

# Carmanhall Road SHD at the Former Avid Technology International Site, Carmanhall Road, Sandyford Industrial Estate, Dublin 18

Stage 3: Planning Application to An Bord Pleanala  
Infrastructure Report

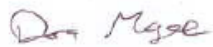
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## Table of Contents

1.	Introduction.....	6
2.	An Bord Pleanála Opinion Case ABP-307978-20 .....	8
3.	Site Investigation.....	8
4.	Surface Water Drainage .....	9
4.1	Existing Surface Water Drainage .....	9
4.2	Proposed Surface Water Drainage.....	9
4.3	SuDS (Sustainable urban Drainage Systems) .....	10
4.3.1	Green Roofs .....	10
4.3.2	Swales.....	11
4.3.3	Bioretention.....	12
4.3.4	Permeable Paving.....	13
4.3.5	Storage Tank (Arch Structure – Stormtech) .....	13
4.3.6	Petrol Interceptor.....	14
4.4	Compliance with Greater Dublin Strategic Drainage Study.....	15
4.4.1	Interception & Treatment Volume Provision .....	17
4.4.2	Interception & Treatment Commentary .....	19
4.5	Flow Exceedance Route.....	20
4.6	Engagement with Dún Laoghaire-Rathdown County Council.....	20
5.	Wastewater Drainage.....	21
5.1	Engagement with Irish Water .....	21
5.2	Proposed Wastewater Network.....	22
6.	Water Supply Layout.....	23
6.1	Engagement with Irish Water .....	23
6.2	Proposed Water Supply.....	23
	Appendix A – Site Investigation .....	24
	Appendix B – DLRCC Existing Records.....	25
	Appendix C – Utility Survey.....	26
	Appendix D – Surface Water Audit (Stage 1).....	27
	Appendix E – Qbar Calculation.....	28
	Appendix F - Met Éireann Rainfall Data .....	29
	Appendix G – Surface Water Network Calculations .....	30
	Appendix H – Bauder XF301 Sedum System & Bauder DSE60 Drainage Layer.....	31
	Appendix I – Stormtech Tank Details .....	32
	Appendix J – SuDS Manual Drainage Maintenance Checklist.....	33
	Appendix K – Irish Water Confirmation of Feasibility.....	34
	Appendix L - Irish Water Statement of Design Acceptance.....	35
	Appendix M – Wastewater Network Calculations.....	36
	Appendix N - Tri Partite Response to An Bord Pleanála.....	37
	Appendix O – Diversion Confirmation of Feasibility .....	38

## Figures

Figure 1.1:	Site Location .....	6
Figure 4.1:	Drainage & Water Records (Source: DLRCC).....	9
Figure 4.2:	Green Roof Layers (Extract form CIRIA C753 SuDS Manual).....	11
Figure 4.3:	Dry Swale (Extract form CIRIA C753 SuDS Manual).....	12
Figure 4.4:	Bioretention Layers (Extract form CIRIA C753 SuDS Manual) .....	12
Figure 4.5:	Permeable Paving System – No Infiltration (Extract form CIRIA C753 SuDS Manual).....	13
Figure 4.6:	Stormtech Standard Detail (Extract from Stormtech MC-4500 Leaflet).....	14

Figure 4.7: Typical Petrol Interceptor Detail (Extract from Ciria C753 SuDS Manual) ..... 14  
Figure 5.1: Existing Civil Infrastructure. (Full map in Appendix A) ..... 21

## Tables

Table 4.1: Green Roof Provision ..... 11  
Table 4.2: GDSDS Table 6.3 ..... 15  
Table 4.3: Roof - Interception Volume ..... 17  
Table 4.4: Roof - Treatment Volume ..... 18  
Table 4.5: Road - Treatment Volume ..... 18  
Table 4.6: Steps Area - Treatment Volume ..... 18  
Table 4.7: Overall Site - Interception & Treatment Volume ..... 18

## 1. Introduction

AECOM have been appointed by Atlas GP Ltd. to undertake the infrastructure design, in support of a Strategic Housing Development (SHD) at the former Avid Technology International Site, Carmanhall Road, Sandyford Industrial Estate, Dublin 18.

The site is located within the jurisdiction of Dún Laoghaire-Rathdown County Council (DLRCC). The application site boundary measures 1.03 ha and the current ownership boundary is 0.73 ha. The area to remain private, not to be Taken In Charge by DLRCC, is 0.67 ha.

The current brownfield site was previously occupied by a commercial building which has now been demolished. The site is bounded to the east by Blackthorn Road, to the north by Carmanhall Road and to the south and west by existing commercial buildings. Refer to Figure 1.1 for the site location.

Permission was previously granted by An Bord Pleanála in April 2019, under a separate application, Reg. Ref. PL06D.303467, for the construction of student accommodation on the site. This was granted under the Strategic Housing Development (SHD) process.

Hughes Planning & Development Consultants submitted a Section 247 planning pack to DLRCC, PAC Number PAC/SHD/91/20. The Section 247 pre-planning meeting took place, via Microsoft Teams, on 30<sup>th</sup> April 2020 with DLRCC.

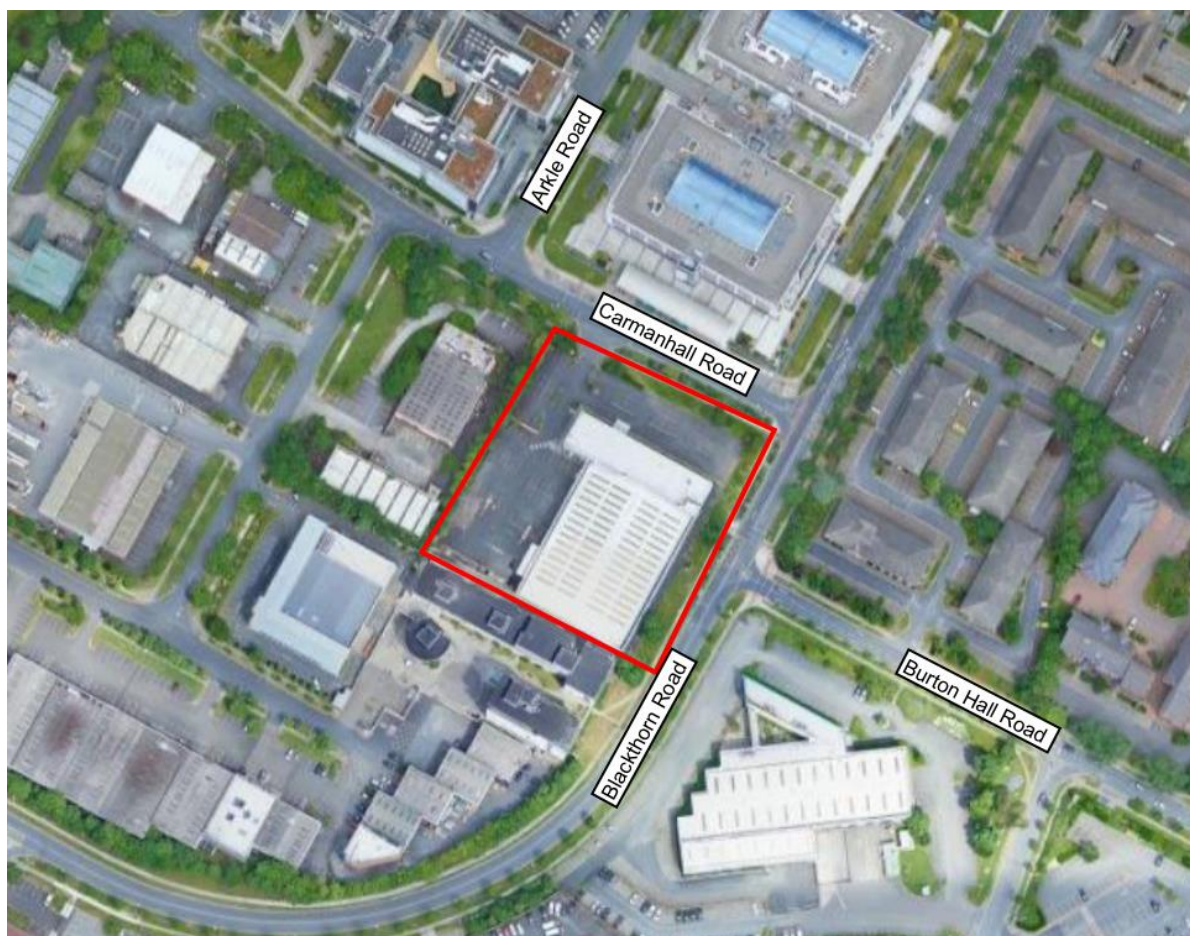


Figure 1.1: Site Location

The full development description is as follows;

(i) construction of a Build-To-Rent residential development within a new part six, part eight, part nine, part eleven storey rising to a landmark seventeen storey over basement level apartment building (40,814sq.m) comprising 428 no. apartments (41 no. studio, 285 no. one-bedroom, 94 no. two-bedroom & 8 no. three-bedroom units) of which 413 no. apartments have access to private amenity space, in the form of a balcony or lawn/terrace, and 15 no. apartments have access to a shared private roof terrace (142sq.m) at ninth floor level;

(ii) all apartments have access to 2,600sq.m of communal amenity space, spread over a courtyard at first floor level and roof terraces at sixth, eighth and ninth floor levels, a 142sq.m resident's childcare facility at ground floor level, 392sq.m of resident's amenities, including concierge/meeting rooms, office/co-working space at ground floor level and a meeting/games room at first floor level, and 696sq.m of resident's amenities/community infrastructure inclusive of cinema, gym, yoga studio, laundry and café/lounge at ground floor level. The café/lounge will primarily serve the residents of the development and will be open for community use on a weekly/sessional basis;

(iii) provision of 145 no. vehicular parking spaces (including 8 no. mobility parking spaces, 2 no. club-car spaces and 44 no. electric charging spaces), 5 no. motorcycle parking spaces, bin stores, plant rooms, switch room and 2 no. ESB sub-stations all at ground floor level; provision of bicycle parking (752 no. spaces), plant and storage at basement level; permission is also sought for the removal of the existing vehicular entrance and construction of a replacement vehicular entrance in the north-western corner of the site off Carmanhall Road;

(iv) provision of improvements to street frontages to adjoining public realm of Carmanhall Road & Blackthorn Road comprising an upgraded pedestrian footpath, new cycling infrastructure, an increased quantum of landscaping and street-planting, new street furniture inclusive of bins, benches and cycle parking facilities and the upgrading of the existing Carmanhall Road & Blackthorn Road junction through provision of a new uncontrolled pedestrian crossing; and,

(v) All ancillary works including provision of play equipment, boundary treatments, drainage works - including SuDS drainage, landscaping, lighting, rooftop telecommunications structure and all other associated site services, site infrastructure and site development works. The former Avid Technology International buildings were demolished on foot of Reg. Ref. D16A/0158 which also permitted a part-five rising to eight storey apartment building. The development approved under Reg. Ref. D16A/0158, and a subsequent part-seven rising to nine storey student accommodation development permitted under Reg. Ref. PL06D.303467, will be superseded by the proposed development.

## 2. An Bord Pleanála Opinion Case ABP-307978-20

Following the Pre-Application meeting held with An Bord Pleanála (ABP), via MS Teams meeting on 23<sup>rd</sup> November 2020, no specific drainage items were raised in the Board's Opinion. In the minutes provided by ABP, Item 5 covers potential "drainage matters".

ABP sought further discussions on

- Irish Water Feasibility
- Surface Water.

In this regard, AECOM have continued to engage with both Irish Water and Dún Laoghaire-Rathdown County Council in order to develop the water supply and drainage design proposed. Further details on these discussions are provided in Section 4 - 6 below.

## 3. Site Investigation

Site Investigation carried out by IGSL, Report No. 22455, (see Appendix A of this report) revealed there is no infiltration present on the site – two infiltration tests revealed zero infiltration. These tests were carried out in the northwest and southeast of the site, refer to the Site Plan in Appendix VII of IGSL Report No. 22455.

The site Investigation also revealed a high water table is present at the site. The highest groundwater table was recorded as 1.63 – 2.5 m bgl (below ground level), in June 2020, four months after installation of the standpipes. It is proposed to collect groundwater in filter trenches adjacent to the proposed basement and retaining structures, before pumping to the surface water network.

Based on these findings, it is considered that there is a risk of the water table rising above the invert level of the proposed attenuation tanks on site. AECOM have approached Stormtech to enquire about the potential for using Stormtech tanks within a water table and if there are any mitigation measures that would need to be considered to avoid uplift and/or water infiltration into the tanks. Stormtech representatives recommend additional foundation stone coupled with a layer of geogrid centred in the foundation stone for anti-buoyancy measures (refer to Appendix I). Additionally, Stormtech representatives advised that a bentonite impermeable liner may be used to prevent water ingress into the tank and to provide sufficient durability such that the integrity of the liner will be maintained over the life of the tank.

The permeable paving and swales are proposed to be lined with an impermeable membrane, due to the lack of infiltration available on the site and to prevent groundwater ingress. Other drainage elements will be further assessed at detail design stage to identify any potential risk of uplift and any required mitigation measures e.g. oil separators, manholes etc.



## 4. Surface Water Drainage

### 4.1 Existing Surface Water Drainage

Records received from DLRCC (see Appendix A), indicate there is an existing 450mm diameter public surface water sewer located in Carmanhall Road, confirmed by a Utility Survey (see Appendix C). A separate existing 375mm public surface water sewer is located in Blackthorn Avenue, which then turns 90° to continue along Burton Hall Road. The site is currently connected to a manhole on Blackthorn Avenue.

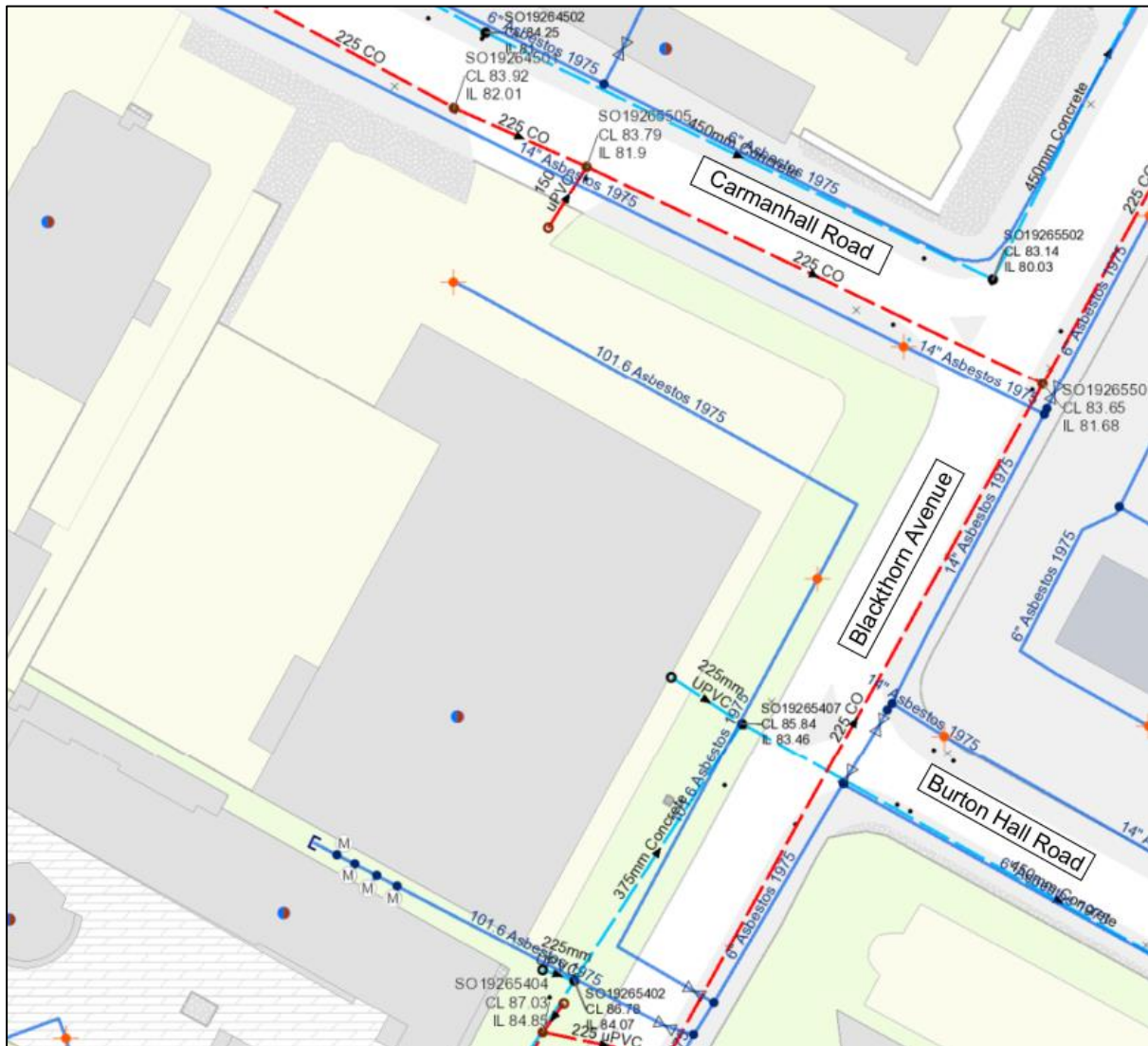


Figure 4.1: Drainage & Water Records (Source: DLRCC)

### 4.2 Proposed Surface Water Drainage

It is proposed to discharge surface water from the development to the existing 450mm diameter concrete surface water sewer in Carmanhall Road, via a new connection to the existing manhole. It is proposed to decommission the existing connection. The proposed storage network to serve the proposed development has been designed and modelled, using Innovzye Microdrainage, for the 1 in 100-year storm event, with an allowance of 20% for climate change, as per the Greater Dublin Strategic Drainage Study (GSDS).

2 no. Stormtech attenuation tanks are proposed, providing a storage volume of 286 m<sup>3</sup>. AECOM have modelled the proposed surface water drainage network, in order to achieve no flood risk within the site. Refer to AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-0502 for the proposed network.

The implementation of the proposed Green Roof system provides additional storage volume throughout the site. However, this storage is not included in the attenuation volume as the green roofs may be saturated at the time of any given storm and flow controls are not proposed on the green roofs. Similarly, other SuDS measures provide storage but are not used in storage calculations.

Soil class 4, which corresponds to a soil index of 0.47 (site investigation borehole logs classify the underlying soil as “stiff to very stiff brown and grey sandy gravelly clay”), was used to calculate  $Q_{bar}$ . The associated  $Q_{bar}$  for the 0.73 ha site was calculated as 4.91 l/s by JBA Consulting in the Stage 1 Surface Water Audit (see Appendix D), using Met Éireann rainfall data. AECOM had previously calculated 5.26 l/s using a SAAR (standard annual average rainfall) value of 985 mm, taken from HR Wallingford. This calculation is available in Appendix E.

The discharge rate of 4.9 l/s, calculated by JBA Consulting in the Surface Water Audit, has been used in the modelling of the surface water network and sizing of attenuation tanks. The proposed maximum discharge rate is significantly lower than the current maximum discharge rate of runoff leaving the site, as it is currently 100% impermeable and discharging runoff unattenuated.

The rainfall inputs to the model were taken from Met Éireann rainfall data; M5-60 of 17.8 and a ratio, R, of 0.275. This data is attached in Appendix F. The surface water network calculations are provided in Appendix G.

It is proposed that the public footpaths, which are outside the north and east perimeter of the proposed building, will drain to the proposed swale and landscaping. It is proposed to drain the additional runoff from the widened public footpath and new cycle path proposed on the eastern side of Blackthorn Road to the existing 450 mm diameter surface water sewer via the existing gully network on Carmanhall Road/Blackthorn Road junction. This is discussed further in the following section.

## 4.3 SuDS (Sustainable urban Drainage Systems)

The proposed development has been assessed in relation to Sustainable Urban Drainage Systems (SuDS) in accordance with the guidelines of the GSDSDS and the SuDS Manual CIRIA C753. The aim of the proposed drainage system is to replicate the natural characteristics of rainfall runoff, minimising the environmental impact from rainfall events by reducing the runoff leaving the site for small rainfall events. Refer to AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-0501 for the proposed SuDS measures.

### 4.3.1 Green Roofs

Green roofs provide ecological, aesthetic and amenity benefits and intercept and retain rainfall, at source, reducing the volume of runoff and attenuating peak flows. Green roofs absorb most of the rainfall that they receive during normal rainfall events, although they will only contribute to attenuation of flows for larger events.

Additionally, green roofs treat surface water through removal of atmospherically deposited urban pollutants. Finally, green roofs may reduce heating (by adding mass and thermal resistance value) and cooling (by evaporative cooling) loads on a building.

The performance of green roofs in the summer is significant in preventing runoff from normal rainfall events due to high levels of evapotranspiration. Green roofs do not provide the same storage in winter as they tend to be saturated for a greater portion of time.

67% of the total roof area is proposed as green roof, in accordance with the County Development Plan (2016-2022). Refer to AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-0501 & PR461030-ACM-XX-00-DR-CE-10-0503 for green roof provision and buildup. Both extensive and intensive green roofs are proposed. Refer to Table 4.1 for a summary of the green roof provision.

Extensive green roofs allow low growing, low maintenance plants consisting of self-sustaining mosses, sedums, succulents, herbs or grasses over a drainage layer and waterproofing membrane. Extensive roofs are usually only accessed for maintenance. Extensive green roofs typically have a 20-150 mm growing medium.

Intensive green roofs typically have a growing medium greater than 150 mm, allowing for a wider array of planting possibilities, including; grasses, shrubs and trees, as ground cover or within planters. Intensive green roofs are typically accessible as they require a higher level of maintenance.

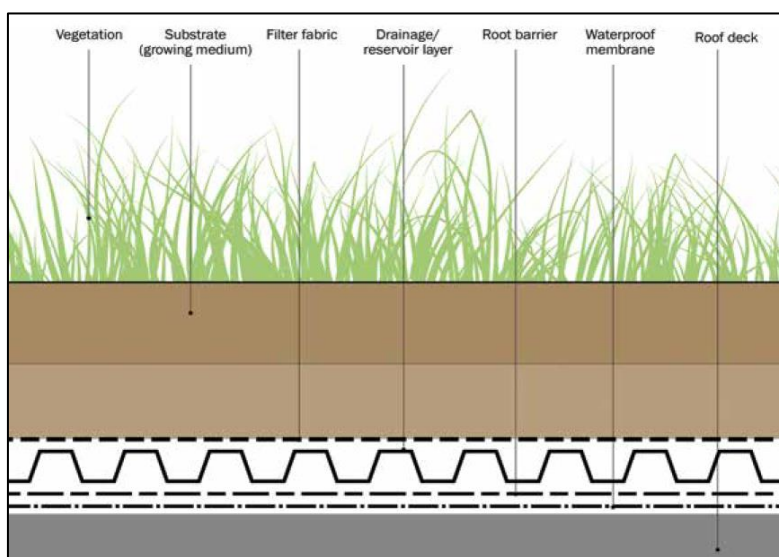


Figure 4.2: Green Roof Layers (Extract form CIRIA C753 SuDS Manual)

Table 4.1: Green Roof Provision

GREEN ROOF PROVISION				
ROOF	TOTAL ROOF AREA (m <sup>2</sup> ) *	GREEN ROOF AREA (m <sup>2</sup> )	GREEN ROOF PROVISION (%)	TYPE
1. 10 <sup>th</sup> FLOOR	547.6	467.0	85%	SEDUM
2. 11 <sup>th</sup> FLOOR	387.2	350.0	90%	SEDUM
3. 17 <sup>th</sup> FLOOR	643.3	560.1	87%	SEDUM
4. 9 <sup>th</sup> FLOOR	304.5	140.5	46%	PLANTER
5. 9 <sup>th</sup> FLOOR	85.5	75.6	88%	SEDUM
6. 6 <sup>th</sup> FLOOR	533.2	294.0	55%	PLANTER
7. 8 <sup>th</sup> FLOOR	893.6	406.5	45%	PLANTER
8. 9 <sup>th</sup> FLOOR	165.6	98.6	60%	PLANTER
<b>TOTAL</b>	<b>3560.4</b>	<b>2392.3</b>	<b>67%</b>	n/a

\* Excludes courtyard, balconies & private terraces, as agreed with DLRCC

### 4.3.2 Swales

300 mm wide dry swales are proposed to take runoff from the proposed private footpath, in order to provide treatment at these locations. A filter medium of prepared soil provides treatment and conveyance capacity. This overlays an underlain system which then drains to the proposed surface water sewer. This proposed measure will effectively filter pollutants from the first flush after a dry weather period. Overflow outlets ensure runoff does not back up and flood the surface during larger rainfall events. Refer to AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-0503 for further detail.

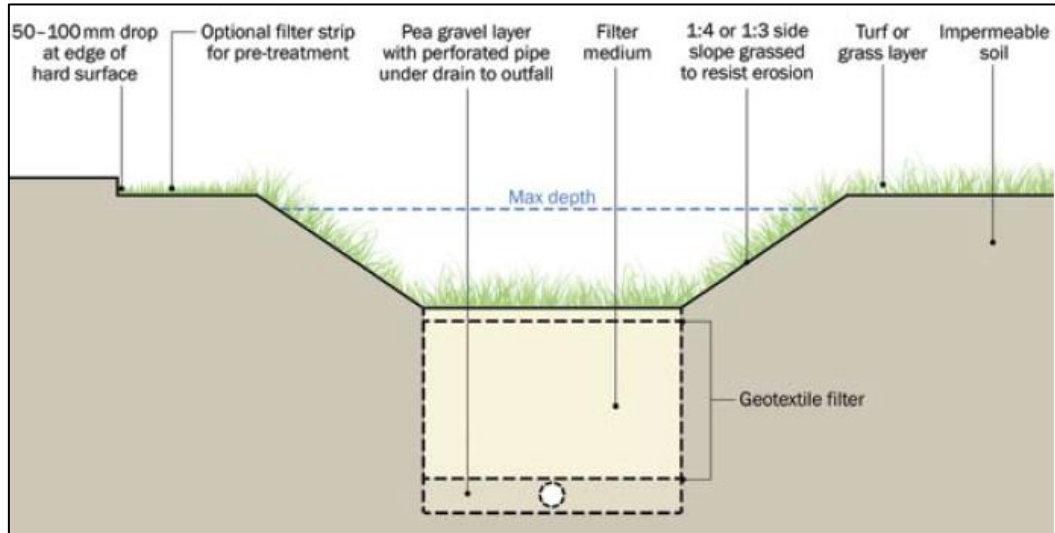


Figure 4.3: Dry Swale (Extract form CIRIA C753 SuDS Manual)

### 4.3.3 Bioretention

Bioretention provides treatment of stormwater and interception, through evapotranspiration and infiltration, if available. Runoff collected from the system is stored on the surface, referred to as the depth of extended detention (normally a maximum of 150 – 300 mm) before filtering through the vegetation and underlying soils. The proposed steps to the courtyard on first floor level are proposed to drain to the bioretention proposed, surrounding the steps. Refer to AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-0503 for further detail.

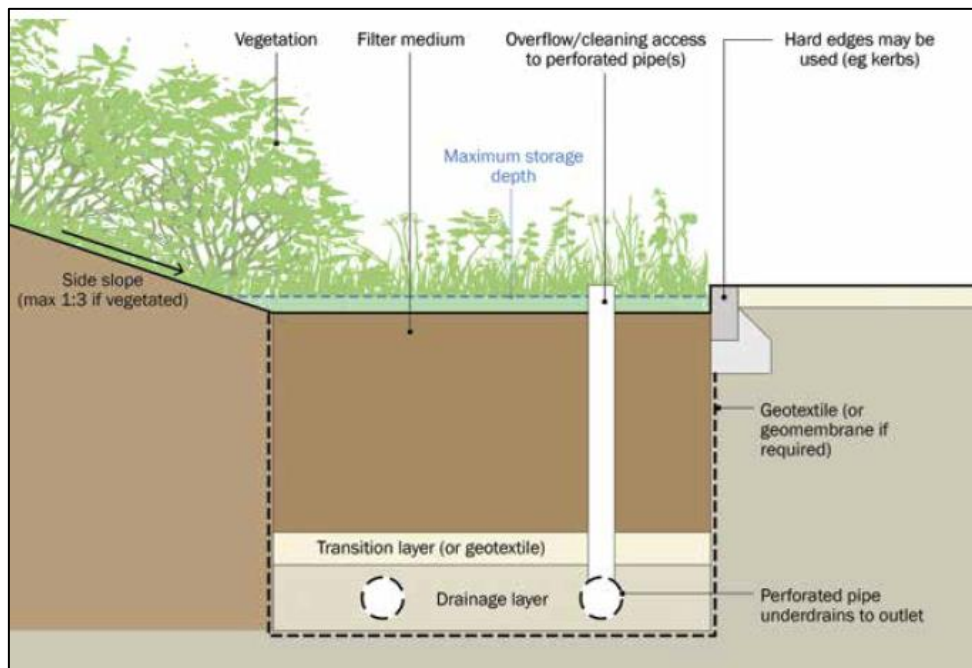


Figure 4.4: Bioretention Layers (Extract form CIRIA C753 SuDS Manual)

#### 4.3.4 Permeable Paving

Porous surfacing (paving block or open graded material) which can treat rainwater, at source, and allow infiltration through to an underlying porous subbase where water can be stored within the voids of the subbase before being slowly released to the drainage collection system through natural flow via the porous medium. A tanked permeable paving system includes an impermeable geotextile at its base and includes an outlet to the surface water system. These systems will allow some form of storage for small rainfall events and can result in water evaporation and adsorption in small quantities, therefore there will be less run-off from these areas in small rainfall events thus mimicking the natural response for this catchment. As well as reducing the amount of run-off from the surface, permeable paving will slow down the rate of runoff from the pavement in extreme rainfall events contributing to attenuation of flows. In addition, permeable paving will increase the quality of water which is intercepted by the system through filtration, biodegradation, pollutant adsorption and settlement and retention of solids, also the reduction in peak flows to the outfall will enhance settlement and biodegradation of pollutants.

Permeable paving is proposed on the access road, outside of the under-croft car park. Based on a minimum depth of 350 mm stone layer beneath the proposed paving course and an area of 306 m<sup>2</sup>, the storage provided by the permeable paving is 43 m<sup>3</sup> (using a stone porosity of 40%).

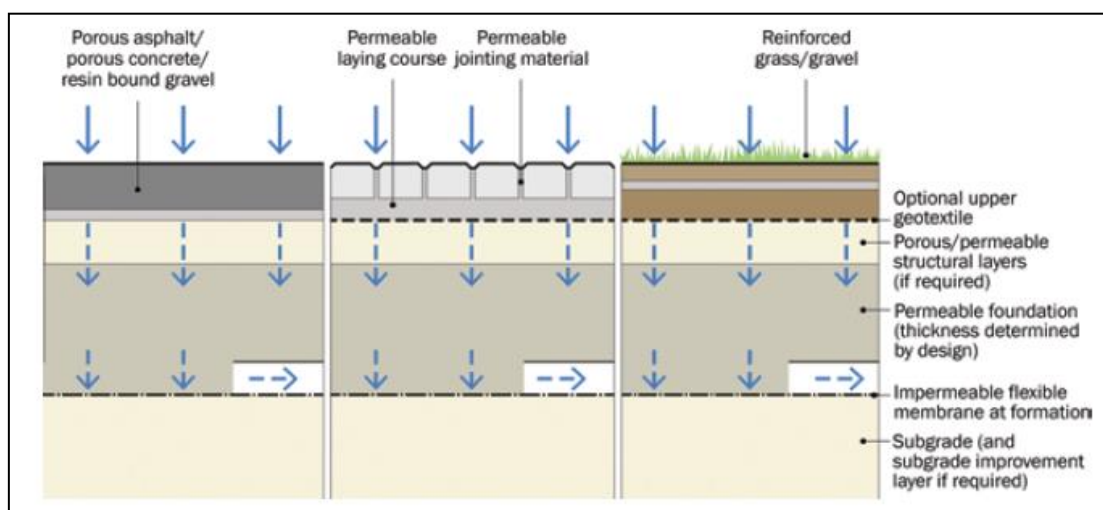


Figure 4.5: Permeable Paving System – No Infiltration (Extract form CIRIA C753 SuDS Manual)

#### 4.3.5 Storage Tank (Arch Structure – Stormtech)

The 2 no. 143 m<sup>3</sup> attenuation tanks proposed are designed using the Stormtech MC-4500 system. An impermeable liner surrounding the tanks is proposed in order to protect the building's foundations. The Stormtech storage systems include a stone medium (the Stormtech chambers are surrounded by stone to manufacturer specification). Sediments are captured in the stone medium providing treatment by removing silts and some hydrocarbons from the runoff. Silt traps (catch-pits) manholes incorporating 500mm deep sumps will also be provided as further silt removing treatment measure in both the upstream and downstream manholes of the attenuation tanks. The total provided storage is 286 m<sup>3</sup>.

Refer to AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-0501 and PR461030-ACM-XX-00-DR-CE-10-0502 for the proposed surface water layout, and PR461030-ACM-XX-00-DR-CE-10-0504 for cross sections of the Stormtech attenuation tanks. Refer to Appendix I for Stormtech Tank details.

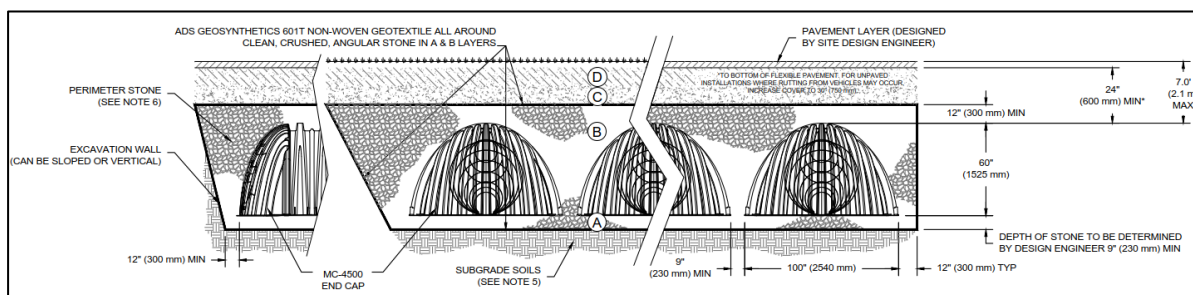


Figure 4.6: Stormtech Standard Detail (Extract from Stormtech MC-4500 Leaflet)

### 4.3.6 Petrol Interceptor

Petrol Interceptors are widely used to avoid and prevent hazardous chemical and petroleum by-products from entering watercourses and public sewers. As standard, petrol interceptors shall be positioned close to the potential pollution source (to minimise emulsification of oils and their coating of sediments) and upstream of the connection point to the public network, within the private boundary. Please refer to AECOM Drawing PR252947-ACM-XX-00-DR-CE-10-0502 for the proposed location. There are two classes of systems:

- Class 1 device means that the resultant effluent should contain 5mg/l hydrocarbon content or less under standard test conditions;
- Class 2 can contain up to 100mg/l in their discharge and are appropriate where drainage is to a foul sewer.

A Class 1 petrol interceptor is proposed in this instance.

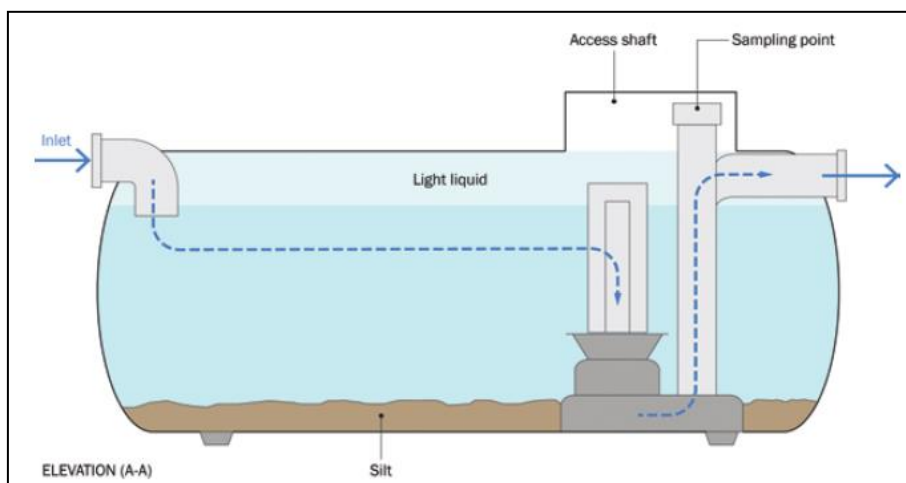


Figure 4.7: Typical Petrol Interceptor Detail (Extract from Ciria C753 SuDS Manual)

All SuDS components shall be constructed in accordance with CIRIA C768 – Guidance on the Construction of SuDS. Please refer to Appendix J for the Drainage Maintenance Checklist from the CIRIA SuDS Manual C753.

## 4.4 Compliance with Greater Dublin Strategic Drainage Study

Site investigation found infiltration is not present on the site. Therefore, in areas where interception (no runoff from the site for rainfall depths of 5mm – GSDSDS) requirements are not achievable, treatment of runoff is satisfied in accordance with the GSDSDS.

**Table 4.2: GSDSDS Table 6.3**

Criteria	Sub-criterion	Return Period (Years)	Design Objective	Design Proposals
<b>Criterion 1</b> River Water Quality Protection	1.1	<1	Interception storage of at least 5mm, and preferably 10mm, of rainfall where runoff to the receiving water can be prevented.	SuDS measures such as green roof, bioretention, swales and permeable paving have been proposed, where possible, to allow interception storage, through evapotranspiration. However, for areas of the site where these interception storage requirements are not satisfied, treatment storage shall be provided as per sub-criterion 1.2.
	1.2	<1	Where initial runoff from at least 5mm of rainfall cannot be intercepted, treatment of runoff (treatment volume) is required.  Retention pond (if used) to have minimum pool volume equivalent to 15mm rainfall.	Treatment volume will be provided through the proposed green roofs, bioretention, permeable paving, swales at or close to the source. The Stormtech attenuation tank's stone medium also provides a certain degree of treatment. Refer to AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-0501.  See treatment volume calculations in Table 4.4 - Table 4.7.
<b>Criterion 2</b> River Regime Protection	2.1	1	Discharge rate equal to 1 year greenfield site peak runoff rate or 2 l/s/ha, whichever is the greater. Site critical duration storm to be used to assess attenuation storage volume.	Runoff from the site will be restricted to a maximum 4.9 l/s.  This is based on a site area of 0.73 ha and a soil class of 4 (as site investigation revealed boulder clay). However, the 1 year peak runoff event will be further restricted due to the Hydrobrake's head/discharge relationship.  It is noted that while the outflow will be set to the Qbar Rate, the outflow is also a function of head. The maximum flow rate is achieved only at the maximum head of water in the attenuation tank (and momentarily just before the vortex starts to form), while for less head of water in the tank (as in the case of the 1 year return period event) the discharge rate is a function of the head-discharge relationship of the Hydro-Brake (flow control) device. This ensures that an appropriate/reasonable discharge flow rate is achieved for each return period event.
	2.2	100	Discharge rate equal to 1 in 100 year greenfield site peak runoff rate. Site critical duration storm to be used to assess attenuation storage volume.	The overall discharge rate proposed for the site is 4.9 l/s, which is achieved for the 100 Year Return Period Events. For more details refer to Surface Water Drainage Reports in Appendix C.
<b>Criterion 3</b> Level of Service	3.1	30	No flooding on site except where specifically planned flooding is approved. Summer design storm of	It is proposed that the Critical Duration Storm 100 Year Return Period event is fully contained within the attenuation tanks. No flooding occurs on site for any event up to the 100 Year event + 20% climate change.

Criteria	Sub-criterion	Return Period (Years)	Design Objective	Design Proposals
(flooding) for the site			15 or 30 minutes are normally critical.	A Flow Exceedance Route (see Section 4.5) for the case of 50% blockage at the Hydrobrake was examined and due to proposed levels and gullies, the associated flooding will flow out of the site onto Carmanhall Road. The Flow Exceedance Route is shown in PR461030-ACM-XX-00-DR-CE-10-0601.
	3.2	100	No internal property flooding. Planned flood routing and temporary flood storage accommodated on site for short high intensity storms. Site critical duration events.	It is proposed that the Critical Duration Storm 100 Year Return Period event is fully contained within the attenuation tanks. No flooding occurs on site for any event up to the 100 Year event + 20% climate change. The Flow Exceedance Route (see Section 4.5) for the case of 50% blockage at the Hydrobrake was examined and due to proposed levels, the associated flooding will flow out of the site onto Carmanhall Road. The Flow Exceedance Route is shown in PR461030-ACM-XX-00-DR-CE-10-0601. Site levels have been proposed to ensure that in the unlikely possibility that ponding occurs, it will be situated away from the building access points, bin store and substation & switch rooms.
	3.3	100	No internal property flooding. Floor levels at least 500mm above maximum river level and adjacent on-site storage retention.	No flooding occurs on site for any event up to and including the 100 Year event + 20% climate change. It is also noted that adjacent attenuation tanks have minimum 650 mm cover. Maximum water level within the proposed network is approx. 1 m below the proposed ground level. In the case of a 50% Hydrobrake blockage, the maximum water level within the network is approx. 0.15 m below the proposed ground level. Refer to Section 5 of the Flood Risk Assessment.
	3.4	100	No flooding of adjacent urban areas. Overland flooding managed within the development.	No flooding occurs on site for any event up to the 100 Year event + 20% climate change.
<b>Criterion 4</b> River Flood Protection (Criterion 4.1, or 4.2 or 4.3 to be applied)	4.1	100	“Long-term” floodwater accommodated on site for development runoff volume which is in excess of the greenfield runoff volume. Temporary flood storage drained by infiltration on a designated flooding area brought into operation by extreme events only. 100 year, 6 hour duration storm to be used for assessment of the additional volume of runoff.	This sub-criterion is not applied. Only one of the three sub-criteria is required to be applied.



Criteria	Sub-criterion	Return Period (Years)	Design Objective	Design Proposals
	4.2	100	Infiltration storage provided equal in volume to "long term" storage. Usually designed to operate for all events.  100year, 6 hour duration storm to be used for assessment of the additional volume of runoff.	This sub-criterion is not applied. Only one of the three sub-criteria is required to be applied.
	4.3	100	Maximum discharge rate of QBAR or 2 l/s/ha, whichever is the greater, for all attenuation storage where separate "long term" storage cannot be provided.	A simulation for the surface water network was undertaken to ensure that all runoff from the site will be limited to 4.9 l/s (Qbar) and no flooding will occur.  2 no. attenuation tanks with total net storage capacity of 286 m <sup>3</sup> are provided within the site to ensure that no flooding occurs on site for the critical duration storm of the 1 in 100 year event plus 20% climate change allowance.

#### 4.4.1 Interception & Treatment Volume Provision

The provided interception and treatment volume proposed for the roof area, the road and the steps area from the courtyard/podium are shown below in Table 4.3 - Table 4.6 The provided interception and treatment volume proposed for the overall site is shown below in Table 4.7. A sub-catchment assessment of interception & treatment, based on areas contributing to runoff, has been undertaken to ensure each sub-catchment of the site is receiving sufficient interception and/or treatment.

**Table 4.3: Roof - Interception Volume**

Building (Roof & private terraces, courtyard & balconies) - Interception			
Area Type (m <sup>2</sup> )	Area (m <sup>2</sup> )	Interception Required (m <sup>3</sup> ) *	Interception Provided (m <sup>3</sup> ) **
Total Roof Area	5940	23.8	-
Extensive	1515	-	7.6
Intensive	1897	-	28.5
<b>Interception Provision:</b>		<b>23.8</b>	<b>36.0</b>

\* Based on the first 5mm of rainfall over 80% of the total impermeable site area, as per the GDSDS,

\*\* Based on an interception volume of 5mm for the extensive green roof, primary treatment is also provided.

**Note:**

- 5 mm of interception on extensive green roof is assumed during summer months, as per CIRIA SuDS Manual C753, Section 12.4.2.
- 15 mm of interception is assumed, based on the various case studies of Section 12.4.2 of the CIRIA SuDS Manual C753. These case studies are of a significantly lower substrate depth than the substrate depth proposed in this scenario.
- It is also noted that interception is most critical during summer months, as prolonged dry periods leave rivers most vulnerable to pollution, as flows are low and dilution is reduced.

**Table 4.4: Roof - Treatment Volume**

<b>Building (Roof &amp; private terraces, courtyard &amp; balconies) - Treatment</b>			
<b>Area Type (m<sup>2</sup>)</b>	<b>Area (m<sup>2</sup>)</b>	<b>Treatment Required (m<sup>3</sup>) *</b>	<b>Treatment Provided (m<sup>3</sup>) **</b>
Total Roof Area	5940	71.3	-
Extensive	1515	-	12.7
Intensive	1897	-	284.6
Permeable Courtyard Paving	772	-	88.0
Accessible Roof Permeable Paving	899	-	13.5
<b>Treatment Provision:</b>		<b>71.3</b>	<b>297.3</b>

\* Based on the first 15mm of rainfall over 80% of the total impermeable site area, as per the GSDSDS,

\*\* Based on respective areas and substrate/subbase depths and porosities as follows; 28 mm substrate depth of extensive green roof (Bauder XF301 Sedum System, 28 mm as specified on Bauder's website, see product datasheet in Appendix H) with 30% porosity, 500 mm intensive green roof planter substrate depth with 30% porosity, 440 mm sub base of permeable courtyard paving with 30% porosity and 50 mm bedding layer of Accessible Roof Permeable Paving with 30% porosity.

Note:

- The assumption of 30% porosity is based on Section 30.4.1 of the CIRIA SuDS Manual C753, for aggregates and clays.
- The Bauder DSE60 drainage layer (see Appendix H), which lies beneath the roof pavements and intensive green roof planters, provides 12 mm of treatment per m<sup>2</sup> as the layer is filled with mineral drain.

**Table 4.5: Road - Treatment Volume**

<b>Road - Treatment</b>			
<b>Road Area (m<sup>2</sup>)</b>	<b>Treatment Required (m<sup>3</sup>) *</b>	<b>Permeable Paving Area (m<sup>2</sup>)</b>	<b>Treatment Provided (m<sup>3</sup>) ***</b>
460	5.5	306.0	42.8

\* Based on the first 15mm of rainfall over 80% of the total impermeable site area, as per the GSDSDS,

\*\* Based on a minimum depth of 350mm of stone media and a void ratio of 0.40.

**Table 4.6: Steps Area - Treatment Volume**

<b>Steps Area - Treatment</b>			
<b>Area (m<sup>2</sup>)</b>	<b>Treatment Required (m<sup>3</sup>) *</b>	<b>Bioretention Area (m<sup>2</sup>)</b>	<b>Treatment Provided (m<sup>3</sup>) **</b>
329	3.9	74.0	3.7

\* Based on the first 15mm of rainfall over 80% of the total impermeable site area, as per the GSDSDS,

\*\* Based on 50 mm depth of extended detention over the respective area.

**Table 4.7: Overall Site - Interception & Treatment Volume**

<b>Overall Site - Interception &amp; Treatment Provision</b>				
<b>Site Area (m<sup>2</sup>)</b>	<b>Interception Required (m<sup>3</sup>)</b>	<b>Interception Provided (m<sup>3</sup>)</b>	<b>Treatment Required (m<sup>3</sup>)</b>	<b>Treatment Provided (m<sup>3</sup>)</b>
6729	26.9	36.0	80.7	343.8

## 4.4.2 Interception & Treatment Commentary

As noted above, based on Section 12.4.2 of the CIRIA SuDS Manual C753, during the summer months 5 mm of interception is provided for extensive green roof and 15 mm is provided for intensive green roofs. Therefore, all intensive green roof planters and extensive green roofs areas are meeting interception requirements for their respective plan areas.

Intensive green roof planters are proposed on the accessible roofs and are above the adjacent paving levels. Therefore, the associated runoff from the paving must receive sufficient treatment from its bedding layer and drainage layer. The GDSDS sets out a requirement of 15 mm of treatment volume for 80% of the paved area, therefore, 12 mm per m<sup>2</sup> of the paving area is required. 15 mm of treatment is provided in the 50 mm bedding layer, per m<sup>2</sup>, as sediments and pollutants are filtered out. A further 12 mm per m<sup>2</sup> of treatment storage shall be provided in the drainage layer, which is filled with mineral drain A Bauder DSE60 drainage layer provides this volume, refer to Appendix H. (This additional treatment has been omitted from treatment calculations, treatment volume is only calculated based on the bedding layer and porosity. It is also noted that a certain amount of interception will take place in the permeable paving via evapotranspiration, however this has not been accounted for in the calculations also.)

Refer to AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-0501 for the interception & treatment proposals, for each sub-catchment area.

Two of the proposed extensive green roofs provide 0.2 m<sup>3</sup> less than the required interception volume (based on 5mm of rainfall over 80% of the area in accordance with the GDSDS). This is due to balconies within the sub-catchment which will drain internally to the service riser. Any pollutants from the balconies will be deposited within sumps or the Stormtech tank's stone media.

The steps from the courtyard/podium will drain to the bioretention, receiving treatment before entering the network. However, a portion of this sub-catchment area will drain to the proposed linear drainage channel untreated. A silt trap is proposed to be incorporated into this linear drainage channel. Any further pollutants will be deposited within sumps or the Stormtech tank's stone media, while hydrocarbons will be removed by the proposed petrol interceptor.

The road carriageway, external to the under-croft car park, is proposed as permeable paving, to treat runoff at source.

All surface water from the site will discharge to the public network after flowing through the proposed petrol interceptor, where hydrocarbons are removed. Proposed balconies on the western side of the building are currently proposed to drain via downpipes and enter the permeable paving. Proposed balconies facing on to the courtyard are proposed to drain via downpipes to the intensive green roof planting proposed.

Swales are proposed within the public landscaping in order to treat runoff from the public footpaths external to the building. While swales and the Stormtech tank's stone medium both provide treatment, it is minimal and difficult to quantify, and these volumes are therefore excluded from the calculations above.

## 4.5 Flow Exceedance Route

The Flow Exceedance Route for the case of 50% blockage at the Hydrobrake was examined. In the event of a blockage during a major rainfall event, the Hydrobrake manhole and surrounding gullies will flood first, when the network has surpassed capacity, as they are lowest proposed gullies on the site. Due to the proposed levels, the associated flooding will flow out of the site onto Carmanhall Road. Approximately 5 m<sup>3</sup> will be retained on site behind the 100 mm raised pedestrian crossing and the 100 mm kerb height. The excess flow should then enter the existing gullies on Carmanhall Road. The Flow Exceedance Route is shown in PR461030-ACM-XX-00-DR-CE-10-0601. Refer also to Section 5 of the Flood Risk Assessment for details of the surcharge analysis.

## 4.6 Engagement with Dún Laoghaire-Rathdown County Council

Following the Pre-Application meeting held on the 23<sup>rd</sup> November 2020 with An Bord Pleanála, AECOM have engaged with the Executive Engineer in the Drainage, Planning and Municipal Services section in Dún Laoghaire County Council. Guidance was provided on;

- The site's discharge rate (Qbar was agreed),
- Public areas to be Taken In Charge and associated drainage which will discharge unrestricted,
- Green Roof provision, and
- Inclusion of permeable roof paving.

As requested, a sub-catchment assessment of interception & treatment, based on areas contributing to runoff, has been undertaken to ensure each sub-catchment of the site is receiving sufficient interception and/or treatment.

Following discussions with DLRCC, the areas which constitute the total roof area have been refined appropriately. The resulting green roof area is 67% of this roof area. Green roof provision is in accordance with DLRCC requirements, as set out in Appendix 16 of The Development Plan.

## 5. Wastewater Drainage

### 5.1 Engagement with Irish Water

A Pre-Connection Enquiry was submitted to Irish Water (Reference No: CDS20000844) for the proposed development on the 6<sup>th</sup> February 2020 and Irish Water issued the Confirmation of Feasibility (Appendix K) on the 14<sup>th</sup> August 2020, which stated the wastewater connection must be made to the foul sewer on Arkle Road. Additional survey was obtained for this sewer. It was found that the furthest upstream pipe was blocked/capped (the sonde extended only 300 mm upstream). It is therefore proposed to connect to the sewer at the next manhole downstream. Refer to Appendix C for Utility Survey records.

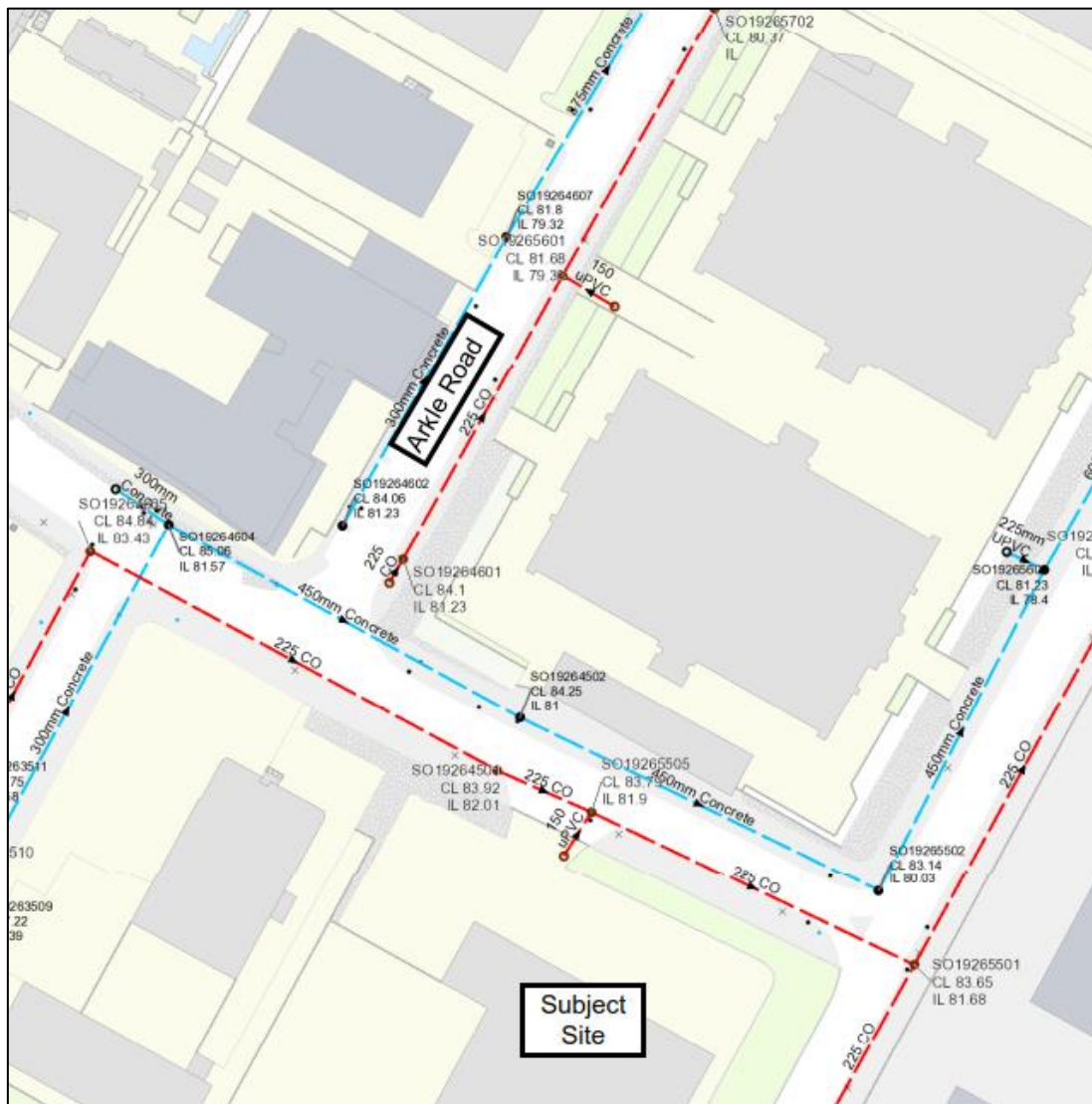


Figure 5.1: Existing Civil Infrastructure. (Full map in Appendix A)

In advance of the Pre-Application meeting, with An Bord Pleanála, held on the 23<sup>rd</sup> November 2020, Irish Water submitted correspondence to ABP dated 18<sup>th</sup> November 2020, which confirmed that a Statement of Design Acceptance had been issued.

Following the ABP Opinion, Case ABP-307978-20, some modifications were made to the scheme, which resulted in modifications to the drainage levels. As a result, AECOM have submitted and obtained an updated Statement of Design Acceptance for the proposed network (Appendix L).

## 5.2 Proposed Wastewater Network

It is proposed to connect the proposed to the existing 225 mm diameter clay wastewater sewer in Arkle Road, as instructed by the Confirmation of Feasibility.

The design has been undertaken in accordance with Irish Water's Code of Practice for Wastewater Infrastructure. Refer to the proposed foul network as shown in AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-0501 and to Appendix K for the wastewater network calculations.

The table below highlights the proposed foul loading on the wastewater associated with the residential units. This is based on the national average population equivalence (PE) of 2.7 persons per dwelling.

Wastewater Discharge						
Use	Proposed No. Residential Units	Population Equivalent (PE)	Peaking Factor	Foul Discharge (l/d) *	Foul Discharge (l/s)	Peak Flow** (l/s)
Residential	428	1156	3.0	190,674	2.21	6.62

\*based on foul loading 165 l/p/d as per Irish Water Requirements

\*\* based on peak factor of 3.0 as per Irish Water Requirements (population between 1001-5000)

The dry weather flow (DWF) is estimated as 2.21 l/s with a peak flow of 6.62 l/s. Refer to Appendix K for foul water network calculations.

## 6. Water Supply Layout

### 6.1 Engagement with Irish Water

A Pre-Connection Enquiry was submitted to Irish Water (Reference No: CDS20000844) for the proposed development. The Confirmation of Feasibility was issued on the 14<sup>th</sup> August 2020 and is attached in Appendix K.

In advance of the Pre-Application meeting, with An Bord Pleanála, held on the 23<sup>rd</sup> November 2020, Irish Water lodged correspondence to ABP dated 18<sup>th</sup> November 2020, which set out some additional requirements in respect of Water Supply – refer to Appendix N. It is noted that the number of residential units proposed has since been reduced to 428.

This correspondence states that “where any proposals by the application to build over or divert existing water or wastewater services the application is required to submit details to Irish Water for assessment of feasibility and have written confirmation of feasibility of diversion(s) from Irish Water ahead of the SHD Application to the board.”

In this regard AECOM have engaged with Irish Water and obtained a Diversion Confirmation of Feasibility – refer to Appendix L. A diversion agreement will be required in addition to a connection agreement from Irish Water, following a grant of planning for the development.

### 6.2 Proposed Water Supply

A 14 inch (~350 mm) Asbestos watermain is present in Carmanhall Road and a 6 inch Asbestos watermain (~150 mm) diameter watermain is present in both Carmanhall Road and Blackthorn Avenue. A 101.6 mm connection to the site from the 6 inch (~150 mm) diameter in Blackthorn Avenue is shown, refer to existing records in Appendix A.

Under Irish Water’s Confirmation of Feasibility (14<sup>th</sup> August), reference is made to the existing Irish Water infrastructure in place on and in the vicinity of the subject site. The existing asbestos supply connection to the site is to be removed and replaced with a 150 mm connection between the existing 6 inch (~150 mm) asbestos watermain in Carmanhall Road and the existing 6 inch (~150 mm) asbestos watermain in Blackthorn Road, in order to supply the development. Due to this proposed upgrade, a Diversion Confirmation of Feasibility was required and was obtained from Irish Water. A Diversion Offer must be obtained before works commence.

1 no. fire hydrant is to be removed as part of the decommissioning the existing connection. 1 no. hydrant is shown on the existing 101.6 mm connection to the site (to be replaced following the upgrade to a 150 mm watermain) and 1 no. existing hydrant is shown on the 14 inch (355.6 mm) watermain on Carmanhall Road, as shown in the existing records in Appendix A. Existing hydrants are to be confirmed on site. 2 no. new hydrants are proposed to serve the development.

The design has been undertaken in accordance with Irish Water’s Code of Practice for Water Infrastructure. Refer to AECOM Drawing No. PR461030-ACM-XX-00-DR-CE-10-2701.

Water Demand					
Use	Proposed No. Residential Units	Associated Population	Average Water Demand* (l/d)	Average Water Demand (l/s)	Peak Demand** (l/s)
Residential	428	1156	173,340	2.01	12.54

\*based on 150 l/p/d as per Irish Water Requirements

\*\* based on average peak demand factor of 1.25 and peak factor of 5, as per Irish Water Requirements

The average water supply has been estimated to be 2.01 l/s, with a total peak of 12.54 l/s.

## Appendix A – Site Investigation



**PROPOSED DEVELOPMENT  
SANDYFORD DUBLIN  
MARLET PROPERTY**

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**AECOM  
CONSULTING ENGINEERS**

**CONTENTS**

<b>I</b>	<b>INTRODUCTION</b>
<b>II</b>	<b>FIELDWORK</b>
<b>III</b>	<b>TESTING</b>
<b>IV</b>	<b>DISCUSSION</b>

**APPENDICES**

<b>I</b>	<b>BORING RECORDS</b>
<b>II</b>	<b>ROTARY CORE LOGS / PHOTOGRAPHS</b>
<b>III</b>	<b>TRIAL PIT RECORDS</b>
<b>IV</b>	<b>PLATE BEARING TEST</b>
<b>V</b>	<b>BRE DIGEST 365 INFILTRATION</b>
<b>VI</b>	<b>TEST DATA</b>
	<b>a. Geotechnical</b>
	<b>b. Environmental / Chemical</b>
	<b>c. Ground Water and Gas</b>
<b>VII</b>	<b>SITE PLAN</b>

## **FOREWORD**

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

### **General.**

Recommendations made, and opinions expressed in the report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held for conditions which have not been revealed by exploratory work, or which occur between exploratory hole locations. Whilst the report may suggest the likely configuration of strata, both between exploratory hole locations, or below the maximum depth of the investigation, this is only indicative, and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

### **Boring Procedures.**

Unless otherwise stated, the 'Shell and Auger' technique of soft ground boring has been employed. All boring operations sampling and/or logging of soils and in-situ testing complies with the recommendations of the British Standard Code of Practice BS 5930 (1981), 'Site Investigation' and BS 1377:1990, 'Methods of test for soils for civil engineering purposes'.

Whilst the technique allows the maximum data to be obtained in soft ground, some disturbance and variation of soft and layered soils is unavoidable. Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Where peat has been encountered during siteworks, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Geologiska Undersöknings torvinventering och några av dess hittills vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 & Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986).

**Routine Sampling.**

Undisturbed samples of soils, predominantly cohesive in nature are obtained unless otherwise stated by a 104mm diameter open-drive tube sampler. In granular soils, and where undisturbed sampling is inappropriate, disturbed samples are collected. Smaller disturbed samples are also recovered at intervals to allow a visual examination of the full strata section.

**In-Situ Testing.**

Standard penetration tests, utilising either the standard split spoon sampler or solid cone and automatic trip-hammer are conducted unless otherwise where required by instruction. Subsequent to a seating drive of 150mm, a summation for the number of blows for 300mm penetration is recorded on the boring records together with the blow count for each 75mm penetration. In cases where incomplete penetration is obtained, the number of blows for the recorded value of penetration are noted. In coarse granular soils, a cone end is fitted to the sampler and a similar procedure adopted.

**Groundwater.**

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level.

Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage condition, tidal variation or other causes.

**Retention of Samples.**

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

**REPORT ON A SITE INVESTIGATION  
AT  
FORMER AVID SITE**

**SANDYFORD  
FOR**

**MARLET PROPERTY GROUP  
AECOM CONSULTING ENGINEERS**

**Report No. 22455**

**JUNE 2020**

**I Introduction**

A new multi-storey residential development is proposed for this site located at the junction of Blackthorn Road and Carmanhall Road in Sandyford. The site was formerly occupied by AVID, the old buildings have all been demolished and the area prepared for this new development.

An investigation of sub soil conditions in the developments area has been carried out by IGSL under the direction of AECOM Consulting Engineers, acting for the developers, MARLET Property Group.

The scope of works scheduled and completed is detailed below:

* Cable Percussion Boreholes	4 nr.
• Rotary Core Drilling	2 nr.
• Trial Pits	12 nr.
• CBR by Plate Test	1 nr.
• Infiltration Test	2 nr.
• Water and Gas Monitoring	
• Geotechnical Laboratory Tests	
• Environmental Laboratory Tests	

The investigation has been carried out in accordance with the various standards outlined in the foreword to this document. Field operations were completed in March 2020.

This report includes all factual data from field operations and laboratory including detailed geotechnical logs and laboratory data.

Recommendations for foundation construction are also presented in this report.

## **II Fieldwork**

The development area is Brownfield following demolition of buildings and site preparation works. The surfaces ranged from hard-core fill to tarmac and topsoil.

The various exploratory locations are noted on the drawing enclosed in Appendix VII. This drawing was provided by AECOM. Each location was set out to the specified co-ordinates by IGSL site personnel.

All exploratory positions were scanned electronically (CAT) to ensure that existing services were not damaged. Hand excavation was also carried out to a depth of 1.00 metres at borehole locations to ensure that underground services were not damaged.

The various exploratory methods are discussed in the following paragraphs.

### ***Boreholes***

Boreholes were 200mm diameter and were constructed using conventional cable percussion equipment. Holes were referenced BH01 to BH04 and were located at the four corners of the site

Detailed geotechnical records are contained in Appendix I to this report - the records give details of stratification, sampling, in-situ testing and groundwater. Note is also taken of any obstructions to normal boring requiring the use of the heavy chisel for advancement. It was not possible to recover undisturbed samples because of the high stone/cobble content of the strata encountered.

The findings at the four locations are quite consistent. Surface FILL extends to depths ranging from 1.00 to 1.90 metres.

In all four boreholes stiff to very stiff brown and grey sandy gravelly CLAY is present below the FILL. Boreholes continued in this stratum to refusal on obstructions at depths ranging from 7.30 to 11.20 metres. An increasing strength with penetration depth has been noted. Cobbles and boulders were present in the gravelly clay stratum.

This gravelly clay is GLACIAL TILL or BOULDER CLAY, very typical of the greater Dublin area.

BH02 and BH04 were dry during boring while slow to moderate water seepages were noted at 3.30 metres in BH01 and 3.10 metres in BH03. Slotted standpipes were installed in BH01 and BH02 to facilitate long term observation of ground water and permit measurement of any gas present.

### ***Rotary Core Drilling***

Rotary core drilling was scheduled at two locations to advance hole depth and establish bedrock horizon. These holes were bored through the boulder clay deposits to the underlying granite bedrock. Rotary holes were designated RC02 and RC04.

A GEO405 rig was used to drill and recover 78mm diameter core of rock using triple tube diamond drilling technique. Open-hole Symmetrix Drilling was used in the overburden soils

All recovered core was returned to the laboratory for detailed logging and photography. The geotechnical core logs are contained in Appendix II. The logs note Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD) as well as presenting a fracture spacing log and detailed geological description.

The drilling was advanced through overburden described as stiff brown and black very gravelly clay with cobbles and boulders throughout.

Weak to Medium Strong grey GRANITE was noted in RC02 at 8.70 metres BGL and 100% core was recovered from 8.70 to 11.70 metres. This core was quite fractured with low SCR and RQD values.

At RC04 very weathered GRANITE was noted at 11.10 metres BGL. Drilling continued to 14.80 metres with only limited recovery of solid core in this location.

Sub samples of the recovered core were taken and sent to the materials laboratory for Point Load Strength Tests.

A 50mm slotted PVC standpipe was installed in both locations with gravel surround and surface seal, details of the installations are provided on the drilling record. Water was noted at final standing levels of 2.20 and 1.32 metres BGL .

### ***Trial Pits***

Trial Pits were excavated at twelve locations to establish stratification and permit sample recovery for environmental analysis. Trial Pits are referenced TP01 to TP12 and fully detailed records are presented in Appendix III. Photographs were also taken at each trial pit and these are also attached for record purposes.

The pits reflect a very high degree of consistency with FILL in all locations (varying from 0.30 to 1.20 metres in thickness) overlying stiff to very stiff BOULDER CLAY. All trial pits were completed at 3.00 metres and no ground water was encountered during the course of the investigation, other than a minor seepage at 2.00 metres in TP01. Excavations remained stable throughout.

Trial Pits were backfilled with compacted excavated material and the areas levelled.

### ***Plate Bearing Test***

The CBR value of the soil at shallow depth was established at one locations using Plate Bearing Test Apparatus. A steel plate is loaded and off-loaded incrementally over two stages and the deflection under load and recovery under off-load is measured by a system of dial gauges. The data is processed and load settlement graphs are prepared. An equivalent CBR value is calculated in accordance with NRA HD25-26/10.

The test was carried out at 0.50 metres on MADE GROUND. An equivalent CBR value of 10% was obtained on the Load Cycle, increasing considerably on re-load.

Test data sheets are presented in Appendix IV.

### ***Infiltration Tests***

Two infiltration tests were carried out in accordance with BRE Digest 365 in the specified locations. Test data is presented in Appendix V.

In both locations no fall in water table was noted over the specified period and a ZERO Infiltration Rate was recorded. The results are typical of the very low permeability boulder clays present on the site and in the general area.

The use of the local authority drainage system for disposal of storm and surface water is therefore recommended.

### ***Water and Gas Monitoring***

Standpipes were installed in four locations to facilitate long term monitoring of ground water levels and determine gas concentrations. Measurements were carried out at intervals following site completion.

Details are presented in Appendix VIc. Final standing water level has stabilised at approximately 2.00 metres BGL.

Concentrations of CO<sub>2</sub>, O<sub>2</sub>, and CH<sub>4</sub> are negligible and no safety issues arise in this regard.

### III. Testing

#### *a) In-Situ :*

Standard penetration tests were carried out at approximate 1.00 metre intervals in the geotechnical boreholes to measure relative in-situ soil strength. Tests were also carried out in the rotary holes. N values are noted in the right hand column of the individual records, representing the blow count required to drive the standard sampler 300mm into the soil, following initial seating blows. Where full test penetration was not achieved the blow count for a specific penetration is recorded, or refusal is indicated where appropriate. Results are summarised as follows.

<b>Stratum / Depth</b>	<b>N Value Range</b>	<b>Comment</b>
<b>FILL DEPOSITS</b>	14 to 17	Medium Dense
<b>BOULDER CLAY</b>		
2.00 metres BGL	21 to 32	Stiff
3.00 metres BGL	18 to 32	Stiff
4.00 metres BGL	28 to 43	Stiff to Very Stiff
5.00 metres BGL	35 to 42	Very Stiff
6.00 metres BGL	36 to 43	Very Stiff
7.00 metres BGL	39 to +50	Very Stiff to Hard
8.00 to 10.00	40 to +50	Very Stiff to Hard

Refusal of SPT apparatus was recorded at the base of each borehole possibly indicative of the granite bedrock horizon.

#### *(b) Laboratory :*

A programme of laboratory testing was scheduled following completion of site operations. Geotechnical soil and rock testing was carried out by IGSL in its INAB-Accredited laboratory. Chemical testing was performed by CHEMTEST in a UKAS accredited laboratory.



The overall test programme included the following elements:

* Moisture Content	IGSL
• Liquid and Plastic Limits	IGSL
• PSD Grading by wet sieve	IGSL
• PSD Grading by Hydrometer	IGSL
• Point Load Test on Rock Core	IGSL
• Sulphate Chloride and pH	CHEMTEST
• RILTA Suite Environmental	CHEMTEST

All test data is presented in Appendices VIa and VIb. and individual test results are discussed as follows:

#### *Classification / Moisture Content*

Six samples of the gravelly CLAY stratum from the boreholes had index properties established. Results consistently fall into Zone CL of the standard Classification, indicative of low plasticity sensitive clay matrix soils. Moisture content for the samples ranges from 11% to 17%. Results are typical of the local boulder clay.

#### *Grading*

Wet sieve analysis and hydrometer was used to establish PSD grading curves for four samples of the glacial till. The graphs reflect material graded smoothly from the clay to gravel fraction, the straight-line pattern of the graphs is typical of the local boulder clay deposition.

#### *Point Load Test*

The strength of the limestone bedrock has been established by Diametric Point Load Tests on four segments of core. Equivalent UCS values ranging from 4 to 40 MPa with an average UCS value of 23 MPa. The low results reflect the highly weathered and weak nature of the bedrock.

*Chemical (BRE SOI Suite)*

Five soil samples were selected for sulphate, Chloride and pH analysis. Sulphate concentrations (SO<sub>4</sub> 2:1 extract) of < 0.010 g/l were established with pH values of 8.4 to 8.7. Chloride contents were also consistently low <0.010 g/l. A sulphate design class of DS-1 (ACEC Classification for Concrete) is indicated for sulphate concentrations less than 0.5 g/l. No special precautions are therefore required to protect foundation concrete from sulphate or chloride aggression.

*RILTA Suite Environmental*

Sixteen samples of the MADE GROUND taken at 0.50 to 1.00 metre from each trial pit were submitted for detailed analysis to RILTA Suite (WAC) parameters.

Fifteen of the sixteen samples are classified as INERT with no elevated contaminant levels established.

In one sample however (TP05 @ 0.50m BGL) an elevated sulphate content was recorded, in excess of the permitted INERT limit. The remaining levels recorded in this sample were all below the INERT levels.

No traces of Asbestos were noted during routine screening.

#### **IV Discussion:**

A new multi-storey residential development is to be undertaken on this site in Sandyford. The nine-storey building will incorporate a single storey basement car park. A formation depth some 3.50 to 4.00 metres BGL is envisaged.

A detailed investigation of sub soil and bedrock conditions has been carried out under the direction of AECOM Consulting Engineers on behalf of MARLET Property Group.

#### ***Summary Stratification***

The findings are very consistent and confirm the presence of shallow surface FILL over BOULDER CLAY deposits with GRANITE bedrock encountered at depth between approximately 9.00 and 11.00 metres.

The FILL extends to a maximum depth of about 1.50 metres and is firm or medium dense in situ, with N values in the range 14 to 17 and an in situ CBR value of 10%.

The BOULDER CLAY or glacial till comprises stiff to hard brown, grey and black sandy gravelly CLAY typically containing cobbles and boulders. SPT values increase with depth from about N=20 at 2.00 metres BGL to N > 50 below 7.00 metres.

The characteristics of the Dublin boulder clay are very well documented and the laboratory data for this site is consistent with the published data.

Ground water seepages were noted in several locations and long term water observations in standpipes indicates a final standing level of about 1.50 metres BGL for this site.

Variation in the general grading pattern of the till can occur, with an elevated granular content and increased moisture content often identified. Bands of water bearing clayey gravel can also typically occur within the generally cohesive soils.

#### ***Proposed Development***

With regard to the proposed development (incorporating multi-storey construction over basement) the following geotechnical issues are discussed.

- Foundations / Bearing Capacity
- Piling
- Basement Construction
- Excavation / Ground Retention
- Groundwater Control / Uplift

### ***Foundations / Bearing Capacity***

At an assumed basement formation depth of 4.00 metres BGL, the sub soils consist of very stiff to hard dark brown or grey gravelly CLAY (Boulder Clay). SPT values at this depth range from N=28 to N=43 with an average value of N=36.

The boulder clay at 4.00 metres BGL should readily support an allowable bearing pressure of the order of 325 KPa for basement slab or column base construction.

N values at 5.00 metre BGL show an increase, with an allowable bearing pressure of the order of 375 KPa recommended at this depth.

The characteristics of the local boulder clay are well documented with numerous publications detailing behavioural and strength / settlement characteristics. The field and laboratory findings from this site are consistent with the extensive local data. The boulder clay will be sensitive to moisture content variation and should be protected from rainfall by blinding. Visual inspection of excavated formation by experienced personnel is also recommended to ensure uniformity and suitability of the founding medium. Any soft zones encountered should be removed and replaced with low-grade concrete.

Settlement in the very stiff to hard glacial till under the above loads should not exceed 5mm and differential movement should be negligible.

### ***Piling***

Should direct excavation to a suitable bearing stratum prove uneconomic from either an engineering or environmental viewpoint, the use of piling techniques can be considered.

Various piling techniques are available with specialist contractors, experienced in local ground conditions available to provide this service.

The stiff to hard black till encountered at about 2.00 metres extends to bedrock horizon at about 10.00 metres and can be used as founding medium for light to moderately loaded piles.

For multi-storey structures with high column loads it is likely that large diameter piles, rock socketed into the granite bedrock will be required.

Proof core drilling has indicated the presence of highly weathered non-intact granite at the soil rock interface, in excess of 3.00 metres in places.

Piling contractors should be consulted to determine the optimum solution for this site, having regard to the geotechnical data and to any possible environmental restraints.

### ***Basement Construction***

As a basement will be incorporated over the full footprint the very stiff to hard lodgement till at approximately 3.50 to 4.00 metres BGL is recommended as founding medium with an allowable bearing pressure of 300 to 350 KPa indicated by SPT values averaging  $N=36$ .

Settlement under this intensity of load will be low ( $< 5\text{mm}$ ) and differential settlement will be negligible.

### ***Excavation / Ground Retention***

Assuming 4.00 metre deep basement construction a retaining wall structure will probably be required to support the soils, prevent undermining of sensitive adjoining buildings or roadways and preclude ground water ingress.

A number of ground retention techniques are available and each should be fully evaluated. These include the following:

- Steel Sheet Pile Wall
- Secant Pile Wall
- King Post Wall

Specialist contractors with will advise on the most suitable and economic option for this development.

### ***Groundwater***

Water ingress was noted in two of the boreholes at approximately 3.00 metres. The inflow was slight to moderate and control of ground water in basement excavation should be readily achieved by conventional pumping from local sumps.

Long-term water observation in standpipes has indicated a final standing level at approximately 2.00 metres BGL and this figure should be adopted in design against uplift.

### ***Roads / Car Parking***

A CBR value of 10% was obtained at 0.50 metres BG in the upper medium dense FILL. This should be suitable for pavement design. Visual inspection of pavement formation is recommended to ensure that all suspect or organic material is removed prior to construction.

### ***Infiltration***

Two percolation tests to BRE Digest 365 confirmed that the soils are unsuitable for dispersion of storm and surface water. The Local Authority drainage system should be utilised.

### ***Environmental***

The results of WAC analyses showed that one sample failed to satisfy the criteria for Inert waste as stipulated by the European Landfill Directive. The fact that only one element of one test out of sixteen analysed exceeded the INERT level, suggests that consultation with landfill operators may well result in acceptance of excavated material from this site.

The results of the RILTA Suite tests can be used to carry out a full Waste Characterisation Assessment (WCA). This assessment is carried out by an environmental specialist and determines whether the soils are Hazardous or Non-Hazardous in advance of being despatched to landfill. Given the test results a WCA may be relevant to this site and may be required by the landfill operators in the event of major excavation.

### ***Concrete***

Low sulphate and chloride contents were established with near neutral pH values. No special precautions are deemed necessary to protect foundation concrete.

***IGSL/JC***  
***June 2020***

## **Appendix I Boring Records**



# GEOTECHNICAL BORING RECORD

REPORT NUMBER

22455

<b>CONTRACT</b> Avid Site, Sandyford		<b>BOREHOLE NO.</b> BH1	
<b>CO-ORDINATES</b>		<b>SHEET</b> Sheet 1 of 1	
<b>GROUND LEVEL (m AOD)</b>		<b>DATE COMMENCED</b> 24/03/2020	
		<b>DATE COMPLETED</b> 25/03/2020	
<b>CLIENT</b> Marlet		<b>SPT HAMMER REF. NO.</b>	
<b>ENGINEER</b> AECOM		<b>ENERGY RATIO (%)</b>	
		<b>BORED BY</b> W.Cahill	
		<b>PROCESSED BY</b> I.Redder	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	TOPSOIL			0.20						
	MADE GROUND (comprised of angular broken rock fill)			0.60						
	MADE GROUND (Comprised of gravelly clay with some stone)			1.00						
1	Firm to stiff, dark brown, sandy silty CLAY with some gravel and occasional cobbles				AA135559	B	1.00		N = 17 (6, 7, 4, 4, 4, 5)	
2					AA135560	B	2.00		N = 21 (4, 4, 5, 5, 5, 6)	
	Stiff, dark grey, sandy silty gravelly CLAY with occasional cobbles			2.50						
3					AA135561	B	3.00		N = 26 (4, 5, 6, 6, 7, 7)	
4					AA135562	B	4.00		N = 33 (6, 7, 7, 8, 8, 10)	
5	Very stiff, brown, sandy gravelly silty CLAY with many subangular to subrounded cobbles and boulders			4.30						
					AA135563	B	5.00		N = 35 (4, 6, 7, 8, 8, 12)	
6					AA135564	B	6.00		N = 40 (7, 8, 8, 9, 11, 12)	
7					AA135565	B	7.00		N = 50/40 mm (25, 50)	
8	Obstruction End of Borehole at 7.30 m			7.30						

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.8	5.1	0.75		3.80	3.80	5.00	1.70	20	Moderate
7.2	7.3	2							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
25-03-20	7.30	1.00	7.00	50mm SP					

<b>REMARKS</b> Hand dug inspection pit for services	<b>Sample Legend</b> D - Small Disturbed (lub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL BH LOG 22455.GPJ IGSL.GDT 29/03/20





# GEOTECHNICAL BORING RECORD

REPORT NUMBER

22455

<b>CONTRACT</b> Avid Site, Sandyford		<b>BOREHOLE NO.</b> BH2
<b>CO-ORDINATES</b>		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (m AOD)</b>	<b>RIG TYPE</b> Dando 2000	<b>DATE COMMENCED</b> 26/03/2020
	<b>BOREHOLE DIAMETER (mm)</b> 200	<b>DATE COMPLETED</b> 27/03/2020
	<b>BOREHOLE DEPTH (m)</b> 8.50	
<b>CLIENT</b> Marlet	<b>SPT HAMMER REF. NO.</b>	<b>BORED BY</b> W.Cahill
<b>ENGINEER</b> AECOM	<b>ENERGY RATIO (%)</b>	<b>PROCESSED BY</b> I.Redder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	TOPSOIL			0.05						
0	Firm, dark brown, sandy silty CLAY with occasional gravel and cobbles (Possibly Made Ground)									
1					SPL1	B	1.00			
1.90				1.90				N = 16 (2, 2, 4, 3, 5, 4)		
2	Stiff to very stiff, dark grey, sandy gravelly silty CLAY with cobbles				SPL2	B	2.00			
3					SPL3	B	3.00			
3.80				3.80				N = 23 (4, 5, 5, 5, 6, 7)		
4	Very stiff, light brown, very sandy CLAY with some gravel				SPL4	B	4.00			
5					SPL5	B	5.00			
5.40				5.40				N = 32 (5, 7, 7, 8, 8, 9)		
6	Very stiff to hard, grey and grey/brown, sandy gravelly silty CLAY with many subangular to subrounded cobbles and boulders				SPL6	B	6.00			
7					SPL7	B	7.00			
8					SPL8	B	8.20			
8.50				8.50				N = 43 (6, 8, 10, 10, 11, 12)		
9	Obstruction End of Borehole at 8.50 m							N = 42 (9, 10, 10, 10, 11, 11)		
								N = 44 (8, 9, 9, 10, 11, 14)		
								N = 39 (6, 8, 8, 9, 10, 12)		
								N = 50/75 mm (12, 16, 32, 18)		

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.7	4.9	1.25							
8.3	8.5	2							No water strike

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
27-03-20	8.50	1.00	8.50	50mm SP	27-03-20	5.40	5.40	0.30	

<b>REMARKS</b> Hand dug inspection pit for services	<b>Sample Legend</b> D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL BH LOG 22455.GPJ IGSL\_GDT\_29/05/20



# GEOTECHNICAL BORING RECORD

REPORT NUMBER

22455

<b>CONTRACT</b> Avid Site, Sandyford		<b>BOREHOLE NO.</b> BH3
<b>CO-ORDINATES</b>		<b>SHEET</b> Sheet 1 of 1
<b>GROUND LEVEL (m AOD)</b>	<b>RIG TYPE</b> Dando 2000	<b>DATE COMMENCED</b> 23/03/2020
	<b>BOREHOLE DIAMETER (mm)</b> 200	<b>DATE COMPLETED</b> 24/03/2020
<b>CLIENT</b> Marlet	<b>SPT HAMMER REF. NO.</b>	<b>BORED BY</b> W.Cahill
<b>ENGINEER</b> AECOM	<b>ENERGY RATIO (%)</b>	<b>PROCESSED BY</b> I.Redder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	TARMAC			0.15						
	MADE GROUND (comprised of angular gravel - C.L.804)			0.30						
1	MADE GROUND (Comprised of brown sandy gravelly clay fill with some brick and concrete fragments)			1.20	AA135551	B	1.00		N = 14 (2, 2, 3, 3, 4, 4)	
2	Stiff grey/brown sandy silty CLAY with some gravel and occasional cobbles				AA135552	B	2.00		N = 20 (3, 4, 4, 5, 6, 5)	
3					AA135553	B	3.00		N = 18 (3, 4, 5, 5, 4, 4)	
4	Very stiff dark brown gravelly CLAY			3.90	AA135554	B	4.00		N = 50/210 mm (6, 14, 14, 20, 16)	
5					AA135555	B	5.00		N = 35 (5, 6, 8, 8, 9, 10)	
6					AA135556	B	6.00		N = 36 (6, 7, 7, 8, 10, 11)	
7	Very stiff, brown and grey/brown, sandy gravelly silty CLAY with many subangular to subrounded cobbles and boulders			6.40	AA135557	B	7.00		N = 40 (7, 8, 10, 10, 9, 11)	
8					AA135558	B	8.00		N = 50/75 mm (10, 14, 46, 4)	
8.30	Obstruction End of Borehole at 8.30 m									

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.2	4.5	1		3.10	3.10	4.20	1.60	20	Moderate
8	8.3	2							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

<b>REMARKS</b> Hand dug inspection pit for services	<b>Sample Legend</b> D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL BH LOG 22455.GPJ | IGSL.GDT 29/5/20



# GEOTECHNICAL BORING RECORD

REPORT NUMBER

22455

<b>CONTRACT</b> Avid Site, Sandyford		<b>BOREHOLE NO.</b> BH4	
<b>CO-ORDINATES</b>		<b>SHEET</b> Sheet 1 of 2	
<b>GROUND LEVEL (m AOD)</b>		<b>RIG TYPE</b> Dando 2000	<b>DATE COMMENCED</b> 20/03/2020
		<b>BOREHOLE DIAMETER (mm)</b> 200	<b>DATE COMPLETED</b> 23/03/2020
<b>CLIENT</b> Marlet		<b>SPT HAMMER REF. NO.</b>	
<b>ENGINEER</b> AECOM		<b>ENERGY RATIO (%)</b>	
		<b>BORED BY</b> W.Cahill	
		<b>PROCESSED BY</b> I.Redder	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	TARMAC			0.15						
	MADE GROUND (comprised of angular gravel - C.L.804)			0.30						
1	Firm to stiff, dark brown, sandy silty CLAY with some gravel (Possibly Made Ground)			1.80	AA130581	B	1.00		N = 17 (2, 3, 4, 4, 4, 5)	
2	Very stiff, dark brown/black, sandy silty gravelly CLAY			3.10	AA130582	B	2.00		N = 32 (5, 6, 8, 8, 7, 9)	
3	Stiff, dark brown, very sandy gravelly CLAY with some cobbles			4.20	AA130583	B	3.00		N = 24 (3, 4, 4, 6, 7, 7)	
4	Stiff to very stiff, brown and brown/grey, sandy gravelly silty CLAY with many cobbles and occasional boulders				AA130584	B	4.00		N = 28 (4, 5, 6, 7, 7, 8)	
5					AA130585	B	5.00		N = 35 (6, 8, 8, 9, 9, 9)	
6					AA130586	B	6.00		N = 43 (6, 8, 10, 10, 11, 12)	
7					AA130587	B	7.00		N = 42 (7, 9, 9, 10, 12, 11)	
8					AA130158	B	8.00		N = 41 (6, 7, 9, 11, 10, 11)	
9					AA130589	B	9.00		N = 43 (7, 9, 10, 11, 10, 12)	

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.3	2.5	1.25							No water strike
6.4	6.7	0.75							
10.9	11.2	2							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
					20-03-20	4.50	4.50	DRY	
					23-03-20	4.50	4.50	1.70	

<b>REMARKS</b> Hand dug inspection pit for services	<b>Sample Legend</b> D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL BH LOG 22455.GPJ IGSL.GDT 29/05/20



# GEOTECHNICAL BORING RECORD

REPORT NUMBER

22455

<b>CONTRACT</b> Avid Site, Sandyford			<b>BOREHOLE NO.</b> BH4	
<b>CO-ORDINATES</b>			<b>SHEET</b> Sheet 2 of 2	
<b>GROUND LEVEL (m AOD)</b>		<b>RIG TYPE</b> Dando 2000	<b>DATE COMMENCED</b> 20/03/2020	
		<b>BOREHOLE DIAMETER (mm)</b> 200	<b>DATE COMPLETED</b> 23/03/2020	
		<b>BOREHOLE DEPTH (m)</b> 11.20		
<b>CLIENT</b> Marlet		<b>SPT HAMMER REF. NO.</b>		<b>BORED BY</b> W.Cahill
<b>ENGINEER</b> AECOM		<b>ENERGY RATIO (%)</b>		<b>PROCESSED BY</b> I.Reder

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Stiff to very stiff, brown and brown/grey, sandy gravelly silty CLAY with many cobbles and occasional boulders <i>(continued)</i>				AA130590	B	10.00		N = 46 (8, 8, 10, 10, 12, 14)	
11	Obstruction End of Borehole at 11.20 m			11.20	AA130591	B	11.00		N = 50/95 mm (13, 12, 27, 23)	
12										
13										
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.3	2.5	1.25							No water strike
6.4	6.7	0.75							
10.9	11.2	2							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

<b>REMARKS</b> Hand dug inspection pit for services	<b>Sample Legend</b> D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL\_BH LOG 22455.GPJ IGSL\_GDT 29/5/20

## **Appendix II Rotary Core Records**



# GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

22455

<b>CONTRACT</b> Avid Site, Sandyford		<b>DRILLHOLE NO</b> RC02
<b>CO-ORDINATES</b>		<b>SHEET</b> Sheet 1 of 2
<b>GROUND LEVEL (mOD)</b>	<b>RIG TYPE</b> Geo405	<b>DATE COMMENCED</b> 11/03/2020
<b>CLIENT</b> Marlet	<b>FLUSH</b> Air/Mist	<b>DATE COMPLETED</b> 12/03/2020
<b>ENGINEER</b> AECOM	<b>INCLINATION (deg)</b> -90	<b>DRILLED BY</b> IGSL
	<b>CORE DIAMETER (mm)</b> 78	<b>LOGGED BY</b> D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			SYMMETRIX DRILLING: No recovery, observed by driller as returns of MADE GROUND consisting of clayey gravel	0.70			
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black silty sandy gravelly CLAY	1.80			
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown clayey sandy GRAVEL	2.30			
3								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black gravelly CLAY				
4												
5												
6												
7												
8									8.10			
8.70								SYMMETRIX DRILLING: No recovery, observed by driller as returns of probable weathered ROCK	8.70			
9	8.70	100	100	85								
	9.30											

<b>REMARKS</b> Hole cased 0.00-8.70m					<b>WATER STRIKE DETAILS</b>					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
<b>INSTALLATION DETAILS</b>					<b>GROUNDWATER DETAILS</b>					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
12-03-20	11.70	8.10	11.70	50mm SP						

IGSL RC F1 10M 22455.GPJ IGSL\_GDT 16/4/20



# GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

22455

CONTRACT Avid Site, Sandyford

DRILLHOLE NO **RC02**

SHEET Sheet 2 of 2

**CO-ORDINATES**

GROUND LEVEL (mOD)

RIG TYPE Geo405

FLUSH Air/Mist

DATE COMMENCED 11/03/2020

DATE COMPLETED 12/03/2020

CLIENT Marlet

INCLINATION (deg) -90

DRILLED BY IGSL

ENGINEER AECOM

CORE DIAMETER (mm) 78

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	100	0	0	0			+	<p>Medium strong (where competent) to predominantly weak, massive to structureless, crystalline, grey/black/white mottled, fine to medium-grained, GRANITE, slightly to predominantly highly weathered (contributing to coreloss at 9.30-10.70m, 11.32-11.38m &amp; 11.46-11.70m).</p> <p>Discontinuities are rough, irregular. Apertures are open, commonly sandy clay-smearred. Dips are irregular. <i>(continued)</i></p> <p style="text-align: center;">End of Borehole at 11.70 m</p>				
10.70							+					
11	100	25	19				+			11.70		
11.70							+					
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS					WATER STRIKE DETAILS					
Hole cased 0.00-8.70m					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
INSTALLATION DETAILS					GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments	
12-03-20	11.70	8.10	11.70	50mm SP	12-03-20	11.70	8.70	9.00	Water level recorded 10mins after end of drilling	

IGSL RC F1.10M 22455.GPJ IGSL.GDT 16/4/20



# GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Site, Sandyford

**DRILLHOLE NO** RC04

**SHEET** Sheet 1 of 2

**CO-ORDINATES**

**GROUND LEVEL (mOD)**

**RIG TYPE** Geo405

**FLUSH** Air/Mist

**INCLINATION (deg)** -90

**CORE DIAMETER (mm)** 78

**DATE COMMENCED** 10/03/2020

**DATE COMPLETED** 11/03/2020

**DRILLED BY** IGSL

**LOGGED BY** D.O'Shea

**CLIENT** Marlet  
**ENGINEER** AECOM

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			SYMMETRIX DRILLING: No recovery, observed by driller as returns of MADE GROUND consisting of clayey gravel	0.90			
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black sandy gravelly CLAY	2.20			
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown clayey sandy GRAVEL	3.20			
3								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black silty sandy gravelly CLAY with occasional cobbles	9.40			
4								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown black silty sandy gravelly CLAY				
5												
6												
7												
8												
9												

**REMARKS**  
Hole cased 0.00-11.30m

WATER STRIKE DETAILS					
Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type
11-03-20	14.80	11.10	0.00	50mm SP

GROUNDWATER DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 22455.GPJ IGSL.GDT 16/4/20





# GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

22455

CONTRACT Avid Site, Sandyford

DRILLHOLE NO **RC04**

SHEET Sheet 2 of 2

**CO-ORDINATES**

GROUND LEVEL (mOD)

RIG TYPE Geo405

FLUSH Air/Mist

DATE COMMENCED 10/03/2020

DATE COMPLETED 11/03/2020

CLIENT Marlet

INCLINATION (deg) -90

DRILLED BY IGSL

ENGINEER AECOM

CORE DIAMETER (mm) 78

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown sandy gravelly CLAY	10.10			
11								SYMMETRIX DRILLING: No recovery, observed by driller as returns of probable weathered ROCK	11.10			
12												
12.60								Probable Weathered ROCK - recovered as sandy gravelly cobbles of GRANITE - Non intact	12.60			
13		32	10	0								
14												
14.80								End of Borehole at 14.80 m	14.80			
15												
16												
17												
18												
19												

**REMARKS**

Hole cased 0.00-11.30m

**WATER STRIKE DETAILS**

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

**GROUNDWATER DETAILS**

**INSTALLATION DETAILS**

Date	Hole Depth	Casing Depth	Depth to Water	Comments
11-03-20	14.80	11.30	1.80	Water level recorded 10mins after end of drilling

IGSL RC Fl 10M 22455.GPJ IGSL.GDT 16/4/20

**RC02 – Box 1 of 1 – 8.70-11.70m**



**RC04 – Box 1 of 1 – 12.60-14.80m**



## **Appendix III Trial Pit Records**



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp01  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 10/03/2020  
**DATE COMPLETED** 10/03/2020

**CLIENT ENGINEER** Marlet Property Groupd  
Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND - Tar		0.10							
	MADE GROUND - Dense sandy gravel. Gravels are fine to coarse and angular to sub rounded.		0.30							
	MADE GROUND - Dense gravel with a high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.50			AA131830	B	0.50		
1.0	Stiff grey light brown slightly silty very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded. Possible made ground.		1.10			AA131831	B	1.00		
	Stiff grey light brown slightly silty very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.									
2.0						AA131832	B	2.00		
	Stiff - very stiff dark grey slightly silty very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.50							
						AA131833	B	2.80		
3.0	End of Trial Pit at 3.00m		3.00							
4.0										

**Groundwater Conditions**  
Seepage at 2 m.

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL\_GDT\_23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp02  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 10/03/2020

**DATE COMPLETED** 10/03/2020

**CLIENT ENGINEER** Marlet Property Group  
Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND - very clayey gravel with occasional wood, plastic, concrete and metal pieces. Gravels are fine to coarse and angular to sub rounded.									
0.40	Firm - stiff dark brown slightly silty gravelly CLAY. Gravels are fine to coarse and angular to sub rounded. Possible made ground.		0.40			AA131834	B	0.50		
1.10	Stiff dark brown very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.10			AA131835	B	1.10		
2.20						AA131836	B	2.20		
2.80			2.80							
3.00	Stiff - very stiff dark grey gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. End of Trial Pit at 3.00m		3.00			AA1318337	B	3.00		

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp03  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 10/03/2020  
**DATE COMPLETED** 10/03/2020

**CLIENT** Marlet Property Group  
**ENGINEER** Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND - Stiff brown very gravelly clay with rare plastic and metal pieces and high cobble content and medium boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.									
0.90	Stiff dark brown gravelly CLAY with low cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.90			AA131838	B	0.50		
1.40	Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		1.40			AA131839	B	1.00		
2.00	Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.00			AA131840	B	2.00		
3.00	End of Trial Pit at 3.00m		3.00			AA131841	B	3.00		

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL GDT 23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp04

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**SHEET** Sheet 1 of 1

**DATE STARTED** 10/03/2020

**DATE COMPLETED** 10/03/2020

**CLIENT ENGINEER** Marlet Property Groupd  
Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND - very clayey gravel with occasional wood, plastic, concrete and metal pieces. Gravels are fine to coarse and angular to sub rounded.									
0.50	Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Possible made ground.		0.50			AA131842	B	0.50		
1.00	Stiff dark brown very gravelly CLAY with medium cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.00			AA131843	B	1.00		
2.00	Stiff - very stiff dark grey very gravelly CLAY with medium cobble content and low boulder content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.00			AA131844	B	2.00		
2.80						AA131845	B	2.80		
3.00	End of Trial Pit at 3.00m		3.00							
4.0										

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL GDT 23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp05  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 11/03/2020  
**DATE COMPLETED** 11/03/2020

**CLIENT** Marlet Property Group  
**ENGINEER** Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND very dense very gravelly sand with occasional red brick metal plastic and concrete pieces and high cobble content and medium boulder content.	[Cross-hatch pattern]								
1.0			1.20			AA131846	B	0.50		
	Stiff dark brown slightly silty very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.	[Stippled pattern]				AA131847	B	1.20		
2.0			2.70			AA131848	B	2.00		
	Stiff - very stiff dark grey gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.	[Stippled pattern]				AA131849	B	3.00		
3.0	End of Trial Pit at 3.00m		3.00							
4.0										

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20





# TRIAL PIT RECORD

REPORT NUMBER

22455

<b>CONTRACT</b> Avid Residential Development - Avid Site , Sandyford , Dublin		<b>TRIAL PIT NO.</b> Tp06
<b>LOGGED BY</b> S.Hannon		<b>SHEET</b> Sheet 1 of 1
<b>CLIENT</b> Marlet Property Group		<b>DATE STARTED</b> 11/03/2020
<b>ENGINEER</b> Aecom		<b>DATE COMPLETED</b> 11/03/2020
<b>CO-ORDINATES</b>		<b>EXCAVATION METHOD</b> JCB
<b>GROUND LEVEL (m)</b>		

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND very gravelly sand with high cobble content and medium boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.									
1.0	Stiff slightly sandy very gravelly CLAY with high cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.10			AA136803	B	1.10		
2.0						AA136804	B	2.00		
3.0	Stiff - very stiff dark grey very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.70							
3.0	End of Trial Pit at 3.00m		3.00			AA136805	B	3.00		

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL\_GDT 23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp07  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 11/03/2020  
**DATE COMPLETED** 11/03/2020

**CLIENT** Marlet Property Group  
**ENGINEER** Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND - Tar		0.10							
	MADE GROUND - very sandy gravel with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.40							
	Stiff dark brown slightly silty very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Possible made ground.		0.60			AA136806	B	0.50		
1.0	Stiff dark brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136807	B	1.00		
2.0						AA136808	B	2.00		
	Stiff - very stiff dark grey gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.50							
3.0	End of Trial Pit at 3.00m		3.00			AA136809	B	3.00		

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL GDT 23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp08  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 11/03/2020  
**DATE COMPLETED** 11/03/2020

**CLIENT** Marlet Property Group  
**ENGINEER** Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND - Tar		0.10							
	MADE GROUND - Dense very sandy gravel with a high cobble content. Gravels are fine to coarse and gravels and cobbles and are angular to sub rounded.		0.30							
	Stiff light brown slightly sandy very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.70			AA136810	B	0.50		
1.0	Stiff brown slightly sandy very gravelly clay with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.					AA136811	B	1.00		
2.0	Stiff - very stiff dark grey very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.00			AA136812	B	2.00		
3.0	End of Trial Pit at 3.00m		3.00			AA136813	B	3.00		
4.0										

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL\_GDT\_23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp09  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 11/03/2020  
**DATE COMPLETED** 11/03/2020

**CLIENT** Marlet Property Groupd  
**ENGINEER** Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND - Dense very sandy very gravelly clay with plastic concrete and metal pieces and a high cobble content. Gravels are fine to coarse and gravels and cobbles and are angular to sub rounded.									
0.50	Stiff light brown slightly silty very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.50			AA136814	B	0.50		
1.0						AA136815	B	1.00		
1.50										
2.0	Stiff - very stiff dark grey very gravelly CLAY with medium cobble content and medium boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		1.50			AA136816	B	2.00		
2.50						AA136817	B	2.50		
3.0	End of Trial Pit at 3.00m		3.00							
4.0										

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL\_GDT\_23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp10  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 11/03/2020  
**DATE COMPLETED** 11/03/2020

**CLIENT ENGINEER** Marlet Property Group  
Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND - very sandy gravel with medium cobble content. Gravels are fine to coarse and angular to sub rounded.	[Cross-hatch pattern]	0.10							
	Stiff brown very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Probable made ground.	[Clay with cobbles pattern]	0.70			AA136818	B	0.50		
1.0	Stiff brown very gravelly CLAY with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.	[Clay with cobbles pattern]				AA136819	B	1.00		
2.0	Stiff - very stiff dark grey very gravelly CLAY with medium cobble content and low boulder content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.	[Clay with cobbles pattern]	1.80			AA136820	B	2.00		
		[Clay with cobbles pattern]				AA136821	B	2.50		
3.0	End of Trial Pit at 3.00m		3.00							
4.0										

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp11  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 11/03/2020

**DATE COMPLETED** 11/03/2020

**CLIENT** Marlet Property Group  
**ENGINEER** Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	<p><b>MADE GROUND</b> - Dense very sandy gravel with a medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.</p> <p>Stiff brown slightly sandy very gravelly clay with high cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Probable made ground.</p> <p>Stiff brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.</p>		0.10							
0.50					AA136822	B	0.50			
1.0						AA136823	B	1.00		
2.0	<p>Stiff - very stiff dark grey very gravelly CLAY with high cobble content and low boulder content . Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.</p>		1.80			AA136824	B	2.00		
2.50					AA136825	B	2.50			
3.0	End of Trial Pit at 3.00m		3.00							
4.0										

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20



# TRIAL PIT RECORD

REPORT NUMBER

22455

**CONTRACT** Avid Residential Development - Avid Site , Sandyford , Dublin

**TRIAL PIT NO.** Tp12  
**SHEET** Sheet 1 of 1

**LOGGED BY** S.Hannon

**CO-ORDINATES**

**DATE STARTED** 11/03/2020  
**DATE COMPLETED** 11/03/2020

**CLIENT ENGINEER** Marlet Property Groupd  
Aecom

**GROUND LEVEL (m)**

**EXCAVATION METHOD** JCB

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	MADE GROUND dense very sandy gravel with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		0.10							
	Stiff brown slightly sandy very gravelly clay with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded. Probable Made ground.		0.50			AA136826	B	0.50		
1.0	Stiff brown very gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		1.20			AA136827	B	1.00		
	Stiff - very stiff dark grey gravelly CLAY with medium cobble content and high cobble content. Gravels are fine to coarse and gravels cobbles and boulders are angular to sub rounded.		2.20			AA136828	B	2.00		
2.0	Stiff yellowish orange silty gravelly CLAY with medium cobble content. Gravels are fine to coarse and gravels and cobbles are angular to sub rounded.		2.20			AA136829	B	2.50		
3.0	End of Trial Pit at 3.00m		3.00							
4.0										

**Groundwater Conditions**  
Dry

**Stability**  
Stable

**General Remarks**  
CAT scanned location for services

IGSL TP LOG 22455.GPJ IGSL.GDT 23/3/20

## **Appendix IV CBR by Plate Test**

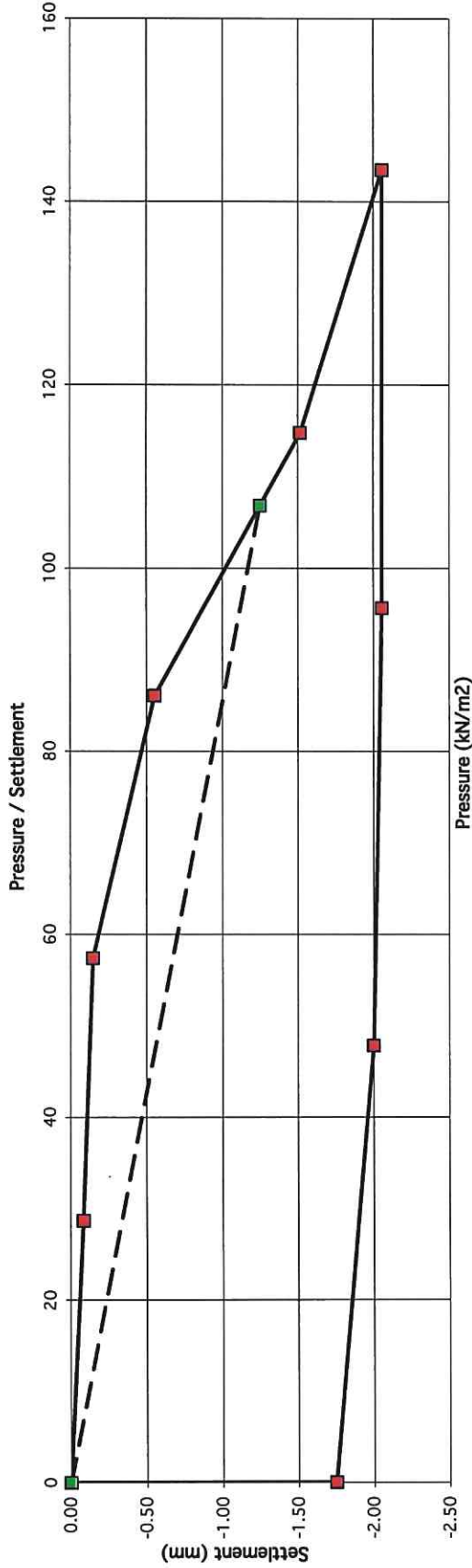


# PLATE TEST REPORT SHEET (F3.1)

# Applied Pressure/Settlement Curve

Reference No. R110689  
 Contract Avid site - Sandyford  
 Test No. PT1 load  
 Location 39 carmanhall road  
 Depth 500 mm  
 Client Marlet  
 Plate Diameter: 450 mm  
 Test Method BS 1377: Part 9: 1990 Test4 - Incremental Loading Test  
 Technician S.Hannon  
 Authorised by *[Signature]*  
 Date 10/03/2020

Description of soil under test  
 (natural soil, placed fill, sub-base)  
 MADE GROUND very gravelly clay.  
 Sample Ref No. N/A  
 Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 85  
 Modulus of subgrade reaction = 55 MPa/m  
 Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10

10.0 %

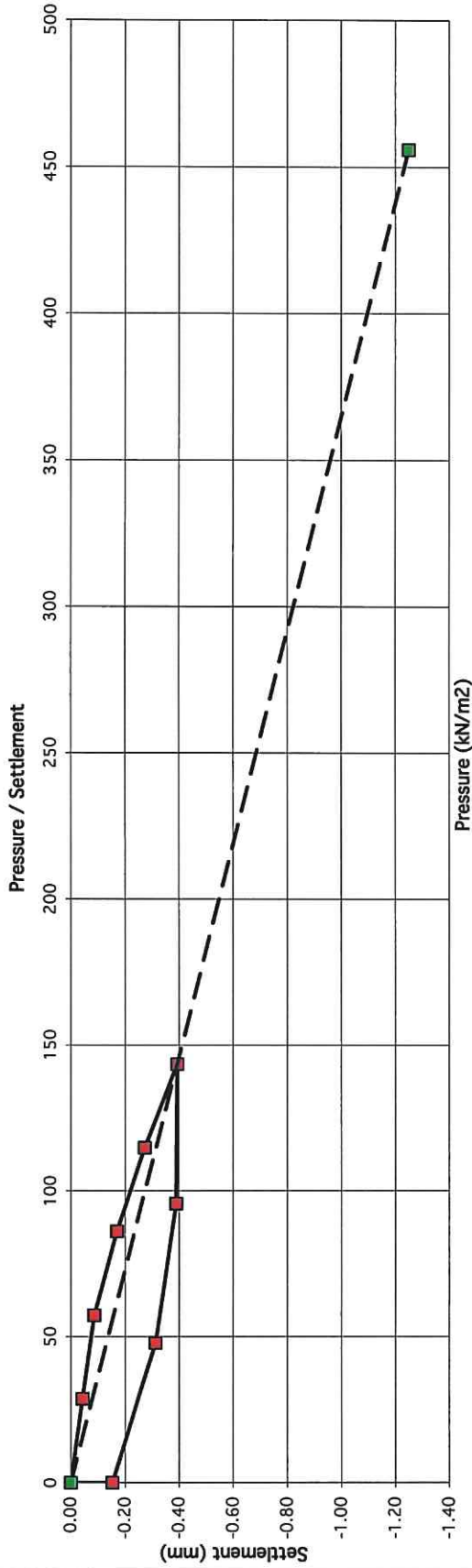
**PLATE TEST REPORT SHEET (F3.1)**

**Applied Pressure/Settlement Curve**

Reference No. R110689  
 Contract Avid site - Sandyford  
 Test No. PT1 reload  
 Location 39 carmanhall road  
 Depth 500 mm  
 Client Aecom  
 Plate Diameter: 450 mm  
 Test Method BS 1377: Part 9: 1990 Test4 - Incremental Loading Test  
 Technician S.Hannon  
 Authorised by *S. Hannon*  
 Date 10/03/2020

Description of soil under test  
 (natural soil, placed fill, sub-base)  
 MADE GROUND very gravelly clay.

Sample Ref No. N/A  
 Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 365  
 Modulus of subgrade reaction = 234 MPa/m  
 Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10

123.5 %

## **Appendix V BRE Digest 365 Tests**

# Soakaway Design f -value from field tests

(F2C) IGS

Contract: Avid site 1-sandyford  
 Test No. SA01  
 Client Marlet  
 Date: 10/03/2020

Contract No. 22455

## Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	MADE GROUND - firm sandy very gravelly clay with occasional metal and plastic.	None observed
0.20	1.50	Firm -stiff very gravelly CLAY with medium cobble content.	
		Gravels are fine to coarse and cobbles are angular to sub rounded.	

Notes:

## Field Data

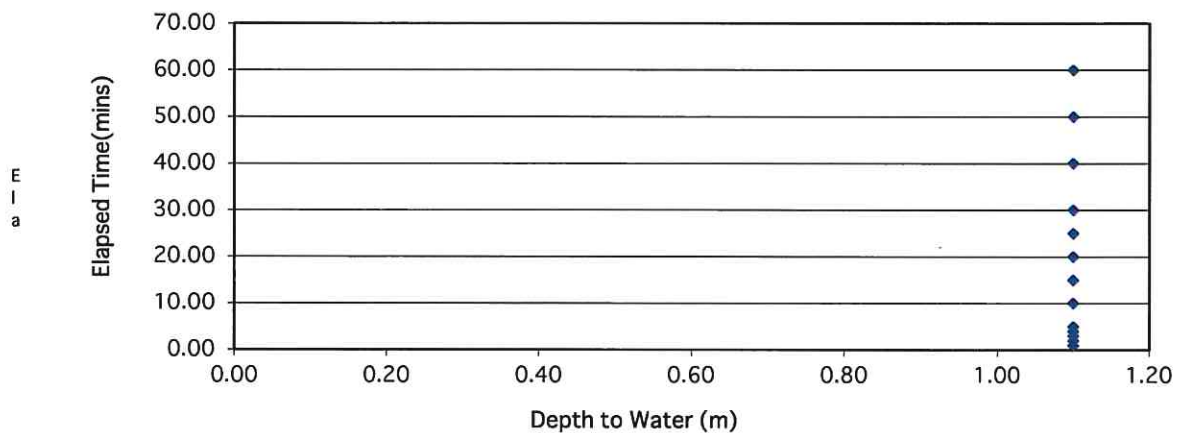
Depth to Water (m)	Elapsed Time (min)
1.10	1.00
1.10	2.00
1.10	3.00
1.10	4.00
1.10	5.00
1.10	10.00
1.10	15.00
1.10	20.00
1.10	25.00
1.10	30.00
1.10	40.00
1.10	50.00
1.10	60.00

## Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	1.10	m
Final depth to water =	1.10	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m <sup>2</sup>
*Av. side area of permeable stratum over test period=	1.84	m <sup>2</sup>
Total Exposed area =	2.74	m <sup>2</sup>

Infiltration rate (f) = Volume of water used/unit exposed area / unit time  
 f= 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



# Soakaway Design f -value from field tests

(F2C) IGS

Contract: Avid site 1-sandyford  
 Test No. SA02  
 Client Marlet  
 Date: 10/03/2020

Contract No. 22455

**Summary of ground conditions**

from	to	Description	Ground water
0.00	0.20	MADE GROUND - firm sandy very gravelly clay with occasional metal and plastic.	None observed
0.20	1.50	Firm -stiff very gravelly CLAY with medium cobble content.	
		Gravels are fine to coarse and cobbles are angular to sub rounded.	

Notes:

**Field Data**

**Field Test**

Depth to Water (m)	Elapsed Time (min)
1.05	1.00
1.05	2.00
1.05	3.00
1.05	4.00
1.05	5.00
1.05	10.00
1.05	15.00
1.05	20.00
1.05	25.00
1.05	30.00
1.05	40.00
1.05	50.00
1.05	60.00

Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	1.80	m

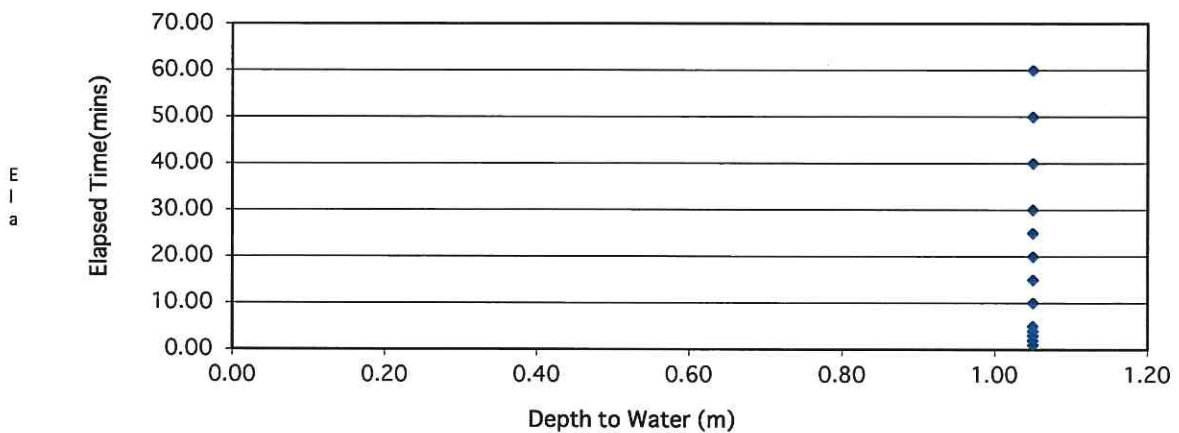
Initial depth to Water =	1.05	m
Final depth to water =	1.05	m
Elapsed time (mins)=	60.00	

Top of permeable soil		m
Base of permeable soil		m

Base area=	0.9	m <sup>2</sup>
*Av. side area of permeable stratum over test period=	2.07	m <sup>2</sup>
Total Exposed area =	2.97	m <sup>2</sup>

Infiltration rate (f) = Volume of water used/unit exposed area / unit time  
 f= 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



## **Appendix VI Laboratory Data**

### **a. Geotechnical Soil and Rock**



# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990, clause 9.2 & 9.5  
(note: Sedimentation stage not accredited)



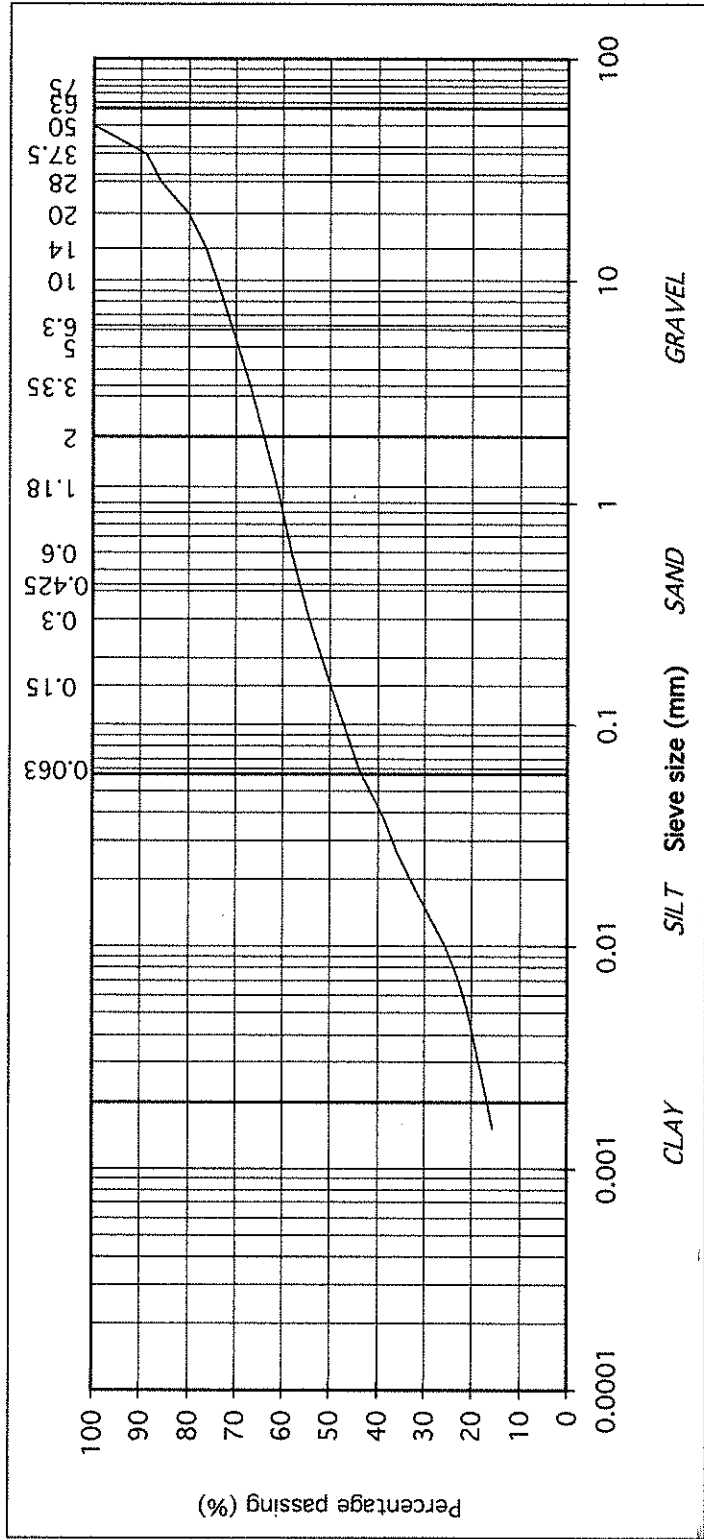
Contract No: 22455 Report No. R111487  
 Contract: Avid Development Sandyford  
 BH/TP: BH01  
 Sample No. 135564 Lab. Sample No. A20/1675  
 Sample Type: B  
 Depth (m) 6.00 Customer: Aecom/Marlet  
 Date Received 07/05/2020 Date Testing started 22/05/2020  
 Description: Brown slightly sandy, gravelly, SILT/CLAY

### Remarks

Note: Clause 9.2 and Clause 9.3 of BS1377:Part 2:1990 have been superseded by BS7887-4:2016. Results apply to sample as received.

Sample size does not meet the requirements of BS1377

particle size	% passing
75	100
63	100
50	100
37.5	89
28	86
20	80
14	76
10	74
6.3	71
5	69
3.35	67
2	64
1.18	61
0.6	58
0.425	56
0.3	54
0.15	50
0.063	44
0.037	39
0.027	36
0.017	31
0.010	26
0.007	23
0.005	21
0.002	16



IGSL Ltd Materials Laboratory

Approved by: *[Signature]* Date: 27/05/20 Page no: 1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)



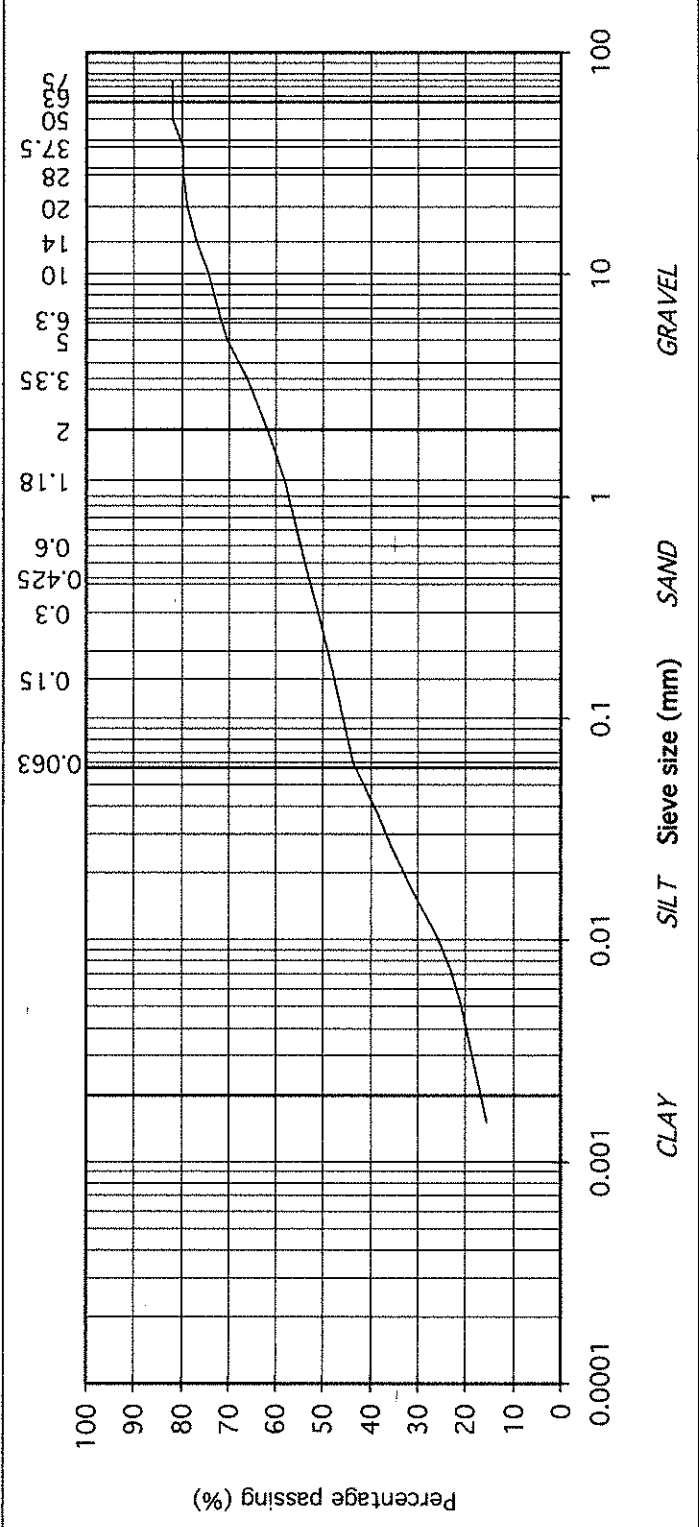
# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990, clause 9.2 & 9.5  
(note: Sedimentation stage not accredited)



Contract No:	22455	Report No.:	R111488
Contract:	Avid Development Sandyford		
BH/TP:	BH02		
Sample No.:	7	Lab. Sample No.:	A20/1677
Sample Type:	B		
Depth (m):	7.00	Customer:	Aecom/Marlet
Date Received:	07/05/2020	Date Testing started:	22/05/2020
Description:	Brown slightly sandy, slightly gravelly, SILT/CLAY with some cobbles		
Remarks:	<p>Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO 7892-4:2016. Results apply to sample as received.</p> <p>Sample size did not meet the requirements of BS1377</p>		



# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990, clause 9.2 & 9.5  
(note: Sedimentation stage not accredited)

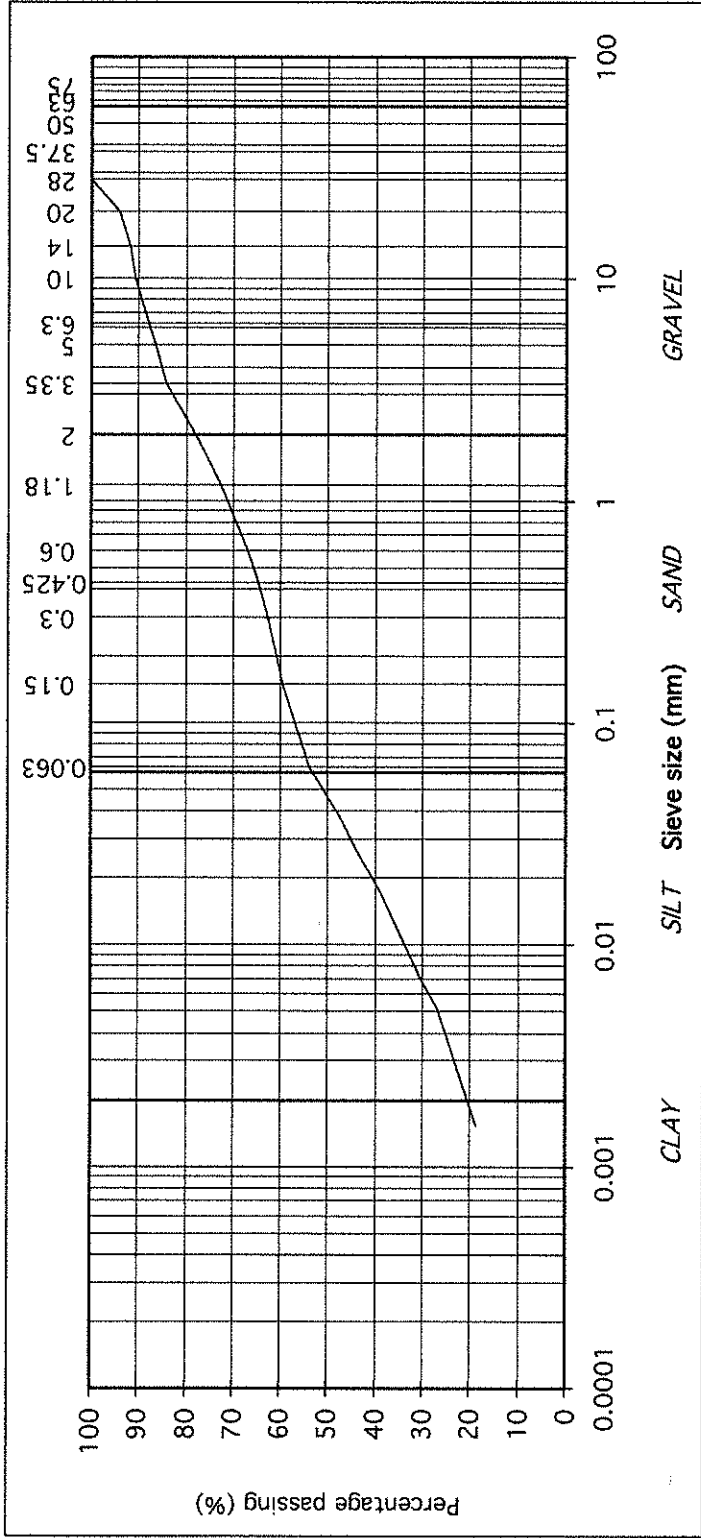


Contract No: 22455 Report No. R111486  
 Contract: Avid Development Sandford  
 BH/TP: BH03  
 Sample No. 13558 Lab. Sample No. A20/1679  
 Sample Type: B  
 Depth (m) 8.00 Customer: Aecom/Marlet  
 Date Received 07/05/2020 Date Testing started 22/05/2020  
 Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by BS17692-4:2016. Results apply to sample as received.

particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	100	
20	94	
14	92	GRAVEL
10	91	
6.3	88	
5	86	
3.35	84	
2	78	
1.18	73	
0.6	67	
0.425	65	SAND
0.3	63	
0.15	60	
0.063	54	
0.038	47	
0.027	44	
0.017	39	
0.010	34	SILT/CLAY
0.007	31	
0.005	27	
0.002	19	



# TEST REPORT

## Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990, clause 9.2 & 9.5  
(note: Sedimentation stage not accredited)

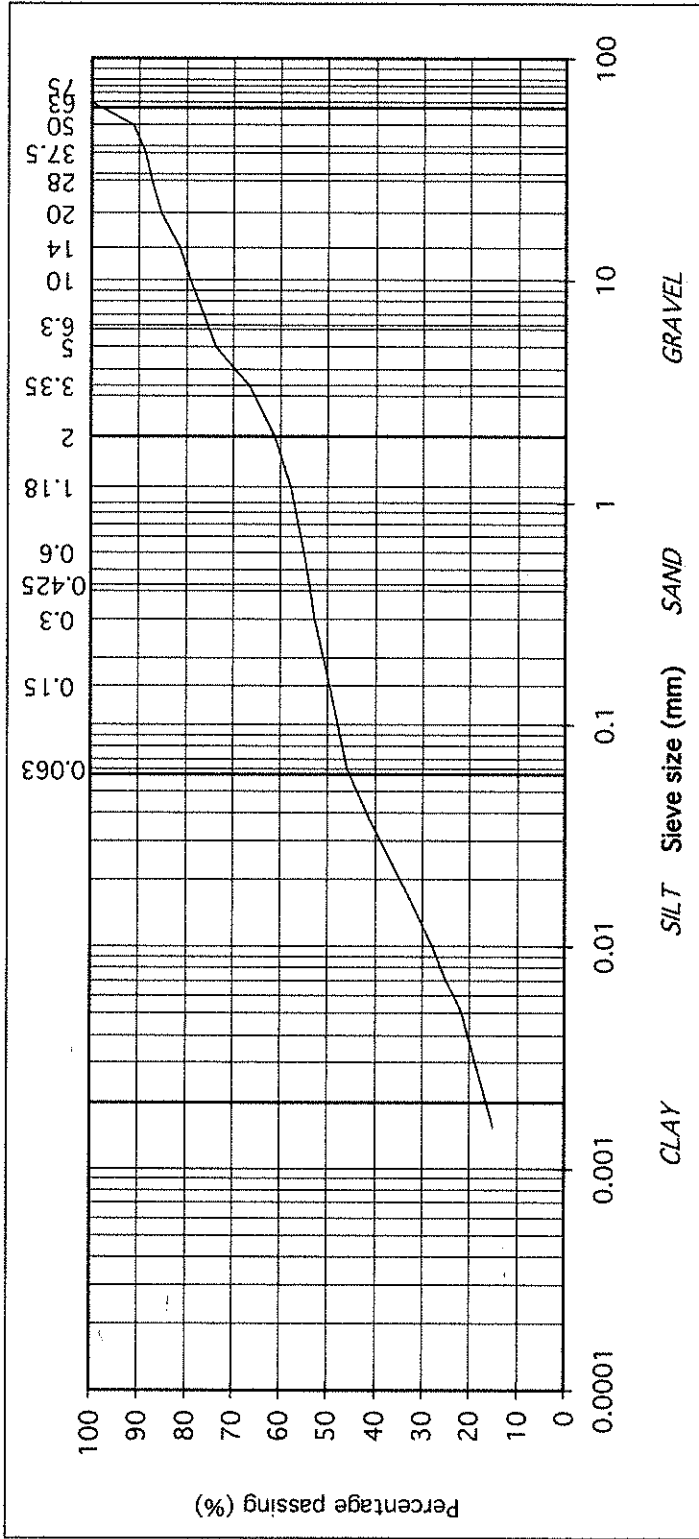


Contract No: 22455 Report No. R111490  
 Contract: Avid Development Sandyford  
 BH/TP: BH04  
 Sample No. 130586 Lab. Sample No. A20/1681  
 Sample Type: B  
 Depth (m) 6.00 Customer: Aecom/Marlet  
 Date Received 07/05/2020 Date Testing started 22/05/2020  
 Description: Brown slightly sandy, gravelly, CLAY

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by BS7182:4:2016. Results apply to sample as received.

Sample site did not meet the requirements of BS1377



particle size	% passing
75	100
63	100
50	91
37.5	89
28	87
20	85
14	81
10	79
6.3	75
5	74
3.35	67
2	61
1.18	58
0.6	55
0.425	54
0.3	53
0.15	50
0.063	46
0.038	41
0.027	38
0.017	33
0.010	28
0.007	25
0.005	22
0.002	15

IGSL Ltd Materials Laboratory

Approved by: *[Signature]* Date: 28/05/20 Page no: 1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

**(Diametrial) POINT LOAD STRENGTH INDEX TEST DATA**



Contract: Avid Site, Sandyford Contract no. 22455 Date of test: 16/04/2020		Sample Type: Core																															
RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orientation																								
RC02	8.8	78	8.0	1.222	1.31	1.61	32	d	//																								
	8.9	78	10.0	1.222	1.64	2.01	40	d	//																								
RC04	10.9	78	4.0	1.222	0.66	0.80	16	d	//																								
	12.8	78	1.0	1.222	0.16	0.20	4	d	//																								
<p><b>Statistical Summary Data</b></p> <table border="1"> <thead> <tr> <th>Number of Samples Tested</th> <th>Is(50)</th> <th>UCS*</th> </tr> </thead> <tbody> <tr> <td>Minimum</td> <td>4</td> <td>4</td> </tr> <tr> <td>Average</td> <td>0.20</td> <td>4</td> </tr> <tr> <td>Maximum</td> <td>1.15</td> <td>23</td> </tr> <tr> <td>Standard Dev.</td> <td>2.01</td> <td>40</td> </tr> <tr> <td>Upper 95% Confidence Limit</td> <td>0.81</td> <td>16</td> </tr> <tr> <td>Lower 95% Confidence Limit</td> <td>2.74</td> <td>54.82</td> </tr> <tr> <td>Comments:</td> <td>-0.43</td> <td>-8.64</td> </tr> </tbody> </table>										Number of Samples Tested	Is(50)	UCS*	Minimum	4	4	Average	0.20	4	Maximum	1.15	23	Standard Dev.	2.01	40	Upper 95% Confidence Limit	0.81	16	Lower 95% Confidence Limit	2.74	54.82	Comments:	-0.43	-8.64
Number of Samples Tested	Is(50)	UCS*																															
Minimum	4	4																															
Average	0.20	4																															
Maximum	1.15	23																															
Standard Dev.	2.01	40																															
Upper 95% Confidence Limit	0.81	16																															
Lower 95% Confidence Limit	2.74	54.82																															
Comments:	-0.43	-8.64																															
<p><b>*UCS Normal Distribution Curve</b></p>																																	
<p><b>Abbreviations</b></p> <table border="1"> <thead> <tr> <th>Abbreviation</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>i</td> <td>irregular</td> </tr> <tr> <td>a</td> <td>axial</td> </tr> <tr> <td>b</td> <td>block</td> </tr> <tr> <td>d</td> <td>diametral</td> </tr> <tr> <td>U</td> <td>approx. orientation to planes of weakness/bedding unknown</td> </tr> <tr> <td>P</td> <td>perpendicular</td> </tr> <tr> <td>//</td> <td>parallel</td> </tr> </tbody> </table>										Abbreviation	Meaning	i	irregular	a	axial	b	block	d	diametral	U	approx. orientation to planes of weakness/bedding unknown	P	perpendicular	//	parallel								
Abbreviation	Meaning																																
i	irregular																																
a	axial																																
b	block																																
d	diametral																																
U	approx. orientation to planes of weakness/bedding unknown																																
P	perpendicular																																
//	parallel																																

\*UCS taken as k x Point Load Is(50): k= 20

## **Appendix VI Laboratory Data**

### **b. Chemical and Environmental**



The right chemistry to deliver results

Chemtest Ltd.

Depot Road

Newmarket

CB8 0AL

Tel: 01638 606070

Email: info@chemtest.com

## Final Report

---

**Report No.:** 20-10240-1

**Initial Date of Issue:** 22-Apr-2020

**Client:** IGSL

**Client Address:** M7 Business Park  
Naas  
County Kildare  
Ireland

**Contact(s):** Darren Keogh

**Project:** 22455 Avid Development Sandyford (Aecom / Marlet)

**Quotation No.:** **Date Received:** 08-Apr-2020

**Order No.:** **Date Instructed:** 14-Apr-2020

**No. of Samples:** 21

**Turnaround (Wkdays):** 7 **Results Due:** 22-Apr-2020

**Date Approved:** 22-Apr-2020

**Approved By:**  


**Details:** Glynn Harvey, Technical Manager

---

## Results - Leachate

Client: IGSL	Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240												
Quotation No.:	Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082	996083	996084	996085	996086	131830	131831	131834	131838	131839	131842	131846	131847	131850	136807	136811	136814	136819			
Order No.:	Client Sample Ref.:	TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6	TP7	TP8	TP9	TP10	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Sample Location:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL																
	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL																
	Top Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.00	0.50	0.50	0.50	1.00	1.00																
	Bottom Depth (m):	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.00	0.50	0.50	0.50	1.00	1.00																
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Type</b>	<b>Units</b>	<b>LOD</b>																									
pH	U	1010	10:1		N/A	8.5	8.3	8.7	8.4	8.8	8.8	8.9	10.2	10.2	8.5	8.5	10.6	10.6	9.3	9.3	9.3	9.3	9.3	9.3	10.4	10.4	9.4			
Ammonium	U	1220	10:1	mg/l	0.050	0.058	0.14	0.21	1.7	< 0.050	0.18	0.18	< 0.050	< 0.050	0.16	0.16	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Ammonium	N	1220	10:1	mg/kg	0.10	0.69	1.6	2.7	19	0.48	2.5	2.5	0.64	0.64	1.9	1.9	0.63	0.63	0.85	0.85	0.85	0.85	0.85	0.85	0.52	0.52	0.25			
Boron (Dissolved)	U	1450	10:1	µg/l	20	27	26	29	32	< 20	< 20	29	< 20	< 20	< 20	< 20	23	23	< 20	< 20	< 20	< 20	< 20	< 20	20	20	< 20	< 20	< 20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20	0.27	0.26	0.29	0.32	< 0.20	< 0.20	0.29	< 0.20	< 0.20	< 0.20	< 0.20	0.23	0.23	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	0.20	0.20	< 0.20	< 0.20	< 0.20	< 0.20

Client: IGSL	Chemtest Job No.:	20-10240	20-10240	20-10240		
Quotation No.:	Chemtest Sample ID.:	996087	996088	996089		
Order No.:	Client Sample Ref.:	138822	136827	13559		
	Sample Location:	TP11	TP12	BH1		
	Sample Type:	SOIL	SOIL	SOIL		
	Top Depth (m):	0.50	1.00	1.00		
	Bottom Depth (m):	0.50	1.00	1.00		
Determinand	Accred.	SOP	Type	Units	LOD	
pH	U	1010	10:1		N/A	9.4
Ammonium	U	1220	10:1	mg/l	0.050	< 0.050
Ammonium	N	1220	10:1	mg/kg	0.10	0.29
Boron (Dissolved)	U	1450	10:1	µg/l	20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20	< 0.20
						9.2
						< 0.050
						0.51
						< 20
						< 0.20



**Project: 22455 Avid Development Sandryford (Aecom / Marlet)**

Client: IGSL	Chemtest Job No.:		20-10240		20-10240		20-10240		20-10240		20-10240		20-10240		20-10240					
	Quotation No.:	Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082	Client Sample Ref.:	131830	131831	131834	131838	131842	131846	131847	131850
Order No.:	Sample Location:		TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		0.50	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	Bottom Depth (m):		0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD	No Asbestos Detected		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected	
ACM Type	U	2192		N/A																
Asbestos Identification	U	2192	%	0.001																
ACM Detection Stage	U	2192		N/A																
Moisture	N	2030	%	0.020	15	16	12	13	8.6	8.2	5.9	17								
pH (2.5:1)	N	2010		4.0																
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.68	0.49	< 0.40	0.48	< 0.40	< 0.40	< 0.40	0.42								
Magnesium (Water Soluble)	N	2120	g/l	0.010																
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010																
Total Sulphur	M	2175	%	0.010																
Sulphur (Elemental)	M	2180	mg/kg	1.0	[A] 3.7	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Chloride (Water Soluble)	M	2220	g/l	0.010																
Nitrate (Water Soluble)	N	2220	g/l	0.010																
Cyanide (Total)	M	2300	mg/kg	0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 3.2	[A] 2.2	[A] 8.1	[A] 9.2	[A] 5.2	[A] 6.5	[A] 7.1	[A] 2.1	[A] 7.2							
Ammonium (Water Soluble)	M	2120	g/l	0.01																
Sulphate (Acid Soluble)	M	2430	%	0.010	[A] 0.074	[A] 0.015	[A] 0.029	[A] 0.054	[A] 0.031	[A] 0.038	[A] 0.45	[A] 0.045	[A] 0.11							
Arsenic	M	2450	mg/kg	1.0	18	14	21	20	24	22	18	14	20							
Barium	M	2450	mg/kg	10	120	98	71	91	46	47	49	68	61							
Cadmium	M	2450	mg/kg	0.10	2.1	1.1	2.4	2.9	1.6	2.1	0.67	2.6	1.2							
Chromium	M	2450	mg/kg	1.0	21	26	16	18	13	12	15	20	20							
Molybdenum	M	2450	mg/kg	2.0	2.8	2.8	3.5	3.4	2.9	3.7	< 2.0	3.9	< 2.0							
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	2.0	2.1	< 2.0	< 2.0	< 2.0	2.2	< 2.0							
Copper	M	2450	mg/kg	0.50	27	21	26	32	20	22	15	29	19							
Mercury	M	2450	mg/kg	0.10	0.17	0.15	< 0.10	0.16	< 0.10	< 0.10	< 0.10	0.11	< 0.10							
Nickel	M	2450	mg/kg	0.50	41	39	48	53	37	41	22	56	32							
Lead	M	2450	mg/kg	0.50	59	34	31	84	19	21	12	28	17							
Selenium	M	2450	mg/kg	0.20	0.83	0.50	0.35	0.54	< 0.20	0.29	< 0.20	0.63	< 0.20							
Zinc	M	2450	mg/kg	0.50	93	140	86	99	59	67	52	110	68							
Chromium (Trivalent)	N	2490	mg/kg	1.0	21	26	16	18	13	12	15	20	20							
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50							
Total Organic Carbon	M	2625	%	0.20	[A] 1.6	[A] 0.50	[A] 0.52	[A] 0.98	[A] 0.35	[A] 0.35	[A] 0.31	[A] 0.61	[A] < 0.20							
Mineral Oil	N	2670	mg/kg	10	< 10	< 10	< 10	< 10	< 10	< 10	150	< 10	< 10							
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0							
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0							
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0							
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0							

**Project: 22455 Avid Development Sandvford (Aecom / Marlet)**

Client: IGSL	Chemtest Job No.:	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240	20-10240
Quotation No.:	Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082	996081	996082
Order No.:	Client Sample Ref.:	131830	131831	131834	131838	131839	131842	131846	131847	131850	131847	131850
Sample Location:	Sample Type:	TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6	TP5	TP6
Top Depth (m):	Bottom Depth (m):	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Asbestos Lab:	Asbestos Lab:	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.20	0.50	1.20	0.50
		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD								
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10
Benzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Toluene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Ethylbenzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
m & p-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
o-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[fluoranthene]	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

**Project: 22455 Avid Development Sandvford (Aecom / Marlet)**

Client: IGSL	Chemtest Job No.:		20-10240		20-10240		20-10240		20-10240		20-10240		20-10240		20-10240		
	Quotation No.:	Chemtest Sample ID.:	996074	996075	996076	996077	996078	996079	996080	996081	996082	131830	131831	131832	131833	131834	131835
Order No.:	Client Sample Ref.:	Sample Location:	TP1	TP1	TP2	TP3	TP3	TP3	TP4	TP5	TP5	TP5	TP5	TP5	TP5	TP5	TP6
	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):	0.50	1.00	0.50	0.50	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.20	0.50
	Bottom Depth (m):	0.50	1.00	0.50	0.50	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.20	0.50
	Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD													
Benzofg,h,ijperylene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 52	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 90+101	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 118	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 153	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 138	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 180	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Project: 22455 Avid Development Sandvford (Aecom / Marlet)

Client: IGSL	Chemtest Job No.:		20-10240		20-10240		20-10240		20-10240		20-10240		20-10240		20-10240		
	Quotation No.:	Chemtest Sample ID.:	996083	996084	996085	996086	996087	996088	996089	996090	996091	996091	996091	996091	996091	996091	
Order No.:	Client Sample Ref.:		136811		136814		136819		136822		136827		13559		135560		
Sample Location:			TP7	TP8	TP9	TP10	TP11	TP12	BH1	BH1	BH1	BH2					
Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL				
Top Depth (m):			1.00	1.00	0.50	1.00	0.50	1.00	1.00	1.00	1.00	1.00	2.00				
Bottom Depth (m):			1.00	1.00	0.50	1.00	0.50	1.00	1.00	1.00	1.00	2.00					
Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY					
Determinand	Accred.	SOP	Units	LOD													
ACM Type	U	2192		N/A													
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-	-	-	-	
Moisture	N	2030	%	0.020	11	9.1	8.5	10	9.1	10	10	10	10	10	12	12	
pH (2.5:1)	N	2010		4.0										[A] 8.6	[A] 8.7	[A] 8.7	
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	
Magnesium (Water Soluble)	N	2120	g/l	0.010												< 0.010	
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010												< 0.010	
Total Sulphur	M	2175	%	0.010												< 0.010	
Sulphur (Elemental)	M	2180	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] 0.036	
Chloride (Water Soluble)	M	2220	g/l	0.010												[A] < 0.010	
Nitrate (Water Soluble)	N	2220	g/l	0.010												< 0.010	
Cyanide (Total)	M	2300	mg/kg	0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.010	
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 6.6	[A] 7.8	[A] 9.3	[A] 8.3	[A] 8.3	[A] 7.6	[A] 6.6	[A] 6.6	[A] 6.6	[A] 6.6	[A] 6.6	[A] 6.6	
Ammonium (Water Soluble)	M	2120	g/l	0.01												0.02	
Sulphate (Acid Soluble)	M	2430	%	0.010	[A] 0.011	[A] 0.013	[A] 0.083	[A] 0.012	[A] 0.033	[A] 0.010	[A] 0.017	[A] 0.017	[A] 0.017	[A] 0.017	[A] 0.018	[A] < 0.010	
Arsenic	M	2450	mg/kg	1.0	23	22	23	23	24	21	23	23	23	23	23	23	
Barium	M	2450	mg/kg	10	71	63	65	100	50	62	71	71	71	71	71	71	
Cadmium	M	2450	mg/kg	0.10	2.3	1.9	1.2	2.0	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Chromium	M	2450	mg/kg	1.0	15	13	15	15	14	14	14	14	14	14	14	14	
Molybdenum	M	2450	mg/kg	2.0	3.4	3.4	2.5	3.7	3.4	3.6	3.5	3.5	3.5	3.5	3.5	3.5	
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	
Copper	M	2450	mg/kg	0.50	26	22	19	26	23	26	26	26	26	26	26	26	
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Nickel	M	2450	mg/kg	0.50	51	41	32	47	42	46	46	46	46	46	46	46	
Lead	M	2450	mg/kg	0.50	21	18	20	19	23	18	19	19	19	19	19	19	
Selenium	M	2450	mg/kg	0.20	< 0.20	0.41	0.30	1.4	0.24	1.6	0.37	0.37	0.37	0.37	0.37	0.37	
Zinc	M	2450	mg/kg	0.50	79	76	64	76	67	75	74	74	74	74	74	74	
Chromium (Trivalent)	N	2490	mg/kg	1.0	15	13	15	15	14	14	14	14	14	14	14	14	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Total Organic Carbon	M	2625	%	0.20	[A] 0.28	[A] 0.35	[A] 0.56	[A] 0.38	[A] 0.31	[A] 0.34	[A] 0.34	[A] 0.34	[A] 0.34	[A] 0.34	[A] 0.34	[A] 0.34	
Mineral Oil	N	2670	mg/kg	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	



Project: 22455 Avid Development Sandvford ( Aecom / Marlet )

Client: IGSL	Chemtest Job No.:		20-10240		20-10240		20-10240		20-10240		20-10240		20-10240		20-10240	
	Quotation No.:	Chemtest Sample ID.:	996083	996084	996085	996086	996087	996088	996089	996090	996091	996091	996091	996091	996091	996091
Order No.:	Client Sample Ref.:	136807	136811	136814	136819	136822	136827	136827	13559	135560	135560	135560	135560	135560	135560	135560
Sample Location:		TP7	TP8	TP9	TP10	TP11	TP12	TP12	BH1	BH1	BH1	BH1	BH1	BH1	BH2	BH2
Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Top Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00
Bottom Depth (m):		1.00	1.00	0.50	1.00	0.50	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00
Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD												
Benzo[a,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.37	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	8.7	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 52	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 90+101	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 118	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 153	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 138	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 180	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

**Project: 22455 Avid Development Sandford ( Aecom / Marlet )**

Client: IGSL	Chemtest Job No.:	20-10240	20-10240	20-10240
Quotation No.:	Chemtest Sample ID.:	996092	996093	996094
Order No.:	Client Sample Ref.:	13551	13553	130581
	Sample Location:	BH3	BH3	BH4
	Sample Type:	SOIL	SOIL	SOIL
	Top Depth (m):	1.00	3.00	1.00
	Bottom Depth (m):	1.00	3.00	1.00
	Asbestos Lab:			
Determinand	Accred.	SOP	Units	LOD
ACM Type	U	2192		N/A
Asbestos Identification	U	2192	%	0.001
ACM Detection Stage	U	2192		N/A
Moisture	N	2030	%	0.020
pH (2.5:1)	N	2010		4.0
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40
Magnesium (Water Soluble)	N	2120	g/l	0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010
Total Sulphur	M	2175	%	0.010
Sulphur (Elemental)	M	2180	mg/kg	1.0
Chloride (Water Soluble)	M	2220	g/l	0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010
Cyanide (Total)	M	2300	mg/kg	0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50
Ammonium (Water Soluble)	M	2120	g/l	0.01
Sulphate (Acid Soluble)	M	2430	%	0.010
Arsenic	M	2450	mg/kg	1.0
Barium	M	2450	mg/kg	10
Cadmium	M	2450	mg/kg	0.10
Chromium	M	2450	mg/kg	1.0
Molybdenum	M	2450	mg/kg	2.0
Antimony	N	2450	mg/kg	2.0
Copper	M	2450	mg/kg	0.50
Mercury	M	2450	mg/kg	0.10
Nickel	M	2450	mg/kg	0.50
Lead	M	2450	mg/kg	0.50
Selenium	M	2450	mg/kg	0.20
Zinc	M	2450	mg/kg	0.50
Chromium (Trivalent)	N	2490	mg/kg	1.0
Chromium (Hexavalent)	N	2490	mg/kg	0.50
Total Organic Carbon	M	2625	%	0.20
Mineral Oil	N	2670	mg/kg	10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0

Project: 22455 Avid Development Sandford / Aecom / Mariet

Client: IGSL		Chemtest Job No.:	20-10240	20-10240	20-10240
Quotation No.:		Chemtest Sample ID.:	996092	996093	996094
Order No.:		Client Sample Ref.:	13551	13553	130581
		Sample Location:	BH3	BH3	BH4
		Sample Type:	SOIL	SOIL	SOIL
		Top Depth (m):	1.00	3.00	1.00
		Bottom Depth (m):	1.00	3.00	1.00
		Asbestos Lab:			
Determinand	Accred.	SOP	Units	LOD	
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	
Benzene	M	2760	µg/kg	1.0	
Toluene	M	2760	µg/kg	1.0	
Ethylbenzene	M	2760	µg/kg	1.0	
m & p-Xylene	M	2760	µg/kg	1.0	
o-Xylene	M	2760	µg/kg	1.0	
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	
Naphthalene	M	2800	mg/kg	0.10	
Acenaphthylene	N	2800	mg/kg	0.10	
Acenaphthene	M	2800	mg/kg	0.10	
Fluorene	M	2800	mg/kg	0.10	
Phenanthrene	M	2800	mg/kg	0.10	
Benzo[ <i>b</i> ]fluoranthene	N	2800	mg/kg	0.10	
Anthracene	M	2800	mg/kg	0.10	
Fluoranthene	M	2800	mg/kg	0.10	
Pyrene	M	2800	mg/kg	0.10	
Benzo[ <i>a</i> ]anthracene	M	2800	mg/kg	0.10	
Chrysene	M	2800	mg/kg	0.10	
Benzo[ <i>b</i> ]fluoranthene	M	2800	mg/kg	0.10	
Benzo[ <i>k</i> ]fluoranthene	M	2800	mg/kg	0.10	
Benzo[ <i>a</i> ]pyrene	M	2800	mg/kg	0.10	
Indeno(1,2,3- <i>c,d</i> )Pyrene	M	2800	mg/kg	0.10	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	



Project: 22455 Avid Development Sandvford (Aecom / Marlet.)

Client: IGSL	Chemtest Job No.:	20-10240	20-10240	20-10240
Quotation No.:	Chemtest Sample ID.:	996092	996093	996094
Order No.:	Client Sample Ref.:	13551	13553	130581
	Sample Location:	BH3	BH3	BH4
	Sample Type:	SOIL	SOIL	SOIL
	Top Depth (m):	1.00	3.00	1.00
	Bottom Depth (m):	1.00	3.00	1.00
	Asbestos Lab:			
Determinand	Accred.	SOP	Units	LOD
Benzofg,h,iperylene	M	2800	mg/kg	0.10
Coronene	N	2800	mg/kg	0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0
PCB 28	U	2815	mg/kg	0.010
PCB 52	U	2815	mg/kg	0.010
PCB 90+101	U	2815	mg/kg	0.010
PCB 118	U	2815	mg/kg	0.010
PCB 153	U	2815	mg/kg	0.010
PCB 138	U	2815	mg/kg	0.010
PCB 180	U	2815	mg/kg	0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10
Total Phenols	M	2920	mg/kg	0.30

## Results - Single Stage WAC

Project: 22455 Avid Development Sandvford ( Aecom / Marlet )

Chemtest Job No: 20-10240

Chemtest Sample ID: 996074

Sample Ref: 131830

Sample ID:

Sample Location: TP1

Top Depth(m): 0.50

Bottom Depth(m): 0.50

Sampling Date:

Determinand

SOP

Accred.

Units

Total Organic Carbon

Loss On Ignition

Total BTEX

Total PCBs (7 Congeners)

TPH Total WAC (Mineral Oil)

Total (Of 17) PAH's

pH

Acid Neutralisation Capacity

Eluate Analysis

Arsenic

Barium

Cadmium

Chromium

Copper

Mercury

Molybdenum

Nickel

Lead

Antimony

Selenium

Zinc

Chloride

Fluoride

Sulphate

Total Dissolved Solids

Phenol Index

Dissolved Organic Carbon

Determinand	SOP	Accred.	Units	10:1 Eluate mg/l	10:1 Eluate mg/kg	Landfill Waste Acceptance Criteria		
						Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	[A] 1.6	3	5	6	
Loss On Ignition	2610	M	%	5.5	--	--	10	
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--	
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--	
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--	
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--	
pH	2010	M		8.2	--	>6	--	
Acid Neutralisation Capacity	2015	N	mol/kg	0.031	--	To evaluate	To evaluate	
Eluate Analysis					Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg			
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25	
Barium	1450	U	0.0093	< 0.50	20	100	300	
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5	
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70	
Copper	1450	U	0.0011	< 0.050	2	50	100	
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2	
Molybdenum	1450	U	0.0033	< 0.050	0.5	10	30	
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40	
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50	
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5	
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7	
Zinc	1450	U	< 0.0010	< 0.50	4	50	200	
Chloride	1220	U	< 1.0	< 10	800	15000	25000	
Fluoride	1220	U	0.47	4.7	10	150	500	
Sulphate	1220	U	16	160	1000	20000	50000	
Total Dissolved Solids	1020	N	85	840	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-	
Dissolved Organic Carbon	1610	U	9.5	95	500	800	1000	

### Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	15

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandford (Aecom / Marlet)

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996075

**Sample Ref:** 131831

**Sample ID:**

**Sample Location:** TP1

**Top Depth(m):** 1.00

**Bottom Depth(m):** 1.00

**Sampling Date:**

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M		--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	0.5	2	25
Barium	1450	U	0.0030	20	100	300
Cadmium	1450	U	< 0.00010	0.04	1	5
Chromium	1450	U	< 0.0010	0.5	10	70
Copper	1450	U	< 0.0010	2	50	100
Mercury	1450	U	< 0.00050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	0.5	10	30
Nickel	1450	U	< 0.0010	0.4	10	40
Lead	1450	U	< 0.0010	0.5	10	50
Antimony	1450	U	< 0.0010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.1	0.5	7
Zinc	1450	U	< 0.0010	4	50	200
Chloride	1220	U	< 1.0	800	15000	25000
Fluoride	1220	U	0.19	10	150	500
Sulphate	1220	U	3.2	1000	20000	50000
Total Dissolved Solids	1020	N	62	4000	60000	100000
Phenol Index	1920	U	< 0.030	1	--	--
Dissolved Organic Carbon	1610	U	5.9	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	16

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 22455 Avid Development Sandvford ( Aecom / Marlet )

Chemtest Job No: 20-10240

Chemtest Sample ID: 996076

Sample Ref: 131834

Sample ID: TP2

Sample Location: 0.50

Top Depth(m): 0.50

Bottom Depth(m):

Sampling Date:

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria	
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill
Total Organic Carbon	2625	M	%	[A] 0.52	6
Loss On Ignition	2610	M	%	3.1	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	--
pH	2010	M		8.5	>6
Acid Neutralisation Capacity	2015	N	mol/kg	0.12	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	To evaluate
Arsenic	1450	U	< 0.0010	< 0.050	25
Barium	1450	U	0.0065	< 0.50	100
Cadmium	1450	U	< 0.0010	< 0.010	1
Chromium	1450	U	< 0.0010	< 0.050	10
Copper	1450	U	0.0014	< 0.050	50
Mercury	1450	U	< 0.00050	< 0.0050	0.2
Molybdenum	1450	U	0.0076	0.076	10
Nickel	1450	U	< 0.0010	< 0.050	10
Lead	1450	U	< 0.0010	< 0.010	10
Antimony	1450	U	< 0.0010	< 0.010	0.7
Selenium	1450	U	< 0.0010	< 0.010	0.5
Zinc	1450	U	< 0.0010	< 0.50	50
Chloride	1220	U	< 1.0	< 10	15000
Fluoride	1220	U	0.27	2.7	150
Sulphate	1220	U	2.3	23	500
Total Dissolved Solids	1020	N	65	650	20000
Phenol Index	1920	U	< 0.030	< 0.30	60000
Dissolved Organic Carbon	1610	U	19	190	1
					500
					800
					1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	12

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandford (Aecom / Marlet)

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996077

**Sample Ref:** 131838

**Sample ID:**

**Sample Location:** TP3

**Top Depth(m):** 0.50

**Bottom Depth(m):** 0.50

**Sampling Date:**

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M	--	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	0.0015	0.5	2	25
Barium	1450	U	0.023	20	100	300
Cadmium	1450	U	<0.00010	0.04	1	5
Chromium	1450	U	<0.0010	0.5	10	70
Copper	1450	U	0.0031	2	50	100
Mercury	1450	U	<0.00050	0.01	0.2	2
Molybdenum	1450	U	0.0047	0.5	10	30
Nickel	1450	U	0.0018	0.4	10	40
Lead	1450	U	<0.0010	0.5	10	50
Antimony	1450	U	0.0015	0.06	0.7	5
Selenium	1450	U	0.0011	0.1	0.5	7
Zinc	1450	U	<0.0010	4	50	200
Chloride	1220	U	<1.0	800	15000	25000
Fluoride	1220	U	0.27	10	150	500
Sulphate	1220	U	5.7	1000	20000	50000
Total Dissolved Solids	1020	N	100	4000	60000	100000
Phenol Index	1920	U	<0.030	1	--	--
Dissolved Organic Carbon	1610	U	14	500	800	1000

### Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	13

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandyford (Aecom / Marlet)

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996078

**Sample Ref:** 131839

**Sample ID:**

**Sample Location:** TP3

**Top Depth(m):** 1.00

**Bottom Depth(m):** 1.00

**Sampling Date:**

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M	--	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	0.5	2	25
Barium	1450	U	0.0015	20	100	300
Cadmium	1450	U	< 0.00010	0.04	1	5
Chromium	1450	U	< 0.0010	0.5	10	70
Copper	1450	U	< 0.0010	2	50	100
Mercury	1450	U	< 0.00050	0.01	0.2	2
Molybdenum	1450	U	0.0052	0.5	10	30
Nickel	1450	U	< 0.0010	0.4	10	40
Lead	1450	U	< 0.0010	0.5	10	50
Antimony	1450	U	< 0.0010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.1	0.5	7
Zinc	1450	U	< 0.0010	4	50	200
Chloride	1220	U	< 1.0	800	15000	25000
Fluoride	1220	U	0.23	10	150	500
Sulphate	1220	U	2.2	1000	20000	50000
Total Dissolved Solids	1020	N	54	4000	60000	100000
Phenol Index	1920	U	< 0.030	1	--	--
Dissolved Organic Carbon	1610	U	8.0	500	800	1000

### Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	8.6

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandryford (Aecom / Marlet )

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996079

**Sample Ref:** 131842

**Sample ID:** TP4

**Sample Location:** 0.50

**Top Depth(m):** 0.50

**Bottom Depth(m):** 0.50

**Sampling Date:**

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M		--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 /kg</b>		
Arsenic	1450	U	< 0.0010	0.5	2	25
Barium	1450	U	0.0020	20	100	300
Cadmium	1450	U	< 0.00010	0.04	1	5
Chromium	1450	U	< 0.0010	0.5	10	70
Copper	1450	U	< 0.0010	2	50	100
Mercury	1450	U	< 0.00050	0.01	0.2	2
Molybdenum	1450	U	0.0074	0.5	10	30
Nickel	1450	U	< 0.0010	0.4	10	40
Lead	1450	U	< 0.0010	0.5	10	50
Antimony	1450	U	< 0.0010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.1	0.5	7
Zinc	1450	U	< 0.0010	4	50	200
Chloride	1220	U	1.1	800	15000	25000
Fluoride	1220	U	0.24	10	150	500
Sulphate	1220	U	7.1	1000	20000	50000
Total Dissolved Solids	1020	N	57	4000	60000	100000
Phenol Index	1920	U	< 0.030	1	-	-
Dissolved Organic Carbon	1610	U	5.6	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.2

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandford (Aecom / Marlet)

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996080

**Sample Ref:** 131846

**Sample ID:** TP5

**Sample Location:** 0.50

**Top Depth(m):** 0.50

**Bottom Depth(m):** 0.50

**Sampling Date:**

Determinand	SOP	Accred.	Units	10:1 Eluate mg/l	10:1 Eluate mg/kg	Landfill Waste Acceptance Criteria		
						Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%		[A] 0.31	3	5	6
Loss On Ignition	2610	M	%		1.7	--	--	10
Total BTEX	2760	M	mg/kg		[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg		< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg		[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg		< 2.0	100	--	--
pH	2010	M			10.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg		0.18	--	To evaluate	To evaluate
Eluate Analysis						Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	0.0011		< 0.050	0.5	2	25
Barium	1450	U	0.023		< 0.50	20	100	300
Cadmium	1450	U	< 0.00010		< 0.010	0.04	1	5
Chromium	1450	U	0.0041		< 0.050	0.5	10	70
Copper	1450	U	< 0.0010		< 0.050	2	50	100
Mercury	1450	U	0.00069		0.0069	0.01	0.2	2
Molybdenum	1450	U	0.0034		< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010		< 0.050	0.4	10	40
Lead	1450	U	< 0.0010		< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010		< 0.010	0.06	0.7	5
Selenium	1450	U	0.0010		0.010	0.1	0.5	7
Zinc	1450	U	0.011		< 0.50	4	50	200
Chloride	1220	U	< 1.0		< 10	800	15000	25000
Fluoride	1220	U	0.14		1.4	10	150	500
Sulphate	1220	U	310		3100	1000	20000	50000
Total Dissolved Solids	1020	N	400		4000	4000	60000	100000
Phenol Index	1920	U	< 0.030		< 0.30	1	--	--
Dissolved Organic Carbon	1610	U	3.7		< 50	500	800	1000

### Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	5.9

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.



## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandford (Aecom / Marlet)

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996081

**Sample Ref:** 131847

**Sample ID:** TP5

**Sample Location:** 1.20

**Top Depth(m):** 1.20

**Bottom Depth(m):** 1.20

**Sampling Date:**

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M		--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	0.5	2	25
Barium	1450	U	0.0061	20	100	300
Cadmium	1450	U	< 0.00010	0.04	1	5
Chromium	1450	U	0.0010	0.5	10	70
Copper	1450	U	< 0.0010	2	50	100
Mercury	1450	U	< 0.00050	0.01	0.2	2
Molybdenum	1450	U	0.0041	0.5	10	30
Nickel	1450	U	< 0.0010	0.4	10	40
Lead	1450	U	< 0.0010	0.5	10	50
Antimony	1450	U	< 0.0010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.1	0.5	7
Zinc	1450	U	< 0.0010	4	50	200
Chloride	1220	U	< 1.0	800	15000	25000
Fluoride	1220	U	0.26	10	150	500
Sulphate	1220	U	16	1000	20000	50000
Total Dissolved Solids	1020	N	85	4000	60000	100000
Phenol Index	1920	U	< 0.030	1	--	--
Dissolved Organic Carbon	1610	U	6.3	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	17

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandvford ( Aecom / Marlet )

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996082

**Sample Ref:** 131850

**Sample ID:** TP6

**Sample Location:** 0.50

**Top Depth(m):** 0.50

**Bottom Depth(m):** 0.50

**Sampling Date:**

Determination	SOP	Accred.	Units	10:1 Eluate mg/l	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg	Landfill Waste Acceptance Criteria		
						Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	[A] < 0.20	3	5	6	
Loss On Ignition	2610	M	%	2.0	--	--	10	
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--	
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--	
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--	
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--	
pH	2010	M		10.8	--	>6	--	
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	--	To evaluate	To evaluate	
Eluate Analysis								
Arsenic	1450	U	0.0029	< 0.050	0.5	2	25	
Barium	1450	U	0.0040	< 0.50	20	100	300	
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5	
Chromium	1450	U	0.0040	< 0.050	0.5	10	70	
Copper	1450	U	< 0.0010	< 0.050	2	50	100	
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2	
Molybdenum	1450	U	0.0031	< 0.050	0.5	10	30	
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40	
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50	
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5	
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7	
Zinc	1450	U	< 0.0010	< 0.50	4	50	200	
Chloride	1220	U	< 1.0	< 10	800	15000	25000	
Fluoride	1220	U	0.19	1.9	10	150	500	
Sulphate	1220	U	23	230	1000	20000	50000	
Total Dissolved Solids	1020	N	100	1000	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.30	1	--	--	
Dissolved Organic Carbon	1610	U	4.9	< 50	500	800	1000	

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.3

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 22455 Avid Development Sandvford ( Aecom / Marlet )

Chemtest Job No: 20-10240

Chemtest Sample ID: 996083

Sample Ref: 136807

Sample ID: TP7

Sample Location: 1.00

Top Depth(m): 1.00

Bottom Depth(m):

Sampling Date:

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M		--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	0.5	2	25
Barium	1450	U	0.0072	20	100	300
Cadmium	1450	U	< 0.00010	0.04	1	5
Chromium	1450	U	< 0.0010	0.5	10	70
Copper	1450	U	< 0.0010	2	50	100
Mercury	1450	U	< 0.00050	0.01	0.2	2
Molybdenum	1450	U	0.014	0.5	10	30
Nickel	1450	U	< 0.0010	0.4	10	40
Lead	1450	U	< 0.0010	0.5	10	50
Antimony	1450	U	< 0.0010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.1	0.5	7
Zinc	1450	U	< 0.0010	4	50	200
Chloride	1220	U	< 1.0	800	15000	25000
Fluoride	1220	U	0.29	10	150	500
Sulphate	1220	U	2.0	1000	20000	50000
Total Dissolved Solids	1020	N	65	4000	60000	100000
Phenol Index	1920	U	< 0.030	1	-	-
Dissolved Organic Carbon	1610	U	4.8	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 22455 Avid Development Sandvford ( Aecom / Marlet )

Chemtest Job No: 20-10240

Chemtest Sample ID: 996084

Sample Ref: 136811

Sample ID: TP8

Sample Location: 1.00

Top Depth(m): 1.00

Bottom Depth(m):

Sampling Date:

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M		--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	0.5	2	25
Barium	1450	U	0.0014	20	100	300
Cadmium	1450	U	< 0.00010	0.04	1	5
Chromium	1450	U	< 0.0010	0.5	10	70
Copper	1450	U	< 0.0010	2	50	100
Mercury	1450	U	< 0.00050	0.01	0.2	2
Molybdenum	1450	U	0.0089	0.5	10	30
Nickel	1450	U	< 0.0010	0.4	10	40
Lead	1450	U	< 0.0010	0.5	10	50
Antimony	1450	U	< 0.0010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.1	0.5	7
Zinc	1450	U	< 0.0010	4	50	200
Chloride	1220	U	< 1.0	800	15000	25000
Fluoride	1220	U	0.19	10	150	500
Sulphate	1220	U	1.4	1000	20000	50000
Total Dissolved Solids	1020	N	49	4000	60000	100000
Phenol Index	1920	U	< 0.030	1	--	--
Dissolved Organic Carbon	1610	U	5.7	500	800	1000

### Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	9.1

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 22455 Avid Development Sandvford ( Aecom / Marlet )

Chemtest Job No: 20-10240

Chemtest Sample ID: 996085

Sample Ref: 136814

Sample ID:

Sample Location: TP9

Top Depth(m): 0.50

Bottom Depth(m): 0.50

Sampling Date:

Determinand

SOP

Accred.

Units

Determinand	SOP	Accred.	Units	10:1 Eluate mg/l	10:1 Eluate mg/kg	Landfill Waste Acceptance Criteria		
						Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	[A] 0.56		3	5	6
Loss On Ignition	2610	M	%	2.3		--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010		6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10		1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10		500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	8.7		100	--	--
pH	2010	M		9.9		--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.18		--	To evaluate	To evaluate
Eluate Analysis						Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	0.0017	< 0.050		0.5	2	25
Barium	1450	U	0.0043	< 0.50		20	100	300
Cadmium	1450	U	< 0.00010	< 0.010		0.04	1	5
Chromium	1450	U	0.0018	< 0.050		0.5	10	70
Copper	1450	U	< 0.0010	< 0.050		2	50	100
Mercury	1450	U	< 0.00050	< 0.0050		0.01	0.2	2
Molybdenum	1450	U	0.015	0.15		0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050		0.4	10	40
Lead	1450	U	< 0.0010	< 0.010		0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010		0.06	0.7	5
Selenium	1450	U	0.0011	0.011		0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50		4	50	200
Chloride	1220	U	< 1.0	< 10		800	15000	25000
Fluoride	1220	U	0.23	2.3		10	150	500
Sulphate	1220	U	42	420		1000	20000	50000
Total Dissolved Solids	1020	N	120	1200		4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30		1	-	-
Dissolved Organic Carbon	1610	U	3.9	< 50		500	800	1000

### Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	8.5

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 22455 Avid Development Sandvford ( Aecom / Marlet )

Chemtest Job No: 20-10240

Chemtest Sample ID: 996086

Sample Ref: 136819

Sample ID: TP10

Sample Location: 1.00

Top Depth(m): 1.00

Bottom Depth(m):

Sampling Date:

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M	--	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	Limit values for compliance leaching test using BS EN 12457 at L/S 10 /kg		
Arsenic	1450	U	< 0.0010	0.5	2	25
Barium	1450	U	0.0019	20	100	300
Cadmium	1450	U	< 0.00010	0.04	1	5
Chromium	1450	U	< 0.0010	0.5	10	70
Copper	1450	U	< 0.0010	2	50	100
Mercury	1450	U	< 0.00050	0.01	0.2	2
Molybdenum	1450	U	0.0071	0.5	10	30
Nickel	1450	U	< 0.0010	0.4	10	40
Lead	1450	U	< 0.0010	0.5	10	50
Antimony	1450	U	< 0.0010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.1	0.5	7
Zinc	1450	U	< 0.0010	4	50	200
Chloride	1220	U	< 1.0	800	15000	25000
Fluoride	1220	U	0.19	10	150	500
Sulphate	1220	U	2.1	1000	20000	50000
Total Dissolved Solids	1020	N	53	4000	--	60000
Phenol Index	1920	U	< 0.030	1	--	100000
Dissolved Organic Carbon	1610	U	5.2	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandvford (Aecom / Marlet)

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996087

**Sample Ref:** 138822

**Sample ID:**

**Sample Location:** TP11

**Top Depth(m):** 0.50

**Bottom Depth(m):** 0.50

**Sampling Date:**

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M		--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
<b>Eluate Analysis</b>				<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1450	U	10:1 Eluate mg/l	0.5	2	25
Barium	1450	U	0.0013	< 0.050	20	100
Cadmium	1450	U	0.0020	< 0.50	1	300
Chromium	1450	U	< 0.00010	< 0.010	0.04	5
Copper	1450	U	< 0.0010	< 0.050	0.5	70
Mercury	1450	U	< 0.0010	< 0.050	2	100
Molybdenum	1450	U	0.00052	0.0052	0.01	2
Nickel	1450	U	0.0072	0.072	0.5	30
Lead	1450	U	< 0.0010	< 0.050	0.4	40
Antimony	1450	U	< 0.0010	< 0.010	0.5	50
Selenium	1450	U	0.0021	0.021	0.06	5
Zinc	1450	U	< 0.0010	< 0.010	0.1	7
Chloride	1220	U	< 0.0010	< 0.50	4	200
Fluoride	1220	U	< 1.0	< 10	800	25000
Sulphate	1220	U	0.19	1.9	10	500
Total Dissolved Solids	1020	N	8.3	83	1000	50000
Phenol Index	1920	U	49	490	4000	100000
Dissolved Organic Carbon	1610	U	< 0.030	< 0.30	1	--
		U	7.7	77	500	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.1

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandvford ( Aecom / Marlet )

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996088

**Sample Ref:** 136827

**Sample ID:** TP-12

**Sample Location:** 1.00

**Top Depth(m):** 1.00

**Bottom Depth(m):** 1.00

**Sampling Date:**

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M		--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	0.5	2	25
Barium	1450	U	0.0026	20	100	300
Cadmium	1450	U	< 0.00010	0.04	1	5
Chromium	1450	U	< 0.0010	0.5	10	70
Copper	1450	U	< 0.0010	2	50	100
Mercury	1450	U	0.00050	0.01	0.2	2
Molybdenum	1450	U	0.014	0.5	10	30
Nickel	1450	U	< 0.0010	0.4	10	40
Lead	1450	U	< 0.0010	0.5	10	50
Antimony	1450	U	< 0.0010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.1	0.5	7
Zinc	1450	U	< 0.0010	4	50	200
Chloride	1220	U	< 1.0	800	15000	25000
Fluoride	1220	U	0.24	10	150	500
Sulphate	1220	U	1.8	1000	20000	50000
Total Dissolved Solids	1020	N	54	4000	60000	100000
Phenol Index	1920	U	< 0.030	1	--	--
Dissolved Organic Carbon	1610	U	7.3	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.



## Results - Single Stage WAC

**Project:** 22455 Avid Development Sandford (Aecom / Marlet)

**Chemtest Job No:** 20-10240

**Chemtest Sample ID:** 996089

**Sample Ref:** 13559

**Sample ID:** BH1

**Sample Location:** 1.00

**Top Depth(m):** 1.00

**Bottom Depth(m):** 1.00

**Sampling Date:**

Determinand	SOP	Accred.	Units	Landfill Waste Acceptance Criteria		
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	M	%	3	5	6
Loss On Ignition	2610	M	%	--	--	10
Total BTEX	2760	M	mg/kg	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	100	--	--
pH	2010	M		--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1450	U	< 0.0010	0.5	2	25
Barium	1450	U	0.0031	20	100	300
Cadmium	1450	U	< 0.00010	0.04	1	5
Chromium	1450	U	< 0.0010	0.5	10	70
Copper	1450	U	< 0.0010	2	50	100
Mercury	1450	U	0.00062	0.01	0.2	2
Molybdenum	1450	U	0.012	0.5	10	30
Nickel	1450	U	< 0.0010	0.4	10	40
Lead	1450	U	< 0.0010	0.5	10	50
Antimony	1450	U	< 0.0010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.1	0.5	7
Zinc	1450	U	< 0.0010	4	50	200
Chloride	1220	U	< 1.0	800	15000	25000
Fluoride	1220	U	0.26	10	150	500
Sulphate	1220	U	2.1	1000	20000	50000
Total Dissolved Solids	1020	N	52	4000	60000	100000
Phenol Index	1920	U	< 0.030	1	-	-
Dissolved Organic Carbon	1610	U	5.3	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

### Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63, Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERT's accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
996074	131830		TP1		A	Amber Glass 250ml
996074	131830		TP1		A	Plastic Tub 500g
996075	131831		TP1		A	Amber Glass 250ml
996075	131831		TP1		A	Plastic Tub 500g
996076	131834		TP2		A	Amber Glass 250ml
996076	131834		TP2		A	Plastic Tub 500g
996077	131838		TP3		A	Amber Glass 250ml
996077	131838		TP3		A	Plastic Tub 500g
996078	131839		TP3		A	Amber Glass 250ml
996078	131839		TP3		A	Plastic Tub 500g
996079	131842		TP4		A	Amber Glass 250ml
996079	131842		TP4		A	Plastic Tub 500g
996080	131846		TP5		A	Amber Glass 250ml
996080	131846		TP5		A	Plastic Tub 500g
996081	131847		TP5		A	Amber Glass 250ml
996081	131847		TP5		A	Plastic Tub 500g
996082	131850		TP6		A	Amber Glass 250ml
996082	131850		TP6		A	Plastic Tub 500g
996083	136807		TP7		A	Amber Glass 250ml
996083	136807		TP7		A	Plastic Tub 500g
996084	136811		TP8		A	Amber Glass 250ml
996084	136811		TP8		A	Plastic Tub 500g

### Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63, Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERT's accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
996085	136814		TP9		A	Amber Glass 250ml
996085	136814		TP9		A	Plastic Tub 500g
996086	136819		TP10		A	Amber Glass 250ml
996086	136819		TP10		A	Plastic Tub 500g
996087	138822		TP11		A	Amber Glass 250ml
996087	138822		TP11		A	Plastic Tub 500g
996088	136827		TP12		A	Amber Glass 250ml
996088	136827		TP12		A	Plastic Tub 500g
996089	13559		BH1		A	Amber Glass 250ml
996089	13559		BH1		A	Plastic Tub 500g
996090	135560		BH1		A	Amber Glass 250ml
996090	135560		BH1		A	Plastic Tub 500g
996091	1		BH2		A	Amber Glass 250ml
996091	1		BH2		A	Plastic Tub 500g
996092	13551		BH3		A	Amber Glass 250ml
996092	13551		BH3		A	Plastic Tub 500g
996093	13553		BH3		A	Amber Glass 250ml
996093	13553		BH3		A	Plastic Tub 500g
996094	130581		BH4		A	Amber Glass 250ml
996094	130581		BH4		A	Plastic Tub 500g

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
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.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N-dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6-C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8-C40	Dichloromethane extraction / GC-FID

SOP	Title	Parameters included	Method summary
2680	TPH A/A Split	Aliphatics: >C5-C6, >C6-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44 Aromatics: >C5-C7, >C7-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7 Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and Trimethylphenols Note: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	Compliance Test for Leaching of Granular Waste Material and Sludge

## 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"

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

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- 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

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All soil samples will be retained for a period of 45 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](mailto:customerservices@chemtest.com)

## **Appendix VI Test Data**

### **c. Water Levels and Gas Concentrations**

Gas & Groundwater Monitoring						
Site Location	Carmanhall road, Sandyford.					
Project No.	22455					
Client	Marlet					
Date	20th March 2020					
	BH3	RC2	BH1	RC4		
WATER LEVEL (m bgl)	2.5	2.9	2.2	2.4		
GAS FLOW	n/a	n/a	n/a	n/a		
CH4(%)	0.0	0.0	0.0	0.0		
LEL(%)	0.0	0.0	0.0	0.0		
CO2(%)	0.1	0.0	0.2	0.0		
O2(%)	20.7	19.9	19.6	20.6		
BAROMETRIC PRESSURE (mb)	1014	1014	1014	1014		
WEATHER	Sunny	Sunny	Sunny	Sunny		
COMMENTS						





## Gas & Groundwater Monitoring

Site Location		Carmanhall road, Sandford.					
Project No.		22455					
Client		Marlet					
Date		15th May 2020					
	BH3		RC2		BH1		RC4
WATER LEVEL (m bgl)	2.2		2.6		1.9		2.05
GAS FLOW	n/a		n/a		n/a		n/a
CH4(%)	0.0		0.0		0.0		0.0
LEL(%)	0.0		0.0		0.0		0.0
CO2(%)	0.1		0.0		0.1		0.0
O2(%)	20.5		19.7		19.9		20.1
BAROMETRIC PRESURE (mb)	1006		1006		1006		1006
WEATHER	Sunny		Sunny		Sunny		Sunny
COMMENTS							



## **Appendix VII Site Plan**

**NOTES**

**NOTE:** THIS IS A PRELIMINARY INVESTIGATION WITH GROUND INVESTIGATION SCOPE OF WORKS

**LEGEND**

TP (Tm)	TP (Tm)
BH (Hm)	BH (Hm)
IT (Tm)	IT (Tm)
CBR (Hm)	CBR (Hm)

**Borehole Schedule**

Ref	Position X	Position Y
BH-01	71942964	72650419
BH-02	71947408	72657300
BH-03	71942183	72649810
BH-04	71937031	72653905

**Trial Pit Schedule**

Ref	Position X	Position Y
TP-01	71942978	72650758
TP-02	71934445	72654169
TP-03	71946301	72650230
TP-04	71943206	72643700
TP-05	71945031	72643253
TP-06	71940939	72654444
TP-07	71938468	72656643
TP-08	71937788	72650033
TP-09	71942378	72653009
TP-10	71943768	72653779
TP-11	71944841	72652038
TP-12	71939923	72657623

**Infiltration Schedule**

Ref	Position X	Position Y
IF-01	719410787	72657730
IF-02	719437351	726565470

**CBR Schedule**

Ref	Position X	Position Y
CBR-01	71939562	72657259

**ISSUE/REVISION**

NO	DATE	ISSUED FOR TENDER	DESCRIPTION
001	18.02.2020	Issued for Tender	

**SUITABILITY STATUS**  
D2 - Suitable for Tender

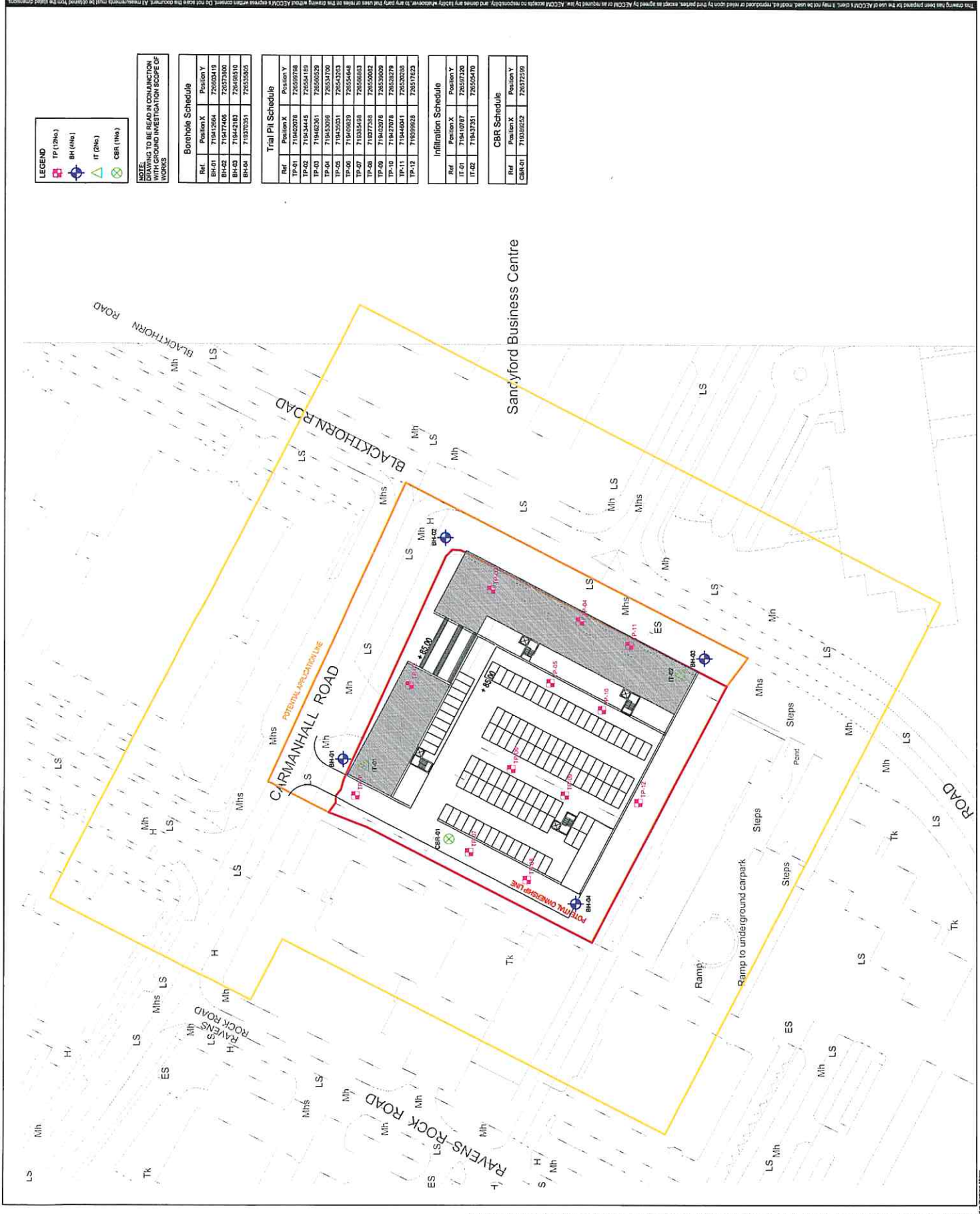
**PROJECT NUMBER**  
PR-461030

**SHEET TITLE**  
Site Investigation  
Scope of Works

**SHEET NUMBER**  
AVID-ACM-00-XX-DR-S-060001

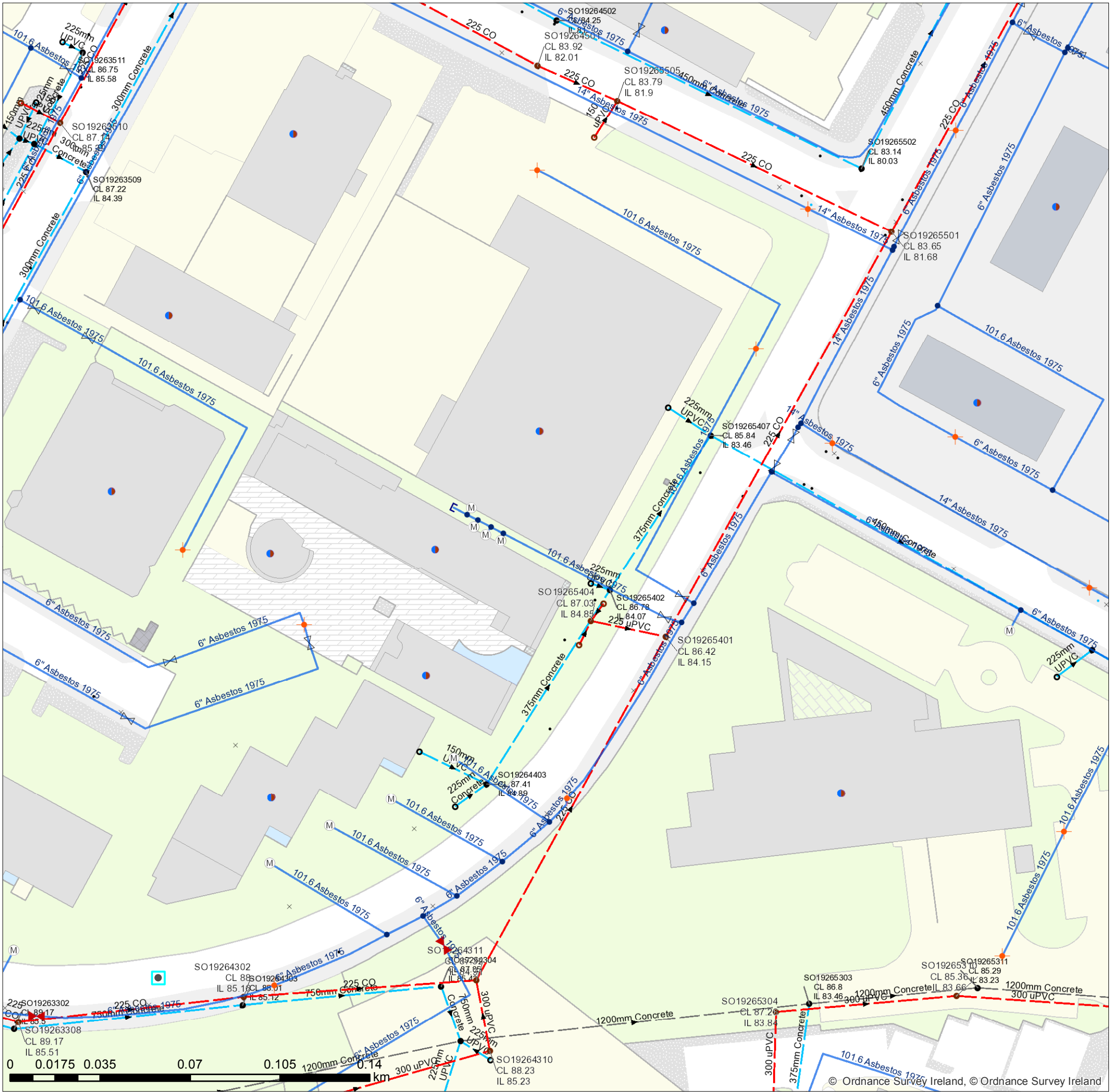
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**REV:** P01



## Appendix B – DLRCC Existing Records

# BLACKTHORN ROAD



<b>Water Distribution Network</b> Water Treatment Plant Water Pump Station Storage Cell/Tower Dosing Point Meter Station Abstraction Point Telemetry Kiosk <b>Reservoir</b> Potable Raw Water <b>Water Distribution Mains</b> Irish Water Private <b>Trunk Water Mains</b> Irish Water Private <b>Water Lateral Lines</b> Irish Water Non IW Water Casings Water Abandoned Lines Boundary Meter Bulk/Check Meter Group Scheme Source Meter Waste Meter Unknown Meter ; Other Meter Non-Return PRV PSV Sluice Line Valve Open/Closed Butterfly Line Valve Open/Closed Sluice Boundary Valve Open/Closed Butterfly Boundary Valve Open/Closed Scour Valves	Single Air Control Valve Double Air Control Valve Water Stop Valves Water Service Connections Water Distribution Chambers Water Network Junctions Pressure Monitoring Point Fire Hydrant Fire Hydrant/Washout Water Fittings Cap Reducer Tap Other Fittings <b>Sewer Foul Combined Network</b> Waste Water Treatment Plant Waste Water Pump station <b>Sewer Mains Irish Water</b> Gravity - Combined Gravity - Foul Gravity - Unknown Pumping - Combined Pumping - Foul Pumping - Unknown Syphon - Combined Syphon - Foul Syphon - Unknown Overflow <b>Sewer Mains Private</b> Gravity - Combined Gravity - Foul Gravity - Unknown Pumping - Combined Pumping - Foul Pumping - Unknown Syphon - Combined Syphon - Foul Syphon - Unknown Overflow Sewer Lateral Lines Sewer Casings <b>Sewer Manholes</b> Standard Backdrop Cascade Catchpit Bifurcation Hatchbox Lamphole Hydrobrake Other; Unknown	<b>Discharge Type</b> Outfall Overflow Soakaway Standard Outlet Other; Unknown <b>Cleanout Type</b> Rodding Eye Flushing Structure Other; Unknown <b>Sewer Inlets</b> Catchpit Gully Standard Other; Unknown <b>Sewer Fittings</b> Vent/Col Other; Unknown	<b>Storm Water Network</b> <b>Surface Water Mains</b> Surface Gravity Mains Surface Gravity Mains Private Surface Water Pressurised Mains Surface Water Pressurised Mains Private <b>Inlet Type</b> Gully Standard Other; Unknown <b>Storm Manholes</b> Standard Backdrop Cascade Catchpit Bifurcation Hatchbox Lamphole Hydrobrake Other; Unknown Storm Culverts Storm Clean Outs Stormwater Chambers <b>Discharge Type</b> Outfall Overflow Soakaway Other; Unknown	<b>Gas Networks Ireland</b> Transmission High Pressure Gasline Distribution Medium Pressure Gasline Distribution Low Pressure Gasline <b>ESB Networks</b> <b>ESB HV Lines</b> HV Underground HV Overhead HV Abandoned <b>ESB MV/LV Lines</b> MV Overhead Three Phase MV Overhead Single Phase LV Overhead Three Phase LV Overhead Single Phase MV/LV Underground Abandoned <b>Non Service Categories</b> Proposed Under Construction Out of Service Decommissioned <b>Water Non Service Assets</b> Water Point Feature Water Pipe Water Structure <b>Waste Non Service Assets</b> Waste Point Feature Sewer Waste Structure
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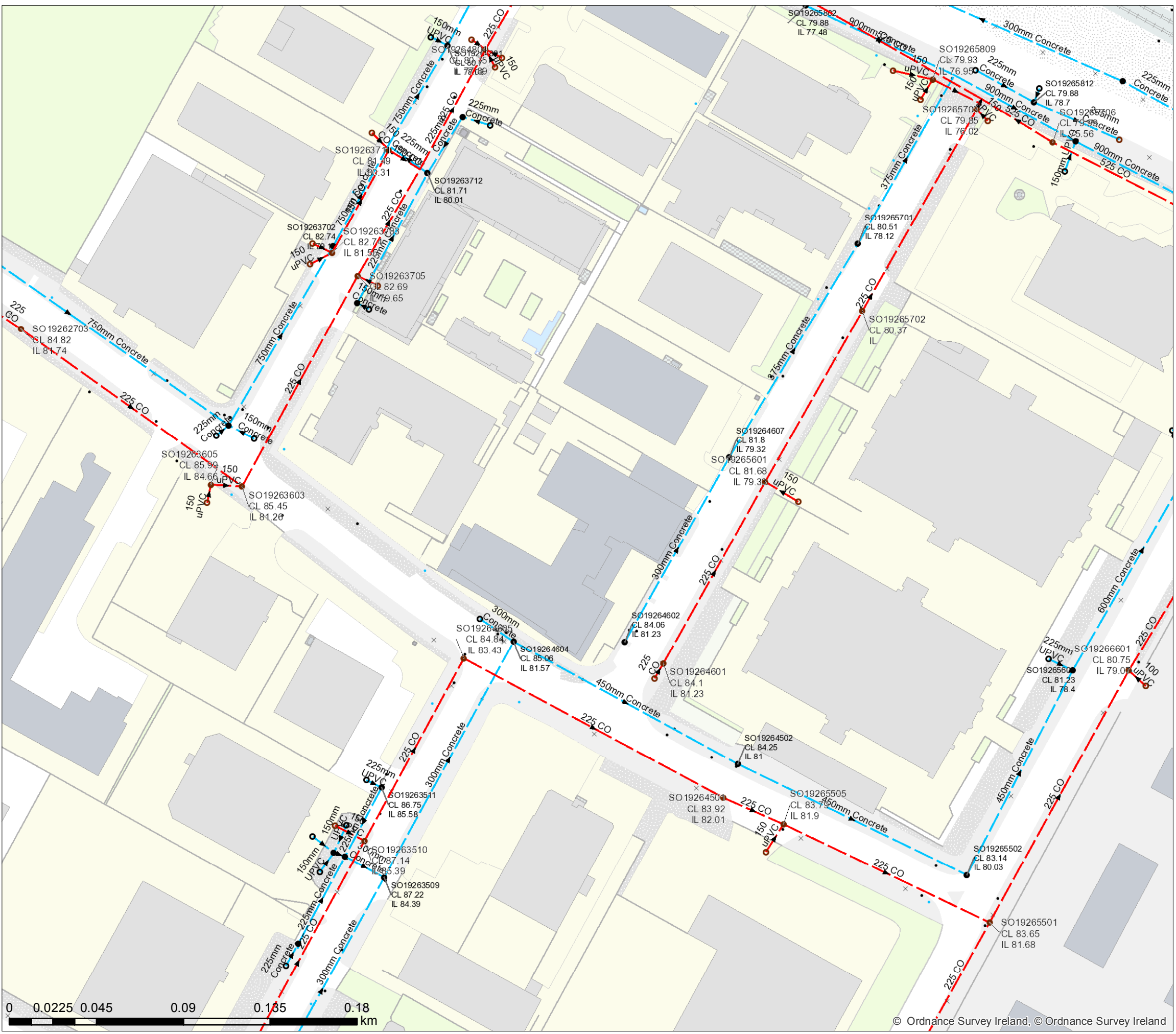
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# - carmanhall road - burton hall road -



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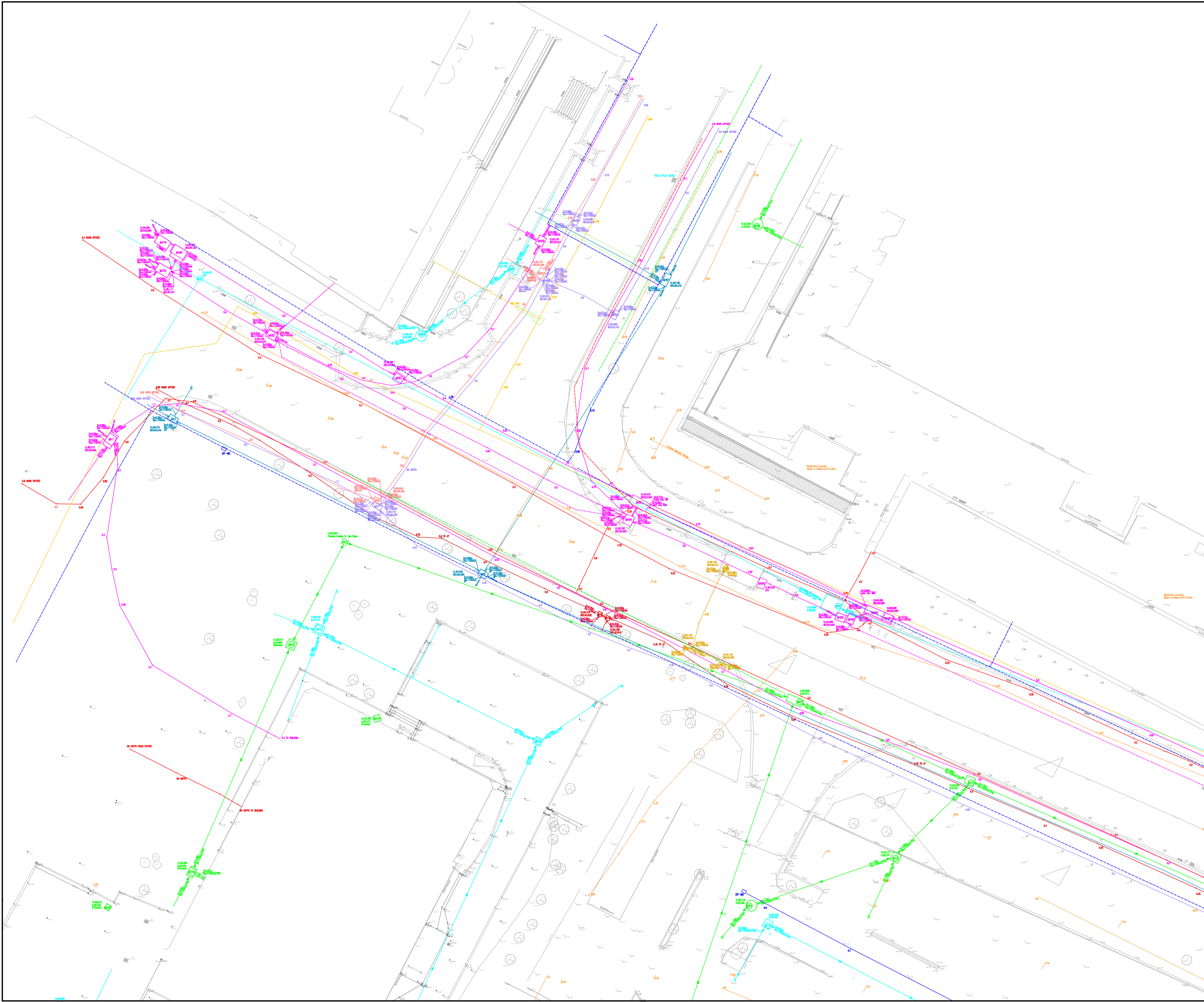
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Water Distribution Network	Sewer Foul Combined Network	Storm Water Network
Water Treatment Plant	Waste Water Treatment Plant	Surface Water Mains
Water Pump Station	Waste Water Pump station	Surface Gravity Mains
Storage Cell/Tower		Surface Gravity Mains Private
Dosing Point		Surface Water Pressurised Mains
Meter Station		Surface Water Pressurised Mains Private
Abstraction Point		Inlet Type
Telemetry Kiosk		Gully
Reservoir		Standard
Potable		Other; Unknown
Raw Water		Storm Manholes
Water Distribution Mains		Standard
Irish Water		Backdrop
Private		Cascade
Trunk Water Mains		Catchpit
Irish Water		Bifurcation
Private		Hatchbox
Water Lateral Lines		Lampole
Irish Water		Hydrobrake
Non IW		Other; Unknown
Water Casings		Storm Culverts
Water Abandoned Lines		Storm Clean Outs
Boundary Meter		Stormwater Chambers
Bulk/Check Meter		Discharge Type
Group Scheme		Outfall
Source Meter		Overflow
Waste Meter		Soakaway
Unknown Meter; Other Meter		Other; Unknown
Non-Return		Gas Networks Ireland
PRV		Transmission High Pressure Gasline
PSV		Distribution Medium Pressure Gasline
Sluice Line Valve Open/Closed		Distribution Low Pressure Gasline
Butterfly Line Valve Open/Closed		ESB Networks
Sluice Boundary Valve Open/Closed		ESB HV Lines
Butterfly Boundary Valve Open/Closed		HV Underground
Scour Valves		HV Overhead
Single Air Control Valve		HV Abandoned
Double Air Control Valve		ESB MVLV Lines
Water Stop Valves		MV Overhead Three Phase
Water Service Connections		MV Overhead Single Phase
Water Distribution Chambers		LV Overhead Three Phase
Water Network Junctions		LV Overhead Single Phase
Pressure Monitoring Point		MVLV Underground
Fire Hydrant		Abandoned
Fire Hydrant/Washout		Non Service Categories
Water Fittings		Proposed
Cap		Under Construction
Reducer		Out of Service
Tap		Decommissioned
Other Fittings		Water Non Service Assets
		Water Point Feature
		Water Pipe
		Water Structure
		Waste Non Service Assets
		Waste Point Feature
		Sewer
		Waste Structure

## Appendix C – Utility Survey

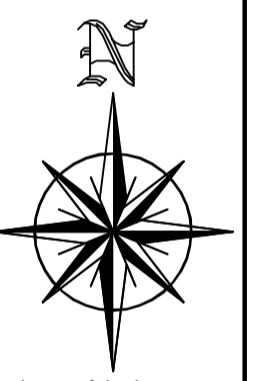




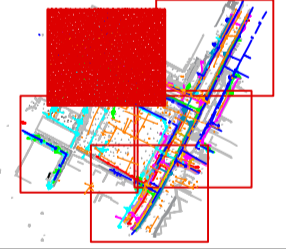
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DESCRIPTION	COLOUR	TRACED SERVICES	INFERRED SERVICES
Foul Sewer/Water	GREEN		
Surface/Storm Water	CYAN		
Combined Sewer	BROWN		
Power	RED		
Telecoms			
Telecom	MAGENTA		
Cable TV	PURPLE		
Alternative Telecoms	PINK		
Watermain	BLUE		
Gas	YELLOW		
Unknown Service/Anomaly	ORANGE		
Trench Scar	LIGHT GREEN		
Utility Providers Records			
ESB Records	RED		
Bord Gais Records	YELLOW		
Telecom Records	MAGENTA		
Water Records	BLUE		
Foul Sewer/Water Manhole	GREEN		
Surface/Storm Water Manhole	CYAN		
Power Manhole	RED		
Telecom Manhole	MAGENTA		
Watermain Manhole	BLUE		
Water Hydrant, Meter, Sluice Valve, Air Valve, Stop Cock	BLUE		
Gas Line Manhole	YELLOW		
Foul Sewer/Water Gully	GREEN		
Surface/Storm Water Gully	CYAN		

- NOTES:**
- Utility survey carried out with RF & GPR equipment.
  - RF = RD8000 Transmitter & Receiver.
  - GPR = Ground Penetrating Radar - Mala 450 Mhz.
  - Unknown voltage on electric cables.
  - 300mm denotes the diameter of the pipe.
  - 0.5 denotes depth in metres below ground level to top of pipe.
  - Survey carried out in September 2019.
  - R denotes sections of services taken from record.
  - UTT denotes unable to Trace, UTO denotes unable to Open
  - Where Invert Levels are shown adjacent to MH's, IC's etc. are to the invert of the lowest pipe/duct within the manhole. There may be further pipes/ducts within the MH which are located closer to ground level as per the depths marked on individual pipes/ducts. Care should be taken as higher level ducts may contain live electrical cables.



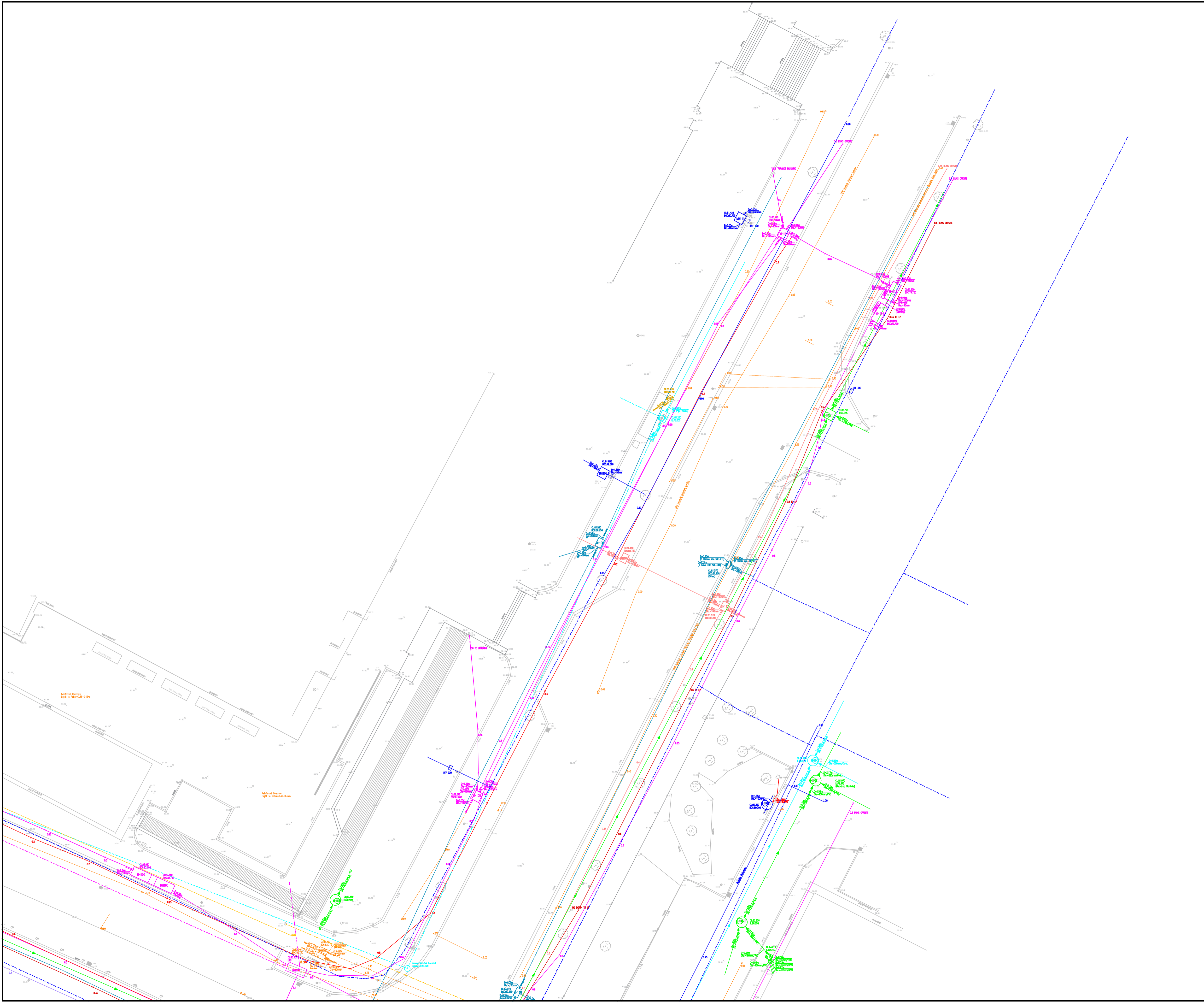
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GPR - Utility Survey

Unit 1 Enterprise, Technology & Innovation Centre, Clonmore Business Park, Mullingar, Co Westmeath.		T: 01 2542680 E: info@scantech.ie www.scantech.ie
Client:	Jones Engineering	
Project Title:	Avid, Sandyford, Dublin.	
Drawing Title:	Underground Services Layout	
Date:	06th April 2020	Drawn By: R.G
Scale:	1/100 on A1	Checked: D.T
Drawing No:	SCT-20047_01_05	Revision:

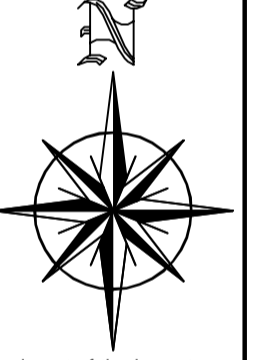


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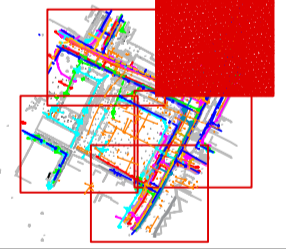
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Foul Sewer/Water	GREEN		
Surface/Storm Water	CYAN		
Combined Sewer	BROWN		
Power	RED		
Telecoms			
Telecom	MAGENTA		
Cable TV	PURPLE		
Alternative Telecoms	PINK		
Watermain	BLUE		
Gas	YELLOW		
Unknown Service/Anomaly	ORANGE		
Trench Scar	LIGHT GREEN		
Utility Providers Records			
ESB Records	RED		
Bord Gais Records	YELLOW		
Telecom Records	MAGENTA		
Water Records	BLUE		
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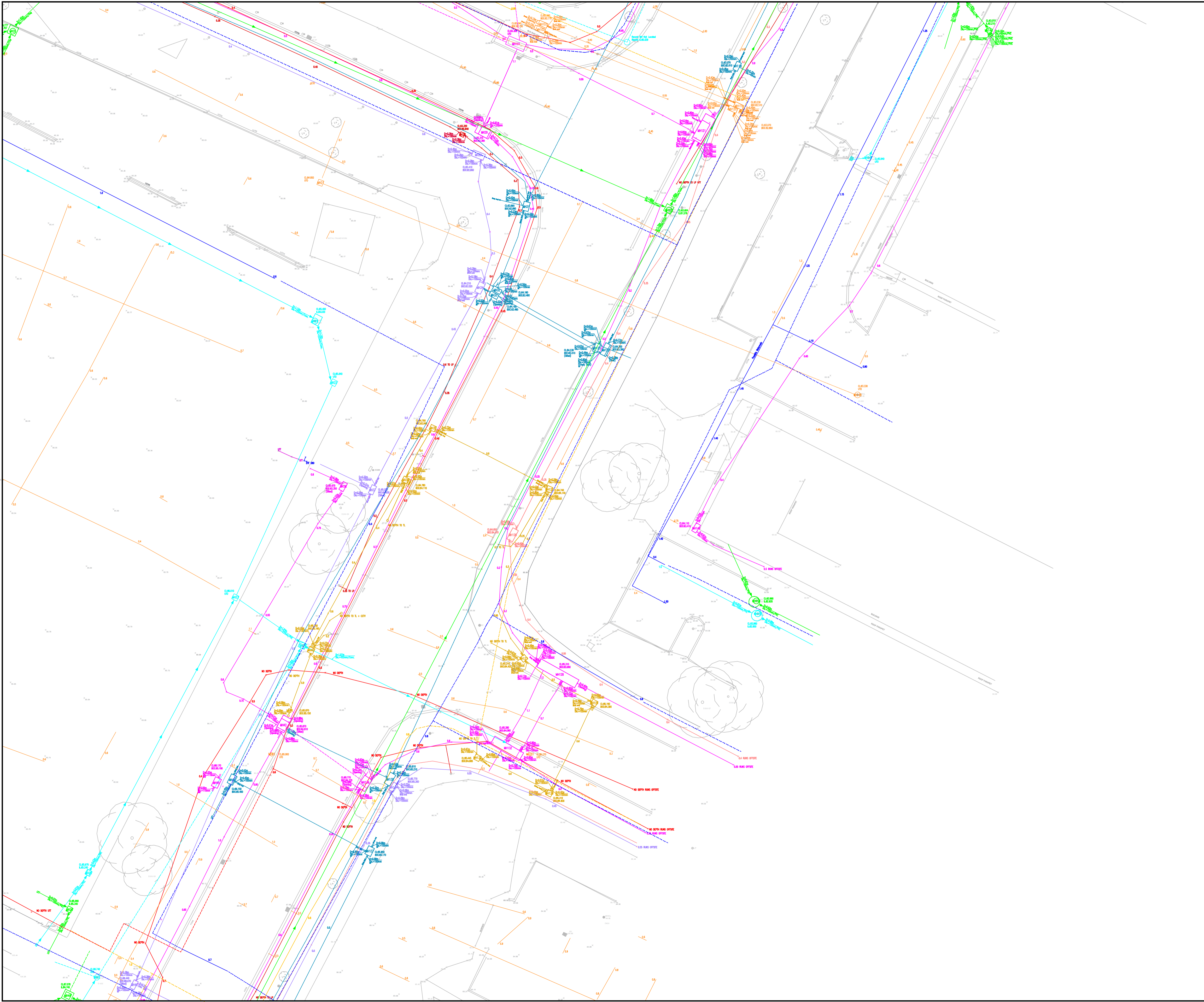
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Drawing Title: Underground Services Layout

Date: 06th April 2020 Drawn By: R.G

Scale: 1/100 on A1 Checked: D.T

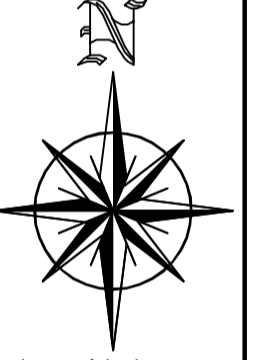
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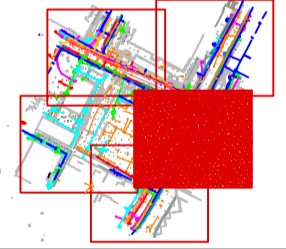
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Combined Sewer	BROWN		
Power	RED		
Telecoms			
Telecom	MAGENTA		
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Alternative Telecoms	PINK		
Watermain	BLUE		
Gas	YELLOW		
Unknown Service/Anomaly	ORANGE		
Trench Scar	LIGHT GREEN		
Utility Providers Records			
ESB Records	RED		
Bord Gais Records	YELLOW		
Telecom Records	MAGENTA		
Water Records	BLUE		
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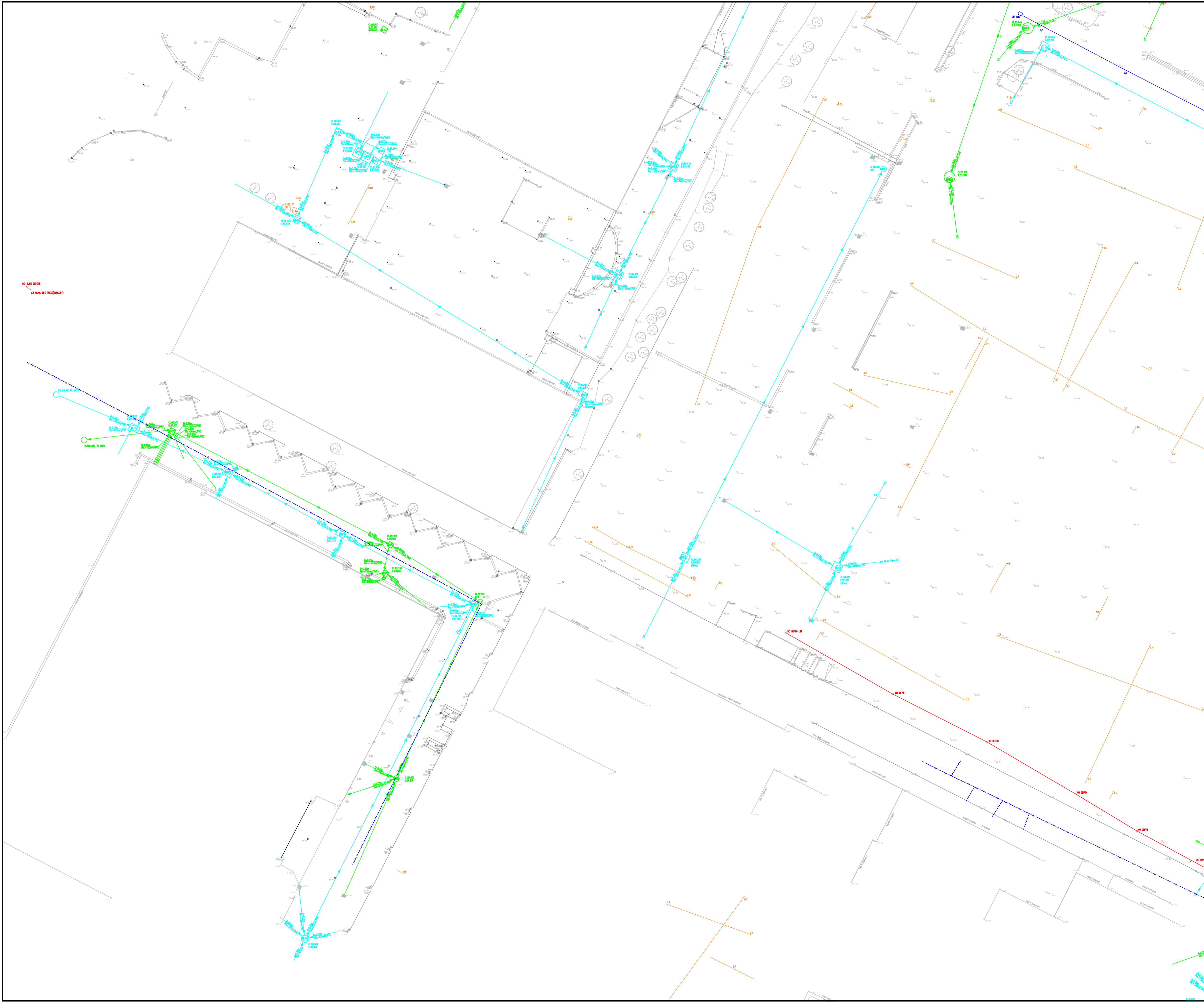
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Drawing Title: Underground Services Layout

Date: 06th April 2020 Drawn By: R.G

Scale: 1/100 on A1 Checked: D.T

Drawing No: SCT-20047\_03\_05 Revision:

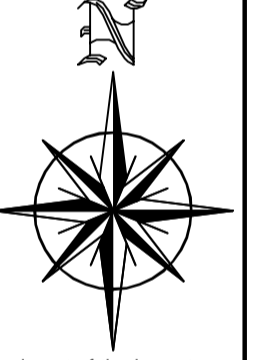


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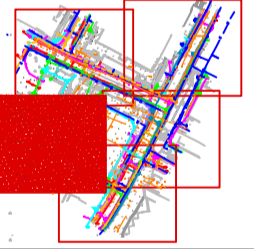
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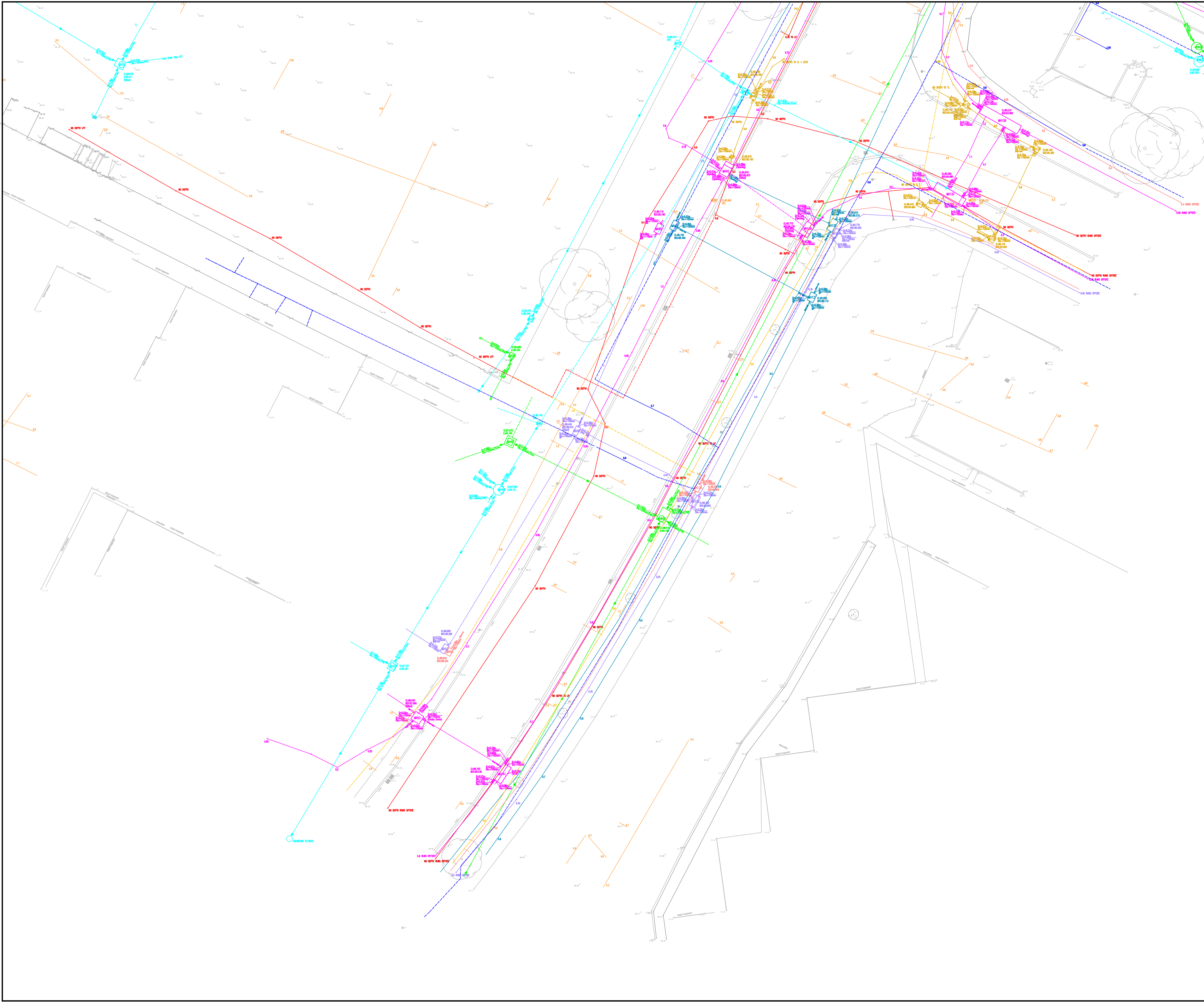


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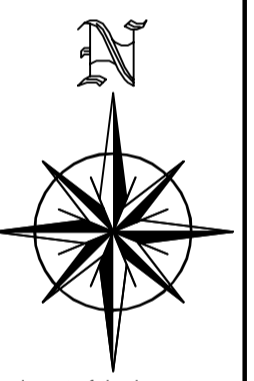
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Project Title:	Avid, Sandyford, Dublin.		
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Scale:	1/100 on A1	Checked:	D.T
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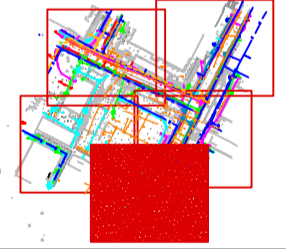
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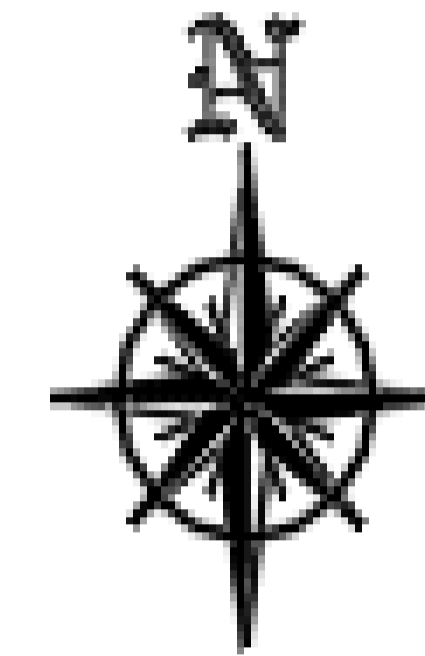
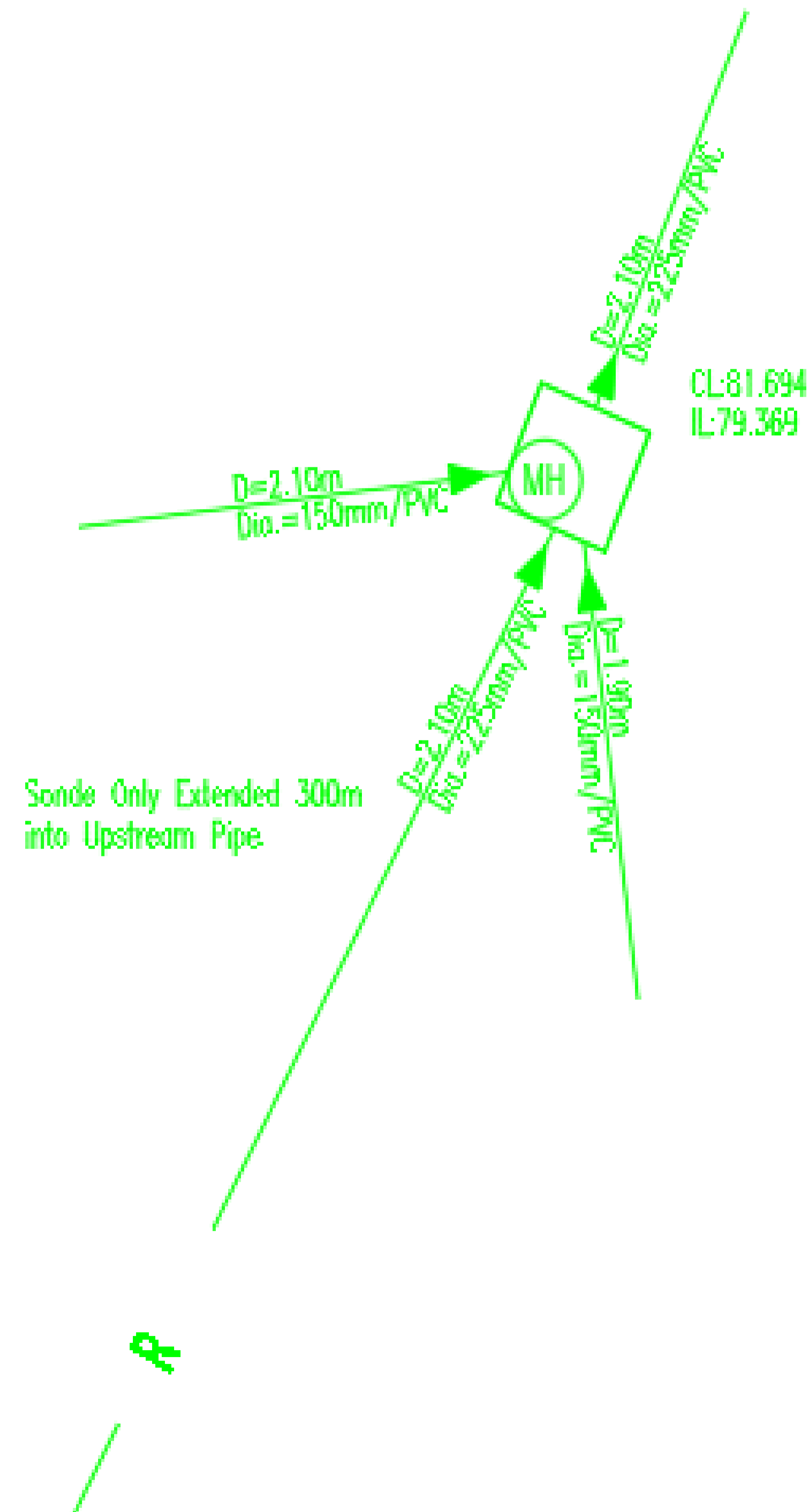
Drawing Title: Underground Services Layout

Date: 06th April 2020 Drawn By: R.G

Scale: 1/100 on A1 Checked: D.T

Drawing No: SCT-20047\_05\_05 Revision:

# Additional Survey on Foul Manhole on Arkle Road



## Appendix D – Surface Water Audit (Stage 1)

# STORMWATER AUDIT (STAGE 1)

JBA Project Code 2020s0790  
 Contract Residential Development– Carmanhall Rd., Sandyford, Dublin 18  
 Client Marlet Property Group  
 Date\_Rev 16<sup>th</sup> February 2021\_P03  
 Author Jamie Cullen  
 Subject **Stormwater Audit - Stage 1 Report**



## 1 Proposed Residential Development, Carmanhall Rd., Sandyford, Dublin 18.

### 1.1 Introduction

JBA Consulting have been contracted by Marlet Property Group c/o AECOM Ireland Limited to undertake a Stage 1 audit of the surface water drainage design for the proposed residential development at Carmanhall Road, Sandyford, Dublin 18. The surface water audit was undertaken in advance of a planning submission.

The audit has been completed in accordance with Dún Laoghaire Rathdown County Council's (DLRCC) Stormwater Audit Procedure (Rev 0, Jan 2012). The results of the audit are set out in the table below.

### 1.2 Stage 1 Audit

Design Parameter	Audit Result
Proposed Development	<p>The site is currently a brownfield site and was previously occupied by a commercial building which has now been demolished.</p> <p>The proposed development will consist of the construction of a Build-To-Rent residential development within a new 6-17 storey over basement level apartment building comprising 438 no. apartments.</p> <p>The total site area is stated to be 0.73 hectares (ha). AECOM also used the total site area as the area which is positively drained for their calculations.</p> <p>The subject of this Stage 1 stormwater audit is to review the proposed surface water drainage design and sustainable urban drainage system proposals for the proposed development.</p>
Relevant Studies/Documents	<p>The following documents were considered as part of this surface water audit:</p> <ul style="list-style-type: none"> <li>• Greater Dublin Strategic Drainage Strategy (GDSDS);</li> <li>• Greater Dublin Regional Code of Practice for Drainage Works;</li> <li>• The SUDs Manual (CIRIA C753).</li> <li>• DLRCC Green Roof Guidance Document (September 2011)</li> <li>• The audit is based on the ACM Infrastructure Report dated 17 August 2020 (Rev 0) and associated drawings.</li> </ul>
Key Considerations & Benefits of SUDs	<p>The key benefits and objectives of SUDs considered as part of this audit and listed below include:</p> <ul style="list-style-type: none"> <li>• Reduction of run-off rates;</li> <li>• Provision of volume storage;</li> <li>• Volume treatment provided;</li> <li>• Reduction in volume run-off;</li> <li>• Water quality improvement;</li> <li>• Biodiversity.</li> </ul>
Site Characteristics	<p><b>Soil:</b>                      The soil type has been indicated as S4 (SPR = 0.47) which is based on site investigation borehole logs which classified the underlying soil as "stiff to very stiff brown and grey sandy gravelly clay".</p> <p><b>Rainfall (basis for surface water pipeline network design):</b>                      Rainfall parameters can be estimated using Met Eireann data, using the Flood Studies Report (FSR) values or the values in the GDSDS. The Met Eireann method can be more representative of a site if selected correctly. A comparison of values estimated by AECOM and JBA is shown below:</p>



# STORMWATER AUDIT (STAGE 1)

JBA Project Code 2020s0790  
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 Client Marlet Property Group  
 Date\_Rev 16<sup>th</sup> February 2021\_P03  
 Author Jamie Cullen  
 Subject **Stormwater Audit - Stage 1 Report**



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Surface Water Drainage Design	<p>All surface water flows generated by the proposed development will be attenuated and discharged at the controlled rate of 2l/sec as agreed with DLRCC requirements and as highlighted within this storm water audit.</p> <p>No storm pipes less than 225mm diameter are proposed for sections of the site that may be taken in charge as per DLRCC requirements.</p>												
SUDs Management Train	<p><b>Source Control</b> and <b>Site Control</b> are addressed by the use of infiltration (interception storage) and attenuation with outflow controlled by a Hydro-brake. Interception has been provided below bioretention areas, permeable paving, and swales. A petrol interceptor is also incorporated into the design to treat surface water run-off however, it is proposed to be placed after the Hydro-brake.</p> <p><b>Regional Control</b> does not apply at the level of this development</p> <p>As recommended with the SUDs Manual (Table 3.3) assuming effective pre-treatment is in place the following number of treatment train components are recommended:</p> <table border="1"> <thead> <tr> <th></th> <th>No. of treatment train components recommended</th> <th>Comment/Proposals</th> </tr> </thead> <tbody> <tr> <td><b>Roof areas (apartments)</b></td> <td>1</td> <td>Green roof system covering 58% of total roof area.</td> </tr> <tr> <td><b>Residential roads, parking areas, commercial</b></td> <td>2</td> <td>Permeable paving on the access road, swales on the private footpath and bioretention areas for the draining from the steps from</td> </tr> </tbody> </table>		No. of treatment train components recommended	Comment/Proposals	<b>Roof areas (apartments)</b>	1	Green roof system covering 58% of total roof area.	<b>Residential roads, parking areas, commercial</b>	2	Permeable paving on the access road, swales on the private footpath and bioretention areas for the draining from the steps from			
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	<p><b>zones</b></p> <p>the courtyard to first floor.</p>
	<p><b>Refuse collection, industrial areas, loading bays, lorry parks and highways.</b></p> <p>3</p> <p>Currently no recycling centre detailed on drawings.</p>
	<p>Generally, site proposals meet the treatment train recommendations within the SuDS Manual. Further clarification is sought from AECOM on the areas which will be draining additional impermeable areas and can be seen in Appendix A.</p>
Climate Change	<p>An allowance of 10% increase in flows has been included for climate change, both for the storm sewer calculations provided and for the rainfall intensities for the purposes of sizing the attenuation structures.</p>
Discharge Rate / Flow Control	<p>From the IH124 method, the QBAR discharge rate, using the FSR growth curves, from the development site is 5.26l/s.</p> <p>This is in accordance with the requirements of the GSDSDS.</p> <p>It is proposed by AECOM and as discussed with DLRCC that surface water run-off from the site will be attenuated to 2l/sec using a Hydro-brake flow control device, while providing surface water attenuation for the full 1 in 100 year event (plus climate change) within the proposed stormwater design / attenuation system.</p> <p>There are very little landscaped areas on site and the ones which are proposed are the bioretention areas and the swales. For the calculations 0.777ha was used as the net drained area which is the whole site which is acceptable.</p> <p>The Hydro-brake will have a minimum outlet of 56mm therefore, blockage of the Hydro-brake is likely to occur. Clear passages less than 75mm can be particularly susceptible to blockage. Preventative measures against blockage will be required at detailed design stage.</p> <p>A minimum of 500mm freeboard from TWL to FFL is proposed which is in accordance with GSDSDS guidance.</p> <p>No flooding at ground level is indicated in the Microdrainage output for the 100-year storm + Climate Change (CC).</p>
Volume Storage	<p>AECOM have provided calculations for the proposed attenuation volumes. Currently, AECOM are proposing an attenuation volume of c.537m<sup>3</sup> (which has been sized for the 100-year return period + climate change) and is based on Criterion 4.3, Table 6.3 of the GSDSDS for all attenuation storage.</p>
Volume Run-off	<p>Greenfield run-off is currently conveyed to the north-western boundary of the site following the natural topography of the site. As the site is currently a brownfield site and with the implementation of SuDS measures and with the discharge from the site is limited to 2l/sec for all storm events as per the requirements of DLRCC the volume of runoff will be less than what is currently occurring.</p>
Treatment Volume / Water Quality Improvement	<p>At least 5mm of interception storage currently proposed in accordance with Table 24.6 of CIRIA C753. Additional impermeable areas which are draining to permeable locations need to be rechecked to see if interception requirements can still be provided.</p>

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Biodiversity	Unless a permanent pond is incorporated into the design, not deemed viable to enhance biodiversity any further given current proposals incorporate green roof and bioretention areas.
Return Period	A 100-year return period plus 10% for climate change has been used in the design for the attenuation systems.
Exceedance flows	<p>AECOM have considered exceedance flows due to 50% blockage of the Hydro-brake. These flows are currently proposed to overflow onto Carmanhall Road only when the flood exceeds 5m<sup>3</sup>. Refer Dwg. 0601.</p> <p>To minimise the risk of blockage AECOM should consider a detail for the overflow from the swale or any other open features to be developed at detailed design stage.</p>
Health & Safety and Maintenance Issues	<p>The proposed drainage system comprises manholes, StormTech attenuation systems, swales, bioretention area, underground pipes and infiltration capacity to the underside of the interception storage units. These elements are considered acceptable from a Health &amp; Safety perspective once supplier/manufacturers guides are followed and complied with during the detailed design, construction and operation.</p> <p>Optimum performance of the SuDS treatment train is subject to the frequency of maintenance provided. At detailed design stage, it is recommended that a maintenance regime be adopted.</p> <p>Regular maintenance and cleaning of the isolator row will be required to remove any sediments, particularly in the wake of heavy rainfall events or local floods.</p> <p>Regular maintenance of the Hydro-brake will also be required to remove any blockages, particularly in the wake of heavy rainfall events or local floods.</p> <p>Particular consideration is required at detailed design stage to the design, maintenance requirements and whole life plan (and replacement) of the interceptor storage.</p> <p>It is recommended that the petrol interceptor be fitted with an audible high-level silt and oil alarm for maintenance and safety purposes. Regular inspection and maintenance is recommended for the petrol interceptor. Please note that silt and debris removed from the petrol interceptor during maintenance will be classified as contaminated material and should only be handled and transported by a suitably licensed contractor and haulier and disposed of at a suitably licensed landfill only.</p>
Design Review Process	<p>Upon review of AECOM's initial drainage design, JBA Consulting provided feedback, resulting in some modifications, namely;</p> <ul style="list-style-type: none"> <li>• Additional interception methods required for impermeable areas currently proposed to drain to permeable locations.</li> <li>• Consideration of exceedance flows from blockage of SuDS features and Hydro-brake</li> <li>• Empty rate of the tank to deal with successive storm events.</li> </ul> <p>A summary of comments and record of the audit trail are appended to this report.</p> <p>Based on this being at preliminary design stage and a Stage 1 Surface Water Audit, JBA Consulting's comments have all been satisfactorily addressed or sufficient commitment provided that details will be confirmed at detailed design</p>

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	stage.
Audit Result	JBA Consulting considers that the surface water drainage design for the proposed development is acceptable and meets the requirements of the Stage 1 Stormwater Audit.

Audit Report Prepared by: Jamie Cullen BEng (Hons) MSc.  
Assistant Engineer

Approved by: Chris Wason BEng CEng MICE  
Principal Engineer

**Note:**

*JBA Consulting Engineers & Scientists Ltd. role on this project is as an independent reviewer/auditor. JBA Consulting Engineers & Scientists hold no design responsibility on this project. All issues raised and comments made by JBA are for the consideration of the Design Engineer (AECOM). Final design, construction supervision, with sign-off and/or commissioning of the surface water system so that the final product is fit for purpose with a suitable design, capacity and life-span, remains the responsibility of the Design Engineers.*

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## Appendix A – Audit Trail Record

JBA Consulting Stormwater Audit - Stage 1 Feedback Form	
Project:	Residential Development at Carmanhall Road, Sandyford, Dublin 18
Date:	04/11/2020
JBA Reviewers	Jamie Cullen - Assistant Engineer
Project Number:	2020s0790

Item No.	JBA Review Comment	Comment/Clarification Request/Suggested Mitigation	Response from Client/Client Representative	Acceptable / Not Acceptable
	<b>04/11/2020</b>			
	<u>Reference Documents</u> - Proposed Drainage Layout - PR461030-ACM-XX-00-DR-CE-10-0502 - Proposed Levels Layout & Exceedance Route - PR461030-ACM-XX-00-DR-CE-10-0601 - Proposed SuDs Layout - PR461030-ACM-XX-00-DR-CE-10-0501 - Stage 2 - Sandyford SHD - Infrastructure Report			
1	<u>Section 2.2.1 Infrastructure Report</u> In the Green Roof section it is stated that "Approximately 58% of the total roof area is proposed as green roof/planting. This is noted to be marginally below the 60% as set out in the DLRCC development plan". It is not clear if this such coverage has been discussed and agreed with DLRCC.	Aecom to review and advise.	The green roof provision will be increased to 60%.	Acceptable
2	<u>Section 2.2.1 Infrastructure Report</u> In the Green Roof section it is stated that "Approximately 58% of the total roof area is proposed as green roof/planting. This is noted to be marginally below the 60% as set out in the DLRCC development plan but the non green roof areas will drain to the green roof". As per Table 24.6 of the SuDS Manual, interception is not provided in this instance.	Aecom to review and advise.	Noted. The green roof provision will be increased to 60%. It is now proposed to provide permeable paving on the hardstanding roof areas. Table 24.6 also states interception is provided by lined pavements. Site Investigation revealed no infiltration is present on site. It is therefore proposed to comply with sub-criterion 1.2 of Table 6.3 of the GSDSDS by providing treatment storage, as sufficient interception is not achievable, i.e. sub-criterion 1.1 is not achievable.	Acceptable
3	<u>Section 2.2.1 Infrastructure Report</u> In the Swales section it is stated that "300mm wide dry swales are proposed to take runoff from the proposed private footpath". As no gradients etc provide, it is not clear if interception is provided as per Table 24.6 of the SuDS Manual.	Aecom to review and advise.	Site Investigation revealed no infiltration is present on site. It is therefore proposed to comply with sub-criterion 1.2 of Table 6.3 of the GSDSDS by providing treatment storage, as sufficient interception is not achievable, i.e. sub-criterion 1.1 is not achievable. The swale has been proposed to provide treatment. However, given the levels, it should be manageable to provide a gradient less than or equal to 1:100 in order to allow interception, as per Table 24.6. Drawings will be updated to include the relevant levels.	Acceptable
4	<u>Section 2.2.1 Infrastructure Report</u> The bioretention areas are proposed to drain the steps to the first floor level from the courtyard and will also drain balconies via downpipes. According to the CIRIA manual table 24.6 "Areas of the site drained to unlined bioretention components can be assumed to comply where the impermeable surface area is less than 5 times the vegetated surface area receiving the runoff. They can be designed to deliver interception for larger areas where suitable infiltration capacity is available". It is not clear if these bioretention areas are complying with interception requirements as set out above.	Aecom to review and advise.	Site Investigation revealed no infiltration is present on site. It is therefore proposed to comply with sub-criterion 1.2 of Table 6.3 of the GSDSDS by providing treatment storage, as sufficient interception is not achievable, i.e. sub-criterion 1.1 is not achievable. The bioretention will be lined as infiltration is not available and bioretention areas are also proposed at first floor level. Table 24.6 does not mention the case of lined bioretention. Negligible interception through evapotranspiration will be assumed.	Acceptable
5	<u>Section 2.2.1 Infrastructure Report &amp; Dwg. 0501</u> The permeable paving proposed shows that there will be no infiltration allowed in the report while on dwg. 0501 states that balconies will drain to the permeable paving. According to the CIRIA Manual Table 24.6 "Interception methods where permeable pavement also drains an adjacent impermeable area and is lined compliance cannot be deemed to have been achieved and extra downstream interception components will be required".	Aecom to review and advise.	Site Investigation revealed no infiltration is present on site. It is therefore proposed to comply with sub-criterion 1.2 of Table 6.3 of the GSDSDS by providing treatment storage, as sufficient interception is not achievable, i.e. sub-criterion 1.1 is not achievable. The sub-base of the permeable paving will be lined with an impermeable membrane.	Acceptable
6	<u>Proposed Drainage Layout Dwg. 0502</u> In terms of the surface car-parking insufficient detail is provided in relation to the fall of perimeter access roads and local landscaping which may convey surface flows in under the proposed building, especially during exceedance rainfall events, which may require local drainage	Aecom to review and advise.	Local Drainage will be provided at these locations.	Acceptable

Item No.	JBA Review Comment	Comment/Clarification Request/Suggested Mitigation	Response from Client/Client Representative	Acceptable / Not Acceptable
7	<p><u>Proposed Drainage Layout Dwg. 0502</u> During extreme storm events the infiltration capacity of the permeable paving will be limited to the capacity of the SuDS feature in addition to infiltration capacity. Exceedance flows in these areas will need to be addressed and conveyed to the attenuation tanks. Exceedance rainfall and/or blockage of the permeable paving may also require local drainage to the underside of the proposed building.</p>	Aecom to review and advise.	<b>Noted. Channels and/or gullies will be provided to allow for exceedance flows.</b>	Acceptable
8	<p><u>Section 2.2 Infrastructure Report &amp; Proposed Drainage Layout Dwg. 0502</u> In the report it is mentioned that it is proposed to drain additional runoff from the widened public footpath and new cycle lane on the western side of Blackton Road (replacing existing landscaping) to the existing road gully. Has agreement been reached with DLRC that these additional impermeable areas can drain to the existing network with no attenuation requirements and has the decision to restrict discharge from the subject development at 2 l/sec been based on compensation for same.</p>	Aecom to review and advise.	<p><b>DLRCC have queried why the Qbar of 5.26 l/s had not been used. AECOM have asked DLRCC would Qbar still be an agreeable discharge rate, given the additional public impermeable area that will be provided and will be draining to the public network unattenuated. DLRCC have commented that using Qbar as the discharge rate is acceptable, once no run-off from the private site enters the public drainage network unattenuated.</b> <b>Qbar will be used as the maximum discharge rate from the site.</b></p>	Acceptable
9	To reduce the demand on the potable water supply or provide surface water management has rainwater harvesting been considered to use for the toilet flushing facilities in the apartment block.	Aecom to review and advise.	The M&E engineer is not proposing rainwater harvesting, as there is insufficient space available in the basement for a rainwater harvesting tank.	Acceptable
10	<p><u>Proposed Levels Layout &amp; Exceedance Route Dwg. 0601</u> In the event of 50% blockage of the hydro-brake exceedance flows are shown to build up to 5m<sup>3</sup> before flowing down Carmanhall Rd. To minimise risk of blockage, a detail for the overflow from the swale or any other open features should be developed at detailed design stage.</p>	Aecom to review and advise.	<b>This will be developed at detailed design stage.</b>	Acceptable
11	<p><u>Appendix D Infrastructure Report &amp; Dwg. 0502</u> Pg. 5 of the MicroDrainage output shows that the cellular storage unit is located at S11 along with the hydro-brake located at S11. The attenuation unit is located before S7 and only one storage structure is mentioned in the MicroDrainage output and not 4 separate ones as shown on Dwg. 0502. Is the location of the storage units sensitive to results?</p>	Aecom to review and advise.	<p><b>As per Innovyze's advice, the flow control and tank were placed on the same manhole to prevent unstable analysis.</b> <b>The model has been updated to include two tanks (changed from 4, as a result of the higher discharge rate from the site), at their proposed locations, upstream of the hydrobrake manhole.</b></p>	Acceptable
12	<p><u>Appendix D Infrastructure Report</u> On pg.6 of the MicroDrainage output the margin for flood risk warning is set at 50mm which is a very low margin of error. Flood risk threshold should be set to 300mm below the cover level.</p>	Aecom to review and advise.	<b>300mm will be used.</b>	Acceptable
13	<p><u>Empty Rate of Tank</u> Given the storage volume of 537m<sup>3</sup> and the discharge rate of 2l/sec, the empty rate is 74.5 hours. Need to consider the probability of successive storm events.</p>	Aecom to review and advise.	<p><b>As the discharge rate of 4.9 l/s (Qbar) has been used, the empty rate is significantly quicker.</b> <b>Microdrainage 2020.1 includes a Half Drain Time feature. The Half Drain Time shows the time taken for the water volume in the tank to reduce to 50%, based on the outflow rate and design head. The Half Drain Times are 605 &amp; 632 minutes for the two tanks respectively, for the critical storm: 600 minute 100 year Winter +10% climate change.</b></p>	Acceptable
14	<p><u>Gradient of Entrance Road</u> Given the proposed fall towards the entrance/exit onto Carmanhall Road, there is the potential for storm flows to run off site as no road gully and/or ACO unit is provided. Consideration should be given to provision of local drainage to connect to the proposed swale along the northern boundary or other internal site drainage.</p>	Aecom to review and advise.	<b>This will be incorporated.</b>	Acceptable



## Appendix E – Qbar Calculation

Calculated by: 

 Site name: 

 Site location: 

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: 

 Longitude: 

 Reference: 

 Date: 

## Runoff estimation approach

## Site characteristics

 Total site area (ha): 

## Methodology

 Q<sub>BAR</sub> estimation method: 

 SPR estimation method: 

## Soil characteristics

	Default	Edited
SOIL type:	1	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.47

## Hydrological characteristics

	Default	Edited
SAAR (mm):	985	985
Hydrological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Growth curve factor 200 years:	2.86	2.86

## Notes

### (1) Is Q<sub>BAR</sub> < 2.0 l/s/ha?

When Q<sub>BAR</sub> 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 <sub>BAR</sub> (l/s):	0.18	5.26
1 in 1 year (l/s):	0.16	4.47
1 in 30 years (l/s):	0.39	11.19
1 in 100 year (l/s):	0.48	13.72
1 in 200 years (l/s):	0.52	15.03

## Appendix F - Met Éireann Rainfall Data


Met Eireann  
Return Period Rainfall Depths for sliding Durations  
Irish Grid: Easting: 319455, Northing: 226518,

**M5,60 = 17.8**  
**R = M5,60min / M5,2d = 0.275**

DURATION	Interval		Years													
	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.7,	4.4,	5.4,	6.1,	6.6,	8.5,	10.6,	12.1,	14.2,	16.0,	17.5,	19.8,	21.6,	23.1,	N/A,
10 mins	3.5,	5.2,	6.1,	7.5,	8.5,	9.2,	11.8,	14.8,	16.8,	19.7,	22.3,	24.4,	27.6,	30.1,	32.2,	N/A,
15 mins	4.1,	6.1,	7.2,	8.8,	10.0,	10.9,	13.9,	17.4,	19.8,	23.2,	26.3,	28.7,	32.5,	35.4,	37.9,	N/A,
30 mins	5.4,	7.9,	9.3,	11.4,	12.8,	13.9,	17.6,	21.9,	24.8,	29.0,	32.7,	35.6,	40.1,	43.6,	46.6,	N/A,
1 hours	7.2,	10.3,	12.0,	14.6,	16.4,	17.8,	22.4,	27.6,	31.2,	36.1,	40.6,	44.1,	49.5,	53.7,	57.2,	N/A,
2 hours	9.5,	13.4,	15.6,	18.8,	21.0,	22.8,	28.4,	34.8,	39.1,	45.1,	50.4,	54.6,	61.1,	66.1,	70.2,	N/A,
3 hours	11.1,	15.7,	18.2,	21.9,	24.4,	26.3,	32.6,	39.9,	44.6,	51.3,	57.3,	61.9,	69.1,	74.6,	79.2,	N/A,
4 hours	12.5,	17.5,	20.2,	24.3,	27.0,	29.1,	36.0,	43.9,	49.0,	56.3,	62.7,	67.7,	75.4,	81.3,	86.3,	N/A,
6 hours	14.7,	20.5,	23.6,	28.1,	31.2,	33.6,	41.4,	50.2,	56.0,	64.0,	71.2,	76.7,	85.2,	91.8,	97.3,	N/A,
9 hours	17.3,	23.9,	27.4,	32.6,	36.1,	38.8,	47.6,	57.5,	63.9,	72.9,	80.9,	87.0,	96.4,	103.7,	109.7,	N/A,
12 hours	19.4,	26.7,	30.5,	36.3,	40.1,	43.0,	52.6,	63.2,	70.2,	79.9,	88.5,	95.1,	105.2,	113.0,	119.4,	N/A,
18 hours	22.8,	31.2,	35.6,	42.0,	46.4,	49.7,	60.4,	72.4,	80.2,	91.0,	100.5,	107.8,	119.0,	127.6,	134.7,	N/A,
24 hours	25.6,	34.8,	39.6,	46.7,	51.4,	55.0,	66.7,	79.7,	88.1,	99.7,	110.0,	117.8,	129.9,	139.1,	146.7,	173.0,
2 days	32.0,	42.5,	47.9,	55.7,	60.9,	64.9,	77.5,	91.3,	100.1,	112.3,	122.9,	131.0,	143.3,	152.7,	160.4,	186.8,
3 days	37.2,	48.7,	54.6,	63.1,	68.6,	72.9,	86.3,	100.8,	110.1,	122.9,	133.9,	142.3,	155.0,	164.6,	172.5,	199.4,
4 days	41.8,	54.2,	60.4,	69.5,	75.4,	79.9,	94.0,	109.2,	118.9,	132.2,	143.6,	152.2,	165.3,	175.2,	183.2,	210.7,
6 days	49.9,	63.7,	70.7,	80.7,	87.2,	92.1,	107.4,	123.9,	134.2,	148.3,	160.5,	169.6,	183.3,	193.7,	202.2,	230.8,
8 days	57.0,	72.2,	79.7,	90.5,	97.5,	102.8,	119.2,	136.6,	147.6,	162.5,	175.2,	184.8,	199.1,	210.0,	218.7,	248.4,
10 days	63.6,	79.9,	88.0,	99.5,	106.9,	112.5,	129.8,	148.2,	159.7,	175.3,	188.6,	198.5,	213.4,	224.6,	233.7,	264.4,
12 days	69.8,	87.1,	95.7,	107.8,	115.6,	121.5,	139.7,	158.9,	170.9,	187.1,	200.9,	211.2,	226.6,	238.2,	247.6,	279.1,
16 days	81.3,	100.5,	109.9,	123.2,	131.7,	138.1,	157.9,	178.5,	191.4,	208.7,	223.4,	234.4,	250.7,	262.9,	272.8,	305.9,
20 days	91.9,	112.8,	123.0,	137.3,	146.5,	153.3,	174.4,	196.4,	210.1,	228.4,	243.8,	255.4,	272.5,	285.3,	295.7,	330.2,
25 days	104.5,	127.3,	138.3,	153.8,	163.7,	171.0,	193.6,	217.1,	231.6,	251.0,	267.3,	279.5,	297.6,	311.0,	321.9,	358.0,

NOTES:  
N/A Data not available  
These values are derived from a Depth Duration Frequency (DDF) Model  
For details refer to:  
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',  
Available for download at [www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies\\_TN61.pdf](http://www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf)

## Appendix G – Surface Water Network Calculations

AECOM		Page 1
Midpoint Alencon Link Basingstoke, RG21 7PP	Sandyford SHD, Carmanhall Road, Sandyford Dublin 18.	
Date 17/02/2021 15:10 File Sandyford SHD Stage 3.MDX	Designed by Dara Magee Checked by Brendan Mitchell	

Innovyze Network 2020.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm









Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	17.800	Add Flow / Climate Change (%)	0
Ratio R	0.275	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	7.508	0.038	197.6	0.022	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	11.942	0.060	199.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	24.199	0.121	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	18.420	0.092	200.2	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	25.924	0.130	200.0	0.205	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	20.028	0.100	200.3	0.199	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	12.362	0.062	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	11.747	0.059	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.14	82.185	0.022	0.0	0.0	0.0	0.93	36.8	3.0
S1.001	50.00	5.35	82.147	0.022	0.0	0.0	0.0	0.92	36.7	3.0
S1.002	50.00	5.79	82.087	0.022	0.0	0.0	0.0	0.92	36.6	3.0
S2.000	50.00	5.33	82.058	0.000	0.0	0.0	0.0	0.92	36.6	0.0
S1.003	50.00	6.26	81.966	0.228	0.0	0.0	0.0	0.92	36.6	30.8
S3.000	50.00	5.36	81.937	0.199	0.0	0.0	0.0	0.92	36.6	26.9
S1.004	50.00	6.44	81.761	0.426	0.0	0.0	0.0	1.11	78.3	57.7
S1.005	50.00	6.62	81.700	0.426	0.0	0.0	0.0	1.11	78.3	57.7

Midpoint  
Alencon Link  
Basingstoke, RG21 7PP

Sandyford SHD,  
Carmanhall Road, Sandyford  
Dublin 18.



Date 17/02/2021 15:10  
File Sandyford SHD Stage 3.MDX

Designed by Dara Magee  
Checked by Brendan Mitchell

Innovyze

Network 2020.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	8.993	0.045	199.8	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	8.681	0.043	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.002	11.488	0.046	250.0	0.109	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	18.117	0.079	230.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	18.015	0.060	300.3	0.114	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.000	11.386	0.057	199.8	0.008	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.008	7.936	0.026	300.0	0.020	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	20.647	0.103	200.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	85.740	1.500	57.2	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	79.572	2.203	36.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.010	7.611	0.038	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.011	16.271	0.081	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	50.00	5.16	81.850	0.000	0.0	0.0	0.0	0.92	36.6	0.0
S4.001	50.00	5.32	81.805	0.000	0.0	0.0	0.0	0.92	36.6	0.0
S4.002	50.00	5.55	81.762	0.109	0.0	0.0	0.0	0.82	32.7	14.7
S1.006	50.00	6.91	81.641	0.535	0.0	0.0	0.0	1.03	73.0	72.4
S1.007	50.00	7.20	81.487	0.649	0.0	0.0	0.0	1.04	114.9	87.9
S5.000	50.00	5.21	81.634	0.008	0.0	0.0	0.0	0.92	36.6	1.1
S1.008	50.00	7.33	81.427	0.677	0.0	0.0	0.0	1.04	115.0	91.7
S1.009	50.00	5.37	81.400	0.000	4.9	0.0	0.0	0.92	36.6	4.9
S6.000	50.00	5.82	85.000	0.000	0.0	0.0	0.0	1.73	68.9	0.0
S6.001	50.00	6.43	83.500	0.000	0.0	0.0	0.0	2.18	86.8	0.0
S1.010	50.00	6.57	81.297	0.000	4.9	0.0	0.0	0.92	36.6	4.9
S1.011	50.00	6.86	81.259	0.000	4.9	0.0	0.0	0.92	36.6	4.9

Midpoint  
Alencon Link  
Basingstoke, RG21 7PP

Sandyford SHD,  
Carmanhall Road, Sandyford  
Dublin 18.



Date 17/02/2021 15:10  
File Sandyford SHD Stage 3.MDX

Designed by Dara Magee  
Checked by Brendan Mitchell

Innovyze

Network 2020.1

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
------------------------	-----------------	-----------------	-----------------	------------------------	-------------	-----------

S1.011	S	83.980	81.178	81.175	0	0
--------	---	--------	--------	--------	---	---


Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.800	Storm Duration (mins)	30
Ratio R	0.275		



AECOM		Page 4
Midpoint Alencon Link Basingstoke, RG21 7PP	Sandyford SHD, Carmanhall Road, Sandyford Dublin 18.	
Date 17/02/2021 15:10 File Sandyford SHD Stage 3.MDX	Designed by Dara Magee Checked by Brendan Mitchell	

Innovyze Network 2020.1

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S16, DS/PN: S1.009, Volume (m³): 4.8

Unit Reference MD-SHE-0087-4900-2355-4900  
 Design Head (m) 2.355  
 Design Flow (l/s) 4.9  
 Flush-Flo™ Calculated  
 Objective Minimise upstream storage  
 Application Surface  
 Sump Available Yes  
 Diameter (mm) 87  
 Invert Level (m) 81.400  
 Minimum Outlet Pipe Diameter (mm) 100  
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.355	4.9	Kick-Flo®	0.779	2.9
Flush-Flo™	0.382	3.7	Mean Flow over Head Range	-	3.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.7	1.200	3.6	3.000	5.5	7.000	8.2
0.200	3.4	1.400	3.8	3.500	5.9	7.500	8.5
0.300	3.6	1.600	4.1	4.000	6.3	8.000	8.7
0.400	3.7	1.800	4.3	4.500	6.6	8.500	9.0
0.500	3.6	2.000	4.5	5.000	7.0	9.000	9.2
0.600	3.5	2.200	4.7	5.500	7.3	9.500	9.5
0.800	3.0	2.400	4.9	6.000	7.6		
1.000	3.3	2.600	5.1	6.500	7.9		

Midpoint Alencon Link Basingstoke, RG21 7PP	Sandyford SHD, Carmanhall Road, Sandyford Dublin 18.
Date 17/02/2021 15:10 File Sandyford SHD Stage 3.MDX	Designed by Dara Magee Checked by Brendan Mitchell
Innovyze Network 2020.1	



Storage Structures for Storm

Cellular Storage Manhole: S8, DS/PN: S1.005

Invert Level (m) 81.793 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.55  
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	126.5	0.0	2.056	0.0	0.0
2.055	126.5	0.0			

Cellular Storage Manhole: S12, DS/PN: S1.006

Invert Level (m) 81.734 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.55  
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	126.5	0.0	2.056	0.0	0.0
2.055	126.5	0.0			

Midpoint Alencon Link Basingstoke, RG21 7PP	Sandyford SHD, Carmanhall Road, Sandyford Dublin 18.
Date 17/02/2021 15:10 File Sandyford SHD Stage 3.MDX	Designed by Dara Magee Checked by Brendan Mitchell
Innovyze <span style="float: right;">Network 2020.1</span>	



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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m <sup>3</sup> /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0


Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.275
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	17.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	600 Winter	100	+20%	30/15 Summer				83.832
S1.001	S2	600 Winter	100	+20%	30/15 Summer				83.832
S1.002	S3	600 Winter	100	+20%	1/240 Winter				83.832
S2.000	S4	600 Winter	100	+20%	1/180 Winter				83.832
S1.003	S5	600 Winter	100	+20%	1/120 Winter				83.832
S3.000	S6	600 Winter	100	+20%	1/120 Summer				83.831
S1.004	S7	600 Winter	100	+20%	1/30 Winter				83.828
S1.005	S8	600 Winter	100	+20%	1/30 Summer				83.826
S4.000	S9	600 Winter	100	+20%	1/60 Summer				83.829
S4.001	S10	600 Winter	100	+20%	1/30 Winter				83.828
S4.002	S11	600 Winter	100	+20%	1/30 Summer				83.829
S1.006	S12	600 Winter	100	+20%	1/15 Summer				83.827
S1.007	S13	600 Winter	100	+20%	1/15 Summer				83.829
S5.000	S14	600 Winter	100	+20%	1/15 Summer				83.829
S1.008	S15	600 Winter	100	+20%	1/15 Summer				83.828
S1.009	S16	600 Winter	100	+20%	1/15 Summer				83.827
S6.000	S17	15 Summer	1	+20%					85.000

AECOM		Page 7
Midpoint Alencon Link Basingstoke, RG21 7PP	Sandyford SHD, Carmanhall Road, Sandyford Dublin 18.	
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Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded	Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)		
S1.000	S1	1.422	0.000	0.03			0.9	SURCHARGED	
S1.001	S2	1.460	0.000	0.02			0.7	SURCHARGED	
S1.002	S3	1.520	0.000	0.02			0.6	SURCHARGED	
S2.000	S4	1.549	0.000	0.00			0.1	SURCHARGED	
S1.003	S5	1.641	0.000	0.30			10.0	SURCHARGED	
S3.000	S6	1.669	0.000	0.29			9.5	SURCHARGED	
S1.004	S7	1.767	0.000	0.31			19.3	SURCHARGED	
S1.005	S8	1.826	0.000	0.13		652	7.9	SURCHARGED	
S4.000	S9	1.754	0.000	0.01			0.3	SURCHARGED	
S4.001	S10	1.798	0.000	0.02			0.5	SURCHARGED	
S4.002	S11	1.842	0.000	0.17			4.7	SURCHARGED	
S1.006	S12	1.887	0.000	0.16		685	10.0	SURCHARGED	
S1.007	S13	1.967	0.000	0.08			7.8	SURCHARGED	
S5.000	S14	1.970	0.000	0.03			1.0	SURCHARGED	
S1.008	S15	2.026	0.000	0.07			6.0	SURCHARGED	
S1.009	S16	2.201	0.000	0.15			5.0	SURCHARGED	
S6.000	S17	-0.225	0.000	0.00			0.0	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level
									(m)
S6.001	S18	15 Summer	1	+20%					83.500
S1.010	S19	600 Winter	100	+20%					81.359
S1.011	S20	600 Winter	100	+20%					81.317

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe		Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Time (mins)	Flow (l/s)	Status		
S6.001	S18	-0.225	0.000	0.00			0.0	OK		
S1.010	S19	-0.163	0.000	0.17			5.0	OK		
S1.011	S20	-0.167	0.000	0.15			5.0	OK		

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MH Name	S15	S13	S12			S5	S3							
Hor Scale 1500														
Ver Scale 200														
Datum (m)78.000														
PN		S1.007	S1.006			S1.003	S1.002							
Dia (mm)		375	300			225	225							
Slope (1:X)		300.3	230.0			200.0	200.0							
Cover Level (m)	84.300	84.450	84.450	84.400	84.400	84.400	84.440	84.410	84.360					
Invert Level (m)	81.427	81.487	81.562	81.641	81.641	81.700	81.761	81.836	81.966	81.966	82.087	82.087	82.147	82.185
Length (m)		18.015	18.117			25.924	24.199							

MH Name	S1	S16					
Hor Scale 1500							
Ver Scale 200							
Datum (m)78.000							
PN		S1.009					
Dia (mm)		225					
Slope (1:X)		200.5					
Cover Level (m)		83.980	84.120	84.150	84.270	84.300	
Invert Level (m)		81.178	81.259	81.297	81.297	81.400	81.427
Length (m)					20.647		

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MH Name	S5	S4
Hor Scale 1500		
Ver Scale 200		1.002
Datum (m)79.000		
PN		S2.000
Dia (mm)		225
Slope (1:X)		200.2
Cover Level (m)	84.400	84.400
Invert Level (m)	81.966	82.058
Length (m)		18.420

MH Name	S7	S6
Hor Scale 1500		
Ver Scale 200		1.003
Datum (m)78.000		
PN		S3.000
Dia (mm)		225
Slope (1:X)		200.3
Cover Level (m)	84.400	84.400
Invert Level (m)	81.837	81.937
Length (m)		20.028

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MH Name	S12			
Hor Scale 1500				
Ver Scale 200				
Datum (m)78.000				
PN				
Dia (mm)				
Slope (1:X)				
Cover Level (m)	84.450	84.470	84.500	84.450
Invert Level (m)	81.716	81.762	81.805	81.850
Length (m)				

MH Name	S15	
Hor Scale 1500		
Ver Scale 200		
Datum (m)78.000		
PN		
Dia (mm)		
Slope (1:X)		
Cover Level (m)	84.300	84.350
Invert Level (m)	81.577	81.634
Length (m)		



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MH Name	S18	S17
Hor Scale 1500		
Ver Scale 200		
Datum (m)	80.000	
PN	S6.000	
Dia (mm)	225	
Slope (1:X)	57.2	
Cover Level (m)	84.950	86.500
Invert Level (m)	83.500	85.000
Length (m)	85.740	

MH Name	S19	S18
Hor Scale 1500		
Ver Scale 200		
Datum (m)	79.000	
PN	S6.001	
Dia (mm)	225	
Slope (1:X)	36.1	
Cover Level (m)	84.150	84.950
Invert Level (m)	81.297	83.500
Length (m)	79.572	

## **Appendix H – Bauder XF301 Sedum System & Bauder DSE60 Drainage Layer**

## PRODUCT DATASHEET

**Bauder XF301 Sedum System**

Single layer, light weight, Sedum System.

**Intended Use**

Bauder XF301 Single Layer Sedum System is an ultra-light weight sedum system. The product can be laid directly onto the waterproofing without the need for a growing medium. XF301 also contains a moisture mat which retains up to 5 Ltr of water/m<sup>2</sup>. The vegetation is a mix of in excess of 14 sedum varieties.

**PRODUCT INFORMATION AND TECHNICAL PERFORMANCE**

Characteristic	Unit	XF300 Sedum Blanket
Maximum Saturated Weight	Kg/m <sup>2</sup>	≤44
Thickness	mm	34 - 44
Sedum and Saxifrage Species	Nos	14 - 17 species
pH Value		6.5 - 7
Typical Supply Size	m	1 x 2
Sedum Species	14+	The species mix is adjusted from time to time. Please contact Bauder Technical for further information
Long Rolls (for use with crane attachment)	m	5 to 10m
Material		Substrate and sedum plants, embedded in a nylon mesh, with a moisture retention fleece

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<b>CERTIFICATION AND ENVIRONMENTAL INFORMATION</b>	
International Standards Organisation (ISO)	ISO 9001:2015 Quality Management Certificates EN1271 (UK) and 70499/03-15_e (Germany).  ISO 14001:2015 Environmental Management Certificates A10552 (UK) and 70499/03-15_d (Germany).  ISO 50001: 2011 Energy Management Certificate 70499/03-15_c
BS 476 Part 3: 2004	Ext. F. AA Ext. S. AA
Recycled content	≥ 80% recycled material

**INSTALLATION GUIDANCE**

Normally installed directly onto the waterproofing or on flat roofs onto SDF mat. Care should be taken not to traffic the sedum. XF301 should be laid by skilled operative. See Bauder's Green Roof Installation Guide for full details.

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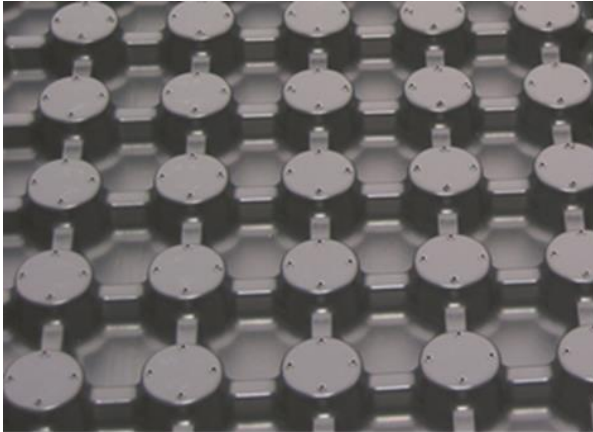
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## PRODUCT DATA SHEET

**Bauder DSE60 Drainage and Protection Layer**

HDPE Water storage and multi-directional drainage layer. Used on roofs below 5° pitch.

**Intended Use**

Provides a pressure resistant stable base for high loads or support for roof mounted equipment without compression to the drainage capacity. If DSE60 is filled with Bauder Mineral Drain, it provides a robust temporary finish able to accept site traffic, including vehicles.

PRODUCT INFORMATION AND TECHNICAL PERFORMANCE			
Characteristic	Test method	Unit	Value
Weight (dry)	EN 1848-1	Kg/m <sup>2</sup>	2
Weight (filled with mineral drain)		Kg/m <sup>2</sup>	51.9
Depth		mm	60
Capacity		l/m <sup>2</sup>	33
Water storage capacity		l/m <sup>2</sup>	17
Water Storage (when filled with mineral drain)		l/m <sup>2</sup>	10-12
Material			High density polyethylene
Board Size		m	0.975 x 1.975 (1.93 m <sup>2</sup> )
Coverage		m <sup>2</sup>	1.9

CERTIFICATION AND ENVIRONMENTAL INFORMATION	
International Standards Organisation (ISO)	ISO 9001:2015 Quality Management Certificates EN1271 (UK) and 70499/03-15_e (Germany).  ISO 14001:2015 Environmental Management Certificates A10552 (UK) and 70499/03-15_d (Germany).  ISO 50001: 2011 Energy Management Certificate 70499/03-15_c (Germany)
Recycled content	100% recycled high density polyethylene

INSTALLATION GUIDANCE
Normally installed over a protection layer, sheets are laid open cells down (as above) over entire areas. Butt up each sheet overlapping the lips. See Bauder's Green Roof Installation Guide for full details.

Bauder reserves the right to amend information and product specifications without prior notice. All reasonable care has been taken to ensure that all data is current at the time of print, however because Bauder pursues a policy of constant development we recommend ensuring that your copy of this information is current by contacting our Technical Department at [technical@bauder.co.uk](mailto:technical@bauder.co.uk)

Recommendations for use should be verified as to the suitability and compliance with actual requirements, specifications, installation techniques and any applicable laws and regulations.

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## Appendix I – Stormtech Tank Details

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

# ADS<sup>®</sup>

## INTERNATIONAL

### SANDYFORD SHD

#### DUBLIN, IRELAND

**SiteASSIST™**  
by StormTech

FOR STORMTECH  
INSTRUCTIONS,  
DOWNLOAD THE  
INSTALLATION APP



### MC-4500 STORMTECH CHAMBER SPECIFICATIONS

- CHAMBERS SHALL BE STORMTECH MC-4500.
- CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
- CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
- THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
- CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
  - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
  - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
  - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, A) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN., B) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLOURS.
- ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
  - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
  - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
  - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
- CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

### IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

- STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
- STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
- CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
  - STONESHOOTER LOCATED OFF THE CHAMBER BED.
  - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUB-GRADE.
  - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
- THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
- JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
- MAINTAIN MINIMUM 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
- INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
- EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE WELL GRADED BETWEEN ¾" AND 2" (20-50 mm).
- STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS AS TO NOT DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
- STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
- THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
- ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUB-SURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

### NOTES FOR CONSTRUCTION EQUIPMENT

- STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
- THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
  - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
  - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
  - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
- FULL 36" (900 mm) OF STABILISED OVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

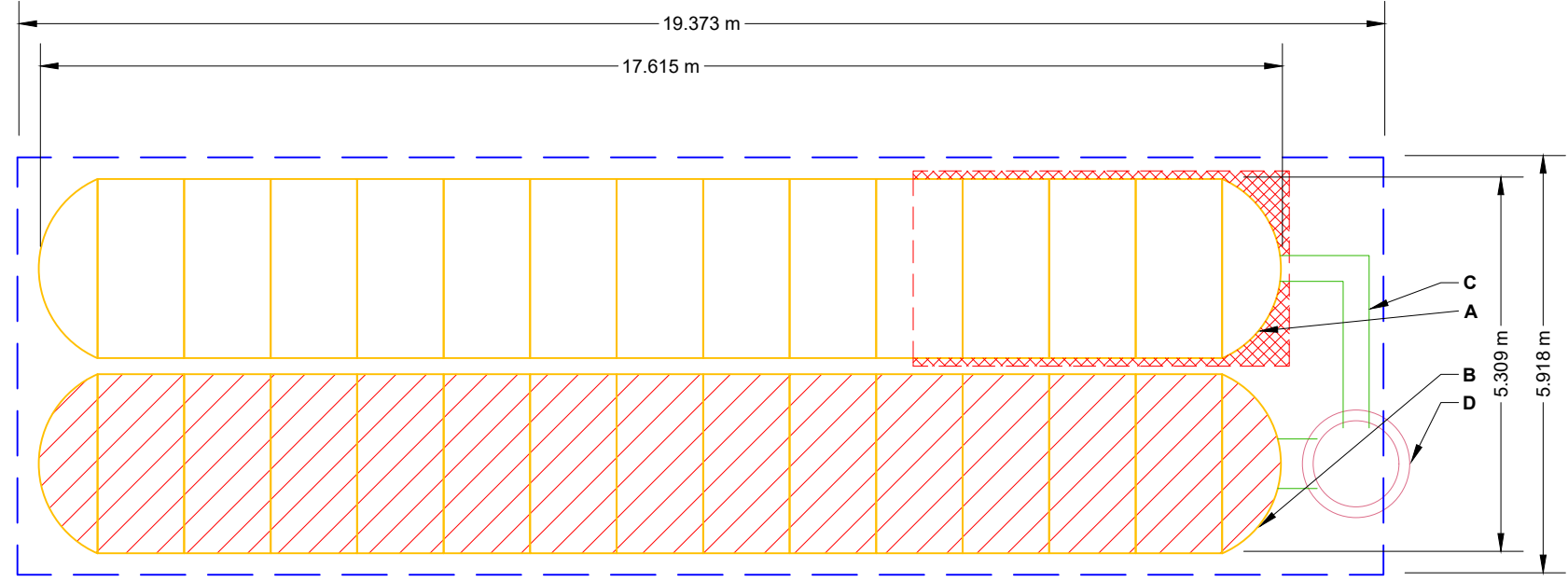
**USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.**

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

**ISOLATOR ROW PLUS COMPONENTS SHOWN ON THIS DESIGN MAY NOT BE AVAILABLE IN THE SPECIFIED PROJECT REGION. PLEASE CONTACT YOUR LOCAL ADS REPRESENTATIVE OR E-MAIL ADSINTERNATIONAL@ADS-PIPE.COM FOR FURTHER INFORMATION**

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS	
26	STORMTECH MC-4500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	3.886
4	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	2.515
305	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	2.362
229	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	2.362
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	2.362
144.1	INSTALLED SYSTEM VOLUME (m <sup>3</sup> ) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	2.057
		TOP OF MC-4500 CHAMBER:	1.753
		300 mm x 300 mm TOP MANIFOLD INVERT:	1.135
		600 mm ISOLATOR ROW PLUS INVERT:	0.286
114.7	SYSTEM AREA (m <sup>2</sup> )	BOTTOM OF MC-4500 CHAMBER:	0.229
50.6	SYSTEM PERIMETER (m)	BOTTOM OF STONE:	0.000

				*INVERT ABOVE BASE OF CHAMBER	
PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW	
PREFABRICATED END CAP	A	300 mm TOP PARTIAL CUT END CAP, PART#: MC4500IEPP12T / TYP OF ALL 300 mm TOP CONNECTIONS	907 mm		
PREFABRICATED END CAP	B	600 mm BOTTOM PARTIAL CUT END CAP, PART#: MC4500IEPP24B / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	57 mm		
MANIFOLD	C	300 mm x 300 mm TOP MANIFOLD, ADS N-12	907 mm		
CONCRETE STRUCTURE	D	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)			70 L/s IN



- ISOLATOR ROW PLUS (SEE DETAIL)
- PLACE MINIMUM 5.334 m OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS
- BED LIMITS

**NOTES**

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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REV DRW CHK	DESCRIPTION	DRAWN: DM CHECKED: N/A	

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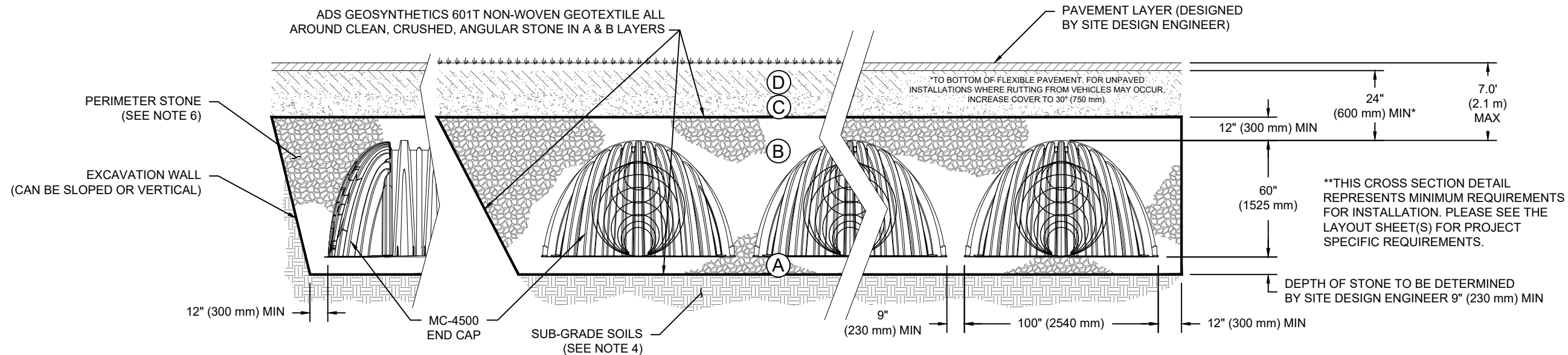


## ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	<b>FINAL FILL:</b> FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUB-BASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUB-GRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	<b>INITIAL FILL:</b> FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUB-BASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE.  MOST PAVEMENT SUB-BASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145 <sup>1</sup> A-1, A-2-4, A-3  OR  AASHTO M43 <sup>1</sup> 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	<b>EMBEDMENT STONE:</b> FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43 <sup>1</sup> 3, 4	NO COMPACTION REQUIRED.
A	<b>FOUNDATION STONE:</b> FILL BELOW CHAMBERS FROM THE SUB-GRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43 <sup>1</sup> 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. <sup>2,3</sup>

**PLEASE NOTE:**

- THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
- STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
- WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
- ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUB-BASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



**NOTES:**

- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
- MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUB-GRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
- PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
  - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
  - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
  - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, A) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN., B) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23°, AND C) CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLOURS.

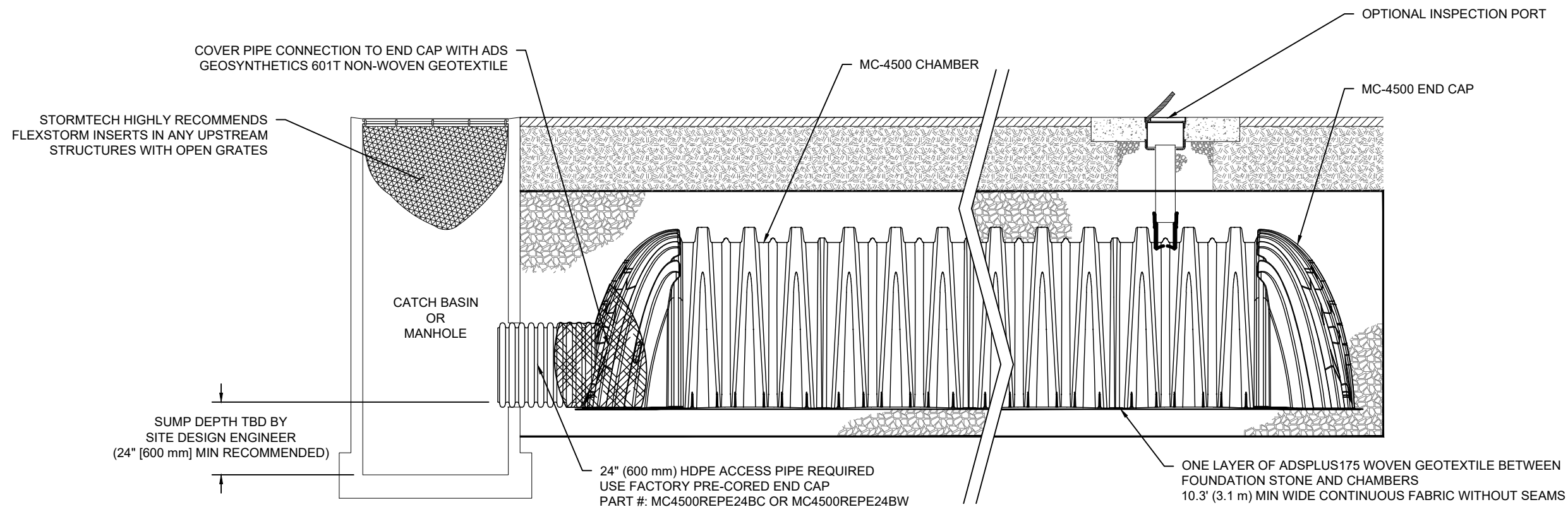
SANDYFORD SHD	DUBLIN, IRELAND	DRAWN: DM	CHECKED: N/A
DESCRIPTION	DATE: 12/7/2020	PROJECT #:	
CHK			
REV			

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SHEET  
**3 OF 5**



**MC-4500 ISOLATOR ROW PLUS DETAIL**

NTS

ISOLATOR ROW PLUS COMPONENTS SHOWN ON THIS DESIGN MAY NOT BE AVAILABLE IN THE SPECIFIED PROJECT REGION. PLEASE CONTACT YOUR LOCAL ADS REPRESENTATIVE OR E-MAIL ADSINTERNATIONAL@ADS-PIPE.COM FOR FURTHER INFORMATION

**INSPECTION & MAINTENANCE**

- STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
  - A. INSPECTION PORTS (IF PRESENT)
    - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
    - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
    - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
    - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
    - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
  - B. ALL ISOLATOR PLUS ROWS
    - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
    - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
      - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
      - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
    - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
  - A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
  - B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
  - C. VACUUM STRUCTURE SUMP AS REQUIRED
- STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.
- STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

**NOTES**

- 1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH-WATER ELEVATIONS.
- 2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

REV	DRW	CHK	DESCRIPTION

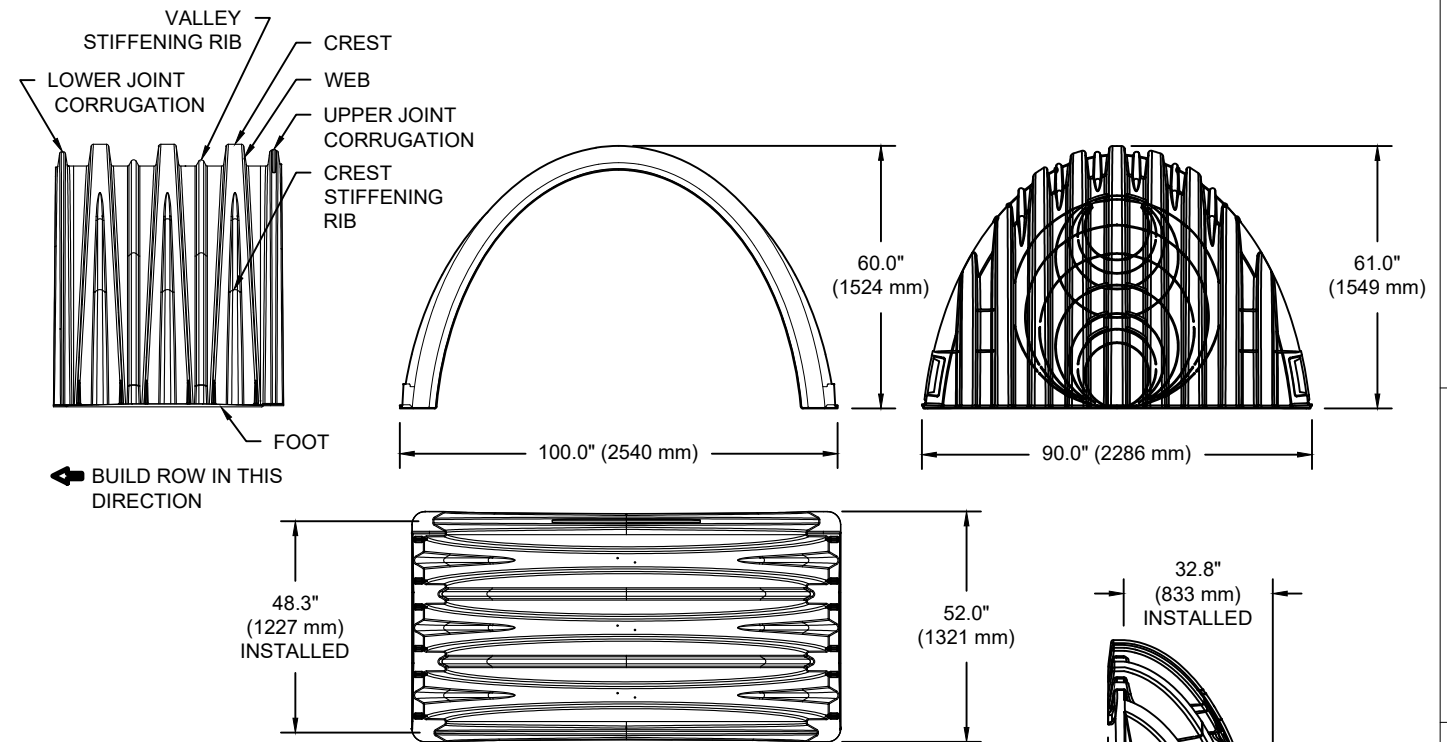
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# MC-4500 TECHNICAL SPECIFICATION

NTS



### NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m <sup>3</sup> )
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m <sup>3</sup> )
WEIGHT (NOMINAL)	125.0 lbs.	(56.7 kg)

### NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m <sup>3</sup> )
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m <sup>3</sup> )
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

\*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

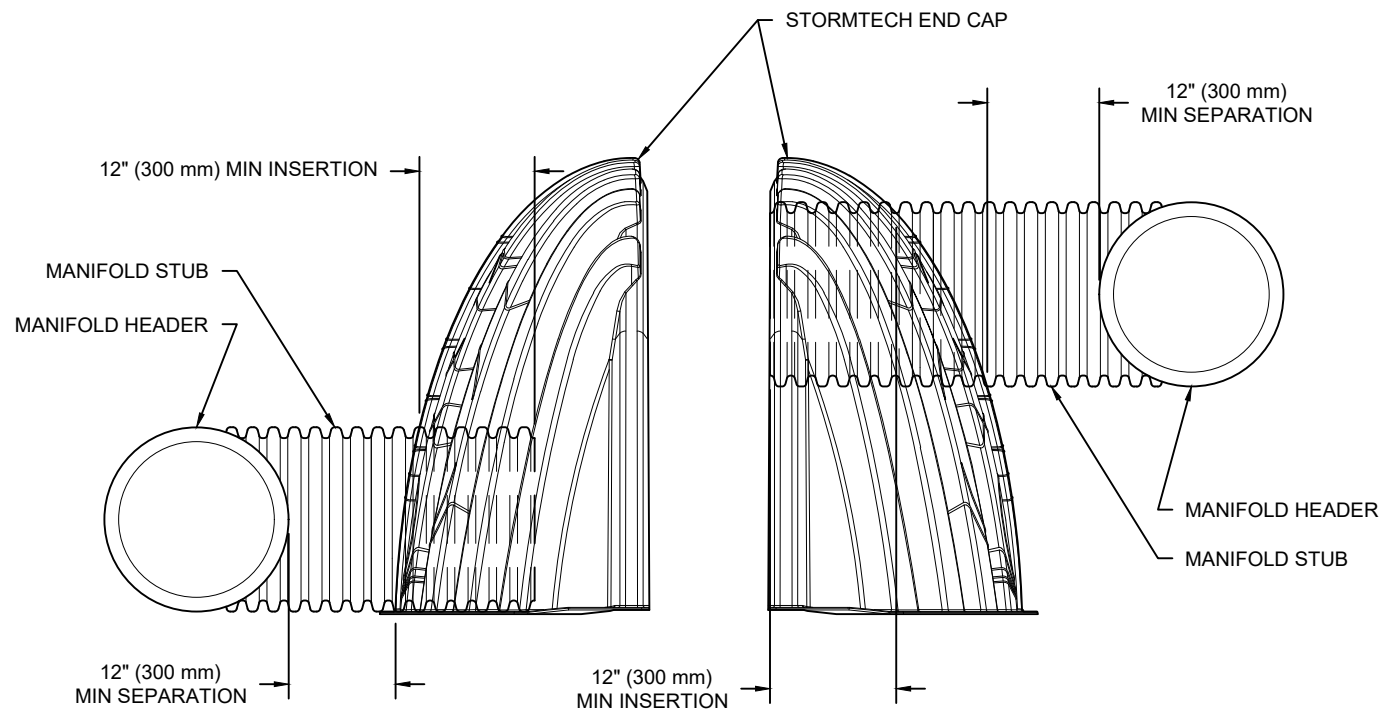
PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"  
 PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"  
 END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500IEPP06T		42.54" (1081 mm)	---
MC4500IEPP06B	6" (150 mm)	---	0.86" (22 mm)
MC4500IEPP08T		40.50" (1029 mm)	---
MC4500IEPP08B	8" (200 mm)	---	1.01" (26 mm)
MC4500IEPP10T		38.37" (975 mm)	---
MC4500IEPP10B	10" (250 mm)	---	1.33" (34 mm)
MC4500IEPP12T		35.69" (907 mm)	---
MC4500IEPP12B	12" (300 mm)	---	1.55" (39 mm)
MC4500IEPP15T		32.72" (831 mm)	---
MC4500IEPP15B	15" (375 mm)	---	1.70" (43 mm)
MC4500IEPP18T		29.36" (746 mm)	---
MC4500IEPP18TW	18" (450 mm)	---	1.97" (50 mm)
MC4500IEPP18B			
MC4500IEPP18BW			
MC4500IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC4500IEPP24TW			
MC4500IEPP24B			
MC4500IEPP24BW		---	2.26" (57 mm)
MC4500IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC4500IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC4500IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL

## MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

REV	DRW	CHK	DESCRIPTION

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Magee, Dara

---

From: Patrick Gavin <Pat.Gavin@resolutegroup.ie>  
Sent: 22 January 2021 14:14  
To: Magee, Dara; Ivan McFadden; Sales  
Subject: [EXTERNAL] RE: Stormtech Sandyford  
Attachments: Stormtech BBA certs.pdf

Hi Dara,

Thanks for your query. In short, yes, as all StormTech arches are rated HGV trafficable once minimum cover levels are achieved. Based on your figures below you will have a minimum of 800mm above the crown of the arch as this allows for the minimum 150mm stone requirement above the SC740 arch, this increases to 300mm minimum for the MC3500.

Please see further note below re traffic loading.

Loading:

I draw your attention to page 9 and table 5 design values of the StormTech BBA attached. Here loadings are explained in further detail.

Design load basis case 1 & case 2: (Axles at 1220 mm centres, wheels at 1830 mm centres, in each case tyre contact area = 508 x 254 mm)

- 142 kilonewton axel load
  - Factor up 1.27 for dynamic impact
  - Factor up 1.2 for multiple presence
  - Factor up 1.75 as safety factor
- 378 Kilonewton per axel
- Per BBA, based on a wheel size of 508mm \* 254mm = 1,472Kilonewtown/m2

Note that above figures are based on the minimum cover requirement of 460mm (crown of the arch to finished surface level for SC740 arch) this increases to 600mm for the MC3500 chamber.  
If that cover level is greater which is will be, then the live loading capacity increases.

Thanks and Regards

Pat Gavin  
Project Engineer

**Resolute Group** 

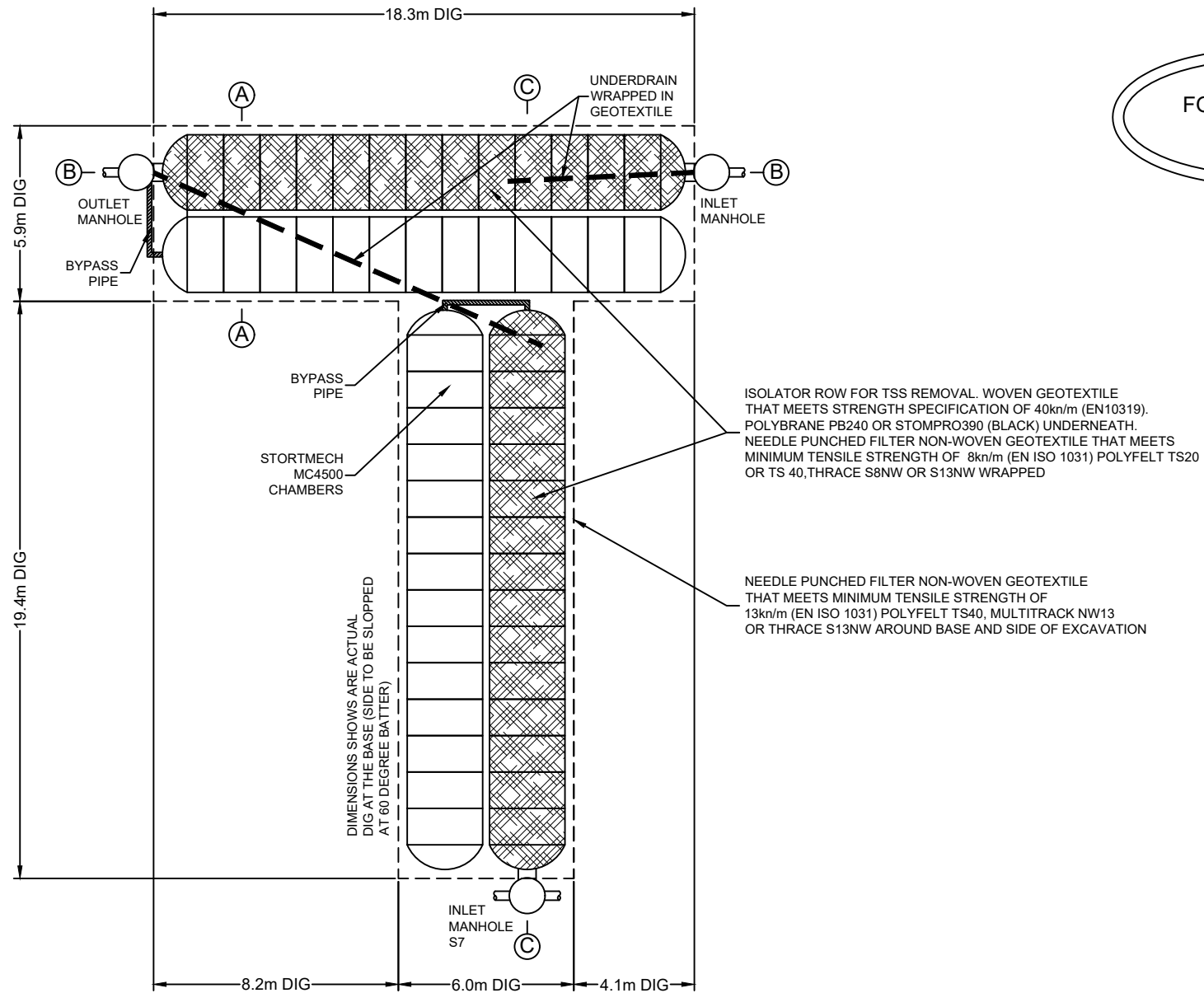
Resolute Engineering Group Ltd

Tel: 01 4853184

Mob: 086 065 7383

Web: [resolutegroup.ie](http://resolutegroup.ie)

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TITLE: PLAN

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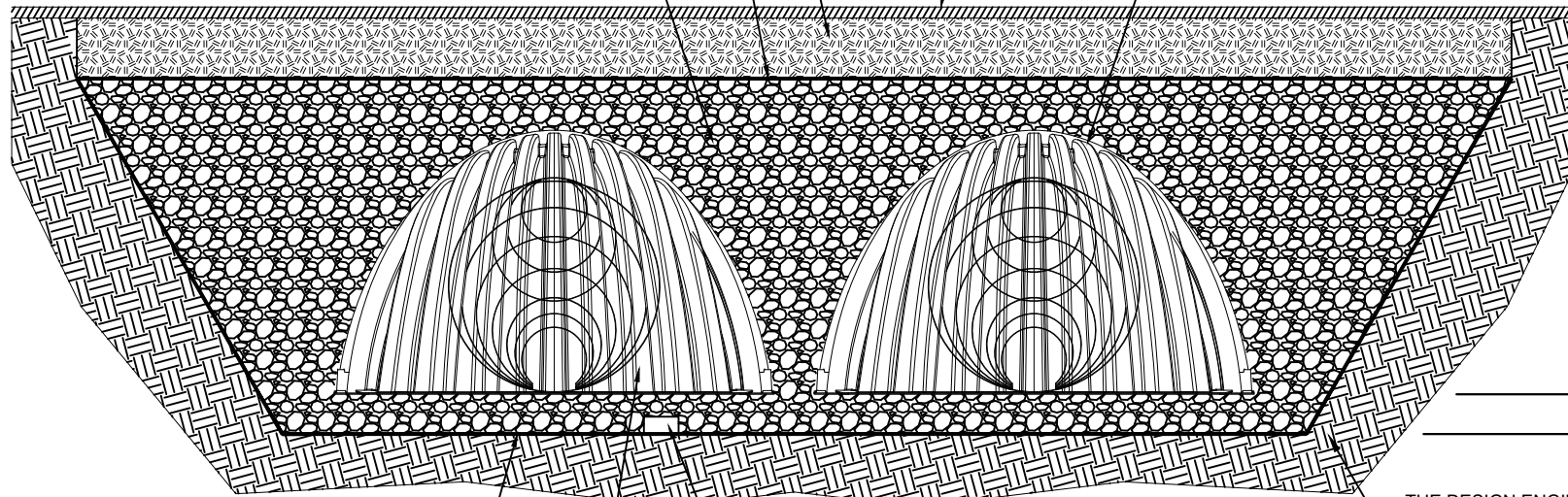
GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES  
COMPACT IN 150mm LIFTS TO 95% PROCTOR DENSITY  
SEE TABLE OF ACCEPTABLE FILL MATERIALS IN  
STORMTECH DESIGN MANUAL

LAYER OF NEEDLE PUNCHED NON-WOVEN GEOTEXTILE  
BETWEEN COVER STONE AND LAYER ABOVE  
THAT MEETS MINIMUM TENSILE STRENGTH OF 13kn/m (EN ISO 1031).  
POLYFELT TS40, MULTITRACK NW13 OR THRACE S13NW

CLAUSE 505B, ANGULAR STONE

FINISHED  
SURFACE

MC-4500 CHAMBERS SHALL MEET THE REQUIREMENTS  
OF ASTM F2418-05, "STANDARD SPECIFICATION  
FOR POLYPROPYLENE (PP) CORRUGATED WALL  
STORMWATER COLLECTION CHAMBERS.



NEEDLE PUNCHED FILTER NON-WOVEN GEOTEXTILE  
THAT MEETS MINIMUM TENSILE STRENGTH OF  
13kn/m (EN ISO 1031) POLYFELT TS40, MULTITRACK NW13  
OR THRACE S13NW AROUND BASE AND SIDE OF EXCAVATION

MC 3500  
END CAP

230  
MIN

2540

300  
MIN

UNDERDRAIN  
WRAPPED IN  
GEOTEXTILE

THE DESIGN ENGINEER IS  
RESPONSIBLE FOR ASSESSING  
THE BEARING RESISTANCE OF  
THE SUBGRADE SOILS\*

SITE: SANDYFORD SHD  
286m3

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2  
PAGE NO.

03/02/21  
DATE.

TITLE: CROSS SECTION A-A CHAMBER

NTS  
SCALE

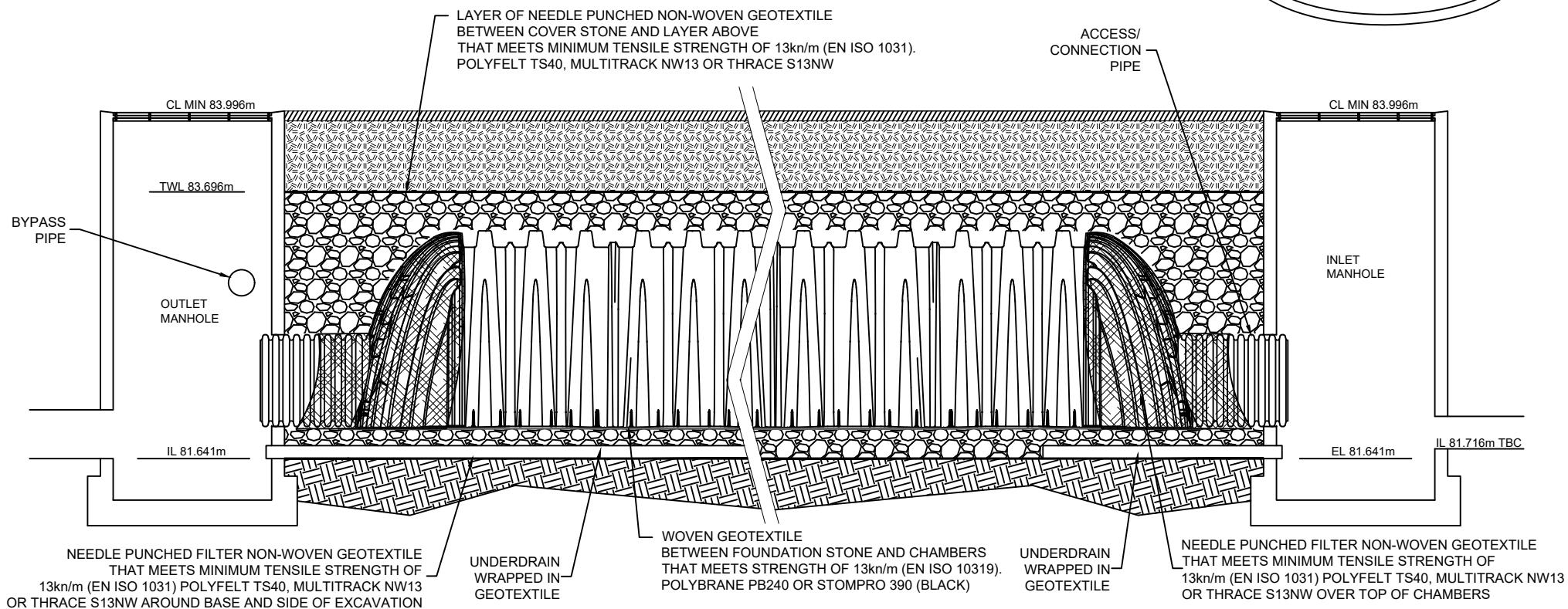
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3  
PAGE NO.

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TITLE: CROSS SECTION B-B ISOLATOR ROW DETAIL

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SCALE

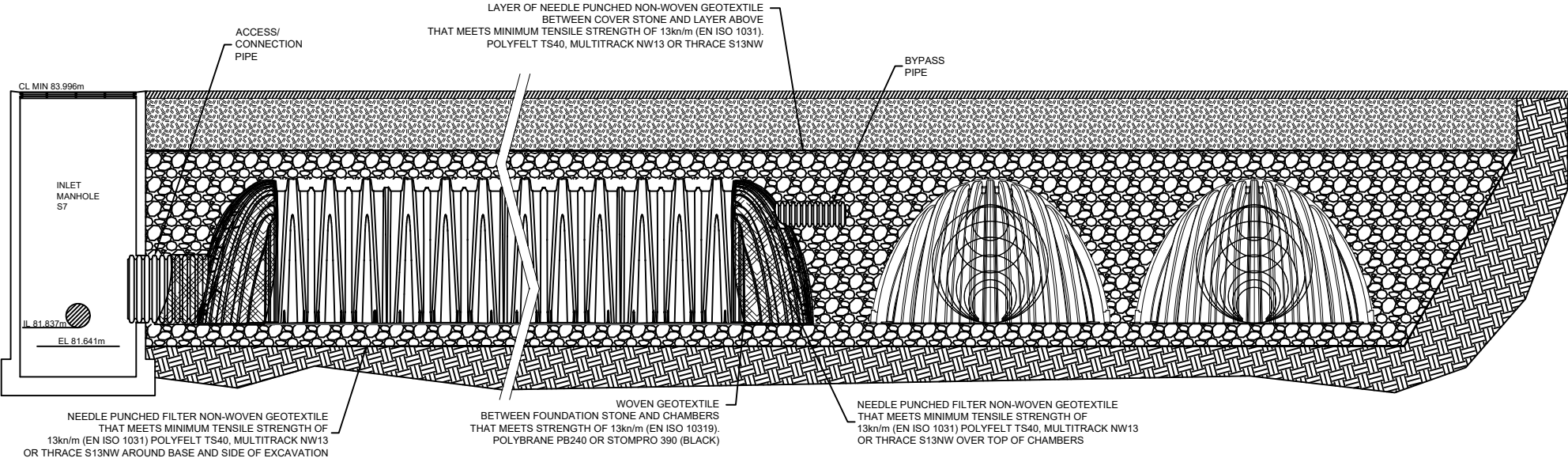
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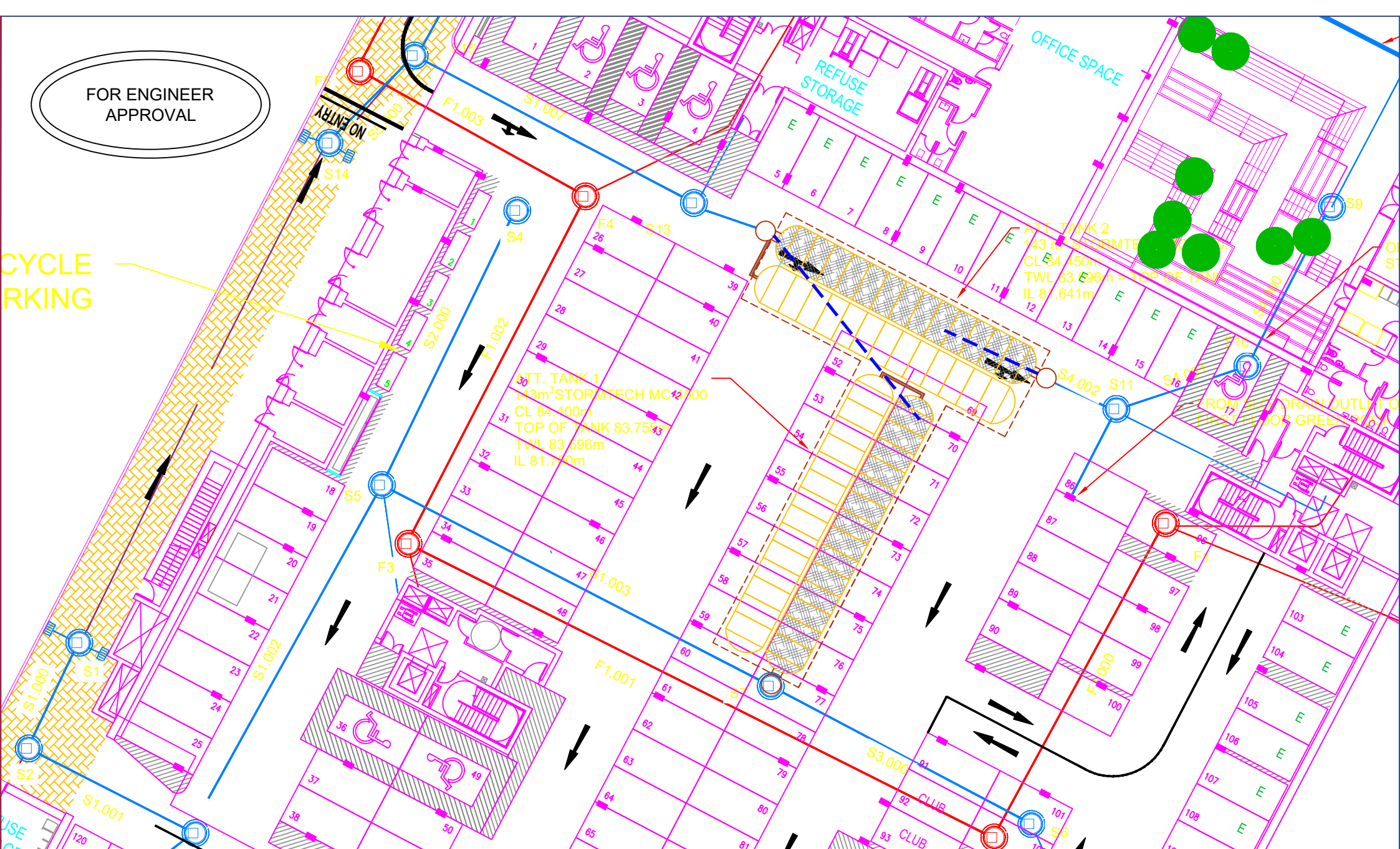


SITE: SANDYFORD SHD 286m3	JN210101 DRAWING NO.	4 PAGE NO.	03/02/21 DATE.	
TITLE: CROSS SECTION C-C ISOLATOR ROW DETAIL	NTS SCALE	LP DRAWN.	LP CHECKED.	



FOR ENGINEER APPROVAL

CYCLE PARKING



SITE: SANDYFORD SHD 286m <sup>3</sup>	JN210101		1	03/02/21
	DRAWING NO.		PAGE NO.	DATE.
TITLE: SITE PLAN OVERLAY	NTS	LP	LP	A
	SCALE	DRAWN.	CHECKED.	REVISION.



## Appendix J – SuDS Manual Drainage Maintenance Checklist

# C753 The SuDS Manual

## Appendix B: Maintenance inspection checklist



Table B.25 SuDS maintenance inspection checklist			
General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference(s)	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (eg biodiversity, wildlife and visual aspects)	

Inspection date								
	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date Completed
<b>General inspection items</b>								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								

# C753 The SuDS Manual

## Appendix B: Maintenance inspection checklist



Silt/sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?)								
Does permeable or porous surfacing require sweeping to remove silt?								
System blockages and litter build-up								
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Vegetation								
Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (Check against approved planting regime.)								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming established? If yes, state action required								
Infrastructure								
Are any check dams or weirs in good condition?								
Is there evidence of any accidental damage to the system (eg wheel ruts?)								

# C753 The SuDS Manual

## Appendix B: Maintenance inspection checklist



Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow controls?								
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								
<b>Other observations</b>								
Information appended (eg photos)								
<b>Suitability of current maintenance regime</b>								
Continue as current Increase maintenance Decrease maintenance								
<b>Next inspection</b>								
Proposed date for next inspection								

## Appendix K – Irish Water Confirmation of Feasibility

Dara Magee

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 George's Street Upper  
 Dun Laoghaire  
 Co. Dublin  
 A96T927

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

Irish Water  
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 South City  
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[www.water.ie](http://www.water.ie)

14 August 2020

**Re: CDS20000844 pre-connection enquiry - Subject to contract | Contract denied**

**Connection for Multi/Mixed Use Development of 500 apartment units at Avid, Sandyford, Co. Dublin**

Dear Sir/Madam,

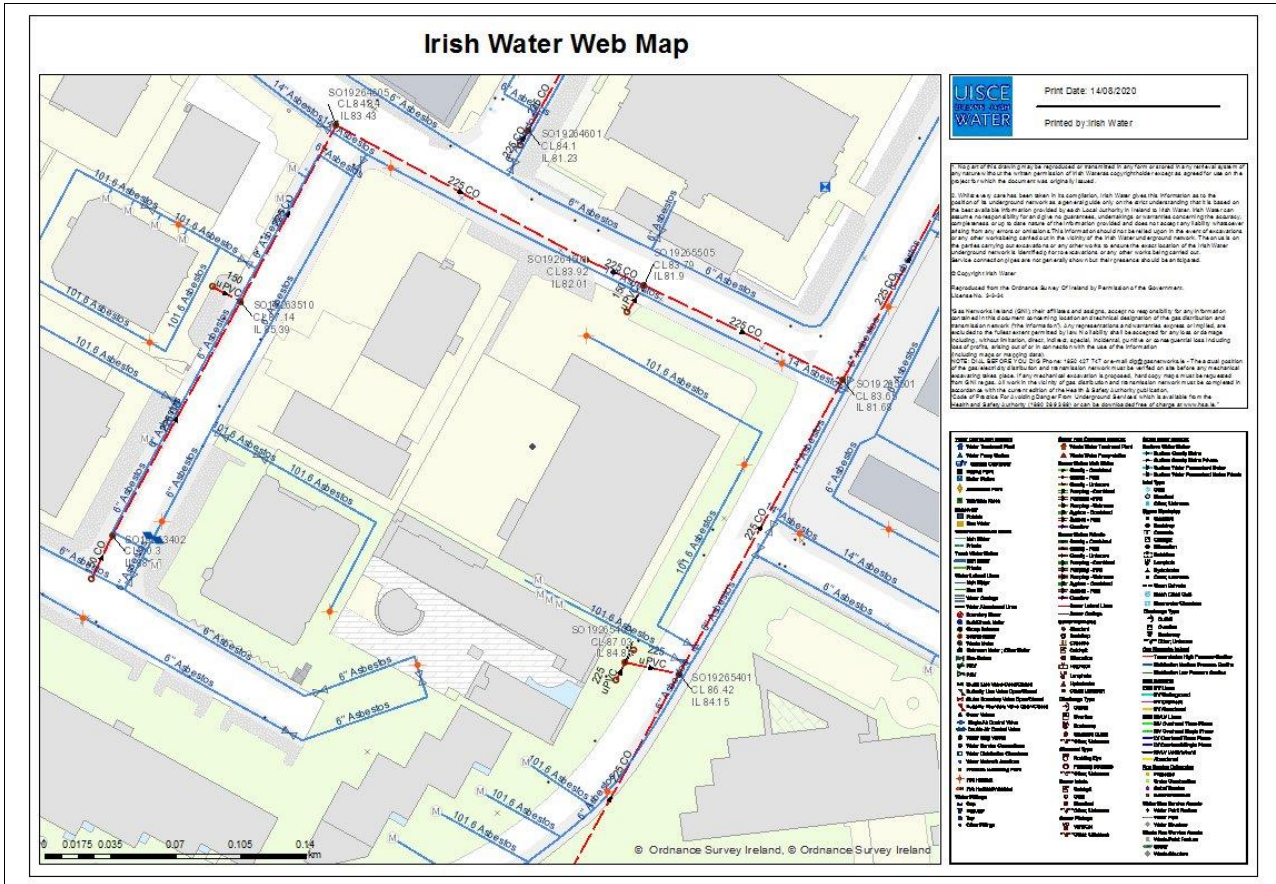
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Avid, Sandyford, Co. Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish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

SERVICE	<b>OUTCOME OF PRE-CONNECTION ENQUIRY</b> <u><b>THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.</b></u>
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible without infrastructure upgrade by Irish Water
<b>SITE SPECIFIC COMMENTS</b>	
Water Connection	<p>New 150mm ID new main to connect to the existing 6" AC. Connection main will have a bulk meter installed along it.</p> <p>There are Irish Water pipes within and in close proximity of the site boundaries (please find attached Irish Water GIS record of the area as a general guide only). The Developer will be required to survey the site to determine the exact location of the pipes. Any trial investigations should be carried out with the agreement and in the presence of the Local Authority Inspector.</p> <p>You are advised that structures or works over or in close proximity to Irish Water infrastructure that will inhibit access for maintenance or endanger structural or functional integrity of the infrastructure are not allowed.</p>

	<p>Separation distances between the Irish Water infrastructure and proposed structures, other services, trees, etc. have to be in accordance with the Irish Water Codes of Practice and Standard Details.</p> <p>If you wish to divert the asset to facilitate the development, you must have entered into a diversion agreement prior to commencing. Prior to submitting your planning application, you are required to submit these detailed design proposals to Irish Water Diversion Team via email address <a href="mailto:diversions@water.ie">diversions@water.ie</a> for review and approval.</p>
Wastewater Connection	Connection has to be to the foul sewer on Arkle Road (MH: SO19264601), see map attached for location.
<p><b>Strategic Housing Development:</b></p> <p>Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:</p> <ul style="list-style-type: none"> <li>A. In advance of submitting your full application to An Bord Pleanála for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.</li> <li>B. You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.</li> </ul>	
<p>The design and construction of the Water &amp; 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.</p>	



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](mailto: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 Deirdre Ryan from the design team on 022 54620 or email [deiryan@water.ie](mailto:deiryan@water.ie) For further information, visit **[www.water.ie/connections](http://www.water.ie/connections)**.

Yours sincerely,



**Maria O'Dwyer**

**Connections and Developer Services**



## Appendix L - Irish Water Statement of Design Acceptance

Dara Magee  
Adelphi Plaza, George's Street Upper  
Dun Laoghaire  
Dublin A96T927

21 October 2020

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](http://www.water.ie)

**Re: Design Submission for Avid,, Sandyford, Co. Dublin (the “Development”)  
(the “Design Submission”) / Connection Reference No: CDS20000844**

Dear Dara Magee,

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](http://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/](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: Alvaro Garcia

Email: [agarcia@water.ie](mailto:agarcia@water.ie)

Yours sincerely,



**Maria O’Dwyer**  
**Connections and Developer Services**

## Appendix A

### Document Title & Revision

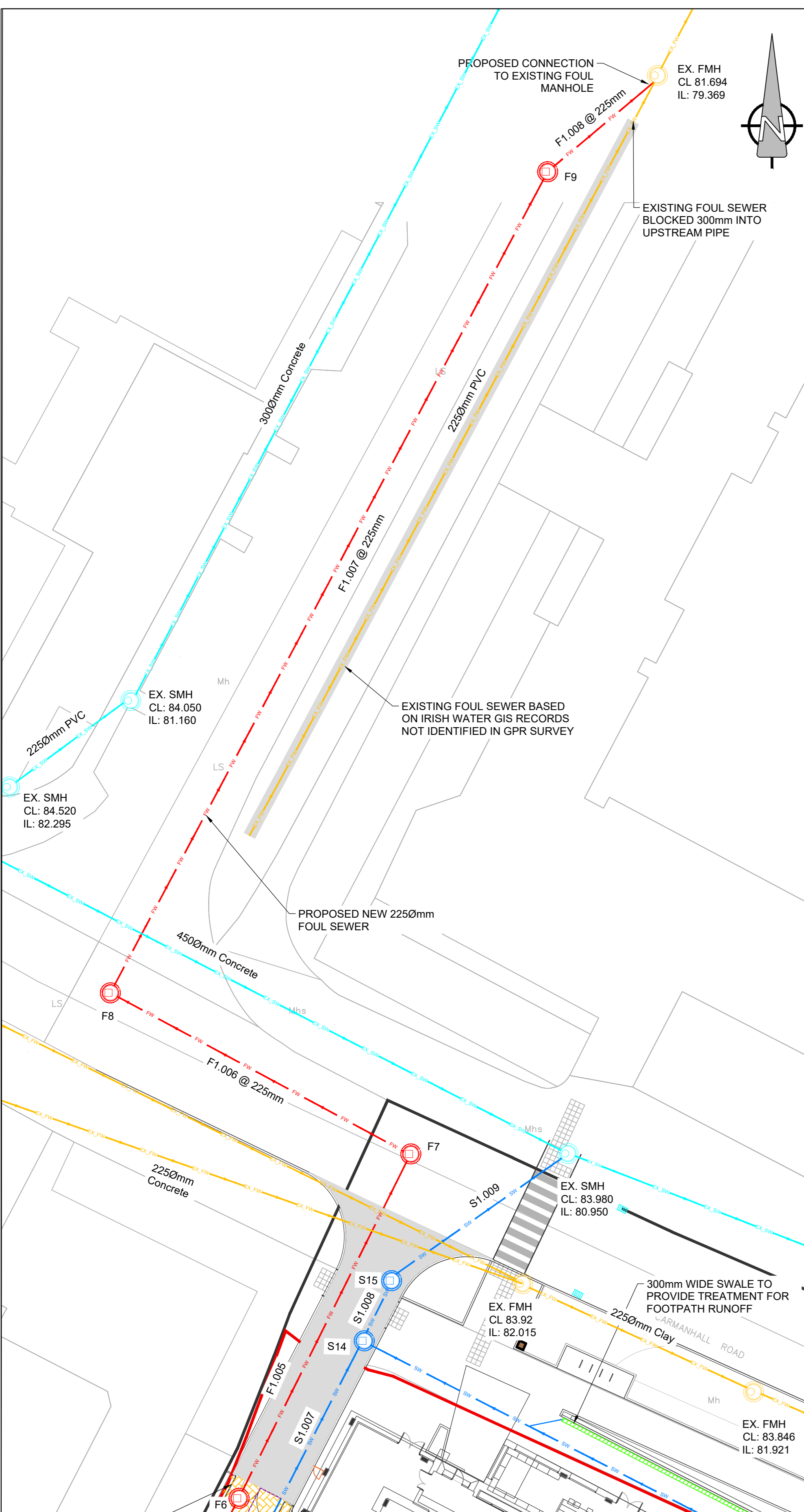
- PR461030-ACM-XX-00-DR-CE-10-0502
- PR461030-ACM-XX-00-DR-CE-10-2701
- Foul long sections

For further information, visit [www.water.ie/connections](http://www.water.ie/connections)

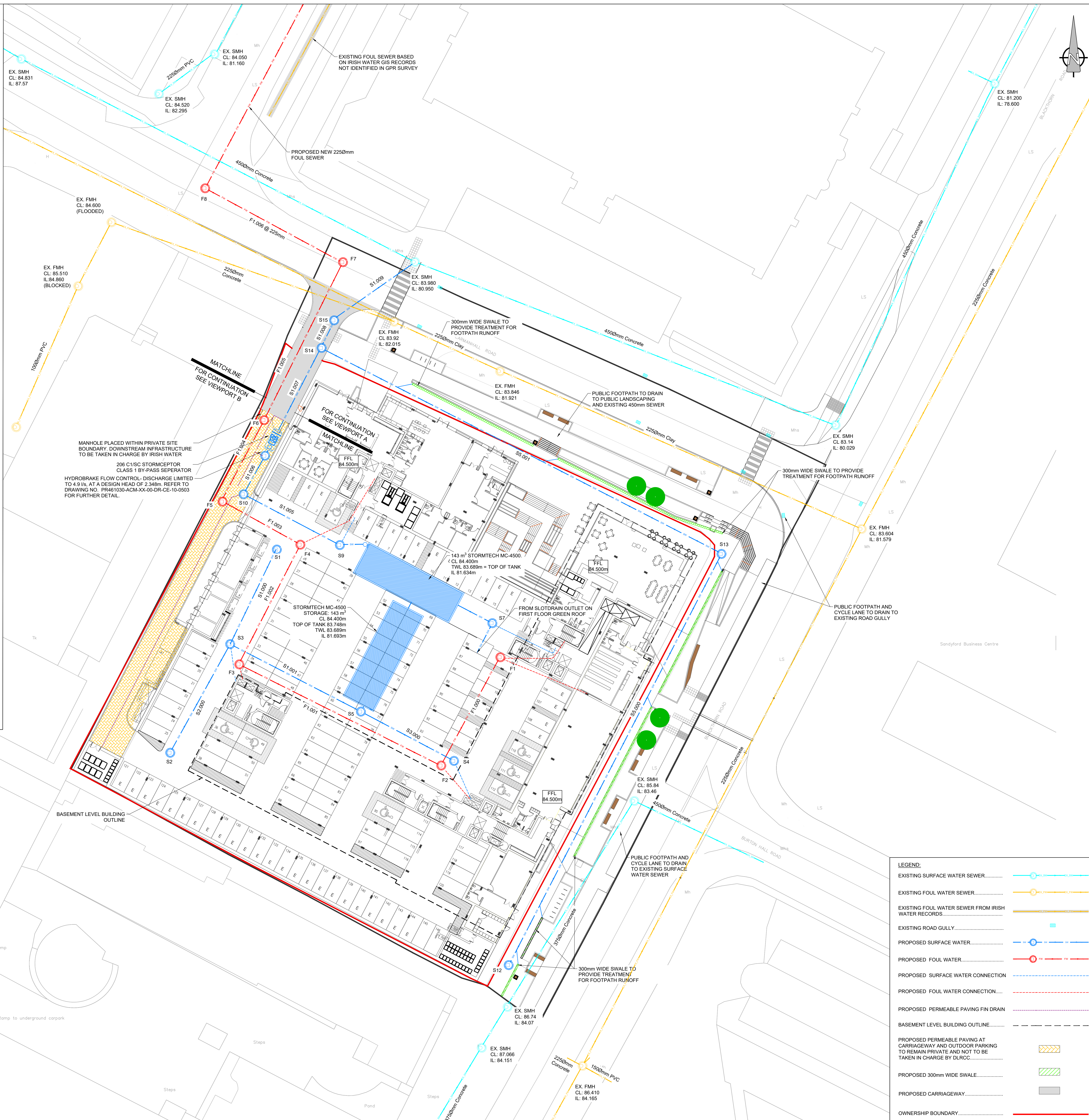
*Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements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

**NOTES**

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH A OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS. ANY DISCREPANCIES, ERRORS OR OMISSIONS TO BE BROUGHT TO THE ATTENTION OF THE DESIGNER.
2. ALL DIMENSIONS TO BE CHECKED BY THE CONTRACTOR ( SITE PRIOR TO COMMENCEMENT OF WORKS.
3. ACCORD LIMITED TO BE INFORMED BY THE CONTRACTOR ( ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT ( WORKS ON SITE.
4. DIMENSIONS OF ALL BOUNDARIES AND ADJOINING ROAD TO BE CHECKED ON SITE PRIOR TO COMMENCEMENT ( WORKS.
5. DO NOT SCALE. ALL MEASUREMENTS AND COORDINATE TO BE CHECKED ON SITE.
6. THE PROPOSED SURFACE WATER SEWERS SHALL I CONTRACTED IN ACCORDANCE WITH THE SPECIFICATIO OF SECTION 3 OF "RECOMMENDATIONS FOR SU DEVELOPMENT WORKS FOR HOUSING" AREA (DEPARTMENT OF ENVIRONMENT & LOCAL GOVERNMENT) AND IRISH WATER STANDARDS DETAILS.
7. THE LOCATION & DEPTH OF SERVICES TO BE CHECKED ( SITE PRIOR TO COMMENCEMENT ANY WORKS.
8. MANHOLE COVERS AND FRAMES IN PUBLICLY ACCESSIBLE AREAS SHALL BE HEAVY DUTY CAST IRON CLASS DHI DOUBLE SEALED AND LOCKABLE TYPE COMPLYING WI BS EN 124:2015
9. GULLY GRATINGS & FRAMES SHALL COMPLY WITH BS I EN 1220
10. EXISTING INVERT LEVELS TO BE VERIFIED ON SITE BEFO COMMENCING CONSTRUCTION.
11. SURFACE WATER & FOUL SEWER PIPES LESS THAN 1:2 BELOW THE ROAD SURFACE OR LESS THAN 0.9M NON-TRAFFICED FOOTPATHS AND LANDSCAPE ARE; WITH AN ABSOLUTE MINIMUM DEPTH OF COVER ABO THE EXTERNAL CROWN OF THE PIPE 0750mm SHALL I PROTECTED FROM DAMAGE BY PROVIDING MINIMUM 150H THICK CONCRETE CROSS HAUNCH IN ACCORDANCE WITH EN 12620
12. ATTENUATION PROPOSALS SHALL BE IN ACCORDAN WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY.
13. CCTV SURVEY TO BE CONDUCTED PRIOR I COMMENCEMENT OF ANY WORKS TO DETERMINE TI CONDITION AND VERIFY LEVELS OF THE EXISTING FOUL AND SURFACE WATER PIPES' MANHOLES AP SUBSTANTIATED OR DEFECTIVE ELEMENTS OF TI EXISTING PIPES/MANHOLES TO BE REPORTED AN CORRECTED.
14. ALL SURFACE WATER DRAINAGE DETAILS TO BE ACCORDANCE WITH THE GREATER DUBLIN STRATEGIC DRAINAGE STUDY AND THE GREATER DUBLIN REGION CODE OF PRACTICE FOR DRAINAGE WORKS.
15. ALL FOUL WATER DETAILS TO BE IN ACCORDANCE WITH THE IRISH WATER INFRASTRUCTURE STANDARD DETAILS AND CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE.
16. MANHOLES AND PIPES TO BE DESIGNED TO PREVENT UPLIFT FROM GROUNDWATER AT DETAILED DESIGN STAG



**B** 0502



**FOUL WATER NETWORK DETAILS**

Pipe Number	US/MH Name	Pipe Length (m)	Fall (m)	Slope (1:X)	USIL (m)	DSIL (m)	US/CL (m)	Pipe DIA (mm)	US D.Depth (m)
F1.000	F1	24.073	0.120	200	83.050	82.930	84.480	225	1.205
F1.001	F2	41.719	0.276	151	82.930	82.654	84.480	225	1.325
F1.002	F3	24.599	0.253	97	82.654	82.401	84.500	225	1.621
F1.003	F4	15.840	0.158	100	82.401	82.242	84.520	225	1.694
F1.004	F5	16.390	0.328	50	82.242	81.915	84.300	225	1.833
F1.005	F6	31.295	0.626	50	81.915	81.289	84.200	225	2.06
F1.006	F7	28.206	0.705	40	81.289	80.583	84.120	225	2.806
F1.007	F8	75.737	1.082	70	80.583	79.502	84.380	225	3.572
F1.008	F9	11.466	0.133	68	79.502	79.369	81.700	225	1.973

**SURFACE WATER NETWORK DETAILS**

Pipe Number	US/MH Name	Pipe Length (m)	Fall (m)	Slope (1:X)	Time of Entry (mins)	USIL (m)	DSIL (m)	US/CL (m)	Pipe DIA (mm)	US D.Depth (m)
S1.000	S1	20.967	0.104	201	5.000	82.070	81.966	84.400	225	2.105
S2.000	S2	19.580	0.098	200	5.000	82.070	81.972	84.400	225	2.105
S1.001	S3	25.365	0.127	200		81.966	81.839	84.400	225	2.209
S3.000	S4	20.967	0.105	200	5.000	82.044	81.939	84.400	225	2.131
S1.002	S5	14.126	0.071	199		81.764	81.683	84.400	300	2.336
S1.003	S6	11.747	0.059	199		81.683	81.634	84.400	300	2.457
S4.000	S7	16.195	0.093	174	5.000	81.902	81.809	84.470	225	2.343
S1.004	S8	18.117	0.072	250		81.634	81.562	84.400	300	2.466
S1.005	S9	18.015	0.080	300		81.487	81.427	84.350	375	2.488
S1.000	S10	7.938	0.026	300		81.427	81.400	84.300	375	2.498
S1.007	S11	20.947	0.103	200		81.200	81.267	84.240	225	2.815
S5.000	S12	85.740	1.175	50	5.000	84.000	82.295	85.500	225	2.275
S5.001	S13	79.572	0.920	87		82.285	81.365	84.950	225	2.44
S1.008	S14	7.611	0.038	200		81.267	81.259	84.150	225	2.628
S1.009	S15	16.271	0.081	200		81.259	81.177	84.120	225	2.836

**A** 0502

**LEGEND:**

- EXISTING SURFACE WATER SEWER
- EXISTING FOUL WATER SEWER
- EXISTING FOUL WATER SEWER FROM IRISH WATER RECORDS
- EXISTING ROAD GULLY
- PROPOSED SURFACE WATER
- PROPOSED FOUL WATER
- PROPOSED SURFACE WATER CONNECTION
- PROPOSED FOUL WATER CONNECTION
- PROPOSED PERMEABLE PAVING FIN DRAIN
- BASEMENT LEVEL BUILDING OUTLINE
- PROPOSED PERMEABLE PAVING AT CARRIAGEWAY AND OUTDOOR PARKING TO REMAIN PRIVATE AND NOT TO BE TAKEN IN CHARGE BY DLRC
- PROPOSED 300mm WIDE SWALE
- PROPOSED CARRIAGEWAY
- OWNERSHIP BOUNDARY



**ISSUE/REVISION**

IR	DATE	DESCRIPTION
B	20.01.2021	ISSUED FOR INFORMATION
A	16.06.2020	DRAFT STAGE 2 PRE-APP

**PROJECT NUMBER**  
 60626107

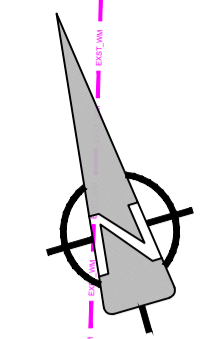
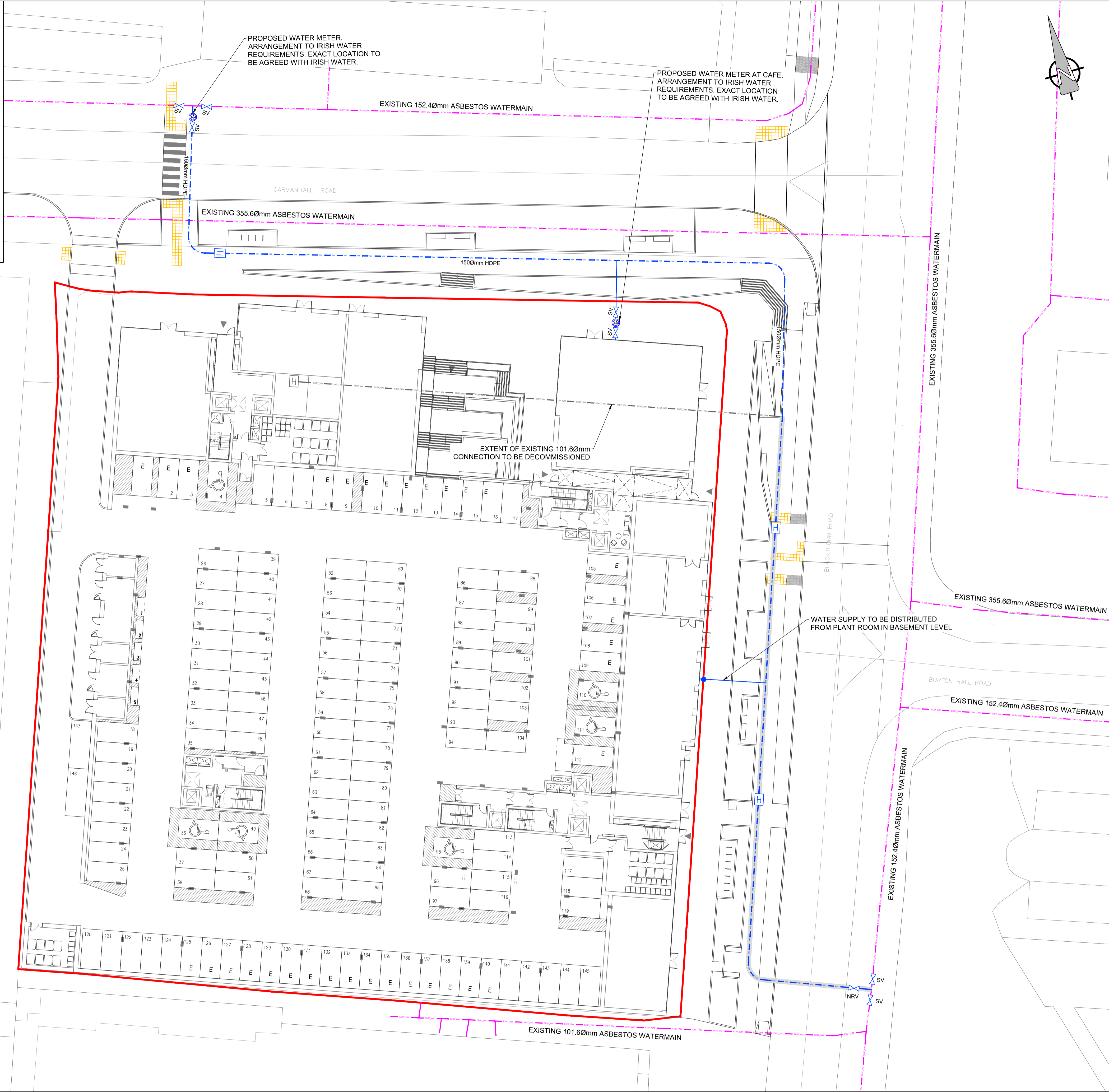
**SHEET TITLE**  
 PROPOSED DRAINAGE LAYOUT

**SHEET NUMBER**  
 PR461030-ACM-XX-00-DR-CE-10-0502

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 Approved: CH  
 Checked: ZC  
 Drawn by: DM  
 Project Management Initials:  
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 Recycled Content Paper

ISO A1 594mm x 841mm  
 Approved: CH  
 Checked: ZC  
 Drawn by: DM  
 Project Management Initials:  
 Last saved by: HENRIQUE BOFFI (2020-10-19) Last Plotfile: 2020-10-21  
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LEGEND	
EXISTING PUBLIC WATERMAIN.....	
EXISTING WATERMAIN CONNECTION TO BE DECOMMISSIONED.....	
PROPOSED 150mm Ø NOMINAL BORE HDPE WATERMAIN.....	
EXISTING 101.60mm Ø WATERMAIN TO BE UPGRADED TO 150mm Ø NOMINAL BORE HDPE WATERMAIN.....	
EXISTING FIRE HYDRANT.....	
PROPOSED FIRE HYDRANT.....	
PROPOSED SLUICE VALVE.....	
PROPOSED NON-RETURN VALVE.....	
PROPOSED BULK WATER METER.....	
PROPOSED CONNECTION WITH BOUNDARY BOX.....	
OWNERSHIP BOUNDARY.....	



**PROJECT**  
 PROPOSED STRATEGIC HOUSING DEVELOPMENT AT CARMANHALL ROAD, SANDYFORD INDUSTRIAL ESTATE, DUBLIN 18

**CLIENT**  
 ATLAS GP LTD

**CONSULTANT**  
 AECOM  
 4th Floor Adelphi Plaza,  
 George's Street Upper,  
 Dun Laoghaire,  
 Co Dublin  
 Tel: +353 (0)1 2383100  
 Fax: +353 (0)1 2383199  
 www.aecom.com

- NOTES**
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS, ANY DISCREPANCIES, ERRORS OR OMISSIONS TO BE BROUGHT TO THE ATTENTION OF THE DESIGNER.
  - ALL DIMENSIONS TO BE CHECKED BY THE CONTRACTOR ON SITE PRIOR TO COMMENCEMENT OF WORKS.
  - AECOM LIMITED TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF WORKS ON SITE.
  - DIMENSIONS OF ALL BOUNDARIES AND ADJOINING ROADS TO BE CHECKED ON SITE PRIOR TO COMMENCEMENT OF WORKS.
  - DO NOT SCALE. ALL MEASUREMENTS AND COORDINATES TO BE CHECKED ON SITE.
  - THE DEVELOPMENT SHALL HAVE A BULK WATER METER (EXACT LOCATION TO BE AGREED WITH IRISH WATER) IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE SECTION 3.15.4.
  - EACH HOUSE UNIT SHALL HAVE AN APPROVAL BOUNDARY BOX (REFER TO APPENDIX A OF THE IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE) WITH INTEGRAL STOPCOCK AND SUITABLE FOR THE RECEPTION OF A WATER METER (REFER TO IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE SECTION 3.14).
  - ALL PROPERTIES SHALL HAVE METERS INSTALLED INTERNALLY WITHIN THE PREMISES IN ACCORDANCE WITH THE BUILDING CONTROL AUTHORITY'S REQUIREMENTS AND SUBJECT TO REVIEW BY IRISH WATER AS PER IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE SECTION 3.15.2.
  - ALL PROPOSED WATERMAIN PIPEWORK TO BE HDPE WITH MINIMUM PE80 RATING IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE.
  - THE MINIMUM PIPE DIAMETER PROPOSED IS 100mm.
  - ALL WATERMANS WILL HAVE A MINIMUM COVER OF 900mm. ALL SERVICE PIPES CONNECTING PROPERTIES WILL HAVE MINIMUM COVER OF 750mm.
  - HYDRANTS SHALL BE DOUBLE FLANGED DRILLED TO PN16 AND SHALL COMPLY WITH BS EN 14339, IS EN 1074 PART 6 AND 135 750. REFER TO IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE SECTION 3.16.5.
  - SLUICE VALVES HAVE BEEN PROVIDED SO THAT INDIVIDUAL SECTIONS CAN BE ISOLATED & WILL COMPLY TO BS 5163. THE DEPTH OF THE SLUICE VALVE SPINDLE CAP BELOW FINISHED GROUND WILL NOT EXCEED 300mm.
  - ALL WATERMAIN DETAILS TO BE IN ACCORDANCE WITH THE IRISH WATER INFRASTRUCTURE STANDARD DETAILS AND CODE OF PRACTICE FOR WATER INFRASTRUCTURE.
  - THERE IS A MINIMUM OF 300mm CLEARANCE BETWEEN THE EXISTING AND PROPOSED WATERMANS WHERE THEY CROSS AS PER SECTION 3.6 OF IRISH WATER CODE OF PRACTICE.

ISSUE/REVISION		
I/R	DATE	DESCRIPTION
2	21.10.2020	UPDATED FOR IRISH WATER
1	19.10.2020	REPOSE TO IRISH WATER
0	17.08.2020	STAGE 2 PRE-APP ISSUE
A	16.06.2020	DRAFT STAGE 2 PRE-APP

**PROJECT NUMBER**  
 60626107

**SHEET TITLE**  
 PROPOSED WATERMAIN LAYOUT

**SHEET NUMBER**  
 PR461030-ACM-XX-00-DR-CE-10-2701

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Midpoint  
Alencon Link  
Basingstoke, RG21 7PP

Proposed SHD,  
Carmanhall Road, Sandyford  
Dublin 18.



Date 21/09/2020 11:53  
File SANDYFORD SHD STAGE 2.MDX

Designed by Dara Magee  
Checked by Marc O'Dowd

Innovyze

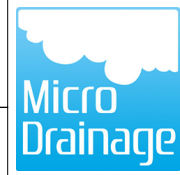
Network 2019.1

MH Name		F1	F2	F3
Hor Scale 1000				
Ver Scale 200				
Datum (m)79.000				
PN		F1.000	F1.001	
Dia (mm)		225	225	
Slope (1:X)		167.2	166.4	
Cover Level (m)		84.480	84.460	84.500
Invert Level (m)		83.100	82.956	82.707
Length (m)		24.073	41.427	

MH Name		F7	F8
Hor Scale 1000			
Ver Scale 200			
Datum (m)79.000			
PN		F1.006	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)		84.180	84.380
Invert Level (m)		82.275	82.174
Length (m)		20.080	

Midpoint  
Alencon Link  
Basingstoke, RG21 7PP

Proposed SHD,  
Carmanhall Road, Sandyford  
Dublin 18.



Date 21/09/2020 11:53  
File SANDYFORD SHD STAGE 2.MDX

Designed by Dara Magee  
Checked by Marc O'Dowd


Innovyze

Network 2019.1

MH Name	F3	F4	F5	F6	F7
Hor Scale 1000					
Ver Scale 200					
Datum (m)79.000					
PN	F1.002	F1.003	F1.004	F1.005	
Dia (mm)	225	225	225	225	
Slope (1:X)	199.3	201.4	199.7	200.0	
Cover Level (m)	84.500	84.320	84.300	84.180	84.180
Invert Level (m)	82.707	82.580 82.580	82.515 82.515	82.365 82.365	82.275
Length (m)	25.306	13.091	29.948	18.039	

MH Name	F8		F
Hor Scale 1000			
Ver Scale 200			
Datum (m)77.000			
PN	F1.007		
Dia (mm)	225		
Slope (1:X)	35.0		
Cover Level (m)	84.380		81.700 81.694
Invert Level (m)	82.174	79.990 79.990	79.688
Length (m)	76.455		

## Appendix M – Wastewater Network Calculations

AECOM		Page 1
Midpoint Alencon Link Basingstoke, RG21 7PP	Sandyford SHD, Carmanhall Road, Sandyford Dublin 18.	
Date 17/02/2021 17:16 File Sandyford SHD Stage 3	Designed by Dara Magee Checked by Brendan Mitchell	

Innovyze Network 2020.1

FOUL SEWERAGE DESIGN










Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200
Flow Per Person (l/per/day)	165.00	Maximum Backdrop Height (m)	1.500
Persons per House	2.70	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	24.073	0.120	200.6	0.000	140	0.0	1.500	o	225	Pipe/Conduit	
F1.001	41.719	0.276	151.1	0.000	110	0.0	1.500	o	225	Pipe/Conduit	
F1.002	24.559	0.253	97.1	0.000	60	0.0	1.500	o	225	Pipe/Conduit	
F1.003	15.849	0.158	100.0	0.000	118	0.0	1.500	o	225	Pipe/Conduit	
F1.004	16.390	0.328	50.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.005	28.207	0.261	108.1	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.006	27.901	0.772	36.1	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.007	78.475	1.420	55.3	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.008	11.466	0.092	124.6	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	
F1.000	83.050	0.000	0.0	140	0.0	56	0.56	0.81	32.2	4.3
F1.001	82.930	0.000	0.0	250	0.0	70	0.74	0.93	37.1	7.7
F1.002	82.654	0.000	0.0	310	0.0	70	0.92	1.17	46.3	9.6
F1.003	82.401	0.000	0.0	428	0.0	83	0.99	1.15	45.6	13.2
F1.004	82.242	0.000	0.0	428	0.0	69	1.28	1.63	64.6	13.2
F1.005	81.915	0.000	0.0	428	0.0	85	0.97	1.10	43.9	13.2
F1.006	81.654	0.000	0.0	428	0.0	64	1.44	1.91	76.1	13.2
F1.007	80.882	0.000	0.0	428	0.0	71	1.23	1.55	61.5	13.2
F1.008	79.462	0.000	0.0	428	0.0	88	0.92	1.03	40.9	13.2

Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.008	F	81.694	79.370	79.369	0	0

Midpoint Alencon Link Basingstoke, RG21 7PP	Sandyford SHD, Carmanhall Road, Sandyford Dublin 18.
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Date 17/02/2021 17:16 File Sandyford SHD Stage 3	Designed by Dara Magee Checked by Brendan Mitchell
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Innovyze	Network 2020.1
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Simulation Criteria for Foul - Main

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs		0 Number of Storage Structures	
Number of Online Controls		0 Number of Time/Area Diagrams	
Number of Offline Controls		0 Number of Real Time Controls	

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.800	Storm Duration (mins)	30
Ratio R	0.275		

Midpoint  
Alencon Link  
Basingstoke, RG21 7PP

Sandyford SHD,  
Carmanhall Road, Sandyford  
Dublin 18.



Date 17/02/2021 17:17

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File Sandyford SHD Stage 3

Checked by Brendan Mitchell

Innovyze

Network 2020.1

MH Name	F6			F3		F2	F1
Hor Scale 1500							
Ver Scale 200							
Datum (m)	79.000						
PN				F1.002	F1.001	F1.000	
Dia (mm)				225	225	225	
Slope (1:X)				97.1	151.1	200.6	
Cover Level (m)	84.200	84.300	84.320	84.500	84.480	84.480	
Invert Level (m)	81.915	82.242	82.242	82.401	82.401	82.654	82.930
				82.654		82.930	83.050
Length (m)				24.559	41.719	24.073	

MH Name	F9	F8		F7	F6
Hor Scale 1500					
Ver Scale 200					
Datum (m)	77.000				
PN	F1.007		F1.006	F1.005	
Dia (mm)	225		225	225	
Slope (1:X)	55.3		36.1	108.1	
Cover Level (m)	81.700	84.380	84.120	84.200	
Invert Level (m)	79.462	80.882	80.882	81.654	81.654
				81.915	
Length (m)	78.475		27.901	28.207	

Midpoint  
Alencon Link  
Basingstoke, RG21 7PP

Sandyford SHD,  
Carmanhall Road, Sandyford  
Dublin 18.



Date 17/02/2021 17:17  
File Sandyford SHD Stage 3

Designed by Dara Magee  
Checked by Brendan Mitchell

Innovyze Network 2020.1

MH Name		F	
Hor Scale 1500			
Ver Scale 200			
Datum (m)76.000			
PN			
Dia (mm)			
Slope (1:X)			
Cover Level (m)		81.694	81.700
Invert Level (m)		79.370	79.462
Length (m)			

## Appendix N - Tri Partite Response to An Bord Pleanála





Your Ref: ABP-307978-20  
Our Ref: CDS20000844

An Bord Pleanála,  
64 Marlborough Street,  
Dublin 1

18<sup>th</sup> November 2020

Uisce Éireann  
Bosca OP 6000  
Baile Átha Cliath 1  
Éire

Irish Water  
PO Box 6000  
Dublin 1  
Ireland

T: +353 1 89 25000  
F: +353 1 89 25001  
[www.water.ie](http://www.water.ie)

Dear Sir/ Madam,

**Re:** Strategic Housing Development – 438 no. Build to Rent apartments, childcare facility and associated site works. Former Avid Technology, Carmanhall Road, Sandyford Industrial Estate, Dublin 18.

Irish Water has received notification of Atlas GP Limited request to enter into consultations under Section 5 of the Planning and Development (Housing) and Residential Tenancies Act 2016 in respect of the above-mentioned proposed development.

Irish Water has assessed and has issued a Confirmation of Feasibility for connection(s) to the Irish Water network(s) subject to the following;

**In respect of Water:**

The applicant has been advised that Irish Water records indicate existing Irish Water infrastructure within and in proximity of the site boundaries. The applicant is required to survey the site to determine the exact location(s) of this infrastructure and must engage with Irish Waters diversion section in regard to a diversions feasibility assessment. The outcome of this feasibility assessment must be agreed with IW ahead of progressing to SHD application to ensure adequate protection of existing assets and to ensure appropriate separation distances can be achieved as per IW standards codes and practices. Any trial investigations should be carried out with the agreement and presence of a Local Authority/Irish Water Inspector.

**General observations;**

All development is to be carried out in compliance with Irish Waters Standards Codes and Practices and that design layouts for the development proposal have been submitted to Irish Water and that a Statement of Design Acceptance has been issued to the applicant by Irish Water ahead of any SHD Application.

Where any proposals by the applicant to build over or divert existing water or wastewater services the applicant is required to submit details to Irish Water for assessment of feasibility and have written confirmation of feasibility of diversion(s) from Irish Water ahead of any SHD Application to the board.

Queries relating to the observations above should be sent to [planning@water.ie](mailto:planning@water.ie)

PP. Ali Robinson

**Yvonne Harris**

Connections and Developer Services

## Appendix O – Diversion Confirmation of Feasibility



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](http://www.water.ie)

Mr. Dara Magee,  
AECOM,  
Adelphi Plaza, George's Street Upper  
Dun Laoghaire  
Dublin A96T927

20 January 2021

Dear Mr Magee,

**Re: Former Avid Technology Site, Carmanhall Road, Sandyford, Dublin 18 /  
Irish Water Diversion reference DIV20249 / Irish Water Connection reference CDS20000844.  
Subject to contract | Contract denied**

Irish Water has reviewed your submission for the proposed diversion of the 101.6 mm (4 inch) Asbestos watermain at the former Avid Technology Site, Carmanhall Road, Sandyford, Dublin 18.

Based upon the details you have provided in your drawing PR461030-ACM-XX-00-DR-CE-10-2701 and as assessed by Irish Water, we wish to advise you that, subject to valid agreements being put in place, the proposal can be facilitated.

You are advised that this correspondence does not constitute an agreement in whole or in part to build near any Irish Water infrastructure and is provided subject to an associated Diversion and/or Self Lay Connection Agreement being executed at a later date. Please engage with Irish Water again in relation to this matter at such time planning permission has been granted for the proposed development at the site.

If you have any further questions, please contact Brendan Kearney from the diversions team on 0871016233 or email [brkearney@water.ie](mailto:brkearney@water.ie). For further information, visit [www.water.ie/connections](http://www.water.ie/connections).

Yours sincerely,

**Yvonne Harris**  
Head of Customer Operations

