7 LAND AND SOILD

7.1 Introduction

This chapter has been prepared by John Considine, BE, MIStructE, MIEI, CEng, FConsEIM, Chartered Engineer of Barrett Mahony Consulting Engineers and Mr. Paul Stephenson, BE, MIEI, CEng, Chartered Engineer of Barrett Mahony Consulting Engineers.

This section of the EIAR assesses the impacts that the proposed development at Leopardstown Road, Dublin 18, may have on the Land and Soils (including land take) on the surrounding area during the construction and operational phases. This report also addresses earthworks proposed on site including any cut and fill works required.

7.2 Methodology

The methodology followed for this section is in accordance with the EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft) 2017, Advice Notes for Preparing Environmental Impact Statements (Draft) 2015 and 2018 DHPLG Guidelines on Environmental Impact Assessment for Planning Authorities and An Bord Pleanála. The following section outlines the legislation and guidelines considered, and the adopted methodology for preparing this chapter.

7.2.1 Guidelines

The following documents were reviewed in the preparation of this chapter:

- Guidelines for the Preparation of Soil, Geology and Hydrogeology Chapters of Environment Impact Statements (Institute of Geologists of Ireland (IGI) 2013);
- Draft Guidelines on the Information to be contained in Environmental Impact Assessments Reports (EPA 2017)
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report, European Commission, 2017
- Revised Guidelines on the Information to be contained in Environmental Impact Statements (EPA 2015a);
- Advice Notes for Preparing Environmental Impact Statements (EPA 2015b);

In order to identify the current ground conditions and to establish any potential impacts for the proposed development it is necessary to undertake a desk top review of the existing geological conditions for the subject lands.

7.2.2 Consultation

To establish same information from the following list of statutory bodies were consulted:

- Dún Laoghaire-Rathdown County Council.
- Geological Survey of Ireland.
- Ordnance Survey of Ireland.
- Environmental Protection Agency.
- Office of Public Works.

7.2.3 Desktop Study

The following sources of information were reviewed to evaluate the soils, geological & hydrogeological aspects of the site:

- Site investigation carried out in 2016 and 2020.

- Current & historical Ordnance Survey Maps (1829 – 1842,1837 – 1842 & 1888, 1913),
- Aerial photography (1995 & 2000),
- The Geology of Ireland, Ed. C. H. Holland, (Dunedin Academic Press, 2001),
- Geological maps of the site produced by the GSI,
- Quaternary Maps,
- Bedrock Mapping,
- Groundwater Vulnerability Mapping,
- Aquifer Yield Maps.
- Teagasc & Environmental Protection Agency *Soil Information system*,
- Historic Mines Sites, Inventory & Risk Classification, (EPA & GSI).
- Historic Ground Investigation.

7.2.4 Application of Methodology

The potential impact of the proposed scheme on soils and geology environment has been assessed by classifying the importance of the relevant attributes and quantifying the likely magnitude of any potential impact.

This impact assessment methodology takes on board the broad direction of the Guidelines for the Preparation of Soils, Geology & Hydrogeology Chapters of Environmental Impact Statements (IGI 2013).

7.2.5 Assessment Methodology

The potential impact i.e. significance of the effects of the proposed development is generally understood to mean the importance of the effects (the consequences of the change). Significance is determined by a combination of (objective) scientific and subjective (social) concerns. Effects are assessed on the following.

- Quality (i.e. positive, negative or neutral);
- Significance (imperceptible, slight, moderate, significant or profound);
- Duration (short term, medium term, long term, permanent or temporary);
- Extent and;
- Context.

In the collation of information to describe effects, reference has been made to the criteria set out in Table 3-4 Checklist for Information Required to Describe Effects as set out in the EPA document – Guidelines on the Information to be contained in Environmental Impact Assessment Report DRAFT, August 2017.

Assessment should also take consideration of secondary impacts e.g., deterioration of surface water quality in an area due to site clearance and soil run-off. Finally, cumulative impacts are also to be addressed/considered, i.e., the addition of many minor or significant effects, including those of neighbouring projects to create larger more significant effects.

This document outlines a thirteen-step methodology as per the Guidelines for the preparation of Soils, Geology and hydrogeology Chapters of Environmental Impact Statements, IGI 2013, which has four distinct elements as follows.

- Initial Assessment (Steps 1 – 5);
- Direct & Indirect Site Investigation and Studies (Steps 6 – 9);
- Mitigation Measures, Residual Impacts and Final Impacts Assessment (Steps 10 – 12); and
- Completion of Soils and Geological (Land & Soil) Sections of EIAR. (Step 13).

The initial assessment as outlined in section 7.3 describes the existing land and soil environment and presents a description of the past and present uses of the site and other neighbouring sites.

This section also describes the nature of the site based on both site specific and neighbouring site investigation data from publicly available sources where available.

Section 7.5 lists the predicted impacts associated with the development of the site. The magnitude of the potential impact is ranked in accordance with the IGI Guidelines and this allows the significance of the impact to be determined.

Cumulative impacts are assessed and described in section 7.6. The magnitude and significance of these residual impacts have also been classified in accordance with IGI Guidelines.

Following the assessment of the impacts, specific mitigation measures have been developed to avoid, reduce and if possible, remedy any negative impacts on the land and soils. These are described in section 7.9.

Interactions between the Land & Soils and other relevant chapters are described in 7.11.

7.2.6 Study Area

The soils & geology study area is confined to the client's lands for the submitted application, refer to the planning drawings. The subject lands cover an area of 2.58 hectares.

7.3 Existing Receiving Environment (Baseline Scenario)

The subject site is located on lands within the townland of St. Joseph's House, Leopardstown Road, Dublin 18. The site is bounded by 2 no. access roads. Silver Pines leading to the N31 Brewery Road to the northeast and the R113 Leopardstown Road to the South. The Silver Pines residential development is located to the north and west of the proposed development. The overall site area totals 2.59ha. Part of the site is currently occupied by St. Joseph's House for Adult Deaf and Deafblind and its grounds. Three domestic houses on the north-east and seven more on the south side make up the remainder of the site.

7.3.1 Topography

The site is currently made up of a combination of existing residential housing to the southeast with the existing St. Joseph's House, supplementary buildings and green space making up the remaining western and northern extents of the site. A detailed topographical survey of the existing site has been prepared; a summarised excerpt can be seen in Figure 0:1 below.

There is little variation in ground levels across the site. In broad terms the site generally slopes down from the higher western side of the site to the lower eastern boundary. The difference in ground levels is minimal, with the highest point of the site recorded at approximately +82.84, and the lowest point recorded at +80.66, a difference of 2.18m over a distance of 150m.

There is no significant risk of flooding affecting the proposed development site or flooding of the site drainage network impacting adjoining properties. Therefore, the development is deemed acceptable from a flood risk assessment perspective. This is dealt with in detail in the Barrett Mahony Flood Risk Assessment Report.

Figure 0:1 – Topographical Survey Extract

7.3.2 Topsoil

A site investigation was carried out in September 2016 by Ground Investigations Ireland and in July 2020 by IGSL Ltd, both are included in as included in Appendix 7.1 and 7.2 of this chapter. The site investigation consisted of trial pits, CBR plate test, infiltration testing and associated environmental laboratory testing.

Trial pits were excavated using a JCB excavator and the overburden across the site presents a high degree of consistency. The made ground extends from ground level down to a depth of 1.6m approx. This made ground predominantly overlies firm to stiff brown sandy gravelly silt / clay, which in turn overlies residual weathered granite.

Environmental testing was carried out on 10no. samples of soil/fill for detailed environmental analysis to RILTA Suite (WAC) parameters. Of the 10no. samples, 9no. recorded no elevated levels of contaminants found and the material can be classified as inert. In 1no. sample, elevated levels of Total Organic Carbon (TOC) and Loss on Ignition (LOI) were recorded.

While the above levels are unlikely to be high enough to warrant a "Hazardous" classification, consultation with the licensed landfill operators will be required with regard to their ability to accept the elevated TOC and LOI.

Table 0.1 – IGSL Trial Pit Record Extract

REF NO.	MADE GROUND (m)	GRAVELLY CLAY (m)	GRANITE SAND (m)	REFUSAL (m)
TP01	0 – 1.60	1.60 – 2.40	2.40	2.40
TP02	0 – 0.60	0.60 – 1.20	1.20 – 1.50	1.50
TP03	0 – 0.20	0.20 – 1.10	1.10 – 2.20	2.20 (w)
TP04	0 – 1.40		1.40 – 1.80	1.80
TP05	0 – 1.60	1.60 – 2.10	2.10	2.10
TP06	0 – 1.40	1.40 – 2.40	2.40 – 2.70	2.70

7.3.3 Bedrock Geology

As discovered during the site investigation works and can be seen in Figure 0:2, the site is predominantly underlain by Granite formed during the Devonian period, which is a geological period spanning 60 million years from 420 to 360 million years ago. This is a strong dense igneous rock which underlies the Dublin / Wicklow mountains and surrounding areas.

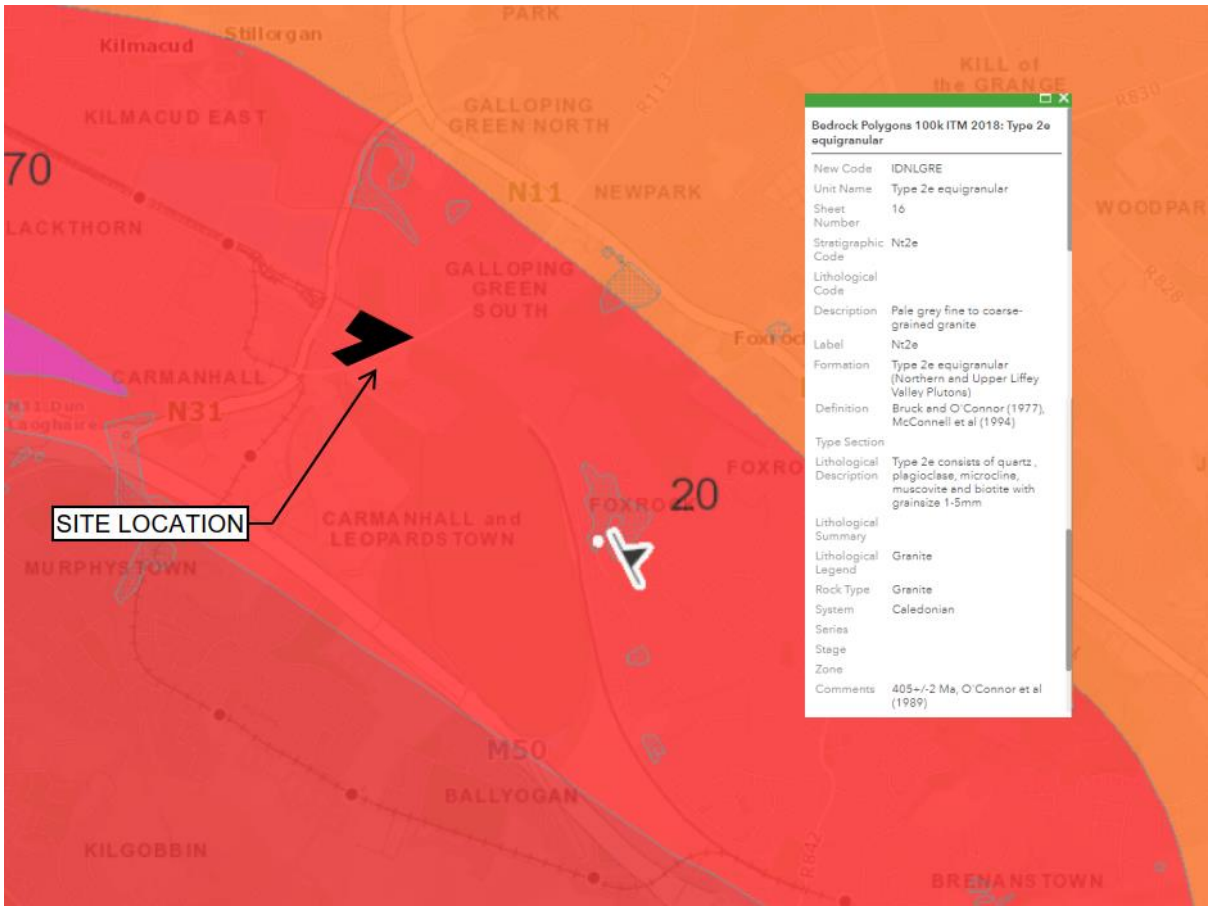

Figure 0:2 – Bedrock Geology (Geological Survey Ireland Extract

7.3.4 Quaternary & Soil

The quaternary period is the most recent stage of the geological time period. It marks the period of the Ice Age and the postglacial period which extends to the present day. Most surface deposits were deposited in the Quaternary Period and provide the parent materials for the soils in the area.

Most sediments of the Quaternary period were deposited during the Ice Age itself either directly from the huge ice sheets or by meltwater from the sheets as they melted. Ice sheets would have slowly eroded the underlying bedrock producing sediment. This sediment may include particles of all sizes ranging from clay to boulders and which when spread over the surface by glacial ice, takes the form

of till (boulder clay). Alternatively, sediment may be carried and sorted by meltwater and deposited as sand and gravel, with silt and clay deposited separately in lake systems or carried away to the sea. Glacial deposits therefore contain fragments of the type of bedrock over which the ice originally passed.

Per Figure 0:3, the site location is situated above Till derived from Limestones, which is a common occurrence in Ireland and particularly in Leinster.

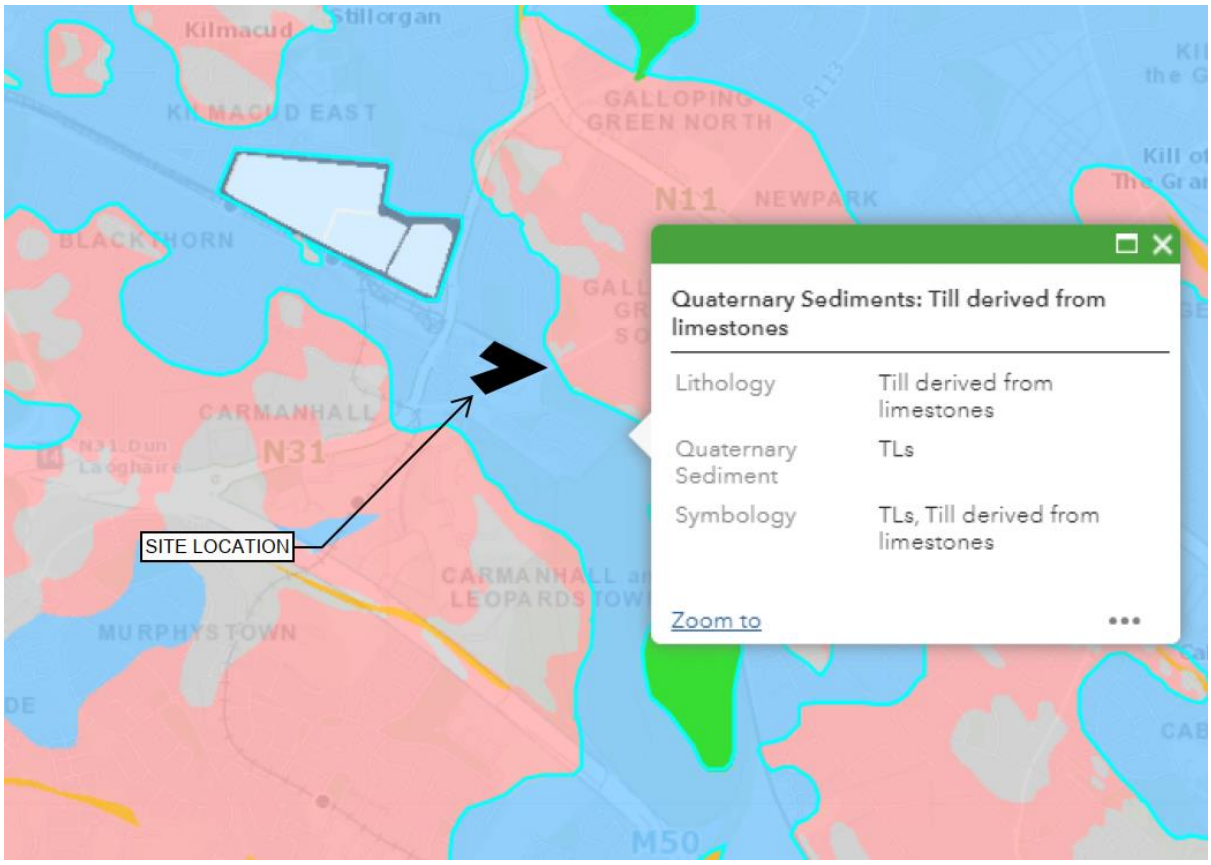

Figure 0:3 - Quaternary Soil Deposit (Geological Survey Ireland Extract)

7.3.5 Hydrogeological aspects

Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub soils. Aquifers are rocks or deposits that contain sufficient void spaces, and which are permeable enough to allow water to flow through them in significant quantities. The potential of the rock to store and transport water is governed by permeability, of which there are two types, intergranular and fissure permeability. Intergranular permeability is found in sediments, sands, gravels and clays. Fissure permeability is found in bedrock, where water moves through (and is stored in) cracks, fissures, planes and solution openings.

When considering groundwater, it is important to consider the underlying geology, its complexity including faults, the large amounts of water and rainfall available for recharge and the overlying Quaternary deposits. The bedrock geology of this area is defined as the Maulin formation, part of the Wicklow/Dublin granite massif. The bedrock mapping for the area as defined in the GSI is included as above.

The Geological Survey of Ireland has devised a system for classifying the aquifers in Ireland based on the hydrogeological characteristics, size and productivity of the groundwater resource. The three main classifications are Regionally Important Aquifers, Locally Important Aquifers and Poor Aquifers.

In Figure 0:4 – Groundwater Aquifer Figure 0:4 the site area is classified by the GSI as a Poor Aquifer. A Poor Aquifer has poorly connect fractures, fissures and joints, with low permeability. The overall

storage capacity, recharge acceptance, length of flow path and baseflow are the lowest of all the aquifers. Rainwater falling on parts of the site will be drained into the groundwater system via soakaways/permeable paving on site. Ground water on the site naturally drains towards the sea, approx. 2km east of the site.

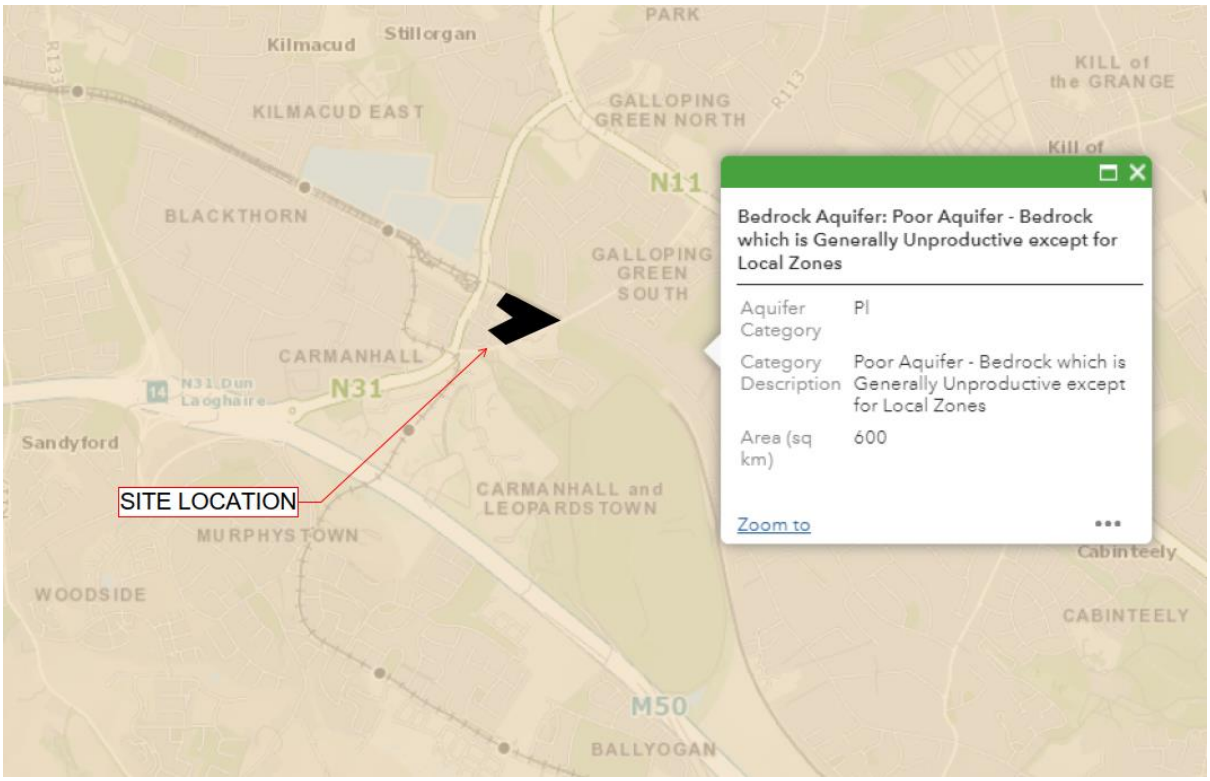

Figure 0:4 – Groundwater Aquifer

7.3.5.1 Groundwater Vulnerability

Aquifer or groundwater vulnerability is a relative measure of the ease with which the groundwater could be contaminated by human activity and depends on the aquifer's intrinsic geological and hydrogeological characteristics. The vulnerability is determined by the permeability of any overlying deposits. For example, bedrock with a thick, low permeability, clay-rich overburden is less vulnerable than bedrock with a thin, high permeability, gravelly overburden. Groundwater vulnerability categories are defined by the GSI as:

- X - Extreme rock at or near surface or karst
- E - Extreme
- H - High
- M - Moderate
- L – Low

Table 0.2 – Aquifer Vulnerability Criteria (DELG/EPA/GSI, 1999)

These categories are used for mapping purposes and in the assessment of risk to ground waters. The

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High Permeability (sand/gravel)	Moderate Permeability (e.g. sandy subsoil)	Low Permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	-
High (H)	>3.0 m	3.0 - 10.0 m	3.0 – 5.0 m	>3.0 m	N/A
Moderate M)	N/A	> 10.0 m	5.0 – 10.0 m	N/A	N/A
Low (L)	N/A	N/A	>10.0 m	N/A	N/A
Notes: (1) N/A = not applicable (2) Precise permeability values cannot be given at present (3) Release point of contaminants is assumed to be 1-2 m below ground surface					

classifications are based on the thickness and permeability of the sub-soils overlying the aquifer. The GSI has classified the aquifer vulnerability underlying the site into "H" (high) which infers bedrock is present within 3 to 10m of the surface below moderately permeable till. Groundwater was noted in TP03 at a depth of 2.7m, and rock was not encountered at refusal depths of 1.5m to 2.7m below ground in the other trial pits. Rotary coreholes identified the rock depth in the northern part of the site found Granite rock at 2.1 to 2.7m below ground level. Boreholes in the southern half have not yet been completed.

Where ground conditions are suitable, sustainable drainage systems (SuDS) can be used to manage and promote soakaway applications, which allow surface water to infiltrate into the ground, replenishing natural water courses and aquifers. The infiltration rate on this site has been tested in the site investigation with soakaway tests in accordance with BRE365 guidance. An infiltration rate of $5.68x10^{-6}$m/s was obtained in a soakaway test at a depth of 2.25m.

Although seepage was noted at 2.2mBGL in the soakaway pit, IGSL have confirmed that this a localised perched flow, and not the groundwater table. They allowed the pit to stand for 30 minutes prior to filling, and the flow quickly dissipated, leaving the bottom of the hole dry.

This infiltration process also helps to maintain the groundwater recharge which would otherwise be reduced by the development. It prevents shallow soils from drying out, and thereby protects local biodiversity and amenity.

The drainage proposals for the eastern part of the site aim to provide aquifer recharge by discharging surface water collected into a soakaway into ground. A significant portion of the whole site is either green space, permeable paving or compacted gravel which will also recharge the ground. Given the residential use the pollution index of the collected surface water discharging to the ground is "low" or "very low" as per the Ciria SuDS Manual. The SuDS interception features as well as the depth of soil and weathered rock through which the water will flow through before reaching the rock aquifer, will provide adequate natural filtration in accordance with the best practice guidelines of Sustainable Drainage Systems (SuDS), to ensure no suspended solids reach the aquifer below. Therefore, the aquifer will not be affected by the proposed new site in terms of water quality or water quantity. It is acknowledged that a slightly concentrated recharge flow will occur; however, this will not have an impact on the groundwater table due to the permeable overburden and surrounding topography.

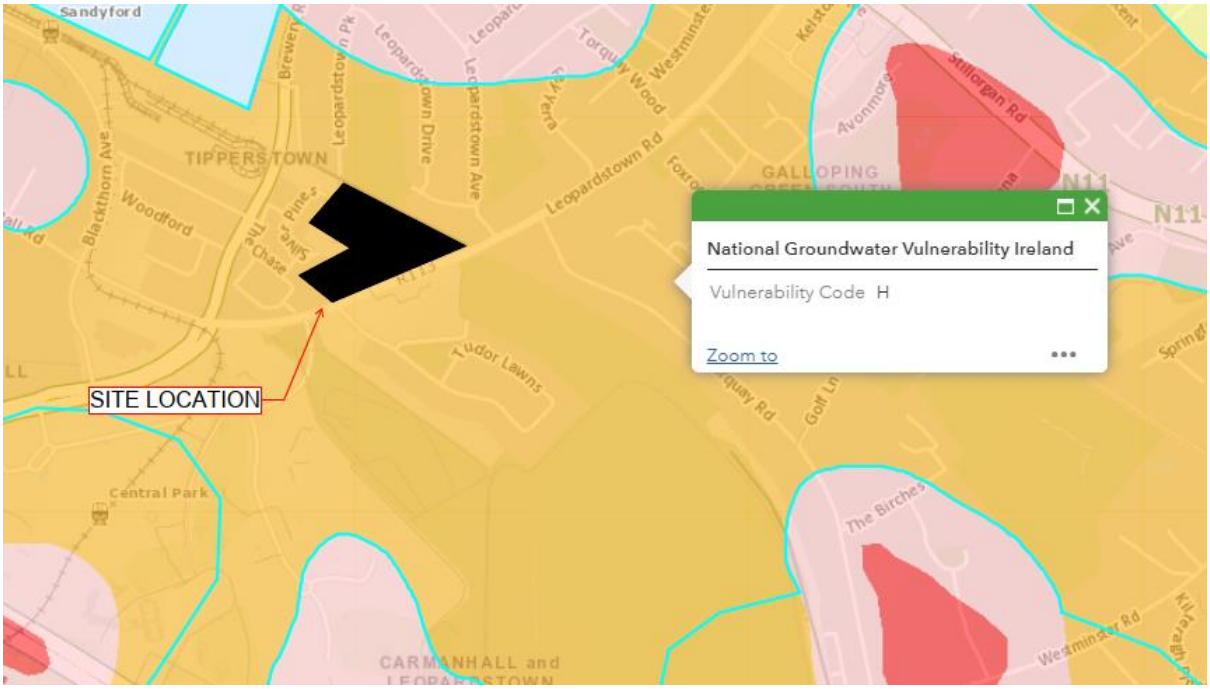

Figure 0:5 – Groundwater Vulnerability

7.3.5.2 Local groundwater usage and source protection area:

The GSI online map identified no domestic wells within the region of the site, or any other source protection requirements.

7.3.6 Recharge:

Effective rainfall is the amount of rainfall available as either recharge to ground or run-off to surface water after evaporation taken up by plants and is 83mm/yr. The recharge coefficient, which is the proportion of effective rainfall to recharge groundwater, is estimated at 20% on the site, indicative of the very low permeability poor aquifer classification of the underlying bedrock (as distinct from the moderate permeability of the overburden into which the soakaway will discharge). Recharge is the amount of rainfall that replenishes the aquifer, it is a function of the effective rainfall, the permeability and thickness of the subsoil and the aquifer characteristics.

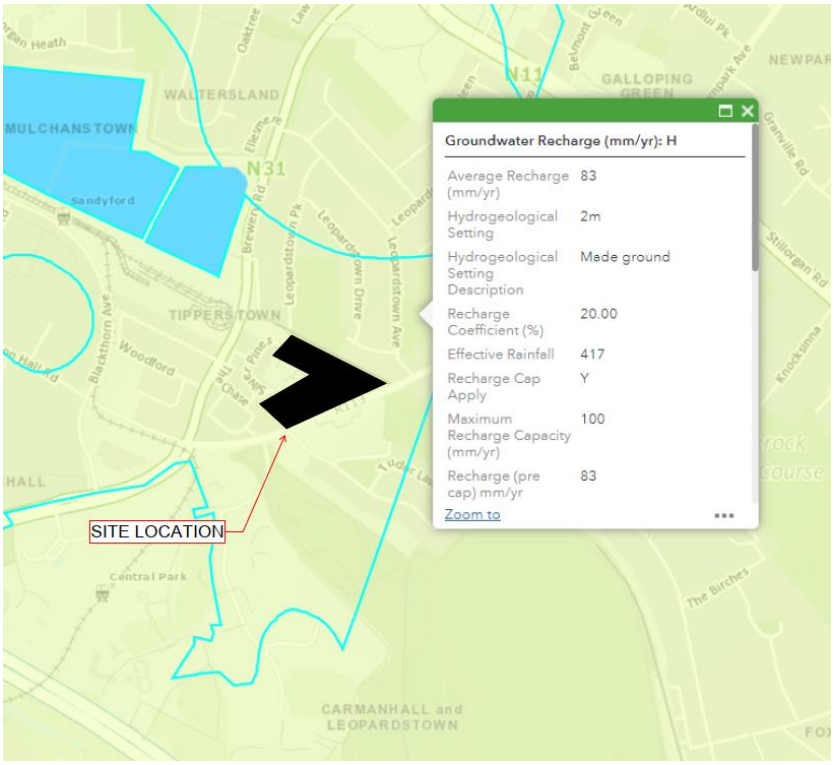

Figure 0:6 – Extract from GSI Groundwater Recharge Map

7.3.7 Site Hydrogeology:

The soakaway proposed is on the upslope side of the basement and due to concerns relating to the discharge of surface water into this area, and the potential restriction of the natural flow path caused by the new basement, a third-party Hydrogeological review was commissioned. This was carried out by IE Consulting, and resulted in the following outcome:

- The primary groundwater flow is in the granular weathered layer overlying the granite bedrock.
- Due to potential for the basement to be founded in rock, the groundwater flow may be cut off, and so an alternative solution should be provided to maintain the flow path.
- Drainage trenches outside the basement walls, connected by a network of pipes crossing under the basement was used to facilitate the natural flow.

IE Consulting have reviewed this proposal as well as the soakaway design and have approved it's suitability on the basis of maintaining the existing groundwater regime.

7.3.7.1 Groundwater Quality:

Under the requirements of the Water Framework Directive, the groundwater body was classified as having an overall good status for water quality and quantity 2013 - 2018. Please refer to Figure 0:6, EPA map extract below.

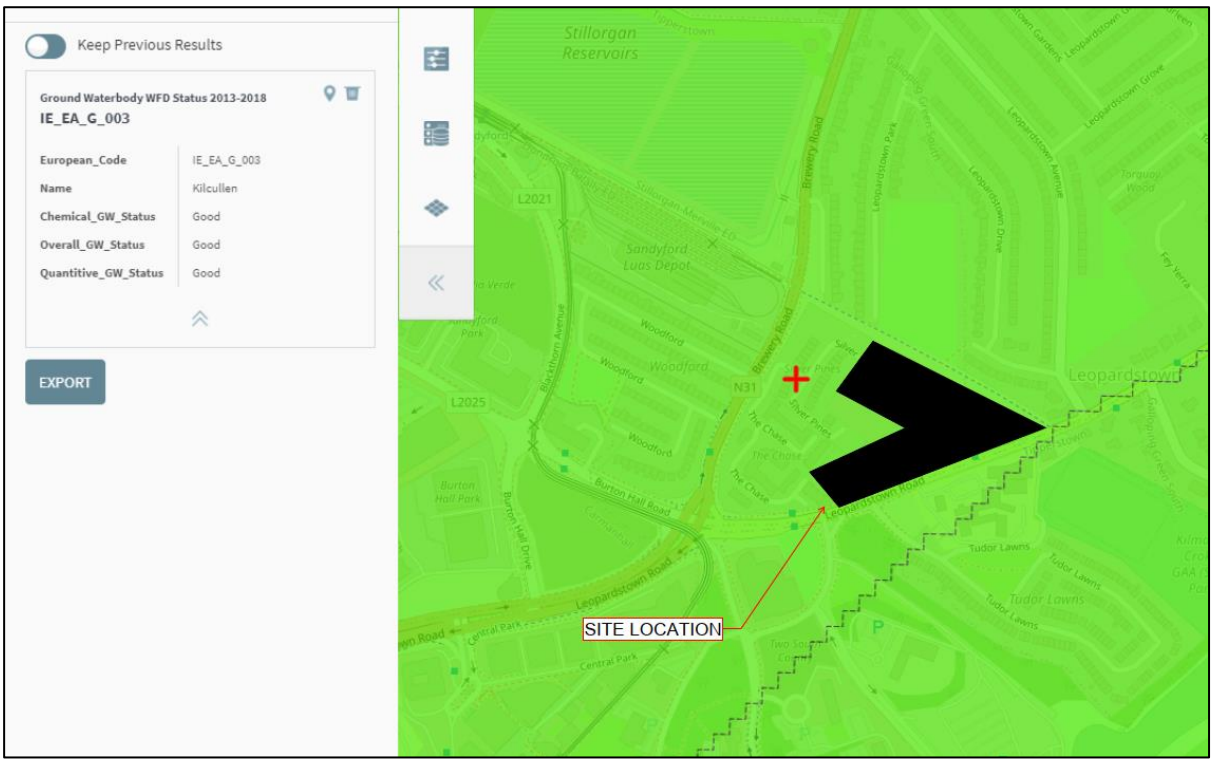

Figure 0:7 – EPA Map Extract

7.3.7.2 Groundwater Flood Risk:

Groundwater flooding can occur during lengthy periods of heavy rainfall, typically during later winter/early spring when the groundwater table is already high. A detailed flood risk assessment has been carried out in accordance with OPW guidelines and is submitted as part of this planning application. This document has found that "*there is no significant risk of flooding affecting the proposed development site or flooding of the site drainage network impacting adjoining properties. Therefore, the development is deemed acceptable from a flood risk assessment perspective*".

7.3.8 Contaminated land

The National Waste Collection Office (NWCPO) issue waste collection permits for all waste management regions in Ireland. According to EPA Mapping there are no waste licensed IPC facilities on the proposed site.

7.4 Characteristics of the Proposed Development

Chapter 3 provides a full description of the proposed development. In addition, the Construction and Environmental Management Plan (CEMP) describes the construction strategy. In summary the development will consist of a new residential and mixed use scheme to include apartments, residential amenity space, a café and a childcare facility. A detailed description is now set out as follows:

The proposal provides for the demolition of 10 no. properties and associated outbuildings at 'Madona House' (single storey), 'Woodleigh' (2 storeys), 'Cloonagh' (2 storeys), 'Souk El Raab (2 storeys), 'Wellbrook' (2 storeys), 'Calador' (2 storeys), 'Alhambra' (2 storeys), 'Dalwhinnie' (2 storeys), 'Annaghkeen' (1-2 storeys) and 'The Crossing' (single storey) (combined demolition approx. 2,291.3 sq m GFA).

The new development will provide for (a) the refurbishment, separation and material change of use of Saint Joseph's House (a Protected Structure, RPS No. 1548) from residential care facility to residential use and a childcare facility; and (b) the construction of a new build element to provide for an overall total of 463 no. residential units, residential amenity space and a café.

The overall development proposal shall provide for the following:

- Block A (5 storeys) comprising 49 no. apartments (13 no. 1 bed units, 33 no. 2 bed units and 3 no. 3 bed units);
- Block B (4 - 7 storeys) comprising 88 no. apartments (28 no. 1 bed units, 57 no. 2 bed units and 3 no. 3 bed units);
- Block C (5 - 7 storeys) comprising 115 no. apartments (26 no. studio units, 26 no. 1 bed units and 57 no. 2 bed units and 6 no. 3 bed units);
- Block D (5 - 10 storeys) comprising 157 no. apartments (36 no. studio unit, 40 no. 1 bed units and 81 no. 2 bed units), residential amenity areas of approx. 636 sq m and a café of approx. 49 sq m;
- Block E (Saint Joseph's House) (2 storeys) comprising 9 no. apartments (8 no. 2 bed units and 1 no. 3 bed units) and a childcare facility of 282 sq m with associated outdoor play areas of approx. 130 sq m;
- Block F (3 - 6 storeys) comprising 45 no. apartments (23 no. studio units, 10 no. 1 bed units; and 12 no. 2 bed units);

Each new build residential unit (in Blocks A, B, C, D and F) has an associated area of private open space in the form of a terrace/balcony. Open Space proposals for Saint Joseph's House (Block E) include a mixture of private terrace/balcony areas and communal open space areas.

The extent of works proposed to Saint Joseph's House (a Protected Structure) include:

- The demolition of a single storey office, conservatory, glazed link, external store, external enclosed escape stairs with associated canopies, toilet extension and 3 no. associated outbuildings to the west of Saint Joseph's House (demolition total approx. 173.4 sq m GFA);
- The removal of external steel gates, all external steel escape stairs, canopies, existing disabled access ramps, concrete steps, an external wall and associated roof area;
- Relocation of external granite steps and the provision of a new raised entrance terrace, concrete steps and ramp areas;
- Replacement of existing rooflights, the addition of roof lights, part new roof / new zinc roof, new external wall and roof to the east of the structure;
- The provision of new door and window openings;
- Modifications to internal layout including the removal of walls and partitions and the addition of new dividing walls.

The Residential Amenity Areas of approx. 636 sq m proposed in Block D comprise a residential club house/multi purpose room, library/reading room, lounge area, concierge area, office area, post room, fitness club, all at ground floor level of Block D. A terrace lounge area is proposed at fifth floor level of Block D. 2 no. roof garden areas are also proposed at fifth floor level of Blocks C and D (approx. 400 sq m and 408 sq m respectively).

Open Space (approx. 9,885 sq m) is proposed in the form of (a) public open space areas (approx. 6,680 sq m) which include a public plaza/court area, a main area of public open space (including a play area and outdoor gym area) and woodland trail; and (b) all communal open space areas (approx. 3,205 sq m) which include areas adjacent to Saint Joseph's House (Block E), Block D and Block F, a courtyard and play area located between Blocks A and B and roof terraces at fifth floor level of Blocks C and D. Visual amenity open space areas (approx. 1,000 sq m) are also proposed at various locations throughout the development.

Basement Level (approx. 9,445 sq m) is proposed with residential access from Blocks A, B, C, D and F. Bin storage areas, water storage areas, and part attenuation are located at this level. 2 no. ESB Substations, 1 no. ESB Kiosk, 2 no. Switch Rooms, waste storage areas for Block E (Saint Joseph's House) and bicycle storage areas are proposed at surface level.

A total of 259 no. car parking spaces (232 no. at basement level and 27 no. at surface level) are proposed. At basement level, a total of 30 no. electric vehicles and 202 no. standard parking spaces are provided for. A total of 968 no. bicycle spaces (816 no. at basement level and 152 no. at surface level), dedicated cycle lift and 10 no. motorcycle spaces (all at basement level) are also proposed.

Proposals for vehicular access comprise 1 no. existing vehicular access point via Silver Pines (an existing all movement junction onto Brewery Road) and 1 no. new vehicular access point at the general location of 'Annaghkeen' at Leopardstown Road (a new Left In / Left Out junction arrangement). The new access point along Leopardstown Road will replace 9 no. existing access

points at 'Woodleigh', 'Cloonagh', 'Souk El Raab', 'Wellbrook', 'Calador', 'Alhambra', 'Dalwhinnie', 'Annaghkeen' and 'The Crossing'. The internal permeability proposed will provide linkages for pedestrians and cyclists to Leopardstown Road and adjoining Greenway. Proposals also provide for the relocation of an existing bus stop along Leopardstown Road.

The associated site and infrastructural works include provision for water services; foul and surface water drainage and connections; waste water pumping station; attenuation proposals; permeable paving; all landscaping works including tree protection, tree removal and new tree planting; green roofs; boundary treatment; internal roads and footpaths; and electrical services.

7.5 Potential Impact of the Proposed Development

7.5.1 Construction Stage

To facilitate the proposed development land take will be required that will change the existing use of the site from the existing combination of greenfield and residential, to predominantly residential. The existing top soil will be stripped and sub-soil will be removed to facilitate the construction of the development.

Should material be required to be removed from the subject site it will be done so in accordance with current legislation.

As part of the proposed apartment buildings, a large underground basement will be constructed and as such a large volume of material will need to be excavated. Refer to Table 0.3 for further details.

Care will be required for the environmental management of the site to ensure that no potential contamination issues are experienced which may impact on the overall groundwater quality.

Potential impacts of the proposed development during the construction are:

- Approximately 5,250m³ (approximately 0.3m depth across the site) of topsoil shall be excavated from the existing ground level in order to form a building platform for the new buildings and associated roads infrastructure. This will result in the exposure of the subsoil to various elements including weather and construction traffic. Therefore, the impact may be characterised as a likely, short term, slight, adverse impact on the natural strength of the subsoil and subsequently resulting in deeper foundations being required.
- Approximately 22,312m³ (based on the formation depth of the proposed basement and estimated rock head level. Approximately 3.5m depth of existing subsoil, weathered rock and solid rock across the basement area) shall be excavated from the existing site in order to facilitate the construction of the new proposed basement soakaways and attenuation tanks. This will result in the exposure of the bedrock geology to various elements including weather and construction traffic. Therefore, the impact may be characterised as a likely, short term, moderate, adverse impact on the existing bedrock.
- Rutting and deterioration of the topsoil layer and any exposed subsoil layers or bedrock by earthworks plant and construction traffic. As such, the impact may be characterised as likely, short term, moderate, adverse impact on subsoil, the consequence of which will be erosion and generation of sediment laden runoff.
- Earthworks are required in the open space areas to accommodate underground surface water soakaway systems and other SuDS features. This landscaping activity will likely have a moderate, positive, permanent, impact on the soil and ground profile. Earthworks to road infrastructure is also required due to the existing steep topography of the site for access.
- During the construction period, large machinery and associated fuel and fuel storage will be present on site. As a result, accidental spills and leaks (e.g. storage of oils and fuels on site), use of cement and concrete during construction works are inevitable during the construction phase. Therefore, the unlikely impact may be characterised as a likely, short term, moderate, slight impact on subsoil and ground water.

- Approximately 2,700m³ of fill (generally comprising normal stone used in the construction of roads, footpaths and buildings) will be required across the development. Therefore, the likely impact may be characterised as, permanent, slight impact on subsoil and ground water.

7.5.1.1 Stripping of Topsoil

Removal of the existing topsoil layer will be required across the site. Stripping of topsoil will result in exposure of the underlying subsoil layers to the effects of weather and construction traffic and may result in subsoil erosion and generation of sediment laden runoff.

7.5.1.2 Excavation

Excavation of existing subsoil layers will be required to allow road construction, basement construction, foundation excavation, drainage and utility installation and provision of surface water attenuation facilities.

Where feasible, excavated material will be reused as part of the site development works (e.g. use as fill material beneath roads) however, unsuitable excavated subsoil is expected and will have to be removed to an approved landfill.

Table 0.3 – Excavation amounts

Item	Topsoil (m^3)	Soil (m^3)
Site Strip	5,250	-
Subsoil (& Weathered Rock)	-	22,312
Rock	-	7,070

7.5.1.3 Construction Traffic

Earthwork's plant (e.g. dump trucks) and vehicles delivering construction materials to and from the site (e.g. road aggregates, concrete deliveries etc.) have potential to cause rutting and deterioration of the topsoil layer and any exposed subsoil layers, resulting in erosion and generation of sediment laden runoff. This issue can be particularly noticeable at site access points (resulting in deposition of mud and soil on the surrounding road network). Dust generation can also occur during extended dry weather periods as a result of construction traffic.

7.5.1.4 Accidental Spills and Leaks

During the construction phase there is a risk of accidental pollution from the sources noted below. Accidental spills and leaks may result in contamination of the soils underlying the site.

- Storage of oils and fuels on site.
- Oils and fuels leaking from construction machinery.
- Spillage during refuelling and maintenance of construction machinery.

7.5.1.5 Geological Environment

It is not envisaged that the excavations will have any discernible impact on the geological environment. When bedrock is encountered it will be crushed, screened and tested for use within the designed works.

7.5.2 Operational Stage

Once the development is completed the operational impacts on the land and soils would be minimal. The biggest risk item is cross contamination of ground water from the operational phase of the development from accidental oil spillages. Refer to the mitigation section below for proposed remedial issues.

7.6 Potential Cumulative Impacts

Cumulative phase looks at the increased overall implications the proposed development may have on the environment in cumulation with existing and permitted development in the area. The primary potential cumulative operational impact considered is the local increase in hard standing and subsequent decrease in local groundwater recharge. In the case the discharge to the public surface water sewer is kept at the greenfield runoff rate, which prevents any cumulative impact on the downstream watercourse environment. For more detail see the Civil Engineering Infrastructure Report and Flood Risk Assessment Report by Barrett Mahony Consulting Engineers included as part of this planning application.

Cumulative impacts, if any, will be limited to the construction stage and will, therefore, be temporary to short-term in duration. Appendix 2.1, submitted as part of this application, has highlighted 25no. applications in the local area. Per the map below (Figure 0:8) there are several permitted and proposed planning applications within 1km that may have a cumulative effect on the Land and Soils, when combined with the proposed development. These developments are shown in Table 0.4:

Figure 0:8 – Planning Applications within 1km of the site.

Table 0.4 – Sites with Potential for Cumulative Effects on Land & Soils

No.	Planning Reference	Brief Summary*	Cumulative Effect	Justification
2	D19A/0972 & ABP 3007574/20	Demolition of existing structures and construction of several 3-storey residential buildings	Negative, imperceptible, short term	The site is located +300m away from the proposed site and involves minimal groundworks.
3	D21A/0294	Demolition of existing structures and construction of several 3-storey residential buildings	Negative, imperceptible, short term	The site is located +375m away from the proposed site and involves minimal groundworks.
15	D17A/1060 & ABP 301661-18	Demolition of existing structures and construction of 3no. commercial buildings ranging from 5-6 storeys with basement car parking	Negative, imperceptible, short term	The site is located +250m from the subject site. There are several primary roads and existing structures between the two sites and any combined effect on the Land & Soils is unlikely to occur.
16, 17, 19, 20, 21	D15A/0695, D17A/0944, D18A/1240, D20A/0422, D21A/0465	Demolition of existing structures and construction of 3 5-storey office buildings ranging from 5 storeys with basement car parking	No effect	The site is located +225m away from the proposed site. The building has been constructed and therefore any risks to Land & Soils are limited.
18	D18A/0707	Demolition of existing structures and construction of 3no. 5-storey office buildings ranging from 5 storeys with basement car parking	No effect	The site is located +300m away from the proposed site. The below ground building elements have been constructed and therefore any risks to Land & Soils are limited.
22, 23, 24, 25	D19A/0298, D19A/0328, D15A/0464, D15A/0350	Installation of PV Panels, 3m high storage sheds and 1no. storey extension	No effect	The site is located +75m away from the proposed site. The construction work is minimal and any risks to Land & Soils are limited.

*For full description please refer to appendix 2.1

As long as mitigation measures for the developments are carried out as permitted, there will be no significant cumulative impacts on the land, geological and hydrogeological environment. Should any future developments be under construction or planned in the vicinity of the site, potential cumulative impacts are not anticipated once similar mitigation measures are implemented.

7.7 Do Nothing Scenario

In the absence of the proposed development being constructed, the permitted development (D17A/0337/PL06D.249248) would likely be implemented. The seven large, detached houses on large plots fronting Leopardstown Road (i.e. the part of the site added subsequent to the granting of the above permission) would remain in use as individual dwellings. The impact in this instance from a land and soils perspective would be to limit the basement excavation, groundwater recharge, and other implications presented above to the footprint of St Josephs House, Block A, Block B, and surrounds.

7.8 Risks to Human Health

A potential risk to human health due to the associated works during construction is the direct contact, ingestion or inhalation of receptors (i.e. construction workers) with any soils which may potentially contain low level hydrocarbon concentrations from Site activities (potential minor leaks, oils and paint).

No human health risks associated with long term exposure to contaminants (via. direct contact ingestion or inhalation) resulting from the proposed development are anticipated.

7.9 Mitigation Measures

7.9.1 Construction Stage

A Construction and Environmental Management Plan (CEMP) is included in the planning application material. This report will be developed by the Contractor and will be submitted to the local authority prior to commencement on site.

In order to reduce the impacts on the soils, geology and hydrogeological environment a number of mitigation measures will be adopted as part of the construction works on site, as set out in the CEMP. The measures will address the main activities of potential impact which include:

- Control of soil excavation and export from site.
- Sources of fill and aggregates for the project.
- Fuel and Chemical handling, transport, and storage; and
- Control of Water during Construction.

The Construction and Environmental Management Plan (CEMP) sets out how the construction of the project will be managed in a safe and organised manner by the Contractor. The CEMP sets out requirements and standards which must be met during the construction stage and includes the relevant mitigation measures outlined in the EIAR and any subsequent conditions relevant to the project.

Care will be required for the environmental management of the site to ensure that no potential contamination issues are experienced which may impact on the overall groundwater quality.

Potential issues can be mitigated against by ensuring that CEMP is adhered to prevent accidental onsite oil spillages and the regular maintenance of onsite plant to eliminate potential risks.

Soil stripping, earthworks and stockpiling of soil will be carried out during the works. Stockpiles have the potential to cause negative impacts on air and water quality. The effects of soil stripping and stockpiling will be mitigated through the implementation of an appropriate earthworks handling protocol during construction as set out in the CEMP Report. It is anticipated that any stockpiles will be formed within the boundary of the excavation and there will be no direct link or pathway from this area to any surface water body. It is anticipated that only local/low level of stockpiling will occur as the bulk of the material will be excavated either straight into trucks for transport off site or will be reused in other areas of the site as fill.

Dust suppression measures (e.g. damping down during dry periods), vehicle wheel washes, road sweeping, and general housekeeping will ensure that the surrounding environment is free of nuisance dust and dirt on roads as set out in the CEMP report.

The following mitigation measures as set out in the CEMP Report will be taken at the construction site in order to prevent any spillages to ground of fuels and prevent any resulting soil and/or groundwater quality impacts:

- Designation of bunded refuelling areas on the site (if required).
- Provision of spill kit facilities across the site.
- Where mobile fuel bowsers are used the following measures will be taken.
- Any flexible pipe, pump, tap or valve will be fitted with a lock and will be secured when not in use.
- All bowsers to carry a spill kit and operatives must have spill response training; and
- Portable generators or similar fuel containing equipment will be placed on suitable drip trays.

In the case of drummed fuel or other potentially polluting substances which may be used during construction the following measures will be adopted:

- Secure storage of all containers that contain potential polluting substances in a dedicated internally bunded chemical storage cabinet unit or inside concrete bunded areas;

- Clear labelling of containers so that appropriate remedial measures can be taken in the event of a spillage;
- All drums to be quality approved and manufactured to a recognised standard;
- If drums are to be moved around the site, they should be done so secured and on spill pallets; and
- Drums to be loaded and unloaded by competent and trained personnel using appropriate equipment.

7.9.2 Operational Stage

During the operational phase of the proposed development there is limited potential for site activities to impact on the geological environment of the area.

Following best practice, as noted above, the potential for the ground water to become polluted via oil spills will be reduced as far as is practical using an oil separator to take run off from carparking areas and passing through same prior to disposal.

7.10 Monitoring

7.10.1 Construction Stage

Proposed monitoring by the contractor during the construction phase in relation to the soil and geological environment are as follows:

- Adherence to the "*Construction & Environmental Management Plan (CEMP)*". The developer will be responsible for ensuring adherence with this report. If construction works are not in accordance with the plan, then the developer will ensure that this is remedied.
- Construction monitoring of the works (e.g. inspection of existing ground conditions on completion of cut to road sub-formation level in advance of placing capping material, stability of excavations etc.).
- Inspection of fuel / oil storage areas. If these are found to be sub-standard then the developer will ensure that they are made fit for purpose.
- Monitoring cleanliness of adjacent road network, implementation of dust suppression and provision of vehicle wheel wash facilities. If these measures are found to be inadequate and the adjacent road network is negatively impacted, the developer will ensure that this is remedied and will ensure that dust suppression measures are implemented more regularly and all vehicles exiting the site use vehicle wheel wash facilities provided.
- Monitoring of contractor's stockpile management (e.g. protection of excavated material to be reused as fill; protection of soils from contamination for removal from site).
- Monitoring sediment control measures (sediment retention ponds, surface water inlet protection etc.). The developer is responsible for ensuring that these measures are fit for purpose. If they are found to be inadequate, then the development will ensure that they are made good and fully utilised.
- Soil removed during the construction phase will be monitored to maximise potential for re-use on site.
- The quantities of topsoil, subsoil and rock removed off site will be recorded.
- Appropriate signage shall be erected on all access roads in the vicinity of the site to inform HGV drivers that engines shall not be left idling for prolonged periods and that the use of horns shall be banned at all times.

7.10.2 Operational Stage

Proposed monitoring during the operational phase in relation to the water and hydrogeological environment are as follows:

- A management company on site will ensure the system is regularly inspected and maintained. Areas of the site with significant SuDS features will remain in the charge of this company.
- The performance of all SuDS features will be monitored by the management company during the life of the development.

- Monitoring of the installed gullies will be required to prevent contamination and increased runoff from the site.

7.11 Reinstatement

As part of the project there will be several open space green areas provided for residents and visitors. Please refer to the landscape drawings submitted as part of this application for further details.

7.12 Interactions

There are interactions between land and soils, water and material assets and built assets (traffic).

There are interactions between land and soils and water, with changes in depth and type of overburden impacting the protection provided to aquifers. The likely impact will be neutral, permanent and slight.

There are interactions between land and soils and water, with some surface water conveyed and stored in SuDS features such as soakaways and discharging to the ground where possible, replicating the existing greenfield site drainage as closely as possible. The likely impact will be permanent, slight and neutral.

There are interactions between lands and soils and material assets, with the construction of drainage, utilities and rock excavation for basement impacting the quantity of soil and subsoil as these materials will be removed to facilitate construction. The likely impact will be permanent slight, permanent and negative.

There are interactions between lands and soils and material assets, with the delivery of stone fill under buildings and roads and footpaths resulting in additional construction vehicles on roads adjacent to the site. The likely impact will be negative, temporary and slight.

7.13 Difficulties Encountered

No difficulties were encountered while developing this report.

Appendix 7.1 – Site Investigations

NEW DEVELOPMENT
LEOPARDSTOWN ROAD
DUBLIN
FOR
HOMELAND SILVER PINES

BARRETT MAHONY
CONSULTING ENGINEERS

CONTENTS

APPENDICES

FOREWORD

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

General.

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

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

Boring Procedures.

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

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

Where peat has been encountered during siteworks, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges 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 & Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986).

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REPORT ON A SITE INVESTIGATION
FOR A PROPOSED RESIDENTIAL DEVELOPMENT
ST JOSEPHS HOUSE
LEOPARDSTOWN ROAD DUBLIN
FOR
HOMELAND SILVER PINES LTD

BARRETT MAHONY
CONSULTING ENGINEERS

Report No. 22530 **July 2020**

I Introduction

A new residential development is proposed for a 2.6 hectare site located off the Leopardstown Road in Dublin. The area includes the existing St. Josephs House for Adult Deaf and a number of existing dwellings.

An investigation of sub soil conditions in the area of the new development has been carried out by IGSL for Barrett Mahony, Consulting Engineers, on behalf of Homeland Silver Pines Limited.

The scheduled site investigation included the following elements:

*	Trial Pit Excavations	6 nr.
•	CBR by Plate Test	2 nr.
•	Infiltration Test to BRE Digest 365	1 nr
•	Geotechnical Laboratory Testing	
•	Environmental Laboratory Testing	

This report includes all factual data from field operations and all laboratory data and discusses these findings relative to the proposed new development.

II Fieldwork

This development is to take place on an extensive site located north of the Leopardstown Road. The site is occupied by several existing dwellings and St. Joseph's House.

The site and the exploratory locations are noted on the drawing enclosed in Appendix V. Locations were marked out by IGSL on site and were surveyed to National Grid and Ordinance Levels were established.

The various elements of the investigation are detailed in the following paragraphs. All field works were supervised by an experienced geotechnical engineer who carefully recorded stratification, took photographs as necessary, recovered samples as required and prepared detailed records.

Each location was scanned electronically (CAT) to ensure that existing services were not damaged.

Site works were undertaken in accordance with COVID 19 government regulations relating to safe "RETURN TO WORK" following the LOCKDOWN.

Trial Pits

Pits were excavated using a JCB excavator under experienced engineering supervision. Detailed trial pit logs with photographs are enclosed in Appendix I. Trial Pits are referenced TP01 to TP06.

The records present a fairly high degree of consistency. MADE GROUND (variable in composition) extends from GL to depths of up to 1.60 metres. The fill generally overlies firm to stiff brown sandy gravelly SILT /CLAY, which in turn overlies residual weathered granite, presenting as dense sandy GRAVEL with cobbles and boulders.

A variation to the above is noted at TP04 where the upper FILL directly overlies the weathered GRANITE zone.

Excavator refusal was noted at depth between 1.50 and 2.70 metres, presumably on granite bedrock. Proof core drilling to confirm bedrock parameters was not scheduled for this project.

Ground water was noted only in TP03 as a light seepage at the base of the excavation.

Trial excavations were backfilled with compacted arisings and ground surfaces were reinstated on completion.

Trial Pit details are summarised in the following TABLE A.

TABLE A

Ref No.	Made Ground	Gravelly CLAY	Granite Sand	Refusal
TP01	0 – 1.60	1.60 - 2.40	2.40	2.40
TP02	0 – 0.60	0.60 – 1.20	1.20 – 1.50	1.50
TP03	0 – 0.20	0.20 – 1.10	1.10 - 2.20	2.20 (W)
TP04	0 – 1.40		1.40 – 1.80	1.80
TP05	0 – 1.60	1.60 – 2.10	2.10	2.10
TP06	0 – 1.40	1.40 – 2.40	2.40 – 2.70	2.70

In Situ CBR by Plate Bearing Test

The CBR value of the soils at shallow depth was established at two specified locations using Plate Bearing Test Apparatus. A steel plate is loaded and off-loaded incrementally over two stages and the deflection under load and recovery under off-load is measured by a system of dial gauges. The data is processed and load settlement graphs are prepared. An equivalent CBR value is calculated in accordance with NRA HD25-26/10. At each location testing was carried out at 0.50 metres BGL

Results are summarised in the following table and details are presented in Appendix II.

TABLE B

Test No.	Depth	CBR at Load Cycle (%)	CBR @ Re-Load (%)
PBT 01	0.50	2.8	5.5
PBT 02	0.50	4.0	9.9

Infiltration Tests

Infiltration testing was performed in accordance with BRE Digest 365 'Soakaway Design' at one specified location. Full details are presented in Appendix III with supporting photographs . The Test Pit was opened to 2.25 metres deep and a detailed log was prepared. Topsoil overlies gravelly CLAY with granite sand from 1.80 to 2.25 metres. Water was noted at the base of the excavated pit.

To obtain a measure of the infiltration rate of the sub-soils, water is poured into the test pit, and records taken of the fall in water level against time. The test is carried out over two cycles following initial soakage. The infiltration rate is the volume of water dispersed per unit-exposed area per unit of time, and is generally expressed as metres/minute or metres/second. In these calculations the exposed area is the sum of the base area and the average internal area of the pit sides over the test duration.

Test data is summarised as follows:

Test No.	Depth	Stratum	Infiltration Rate (f) m/min
SA01 (1st Cycle)	2.25	Clay / Sand	0.00034
SA01 (2nd Cycle)	2.25	Clay / Sand	0.00026

III. Laboratory Testing

A programme of laboratory testing was scheduled following completion of site operations. Geotechnical testing was carried out by IGSL in it's INAB-Accredited laboratory. Environmental and Chemical testing was carried out in the UK by CHEMTEST Ltd.

The test programme included the following elements:

- Liquid and Plastic Limits / Moisture Content
- PSD Grading by wet sieve and hydrometer.
- Sulphate / Chloride and pH
- RILTA Suite Environmental

The various results are discussed in the following paragraphs.

Liquid and Plastic Limits

Tests were carried out on the gravelly CLAY/SILT stratum noted in the trial pits at depths between 0.50 and 2.00 metres. The results indicate a predominantly CLAY matrix for this stratum, plotting in the CL/CI Zones of the standard Casagrande Classification Chart. Natural Moisture Content for this stratum ranges from 13 to 26% but more generally from 13 to 16%.

PSD Grading

The particle size distribution curves for samples from each of the trial pits have been established by wet sieve analysis and hydrometer analysis as appropriate. Samples from the clay stratum grade smoothly from the fine clay to coarse gravel fraction, the straight line grading is typical of boulder clay or glacial till deposition.

The lower residual granite stratum grades as clayey gravelly sandy SILT.

Sulphate Chloride and pH.

Three samples have been analysed to determine sulphate, chloride and pH values. Sulphate concentrations (SO4 2:1 extract) of < 0.010 g/l were established with pH values of 7.7 to 8.1. Water Soluble Chloride contents of < 0.010 g/l to 0.016 g/l were also established.

A sulphate design class of DS-1 (ACEC Classification for Concrete) is indicated for sulphate concentrations lower than 0.5 g/l. No special precautions are therefore deemed necessary for protection of below ground concrete.

Environmental

Ten sample of soil/fill were submitted for detailed environmental analysis to RILTA Suite (WAC) parameters. This is used to determine the suitability of the soil for disposal to landfill and includes Heavy Metals, Polycyclic Aromatic Hydrocarbons (PAH), TPH-CWG, BTEX and Total Organic Carbon (TOC) all carried out on dry soil samples.

Also included are Leachate Analyses, where leachate is generated in accordance with CEN 10:1 specification. This is tested for the presence of recognised contaminants including Heavy Metals, Dissolved Organic Carbon (DOC) and Total Dissolved Solids (TDS). An asbestos screen is also included as part of each RILTA Suite.

The results from nine of the samples confirm that no elevated levels of contaminants were found and that the material can be classified as INERT.

In one sample of FILL however (TP01 at 1.00 metre) elevated levels of Total Organic Carbon (TOC) and Loss on Ignition (LOI) were recorded.

IV. Discussion:

The area examined by this geotechnical investigation is to be developed for residential purposes.

The investigation has been carried out on accordance with the Barrett Mahony Specification and full details of site operations and laboratory data are included in the various appendices to this document.

STRATIFICATION

Based on the trial pit findings, the stratification comprises the following,.

Top Soil / Made Ground	GL to maximum depth 1.60 metres
Firm to Stiff brown gravelly Clay (Boulder Clay)	0.60 to maximum depth 2.40 metres
Granitic Sandy Gravel (Highly weathered Granite)	1.20 to 2.70 metres
Solid Granite	1.40 to 2.70

GROUND WATER

Noted as seepage at the base of TP03 and at the base of SA01 at approximately 2.20 metres BGL.

ALLOWABLE BEARING PRESSURES

MADE GROUND	Unsuitable as a founding medium for either structural or ground floor loading.
BROWN BOULDER CLAY	Based on engineering assessment of trial excavations and laboratory data an allowable bearing pressure of 150 KPa can be assumed for this stratum. Settlement of about 10 to 12 mm can be expected.

SANDY GRAVEL (Residual Weathered Granite)	Assuming medium dense to dense condition an allowable bearing pressure of 150 KPa can be assumed with associated settlement of 20 mm.
GRANITE	The intact granite bedrock should readily support loads of the order of 400 KPa at its upper horizon. This will increase substantially in hard un-weathered bedrock

Notes on Above

Allowable bearing pressures above are based on visual assessment of stratification on site and extensive published data relating to boulder clay / residual granite / solid granite.

The refusal of excavator in each location is deemed to indicate the intact granite rock horizon. There is a possibility, however, that large granite boulders may be present in places, resulting in excavator refusal.

Careful visual assessment of excavated formation at each unit is advised to ensure uniformity of founding medium. All soft or suspect soils should be removed and replaced with low-grade concrete. To avoid deterioration of the soils, foundation excavations should be protected by blinding,

Consideration can be given to additional investigation to confirm bedrock parameters by rotary core drilling or to more accurately determine allowable bearing pressures in the overburden soils by Heavy Duty Dynamic Probe.

Roads / Paved Areas

CBR values have been established by Plate Bearing Test at two locations. An average CBR of 4 to 5% can be adopted for design purposes. Visual inspection of excavated formation is again advised to ensure that all organic or unsuitable fill material is removed.

Infiltration

A low infiltration rate was recorded in the single test location. The boulder clay stratum will be quite impermeable, however some soakage may be available in the highly weathered granite presenting as sandy gravel. The water ingress noted at about 2.00 metres in some trial pits is also noted.

Should conventional soakaways be impractical the use of the Local Authority drainage system would be recommended.

Concrete

Tests have confirmed very low concentrations of soluble sulphate and chloride with a near-neutral pH. No special precautions are deemed necessary to protect foundation concrete.

Environmental Tests (RILTA)

Detailed test data is presented in Appendix IVb and this has been detailed in Part III of this document.

No issues arise as to disposal of excavated material on site for non-engineering purposes such as landscaping.

In terms of landfill disposal the sample from TP01 shows elevated TOC and LOI levels.

While the above levels are unlikely to be high enough to warrant a 'Hazardous' classification, consultation with the landfills will be required with regard to their ability to accept the elevated TOC and LOI.

It is noted that this report does not include a waste classification assessment (WCA) which is typically undertaken by an environmental specialist in order to determine whether the soils are hazardous or non-hazardous.

It should also be noted that the chosen landfill may require additional sampling to achieve the frequency of analysis (i.e. no of samples per unit volume of excavation) that meets their license requirements.

Monitoring of excavation operations will be important to identify any contamination that may have remained undetected during this limited investigation.

Appendix I Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 22530

CONTRACT	Berwick Pines	TRIAL PIT NO.	TP01
		SHEET	Sheet 1 of 1
LOGGED BY	S.Cunningham	CO-ORDINATES	720,204.79 E 726,343.87 N
		DATE STARTED	26/05/2020
		DATE COMPLETED	26/05/2020
CLIENT	BCME	GROUND LEVEL (m)	81.63
ENGINEER		EXCAVATION METHOD	7T JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.10	81.53		AA136472	Env	0.00-1.50		
MADE GROUND comprised of soft black ash and charcoal with glass bottles and china fragments.									
MADE GROUND comprised of reddish sandy gravelly silty CLAY with red brick and glass fragments.		0.60	81.03		AA136470	B	0.50		
1.0					AA136471	B	1.00		
Stiff brown very sandy gravelly CLAY with a medium cobble content and occasional boulders. Sand is fine to coarse. Gravel is subrounded to subangular, fine to coarse. Cobbles and boulders are rounded comprised of granite.		1.60	80.03		AA136474	Env	1.60-2.40		
2.0					AA136473	B	2.00		
End of Trial Pit at 2.40m		2.40	79.23						
3.0									
4.0									

Groundwater Conditions
Pit was dry

Stability
Unstable in MADE GROUND

General Remarks
Pit terminated at 2.2mbgl due to large granite boulders/possible bedrock.

IGSL TP LOG 22530.GPJ IGSL.GDT 4/6/20

TRIAL PIT RECORD

REPORT NUMBER 22530

CONTRACT	Berwick Pines	TRIAL PIT NO.	TP02
		SHEET	Sheet 1 of 1
LOGGED BY	S.Cunningham	CO-ORDINATES	720,234.35 E 726,317.10 N
		DATE STARTED	26/05/2020
		DATE COMPLETED	26/05/2020
CLIENT	BCME	GROUND LEVEL (m)	82.55
ENGINEER		EXCAVATION METHOD	7T JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
TOPSOIL		0.00			AA136500	Env	0.00-1.50		
MADE GROUND comprised of grey/white ash and charcoal fragments		0.20	82.35						
Firm brown sandy gravelly CLAY with a low cobble content and occasional boulders. Sand is fine to coarse. Gravel is subrounded to subangular, fine to coarse. Cobbles and boulders are rounded comprised of granite.		0.60	81.95		AA136499	B	0.50		
		1.00			AA136482	B	1.00		
Medium dense golden gravelly granitic SAND with a low cobble content and occasional boulders. Sand is fine to coarse. Gravel is subrounded to subangular, fine to coarse. Cobbles and boulders are rounded comprised of granite. (Highly weathered granite)		1.20	81.35						
End of Trial Pit at 1.70m		1.50	81.05						

Groundwater Conditions
Pit was dry

Stability
Stable

General Remarks
Pit terminated at 1.7mbgl due to large granite boulders

IGSL TP LOG 22530.GPJ IGSL.GDT 4/6/20

TRIAL PIT RECORD

REPORT NUMBER 22530

CONTRACT	Berwick Pines	TRIAL PIT NO.	TP03
		SHEET	Sheet 1 of 1
LOGGED BY	S.Cunningham	CO-ORDINATES	720,261.31 E 726,370.76 N
		DATE STARTED	26/05/2020
		DATE COMPLETED	26/05/2020
CLIENT	BCME	GROUND LEVEL (m)	81.48
ENGINEER		EXCAVATION METHOD	7T JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm brown very sandy gravelly CLAY with a medium cobble content and frequent large granite boulders (>1.0m). Sand is fine to coarse. Gravel is subrounded to subangular, fine to coarse. Cobbles and boulders are rounded comprised of granite.		0.20	81.28		AA136466	Env	0.20-1.10		
					AA136465	B	0.70		
1.0 Medium dense brown clayey gravelly granitic SAND with a high cobble content and frequent boulders. Sand is fine to coarse. Gravel is subrounded to subangular, fine to coarse. Cobbles and boulders are rounded comprised of granite.		1.10	80.38		AA136467	B	1.20		
					AA136468	Env	1.20-2.00		
2.0 End of Trial Pit at 2.20m		2.20	79.28	(Seepage)	AA136469	B	2.20		
3.0									
4.0									

Groundwater Conditions
Seepage at 2.2mbgl

Stability
Stable

General Remarks
Pit terminated at 2.2mbgl due to possible bedrock.

TRIAL PIT RECORD

REPORT NUMBER 22530

CONTRACT	Berwick Pines	TRIAL PIT NO.	TP04
		SHEET	Sheet 1 of 1
LOGGED BY	S.Cunningham	CO-ORDINATES	720,292.48 E 726,350.38 N
		DATE STARTED	26/05/2020
		DATE COMPLETED	26/05/2020
CLIENT	BCME	GROUND LEVEL (m)	82.02
ENGINEER		EXCAVATION METHOD	7T JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
MADE GROUND comprised of very sandy gravelly CLAY with a medium cobble and boulder content with an abundance of buried breezeblocks and rooftiles.		0.30	81.72		AA103791	Env	0.30-1.30		
					AA136475	B	0.70		
1.0									
Medium dense golden gravelly granitic SAND with a low cobble content and occasional boulders. Sand is fine to coarse. Gravel is subrounded to subangular, fine to coarse. Cobbles and boulders are rounded comprised of granite. (Highly weathered granite)		1.40	80.62		AA103793	Env	1.40-1.80		
					AA103792	B	1.60		
End of Trial Pit at 1.80m		1.80	80.22						
2.0									
3.0									
4.0									

Groundwater Conditions
Pit was dry

Stability
Very Unstable between 0.5mbgl - 1.0mbgl due to high quantity of buried breezeblocks/roof tiles

General Remarks
Pit terminated at 1.8mbgl due to possible bedrock.

TRIAL PIT RECORD

REPORT NUMBER 22530

CONTRACT	Berwick Pines	TRIAL PIT NO.	TP05
		SHEET	Sheet 1 of 1
LOGGED BY	S.Cunningham	CO-ORDINATES	720,383.01 E 726,393.07 N
		DATE STARTED	27/05/2020
		DATE COMPLETED	27/05/2020
CLIENT	BCME	GROUND LEVEL (m)	80.52
ENGINEER		EXCAVATION METHOD	7T JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.25	80.27						
Firm brown slightly sandy slightly gravelly CLAY. (Possible MADE GROUND - Possible built up ground according to landowner)					AA136485	Env	0.30-1.30		
					AA136483	B	0.60		
1.0					AA136487	B	1.20		
		1.60	78.92						
Firm brown sandy gravelly CLAY with a low cobble content and occasional boulders. Sand is fine to coarse. Gravel is subrounded to subangular, fine to coarse. Cobbles and boulders are rounded comprised of granite.					AA136486	Env	1.60-2.10		
					AA136484	B	1.75		
2.0					AA136488	B	1.90		
End of Trial Pit at 2.10m		2.10	78.42						
3.0									
4.0									

Groundwater Conditions
Pit was dry

Stability
Stable

General Remarks
Pit terminated at 2.1mbgl due to large granite boulders. 1 foot bucket used at landowner request

IGSL TP LOG 22530.GPJ IGSL.GDT 4/6/20

TRIAL PIT RECORD

REPORT NUMBER 22530

CONTRACT	Berwick Pines	TRIAL PIT NO.	TP06
		SHEET	Sheet 1 of 1
LOGGED BY	S.Cunningham	CO-ORDINATES	720,372.21 E 726,374.26 N
		DATE STARTED	
		DATE COMPLETED	
CLIENT	BCME	GROUND LEVEL (m)	80.84
ENGINEER		EXCAVATION METHOD	7T JCB

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 - Gravel surface									
MADE GROUND comprised of grey/brown very sandy very gravelly CLAY.		0.20	80.64		AA136489	Env	0.20-1.00		
Brown very sandy very gravelly CLAY with a medium cobble content and frequent boulders. (Possible reworked material - Possible MADE GROUND)		0.40	80.44		AA136491	B	0.50		
1.0					AA136492	B	1.20		
Firm to stiff brown/grey slightly sandy gravelly CLAY with a medium cobble and boulder content. Sand is fine to coarse. Gravel is subrounded to subangular, fine to coarse. Cobbles and boulders are rounded comprised of granite.		1.40	79.44		AA136490	Env	1.40-2.40		
2.0					AA136493	B	2.00		
Medium dense golden gravelly granitic SAND with a low cobble content and occasional boulders. Sand is fine to coarse. Gravel is subrounded to subangular, fine to coarse. Cobbles and boulders are rounded comprised of granite. (Highly weathered granite)		2.40	78.44		AA136494	B	2.50		
		2.70	78.14						
End of Trial Pit at 0.00m									
3.0									
4.0									

Groundwater Conditions

Stability

General Remarks

IGSL TP LOG 22530.GPJ IGSL.GDT 4/6/20

TP01 – 1 of 4

TP01 – 2 of 4

TP01 – 3 of 4

TP01 – 4 of 4

TP02 – 1 of 3

TP02 – 2 of 3

TP02 – 3 of 3

TP03 – 1 of 4

TP03 – 2 of 4

TP03 – 3 of 4

TP03 – 4 of 4

TP04 – 1 of 3

TP04 – 2 of 3

TP04 – 3 of 3

TP05 – 1 of 3

TP05 – 2 of 3

TP05 – 3 of 3

TP06 – 1 of 3

TP06 – 2 of 3

TP06 – 3 of 3

Appendix II CBR by Plate Test

PLATE TEST REPORT SHEET (F3.1)

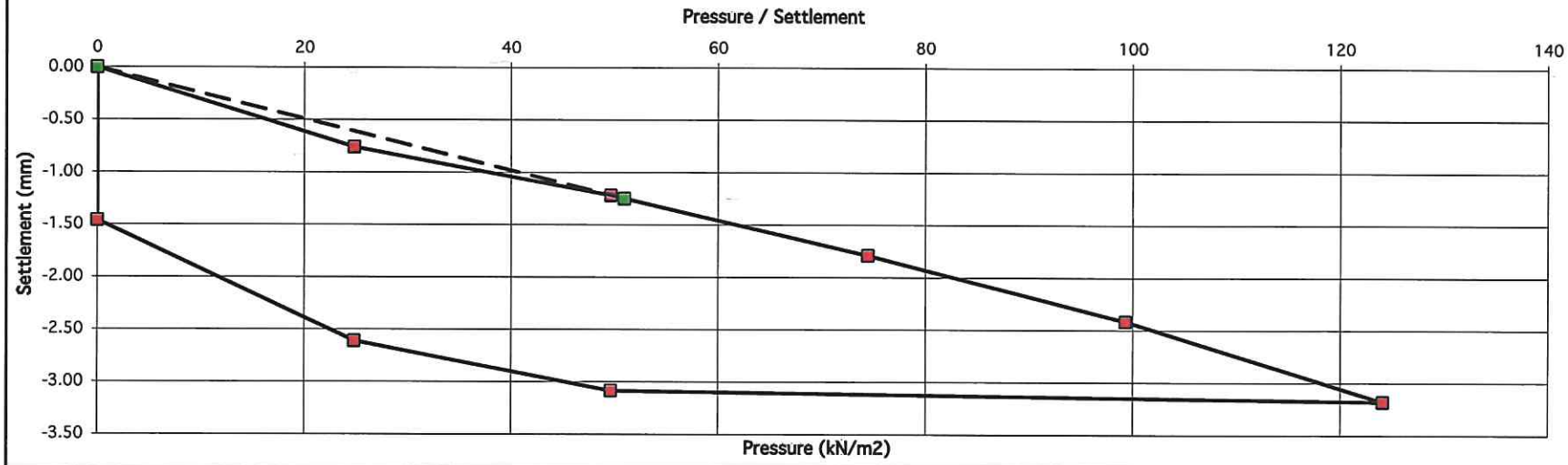
Reference No.	R111442
Contract	22530 - Berwick Pines
Test No.	CBR01- Load
Location	See Map for Reference
Depth	0.5mbgl
Client	BCME
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Cunningham
Authorised by	H. Byrne
Date	26/05/2020

Applied Pressure/Settlement Curve

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

Brown very sandy slightly gravelly CLAY with a low cobble content

Easting	720301.2
Northing	726377.9
Elevation	81.55



Gradient at 1.25 mm settlement intersection = 41
Modulus of subgrade reaction = 26 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.8 %

PLATE TEST REPORT SHEET (F3.1)

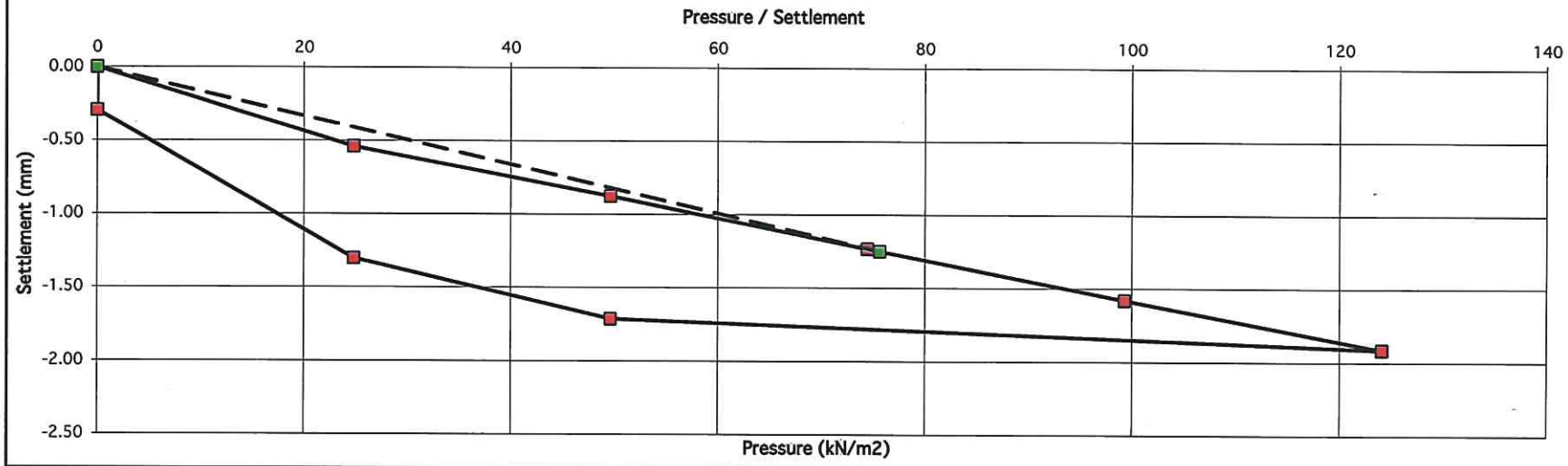
Applied Pressure/Settlement Curve

Reference No.	R111442
Contract	22530 - Berwick Pines
Test No.	CBR01 - Reload
Location	See Map for Reference
Depth	0.5mbgl
Client	BCME
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Cunningham
Authorised by	H. Byrne
Date	26/05/2020

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

Brown very sandy slightly gravelly CLAY with a low cobble content

Easting	720301.2
Northing	726377.9
Elevation	81.55



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)

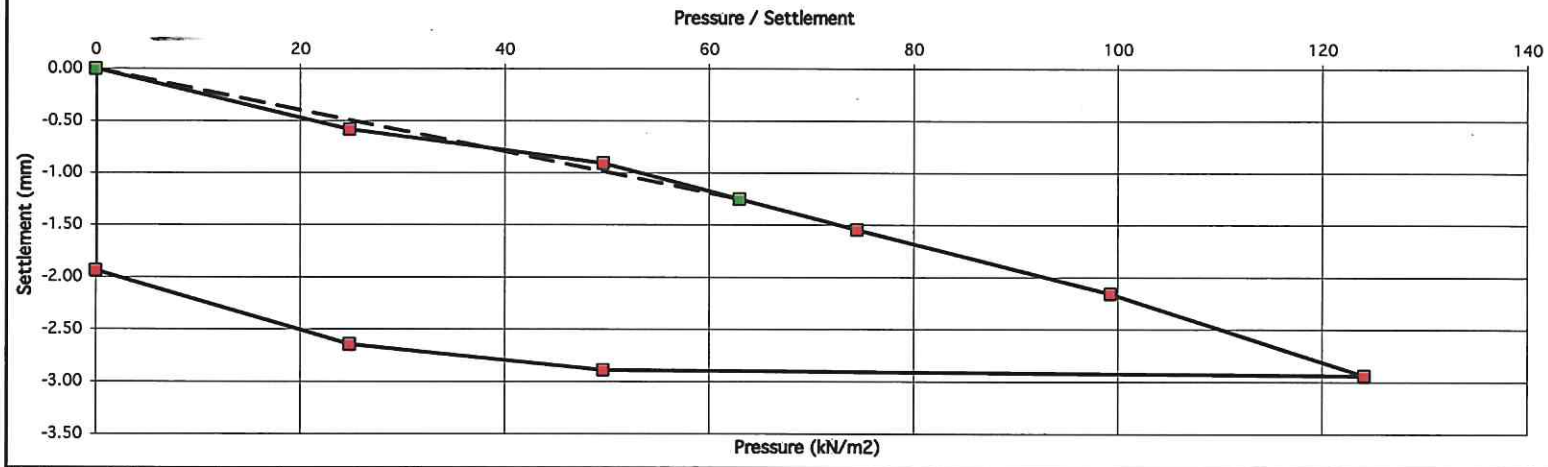
Reference No.	R111443
Contract	22530 - Berwick Pines
Test No.	CBR02- Load
Location	See Map for Reference
Depth	0.5mbgl
Client	BCME
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Cunningham
Authorised by	H. Byrne
Date	26/05/2020

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

Brown very sandy slightly gravelly CLAY with a low cobble content

Easting	720326.188
Northing	726353.235
Elevation	81.93

Applied Pressure/Settlement Curve



Gradient at 1.25 mm settlement intersection = 50
Modulus of subgrade reaction = 32 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.0 %

PLATE TEST REPORT SHEET (F3.1)

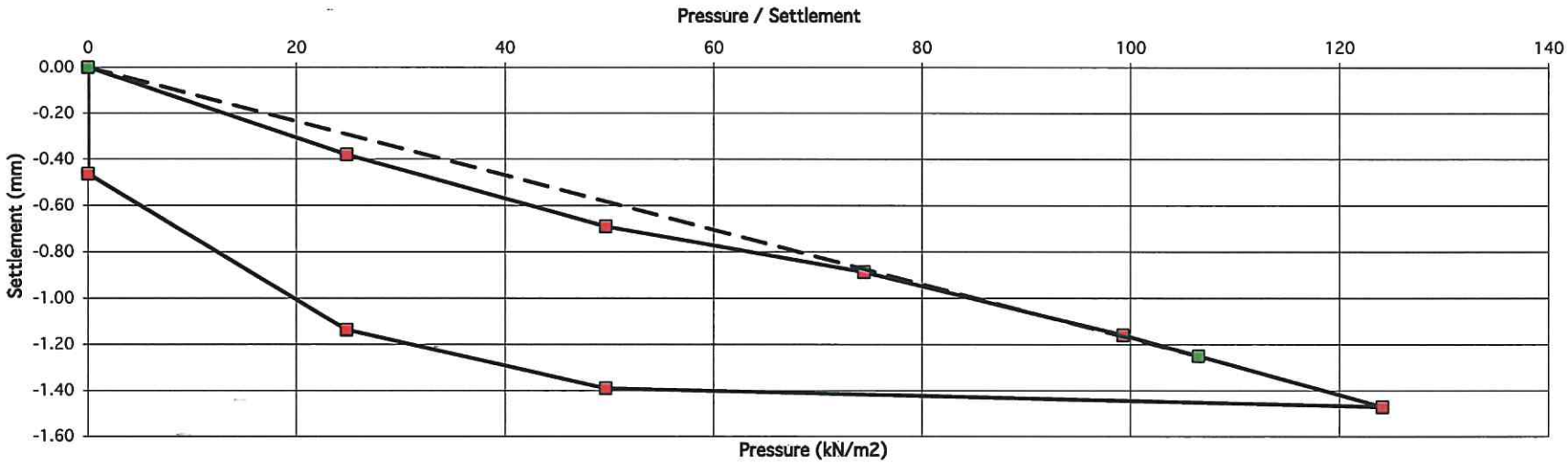
Applied Pressure/Settlement Curve

Reference No.	R111443
Contract	22530 - Berwick Pines
Test No.	CBR02 - Reload
Location	See Map for Reference
Depth	0.5mbgl
Client	BCME
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Cunningham
Authorised by	H. Byrne
Date	26/05/2020

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

Brown very sandy slightly gravelly CLAY with a low cobble content

Easting	720326.188
Northing	726353.235
Elevation	81.93



Gradient at 1.25 mm settlement intersection = 85

Modulus of subgrade reaction = 55 MPa/m

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

Equivalent CBR value in accordance with NRA HD25-26/10 9.9 %

Appendix III BRE Digest 365 Percolation

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

Contract:	Berwick Pines	Contract No:	22530
Test No.	SA01 - Cycle 1	Northing:	720248.762
Client	BMCE	Easting:	726355.221
Date:	27/05/2020	Elevation:	81.736

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	Seepage at 2.2
0.20	1.80	Brown very sandy gravelly CLAY with cobble and boulders	
1.80	2.25	Golden gravelly granitic SAND with cobble and boulders	

Notes: Two cycles carried out. Presoak carried out before Cycle 1 for 60mins.
(B) - AA136498 - 2.0mbgl
(B)- AA136497 - 0.9mbgl

Field Data

Depth to Water (m)	Elapsed Time (min)
0.81	0.00
0.82	1.00
0.83	2.00
0.83	3.00
0.84	4.00
0.84	5.00
0.87	10.00
0.89	15.00
0.90	20.00
0.92	25.00
0.94	30.00
0.96	35.00
0.97	40.00
0.98	50.00
0.99	60.00

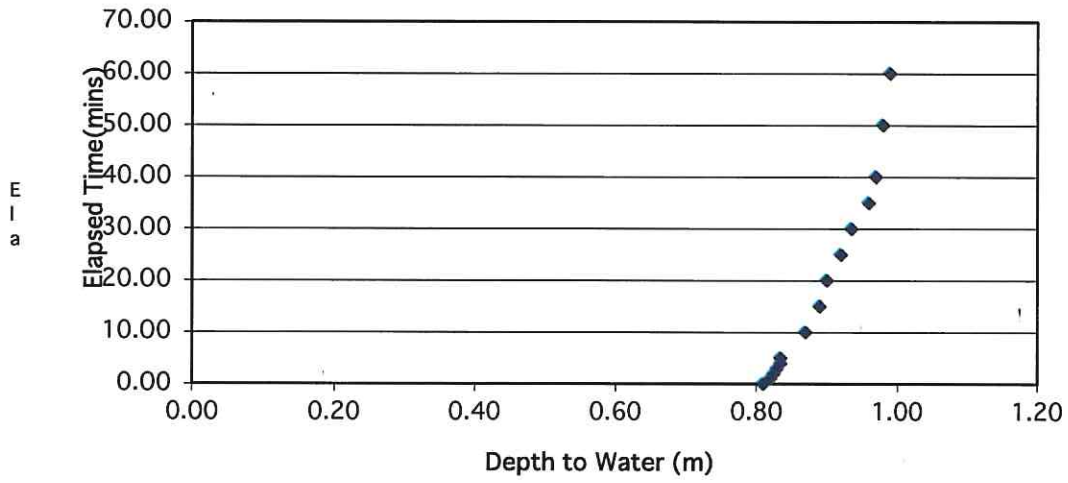
Field Test

Depth of Pit (D)	2.25	m
Width of Pit (B)	0.45	m
Length of Pit (L)	1.50	m
Initial depth to Water =	0.81	m
Final depth to water =	0.99	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.675	m2
*Av. side area of permeable stratum over test perio	5.265	m2
Total Exposed area =	5.94	m2

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

f= 0.00034 m/min or 5.682E-06 m/sec

Depth of water vs Elapsed Time (mins)



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

Contract:	Berwick Pines	Contract No:	22530
Test No.	SA01 - Cycle 2	Northing:	720248.762
Client	BMCE	Easting:	726355.221
Date:	27/05/2020	Elevation:	81.736

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	Seepage at 2.2
0.20	1.80	Brown very sandy gravelly CLAY with cobble and boulders	
1.80	2.25	Golden gravelly granitic SAND with cobble and boulders	

Notes: Two cycles carried out. Presoak carried out before Cycle 1 for 60mins.
(B) - AA136498 - 2.0mbgl
(B)- AA136497 - 0.9mbgl

Field Data

Depth to Water (m)	Elapsed Time (min)
0.70	0.00
0.70	1.00
0.70	2.00
0.70	3.00
0.71	4.00
0.71	5.00
0.73	10.00
0.75	15.00
0.77	20.00
0.78	25.00
0.79	30.00
0.80	35.00
0.82	40.00
0.83	50.00
0.85	60.00

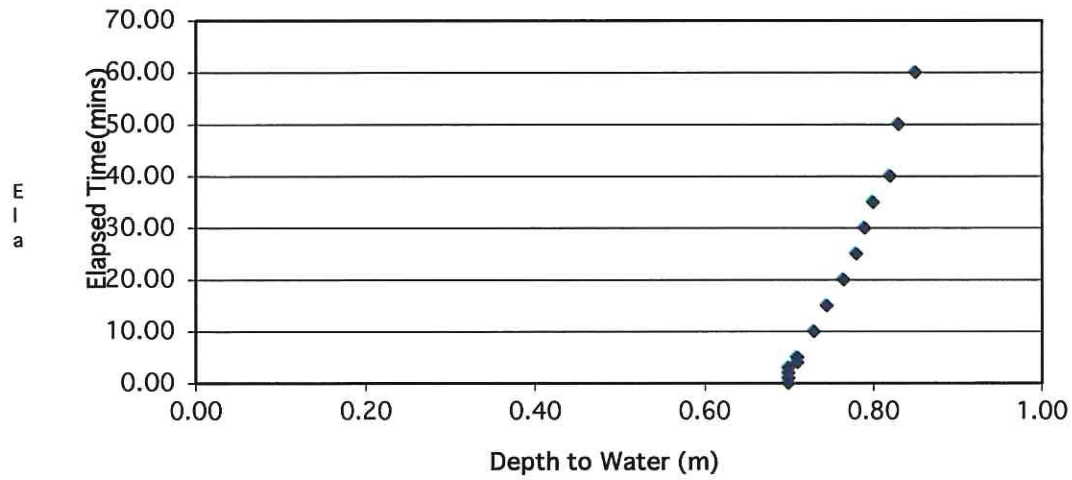
Field Test

Depth of Pit (D)	2.25	m
Width of Pit (B)	0.45	m
Length of Pit (L)	1.50	m
Initial depth to Water =	0.70	m
Final depth to water =	0.85	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.675	m2
*Av. side area of permeable stratum over test perio	5.7525	m2
Total Exposed area =	6.4275	m2

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

f= 0.00026 m/min or 4.376E-06 m/sec

Depth of water vs Elapsed Time (mins)



SA01 – 1 of 4

SA01 – 2 of 4

SA01 – 3 of 4

SA01 – 4 of 4

Appendix IV a Geotechnical Laboratory Data

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

Report No. **R111824** Contract No. 22530 Contract Name: Berwick Pines , Leopardstown , Dublin 18

Customer BMCE

Samples Received: 03/06/20 Date Tested: 05/06/20

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
TP01	AA136471	1.0	A20/1840	B	26	68	NP	NP	30	WS	4.4		Dark brown gravelly sandy SILT
TP02	AA136499	0.5	A20/1842	B	14								Brown sandy gravelly SILT/CLAY
TP02	AA136482	1.0	A20/1843	B	14	40	20	20	49	WS	4.4	C I	Brown sandy gravelly CLAY
TP03	AA136436	0.7	A20/1844	B	16	43	22	21	31	WS	4.4	C I	Brown very sandy gravelly CLAY
TP03	AA136467	1.2	A20/1845	B	14								Brown sandy gravelly SILT/CLAY
TP04	AA136475	0.7	A20/846	B	17								Brown sandy gravelly SILT/CLAY
TP05	AA136483	0.8	A20/1848	B	9.2								Brown sandy gravelly SILT/CLAY
TP06	AA136491	2.0	A20/1849	B	13	34	15	19	52	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY

Notes: 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 apply to the sample as received.
NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports
H Byrne (Laboratory Manager)

Approved by | Date: 12/06/20 | 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)

particle size	% passing	
75	100	COBBLES
63	90	
50	90	GRAVEL
37.5	90	
28	88	
20	84	
14	79	
10	76	
6.3	71	
5	68	
3.35	58	
2	49	
1.18	44	SAND
0.6	39	
0.425	37	
0.3	35	
0.15	30	
0.063	26	SILT/CLAY
0.037	23	
0.027	21	
0.017	18	
0.010	16	
0.007	14	
0.005	12	
0.002	9	

Contract No. 22530 Report No. R111825

Contract: Berwick Pines , Leopardstown , Dublin 18

BH/TP : TP01

Sample No. AA136473 Lab. Sample No. A20/1841

Sample Type: B

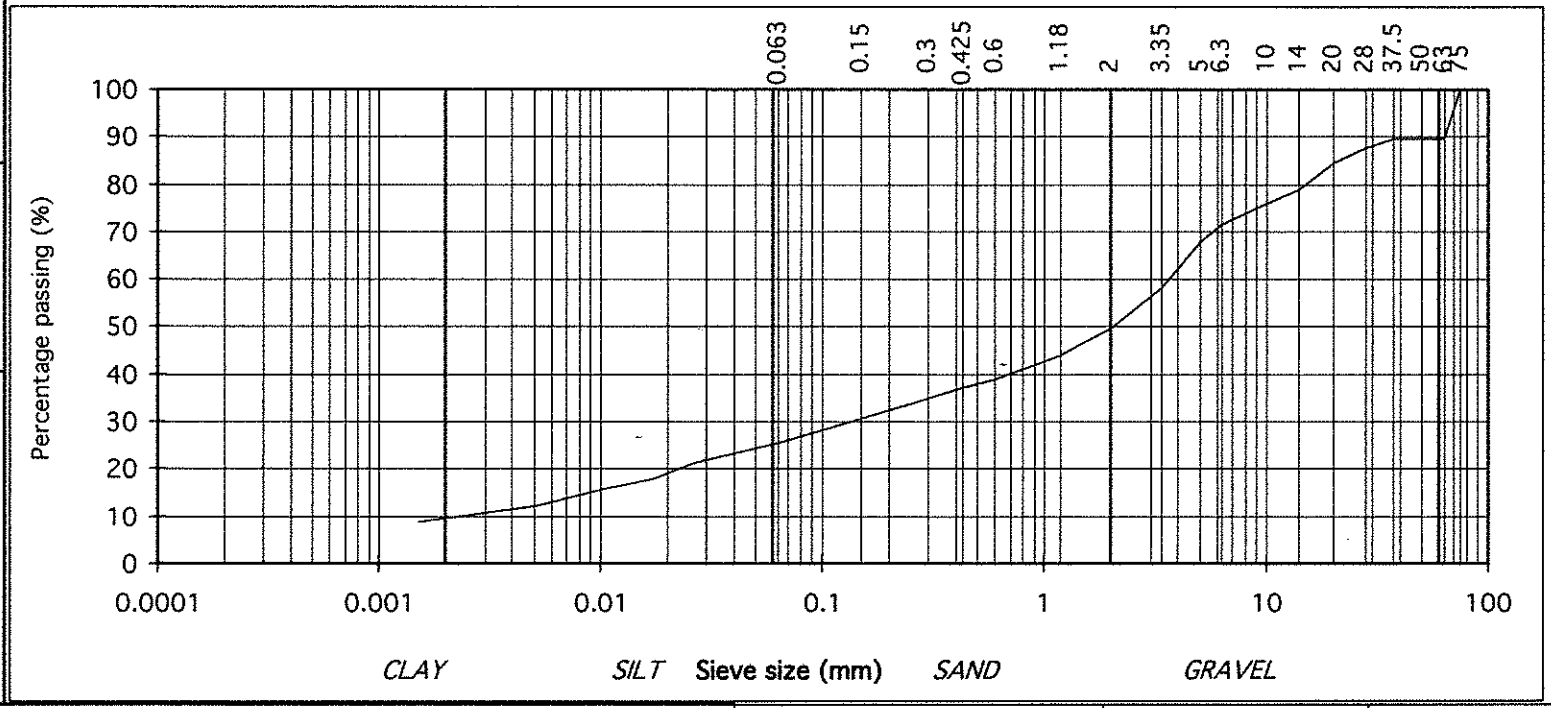
Depth (m) 2.00 Customer: BMCE

Date Received 03/06/2020 Date Testing started 05/06/2020

Description: Brown slightly sandy, gravelly, SILT/CLAY with some cobbles

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	12/06/20	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

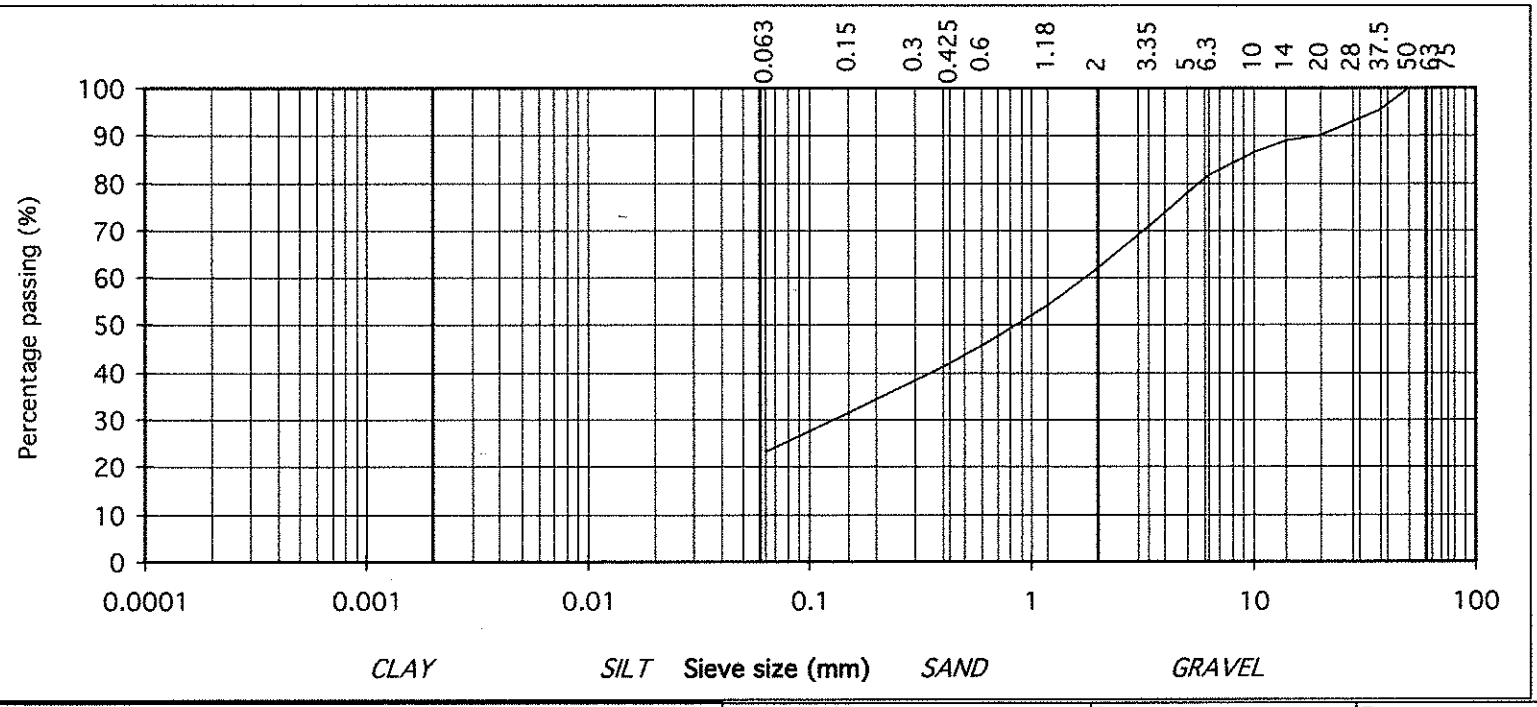
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	95	
28	93	
20	90	
14	89	
10	86	
6.3	82	
5	78	
3.35	71	
2	62	
1.18	54	SAND
0.6	45	
0.425	42	
0.3	38	
0.15	32	
0.063	23	SILT/CLAY

Contract No.	22530	Report No.	R111826
Contract:	Berwick Pines , Leopardstown , Dublin 18		
BH/TP :	TP03		
Sample No.	AA136467	Lab. Sample No.	A20/1845
Sample Type:	B		
Depth (m)	1.20	Customer:	BMCE
Date Received	03/06/2020	Date Testing started	05/06/2020
Description:	Brown sandy, 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 apply to sample as received.



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	12/06/20	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 IVNAB Accredited TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	90	
28	87	
20	83	
14	80	
10	78	
6.3	74	
5	72	
3.35	65	
2	56	
1.18	48	SAND
0.6	36	
0.425	32	
0.3	30	
0.15	26	
0.063	23	SILT/CLAY

Contract No. 22530 Report No. R111827

Contract: Berwick Pines , Leopardstown , Dublin 18

BH/TP : TP04

Sample No. AA103793 Lab. Sample No. A20/1847

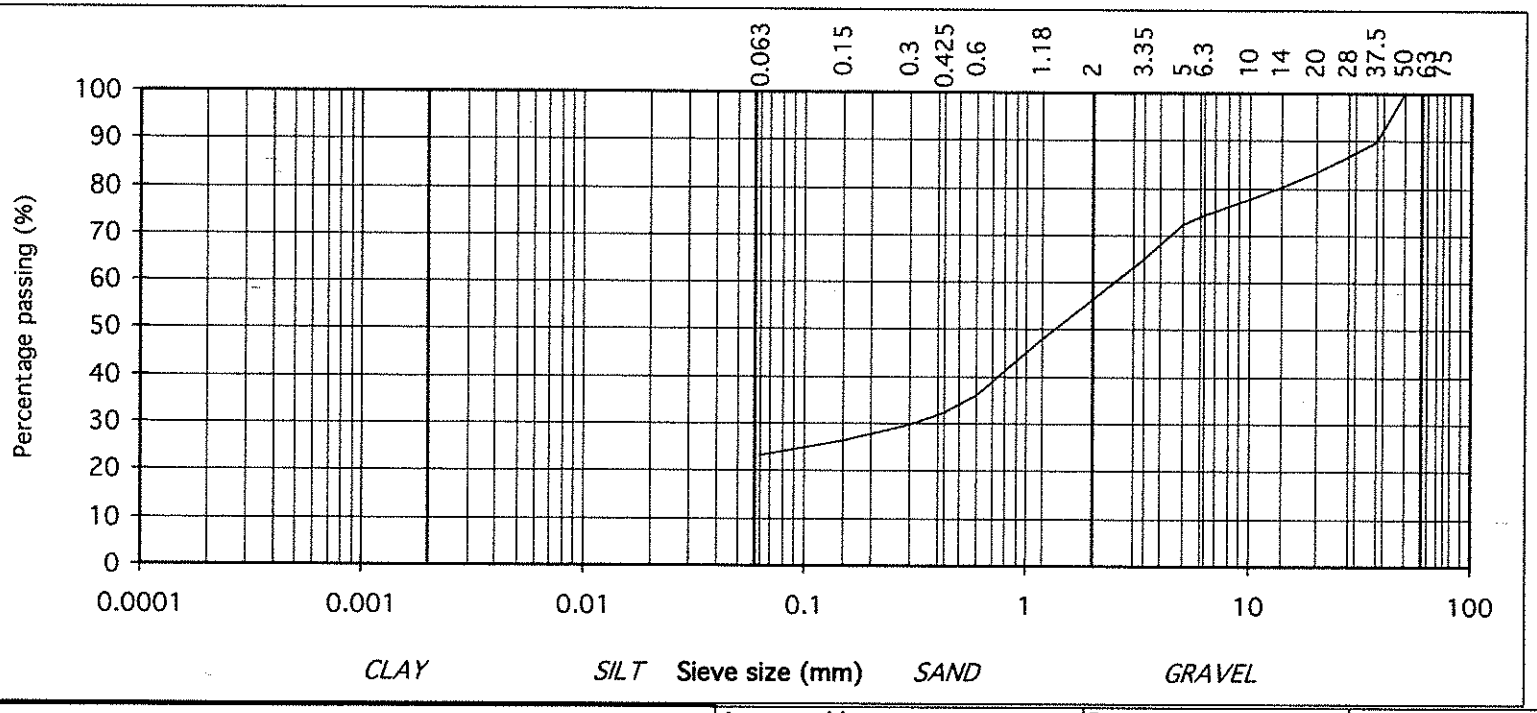
Sample Type: B

Depth (m) 1.40 Customer: BMCE

Date Received 03/06/2020 Date Testing started 05/06/2020

Description: Brown slightly sandy, 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 apply to sample as received.



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	12/06/20	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

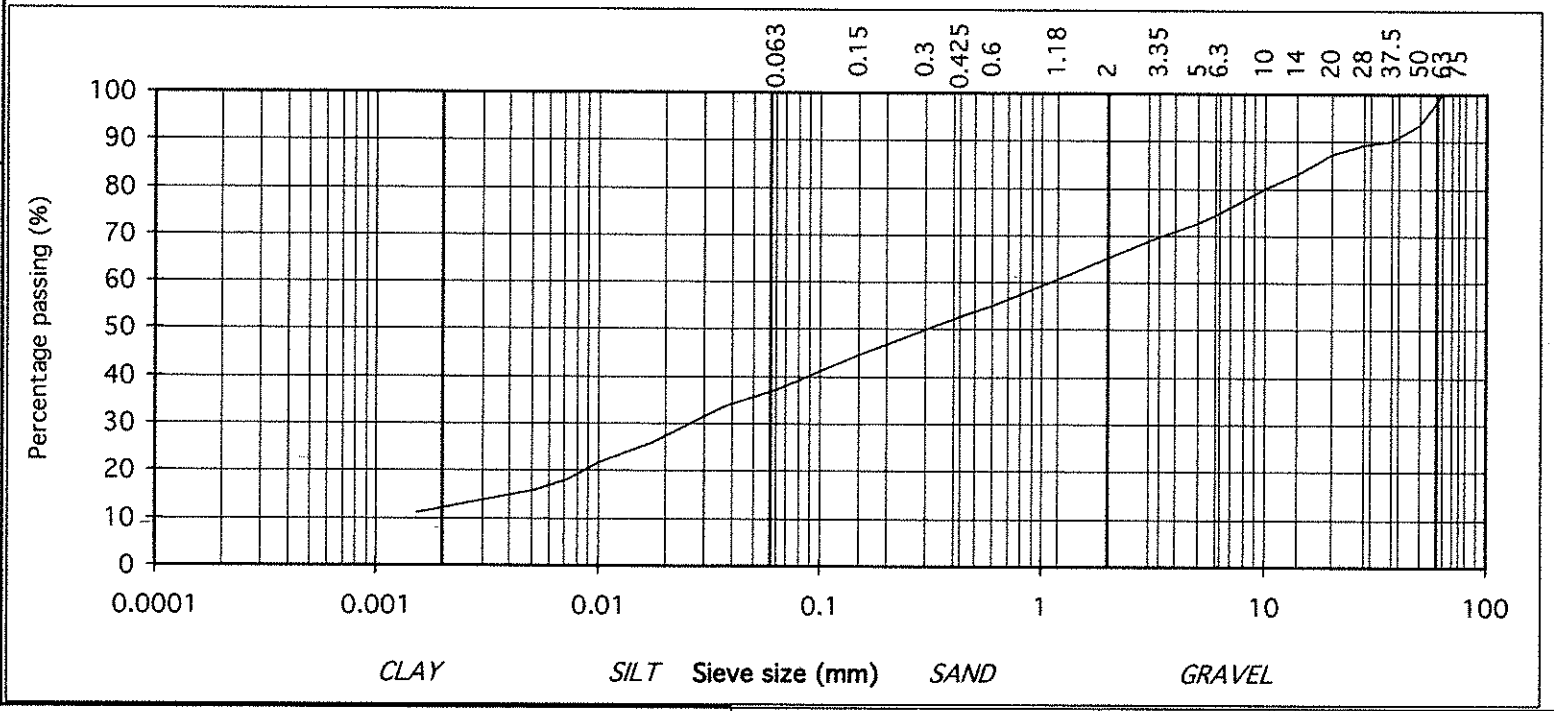
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	94	GRAVEL
37.5	90	
28	89	
20	87	
14	83	
10	80	
6.3	75	
5	72	
3.35	70	
2	65	
1.18	61	SAND
0.6	55	
0.425	53	
0.3	50	
0.15	44	
0.063	37	SILT/CLAY
0.037	34	
0.027	30	
0.017	26	
0.010	22	
0.007	18	
0.005	16	
0.002	11	

Contract No.	22530	Report No.	R111828
Contract:	Berwick Pines , Leopardstown , Dublin 18		
BH/TP :	TP06		
Sample No.	AA136491	Lab. Sample No.	A20/1849
Sample Type:	B		
Depth (m)	2.00	Customer:	BMCE
Date Received	03/06/2020	Date Testing started	05/06/2020
Description:	Brown slightly sandy, slightly gravelly, CLAY		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 . Results apply to sample as received.



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	12/06/20	1 of 1

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

Appendix IV b Environmental Laboratory Data

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING 2183

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Final Report

Report No.:	20-14197-1		
Initial Date of Issue:	15-Jun-2020		
Client	IGSL		
Client Address:	M7 Business Park Naas County Kildare Ireland		
Contact(s):	Darren Keogh		
Project	22530 Berwick Pines Leopardstown Dublin		
Quotation No.:	Q19-18246	**Date Received:**	05-Jun-2020
Order No.:		**Date Instructed:**	05-Jun-2020
No. of Samples:	13		
Turnaround (Wkdays):	7	**Results Due:**	15-Jun-2020
Date Approved:	15-Jun-2020		

Approved By:

Details: Glynn Harvey, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 22530 Berwick Pines Leopardstown Dublin

Client: IGSL						**Chemtest Job No.:**	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197
Quotation No.: Q19-18246						**Chemtest Sample ID.:**	1013340	1013341	1013342	1013344	1013345	1013346	1013347	1013348	1013349	1013351
						Client Sample ID.:	AA136472	AA136474	AA136500	AA136468	AA136466	AA103791	AA136485	AA136486	AA136487	AA136488
						Sample Location:	TP1	TP1	TP2	TP3	TP3	TP4	TP5	TP5	TP6	TP6
						Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
						Top Depth (m):	0.00	1.5	0.0	1.2	0.2	0.0	0.0	1.5	0.0	1.4
						Bottom Depth (m):	1.50	2.40	1.50	2.2	1.1	1.4	1.5	2.1	1.4	2.4
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**											
pH	U	1010	10:1		N/A		8.3	8.3	8.1	8.1	8.0	8.4	8.8	8.7	8.7	8.8
Ammonium	U	1220	10:1	mg/l	0.050		0.081	0.14	0.22	0.13	0.60	0.087	0.53	0.21	0.11	0.11
Ammonium	N	1220	10:1	mg/kg	0.10		0.91	1.6	2.4	1.4	6.3	1.0	7.1	2.7	1.4	1.5
Boron (Dissolved)	U	1450	10:1	µg/l	20		< 20	35	32	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20		< 0.20	0.35	0.32	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

Chemtest
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Results - Soil

Project: 22530 Berwick Pines Leopardstown Dublin

Client: IGSL					Chemtest Job No.:	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197
Quotation No.: Q19-18246					Chemtest Sample ID.:	1013339	1013340	1013341	1013342	1013343	1013344	1013345	1013346	1013347
					Client Sample ID.:	AA136471	AA136472	AA136474	AA136500	AA136465	AA136468	AA136466	AA103791	AA136485
					Sample Location:	TP1	TP1	TP1	TP2	TP3	TP3	TP3	TP4	TP5
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	0.00	1.5	0.0	0.70	1.2	0.2	0.0	0.0
					Bottom Depth (m):	1.00	1.50	2.40	1.50	0.70	2.2	1.1	1.4	1.5
					Asbestos Lab:		DURHAM	DURHAM	DURHAM		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A			-	-	-		-	-	-	-
Asbestos Identification	U	2192	%	0.001			No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A			-	-	-		-	-	-	-
Moisture	N	2030	%	0.020	19		18	14	9.3	12	10	13	5.8	6.3
pH (2.5:1)	N	2010		4.0	[A] 7.7					[A] 7.9				
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40			0.65	0.75	0.68		< 0.40	0.55	< 0.40	0.41
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010					< 0.010				
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.056					< 0.010				
Total Sulphur	M	2175	%	0.010	[A] 0.28					[A] 0.032				
Sulphur (Elemental)	M	2180	mg/kg	1.0			[A] 19	[A] 5.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Chloride (Water Soluble)	M	2220	g/l	0.010	[A] < 0.010					[A] < 0.010				
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010					< 0.010				
Cyanide (Total)	M	2300	mg/kg	0.50			[A] < 0.50	[A] < 0.50	[A] < 0.50		[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50			[A] 6.9	[A] 3.4	[A] 3.0		[A] 2.7	[A] 3.2	[A] 5.4	[A] 6.4
Ammonium (Water Soluble)	M	2120	g/l	0.01	0.13					0.05				
Sulphate (Acid Soluble)	M	2430	%	0.010	[A] 0.21		[A] 0.20	[A] < 0.010	[A] 0.020	[A] 0.020	[A] < 0.010	[A] 0.037	[A] < 0.010	[A] 0.034
Arsenic	M	2450	mg/kg	1.0			72	18	27		14	15	22	17
Barium	M	2450	mg/kg	10			380	59	68		39	100	93	58
Cadmium	M	2450	mg/kg	0.10			1.0	0.52	1.7		0.82	2.6	1.6	1.9
Chromium	M	2450	mg/kg	1.0			21	17	17		9.7	15	7.7	13
Molybdenum	M	2450	mg/kg	2.0			12	4.2	< 2.0		< 2.0	< 2.0	< 2.0	2.3
Antimony	N	2450	mg/kg	2.0			4.3	< 2.0	< 2.0		< 2.0	< 2.0	< 2.0	< 2.0
Copper	M	2450	mg/kg	0.50			110	20	40		18	20	16	18
Mercury	M	2450	mg/kg	0.10			0.40	< 0.10	0.16		0.13	0.12	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50			62	25	38		22	34	24	33
Lead	M	2450	mg/kg	0.50			640	68	52		30	40	21	22
Selenium	M	2450	mg/kg	0.20			0.37	0.31	0.58		0.29	0.62	< 0.20	0.48
Zinc	M	2450	mg/kg	0.50			200	88	120		98	96	84	81
Chromium (Trivalent)	N	2490	mg/kg	1.0			21	17	17		9.7	15	7.7	13
Chromium (Hexavalent)	N	2490	mg/kg	0.50			< 0.50	< 0.50	< 0.50		< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	M	2625	%	0.20			[A] 7.6	[A] 0.27	[A] 1.3		[A] 0.39	[A] 0.83	[A] 0.28	[A] 0.83
Mineral Oil	N	2670	mg/kg	10			< 10	< 10	< 10		< 10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0			[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0			[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0			[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0			[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0			[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0

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Results - Soil

Project: 22530 Berwick Pines Leopardstown Dublin

Client: IGSL					Chemtest Job No.:	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197
Quotation No.: Q19-18246					Chemtest Sample ID.:	1013339	1013340	1013341	1013342	1013343	1013344	1013345	1013346	1013347
					Client Sample ID.:	AA136471	AA136472	AA136474	AA136500	AA136465	AA136468	AA136466	AA103791	AA136485
					Sample Location:	TP1	TP1	TP1	TP2	TP3	TP3	TP3	TP4	TP5
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	0.00	1.5	0.0	0.70	1.2	0.2	0.0	0.0
					Bottom Depth (m):	1.00	1.50	2.40	1.50	0.70	2.2	1.1	1.4	1.5
					Asbestos Lab:		DURHAM	DURHAM	DURHAM		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		[A] < 5.0	[A] < 5.0	[A] < 5.0		[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		[A] < 5.0	[A] < 5.0	[A] < 5.0		[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		[A] < 10	[A] < 10	[A] < 10		[A] < 10	[A] < 10	[A] < 10	[A] < 10	
Benzene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Toluene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Ethylbenzene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
m & p-Xylene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
o-Xylene	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	
Naphthalene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthylene	N	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Fluorene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Phenanthrene	M	2800	mg/kg	0.10		0.11	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[j]fluoranthene	N	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Anthracene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Fluoranthene	M	2800	mg/kg	0.10		0.15	< 0.10	< 0.10		< 0.10	0.28	< 0.10	< 0.10	
Pyrene	M	2800	mg/kg	0.10		0.12	< 0.10	< 0.10		< 0.10	0.26	< 0.10	< 0.10	
Benzo[a]anthracene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Chrysene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[b]fluoranthene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[k]fluoranthene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[a]pyrene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Coronene	N	2800	mg/kg	0.10		< 0.10	< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	

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Results - Soil

Project: 22530 Berwick Pines Leopardstown Dublin

Client: IGSL					Chemtest Job No.:	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197	20-14197
Quotation No.: Q19-18246					Chemtest Sample ID.:	1013339	1013340	1013341	1013342	1013343	1013344	1013345	1013346	1013347
					Client Sample ID.:	AA136471	AA136472	AA136474	AA136500	AA136465	AA136468	AA136466	AA103791	AA136485
					Sample Location:	TP1	TP1	TP1	TP2	TP3	TP3	TP3	TP4	TP5
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	0.00	1.5	0.0	0.70	1.2	0.2	0.0	0.0
					Bottom Depth (m):	1.00	1.50	2.40	1.50	0.70	2.2	1.1	1.4	1.5
					Asbestos Lab:		DURHAM	DURHAM	DURHAM		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Total Of 17 PAH's	N	2800	mg/kg	2.0		< 2.0	< 2.0	< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	
PCB 28	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	
PCB 52	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	
PCB 90+101	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	
PCB 118	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	
PCB 153	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	
PCB 138	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	
PCB 180	U	2815	mg/kg	0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	
Total Phenols	M	2920	mg/kg	0.30		< 0.30	< 0.30	< 0.30		< 0.30	< 0.30	< 0.30	< 0.30	

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 22530 Berwick Pines Leopardstown Dublin

Client: IGSL				Chemtest Job No.:	20-14197	20-14197	20-14197	20-14197
Quotation No.: Q19-18246				Chemtest Sample ID.:	1013348	1013349	1013350	1013351
				Client Sample ID.:	AA136486	AA136487	AA136490	AA136488
				Sample Location:	TP5	TP6	TP6	TP6
				Sample Type:	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	1.5	0.0	1.2	1.4
				Bottom Depth (m):	2.1	1.4		2.4
				Asbestos Lab:	DURHAM	DURHAM		DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A	-	-		-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-		-
Moisture	N	2030	%	0.020	7.8	14	9.4	13
pH (2.5:1)	N	2010		4.0			[A] 8.1	
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.43	< 0.40		< 0.40
Magnesium (Water Soluble)	N	2120	g/l	0.010			< 0.010	
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010			< 0.010	
Total Sulphur	M	2175	%	0.010			[A] 0.029	
Sulphur (Elemental)	M	2180	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Chloride (Water Soluble)	M	2220	g/l	0.010			[A] 0.016	
Nitrate (Water Soluble)	N	2220	g/l	0.010			< 0.010	
Cyanide (Total)	M	2300	mg/kg	0.50	[A] < 0.50	[A] < 0.50		[A] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 6.5	[A] 4.0		[A] 7.8
Ammonium (Water Soluble)	M	2120	g/l	0.01			0.10	
Sulphate (Acid Soluble)	M	2430	%	0.010	[A] 0.045	[A] 0.028	[A] 0.010	[A] 0.044
Arsenic	M	2450	mg/kg	1.0	17	20		23
Barium	M	2450	mg/kg	10	58	65		49
Cadmium	M	2450	mg/kg	0.10	2.1	2.4		2.2
Chromium	M	2450	mg/kg	1.0	12	14		14
Molybdenum	M	2450	mg/kg	2.0	< 2.0	2.6		3.4
Antimony	N	2450	mg/kg	2.0	< 2.0	2.1		2.4
Copper	M	2450	mg/kg	0.50	20	21		30
Mercury	M	2450	mg/kg	0.10	< 0.10	0.13		0.10
Nickel	M	2450	mg/kg	0.50	31	37		53
Lead	M	2450	mg/kg	0.50	27	31		22
Selenium	M	2450	mg/kg	0.20	0.26	0.68		0.49
Zinc	M	2450	mg/kg	0.50	74	87		83
Chromium (Trivalent)	N	2490	mg/kg	1.0	12	14		14
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50		< 0.50
Total Organic Carbon	M	2625	%	0.20	[A] 1.5	[A] 2.1		[A] 1.4
Mineral Oil	N	2670	mg/kg	10	< 10	< 10		< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0

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Results - Soil

Project: 22530 Berwick Pines Leopardstown Dublin

Client: IGSL		Chemtest Job No.:			20-14197	20-14197	20-14197	20-14197
Quotation No.: Q19-18246		Chemtest Sample ID.:			1013348	1013349	1013350	1013351
		Client Sample ID.:			AA136486	AA136487	AA136490	AA136488
		Sample Location:			TP5	TP6	TP6	TP6
		Sample Type:			SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			1.5	0.0	1.2	1.4
		Bottom Depth (m):			2.1	1.4		2.4
		Asbestos Lab:			DURHAM	DURHAM		DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0		[A] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0		[A] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10	[A] < 10		[A] < 10
Benzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Toluene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Ethylbenzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
m & p-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
o-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Benzo[j]fluoranthene	N	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Fluoranthene	M	2800	mg/kg	0.10	< 0.10	0.10		< 0.10
Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10		< 0.10

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Results - Soil

Project: 22530 Berwick Pines Leopardstown Dublin

Client: IGSL			Chemtest Job No.:		20-14197	20-14197	20-14197	20-14197
Quotation No.: Q19-18246			Chemtest Sample ID.:		1013348	1013349	1013350	1013351
			Client Sample ID.:		AA136486	AA136487	AA136490	AA136488
			Sample Location:		TP5	TP6	TP6	TP6
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.5	0.0	1.2	1.4
			Bottom Depth (m):		2.1	1.4		2.4
			Asbestos Lab:		DURHAM	DURHAM		DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0		< 2.0
PCB 28	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
PCB 52	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
PCB 90+101	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
PCB 118	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
PCB 153	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
PCB 138	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
PCB 180	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	[A] < 0.10	[A] < 0.10		[A] < 0.10
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30		< 0.30

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Results - Single Stage WAC

Project: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013340						
Sample Ref:							
Sample ID:	AA136472						
Sample Location:	TP1						
Top Depth(m):	0.00						
Bottom Depth(m):	1.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 7.6	3	5	6
Loss On Ignition	2610	M	%	15	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		7.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.048	--	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	1450	U	0.013	0.13	0.5	2	25
Barium	1450	U	0.043	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	0.0012	< 0.050	0.5	10	70
Copper	1450	U	0.0012	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0099	0.099	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	0.0012	0.012	0.5	10	50
Antimony	1450	U	0.0015	0.015	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.24	2.4	10	150	500
Sulphate	1220	U	7.9	79	1000	20000	50000
Total Dissolved Solids	1020	N	100	1000	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.3	53	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	18

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.

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Results - Single Stage WAC

Project: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013341						
Sample Ref:							
Sample ID:	AA136474						
Sample Location:	TP1						
Top Depth(m):	1.5						
Bottom Depth(m):	2.40						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.27	3	5	6
Loss On Ignition	2610	M	%	1.8	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.027	--	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	1450	U	0.0011	< 0.050	0.5	2	25
Barium	1450	U	0.0013	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0022	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.029	0.29	0.5	10	30
Nickel	1450	U	0.0014	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	1.2	12	10	150	500
Sulphate	1220	U	4.5	45	1000	20000	50000
Total Dissolved Solids	1020	N	45	450	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.7	67	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	14

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.

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Results - Single Stage WAC

Project: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013342						
Sample Ref:							
Sample ID:	AA136500						
Sample Location:	TP2						
Top Depth(m):	0.0						
Bottom Depth(m):	1.50						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 1.3	3	5	6
Loss On Ignition	2610	M	%	2.6	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	< 0.0020	--	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	1450	U	0.0045	< 0.050	0.5	2	25
Barium	1450	U	0.0044	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0043	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0018	< 0.050	0.5	10	30
Nickel	1450	U	0.0027	< 0.050	0.4	10	40
Lead	1450	U	0.0024	0.024	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.014	< 0.50	4	50	200
Chloride	1220	U	2.6	26	800	15000	25000
Fluoride	1220	U	0.35	3.5	10	150	500
Sulphate	1220	U	8.2	82	1000	20000	50000
Total Dissolved Solids	1020	N	30	300	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.3	73	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.3

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013344						
Sample Ref:							
Sample ID:	AA136468						
Sample Location:	TP3						
Top Depth(m):	1.2						
Bottom Depth(m):	2.2						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.39	3	5	6
Loss On Ignition	2610	M	%	1.2	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.0050	--	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	1450	U	0.0013	< 0.050	0.5	2	25
Barium	1450	U	0.0016	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0019	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0012	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0022	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.28	2.8	10	150	500
Sulphate	1220	U	2.5	25	1000	20000	50000
Total Dissolved Solids	1020	N	16	160	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.7	77	500	800	1000

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

Waste Acceptance Criteria

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

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Results - Single Stage WAC

Project: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013345						
Sample Ref:							
Sample ID:	AA136466						
Sample Location:	TP3						
Top Depth(m):	0.2						
Bottom Depth(m):	1.1						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.83	3	5	6
Loss On Ignition	2610	M	%	2.9	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	< 0.0020	--	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	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0022	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0021	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0013	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	0.0011	0.011	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0029	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	4.3	43	1000	20000	50000
Total Dissolved Solids	1020	N	27	270	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.2	72	500	800	1000

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

Waste Acceptance Criteria

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

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Results - Single Stage WAC

Project: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013346						
Sample Ref:							
Sample ID:	AA103791						
Sample Location:	TP4						
Top Depth(m):	0.0						
Bottom Depth(m):	1.4						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.28	3	5	6
Loss On Ignition	2610	M	%	1.4	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.025	--	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	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0013	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0011	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0014	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.25	2.5	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	44	440	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.5	65	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	5.8

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.

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Results - Single Stage WAC

Project: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013347						
Sample Ref:							
Sample ID:	AA136485						
Sample Location:	TP5						
Top Depth(m):	0.0						
Bottom Depth(m):	1.5						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.83	3	5	6
Loss On Ignition	2610	M	%	1.9	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.030	--	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	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0017	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0016	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	2.4	24	800	15000	25000
Fluoride	1220	U	0.22	2.2	10	150	500
Sulphate	1220	U	1.3	13	1000	20000	50000
Total Dissolved Solids	1020	N	52	520	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.5	65	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	6.3

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013348						
Sample Ref:							
Sample ID:	AA136486						
Sample Location:	TP5						
Top Depth(m):	1.5						
Bottom Depth(m):	2.1						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 1.5	3	5	6
Loss On Ignition	2610	M	%	2.6	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.031	--	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	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0018	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0018	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0025	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.1	11	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	60	600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.8	68	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.8

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.

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Results - Single Stage WAC

Project: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013349						
Sample Ref:							
Sample ID:	AA136487						
Sample Location:	TP6						
Top Depth(m):	0.0						
Bottom Depth(m):	1.4						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 2.1	3	5	6
Loss On Ignition	2610	M	%	2.6	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.046	--	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	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0022	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0017	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.16	1.6	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	59	590	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.1	61	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	14

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: 22530 Berwick Pines Leopardstown Dublin

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-14197						
Chemtest Sample ID:	1013351						
Sample Ref:							
Sample ID:	AA136488						
Sample Location:	TP6						
Top Depth(m):	1.4						
Bottom Depth(m):	2.4						
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 1.4	3	5	6
Loss On Ignition	2610	M	%	2.0	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.033	--	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	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	< 0.0010	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0015	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.17	1.7	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	48	470	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.0	60	500	800	1000

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

Waste Acceptance Criteria

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

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Deviations

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

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1013339		AA136471	TP1		A	Amber Glass 250ml
1013339		AA136471	TP1		A	Plastic Tub 500g
1013340		AA136472	TP1		A	Amber Glass 250ml
1013340		AA136472	TP1		A	Plastic Tub 500g
1013341		AA136474	TP1		A	Amber Glass 250ml
1013341		AA136474	TP1		A	Plastic Tub 500g
1013342		AA136500	TP2		A	Amber Glass 250ml
1013342		AA136500	TP2		A	Plastic Tub 500g
1013343		AA136465	TP3		A	Amber Glass 250ml
1013343		AA136465	TP3		A	Plastic Tub 500g
1013344		AA136468	TP3		A	Amber Glass 250ml
1013344		AA136468	TP3		A	Plastic Tub 500g
1013345		AA136466	TP3		A	Amber Glass 250ml
1013345		AA136466	TP3		A	Plastic Tub 500g
1013346		AA103791	TP4		A	Amber Glass 250ml
1013346		AA103791	TP4		A	Plastic Tub 500g
1013347		AA136485	TP5		A	Amber Glass 250ml
1013347		AA136485	TP5		A	Plastic Tub 500g
1013348		AA136486	TP5		A	Amber Glass 250ml
1013348		AA136486	TP5		A	Plastic Tub 500g
1013349		AA136487	TP6		A	Amber Glass 250ml
1013349		AA136487	TP6		A	Plastic Tub 500g

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Deviations

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

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1013350		AA136490	TP6		A	Amber Glass 250ml
1013350		AA136490	TP6		A	Plastic Tub 500g
1013351		AA136488	TP6		A	Amber Glass 250ml
1013351		AA136488	TP6		A	Plastic Tub 500g

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Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
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.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID

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Test Methods

SOP	Title	Parameters included	Method summary
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and 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

Chemtest
The right chemistry to deliver results

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

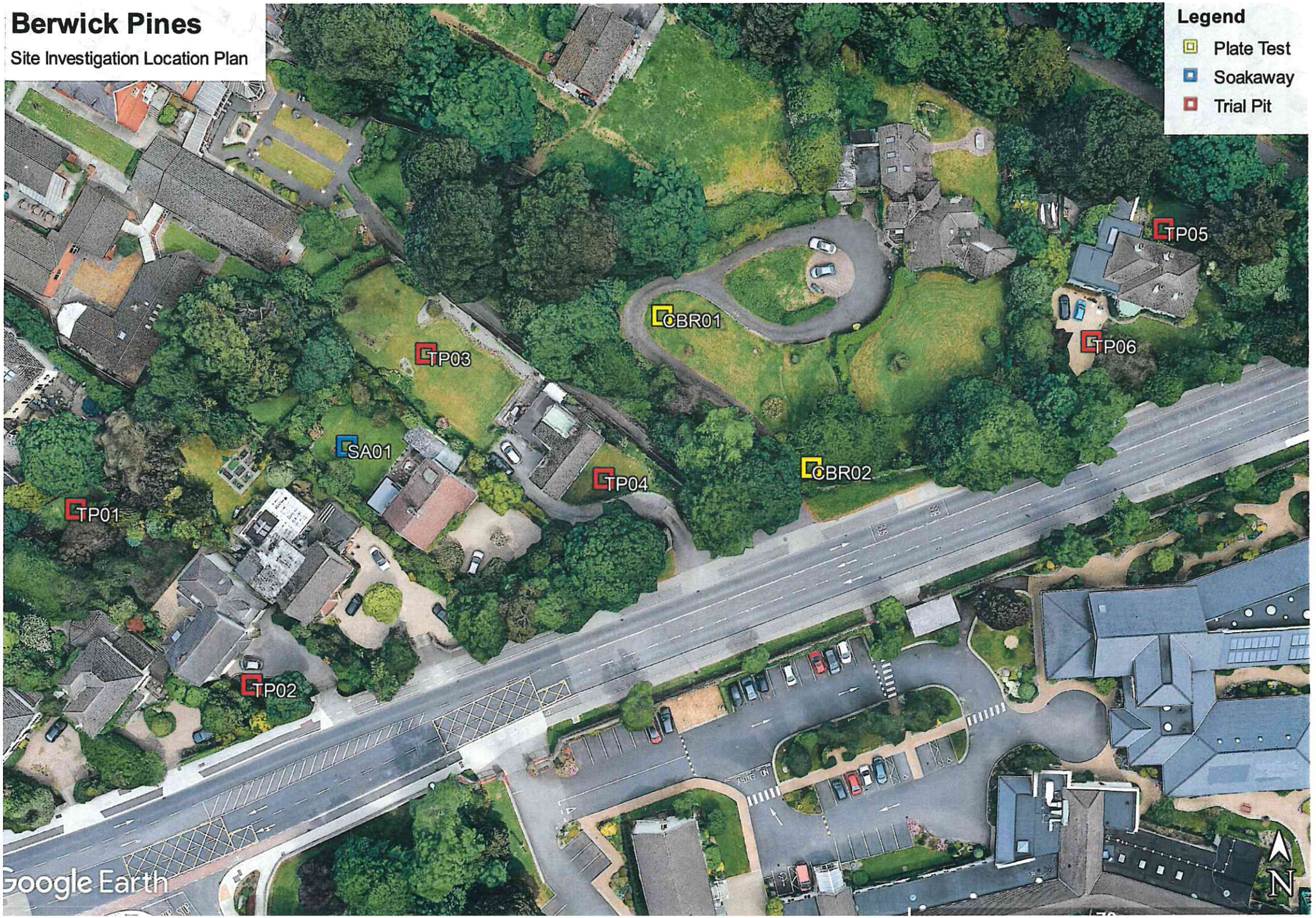
All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

Appendix V Site Plan

Berwick Pines

Site Investigation Location Plan



Appendix 7.2 – Ground Investigations Report

Ground Investigations Ireland Ltd.,
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Ground Investigations Ireland

Silverpines Residential Development

Ground Investigation Report

DOCUMENT CONTROL SHEET

Project Title	Silverpines Residential Development
Engineer	Homeland Projects
Client	Homeland Projects
Project No	6079-07-16
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	C Finnerty	F McNamara	J Lombard	Dublin	26 September 2016

GROUND INVESTIGATIONS IRELAND

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CONTENTS

APPENDICES

1.0 Preamble

On the instructions of Homeland Projects, a site investigation was carried out by Ground Investigations Ireland Ltd., between August and September 2016 at the site of the proposed residential development for the Silverpines site off the Leopardstown Road in South Co. Dublin.

2.0 Overview

2.1. Background

It is proposed to construct a new residential development with associated services, access roads and car parking at the proposed site. The site is currently greenfield to the rear of an existing residential development and is situated off the Leopardstown Road in South Co. Dublin. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 9 No. Trial Pits to a maximum depth of 2.5m BGL
- Carry out 3 No. Rotary Core Boreholes to a maximum depth of 6.0m BGL
- Installation of 1 No. Groundwater monitoring well
- Geotechnical Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using a JCB 3CX excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the “overshoot” recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit, and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 3 of this Report.

3.4. Groundwater/Gas Monitoring Installations

Groundwater and or Gas Monitoring Installation were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.5. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Rock strength testing including Point Load (Is_{50}) and Unconfined Compressive Strength (UCS) testing was carried out in Trinity College Dublin's Geotechnical Laboratory. The results of the laboratory testing are included in Appendix 4 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil/Surfacing
- Made Ground
- Cohesive Deposits
- Granular Deposits/Weathered Bedrock
- Bedrock

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.3m BGL. Tarmac surfacing was present typically to a depth of 0.05m BGL.

MADE GROUND: Made Ground deposits were encountered in TP09 only beneath the Topsoil/Surfacing and was present to a depth of 0.8m BGL. These deposits were described generally as *greyish brown very sandy Gravel with many cobbles and contained occasional fragments of ceramics.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *orange brown sandy gravelly SILT with occasional cobbles and boulders* overlying a *firm to stiff brown sandy gravelly CLAY with occasional cobbles and boulders*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs. These deposits were typically present to a depth of 0.9m to 2.1m BGL below which granular deposits consisting of a weathered Granite were encountered.

GRANULAR DEPOSITS/ WEATHERED BEDROCK: The granular deposits were encountered below the base of the cohesive deposits and were typically described as Light *brown gravelly fine to coarse SAND with occasional cobbles and rare boulders.* The secondary sand and gravel constituents varied across the

site and with depth while occasional or frequent cobble and boulder content also present where noted on the exploratory hole logs. In the majority of exploratory holes weathered rock was encountered which was digable with the large excavator to a depth of between 0.1m to 1.3m below the top of the stratum. The trial pits were terminated upon encountering the more competent bedrock, in which further excavation became more difficult.

BEDROCK: The rotary core boreholes recovered Weak to Medium strong light brown coarse grained GRANITE. The depth to rock varies from 0.9m BGL in the trial pits to a depth of 3.5m in BH01 where the core was recovered intact at a deeper depth than the adjacent BH's 2.5m and 2.7m BGL.

4.2. Groundwater

Seepage was noted in the trial pits at 2.2m to 2.3m BGL however we would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason a standpipe was installed in BH2 to allow the equilibrium groundwater level to be determined.

4.3. Laboratory Testing

The I_{s50} point load results vary from 0.79MPa to 1.63MPa and the UCS result was 43.4MPa. These results confirm the weak to medium strong strength descriptions on the logs. The results from the completed laboratory testing is included in Appendix 4 of this report.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

An allowable bearing capacity of 200 kN/m^2 is recommended for conventional strip or pad foundations on the weathered rock deposits at depths of 1.0m BGL to 2.0m BGL. Where the excavation is expected to be deeper or a higher allowable bearing capacity is required an allowable bearing capacity of $500kN/m^2$ is recommended for foundations on the intact rock at a depth of 2.5m to 3.5m BGL.

In any part of the site, should part of the foundation be on rock we would recommend that all the foundations of the unit in question be lowered to the competent rock stratum to avoid differential settlement.
The possibility for variation in the depth of the weathered rock and competent rock in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete.

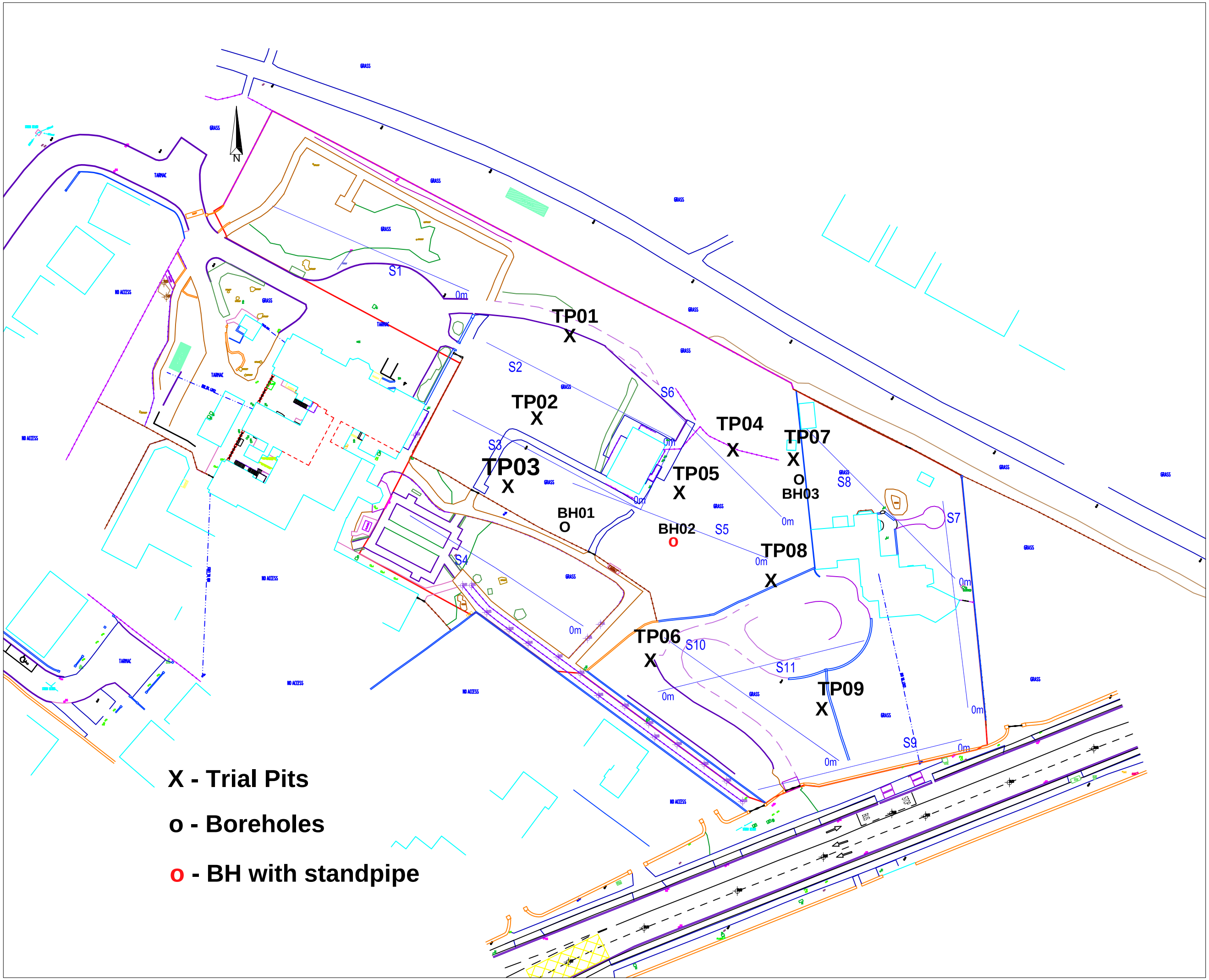
5.3. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry. Any excavations which penetrate the granular deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs in the Appendices of this Report.
The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations. Generally, where significant excavations are required in water bearing granular deposits a cut-off wall may be more cost effective than extensive dewatering. An assessment by a specialist dewatering contractor is recommended to determine the most cost effective approach to the proposed excavation.

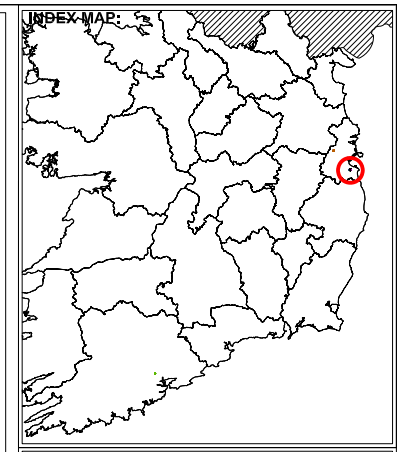
Excavations in the upper cohesive and weathered rock deposits are expected to be excavatable with conventional excavation equipment, with zones of more intact bedrock below this depth requiring rock breaking techniques. Based on the fracture spacing, the rock strength testing and Pettifer & Fookes (1994) Revised Excavatability Graph, the Granite ranges from hard digging to hard ripping, however the zones recovered as non-intact should be easy to hard digging. The JCB excavator was generally able to excavate to depths of 0.1m to 1.3m below the top of the weathered rock, and became difficult to excavate within the confines of the trial pit on encountering the more competent rock.
Any material to be removed off site should be disposed of to a suitably licenced landfill.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan



INDEX MAP:



LEGEND:

Seismic Refraction Profile

Site Boundary

apex geoservices

6 Knockmullen Business Park
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Co. Wexford
Ireland.
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F +353 (0)402-21843
E info@apexgeoservices.ie
www.apexgeoservices.ie

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Castle Donington
Derby DE74 2TZ
UK
T +44 (0)844 8700 692
E info@apexgeoservices.co.uk
www.apexgeoservices.co.uk

PROJECT:	LEOPARDSTOWN ROAD GEOPHYSICAL SURVEY
CLIENT:	TONY LAWLESS
DRAWING NO:	AGL16094_01 PROFILE LOCATIONS
SCALE:	1:750 @ A3
DATE:	12.05.16

Version:	Date:	Drawn By:	Checked:
1	12.05.16	SOR	POC

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Trial Pit Number** TP01
Machine : JCB **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	TOPSOIL: Dark greyish brown slightly sandy slightly gravelly Silt		
					(0.44) 0.64	Firm orange brown slightly clayey slightly sandy gravelly SILT with occasional granite cobbles and rare boulders		
0.50	B				(0.66) 1.30	Firm to stiff brown very sandy gravelly CLAY with some cobbles		
					(0.70) 2.00	Dense medium to light brown silty gravelly fine to coarse SAND with some cobbles boulders of granite (Weathered Granite)		
						Complete at 2.00m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Trial pit back filled on completion

Scale (approx)	Logged By	Figure No.
1:25	G K	6079-07-16.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Trial Pit Number** TP02
Machine : JCB **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	TOPSOIL: Dark greyish brown slightly sandy slightly gravelly Silt		
					0.30			
					(0.40)	Firm orange brown slightly sandy slightly gravelly SILT with occasional granite boulders		
					0.70			
					(0.30)	Firm to stiff brown slightly sandy silty CLAY		
					1.00			
1.20	B				(1.30)	Dense light brown clayey gravelly SAND with some cobbles and boulders of granite (Weathered Granite)		
					2.30	Complete at 2.30m		

Plan

Remarks

Groundwater at 2.2m
Trial Pit Stable
Trial pit back filled on completion

Scale (approx)	Logged By	Figure No.
1:25	G K	6079-07-16.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Trial Pit Number** TP03
Machine : JCB **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	TOPSOIL: Dark greyish brown slightly sandy slightly gravelly Silt		
					0.30			
					(0.28)	Firm orange brown slightly sandy gravelly SILT with occasional granite boulders		
					0.58			
0.70	B				(0.32)	Firm to stiff brown sligtly clayey sandy gravelly SILT		
					0.90			
					(0.70)	Dense light brown slightly clayey silty gravelly SAND with some boulders of granite (Weathered Granite)		
					1.60	Complete at 1.60m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Trial pit back filled on completion

Scale (approx)	Logged By	Figure No.
1:25	G K	6079-07-16.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Trial Pit Number** TP04
Machine : JCB **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	TOPSOIL: Dark greyish brown slightly sandy slightly gravelly Silt		
					(0.85) 1.05	Firm orange brown slightly sandy slightly gravelly SILT with occasional sub rounded granite cobbles and rare boulders		
					(0.45) 1.50	Firm to stiff brown slightly sandy slightly gravelly CLAY with occasional angular to sub rounded cobbles		
					(0.50) 2.00	Stiff sandy gravelly CLAY/SILT with many sub rounded to sub angular cobbles		
					(0.50) 2.50	Dense light brown gravelly fine to coarse SAND with some cobbles and boulders of granite (Weathered Granite)		
						Complete at 2.50m		

Plan

Remarks

Groundwater encountered at 2.3m
Trial pit stable
Trial pit back filled on completion

Scale (approx)	Logged By	Figure No.
1:25	G K	6079-07-16.TP02

Ground Investigations Ireland Ltd
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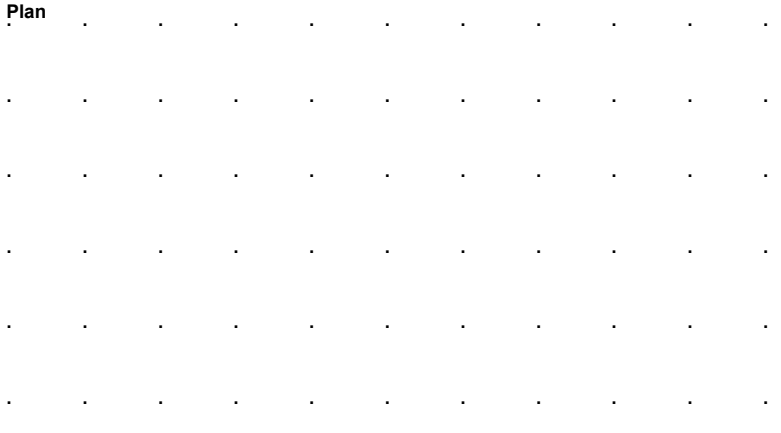
Site Silverpines			**Trial Pit Number** TP05
Machine : JCB **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	TOPSOIL: Dark greyish brown slightly sandy slightly gravelly Silt		
					(0.40) 0.60	Firm orange brown slightly sandy slightly gravelly SILT with occasional sub rounded to sub angular cobbles		
0.50	B				(0.35) 0.95	Firm greyish brown very sandy gravelly CLAY		
					(0.25) 1.20	Dense light brown very gravelly fine to corase SAND with some sub rounded granite cobbles (Weathered Granite)		
						Complete at 1.20m		

Plan



Remarks

No Groundwater encountered
Trial Pit Stable
Trial pit back filled on completion

Scale (approx)	Logged By	Figure No.
1:25	G K	6079-07-16.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Trial Pit Number** TP06
Machine : JCB **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30) 0.30	MADE GROUND: Dark greyish brown slightly sandy slightly gravelly Silt with plastic lining		
					(0.70) 1.00	Firm orange brown slightly sandy gravelly SILT		
1.00	B				(0.40) 1.40	Brown very sandy silty GRAVEL with many sub rounded cobbles and rare boulders		
					(0.60) 2.00	Stiff brown sandy slightly gravelly CLAY/SILT		
					(0.20) 2.20	Dense light brown gravelly fine to coarse SAND with some sub rounded granite cobbles (Weathered Granite)		
						Complete at 2.20m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Trial pit back filled on completion

Scale (approx)	Logged By	Figure No.
1:25	G K	6079-07-16.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Trial Pit Number** TP07
Machine : JCB **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Soft to firm dark greyish brown slightly sandy slightly gravelly SILT		
					0.40			
					(0.70)	Firm orange brown slightly sandy gravelly SILT with occasional granite boulders		
					1.10			
					(0.60)	Firm brown sandy gravelly SILT/CLAY with some granite boulders		
					1.70	Granite Complete at 1.70m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Trial pit back filled on completion

Scale (approx)	Logged By	Figure No.
1:25	G K	6079-07-16.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Trial Pit Number** TP08
Machine : JCB **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TOPSOIL: Dark grey slightly sandy gravelly SILT with rootlets		
					(0.25)	MADE GROUND: Greyish brown slightly very sandy Gravel		
					0.35			
					(0.35)	MADE GROUND: Greyish brown silty very gravelly SAND with many cobbles and ceramic fragment		
					0.70			
1.20	B				(1.00)	Firm to stiff brown slightly sandy slightly gravelly SILT/CLAY with some sub rounded to sub angular cobbles and granite boulders		
					1.70			
					(0.40)	Light brown gravelly fine to coarse SAND with sub rounded granite cobbles (Weathered Granite)		
					2.10	Complete at 2.10m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Trial pit back filled on completion

Scale (approx)	Logged By	Figure No.
1:25	G K	6079-07-16.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Trial Pit Number** TP09
Machine : JCB **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	TOPSOIL: Dark greyish brown slightly sandy slightly gravelly Silt		
0.50	B				(0.60) 0.80	MADE GROUND: Greyish brown very sandy Gravel with many sub rounded to sub angular cobbles and ceramic fragment		
					(0.40) 1.20	Firm brown slightly clayey very gravelly SAND with many sub rounded cobbles		
					(0.30) 1.50	Light brown gravelly fine to coarse SAND with sub rounded cobbles (Weathered Granite)		
						Complete at 1.90m		

Plan

Remarks

No Groundwater encountered
Trial Pit Stable
Trial pit back filled on completion

Scale (approx)	Logged By	Figure No.
1:25	G K	6079-07-16.TP02

Silverpines, Dublin – Trial Pit photographs

TP01

TP02

TP03

TP04

TP05

TP06

TP07

TP08

TP09

APPENDIX 3 - Rotary Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Borehole Number** BH01
Machine : Berreta T44 **Flush :** Airmist **Core Dia :** 200 mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	16			NI			(1.30)	Recovery consists of cobble and gravel sized fragments. Driller notes: Brown Clay.		
							1.30			
							(0.80)	No Recovery. Driler notes Sand washed away		
2.10							2.10			
							(0.36)	Weak to medium strong light brownish white distinctly weathered coarse grained GRANITE		
	44	24	24				2.46	Light brown fine to coarse SAND (reworked Granite)		
							(1.04)			
3.60							3.50			
3.60-3.74					PL			Medium strong light brownish white distinctly weathered coarse grained GRANITE		
4.10-4.32	100	77	52	12	UC		(1.65)	Two fracture sets. F1: Fractures are very closely spaced sub horizontal rough undulating tight to open fractures with no infill. F2: Fractures are medium spaced sub vertical rough undulating tight to open fractures with no infill.		
5.15							5.15	Complete at 5.15m		

Remarks
Borehole back filled on completion

Scale (approx)	Logged By
1:50	G K

Figure No. 6079-07-16.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Borehole Number** BH02
Machine : Berreta T44 **Flush :** Airmist **Core Dia :** 200 mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client** Homelands Projects **Project Contractor** Ground Investigation Ireland
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Job Number** 6079-07-16 **Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	15			NI			(1.50) 1.50	Recovery consists of brown sligthly sandy CLAY. Driller notes: Brown Clay			
2.10	44						(1.20) 2.70	Recovery consists of light brown SAND. Driller notes reworked weathered Granite			
3.60	47	29	13	10			(0.70) 3.40	Weak to medium strong light brownish white distinctly weathered coarse grained GRANITE			
5.10	35	11	11				(2.60) 6.00	Medium strong light brown distinctly weathered coarse grained GRANITE Two fracture sets. F1: Fractures are very closely spaced sub horizontal rough undulating tight to open fractures with no infill. F2: Fractures are medium spaced sub vertical rough undulating tight to open fractures with no infill.			
6.00								Complete at 6.00m			

Remarks
50mm slotted standpipe installed from 6.0m to 2.0m BGL with pea gravel suround. Plain pipe installed from 2.0m to ground level with bentonite seal with a raised cover

Scale (approx)	Logged By
1:50	G K

Figure No. 6079-07-16.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Site Silverpines			**Borehole Number** BH03
Machine : Berreta T44 **Flush :** Airmist **Core Dia :** 200 mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client** Homelands Projects	**Job Number** 6079-07-16
	Location Stillorgan, Dublin	**Dates** 03/08/2016	**Project Contractor** Ground Investigation Ireland	**Sheet** 1/1

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	10			NI			(2.10)	Recovery consists of gravel sized fragments. Driller notes: gravelly CLAY		
2.10							2.10			
2.40	67	29	29				(0.40) 2.50	Light brown fine to coarse SAND (reworked Granite)		
3.60	80	33	33	10			(3.20)	Weak to medium strong light brownish white distinctly weathered coarse grained GRANITE Two fracture sets. F1: Fractures are very closely spaced sub horizontal rough undulating tight to open fractures with no infill. F2: Fractures are medium spaced sub vertical rough undulating tight to open fractures with no infill.		
4.90-5.10					PL					
5.10	92	20	0							
5.70							5.70	Complete at 5.70m		

Remarks
Borehole back filled on completion

Scale (approx)	Logged By
1:50	G K

Figure No. 6079-07-16.TP02

Silverpines - Rotary Core Photographs

BH01

BH02

BH03


Silverpines
Engineer
Homeland Projects
Contractor
Ground Investigations Ireland Ltd.
HOLE ID:
BH: 03
FROM:
0.0 m
TO:
5.70 m
BOX NO.
1 of 1
DATE:
3/8/16
Date refers to start date of drilling:
0.00
2.10
3.60
5.10
5.70

APPENDIX 4 – Laboratory Testing

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Geotechnical Laboratory,
Civil, Structural & Environmental Engineering
& Environmental Engineering
Trinity College,
Dublin.2.

+353 1 8961009
edunne@tcd.ie

Ground Investigations Ireland Ltd,
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin

Point Load Index Tests (single diametral determination)

Project: Silverpines **Delivery date:** 22.08.2016

Project No: **Test Date:** 23.08.2016

Diametric samples

Borehole No.	Depth (m)	Is(50) (Mpa)
BH. 01	3.60 - 3.74	0.79
BH. 03	4.90 - 5.10	1.63

Prof. Brendan O'Kelly

Specimens prepared and tested in accordance with suggested method from International Society for Rock Mechanics (ISRM), 1985

Trinity College Dublin
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The University of Dublin

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Civil, Structural & Environmental Engineering
& Environmental Engineering
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Ground Investigations Ireland Ltd,
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin

Unconfined Compression Tests On Rock Cores

Project: Silverpines **Delivery Date:** 22.08.2016

Project No: **Test Date:** 23.08.2016

Borehole Number	Depth (m)	Average Diameter (mm)	Height (mm)	Length/Dia. (Ratio)	Unconfined Compressive Strength (Mpa)	Density (Mg/m^3)
Bh. 01	4.10 - 4.32	62.8	121.5	1.93	43.4	2.57

Prof. B. O'Kelly

Specimens prepared and tested in accordance with BS EN 1926 : 2007

APPENDIX 5 – Groundwater Monitoring

Ground Investigations Ireland Ltd.,
Catherinestown House,
Hazelhatch Road,
Newcastle, Co Dublin.
Tel: 01 601 5175 / 5176 | Fax: 01 601 5173
Email: info@gii.ie | Web: gii.ie

GROUNDWATER MONITORING

Silverpines

BOREHOLE	DATE	TIME	GROUNDWATER (mBGL)	Comments
BH03	25/09/2016	10.00	2.43	

Appendix 7.3 – Soil Infiltration Test

Trinity Green
Environmental Consultants

Clonfert
Maynooth
Co. Kildare
t: 01-6290616
m: 086-2434828
Vat No. 3251411B

Soil Infiltration Test for Design of Soakaway

At

Berwick Pines, Leopardstown Road, Sandyford

Prepared by

Dr. Eugene Bolton
Senior Consultant
Trinity Green

Report on Soil Infiltration Test

Introduction

To manage the surface water from the development it is proposed to construct Soakaways in accordance with BRE Digest365 As part of this, the infiltration capacity of the soil was assessed. Dr. Eugene Bolton of Trinity Green Environmental Consultants was commissioned to carry out soil Infiltration Tests in accordance with BRE Digest365 to establish the suitability of the site for disposal of water.

1.0 Visual assessment of Site

The site is located in an Urban setting where the landscape is relatively flat and on the day of the tests there was no surface water present. There is no vegetation on the site or in adjoining lands that would indicate poor soakage

2.0 *Sub-soil profile*

Tests were completed at 2 locations. Location 1 is the larger site.

2.1 Location 1

A test pit was excavated to 2.1mbgl. The topsoil consists of a 400mm layer of gravely clay
The subsoil is a brown Gravely CLAY but with increasing gravel content down to 1.8m bgl where the subsoil is a gravel with high clay content. A large boulder was present at 1.6m bgl
There was no evidence of a watertable in this pit.

2.11Infiltration Tests

The Infiltration rate, generally expressed as metres per second, is the volume of water that enters the soil over a unit area and unit time. In order to obtain this measurement a pit is excavated and filled with water. The fall in the level of the water is recorded over time.
A separate test pit was excavated and this pit had dimensions

Length 1.3m
Width 0.3m
Depth 1.2m

The base of the pit was filled with water to a depth of 800mm and the drop in the water level was followed over time

2.12 Results

The time required for the level to fall from 75% full to 25% full (ie 50% drop) – from a water depth of 0.6m to a water depth of 0.2m is estimated to be 336min.

Table 1 – Time taken for water level to fall

Elapsed Time (Mins)	Depth of Water (mm)
0	800
3	780
37	580
44	540
71	500
84	480
109	460
127	430
169	370
191	340
225	300
262	260
284	240
320	210
334	200

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

Volume = pit length (m) x Width (m) x Drop in water level (m)
= 1.3 x 0.3 x 0.4
= 0.156m3

Exposed area = (Length x Half the effective height x 2) + (Width x Half the effective height x 2) + Base area
= (1.3 x 0.4 x 2) + (0.3 x 0.4 x 2) + (1.3 x 0.3)
= 1.67m2

Time = 336min

Infiltration rate (f) = 0.156/1.67/336

= 2.78E-04 m/min

f = 4.6E-06 m/sec

2.2 Location 2

A test pit was excavated to 2.0 mbgl. The topsoil consists of a 300mm layer of gravely clay The subsoil is a redish brown CLAY down to 1m. From 1m to pit base the subsoil is a compacted granite derived gravel with low clay content

There was water in this pit at 1.8m bgl – there may be mottling at a higher level but this wasn't evident due to the nature and colour of the subsoil.

2.21 Infiltration Tests

The Infiltration rate, generally expressed as metres per second, is the volume of water that enters the soil over a unit area and unit time. In order to obtain this measurement a pit is excavated and filled with water. The fall in the level of the water is recorded over time.
A separate test pit was excavated and this pit had dimensions

Length 1.2m
Width 0.35m
Depth 1.2m

The base of the pit was filled with water to a depth of 800mm and the drop in the water level was followed over time

2.3 Results

The time required for the level to fall from 75% full to 25% full (ie 50% drop) – from a water depth of 0.6m to a water depth of 0.2m is estimated to be 314min.

Table 1 – Time taken for water level to fall

Elapsed Time (Mins)	Depth of Water (mm)
0	800
3	770
10	740
28	680
33	670
63	600
78	570
99	530
116	500
128	480
162	430
183	400
191	390
223	350
257	310
285	280
314	250
379	200

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

Volume = pit length (m) x Width (m) x Drop in water level (m)
= 1.2 x 0.35 x 0.4
= 0.168m3

Exposed area = (Length x Half the effective height x 2) + (Width x Half the effective height x 2) + Base area
= (1.2 x 0.4 x 2) + (0.35 x 0.4 x 2) + (1.2 x 0.35)
= 1.66m2

Time = 314min

Infiltration rate (f) = 0.168/1.66/314

= 3.2E-04 m/min

f = 5.3E-06 m/sec

3.0 *Conclusions*

From the above observation it is concluded that the soakage is reasonable but from the result of the second test the watertable is at about 1.8m bgl

30/07/2019

Photo

Location 1 - Trial Pit – Depth 2.1

Test Pit before water added – Depth 1.2m

Pit during test

Location 2

Test Pit before addition of water – depth 1.2m

Pit during test


St. Joseph House
Silver Pines
Anne Sullivan Centre for people who are deafblind
Leopardstown
Leopardstown
Silverpark GAA g
LauraLynn - Ireland's Children's Hospice
1
2