An Triantán, Station Road Housing Kildare

Part 8 – Civils Basis of Design Report

Kildare County Council

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Executive Summary

This report outlines the Civil basis of design strategy for the 30-unit housing development located in Kildare Town, Co. Kildare and forms part of the Part 8 application.

The report will detail the existing drainage networks, from available information to date, and provide an outline of the proposed intended drainage strategies for each of the services. It is proposed to provide Sustainable Drainage Systems (SuDS) and Nature-Based Solutions (NBS) wherever possible throughout the design.

The Civil Engineering design, detailed in this report, has been developed based on survey information received to date. Further investigations are scheduled (slit trenches) in order to verify and supplement the CCTV / GPR information for design of the proposed diversions. The proposed development will consist of the following:

The construction of 30 social housing units to include:

- 5no. 3 bedroom two storey duplex apartments;
- 1no. 3 bedroom three storey house;
- 2no. 2 bedroom two storey houses;
- 2no. 2 bedroom single storey apartments;
- 4no. 2 bedroom 3 person single storey apartments;
- 6no. 2 bedroom two storey duplex apartments;
- 10no. 1 bedroom single storey apartments;

The construction of ancillary structures to include:

- ESB substation;
- Switchroom;
- Secure cycle storage rooms;

Associated site works to include:

- Demolition of 2no. existing cottages and associated ancillary structures on Station Road;
- Erection of new boundary treatment to south, east and north boundaries;
- New vehicular and pedestrian entrance from Station Road;
- 26no. vehicle parking spaces
- Of which 6no. provided with EV charging points
- 54 no. residents' bicycle parking spaces
- Of which 4no. suitable for adapted cycles/cargo bikes
- 16no. visitor bicycle parking spaces
- Of which 4no. suitable for adapted cycles/cargo bikes
- New landscaping, internal vehicular and pedestrian shared surface route, public lighting, site drainage works, ancillary site services and development works above and below ground.

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1.0

Introduction

1.0 Introduction

1.1 Background

Cundall (Ireland) Ltd. have been commissioned by Kildare County Council (KCC) to provide engineering services for a proposed new social housing development located in Kildare Town, Co. Kildare.

This report outlines the Part 8 Basis of Design for Civils-related infrastructure including:

- Surface Water Drainage
- Flood Risk
- Foul Drainage
- Water Supply

1.2 Existing Site Location

The proposed development site is located to the east of Station Road (R415) and the south of Melitta Road (R413), at National Grid Reference (NGR) N 73008 12548 (ITM coordinates X: 672952, Y: 712574).

The existing site is currently a brownfield site with two existing cottages and a shed. A Virgin Media telecommunications mast with associated infrastructure is also on the site. The majority of the site is covered in vegetation and trees including Japanese Knotweed which has been undergoing treatment prior to removal. The site is bounded by existing residential developments along each of the boundaries with the site location and red line boundary indicated in Figure 1-1 below.

Figure 1-1: Site Location (Google Earth)

The site gradient falls from the eastern boundary at a level of approx. +102mAOD in each direction with the lowest point of the site noted at the western boundary, +100.83mAOD, giving a gradient of approx. 1 in 47. Please refer to Appendix A for the topographical survey carried out by Apex Surveys in December 2023.

1.3 Proposed Development

Full details for the proposed development are included in the site description and within the architect's information and reference should be made to this area. The proposed development is displayed in Figure 1-2 below.

Figure 1-2: Proposed Site Layout (Architect Drawing No. 2308-Z-DR-SCA-AR-2000-07)

1.4 Ground Investigations

Ground Investigations (GI) have been provided by IGSL which indicates a very good infiltration rate with the stage 3 results from the two trial pits indicating results of 2.10×10^{-4} m/sec and 2.39×10^{-4} m/sec. From the four trial pits carried out no groundwater was encountered and the boreholes did not encounter any water strikes with these carried out to a maximum depth of 6.7m below ground level. Please refer to Appendix B for the final GI report.

1.5 Utility Survey

The final Ground Penetrating Radar (GPR) survey information by Murphy's Geospatial has been utilised within this report with regards to the extent that services could be captured within the site and within Station Road.

It was noted that two existing manholes were located to the north-east corner of the site. There are no available records for these networks but it was noted that one of the manholes was overflowing with effluent. Based on this a CCTV survey was commissioned to verify the connections on the existing manholes.

Further details on the individual services captured are provided in their respective sections below. The final GPR survey information is provided within Appendix C of this report.

1.6 CCTV Survey

A CCTV survey was carried out in the existing manholes within the site to verify the routes of the connecting pipes. Due to the level of silt within the pipes the survey was unable to verify the lengths and routes of the pipes. It was noted that the manholes were not connected i.e., surface water and wastewater systems are seperate.

Further details on the individual services captured are provided in their respective sections below. The CCTV survey information, including a sketch of the assumed piped routes, is provided in Appendix D of this report.

On completion of the CCTV survey and due to the limited information available on the pipe routes a GPR survey was commissioned to verify the pipe routes. However, due to the silt buildup within the pipes the survey was limited.

1.7 Flood Risk Assessment

A separate report has been prepared, ATR-CDL-XX-XX-RP-Z-90200, as part of the planning application submission which reviews the potential flood risks to the site from Fluvial, Pluvial, Coastal, and Groundwater flooding.

It has been determined that the site is located sufficiently outside the flood zone risks for Fluvial, Coastal, and Groundwater. However, the site, as indicated through the Kildare Town Local Area Plan (LAP) 2023 – 2029, shows that there is potential for Pluvial flooding to occur as the site is located within the Pluvial Risk Assessment Zone and is noted to be within lands that have had capacity issues in the past with their drainage networks.

To mitigate against the pluvial flood risk the drainage design will account for the 1 in 100-year event, plus 30% climate change and 10% urban creep factors, with suitable attenuation provisions provided on-site. In addition to this, finished floor levels (FFL) throughout the site will be set a minimum of 500mm above the top water level of any attenuation structure with ground levels designed to fall from away from the units to ensure during exceedance events there is no risk to any internal property flooding.

Sustainable Drainage Systems (SuDS) and Nature-Based Solutions (NBS) will also be provided wherever possible throughout the site and will be designed as such to allow runoff to build up within these areas and infiltrate through the ground.

Surface Water Drainage

2.0 Surface Water Drainage

2.1 Existing Surface Water Drainage

Uisce Éireann (UÉ) record maps received from KCC, refer Figure 2-1 below, do not indicate any existing surface water sewers within or in close proximity to the site. However, there is a network assumed to be within the footway of Station Road with locations of gullies noted in the footway outside the existing cottage.

It was noted from site walks conducted that two existing manholes are within the site boundary, approximate locations of manholes indicated in Figure 2-1 below.

Figure 2-1: UÉ record maps (KCC)

From the GPR survey information received it was noted that there is a surface water network present within the footway immediately outside the existing cottage garage. Two gullies, one located in the footway and the other within the road, discharge into a manhole located here which was traced futher down the pathway, but from this point onwards the pipe could not be traced due to excessive silt build up within the pipe. Additionally, it was noted that the manholes are approximately 450mm below ground level.

A CCTV survey was conducted on site to verify what the two existing manholes located to the north-east corner are serving and if they are in operation. Their initial findings indicate that one of these relates to an existing surface water network that serves the Dara Park residential estate to the south-east of the site. It was noted that there was a defect within this line which occurs at the bend on the pipeline as it changes direction towards Dara Park. The defect does not appear to be preventing the surface water flow through the pipe.

There was also an additional feeder line that appears to come from the back of the properties 1-8 on Station Road into the existing manhole. This line was noted to be partially blocked with the camera unable to pass. The defect does not appear to be preventing the surface water flow through the pipe.

2.2 Proposed Surface Water Drainage

The proposed surface water drainage network will collect surface water runoff and convey it to the main attenuation feature before discharging it via infiltration. As the site has very good infiltration rates and given the limited options to connect to an existing surface water sewer within Station Road an infiltration design is deemed appropriate for the development.

The proposed design intention for the surface water network is provided on drawing ATR-CDL-ZZ-XX-D-C-14001. As the existing sewer within the site is noted to be live, this will be diverted to ensure there is no reduction in the number of units to be provided. This diversion will be kept as tight to the boundaries as possible. Slit trenching is to be carried out to verify the depths where the existing networks enter the site.

Surface water runoff from the site's road network will be captured at source through the proposed porous paving surfacing on the carriageway with impermeable footways discharging to adjacent bio-retention zones, overflows to the main drainage network will also be provided. Porous pavements will collect surface water runoff from parking spaces also. Surface water runoff will also be collected in tree catch pits, which will overflow into the main piped network. Surface water runoff from rooftops will be collected from green roofs and be directed to the proposed surface water pipe network via connections from downpipe locations. Rain gardens will be provided wherver possible in the green areas as a form of attenuation and biodiversity. Refer to Figure 2-2 below for the proposed surface water design strategy.

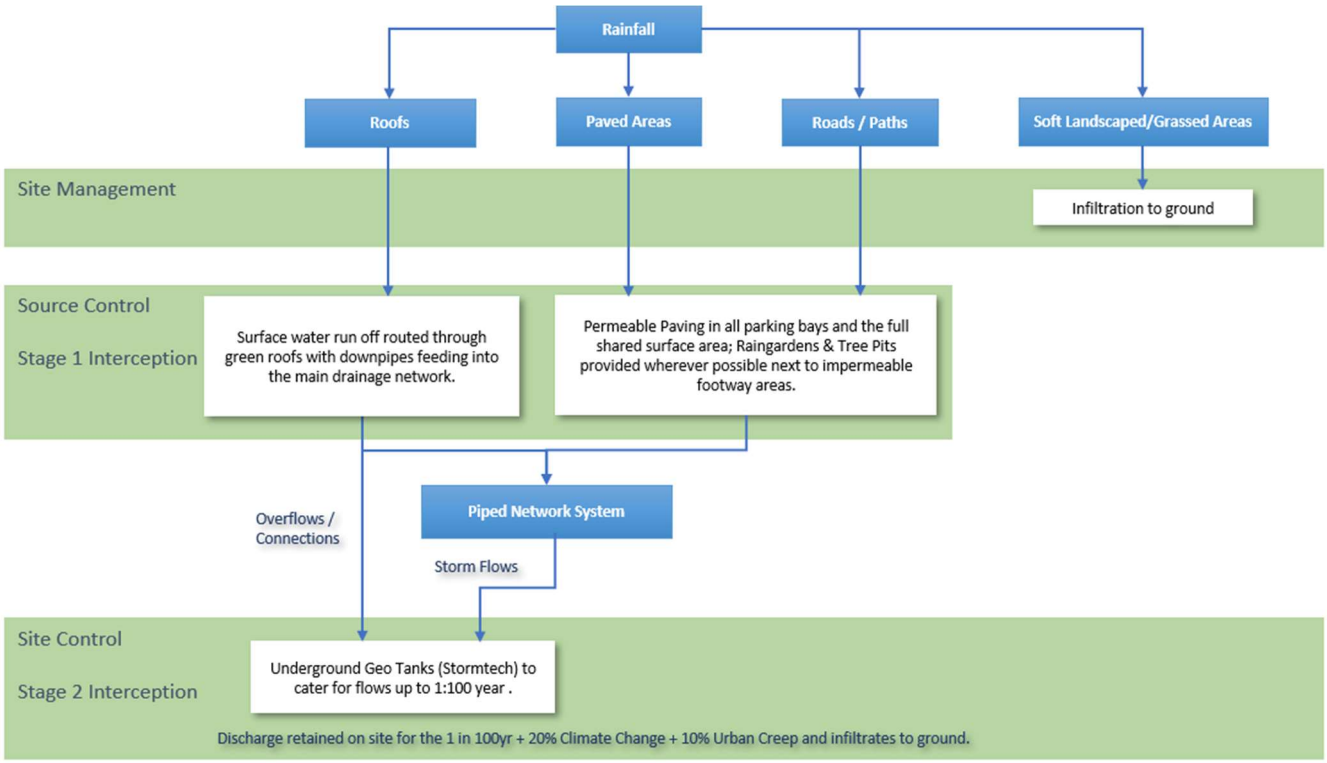


Figure 2-2: Surface Water Management Design Strategy

It was noted that the provision of swales, filter drains, detention basins/ponds, and rainwater harvesting are not possible for the site given the nature of the site and proposed service separation distances throughout the site. Green living walls were considered but determined to be not suitable for this form of development.

Given the limited water table readings captured from the GI carried out in June 2024 it is assumed that a minimum of 1m of an unsaturated zone between the base on infiltration system and site groundwater levels will be achievable. The

SuDS systems will also be separated sufficiently from services, buildings, and structures to prevent water ingress damage to the services or buildings.

2.2.1 Qbar (Greenfield Runoff)

As part of the initial design it was intended to restrict runoff from the site to the associated Qbar which has been calculated to be 2.0 L/sec. Qbar was calculated using the UKSuDS quick storage estimate tool and the calculation input parameters are as follows:

- Site Area – 0.495ha.
- Soil Type 3 – Standard Percentage Runoff (SPR) value of 0.37 (conservative estimate with no available GI).
- The Standard Annual Average Rainfall (SAAR) – 868mm.

The calculation is based on the Institute of Hydrology equation, as recommended in the Greater Dublin Strategic Drainage Study (GDSDS), which is as follows:

$$Qbar\ [rural] = 0.00108\ x\ AREA^{0.89} x\ SAAR^{1.17}\ \text{X Soil}^{2.17}$$

Where:

- Qbar[rural] is the mean catchment annual flow from a rural catchment in m^3/s.
- AREA is the area of the catchment in km^2.
- SAAR is the standard average annual rainfall.
- SOIL is the soil index, with 5 soil types used and SPR values applied to each soil type. The SPR values for the 5 soil types are as follows: Soil 1 = 0.1; Soil 2 = 0.3; Soil 3 = 0.37; Soil 4 = 0.47; Soil 5 = 0.53.

Please refer to Appendix D for the Qbar calculation sheet. This calculation sheet was used at the initial design stages to provide an approximation on the maximum tank size that would be required when assuming the site is fully impermeable in the absence of any existing site information.

2.2.2 Design Criteria

The proposed surface water network will be carried out in accordance with the following guidance documents:

- GDSDS.
- Greater Dublin Regional Code of Practice for Drainage Works.
- The Department of the Environment's Recommendations for Site Development Works for Housing Areas.
- The Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Wastewater Disposal".
- BS EN 752: 2008 Drain and Sewer Systems Outside Buildings.
- IS EN 12056: Part 2 (2000) Gravity Drainage Systems Inside Buildings.
- CIRIA C753 – The SuDS Manual.
- CIRIA C768 – Guidance on Construction of SuDS.
- CIRIA C698 – Site Handbook for the Construction of SuDS.
- Kildare County Development Plan 2023 – 2029.
- Kildare Local Area Plan (LAP) 2023 – 2029.
- Kildare Town Surface Water Drainage Study 2022.
- KCC SuDS Guidance Document 2024.

The proposed surface water drainage network has been designed using InfoDrainage modelling software. The following criteria will be applied to the surface water modelling:

- Return Period for Pipework Design: 1 year, no flooding
  – check 30-year, no flooding.

– check 100-year, no internal property flooding. Flood routing plan. FFL 500mm freeboard above 100-year flood level where flooding is allowed in designated areas.

- Allowable outflow: 2.0 L/sec (Discharge to off-site areas)
- Time of entry: 5 minutes
- Infiltration Rate: 0.379 m/hr through base and 0.757m/sec through sides
- Safety Factor: 10.0
- Pipe Friction (Ks): 0.6 mm
- Minimum Velocity: 1.0 m/s
- SAAR: 868mm (Met Eireann 1km2 grid)
- M5-60: 14.900mm (Met Eireann, refer to Appendix F)
- Ratio R (M5-60/M5-2D): 0.281 (Met Eireann, refer to Appendix F)
- Attenuation Storm Return Event: 1 in 100-year + Climate Change & Urban Creep
- Climate Change Allowance: 30%
- Runoff from Unit Areas (Roofs): 95%
- Runoff from Road Areas: 90%
- Runoff from Parking Areas: 50%
- Runoff from Contributing Landscaped Areas: 30%
- Urban Creep Factor: 10%
- Cv winter: As per rates above
- Cv summer: As per rates above

Note on Cv Factors: The Recommendations for Site Development Works note that the volumetric runoff coefficient Cv should be set at 0.6 for rapidly draining soils and 0.9 for heavy soils. Applying a Cv rate as per the percentage of runoff for each catchment area is deemed appropriate for this site.

The flows will be retained within an attenuation storage chamber on site for the 1 in 100-year storm event, including climate change and urban creep allowances. Based on the results from the Infodrainage model, provided in Appendix G, an attenuation volume of 185m^3 would be required to ensure there is no flooding on site. The Stormtech attenuation chamber details are provided on drawing ATR-CDL-ZZ-XX-D-C-16003.

2.3 Sustainable Drainage Systems (SuDS)

In accordance with the GDSDS it is proposed to use SuDS and NBS for managing stormwater for the proposed development. The aim of the SuDS and NBS strategy for the site will be to:

- Attenuate stormwater run-off at source and site control areas.
- Reduce stormwater run-off.
- Reduce pollution impact and improve water quality.
- Replicate the natural characteristics of rainfall-runoff for the site.
- Recharge the groundwater profile.
- Biodiversity and ecology benefits

It is currently proposed to provide bio-retention areas/rain gardens and tree pits wherever possible throughout the site to help achieve a suitable NBS strategy. Green roofs will also be provided above each of the units.

Given the tight site constraints no other NBS strategy were deemed feasible for this development therefore, impermeable areas were reduced as much as possible with porous paving and soft landscaping provided wherever possible.

Outlined below are the proposed SuDS features that could be utilised within the development to intercept and/or treat and store surface water prior to connection to the existing drainage network.

2.3.1 Porous Paving

Porous paving is suitable for pedestrian and/or vehicle traffic, while allowing rainfall to pass through the surface and into the underlying structural layers. Stormwater that infiltrates through the permeable paving, is stored before being discharged into the existing drainage network. Temporarily storing the stormwater in the structural layers slows the rainfall reaching the drainage network and reduces the risk of overloading the system.

Permeable paving is currently proposed to the parking bays and shared surface carriageway which will provide sufficient attenuation and treatment. Refer to Figure 2-3 for a typical example of porous paving systems with partial infiltration considered possible.

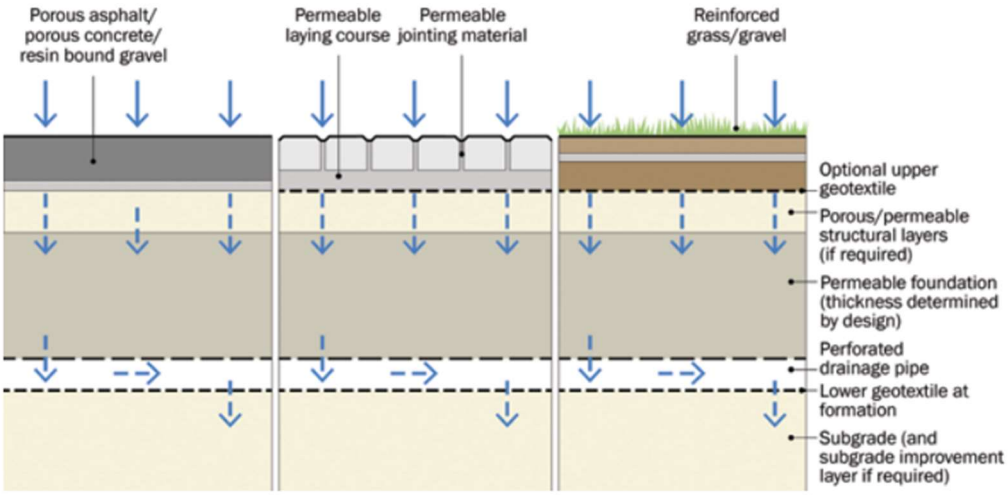


Figure 2-3: Typical Porous Paving Systems - Type B Partial Infiltration (CIRIA SuDS Manual C753)

2.3.2 Bio-Retention

Bio-retention systems are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution using engineered soils and vegetation. They also provide the benefit of providing attractive landscape features that are self-irrigating and fertilising and increase the habitat and biodiversity for the area.

It is currently proposed to provide bio-retention areas wherever possible within the soft landscaped areas of the site to drain adjacent impermeable areas. A typical section detail of the components of a bio-retention system is provided below in Figure 2-4.

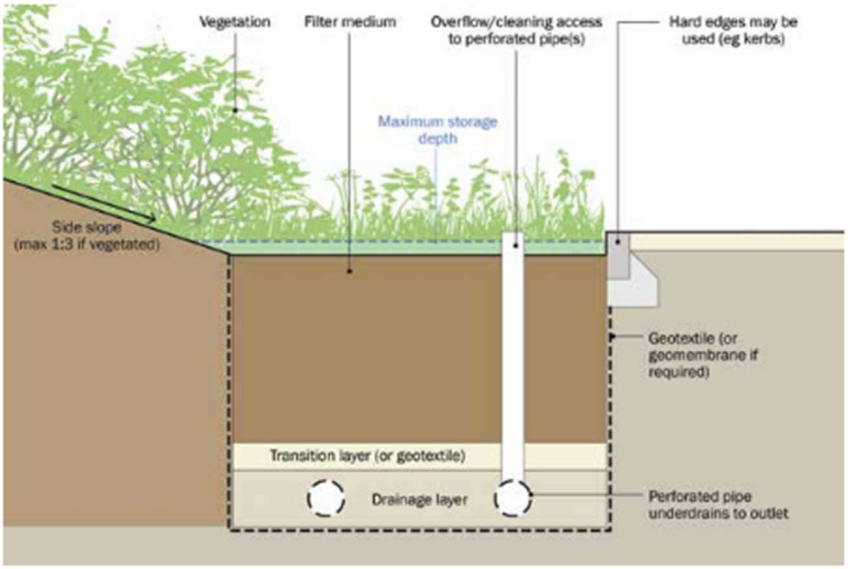


Figure 2-4: Components of a Bio-Retention System (CIRIA SuDS Manual C753)

2.3.3 Tree Pits

Trees can be planted within other SuDS components, such as bio-retention systems and swales, to improve their performance or they can be provided as standalone features within soil-filled tree pits, tree planters or structural soils.

Tree pits can be designed to collect and attenuate runoff by providing storage within an underlying structure. The soils around the trees can also provide treatment of runoff by filtering out the pollutants from runoff directed towards the features. Tree pits are proposed wherever possible on the site and will be surrounded with a root protection barrier to ensure sufficient protection is provided to the roots and other services. A typical section detailing the surface water runoff for trees is provided in Figure 2-5 below.

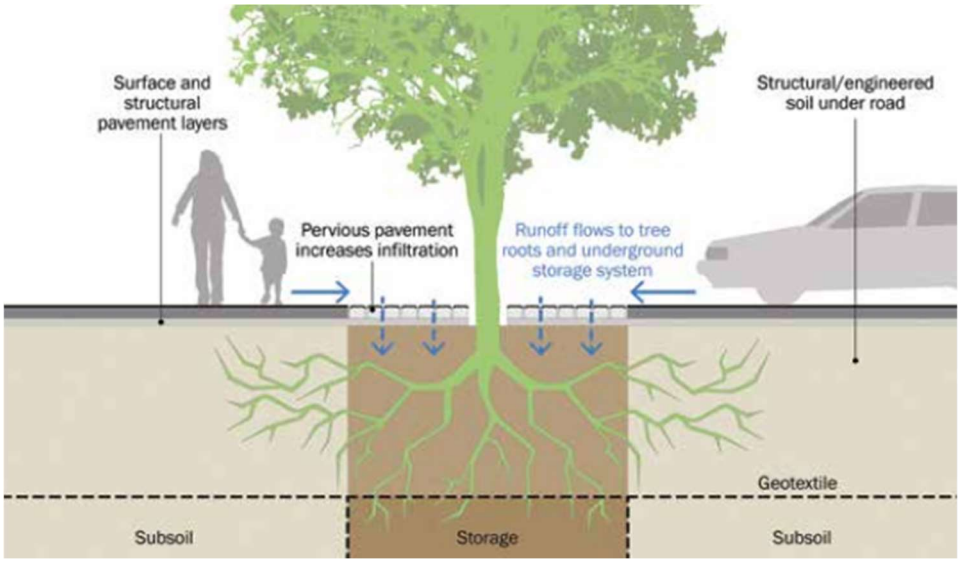


Figure 2-5: Typical Tree Pit Detail (CIRIA SuDS Manual C753)

2.3.4 Stormtech Attenuation Tank

It is proposed that a Stormtech attenuation chamber will be provided for the infiltration tank design. This type of storage system is proposed as the arched chambers are surrounded by stone, to the manufacturers specification. The sediments are captured within this stone providing interception and/or treatment by removing silts and some hydrocarbons from the runoff. Catch pit manholes, with sumps min. 500mm deep, will also provide further silt removing

treatment measure in both the upstream and downstream manholes of the attenuation tank. A typical cross section detail through a MC-3500 Stormtech tank is provided in Figure 2-6 below.

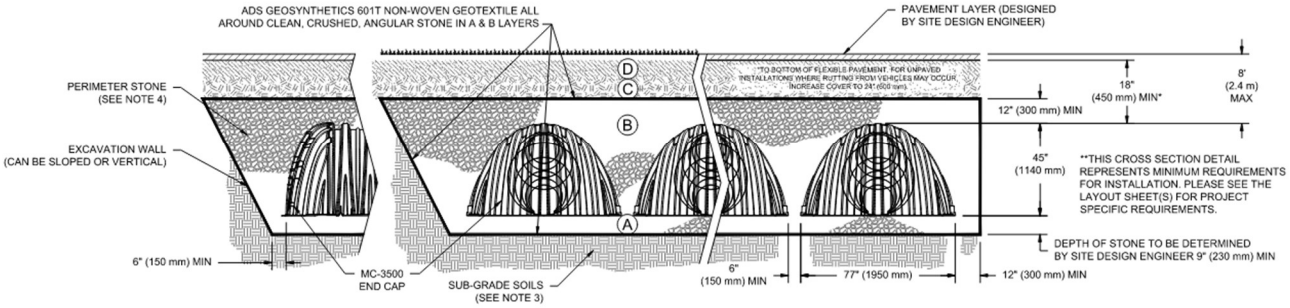


Figure 2-6: Typical Cross Section Detail through MC-3500 Tank

2.3.5 SuDS Maintenance Inspection Checklist

The typical operation and maintenance requirements for the proposed SuDS features discussed above are provided in Appendix H, this is sourced from the CIRIA SuDS Manual C753.

2.4 Compliance with the GDSDS

The GDSDS outlines regional drainage policies to address the drainage needs of the Greater Dublin Area but have also been adopted by many local authorities' drainage policies. These policies address surface water management from the development site from the point of view of water quality, quantity, risk of flooding and compliance with relevant legislation.

As per the GDSDS, proposed developments must be drained on separate foul and surface water systems and must incorporate SuDS for the management of surface water. To ensure compliance with Table 6.3 of the GDSDS, Table 2-1 provides a breakdown of how the surface water network will be designed.

Table 2-1: Compliance with the GDSDS Table 6.3

Criteria	Sub criterion	Return Period (Years)	Design Objective	Design Proposals (include our proposals that are site specific)
Criterion 1 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.	Interception storage will be provided on site via a fully infiltration design for the 1 in 100yr event + 30% Climate Change and 10% Urban Creep.
	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 is not required as interception storage will be provided on site.
Criterion 2 River regime protection	2.1	1	Discharge rate equal to 1 year greenfield site peak runoff rate or 2l/s/ha, whichever is greater. Site critical duration storm to be used to assess attenuation storage volume.	Sufficient attenuation storage is provided for the critical storm event with only surcharging of the network noted from network design calculations carried out, refer to Appendix G. It is also noted that the depth of the Top Water Levels (TWL) within the junctions are in the range of 0.9m to 1m below the cover level during the critical 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	No discharge from the site for the critical storm event with sufficient storage provided within Stormtech attenuation chambers to allow the flows to infiltrate to ground.
Criterion 3 Level of service (flooding) for the site	3.1	30	No flooding on site except where specifically planned flooding is approved. Summer Design storm of 15 or 30 minutes are normally critical.	Analysis has been carried out assuming a 50% reduction in the infiltration rate from the attenuation storage. To ensure no flooding on site it is proposed to fit an overflow connection set 264mm above the Top Water Level (TWL) noted from the critical storm event in Appendix G. Any flows which enter this overflow are restricted to 2.0L/sec via a hydrobrake flow control device in a downstream manhole from the connection. This is to ensure downstream areas are not negatively impacted upon during exceedance events with a controlled rate used. The proposal has been modelled to ensure it works sufficiently during such events with the results provided in Appendix I. It should be noted that from the calculations carried out it is only during the 1 in 100yr +30% Climate Change & 10% Urban Creep when flows enter this overflow. There are no flows through this pipe during the 1yr or 30yr events. The proposed flood exceedance design is provided on drawing ATR-CDL-ZZ-XX-D-C-14001.
	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.	Site levels have been designed to ensure that if ponding was to occur it will be situated away from building access points, bin stores, substations, and switch rooms. Please refer to drawing ATR-CDL-ZZ-XX-D-C-62001 for the proposed levels design.
	3.3	100	No internal property flooding. Floor levels at least 500mm above maximum river level and adjacent on-site storage retention.	The on-site attenuation structure has a TWL of 100.331m for the critical storm event which is 819mm lower than the lowest FFL of 101.150m for the unit at station road.
	3.4	100	No flooding of adjacent urban areas. Overland flooding managed within the development.	Levels have been designed to ensure that any flooding will be directed towards designated low points within the landscaped areas. Given the very good infiltration rates on site this will slowly infiltrate back to ground ensuring that no flooding of adjacent urban areas will occur.
Criterion 4 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.	This sub-criterion will not be applied within the design as only one of the three sub-criterion are required.

			100 year, 6 hour duration storm to be used for assessment of the additional volume of runoff.	
	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	The surface water network has been modelled with discharge to be via infiltration only. The infiltration rate has been applied to the model via a filtration outfall method with a factor of safety of 10 applied. A further conservative estimate was placed on the tank design with the infiltration rate assumed to be reduced by 50% through the base with a full rate through the sides of the attenuation structure. This was applied due to any unforeseen changes that may occur to the infiltration rate during the construction activities. The results from the model are provided within Appendix G where it is noted that there is sufficient storage for the critical storm event + 30% Climate Change & 10% Urban Creep. Further assessment was carried out for the exceedance design where the infiltration rates were reduced by 50% to see what impact this has on the network. To prevent flooding an overflow connection will be provided on the tank and flows will be restricted to 2.0L/sec via a hydrobrake. It should be noted that this overflow will only be used during the 1 in 100yr critical event with no flows evident during the 1yr or 30yr events. .
	4.3	100	Maximum discharge rate of QBAR or 2 l/s/ha, whichever is greater, for all attenuation storage where separate “long term” storage cannot be provided.	This sub-criterion will not be applied within the design as only one of the three sub-criterion are required.

2.4.1 Interception & Treatment Volumes

Criterion 1.1 requires interception storage to be incorporated into surface water drainage design to limit discharge of sediment and pollutants into the downstream surface water drainage network and receiving water courses.

This interception storage is designed to capture surface water run-off from rainfall depths of 5mm (and up to 10mm if possible). Where interception storage is not possible treatment volume is to be provided for 15mm of rainfall, in accordance with Criterion 1.2.

Given the proposed design intention is for infiltration interception storage is provided as all flows up to and including the 1 in 100yr event + 30% Climate Change & 10% Urban Creep will be retained on site and discharge to ground.

2.5 Flood Exceedance Design

As detailed in Table 2-1 above analysis was carried out to verify the flood exceedance design by assuming the infiltration rates from the tanks were reduced by 50%. From the analysis carried out, refer to Appendix I, the tank provides sufficient storage up to the 1 in 30yr critical event. To prevent flooding on site it is proposed to provide an overflow connection set 264mm above the TWL of stormtech chambers for the 1 in 100yr critical storm event site model, Appendix G.

Flows from this overflow are restricted to 2 L/sec via a hydrobrake flow control device to ensure no downstream areas are negatively impacted upon. The proposed flood exceedance design is provided on drawing ATR-CDL-ZZ-XX-D-C-14001.

Wastewater Drainage

3.0 Wastewater Drainage

3.1 Existing Wastewater Drainage

UÉ record maps received from KCC, refer Figure 3-1 below, indicates an existing 150mm dia. wastewater sewer of unknown material within Station Road.

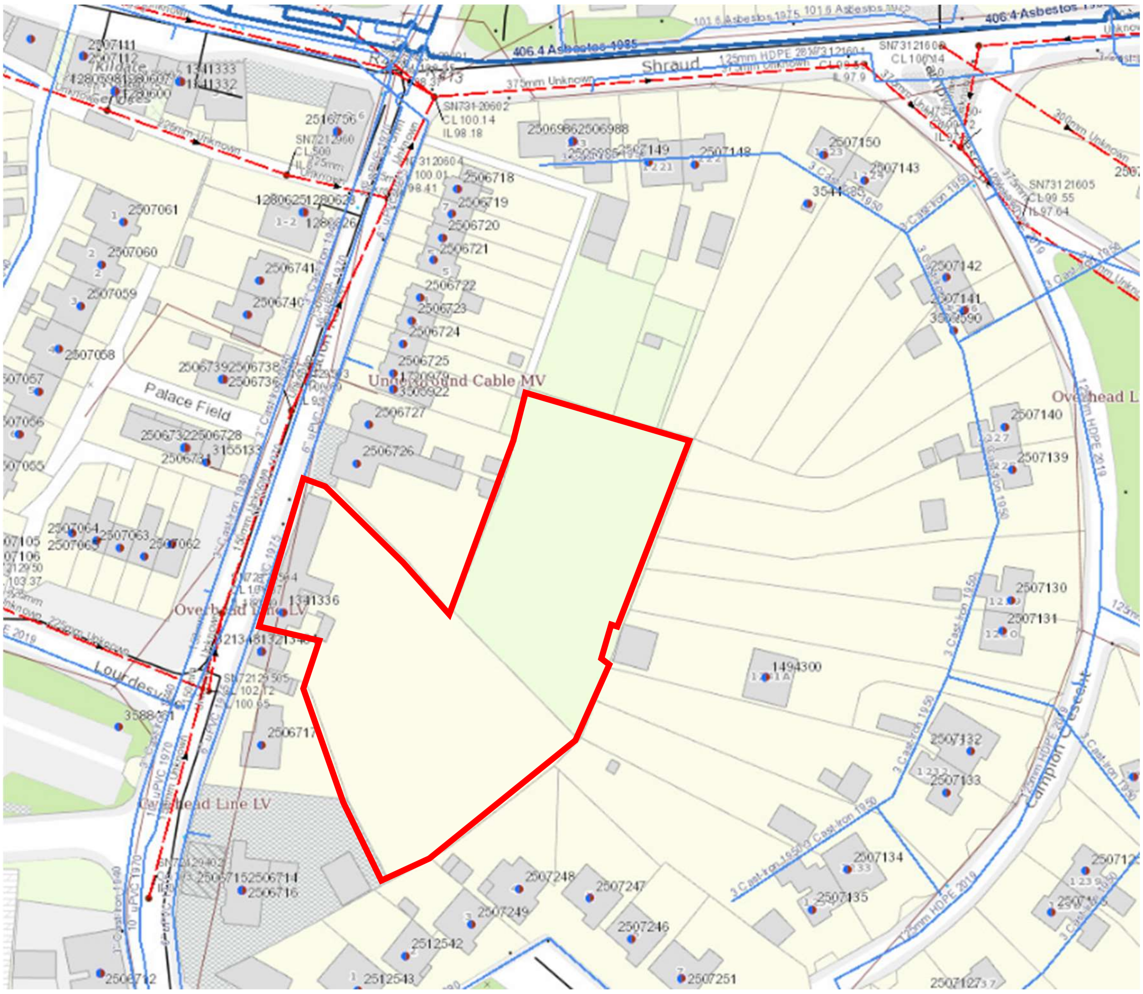


Figure 3-1: UÉ Record Map (KCC)

From the GPR survey information received to date it is noted that there is an existing wastewater sewer within Station Road with manhole depths ranging from 0.8m to 1.4m along the 150mm dia. vitirified clay pipe run.

CCTV survey was conducted on the two existing manholes on the site with one appearing to be a wastewater sewer line running from Dara Park residential estate and continues into 1223 Campion Crescent. The status of this line could not be fully confirmed as gravel and limescale was present in the pipe with the camera unable to fully survey the pipe.

As the line is partially blocked within the site and it was noted by the CCTV surveyors that from local knowledge that the line may be blocked up within Campion Crescent that this line may be redundant. However, this manhole has been noted to flood and vary in levels during the year and may require a diversion.

3.2 Design Strategy

The wastewater drainage network for the proposed development will be designed in accordance with the following guidance documents:

- UE Code of Practice for Wastewater and Water Infrastructure
- Department of the Environment's Recommendations for Site Development Works for Housing Areas
- Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal"
- BS EN 752: 2008 Drain and Sewer Systems Outside Buildings
- IS EN 12056: Part 2 (2000) Gravity Drainage Systems Inside Buildings

3.3 Proposed Wastewater Drainage

The proposed foul drainage network for the site will comprise a series of 150mm and 225mm pipes where applicable. Each residential unit is to be serviced by individual 100mm diameter connections.

The estimated wastewater discharge from the proposed development was calculated following the UÉ Code of Practice for Wastewater Infrastructure with an average daily discharge of 0.15 L/sec and a peak flow of 0.93 L/sec.

A Confirmation of Feasibility, CoF, (CDS23008235, refer to Appendix J) was received, and it was noted that the foul sewer connection is feasible once approximately 90m of the existing 150mm gravity sewer in Station Road is upgraded to a 225mm pipe.

An updated Pre-Connection Enquiry has been submitted to UÉ in October 2024 to verify the above CoF is still relevant. A response is outstanding as per the date of this report.

While the existing foul sewer appears to be redundant the presence of foul material is evident from site walks conducted which would indicate some form of loading is being entered into the network. With the levels of this network to be verified and the shallow network within Station Road it is proposed to divert this network within the site as indicated on drawing ATR-CDL-ZZ-XX-D-C-14011.

As it is not clear whether this existing pipe is live further investigation is proposed where a flow measuring will be placed within the existing manhole in Dara Park and left over an agreed period of time. This will verify whether the diversion of the existing wastewater sewer.

The proposed connection point for the site is shown in Figure 3-2 below with the approximate section of sewer to be upgraded outlined in red. The level of this wastewater connection may impact on the proposed levels design as to ensure the connection discharges via gravity levels with the development may have to increase.

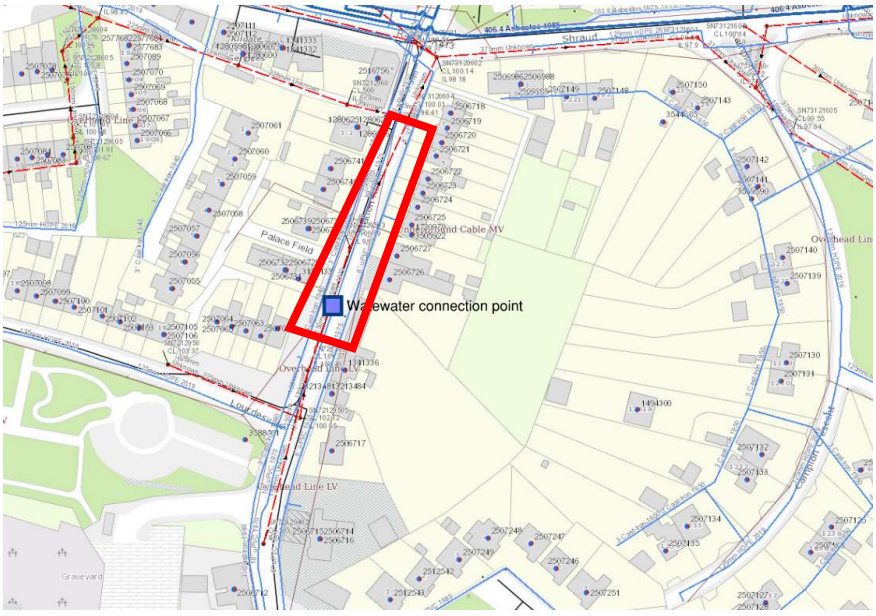


Figure 3-2: Proposed Connection Point and Upgrade Works

4.0

Water Supply & Distribution

4.0 Water Supply & Distribution

4.1 Existing Water Supply Network

UÉ record maps received from KCC, refer Figure 4-1 below, indicates two watermain pipes within Station Road, one 3" (75mm) dia. cast-iron pipe and the other a 6" (150mm) dia. uPVC pipe.

This was verified via the GPR survey with three existing pipe networks picked up, however it is noted on the preliminary survey that one pipe is 10" (250mm) dia. uPVC located within the main Station Road and the other is a possible 10" dia. uPVC located in the footway outside the development site.

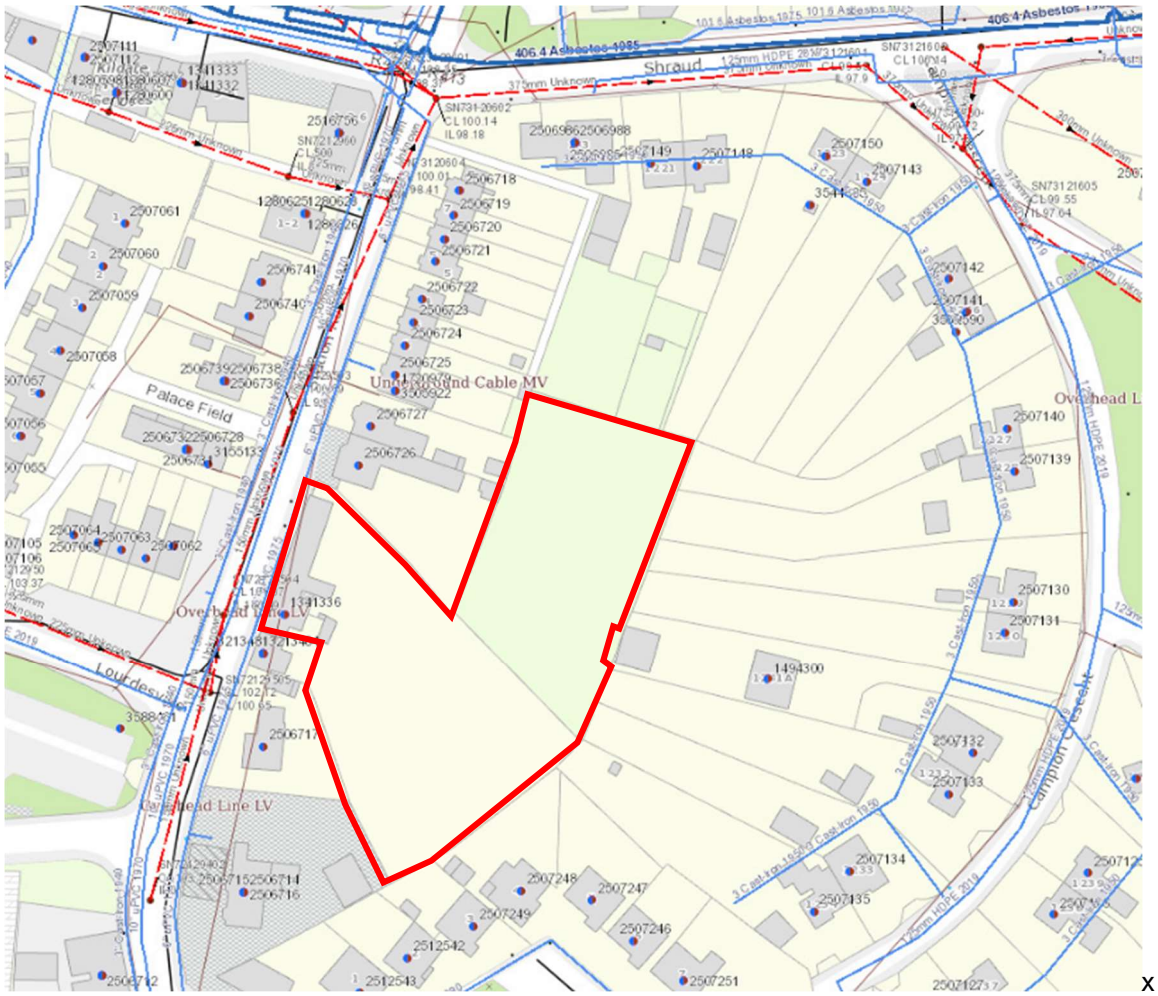


Figure 4-1: UÉ Record Map (KCC)

4.2 Proposed Water Supply Network

The proposed water drainage network will consist of a 100mm diameter looped water main, generally along the site's pathways. The proposed water main layout and connections to existing public water mains will be designed in accordance with UÉ Code of Practice for Water Infrastructure and Standard Details.

Sluice Valves will be arranged in accordance with STD-W-02. Individual houses will be provided with 25mm service connections via meter/boundary boxes from the distribution water mains. Individual connections will be installed in accordance with STD-W-03.

The proposed water main layout will be arranged such that all buildings are within a maximum distance of 46.0m from a hydrant in accordance with the Department of the Environment's Building Regulations "Technical Guidance Document

Part B Fire Safety" and UÉ standards. Hydrants shall comply with the requirements of BS 750: 2023 and shall be installed in accordance with UÉ Code of Practice and Standard Details.

Individual houses will provide water storage in header tanks and include provision of water conservation measures such as dual flush water cisterns and low flow taps.

The estimated wastewater discharge from the proposed development was calculated following the UÉ Code of Practice for Water Infrastructure with an average daily domestic demand of 0.14 L/sec, average day/peak week demand of 0.18 L/sec, and a peak hour water demand of 0.88 L/sec.

As per the CoF (CDS23008235, refer to Appendix J) it was determined that the water connection is feasible without any infrastructure upgrade work. It is proposed to provide the connection for the site off the existing 6" (150mm) water main running along Station Road outside the proposed housing development, refer to Figure 4-2 below.

Figure 4-2: Proposed Connection Point Watermain

An updated Pre-Connection Enquiry has been submitted to UÉ in October 2024 to verify the above CoF is still relevant. A response is outstanding as per the date of this report.

Appendices

Appendix A – Topographical Survey

www.apexsurveys.ie
info@apexsurveys.ie
00353 1 691 0156

RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH — TR
CATTLE GRID — GRID

LINEWORK:

EMBANKEMENT TOP — 101.50
DRAIN — 101.50
BREAKLINE — 101.50
BUILDING — 101.50
KERB BOTTOM — 101.50
WALL — 101.50
PATH/CHANGE SURFACE — 101.50
O/HEAD ELECTRICITY — OE
O/HEAD TELECOM — OT

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

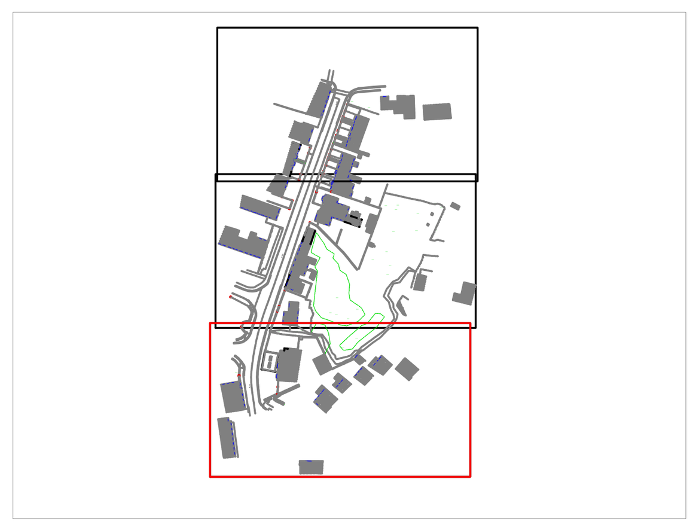
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	BED101.50
EAVE LEVEL	E101.50
FLOOR LEVEL	FL101.50
INVERT LEVEL	IL101.50
ROAD LEVEL	101.50
RIDGE LEVEL	R101.50
SOFFIT LEVEL	SL101.50
SPOT LEVEL	101.50
TOP OF FENCE LEVEL	TOF101.50
TOP OF WALL LEVEL	TOW101.50
WATER LEVEL	WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



PLAN PRODUCED BY:

APEX SURVEYS

CONTACT INFORMATION:

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Dunboyne, Co. Meath, Ireland
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info@apexsurveys.ie
00353 1 691 0156

CLIENT:

Kildare County Council

PROJECT:

Station Road, Kildare

GRID SYSTEM: Irish Transverse Mercator
DATUM: Malin Head (OSGM15)
NOTES: Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

SCALE : 1/200 A1

DATE : 16/12/2023

DRG No: 6075

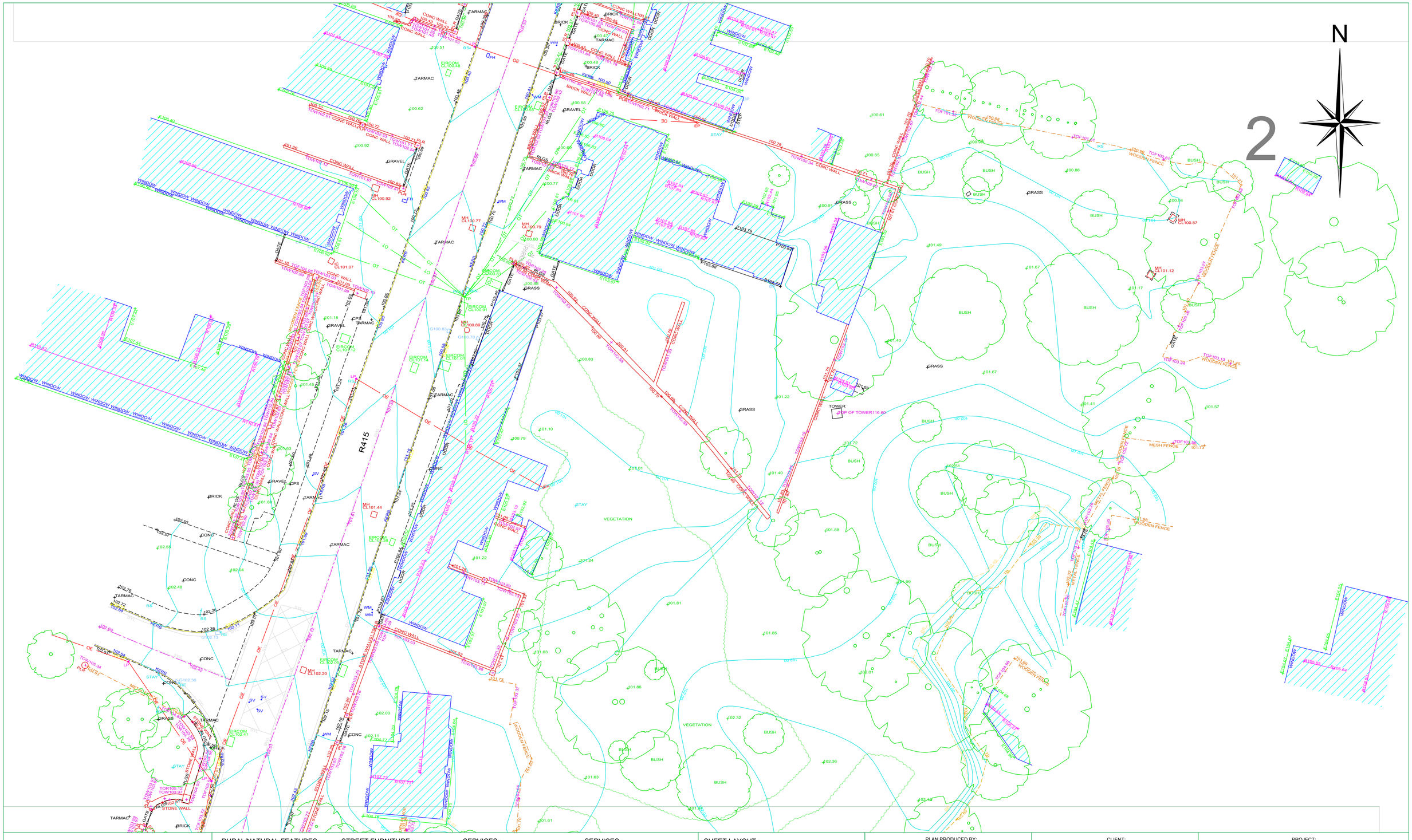
DESCRIPTION : 2D Topographical

SURVEYED BY : C.F.

PROCESSED BY : F.S.

SHEET: 1 of 3

CHECKED BY : A.B.



APEX SURVEYS

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- SAPLING
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EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS RS
SIGN POST	SIGN
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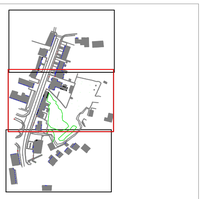

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Kildare County Council

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DATUM: Malin Head (OSGM15)
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DRG No: 6075

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SHEET: 2 of 3

PROCESSED BY : F.S.

CHECKED BY : A.B.

3

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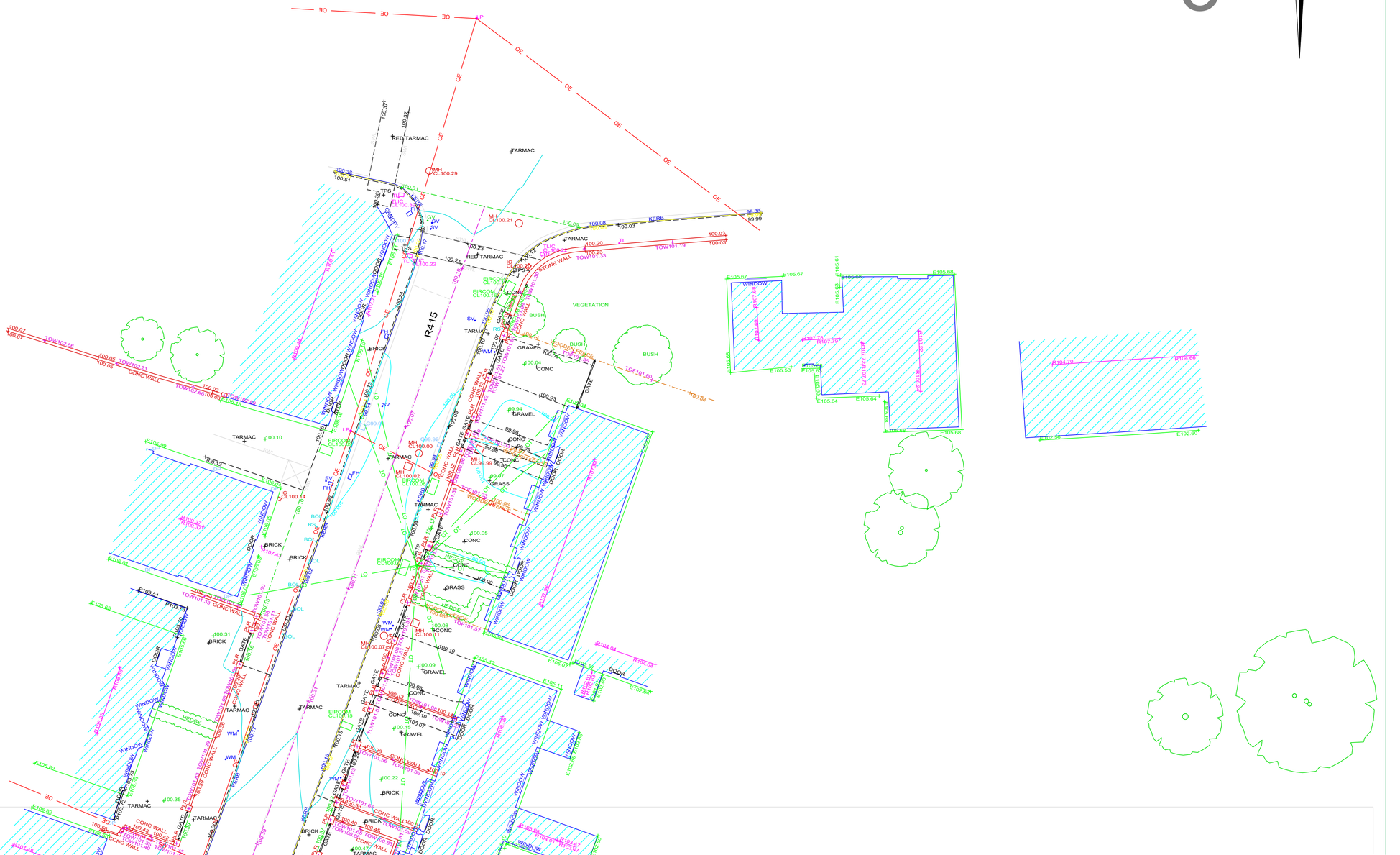

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SOFFIT LEVEL	+SL101.50
SPOT LEVEL	+101.50
TOP OF FENCE LEVEL	+TOF101.50
TOP OF WALL LEVEL	+TOW101.50
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SURVEY CONTROL STATION	

SHEET LAYOUT :

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SCALE : 1/200 A1

DATE : 16/12/2023

DRG No: 6075

SHEET: 3 of 3

DESCRIPTION : 2D Topographical
SURVEYED BY : C.F.
PROCESSED BY : F.S.
CHECKED BY : A.B.

Appendix B – Site Investigations Report

IGSL Ltd

An Triantán,
Station Road Housing

Ground Investigation & Geotechnical Report

Project No. 25468

September 2024

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DOCUMENT ISSUE REGISTER

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Cundall	PDF by email	0	11-09-2024	J. Lawler BSc MSc PGeo EurGeol FGS	P. Quigley BEng CEng MICE MIEI FGS RoGEP Adviser

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FIGURES

TABLES

APPENDICES

FOREWORD
The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards
The ground investigation works for this project (**An Triantán, Station Road Housing**) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as Engineers Ireland Specification for Ground Investigation (2nd Ed, 2016), BS 5930 (2015+A1:2020) and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Principles for a classification
- EN ISO 14689-1:2017 Geotechnical Investigation and Testing – Identification, description & classification of rock

The Eurocode 7, Part 2 – Ground Investigation and Testing GI specification shall be read in conjunction with the Specification and Related Documents for Ground Investigation in Ireland, 2nd Edition, published by Engineers Ireland in 2016.

Reporting
No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations. The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

This report has been prepared for Cundall and the information should not be used without their prior written permission. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

Boring Procedures
Where required, 'shell and auger' or cable percussive boring technique is employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing meet with the recommendations set out in IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variation is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). 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.

In-Situ Testing
Where required, Standard Penetration Tests (SPT's) are conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is

available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Soil Sampling

Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Class 1 thin wall undisturbed tube samples (UT100) were obtained in fine grained soils and strictly meet the requirements of EN 1997-2:2002 and EN ISO 22475-1:2006. Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

Table A – Details of Sample Quality Requirements

EN 1997 Clause	Test	Minimum Sample Quality Class
5.5.3	Water Content	3
5.5.4	Bulk Density	2
5.5.5	Particle Density	N/S
5.5.6	Particle Size Analysis	N/S
5.5.7	Consistency Limits	4
5.5.8	Density Index	N/S
5.5.9	Soil Dispersivity	N/S
5.5.10	Frost Susceptibility	N/S
5.6.2	Organic Content	4
5.6.3	Carbonate Content	3
5.6.4	Sulphate Content	3
5.6.5	pH	3
5.6.6	Chloride Content	3
5.7	Strength Index	1
5.8	Strength Tests	1
5.9	Compressibility Tests	1
5.10	Compaction Tests	N/S
5.11	Permeability	2

N/S – not stated. Presume a representative sample of appropriate size.

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

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 conditions, tidal variations etc.

Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2017 and IS EN ISO 14688-2:2017. Rock weathering classification conforms to IS EN ISO 14689-1:2017 along with discontinuities (bedding planes, joints, cleavages, faults etc) as classified in Section 6.4 of IS EN ISO 14689-1:2017 and Annex C of same. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

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

Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be 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.

1. INTRODUCTION

IGSL Limited has undertaken a ground investigation at a greenfield site in Kildare Town. The site comprises an enclosed grassed area bound on all sides by existing housing and their rear gardens. The 1.3acre site was accessed off the R145 Station Road for the purposes of the investigation. The works were undertaken to establish the ground and groundwater conditions for a proposed new 1 to 3-storey housing development at the existing site.

Intrusive works were sited on grassed areas set out (and micro-sited where necessary) according to the Cundall drawing ATR-CDL-XX-XX-DR-GE-60801 entitled 'Proposed Exploratory Hole Location Plan'. The site is bound to the east by the houses of Campion Cresent, to the west by a low terrace of vacant properties fronting onto Station Road and to the south by Dara Park housing estate.

Figure 1 – Site Location Plan

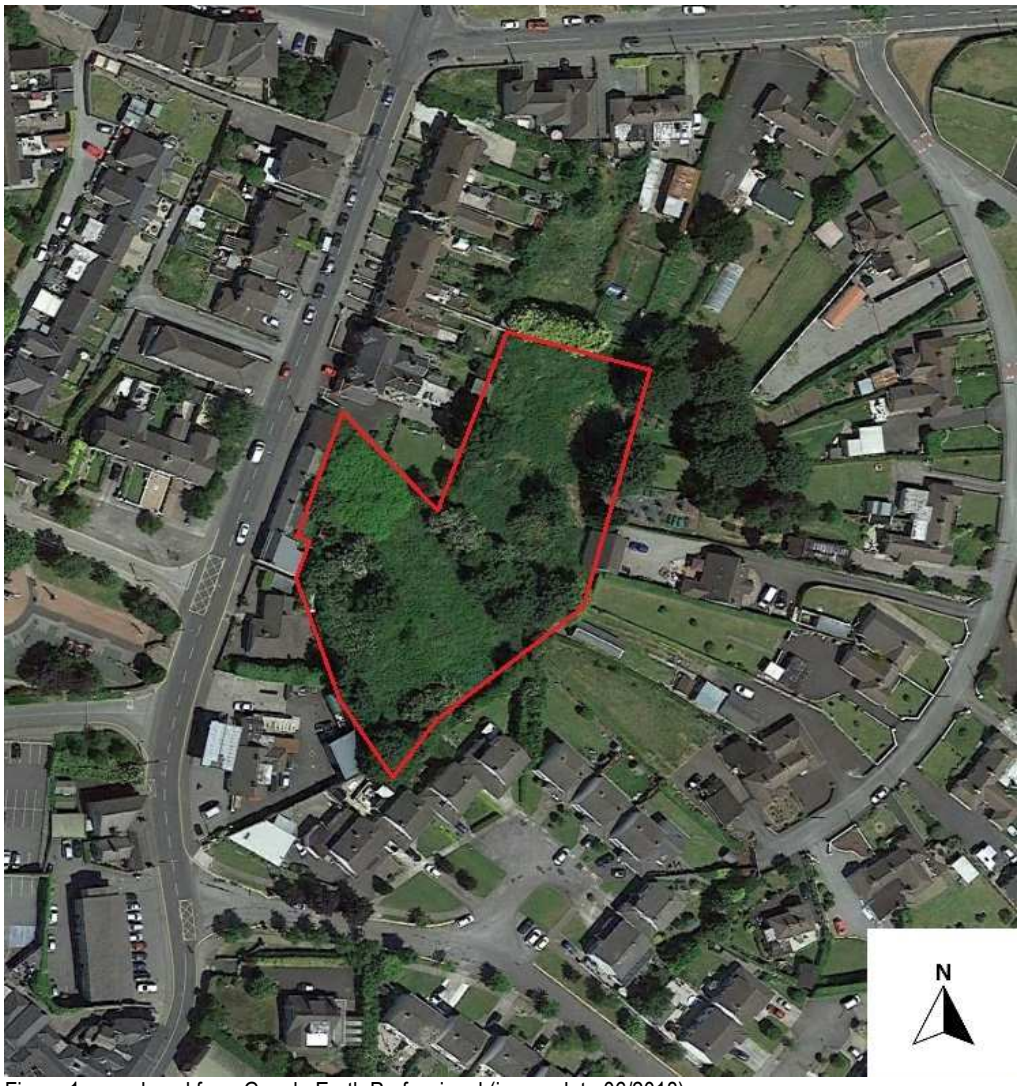


Figure 1 reproduced from Google Earth Professional (image date 06/2018)

The investigation comprised machine-dug trial pits, cable percussion boreholes, soakaway tests (to BRE365) and plate bearing tests. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (2015+A1:2020) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing and supervised by an IGSL geotechnical engineer.

Geotechnical, chemical and environmental laboratory testing was scheduled on a range of soil samples. The geotechnical testing included moisture contents, Atterberg Limits, PSD gradings and hydrometer tests. Chemical testing was undertaken to BRE SD-1 on the soil samples. Environmental tests were undertaken on soil samples (WAC *Rilta* suite) to assess suitability for off-site disposal to landfill and/or Soil Recovery Facility.

The 'as-built' co-ordinates and ground levels are shown on the exploratory hole logs. The exploratory hole locations are plotted on the site plan in Appendix 8. Stratigraphic cross sections feature in Appendix 9 drafted in both S-N and W-E orientations. This report presents an interpretation and evaluation of the ground and groundwater conditions and an assessment of the key geotechnical issues impacting on the proposed development.

.

2. FIELDWORK

2.1 General

The fieldworks were undertaken in June and early July 2024 and comprised the following:

- Trial Pits (4 No.)
- Cable Percussion Boreholes (5 No.)
- Soakway Test (2 No.)
- Plate Bearing Tests (4 No.)
- Groundwater Monitoring
- Surveying of Exploratory Hole Locations

2.2 Trial Pits

Trial pitting was performed at four locations across the site with pits ranging in depth from 2.20m to 2.70m. All trial pits were excavated, logged and sampled under the direction of an IGSL geotechnical engineer in accordance with BS 5930 (2015+A1:2020). Bulk disturbed samples (typically 20 to 30kg) were taken as the pits progressed. Environmental samples were also taken in the upper strata.

The bulk samples were placed in heavy-duty polyethylene bags. The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site geotechnical engineer. The trial pit logs and photos are presented in Appendix 1 and include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls.

2.3 Cable Percussion Boreholes

Cable percussive boring (200mm diameter) was undertaken at five locations using a Dando 150 rig. The boreholes extended to depths of between 5.40m and 6.70m. At each location, boring commenced through a hand-dug service inspection pit. Throughout boring, disturbed bulk samples were recovered at 1m intervals or change of strata during boring and these are denoted 'B' on the engineering logs. As with trial pits, environmental samples were also taken in the upper strata. These are recorded 'Env' on the logs.

Standard Penetration Tests (SPT's) were performed in the boreholes and given the nature of the soils, a solid cone was used. It is noted that the SPT N-Values reported are the number of blows for 300mm increment penetration (e.g. BH01 at 2.0m where N=18). These exclude the seating blow values, which represent the initial 150mm depth of penetration. Where partial penetration was achieved during testing, the number of blows is shown for the actual penetration depth achieved (e.g. BH04 at 6.0m where N=50/75mm). In accordance with Eurocode 7, the SPT hammer has been calibrated and the energy ratio (Er) value is incorporated on the engineering logs. It is highlighted that the SPT N-Values reported on the engineering logs are uncorrected for energy ratio. The hammer calibration certificate is presented in Appendix 2 with the logs.

Descriptions of the soils encountered, in-situ tests undertaken and samples recovered are presented on the borehole records in Appendix 2. Details of groundwater strikes and hard strata boring (i.e. chiselling) are also presented on the aforementioned records.

2.4 Soakaway Tests (to BRE 365)

Two number infiltration tests were performed to assess the suitability of the sub-soils for dispersion of storm water through a soakaway system. The infiltration tests, undertaken in the test pits (BRE_), were performed in accordance with BRE Digest 365 'Soakaway Design'. To obtain a measure of the infiltration rate of the sub-soils, water was poured into each test pit, with records taken of the fall in water level against time. Following the first soak cycle, the procedure was repeated to ensure saturation of the sub-soils. A total of three soak cycles were completed at each test location. The infiltration rate is the volume of water dispersed per unit of exposed area per unit of time, and is generally expressed as metres / minute or metres / second. Designs are based on the slowest

infiltration rate, which is generally calculated from the final soak cycle. The soakaway design logs are presented in Appendix 3.

2.5 Plate Bearing Tests

Four plate bearing tests were conducted at depths ranging 0.30m to 0.70m below ground level [bgl]. Plate testing was undertaken to evaluate the modulus of sub-grade reaction (Ks) and equivalent CBR value. A 450mm diameter plate was used for the tests with kentledge provided by a tracked excavator. Two load cycle tests, in accordance with BS 1377, were performed and the load / settlement plots, Ks and equivalent CBR values are presented in Appendix 4 of the report.

2.6 Groundwater Monitoring

Groundwater monitoring was undertaken following installation of standpipes in the two cable percussion boreholes. Groundwater levels were measured using an electric dipmeter. The levels recorded are shown in Appendix 5.

2.7 Surveying of Exploratory Hole Locations

Following completion of the exploratory works, surveying was carried out using GPS techniques. Co-ordinates (x, y) were measured to Irish Transverse Mercator and ground levels (z) established to Malin Head. The co-ordinates and ground levels are shown on the exploratory hole logs with locations shown on the exploratory hole plan in Appendix 8.

3. LABORATORY TESTING

Geotechnical laboratory testing was performed at IGSL's INAB-accredited laboratory in accordance with the methods set out in BS1377; British Standard Methods of Test for Soils for Civil Engineering Purposes; British Standards Institute:1990. The geotechnical testing included moisture contents, Atterberg Limits and particle size distribution [PSD] testing. The results from geotechnical testing on selected trial pit and borehole soils are presented in Appendix 6.

Both chemical (BRE SD1 – Suite D) and geo-environmental testing (*Rilta* Suite) was undertaken on soils. The chemical and environmental results are presented in Appendix 7.

4. DESK STUDY

4.1 Online Historical Drawings

The OSI drawing retrieved from the UCD online library "surveyed" in 1872 (Figure 3) shows the southern portion of the site and the subdivision of the rear gardens off what was known as 'SHRAUD' rather than Station Road. A '*Forge*' is located at the northern end of the terrace.

Reference to the OSI drawings from the nineteenth (1829-41) and turn of the nineteenth / twentieth century (1897-1913) shows a largely greenfield site. The back gardens of the terrace on Station Road extend to the southeast across the plot.

Brick-built Victorian semi-detached housing named '*Kilmore*' and '*Tourville*' are noted on the OSI 25" drawing.

OSI Orthophotography from 2013-18 show the site in a grassed state with encroaching boundary hedges from neighbouring gardens.

Figure 2 – Part of Map 4 Ordnance Survey Index to the Map of the Town of Kildare showing housing terrace & 'Forge'. Survey dated 1872. (OSI, 1874)

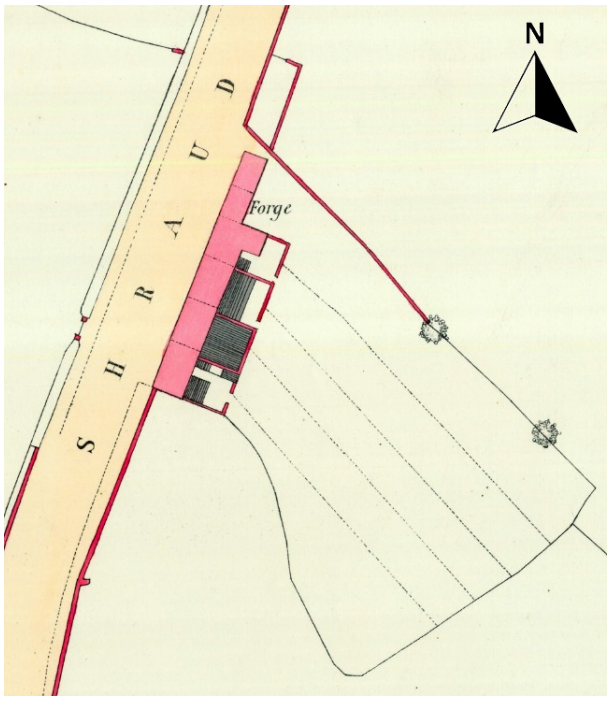
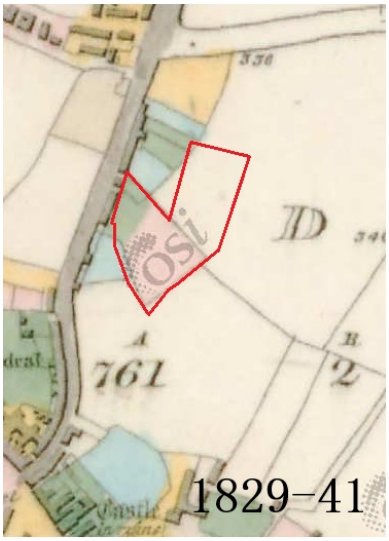
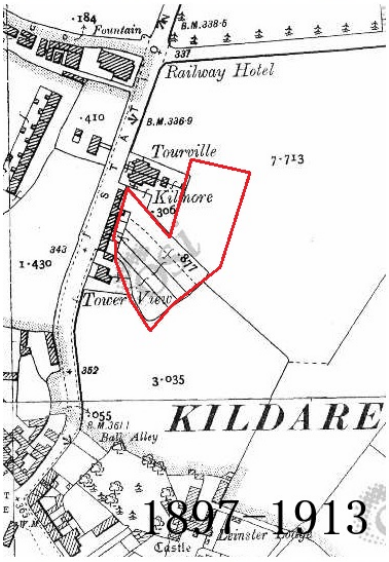


Figure 3 – OSI 6" and 25" scale drawings dated 1829-41 and 1897-1913. Aerial image dated 2013-18. Site outlined red.
Retrieved from Tailte Éireann Irish Townland and Historical Map Viewer

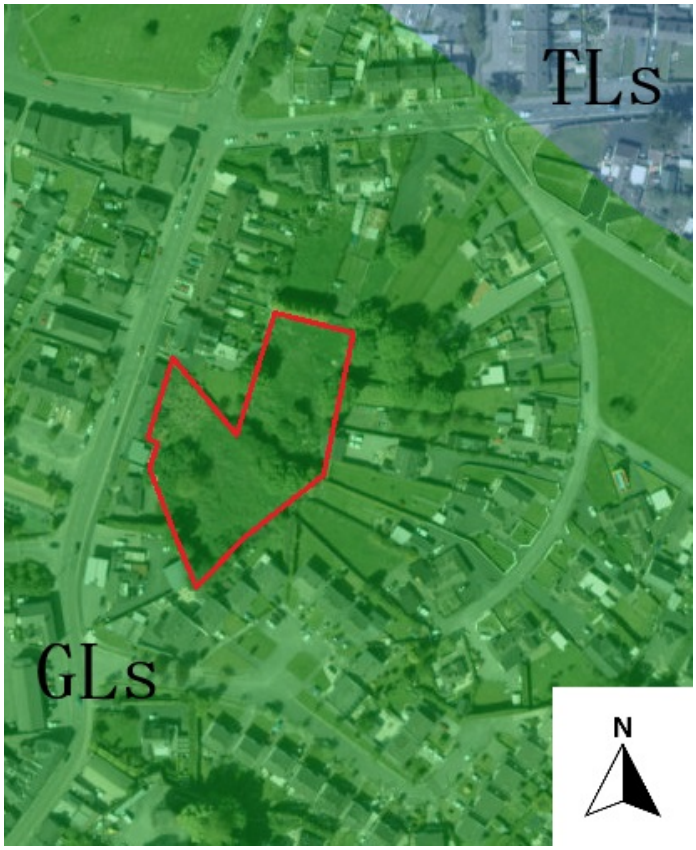




4.2 GSI Database Information

The Quaternary Soils map for the area (Figure 4 - retrieved from GSI website) indicates the presence of Gravels derived from Carboniferous-aged limestone.

Figure 4 – Quaternary Soils Map for the Kildare Town Site



Map Key	**TLs**	- Till derived from Limestones
	GLs	- Gravels derived from Limestones

Reference to the GSI map for the area (Figure 5, extract from 1:100,000 Solid Geology series) shows that the site is underlain by the Carboniferous-aged nodular and muddy limestone and shales of the Boston Hill Formation (BN).

Figure 5 - Bedrock Geological Map for the Kildare Town Site

Key: **BN** = Boston Hill Formation
RK = Rickardstown Formation

5. GROUND CONDITIONS & GROUNDWATER

5.1 Ground Profile – Superficial Deposits

The following is a summary of the ground conditions encountered at the proposed housing development:

TOPSOIL

- Borehole locations report widely varying thicknesses of topsoil ranging from 0.10m to 0.65m. Pits show upper dark brown sandy gravelly clay soils contain many roots and rootlets. However, the pit logs suggest these are part of a mantle of Made Ground which exists up to thicknesses of 1.70m bgl (TP01).

MADE GROUND

- Despite not being registered by the drilling team in any of the five boreholes, the four trial pits each reported Made Ground to depths ranging 0.40m to 1.70m. It should be noted that the 1.70m thickness of Made Ground logged in TP01 was measured from the top of a localised embankment and as such does not imply Made Ground to 1.70m below existing ground level on the site. The greatest depth to the base of Made Ground was measured in TP04 to the north of the site where the pit showed a thickness of 1.50m (99.29m OD) of Made Ground.

- The Made Ground at TP01 (inclusive of the embankment of heaped soil) was described as a dark brown sandy gravelly Silt with rare waste (plastic, cans), rare roothair, rootlets and pockets of organic material. It was logged to a depth of 1.70m (101.29m OD) in the pit.

- A thin cover of Made Ground was excavated in TP02. Rare waste (discarded rubbish) was remarked in the layer of dark brown sandy gravelly CLAY with rootlets to a depth of 0.40m bgl (101.34m OD).

- At TP03, a 0.70m thick cover of Made Ground was identified. No anthropogenic content was observed however. The stratum extended to a depth of 0.70m (101.05m OD).

- As noted earlier, the thickest accumulation of Made Ground was found in TP04 where a depth of 1.50m (99.29m OD) was recorded. The soil was logged as a dark brown sandy gravelly Clay with rare waste (discarded rubbish) and rootlets.

- The geo-environmental testing performed on samples from both TP01 and TP04 where Made Ground was logged, found no metallic or organic exceedance which might suggest Made Ground. However, a very slight Total 17 Polycyclic Aromatic Hydrocarbon signature was detected in a sample from BH03 at 0.65m bgl. This may indicate the presence of contaminated ground locally.

OVERBURDEN DEPOSITS

- Pit TP01, to the east of the site, revealed from 1.70m (101.29m OD) a firm to stiff light brown slightly sandy slightly gravelly SILT/CLAY with a low cobble content. The pit was ended at 2.60m (100.39m OD) in this same material.

- TP02 and TP04 exhibited a similar soil profile. In both pits the uppermost indigenous soils were described as stiff light brown sandy gravelly silty CLAY to ca. 1.30m / 1.50m bgl.

- From 1.30m (TP02) and 1.50m (TP04) however, the deposits were classed as (dense to medium dense) greyish brown clayey/silty very sandy GRAVEL with a medium cobble

content. This deposit was found to the base of both trial pits to depths of 2.20m (99.54m OD) and 2.70m (98.09m OD).

- TP03, similar to TP01, was found to have stiff light brown sandy gravelly CLAY with a low cobble content. The pit ended in this material at 2.20m bgl.

- Each of the five boreholes conducted on site intercepted a light brown sandy gravelly CLAY/SILT, reported firm based on SPT N-values (See Figure 6). From ca. 1.50m to 2.50m, stiff ground was noted, again based on SPT N-values. The soils were still described as fine grained, comprising brown slightly sandy slightly gravelly CLAY.

- The entry of coarse medium dense to dense slightly clayey/silty very sandy GRAVEL was not recorded until depths ranging 3.50m to 4.50m bgl. Save for BH04, all bores terminated in this granular deposit between 5.40m and 6.20m. A sieve analysis undertaken on a sample from the base of BH04 suggests the soil profile transitioned to a stiff brown slightly sandy slightly gravelly SILT/CLAY. BH04 terminated at 6.70m bgl (95.44m OD).

- In-situ testing was undertaken during the construction of all five cable percussion bores. The standard penetration test [SPT] allows for an appraisal of the ground stiffness. A plot showing the blowcounts generated from testing is presented in Figure 6. SPT testing undertaken in the natural overburden soils generally proved the presence of initially firm becoming stiff to eventually very stiff CLAY passing to a dense GRAVEL deposit with depth. From 5m bgl, many of the test drives were reported as refusals once in the deeper-seated soils and therefore appear along the right-hand side of the plot.

Figure 6 – SPT Plot versus Depth for Cable Percussion boreholes

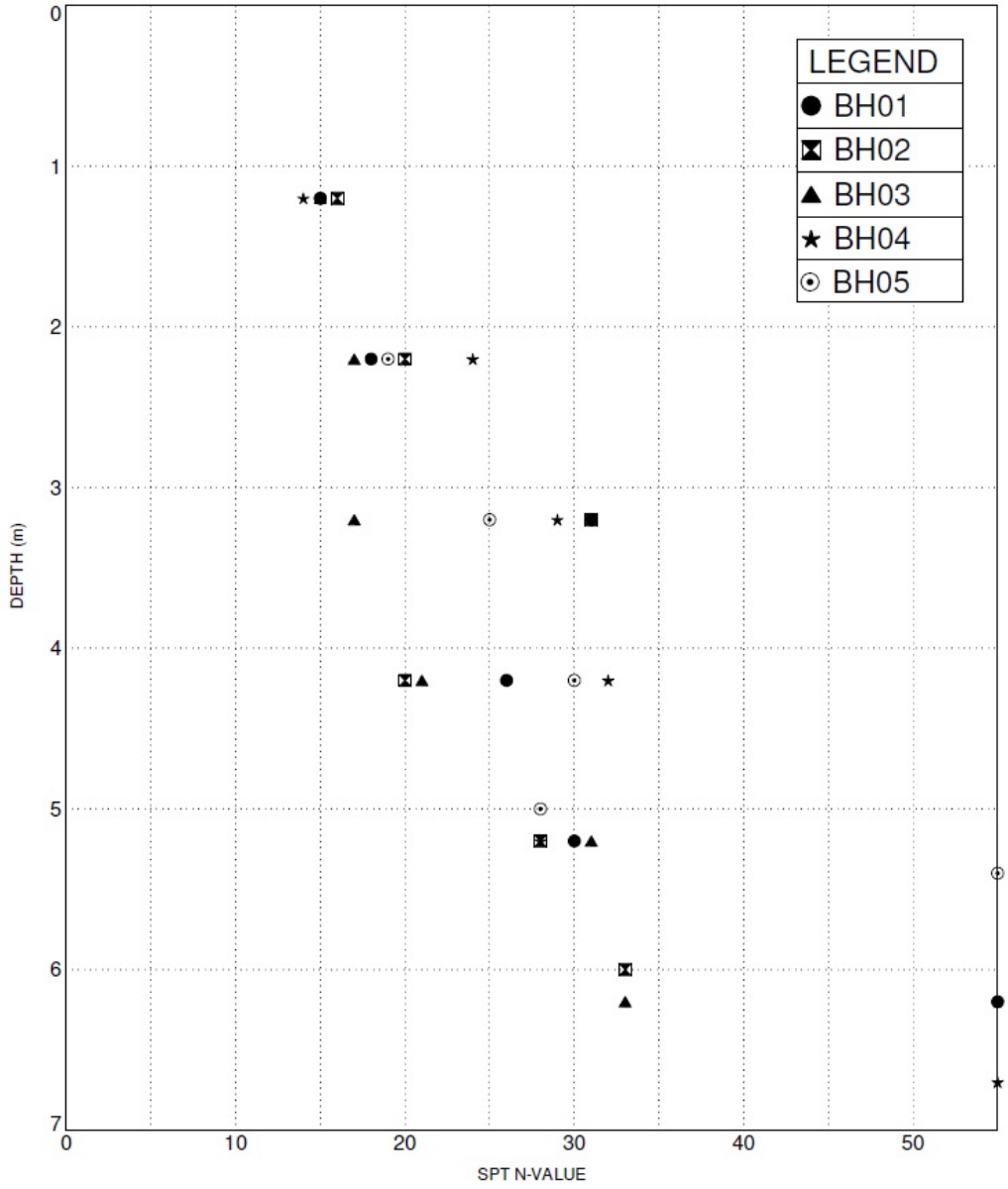


Figure 7A - 7F – Soil profiles in pits TP01, TP03 & TP04. Fig 7A Sidewall in TP01 to 2.60m base – dry pit. Dark brown sandy gravelly SILT with rare waste (plastic, cans), rare roothair, rootlets, pockets of organic material and lenses of sand (MADE GROUND) to 1.70m bgl. Firm to stiff light brown slightly sandy slightly gravelly SILT/CLAY logged to pit end depth of 2.60m. Pit reported to have been excavated into an embankment. **Fig 7B** TP01 spoil. **Fig 7C** TP03 sidewall showing MG / Clay to 0.70m. Made Ground underlain by stiff light brown sandy gravelly CLAY with cobbles to 2.20m bgl. **Fig 7D** TP03 spoil. **Fig 7E** TP04 sidewall showing MG / dark brown sandy gravelly Clay to 1.50m. A thin layer of stiff light brown sandy gravelly silty CLAY extended from 1.50-1.60m. The pit ended in (dense to medium dense) greyish brown clayey/silty very sandy GRAVEL to 2.70m. **Fig 7F** TP04 spoil.

Fig 7A

Fig 7B

Fig 7C

Fig 7D

Fig 7E

Fig 7F

5.2 Bedrock

As referenced earlier in Section 4.2, the GSI rock map for the area (Figure 5, 1:100,000 Solid Geology series) shows that the Boston Hill Formation underlies the site. The formation is comprised of nodular and muddy limestone and shales. Rotary core drilling of bedrock was not specified as part of the scope.

5.3 Groundwater

Water strikes were absent in the four trial pits to their base depths ranging 2.20m to 2.70m bgl. Water was added to boreholes to promote shelling in dry sandy gravel. No actual strikes were observed in the boreholes but water was dipped following drilling and at the end of each borehole. The addition of water to facilitate boring may have served to artificially inflate "groundwater" depths measured in open bores. Wells were installed in both bores BH02 and BH05 to allow longer term monitoring.

As noted, standing water was measured following completion of boring shifts and at the end of actual borehole construction. The water observations are presented in Table 1. The potential does exist for there to be seasonal changes in groundwater level. Additionally, a consistent groundwater level may take time to re-establish.

Table 1 – Water measurements in on-site exploratory holes

Exploratory Hole No.	Remarks / Stratum of water ingress (m OD)
BH01	Water dipped at 2.50m bgl / 99.59m OD at the end of BH. BH at 6.20m (27-06-24).
BH02	Water dipped at 4.80m bgl / 96.77m OD at the end of Day 1. BH at 5.0m (25-06-24). Water dipped at 5.80m bgl / 95.77m OD at the end of BH. BH at 6.0m (26-06-24). Well dipped 11-09-24 – Dry (Well base 5.60m)
BH03	Bore reported dry at 4.0m bgl / 97.10m OD at the end of Day 1 (28-06-24). Water dipped at 5.60m bgl / 96.10m OD at the end of BH. BH at 6.20m (29-06-24).
BH04	Water dipped at 5.0m bgl / 97.14m OD at the end of Day 2. BH at 5.20m (19-06-24). Water dipped at 6.0m bgl / 96.14m OD at the end of BH. BH at 6.70m (20-06-24).
BH05	Water was dipped at 2.40m bgl / 98.43m OD at the end of BH. BH at 5.40m (03-07-24). Well dipped 11-09-24. Groundwater at 3.80m bgl.

6. GROUND ASSESSMENT & ENGINEERING RECOMMENDATIONS

6.1 General

In light of the ground investigation findings, the following geotechnical issues are developed and discussed for engineering design:

- Bearing Capacity & Foundations
- Ground Bearing Slab
- Groundwater / Infiltration
- Slope / Batters
- Pavement Construction
- Buried Concrete
- Waste Acceptance Criteria [WAC] & Environmental Testing – *Soils destined for Landfill*

6.2 Bearing Capacity & Foundations

Boreholes established near surface firm and firm to stiff sandy gravelly SILT/CLAY from ca. 0.50m. However, the trial pits noted significant thicknesses of Made Ground gravelly Clay from 0.40m to 1.70m. In the case of TP03, Made Ground was logged to 1.50m depth, an equivalent level of 99.29m OD. Dig depths will ultimately be influenced by the localised thicknesses of Made Ground. It is expected that excavate and replace methods will be required whereby low-grade concrete (C20) would be used to build up dig levels to underside of foundations. In the trial pits, Made Ground was found to be underlain by a natural firm to stiff, in some cases stiff CLAY/SILT.

As can be seen from the SPT N-Values v Depth plot (Figure 6), the soils from c1.20 to 2.20m are classed as firm to stiff. According to SPT testing, there is consistency in the strength profile of the upper soils, a feature which might not be expected given the discovery of Made Ground in trial pits - up to 1.50m deep in TP04.

Overall, accounting for the presence of Made Ground (potentially up to 1.50m deep), the natural soils are generally firm becoming firm to stiff. At a dig depth of 1.50m, these soils should provide an allowable bearing capacity of 125kPa. Where Made Ground is absent, and where suitably firm / stiff indigenous soils are present higher in the stratigraphy, the dig depth could be reduced somewhat, ie., to ca. 0.70-0.80m.

Should higher bearing pressures be required, the underlying superficial deposits show some increase in strength. The SPT plot generated from borehole in situ testing suggests stiff CLAY occurs from ca. 2m depth. The occurrence of sandy Gravel varies from 1.30 to 1.60m in trial pits and from 3.50 to 4.50m in boreholes. Gravels were intercepted in two of the trial pits prior to their termination. Their presence in trial pits implies sandy Gravel occurs higher in the stratigraphy than was evidenced in the boreholes.

The medium dense sandy Gravel (1.30-1.60m trial pits) should provide an allowable bearing capacity of 150kPa. Pits ended in the denser Gravel at depths ranging 2.20m to 2.70m. Capacities of 200kPa should be achieveable in this deeper-seated Gravel from approximately 2.0m. Although not viewed in boreholes until 3.50m bgl, a stiff CLAY exists from ca. 2.0 to 2.50m bgl. Therefore, a bearing capacity value of 200kPa could also be attributed to this layer at ca. 2.0m bgl.

Given the variable conditions on site coupled with inconsistent Made Ground thicknesses, excavation of pads / strip footings on site should be monitored by a suitably qualified engineering geologist / geotechnical engineer. Plate load tests (minimum of 600mm diameter), if practical given dig depths, are particularly useful in evaluating performance under loading and deciding on a suitable formation depth.

6.3 Ground Bearing Slab

In order to support conventional ground bearing slabs, it is recommended that a firm (medium strength) formation is reached (minimum CBR value of 3% by plate load test method Any soft or low strength upper soils / Made Ground should be removed before placement of hardcore (T0, T1).

It is possible that plastic dominant Made Ground and/or organic-containing material (wood / root fragments) will be intercepted across the dig area. Where soft or Made Ground soils occur, they will require special attention. Depending on their areal extent, they could be excavated and replaced with imported T0 or T1 Struc unbound granular fill, compacted in layers. It will be important to discern the extent and depth of Made Ground mantling the site as this will better inform the quantities of soil for eventual removal and replacement. Additional pitting / window sampling in the area of both TP01 and TP04 would be recommended in this case.

T0 / T1 used on site should meet the requirements in Annex E of SR21:2014+A1:2016 and would be expected, upon compaction, to achieve a CBR of 15% (as determined by plate load test method).

Ahead of using engineered FILL beneath floor slabs, imported granular fill 'hardcore' used in any foundation application or under concrete slabs at the site should meet the requirements of Annex E of SR 21;2014+A1;2016. It is recommended that T0 Struc is used in conjunction with T1 Struc. The T0 and T1 hardcore fills should be rigorously tested (independent of the quarry source) to ensure that they meet the physical, durability, chemical and mineralogical characteristics as set out in the aforementioned Annex E of SR 21;2014+A1;2016. Independent testing on samples of the proposed source hardcore is strongly recommended in advance of the material being used on the site. As a minimum, particle size gradings, chemical tests and geological classification / simplified petrology are advised to screen the material and independently assess compliance with Annex E, SR21;2014+A1;2016.

Compaction / Placement of imported granular fill or hardcore will need to achieve a low air voids (<5%) and ensure that settlement is not an issue. In the case of layer thickness, number of roller passes and mass per metre and width of roll should meet the guidelines in I.S. 888:2016. Layer thickness should not exceed 200mm using a smooth drum roller with a mass per metre of roll of not less than 5400 kg.

6.4 Groundwater / Infiltration

As noted in Section 5.3, groundwater strikes were absent in both trial pits and boreholes. However, water was later reported in the base of boreholes upon completion. Returning to site in September 2024, the wells installed at BH02 and BH05 were dipped. BH02 was found to be dry to a base depth of 5.60m bgl (95.97m OD). Water was dipped in BH05 at 3.80m bgl. Based on these findings and those made during the construction of the intrusive exploratory holes, shallow temporary excavation should generally see an absence of water ingress in natural deposits.

Should water be encountered during deeper digs / excavations, it is likely that de-watering will be required through a combination of strategic sump pumping and / or perimeter drains. As mentioned in Section 5.3, the potential does exist for there to be seasonal changes in groundwater level. The works were carried out during summer 2024. It may be the case that the various waterbodies at depth are subject to seasonal variations.

Two soakaway tests were conducted on the site. The tests were carried out in the overburden soils within open excavations. The test pits were excavated through the uppermost firm / stiff silty CLAY and clay Made Ground in the case of SA02 (TP04), exposing the sandy GRAVEL at depth. The permeable nature of the coarse-grained soils may account for the moderate to low infiltration observed at both test pits.

The soils demonstrated a natural permeability, providing low to moderate natural soakage. The existence of lowerbound dry Gravel in all five boreholes suggests the coarse-grained soils may be extensive at depth. This may warrant further examination to assess the areal extent of the permeable deposit.

Table 2 – Measured infiltration rates (f) expressed as exposed area (metre) per unit time (minute)

Soakaway Test No.	Depth of Test (m bgl)	*f* (m/min)	*f* (m/sec)
SA01 (TP02) (Stage 1)	1.60	0.05217 m/min	8.695E -04 m/sec
SA01 (TP02) (Stage 2)	1.60	0.01664 m/min	2.773E -04 m/sec
SA01 (TP02) (Stage 3)	1.60	0.01431 m/min	2.385E -04m/sec
SA02 (TP04) (Stage 1)	1.75	0.01214 m/min	2.02E -04 m/sec
SA02 (TP04) (Stage 2)	1.75	0.01143 m/min	1.90E -04 m/sec
SA02 (TP04) (Stage 3)	1.75	0.01262 m/min	2.10E -04m/sec

6.5 Slopes / Batters

A maximum slope angle of 1V to 1.5H (33º) is recommended for temporary berms or batters formed within the upper medium strength fine grained soils. A long-term slope angle of 1V to 2 (26°) should be appropriate for batters in the same soils. Where deep excavation works are required in the superficial deposits, the use of trench box support is advised, especially given the potential for encountering coarse-grained depsits at depth. In addition, the uppermost fine subsoils will be susceptible to softening and degradation and surface water or groundwater ingress can lead to a significant reduction in shear strength. Perched water can exist locally (potentially in isolated lenses of sandy Gravel) and this should be considered in risk assessments for excavations.

Site operatives or personnel should not enter unsupported excavations and should be informed of potential risks. Where site operatives or engineering staff work in close proximity to temporary slopes or batters, these should be inspected and approved by a suitably experienced civil engineer, preferably with geotechnical experience. Where there is a risk of spalling of battered slopes, the use of a geogrid is recommended. The geogrid should be anchored at the top and bottom of the ridge face to contain particles such as gravel, cobbles and / or boulders that may become dislodged.

Man-entry into any deep excavation should be appropriately assessed and an AF3 form completed. The AF3 form details the thorough examination of an open excavation as well as documenting daily worksite inspections.

6.6 Pavement Construction

Four plate load tests were conducted on the shallow subsoils at depths ranging 0.30m to 0.70m bgl. The plate load test permits an assessment of the in-situ stiffness of the upper soil. The test results are reported in Appendix 4 of the report and are summarised below in Table 3. Equivalent CBR values of 1.8 to 8.6% were determined on the initial loading cycles (Cycle 1) with values of 4.1 to 17.4% on the reload cycles (Cycle 2). It should be noted that each plate load test was conducted on brown sandy gravelly Clay soils, thought to be Made Ground. An improvement in stiffness was noted from load to reload cycle which would suggest proof-rolling of the subgrade soils ahead of hardcore placement will be of benefit to the overall strength of the layer.

Table 3 – Equivalent CBR % Values obtained in Plate Bearing Testing

Test No.	Depth	CBR at Load Cycle (%)	CBR at Re-Load (%)
PBT 01*	0.65	8.6	9.4
PBT 02*	0.30	5.5	17.4
PBT 03*	0.50	2.9	4.7
PBT 04*	0.70	1.8	4.1

*Test performed on Made Ground - Based on Trial Pit Logs

Based on the plate load test results, and in accordance with the Design Guidance for Road Pavement (HD 25-26/10:2010), a conservative CBR design value of 2% is recommended for the near surface soils in their current state. Ahead of road construction, and following static compaction of the soils, a further set of plate testing (450 or 600mm diameter) could be undertaken to assess the improvement in stiffness of the formation. Given the improvement seen in testing (from load to reload), if the same test levels are again adopted it is likely that some improvement will be achieved. Likewise, should a deeper stratum be chosen as road formation level, there may be a marked improvement registered in subgrade quality, ie., a higher CBR value obtained in plate testing.

Assuming a design CBR value of 2% for the upper soils then a minimum 6F capping thickness of 500 to 600mm and a sub-base thickness (UGM) of 150mm is recommended to support road pavements. If or where very low strength subgrade occurs (CBR <1%) either geogrid reinforcement or the use of starter material (Class 6A / 6B) could be considered to provide a suitable foundation layer especially for access or haul / spine roads if they traverse low strength subgrades. Such a mechanically stabilized layer could consist of a layer of geogrid with 500 to 600mm of granular fill (well graded aggregate with maximum particle size of 75mm). Where geogrid is not utilized then approximately 500mm build-up of Class 6A / 6B starter layer material could be considered in conjunction with a capping layer (Class 6F capping in line with Series 600 of TII SRW). This should provide a satisfactory foundation layer to adequately support the subbase / pavement (150mm of unbound granular material (UGM) in accordance with Table 2.1 of CC-SPW-00800 (TII August 2022). The aforementioned Class 6A / 6B material could be used in conjunction with ca. 300mm of 6F capping material. This should provide a robust foundation layer.

The time of year will play a role in sub-grade strength especially during winter or early spring where heavy rainfall would cause degradation / wash-out of the formation or dilatancy in the upper occasionally silt-dominant subsoil. Oppositely, in summer, the performance of the soil subgrade may be significantly improved dependent on moisture content levels in the upper soil. If there are particular concerns regarding the condition of the formation soils, then additional plate bearing tests should be considered during construction to verify or validate the stiffness / density of the formation soils and adequate capping thickness.

The durability of the capping material should be confirmed as capping will be exposed to the elements (especially if the works are undertaken during the winter / spring period). It is important that argillaceous sedimentary rocks (i.e. muddy limestone, calcareous mudstone, shale, etc.) are not used as capping or as a starter layer. These have high potential to give rise to degradation (i.e. poor durability and soundness) and slaking and therefore would not be suitable.

All granular fills / unbound granular mixtures (UGM) used in pavement construction should be tested and approved in advance of being used in pavement construction. They should meet the compositional, chemical and soundness requirements as prescribed in the TII publication entitled Road Pavements – Unbound and Hydraulically Bound Mixtures (CC-SPW-00800 – dated August 2022).

Compaction / Placement of imported granular fill or hardcore should achieve a low air voids (<5%) and ensure that settlement is not an issue. The number of roller passes and mass per metre and width of roll should meet the guidelines in I.S. 888:2016 Annex B: Compaction requirements for unbound mixtures Table B.1. It is recommended to use a smooth drum roller (without vibration) with a mass per metre of roll of not less than 5400kg. Unbound mixtures should not be laid in layers greater than 150mm if using this compaction method.

6.7 Buried Concrete

The chemical analysis tests on natural soil samples show pH values ranging from 8.3 to 8.6. The sulphate aqueous extract (SO_4) results from the borehole and trial pit soil samples determined values of <10mg/l. This would suggest BRE Design Sulphate Class DS-1. Table C1 ACEC for greenfield sites in BRE SD 1 (2005) can be used in the selection and design of concrete. If mobile groundwater conditions prevail at the site and given the pH values obtained from the testing, then ACEC class AC-1^d would be expected to be appropriate for buried concrete in the soils. In line with I.S. EN 206-1:2013, concrete could be manufactured to Class XA1 where founded or positioned in the upper soils (Class XA1 being ≥ 2000 and ≤ 3000 SO_4^{2-} mg/kg).

6.8 Waste Acceptance Criteria [WAC] & Environmental Testing

Five soil samples selected from trial pits and shallow boreholes were analysed for their compliance to the criteria set out in the 2002 European Landfill Directive (2003/33/EC). Two of the five samples tested proved compliant with Waste Acceptance Criteria and therefore would be accepted by an inert landfill.

The three exceptions were soil specimens from BH03 (0.65m), BH04 (0.35m) and BH05 (1.20m). Each of the three were noted to exceed inert waste limits for Total Organic Carbon [TOC]. Indeed, the samples from both BH03 and BH05 exceeded hazardous limits for TOC. The samples would therefore not be accepted by an inert landfill due to their TOC content and should instead be dealt with by a suitably licensed waste facilitator. Table 4 below shows the concentration of Total Organic Carbon found in the aforementioned soil samples compared with the published inert, non-hazardous and hazardous landfill limits.

Table 4 – Elevated values (WAC Testing)

Parameter	**Landfill Limits** Inert / non-Haz / Haz	**BH03** **0.65m**	**BH04** **0.35m**	**BH05** **1.20m**
Total Organic Carbon	3% - 5% - 6%	*8.6%*	*4.1%*	*6.9%*
Dissolved Organic Carbon	500 – 800 – 1000 mg/kg	<50	59	<50
Loss on Ignition (LOI)	10% (Hazardous)	*20%*	*6.5%*	*14%*

In the case of the sample from BH04, where only the inert value for TOC is exceeded, the EU Landfill Directive allows for the following dispensation:

"In the case of soils, a higher limit value may be admitted by the competent authority, provided the DOC value of 500 mg/kg is achieved at L/S = 10 l/kg, either at the soil's own pH or at a pH value between 7.5 and 8.0."

Notably the DOC [Dissolved Organic Carbon] content did not exceed 500mg/kg for the sample from BH04 (59mg/kg). In certain inert landfills, an additional criterion is set whereby samples with elevated TOC levels must also exhibit Loss on Ignition (LOI) levels that are less than 5% by weight. This test returned a value of 6.5% for BH04. In any event, given that the only single exceedance noted in BH04 (0.35m) was restricted to one parameter, it seems possible that the sample may be accepted by an inert landfill. **The relaxation of the criteria as outlined here should be confirmed with the respective inert landfill ahead of soil removal from site.**

The results obtained from the testing of the two inert samples (TP01 at 0.40m & TP04 at 0.50m) were compared with published limits set out in the EPA Guidance on waste acceptance criteria at authorized soil recovery facilities (EPA, 2020). With regard to each of the criteria set for Total Organic Carbon and for the organic compounds BTEX, Mineral Oil, PAH and PCB's, the EPA limits were met.

Furthermore, in relation to total metal concentrations, the EPA Guidance document employs a set of specific metal trigger limits to each of seven geochemical domains across the country. Depending on the domain in which the accepting recovery site falls, there are specific limits prescribed for certain metals. In order to further analyse the soils suitability for acceptance at an EPA recovery facility, the domain of the receiving facility would have to be known. For the purposes of this report, the maximum concentrations and / or trigger levels in soil and stone for soil recovery facilities for Geochemical Domain 2 (Carboniferous limestone and related rocks) are applied. In relation to the remaining two samples (TP01 at 0.40m & TP04 at 0.50m), both exhibit metal concentrations within those published for Geochemical Domain 2 and would therefore, based on metal and TOC / organic compound contents be accepted at an authorized soil recovery facility.

Furthermore, written into the EPA (2002) document, only "soil and stone containing up to 2% non-natural materials by weight is acceptable, ie., anthropogenic or man-made substances such as rubble, concrete, bricks, metal and bitumen that are non-natural to the environment from which the material was extracted". This 2% content level for man-made materials would have to be complied with should the soils be exported to an EPA-licenced Soil Recovery Facility.

In relation to sending the analysed samples to an EPA-licenced Soil Recovery Facility, the limits for acceptance at the nominated facility should be checked against the results listed in the test record sheet - final report.

Note that, depending on the extent and depth of envisaged excavations and quantities for soil removal (if required), a landfill or Soil Recovery Facility may require additional testing to achieve the frequency of analysis (i.e. number of samples per unit volume of excavation) that meets their licence requirements.

No asbestos was detected in screens ran on the five soil samples.

It would be prudent, given the varying degree of compliance with WAC limits, that a waste characterisation assessment of the results would be carried out in accordance with the Environmental Protection Agency (EPA) Guidelines on the Classification of Waste (2015). We would recommend that a specialist environmental consultant (such as O'Callaghan Moran Consultants) be engaged to undertake this assessment.

REFERENCES

1.0 BS 5930 (2015+A1:2020) Code of Practice for Site Investigation, British Standards Institution (BSI).

2.0 BS 1377 (1990) Methods of Testing of Soils for Civil Engineering Purposes, BSI.

3.0 Eurocode 7, Part 2: Ground Investigation & Testing (EN 1997-2:2007)

4.0 Irish Standard IS 888:2016, NSAI (Published in March 2016)

5.0 OSI (1874). Map 4 (Colour) from Ordnance Survey Index to the Map of the Town of Kildare. 1:500 Ten feet to one statute mile. Retrieved September 10, 2024 from the UCD Digital Library https://digital.ucd.ie/view/ucdlib:41166

6.0 Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

7.0 Sowers, G.F. (1962) Shallow Foundations, Foundation Engineering, McGraw Hill

8.0 SR21:2014+A1:2016 Guidance on the use of IS EN 13242+A1:2007

9.0 Terzaghi, K., Peck, R.B., & Mesri, G. (1996). Soil Mechanics in Engineering, 3rd Edition. New York, Wiley.

10.0 Tomlinson, M.J. Pile Design & Construction Practice, 4th Edition

Appendix 1

Trial Pit Logs & Photographs

TRIAL PIT RECORD

REPORT NUMBER 25468

CONTRACT	An Triantán, Station Road Housing	**TRIAL PIT NO.**	**TP01**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	672,998.46 E 712,576.92 N
		DATE STARTED	20/06/2024
		DATE COMPLETED	20/06/2024
CLIENT	Kildare County Council	**GROUND LEVEL (m)**	102.99
ENGINEER	Cundall	**EXCAVATION METHOD**	Tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND: Dark brown sandy gravelly SILT with rare waste (plastics, cans), rare roothair, rootlets, pockets of organic material and rare lenses of orange brown and cream clayey Sand.					AA229995 Env	B Env	0.40-0.50 0.40-0.50		
1.0					AA229996 Env	B Env	1.50-1.60 1.50-1.60		
Firm to stiff light brown slightly sandy slightly gravelly SILT/CLAY with a low cobble content. Sand is fine to medium. Gravel is fine to coarse, subangular to rounded. Cobbles are subangular to subrounded.		1.70	101.29						
2.0					AA229997	B	2.30-2.40		
Obstruction End of Trial Pit at 2.60m		2.60	100.39						
3.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit ended due to slow progress in very stiff ground. PBT01 carried out in pit.

TRIAL PIT RECORD

REPORT NUMBER 25468

CONTRACT	An Triantán, Station Road Housing	**TRIAL PIT NO.**	**TP02**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	672,967.26 E 712,570.08 N
		DATE STARTED	20/06/2024
		DATE COMPLETED	20/06/2024
CLIENT	Kildare County Council	**GROUND LEVEL (m)**	101.74
ENGINEER	Cundall	**EXCAVATION METHOD**	Tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND: Dark brown sandy gravelly CLAY with rare waste (discarded rubbish) and rare roothair and rootlets.					AA229988	B	0.30-0.40		
					Env	Env	0.30-0.40		
Stiff light brown sandy gravelly silty CLAY with a medium cobble content. Sand is fine to medium. Gravel is medium to coarse, subangular to rounded. Cobbles are subangular to subrounded.		0.40	101.34						
					AA229989	B	0.60-0.70		
1.0					Env	Env	0.60-0.70		
(Dense to medium dense) Greyish brown clayey/silty very sandy GRAVEL. Sand is coarse. Gravel is fine to coarse, subangular to rounded.		1.30	100.44		AA229990	B	1.60-1.70		
2.0 (Dense to medium dense) Greyish brown slightly clayey/silty SAND and GRAVEL with a low cobble content and a low boulder content. Sand is medium to coarse. Gravel is fine to coarse, subangular to rounded. Cobbles are subangular to subrounded. Boulders are subangular.		2.00	99.74		AA229991	B	2.10-2.20		
Obstruction		2.20	99.54						
End of Trial Pit at 2.20m									
3.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit ended due to possible boulder refusal. PBT02 and SA01 carried out at TP02.

TRIAL PIT RECORD

REPORT NUMBER 25468

CONTRACT	An Triantán, Station Road Housing	**TRIAL PIT NO.**	**TP03**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	672,945.80 E 712,565.60 N
		DATE STARTED	20/06/2024
		DATE COMPLETED	20/06/2024
CLIENT	Kildare County Council	**GROUND LEVEL (m)**	101.75
		EXCAVATION METHOD	Tracked excavator
ENGINEER	Cundall		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND: Dark brown sandy gravelly CLAY with occasional roothair and rootlets.					AA229998 Env	B Env	0.50-0.60 0.50-0.60		
		0.70	101.05						
Stiff light brown sandy gravelly CLAY with a low cobble content. Sand is fine to medium. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular.					AA229999 Env	B Env	1.40-1.50 1.40-1.50		
1.0									
2.0					AA230000	B	2.10-2.20		
		2.20	99.55						
Obstruction End of Trial Pit at 2.20m									
3.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit ended due to slow progress in very stiff ground. PBT03 carried out in pit.

TRIAL PIT RECORD

REPORT NUMBER 25468

CONTRACT	An Triantán, Station Road Housing	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	672,995.10 E 712,611.60 N
		DATE STARTED	20/06/2024
		DATE COMPLETED	20/06/2024
CLIENT	Kildare County Council	**GROUND LEVEL (m)**	100.79
		EXCAVATION METHOD	Tracked excavator
ENGINEER	Cundall		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0									
MADE GROUND: Dark brown sandy gravelly CLAY with rare waste (discarded rubbish) and occasional roothair and rootlets.					AA229992 Env	B Env	0.50-0.60 0.50-0.60		
1.0									
Stiff light brown sandy gravelly silty CLAY. Sand is fine to medium. Gravel is fine to coarse, subangular to subrounded.		1.50	99.29		AA229993 Env	B Env	1.50-1.60 1.50-1.60		
(Dense to medium dense) Greyish brown clayey/silty very sandy GRAVEL with a medium cobble content. Sand is medium to coarse. Gravel is fine to coarse, subangular to rounded. Cobbles are subangular to subrounded.		1.60	99.19						
2.0					AA229994	B	2.40-2.60		
Obstruction End of Trial Pit at 2.70m		2.70	98.09						
3.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit excavated into embankment. Pit ended due to slow progress in dense ground. PBT04 and SA02 carried out at TP04.

TP01

TP01 – 1 of 4

TP01 – 2 of 4

TP01 – 3 of 4

TP01 – 4 of 4

TP02

TP02 – 1 of 4

TP02 – 2 of 4

TP02 – 3 of 4

TP02 – 4 of 4

TP03

TP03 – 1 of 4

TP03 – 2 of 4

TP03 – 3 of 4

TP03 – 4 of 4

TP04

TP04 – 1 of 4

TP04 – 2 of 4

TP04 – 3 of 4

TP04 – 4 of 4

Appendix 2

Cable Percussion Borehole Logs

SPT Er Calibration Certificate

GEOTECHNICAL BORING RECORD

REPORT NUMBER 25468

CONTRACT	An Triantán, Station Road Housing	**BOREHOLE NO.**	**BH01**
		SHEET	Sheet 1 of 1
CO-ORDINATES	672,984.30 E 712,582.30 N	**RIG TYPE**	Dando 150
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)	102.09	**BOREHOLE DEPTH (m)**	6.20
		DATE COMMENCED	27/06/2024
		DATE COMPLETED	27/06/2024
CLIENT	Kildare County Council	**SPT HAMMER REF. NO.**	10-10-1
ENGINEER	Cundall	**ENERGY RATIO (%)**	70.5
		BORED BY	R.Allan
		PROCESSED BY	OK

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		101.99	0.10						
	Brown SILT/CLAY with roots		101.39	0.70	AA227517	B	0.50-0.70			
					Env	ENV	0.50-0.70			
	Firm light brown sandy gravelly SILT				AA227518	B	0.70-1.20			
1					Env	ENV	0.70-1.20			
					AA227519	B	1.20-1.70		N = 15	
					Env	ENV	1.20-1.70		(2, 3, 4, 4, 4, 3)	
2					AA227520	B	2.20-2.70		N = 18	
					Env	ENV	2.20-2.70		(3, 4, 4, 5, 3, 6)	
			99.29	2.80						
3	Stiff to very stiff slightly sandy slightly gravelly SILT/CLAY with occasional cobbles				AA227521	B	3.20-3.70		N = 31	
									(4, 5, 7, 7, 8, 9)	
4					AA227522	B	4.20-4.70		N = 26	
			97.59	4.50					(3, 5, 6, 6, 7, 7)	
	Medium dense brown/grey slightly clayey/silty very sandy GRAVEL with occasional cobbles									
5					AA227523	B	5.20-5.70		N = 30	
									(4, 5, 6, 7, 8, 9)	
6			95.89	6.20						
	Obstruction End of Borehole at 6.20 m								N = 50/225 mm (7, 12, 14, 16, 20)	
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
6.10	6.20	1.5	

WATER STRIKE DETAILS

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

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
27-06-24	6.20	Nil	2.50	End of BH01

REMARKS CAT scanned location and hand dug inspection pit carried out. Water added to dry Gravel from 4.50m.

Sample Legend

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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GEOTECHNICAL BORING RECORD

REPORT NUMBER 25468

CONTRACT	An Triantán, Station Road Housing	**BOREHOLE NO.**	**BH02**
		SHEET	Sheet 1 of 1
CO-ORDINATES	672,953.32 E 712,544.19 N	**RIG TYPE**	Dando 150
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)	101.57	**BOREHOLE DEPTH (m)**	6.00
		DATE COMMENCED	25/06/2024
		DATE COMPLETED	26/06/2024
CLIENT	Kildare County Council	**SPT HAMMER REF. NO.**	10-10-1
ENGINEER	Cundall	**ENERGY RATIO (%)**	70.5
		BORED BY	R.Allan
		PROCESSED BY	OK

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		101.22	0.35	AA227510	B	0.20-0.35			
					Env	ENV	0.20-0.35			
	Firm light brown sandy gravelly CLAY				AA227511	B	0.35-1.20			
					Env	ENV	0.35-1.20			
1					AA227512	B	1.20-1.70		N = 16	
					Env	ENV	1.20-1.70		(2, 3, 4, 4, 4, 4)	
2			99.47	2.10						
	Stiff to very stiff brown slightly sandy slightly gravelly CLAY				AA227513	B	2.20-2.70		N = 20	
					Env	ENV	2.20-2.70		(3, 4, 4, 5, 5, 6)	
3					AA227514	B	3.20-3.70		N = 31	
			97.87	3.70					(4, 5, 7, 8, 8, 8)	
	Medium dense brown/grey sandy GRAVEL with many cobbles									
4					AA227515	B	4.20-4.70		N = 20	
									(3, 4, 4, 5, 5, 6)	
5					AA227516	B	5.20-5.70		N = 28	
									(4, 5, 6, 7, 7, 8)	
			95.57	6.00						
6	End of Borehole at 6.00 m								N = 33	
									(5, 7, 7, 9, 10, 7)	
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

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

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
26-06-24	6.00	5.00	6.00	50mm SP

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
25-06-24	5.00	5.00	4.80	End of 1st day
26-06-24	6.00	Nil	5.80	End of BH02

REMARKS CAT scanned location and hand dug inspection pit carried out. Water added to dry Gravel from 3.70m.

Sample Legend

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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GEOTECHNICAL BORING RECORD

REPORT NUMBER 25468

CONTRACT	An Triantán, Station Road Housing	**BOREHOLE NO.**	**BH03**
		SHEET	Sheet 1 of 1
CO-ORDINATES	672,977.09 E 712,582.93 N	**RIG TYPE**	Dando 150
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)	101.70	**BOREHOLE DEPTH (m)**	6.20
		DATE COMMENCED	28/06/2024
		DATE COMPLETED	29/06/2024
CLIENT	Kildare County Council	**SPT HAMMER REF. NO.**	10-10-1
ENGINEER	Cundall	**ENERGY RATIO (%)**	70.5
		BORED BY	R.Allan
		PROCESSED BY	OK

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		101.05	0.65	AA227524 Env	B ENV	0.40-0.65 0.40-0.65			
1	Firm light brown sandy slightly gravelly SILT/CLAY				AA227525 Env	B ENV	0.65-1.20 0.65-1.20			
2			99.60	2.10	AA227526 Env	B ENV	1.20-1.70 1.20-1.70		N = 15 (2, 3, 3, 4, 4, 4)	
3	Stiff brown slightly sandy slightly gravelly CLAY with some cobbles				AA227527 Env	B ENV	2.20-2.70 2.20-2.70		N = 17 (3, 3, 3, 4, 5, 5)	
4			97.50	4.20	AA227528	B	3.20-3.70		N = 17 (2, 3, 4, 4, 4, 5)	
5	Dense brown/grey clayey/silty very sandy GRAVEL with a low cobble content				AA227529	B	4.20-4.70		N = 21 (3, 4, 4, 5, 6, 6)	
6			95.50	6.20	AA227530	B	5.20-5.70		N = 31 (4, 6, 7, 8, 8, 8)	
	End of Borehole at 6.20 m								N = 33 (4, 5, 7, 8, 9, 9)	
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.70	4.90	0.5	

WATER STRIKE DETAILS

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

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
28-06-24	4.00	4.00	Dry	End of 1st day
29-06-24	6.20	Nil	5.60	End of BH03

REMARKS CAT scanned location and hand dug inspection pit carried out. Water added to dry Gravel from 4.60m.

Sample Legend

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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GEOTECHNICAL BORING RECORD

REPORT NUMBER 25468

CONTRACT	An Triantán, Station Road Housing	**BOREHOLE NO.**	**BH04**
		SHEET	Sheet 1 of 1
CO-ORDINATES	672,987.74 E 712,555.73 N	**RIG TYPE**	Dando 150
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)	102.14	**BOREHOLE DEPTH (m)**	6.70
		DATE COMMENCED	15/06/2024
		DATE COMPLETED	20/06/2024
CLIENT	Kildare County Council	**SPT HAMMER REF. NO.**	10-10-1
ENGINEER	Cundall	**ENERGY RATIO (%)**	70.5
		BORED BY	R.Allan
		PROCESSED BY	OK

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		101.79	0.35	AA227501	B	0.20-0.35			
					Env	ENV	0.20-0.35			
	Firm light brown slightly sandy slightly gravelly SILT/CLAY				AA227502	B	0.35-1.20			
					Env	ENV	0.35-1.20			
1			100.74	1.40	AA227503	B	1.20-1.70		N = 14	
					Env	ENV	1.20-1.70		(4, 4, 4, 3, 4, 3)	
	Brown and grey/brown gravelly SILT with occasional cobbles									
2					AA227504	B	2.20-2.70		N = 24	
					Env	ENV	2.20-2.70		(4, 5, 5, 6, 6, 7)	
3			98.64	3.50					N = 29	
									(5, 6, 6, 6, 8, 9)	
	Medium dense brown/grey very sandy GRAVEL with occasional cobbles				AA227506	B	3.50-4.00			
4					AA227507	B	4.20-4.70		N = 32	
									(7, 5, 8, 13, 1, 10)	
5					AA227508	B	5.20-5.70		N = 28	
									(5, 6, 6, 7, 7, 8)	
6			95.94	6.20						
	Stiff brown slightly sandy slightly gravelly SILT/CLAY				AA227509	B	6.20-6.70		N = 50/75 mm	
			95.44	6.70					(25, 50)	
	Obstruction								N = 50/75 mm	
7	End of Borehole at 6.70 m								(14, 11, 50)	
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.20	4.80	0.45	
6.20	6.70	1	

WATER STRIKE DETAILS

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

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
19-06-24	5.20	5.20	5.00	End of 2nd day
20-06-24	6.70	Nil	6.00	End of 3rd day

REMARKS CAT scanned location and hand dug inspection pit carried out. Water added from 3.50m in dry Gravel.

Sample Legend
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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GEOTECHNICAL BORING RECORD

REPORT NUMBER 25468

CONTRACT	An Triantán, Station Road Housing	**BOREHOLE NO.**	**BH05**
		SHEET	Sheet 1 of 1
CO-ORDINATES	672,997.03 E 712,621.26 N	**RIG TYPE**	Dando 150
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)	100.83	**BOREHOLE DEPTH (m)**	5.40
		DATE COMMENCED	02/07/2024
		DATE COMPLETED	03/07/2024
CLIENT	Kildare County Council	**SPT HAMMER REF. NO.**	10-10-1
ENGINEER	Cundall	**ENERGY RATIO (%)**	70.5
		BORED BY	R.Allan
		PROCESSED BY	OK

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		100.33	0.50						
	Firm light brown sandy slightly gravelly SILT/CLAY				AA227531 AA227531	B ENV	0.50-1.20 0.50-1.20			
1					AA227532 AA227532	B ENV	1.20-1.70 1.20-1.70		N = 15 (3, 4, 3, 4, 4, 4)	
			98.93	1.90						
2	Stiff brown slightly sandy slightly gravelly CLAY with occasional cobbles				AA227533 AA227533	B ENV	2.20-2.70 2.20-2.70		N = 19 (3, 3, 4, 5, 5, 5)	
3					AA227534 AA227534	B ENV	3.20-3.70 3.20-3.70		N = 25 (4, 5, 5, 6, 7, 7)	
4			96.33	4.50					N = 30 (3, 4, 6, 8, 8, 8)	
	Medium dense brown/grey sandy GRAVEL with occasional cobbles				AA227535	B	4.50-5.00			
5			95.43	5.40					N = 28 (5, 6, 8, 7, 7, 6)	
	End of Borehole at 5.40 m				AA227536	B	5.40		N = 50/150 mm (12, 15, 17, 33)	
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
5.00	5.40	1.5	

WATER STRIKE DETAILS

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

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
03-07-24	5.40	1.00	5.40	50mm SP

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
02-07-24	5.40	Nil	2.40	End of BH05

REMARKS CAT scanned location and hand dug inspection pit carried out. Water was added from 4.0m. Large boulder encountered at 5.0m preventing progress in borehole. Bore ended at 5.40m.

Sample Legend
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

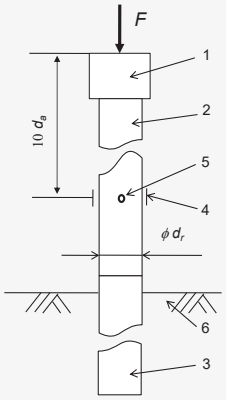
IGSL BH LOG 25468.GPJ IGSL.GDT 11/9/24

SPT Calibration Report

Hammer Energy Measurement Report

Type of Hammer		SPT HAMMER
Test No		EQU2024_27
Client		IGSL
Test Depth (m)		9.10
Mass of hammer	m =	63.5kg
Falling height	h =	0.76m
E_{theor} =	$m \times g \times h$ =	473J

Characteristics of the instrumented rod



Key

1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

F Force
d_r Diameter of rod

Fig. B.1 and B.2
BS EN ISO 22476-3 : 2005 + A1 : 2011

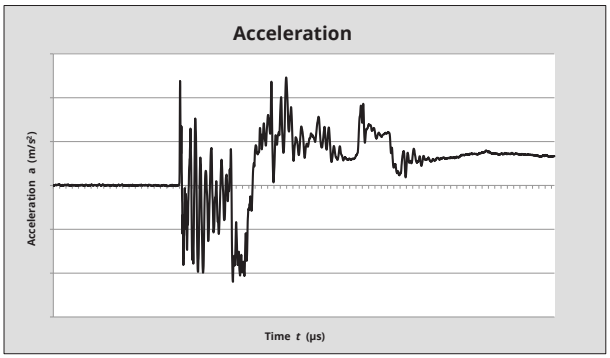
Diameter	d_r =	0.052 m
Length of instrumented rod		0.558 m
Area	A =	11.61 cm²
Modulus	E_a =	206843 MPa

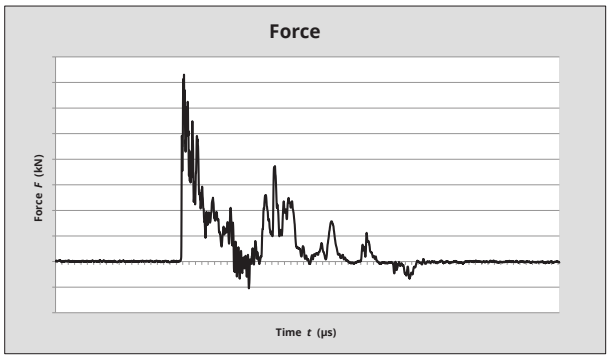
E_{meas} = **0.333** kN-m

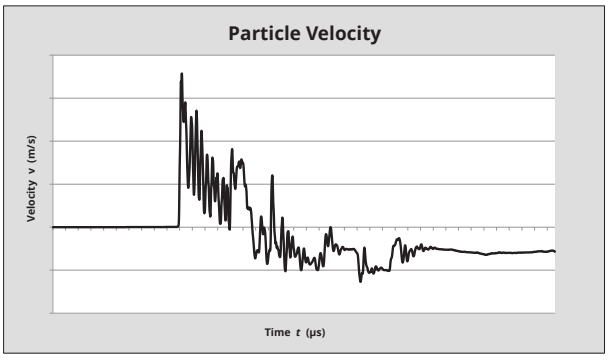
E_{theor} = **0.473** kN-m

Comments

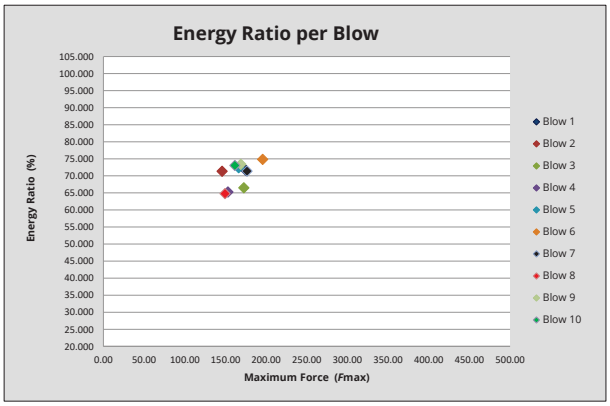
DATE OF TEST	VALID UNTIL	HAMMER ID
11/03/2024	11/03/2025	10-10-1







Energy Ratio (Er) = $\frac{E_{meas}}{E_{theor}}$ **70.50%**



Equipe SPT Analyzer Operator	Certificate prepared by	Certificate checked by	Certificate date
JL			21/03/2024

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

Appendix 3

Soakaway Test Records

Soakaway Design f -value from field tests

(F2C) IGSL

Contract:	An Triantán, Station Road Housing	Contract No.	25468
Test No.	SA01 - Stage 1	Easting	672967.264
Client:	Kildare County Council	Northing	712570.079
Date:	20/06/2024	Elevation (m OD)	101.743

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	MADE GROUND: Dark brown sandy gravelly CLAY with rare waste (discarded rubbish) and rare roothair and rootlets	None observed
0.40	1.30	Stiff light brown sandy gravelly silty CLAY with a medium cobble content	
1.30	1.60	(Dense to medium dense) Greyish brown clayey/silty very sandy GRAVEL	

Notes: **SA01 carried out in trial pit TP02**

Field Data

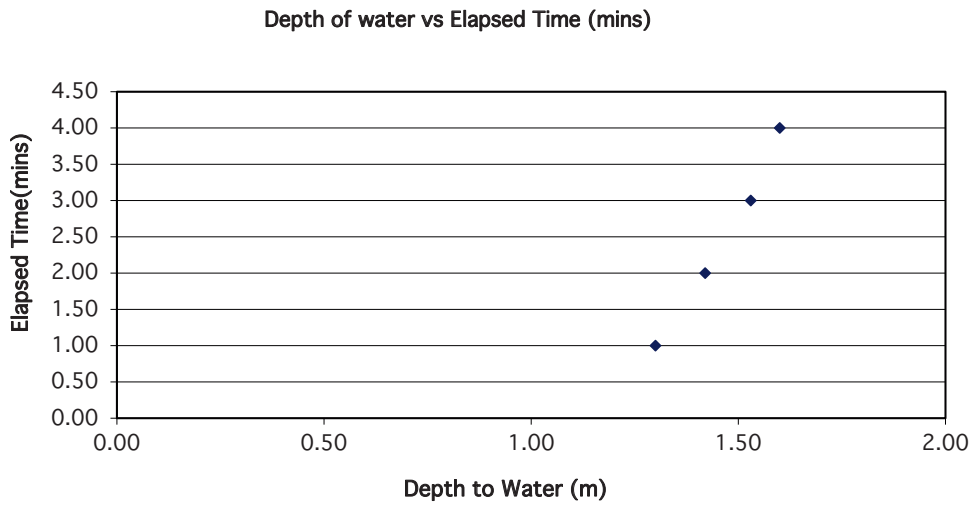
Depth to Water (m)	Elapsed Time (min)
1.20	0.00
1.30	1.00
1.42	2.00
1.53	3.00
1.60	4.00

Field Test

Depth of Pit (D)	1.60	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.60	m
Initial depth to Water =	1.20	m
Final depth to water =	1.60	m
Elapsed time (mins)=	4.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.96	m2
*Av. side area of permeable stratum over test perio	0.88	m2
Total Exposed area =	1.84	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.05217 m/min or 0.000869565 m/sec



Soakaway Design f -value from field tests

(F2C) IGSL

Contract:	An Triantán, Station Road Housing	Contract No.	25468
Test No.	SA01 - Stage 2	Easting	672967.264
Client:	Kildare County Council	Northing	712570.079
Date:	20/06/2024	Elevation (m OD)	101.743

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	MADE GROUND: Dark brown sandy gravelly CLAY with rare waste (discarded rubbish) and rare roothair and rootlets	None observed
0.40	1.30	Stiff light brown sandy gravelly silty CLAY with a medium cobble content	
1.30	1.60	(Dense to medium dense) Greyish brown clayey/silty very sandy GRAVEL	

Notes: **SA01 carried out in trial pit TP02**

Field Data

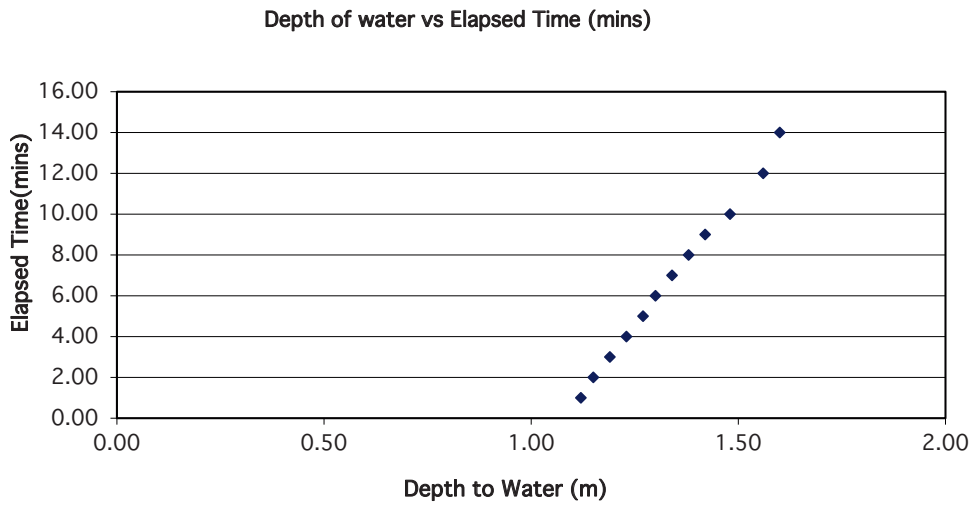
Depth to Water (m)	Elapsed Time (min)
1.10	0.00
1.12	1.00
1.15	2.00
1.19	3.00
1.23	4.00
1.27	5.00
1.30	6.00
1.34	7.00
1.38	8.00
1.42	9.00
1.48	10.00
1.56	12.00
1.60	14.00

Field Test

Depth of Pit (D)	1.60	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.60	m
Initial depth to Water =	1.10	m
Final depth to water =	1.60	m
Elapsed time (mins)=	14.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.96	m2
*Av. side area of permeable stratum over test perio	1.1	m2
Total Exposed area =	2.06	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.01664 m/min or 0.000277393 m/sec



Soakaway Design f -value from field tests

(F2C) IGSL

Contract:	An Triantán, Station Road Housing	Contract No.	25468
Test No.	SA01 - Stage 3	Easting	672967.264
Client:	Kildare County Council	Northing	712570.079
Date:	20/06/2024	Elevation (m OD)	101.743

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	MADE GROUND: Dark brown sandy gravelly CLAY with rare waste (discarded rubbish) and rare roothair and rootlets	None observed
0.40	1.30	Stiff light brown sandy gravelly silty CLAY with a medium cobble content	
1.30	1.60	(Dense to medium dense) Greyish brown clayey/silty very sandy GRAVEL	

Notes: **SA01 carried out in trial pit TP02**

Field Data

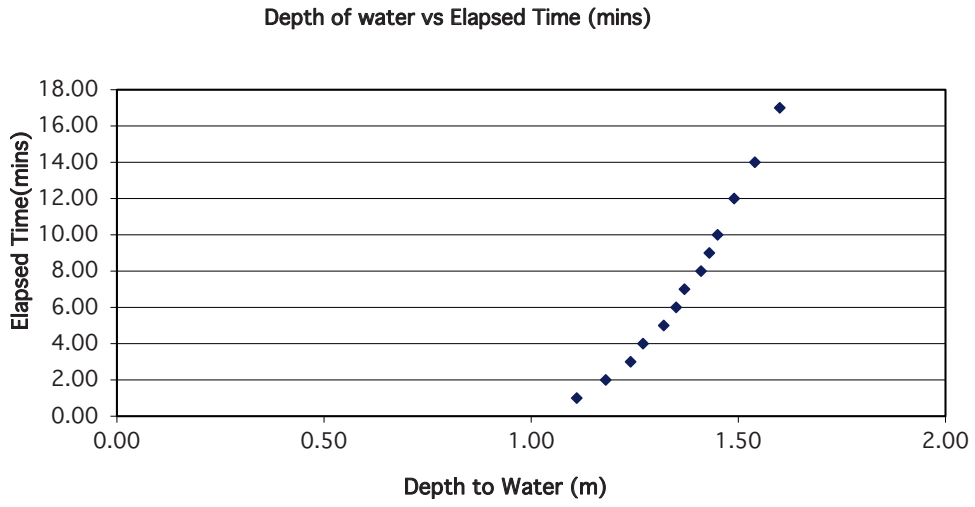
Depth to Water (m)	Elapsed Time (min)
1.05	0.00
1.11	1.00
1.18	2.00
1.24	3.00
1.27	4.00
1.32	5.00
1.35	6.00
1.37	7.00
1.41	8.00
1.43	9.00
1.45	10.00
1.49	12.00
1.54	14.00
1.60	17.00

Field Test

Depth of Pit (D)	1.60	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.60	m
Initial depth to Water =	1.05	m
Final depth to water =	1.60	m
Elapsed time (mins)=	17.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.96	m2
*Av. side area of permeable stratum over test perio	1.21	m2
Total Exposed area =	2.17	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.01431 m/min or 0.000238547 m/sec



Soakaway Design f -value from field tests

(F2C) IGSL

Contract:	An Triantán, Station Road Housing	Contract No.	25468
Test No.	SA02 - Stage 1	Easting	672995.1
Client:	Kildare County Council	Northing	712611.6
Date:	20/06/2024	Elevation (m OD)	100.785

Summary of ground conditions

from	to	Description	Ground water
0.00	1.50	MADE GROUND: Dark brown sandy gravelly CLAY with rare waste (discarded rubbish) and occasional roothair and rootlets.	None observed
1.50	1.60	Stiff light brown sandy gravelly silty CLAY	
1.60	1.75	(Dense to medium dense) Greyish brown clayey/silty very sandy GRAVEL with a medium cobble content	

Notes: **SA02 carried out in trial pit TP04**

Field Data

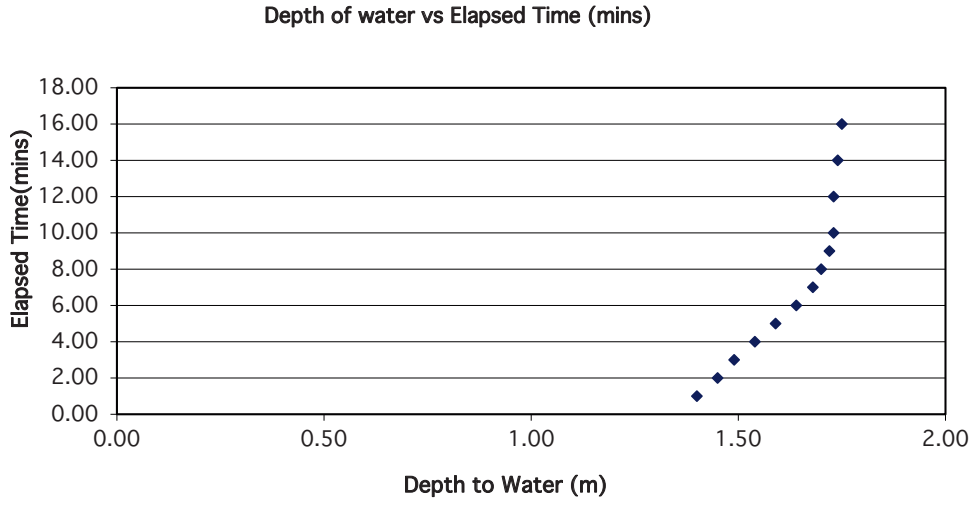
Depth to Water (m)	Elapsed Time (min)
1.40	0.00
1.40	1.00
1.45	2.00
1.49	3.00
1.54	4.00
1.59	5.00
1.64	6.00
1.68	7.00
1.70	8.00
1.72	9.00
1.73	10.00
1.73	12.00
1.74	14.00
1.75	16.00

Field Test

Depth of Pit (D)	1.75	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.60	m
Initial depth to Water =	1.40	m
Final depth to water =	1.75	m
Elapsed time (mins)=	16.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.96	m2
*Av. side area of permeable stratum over test perio	0.77	m2
Total Exposed area =	1.73	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.01214 m/min or 0.000202312 m/sec



Soakaway Design f -value from field tests

(F2C) IGSL

Contract:	An Triantán, Station Road Housing	Contract No.	25468
Test No.	SA02 - Stage 2	Easting	672995.1
Client:	Kildare County Council	Northing	712611.6
Date:	20/06/2024	Elevation (m OD)	100.785

Summary of ground conditions

from	to	Description	Ground water
0.00	1.50	MADE GROUND: Dark brown sandy gravelly CLAY with rare waste (discarded rubbish) and occasional roothair and rootlets.	None observed
1.50	1.60	Stiff light brown sandy gravelly silty CLAY	
1.60	1.75	(Dense to medium dense) Greyish brown clayey/silty very sandy GRAVEL with a medium cobble content	

Notes: **SA02 carried out in trial pit TP04**

Field Data

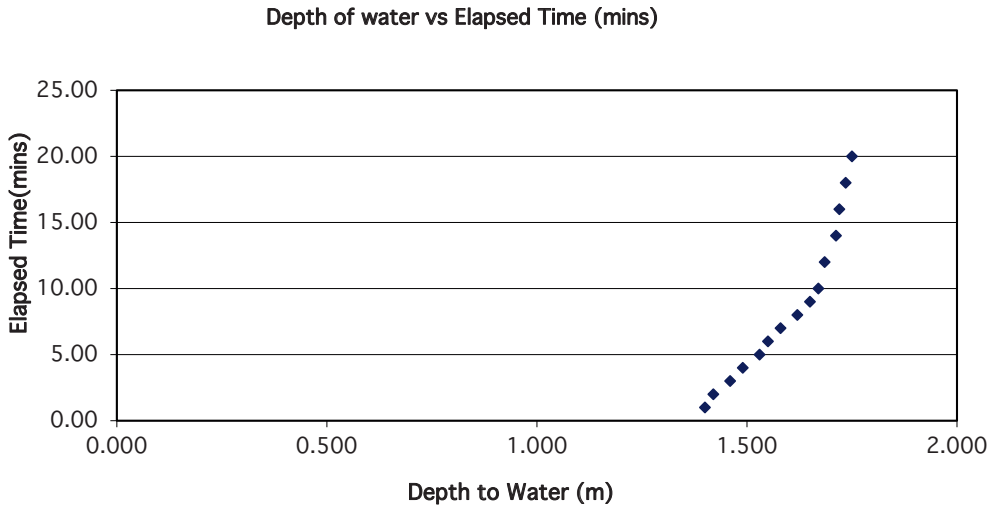
Depth to Water (m)	Elapsed Time (min)
1.380	0.00
1.400	1.00
1.420	2.00
1.460	3.00
1.490	4.00
1.530	5.00
1.550	6.00
1.580	7.00
1.620	8.00
1.650	9.00
1.670	10.00
1.685	12.00
1.712	14.00
1.720	16.00
1.735	18.00
1.750	20.00

Field Test

Depth of Pit (D)	1.70	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.60	m
Initial depth to Water =	1.38	m
Final depth to water =	1.75	m
Elapsed time (mins)=	20.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.96	m2
*Av. side area of permeable stratum over test period	0.594	m2
Total Exposed area =	1.554	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.01143 m/min or 0.000190476 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract:	An Triantán, Station Road Housing	Contract No.	25468
Test No.	SA02 - Stage 3	Easting	672995.1
Client:	Kildare County Council	Northing	712611.6
Date:	20/06/2024	Elevation (m OD)	100.785

Summary of ground conditions

from	to	Description	Ground water
0.00	1.50	MADE GROUND: Dark brown sandy gravelly CLAY with rare waste (discarded rubbish) and occasional roothair and rootlets.	None observed
1.50	1.60	Stiff light brown sandy gravelly silty CLAY	
1.60	1.75	(Dense to medium dense) Greyish brown clayey/silty very sandy GRAVEL with a medium cobble content	

Notes: **SA02 carried out in trial pit TP04**

Field Data

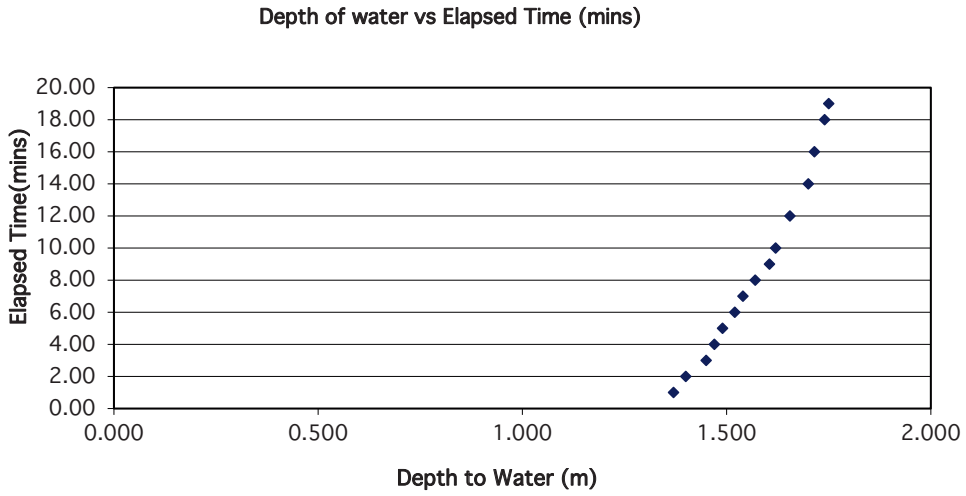
Depth to Water (m)	Elapsed Time (min)
1.340	0.00
1.370	1.00
1.400	2.00
1.450	3.00
1.470	4.00
1.490	5.00
1.520	6.00
1.540	7.00
1.570	8.00
1.605	9.00
1.620	10.00
1.655	12.00
1.700	14.00
1.715	16.00
1.740	18.00
1.750	19.00

Field Test

Depth of Pit (D)	1.70	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.60	m
Initial depth to Water =	1.34	m
Final depth to water =	1.75	m
Elapsed time (mins)=	19.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.96	m2
*Av. side area of permeable stratum over test perio	0.682	m2
Total Exposed area =	1.642	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.01262 m/min or 0.00021027 m/sec



Appendix 4

Plate Bearing Test Records

PLATE TEST REPORT SHEET (F3.1)

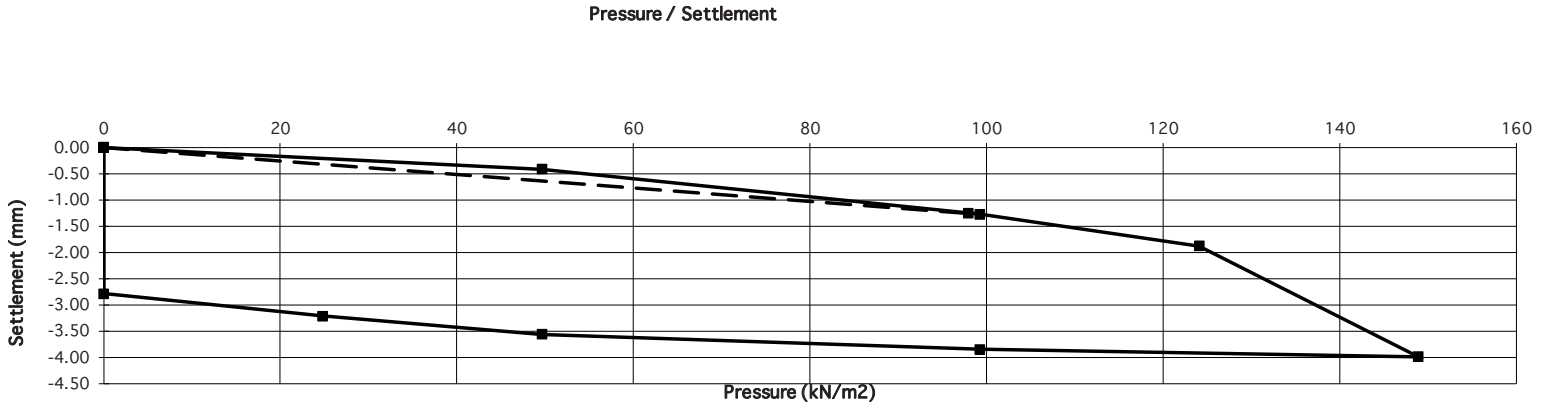
Reference No.	R157917
Contract	An Thriantán, Station Road Housing
Test No.	PBT01
Location	E:672998.459 N:712576.917 El:102.994
Depth	0.65m
Client	Kildare County Council
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	P.Nixon
Authorised by	
Date	06/12/2024

Description of soil under test
(natural soil, placed fill, sub-base)

Brown Sandy Gravely Clay

Sample Ref No. N/A
Depth 0.00 m bgl

Applied Pressure/Settlement Curve



Gradient at 1.25 mm settlement intersection = 78
Modulus of subgrade reaction = 50 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 8.6 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

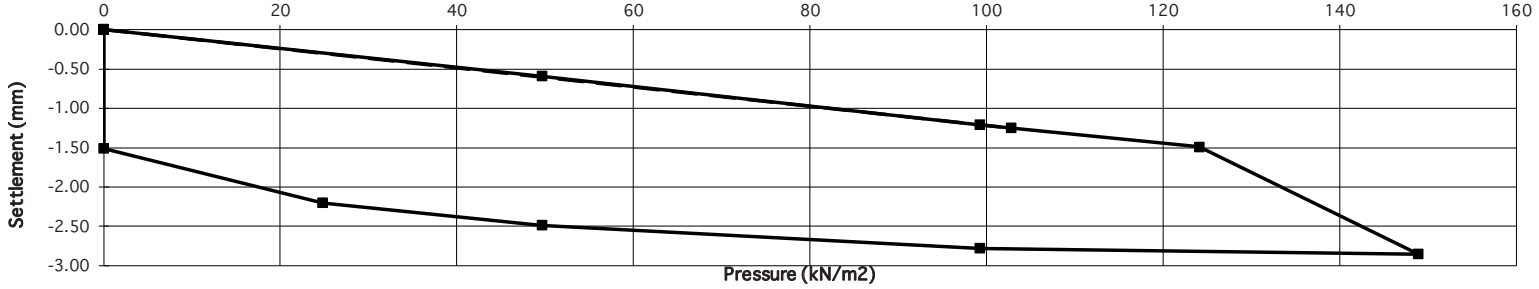
Reference No.	R157917
Contract	An Thriantán, Station Road Housing
Test No.	PBT01 - Reload
Location	E:672998.459 N:712576.917 El:102.994
Depth	0.65m
Client	Kildare County Council
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	P.Nixon
Authorised by	
Date	06/12/2024

Description of soil under test (natural soil, placed fill, sub-base)

Brown Sandy Gravely Clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 82

Modulus of subgrade reaction = 53 MPa/m

Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 9.4 %

PLATE TEST REPORT SHEET (F3.1)

Reference No.	R157916
Contract	An Thriantán, Station Road Housing
Test No.	PBT02
Location	E:672967.264 N:712570.079 El:101.743
Depth	0.30m
Client	Kildare County Council
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	P.Nixon
Authorised by	
Date	06/12/2024

Applied Pressure/Settlement Curve

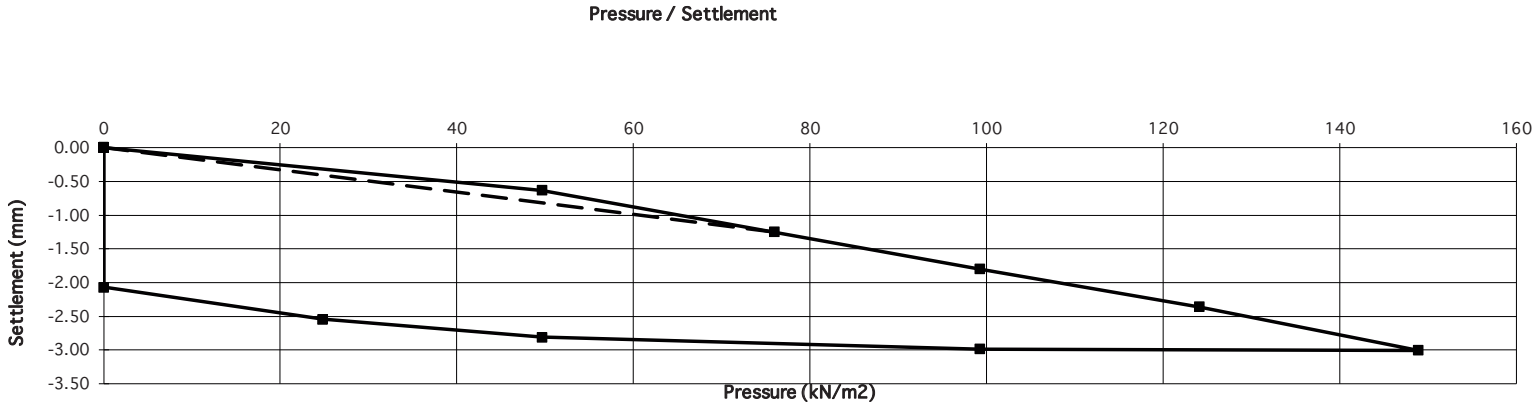
Description of soil under test
(natural soil, placed fill, sub-base)

Brown Sandy Gravely Clay

Sample Ref No. N/A
Depth 0.00 m bgl

IGSL Ltd.

IVNAB ISO 17025 accredited TESTING



Gradient at 1.25 mm settlement intersection = 61
Modulus of subgrade reaction = 39 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 5.5 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R157916
Contract	An Thriantán, Station Road Housing
Test No.	PBT02 - Reload
Location	E:672967.264 N:712570.079 El:101.743
Depth	0.30m
Client	Kildare County Council
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	P.Nixon
Authorised by	
Date	06/12/2024

Description of soil under test
(natural soil, placed fill, sub-base)

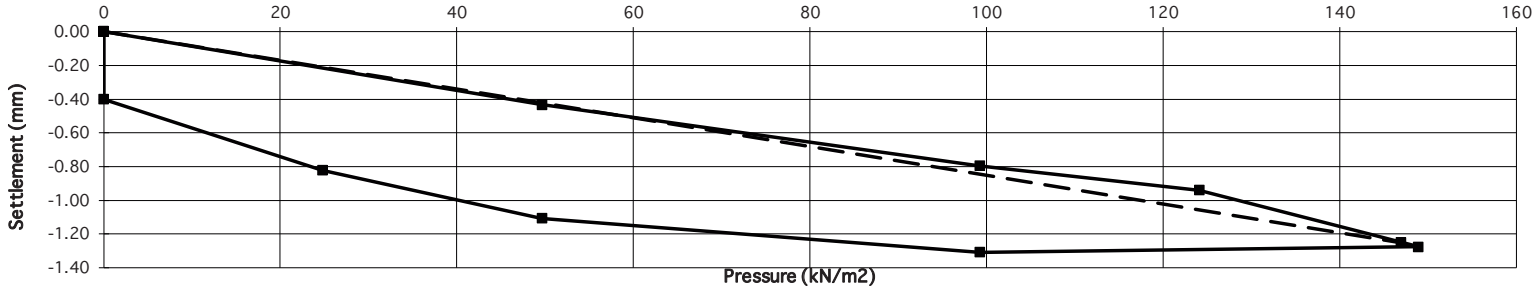
Brown Sandy Gravely Clay

Sample Ref No. N/A
Depth 0.00 m bgl

IGSL Ltd.

IVNAB ISO 17025 accredited TESTING

Pressure / Settlement



Gradient at 1.25 mm settlement intersection = 118
Modulus of subgrade reaction = 76 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 17.4 %

PLATE TEST REPORT SHEET (F3.1)

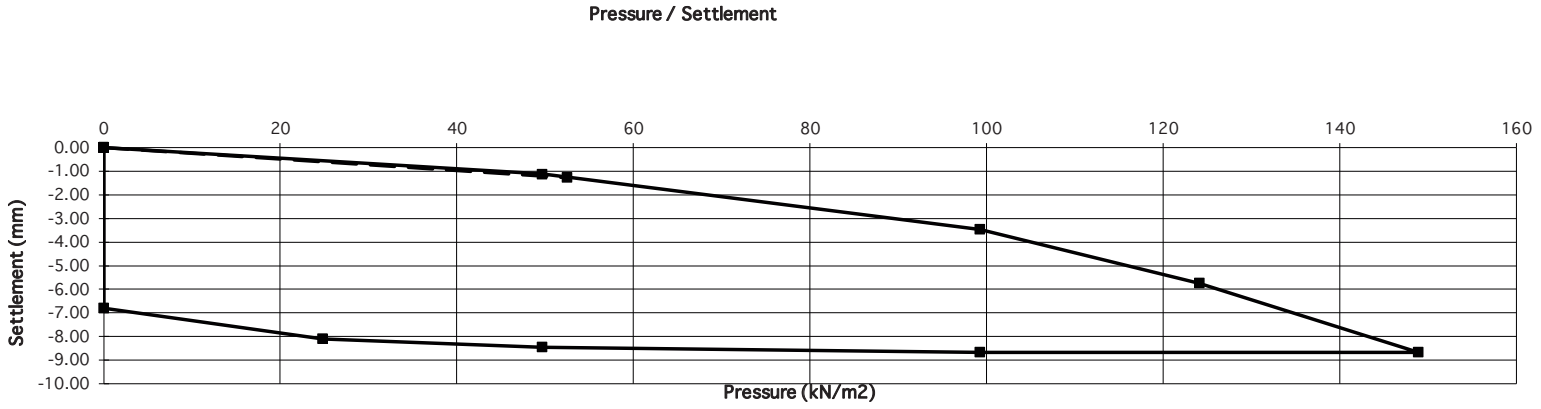
Reference No.	R157915
Contract	An Thriantán, Station Road Housing
Test No.	PBT03
Location	E:672945.8 N:712565.6 El:101.752
Depth	0.50m
Client	Kildare County Council
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	P.Nixon
Authorised by	
Date	06/12/2024

Description of soil under test
(natural soil, placed fill, sub-base)

Brown Sandy Gravely Clay

Sample Ref No. N/A
Depth 0.00 m bgl

Applied Pressure/Settlement Curve



Gradient at 1.25 mm settlement intersection = 42
Modulus of subgrade reaction = 27 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.9 %

PLATE TEST REPORT SHEET (F3.1)

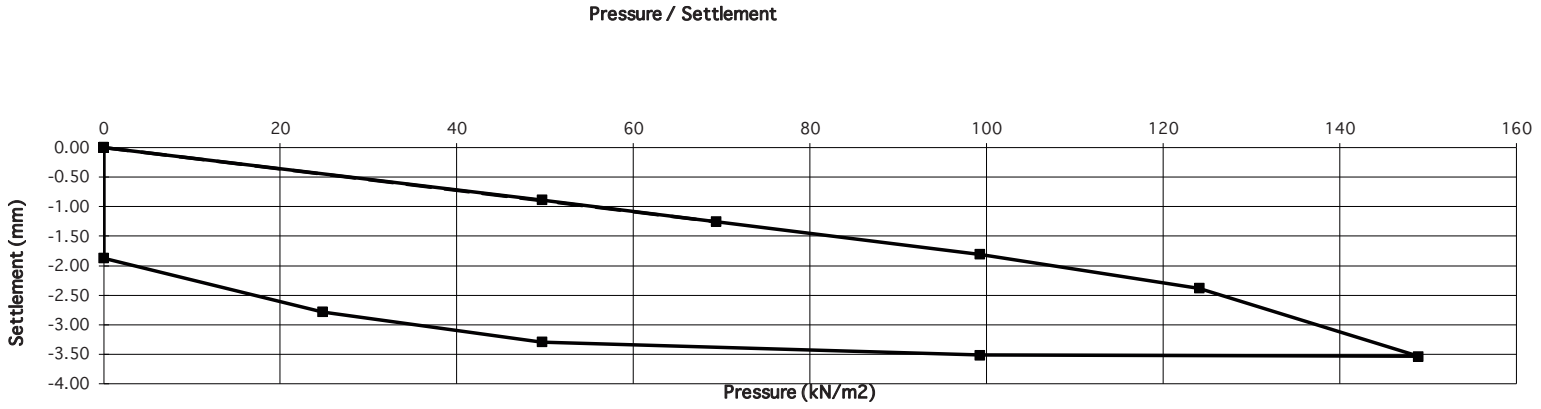
Reference No.	R157915
Contract	An Thriantán, Station Road Housing
Test No.	PBT03 - Reload
Location	E:672945.8 N:712565.6 El:101.752
Depth	0.50m
Client	Kildare County Council
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	P.Nixon
Authorised by	
Date	06/12/2024

Description of soil under test
(natural soil, placed fill, sub-base)

Brown Sandy Gravely Clay

Sample Ref No. N/A
Depth 0.00 m bgl

Applied Pressure/Settlement Curve



Gradient at 1.25 mm settlement intersection = 55
Modulus of subgrade reaction = 36 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.7 %

PLATE TEST REPORT SHEET (F3.1)

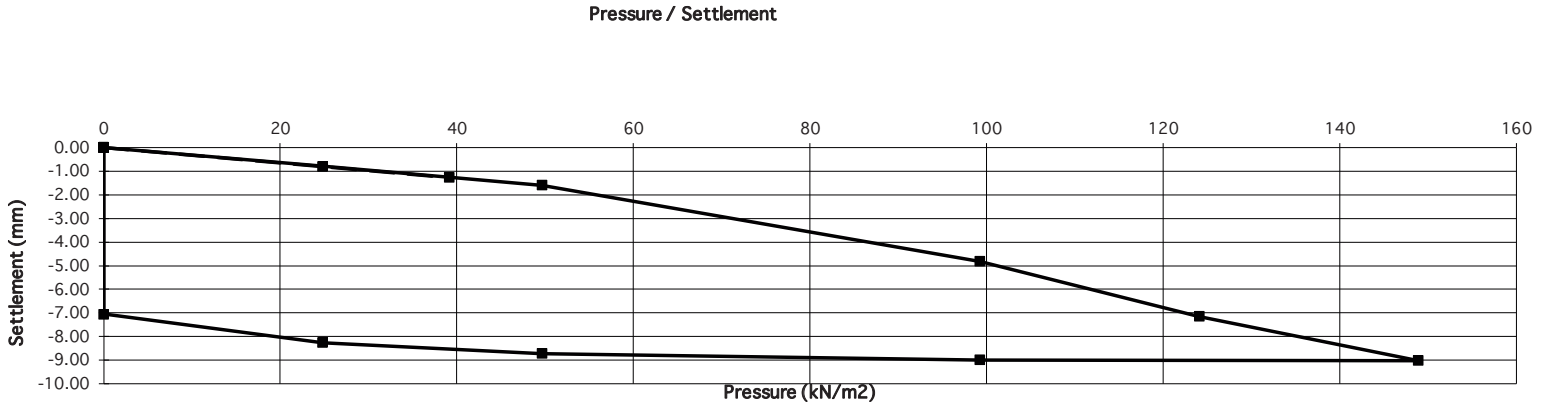
Reference No.	R157914
Contract	An Thriantán, Station Road Housing
Test No.	PBT04
Location	E:672995.1 N:712611.6 El:100.785
Depth	0.70m
Client	Kildare County Council
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	P.Nixon
Authorised by	
Date	06/12/2024

Description of soil under test
(natural soil, placed fill, sub-base)

Brown Sandy Gravely Clay

Sample Ref No. N/A
Depth 0.00 m bgl

Applied Pressure/Settlement Curve



Gradient at 1.25 mm settlement intersection = 31
Modulus of subgrade reaction = 20 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.8 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R157914
Contract	An Thriantán, Station Road Housing
Test No.	PBT04 - Reload
Location	E:672995.1 N:712611.6 El:100.785
Depth	0.70m
Client	Kildare County Council
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	P.Nixon
Authorised by	
Date	06/12/2024

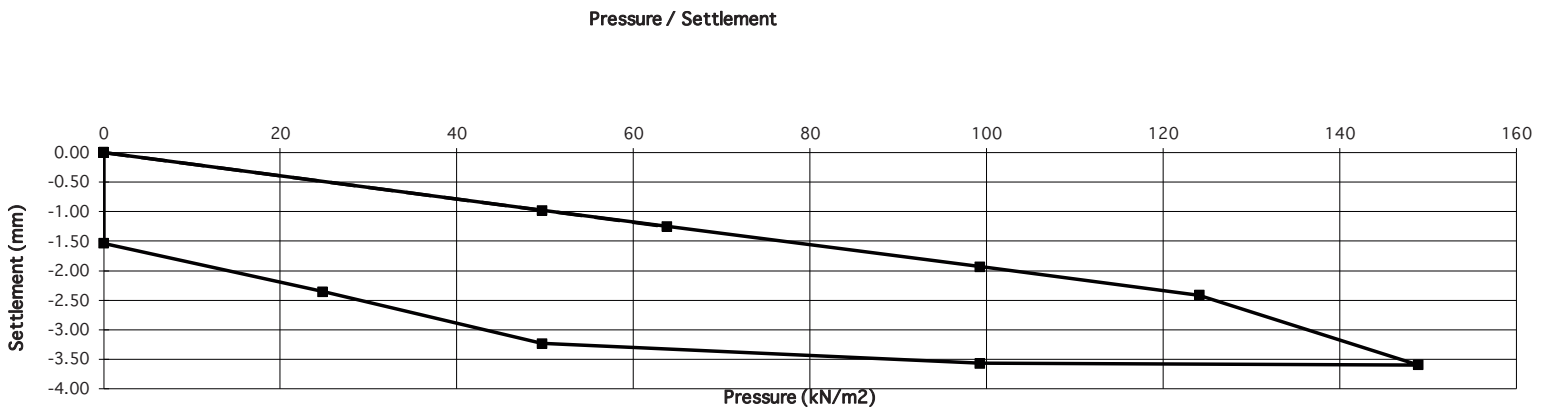
Description of soil under test
(natural soil, placed fill, sub-base)

Brown Sandy Gravely Clay

Sample Ref No. N/A
Depth 0.00 m bgl

IGSL Ltd.

INAB



Gradient at 1.25 mm settlement intersection = 51
Modulus of subgrade reaction = 33 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.1 %

Appendix 5

Groundwater Monitoring

Project No. 25468	**GROUNDWATER MONITORING DATA SHEET**	***IGSL Ltd***
Project: An Triantán, Station Road Housing Engineer: Cundall		

Exploratory Hole No.	Hole Depth (m bgl)	Response Zone Top (m bgl)	Response Zone Base (m bgl)	Groundwater level (m bgl) (11/09/24)	Groundwater level (m bgl)	Groundwater level (m bgl)	Groundwater level (m bgl)	Comments
BH02	6.00	5.00	6.00	Dry				
BH05	5.40	1.00	5.40	3.80				

Remarks: Water levels measured using electric dipmeter
BH - denotes cable percussion borehole
RC - denotes rotary core drillhole

Appendix 6

Geotechnical Laboratory Results (Soil)

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3**

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

Report No. **R159645** Contract No. 25468 Contract Name: An Triantan Housing Development Kildare

Customer Kildare Co.Co. / Cundell

Samples Received: 24/07/24 Date Tested: 24/07/24

BH/TP*	Sample No.	Depth* (m)	Lab. Ref	Sample Type*	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
BH01	AA227519	1.2	A24/3353	B	12	24	NP	NP	66	WS	4.4		Brown sandy gravelly SILT
BH02	AA227512	1.2	A24/3358	B	13	31	17	14	69	WS	4.4	C L	Brown sandy gravelly CLAY
BH02	AA227514	3.2	A24/3359	B	13	26	14	12	69	WS	4.4	C L	Brown sandy gravelly CLAY
BH03	AA227527	2.2	A24/3356	B	12	25	13	12	72	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
BH04	AA227504	2.2	A24/3361	B	10	28	NP	NP	58	WS	4.4		Brown sandy gravelly SILT
BH05	AA227533	2.3	A24/3364	B	13	27	14	13	67	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
TP01	AA229996	1.5	A24/3366	B	35	54	NP	NP	57	WS	4.4		Brown sandy gravelly SILT
TP03	AA229999	1.4	A24/3369	B	13	27	15	12	68	WS	4.4	C L	Brown sandy gravelly CLAY

Preparation: WS - Wet sieved
AR - As received
NP - Non plastic

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method
4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed
U - Undisturbed

Remarks:
Results relate only to the specimen tested,in as received condition unless otherwise noted.
NOTE: **These clauses have been superceded by EN 17892-1 and EN17892-12.
Opinions and interpretations are outside the scope of accreditation. * denotes Customer supplied information.
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IGSL Ltd Materials Laboratory

Persons authorized to approve reports
H Byrne (Laboratory Manager)

Approved by: H Byrne

Date: 28/08/24

Page: 1 of 1

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	96	
20	96	
14	94	
10	91	
6.3	87	
5	86	
3.35	84	
2	81	
1.18	78	SAND
0.6	73	
0.425	71	
0.3	69	
0.15	60	
0.063	50	SILT/CLAY
0.038	43	
0.027	39	
0.017	34	
0.010	31	
0.007	26	
0.005	22	
0.002	12	

Contract No. 25468 Report No. R160547

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH01

Sample No.* AA227521 Lab. Sample No. A24/3354

Sample Type: B

Depth* (m) 3.20 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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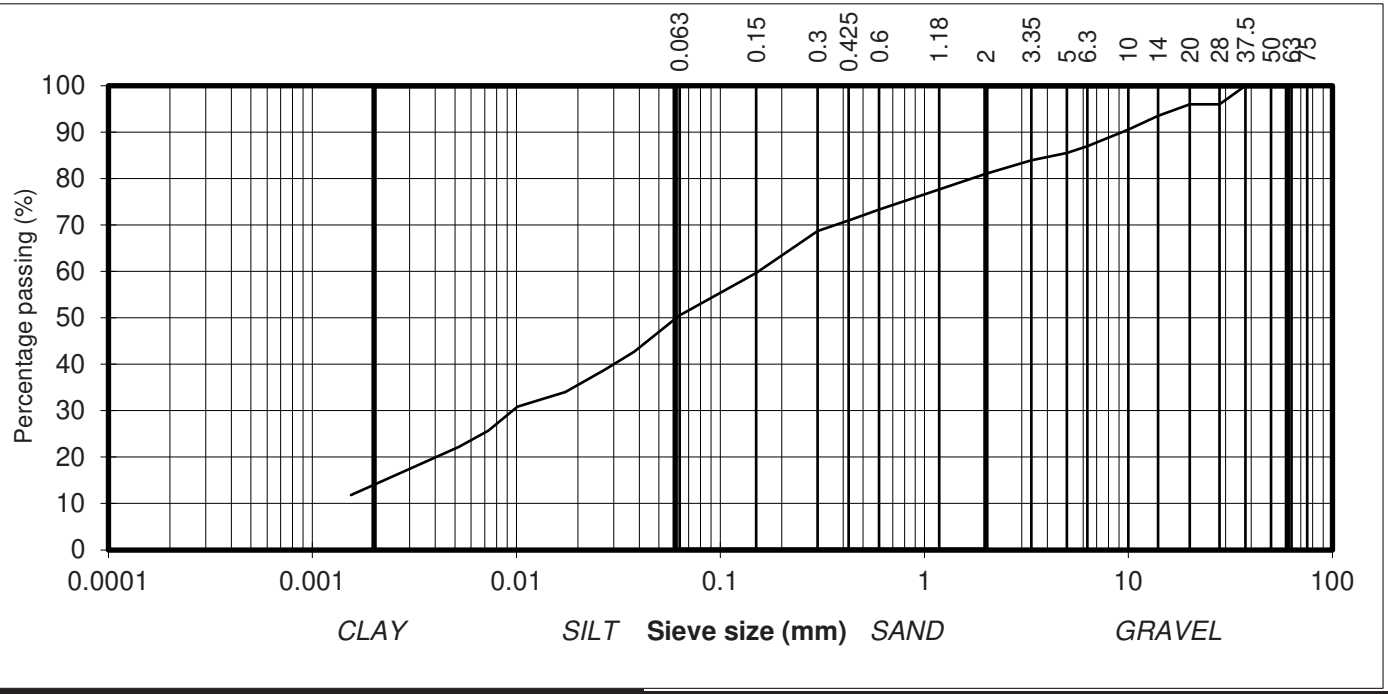

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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	76	
50	76	GRAVEL
37.5	67	
28	64	
20	59	
14	55	
10	50	
6.3	43	
5	39	
3.35	32	
2	26	
1.18	20	SAND
0.6	12	
0.425	8	
0.3	5	
0.15	3	
0.063	2	SILT/CLAY

Contract No. 25468 Report No. R159646

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH01

Sample No.* AA227523 Lab. Sample No. A24/3355

Sample Type: B

Depth* (m) 5.20 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Brown slightly clayey/silty, very sandy, GRAVEL with many cobbles

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Sample size did not meet the requirements of BS1377

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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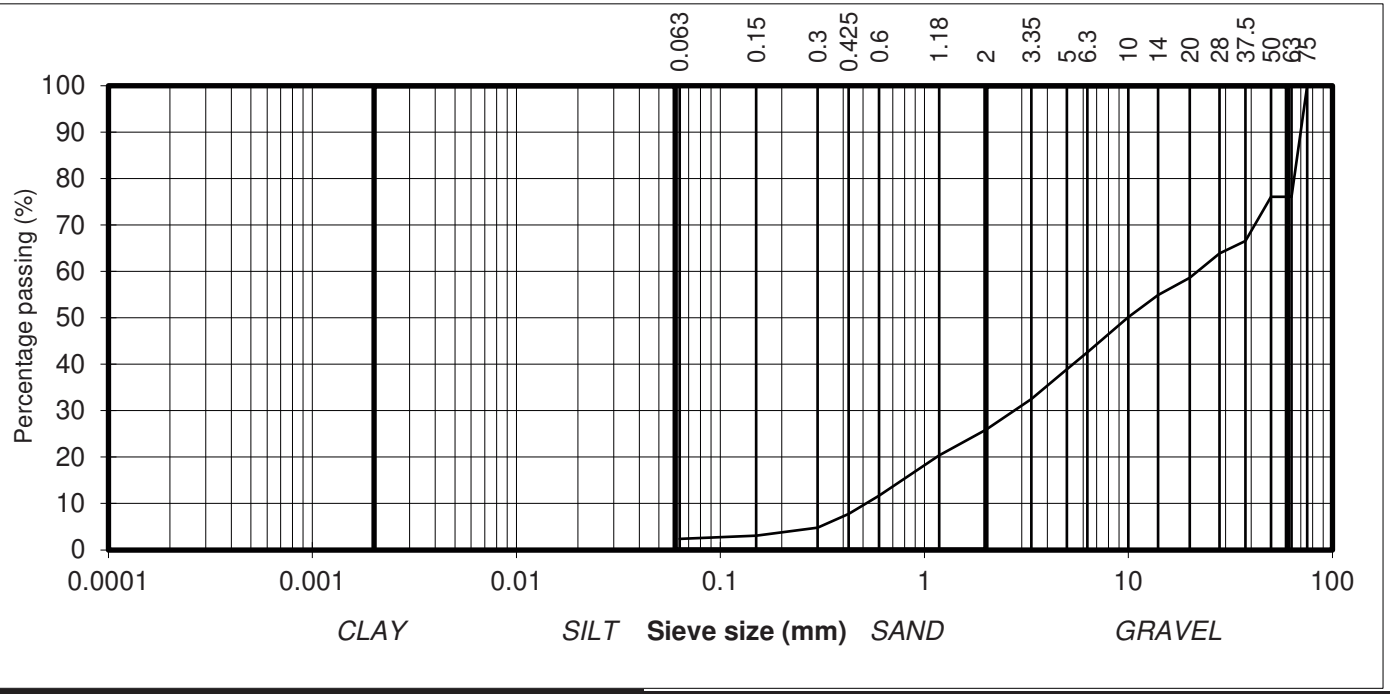

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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	98	
20	95	
14	92	
10	89	
6.3	85	
5	84	
3.35	81	
2	78	
1.18	75	SAND
0.6	71	
0.425	69	
0.3	66	
0.15	59	
0.063	51	SILT/CLAY

Contract No. 25468 Report No. R159647

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH02

Sample No.* AA227514 Lab. Sample No. A24/3359

Sample Type: B

Depth* (m) 3.20 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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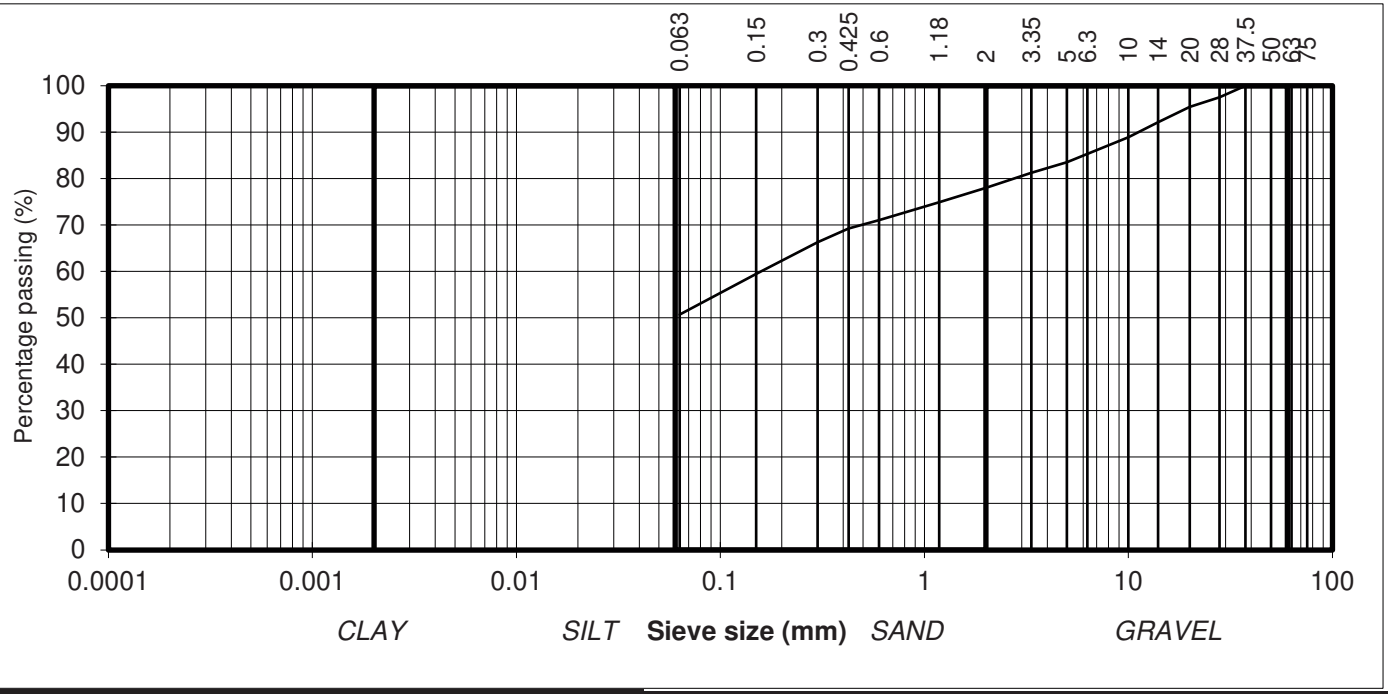

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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	61	COBBLES
63	61	
50	55	GRAVEL
37.5	49	
28	43	
20	41	
14	36	
10	33	
6.3	26	
5	22	
3.35	18	
2	12	
1.18	8	SAND
0.6	4	
0.425	3	
0.3	2	
0.15	1	
0.063	0	SILT/CLAY

Contract No. 25468 Report No. R159648

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH02

Sample No.* AA227516 Lab. Sample No. A24/3360

Sample Type: B

Depth* (m) 5.20 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Grey sandy, GRAVEL with many cobbles

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Sample size did not meet the requirements of BS1377

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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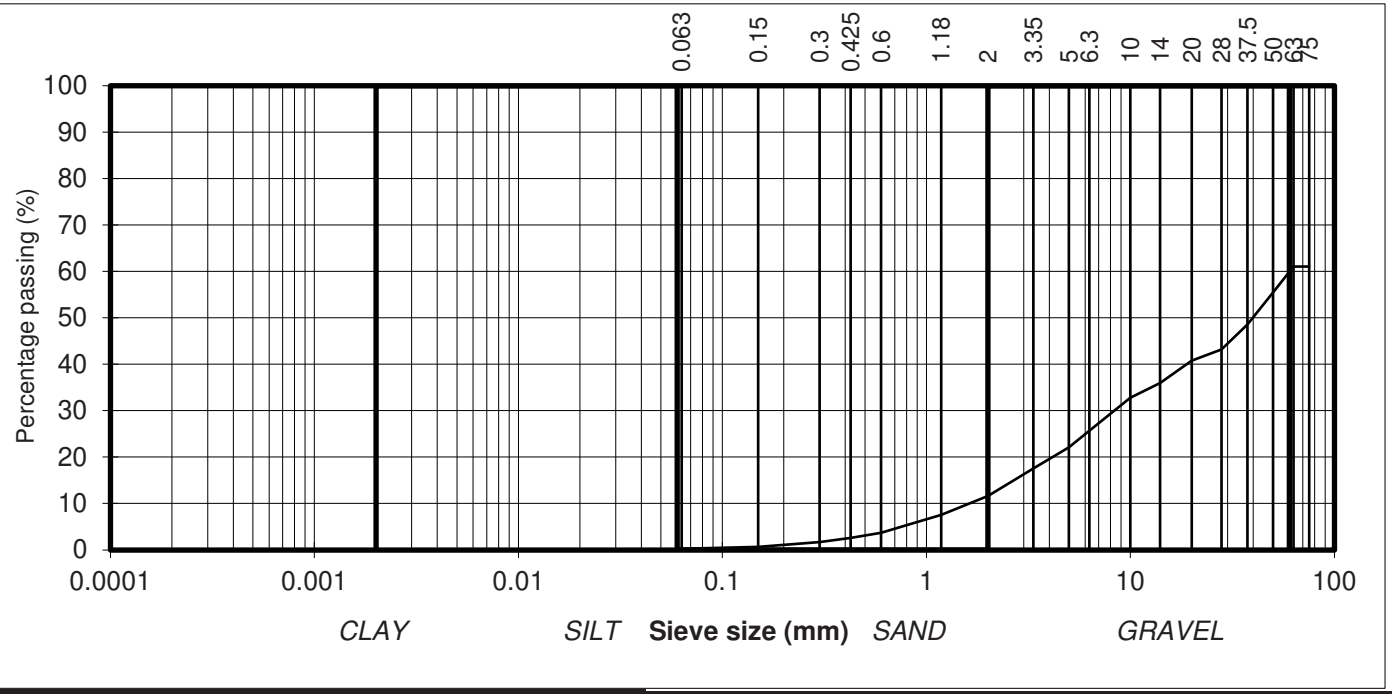

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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	95	
28	95	
20	91	
14	88	
10	86	
6.3	83	
5	81	
3.35	79	
2	76	
1.18	74	SAND
0.6	70	
0.425	69	
0.3	67	
0.15	61	
0.063	52	SILT/CLAY
0.038	43	
0.027	40	
0.017	36	
0.010	33	
0.007	28	
0.005	24	
0.002	14	

Contract No. 25468 Report No. R159649

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH03

Sample No.* AA227527 Lab. Sample No. A24/3356

Sample Type: B

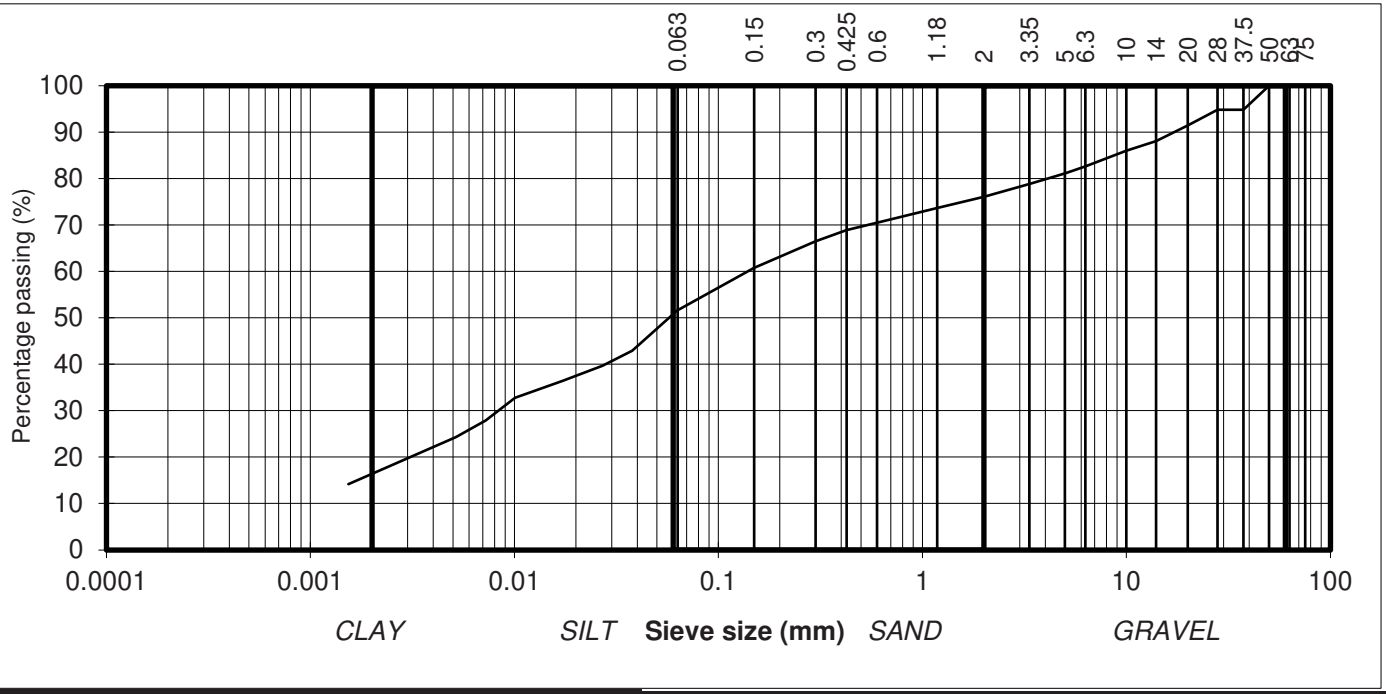
Depth* (m) 2.20 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

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 ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.



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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)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	86	GRAVEL
37.5	86	
28	86	
20	83	
14	79	
10	74	
6.3	67	
5	63	
3.35	59	
2	53	
1.18	48	SAND
0.6	41	
0.425	38	
0.3	33	
0.15	20	
0.063	8	SILT/CLAY

Contract No. 25468 Report No. R160546

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH03

Sample No.* AA227529 Lab. Sample No. A24/3357

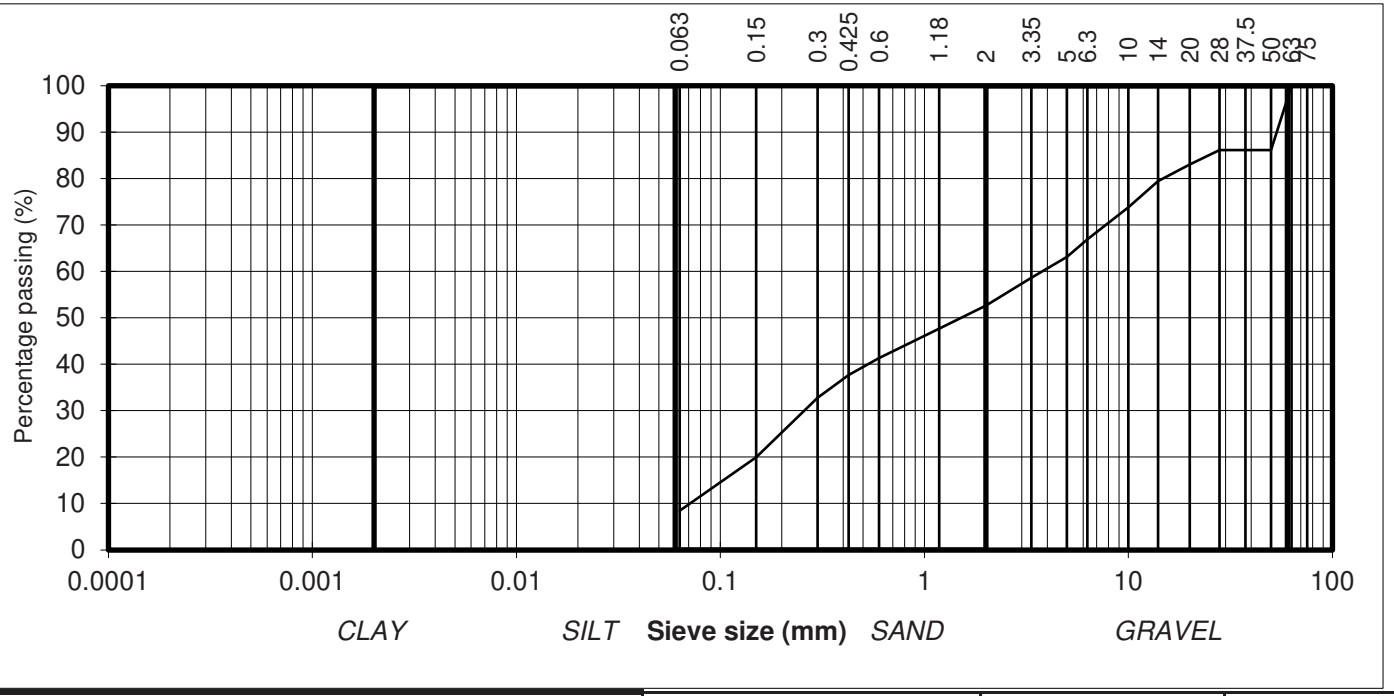
Sample Type: B

Depth* (m) 4.20 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Brown clayey/silty, very sandy, GRAVEL

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Sample size did not meet the requirements of BS1377



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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)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	97	
28	87	
20	82	
14	77	
10	70	
6.3	55	
5	46	
3.35	35	
2	21	
1.18	12	SAND
0.6	6	
0.425	4	
0.3	3	
0.15	1	
0.063	0	SILT/CLAY

Contract No. 25468 Report No. R159650

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH04

Sample No.* AA227507 Lab. Sample No. A24/3362

Sample Type: B

Depth* (m) 4.20 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Grey very sandy, GRAVEL

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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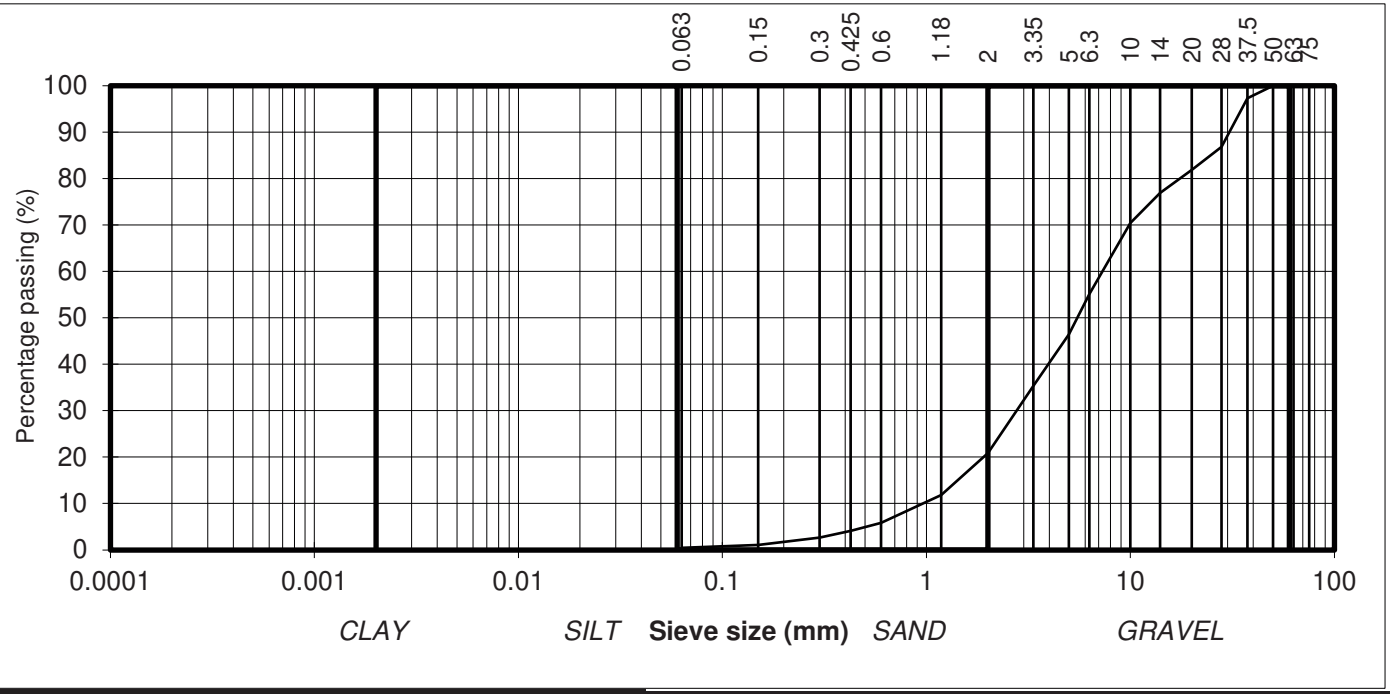

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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	95	
28	95	
20	92	
14	88	
10	86	
6.3	83	
5	81	
3.35	79	
2	76	
1.18	74	SAND
0.6	71	
0.425	69	
0.3	67	
0.15	61	
0.063	52	SILT/CLAY
0.038	43	
0.027	40	
0.017	36	
0.010	33	
0.007	28	
0.005	24	
0.002	14	

Contract No. 25468 Report No. R160545

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH04

Sample No.* AA227509 Lab. Sample No. A24/3363

Sample Type: B

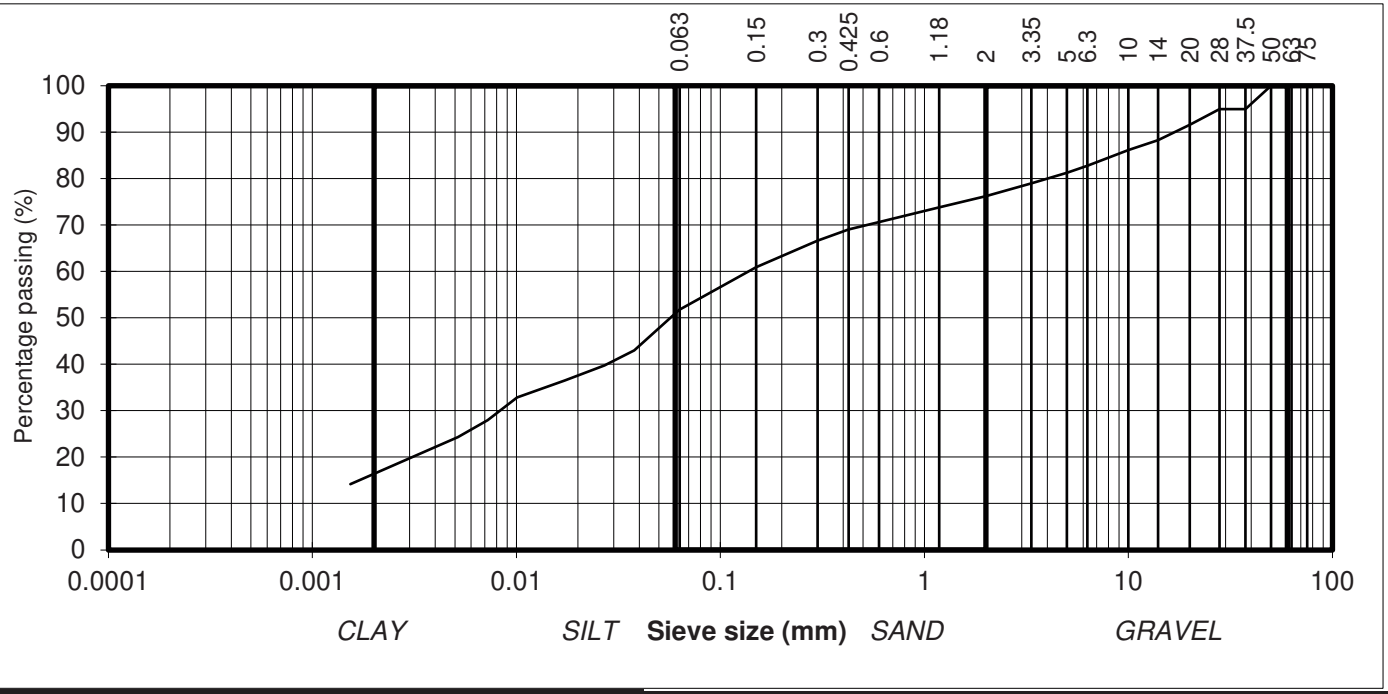
Depth* (m) 6.20 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.



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Approved by:	Date:	Page no:
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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)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	96	
14	94	
10	91	
6.3	86	
5	85	
3.35	82	
2	79	
1.18	76	SAND
0.6	71	
0.425	69	
0.3	66	
0.15	59	
0.063	51	SILT/CLAY
0.039	47	
0.028	43	
0.018	39	
0.010	34	
0.007	30	
0.005	24	
0.002	14	

Contract No. 25468 Report No. R159651

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH05

Sample No.* AA227533 Lab. Sample No. A24/3364

Sample Type: B

Depth* (m) 2.20 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

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 ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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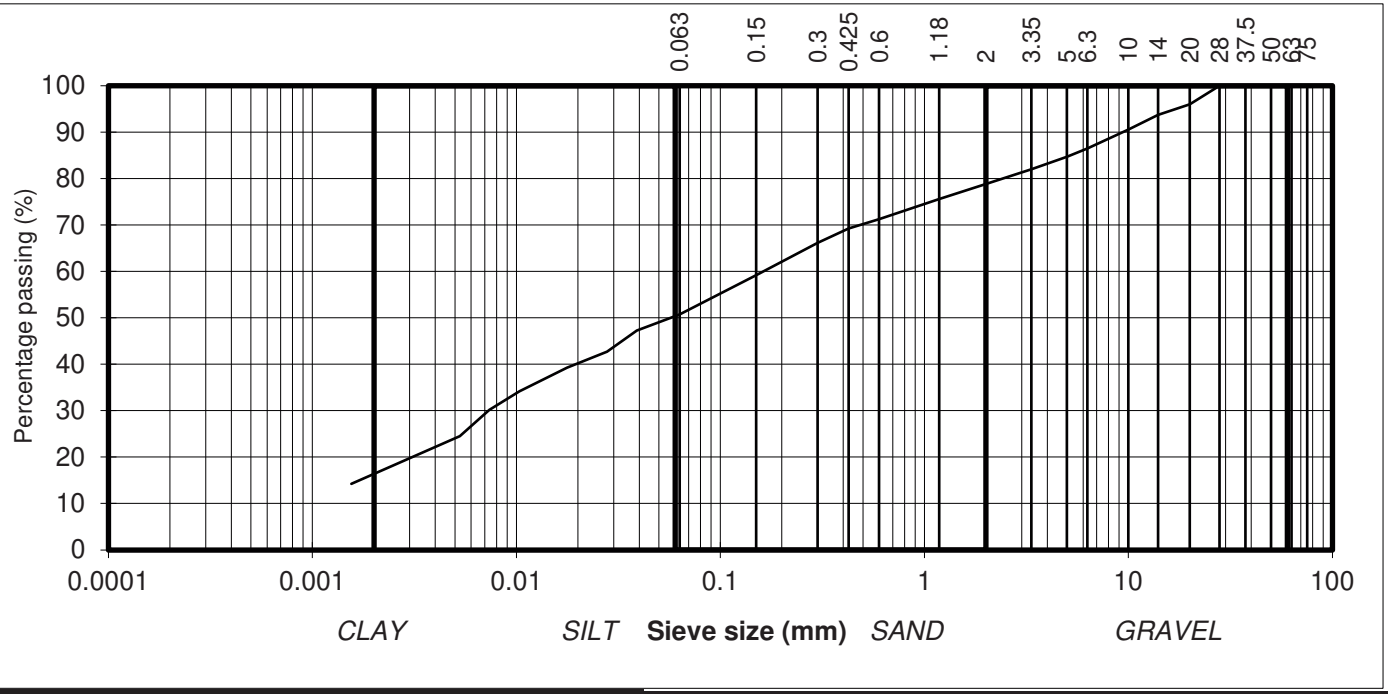

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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	88	GRAVEL
37.5	88	
28	82	
20	80	
14	74	
10	66	
6.3	52	
5	44	
3.35	32	
2	20	
1.18	11	SAND
0.6	5	
0.425	3	
0.3	2	
0.15	1	
0.063	0	SILT/CLAY

Contract No. 25468 Report No. R160549

Contract Name : An Triantan Housing Development Kildare

BH/TP No. BH05

Sample No.* AA227536 Lab. Sample No. A24/3365

Sample Type: B

Depth* (m) 5.50 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Brown sandy, GRAVEL

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Sample size did not meet the requirements of BS1377

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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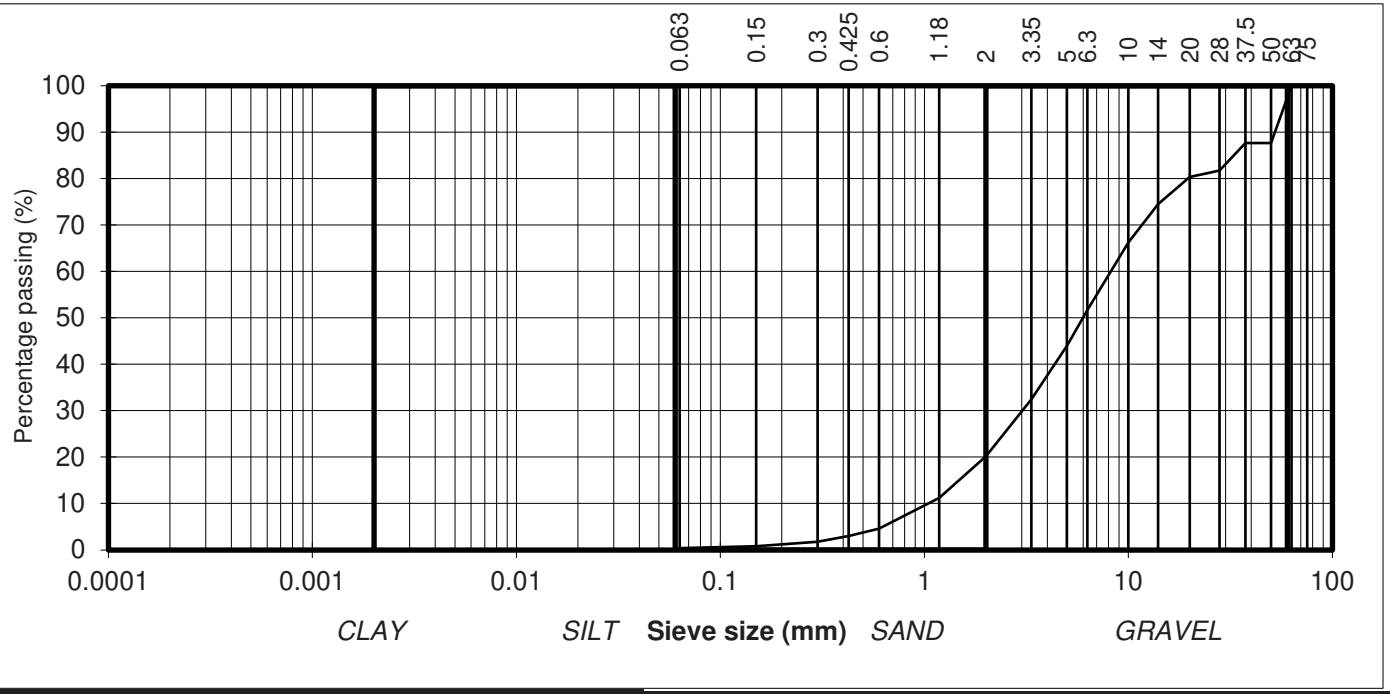

IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	28/08/24	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)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	98	
14	96	
10	93	
6.3	89	
5	88	
3.35	85	
2	82	
1.18	79	SAND
0.6	76	
0.425	74	
0.3	71	
0.15	65	
0.063	56	SILT/CLAY
0.038	48	
0.027	43	
0.017	40	
0.010	35	
0.007	30	
0.005	25	
0.002	14	

Contract No. 25468 Report No. R159652

Contract Name : An Triantan Housing Development Kildare

BH/TP No. TP01

Sample No.* AA229997 Lab. Sample No. A24/3367

Sample Type: B

Depth* (m) 2.30 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

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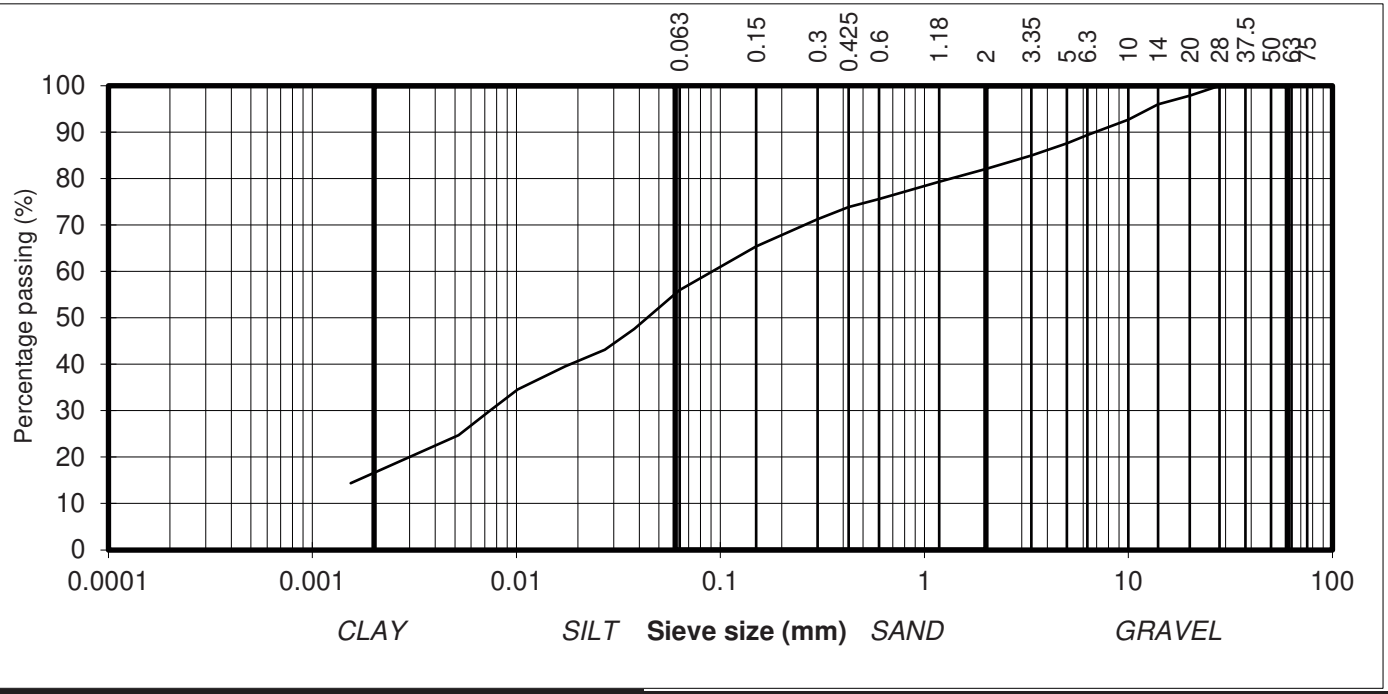


IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	28/08/24	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)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	100	
50	93	GRAVEL
37.5	93	
28	88	
20	86	
14	83	
10	77	
6.3	68	
5	63	
3.35	57	
2	46	
1.18	34	SAND
0.6	24	
0.425	22	
0.3	20	
0.15	17	
0.063	15	SILT/CLAY

Contract No. 25468 Report No. R160548

Contract Name : An Triantan Housing Development Kildare

BH/TP No. TP02

Sample No.* AA229990 Lab. Sample No. A24/3373

Sample Type: B

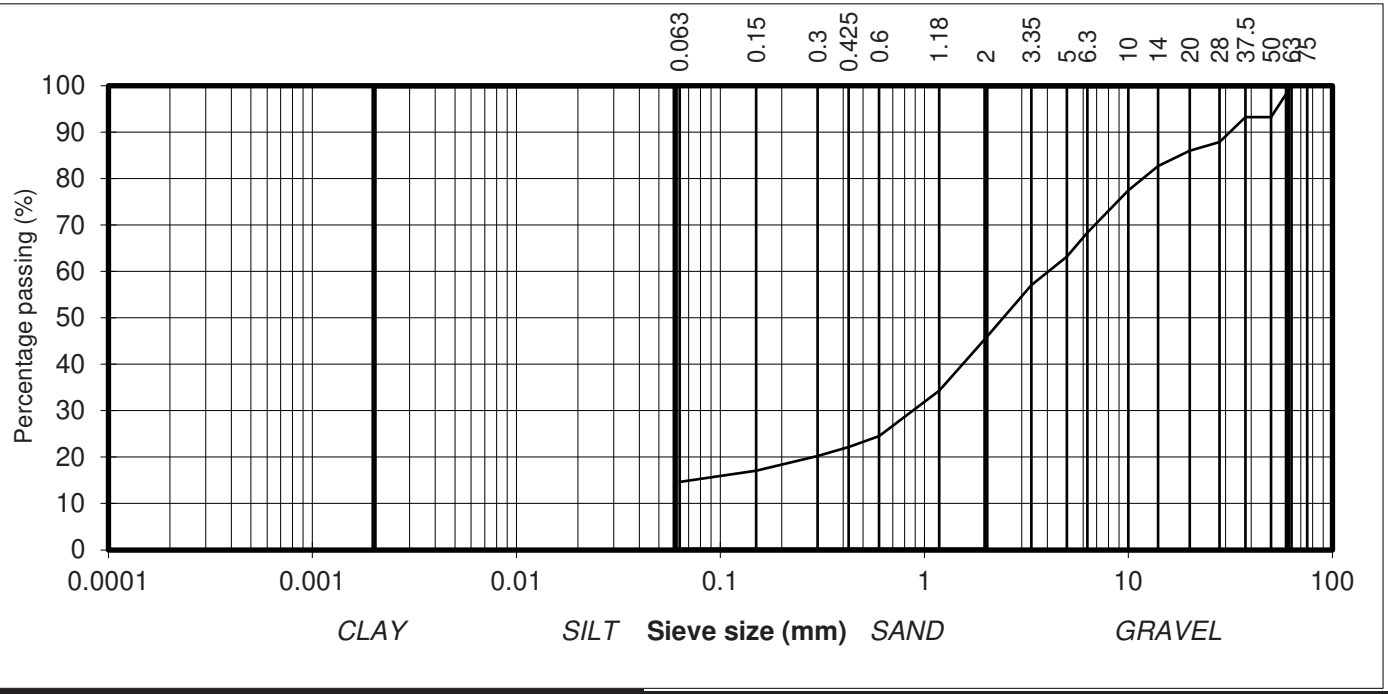
Depth* (m) 1.60 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Brown clayey/silty, very sandy, GRAVEL

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.



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Approved by:	Date:	Page no:
H Byrne	28/08/24	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)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

particle size	% passing	
75	100	COBBLES
63	83	
50	83	GRAVEL
37.5	76	
28	69	
20	64	
14	59	
10	55	
6.3	49	
5	46	
3.35	42	
2	36	
1.18	30	SAND
0.6	23	
0.425	20	
0.3	17	
0.15	13	
0.063	11	SILT/CLAY

Contract No. 25468 Report No. R159653

Contract Name : An Triantan Housing Development Kildare

BH/TP No. TP04

Sample No.* AA229994 Lab. Sample No. A24/3370

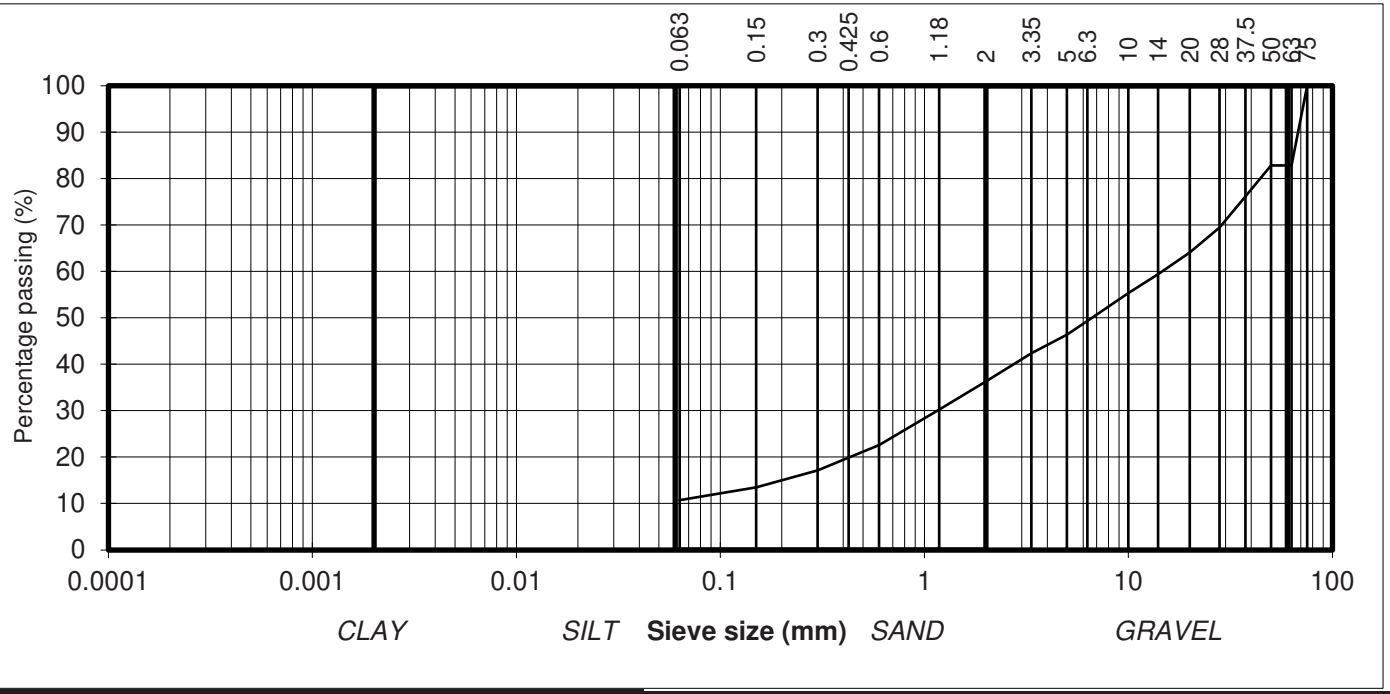
Sample Type: B

Depth* (m) 2.40 Customer: Kildare Co.Co. / Cundell

Date Received 24/07/2024 Date Testing started 24/07/2024

Description: Brown clayey/silty, very sandy, GRAVEL with some cobbles

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	28/08/24	1 of 1

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

Appendix 7

Chemical & Environmental Test Records (Soil)

24-23378

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

Final Report

Report No.:	24-23378-1
Initial Date of Issue:	01-Aug-2024
Re-Issue Details:	
Client	IGSL
Client Address:	M7 Business Park Naas County Kildare Ireland
Contact(s):	Darren Keogh
Project	25408 An Triantan
Quotation No.:	Q24-34387
Date Received:	23-Jul-2024
Order No.:	
Date Instructed:	23-Jul-2024
No. of Samples:	10
Turnaround (Wkdays):	7
Results Due:	31-Jul-2024
Date Approved:	01-Aug-2024
Approved By:	
Details:	David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Leachate

Project: 25408 An Triantan

Client: IGSL						**Chemtest Job No.:**	24-23378	24-23378	24-23378	24-23378
Quotation No.: Q24-34387						**Chemtest Sample ID.:**	1839477	1839479	1839481	1839482	1839485
Order No.:						Client Sample Ref.:	BH3	BH4	BH5	TP1	TP4
						Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL
						Top Depth (m):	0.65	0.35	1.20	0.40	0.50
						Date Sampled:	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**						
Ammonium	U	1220	10:1	mg/l	0.050		0.056	0.096	0.053	0.081	0.17
Ammonium	N	1220	10:1	mg/kg	0.10		0.67	1.2	0.57	0.84	1.7

Results - Soil

Project: 25408 An Triantan

Client: IGSL				**Chemtest Job No.:**		24-23378	24-23378	24-23378	24-23378	24-23378	24-23378	24-23378	24-23378
Quotation No.: Q24-34387				**Chemtest Sample ID.:**		1839476	1839477	1839478	1839479	1839480	1839481	1839482	1839483
Order No.:				Client Sample Ref.:		BH1	BH3	BH2	BH4	BH4	BH5	TP1	TP1
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.20	0.65	1.20	0.35	2.00	1.20	0.40	1.50
				Date Sampled:		19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024
				Asbestos Lab:			NEW-ASB		NEW-ASB		NEW-ASB	NEW-ASB	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type		U	2192		N/A		-		-		-	-	
Asbestos Identification		U	2192		N/A		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	
Moisture		N	2030	%	0.020	11	30	14	16	9.8	20	19	21
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones	Stones and Roots	Stones	Stones and Roots	Stones	Stones and Roots	Stones and Roots	Stones and Roots
Soil Texture		N	2040		N/A	Clay	Sand	Sand	Sand	Sand	Sand	Sand	Sand
pH (2.5:1) at 20C		N	2010		4.0	8.4		8.3		8.3			8.4
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40		1.1		1.2		3.3	1.8	
Magnesium (Water Soluble)		N	2120	g/l	0.010	< 0.010		< 0.010		< 0.010			< 0.010
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	< 0.010		< 0.010		< 0.010			< 0.010
Total Sulphur		U	2175	%	0.010	0.030		0.020		0.020			0.040
Sulphur (Elemental)		M	2180	mg/kg	1.0		1.1		1.4		1.1	< 1.0	
Chloride (Water Soluble)		M	2220	g/l	0.010	< 0.010		< 0.010		< 0.010			< 0.010
Nitrate (Water Soluble)		N	2220	g/l	0.010	< 0.010		< 0.010		< 0.010			0.040
Cyanide (Total)		M	2300	mg/kg	0.50		0.50		< 0.50		0.60	< 0.50	
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50		9.2		4.5		5.9	6.5	
Ammonium (Water Soluble)		M	2220	g/l	0.01	< 0.01		< 0.01		< 0.01			< 0.01
Sulphate (Total)		U	2430	%	0.010		0.29		0.12		0.21	0.098	
Sulphate (Acid Soluble)		U	2430	%	0.010	< 0.010		0.012		< 0.010			0.052
Arsenic		M	2455	mg/kg	0.5		4.0		5.3		5.1	6.2	
Barium		M	2455	mg/kg	0.5		80		90		130	150	
Cadmium		M	2455	mg/kg	0.10		2.3		0.56		1.3	0.91	
Chromium		M	2455	mg/kg	0.5		9.0		9.5		13	11	
Molybdenum		M	2455	mg/kg	0.5		0.9		0.6		0.5	0.6	
Antimony		N	2455	mg/kg	2.0		< 2.0		3.4		< 2.0	< 2.0	
Copper		M	2455	mg/kg	0.50		20		18		24	19	
Mercury		M	2455	mg/kg	0.05		0.13		0.32		0.11	< 0.05	
Nickel		M	2455	mg/kg	0.50		17		17		19	22	
Lead		M	2455	mg/kg	0.50		31		47		50	15	
Selenium		M	2455	mg/kg	0.25		0.84		0.69		0.61	0.52	
Zinc		M	2455	mg/kg	0.50		120		82		190	84	
Chromium (Trivalent)		N	2490	mg/kg	1.0		9.0		9.5		13	11	
Chromium (Hexavalent)		N	2490	mg/kg	0.50		< 0.50		< 0.50		< 0.50	< 0.50	
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05	< 0.05	
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05	< 0.05	
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05	< 0.05	
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05	< 0.05	

Results - Soil

Project: 25408 An Triantan

Client: IGSL				**Chemtest Job No.:**		24-23378	24-23378	24-23378	24-23378	24-23378	24-23378	24-23378	24-23378
Quotation No.: Q24-34387				**Chemtest Sample ID.:**		1839476	1839477	1839478	1839479	1839480	1839481	1839482	1839483
Order No.:				Client Sample Ref.:		BH1	BH3	BH2	BH4	BH4	BH5	TP1	TP1
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.20	0.65	1.20	0.35	2.00	1.20	0.40	1.50
				Date Sampled:		19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024
				Asbestos Lab:			NEW-ASB		NEW-ASB		NEW-ASB	NEW-ASB	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25		< 0.25		< 0.25		< 0.25	< 0.25	
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00		< 2.0		< 2.0		< 2.0	< 2.0	
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00		< 1.0		< 1.0		< 1.0	< 1.0	
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00		4.2		< 2.0		< 2.0	< 2.0	
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00		22		3.5		12	< 3.0	
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00		< 10		< 10		< 10	< 10	
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00		27		< 5.0		13	< 5.0	
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05	< 0.05	
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05	< 0.05	
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05	< 0.05	
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25		< 0.25		< 0.25		< 0.25	< 0.25	
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00		< 1.0		< 1.0		< 1.0	< 1.0	
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00		< 1.0		< 1.0		< 1.0	< 1.0	
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00		2.9		3.8		3.9	3.1	
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00		49		7.1		24	3.9	
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00		18		< 1.0		13	2.6	
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00		52		11		28	7.0	
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50		< 0.50		< 0.50		< 0.50	< 0.50	
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00		80		14		41	< 10	
Mineral Oil EPH		N	2670	mg/kg	10		< 10		< 10		< 10	< 10	
Benzene		M	2760	µg/kg	1.0		< 1.0		< 1.0		< 1.0	< 1.0	
Toluene		M	2760	µg/kg	1.0		< 1.0		< 1.0		< 1.0	< 1.0	
Ethylbenzene		M	2760	µg/kg	1.0		< 1.0		< 1.0		< 1.0	< 1.0	
m & p-Xylene		M	2760	µg/kg	1.0		< 1.0		< 1.0		< 1.0	< 1.0	
o-Xylene		M	2760	µg/kg	1.0		< 1.0		< 1.0		< 1.0	< 1.0	
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0		< 1.0		< 1.0		< 1.0	< 1.0	
Naphthalene		M	2800	mg/kg	0.10		0.19		< 0.10		< 0.10	< 0.10	
Acenaphthylene		N	2800	mg/kg	0.10		0.15		< 0.10		< 0.10	< 0.10	
Acenaphthene		M	2800	mg/kg	0.10		0.27		< 0.10		< 0.10	< 0.10	
Fluorene		M	2800	mg/kg	0.10		0.24		< 0.10		< 0.10	< 0.10	
Phenanthrene		M	2800	mg/kg	0.10		0.34		< 0.10		< 0.10	< 0.10	
Anthracene		M	2800	mg/kg	0.10		0.24		< 0.10		< 0.10	< 0.10	
Fluoranthene		M	2800	mg/kg	0.10		0.55		< 0.10		< 0.10	< 0.10	
Pyrene		M	2800	mg/kg	0.10		0.53		< 0.10		< 0.10	< 0.10	
Benzo[a]anthracene		M	2800	mg/kg	0.10		0.44		< 0.10		< 0.10	< 0.10	
Chrysene		M	2800	mg/kg	0.10		0.47		< 0.10		< 0.10	< 0.10	
Benzo[b]fluoranthene		M	2800	mg/kg	0.10		0.55		< 0.10		< 0.10	< 0.10	
Benzo[k]fluoranthene		M	2800	mg/kg	0.10		0.34		< 0.10		< 0.10	< 0.10	
Benzo[a]pyrene		M	2800	mg/kg	0.10		0.43		< 0.10		< 0.10	< 0.10	

Results - Soil

Project: 25408 An Triantan

Client: IGSL				**Chemtest Job No.:**		24-23378	24-23378	24-23378	24-23378	24-23378	24-23378	24-23378	24-23378
Quotation No.: Q24-34387				**Chemtest Sample ID.:**		1839476	1839477	1839478	1839479	1839480	1839481	1839482	1839483
Order No.:				Client Sample Ref.:		BH1	BH3	BH2	BH4	BH4	BH5	TP1	TP1
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.20	0.65	1.20	0.35	2.00	1.20	0.40	1.50
				Date Sampled:		19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024	19-Jul-2024
				Asbestos Lab:			NEW-ASB		NEW-ASB		NEW-ASB	NEW-ASB	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10		0.52		< 0.10		< 0.10	< 0.10	
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10		< 0.10		< 0.10		< 0.10	< 0.10	
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10		0.44		< 0.10		< 0.10	< 0.10	
Coronene		N	2800	mg/kg	0.10		< 0.10		< 0.10		< 0.10	< 0.10	
PCB 28		U	2815	mg/kg	0.010		< 0.010		< 0.010		< 0.010	< 0.010	
PCB 52		U	2815	mg/kg	0.010		< 0.010		< 0.010		< 0.010	< 0.010	
PCB 101		U	2815	mg/kg	0.010		< 0.010		< 0.010		< 0.010	< 0.010	
PCB 118		U	2815	mg/kg	0.010		< 0.010		< 0.010		< 0.010	< 0.010	
PCB 153		U	2815	mg/kg	0.010		< 0.010		< 0.010		< 0.010	< 0.010	
PCB 138		U	2815	mg/kg	0.010		< 0.010		< 0.010		< 0.010	< 0.010	
PCB 180		U	2815	mg/kg	0.010		< 0.010		< 0.010		< 0.010	< 0.010	
Tot PCBs Low (7 Congeners)		N	2815	mg/kg	0.05		< 0.05		< 0.05		< 0.05	< 0.05	
Total Phenols		M	2920	mg/kg	0.10		< 0.10		< 0.10		< 0.10	< 0.10	

Results - Soil

Project: 25408 An Triantan

Client: IGSL				**Chemtest Job No.:**		24-23378	24-23378
Quotation No.: Q24-34387				**Chemtest Sample ID.:**		1839484	1839485
Order No.:				Client Sample Ref.:		TP3	TP4
				Sample Type:		SOIL	SOIL
				Top Depth (m):		1.40	0.50
				Date Sampled:		19-Jul-2024	19-Jul-2024
				Asbestos Lab:			NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type		U	2192		N/A		-
Asbestos Identification		U	2192		N/A		No Asbestos Detected
Moisture		N	2030	%	0.020	10	15
Soil Colour		N	2040		N/A	Brown	Brown
Other Material		N	2040		N/A	Stones	Stones and Roots
Soil Texture		N	2040		N/A	Sand	Sand
pH (2.5:1) at 20C		N	2010		4.0	8.6	
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40		1.5
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		U	2175	%	0.010	0.020	
Sulphur (Elemental)		M	2180	mg/kg	1.0		2.6
Chloride (Water Soluble)		M	2220	g/l	0.010	< 0.010	
Nitrate (Water Soluble)		N	2220	g/l	0.010	< 0.010	
Cyanide (Total)		M	2300	mg/kg	0.50		< 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50		2.8
Ammonium (Water Soluble)		M	2220	g/l	0.01	< 0.01	
Sulphate (Total)		U	2430	%	0.010		0.065
Sulphate (Acid Soluble)		U	2430	%	0.010	< 0.010	
Arsenic		M	2455	mg/kg	0.5		4.8
Barium		M	2455	mg/kg	0.5		85
Cadmium		M	2455	mg/kg	0.10		0.74
Chromium		M	2455	mg/kg	0.5		8.7
Molybdenum		M	2455	mg/kg	0.5		< 0.5
Antimony		N	2455	mg/kg	2.0		< 2.0
Copper		M	2455	mg/kg	0.50		19
Mercury		M	2455	mg/kg	0.05		< 0.05
Nickel		M	2455	mg/kg	0.50		18
Lead		M	2455	mg/kg	0.50		14
Selenium		M	2455	mg/kg	0.25		0.40
Zinc		M	2455	mg/kg	0.50		84
Chromium (Trivalent)		N	2490	mg/kg	1.0		8.7
Chromium (Hexavalent)		N	2490	mg/kg	0.50		< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05

Results - Soil

Project: 25408 An Triantan

Client: IGSL				**Chemtest Job No.:**		24-23378	24-23378
Quotation No.: Q24-34387				**Chemtest Sample ID.:**		1839484	1839485
Order No.:				Client Sample Ref.:		TP3	TP4
				Sample Type:		SOIL	SOIL
				Top Depth (m):		1.40	0.50
				Date Sampled:		19-Jul-2024	19-Jul-2024
				Asbestos Lab:			NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25		< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00		< 2.0
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00		< 1.0
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00		< 2.0
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00		4.1
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00		< 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00		< 5.0
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05		< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05		< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05		< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25		< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00		< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00		< 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00		3.5
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00		3.9
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00		< 1.0
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00		7.4
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50		< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00		12
Mineral Oil EPH		N	2670	mg/kg	10		< 10
Benzene		M	2760	µg/kg	1.0		< 1.0
Toluene		M	2760	µg/kg	1.0		< 1.0
Ethylbenzene		M	2760	µg/kg	1.0		< 1.0
m & p-Xylene		M	2760	µg/kg	1.0		< 1.0
o-Xylene		M	2760	µg/kg	1.0		< 1.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0		< 1.0
Naphthalene		M	2800	mg/kg	0.10		< 0.10
Acenaphthylene		N	2800	mg/kg	0.10		< 0.10
Acenaphthene		M	2800	mg/kg	0.10		< 0.10
Fluorene		M	2800	mg/kg	0.10		< 0.10
Phenanthrene		M	2800	mg/kg	0.10		< 0.10
Anthracene		M	2800	mg/kg	0.10		< 0.10
Fluoranthene		M	2800	mg/kg	0.10		< 0.10
Pyrene		M	2800	mg/kg	0.10		< 0.10
Benzo[a]anthracene		M	2800	mg/kg	0.10		< 0.10
Chrysene		M	2800	mg/kg	0.10		< 0.10
Benzo[b]fluoranthene		M	2800	mg/kg	0.10		< 0.10
Benzo[k]fluoranthene		M	2800	mg/kg	0.10		< 0.10
Benzo[a]pyrene		M	2800	mg/kg	0.10		< 0.10

Results - Soil

Project: 25408 An Triantan

Client: IGSL				**Chemtest Job No.:**		24-23378	24-23378
Quotation No.: Q24-34387				**Chemtest Sample ID.:**		1839484	1839485
Order No.:				Client Sample Ref.:		TP3	TP4
				Sample Type:		SOIL	SOIL
				Top Depth (m):		1.40	0.50
				Date Sampled:		19-Jul-2024	19-Jul-2024
				Asbestos Lab:			NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10		< 0.10
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10		< 0.10
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10		< 0.10
Coronene		N	2800	mg/kg	0.10		< 0.10
PCB 28		U	2815	mg/kg	0.010		< 0.010
PCB 52		U	2815	mg/kg	0.010		< 0.010
PCB 101		U	2815	mg/kg	0.010		< 0.010
PCB 118		U	2815	mg/kg	0.010		< 0.010
PCB 153		U	2815	mg/kg	0.010		< 0.010
PCB 138		U	2815	mg/kg	0.010		< 0.010
PCB 180		U	2815	mg/kg	0.010		< 0.010
Tot PCBs Low (7 Congeners)		N	2815	mg/kg	0.05		< 0.05
Total Phenols		M	2920	mg/kg	0.10		< 0.10

Results - Single Stage WAC

Project: 25408 An Triantan

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-23378							
Chemtest Sample ID:	1839477							
Sample Ref:	BH3							
Sample ID:								
Sample Location:								
Top Depth(m):	0.65							
Bottom Depth(m):								
Sampling Date:	19-Jul-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		M	%	8.6	3	5	6
Loss On Ignition	2610		M	%	20	--	--	10
Total BTEX	2760		M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_CU_1D_Total	M	mg/kg	< 10	500	--	--
Total Of 17 PAHs Lower	2800		N	mg/kg	5.7	100	--	--
pH at 20C	2010		M		8.9	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.0080	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0003	0.0035	0.5	2	25
Barium	1455		U	< 0.005	< 0.050	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455		U	0.0018	0.018	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0006	0.0059	0.5	10	30
Nickel	1455		U	0.0007	0.0071	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.006	0.055	4	50	200
Chloride	1220		U	< 1.0	< 10	800	15000	25000
Fluoride	1220		U	0.094	< 1.0	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	76	750	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	4.3	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	30

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: 25408 An Triantan

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-23378							
Chemtest Sample ID:	1839479							
Sample Ref:	BH4							
Sample ID:								
Sample Location:								
Top Depth(m):	0.35							
Bottom Depth(m):								
Sampling Date:	19-Jul-2024					**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**				
Total Organic Carbon	2625		M	%	4.1	3	5	6
Loss On Ignition	2610		M	%	6.5	--	--	10
Total BTEX	2760		M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_CU_1D_Total	M	mg/kg	< 10	500	--	--
Total Of 17 PAHs Lower	2800		N	mg/kg	< 1.0	100	--	--
pH at 20C	2010		M		8.8	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.015	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0013	0.013	0.5	2	25
Barium	1455		U	< 0.005	< 0.050	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	0.0006	0.0057	0.5	10	70
Copper	1455		U	0.0016	0.016	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0006	0.0065	0.5	10	30
Nickel	1455		U	0.0013	0.013	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.006	0.063	4	50	200
Chloride	1220		U	< 1.0	< 10	800	15000	25000
Fluoride	1220		U	0.096	< 1.0	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	51	510	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	5.9	59	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: 25408 An Triantan

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-23378							
Chemtest Sample ID:	1839481							
Sample Ref:	BH5							
Sample ID:								
Sample Location:								
Top Depth(m):	1.20							
Bottom Depth(m):								
Sampling Date:	19-Jul-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		M	%	6.9	3	5	6
Loss On Ignition	2610		M	%	14	--	--	10
Total BTEX	2760		M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_CU_1D_Total	M	mg/kg	< 10	500	--	--
Total Of 17 PAHs Lower	2800		N	mg/kg	< 1.0	100	--	--
pH at 20C	2010		M		8.9	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.014	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0005	0.0051	0.5	2	25
Barium	1455		U	< 0.005	< 0.050	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455		U	0.0019	0.019	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0002	0.0020	0.5	10	30
Nickel	1455		U	0.0009	0.0092	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	0.0006	0.0063	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.008	0.083	4	50	200
Chloride	1220		U	2.0	20	800	15000	25000
Fluoride	1220		U	0.10	1.0	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	43	430	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	4.3	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	20

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: 25408 An Triantan

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-23378							
Chemtest Sample ID:	1839482							
Sample Ref:	TP1							
Sample ID:								
Sample Location:								
Top Depth(m):	0.40							
Bottom Depth(m):								
Sampling Date:	19-Jul-2024					**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**				
Total Organic Carbon	2625		M	%	2.8	3	5	6
Loss On Ignition	2610		M	%	5.4	--	--	10
Total BTEX	2760		M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_CU_1D_Total	M	mg/kg	< 10	500	--	--
Total Of 17 PAHs Lower	2800		N	mg/kg	< 1.0	100	--	--
pH at 20C	2010		M		8.0	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.011	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0011	0.011	0.5	2	25
Barium	1455		U	< 0.005	< 0.050	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	0.0007	0.0072	0.5	10	70
Copper	1455		U	0.0014	0.014	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0004	0.0040	0.5	10	30
Nickel	1455		U	0.0017	0.017	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.004	0.040	4	50	200
Chloride	1220		U	< 1.0	< 10	800	15000	25000
Fluoride	1220		U	0.10	1.0	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	36	360	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	4.6	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	19

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: 25408 An Triantan

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-23378							
Chemtest Sample ID:	1839485							
Sample Ref:	TP4							
Sample ID:								
Sample Location:								
Top Depth(m):	0.50							
Bottom Depth(m):								
Sampling Date:	19-Jul-2024					**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**				
Total Organic Carbon	2625		M	%	1.5	3	5	6
Loss On Ignition	2610		M	%	4.2	--	--	10
Total BTEX	2760		M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815		M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	EH_CU_1D_Total	M	mg/kg	< 10	500	--	--
Total Of 17 PAHs Lower	2800		N	mg/kg	< 1.0	100	--	--
pH at 20C	2010		M		8.3	--	>6	--
Acid Neutralisation Capacity	2015		N	mol/kg	0.0090	--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455		U	0.0008	0.0077	0.5	2	25
Barium	1455		U	< 0.005	< 0.050	20	100	300
Cadmium	1455		U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455		U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455		U	0.0014	0.014	2	50	100
Mercury	1455		U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455		U	0.0003	0.0033	0.5	10	30
Nickel	1455		U	0.0011	0.011	0.4	10	40
Lead	1455		U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455		U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455		U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455		U	0.008	0.078	4	50	200
Chloride	1220		U	< 1.0	< 10	800	15000	25000
Fluoride	1220		U	0.10	1.0	10	150	500
Sulphate	1220		U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020		N	35	350	4000	60000	100000
Phenol Index	1920		U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610		U	5.3	53	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.

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1010	pH Value of Waters	pH at 20°C	pH Meter	
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C 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.	
1455	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 at 20°C	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 <30°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES	
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 measuremernt 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	Allkaline 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.	
2455	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	

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane 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.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
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) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: 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	ComplianceTest 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"
SOP	Standard operating procedure
LOD	Limit of detection

Any comments or interpretations are outside the scope of UKAS accreditation.

The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.

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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°C prior to analysis.

All Asbestos testing is performed at the indicated laboratory .

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1.

Sample Deviation Codes

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt.

All water samples will be retained for 14 days from the date of receipt.

Charges may apply to extended sample storage.

Water Sample Category Key for Accreditation

DW - Drinking Water

GW - Ground Water

LE - Land Leachate

NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

Appendix 8

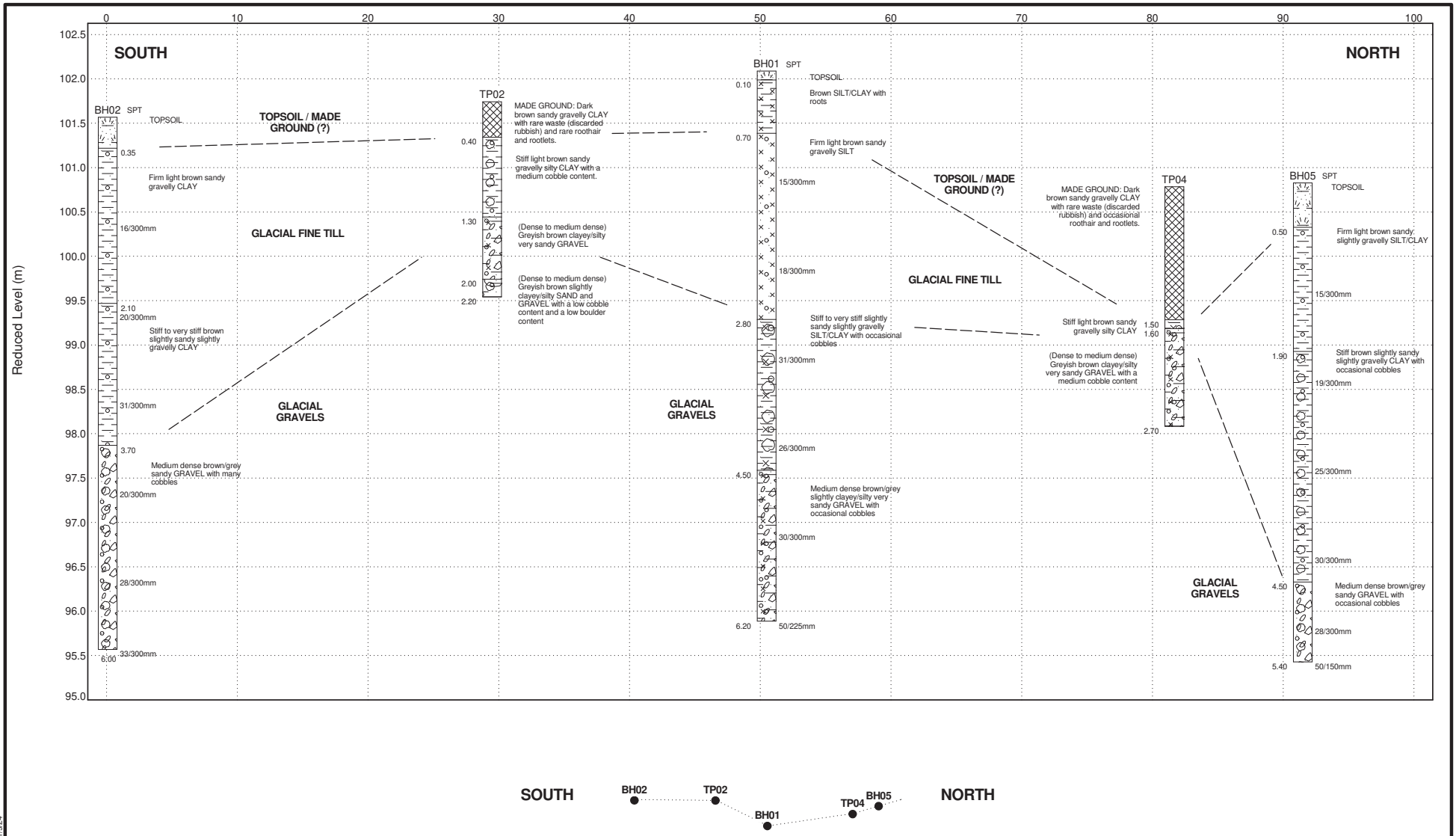
Exploratory Hole Location Plan

25468 - An Triantán, Station Road Housing

Exploratory Hole Location Plan

Appendix 9

Stratigraphic Cross Sections



LITHOLOGY GRAPHICS

- TOPSOIL
- Silty CLAY
- Sandy gravelly SILT
- Sandy gravelly silty CLAY with cobbles
- Clayey silty sandy cobbly GRAVEL
- Sandy gravelly CLAY
- Sandy cobbly GRAVEL
- Sandy gravelly cobbly CLAY
- MADE GROUND
- Clayey silty sandy GRAVEL
- Clayey gravelly cobbly bouldery SAND
- Sandy gravelly silty CLAY

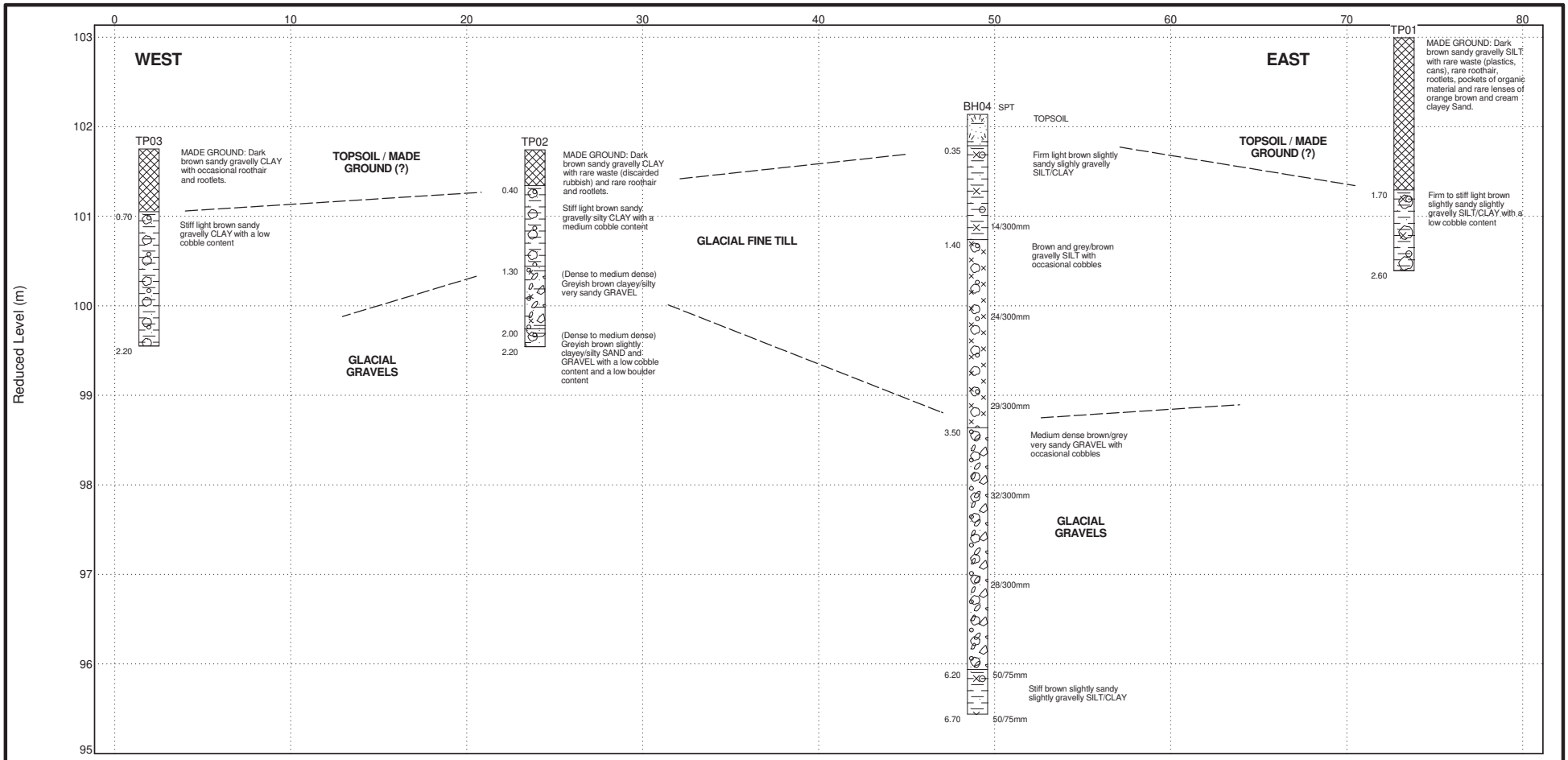
SUBSURFACE SECTION S - N

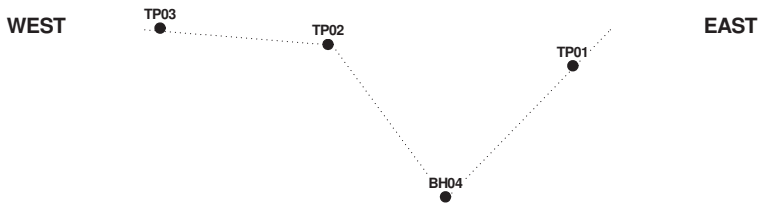
Client: Kildare County Council

Project: An Triantán, Station Road Housing

Number: 25468

FENCE BH AND PROBE 25468.GPJ IGSL.GDT 11/9/24





LITHOLOGY GRAPHICS

- TOPSOIL
- Sandy gravelly silty CLAY
- Gravelly cobbly SILT
- Sandy cobbly GRAVEL
- MADE GROUND
- Sandy gravelly silty CLAY with cobbles
- Sandy gravelly cobbly CLAY
- Clayey silty sandy GRAVEL
- Clayey gravelly cobbly bouldery SAND

SUBSURFACE SECTION W - E

Client: Kildare County Council

Project: An Triantán, Station Road Housing

Number: 25468

FENCE BH AND PROBE 25468.GPJ IGSL.GDT 11/9/24

Appendix C – Utility Survey

LEGEND
Underground Utilities

- WM Water Main
- FW Fire Water
- PW Process Water
- SW Storm Water Drainage
- FS Foul Sewer
- CC Combined Sewer
- Manhole Chamber
- Eircom
- Vir NTL/Virgin
- ENET/OCEAN
- BT BT/ESAT
- Colt Colt
- Aurora Aurora
- Bend / Weld
- Oxy Oxygen Pipe
- WELD Weld Point
- Gas Gas
- Hydrogen Hydrogen Pipe
- Oil Oil Pipe
- Mag Magnet
- Ad Adshel
- Traf Traffic
- Heat Heating Pipe
- Elec Electrical
- PL Public Lighting
- GPR Anomaly
- Unk Duct Unknown Cable Duct
- Unk Unknown Empty Duct
- Nitrogen Nitrogen Pipe
- Unk Ser Unidentified Service
- UR Unidentified Radio Signal
- UP Unidentified Power Signal
- Photo point

Reinforced Concrete (GPR) — Possible Slab (GPR)

Other observations - see description (GPR)

(DP0.45) Depth from ground level to Top of Pipe/GPR Target (m)
(D150 PE) Pipe/Duct diameter (mm) and material

- S/L Signal Lost
- T/L Trace Lost
- N/S No Signal
- Exp Exposed
- O/S Off-site
- UTT Unable to trace
- UTS Unable to sonde
- BKG Blocked
- CD Closed Duct
- UTO Unable to Open
- NPV No pipes visible
- WL Water Level
- FO Fibre Optic
- Unk Unknown
- AB Abandoned
- (ASS) Assumed

(Records) Utility taken from records

- CC Concrete
- VC Vitrified Clay
- BR Brick
- CI Cast Iron
- DI Ductile Iron
- ST Steel
- Poss./Prob. Possible/Probable
- AC Asbestos Concrete
- PE Polyethylene

S1 Survey Station

The orange line, as shown, on this particular drawing and bounding the entire of the utility survey area is merely for the purpose of indicating the extent of the area that was surveyed. It must not be taken as being commensurate with the extents of the entire of the plot of ground that the Client may own [or not]. In order to establish the ownership of the survey area Murphy Geospatial do advise consulting with your Client and their legal team.

Murphy Geospatial Ltd. Disclaimer

The survey aims to map all existing utilities and sub surface structures and provide information with respect to pipe size, material type and drainage connectivity. However GPR surveying is limited by the following guidelines and it may not be possible to accurately survey, define and locate all services and sub surface features.

- Locational accuracy is determined by referring to the manufacturers guidelines for the detectors used.
- Existing record information showing underground services is often incomplete and unknown accuracy; therefore it should be regarded only as an indication.
- In ideal conditions these spatial accuracies for the underground utilities are +/- 5% for the RD4000 and +/- 10% of depth for the GPR to 2.5m deep. However, variations within the subsurface may alter this estimated accuracy.
- Although all reasonable steps have been taken to locate all features, there is no guarantee that all will be shown on the drawing as some above ground features may have obstructed the survey.
- GPR surveying operates best within high resistivity material. Clay overburden can impair GPR surveying.
- Due to the attenuation of the radar signal with depth, resolution is restricted, hence making identification of anomalies difficult with increasing depth.
- The depth penetration and quality of the data depends on the ground conditions on the site. Poor data may be a result of areas with high conductivity. Also, high reflective materials close to the surface i.e. rebar may hide deeper anomalies.
- It is not always possible to trace the entire length of each underground service.
- It is always our intention to use the Utility providers' details, if supplied prior to survey commencement as a guide for location purposes. However, should we not be able to locate those guided services we shall not be held responsible for the accuracy, or otherwise, of the location of that service, as issued by the utility provider and therefore shown "Taken from Records" on the drawing and we are not liable for any loss that may arise due to the lack of accuracy in the guided information.
- Unless otherwise stated, all services and sub surface structures shown on Murphy Geospatial Limited plan drawings have been surveyed using approved detectors and the connections between manholes, if not traced, are assumed to run straight.
- Plan accuracies of the order of + or - 150mm may be achieved but this figure will depend on the depth of the service below ground level. Where similar services run on close proximity, separation may be impossible. Successful tracing of non metallic pipes may be limited.
- Please note that not all buried pipes, cables and ducts can be detected and mapped in consideration of their depth, location, material type, geology and proximity to other utilities. Even an appropriate and professionally executed survey may not be able to achieve a 100% detection rate.
- Services which have been untraceable are shown from Records where possible.
- DP represents distance from the surface level to the top of the service/ radar.

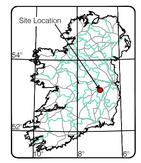
No allowance has been made within our quotation, unless otherwise stated, for the location and mapping of undeclared services. Failure to detect or fully map any declared service will be recorded within the notes accompanying our final drawings.
Where technically possible, depth indications will be given. These should be used for guidance only and wherever critical accuracy is required these should be confirmed by the Client by undertaking trial excavations or similar. Bends, lateral service connections, or the close proximity of other services and local magnetic, atmospheric or ground conditions, could in certain situations influence the accuracy of the plan and depth indication facility. Depths will not be provided unless we are reasonably confident of their validity.
Where Murphy Geospatial Limited issues a CAD drawn utility service plan, this should be read in conjunction with all available public utility records etc. As part of our exhaustive Quality Control procedures, Murphy Geospatial Limited Endeavour to add relevant Public Utility record information onto the final issue drawing. An allowance should be made for the width of services, particularly where these are laid in bands or are of significant size etc. For clarification or appropriate easement bands, we would recommend that direct contact is made with the Asset Owner or Statutory Undertaker.
We exclude the following, except where otherwise specified and possible to do so;

- All private service connections, (including water or gas fittings where no through flow of applied signal is possible.
- Pot ended or disconnected cables or terminated short lengths of pipe.
- Internal building services
- Fibre optic cables (except where laid with a standard communications cable or built in tracer wire or similar conductor system) or can be clearly located using ground penetrating radar.
- Small diameter cables less than 17mm diameter, or pipes less than 38mm diameter.
- Above ground services unless specifically requested.
- Lifting manhole covers which require longer than 10 minute effort using standard heavy duty lifting apparatus.
- Services positioned directly below other pipes or cables etc (i.e. masking signal) - intrusive verification options available on request.
- Deep non metallic pipes, ducts or culverts (unless probing or Pipe Track 3d is specified as part of the fully invasive survey option).
- Passing through detective pipework (displaced joints etc) or acute bends between access points.

Please note that our Quotation does not allow for location of individual service feeds to properties unless reasonable to do so, as access would be required into each property to apply direct connections to inlet points and this would significantly increase the scope of work, survey cost and also cause possible disruption to occupants.
All work carried out by Murphy Geospatial Limited (MGS) conforms to the guidelines set out by The Survey Association (TSA).

North

Site Location



Map Sheet Layout:

Surveyed by :	MGS	Date: Nov 2024	Datum: Malin Head
Drawn by :	IC,AB	Date: 07.11.2024	Grid System:
Checked by :	DS	Date: 08.11.2024	Irish National Grid ☐ ITM ☒

Revisions

No.	Date	Description
0	20.09.24	First Drawing (MGS56548_U.dwg)
1	08.11.24	Revision 1 - New project number MGS60489

SCSI Chartered property, land and construction surveyors
RICS the mark of property professionalism worldwide
THE SURVEY ASSOCIATION FULL MEMBER
EUROPEAN GPR ASSOCIATION

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Topographic surveys, Measured Building Surveys, Setting-Out, As-Built Surveys, Hydrographic Surveys, Legal Mapping, Pipeline Surveys, Services Location, Ground Penetrating Radar, Laser Scanning, Rectified Photography

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Global House
Kilcullen Business Campus
Kilcullen Co. Kildare, Ireland

Phone: (+353) 045 484040
Fax: (+353) 045 484004
Email: info@murphygs.ie

Client :	Cundall
Project :	Station Road Kildare Town
Date : 08.11.2024	**Scale :** NTS@A1
Description :	Utility Survey
Drawing Number :	**MGS60489_U**

Appendix D – CCTV Survey

Project

Project Name: Kildare Town_ Kildare County Council

Project Date: 20/08/2024

Inspection Standard: MSCC5 Sewers & Drainage GB (SRM5 Scoring)

Table of Contents

Project Name	Project Number	Project Date
Kildare Town_ Kildare County Council		20/08/2024

Project Information

Project Name	Project Number	Project Date
Kildare Town_ Kildare County Council		20/08/2024

Client

Company: Kildare County Council
Contact: James Glancy
Street: Council Buildings
Town or City: Naas
County: Kiladre

Contractor

Company: McGuiness Maintenance Services
Contact: Frank McGuiness
Street: Shean
Town or City: Edenderry
County: Offaly

Scoring Summary

Project Name	Project Number	Project Date
Kildare Town_ Kildare County Council		20/08/2024

Structural Defects

Grade 3: Best practice suggests consideration should be given to repairs in the medium term.

Grade 4: Best practice suggests consideration should be given to repairs to avoid a potential collapse.

Grade 5: Best practice suggests that this pipe is at risk of collapse at any time. Urgent consideration should be given to repairs to avoid total failure.

Section	PLR	Grade	Description
5	Line AX	4	Broken pipe from 10 o'clock to 2 o'clock

Service / Operational Condition

Grade 3: Best practice suggests consideration should be given to maintenance activities in the medium term.

Grade 4: Best practice suggests consideration should be given to maintenance activity to avoid potential blockages.

Grade 5: Best practice suggests that this pipe is at a high risk of backing up or causing flooding.

Section	PLR	Grade	Description
2	MH 1X	4	Settled deposits, fine, 30% cross-sectional area loss
3	MH 4X	4	Settled deposits, fine, 30% cross-sectional area loss
5	Line AX	5	Other obstacles, protruding through wall from 10 o'clock to 2 o'clock, 50% cross-sectional area loss

Abandoned Surveys

Section	PLR	Description
2	MH 1X	Survey abandoned
3	MH 4X	Survey abandoned
4	MH 1X	Survey abandoned
5	Line AX	Survey abandoned

Information

These scoring summaries are based on the SRM grading from the WRc.

Section Profile

Project Name	Project Number	Project Date
Kildare Town_ Kildare County Council		20/08/2024

Circular, 225 mm

Item No.	Upstream Node	Downstream Node	Date	Road	Material	Total Length	Inspected Length
1	Melitta Rd	MH 1	20/08/2024	Kildare	Polyvinyl chloride	0.00 m	0.00 m

Total: 1 Inspection x Circular 225 mm, 0 mm = 0.00 m Total Length and 0.00 m Inspected Length

Total: 1 Inspection = 0.00 m Total Length and 0.00 m Inspected Length

Section Inspection - 20/08/2024 - Melitta RdX

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
1	1	20/08/24	16:49	Not Specified	No Rain Or Snow	Not Specified	MELITTA RDX

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
Not Specified	Not Specified	Mini Cam	Not Specified	Not Specified	Not Specified

Town or Village:	Kildare Town	**Inspection Direction:**	Downstream	**Upstream Node:**	MELITTA RD
Road:	Kildare	**Inspected Length:**	0.00 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	0.00 m	**Downstream Node:**	MH 1
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	

Use:		**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	225 mm
Flow Control:	No flow control	**Material:**	Polyvinyl chloride
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:50

Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: Melitta Rd	00:00:00	Melitta RdX_2008 2024_164	
0.00	WL	Water level, 5% of the vertical dimension	00:00:00		
0.00	WL	Water level, 5% of the vertical dimension: Unknown distance camera length didn't change	00:02:35		
0.00	MHF	Finish node, manhole, reference: MH 1: Unknown distance camera length didn't change	00:02:35	Melitta RdX_2008 2024_164	

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Pictures - 20/08/2024 - Melitta RdX

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
1	Downstream	MELITTA RDX		

Melitta RdX_20082024_1649_Sec1_Insp1_MH_0m.jpg, 00:00:00, 0.00 m
Start node, manhole, reference: Melitta Rd

Melitta RdX_20082024_1649_Sec1_Insp1_MHF_0m.jpg, 00:02:35, 0.00 m
Finish node, manhole, reference: MH 1, Unknown distance
camera length didn't change

Section Inspection - 16/08/2024 - MH 1X

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
2	1	16/08/24	14:51	Not Specified	No Rain Or Snow	Not Specified	MH 1X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
Not Specified	Not Specified	Mini Cam	Not Specified	Not Specified	Not Specified

Town or Village:	Kildare Town	**Inspection Direction:**	Downstream	**Upstream Node:**	MH 1
Road:	Kildare	**Inspected Length:**	0.00 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	0.00 m	**Downstream Node:**	MH 3
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	

Use:		**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	225 mm
Flow Control:	No flow control	**Material:**	Polyvinyl chloride
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:50 Depth: m	Position [m]	Code	Observation	MPEG	Photo	Grade
MH 1						
	0.00	MH	Start node, manhole, reference: MH 1	00:00:00	MH 1X_16082024_1451	
	0.00	WL	Water level, 5% of the vertical dimension	00:00:00		
	0.00	DES	Settled deposits, fine, 30% cross-sectional area loss	00:00:00	MH 1X_16082024_1451	4
	0.00	SA	Survey abandoned: Unable to complete survey due to silt in line	00:00:13	MH 1X_16082024_1451	

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	1	5.0	0.0	5.0	4.0

Section Pictures - 16/08/2024 - MH 1X

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
2	Downstream	MH 1X		

MH 1X_16082024_1451_Sec2_Insp1_MH_0m.jpg, 00:00:00, 0.00 m
Start node, manhole, reference: MH 1

MH 1X_16082024_1451_Sec2_Insp1_DES_0m.jpg, 00:00:00, 0.00 m
Settled deposits, fine, 30% cross-sectional area loss

MH 1X_16082024_1451_Sec2_Insp1_SA_0m.jpg, 00:00:13, 0.00 m
Survey abandoned, Unable to complete survey due to silt in line

Section Inspection - 16/08/2024 - MH 4X

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
3	1	16/08/24	14:51	Not Specified	No Rain Or Snow	Not Specified	MH 4X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
Not Specified	Not Specified	Mini Cam	Not Specified	Not Specified	Not Specified

Town or Village:	Kildare Town	**Inspection Direction:**	Downstream	**Upstream Node:**	MH 4
Road:	Kildare	**Inspected Length:**	0.00 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	0.00 m	**Downstream Node:**	LINE B
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	

Use:		**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	225 mm
Flow Control:	No flow control	**Material:**	Polyvinyl chloride
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:50 Depth: m	Position [m]	Code	Observation	MPEG	Photo	Grade
MH 4						
	0.00	MH	Start node, manhole, reference: MH 4	00:00:00	MH 4X_16082024_1451	
	0.00	WL	Water level, 5% of the vertical dimension	00:00:00		
	0.00	WL	Water level, 20% of the vertical dimension	00:00:00		
	0.00	DES	Settled deposits, fine, 30% cross-sectional area loss	00:00:00	MH 4X_16082024_1451	4
	0.00	SA	Survey abandoned: Unable to complete survey due to silt in line	00:00:15	MH 4X_16082024_1451	

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	1	5.0	0.0	5.0	4.0

Section Pictures - 16/08/2024 - MH 4X

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
3	Downstream	MH 4X		

MH 4X_16082024_1451_Sec3_Insp1_MH_0m.jpg, 00:00:00, 0.00 m
Start node, manhole, reference: MH 4

MH 4X_16082024_1451_Sec3_Insp1_DES_0m.jpg, 00:00:00, 0.00 m
Settled deposits, fine, 30% cross-sectional area loss

MH 4X_16082024_1451_Sec3_Insp1_SA_0m.jpg, 00:00:15, 0.00 m
Survey abandoned, Unable to complete survey due to silt in line

Section Inspection - 16/08/2024 - MH 1X

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
4	1	16/08/24	14:51	Not Specified	No Rain Or Snow	Not Specified	MH 1X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
Not Specified	Not Specified	Mini Cam	Not Specified	Not Specified	Not Specified

Town or Village:	Kildare Town	**Inspection Direction:**	Downstream	**Upstream Node:**	MH 1
Road:	Kildare	**Inspected Length:**	0.00 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	0.00 m	**Downstream Node:**	LINE B
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	

Use:		**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	225 mm
Flow Control:	No flow control	**Material:**	Polyvinyl chloride
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:50 Depth: m	Position [m]	Code	Observation	MPEG	Photo	Grade
MH 1						
	0.00	MH	Start node, manhole, reference: MH 1	00:00:00	MH 1X_16082024_1451	
	0.00	WL	Water level, 5% of the vertical dimension	00:00:00		
	0.00	SA	Survey abandoned: Unable to complete survey due to greese on pipe. Unable to determind length due to no meterage chang	00:01:28	MH 1X_16082024_1451	

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Pictures - 16/08/2024 - MH 1X

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
4	Downstream	MH 1X		

MH 1X_16082024_1451_Sec4_Insp1_MH_0m.jpg, 00:00:00, 0.00 m
Start node, manhole, reference: MH 1

MH 1X_16082024_1451_Sec4_Insp1_SA_0m.jpg, 00:01:28, 0.00 m
Survey abandoned, Unable to complete survey due to greese on pipe. Unable to determind length due to no meterage chang

Section Inspection - 20/08/2024 - Line AX

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
5	1	20/08/24	16:50	Not Specified	No Rain Or Snow	Not Specified	LINE AX

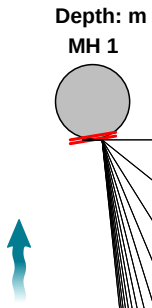
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
Not Specified	Not Specified	Mini Cam	Not Specified	Not Specified	Not Specified

Town or Village:	Kildare Town	**Inspection Direction:**	Upstream	**Upstream Node:**	LINE A
Road:	Kildare	**Inspected Length:**	0.00 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	0.00 m	**Downstream Node:**	MH 1
Surface Type:		**Joint Length:**		**Downstream Pipe Depth:**	

Use:		**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	225 mm
Flow Control:	No flow control	**Material:**	Polyvinyl chloride
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Sample condition survey	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:50



Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: MH 1	00:00:00	Line AX_20082024_1650	
0.00	WL	Water level, 5% of the vertical dimension	00:00:00		
0.00	D	Deformed sewer or drain, 5%: Unable to determind distance	00:00:11	Line AX_20082024_1650	1 / 2
0.00	D	Deformed sewer or drain, 10%: Unable to determind distance	00:00:18	Line AX_ed1b6028-5474-	2 / 3
0.00	D	Deformed sewer or drain, 10%: Unable to determind distance	00:00:28	Line AX_6473e9a3-9db9-	2 / 3
0.00	WL	Water level, 10% of the vertical dimension: Unable to determind distance	00:00:46	Line AX_20082024_1650	
0.00	D	Deformed sewer or drain, 10%: Unable to determind distance	00:01:39	Line AX_c51e83d6-db06-	2 / 3
0.00	WL	Water level, 25% of the vertical dimension: Unable to determind distance	00:01:45	Line AX_e633aec3-42f0-4	
0.00	WL	Water level, 5% of the vertical dimension: Unable to determind distance	00:01:57	Line AX_8e3d9872-70a6-	
0.00	WL	Water level, 15% of the vertical dimension: Unable to determind distance	00:03:33	Line AX_cbc976fb-1872-4	
0.00	OBI	Other obstacles, protruding through wall from 10 o'clock to 2 o'clock, 50% cross-sectional area loss: Unable to determind distance	00:04:24	Line AX_20082024_1650	5
0.00	B	Broken pipe from 10 o'clock to 2 o'clock: Unable to determind distance	00:05:08	Line AX_20082024_1650	4
0.00	SA	Survey abandoned: Unable to complete survey. Unable to determind distance	00:05:30	Line AX_20082024_1650	

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
5	140.0	0.0	140.0	4.0	5	17.0	0.0	17.0	5.0

Section Pictures - 20/08/2024 - Line AX

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
5	Upstream	LINE AX		

Line AX_20082024_1650_Sec5_Insp1_MH_0m.jpg, 00:00:00, 0.00 m
Start node, manhole, reference: MH 1

Line AX_20082024_1650_Sec5_Insp1_D_0m.jpg, 00:00:11, 0.00 m
Deformed sewer or drain, 5%, Unable to determind distance

Line AX_ed1b6028-5474-4215-83a9-41bf159f7d4e_20240820_171844_818.jpg, 00:00:18, 0.00 m
Deformed sewer or drain, 10%, Unable to determind distance

Line AX_6473e9a3-9db9-4550-ad29-d708b40861ce_20240820_171854_459.jpg, 00:00:28, 0.00 m
Deformed sewer or drain, 10%, Unable to determind distance

Section Pictures - 20/08/2024 - Line AX

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
5	Upstream	LINE AX		

Line AX_20082024_1650_Sec5_Insp1_WL_0m.jpg, 00:00:46, 0.00 m
Water level, 10% of the vertical dimension, Unable to determind distance

Line AX_c51e83d6-db06-475e-85e5-6e911c16fe16_20240820_171919_721.jpg, 00:01:39, 0.00 m
Deformed sewer or drain, 10%, Unable to determind distance

Line AX_e633aec3-42f0-4952-a30a-278291efbcc5_20240820_171934_991.jpg, 00:01:45, 0.00 m
Water level, 25% of the vertical dimension, Unable to determind distance

Line AX_8e3d9872-70a6-485c-b95d-df6be60fe84c_20240820_171948_311.jpg, 00:01:57, 0.00 m
Water level, 5% of the vertical dimension, Unable to determind distance

Section Pictures - 20/08/2024 - Line AX

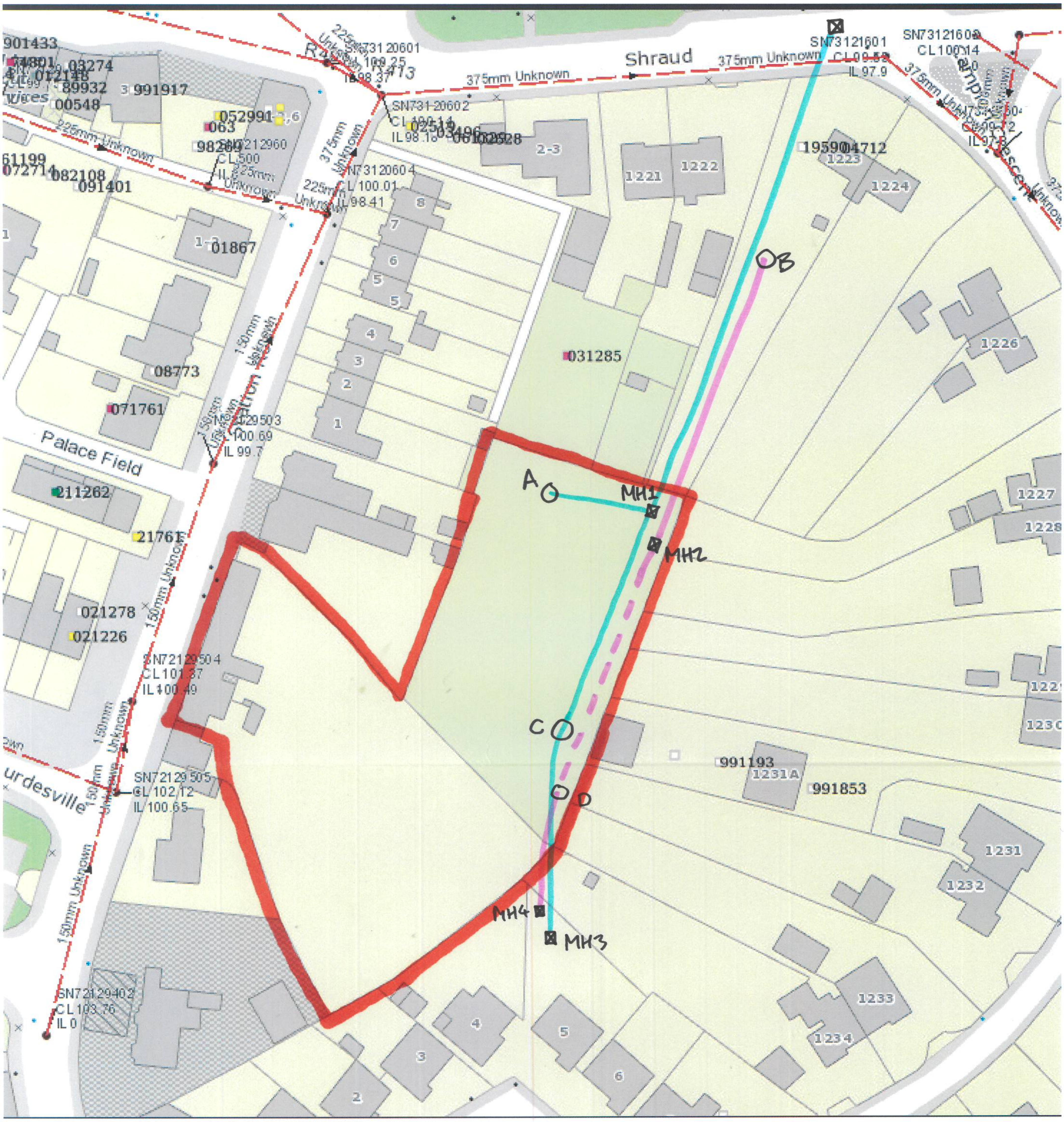
Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
5	Upstream	LINE AX		

Line AX_cbc976fb-1872-4687-bc74-bfcce0c22b4e_20240820_172010_969.jpg, 00:03:33, 0.00 m
Water level, 15% of the vertical dimension, Unable to determind distance

Line AX_20082024_1650_Sec5_Insp1_OBI_0m.jpg, 00:04:24, 0.00 m
Other obstacles, protruding through wall from 10 o'clock to 2 o'clock, 50% cross-sectional area loss, Unable to determind distance

Line AX_20082024_1650_Sec5_Insp1_B_0m.jpg, 00:05:08, 0.00 m
Broken pipe from 10 o'clock to 2 o'clock, Unable to determind distance

Line AX_20082024_1650_Sec5_Insp1_SA_0m.jpg, 00:05:30, 0.00 m
Survey abandoned, Unable to complete survey. Unable to determind distance



DRAINAGE LINE A

DRAINAGE LINE B

DRAINAGE LINE B ⇒ NOT CAMERA'D

Appendix E – UKSuDS Greenfield Runoff Calculation

Calculated by:	Jamie Cullen
Site name:	An Triantán
Site location:	Kildare

This is an estimation of the storage volume requirements that are needed to meet normal
best practice criteria in line with Environment Agency guidance "Rainfall runoff management
for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and
the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design
of drainage systems. It is recommended that hydraulic modelling software is used to calculate
volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	53.15863° N
Longitude:	6.90868° W
Reference:	3052924632
Date:	Oct 31 2023 16:33

Site characteristics

Total site area (ha):	0.495
Significant public open space (ha):	0
Area positively drained (ha):	0.495
Impermeable area (ha):	0.495
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.5
Net impermable area for storage volume design (ha):	0.5
Pervious area contribution to runoff (%):	30

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

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	3
SPR:	0.3	0.37

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	61
Rainfall 100 yrs 12 hrs:	--	73
FEH / FSR conversion factor:	1	1
SAAR (mm):	838	868
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.3	0.3
Hydological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.72	1.72
Growth curve factor 30 year:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Q_{BAR} for total site area (l/s):	1.11	1.83

Design criteria

Climate change allowance factor:	1.3

Urban creep allowance factor:	1.1	Q_{BAR} for net site area (l/s):	1.11	1.83
Volume control approach	Flow control to max of 2 l/s/ha or Qbar			
Interception rainfall depth (mm):	5			
Minimum flow rate (l/s):	2			

Site discharge rates

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

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m^3):	398	398
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	398	398

Appendix F – Met Éireann Site Rainfall Data

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 272990, Northing: 212574,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.6,	3.5,	4.0,	4.7,	5.2,	5.5,	6.7,	8.0,	8.9,	10.1,	11.1,	11.9,	13.1,	14.1,	14.9,	N/A ,
10 mins	3.6,	4.9,	5.6,	6.5,	7.2,	7.7,	9.4,	11.2,	12.4,	14.1,	15.5,	16.6,	18.3,	19.6,	20.7,	N/A ,
15 mins	4.2,	5.7,	6.5,	7.7,	8.5,	9.1,	11.0,	13.2,	14.6,	16.5,	18.2,	19.6,	21.6,	23.1,	24.4,	N/A ,
30 mins	5.6,	7.5,	8.5,	9.9,	10.9,	11.6,	14.0,	16.6,	18.3,	20.6,	22.6,	24.2,	26.5,	28.3,	29.8,	N/A ,
1 hours	7.4,	9.8,	11.0,	12.8,	14.0,	14.9,	17.7,	20.9,	22.9,	25.6,	28.0,	29.9,	32.7,	34.8,	36.5,	N/A ,
2 hours	9.7,	12.7,	14.2,	16.4,	17.9,	19.0,	22.5,	26.2,	28.6,	31.9,	34.8,	36.9,	40.2,	42.7,	44.7,	N/A ,
3 hours	11.5,	14.9,	16.6,	19.1,	20.7,	21.9,	25.8,	30.0,	32.7,	36.3,	39.4,	41.8,	45.4,	48.1,	50.4,	N/A ,
4 hours	12.9,	16.6,	18.5,	21.2,	22.9,	24.3,	28.5,	33.0,	35.9,	39.8,	43.1,	45.7,	49.5,	52.4,	54.8,	N/A ,
6 hours	15.2,	19.4,	21.5,	24.5,	26.5,	28.0,	32.7,	37.7,	40.9,	45.2,	48.9,	51.7,	55.9,	59.1,	61.7,	N/A ,
9 hours	17.8,	22.6,	25.0,	28.5,	30.7,	32.4,	37.6,	43.2,	46.7,	51.4,	55.5,	58.5,	63.1,	66.6,	69.4,	N/A ,
12 hours	20.0,	25.3,	27.9,	31.6,	34.0,	35.8,	41.5,	47.5,	51.2,	56.3,	60.7,	63.9,	68.8,	72.5,	75.5,	N/A ,
18 hours	23.6,	29.5,	32.5,	36.6,	39.3,	41.4,	47.6,	54.3,	58.4,	64.0,	68.8,	72.4,	77.7,	81.8,	85.0,	N/A ,
24 hours	26.5,	33.0,	36.2,	40.7,	43.6,	45.8,	52.6,	59.7,	64.1,	70.1,	75.2,	79.0,	84.7,	89.0,	92.5,	104.1,
2 days	32.0,	39.2,	42.7,	47.6,	50.7,	53.0,	60.2,	67.7,	72.4,	78.6,	83.8,	87.7,	93.6,	97.9,	101.4,	113.1,
3 days	36.8,	44.6,	48.4,	53.6,	57.0,	59.5,	67.1,	75.1,	79.9,	86.5,	91.9,	96.0,	102.1,	106.6,	110.2,	122.3,
4 days	41.2,	49.5,	53.6,	59.2,	62.7,	65.4,	73.5,	81.8,	86.9,	93.8,	99.5,	103.7,	110.0,	114.7,	118.4,	130.9,
6 days	49.1,	58.5,	63.0,	69.3,	73.2,	76.1,	85.0,	94.1,	99.7,	107.0,	113.2,	117.8,	124.5,	129.5,	133.6,	146.8,
8 days	56.4,	66.7,	71.7,	78.5,	82.7,	85.9,	95.5,	105.3,	111.3,	119.2,	125.7,	130.6,	137.8,	143.1,	147.3,	161.4,
10 days	63.3,	74.5,	79.8,	87.1,	91.6,	95.0,	105.3,	115.7,	122.1,	130.5,	137.4,	142.6,	150.1,	155.7,	160.2,	174.9,
12 days	69.8,	81.8,	87.5,	95.3,	100.1,	103.7,	114.6,	125.6,	132.3,	141.2,	148.5,	153.9,	161.8,	167.7,	172.4,	187.8,
16 days	82.3,	95.8,	102.1,	110.8,	116.2,	120.2,	132.2,	144.3,	151.7,	161.3,	169.3,	175.2,	183.8,	190.2,	195.2,	211.8,
20 days	94.3,	109.0,	116.0,	125.5,	131.4,	135.7,	148.8,	161.9,	169.8,	180.2,	188.8,	195.2,	204.4,	211.2,	216.6,	234.4,
25 days	108.6,	125.0,	132.6,	143.0,	149.5,	154.2,	168.5,	182.8,	191.4,	202.7,	212.0,	218.8,	228.8,	236.1,	242.0,	261.0,

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

Appendix G – Surface Water Network Calculations

SW3.0 Zone D Units

Type : Catchment Area

Area (ha)	0.067

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

NOTE:

Volumetric Runoff Coefficient (Cv) applied as follows to the catchment areas:

- 0.95 to unit areas (including roofs);
- 0.9 to road areas (porous carriageway proposed but rate as set in KCC guidance documents);
- 0.5 to car parking areas (porous surfacing used in parking areas and assumed as a sufficient rate given the infiltration on site from the Ground Investigations)
- 0.3 to landscape areas and surrounding footways (assumed sufficient rate given rate of infiltration from GI)

SW3.0 Footway & Landscape

Type : Catchment Area

Area (ha)	0.037

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.300
Winter Volumetric Runoff	0.300
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.0 Zone A1 Units

Type : Catchment Area

Area (ha)	0.033

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.0 Zone A2 Unit

Type : Catchment Area

Area (ha)	0.011

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.0 Access Road

Type : Catchment Area

Area (ha)	0.022

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.1 Parking & Landscape

Type : Catchment Area

Area (ha)	0.009

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.500
Winter Volumetric Runoff	0.500
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW2.0 Access Road

Type : Catchment Area

Area (ha)	0.018

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW2.0 Storage Areas

Type : Catchment Area

Area (ha)	0.006

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.1 Zone B1 Units

Type : Catchment Area

Area (ha)	0.032

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.2 Zone B2 Unit

Type : Catchment Area

Area (ha)	0.019

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.3 Zone C1 Units

Type : Catchment Area

Area (ha)	0.076

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.4 Zone C2 Units

Type : Catchment Area

Area (ha)	0.025

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.5 Zone C3 Units

Type : Catchment Area

Area (ha)	0.022

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.4 Parking

Type : Catchment Area

Area (ha)	0.012

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.500
Winter Volumetric Runoff	0.500
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.1 Landscape Area

Type : Catchment Area

Area (ha)	0.013

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.300
Winter Volumetric Runoff	0.300
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.3 Landscape Area

Type : Catchment Area

Area (ha)	0.023

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.300
Winter Volumetric Runoff	0.300
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.4 Landscape Area

Type : Catchment Area

Area (ha)	0.003

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.300
Winter Volumetric Runoff	0.300
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.5 Access Road

Type : Catchment Area

Area (ha)	0.008

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Tank - Courtyard Area

Type : Catchment Area

Area (ha)	0.06

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Junctions Storm Phase: Phase	2 Dawson Street Dublin		

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
SW2.0	Manhole	672966.750	712577.945	101.660	2.168	99.492	Circular	1.200
SW1.5	Manhole	672979.317	712573.247	101.695	2.420	99.275	Circular	1.200
SW1.1	Manhole	672952.899	712583.334	101.585	1.371	100.214	Circular	1.200
SW1.0	Manhole	672936.565	712588.998	101.510	1.210	100.300	Circular	1.200
SW1.6	Manhole	672984.361	712586.505	101.690	2.462	99.228	Circular	1.200
SW3.0	Manhole	672985.769	712604.925	101.790	2.030	99.760	Circular	1.200
SW3.1	Manhole	673003.370	712598.465	101.790	2.340	99.450	Circular	1.200
SW1.2	Manhole	672960.564	712561.109	101.380	1.284	100.096	Circular	1.200
SW1.3	Manhole	672963.298	712557.548	101.365	1.666	99.699	Circular	1.200
SW1.4	Manhole	672975.697	712566.005	101.500	2.110	99.390	Circular	1.200

Name	Lock
SW2.0	None
SW1.5	None
SW1.1	None
SW1.0	None
SW1.6	None
SW3.0	None
SW3.1	None
SW1.2	None
SW1.3	None
SW1.4	None

MC3500

Type : Chamber

Dimensions

Exceedance Level (m)	100.830
Depth (m)	2.048
Base Level (m)	98.772
Number of Chambers	29
Number of Rows	8
Distance Between Rows (mm)	150
Total Volume (m³)	184.534

Chamber Shape

Type	Parabolic Arch Chamber
Chamber Length (m)	2.184
Wall Thickness (mm)	50
Diameter / Base Width (mm)	1956
Height (mm)	1143

Embedded Parameters

Porosity (%)	40
Height Above (m)	0.405
Height Below (m)	0.450
Sides (m)	0.300
Ends (m)	0.150

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Filtration

Permeability Coefficient (m/hr)	0.757
Safety Factor	10.000
Bed Depth (m)	0.450
Area (m²)	100.00
Invert Level (m)	98.772

Advanced

Base Infiltration Rate (m/hr)	0.379
Side Infiltration Rate (m/hr)	0.757
Safety Factor	10.0

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Inflow Summary Storm Phase: Phase	2 Dawson Street Dublin		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
SW1.0 Access Road	SW1.0		Time of Concentration	0.022	100	10	110	0.024
SW1.0 Zone A1 Units	SW1.0		Time of Concentration	0.033	100	10	110	0.036
SW1.0 Zone A2 Unit	SW1.0		Time of Concentration	0.011	100	10	110	0.013
SW1.1 Landscape Area	SW1.1		Time of Concentration	0.013	100	10	110	0.014
SW1.1 Parking & Landscape	SW1.1		Time of Concentration	0.009	100	10	110	0.010
SW1.1 Zone B1 Units	SW1.1		Time of Concentration	0.032	100	10	110	0.035
SW1.2 Zone B2 Unit	SW1.2		Time of Concentration	0.019	100	10	110	0.021
SW1.3 Landscape Area	SW1.3		Time of Concentration	0.023	100	10	110	0.026
SW1.3 Zone C1 Units	SW1.3		Time of Concentration	0.076	100	10	110	0.083
SW1.4 Landscape Area	SW1.4		Time of Concentration	0.003	100	10	110	0.003
SW1.4 Parking	SW1.4		Time of Concentration	0.012	100	10	110	0.013
SW1.4 Zone C2 Units	SW1.4		Time of Concentration	0.025	100	10	110	0.028
SW1.5 Access Road	SW1.5		Time of Concentration	0.008	100	10	110	0.009
SW1.5 Zone C3 Units	SW1.5		Time of Concentration	0.022	100	10	110	0.024
SW2.0 Access Road	SW2.0		Time of Concentration	0.018	100	10	110	0.020
SW2.0 Storage Areas	SW2.0		Time of Concentration	0.006	100	10	110	0.006
SW3.0 Footway & Landscape	SW3.0		Time of Concentration	0.037	100	10	110	0.041
SW3.0 Zone D Units	SW3.0		Time of Concentration	0.067	100	10	110	0.074
Tank - Courtyard Area	MC3500		Time of Concentration	0.060	100	10	110	0.066
TOTAL		**0.0**		**0.496**				**0.546**

Total Contributing Catchment Area including 10% urban creep factor in accordance with KCC guidance documents

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Cover Depth (m)	1.200
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Manhole Options

Apply Offset	☐

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Shortest
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	10
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FSR

Type: FSR

Region	Scotland And Ireland
M5-60 (mm)	14.9
Ratio R	0.281
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
1.0	30.000
30.0	30.000
100.0	30.000

30% applied for climate change in accordance with KCC guidance documents

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Junctions Summary Storm Phase: Phase	2 Dawson Street Dublin		

FSR: 1 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW2.0	FSR: 1 years: +30 %: 15 mins: Summer	101.660	99.492	99.543	0.051	4.1	0.058	0.000	3.8	1.770	OK
SW1.5	FSR: 1 years: +30 %: 15 mins: Summer	101.695	99.275	99.459	0.184	46.4	0.208	0.000	45.1	22.500	OK
SW1.1	FSR: 1 years: +30 %: 15 mins: Summer	101.585	100.214	100.328	0.114	18.3	0.129	0.000	17.1	8.127	OK
SW1.0	FSR: 1 years: +30 %: 15 mins: Summer	101.510	100.300	100.388	0.088	11.5	0.100	0.000	11.1	4.992	OK
SW1.6	FSR: 1 years: +30 %: 15 mins: Summer	101.690	99.228	99.403	0.175	45.1	0.198	0.000	43.7	22.475	OK
SW3.0	FSR: 1 years: +30 %: 15 mins: Summer	101.790	99.760	99.833	0.073	14.0	0.082	0.000	13.7	6.085	OK
SW3.1	FSR: 1 years: +30 %: 15 mins: Summer	101.790	99.450	99.515	0.065	13.7	0.073	0.000	13.2	6.080	OK
SW1.2	FSR: 1 years: +30 %: 15 mins: Summer	101.380	100.096	100.227	0.131	20.4	0.148	0.000	19.3	9.552	OK
SW1.3	FSR: 1 years: +30 %: 15 mins: Summer	101.365	99.699	99.846	0.147	34.1	0.166	0.000	32.6	15.941	OK
SW1.4	FSR: 1 years: +30 %: 15 mins: Summer	101.500	99.390	99.553	0.163	38.4	0.184	0.000	37.3	18.434	OK

Summary:

For the 1yr return period; +30% climate change; 15mins. - 10080mins there is no surcharging or surface flooding on the site.

The top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)
MC-3500 Stormtech	98.772	100.820	99.384

FSR: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW2.0	FSR: 30 years: +30 %: 240 mins: Summer	101.660	99.492	99.942	0.450	2.9	0.509	0.000	2.9	11.232	Surcharged
SW1.5	FSR: 30 years: +30 %: 240 mins: Summer	101.695	99.275	99.942	0.667	36.0	0.755	0.000	34.2	143.317	Surcharged
SW1.1	FSR: 30 years: +30 %: 15 mins: Summer	101.585	100.214	100.439	0.226	39.1	0.255	0.000	35.5	18.011	Surcharged
SW1.0	FSR: 30 years: +30 %: 15 mins: Summer	101.510	100.300	100.466	0.166	25.5	0.188	0.000	23.1	11.065	OK
SW1.6	FSR: 30 years: +30 %: 240 mins: Summer	101.690	99.228	99.942	0.714	34.2	0.808	0.000	33.3	143.267	Surcharged
SW3.0	FSR: 30 years: +30 %: 240 mins: Summer	101.790	99.760	99.942	0.182	10.0	0.206	0.000	10.1	38.665	OK
SW3.1	FSR: 30 years: +30 %: 240 mins: Summer	101.790	99.450	99.942	0.492	10.1	0.557	0.000	8.8	38.639	Surcharged
SW1.2	FSR: 30 years: +30 %: 15 mins: Summer	101.380	100.096	100.317	0.221	42.9	0.250	0.000	42.2	21.180	OK
SW1.3	FSR: 30 years: +30 %: 15 mins: Summer	101.365	99.699	99.951	0.252	74.9	0.285	0.000	72.5	35.354	OK
SW1.4	FSR: 30 years: +30 %: 240 mins: Summer	101.500	99.390	99.943	0.553	30.4	0.625	0.000	29.7	117.298	Surcharged

Summary:

For the 30yr return period; +30% climate change; 15mins. - 10080mins there is some surcharging of the network but there is no surface flooding on the site.

The top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)
MC-3500 Stormtech	98.772	100.820	99.942

FSR: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW2.0	FSR: 100 years: +30 %: 360 mins: Summer	101.660	99.492	100.331	0.839	2.9	0.949	0.000	2.5	16.272	Surcharged
SW1.5	FSR: 100 years: +30 %: 360 mins: Summer	101.695	99.275	100.331	1.056	35.3	1.194	0.000	34.7	207.515	Surcharged
SW1.1	FSR: 100 years: +30 %: 15 mins: Summer	101.585	100.214	100.617	0.404	50.1	0.457	0.000	46.9	23.287	Surcharged
SW1.0	FSR: 100 years: +30 %: 15 mins: Summer	101.510	100.300	100.690	0.390	33.0	0.442	0.000	29.3	14.303	Surcharged
SW1.6	FSR: 100 years: +30 %: 360 mins: Summer	101.690	99.228	100.330	1.103	34.7	1.247	0.000	34.2	207.475	Surcharged
SW3.0	FSR: 100 years: +30 %: 360 mins: Summer	101.790	99.760	100.331	0.571	9.9	0.646	0.000	9.9	55.987	Surcharged
SW3.1	FSR: 100 years: +30 %: 360 mins: Summer	101.790	99.450	100.331	0.881	9.9	0.996	0.000	9.1	55.972	Surcharged
SW1.2	FSR: 100 years: +30 %: 15 mins: Summer	101.380	100.096	100.388	0.292	56.5	0.330	0.000	55.3	27.392	Surcharged
SW1.3	FSR: 100 years: +30 %: 360 mins: Summer	101.365	99.699	100.332	0.633	26.0	0.716	0.000	25.6	146.818	Surcharged
SW1.4	FSR: 100 years: +30 %: 360 mins: Summer	101.500	99.390	100.332	0.942	29.6	1.065	0.000	29.2	169.911	Surcharged

Summary:

For the 100yr return period; +30% climate change; 15mins. - 10080mins the entire network is surcharged but no manholes are under flood risk. There is also no surface water flooding evident with the TWL of each manhole around 1m below their respected cover levels.

The top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)
MC-3500 Stormtech	98.772	100.820	100.331

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Stormwater Controls Summary Storm Phase: Phase	2 Dawson Street Dublin		

FSR: 1 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
MC3500	FSR: 1 years: +30 %: 240 mins: Summer	99.384	99.384	0.612	0.612	26.0	50.589	0.000	25.390	5.0	75.028	72.586	OK

Summary:

For the 1yr return period; +30% climate change; 15mins. - 10080mins the top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)	Depth of Water (m)
MC-3500 Stormtech	98.772	100.820	99.384	0.612

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by: CH	Checked by: JC	Approved By: JC
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Cundall: 2 Dawson Street Dublin		

FSR: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
MC3500	FSR: 30 years: +30 %: 240 mins: Summer	99.942	99.942	1.170	1.170	49.3	120.122	0.000	41.831	7.6	148.231	34.906	OK

Summary:

For the 30yr return period; +30% climate change; 15mins. - 10080mins the top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)	Depth of Water (m)
MC-3500 Stormtech	98.772	100.820	99.942	1.170

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by: CH	Checked by: JC	Approved By: JC
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Cundall: 2 Dawson Street Dublin		

FSR: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
MC3500	FSR: 100 years: +30 %: 360 mins: Summer	100.331	100.331	1.559	1.559	50.4	158.206	0.000	65.796	9.4	234.857	14.268	OK

Summary:

For the 100yr return period; +30% climate change; 15mins. - 10080mins the top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)	Depth of Water (m)
MC-3500 Stormtech	98.772	100.820	100.331	1.559

Appendix H – SuDS Maintenance Checklist

TABLE 18.3 Operation and maintenance requirements for bioretention systems

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

TABLE 19.3 Operation and maintenance requirements for trees (after CRWA, 2009)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets and outlets	Inspect monthly
Occasional maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually, or as required
	Water	As required (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Appendix I – Exceedance Design Calculations

SW3.0 Zone D Units

Type : Catchment Area

Area (ha)	0.067

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

NOTE:

Volumetric Runoff Coefficient (Cv) applied as follows to the catchment areas:

- 0.95 to unit areas (including roofs);
- 0.9 to road areas (porous carriageway proposed but rate as set in KCC guidance documents);
- 0.5 to car parking areas (porous surfacing used in parking areas and assumed as a sufficient rate given the infiltration on site from the Ground Investigations)
- 0.3 to landscape areas and surrounding footways (assumed sufficient rate given rate of infiltration from GI)

SW3.0 Footway & Landscape

Type : Catchment Area

Area (ha)	0.037

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.300
Winter Volumetric Runoff	0.300
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.0 Zone A1 Units

Type : Catchment Area

Area (ha)	0.033

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.0 Zone A2 Unit

Type : Catchment Area

Area (ha)	0.011

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.0 Access Road

Type : Catchment Area

Area (ha)	0.022

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.1 Parking & Landscape

Type : Catchment Area

Area (ha)	0.009

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.500
Winter Volumetric Runoff	0.500
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW2.0 Access Road

Type : Catchment Area

Area (ha)	0.018

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW2.0 Storage Areas

Type : Catchment Area

Area (ha)	0.006

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.1 Zone B1 Units

Type : Catchment Area

Area (ha)	0.032

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.2 Zone B2 Unit

Type : Catchment Area

Area (ha)	0.019

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.3 Zone C1 Units

Type : Catchment Area

Area (ha)	0.076

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.4 Zone C2 Units

Type : Catchment Area

Area (ha)	0.025

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.5 Zone C3 Units

Type : Catchment Area

Area (ha)	0.022

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.4 Parking

Type : Catchment Area

Area (ha)	0.012

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.500
Winter Volumetric Runoff	0.500
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.1 Landscape Area

Type : Catchment Area

Area (ha)	0.013

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.300
Winter Volumetric Runoff	0.300
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.3 Landscape Area

Type : Catchment Area

Area (ha)	0.023

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.300
Winter Volumetric Runoff	0.300
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.4 Landscape Area

Type : Catchment Area

Area (ha)	0.003

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.300
Winter Volumetric Runoff	0.300
Time of Concentration (mins)	5
Percentage Impervious (%)	100

SW1.5 Access Road

Type : Catchment Area

Area (ha)	0.008

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Tank - Courtyard Area

Type : Catchment Area

Area (ha)	0.06

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Junctions Storm Phase: Phase	2 Dawson Street Dublin		

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
SW2.0	Manhole	672966.750	712577.945	101.660	2.168	99.492	Circular	1.200
SW1.5	Manhole	672979.317	712573.247	101.695	2.420	99.275	Circular	1.200
SW1.1	Manhole	672952.899	712583.334	101.585	1.371	100.214	Circular	1.200
SW1.0	Manhole	672936.565	712588.998	101.510	1.210	100.300	Circular	1.200
SW1.6	Manhole	672984.361	712586.505	101.690	2.462	99.228	Circular	1.200
SW3.0	Manhole	672985.769	712604.925	101.790	2.030	99.760	Circular	1.200
SW3.1	Manhole	673003.370	712598.465	101.790	2.340	99.450	Circular	1.200
SW1.2	Manhole	672960.564	712561.109	101.380	1.284	100.096	Circular	1.200
SW1.3	Manhole	672963.298	712557.548	101.365	1.666	99.699	Circular	1.200
SW1.4	Manhole	672975.697	712566.005	101.500	2.110	99.390	Circular	1.200
SW4.0	Manhole	673001.565	712585.907	101.760	1.859	99.901	Circular	1.200
SW4.1	Manhole	673005.601	712584.567	101.885	2.085	99.800	Circular	1.200

Name	Lock
SW2.0	None
SW1.5	None
SW1.1	None
SW1.0	None
SW1.6	None
SW3.0	None
SW3.1	None
SW1.2	None
SW1.3	None
SW1.4	None
SW4.0	None
SW4.1	None

MC3500

Type : Chamber

Dimensions

Exceedance Level (m)	100.830
Depth (m)	2.048
Base Level (m)	98.772
Number of Chambers	29
Number of Rows	8
Distance Between Rows (mm)	150
Total Volume (m³)	184.534

Chamber Shape

Type	Parabolic Arch Chamber
Chamber Length (m)	2.184
Wall Thickness (mm)	50
Diameter / Base Width (mm)	1956
Height (mm)	1143

Embedded Parameters

Porosity (%)	40
Height Above (m)	0.405
Height Below (m)	0.450
Sides (m)	0.300
Ends (m)	0.150

Outlets

Outlet

Outgoing Connection	(None)	
Outlet Type	Filtration	
Permeability Coefficient (m/hr)		0.379
Safety Factor		10.000
Bed Depth (m)		0.450
Area (m²)		100.00
Invert Level (m)		98.772

Infiltration rates reduced by 50% as part of the exceedance design.

Outlet (1)

Outgoing Connection	OF4.000
Outlet Type	Free Discharge

Advanced

Base Infiltration Rate (m/hr)	0.19
Side Infiltration Rate (m/hr)	0.379
Safety Factor	10.0

Overflow connection set 264mm above the Top Water Level (TWL) of the critical storm event when no blockage is assumed. Refer to Appendix G for these results.

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Inflow Summary Storm Phase: Phase	2 Dawson Street Dublin		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
SW1.0 Access Road	SW1.0		Time of Concentration	0.022	100	10	110	0.024
SW1.0 Zone A1 Units	SW1.0		Time of Concentration	0.033	100	10	110	0.036
SW1.0 Zone A2 Unit	SW1.0		Time of Concentration	0.011	100	10	110	0.013
SW1.1 Landscape Area	SW1.1		Time of Concentration	0.013	100	10	110	0.014
SW1.1 Parking & Landscape	SW1.1		Time of Concentration	0.009	100	10	110	0.010
SW1.1 Zone B1 Units	SW1.1		Time of Concentration	0.032	100	10	110	0.035
SW1.2 Zone B2 Unit	SW1.2		Time of Concentration	0.019	100	10	110	0.021
SW1.3 Landscape Area	SW1.3		Time of Concentration	0.023	100	10	110	0.026
SW1.3 Zone C1 Units	SW1.3		Time of Concentration	0.076	100	10	110	0.083
SW1.4 Landscape Area	SW1.4		Time of Concentration	0.003	100	10	110	0.003
SW1.4 Parking	SW1.4		Time of Concentration	0.012	100	10	110	0.013
SW1.4 Zone C2 Units	SW1.4		Time of Concentration	0.025	100	10	110	0.028
SW1.5 Access Road	SW1.5		Time of Concentration	0.008	100	10	110	0.009
SW1.5 Zone C3 Units	SW1.5		Time of Concentration	0.022	100	10	110	0.024
SW2.0 Access Road	SW2.0		Time of Concentration	0.018	100	10	110	0.020
SW2.0 Storage Areas	SW2.0		Time of Concentration	0.006	100	10	110	0.006
SW3.0 Footway & Landscape	SW3.0		Time of Concentration	0.037	100	10	110	0.041
SW3.0 Zone D Units	SW3.0		Time of Concentration	0.067	100	10	110	0.074
Tank - Courtyard Area	MC3500		Time of Concentration	0.060	100	10	110	0.066
TOTAL		**0.0**		**0.496**				**0.546**

Total Contributing Catchment Area including 10% urban creep factor in accordance with KCC guidance documents

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Cover Depth (m)	1.200
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Manhole Options

Apply Offset	☐

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Rainfall Analysis Criteria	2 Dawson Street Dublin		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Shortest
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	10
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FSR

Type: FSR

Region	Scotland And Ireland
M5-60 (mm)	14.9
Ratio R	0.281
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
1.0	30.000
30.0	30.000
100.0	30.000

30% applied for climate change in accordance with KCC guidance documents

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Junctions Summary Storm Phase: Phase	2 Dawson Street Dublin		

FSR: 1 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW2.0	FSR: 1 years: +30 %: 15 mins: Summer	101.660	99.492	99.543	0.051	4.1	0.058	0.000	3.8	1.770	OK
SW1.5	FSR: 1 years: +30 %: 600 mins: Summer	101.695	99.275	99.523	0.248	10.4	0.281	0.000	10.4	95.990	OK
SW1.1	FSR: 1 years: +30 %: 15 mins: Summer	101.585	100.214	100.328	0.114	18.3	0.129	0.000	17.1	8.127	OK
SW1.0	FSR: 1 years: +30 %: 15 mins: Summer	101.510	100.300	100.388	0.088	11.5	0.100	0.000	11.1	4.991	OK
SW1.6	FSR: 1 years: +30 %: 600 mins: Summer	101.690	99.228	99.523	0.295	10.4	0.334	0.000	10.1	95.959	OK
SW3.0	FSR: 1 years: +30 %: 15 mins: Summer	101.790	99.760	99.833	0.073	14.0	0.082	0.000	13.7	6.085	OK
SW3.1	FSR: 1 years: +30 %: 600 mins: Summer	101.790	99.450	99.523	0.073	2.8	0.083	0.000	2.8	25.927	OK
SW1.2	FSR: 1 years: +30 %: 15 mins: Summer	101.380	100.096	100.227	0.131	20.5	0.148	0.000	19.3	9.551	OK
SW1.3	FSR: 1 years: +30 %: 15 mins: Summer	101.365	99.699	99.846	0.147	34.1	0.166	0.000	32.6	15.940	OK
SW1.4	FSR: 1 years: +30 %: 15 mins: Summer	101.500	99.390	99.553	0.163	38.4	0.184	0.000	37.3	18.433	OK
SW4.0	FSR: 1 years: +30 %: 15 mins: Summer	101.760	99.901	99.901	0.000	0.0	0.000	0.000	0.0	0.000	OK
SW4.1	FSR: 1 years: +30 %: 15 mins: Summer	101.885	99.800	99.800	0.000	0.0	0.000	0.000	0.0	0.000	OK

Summary:

For the 1yr return period; +30% climate change; 15mins. - 10080mins there is no surcharging or surface flooding on the site. No flows exit the site with everything retained within the MC-3500 Stormtech Chambers.

The top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)
MC-3500 Stormtech	98.772	100.820	99.523

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Junctions Summary Storm Phase: Phase	2 Dawson Street Dublin		

FSR: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW2.0	FSR: 30 years: +30 %: 600 mins: Summer	101.660	99.492	100.275	0.783	1.6	0.886	0.000	1.4	14.977	Surcharged
SW1.5	FSR: 30 years: +30 %: 600 mins: Summer	101.695	99.275	100.275	1.000	20.0	1.131	0.000	19.7	191.056	Surcharged
SW1.1	FSR: 30 years: +30 %: 15 mins: Summer	101.585	100.214	100.439	0.226	39.1	0.255	0.000	35.5	18.010	Surcharged
SW1.0	FSR: 30 years: +30 %: 15 mins: Summer	101.510	100.300	100.466	0.166	25.5	0.188	0.000	23.1	11.065	OK
SW1.6	FSR: 30 years: +30 %: 600 mins: Summer	101.690	99.228	100.275	1.047	19.7	1.184	0.000	19.4	191.027	Surcharged
SW3.0	FSR: 30 years: +30 %: 600 mins: Summer	101.790	99.760	100.275	0.515	5.6	0.583	0.000	5.6	51.546	Surcharged
SW3.1	FSR: 30 years: +30 %: 600 mins: Summer	101.790	99.450	100.275	0.825	5.6	0.933	0.000	5.2	51.531	Surcharged
SW1.2	FSR: 30 years: +30 %: 15 mins: Summer	101.380	100.096	100.317	0.221	42.9	0.250	0.000	42.2	21.179	OK
SW1.3	FSR: 30 years: +30 %: 600 mins: Summer	101.365	99.699	100.275	0.576	14.7	0.652	0.000	14.8	135.201	Surcharged
SW1.4	FSR: 30 years: +30 %: 600 mins: Summer	101.500	99.390	100.275	0.885	17.1	1.001	0.000	16.6	156.477	Surcharged
SW4.0	FSR: 30 years: +30 %: 15 mins: Summer	101.760	99.901	99.901	0.000	0.0	0.000	0.000	0.0	0.000	OK
SW4.1	FSR: 30 years: +30 %: 15 mins: Summer	101.885	99.800	99.800	0.000	0.0	0.000	0.000	0.0	0.000	OK

Summary:

For the 30yr return period; +30% climate change; 15mins. - 10080mins there is some surcharging of the network but there is no surface flooding on the site. No flows exit the site for this event with 0L/sec noted in SW4.0 and SW4.1.

The top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)
MC-3500 Stormtech	98.772	100.820	100.275

FSR: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SW2.0	FSR: 100 years: +30 %: 600 mins: Summer	101.660	99.492	100.796	1.304	2.1	1.475	0.000	1.7	18.938	Surcharged
SW1.5	FSR: 100 years: +30 %: 600 mins: Summer	101.695	99.275	100.796	1.521	25.1	1.721	0.000	24.8	241.110	Surcharged
SW1.1	FSR: 100 years: +30 %: 600 mins: Summer	101.585	100.214	100.798	0.584	9.5	0.661	0.000	9.5	86.945	Surcharged
SW1.0	FSR: 100 years: +30 %: 600 mins: Summer	101.510	100.300	100.798	0.498	5.8	0.564	0.000	5.8	53.371	Surcharged
SW1.6	FSR: 100 years: +30 %: 600 mins: Summer	101.690	99.228	100.796	1.568	24.8	1.774	0.000	24.5	241.082	Surcharged
SW3.0	FSR: 100 years: +30 %: 600 mins: Summer	101.790	99.760	100.797	1.037	7.1	1.172	0.000	6.7	65.057	Surcharged
SW3.1	FSR: 100 years: +30 %: 600 mins: Summer	101.790	99.450	100.796	1.346	6.7	1.523	0.000	6.4	65.044	Surcharged
SW1.2	FSR: 100 years: +30 %: 600 mins: Summer	101.380	100.096	100.797	0.701	11.1	0.793	0.000	11.1	102.264	Surcharged
SW1.3	FSR: 100 years: +30 %: 600 mins: Summer	101.365	99.699	100.797	1.098	18.6	1.242	0.000	18.2	170.640	Surcharged
SW1.4	FSR: 100 years: +30 %: 600 mins: Summer	101.500	99.390	100.797	1.407	21.1	1.591	0.000	20.7	197.439	Surcharged
SW4.0	FSR: 100 years: +30 %: 600 mins: Summer	101.760	99.901	100.796	0.895	4.7	1.012	0.000	2.2	17.966	Surcharged
SW4.1	FSR: 100 years: +30 %: 720 mins: Summer	101.885	99.800	99.825	0.025	2.2	0.000	0.000	2.2	17.723	OK

Summary:

For the 100yr return period; +30% climate change; 15mins. - 10080mins the entire network is surcharged but no manholes are under flood risk. There is also no surface water flooding evident with the TWL of each manhole around 800mm-900mm below their respected cover levels. As can be seen for this event flows exit the site at a controlled rate through the overflow connection.

The top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)
MC-3500 Stormtech	98.772	100.820	100.796

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by:	Checked by:	Approved By:
	CH	JC	JC
Report Details:	Cundall:		
Type: Stormwater Controls Summary Storm Phase: Phase	2 Dawson Street Dublin		

FSR: 1 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
MC3500	FSR: 1 years: +30 %: 600 mins: Summer	99.523	99.523	0.751	0.751	15.0	68.720	0.000	34.015	2.8	106.403	62.760	OK

Summary:

For the 1yr return period; +30% climate change; 15mins. - 10080mins the top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)	Depth of Water (m)
MC-3500 Stormtech	98.772	100.820	99.523	0.751

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by: CH	Checked by: JC	Approved By: JC
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Cundall: 2 Dawson Street Dublin		

FSR: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
MC3500	FSR: 30 years: +30 %: 600 mins: Summer	100.275	100.275	1.503	1.503	28.5	153.967	0.000	57.254	4.6	206.524	16.565	OK

Summary:

For the 30yr return period; +30% climate change; 15mins. - 10080mins the top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)	Depth of Water (m)
MC-3500 Stormtech	98.772	100.820	100.275	1.503

An Triantan:	Date:		
Kildare Town Co. Kildare	19/12/2024		
	Designed by: CH	Checked by: JC	Approved By: JC
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Cundall: 2 Dawson Street Dublin		

FSR: 100 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
MC3500	FSR: 100 years: +30 %: 600 mins: Summer	100.796	100.796	2.024	2.024	35.9	187.715	0.000	65.575	10.3	259.066	-1.724	OK

Summary:

For the 100yr return period; +30% climate change; 15mins. - 10080mins the top water level in the attenuation chamber has been compared to the physical chamber invert / crown levels as follows:

	Invert Level (m)	Crown Level (m)	Top of Water Level (m)	Depth of Water (m)
MC-3500 Stormtech	98.772	100.820	100.796	2.024

Appendix J – Uisce Éireann Confirmation of Feasibility (CoF)

CONFIRMATION OF FEASIBILITY

Cian Hill

CUNDALL
2 Dawson Street
Dublin
D02VK75

1 December 2023

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

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

Our Ref: CDS23008235 Pre-Connection Enquiry
Residential Development, Station Road, Kildare Town, Kildare

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 30 unit(s) at Residential Development, Station Road, Kildare Town, Kildare, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Irish Water
- **Wastewater Connection** - Feasible Subject to upgrades

- In order to accommodate the proposed connection, approx. 90m of the existing 150mm gravity sewer on Station Road has to be upgraded to 225mm pipe. The Developer will be required to fund the upgrade works. The fee will be calculated at a connection application stage.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

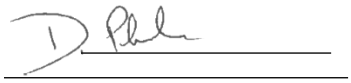
Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

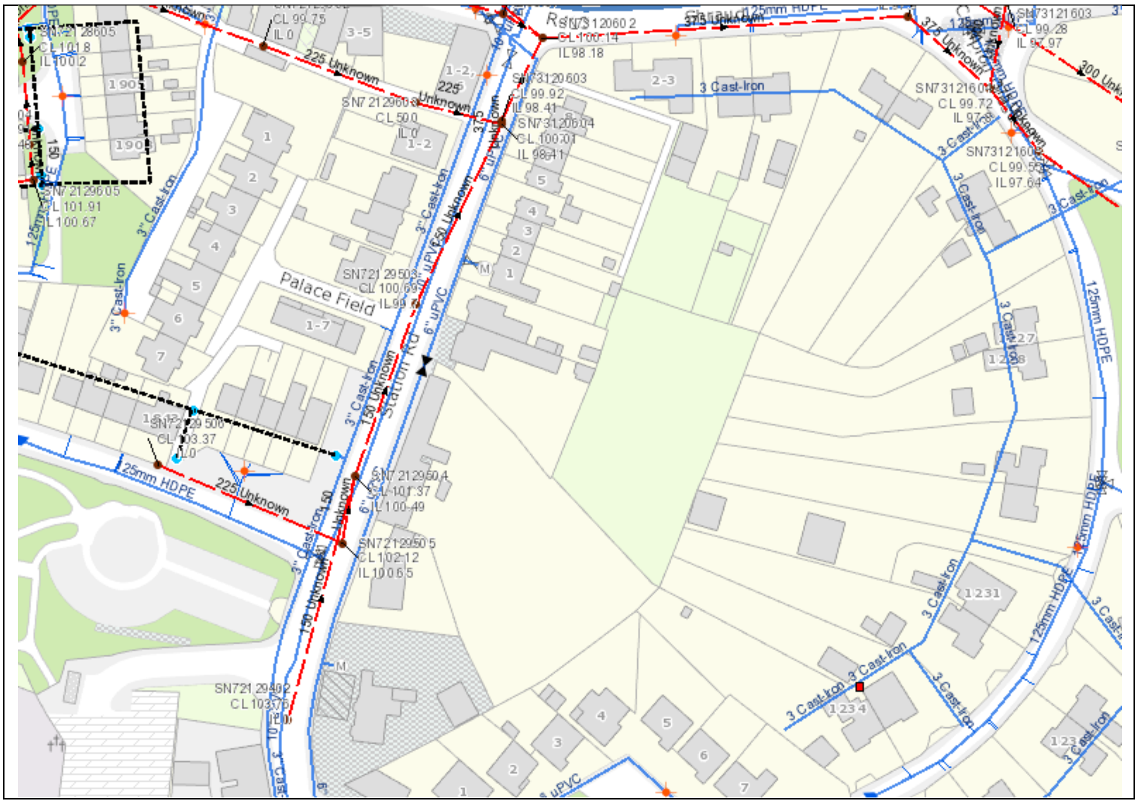
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Uisce Éireann's Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email datarequests@water.ie



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Note: The information provided on the included maps as to the position of Uisce Éireann's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann's underground network(s) 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.

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ZERO CARBON DESIGN 2030