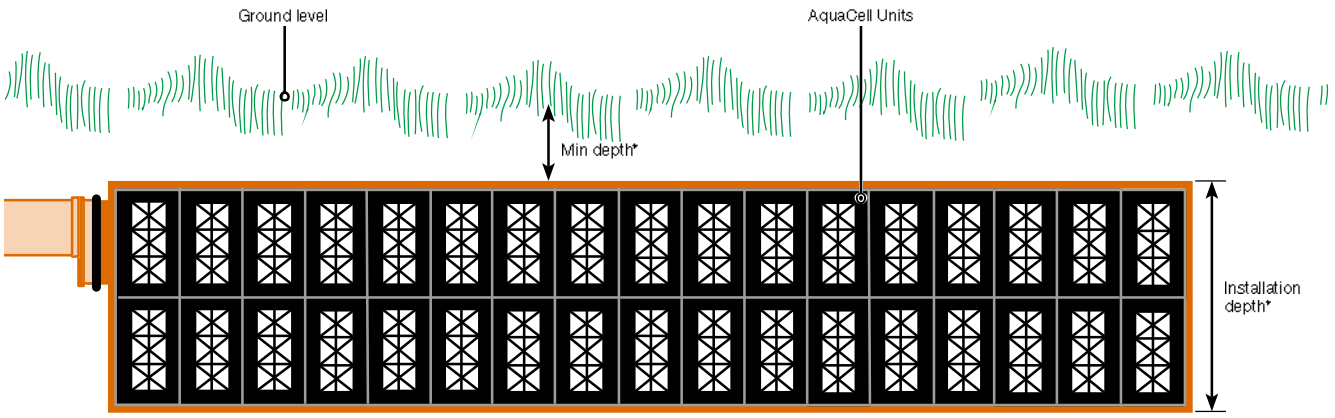
NOTE: See pages 25 and 28 for this option in context.

Soakaway – Non-Traffic Loading

Soakaway



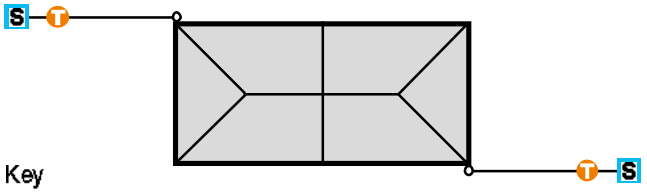
Trench soakaway



Notes

1. Soakaways should be sited at least 5m away from the building (Ref BS EN 752-4).
2. The exact size and shape of the soakaways are to be determined once all the necessary calculations have been produced.

*For information regarding cover depths and installation depths, see page 11.



Key

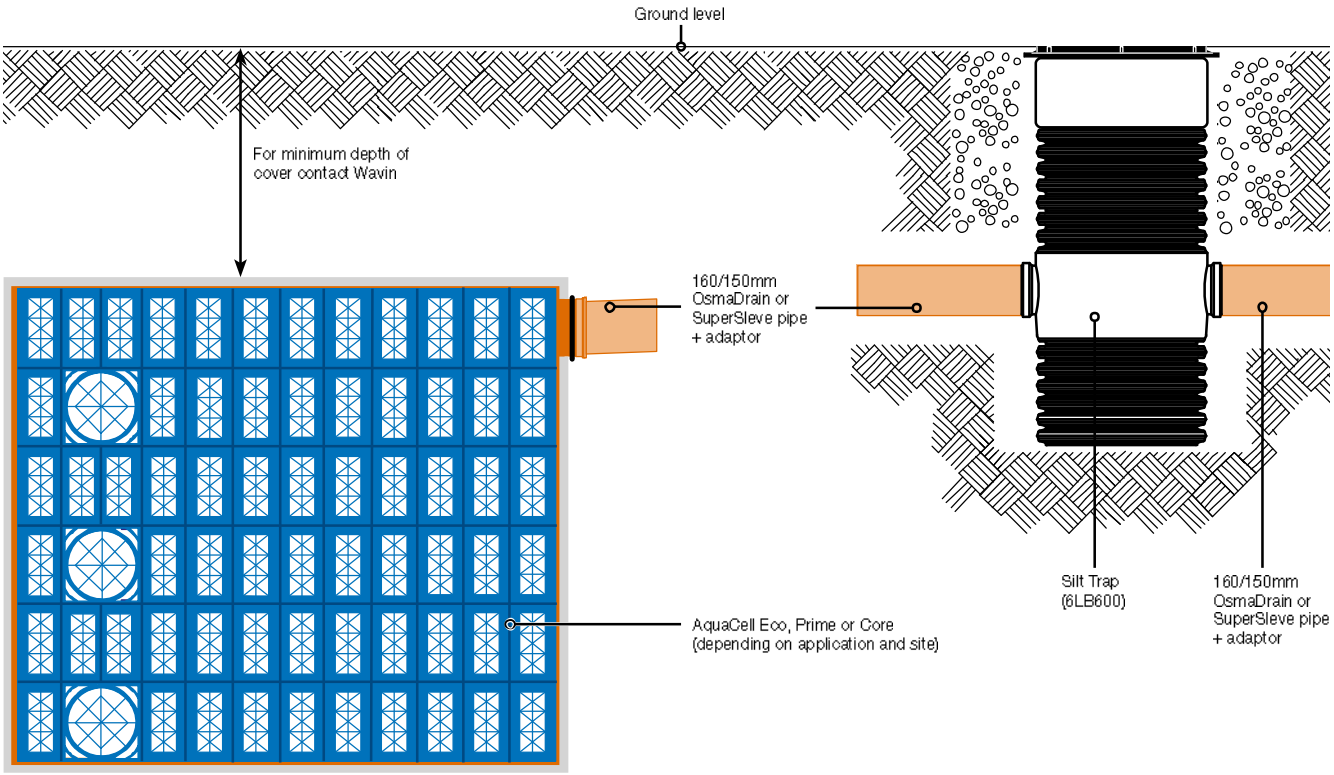
S = AquaCell units soakaway (See note 2)

T = 250mm Dia Silt Trap

Typical Details
AquaCell Units

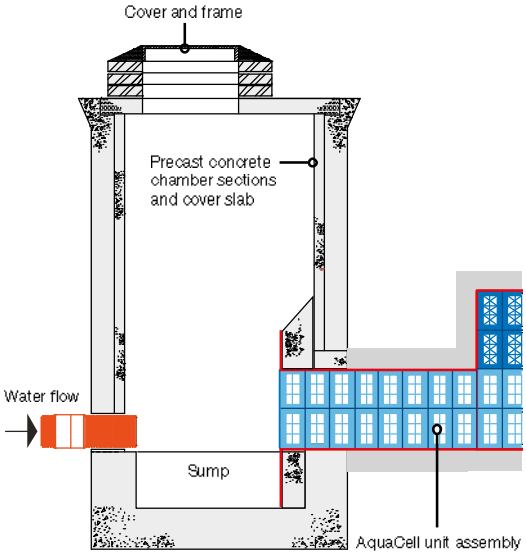
Soakaway – Traffic Loading

Soakaway

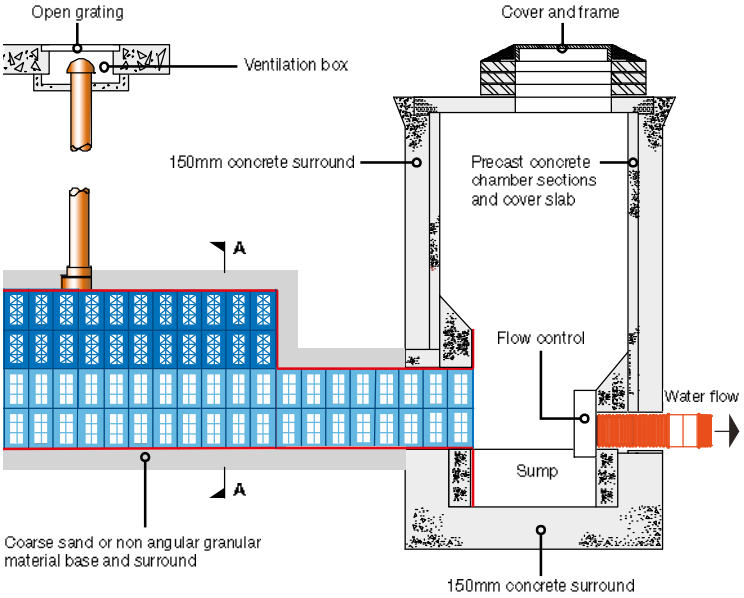


On-Line Storage – Box Feed

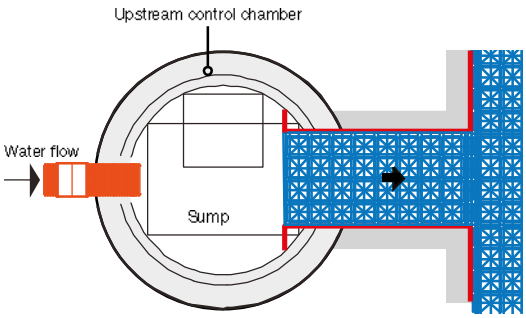
Long section

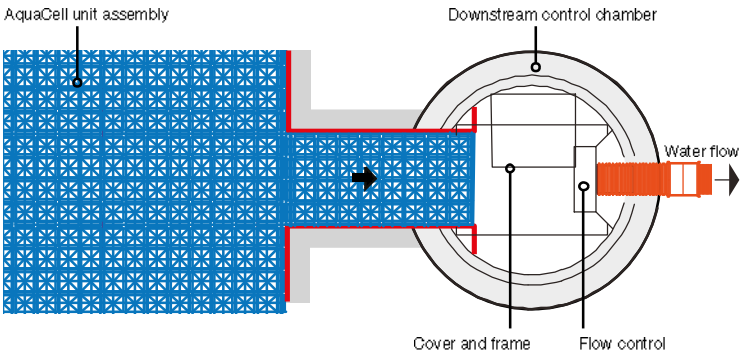


Typical vent detail

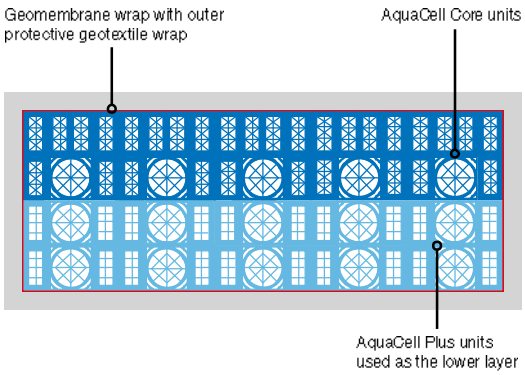


Plan





Cross section A-A



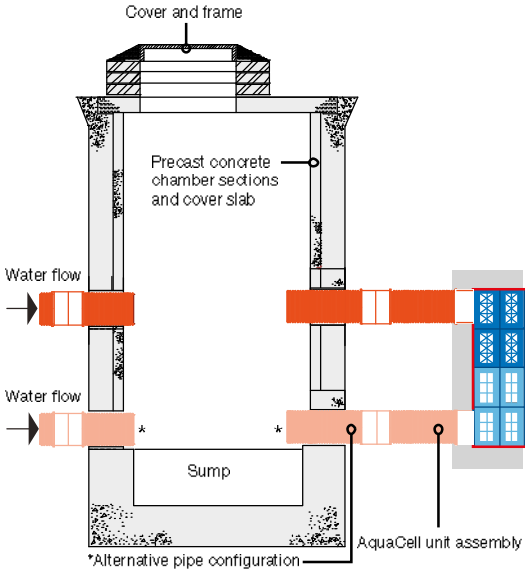
What happens to the water?

1. The water level in the upstream control chamber rises.
2. Then, during a storm event, the AquaCell storage assembly quickly fills with water via the AquaCell feed connection.
3. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

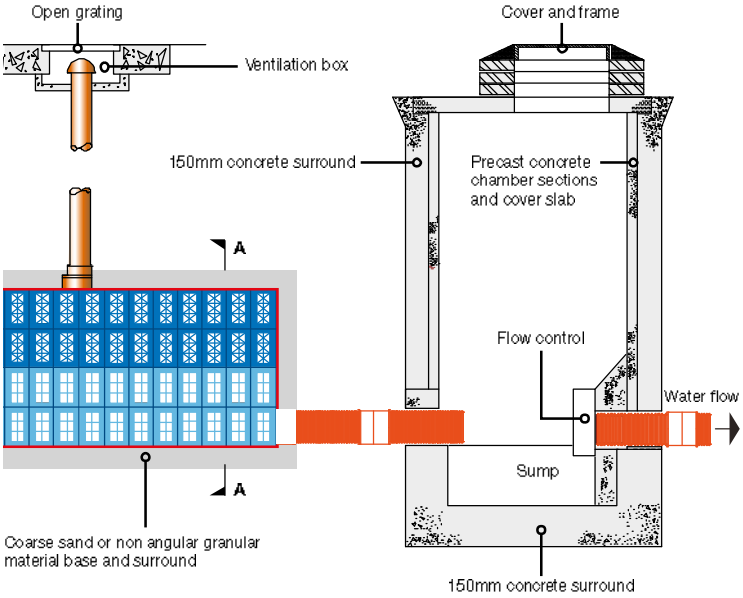
Typical Details
AquaCell Units

On-Line Storage – Manifold Feed

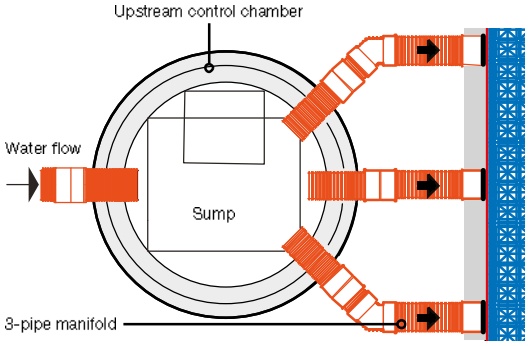
Long section

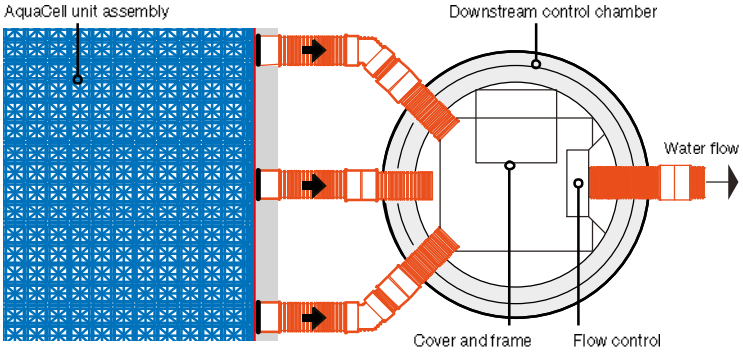


Typical vent detail

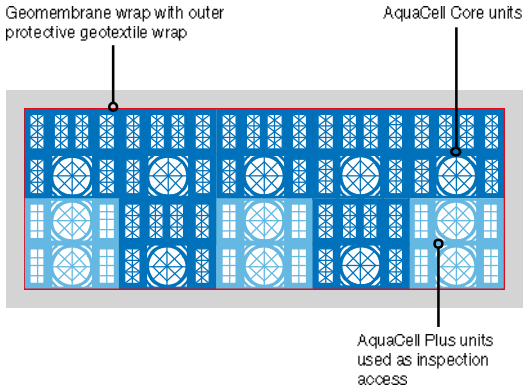


Plan





Cross section A-A

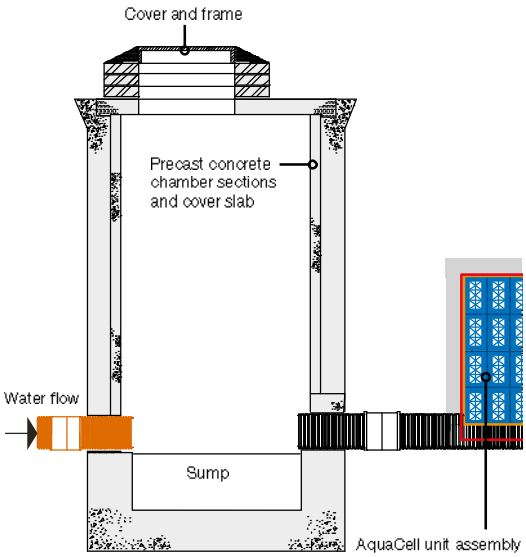


What happens to the water?

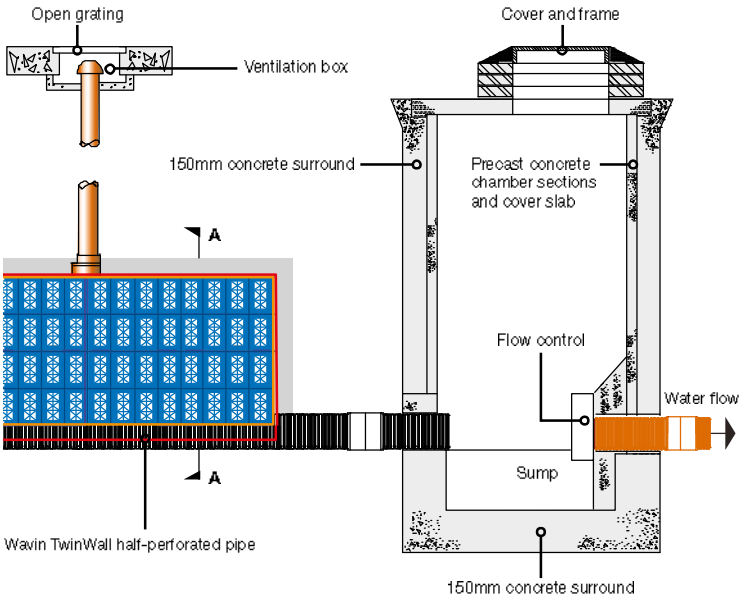
1. The water level in the upstream control chamber rises.
2. During a storm event, the AquaCell storage assembly fills with water via the manifold feed connection.
3. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

On-Line Storage – Central Pipe Feed

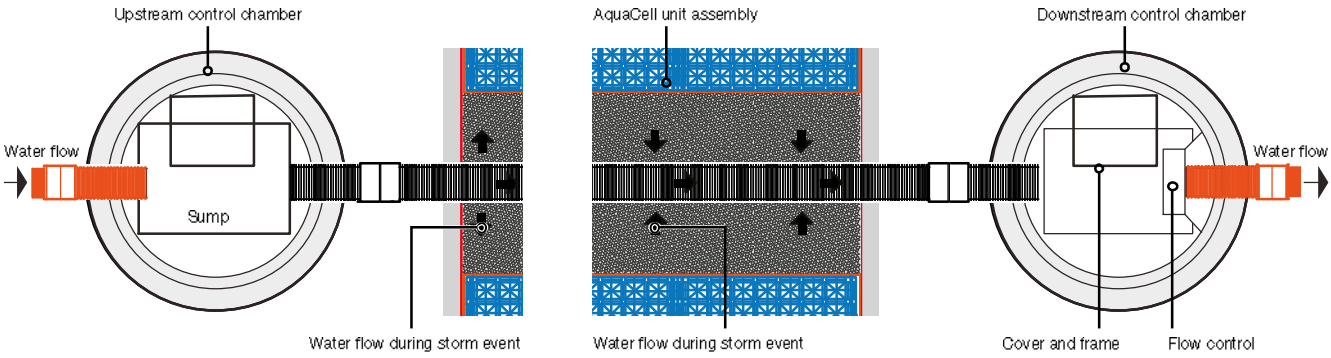
Long section



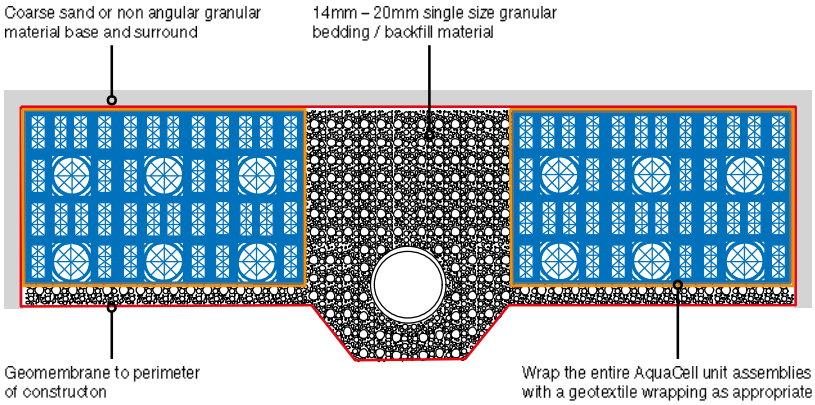
Typical vent detail



Plan



Cross section A-A



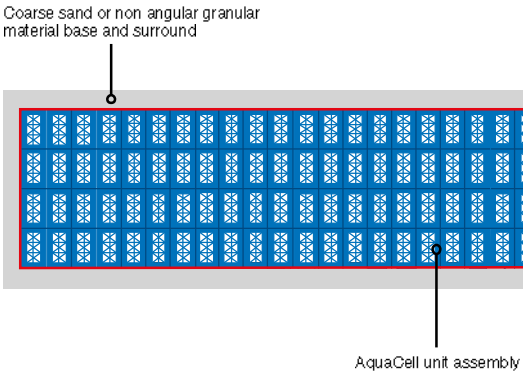
What happens to the water?

1. The water level in the upstream control chamber rises.
2. AquaCell storage assemblies fill with water via the central pipe connection and percolate's through the granular bedding material.
3. After storm event, water flows back out of the AquaCell storage assemblies, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

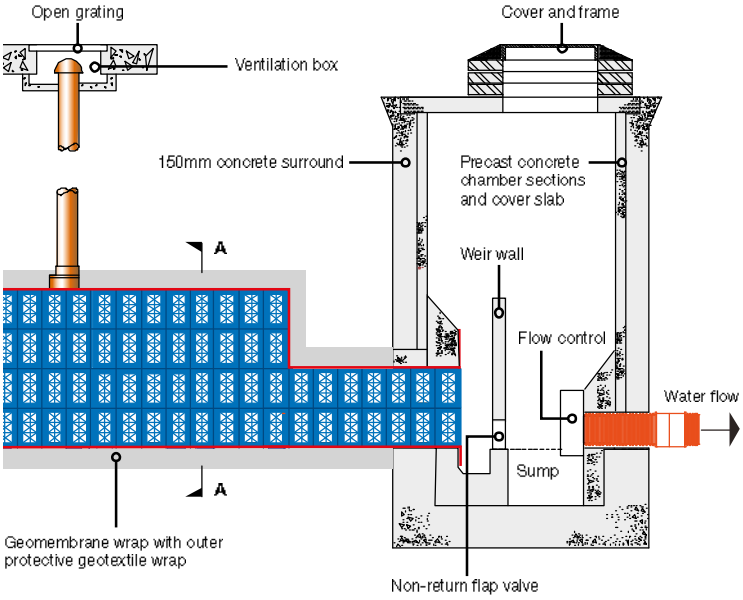
Typical Details
AquaCell Units

Off-Line Storage – Box Feed

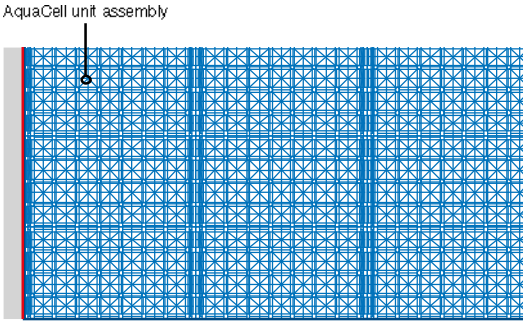
Long section

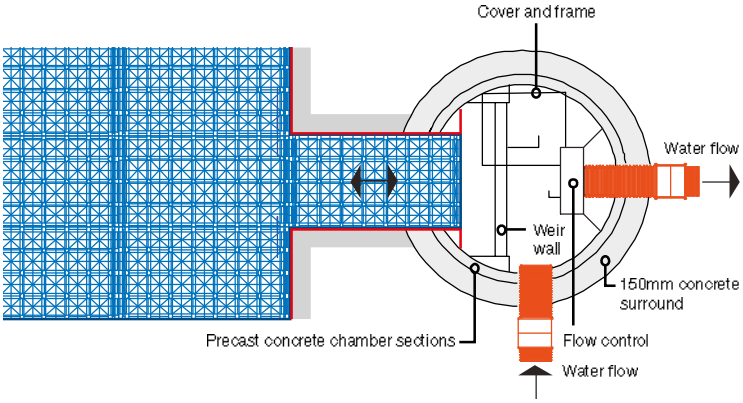


Typical vent detail

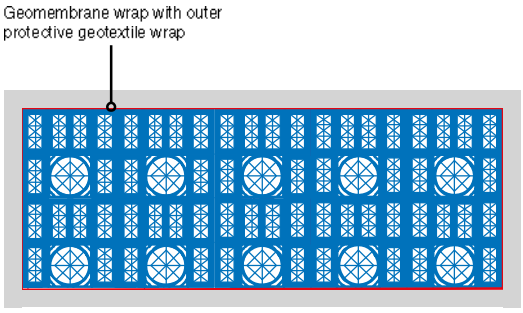


Plan





Cross section A-A

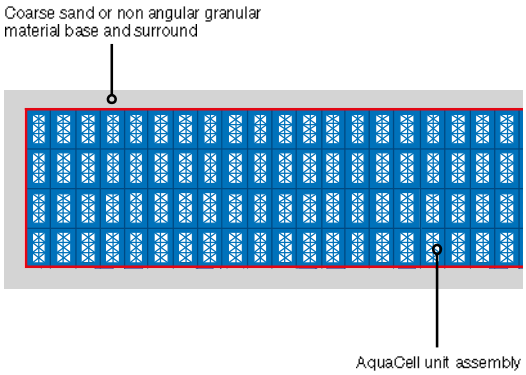


What happens to the water?

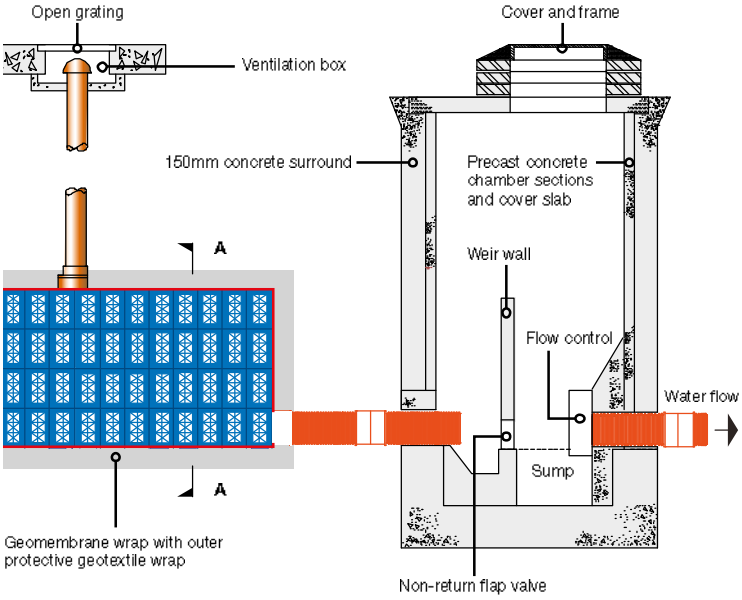
1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assembly via the AquaCell connection.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve.

Off-Line Storage – Manifold Feed

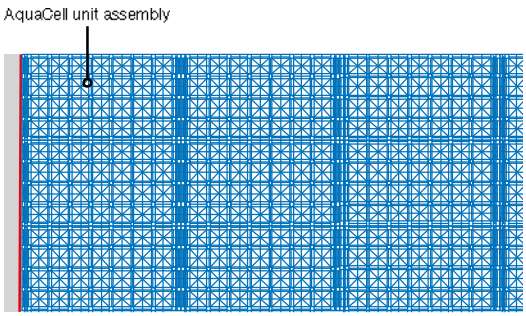
Long section

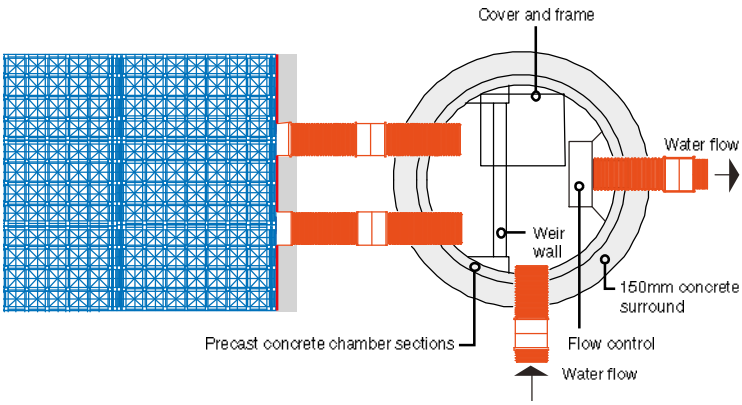


Typical vent detail

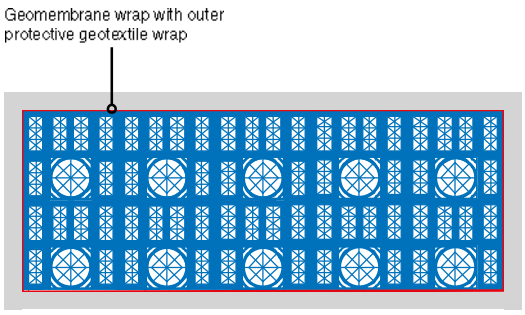


Plan





Cross section A-A



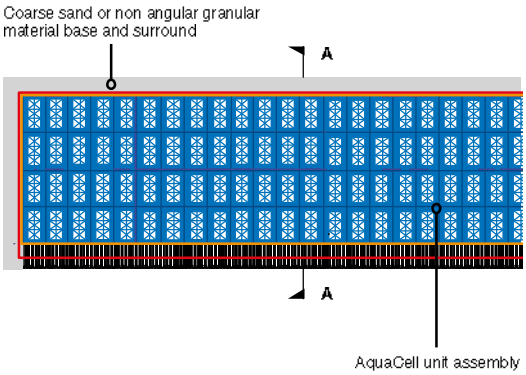
What happens to the water?

1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assembly via the manifold connection.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve.

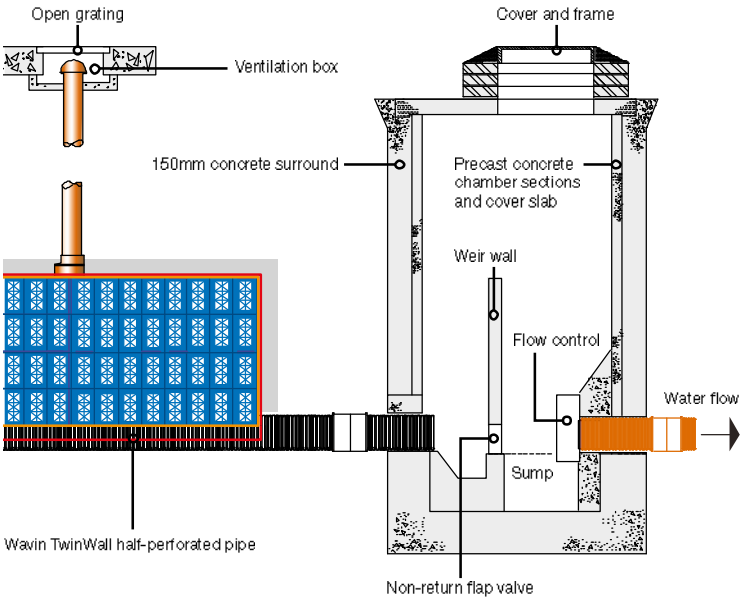
Typical Details
AquaCell Units

Off-Line Storage – Central Pipe Feed

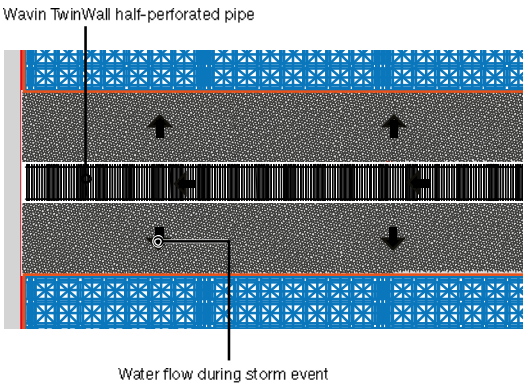
Long section

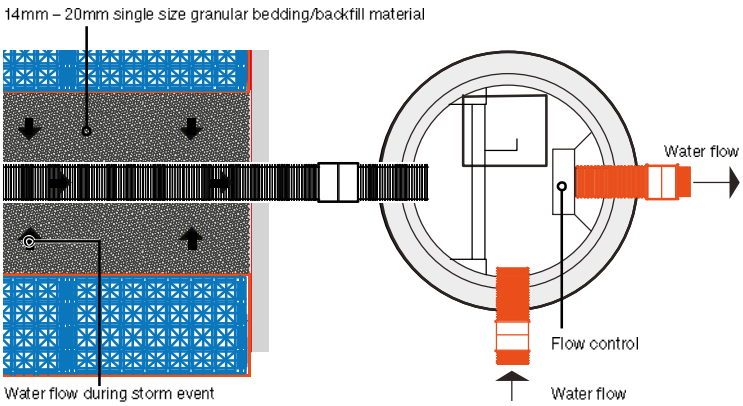


Typical vent detail

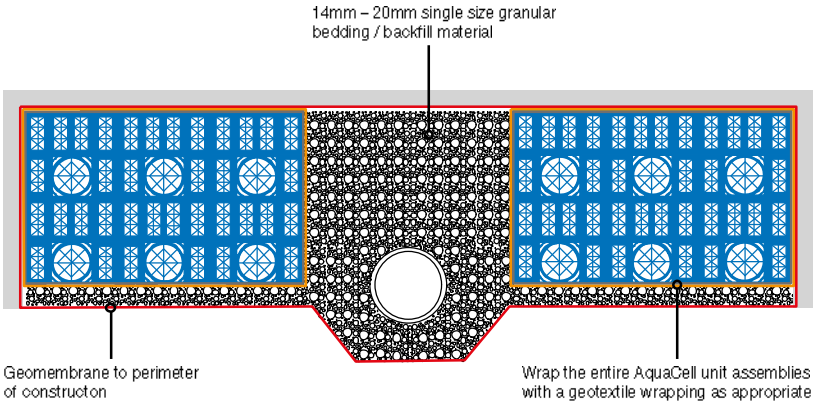


Plan





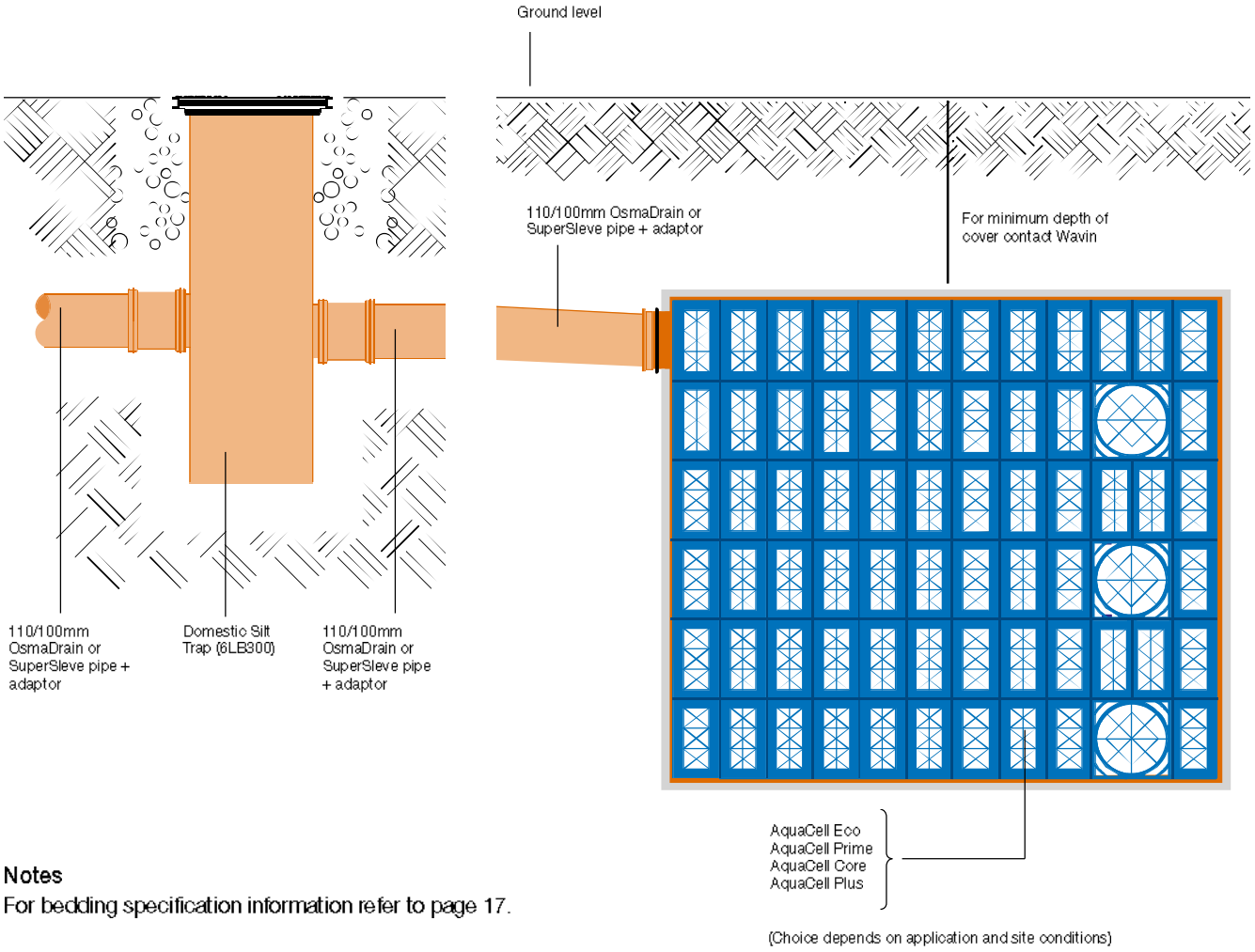
Cross section A-A



What happens to the water?

1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assemblies via the central pipe connection and percolate's through the granular bedding material.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assemblies, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve

Soakaway or Storage Tank – With Silt Trap



Notes

For bedding specification information refer to page 17.

The silt trap can be used in conjunction with a soakaway (as shown) or a storage tank.

Wavin Stormwater Management
AquaCell Systems

To Achieve Optimum Stormwater Management

The Wavin Stormwater Management System represents a combination of specialist expertise and technology from Wavin. This is specifically focused on achieving the optimum solution for each project requiring effective and sustainable management of stormwater.

Such a solution may be entirely based on a tailored combination of our engineered systems.

In other cases, Wavin Stormwater Systems can be integrated with 'soft' SUDS techniques, such as ponds and swales, to help achieve the optimal solution.

Other Wavin Stormwater Systems

Oil Separators

A comprehensive range of NS Oil Separators, tested to EN 858 Class 1 standard and complying with PPG-3 legislation for England and Wales.

Channel Drainage

Environmentally-friendly polyester concrete systems to cover all EN 1433 load classes. With outstanding chemical resistance and low water absorption:

- PolyChannel SK range: general purpose channel for applications up to E600
- PolyChannel SKS range: heavy duty channel for applications up to F900

Plastic Pervious Paving

High performance, plastic pervious paving system, for use in all types of Sustainable Drainage systems (SUDS).

- AquaGrid 50 – for use in landscape projects
- AquaGrid 75 – for use in car parking areas

Flow Control Valves

The Wavin+Mosbaek range of vortex flow control valves are manufactured from stainless steel and are custom-built to meet exact site requirements:

- Self-activating with no moving parts or power requirements
- Unique integral by-pass/drain down features to suit all types of applications

Anti-flood Valves

- Anti-Flood Valves that comply with EN 13546-1, and Part H1– Sections 2.8-2.12 of Building Regulations

Below Ground Water Transportation

Wavin Stormwater installations can draw from an extensive choice of plastic and clay water conveyance systems, including:

- OsmaDrain solid wall PVC-U pipe system
- Structured wall plastic UltraRib and TwinWall pipe systems
- SuperSleve and HepSeal clay pipe systems

Other options include perforated pipe for land drainage: WavinCoil plastic and HepLine clay – and a full range of Wavin Non-Entry Inspection Chambers.

Rainwater Re-Use

The Wavin Stormwater Water Range can also exploit stored rainwater. These reduce the use of potable mains water for nonpotable purposes.

Below ground domestic rainwater re-use systems are available.

The Wavin Stormwater Service

Precision and Performance

The Wavin Stormwater team are ready to contribute to any stormwater management project.

This may be at the very earliest stage – or when initial plans have already been developed. There are no pre-conditions with regards to you requesting Wavin to become involved.

We are ready to:

- Originate project design
- Comment on an existing design
- Help validate a specification – or, where we see an opportunity to do so, to suggest how it may be enhanced
- Check, clarify and confirm maximum cost-efficiency, performance capability and regulatory compliance

This involvement is a core part of the Wavin principle. It extends beyond the systems and components.

To discuss your stormwater management project, call 0844 856 5161 or email technical.design@wavin.co.uk.

CONNECT TO BETTER

General Information
AquaCell Systems

Descriptions

Descriptions and illustrations in this publication are for guidance only. No responsibility can be accepted for any errors, omissions or incorrect assumptions. Refer to the product itself if more detailed information is required. Due to the continuing programme of product improvement the Company reserves the right to amend any published information or to modify any product without prior notice.

Dimensions

Unless otherwise stated all dimensions are in millimetres (mm).

Symbols

a) British Standard Kitemark
Identifies pipes and fittings which are manufactured under the B.S.I. Certification Scheme.

b) British Board of Agrément
Identifies non-Kitemarked fittings which are covered by a British Board of Agrément Certificate.

Colour

AquaCell Eco – Black
AquaCell Prime – Grey
AquaCell Core – Dark Blue
AquaCell Plus – Light Blue

Supply

All AquaCell components are supplied through a nationwide network of merchant distributors. For further information contact Customer Services on 0844 856 5152.

Technical Advice

The AquaCell System is backed by Wavin's comprehensive technical advice service. This is available to provide expert assistance at every stage of a project, from planning and product selection to installation and maintenance.

Contact Wavin Technical Design Department:

Tel: 0844 856 5165

Email: technical.design@wavin.co.uk or via online enquiry at wavin.co.uk

Literature

The following Wavin publications are also available from the Literature Department at Chippenham.

General
- Wavin Below Ground & Civils System: Trade Price List

Stormwater Management Systems
- Wavin AquaCell System: Product and Installation Guide
- Wavin Flow Control Range: Product and Installation Guide
- Wavin Commercial Rainwater Re-use System: Product Summary
- Wavin Poly-Concrete Channel Systems: Product and Installation Guide
- Wavin Quickstream Siphonic Roof Drainage Systems: Product and Installation Guide

Gravity Drain and Sewer Systems
- OsmaDrain System: Product and Installation Guide
- Osma UltraRib System: Product and Installation Guide
- Osma Non Man-Entry Inspection Chamber Range: Product and Installation Guide

To request details with regards to any of the above components and/or for any technical enquires please contact:

Literature Request
Tel: 01249 766333
Email: literature@wavin.co.uk

Technical Design
Tel: 0844 856 5165
Email: technical.design@wavin.co.uk

Wavin Online
The complete range of Wavin/Osma product and installation guides are also available online at: wavin.co.uk

Discover our broad portfolio at
www.wavin.co.uk

Water management | Plumbing and heating | Waste water drainage
Water and gas distribution | Cable ducting

Wavin Limited
Registered Office
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Doncaster | DN12 1BY
Tel. 0844 856 5152
www.wavin.co.uk | info@wavin.co.uk

For further product information visit: wavin.co.uk

wavin
CONNECT TO BETTER

WM424 – October 2015

Appendix 3 - Klargester Hydrocarbon Interceptor Technical Literature

Kingspan Klargester

SEPARATORS

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

ADVANCED ROTOMOULDED CONSTRUCTION ON SELECTED MODELS!

Let us help!
Free professional site visit with friendly support and advice.
helpingyou@klargester.com
to make the right decision
or call 028 302 66799

Kingspan Environmental

Separators

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Surface water drains normally discharge to a watercourse or indirectly into underground waters (groundwater) via a soakaway. Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on the receiving water.

The Environment Regulators, Environment Agency, England and Wales, SEPA, Scottish Environmental Protection Agency in Scotland and Department of Environment & Heritage in Northern Ireland, have published guidance on surface water disposal, which offers a range of means of dealing with pollution both at source and at the point of discharge from site (so called 'end of pipe' treatment). These techniques are known as 'Sustainable Drainage Systems' (SuDS).

Where run-off is draining from relatively low risk areas such as car-parks and non-operational areas, a source control approach, such as permeable surfaces or infiltration trenches, may offer a suitable means of treatment, removing the need for a separator.

Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, which may be present due to minor leaks from vehicles and plant, from accidental spillage.

Effluent from industrial processes and vehicle washing should normally be discharged to the foul sewer (subject to the approval of the sewerage undertaker) for further treatment at a municipal treatment works.

SEPARATOR STANDARDS AND TYPES

A British (and European) standard (EN 858-1 and 858-2) for the design and use of prefabricated oil separators has been adopted. New prefabricated separators should comply with the standard.

SEPARATOR CLASSES

The standard refers to two 'classes' of separator, based on performance under standard test conditions.

CLASS I

Designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets.

CLASS II

Designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies (for example where the effluent passes to foul sewer).

Both classes can be produced as full retention or bypass separators. The oil concentration limits of 5 mg/l and 100 mg/l are only applicable under standard test conditions. It should not be expected that separators will comply with these limits when operating under field conditions.

FULL RETENTION SEPARATORS

Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr.

On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems.

BYPASS SEPARATORS

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

FORECOURT SEPARATORS

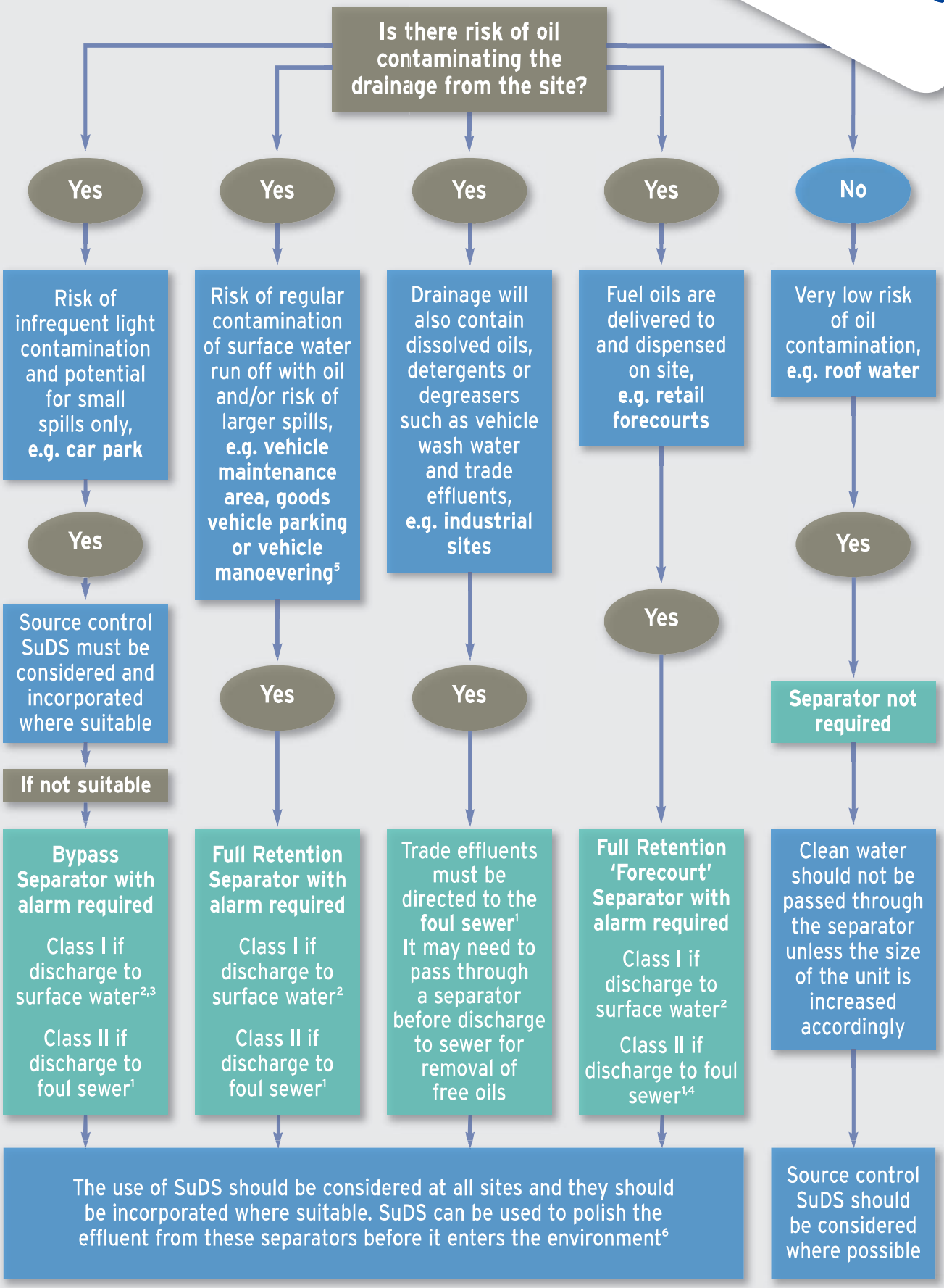
Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur on a petrol filling station. They are required for both safety and environmental reasons and will treat spillages occurring during vehicle refuelling and road tanker delivery. The size of the separator is increased in order to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

SELECTING THE RIGHT SEPARATOR

The chart on the following page gives guidance to aid selection of the appropriate type of fuel/oil separator for use in surface water drainage systems which discharge into rivers and soakaways.

For further detailed information, please consult the Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems' available from their website.

Klargester has a specialist team who provide technical assistance in selecting the appropriate separator for your application.



1 *You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.*
2 *You must seek prior permission from the relevant environmental body before you decide which separator to install.*
3 *In this case, if it is considered that there is a low risk of pollution a source control SuDS scheme may be appropriate.*
4 *In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.*
5 *Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.*
6 *In certain circumstances, a separator may be one of the devices used in the SuDS scheme. Ask us for advice.*

Bypass NSB RANGE

APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

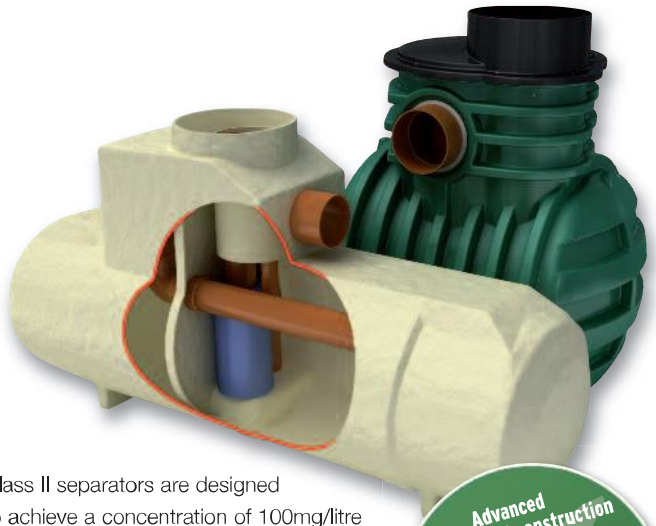
Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Klargester full retention separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Oil storage volume.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.



Class II separators are designed to achieve a concentration of 100mg/litre of oil under standard test conditions.

Advanced rotomoulded construction on selected models
- Compact and robust
- Require less backfill
- Tough, lightweight and easy to handle

FEATURES

- Light and easy to install.
- Class I and Class II designs.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped .
- The required discharge standard. This will decide whether a Class I or Class II unit is required.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m^2)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA. (mm)
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction *GRP chamber construction* ** Some units have more than one access shaft – diameter of largest shown.*

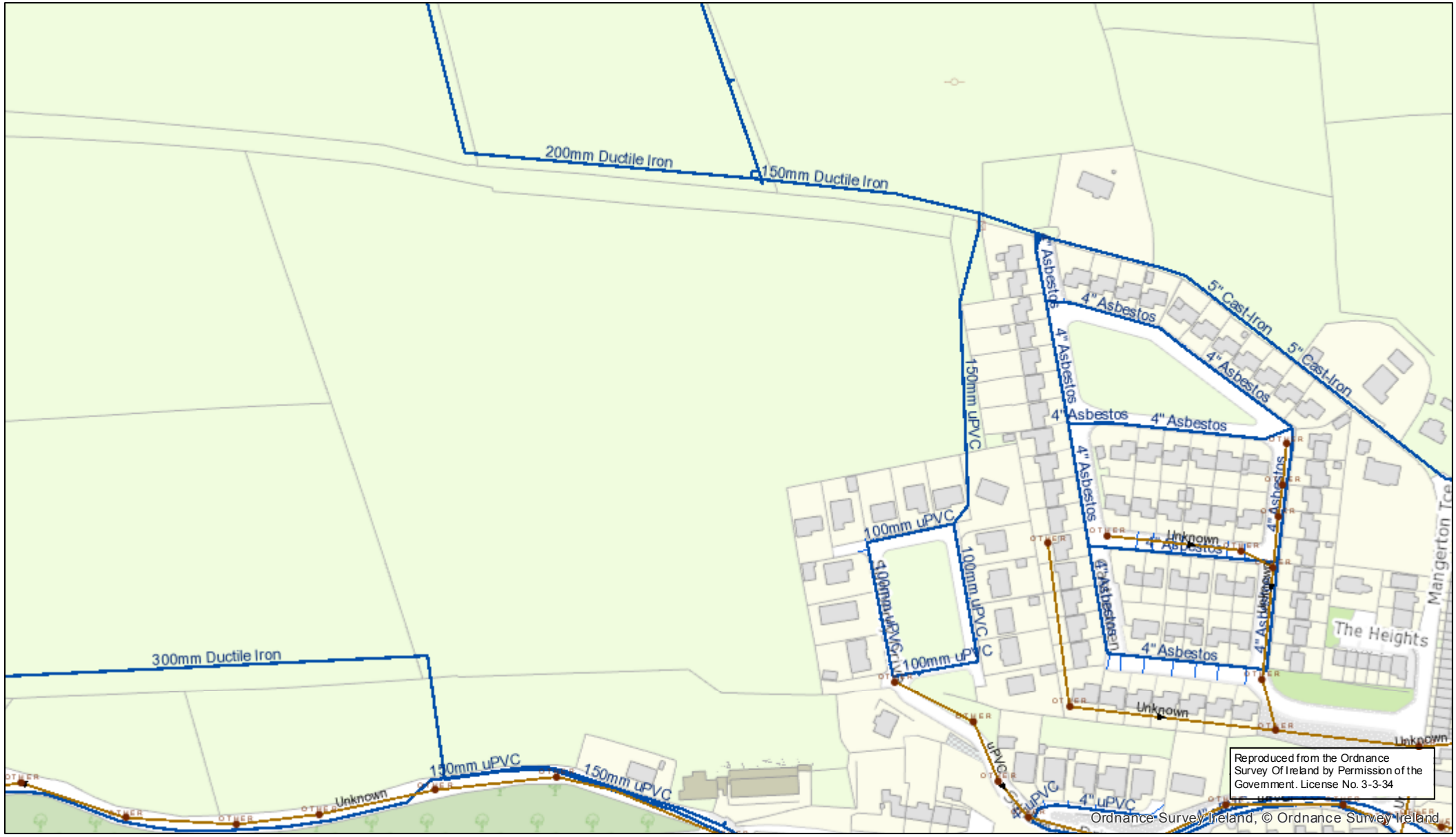
Appendix 4 - Irish Water Correspondence

Irish Water Web Map - 14th March 2017.

Irish Water Confirmation of Feasibility 24th March 2021.

Irish Water Statement of Design Acceptance 16th September 2021.

Irish Water Web Map



March 14, 2017

1:4,514

0 0.0375 0.075 0.15 mi

0 0.05 0.1 0.2 km

Legend

Gravity Main (Irish Water Owned)
- Surface

Gravity Main (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

UISCE ÉIREANN : IRISH WATER

Fachtna Sheehy

3 Saint Patricks Place
Bandon
Co. Cork

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

24 March 2021

Re: CDS21000522 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 145 unit(s) at Moncnapa, Blarney, Cork

Dear Sir/Madam,

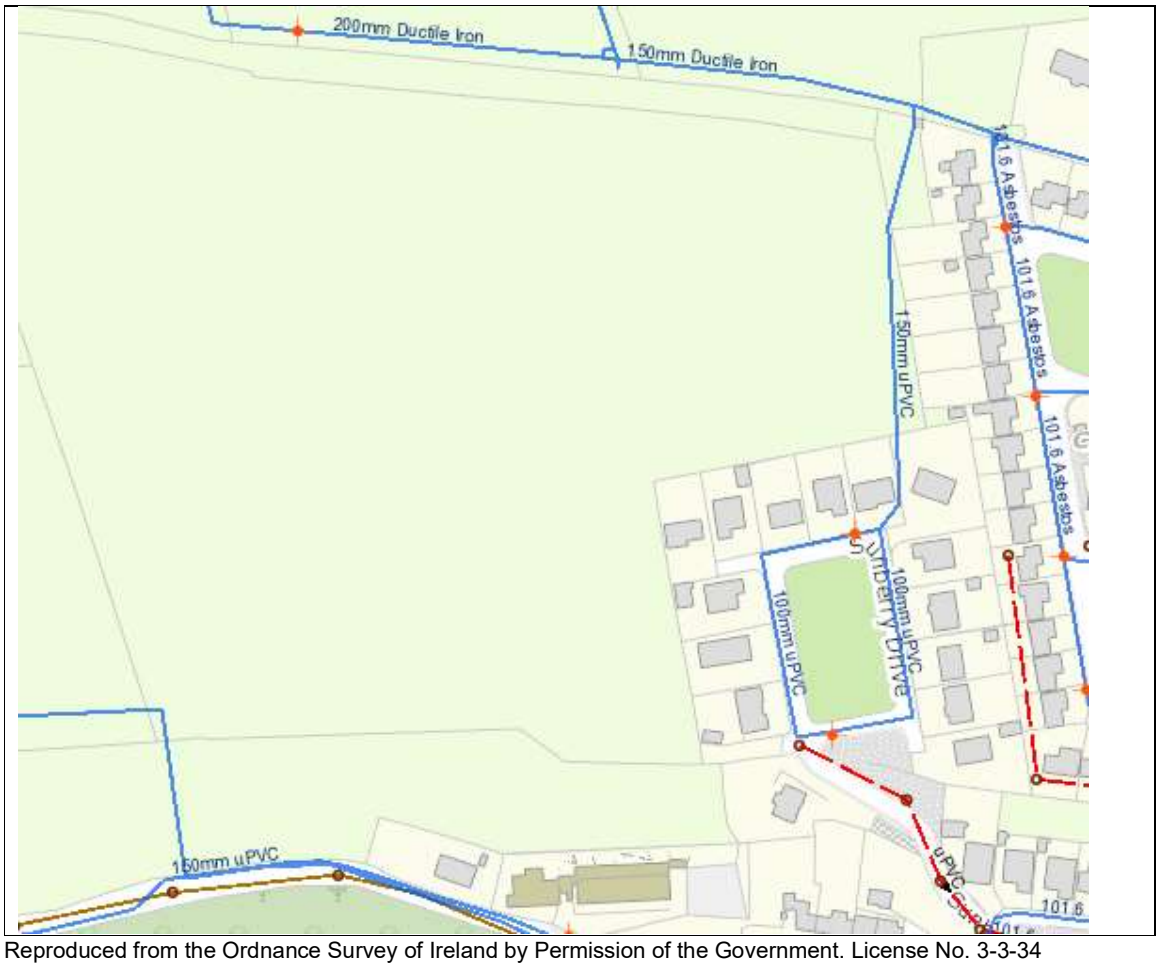
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Moncnapa, Blarney, Cork (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water 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 without infrastructure upgrade by Irish Water
SITE SPECIFIC COMMENTS	
Water Connection	The preferred connection point for water is the 150mm main running through the the north east of the site. The exact route of this pipe will have to be investigated on site. It will not be permitted to build over any Irish water infrastructure. The layout of the development must ensure that this pipe is protected and adequate separation distances are provided between Irish Water infrastructure and any structures on site. Alternatively you may enter into a diversion agreement with Irish Water and divert the pipe to accommodate your development. If you wish to proceed with this option please contact with Irish Water at Diversions@water.ie and submit detailed design drawings before submitting your planning application. It will be necessary to provide a wayleave over this pipe to the benefit of Irish Water and ensure that it is accessible for maintenance.
Wastewater Connection	Upgrades to the wastewater network (upsizing of approximately 320m of 150mm diameter sewer and upsizing of approximately 310m of 225mm diameter sewer) will be required to cater for this development. Further

	upgrades may be required to the trunk main further downstream from this. Exact upgrade requirements will be identified through an internal Irish Water modelling exercise which is ongoing. Irish Water currently does not have any plans to upgrade these sewers. Should you wish to proceed with a connection the network upgrade will be carried out by Irish Water and funded by you, the developer as part of the connection agreement.

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

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



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

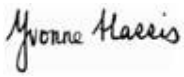
should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior 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 Brian O'Mahony from the design team on 022 52205 or email bomahony@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

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

Fachtna Sheehy
3 Saint Patricks Place
Bandon
Co. Cork

16 September 2021

Re: Design Submission for Moncnapa, Blarney, Cork (the "Development") (the "Design Submission") / Connection Reference No: CDS21000522

Dear Fachtna Sheehy,

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: Brian O'Mahony
Phone: 022 52205
Email: bomahony@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

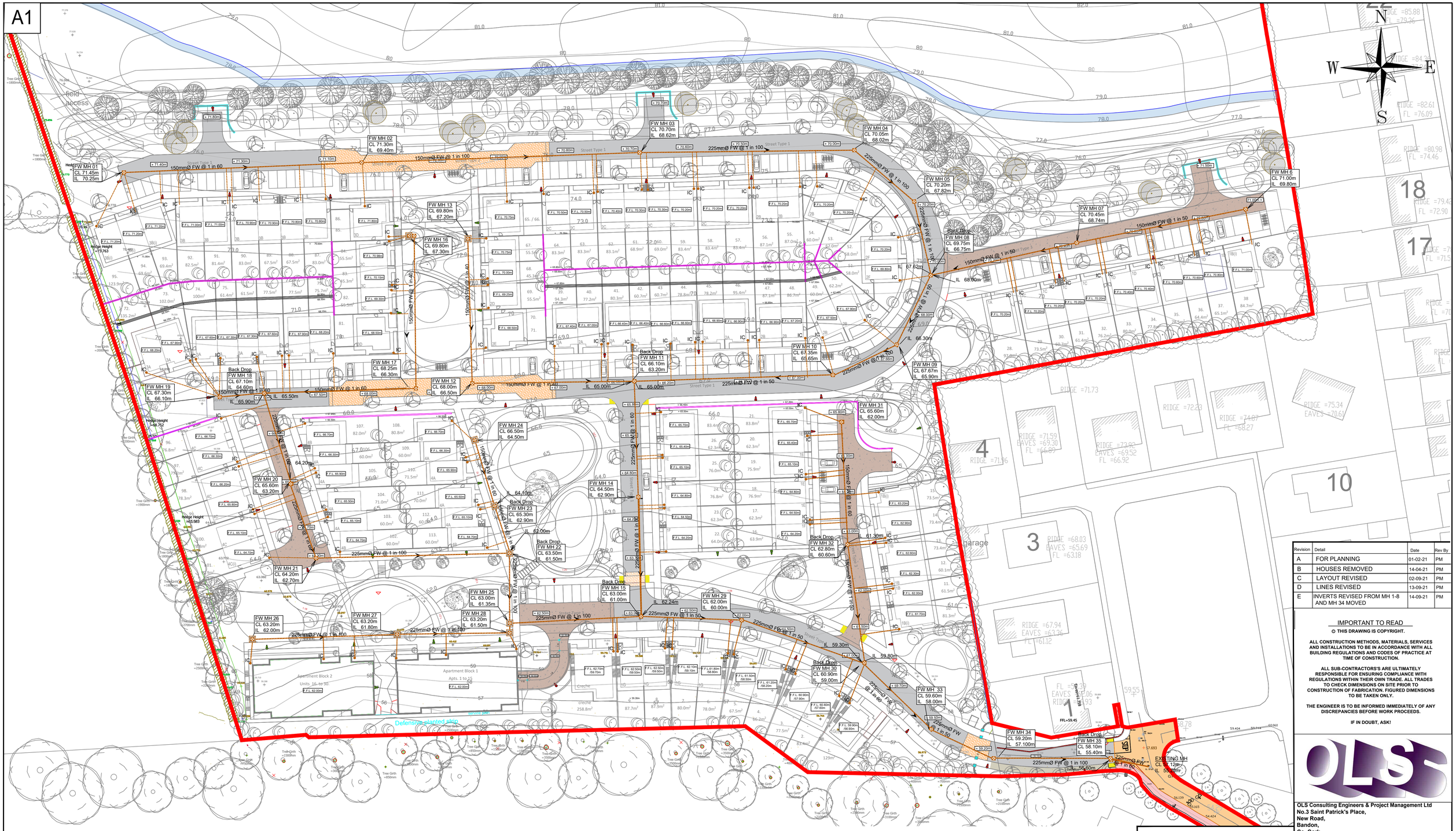
- [21017-PL08 E Site Plan Showing Foul Water Drainage A1 21017-PL09 C LONGITUDINAL SECTION & DETAIL OF FOUL WATER DRAINAGE A1]

- [21017-PL11 Rev-F Site Plan showing Water Main]

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

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

A1



SITE PLAN SHOWING SURFACE FOUL DRAINAGE
SCALE 1:500

Notes

1/ DRAINAGE TO BE INSTALLED IN ACCORDANCE SI NO. 272/2009 EUROPEAN COMMUNITIES ENVIRONMENTAL OBJECTIVE SURFACE WATERS) REGULATIONS 2009

2/ ALL DIMENSIONS ARE IN (mm.) UNLESS OTHERWISE NOTED. CONTRACTOR SHALL BE RESPONSIBLE FOR SETTING OUT JUNCTION BOXES, CHAMBERS, MANHOLES, GULLIES TO ENSURE NO CLASHES WITH SERVICE DUCTS AND PIPES.

3/ ALL LEVELS ARE IN METRES ABOVE DATUM UNLESS OTHERWISE NOTED.

4/ THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEER'S AND MANUFACTURERS' DRAWINGS AND SPECIFICATIONS.

5/ ALL PIPE DIAMETERS ARE NOMINAL. PIPES TO BE MINIMUM 1m FROM KERB & MANHOLES 500mm FROM KERB LINES

6/ THE CONTRACTOR MUST CONTACT THE RELEVANT AUTHORITIES PRIOR TO CONSTRUCTION WORK, AND SATISFY HIMSELF IN RESPECT TO THE LOCATION OF ALL EXISTING SERVICES.

7/ 600mm MAX. LENGTH ROCKER PIPES ARE TO BE PROVIDED ON SEWERS WHERE: (A). A PIPE ENTERS A MANHOLE OR PUMPING STATION. (B). A PIPE LEAVES A MANHOLE. (C). A PIPE ENTERS CONCRETE ENCASEMENT. (D). A PIPE LEAVES CONCRETE ENCASEMENT. (E). ANY OTHER LOCATION AS DIRECTED BY THE ENGINEER.

8/ ALL SEWER ROCKER PIPES ARE TO BE FORMED BY CUTTING AND TRIMMING A LENGTH OF SPIGOT & SOCKET PIPE TO FORM A SPIGOT AT THE CUT END, THEREBY FORMING SPIGOT & SOCKET JOINTS AT BOTH ENDS OF THE ROCKER PIPE.

9/ ALL PIPE RUNS BETWEEN ACCESS JUNCTIONS TO BE 100Ø, 1 IN 40 GRADIENT.

10/ WHERE SEWER PIPES, RISING MAINS OR ROAD GULLY DRAINS CROSS EXISTING ROADS, THE CONTRACTOR IS REQUIRED TO: (A). CONTACT THE RELEVANT AUTHORITIES PRIOR TO COMMENCING WORK. (B). MAKE GOOD THE EXISTING ROAD TO ITS ORIGINAL SPECIFICATION AS APPROVED BY THE ENGINEER.

11/ 600mm MAX LENGTH ROCKER PIPES ARE TO BE PROVIDED ON RISING MAINS WHERE: (A). THE MAIN LEAVES A PUMPING STATION OR VALVE CHAMBER. (B). THE MAIN ENTERS A MANHOLE OR VALVE CHAMBER. (C). A PIPE ENTERS CONCRETE ENCASEMENT. (D). A PIPE LEAVES CONCRETE ENCASEMENT. (E). ANY OTHER LOCATION AS DIRECTED BY THE ENGINEER.

12/ ABANDONED SEWER RUNS TO BE BROKEN OUT AND TRENCH/MANHOLES TO BE BACKFILLED WITH CLASS 15/20N LEAN MIX CONCRETE.

13/ WHERE PIPE RUNS PASS UNDER FOUNDATIONS, PIPE TRENCH TO BE BACKFILLED TO FORMATION LEVEL WITH CLASS 15/20 CONCRETE.

14/ ALL EXISTING MAIN SEWER RUNS TO BE JETTED TO REMOVE BLOCKAGE/DEBRIS.

15/ CCTV SURVEY TO BE CARRIED OUT ON ALL NEW DRAINAGE RUNS.

16/CONTRACTOR TO PROVIDE IL, PIPE DIAMETER AND DIRECTION OF FLOW IN EXISTING MANHOLE ON COMMENCEMENT OF THE WORKS TO DESIGN ENGINEER

17/ MINIMUM COVER TO FLEXIBLE PIPES 1200mm FOR ROADWAYS, 900mm FOR OPEN SPACES & FOOTPATHS NOT ADJACENT TO ROADS, 600mm FOR GARDENS WHERE MINIMUM COVER IS NOT ACHIEVED PLEASE REFER TO ENGINEER FOR PIPE PROTECTION DETAIL

18/ FOUL SEWER PIPE SPECIFICATION TO BE IN ACCORDANCE WITH SECTION 3.13.3 UNPLASTICISED PVC OF THE WASTEWATER CODE OF PRACTICE.
ALL FOUL INFRASTRUCTURE TO BE LAID IN ACCORDANCE WITHIRISH WATER CODE OF PRACTICE AND STANDARD DETAILS

19/ MANHOLES LOCATED IN SOFT LANDSCAPE GRASS AREAS TO BE SURROUNDED WITH 100mm DEEP CONCRETE 20mm AGGREGATE SIZE BEDDED IN CLAUSE 804 MATERIAL 200mm ALL AROUND

Legend

- New Polyethylene(PE) Foul water pipework
- New Foul water Manhole
- 200mm Concrete plinth around manholes in soft landscaped/grass areas
- Inspection chamber and 100mmØ branch (one per house)

Revision	Detail	Date	Rev By
A	FOR PLANNING	01-02-21	PM
B	HOUSES REMOVED	14-04-21	PM
C	LAYOUT REVISED	02-09-21	PM
D	LINES REVISED	13-09-21	PM
E	INVERTS REVISED FROM MH 1-8 AND MH 34 MOVED	14-09-21	PM

IMPORTANT TO READ

ALL CONSTRUCTION METHODS, MATERIALS, SERVICES AND INSTALLATIONS TO BE IN ACCORDANCE WITH ALL BUILDING REGULATIONS AND CODES OF PRACTICE AT TIME OF CONSTRUCTION.

ALL SUB-CONTRACTORS'S ARE ULTIMATELY RESPONSIBLE FOR ENSURING COMPLIANCE WITH REGULATIONS WITHIN THEIR OWN TRADE. ALL TRADES TO CHECK DIMENSIONS ON SITE PRIOR TO CONSTRUCTION OF FABRICATION. FIGURED DIMENSIONS TO BE TAKEN ONLY.

THE ENGINEER IS TO BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BEFORE WORK PROCEEDS.

IF IN DOUBT, ASK!

OLS Consulting Engineers & Project Management Ltd
No.3 Saint Patrick's Place,
New Road,
Bandon,
Co. Cork
P72 FK52
Tel: (023) 8843990
Email: info@olsconsultingengineers.ie
Web: www.olsconsultingengineers.ie

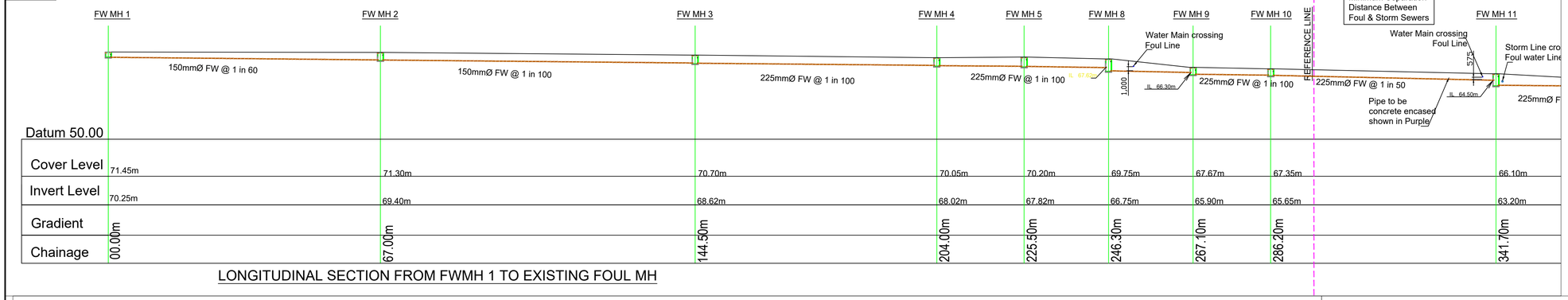
Client
EOIN SHEEHAN

Job Title
PROPOSED RESIDENTIAL DEVELOPMENT IN BLARNEY

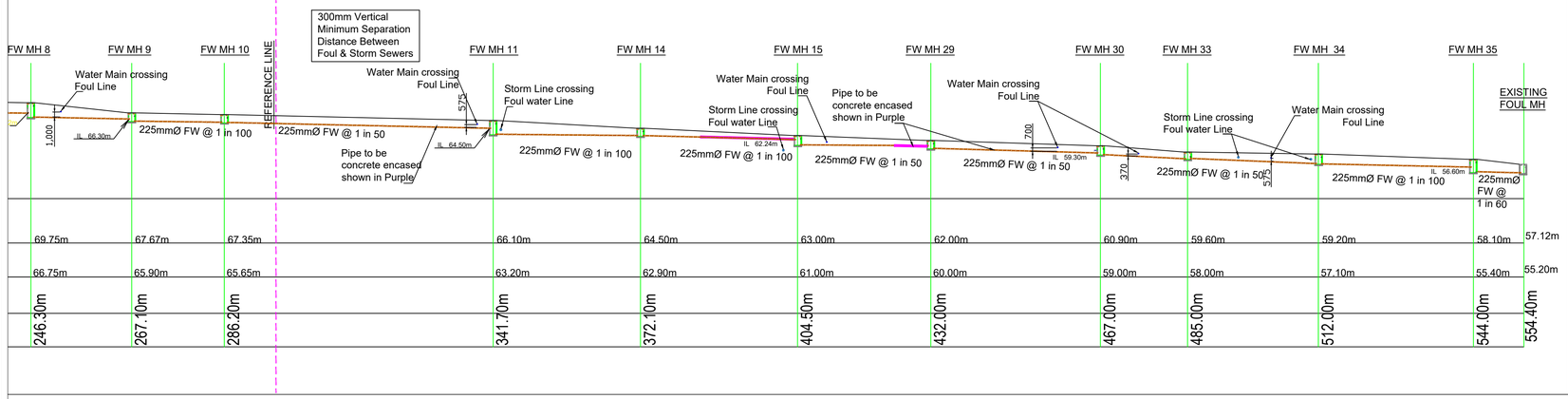
Drg. Title
SITE PLAN SHOWING FOUL WATER DRAINAGE

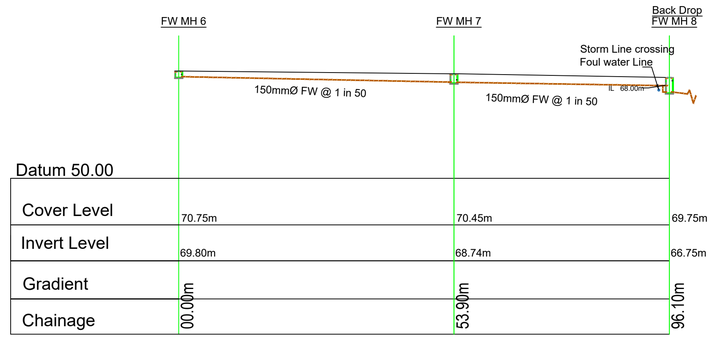
Date	Drawn	Drg No	Rev
01-02-21	PM	21017-PL08	E
Scale 1:500	Checked PM		

A1

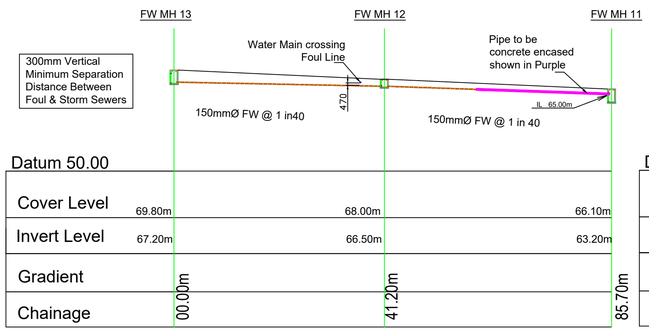


LONGITUDINAL SECTION FROM FWMH 1 TO EXISTING FOUL MH

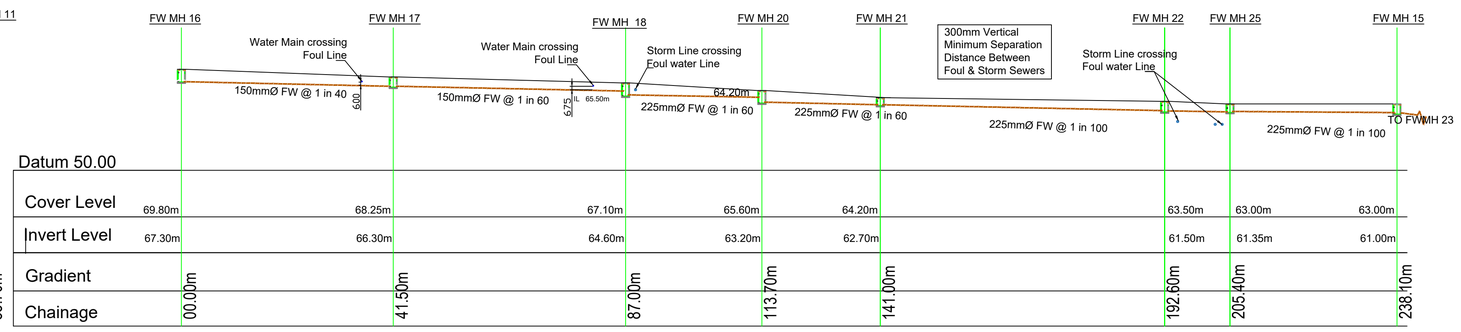




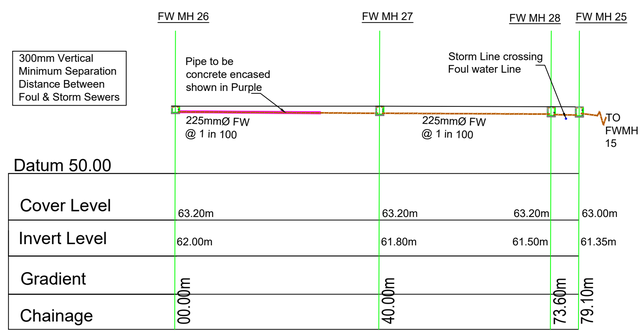
LONGITUDINAL SECTION FROM FWMH 6 TO FWMH 8



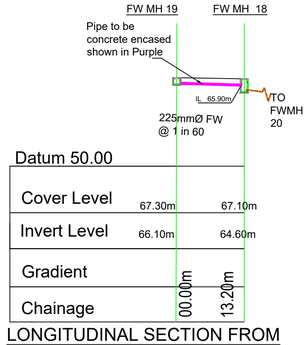
LONGITUDINAL SECTION FROM FWMH 13 TO FWMH 11



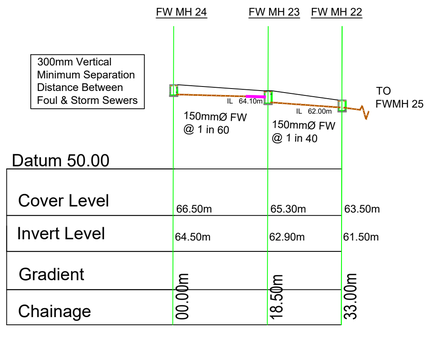
LONGITUDINAL SECTION FROM FWMH 16 TO FWMH 15



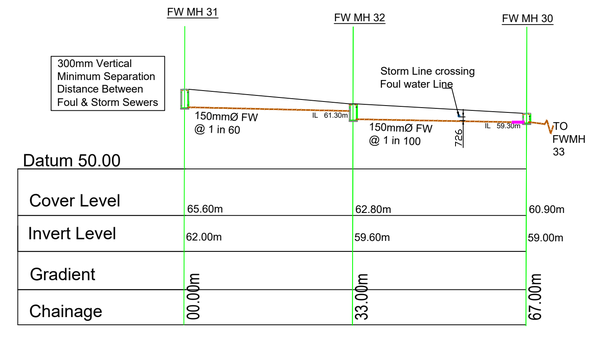
LONGITUDINAL SECTION FROM FWMH 26 TO FWMH 25



LONGITUDINAL SECTION FROM FWMH 19 TO FWMH 18



LONGITUDINAL SECTION FROM FWMH 24 TO FWMH 22



LONGITUDINAL SECTION FROM FWMH 31 TO FWMH 30

Revision	Detail	Date	Rev By
A	FOR PLANNING	01-02-21	PM
B	LAYOUT REVISED	02-09-21	PM
C	LINES REVISED	16-09-21	PM

OLS Consulting Engineers & Project Management Ltd
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Email: info@olsconsultingengineers.ie
Web: www.olsconsultingengineers.ie

Client: EOIN SHEEHAN

Job Title: PROPOSED RESIDENTIAL DEVELOPMENT IN BLARNEY

Drg. Title: LONGITUDINAL SECTION & DETAIL OF FOUL WATER DRAINAGE

Date	Drawn	Drg No	Rev
01-02-21	PM	21017-PL09	C

Scale: 1:500 | Checked: PM

A1

Legend

- Existing Water Main
- New Water Main
- 25mmØ OD Service Connection & Boundary box
- WM — Water Meter
- Sluice Valve
- H — Fire Hydrant
- Non return Valve
- Scour Chamber Valve
- Air Valve
- Marker Post and plate in accordance with STD-W-227

Notes

1. WATER MAIN LAYOUTS SHALL BE ARRANGED IN LOOPS OR RINGS SO AS TO AVOID "DEAD ENDS" OR TERMINAL POINTS. ALL MAINS SHALL TERMINATE IN A LOOP OR RING TO ACCOMMODATE ONE-DIRECTIONAL FLUSHING OF THE NETWORK. LOOPS SHALL HAVE A MINIMUM OF 4 HOUSES AND 1 HYDRANT.

2. THE MINIMUM PIPE SIZE SHALL BE 100mm INTERNAL DIAMETER IN HOUSING DEVELOPMENTS OF 40 AND UP TO 100 HOUSES. DEVELOPMENTS OF 100 HOUSES AND ABOVE SHALL HAVE A MINIMUM PIPE SIZE OF 150mm INTERNAL DIAMETER SPINE AND 100mm BRANCH MAINS. NOMINAL INTERNAL DIAMETERS OF 80mm AND LESS MAY BE ALLOWED IN SMALLER DEVELOPMENTS BUT NOT WHERE HYDRANTS ARE LOCATED AND ONLY AFTER PRIOR WRITTEN AGREEMENT FROM IRISH WATER

3. THE MINIMUM PIPE SIZE SHALL BE 150mm IN INDUSTRIAL OR COMMERCIAL DEVELOPMENTS.

4. EVERY PREMISE SHOULD HAVE A SEPARATE SERVICE CONNECTION. THE USE OF COMMON SERVICE PIPES IS NOT ALLOWED. SERVICE CONNECTIONS SHALL BE AS SHORT AS REASONABLY POSSIBLE. LONG SERVICE CONNECTIONS (IN EXCESS OF 15m) WILL NOT BE ALLOWED. A RIDER MAIN AT THE OPPOSITE SIDE OF THE ROAD TO THE MAIN WATER MAIN MAY BE REQUIRED SUBJECT TO APPROVAL FROM IRISH WATER. SERVICE CONNECTIONS SHALL BE A MINIMUM PIPE SIZE OF 25mm OUTSIDE DIAMETER, 20mm INTERNAL DIAMETER.

5. WATER MAINS SHOULD BE LAID TO PROVIDE THE OPTIMUM CIRCULATION IN THE LOCAL WATER NETWORK. WATER MAINS MAY TERMINATE IN A DEAD END ONLY WITH IRISH WATER APPROVAL IN WHICH CASE A DUCK-FOOT WASHOUT HYDRANT SHALL BE PROVIDED AT THE DEAD END, LOCATED WITHIN A CHAMBER OR KIOSK.

6. VALVES SHALL BE ARRANGED IN SUCH A MANNER TO ALLOW THE NETWORK TO BE MANAGED TO ENSURE THAT NO MORE THAN 40 PROPERTIES LOSE WATER FROM A BURST ON THE SYSTEM, AT ANY ONE TIME

7. NO DOMESTIC PROPERTY SHALL BE MORE THAN 46m FROM A HYDRANT. HYDRANT DETAILS AND LOCATIONS SHALL BE SUBJECT TO THE APPROVAL OF THE RELEVANT LOCAL AUTHORITY FIRE DEPARTMENT.

8. WATER SUPPLY MAINS SHALL BE LAID IN COMMON AREAS AND NOT THROUGH INDIVIDUAL PRIVATE GARDENS OR DRIVEWAYS ETC.

9. A THREE-WAY VALVE ARRANGEMENT SHALL BE PROVIDED AT ALL JUNCTIONS, AS A MINIMUM.

10. THE WATER MAIN PIPEWORK TO NEW DEVELOPMENTS SHOULD BE LOCATED AT THE RIGHT HAND SIDE OF THE ENTRANCE TO THE NEW DEVELOPMENT (FROM A VIEW FACING INTO THE DEVELOPMENT) IF POSSIBLE AND WHERE
THE PROPERTIES ARE EQUALLY AND REASONABLY DISTRIBUTED AT BOTH SIDES OF THE ESTATE ROADWAY.

11. AIR VALVES TO BE LOCATED AT POINTS WHERE AIR IS LIKELY TO BUILD UP.

12. THE DEVELOPER IS TO LIAISE WITH THE FIRE SERVICES AUTHORITY IN ORDER TO ENSURE FIRE FLOWS ARE AVAILABLE THROUGHOUT THE DEVELOPMENT.

13. ALL WATER MAIN PIPEWORK TO BE POLYETHYLENE IN ACCORDANCE WITH SECTION 3.13 OF THE WASTEWATER CODE OF PRACTICE OR APPROVED

14.ALL HOUSED TO HAVE 25mm OD PIPE WITH METER/BOUNDARY BOX FOR DETAIL SEE DRAWING 16175-PL04-2

15.BOOSTED SUPPLY SYSTEM WITHIN APARTMENT BLOCKS TO BE SUPPLIED WITH ISOLATION DEVICE USING A CONNECTION VIA AN UNRESTRICTED AIR-GAP DEVICE TO PREVENT BACKFLOW

SITE PLAN SHOWING WATERMAIN
SCALE 1:500

N W E S

MARKER POST & PLATES

CONNECTION BETWEEN PROPOSED AND EXISTING WATER MAIN

BULK FLOW METER WITH KIOSK

EXISTING 150mmØ WATER MAIN

MARKER POST & PLATE

SCOUR CHAMBER WITH SCOUR CHAMBER VALVE & NON RETURN VALVE CONNECTED SW SYSTEM IN ACCORDANCE WITH STD-W-30

SW MH 37

Revision	Detail	Date	Rev By
A	FOR PLANNING	01-02-21	PM
B	BOOSTER PUMPS ADDED & CONNECTION TO EXISTING REVISED	01-03-21	PM
C	HOUSES REMOVED	14-04-21	PM
D	LAYOUT REVISED	02-09-21	PM
E	LINES REVISED	13-09-21	PM
F	SLUICE VALVES ADDED TO LOOPS	14-09-21	PM

IMPORTANT TO READ

OLS Consulting Engineers & Project Management Ltd
No.3 Saint Patrick's Place,
New Road,
Bandon,
Co. Cork
P72 FK52
Tel: (023) 8843990
Email: info@olsconsultingengineers.ie
Web: www.olsconsultingengineers.ie

Client: EOIN SHEEHAN

Job Title: PROPOSED RESIDENTIAL DEVELOPMENT IN BLARNEY

Drg. Title: SITE PLAN SHOWING WATER MAIN

Date	Drawn	Drg No	Rev
01-02-21	PM	21017-PL11	F
Scale 1:500	Checked PM		

Appendix 5 –Irish Hydrodata Ltd. – Catchment Runoff Assessment

Document Ref. No. 1390-1/21

CATCHMENT RUNOFF ASSESSMENT

Lands at
Monacnapa,
Blarney.

ABP-310013-21

Prepared for:
OLS Consulting Engineers Ltd

Prepared by:
Irish Hydrodata Limited,
Ballygarvan,
Cork.

Ph. 021-4311255
e-mail: admin@hydrodata.ie

10th Sept 2021

CONTENTS

Revision History	Note	Date
1390-1/21	Document Issue	10/Sept/21

1. Introduction

Irish Hydrodata Limited (IHD) was commissioned by OLS to conduct a catchment runoff analysis for a site at Monacnapa, Blarney. Planning permission is being sought for a residential development on the site under the SHD process.

2. Local Terrain Data

The site is located on elevated lands with a southerly aspect. Terrain data for the site and wider area was obtained from BlueSky Ireland. Elevation points are available on a bare earth 5m x 5m DTM grid. The contoured data is shown in Figure 1.

A ground profile section along the northern boundary of the site is indicated in Figure 2.

3 Drainage Channels & Catchment Delineation

Stream and drainage pathways were identified during a site visit (Aug. 2021) and are indicated in Figure 3. There is one shallow drainage channel along the western boundary of the site. This does not appear to convey significant flows as the bed shows no erosional features. It was dry during the site visit. A larger drainage channel is located on the opposite side of the western boundary in the adjoining lands. It was observed to be conveying water. Both channels combine near the south western corner of the site and flow downhill to a culvert (0.6mΦ) under the Kilowen Road.

A drainage pipe enters this culvert from the west at the inlet. It is presumed to convey road and other runoff from areas to the west. The area directly contributing to this pipe is not fully clear. It was dry during the site visit.

Flow accumulation mapping was conducted on the terrain DTM data with QGIS. This indicated the flow pathways and areas of likely flow concentration based on the local terrain gradients (Figure 4).

The various local catchment areas were then identified and are shown in Figure 5. For the existing scenario, four sub-catchments drain to the culvert under the Kilowen road. The associated areas are indicated in Table 1. A large part of the proposed site does not contribute to the stream flow.

The proposed development will alter the local flow pathways. An interceptor channel will be provided within the site to prevent overland flows entering the built-up areas. This interceptor will divert collected water into the stream channel on the western boundary.

Runoff from the built-up areas will be collected by the surface water drainage network and attenuated. It will then be discharged to the western stream channel. The revised post development catchments are indicated in Figure 6.

4 Runoff Calculations

Runoff calculations for the various catchment areas have been undertaken with the UKSuDS web tool. The parameters used were:

- SAAR: 1179mm
- Soil Type: 2
- 1:100 Growth Curve: 1.95

The calculated flows for the existing and developed scenarios are included in Table 1.

	Catchment Area (Ha)	**Computed 1%AEP Flow**
Existing Scenario		
East Catchment - Area 1	4.5	
West Catchment - Area 2	4.8	
Lower Catchment - Area 3	0.5	
Combined Areas to Stream Channel	9.8	64.1 l/s
Contributing to Roadside Drain - Area 4	8.9	58.2 l/s
Combined flow at culvert		122.3
Developed Scenario		
East Catchment - Area A	2.5	
East Catchment - Area B	2.9	
West Catchment - Area 2	4.8	
Lower Catchment - Area 3	0.5	
Combined Area to Stream Channel	10.7	70.0 l/s
Draining to stream from SW network	attenuated	13.8 l/s
Contributing to Roadside Drain - Area 4	8.9	58.2 l/s
		142.0 l/s

Table 1 – Catchment Areas and Computed Flows

5 Closure

Based on the available DTM data it is calculated that the proposed development will increase the 1:100year peak flow at the Kilowen road culvert by about 20 l/s. The calculated peak flow post development is 142 l/s which is well below the culvert capacity of circa 400l/s.

J.F. Walshe BE,MEngSc,
Chartered Engineer, MIEI.

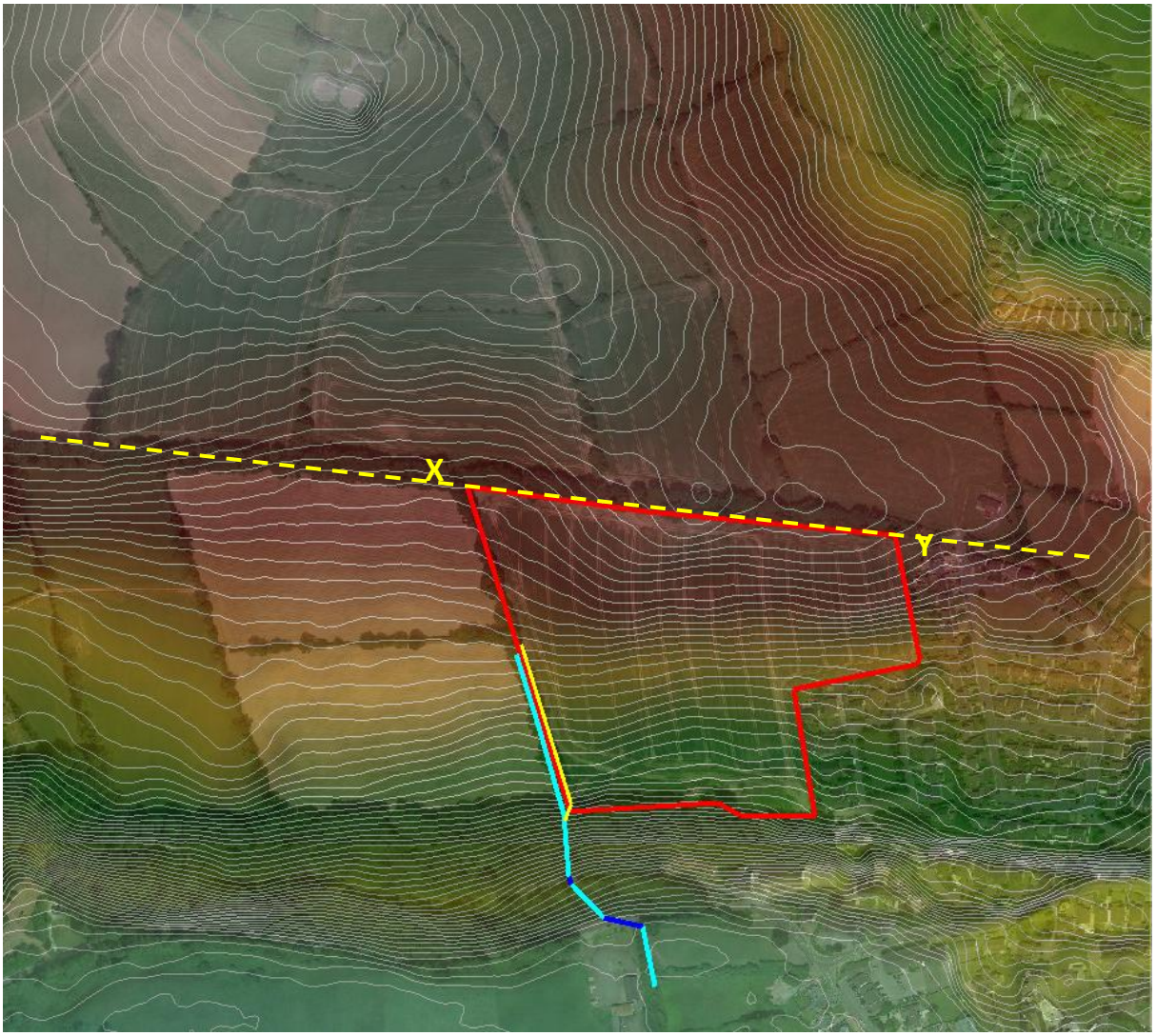


Figure 1 - Terrain & Contours (BlueSky DTM data)

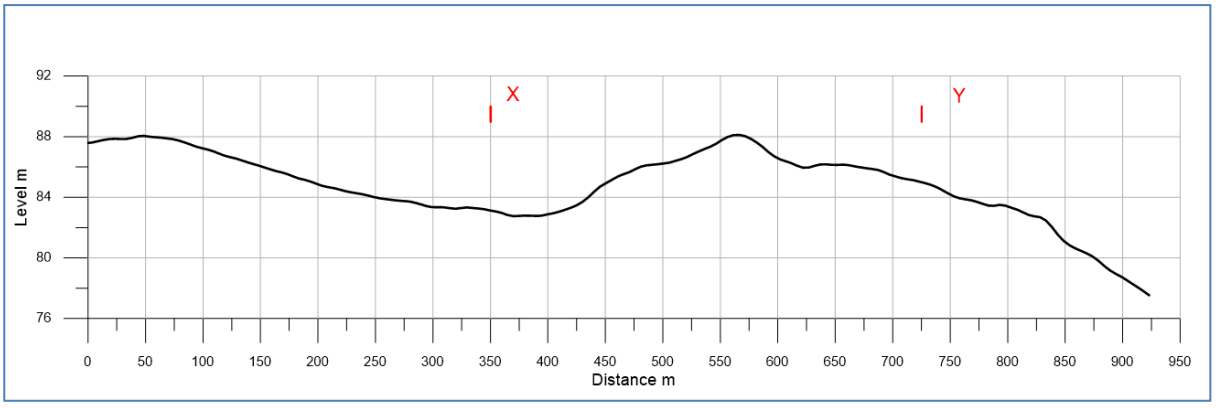


Figure 2 - Section along northern site boundary

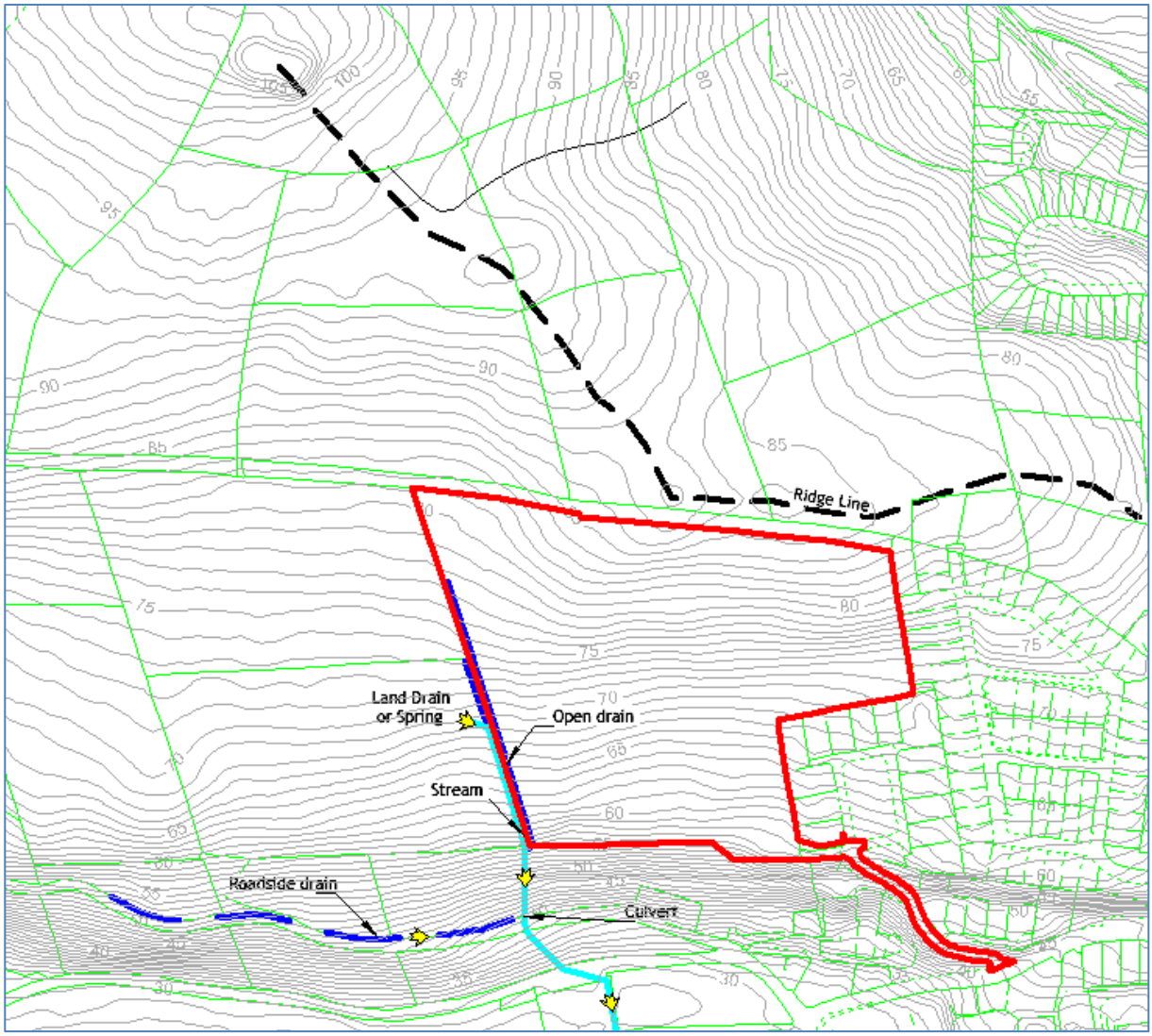


Figure 3 - Stream & drainage channels

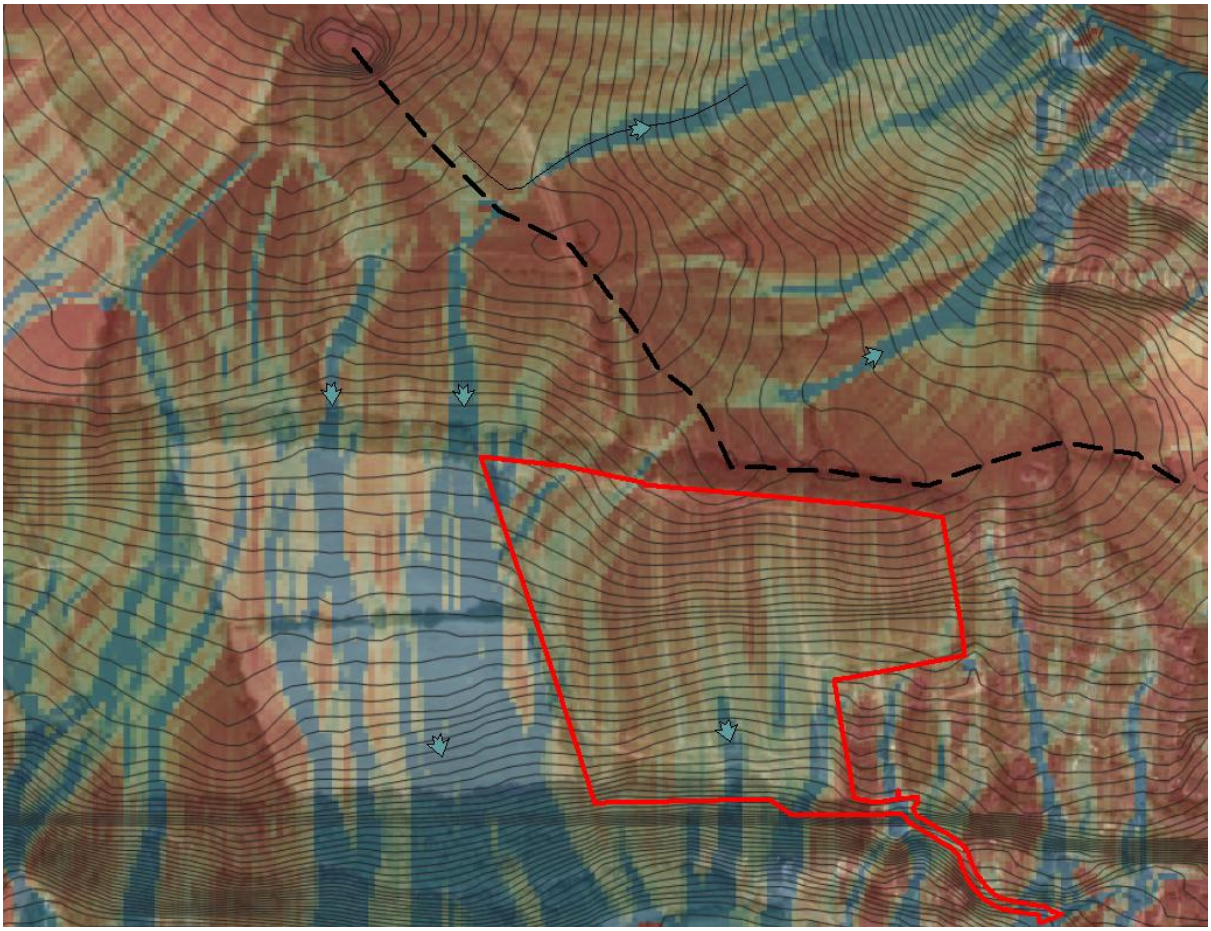


Figure 4 - Flow accumulation (areas of concentrated flow) based on DTM data analysis

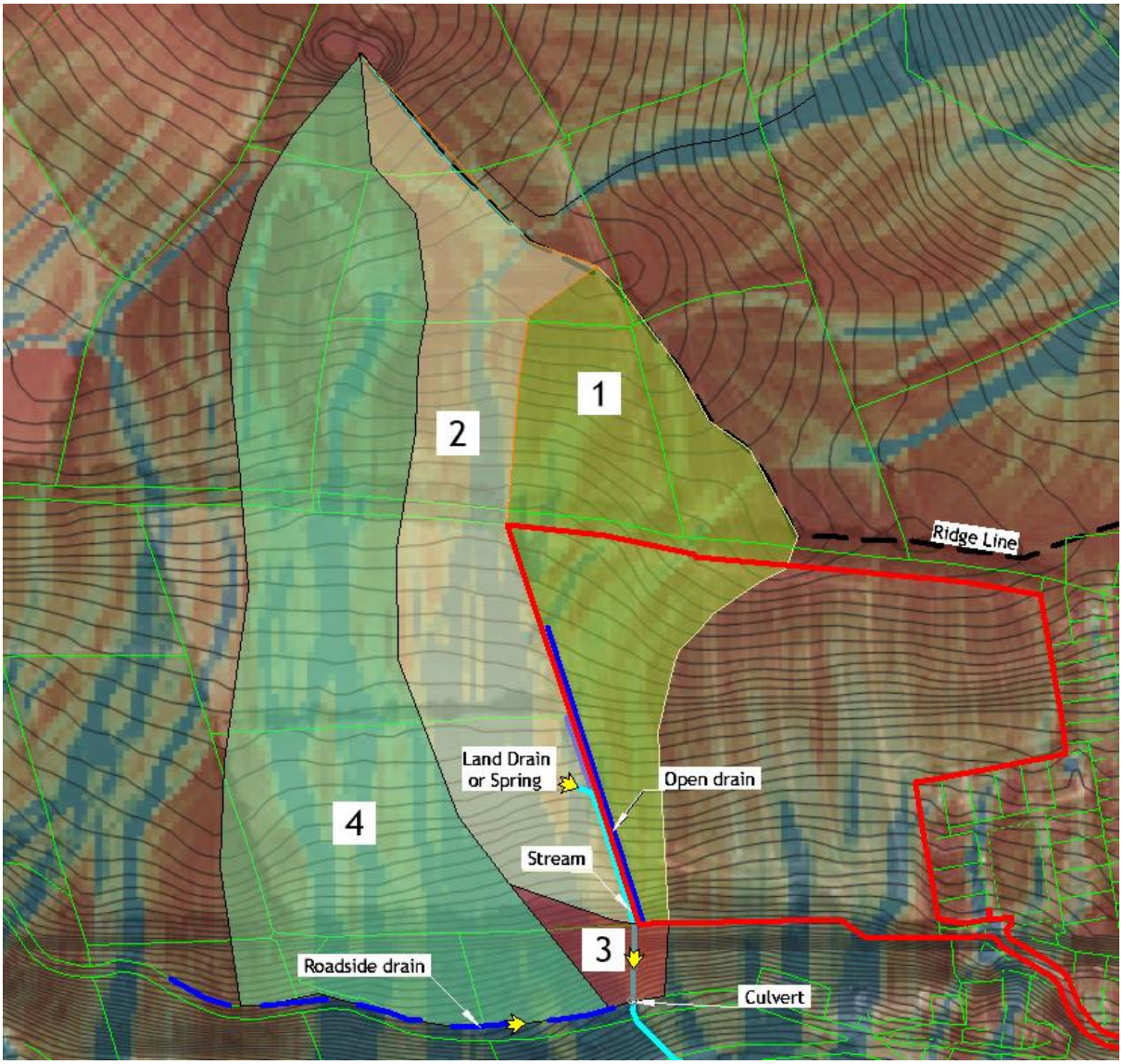


Figure 5 – Catchment Delineation - Existing Scenario

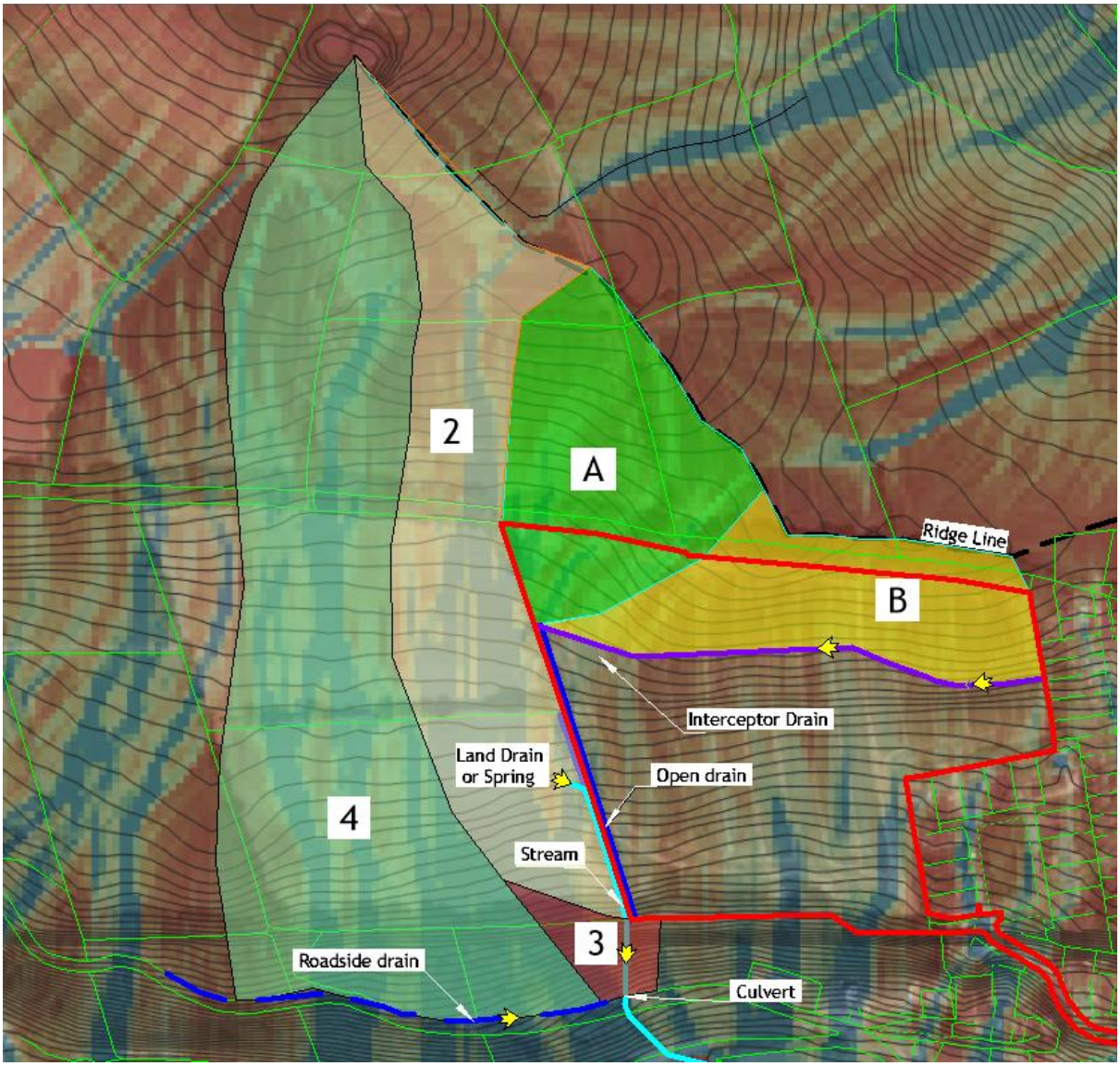


Figure 6 – Catchment Delineation - Developed Scenario

Appendix 6- ESB Networks Correspondence

NETWORKS

esbnetworks.ie

Rannán an Deisceart, Bandon, Co. Corcaigh, Éire
Fón 1850 372 757

Southern Division, Bandon, Co. Cork, Ireland
Phone 1850 372 757

08th July 2020

Fachtna Sheehy,
OLS Consulting Engineers
& Project Management Ltd.,
No.3 Saint Patrick's Place,
Bandon,
Co.Cork.

Re: Mr Eoin Sheehan,Sunberry Drive, Blarney, Co.Cork
Application for Relocation/Alteration to ESB Networks

To whom it may concern,

ESB Networks has received correspondence from OLS Consulting in relation to Electricial Network at Sunberry Drive, Monacnapa, Blarney, Co.Cork.

Once planning has been granted, ESB will engage with the Grantee regarding the Connection to the Network and potential Relocation of existing Substation.

If you have any further queries, please contact number below.

Yours sincerely

Barry O Sullivan
ESB Networks
Tel: 023 8842351

Appendix 7 – Priority Geotechnical Site Investigation Report

Our Ref: GH/Rp/P20149A

03rd December, 2021

OLS Consulting Engineers & Project Management Ltd.

No.3 Saint Patrick's Place,

Bandon,

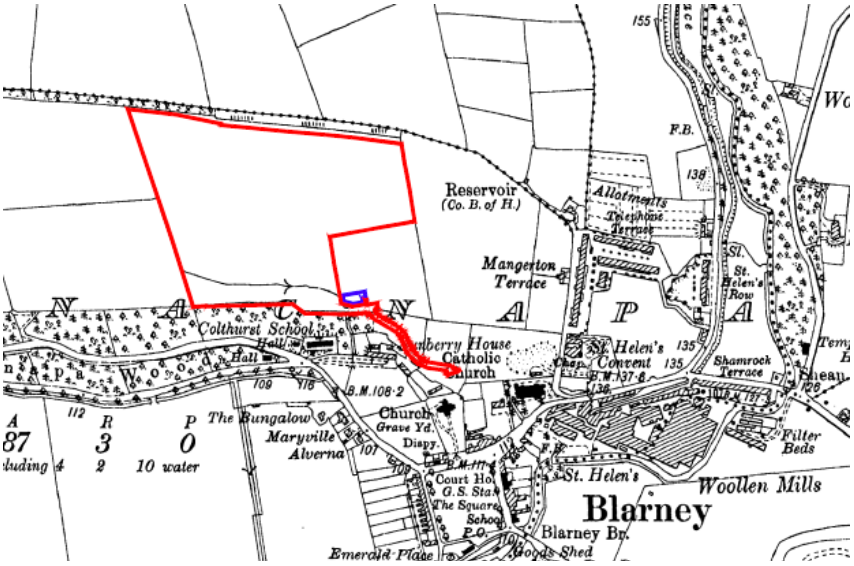
Co. Cork

P72 FK52

Re: Monacnapa, Social Housing Development, Blarney, Co. Cork. Ground investigation, Report.

Introduction

In March 2021, Priority Geotechnical (PGL) were requested by OLS on behalf of their Clien; Mr. E. Sheehan, to undertake a ground investigation as part of a planning application for a social housing development at Monacnapa, Blarney Co. Cork.



The purpose of the investigation is to establish the ground and groundwater conditions in order to inform the engineering design solutions for the proposed social housing development as part of the planning process.

The scope of the works as defined by OLS comprised of;

- 04Nr. Rotary boreholes;
- 06Nr. Trial pit excavations;
- 02Nr. BRE365 Soakaway tests;
- *In situ* standard penetration testing;
- Associated sampling;
- Laboratory testing; and
- Associated reporting.

Fieldworks

The fieldwork was carried out by PGL on the 11th March 2021 and again between the 13th and 14th May, 2021, in general accordance with, BS 5930 (2015) Code of Practice for Site Investigation and Part 9 of BS 1377 (1990), Method of Tests for Soil for Civil Engineering Purposes, *in situ* Tests. Details of the plant and equipment used are detailed on the relevant exploratory records, accompanying this report presenting the fieldworks records. This report should be read in conjunction with the accompanying exploratory records and laboratory test data.

Trial Pits

Six (6) trial pits were excavated to depths 2.0m below existing ground level (bgl) to 4.1m bgl using an 8t tracked excavator. The logs are accompanying this report and are discussed herein, noting there are no photographic records available for the trial pits.

Location	Final depth, m bgl	Remarks	
		Stability	Groundwater
TP01	2.9	Good	None encountered
TP02	4.1	Good	None encountered
TP03	2.0	Poor	None encountered
TP04	4.6	Good	None encountered
TP05	2.0	Moderate	None encountered
TP06	3.7	Good	None encountered

Boreholes

Four (4) rotary follow on borehole was drilled to depth 8.8m bgl to 17.5m bgl using PGL's Soilmec PSM8G Rig and 104mm diameter Symmetrex casing. The logs are accompanying this report and are discussed herein.

Location	Depth (m bgl)
RC01	8.8
RC02	12.0
RC03	17.5
RC04	15.0

Sampling

Fourteen (14) bulk disturbed samples (B), fourteen (14) small disturbed samples 9D) and 9.0lin.m of core were recovered from the exploratory holes in accordance with Geotechnical Investigation and Sampling – Sampling Methods and Groundwater Measurements (EN ISO 22475-1:2006).

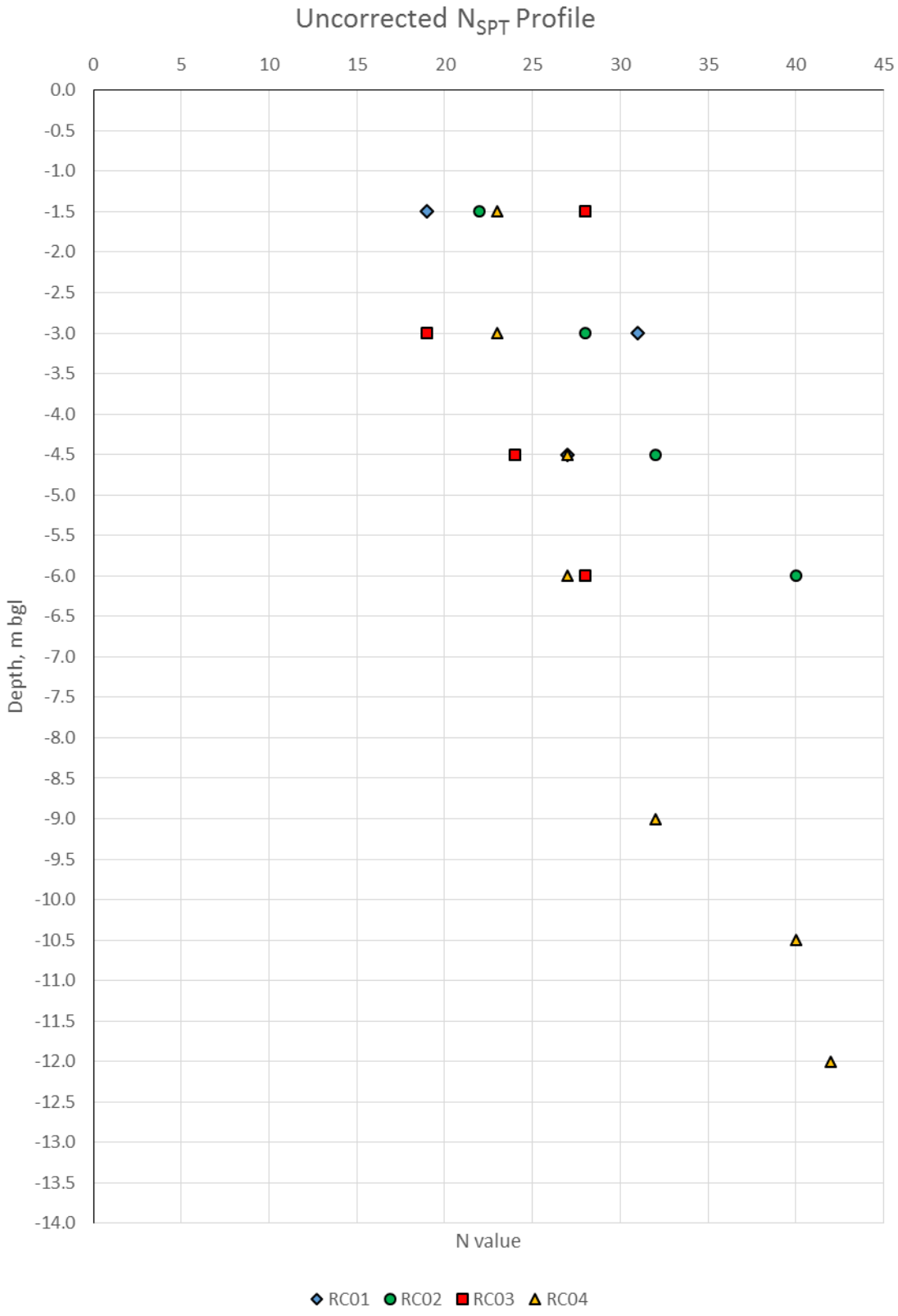
***In-situ* testing**

BRE365 Soakaway

Two (2) infiltration/ soakaway test was carried out at exploratory location TP05/ SA01 and TP03/SA02, in general accordance with BRE Digest 365, Soakaway Design (2003/ 2007). The data from the testing is presented accompanying the relevant exploratory records attached, herein Infiltration was determined over a single (1) drainage cycle at TP05 where there was an insufficient rate of drainage; two (2) cycles were achieved at TP03.

Standard penetration test

Thirty (30) standard penetration tests, were carried out in the rotary boreholes using the 60^{o} solid cone in place of the standard split barrel sampler in accordance with Geotechnical Investigation and Testing, Part 3 Standard penetration test, BS EN ISO 22476-3:2005+A1:2011. N_{SPT} values ranged from 19 to 42. The data is presented on the exploratory logs accompanying this report and are discussed herein.


Uncorrected N_{SPT} Profile
0
5
10
15
20
25
30
35
40
45
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
-5.5
-6.0
-6.5
-7.0
-7.5
-8.0
-8.5
-9.0
-9.5
-10.0
-10.5
-11.0
-11.5
-12.0
-12.5
-13.0
-13.5
-14.0
Depth, m bgl
N value
RC01
RC02
RC03
RC04

Laboratory Testing

Laboratory testing was scheduled by PGL and carried out in accordance with BS1377 (1990), Methods of test for soils for civil engineering purposes and the ISRM suggested methods for rock characterisation, testing and monitoring. Specialist chemical testing was undertaken by Eurofins Chemtest Ltd. (UK) on behalf of PGL. The laboratory data accompanied this factual report and was summarised as follows;

SUMMARY OF LABORATORY TESTING

Type	**Nr.**	**Remarks**
Natural Moisture Content	14	11% to 24%
Atterberg Limits	5	Liquid Limit, LL 23% to 46% Plastic Limit, PL 15% to 33% Plasticity Index, PI 8 to 13
Particle Size Distribution	5	2Nr. hydrometer analysis on fine soils
California bearing ratio, CBR	2	TP03 0.5m and TP06 0.5m **CBR0.3%**
pH	4	8.1 and 8.2
SO_4 acid soluble	4	<0.010%
SO_4	4	<0.010g/l

Please note that all samples shall be retained for a period no longer than 28 days from the date of this report. Thereafter all remaining samples shall be appropriately disposed of unless a written instruction to the contrary is received by PGL prior to the date of this reporting and within the 28 day period outlined above. Laboratory testing will result in a reduction of sample quantity and in some cased the use of the full sample mass. Samples already tested may not be suitable or available for further testing.

Survey and Drawings

The exploratory locations were selected by OLS and set out subject to work space restrictions and available access. The 'as constructed' exploratory locations were subsequently surveyed using Trimble V8 GPS equipment to the Ordinance Survey, Irish Transverse Mercator (ITM) system of co-ordinates and elevations to Malin Head datum. These locations are shown on the exploration location layout and plan (dwg. No. P20149-SI-A and P20149-SI-01) accompanying this report.

Location	Easting	Northing	Elevation, mOD Malin	Depth, m bgl	Date dd/mm/yyyy
RC01	560565.000	576184.000	75.800	8.8	13/05/2021
RC02	560763.968	576184.990	74.763	12.0	14/05/2021
RC03	560564.365	576083.264	64.353	17.5	13/05/2021
RC04	560715.581	576066.487	61.014	15.0	14/05/2021
TP01	560515.444	576192.105	75.504	2.9	11/03/2021
TP02	560607.972	576156.365	71.101	4.1	11/03/2021
TP03	560684.203	576188.030	75.024	2.0	11/03/2021
TP04	560793.354	576160.473	70.785	4.6	11/03/2021
TP05	560600.653	576077.068	62.368	2.0	11/03/2021
TP06	560690.947	576102.711	64.272	3.7	11/03/2021

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.

No groundwater was encountered within the boreholes or trial excavations during the period of works. Groundwater conditions observed are those relating to the period of the investigation. Borehole casing may cut off low volume flow in cohesive deposits. The groundwater regime should be assessed from standpipe well installations, where available. No standpipes were constructed.

Exploratory holes were backfilled with arisings.

 Arisings, backfill to boreholes.

Geotechnical review

The following geotechnical review provides an overview of the ground conditions encountered along with the characterisation of the deposits encountered. The following sections should be read in conjunction with the exploratory records accompanying this report.

The site was provisionally characterized geotechnical category GC-1.

> *Category 1 contains only small and simple structures. The fundamental requirements of EC7 may be satisfied only on the qualitative and experience geotechnical investigations. There is a negligible risk for life and property. The design of structures of this category requires person with appropriate comparable experience. Some examples of structures of category 1 are structures with maximum design column load 250kN and maximum design wall load of 100kN, retaining walls and excavation which does not exceed the 2m and small excavations for pipes and drainage (Orr and Farrell, 1999).*

Published Geology

A search of the Geological Survey Ireland (GSI) online mapping (100k) sheet 25 showed the area to be directly underlain by the Gyleen Formation (GY), described as Sandstone with Mudtsone and Siltstone. The Cuskinny Member (KNcu) lies to the south eastern corner of the site and is described by flaser bedded Sandstone and Mudstone. Outcropping bedrock is mapped 50m west and 500m east of the site. A search of the GSI well database (GSI wel ref: 1407SEW101 and 1407SEW078) described bedrock at 1.8m and 3.3m 550m north of the site. Groundwater vulnerability indicated extreme vulnerability indicative of shallow bedrock to the northern extent of the site becoming moderate towards the southern extent indicative of deeper bedrock. A search of the GSI well database (GSI well ref: 1407SEW127 and 1407SEW128) described bedrock at 3.0m and 8.0m 520m south of the site and possibly deeper than 22.9m (GSI well ref: 1407SEW127). Teagasc subsoil mapping indicated the area was underlain by glacial till derived from Devonian Sandstones (TDSs). Non-carboniferous surface bedrock (RckNCa) was mapped immediately south of the site. Alluvial deposits were noted south of the site.

Ground model

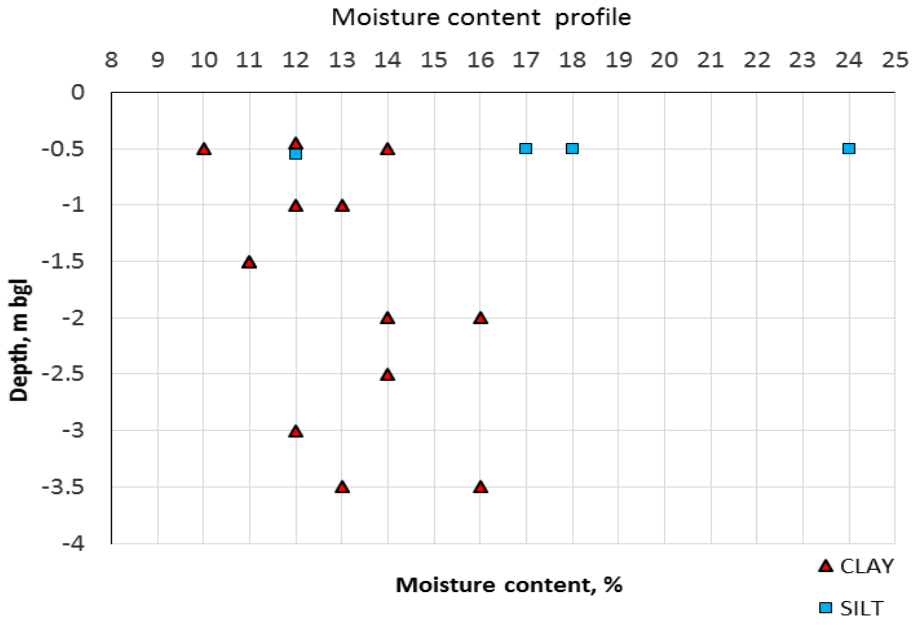
The current conceptual ground model was such that: Topsoil 100mm to 400mm thick overlay soft to firm slightly sandy gravelly SILT to a depth 0.8m, below existing ground level to 1.8m bgl. Below this firm becoming stiff mixed glacial deposits slightly sandy gravelly CLAY with medium to high Cobble content were encountered to depths between 5.6m bgl (RC01) and 14.5m bgl (RC03). Stiffness increased with depth. Medium strong SILTSTONE was encountered below the CLAY deposits 5.6m bgl to 8.9m bgl (RC01 and RC02); medium strong SANDSTONE was encountered 14.5m bgl at RC03. There was no bedrock encountered within 15.0m bgl at exploratory hole location, RC04.

No groundwater was encountered.

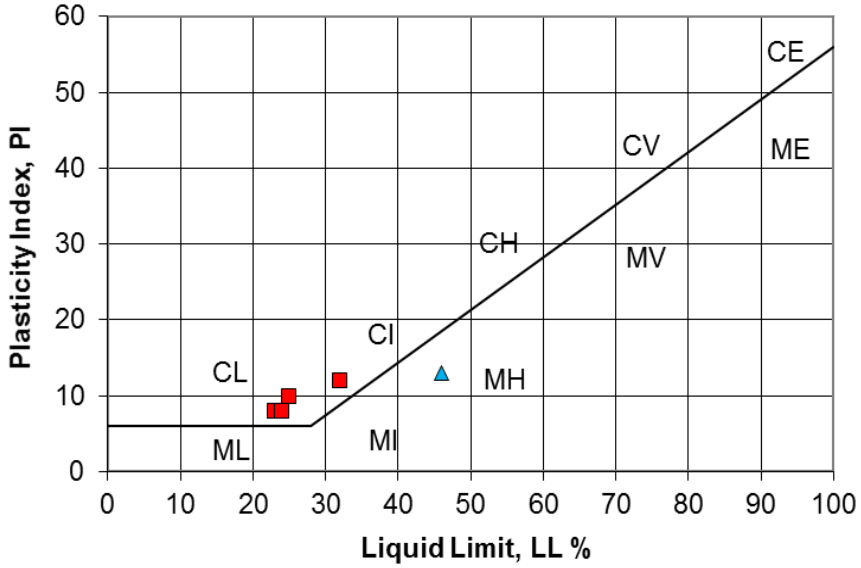
Characteristic properties

The upper shallow SILT deposits were characterised by natural moisture content 12% to 24% and intermediate plasticities (MI). Grading analysis indicated 44% Gravel fraction (content); 27% Sand fraction and 29% Silt fraction.

The underlying mixed glacial CLAY deposits were characterised by natural moisture content 10% to 16% and low plasticities (CL). Grading analysis indicated 25% to 49% Gravel fraction (content); 19% to 31% Sand fraction and 32% to 44% Clay fraction; with Cobble content(s).

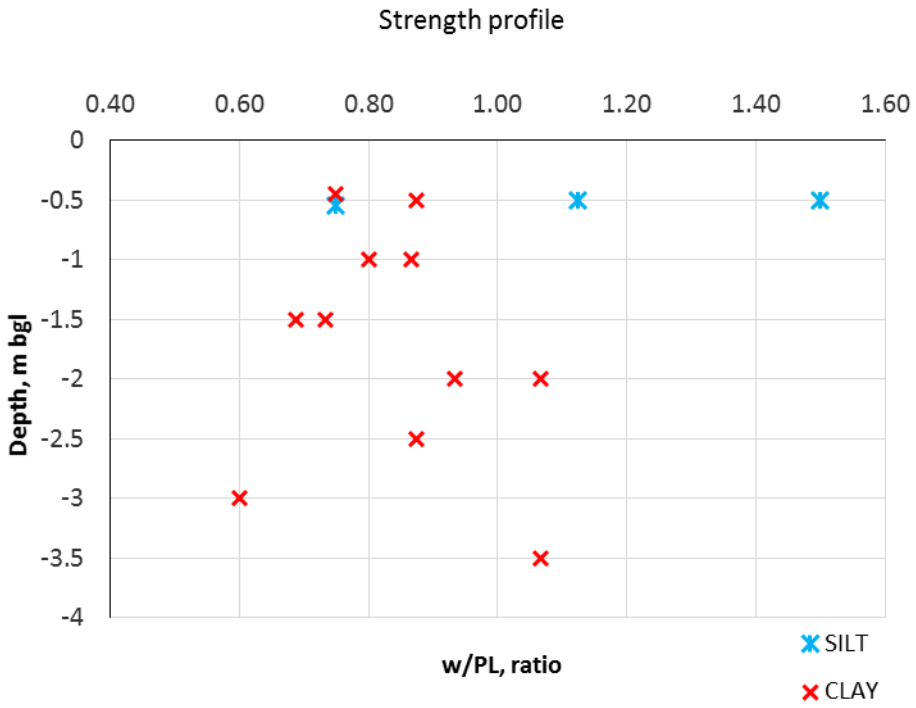


Summary of plasticity data



A basic review of the moisture content, *w* data indicated natural moisture content, *w* to plastic limit, PL ratio; *w*/PL ranged from 0.75 to 1.50 for the SILT deposits. This was indicative of firm (w/PL<1.0) and soft (w/PL>1.2) deposits (C504 Engineering in glacial tills, figure 5.19). Undrained shear strength of 20kPa to 75kPa can be expected (BS5930, 1999). Tactile assessment described soft to firm deposits.

A review of the moisture content, *w* data indicated natural moisture content, *w* to plastic limit, PL ratio; *w*/PL ranged from 0.69 to 1.07 for the CLAY deposits. This was indicative of stiff (w/PL<0.7) and firm (w/PL<1.2) deposits (C504). Undrained shear strength of 40kPa to 150kPa can be expected (BS5930, 1999). Tactile assessment described soft to firm and stiff deposits.



Undrained shear strength was assessed as follows:

Cu (kPa) = f_1 x N_{SPT};

where f_1 a function of plasticity (Stroud, 1974)

A factor f_1 of 4.5 has been provided for the SILT deposits (MI), where PI 30. A factor f_1 of 5.5 has been provided for the CLAY deposits (CL), where PI 8 - 12.

There were no N_{SPT} values associated with the shallow SILT deposits.

It is recommended to undertake dynamic probing to fully assess the shallow deposits for detailed design.

With equivalent standard penetration test N_{SPT} values of 14 to 42 undrained shear strenghts of 105kPa to >150kPa are expected of the mixed glacial deposits. Elevated values are assumed associated with coarse inclusions.

Friction ϕ for cohesive deposits was assessed where;

$$\phi^o = 43 - 10 \times \log_{10}(I_P)$$ (*Ladd et al, 1977*).

Plasticity data indicated a $\phi = 28^o$ for the SILT (MI) deposits.

Plasticity data indicated a $\phi = 32^o$ to 34^o for the CLAY (CL) deposits.

Bulk densities were assessed as follows:

Soil Unit Weight(s):

Cohesive: $\gamma_{sat} = 16.8 = N_{SPT} \times 0.15$ (kN m^{-3})

Unit weights of 19.65kPa to 23.00kPa are provided for the mixed glacial,CLAY deposits, with a median value of 20.85kPa.

Elastic modulus was provided as follows:

E (kPa) = Cu x 600 PI <20 (Bowles, 1997)

Elastic modulus E_{CLAY}, of 63MPa is considered for the mixed glacial CLAY deposits.

Given the depth to the rockmass it is not expected to interact with the SILTSTONE and SANDSTONE and so no futher assessment has been made at this, the planning stage.

Foundations

It is not recommended to found within soft SILT deposits.

A suitable bearing strata has been identified within the stiff mixed glacial, CLAY deposits.

A presumed allowable bearing value (presumed bearing resistance) of 75kNm^{-2} (kPa) to 150kPa is expect of firm CLAY deposits (BS8004, Code of practice for foundations, 1986, Table 1); a presumed allowable bearing value (presumed bearing resistance) of 150kPa to 300kPa is expect of stiff CLAY deposits (BS8004).

Table 1 — Presumed allowable bearing values under static loading

NOTE These values are for preliminary design purposes only, and may need alteration upwards or downwards. No addition has been made for the depth of embedment of the foundation (see 2.1.2.3.2 and 2.1.2.3.3).

Category	Types of rocks and soils	Presumed allowable bearing value		Remarks
		kN/m^2 [a]	kgf/cm^2 [a] tonf/ft^2	
Rocks	Strong igneous and gneissic rocks in sound condition	10 000 4 000	100 40	These values are based on the assumption that the foundations are taken down to unweathered rock. For weak, weathered and broken rock,
	Strong limestones and strong sandstones	3 000	30	
	Schists and slates	2 000	20	
	Strong shales, strong mudstones and strong siltstones			
Non-cohesive soils	Dense gravel, or dense sand and gravel	> 600	> 6	Width of foundation not less than 1 m. Groundwater level assumed to be a depth not less than below the base of the foundation. For effect of relative density and groundwater level,
	Medium dense gravel, or medium dense sand and gravel	< 200 to 600	< 2 to 6	
	Loose gravel, or loose sand and gravel	< 200	< 2	
	Compact sand	> 300	> 3	
	Medium dense sand	100 to 300	1 to 3	
	Loose sand	< 100	< 1	
		Value depending on degree of looseness		
Cohesive soils	Very stiff boulder clays and hard clays	300 to 600	3 to 6	Group 3 is susceptible to long-term consolidation settlement (see 2.1.2.3.3). For consistencies of clays, see Table 5
	Stiff clays	150 to 300	1.5 to 3	
	Firm clays	75 to 150	0.75 to 1.5	
	Soft clays and silts	<75	<0.75	
	Very soft clays and silts	Not applicable		
Peat and organic soils		Not applicable		
Made ground or fill		Not applicable		

[a] 107.25 kN/m^2 = 1.094 kgf/cm^2 = 1 tonf/ft^2.

Taking the following empirical relationship for allowable bearing capacity;

$$Qall\ (kPa) = N_{SPT} \times 10 \text{ (Terzaghi and Peck, 1967)}$$

with a settlement up to a maximum of 25mm;

for a 95th percentile N_{SPT} = 19, a design allowable bearing resistance of 150kPa is considered.

For shallow strip foundations within the CLAY deposits; an ultimate bearing resistance of 475kPa is consider for an undrained shear strength of 104kPa having allowed for a partial factor of safety 1.4 at a depth D at least 1.2m bgl (D/B 1.33; bearing capacity factor N_C = 6.4, Skempton, 1951).

Low plasticity (CL) was indicative of low compressibility.

For shallow strip foundations, the maximum depth of influence of foundation loading is 1.5m below the foundation (Burland and Burbidge, 1985). Using coefficients of vertical displacement μ_0 and μ_1 and Elastic stiffness a predicted settlement for the CLAY

deposits of 0.022mm/kPa was predicted for shallow foundations, D = 1.2m bgl and B = 0.9m having allowed for a geometric adjustment for strip foundation L/B.

It is recommended to undertake plate loading tests to fully assess the mixed glacial deposits for detailed foundation design.

An allowable bearing resistance of 150kPa is considered for settlement <10mm in the stiff CLAY deposits for shallow strip foundations a minimum 0.9m wide at depths at least below 1.2m bgl.

Some over excavation to the stiff deposits can be expected within the site.

Pavement

Plasticity data PI = 8, 12 at depths to 1.0m bgl suggested California bearing ratio, CBR2.5% to CBR4.5% (TRRL 889 Black and Lister, 1979; DN-PAV-03021). The ratio of natural moisture content *w*, to plastic limit (C504) suggested varied: >CBR2% in the upper 1.0m for the CLAY and <CBR2.0% in the SILT. The low CBR was assumed associated with elevated moisture contents in the SILT.

Laboratory determined CBR values of CBR0.3% were measured in the upper 1.0m.

Subject to the proposed road/ hardstanding levels capping thickness of 400mm to 600mm with 150mm sub base is required for hardstanding and pavement in accordance with Tii DMRB Vol 7 Pt 2A, TD25-26/1- Figure 4.1. In accordance with TD25-26/1 3.24 with a <CBR2.5% some form of improvement is required; over excavation of the soft SILT deposits shall be considered or the localised use of bi-axial geogrids; subject to the pavement vertical alignment and proposed formation levels.

A drainage system shall be provided a minimum of 600mm below formation (underside of capping).

Groundwater

A particle size d_{10} = 0.001 was measured in the CLAY deposits; yielding an estimated permeability 1.0 x $10^{-8}ms^{-1}$ (Hazen, 1911), describing low permeability CLAY, mixed glacial deposits.

Infiltration viability may be given full consideration where an infiltration coefficient of magnitude 10^{-5} ms^{-1} or greater exists (SUDS Manual C753, 2015). Suitability for the construction of a soakaway to control surface (storm) water will be dependent on the area to be drained and the size of the proposed soakaway or available plan area for the soakaway.

Infiltration coefficients of 1.51 x $10^{-6}ms^{-1}$ (TP05) and 1.32 x $10^{-5}ms^{-1}$ (TP03) were measured at soakaway locations.

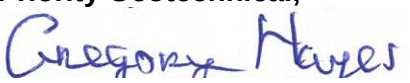
Chemical

pH (8.1 and 8.2) and sulphate (<0.010g/l; <0.010%) data indicated a design class DS-1 for the glacial tills in accordance with BRE digest for concrete in aggressive ground. There are no special requirements with regard to concrete mix design.

Location		TP01	TP01	TP04	TP05
Depth	**m bgl**	0.5	1.5	3.5	0.5
Moisture	**%**	17	11	13	9.6
pH	**-**	8.1	8.2	8.1	8.1
Sulphate (2:1 Water Soluble) as SO_4	**g/l**	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	**%**	< 0.010	< 0.010	< 0.010	< 0.010

Should there be any queries in relation to the data collected, please do not hesitate to contact our office.

Yours sincerely,
For **Priority Geotechnical,**



Greg Hayes BE MEngSc CEng MIEI
Geotechnical Specialist

No responsibility or liability 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. The scope of the works has been defined by others. Additional works and further observations may form part of a more detailed investigation. This report may be subject to change where further information becomes available.

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.

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

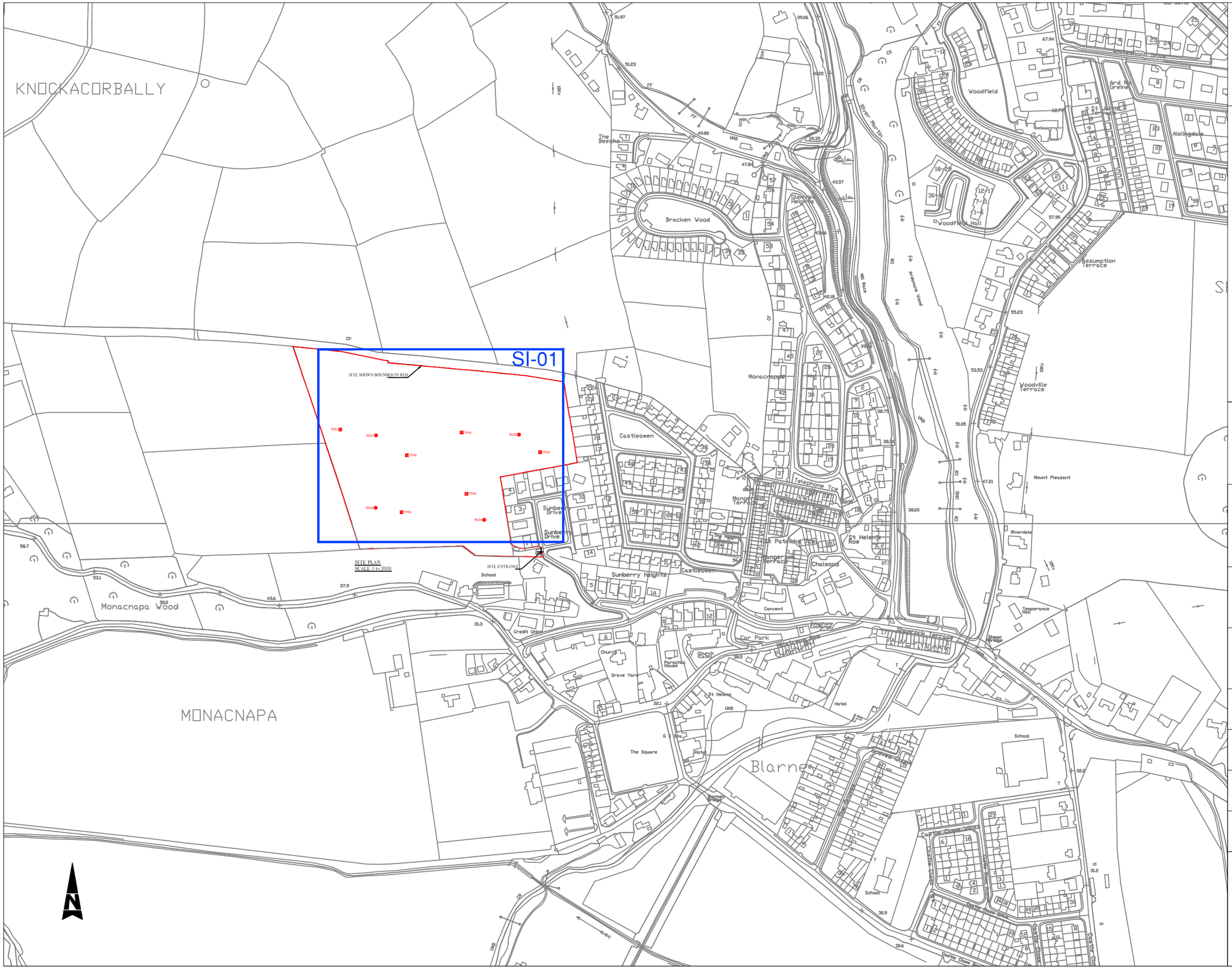
S	Standard Penetration Test - split barrel sampler
C	Standard Penetration Test - solid 60^o cone
SW	Self Weight Penetration
Ivp, HVp (R)	In Situ Vane Test, Hand Vane Test (R) demonstrates remoulded strength
K(F), (C), (R), (P)	Permeability Test
HP	Hand Penetrometer Test

MEASURED PROPERTIES

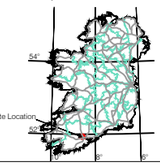
N	Standard Penetration Test - blows required to drive 300mm after seating drive
x/y	Denotes x blows for y mm within the Standard Penetration Test
x*/y	Denotes x blows for y mm within the seating drive
c_u	Undrained Shear Strength (kN/m^2)
CBR	California Bearing Ratio

ROTARY DRILLING SIZES

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



Priority Geotechnical Site



JOB NAME:

Monacnapa,
Blarney,
Co. Cork.

Sheet Title:

EXPLORATORY LOCATION LAYOUT

JOB NUMBER:

P20149A

DRAWING NUMBER:

P20149A-SI-A

DRAWN BY:

Gary Curtin

DATE:

24/11/2021

SCALE:	APPROVED:
1:5000 ON A3	GH

REVISION:

D01

SITE SHOWN BOUNDED IN RED

TP01

RC01

TP03

RC02

TP02

TP04

TP06

RC03

TP05

RC04

4

3

Sunber
Drive

Sunber
Drive

KEY:

TP00 Denotes Trial Pit location

RC00 Denotes Rotary Core location

JOB NAME:

Monacnapa,
Blarney,
Co. Cork.

Sheet Title:

EXPLORATION LOCATION PLAN

JOB NUMBER:

P20149A

DRAWING NUMBER:

P20149A-SI-01

DRAWN BY:

Gary Curtin

DATE:

24/11/2021

SCALE:

1:1000 ON A3

APPROVED:

GH

REVISION:

D01

pgl priority geotechnical

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: GW Logged By: RD	Borehole No. **RC01** Sheet 1 of 2

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560565E - 576184N	**Hole Type** RC
Location: Blarney, Cork		**Level:** 75.80 m OD	**Scale** 1:50
Client: Mr. Eoin Sheehan		**Dates:** 13/05/2021 13/05/2021	

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
		N=19 (3,3/4,5,5,5) (C)								Driller described: Stiff sandy gravelly Clay.
		N=31 (5,6/7,7,8,9) (C)					2.70	73.10		Driller described: Medium dense Gravel.
		N=27 (5,4/5,7,7,8) (C)					4.00 4.10	71.80 71.70		Driller described: Boulder. Driller described: Stiff gravelly Clay.
		~~50 (25 for 0mm/50 for 0mm)~~ (C)					5.60 5.80	70.20 70.00		Driller described: Rock - Assumed Siltstone.
		5.80 - 7.30	50mm 200mm 120mm	100	73	13	10/m			Lithology: Moderately strong green SILTSTONE. Weathering: Core is relatively fresh. Clay smearing 6.00m, 6.40m and 7.30m. Brown black orange oxidation discolouration of some fracture surfaces.
		7.30 - 8.80	40mm 400mm 110mm 70mm 250mm 150mm	100			5/m 9/m			Fractures: Set 1 dipping 70 degrees, undulated rough, close to wide spacing. Set 2 dipping 50 degrees, undulated rough fracture surfaces, medium to wide spacing. Set 3 dipping 30 degrees, stepped rough, close to wide spacing. Step 4 dipping 20 to 45 degrees, stepped rough, wide spacing. Detail: Thin layer of weak rock at 6.20m bgl. Rock showing cross and lamellar bedding. Grain size increasing with depth
							8.80	67.00		

Groundwater:

Struck (m bgl)	Level (m bgl)	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
8.80	76	131

Equipment: Soilmec PSM

Method: Compressed air

Remarks:

Borehole terminated at 8.80m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	13/05/2021 08:00	0.00	Start of shift.
	13/05/2021 18:00	8.80	End of borehole.

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: GW Logged By: RD	Borehole No. **RC01** Sheet 2 of 2

Project Name:	Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:**	560565E - 576184N	**Hole Type** RC
Location:	Blarney, Cork		**Level:**	75.80 m OD	**Scale** 1:50
Client:	Mr. Eoin Sheehan		**Dates:**	13/05/2021	13/05/2021

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Lithology: Moderately strong green SILTSTONE. Weathering: Core is relatively fresh. Clay smearing 6.00m, 6.40m and 7.30m. Brown black orange oxidation discolouration of some fracture surfaces. Fractures: Set 1 dipping 70 degrees, undulated rough, close to wide spacing. Set 2 dipping 50 degrees, undulated rough fracture surfaces, medium to wide spacing. Set 3 dipping 30 degrees, stepped rough, close to wide spacing. Step 4 dipping 20 to 45 degrees, stepped rough, wide spacing. Detail: Thin layer of weak rock at 6.20m bgl. Rock showing cross and lamellar bedding. Grain size increasing with depth to a fine grained Sandstone. End of Borehole at 8.800m

10 11 12 13 14 15 16 17 18

Groundwater:

Struck (m bgl)	Level (m bgl)	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
8.80	76	131

Equipment:	Soilmec PSM
Method:	Compressed air

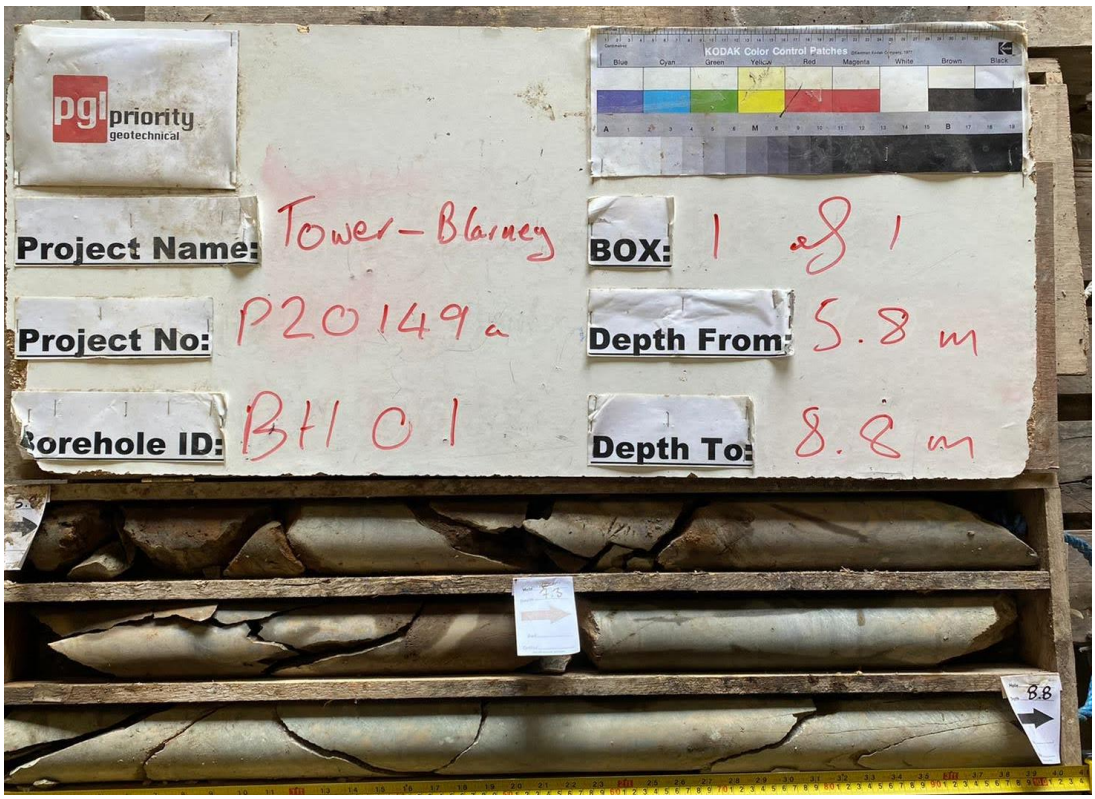
Remarks:

Borehole terminated at 8.80m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
	13/05/2021 08:00	0.00	Start of shift.
Dry	13/05/2021 18:00	8.80	End of borehole.

Photographic Record



Number:	**RC01**	**Project**	Monacnapa, Blarney	
		Project No	P20149A	
		Engineer	OLS	

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: GW Logged By: RD	Borehole No. **RC02** Sheet 1 of 2

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560764E - 576185N		**Hole Type** RC
Location: Blarney, Cork		**Level:** 74.76 m OD		**Scale** 1:50
Client: Mr. Eoin Sheehan		**Dates:** 14/05/2021	14/05/2021	

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
							0.30	74.46		Driller described: TOPSOIL.
							1.30	73.46		Driller described: Gravelly Clay.
		N=22 (4,5/4,4,6,8) (C)								Driller described: Stiff sandy Gravelly Clay.
		N=28 (6,7/7,7,6,8) (C)								
							3.80	70.96		Stiff light brown slightly sandy gravelly CLAY. Sand fine to coarse, Gravel fine to coarse angular - sub-rounded, mixed lithology.
		N=32 (7,8/8,9,8,7) (C)								
		N=40 (6,8/8,9,10,13) (C)								
		34 (6,8/34 for 105mm) (C)								
							8.90	65.86		
							9.00	65.76		

Groundwater:

Struck (m bgl)	Level (m bgl)	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
12.00	76	131

Equipment: Soilmec PSM

Method: Compressed air

Remarks:

Borehole terminated at 12.00m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	14/05/2021 08:00	0.00	Start of shift.
	14/05/2021 18:00	12.00	End of borehole.

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Project Name:	Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560764E - 576185N	**Hole Type** RC
Location:	Blarney, Cork		**Level:** 74.76 m OD	**Scale** 1:50
Client:	Mr. Eoin Sheehan		**Dates:** 14/05/2021	14/05/2021

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
		0 (47 for 105mm/0 for 0mm) (C) 9.00 - 10.50	30mm 150mm 80mm	87	36	15				Driller described: Rock (Assumed Siltstone). Lithology: Weak to moderately weak grey brown SILTSTONE. Weathering: Core is highly weathered. Core is highly fractured from 10.00m to 10.25m, 10.50m to 10.70m, 11.20m to 11.60m and 11.80m to 12.00m. Clay smearing on all fracture surfaces. Oxidation discolouration of fracture surfaces. Fractures: Set 1 dipping 70 degrees, stepped smooth, close to medium spacing. Set 2 dipping 50 degrees, undulated smooth, close to medium spacing. Set 3 dipping 0 to 20 degrees, undulated smooth, medium spacing. Detail: Core is showing lamellar bedding.
		10.50 - 12.00	30mm 160mm 60mm	100	27	0				
							12.00	62.76		End of Borehole at 12.000m

10 11 12 13 14 15 16 17 18

Groundwater:

Struck (m bgl)	Level (m bgl)	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
12.00	76	131

Equipment: Soilmec PSM

Method: Compressed air

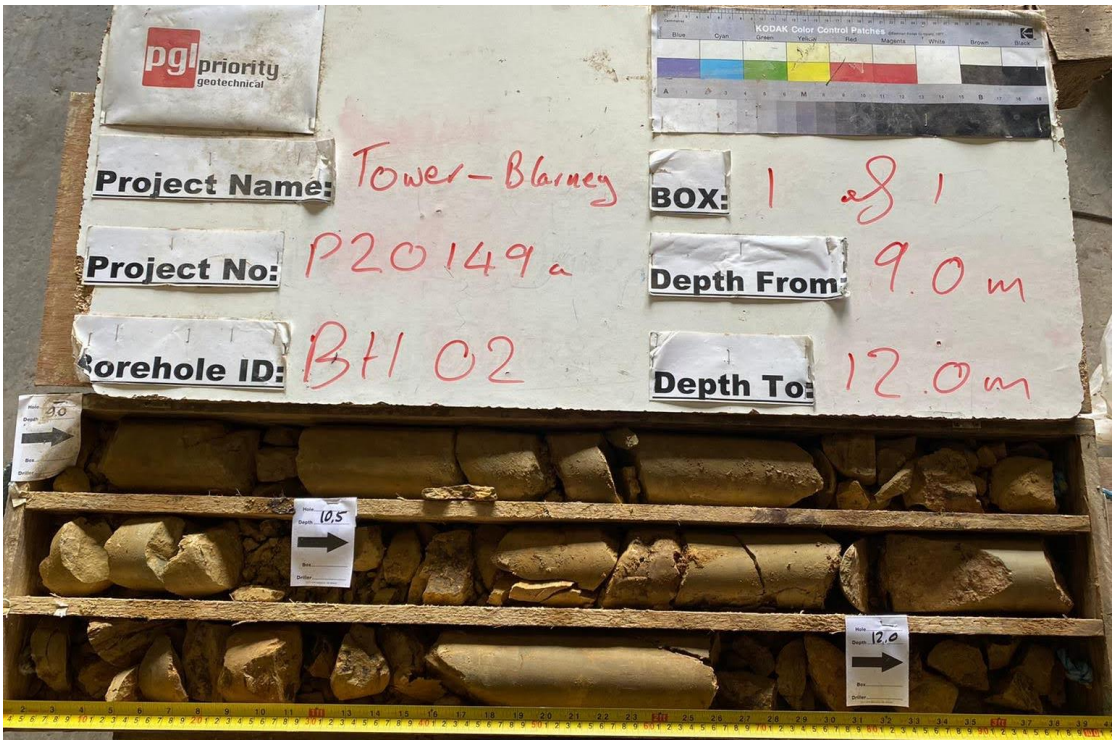
Remarks:

Borehole terminated at 12.00m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	14/05/2021 08:00	0.00	Start of shift.
	14/05/2021 18:00	12.00	End of borehole.

Photographic Record



Number:	**RC02**	**Project**	Monacnapa, Blarney	
		Project No	P20149A	
		Engineer	OLS	

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: GW Logged By: RD	Borehole No. **RC03** Sheet 1 of 3

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560564E - 576083N		**Hole Type** RC
Location: Blarney, Cork		**Level:** 64.35 m OD		**Scale** 1:50
Client: Mr. Eoin Sheehan		**Dates:** 13/05/2021	13/05/2021	

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
							0.20	64.15		Driller describes: (TOPSOIL)
										Driller describes: stiff sandy gravelly CLAY.
		N=28 (6,6/7,6,7,8) (C)								
		N=19 (4,5/4,5,5,5) (C)								
		N=24 (5,6/6,6,6,6) (C)								
		N=28 (4,5/7,7,7,7) (C)								
		N=72 (5,4/72 for 275mm) (C)								
							9.00	55.35		

1 2 3 4 5 6 7 8 9

Groundwater:

Struck (m bgl)	Level (m bgl)	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
17.50	76	131

Equipment: Soilmec PSM

Method: Compressed air

Remarks:

Borehole terminated at 17.50m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	13/05/2021 08:00	0.00	Start of shift.
	13/05/2021 18:00	17.50	End of borehole.

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: GW Logged By: RD	Borehole No. **RC03** Sheet 2 of 3

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560564E - 576083N	**Hole Type** RC
Location: Blarney, Cork		**Level:** 64.35 m OD	**Scale** 1:50
Client: Mr. Eoin Sheehan		**Dates:** 13/05/2021 13/05/2021	

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
		29 (16,18/29 for 115mm) (C)								Attempted core run, no recovery. Dense Gravel assumed.
		46 (10,12/46 for 85mm) (C)					10.50	53.85		Driller describes: Dense sandy clayey angular GRAVEL. Possible weak weathered rock.
		70 (14,18/70 for 150mm) (C)								
		59 (8,10/59 for 150mm) (C)								
		~~50 (25 for 0mm/50 for 0mm)~~ (C) 14.50 - 15.50		100	54	24	14.50	49.85		Lithology: Moderately strong, green/grey SANDSTONE. Weathering: Core is moderately weathered. Highly fragmented from 14.50m to 15.00. Clay infill in two crosscutting fracture sets at 16.00m. Oxidation discolouration to brown on fracture surfaces
		15.50 - 16.50	10mm 150mm 50mm	73	52	0	15/m			
		16.50 - 17.50	5mm 110mm 40mm	80	59	0	15/m			
							17.50	46.85		Fractures: 3 sets identified. Set 1: Dipping at 50 degrees, planer and rough with very close to medium spacing. Set 2: dipping at 30 degrees, stepped and rough with wide spacing. Set 3: dipping at 70 degrees, undulating and rough with medium spacing. Details: The core contains quartz veins. Some slickenslides at 16.00m in the bedding

10 11 12 13 14 15 16 17 18

Groundwater:

Struck (m bgl)	Level (m bgl)	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
17.50	76	131

Equipment: Soilmec PSM

Method: Compressed air

Remarks:

Borehole terminated at 17.50m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	13/05/2021 08:00 13/05/2021 18:00	0.00 17.50	Start of shift. End of borehole.

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: GW Logged By: RD	Borehole No. **RC03** Sheet 3 of 3

Project Name:	Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:**	560564E - 576083N	**Hole Type** RC
Location:	Blarney, Cork		**Level:**	64.35 m OD	**Scale** 1:50
Client:	Mr. Eoin Sheehan		**Dates:**	13/05/2021	13/05/2021

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Lithology: Moderately strong, green/grey SANDSTONE. Weathering: Core is moderately weathered. Highly fragmented from 14.50m to 15.00. Clay infill in two crosscutting fracture sets at 16.00m. Oxidation discolouration to brown on fracture surfaces Fractures: 3 sets identified. Set 1: Dipping at 50 degrees, planer and rough with very close to medium spacing. Set 2: dipping at 30 degrees, stepped and rough with wide spacing. Set 3: dipping at 70 degrees, undulating and rough with medium spacing. Details: The core contains quartz veins. Some slickenslides at 16.00m in the bedding planes. Some cross bedding , majority if bedding is lenticular. End of Borehole at 17.500m

19 20 21 22 23 24 25 26 27

Groundwater:

Struck (m bgl)	Level (m bgl)	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
17.50	76	131

Equipment: Soilmec PSM

Method: Compressed air

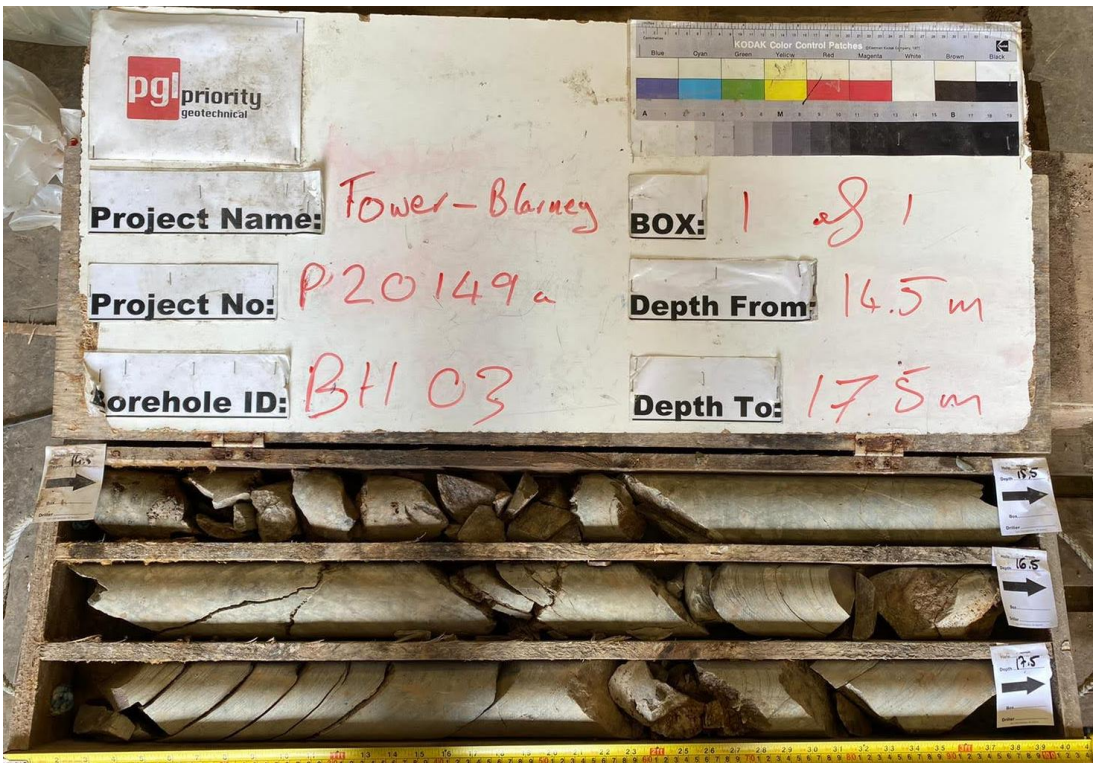
Remarks:

Borehole terminated at 17.50m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	13/05/2021 08:00	0.00	Start of shift.
	13/05/2021 18:00	17.50	End of borehole.

Photographic Record



Number:	**RC03**	**Project**	Monacnapa, Blarney	
		Project No	P20149A	
		Engineer	OLS	

Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie	Drilled By: GW Logged By:	Borehole No. **RC04** Sheet 1 of 2

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560716E - 576066N	**Hole Type** RC
Location: Blarney, Cork		**Level:** 61.01 m OD	**Scale** 1:50
Client: Mr. Eoin Sheehan		**Dates:** 14/05/2021 14/05/2021	

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
							0.30	60.71		Driller described: TOPSOIL.
										Driller described: Gravelly CLAY.
							1.00	60.01		Driller described: Stiff, sandy gravelly CLAY.
		N=23 (4,5/5,6,5,7) (C)								
		N=23 (3,4/4,5,7,7) (C)								
		N=27 (6,6/6,7,7,7) (C)								
		N=27 (5,4/5,7,7,8) (C)								
		25 (8,19/25 for 0mm) (C)								

1 2 3 4 5 6 7 8 9

Groundwater:

Struck (m bgl)	Level (m bgl)	After (min)	Sealed	Comment
				None encountered

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
15.00	131	131

Equipment:	Soilmec PSM
Method:	Compressed air mist.

Remarks:

Borehole terminated at 15.00m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
	14/05/2021 08:00	0.00	Start of shift.
	14/05/2021 18:00	15.00	End of shift.

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Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560716E - 576066N		**Hole Type** RC
Location: Blarney, Cork		**Level:** 61.01 m OD		**Scale** 1:50
Client: Mr. Eoin Sheehan		**Dates:** 14/05/2021	14/05/2021	

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
		N=32 (5,5/6,7,8,11) (C)								Driller described: Stiff, sandy gravelly CLAY.
		N=40 (6,6/8,10,10,12) (C)								
		N=42 (9,10/10,11,9,12) (C)								
		25 (8,16/25 for 40mm) (C)								
		58 (12,13/58 for 160mm) (C)					15.00	46.01		End of Borehole at 15.000m

10 11 12 13 14 15 16 17 18

Groundwater:

Struck (m bgl)	Level (m bgl)	After (min)	Sealed	Comment
				None encountered

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
15.00	131	131

Equipment: Soilmec PSM

Method: Compressed air mist.

Remarks:

Borehole terminated at 15.00m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
	14/05/2021 08:00	0.00	Start of shift.
	14/05/2021 18:00	15.00	End of shift.

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Trial Pit No
TP01
Sheet 1 of 1

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560515E - 576192N **Level:** 75.50m OD	**Date** 11/03/2021
Location: Blarney, Cork		**Dimensions (m):** 4.00 / 0.60	**Scale** 1:25
Client: Mr. Eoin Sheehan		**Depth:** 2.90m BGL	**Logged** BS

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.40	75.10		(TOPSOIL) Brown sandy SILT.
	0.50 - 1.00 0.50 - 1.00	B D					Soft to firm, brown, slightly sandy gravely SILT.
				1.10	74.40		Stiff, brown, slightly sandy gravely CLAY with high cobble and medium boulder content. Cobbles are 63-200mm angular to sub rounded. Boulders are 200-350mm, angular to sub angular.
	1.50 - 2.50 1.50 - 2.50	B D					
				2.90	72.60		End of Pit at 2.900m

Stability: Good
Plant: 8 Ton track machine
Backfill: Arisings

Groundwater: None encountered

Remarks: Trial pit terminated at 2.9m bgl, refusal on suspected bedrock.

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Trial Pit No
TP02
Sheet 1 of 1

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560608E - 576156N **Level:** 71.10m OD	**Date** 11/03/2021
Location: Blarney, Cork		**Dimensions (m):** 4.20 × 0.60	**Scale** 1:25
Client: Mr. Eoin Sheehan		**Depth:** 4.10m BGL	**Logged** BS

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.40	70.70		(TOPSOIL) Brown, gravely SILT. Gravel is fine to coarse, sub angular to sub rounded.
	0.50 - 1.50 0.50 - 1.50	B D					Soft to firm, brown, slightly sandy gravely SILT with high cobble and low boulder content. Cobbles are 63-200mm, sub angular to sub rounded. Boulders are 200-250mm, angular to sub angular.
				1.80	69.30		
	2.00 - 2.50 2.00 - 2.50	B D					Stiff, brown, slightly sandy gravely CLAY, medium cobble content. Cobbles are 63-170mm, angular to sub angular.
				2.80	68.30		
	3.00 - 4.00 3.00 - 4.00	B D					Stiff, brown, slightly sandy gravely CLAY with high cobble and low boulder content. Cobbles are 63-200mm, sub angular to sub rounded. Boulders are 200-260mm, angular to sub angular.
				4.10	67.00		End of Pit at 4.100m

1 2 3 4 5

Stability: Unknown
Plant: 8 Ton trackmachine
Backfill: Arisings

Groundwater: None encountered

Remarks: Borehole terminated at 4.1m bgl, refusal on suspected bedrock.

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Trial Pit No
TP03
Sheet 1 of 1

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560684E - 576188N **Level:** 75.02m OD	**Date** 11/03/2021
Location: Blarney, Cork		**Dimensions (m):** 2.10 × 0.50	**Scale** 1:25
Client: Mr. Eoin Sheehan		**Depth:** 2.00m BGL	**Logged** BS

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.20	74.82		(TOPSOIL) Gravely SILT.
	0.50 - 0.80 0.50 - 0.80	B D					Soft to firm, brown, slightly sandy gravely SILT, low cobble content. Cobbles are 63-130mm, angular to sub angular.
				0.80	74.22		Soft to firm, brown, slightly sandy gravely CLAY, low cobble content. Cobbles are 63-180mm, angular to sub angular.
	1.00 - 2.00 1.00 - 2.00	B D					
				2.00	73.02		End of Pit at 2.000m

Stability: Poor
Plant: 8 Ton track machine
Backfill: Arisings

Groundwater: None encountered

Remarks: Trial pit terminated at 2.0m bgl, BRE365 Soakaway test.

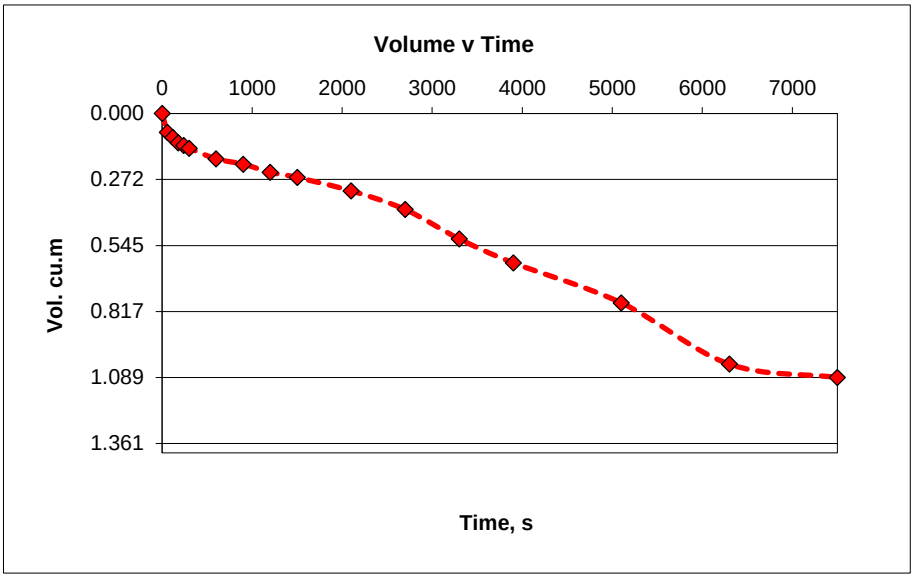
P20149 **Gleann Fia, Blarney**

Test 1 **SA02_1** **11/03/2021**

				d, m	**2.00**
l, m	**2.20**	b, m	**0.50**	d_eff, m	**0.99**
l_base, m	**2.20**				
l_eff, m	**2.20**				

Time, min	Measure, m bgl	Time, sec	Depth water, m	Fall, m	Volume
0	1.01	0	0.99	0.00	0.000
1	1.08	60	0.92	0.07	0.077
2	1.10	120	0.90	0.09	0.099
3	1.12	180	0.88	0.11	0.121
4	1.13	240	0.87	0.12	0.132
5	1.14	300	0.86	0.13	0.143
10	1.18	600	0.82	0.17	0.187
15	1.20	900	0.80	0.19	0.209
20	1.23	1200	0.77	0.22	0.242
25	1.25	1500	0.75	0.24	0.264
35	1.30	2100	0.70	0.29	0.319
45	1.37	2700	0.63	0.36	0.396
55	1.48	3300	0.52	0.47	0.517
65	1.57	3900	0.43	0.56	0.616
85	1.72	5100	0.28	0.71	0.781
105	1.95	6300	0.05	0.94	1.034
125	2.00	7500	0.00	0.99	1.089

Area	1.1 m^2				
50% Area_eff, a_{p50}	3.773 m^2	$V_{p75\text{-}25\ theory}$	volume	0.5445	m^3
50% Area_act, a_{p50}	3.773 m^2	$V_{p\ 75\ -\ 25\ actual}$	volume	0.5445	m^3
		$t_{p\ 75\text{-}\ 25\ actual}$	time	3780.00	s
		Infiltration Coefficient	*f*	3.818E-05	ms^-1



NOTES:
See TP03 for strata details: Slightly sandy gravelly CLAY
No groundwater encountered. Pit assumed unsaturated.

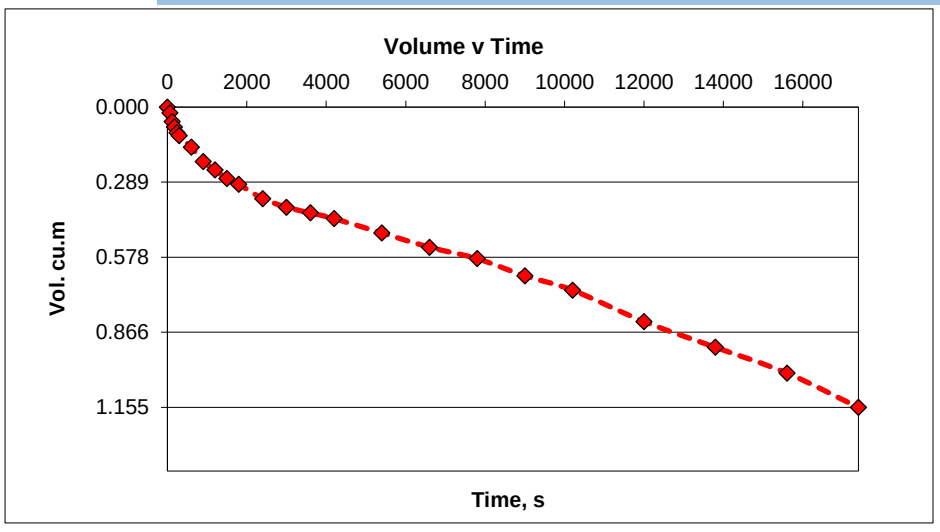
P20149 **Gleann Fia, Blarney**

Test 2 **SA02_2** **11/03/2021**

				d, m	**2.00**
l, m	**2.20**	b, m	**0.50**	d_eff, m	**1.09**
l_base, m	**2.20**				
l_eff, m	**2.20**				

Time, min	Measure, m bgl	Time, sec	Depth water, m	Fall, m	Volume
0	0.91	0	1.09	0.00	0.000
1	0.93	60	1.07	0.02	0.022
2	0.96	120	1.04	0.05	0.055
3	0.98	180	1.02	0.07	0.077
4	1.00	240	1.00	0.09	0.099
5	1.01	300	0.99	0.10	0.110
10	1.05	600	0.95	0.14	0.154
15	1.10	900	0.90	0.19	0.209
20	1.13	1200	0.87	0.22	0.242
25	1.16	1500	0.84	0.25	0.275
30	1.18	1800	0.82	0.27	0.297
40	1.23	2400	0.77	0.32	0.352
50	1.26	3000	0.74	0.35	0.385
60	1.28	3600	0.72	0.37	0.407
70	1.30	4200	0.70	0.39	0.429
90	1.35	5400	0.65	0.44	0.484
110	1.40	6600	0.60	0.49	0.539
130	1.44	7800	0.56	0.53	0.583
150	1.50	9000	0.50	0.59	0.649
170	1.55	10200	0.45	0.64	0.704
200	1.66	12000	0.34	0.75	0.825
230	1.75	13800	0.25	0.84	0.924
260	1.84	15600	0.16	0.93	1.023
290	1.96	17400	0.04	1.05	1.155

Area	1.1 m^2				
50% Area_eff, a_{p50}	4.043 m^2	$V_{p75\text{-}25\ theory}$	volume	0.5995	m^3
50% Area_act, a_{p50}	3.935 m^2	$V_{p\ 75\ -\ 25\ actual}$	volume	0.5775	m^3
		$t_{p\ 75\text{-}\ 25\ actual}$	time	11092.50	s
		Infiltration Coefficient	*f*	1.323E-05	ms^-1



NOTES:

See TP03 for strata details: Slightly sandy gravelly CLAY

No groundwater encountered. Pit assumed unsaturated.

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Trial Pit No
TP04
Sheet 1 of 1

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560793E - 576160N **Level:** 70.78m OD	**Date** 11/03/2021
Location: Blarney, Cork		**Dimensions (m):** 4.30 x 1.05	**Scale** 1:25
Client: Mr. Eoin Sheehan		**Depth:** 4.60m BGL	**Logged** BS

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
							(TOPSOIL)
				0.50	70.28		Soft to firm, brown, slightly sandy gravely CLAY, high cobble and low boulder content. Cobbles are 63-200mm, angular to sub angular. Boulders are 200-300mm, sub angular.
	1.00 - 2.00 1.00 - 2.00	B D					
	2.00 - 3.00 2.00 - 3.00	B D		2.20	68.58		Stiff, brown white, slightly sandy slightly gravely CLAY.
	3.50 - 4.50 3.50 - 4.50	B D					
				4.60	66.18		End of Pit at 4.600m

1 2 3 4 5

Stability: Good
Plant: 8 Ton track machine
Backfill: Arisings

Groundwater: None encountered

Remarks: Trial pit terminated at 4.6m bgl, as required depth reached.

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Trial Pit No
TP05
Sheet 1 of 1

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560601E - 576077N **Level:** 62.37m OD	**Date** 11/03/2021
Location: Blarney, Cork		**Dimensions (m):** 2.10 × 0.50	**Scale** 1:25
Client: Mr. Eoin Sheehan		**Depth:** 2.00m BGL	**Logged** BS

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.10	62.27		(TOPSOIL) gravely SILT.
							Soft to firm, brown, slightly sandy gravelly CLAY.
	0.50 - 1.00 0.50 - 1.00	B D					
	1.50 - 2.00 1.50 - 2.00	B D					
				2.00	60.37		End of Pit at 2.000m

1
2
3
4
5

Stability: Moderate
Plant: 8 Ton track machine
Backfill: Arisings

Groundwater: None encountered

Remarks: Trial pit terminated at 2.0m bgl. BRE365 Soakaway test.

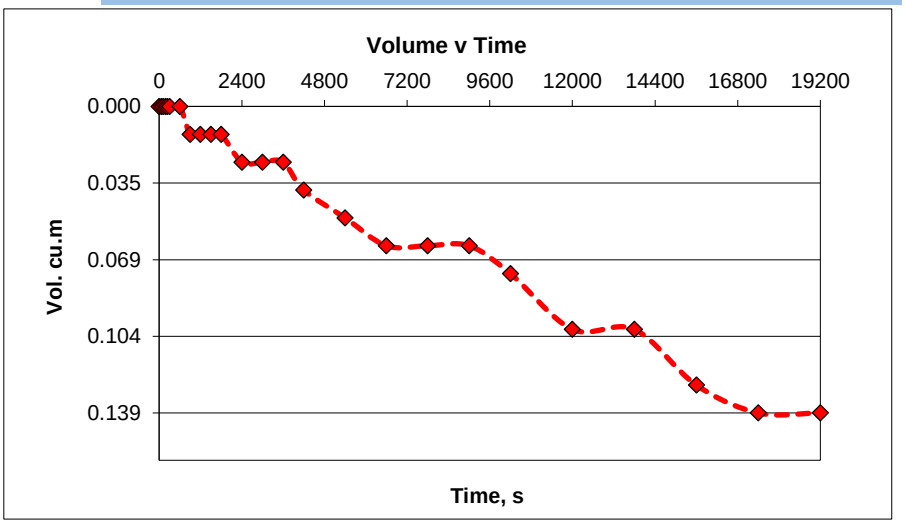
P20149 **Gleann Fia, Blarney**

Test 1 **SA01** **11/03/2021**

				d, m	**2.00**
l, m	**2.10**	b, m	**0.60**	d_eff, m	**1.35**
l_base, m	**2.10**				
l_eff, m	**2.10**				

Time, min	Measure, m bgl	Time, sec	Depth water, m	Fall, m	Volume
0	0.65	0	1.35	0.000	0.000
1	0.65	60	1.35	0.000	0.000
2	0.65	120	1.35	0.000	0.000
3	0.65	180	1.35	0.000	0.000
4	0.65	240	1.35	0.000	0.000
5	0.65	300	1.35	0.000	0.000
10	0.65	600	1.35	0.000	0.000
15	0.66	900	1.34	0.010	0.013
20	0.66	1200	1.34	0.010	0.013
25	0.66	1500	1.34	0.010	0.013
30	0.66	1800	1.34	0.010	0.013
40	0.67	2400	1.33	0.020	0.025
50	0.67	3000	1.33	0.020	0.025
60	0.67	3600	1.33	0.020	0.025
70	0.68	4200	1.32	0.030	0.038
90	0.69	5400	1.31	0.040	0.050
110	0.70	6600	1.30	0.050	0.063
130	0.70	7800	1.30	0.050	0.063
150	0.70	9000	1.30	0.050	0.063
170	0.71	10200	1.29	0.060	0.076
200	0.73	12000	1.27	0.080	0.101
230	0.73	13800	1.27	0.080	0.101
260	0.75	15600	1.25	0.100	0.126
290	0.76	17400	1.24	0.110	0.139
320	0.76	19200	1.24	0.110	0.139

Area	1.26	m^2			
50% Area_eff, a_{p50}	4.905	m^2	$V_{p75\text{-}25\ theory}$	volume	0.8505 m^3
50% Area_act, a_{p50}	4.608	m^2	$V_{p\ 75\ -\ 25\ actual}$	volume	0.0693 m^3
			$t_{p\ 75\text{-}\ 25\ actual}$	time	9975.00 s
			Infiltration Coefficient	*f*	1.508E-06 ms^-1



NOTES:

See TP05 for strata details: Slightly sandy gravelly CLAY.

No groundwater encountered. Pit assumed unsaturated.

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Trial Pit No
TP06
Sheet 1 of 1

Project Name: Monacnapa Site Investigation	**Project No.** P20149A	**Co-ords:** 560691E - 576103N **Level:** 64.27m OD	**Date** 11/03/2021
Location: Blarney, Cork		**Dimensions (m):** 3.20 / 1.10	**Scale** 1:25
Client: Mr. Eoin Sheehan		**Depth:** 3.70m BGL	**Logged** BS

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.30	63.97		(TOPSOIL) Brown, gravely SILT
	0.50 - 1.50 0.50 - 1.50	B D					Soft to firm, brown, slightly sandy gravely CLAY with low cobble content. Cobbles are 63-150mm, sub angular.
				1.60	62.67		Stiff, brown, slightly sandy gravely CLAY.
	2.50 - 3.50 2.50 - 3.50	B D					
				3.70	60.57		End of Pit at 3.700m

1 2 3 4 5

Stability: Good
Plant: 8 Ton track machine
Backfill: Arisings

Groundwater: None encountered

Remarks: Trial pit terminated at 3.7m bgl, refusal on suspected boulders.

KEY TO SYMBOLS - LABORATORY TEST RESULT

U	Undisturbed Sample	
P	Piston Sample	
TWS	Thin Wall Sample	
B	Bulk Sample - Disturbed	
D	Jar Sample - Disturbed	
W	Water Sample	
pH	Acidity/Alkalinity Index	
SO_3	% - Total Sulphate Content (acid soluble)	
SO_3	g/ltr - Water Soluble Sulphate (Water or 2:1 Aqueous Soil Extract)	
+	Calcareous Reaction	
Cl	Chloride Content	
PI	Plasticity Index	
<425	% of material in sample passing 425 micron sieve	
LL	Liquid Limit	
PL	Plastic Limit	
MC	Water Content	
NP	Non Plastic	
Yb	Bulk Density	
Yd	Dry Density	
Ps	Particle Density	
U/D	Undrained/Drained Triaxial	
U/C	Unconsolidated/Consolidated Triaxial	
T/M	Single Stage/Multistage Triaxial	
100/38	Sample Diameter (mm)	
REM	Remoulded Triaxial Test Specimen	
TST	Triaxial Suction Test	
V	Vane Test	
DSB	Drained Shear Box	
RSB	Residual Shear Box	
RS	Ring Shear	
σ_3	Cell Pressure	
σ_1-σ_3	Deviator Stress	
c	Cohesion	
c_	Effective Cohesion Intercept	
ϕ	Angle of Shearing Resistance - Degrees	
ϕ_	Effective Angle of Shearing Resistance	
εf	Strain at Failure	
*	Failed under 1st Load	
**	Failed under 2nd Load	
#	Untestable	
##	Excessive Strain	
p_o	Effective Overburden Pressure	
m_v	Coefficient of Volume Decrease	
c_v	Coefficient of Consolidation	
Opt	Optimum	
Nat	Natural	
Std	Standard Compaction - 2.5kg Rammer	(¶ CBR)
Hvy	Heavy Compaction - 4.5kg Rammer	(§ CBR)
Vib	Vibratory Compaction	
CBR	California Bearing Ratio	
Sat m.c.	Saturation Moisture Content	
MCV	Moisture Condition Value	

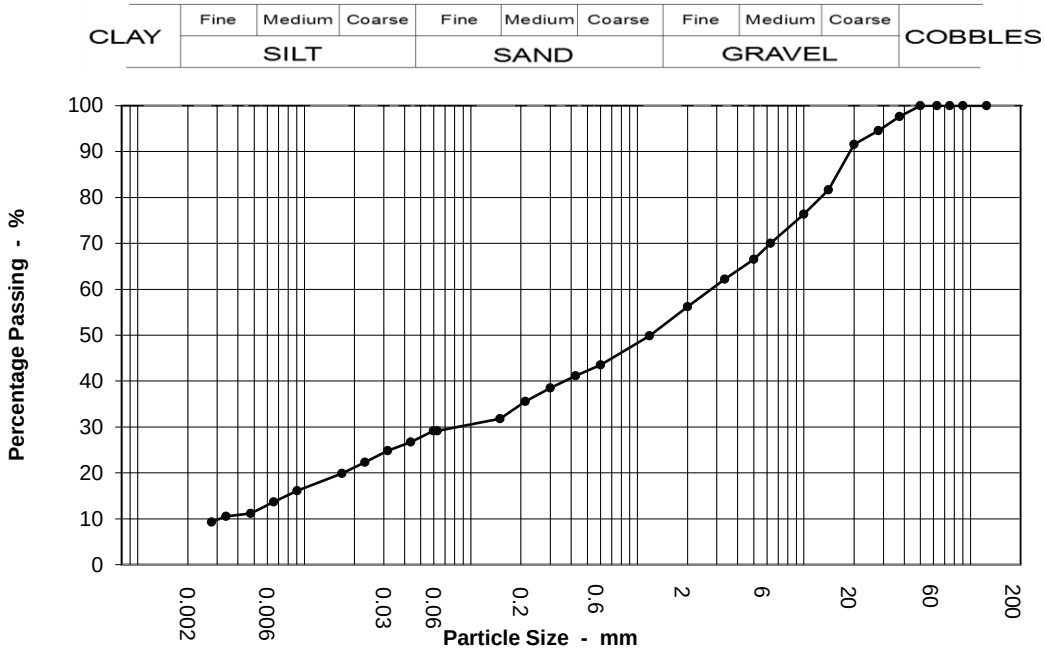
pgl priority geotechnical	**Natural Moisture Content/Atterberg Limits Summary** **BS 1377 : Part 2 : 1990 : Clause 3**	**Job Ref**
Location	**Monacnapa Site Investigation**	**P20149A**

Hole ID	Sample Ref	Depth (m)	Sample Type	Sample Description	MC	LL	PL	PI	% Pass 425
TP01	1	0.5	B	Slightly sandy gravelly SILT		46	16	30	64
TP01	2	0.5	D	Slightly sandy gravelly SILT	24				
TP01	3	1.5	B	Slightly sandy gravelly CLAY		23	15	8	57.6
TP01	4	1.5	D	Slightly sandy gravelly CLAY	11				
TP02	2	0.5	D	Slightly sandy gravelly SILT	12				
TP02	4	2	D	Slightly sandy gravelly CLAY	14				
TP02	6	3	D	Slightly sandy gravelly CLAY	12				
TP03	2	0.5	D	Slightly sandy gravelly SILT	18				
TP03	4	1	D	Slightly sandy gravelly CLAY	12				
TP04	1	1	B	Slightly sandy gravelly CLAY		25	15	10	70.2
TP04	2	1	D	Slightly sandy gravelly CLAY	13				
TP04	4	2	D	Slightly sandy gravelly CLAY	16				
TP04	5	3.5	B	Slightly sandy slightly gravelly CLAY		32	20	12	69.9
TP04	6	3.5	D	Slightly sandy slightly gravelly CLAY	16				
TP05	1	0.5	B	Slightly sandy gravelly CLAY		24	16	8	61.5
TP05	2	0.5	D	Slightly sandy gravelly CLAY	12				
TP05	4	1.5	D	Slightly sandy gravelly CLAY	11				
TP06	2	0.5	D	Slightly sandy gravelly CLAY	14				
TP06	4	2.5	D	Slightly sandy gravelly CLAY	14				

PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

		Job Ref	**P20149A**
		Borehole / Pit No	TP01
Location	**Monacnapa Site Investigation**	Sample No	1
		Depth	0.50 m
Soil Description	Slightly sandy gravelly SILT	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.060	29
90	100	0.044	27
75	100	0.032	25
63	100	0.023	22
50	100	0.017	20
37.5	98	0.009	16
28	95	0.007	14
20	92	0.005	11
14	82	0.003	11
10	76	0.003	9
6.3	70	0.001	7
5	67		
3.35	62		
2	56		
1.18	50		
0.6	44		
0.425	41		
0.3	38		
0.212	36		
0.15	32		
0.063	29		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.5
Sedimentation	Clause 9.5

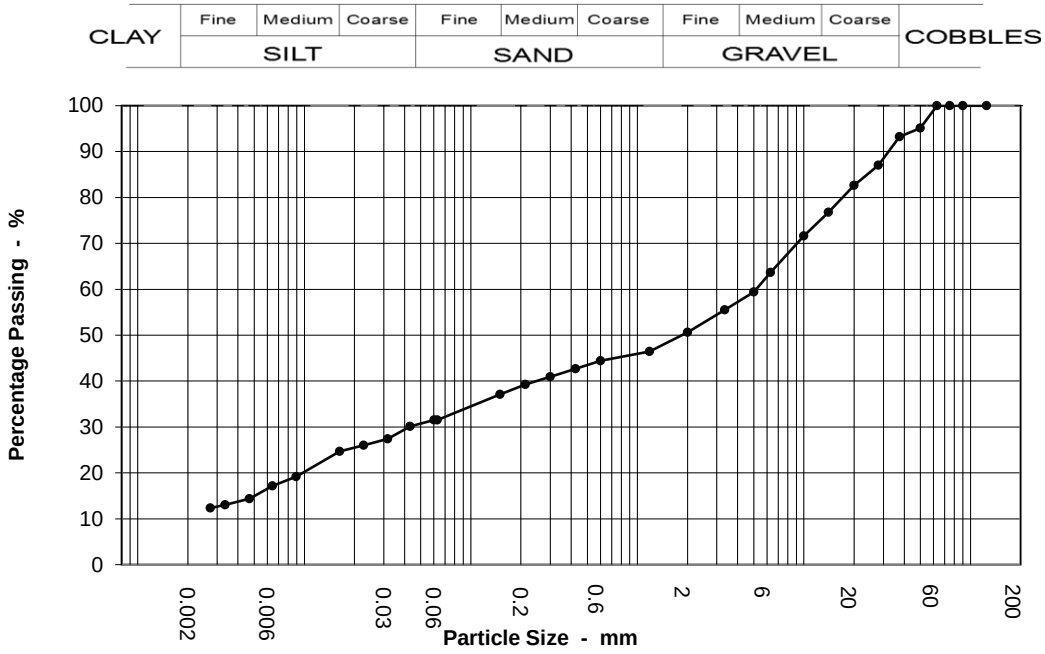
Sample Proportions	
Cobbles	0.0
Gravel	44.0
Sand	27.0
Silt	21.0
Clay	8.0

Grading Analysis	
D100	50.00
D60	2.77
D10	0.00
Uniformity Coefficient	890.00

PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

		Job Ref	**P20149A**
		Borehole / Pit No	TP01
Location	**Monacnapa Site Investigation**	Sample No	3
		Depth	1.50 m
Soil Description	Slightly sandy gravelly CLAY	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.060	31
90	100	0.043	30
75	100	0.032	27
63	100	0.023	26
50	95	0.016	25
37.5	93	0.009	19
28	87	0.006	17
20	83	0.005	14
14	77	0.003	13
10	72	0.003	12
6.3	64	0.001	10
5	59		
3.35	56		
2	51		
1.18	46		
0.6	44		
0.425	43		
0.3	41		
0.212	39		
0.15	37		
0.063	31		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.5
Sedimentation	Clause 9.5

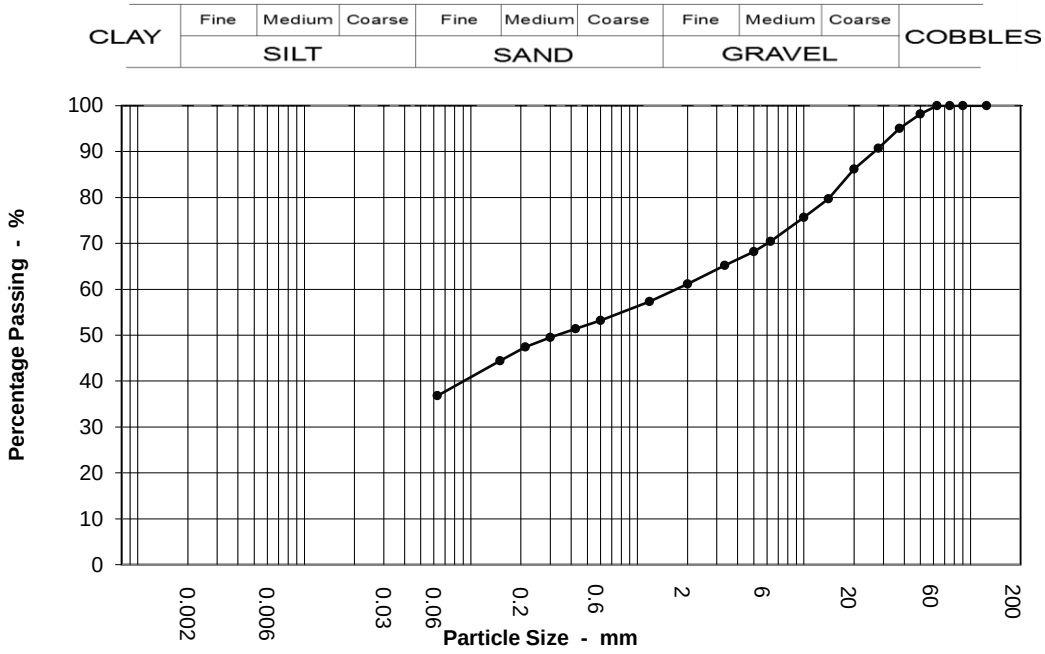
Sample Proportions	
Cobbles	0.0
Gravel	49.0
Sand	19.0
Silt	21.0
Clay	11.0

Grading Analysis	
D100	63.00
D60	5.17
D10	0.00
Uniformity Coefficient	3200.00

PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

		Job Ref	**P20149A**
		Borehole / Pit No	TP04
Location	**Monacnapa Site Investigation**	Sample No	1
		Depth	1.00 m
Soil Description	Slightly sandy gravelly CLAY	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	98		
37.5	95		
28	91		
20	86		
14	80		
10	76		
6.3	70		
5	68		
3.35	65		
2	61		
1.18	57		
0.6	53		
0.425	51		
0.3	50		
0.212	47		
0.15	44		
0.063	37		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.3
Sedimentation	N/A

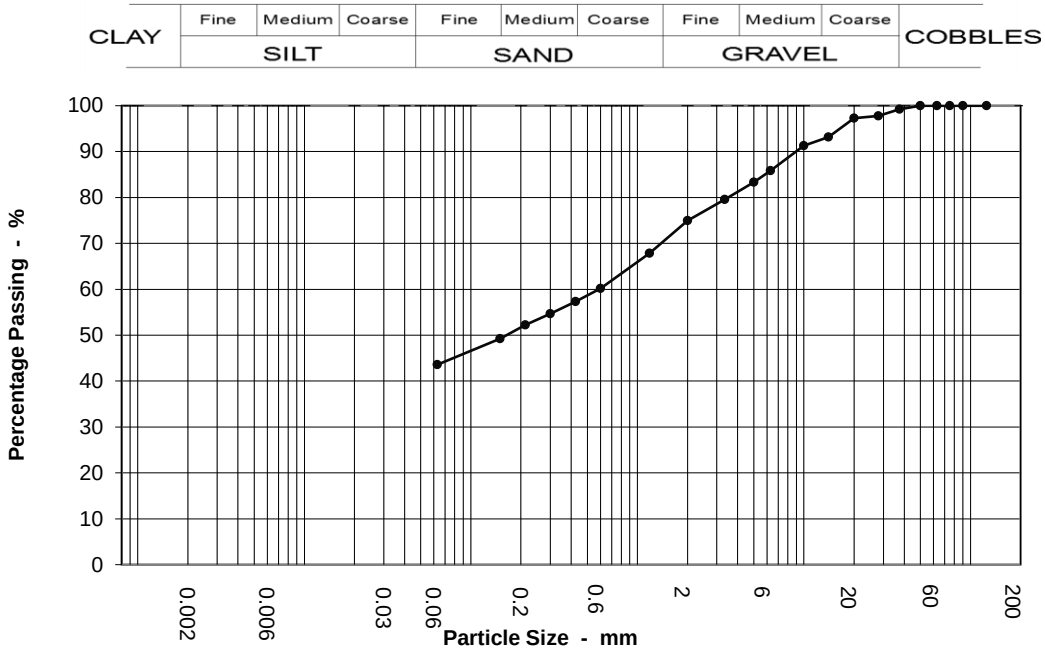
Sample Proportions	
Cobbles	0.0
Gravel	39.0
Sand	24.0
Silt & Clay	37.0

Grading Analysis	
D100	63.00
D60	1.70
D10	
Uniformity Coefficient	

PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

		Job Ref	**P20149A**
		Borehole / Pit No	TP04
Location	**Monacnapa Site Investigation**	Sample No	5
		Depth	3.50 m
Soil Description	Slightly sandy slightly gravelly CLAY	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	99		
28	98		
20	97		
14	93		
10	91		
6.3	86		
5	83		
3.35	80		
2	75		
1.18	68		
0.6	60		
0.425	57		
0.3	55		
0.212	52		
0.15	49		
0.063	44		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.3
Sedimentation	N/A

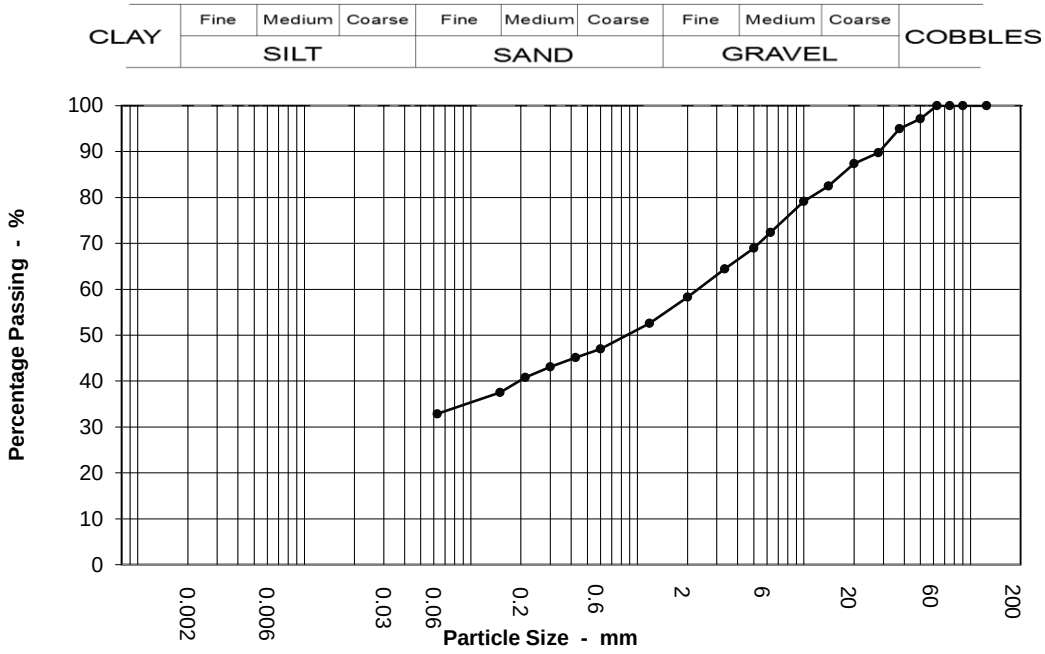
Sample Proportions	
Cobbles	0.0
Gravel	25.0
Sand	31.0
Silt & Clay	44.0

Grading Analysis	
D100	50.00
D60	0.59
D10	
Uniformity Coefficient	

PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

		Job Ref	**P20149A**
		Borehole / Pit No	TP05
Location	**Monacnapa Site Investigation**	Sample No	1
		Depth	0.50 m
Soil Description	Slightly sandy gravelly CLAY	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	97		
37.5	95		
28	90		
20	87		
14	82		
10	79		
6.3	72		
5	69		
3.35	64		
2	58		
1.18	53		
0.6	47		
0.425	45		
0.3	43		
0.212	41		
0.15	38		
0.063	33		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.3
Sedimentation	N/A

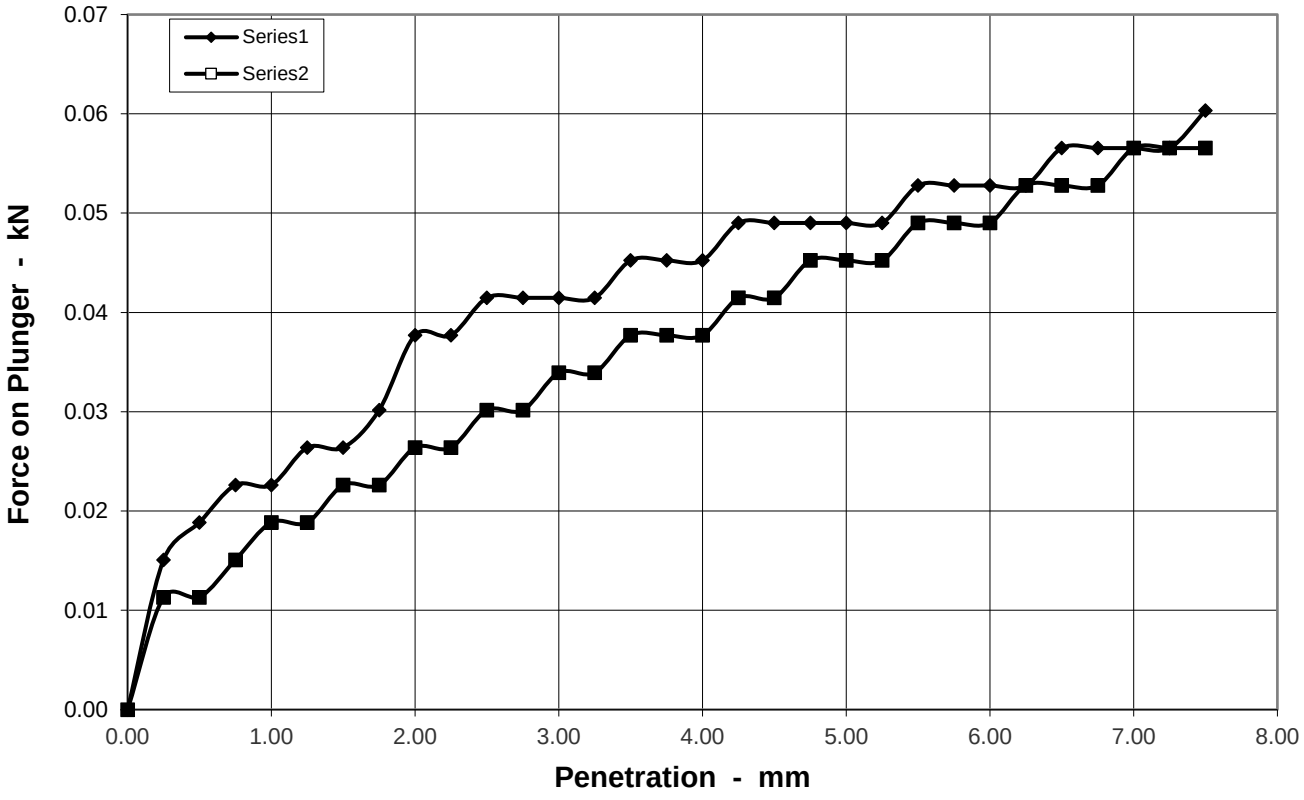
Sample Proportions	
Cobbles	0.0
Gravel	42.0
Sand	25.0
Silt & Clay	33.0

Grading Analysis	
D100	63.00
D60	2.30
D10	
Uniformity Coefficient	

CALIFORNIA BEARING RATIO

BS 13377 : Part 4 : 1990 Clause 7.4

		Job Ref	**P20149A**
		Borehole / Pit No	TP03
Site Name	**Monacnapa Site Investigation**	Sample No	1
		Depth	0.5 m
Soil Description	Slightly sandy gravelly SILT		



Preparation	Method of Compation		
	Hammer type		2.5kg Rammer
	Soaking Period	days	
	Amount of Swell	mm	

Sample Conditions		
Natural Moisture Content	%	24.0
Moisture Content - TOP	%	23.8
Moisture Content - BASE	%	24.1
Bulk Density	Mg/m³	2.00
Dry Density	Mg/m³	1.62

Test Conditions		
Sample Retained on 20 mm sieve	%	11.2
Seating Load - TOP	N	
Seating Load - BASE	N	
Surcharge	kg	8

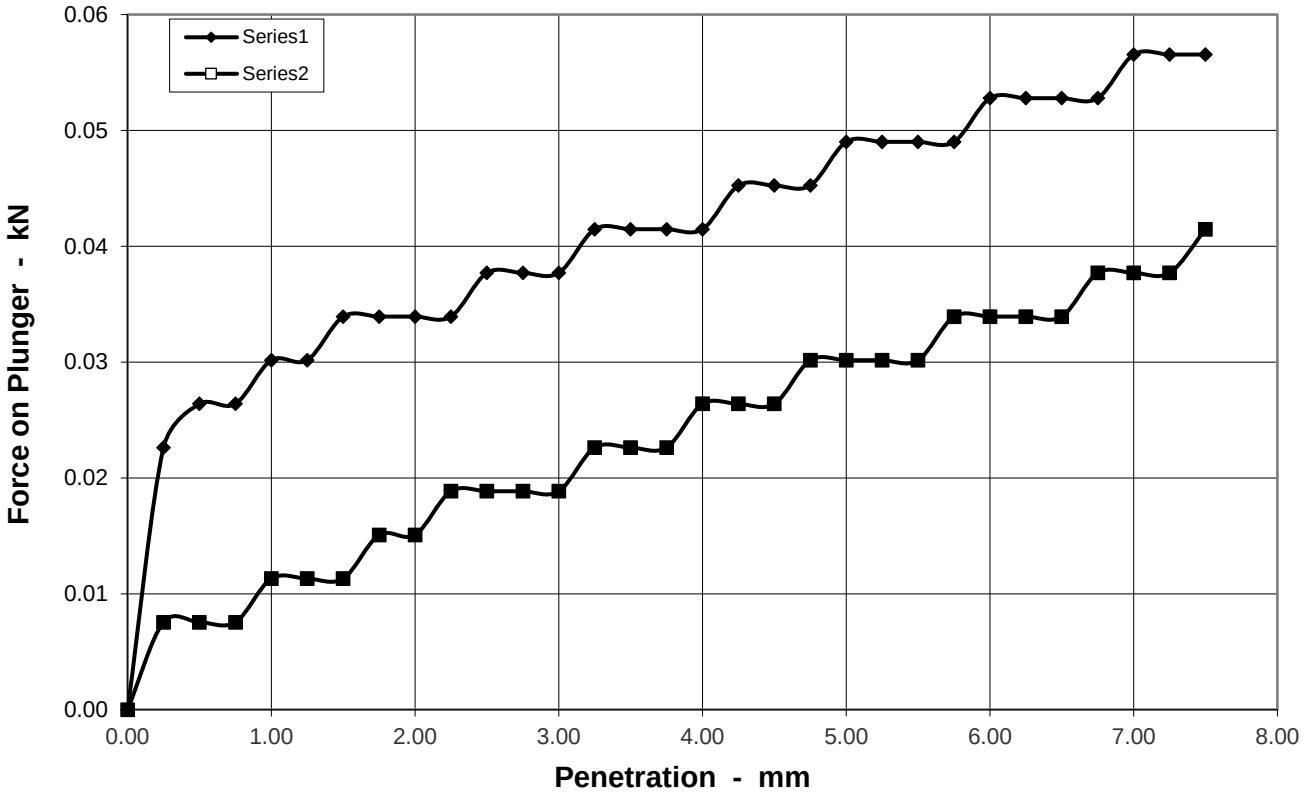
Penetration mm	CBR Values %	
	TOP	BASE
2.5	0.3	0.2
5	0.2	0.2
Accepted CBR	**0.3**	**0.2**

			Remarks	

CALIFORNIA BEARING RATIO

BS 13377 : Part 4 : 1990 Clause 7.4

		Job Ref	**P20149A**
		Borehole / Pit No	TP06
Site Name	**Monacnapa Site Investigation**	Sample No	1
		Depth	0.5 m
Soil Description	Slightly sandy gravelly CLAY		



Preparation	Method of Compation		
	Hammer type		2.5kg Rammer
	Soaking Period	days	
	Amount of Swell	mm	

Sample Conditions		
Natural Moisture Content	%	27.0
Moisture Content - TOP	%	26.9
Moisture Content - BASE	%	26.0
Bulk Density	Mg/m³	1.97
Dry Density	Mg/m³	1.55

Test Conditions		
Sample Retained on 20 mm sieve	%	11.6
Seating Load - TOP	N	
Seating Load - BASE	N	
Surcharge	kg	8

Penetration mm	CBR Values %	
	TOP	BASE
2.5	0.3	0.1
5	0.2	0.2
Accepted CBR	**0.3**	**0.2**

			Remarks	

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-22249-1		
Initial Date of Issue:	02-Jul-2021		
Client	Priority Geotechnical Ltd		
Client Address:	Unit 12 Owenacurra Business Park Midleton County Cork Ireland		
Contact(s):	Colette Kelly		
Project	P20149A Blarney		
Quotation No.:		**Date Received:**	29-Jun-2021
Order No.:	13849	**Date Instructed:**	29-Jun-2021
No. of Samples:	4		
Turnaround (Wkdays):	5	**Results Due:**	05-Jul-2021
Date Approved:	02-Jul-2021		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Soil

Project: P20149A Blarney

Client: Priority Geotechnical Ltd			**Chemtest Job No.:**		21-22249	21-22249	21-22249	21-22249
Quotation No.:			**Chemtest Sample ID.:**		1230704	1230705	1230706	1230707
			Sample Location:		TP01	TP01	TP04	TP05
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.5	1.5	3.5	0.5
			Date Sampled:		28-Jun-2021	28-Jun-2021	28-Jun-2021	28-Jun-2021
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Moisture	N	2030	%	0.020	17	11	13	9.6
pH	U	2010		4.0	8.1	8.2	8.1	8.1
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	< 0.010	< 0.010	< 0.010	< 0.010

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix 8 – Cork City Council Correspondence

Comhairle Cathrach Chorcaí
Cork City Council

Halla na Cathrach, Corcaigh - City Hall, Cork - T12 T997

Property Section,
City Hall,
Cork.
Fón/Tel: 021-4924258/4924259
Faics/Fax: 021-4924530

Rannóg Sealúchais,
Halla na Cathrach,
Corcaigh.

Fachtna Sheehy
OLS Consulting Engineers & Project Management Ltd,
3 Saint Patrick's Place,
Bandon,
Cork

15th February 2021

WITHOUT PREDJUDICE

Re: Consent to apply for planning permission affecting City Council land at Sunberry Heights, Monacnapa, Blarney, Cork.

Dear Fachtna,

I refer to your proposed SHD planning application on behalf of your client Eoin Sheehan for the construction of 145 no. residential units consisting of detached, semi-detached, terrace units, apartments and a creche. The access to the site is proposed via the existing estate road serving Sunberry Heights which is accessed from a junction with the R617.

I confirm that Cork City Council hereby consents to you making this application for planning permission affecting lands in the City Council's control / and or ownership in order to carry out a suite of improvement works on the Sunberry Heights Estate Road. Such works include:-

- Provision of a raised platform complete with tactile paving at the junction with the R617 to improve pedestrian safety at the junction.
- Modification to the carriageway surfacing on the existing estate road to enable the carriageway to be designated as a shared street in accordance with the National Cycle Manual with road markings and signage
- Provision of a speed reduction table along the estate road complete with advance warning signage
- Provision of a traffic barrier along the full extent of the footpath to supplement the existing barrier.
- Some minor soft landscaping works to improve the sightlines at the junction with the R617 and to maximise the existing footpath width.

As the proposed works for the development had yet to be agreed by the issuing of this letter I would like to note that this letter is being issued without prejudice to the actual proposed works which themselves are not required to be agreed prior to the issuing of the letter.

This consent is being issued solely to facilitate this application for planning permission only for the above- mentioned development. Please also note that it is being issued strictly subject and without prejudice to the following:

(i) Consideration of the said planning application by Cork City Council or on appeal by An Bord Pleanála,
(ii) Adherence to and compliance with all planning conditions, bonds and planning contributions that may apply to the final grant of permission.

It should also be noted that any disposal of lands owned or interest held by Cork City Council, if relevant, will be subject to agreement on price, terms and conditions, title, approval of the Chief Executive and the approval of the elected Council under section 183 of the Local Government Act, 2001 where required. Subject thereto, any disposal would be subject to the execution of formal contracts and compliance with the conditions thereof including compliance with the conditions of all relevant planning permissions as required.

Finally, please note that I have no authority expressed or implied to bind Cork City Council and this letter shall not constitute a note or memorandum for the purposes of the provisions of section 51 of the *Land and Conveyancing Law Reform Act, 2009.*

P.P. Michael Nagle

Stephen Fox MRICS
Senior Executive Estates Officer
Corporate and External Affairs
Cork City Council