Environmental Impact Assessment Report Vol. II(Appendices)

FORMER GALLAHER'S SITE, AIRTON

FEBRUARY 2020

Prepared by:
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In Association with:
Ferreira Architects, Traynor Consulting, Barrett Mahony Consulting Engineers, IAC Archaeology,
Mitchell+ Associates, Whitehill Environmental, Tree Management Services, 3D Design,
IN2 Engineering Design partnership, and Renaissance Engineering ltd.

McGill Planning
Chartered Town Planners

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5 BIODIVERSITY - APPENDICES

5.1 SPECIES LIST

Common Name	Scientific Name
Ash	*Fraxinus excelsior*
Autumn hawkbit	*Scorzoneroides autumnalis*
Barberry	*Berberis*
Black medick	*Medicago lupulina*
Bramble	*Rubus fruticosus agg.*
Broadleaved Dock	*Rumex obtusifolius*
Butterfly bush	*Budleia*
Cat's ear	*Hypochaeris radicata*
Cleavers	*Galium aparine*
Cock's-foot	*Dactylis glomerata*
Coltsfoot	*Tussilago farfara*
Common chickweed	*Stellaria media*
Cow parsley	*Anthriscus sylvestris*
Cowslip	*Primula veris*
Common ragwort	*Senecio jacobaea*
Bearberry	*Cotoneaster*
Blackthorn	*Prunus spinosa*
Creeping buttercup	*Ranunculus repens*
Creeping cinquefoil	*Potentilla* reptans
Creeping thistle	*Cirsium arvense*
Cuckoo flower	*Cardamine pratensis*
Daisy	*Bellis perennis*
Dandelion	*Taraxacum officinale*
Dog rose	*Rosa canina*
Dogwood	*Cornus sp.*
Firethorn	*Pyracantha*
Germander speedwell	*Veronica chamaedrys*
Groundsel	*Senecio vulgaris*
Hairy bittercress	*Cardamine hirsuta*
Hawthorn	*Crategus monogyna*
Hazel	*Corylus avellana*
Herb Robert	*Geranium robertianum*
Hogweed	*Heracleum sphondylium*
Honeysuckle (ornamental)	*Lonicera periclymenum*
Ivy	*Hedera helix*
Lilac	*Syringa vulgaris*
Meadow buttercup	*Ranunculus acris*
Meadow grasses	*5.2Poa sp*
Mouse ear	*Cerastium fontanum*
Nettle	*Urtica dioica*
Norway maple	*Acer platanoides*
Oak	*Quercus sp*
Red clover	*Trifolium pratense*
Red fescue	*Festuca rubra.*
Rhododendron	*Rhododendron*
Rye grasses	*5.2Lolium sp.*
Ribwort plantain	*Pantago lanceolate*
Self-heal	*Prunella vulgaris*
Sheep's sorrel	*Rumex acetosella*
Silver birch	*Betula pendula*
Smooth sow thistle	*Sonchus oleraceus*
Spear thistle	*Cirsium vulgare*
Sycamore	*Acer pseudoplatanus*
Timothy grass	*Phleum pratense*
Tufted vetch	*Vicia cracca*
Tutsan	*Hypericum*
Whitebeam	*Sorbus sp*
White clover	*Trifolium repens*
Weeping willow	*Salix babylonica*
Willow (Sally)	*Salix cinerea*
Willowherb	*Ebilobium sp*
Vetches	*Vicia sp*
Vibernum	*Vibernum*
Yarrow	*Achillea millefolium*
Yorkshire fog	*Holcus lanatus*

5.2 PHOTOGRAPHS

Buildings and Surfaces to the West of the Site

Fence and Scattered Trees at the Front of the Site

Grassland Habitat Within the Site

The Existing Building on the Eastern Side of the Site

Driveway and Grassy Verge Habitat

Black Poplar Treeline

6 LAND, SOIL &GEOLOGY - APPENDICES

6.1 SITE INVESTIGATION REPORT

AIRTON ROAD
DEVELOPMENT
FOR
AIRTON ROAD PROPERTIES

B.M.C.E.
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.

Standards

The ground investigation works for this project have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930 (1999), BS 1377 (Parts 1 to 9) and Engineers Ireland Specification & Related Documents for Ground Investigation in Ireland (2006). The following Irish (IS) and European Standards or Norms are referenced:

- IS EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- IS EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- IS EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- IS EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles

Routine Sampling.

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

In-Situ Testing.

Standard penetration tests were conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 to obtain the Energy Ratio (E_r) of each hammer. A calibration certificate is available upon request. The E_r is defined as the ratio of the actual energy E_{mes} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The recorded number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Groundwater

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004.

Where peat has been encountered during site works, 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).

Retention of Samples.

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

Reporting

Recommendations made and opinions expressed in this 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 by IGSL Ltd for ground conditions between exploratory hole locations.

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

REPORT ON A SITE INVESTIGATION FOR A DEVELOPMENT AT AIRTON ROAD TALLAGHT

FOR
AIRTON ROAD PROPERTIES LTD

BARRETT MAHONY CONSULTING ENGINEERS (BMCE)

Report No. 21813 **JULY 2019**

1 Introduction

A new commercial development is proposed for a brownfield site located off Airton Road in Tallaght A large disused commercial building occupies much of the site.

An investigation of sub soil conditions in the area of the development has been carried out by IGSL for Barrett Mahony Consulting Engineers on behalf of Airton Road Properties Ltd.

This work was carried out by IGSL Ltd. following a competitive tender process.

The site investigation included the following elements:

*	Boreholes	7 nr.
*	Rotary Core Drilling	7 nr.
•	Trial Pit Excavations	9 nr.
•	CBR by Plate Test	7 nr.
•	BRE Digest 365 Percolation	3 nr.
•	Geotechnical Laboratory Testing	
•	Environmental Laboratory Testing	

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

II Fieldwork

The site and the exploratory locations are noted on the drawing enclosed in Appendix VII. This drawing was provided by BMCE.

The site is located off the Airton Road in Tallaght. The area contains a large disused building with surrounding surfaces of concrete, hardcore and grass.

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, recovered samples as required and prepared detailed records.

Each location was scanned electronically (CAT) to ensure that existing services were not damaged. At borehole locations a 1.00 metre deep inspection pit was opened by hand to confirm the absence of services. All locations have been referenced to National Grid and OD levels have been determined.

Boreholes

Seven exploratory holes were bored with conventional 200mm cable-tool methods using a Dando Exploratory Rig. Locations were referenced as per the original drawing. One re-bore was taken following shallow refusal on obstruction in BH02.

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

The findings are relatively consistent. Surface Concrete and Hardcore overlies some generally firm CLAY FILL. The fill extends generally to approximately 1.00 to 1.50 metres, but in three locations to an average depth of 2.80 metres.

Below these upper zones very stiff to hard GLACIAL TILL or BOULDER CLAY is encountered. This comprises stiff BROWN BOULDER CLAY which extends to depth ranging from 1.90 to 2.90 metres. Very stiff to hard BLACK BOULDER CLAY forms the base stratum and all seven boreholes were terminated in this stratum when further advancement was not possible despite the use of the heavy chisel.

Final borehole refusal depths ranged from 5.90 to 8.30 metres, with boulder obstruction noted at each location.

Ground water was encountered as light seepage in several of the boreholes, probably indicative of some granular zones within the generally cohesive boulder clays.

Rotary Core Drilling

Rotary drilling was scheduled at each location to advance the borehole depths and establish bedrock horizon if practical.

A tracked GEO305 rig was mobilised to drill 90 mm diameter boreholes with 78mm diameter core recovered if possible using triple tube diamond drilling technique.

Detailed drilling records are presented in Appendix II, noting stratification, core recovery and in-situ test data.

The exploratory drill holes penetrated to depths ranging from 12.00 to 13.70 metres BGL. Limestone bedrock was not identified within this depth range.

Recovery of core was generally impractical, however some core of the hard black boulder clay was possible at RC01 and RC05.

The overburden stratum is variously described as very stiff to hard brown and black very gravelly CLAY with cobbles and boulders grading in places to more granular material described as silt or clay-bound sandy GRAVEL.

Standard penetration tests were carried out at intervals in each rotary hole to establish in-situ soil strength. N values are noted in the RH column of the individual records.

Monitoring standpipes were installed in three locations (RC01, RC06 and RC07) to facilitate long term ground water and possible landfill gas concentrations. Each installation was protected by a steel cover. Readings have been taken in the period following the site works. Results are presented with the drilling data in Appendix II.

Trial Pits

Pits were excavated at nine locations under experienced engineering supervision. Each location was electronically scanned (CAT) to ensure that underground services were not damaged. Detailed trial pit logs are enclosed in Appendix III.

The records confirm the borehole findings. Surface FILL extends to up to 0.90 metres. Firm to stiff brown BOULDER CLAY is then encountered and penetrated to depths ranging from 2.10 to 2.90 metres. Hard black BOULDER CLAY was noted at the base of each excavation with excavator refusal on very hard black clay / boulders generally at 2.80 to 3.00 metres BGL.

Four of the trial excavations were dry, however, some minor water ingress was recorded at varying depth in TPs.01, 02, 04, 08 and 09. All trial excavations were recorded as stable during the short-term investigation period.

In Situ CBR by Plate Bearing Test

The CBR value of the soils at shallow depth was established at seven trial pit locations 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.

Results are summarised in the following table and details are presented in Appendix IV

TABLE A

Test No.	Depth	CBR at Load Cycle (%)	CBR @ Re-Load (%)
PBT 1	0.50	12.2	55.5
PBT 2	0.50	14.5	106.4
PBT 3	0.50	6.2	21.2
PBT 4	0.50	6.1	37.3
PBT 5	0.50	3.7	23.6
PBT 6	0.50	26.7	N/A
PBT 7	0.50	9.6	50.2

Percolation Tests (BRE Digest 365)

Infiltration testing was performed at three locations in accordance with BRE Digest 365 'Soakaway Design'. Details are presented in Appendix V. The Test Pits were opened to approximately 2.00 metres deep in gravelly boulder CLAY and detailed logs were prepared.

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.

Designs are based on the slowest infiltration rate, which is generally calculated from the final cycle. In each location no fall in water level was measured over the test period and the results confirm the very low permeability of the glacial till or boulder clay.

III. Testing

(a) In-Situ

Standard penetration tests were carried out in the boreholes at 1.00 metre intervals to establish relative soil strength. In addition SPT values were also established at intervals during rotary drilling. Results are presented in the right hand column of the boring and drilling records and are summarised as follows in Table B.

TABLE B

Stratum / Depth	N Value Range	Comment
FILL DEPOSITS	3 to 25	Variable soft to stiff
BROWN BOULDER CLAY		
1.00 metres BGL	18 to 24	Stiff
2.00 metres BGL	21 to 44	Stiff to Very Stiff
BLACK BOULDER CLAY		
3.00 metres BGL	28 to 55	Stiff to Hard
4.00 metres BGL	44 to 64	Hard
5.00 metres BGL	42 to 56	Hard
> 5.00 metres BGL	40 to 60	Hard

Refusal of SPT apparatus was recorded on numerous boulders throughout and at the base of the respective boreholes.

(b) Laboratory

A programme of laboratory testing was scheduled following completion of site operations. Geotechnical soil testing was carried out by IGSL in it's INAB-Accredited laboratory. Chemical and Environmental testing was carried out in the UK by specialist laboratory. All test results are presented in Appendices VIa and VIb. The test programme includes the following elements:

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

Individual test results are discussed in the following paragraphs.

Classification

Thirteen samples from the boreholes and trial pits had index properties established. Results consistently fall into Zones CL and CI of the standard Classification, indicative of low plasticity sensitive clay matrix soils.

Two samples have been classified as clay-bound sandy GRAVEL.
Moisture content for the clay samples range from 8% to 18% while for the gravel samples moisture contents of 3.9 and 8.1% were established.

Grading

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

Two graphs from the more granular soils confirm coarser grading in the sand gravel fraction with up to 18% of material passing to the fine silt/clay fraction.

Sulphate and pH.

Three soil samples were selected for sulphate and pH analysis. Sulphate concentrations (SO4 2:1 extract) of from < 0.010 g/l to 0.076 g/l were established with pH values from 7.6 to 8.6. No special precautions are necessary to protect foundation concrete from sulphate aggression. A sulphate design class of DS-1 (ACEC Classification for Concrete) is indicated for concentrations less than 0.5 g/l.

RILTA Environmental

Twenty-five soil samples were submitted for detailed environmental analysis to RILTA (WAC) parameters. The results confirm that the soils can be classified as INERT with no elevated contaminant levels recorded on any of the samples submitted. Results indicate that material excavated from this site can be readily disposed of either on-site or to a licensed landfill facility.

No asbestos traces were found during routine screening.

IV. Discussion:

The new development is to be carried out on a Brownfield site located at Airton Road in Tallaght.

A comprehensive site investigation has been carried out for BMCE and Airton Road Properties Ltd. to establish design parameters for new structures and confirm that the sub soils are not contaminated.

Summary Stratification

The findings reflect the general stratification of the Airton Road / Tallaght area where GLACIAL TLL deposits are encountered below superficial surface soils comprising FILL / OLD TOPSOIL / RECENT SANDY CLAY OR SILT.

The glacial till comprises firm to stiff brown sandy gravelly CLAY (Brown Boulder Clay) overlying at an approximate depth of 2.00 metres very stiff to hard black silty gravelly CLAY (Black Boulder Clay or Lodgement Till)

Exploratory holes have been formed using both cable percussion and rotary drilling to depths in excess of 15.00 metres. Bedrock was not encountered within this depth zone.

Pockets or more extensive zones of GRAVEL can typically and randomly occur within the cohesive boulder clay deposits. These are generally water bearing.

Variation in the general grading pattern of the till can also occur, with a higher granular content and increased moisture content classifying the material as either clay or silt bound sandy GRAVEL.

Foundations

The made ground encountered over the site area is variable in both composition and compaction and no information is available as to it's origin and method of placement.

This material is therefore regarded as unsuitable as a founding medium and structural loads should be transferred to the competent underling boulder clays.

The following table outlines the allowable bearing pressures available in the various strata at various depths BGL based on in-situ test results, visual assessment of soils during trial pit excavation and consideration of the geotechnical laboratory data.

The characteristics of the local boulder clays are well documented in numerous publications. These have also been considered in preparing this report.

TABLE C

Stratum	Depth	Allowable Bearing Pressure
FILL	GL to 2.00	Not Suitable
Brown Boulder CLAY	1.00 m 2.00 m	200 KPa 250 KPa
Black Boulder CLAY	2.00 m 3.00 m 4.00 m +	250 KPa 300 KPa 400 Kpa

Settlement in the glacial till under the above loads will be less than10mm in the brown boulder clay and less than 5mm in the black lodgement till.

Conventional reinforced strip or pad foundations are therefore recommended for this development. If basements are proposed the black lodgement till below 2.00 metres will be the obvious founding medium with allowable bearing pressures probabaly exceeding design requirements.

Significant ground water ingress during shallow foundation construction is not expected. Should isolated seepages occur they will be readily controlled using light pumping from local sumps.

Installed standpipes indicate that the final standing ground water level is approximately 1.20 metres BGL. This will be significant if basement construction is envisaged.

Visual inspection of all foundation excavation is strongly recommended to ensure uniformity and suitability of the founding medium. Any soft or suspect material should be removed and replaced with low-grade concrete.

Excavation

Trial Pit excavations were quite stable and foundation or trench excavations should remain stable during the construction period.

Statutory safety regulations should however be observed. These prohibit personnel entering unsupported excavations greater than 1.20 metres deep, irrespective of apparent stability.

The very high strength of the black boulder clay and presence of boulders may present excavation difficulties. Experienced local contractors will be well acquainted with excavation in this material and plant requirements for the purpose.

Ground Water / Gas

Ground water and gas levels were monitored in the three installed standpipes over two site visits after completion of works. Full details are presented in Appendix II.

Water levels ranged from 3.25 to 4.40 metres BGL on the initial visit with levels rising to 2.30 to 3.80 metres BGL one month after completion of drilling. A final standing water table of 1.50 to 2.00 metres BGL can be expected and would be typical of the local boulder clay deposits.

Landfill gas concentrations were also established at both site visits. Levels for CH4, CO2, o2, CO and H2S were negligible and no issues relating to gas generation arise.

Roads

CBR values have been established at seven locations over the site area Tests were carried out on generally granular material (FILL) at a depth of 0.50 metres.

High values were established with an average CBR in excess of 10% indicating suitability for road or car park construction.

We would recommend careful visual inspection of excavated formation to ensure that all top soil and organic peaty soils is removed.

Percolation (BRE Digest 365)

Three percolation tests carried out in the gravelly boulder clay all recorded refusal. The results are typical of the highly impermeable soils of the greater Dublin area.

Disposal of storm or surface water to the local authority system of to a suitable watercourse should be considered.

Concrete

Low sulphate content and near neutral pH values confirm that no special precautions are required for protection of foundation concrete.

Environmental

Comprehensive RILTA Suite (WAC) testing confirms that the made ground and sub soil is INERT and no issues arise as to safety of personnel on site or disposal of excavated material either on or off site.

IGSL/JC
July 2019

Appendix I Boring Records

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	BOREHOLE NO.	BH01
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	5.70
		DATE COMMENCED	27/05/2019
		DATE COMPLETED	27/05/2019
CLIENT	Airton Road Properties Ltd.	SPT HAMMER REF. NO.	
ENGINEER	Barrett Mahony CE	ENERGY RATIO (%)	
		BORED BY	D. Tolster
		PROCESSED BY	E. Kearney

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	MADE GROUND comprised of: Stiff brown sandy gravelly CLAY.			0.20						
1	MADE GROUND comprised of: Firm to stiff brown mottled grey sandy gravelly silty CLAY.				AA38088	B	1.00		N = 25 (4, 6, 6, 6, 6, 7)	
2					AA38089	B	2.00		N = 14 (2, 1, 2, 3, 4, 5)	
3	Very stiff to hard black sandy gravelly silty CLAY. Has a medium cobble and boulder content which are >500mm in size.			2.80	AA38090	B	3.00		N = 35 (5, 7, 9, 6, 8, 9)	
4					AA38091	B	4.00		N = 50/150 mm (19, 6, 32, 18)	
5					AA111709	B	5.00		N = 42 (7, 8, 11, 11, 10, 10)	
6	OBSTRUCTION End of Borehole at 5.70 m			5.90					N = 50/75 mm (18, 25, 50)	
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.1	4.3	1	
5.7	5.9	2	

WATER STRIKE DETAILS

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

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS CAT scanned location.

Sample Legend
D - Small Disturbed Bulk
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

GSL BH LOG 21813X.GPJ GSL.GDT 17/6/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	BOREHOLE NO.	BH02
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	1.40
		DATE COMMENCED	28/05/2019
		DATE COMPLETED	28/05/2019
CLIENT	Airton Road Properties Ltd.	SPT HAMMER REF. NO.	
		BORED BY	D. Tolster
ENGINEER	Barrett Mahony CE	ENERGY RATIO (%)	
		PROCESSED BY	E. Kearney

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	MADE GROUND comprised of: Soft sandy gravelly silty CLAY. Has a low cobble and boulder content which are >400mm in size.									
1									N = 11 (2, 2, 1, 3, 5, 2)	
				1.40						
2	OBSTRUCTION: Possibly a large cobble or boulder. End of Borehole at 1.40 m									
3										
4										
5										
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
1.2	1.4	1.5	

WATER STRIKE DETAILS

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

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS CAT scanned location.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U/T - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21813X.GPJ IGSL.GDT 17/6/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	BOREHOLE NO.	BH02A
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	6.10
		DATE COMMENCED	28/05/2019
		DATE COMPLETED	28/05/2019
CLIENT	Airton Road Properties Ltd.	SPT HAMMER REF. NO.	
		BORED BY	D. Tolster
ENGINEER	Barrett Mahony CE	ENERGY RATIO (%)	
		PROCESSED BY	E. Kearney

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	MADE GROUND comprised of: Soft sandy gravelly silty CLAY. Has a low cobble and boulder content which are >400mm in size.									
1					AA38092	B	1.00		N = 7 (3, 4, 2, 2, 1, 2)	
2					AA38093	B	2.00		N = 3 (0, 0, 0, 0, 1, 2)	
				2.70						
3	Stiff grey and grey/brown sandy gravelly silty CLAY. Has a medium cobble and boulder content which are >500mm in size.				AA38094	B	3.00		N = 26 (11, 6, 4, 6, 8, 10)	
				3.90						
4	Very stiff to hard/black very sandy gravelly silty CLAY. Has a medium cobble and boulder content which are >600mm in size.				AA38095	B	4.00		N = 53 (8, 13, 15, 12, 12, 14)	
5					AA38096	B	5.00		N = 46 (5, 14, 10, 10, 15, 11)	
				6.10						
6	OBSTRUCTION End of Borehole at 6.10 m								N = 50/190 mm (12, 18, 27, 23)	
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.2	4.4	1	
5.3	5.4	0.75	
5.9	6.1	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.00	4.00			20	Seepage

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS CAT scanned location.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U/T - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21813X.GPJ IGSL.GDT 17/6/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

BOREHOLE NO. BH03
SHEET Sheet 1 of 1

CO-ORDINATES
GROUND LEVEL (m AOD)

RIG TYPE Dando 2000
BOREHOLE DIAMETER (mm) 200
BOREHOLE DEPTH (m) 6.40

DATE COMMENCED 31/05/2019
DATE COMPLETED 04/06/2019

CLIENT Airton Road Properties Ltd.
ENGINEER Barrett Mahony CE

SPT HAMMER REF. NO.
ENERGY RATIO (%)

BORED BY D. Tolster
PROCESSED BY F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TARMACADAM			0.10						
	MADE GROUND (Comprised of CL804 stone fill with cobbles)			0.50						
1	Firm grey/brown SILT/CLAY with some gravel			1.40	AA117468	B	1.00		N = 18 (2, 3, 3, 4, 6, 5)	
	Firm dark brown/grey gravelly CLAY			1.90						
2	Very stiff to hard black sandy gravelly CLAY with angular cobbles				AA117469	B	2.00		N = 34 (4, 3, 6, 8, 10, 10)	
3					AA117470	B	3.00		N = 55 (4, 8, 12, 14, 14, 15)	
4					AA117471	B	4.00		N = 54 (8, 9, 15, 10, 12, 17)	
5					AA117472	B	5.00		N = 53 (5, 12, 14, 18, 19, 12)	
6					AA117473	B	6.00		N = 50/75 mm (25, 50)	
	OBSTRUCTION			6.40						
	End of Borehole at 6.40 m									

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
5	5.3	1.5	
5.7	5.8	0.5	
6.3	6.4	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.00	4.00	No	3.50	20	Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
31-05-19	5.00	5.00	4.00	End of 1st Day
04-06-19	6.00	Nil	1.10	End of BH

REMARKS CAT scanned location and hand dug inspection pit carried out

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21813X.GPJ IGSL.GDT 17/6/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

BOREHOLE NO. BH04
SHEET Sheet 1 of 1

CO-ORDINATES
GROUND LEVEL (m AOD)

RIG TYPE Dando 2000
BOREHOLE DIAMETER (mm) 200
BOREHOLE DEPTH (m) 6.40

DATE COMMENCED 30/05/2019
DATE COMPLETED 30/05/2019

CLIENT Airton Road Properties Ltd.
ENGINEER Barrett Mahony CE

SPT HAMMER REF. NO.
ENERGY RATIO (%)

BORED BY D. Tolster
PROCESSED BY F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Tarmacadam			0.10						
	MADE GROUND (Comprised of CL 804 stone fill)			0.40						
1	Firm brown sandy SILT/CLAY with some fine gravel			1.60	AA105096	B	1.00		N = 24 (3, 5, 5, 5, 6, 8)	
2	Very stiff brown gravelly CLAY with occasional cobbles			2.80	AA105097	B	2.00		N = 44 (6, 7, 9, 12, 11, 12)	
3	Hard black sandy gravelly CLAY with large angular cobbles				AA105098	B	3.00		N = 48 (6, 8, 13, 12, 12, 11)	
4					AA105099	B	4.00		N = 64 (7, 11, 15, 15, 16, 18)	
5					AA105100	B	5.00		N = 56 (9, 14, 10, 14, 14, 18)	
6					AA105101	B	6.00		N = 50/75 mm (25, 50)	
	Obstruction			6.40						
	End of Borehole at 6.40 m									

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.1	3.4	1	
5.6	5.8	0.75	
6.3	6.4	2	

WATER STRIKE DETAILS

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

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS CAT scanned location and hand dug inspection pit carried out

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21813X.GPJ IGSL.GDT 17/6/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

BOREHOLE NO. BH05

SHEET Sheet 1 of 1

CO-ORDINATES

GROUND LEVEL (m AOD)

RIG TYPE Dando 2000

BOREHOLE DIAMETER (mm) 200

BOREHOLE DEPTH (m) 8.30

DATE COMMENCED 28/05/2019

DATE COMPLETED 29/05/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

SPT HAMMER REF. NO.

ENERGY RATIO (%)

BORED BY D. Tolster

PROCESSED BY E. Kearney

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	MADE GROUND comprised of: Firm brown sandy gravelly silty CLAY.			1.10	AA11401	B	1.00		N = 22 (2, 5, 6, 6, 6, 4)	
1	MADE GROUND comprised of: Firm to stiff brown sandy gravelly silty CLAY. Has a low cobble content.				AA11402	B	2.00		N = 19 (2, 2, 4, 4, 5, 6)	
2				2.90						
3	Very stiff dark grey sandy gravelly silty CLAY. Has a low cobble and boulder content which are >400mm in size.			3.40	AA11403	B	3.00		N = 53 (8, 7, 13, 16, 14, 10)	
4	Very stiff to hard black sandy gravelly silty CLAY. Has a low cobble and boulder content which are >500mm in size.				AA11404	B	4.00		N = 37 (5, 4, 7, 9, 10, 11)	
5					AA11405	B	5.00		N = 50/150 mm (8, 11, 16, 34)	
6					AA11406	B	6.00		N = 50 (8, 11, 12, 14, 13, 16)	
7					AA11407	B	7.00		N = 51 (8, 10, 12, 14, 12, 13)	
8				8.30	AA11408	B	8.00		N = 50/225 mm (16, 9, 20, 23, 8)	
9	End of Borehole at 8.30 m									

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.2	3.5	0.5	
5.2	5.4	0.75	
8.1	8.3	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
6.50	6.50	6.70	5.80	20	Moderate

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS CAT scanned location.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LD - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21813X.GPJ IGSL.GDT 17/6/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

BOREHOLE NO. BH06

SHEET Sheet 1 of 1

CO-ORDINATES

GROUND LEVEL (m AOD)

RIG TYPE Dando 2000

BOREHOLE DIAMETER (mm) 200

BOREHOLE DEPTH (m) 6.60

DATE COMMENCED 30/05/2019

DATE COMPLETED 30/05/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

SPT HAMMER REF. NO.

ENERGY RATIO (%)

BORED BY D. Tolster

PROCESSED BY F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	MADE GROUND (Comprised of brown sandy gravelly CLAY with some cobbles)			1.30	AA11409	B	1.00		N = 19 (3, 3, 4, 4, 4, 3)	
1	Firm to stiff brown sandy SILT/CLAY with some gravel and occasional cobbles				AA11410	B	2.00		N = 21 (2, 2, 4, 5, 6, 6)	
2				2.90						
3	Very stiff to hard black sandy gravelly CLAY with some cobbles and occasional boulders				AA11411	B	3.00		N = 32 (7, 7, 8, 8, 9, 9)	
4					AA11412	B	4.00		N = 44 (10, 6, 11, 10, 11, 12)	
5					AA11413	B	5.00		N = 46 (12, 13, 16, 8, 10, 12)	
6					AA11414	B	6.00		N = 50/225 mm (10, 19, 12, 15, 23)	
7				6.60						
8	Obstruction End of Borehole at 6.60 m									
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3	3.3	0.5	
4.5	4.7	0.5	
6.4	6.6	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
6.00	6.00	No	5.30	20	Moderate

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
30-05-19	6.00	Nil	5.00	End of BH

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS CAT scanned location and hand dug inspection pit carried out .

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LD - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21813X.GPJ IGSL.GDT 17/6/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	BOREHOLE NO.	BH07
		SHEET	Sheet 1 of 1
CO-ORDINATES		RIG TYPE	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)		BOREHOLE DEPTH (m)	7.40
		DATE COMMENCED	31/05/2019
		DATE COMPLETED	04/06/2019
CLIENT	Airton Road Properties Ltd.	SPT HAMMER REF. NO.	
ENGINEER	Barrett Mahony CE	ENERGY RATIO (%)	
		BORED BY	D. Tolster
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TARMACADAM			0.10						
	Firm brown sandy SILT/CLAY with some gravel				AA114415	B	1.00		N = 17 (3, 2, 3, 4, 5, 5)	
				1.50						
2	Stiff grey/brown sandy SILT/CLAY with gravel and occasional cobbles				AA114416	B	2.00		N = 21 (5, 3, 3, 7, 6, 8)	
				2.60						
3	Very stiff to hard very sandy veryy gravelly CLAY with some cobbles and occasional boulders				AA114417	B	3.00		N = 44 (8, 7, 10, 10, 14, 10)	
4					AA114418	B	4.00		N = 50 (8, 13, 13, 10, 14, 13)	
5					AA114419	B	5.00		N = 43 (8, 7, 7, 8, 12, 16)	
6					AA114420	B	6.00		N = 60 (4, 13, 19, 15, 10, 16)	
7					AA114421	B	7.00		N = 56 (8, 12, 11, 17, 13, 15)	
				7.40						
	Obstruction End of Borehole at 7.40 m									
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.1	3.4	1	
5.2	5.5	1.5	
7.2	7.4	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.30	4.30	4.50	3.50	20	Moderate
5.50	5.50	7.00	4.70	20	

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS CAT scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LD - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21813X.GPJ IGSL.GDT 17/6/19

Appendix II Rotary Core Records

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC01
SHEET Sheet 1 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 78

DATE DRILLED 28/05/2019
DATE LOGGED 28/05/2019

CLIENT Airton Road Properties Ltd.
ENGINEER Barrett Mahony CE

DRILLED BY IGSL
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly CLAY with occasional cobbles				
1		0	0	0								
1.50												
2		0	0	0								N = 20 (5, 7, 5, 2, 7, 6)
3.00												
3		0	0	0								N = 35 (2, 4, 9, 11, 7, 9)
4.50												
4		0	0	0								N = 27 (5, 6, 7, 9, 4, 7)
6.00												
6		0	0	0								N = 45 (9, 11, 22, 8, 4, 9)
7.50									7.50			
8		47	0	0				Returns of firm black slightly sandy gravelly CLAY with occasional cobbles. Sand is fine. Gravel is angular to subrounded fine to coarse of limestone. Cobbles are subangular of limestone.				N = 29/50 mm (25, 29)
9.00									9.00			
9		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as gravelly cobbly CLAY				N = 48 (4, 7, 9, 12, 11, 16)

REMARKS
Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.50	8.50	No			Slow

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
28-05-19	12.00	1.50	12.00	50mm SP

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 21813.GPJ IGSL.GDT 16/5/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC01
SHEET Sheet 2 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 78

DATE DRILLED 28/05/2019
DATE LOGGED 28/05/2019

CLIENT Airton Road Properties Ltd.
ENGINEER Barrett Mahony CE

DRILLED BY IGSL
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10												
10.50								SYMMETRIX DRILLING: No recovery, observed by driller as gravelly cobbly CLAY *(continued)*				N = 65 (9, 11, 17, 19, 10, 19)
11		0	0	0								
12.00									12.00			
12		100	0	0				Very stiff to hard, medium brown slightly sandy gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of limestone.				N = 53 (7, 4, 11, 6, 19, 17)
13.50									13.50			
13								End of Borehole at 13.50 m				
14												
15												
16												
17												
18												
19												

REMARKS
Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.50	8.50	No			Slow

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
28-05-19	12.00	1.50	12.00	50mm SP

Date	Hole Depth	Casing Depth	Depth to Water	Comments
28-05-19	13.50	12.00	4.75	Water level recorded at 5 mins after end of drilling

IGSL RC FI 10M 21813.GPJ IGSL.GDT 16/5/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC02

SHEET Sheet 1 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305

FLUSH Air/Mist

DATE DRILLED 23/05/2019

DATE LOGGED 23/05/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

INCLINATION (deg) -90

CORE DIAMETER (mm) 78

DRILLED BY IGSL

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as very sandy gravelly CLAY with occasional cobbles				
1	1.50	0	0	0					1.50			
2		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly CLAY with occasional cobbles				N = 24 (3, 4, 4, 4, 9, 7)
3	3.00								3.00			
4		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as very sandy gravelly CLAY with occasional cobbles				N = 33 (12, 9, 7, 6, 11, 7)
5	4.50	0	0	0								N = 29 (6, 5, 5, 9, 7, 9)
6	6.00	0	0	0								N = 48 (7, 6, 7, 10, 11, 20)
7	7.50	0	0	0								N = 52 (5, 6, 6, 10, 14, 22)
8	9.00	0	0	0								N = 54 (4, 19, 11, 17, 14, 12)
9		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as GRAVEL	9.60			

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
9.60	9.60	No			Slow

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 21813.GPJ IGSL.GDT 15/9/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC02

SHEET Sheet 2 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305

FLUSH Air/Mist

DATE DRILLED 23/05/2019

DATE LOGGED 23/05/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

INCLINATION (deg) -90

CORE DIAMETER (mm) 78

DRILLED BY IGSL

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.50	0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as GRAVEL *(continued)*				N = 31 (2, 3, 7, 5, 9, 10)
11												
12	12.00							End of Borehole at 12.00 m	12.00			N = 28 (5, 5, 5, 8, 7, 8)
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
9.60	9.60	No			Slow

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments
29-05-19	12.00	12.00	3.75	Water level recorded at 5 mins after end of drilling

IGSL RC FI 10M 21813.GPJ IGSL.GDT 15/9/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC03

SHEET Sheet 1 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305

FLUSH Air/Mist

DATE DRILLED 04/06/2019

DATE LOGGED 05/06/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

INCLINATION (deg) -90

CORE DIAMETER (mm) 78

DRILLED BY IGSL

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly CLAY with occasional cobbles				
1	1.50	0	0	0					1.50			
2		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as sandy GRAVEL				N = 26 (3, 7, 9, 5, 5, 7)
3	3.00	0	0	0								N = 37 (2, 2, 14, 7, 8, 8)
4	4.50	0	0	0								N = 14 (3, 2, 3, 4, 3, 4)
5		0	0	0								
6	6.00	0	0	0								N = 15 (2, 2, 2, 3, 5, 5)
7	7.50	0	0	0								N = 22 (3, 4, 5, 5, 6, 6)
8		0	0	0								
9	9.00	0	0	0								N = 12 (2, 2, 2, 3, 3, 4)

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.90	1.90	No			Slow

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments

KSL RC FI 1/04 21813.GPJ IGSL.GDT 15/5/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC03

SHEET Sheet 2 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305

FLUSH Air/Mist

DATE DRILLED 04/06/2019

DATE LOGGED 05/06/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

INCLINATION (deg) -90

CORE DIAMETER (mm) 78

DRILLED BY IGSL

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.50							SYMMETRIX DRILLING: No recovery, observed by driller as sandy GRAVEL *(continued)*				N = 32 (4, 7, 7, 8, 8, 9)
11		0	0	0								
12	12.00							End of Borehole at 12.00 m	12.00			N = 24 (3, 3, 3, 5, 7, 9)
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.90	1.90	No			Slow

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments
05-06-19	12.00	12.00	5.60	Water level recorded at 5 mins after end of drilling

KSL RC FI 1/04 21813.GPJ IGSL.GDT 15/5/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC04
SHEET Sheet 1 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 78

DATE DRILLED 04/06/2019
DATE LOGGED 04/06/2019

CLIENT Airton Road Properties Ltd.
ENGINEER Barrett Mahony CE

DRILLED BY IGSL
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-Intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as sandy GRAVEL				
1	1.50	0	0	0					1.50			
2		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly CLAY with occasional cobbles				N = 19 (2, 3, 3, 4, 7, 5)
3	3.00	0	0	0								N = 18 (3, 3, 3, 3, 5, 5)
4	4.50	0	0	0					4.50			
5		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as cobbly SAND				N = 14 (2, 2, 4, 3, 3, 4)
6	6.00	0	0	0								N = 18 (3, 6, 4, 4, 5, 5)
7	7.50	0	0	0					7.50			
8		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as cobbly GRAVEL				N = 36 (6, 7, 11, 8, 8, 9)
9	9.00	0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as GRAVEL	9.00			N = 29 (4, 6, 8, 9, 1, 11)

REMARKS
Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.50	8.50	No			Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL_RC FI 10M 21813.GPJ IGSL.GDT 15/6/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC04
SHEET Sheet 2 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 78

DATE DRILLED 04/06/2019
DATE LOGGED 04/06/2019

CLIENT Airton Road Properties Ltd.
ENGINEER Barrett Mahony CE

DRILLED BY IGSL
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-Intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.50							SYMMETRIX DRILLING: No recovery, observed by driller as GRAVEL *(continued)*	10.50			
11		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as gravelly CLAY				N = 43 (6, 6, 8, 11, 12, 12)
12	12.00							End of Borehole at 12.00 m	12.00			N = 32 (5, 7, 7, 7, 9, 9)
13												
14												
15												
16												
17												
18												
19												

REMARKS
Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.50	8.50	No			Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
04-06-19	12.00	12.00	4.90	Water level recorded at 5 mins after end of drilling

IGSL_RC FI 10M 21813.GPJ IGSL.GDT 15/6/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC05

SHEET Sheet 1 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305

FLUSH Air/Mist

DATE DRILLED 30/05/2019

DATE LOGGED 31/05/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

INCLINATION (deg) -90

CORE DIAMETER (mm) 78

DRILLED BY IGSL

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-Intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly CLAY with occasional cobbles				
1		0	0	0								
1.50												
2		0	0	0								N = 21 (3, 3, 4, 5, 8, 8)
3	3.00	0	0	0								N = 33 (9, 12, 7, 7, 9, 10)
4		0	0	0								
4.50												
5		0	0	0								N = 38 (4, 4, 5, 5, 12, 14)
6	6.00	0	0	0								N = 44 (5, 11, 10, 11, 11, 12)
7		0	0	0								
7.50												
8		0	0	0								N = 47 (7, 7, 7, 14, 12, 14)
9	9.00	0	0	0					9.00			
								SYMMETRIX DRILLING: No recovery, observed by driller as very sandy gravelly CLAY with occasional cobbles				N = 65 (9, 12, 28, 12, 10, 15)

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.90	8.90	No			Slow

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 21813.GPJ IGSL.GDT 15/6/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC05

SHEET Sheet 2 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305

FLUSH Air/Mist

DATE DRILLED 30/05/2019

DATE LOGGED 31/05/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

INCLINATION (deg) -90

CORE DIAMETER (mm) 78

DRILLED BY IGSL

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-Intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.50							SYMMETRIX DRILLING: No recovery, observed by driller as very sandy gravelly CLAY with occasional cobbles *(continued)*				N = 27 (17, 12, 6, 7, 7, 7)
11		0	0	0								
	12.00								12.00			
12		0	0	0				Very stiff to hard, medium brown slightly sandy gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of limestone.				N = 29/50 mm (27, 29)
13	13.50	0	0	0								
	13.70							End of Borehole at 13.70 m	13.70			
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.90	8.90	No			Slow

GROUNDWATER DETAILS

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

Date	Hole Depth	Casing Depth	Depth to Water	Comments
31-05-19	13.70	12.00	4.50	Water level recorded at 5 mins after end of drilling

IGSL RC FI 10M 21813.GPJ IGSL.GDT 15/6/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC06

SHEET Sheet 1 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305

FLUSH Air/Mist

DATE DRILLED 06/06/2019

DATE LOGGED 06/06/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

INCLINATION (deg) -90

CORE DIAMETER (mm) 78

DRILLED BY IGSL

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly CLAY with occasional cobbles				
1		0	0	0								
2	1.50	0	0	0								N = 28 (2, 2, 3, 14, 6, 4)
3	3.00	0	0	0								N = 33 (3, 3, 3, 3, 12, 9)
4	4.50	0	0	0					4.50			
5		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as very sandy gravelly CLAY with occasional cobbles				N = 24 (2, 3, 4, 4, 7, 9)
6	6.00	0	0	0					6.00			
7		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as clayey GRAVEL				N = 25 (3, 4, 4, 5, 9, 7)
8	7.50	0	0	0					7.50			
9	9.00	0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as sandy gravelly CLAY with occasional cobbles	9.00			N = 27/225 mm (7, 9, 9, 8, 10)
		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as sandy GRAVEL				N = 71 (10, 24, 14, 17, 19, 21)

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
5.70	5.70	No			Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
07-06-19	12.00	1.00	12.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 10M 21813.GPJ IGSL.GDT 15/8/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT Airton Road, Tallaght

DRILLHOLE NO RC06

SHEET Sheet 2 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Geo 305

FLUSH Air/Mist

DATE DRILLED 06/06/2019

DATE LOGGED 06/06/2019

CLIENT Airton Road Properties Ltd.

ENGINEER Barrett Mahony CE

INCLINATION (deg) -90

CORE DIAMETER (mm) 78

DRILLED BY IGSL

LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.50							SYMMETRIX DRILLING: No recovery, observed by driller as sandy GRAVEL *(continued)*				N = 30 (4, 6, 6, 7, 8, 9)
11		0	0	0								
12	12.00							End of Borehole at 12.00 m	12.00			N = 41 (3, 5, 9, 9, 11, 12)
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
5.70	5.70	No			Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
07-06-19	12.00	1.00	12.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
07-06-19	12.00	12.00	3.10	Water level recorded at 5 mins after end of drilling

IGSL RC FI 10M 21813.GPJ IGSL.GDT 15/8/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	DRILLHOLE NO	RC07
		SHEET	Sheet 1 of 2
CO-ORDINATES		DATE DRILLED	05/06/2019
GROUND LEVEL (mOD)		DATE LOGGED	06/06/2019
CLIENT	Airton Road Properties Ltd.	RIG TYPE	Geo 305
ENGINEER	Barrett Mahony CE	FLUSH	Air/Mist
		INCLINATION (deg)	-90
		CORE DIAMETER (mm)	78
		DRILLED BY	IGSL
		LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as CLAY				
1	1.50	0	0	0					1.50			
2		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as clayey sandy GRAVEL				N = 13 (2, 2, 3, 3, 3, 4)
3	3.00								3.00			
4	4.50	0	0	0				SYMMETRIX DRILLING. No recovery, observed by driller as clayey COBBLES				N = 25 (3, 3, 9, 5, 7, 4)
5		0	0	0								N = 55 (14, 7, 24, 11, 12, 8)
6	6.00								6.00			
7		0	0	0				SYMMETRIX DRILLING: No recovery, observed by driller as clayey GRAVEL				N = 23 (4, 4, 4, 5, 7, 7)
8	7.50	0	0	0								N = 37 (6, 7, 7, 9, 10, 11)
9	9.00	0	0	0								N = 36 (7, 7, 7, 8, 9, 12)

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
5.40	5.40	No			Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
06-06-19	12.00	1.00	12.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI 1094 21813.GPJ IGSL.GDT 15/8/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	DRILLHOLE NO	RC07
		SHEET	Sheet 2 of 2
CO-ORDINATES		DATE DRILLED	05/06/2019
GROUND LEVEL (mOD)		DATE LOGGED	06/06/2019
CLIENT	Airton Road Properties Ltd.	RIG TYPE	Geo 305
ENGINEER	Barrett Mahony CE	FLUSH	Air/Mist
		INCLINATION (deg)	-90
		CORE DIAMETER (mm)	78
		DRILLED BY	IGSL
		LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.50							SYMMETRIX DRILLING: No recovery, observed by driller as clayey GRAVEL *(continued)*				N = 34 (6, 7, 8, 8, 8, 9)
11		0	0	0								
12	12.00							End of Borehole at 12.00 m	12.00			N = 30 (5, 5, 7, 8, 7, 8)
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.00-12.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
5.40	5.40	No			Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
06-06-19	12.00	1.00	12.00	50mm SP

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
06-06-19	12.00	12.00	3.85	Water level recorded at 5 mins after end of drilling

IGSL RC FI 1094 21813.GPJ IGSL.GDT 15/8/19

RC01 Box 1 of 1 – 7.50-13.50m

RC05 Box 1 of 1 – 12.00-13.70m

Gas & Groundwater Monitoring

Site Location	Airton Road, Tallaght						
Project No.	21813						
Client	Barrett Mahoney Chartered Engineers						
Date	21-Jun-19						
Engineer	E. Kearney						
Equipment	Dip meter and gas monitor						
	Peak / Steady State Readings						
Location ID	**BH01**						
Water Level (mbgl)	4.05m						
Gas Flow (l/hr)							
CH4 (%)	0.0						
CO2 (%)	0.4						
O2 (%)	18.2						
CO (ppm)	0.0						
H2S (ppm)	0.0						
Balance (%)	81.4						
Barometric Pressure (mbar)	1016						
Weather/Temp.	Dry						
Location ID	**BH05**						
Time (sec)							
Water Level (mbgl)	4.40m						
Gas Flow (l/hr)							
CH4 (%)	0.0						
CO2 (%)	0.2						
O2 (%)	18.8						
CO (ppm)	0.0						
H2S (ppm)	0.0						
Balance (%)	81.0						
Barometric Pressure (mbar)	1016						
Weather/Temp.	Dry						
Location ID	**BH07**						
Time (sec)							
Water Level (mbgl)	3.25						
Gas Flow (l/hr)							
CH4 (%)	0.0						
CO2 (%)	0.2						
O2 (%)	18.8						
CO (ppm)	0.0						
H2S (ppm)	0.0						
Balance (%)	81.0						
Barometric Pressure (mbar)	1013						
Weather/Temp.	Dry						
Comments							

Gas & Groundwater Monitoring

Site Location	Airton Road, Tallaght					
Project No.	21613					
Client	Barrett Mahoney Chartered Engineers					
Date	04-Jul-19					
Engineer	E. Kearney					
Equipment	Dip meter and gas monitor					
	Peak / Steady State Readings					
Location ID	**BH01**					
Water Level (mbgl)	3.5m					
Gas Flow (l/hr)						
CH4 (%)	0.0					
CO2 (%)	0.6					
O2 (%)	18.0					
CO (ppm)	0.0					
H2S (ppm)	0.0					
Balance (%)	81.4					
Barometric Pressure (mbar)	1013					
Weather/Temp.	Dry					
Location ID	**BH05**					
Time (sec)						
Water Level (mbgl)	3.8					
Gas Flow (l/hr)						
CH4 (%)	0.0					
CO2 (%)	0.1					
O2 (%)	18.8					
CO (ppm)	0.0					
H2S (ppm)	0.0					
Balance (%)	81.1					
Barometric Pressure (mbar)	1013					
Weather/Temp.	Dry					
Location ID	**BH07**					
Time (sec)						
Water Level (mbgl)	2.3					
Gas Flow (l/hr)						
CH4 (%)	0.0					
CO2 (%)	0.0					
O2 (%)	20.1					
CO (ppm)	0.0					
H2S (ppm)	0.0					
Balance (%)	79.9					
Barometric Pressure (mbar)	1013					
Weather/Temp.	Dry					
Comments						

III Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	TRIAL PIT NO.	TP01
		SHEET	Sheet 1 of 1
LOGGED BY	E. Kearney	CO-ORDINATES	
		DATE STARTED	27/05/2019
		DATE COMPLETED	27/05/2019
CLIENT	Airton Road Properties Ltd.	GROUND LEVEL (m)	
ENGINEER	Barrett Mahony CE	EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 CONCRETE with a plastic membrane underneath.									
Stiff dark brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a medium subangular to subrounded cobble content.		0.20			AA118502	B	0.50		
					AA118503	B	1.00		
Very stiff black sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble and boulder content which are >600mm in size.		2.10			AA118504	B	2.00		
OBSTRUCTION End of Trial Pit at 2.90m		2.90		1 (Seepage)	AA118505	B	2.90		

Groundwater Conditions
Seepage at 2.80m.

Stability
Stable

General Remarks
CAT scanned location.

IGSL TP LOG 21813.GPJ IGSL.GDT 6/6/19

TRIAL PIT RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	TRIAL PIT NO.	TP02
		SHEET	Sheet 1 of 1
LOGGED BY	E. Kearney	CO-ORDINATES	
		DATE STARTED	27/05/2019
		DATE COMPLETED	27/05/2019
CLIENT	Airton Road Properties Ltd.	GROUND LEVEL (m)	
ENGINEER	Barrett Mahony CE	EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 CONCRETE with a plastic membrane underneath.									
Stiff dark brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a medium subangular to subrounded cobble and boulder content which are >600mm in size.		0.20			AA113509	B	0.50		
					AA113510	B	1.00		
					AA113511	B	2.00		
Very stiff black sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble and boulder content which are >600mm in size.		2.80		1 (Seepage)					
OBSTRUCTION End of Trial Pit at 3.00m		3.00			AA113512	B	3.00		

Groundwater Conditions
Seepage at 2.90m.

Stability
Stable

General Remarks
CAT scanned location.

IGSL TP LOG 21813.GPJ IGSL.GDT 6/6/19

TRIAL PIT RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	TRIAL PIT NO.	TP03
		SHEET	Sheet 1 of 1
LOGGED BY	E. Kearney	DATE STARTED	24/05/2019
	CO-ORDINATES	DATE COMPLETED	24/05/2019
CLIENT	Airton Road Properties Ltd.	EXCAVATION METHOD	JCB
ENGINEER	Barrett Mahony CE	GROUND LEVEL (m)	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 CONCRETE (Large bricks)		0.05							
TOPSOIL		0.30							
Stiff dark grey brown gravelly CLAY. Gravel is fine to coarse and subangular to subrounded. Has a medium subrounded cobble content. (Possible made ground).		0.50			AA99943	B	0.50		
Stiff brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and angular. Has a low subangular to subronded cobble and boulder content which are >600mm in size. (Possible made ground).					AA99944	B	1.00		
1.0									
2.0					AA99945	B	2.00		
Very stiff black sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble and boulder content which are >600mm in size.		2.20							
End of Trial Pit at 2.40m		2.40			AA99946	B	2.40		
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location.

IGSL TP LOG 21813.GPJ IGSL.GDT 6/6/19

TRIAL PIT RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	TRIAL PIT NO.	TP04
		SHEET	Sheet 1 of 1
LOGGED BY	E. Kearney	DATE STARTED	24/05/2019
	CO-ORDINATES	DATE COMPLETED	24/05/2019
CLIENT	Airton Road Properties Ltd.	EXCAVATION METHOD	JCB
ENGINEER	Barrett Mahony CE	GROUND LEVEL (m)	

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 sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. (Possibly made ground).		0.30			AA99938	B	0.50		
Stiff grey brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble and boulder content which are >400mm in size. (Possibly made ground).		0.80		(Seepage)	AA99939	B	1.00		
1.0									
2.0					AA99940	B	2.00		
Stiff black sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble and boulder content which are >700mm in size.		2.50			AA99942	B	2.50		
OBSTRUCTION End of Trial Pit at 2.90m		2.90			AA99941	B	2.90		
3.0									
4.0									

Groundwater Conditions
Seepage at 1.80m.

Stability
Stable

General Remarks
CAT scanned location.

IGSL TP LOG 21813.GPJ IGSL.GDT 6/6/19

TRIAL PIT RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	TRIAL PIT NO.	TP05
		SHEET	Sheet 1 of 1
LOGGED BY	E. Kearney	DATE STARTED	27/05/2019
		DATE COMPLETED	27/05/2019
CLIENT	Airton Road Properties Ltd.	EXCAVATION METHOD	JCB
ENGINEER	Barrett Mahony CE		
CO-ORDINATES			
GROUND LEVEL (m)			

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 CONCRETE with a plastic membrane underneath.									
Stiff dark brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a medium subangular to subrounded cobble content.		0.20			AA113513	B	0.50		
					AA113514	B	1.00		
					AA113515	B	2.00		
OBSTRUCTION End of Trial Pit at 2.50m		2.50							

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location.

IGSL TP LOG 21813.GPJ IGSL.GDT 6/6/19

TRIAL PIT RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	TRIAL PIT NO.	TP06
		SHEET	Sheet 1 of 1
LOGGED BY	E. Kearney	DATE STARTED	27/05/2019
		DATE COMPLETED	27/05/2019
CLIENT	Airton Road Properties Ltd.	EXCAVATION METHOD	JCB
ENGINEER	Barrett Mahony CE		
CO-ORDINATES			
GROUND LEVEL (m)			

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 CONCRETE with a plastic membrane underneath.									
Stiff dark brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a medium subangular to subrounded cobble content.		0.20			AA113516	B	0.50		
					AA113517	B	1.00		
					AA113518	B	2.00		
Very stiff black sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble and boulder content which are >600mm in size.		2.90			AA113519	B	3.00		
OBSTRUCTION End of Trial Pit at 3.10m		3.10							

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location.

IGSL TP LOG 21813.GPJ IGSL.GDT 6/6/19

TRIAL PIT RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	TRIAL PIT NO.	TP07
		SHEET	Sheet 1 of 1
LOGGED BY	E. Kearney	DATE STARTED	24/05/2019
		DATE COMPLETED	24/05/2019
CLIENT	Airton Road Properties Ltd.	EXCAVATION METHOD	JCB
ENGINEER	Barrett Mahony CE		

CO-ORDINATES

GROUND LEVEL (m)

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: Firm brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble content. Contains infrequent red brick fragments.		0.30			AA99935	B	0.50		
Firm brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble content. (Possibly made ground).		0.60			AA99936	B	1.00		
1.0 Stiff dark brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular. Has a low subangular to subrounded cobble and boulder content which are >500mm in size. (Possibly made ground)		0.90							
2.0					AA99937	B	2.00		
OBSTRUCTION End of Trial Pit at 2.30m		2.30							
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location.

IGSL TP LOG 21813.GPJ IGSL.GDT 6/6/19

TRIAL PIT RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	TRIAL PIT NO.	TP08
		SHEET	Sheet 1 of 1
LOGGED BY	E. Kearney	DATE STARTED	24/05/2019
		DATE COMPLETED	24/05/2019
CLIENT	Airton Road Properties Ltd.	EXCAVATION METHOD	JCB
ENGINEER	Barrett Mahony CE		

CO-ORDINATES

GROUND LEVEL (m)

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TARMACADAM		0.10							
MADE GROUND comprised of: Dense grey coarse angular GRAVEL. (HARDCORE).		0.40			AA99931	B	0.50		
MADE GROUND comprised of: Firm to stiff brown slightly sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular. Has a low subangular to subrounded cobble and boulder content which are >500mm in size. Contains infrequent rebar, plastic and red brick fragments.		0.90			AA99932	B	1.00		
1.0 Firm to stiff brown slightly sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular. Has a low subangular to subrounded cobble and boulder content which are >500mm in size. (Possibly made ground).									
2.0				(Seepage)	AA99933	B	2.00		
Stiff black sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble and boulder content which are >700mm in size.		2.30							
OBSTRUCTION End of Trial Pit at 2.80m		2.80			AA99934	B	2.80		
3.0									
4.0									

Groundwater Conditions
Seepage at 2.10m.

Stability
Stable

General Remarks
CAT scanned location.

IGSL TP LOG 21813.GPJ IGSL.GDT 6/6/19

TRIAL PIT RECORD

REPORT NUMBER 21813

CONTRACT	Airton Road, Tallaght	TRIAL PIT NO.	TP09
		SHEET	Sheet 1 of 1
LOGGED BY	E. Kearney	CO-ORDINATES	
		DATE STARTED	24/05/2019
		DATE COMPLETED	24/05/2019
CLIENT	Airton Road Properties Ltd.	GROUND LEVEL (m)	
ENGINEER	Barrett Mahony CE	EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
TARMACADAM		0.10							
MADE GROUND comprised of: Dense grey coarse angular GRAVEL. (HARDCORE).		0.30							
Firm to stiff brown slightly sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular. Has a low subangular to subrounded cobble and boulder content which are >500mm in size. (Possibly made ground).					AA99927	B	0.50		
					AA99928	B	1.00		
				(Seepage)	AA99929	B	2.00		
Stiff black sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble and boulder content which are >700mm in size.		2.60			AA99930	B	3.00		
End of Trial Pit at 3.50m		3.50							

Groundwater Conditions
Seepage at 2.10m.

Stability
Stable

General Remarks
CAT scanned location.

IGSL TP LOG 21813.GPJ IGSL.GDT 8/8/19

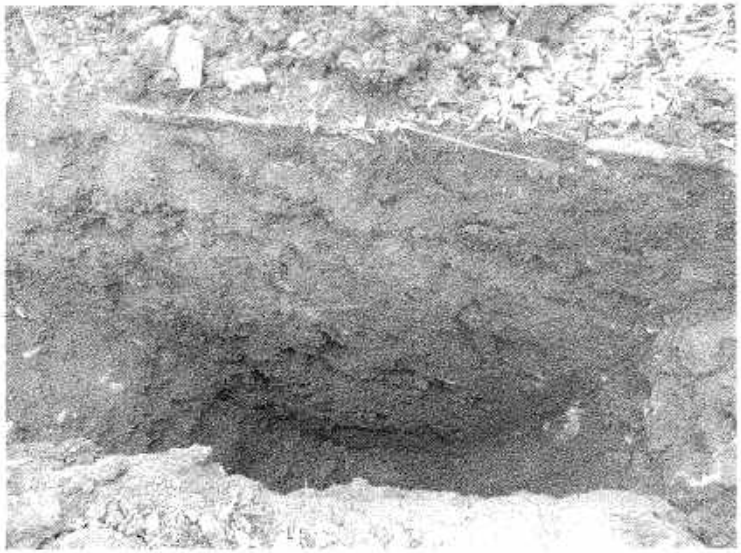
Avonmore, Delgany
Report No: 21813

TP01 Photo 1

TP02 Photo 1 of 2

TP02 Photo 2 of 2

TP03 Photo 1 of 2

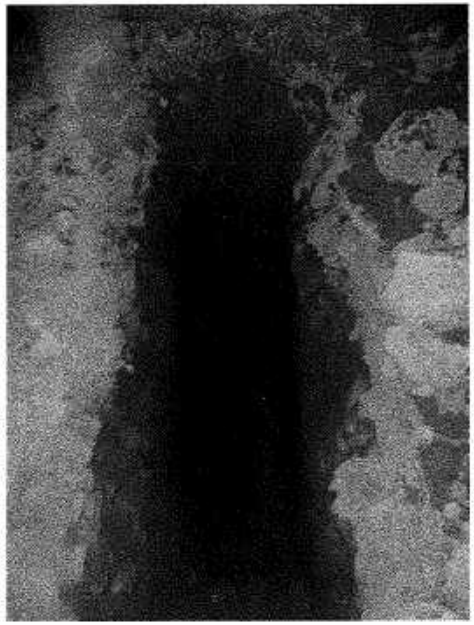


Avonmore, Delgany
Report No: 21813

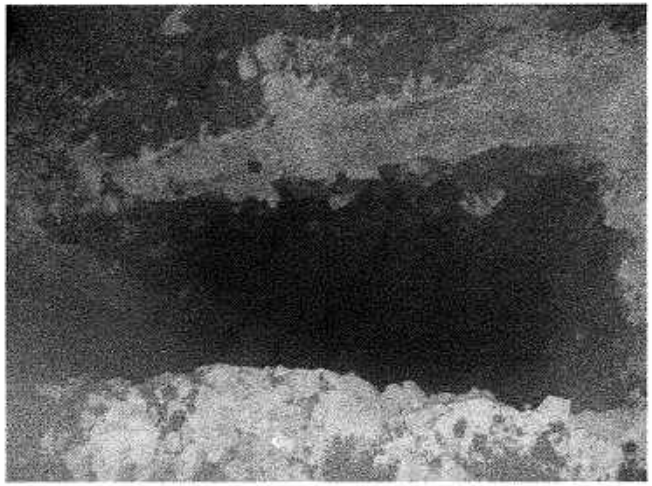
TP03 Photo 2 of 2

TP04 Photo 1

TP05 Photo 1

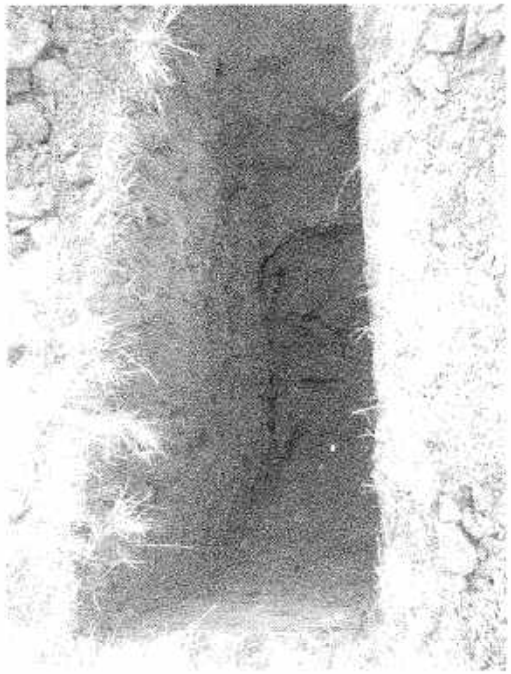


TP06 Photo 1



Avonmore, Delgany
Report No: 21813

TP07 Photo 1 of 2



TP07 Photo 2 of 2

TP08 Photo 1 of 2

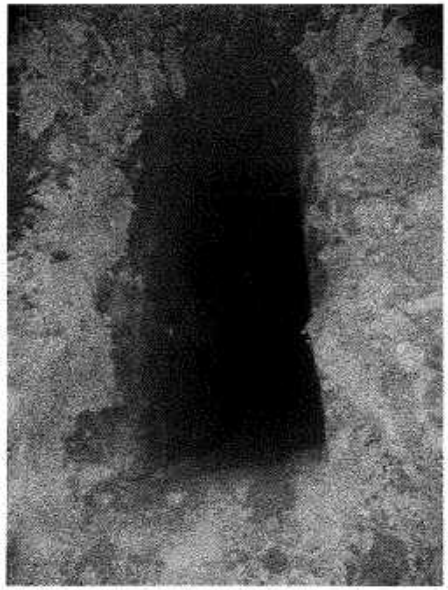
TP08 Photo 2 of 2

Avonmore, Delgany
Report No: 21813

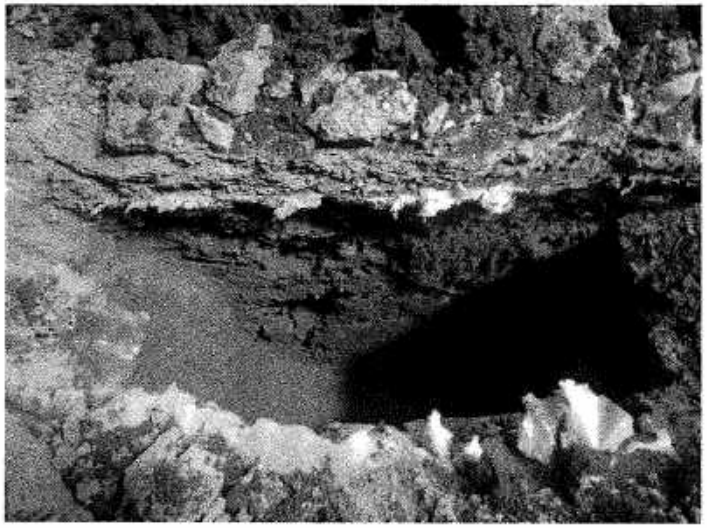
TP09 Photo 1 of 2

TP09 Photo 2 of 2

TP01 Photo 1



TP02 Photo 1 of 2



Avonmore, Delgany
Report No: 21813

TP02 Photo 2 of 2

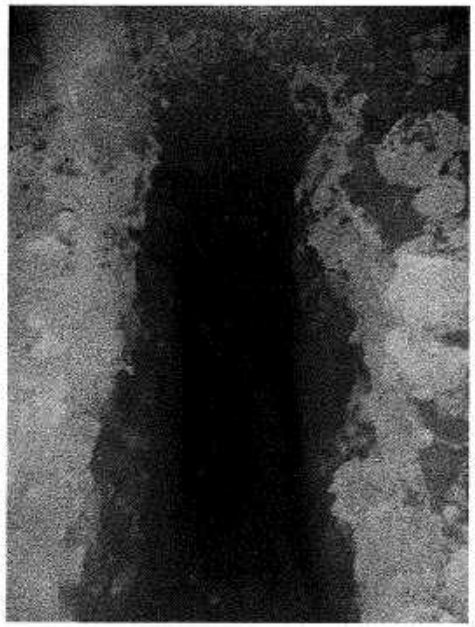
TP03 Photo 1 of 2

TP03 Photo 2 of 2

TP04 Photo 1

Avonmore, Delgany
Report No: 21813

TP05 Photo 1



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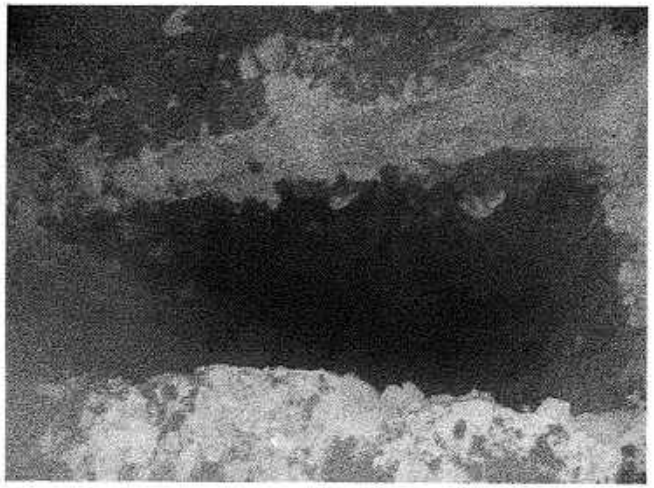
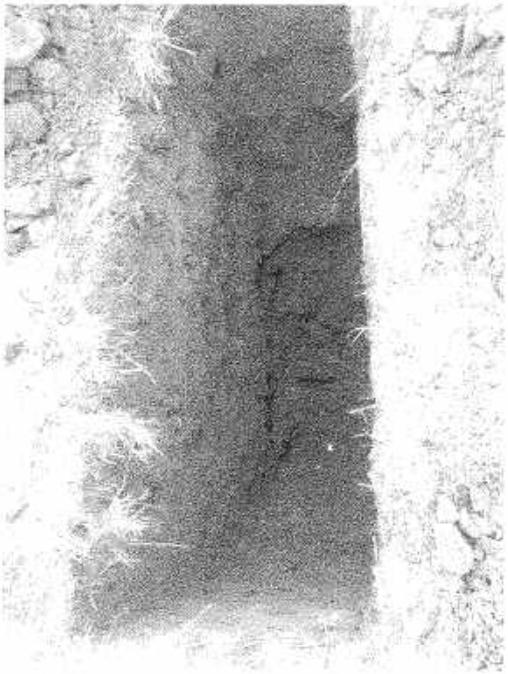


TP07 Photo 1 of 2



TP07 Photo 2 of 2

Avonmore, Delgany
Report No: 21813

TP08 Photo 1 of 2

TP08 Photo 2 of 2

TP09 Photo 1 of 2

TP09 Photo 2 of 2

IV Plate Bearing Tests

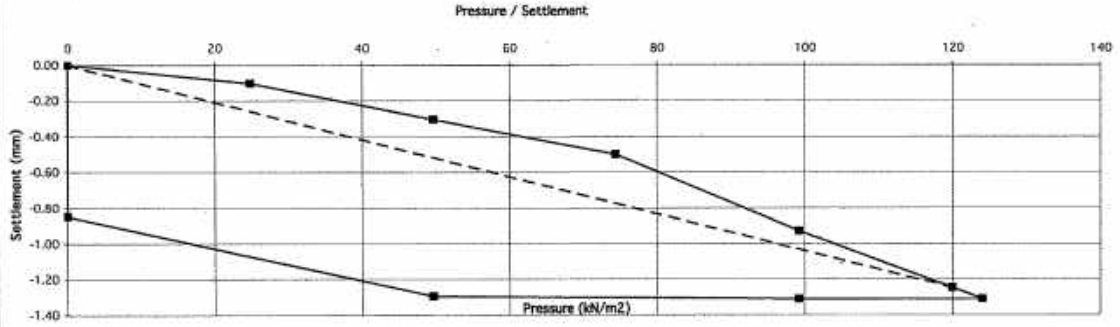
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102082
Contract	Airton Road
Test No.	PBT 1 Load
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	23/5/19

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA99917 & AA99918
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 96
Modulus of subgrade reaction = 62 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 12.2 %

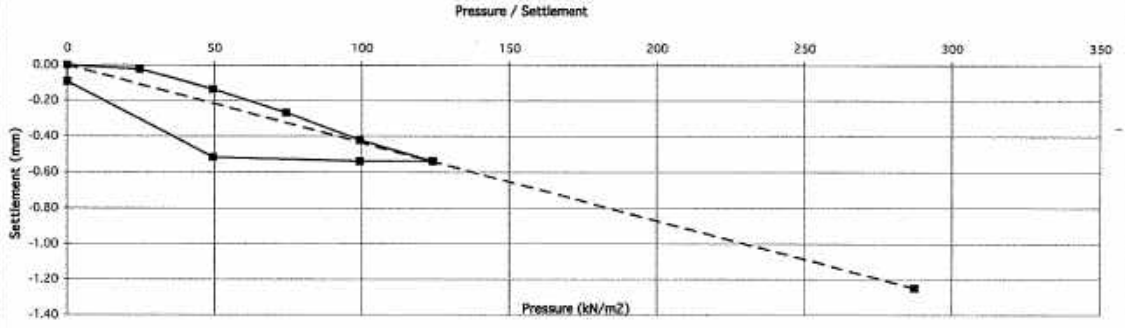
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102082
Contract	Airton Road
Test No.	PBT 1 Reload
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	23/05/2019

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA99917 & AA99918
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 230
Modulus of subgrade reaction = 148 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 55.5 %

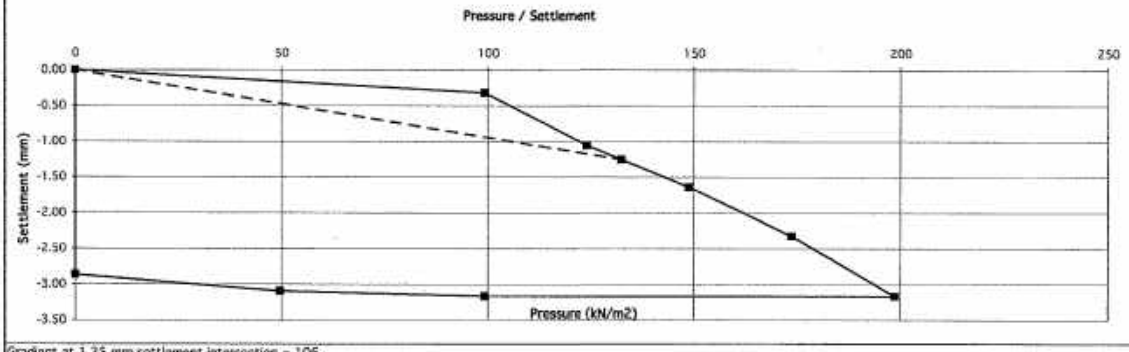
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102082
Contract	Airton Road
Test No.	PBT 1 Reload
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	23/05/2019

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA99919 & AA99920
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 106
Modulus of subgrade reaction = 68 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 14.5 %

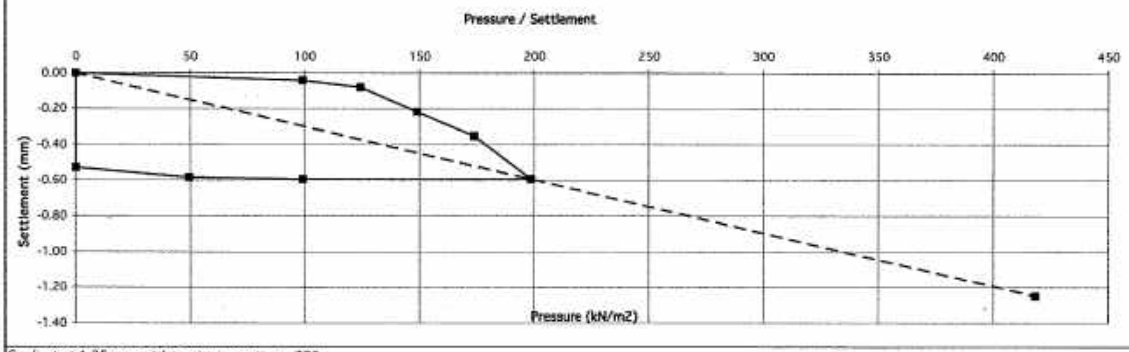
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102083
Contract	Airton Road
Test No.	PBT 2 Reload
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	23/05/2019

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA99919 & AA99920
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 335
Modulus of subgrade reaction = 215 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 106.4 %

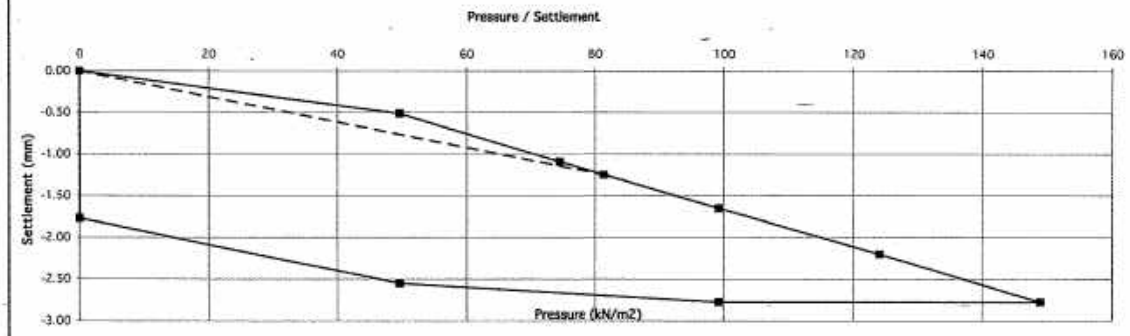
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R102084
Contract	Airton Road
Test No.	PBT 3 Load
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	23/05/2019

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA94949 & AA94950
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 65
Modulus of subgrade reaction = 42 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 6.2 %

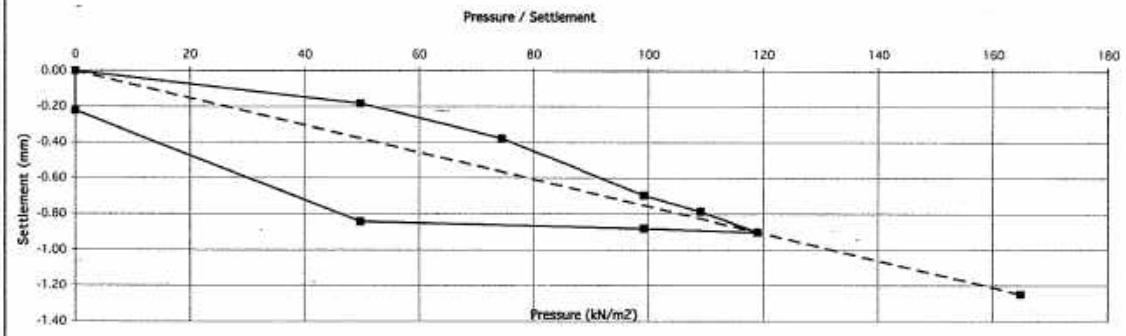
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R102084
Contract	Airton Road
Test No.	PBT 3 Reload
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	23/05/2019

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA94949 & AA94950
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 132
Modulus of subgrade reaction = 85 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 21.2 %

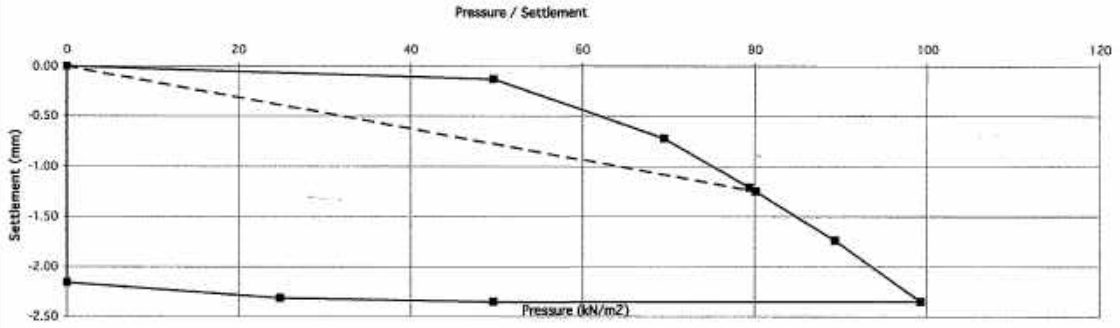
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102085
Contract	Airton Road
Test No.	PBT 4 Load
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	24/5/19

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA94947 & AA94948
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 64
Modulus of subgrade reaction = 41 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 6.1 %

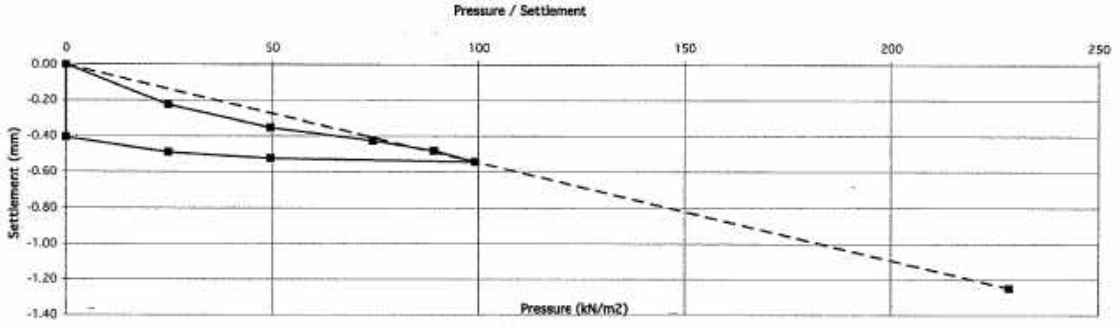
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102085
Contract	Airton Road
Test No.	PBT 4 Reload
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	24/05/2019

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA94947 & AA94948
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 183
Modulus of subgrade reaction = 117 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 37.3 %

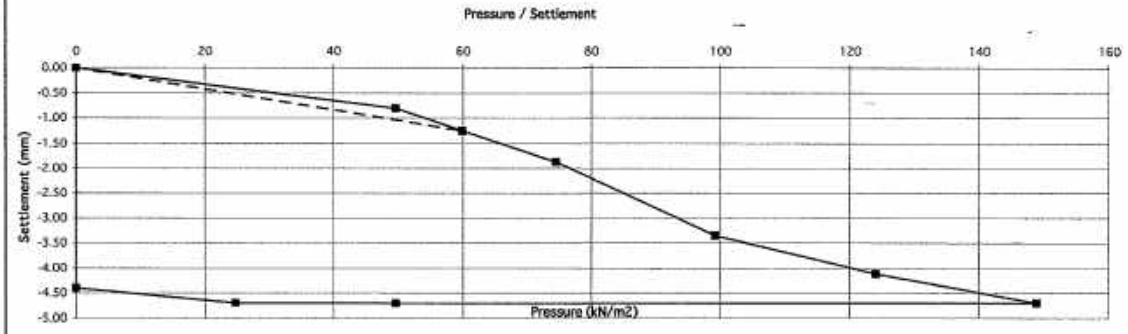
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102086
Contract	Airton Road
Test No.	PBT 5 Load
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Data	23/05/2019

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA99921& AA99922
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 48
Modulus of subgrade reaction = 31 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.7 %

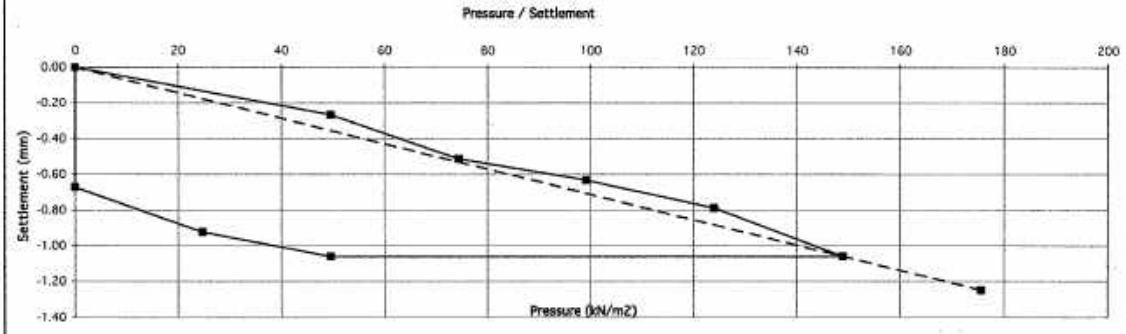
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102086
Contract	Airton Road
Test No.	PBT 5 Reload
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	23/05/2019

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA99921& AA99922
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 141
Modulus of subgrade reaction = 90 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 23.6 %

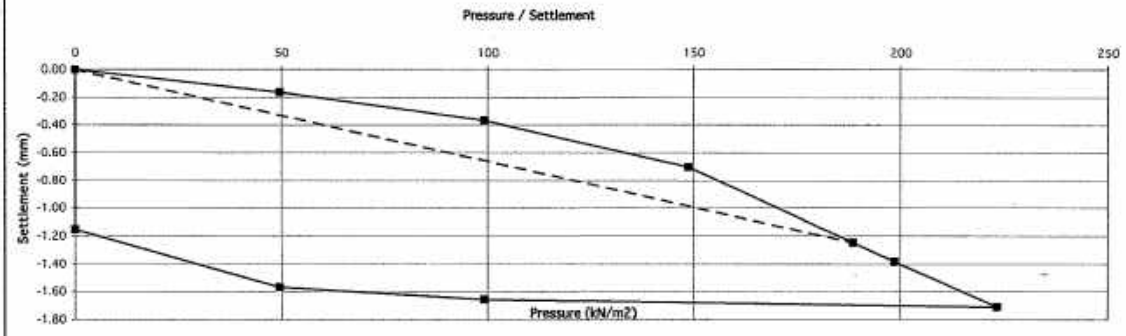
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102087
Contract	Airton Road
Test No.	PBT 6 Load
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	23/05/2019

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA99923 & AA99924
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 151
Modulus of subgrade reaction = 97 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 26.7 %

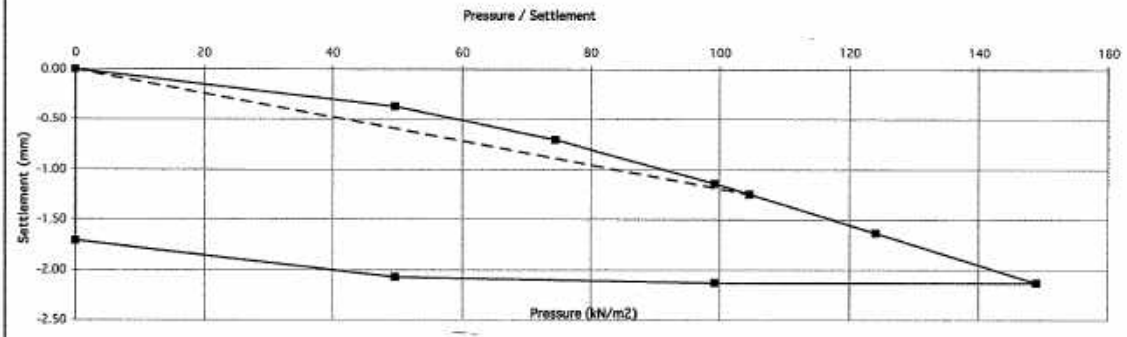
PLATE TEST REPORT SHEET (F3.1)

Reference No.	R102088
Contract	Airton Road
Test No.	PBT 7 Load
Location	Tallaght
Depth	0.50
Client	Marrett Mahony CE
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	E. Kearney
Authorised by	
Date	24/05/2019

Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)
MADE GROUND: Firm brown sandy gravelly CLAY.

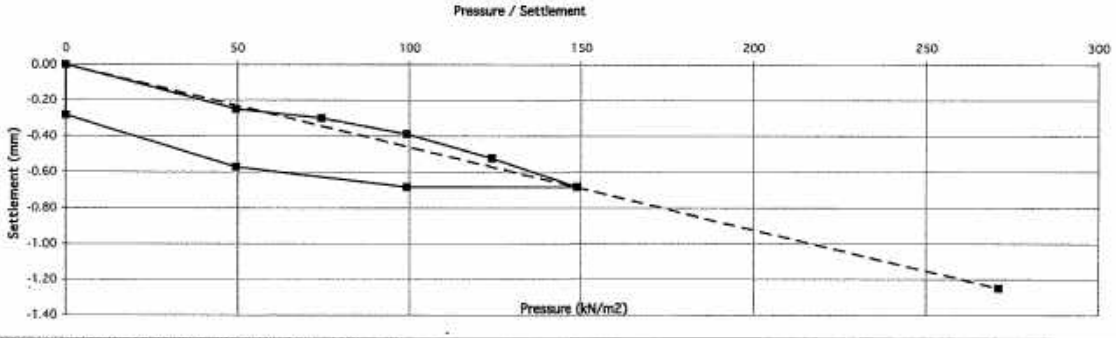
Easting (m)
Northing (m)
Ground Level (mOD)
Sample Ref No. AA99925 & AA99926
Depth 0.5 & 1 m bgl



Gradient at 1.25 mm settlement intersection = 84
Modulus of subgrade reaction = 54 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 9.6 %

PLATE TEST REPORT SHEET (F3.1)		Applied Pressure/Settlement Curve
Reference No.	R102088	
Contract	Airton Road	Description of soil under test (natural soil, placed fill, sub-base)
Test No.	PBT 7 Reload	MADE GROUND: Firm brown sandy gravelly CLAY.
Location	Tallaght	
Depth	0.50	Easting (m)
Client	Marrett Mahony CE	Northing (m)
Plate Diameter:	450 mm	Ground Level (mOD)
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test	Sample Ref No. AA99925 & AA99926
Technician	E. Kearney	Depth 0.5 & 1 m bgl
Authorised by		
Date	24/05/2019	



Gradient at 1.25 mm settlement intersection = 217
Modulus of subgrade reaction = 139 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 50.2 %

Appendix V Percolation

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

Contract: Airton Rd, Tallaght Contract No. 21813
Test No. SA01
Client Barrett Mahony CE
Date: 28.05.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	Dry
0.30	0.90	MADE GROUND: Firm brown mottled grey sandy gravelly CLAY. Has a low subangular to subrounded cobble content. Contains infrequent plastic and concrete block fragments.	
0.90	2.00	Stiff brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble content.	

Field Data

Depth to Water (m)	Elapsed Time (min)
1.40	0.00
1.40	1.00
1.40	2.00
1.40	3.00
1.40	4.00
1.40	5.00
1.40	10.00
1.40	15.00
1.40	20.00
1.40	25.00
1.40	30.00
1.40	40.00
1.40	60.00

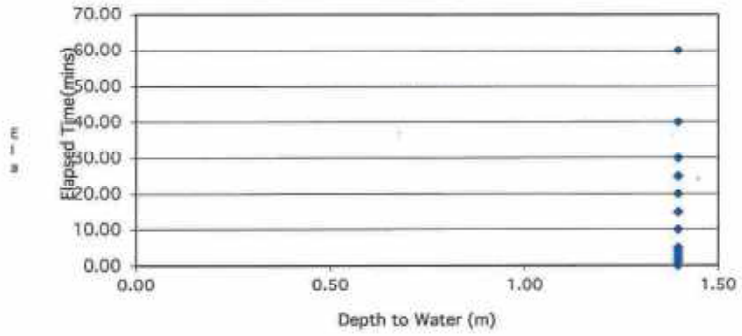
Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.30	m
Length of Pit (L)	1.20	m
Initial depth to Water =	1.40	m
Final depth to water =	1.40	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.36	m2
*Av. side area of permeable stratum over test perio	1.8	m2
Total Exposed area =	2.16	m2

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

f= 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



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

Contract: Airton Rd, Tallaght Contract No. 21813
Test No. SA02
Client Barrett Mahony CE
Date: 28.05.2019

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	Dry
0.20	0.90	MADE GROUND: Firm brown mottled grey sandy gravelly CLAY. Has a low subangular to subrounded cobble content. Contains infrequent red brick fragments.	
0.90	2.00	Stiff brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a low subangular to subrounded cobble content.	

Field Data

Depth to Water (m)	Elapsed Time (min)
1.10	0.00
1.10	1.00
1.10	2.00
1.10	3.00
1.10	4.00
1.10	5.00
1.10	10.00
1.10	15.00
1.10	20.00
1.10	25.00
1.10	30.00
1.10	40.00
1.10	60.00

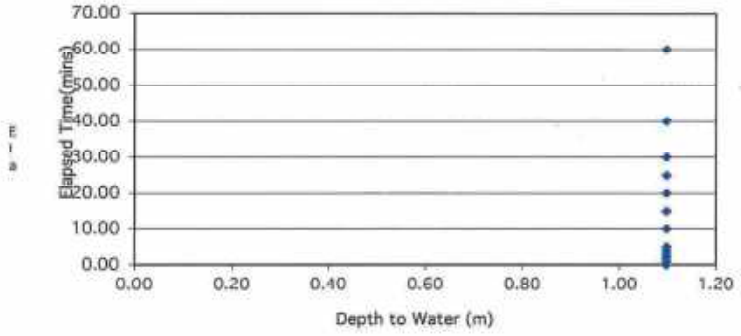
Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.30	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.10	m
Final depth to water =	1.10	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.45	m2
*Av. side area of permeable stratum over test perio	3.24	m2
Total Exposed area =	3.69	m2

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

f= 0 m/min or 0 m/sec

Depth of water vs Elapsed Time (mins)



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

Contract:	Airton Rd, Tallaght	Contract No.	21813
Test No.	SA03		
Client	Barrett Mahony CE		
Date:	28.05.2019		

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Concrete	Dry
0.20	2.00	MADE GROUND: Stiff brown sandy gravelly CLAY. Sand is medium. Gravel is fine to coarse and subangular to subrounded. Has a medium subangular to subrounded cobble content.	

Field Data

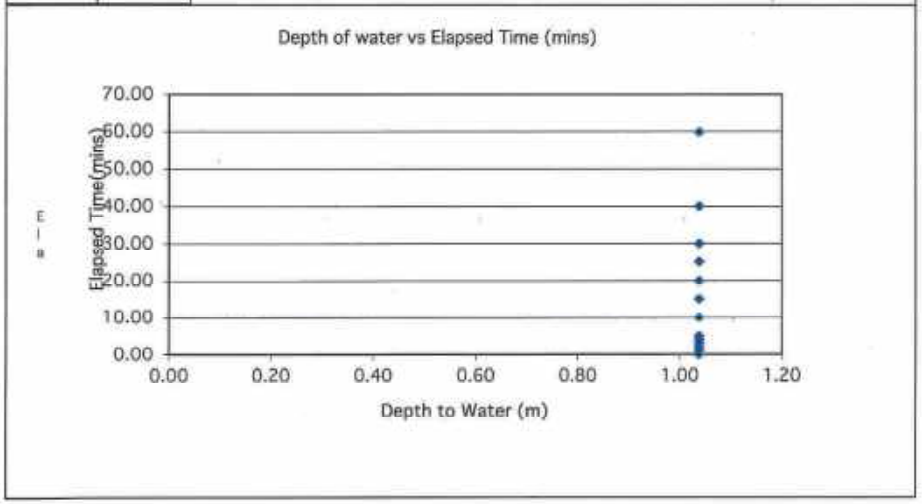
Depth to Water (m)	Elapsed Time (min)
1.04	0.00
1.04	1.00
1.04	2.00
1.04	3.00
1.04	4.00
1.04	5.00
1.04	10.00
1.04	15.00
1.04	20.00
1.04	25.00
1.04	30.00
1.04	40.00
1.04	60.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.30	m
Length of Pit (L)	1.30	m
Initial depth to Water =	1.04	m
Final depth to water =	1.04	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.39	m2
*Av. side area of permeable stratum over test perio	3.072	m2
Total Exposed area =	3.462	m2

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

f= 0 m/min or 0 m/sec



Appendix VI Laboratory

a. Geotechnical

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. **R102259** Contract No. 21813 Contract Name: Airton Road , Tallaght , Dublin

Customer Barrett Mahony Consulting Engineers, Sandwith House, 52-54 Sandwith Street Lower, Dublin 2

Samples Received: 06/06/19 Date Tested: 07/06/19

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	AA99929	2.0	A19/2420	B	11	33	16	17	57	WS	4.4	C L	Grey/brown sandy gravelly CLAY
TP02	AA113512	3.0	A19/2422	B	18	33	16	17	30	WS	4.4	C L	Black slightly sandy, gravelly, CLAY
TP04	AA99940	2.0	A19/2425	B	13	36	17	19	47	WS	4.4	C I	Dark brown sandy gravelly CLAY
TP06	AA113517	1.0	A19/2432	B	12	34	17	17	55	WS	4.4	C L	Dark brown slightly sandy, gravelly, CLAY with some cobbles
TP09	AA99928	1.0	A19/2440	B	15	36	18	18	53	WS	4.4	C I	Brown sandy gravelly CLAY
BH01	AA38091	4.0	A19/2442	B	8.1	30	16	14	53	WS	4.4	C L	Grey clayey, sandy, GRAVEL with many cobbles
BH02	AA38096	4.0	A19/2443	B	9.8	25	NP	NP	58	WS	4.4		Black slightly sandy, slightly gravelly, SILT
BH03	AA117470	3.0	A19/2444	B	8.0	27	14	13	46	WS	4.4	C L	Black sandy gravelly CLAY
BH03	AA117472	5.0	A19/2445	B	9.0	32	15	17	60	WS	4.4	C L	Black slightly sandy, gravelly, CLAY
BH04	AA10699	4.0	A19/2456	B	7.9	28	15	13	34	WS	4.4	C L	Black sandy gravelly CLAY
BH05	AA111406	6.0	A19/2457	0	9.6	25	NP	NP	41	WS	4.4		Black slightly sandy, gravelly, SILT
BH06	AA114412	4.0	A19/2460	B	12	32	16	16	45	WS	4.4	C L	Black sandy gravelly CLAY
BH07	AA114419	5.0	A19/2459	B	3.9	21	NP	NP	33	WS	4.4		Black silty, sandy, GRAVEL with many cobbles

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 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: 25/06/19 | Page: 1 of 1

R102259.PI.xls Tmp: PLII Rev 02/10

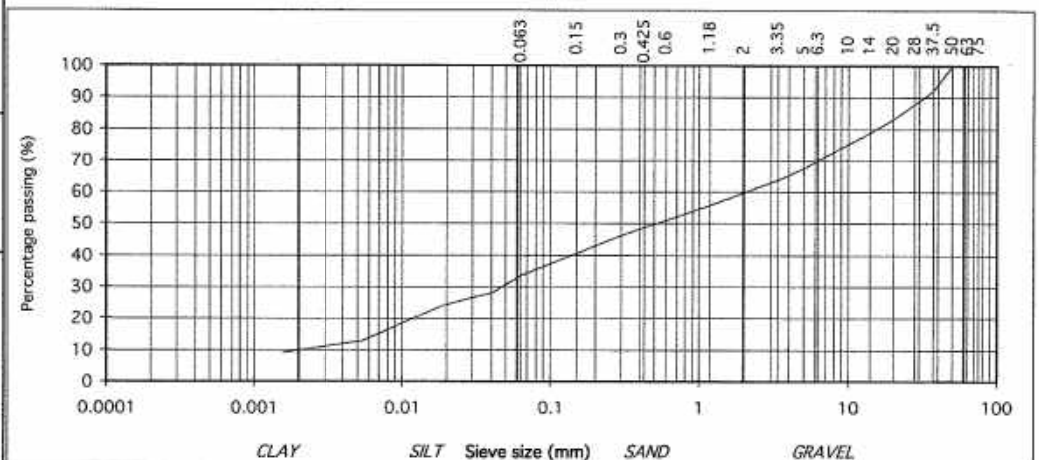
TEST REPORT

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	92	
28	88	
20	83	
14	79	
10	75	
6.3	70	
5	67	
3.35	64	
2	60	
1.18	56	SAND
0.6	51	
0.425	49	
0.3	46	
0.15	41	
0.063	33	SILT/CLAY
0.041	28	
0.029	26	
0.018	24	
0.011	19	
0.008	16	
0.005	13	
0.002	9	

Contract No: 21813 Report No. R102565
Contract: Airton Road , Tallaght , Dublin
BH/TP : TP02
Sample No. AA113512 Lab. Sample No. A19/2422
Sample Type: B
Depth (m) 3.00 Customer: Barrett Mahony Consulting Engineers, Sandwith House, 52-54 Sandwith Street Lower, Dublin 2
Date Received 06/06/2019 Date Testing started 07/06/2019
Description: Black slightly sandy, gravelly, CLAY
Remarks



IGSL Ltd Materials Laboratory

Approved by: | Date: 17/06/19 | Page no: 1 of 1

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

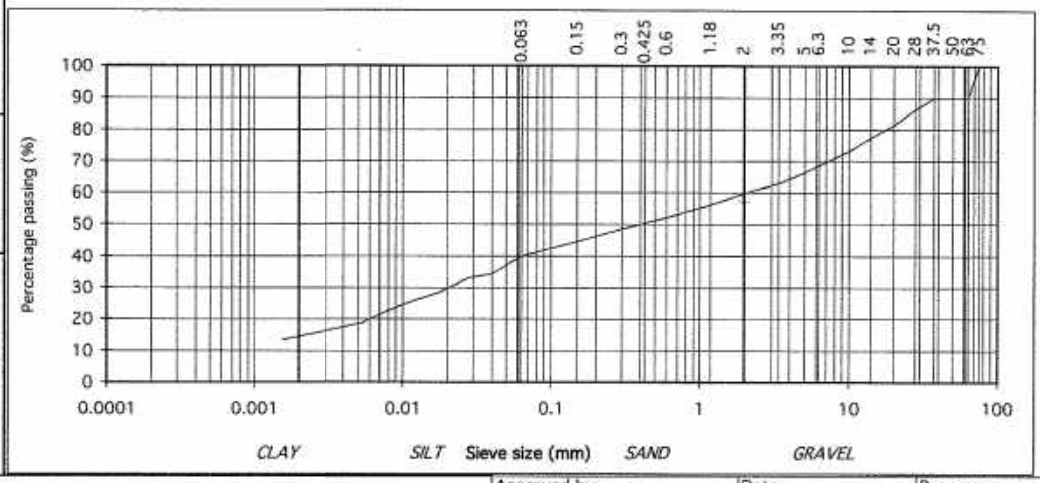
TEST REPORT
Determination of Particle Size Distribution

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

particle size	% passing	
75	100	COBBLES
63	90	
50	90	GRAVEL
37.5	90	
28	87	
20	81	
14	77	
10	73	
6.3	68	
5	66	
3.35	63	
2	60	
1.18	56	SAND
0.6	52	
0.425	50	
0.3	48	
0.15	45	
0.063	40	SILT/CLAY
0.040	34	
0.028	33	
0.018	29	
0.011	25	
0.007	22	
0.005	19	
0.002	13	

Contract No: 21813 Report No. R102566
Contract: Airton Road , Tallaght , Dublin
BH/TP : TP06
Sample No. AA113517 Lab. Sample No. A19?2432
Sample Type: B
Depth (m) 1.00 Customer: Barrett Mahony Consulting Engineers, Sandwith House, 52-54 Sandwith Street Lower, Dublin 2
Date Received 06/06/2019 Date Testing started 07/06/2019
Description: Dark brown slightly sandy, gravelly, CLAY with some cobbles

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	17/06/19	1 of 1

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

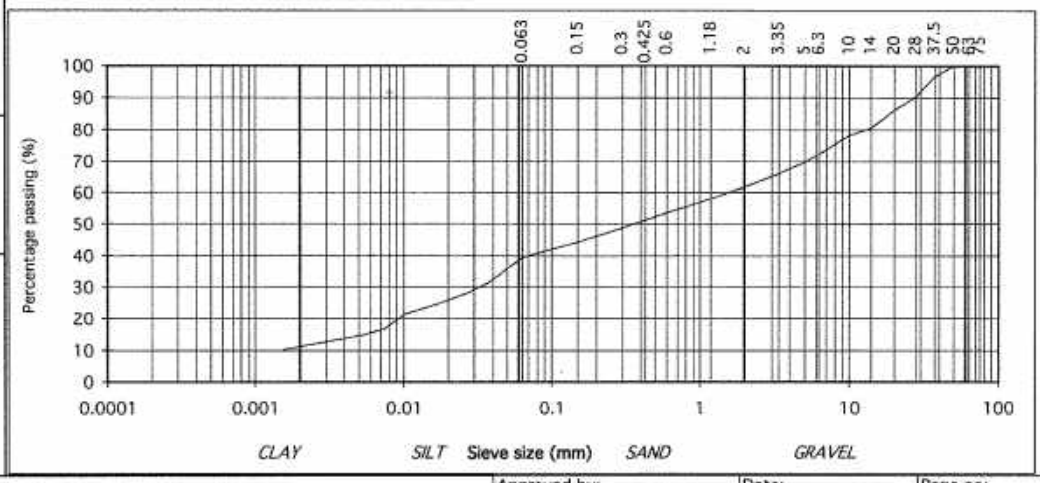
TEST REPORT
Determination of Particle Size Distribution

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	97	
28	90	
20	86	
14	81	
10	78	
6.3	72	
5	70	
3.35	66	
2	62	
1.18	58	SAND
0.6	53	
0.425	51	
0.3	49	
0.15	44	
0.063	39	SILT/CLAY
0.039	32	
0.028	28	
0.018	25	
0.010	21	
0.007	17	
0.005	15	
0.002	10	

Contract No: 21813 Report No. R102567
Contract: Airton Road , Tallaght , Dublin
BH/TP : TP08
Sample No. AA99934 Lab. Sample No. A19/2438
Sample Type: B
Depth (m) 2.80 Customer: Barrett Mahony Consulting Engineers, Sandwith House, 52-54 Sandwith Street Lower, Dublin 2
Date Received 06/06/2019 Date Testing started 07/06/2019
Description: Brown slightly sandy, gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	17/06/19	1 of 1

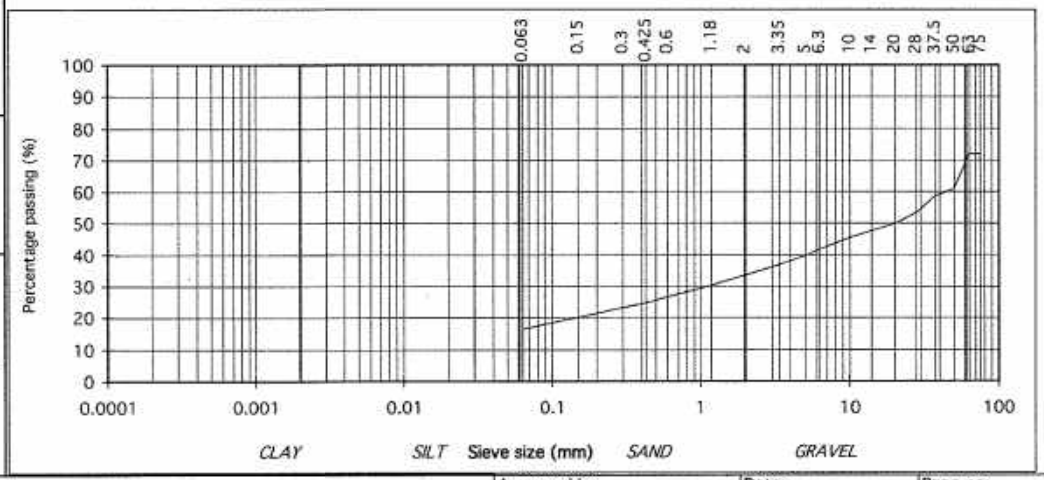
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

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	72	COBBLES
63	72	
50	61	GRAVEL
37.5	59	
28	53	
20	50	
14	48	
10	45	
6.3	42	
5	40	
3.35	37	
2	33	
1.18	30	SAND
0.6	27	
0.425	25	
0.3	23	
0.15	20	
0.063	16	SILT/CLAY

Contract No: 21813 Report No. R1025600
Contract: Airton Road , Tallaght , Dublin
BH/TP : BH01
Sample No. AA38091 Lab. Sample No. A19/2442
Sample Type: B
Depth (m) 4.00 Customer: Barrett Mahony Consulting Engineers, Sandwith House, 52-54 Sandwith Street Lower, Dublin 2
Date Received 06/06/2019 Date Testing started 07/06/2019
Description: Grey clayey, sandy, GRAVEL with many cobbles

Remarks [illegible]



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
[signature]	17/06/19	1 of 1

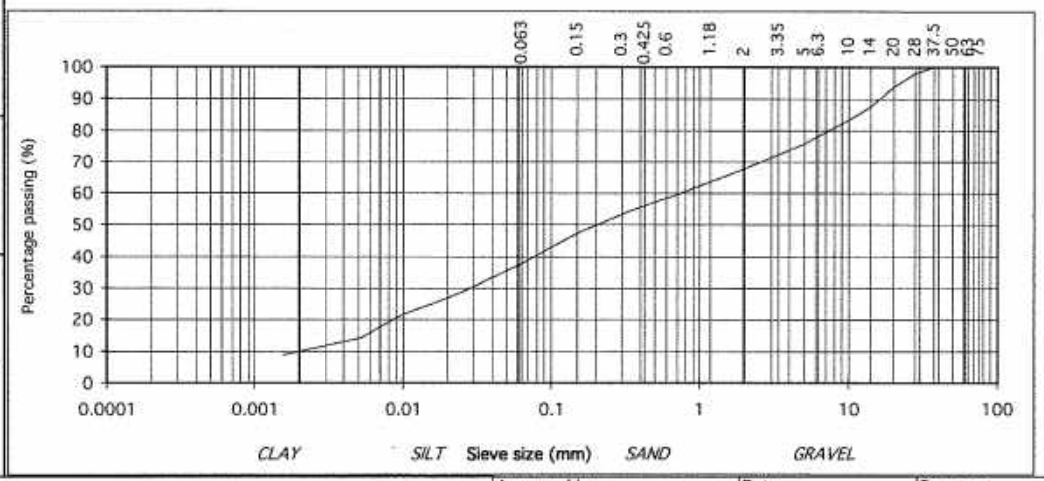
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

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	100	
28	98	
20	94	
14	88	
10	83	
6.3	78	
5	76	
3.35	72	
2	68	
1.18	64	SAND
0.6	58	
0.425	56	
0.3	53	
0.15	47	
0.063	38	SILT/CLAY
0.038	33	
0.027	30	
0.017	26	
0.010	22	
0.007	18	
0.005	14	
0.002	9	

Contract No: 21813 Report No. R102561
Contract: Airton Road , Tallaght , Dublin
BH/TP : BH02
Sample No. AA38096 Lab. Sample No. A19/2448
Sample Type: B
Depth (m) 4.00 Customer: Barrett Mahony Consulting Engineers, Sandwith House, 52-54 Sandwith Street Lower, Dublin 2
Date Received 06/06/2019 Date Testing started 07/06/2019
Description: Black slightly sandy, slightly gravelly, CLAY

Remarks [illegible]



IGSL Ltd Materials Laboratory

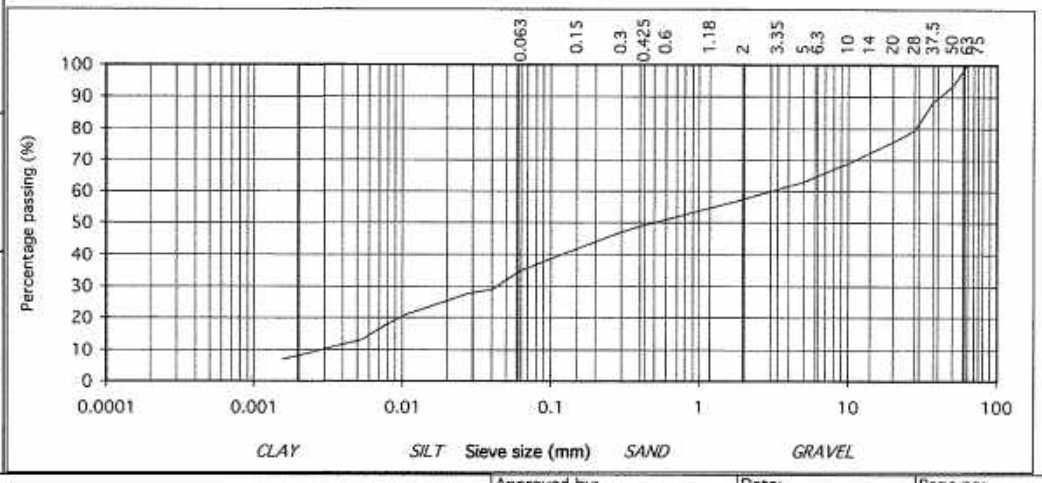
Approved by:	Date:	Page no:
[signature]	17/06/19	1 of 1

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	93	GRAVEL
37.5	88	
28	79	
20	76	
14	72	
10	69	
6.3	65	
5	63	
3.35	61	
2	58	
1.18	55	SAND
0.6	51	
0.425	49	
0.3	47	
0.15	42	
0.063	35	SILT/CLAY
0.040	29	
0.029	28	
0.018	25	
0.011	21	
0.008	17	
0.005	13	
0.002	7	

Contract No: 21813 Report No. R102562
Contract: Airton Road , Tallaght , Dublin
BH/TP : BH03
Sample No. AA117472 Lab. Sample No. A19/2445
Sample Type: B
Depth (m) 5.00 Customer: Barrett Mahony Consulting Engineers, Sandwith House, 52-54 Sandwith Street Lower, Dublin 2
Date Received 06/06/2019 Date Testing started 07/06/2019
Description: Black slightly sandy, gravelly, CLAY
Remarks



IGSL Ltd Materials Laboratory

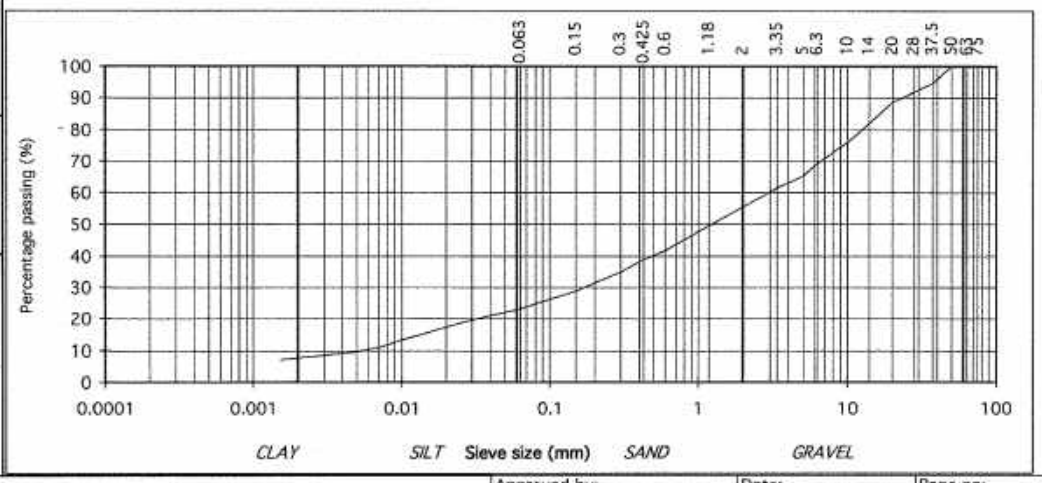
Approved by:	Date:	Page no:
	17/06/19	1 of 1

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	92	
20	89	
14	82	
10	76	
6.3	69	
5	65	
3.35	61	
2	56	
1.18	50	SAND
0.6	42	
0.425	39	
0.3	35	
0.15	29	
0.063	23	SILT/CLAY
0.037	21	
0.027	19	
0.017	16	
0.010	13	
0.007	11	
0.005	10	
0.002	7	

Contract No: 21813 Report No. R102563
Contract: Airton Road , Tallaght , Dublin
BH/TP : BH05
Sample No. AA114406 Lab. Sample No. A19/2457
Sample Type: B
Depth (m) 6.00 Customer: Barrett Mahony Consulting Engineers, Sandwith House, 52-54 Sandwith Street Lower, Dublin 2
Date Received 06/06/2019 Date Testing started 12/06/2019
Description: Black slightly sandy, gravelly, SILT
Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	17/06/19	1 of 1

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

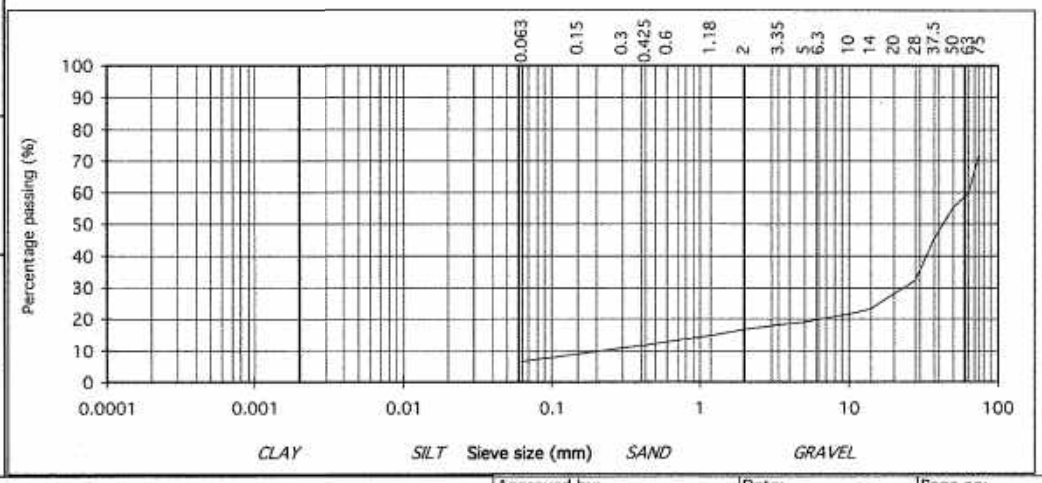
TEST REPORT
Determination of Particle Size Distribution

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

particle size	% passing	
75	72	COBBLES
63	60	
50	55	GRAVEL
37.5	45	
28	32	
20	28	
14	23	
10	21	
6.3	20	
5	19	
3.35	18	
2	17	
1.18	15	SAND
0.6	13	
0.425	12	
0.3	11	
0.15	9	
0.063	7	SILT/CLAY

Contract No: 21813 Report No. R102564
Contract: Airton Road , Tallaght , Dublin
BH/TP : BH07
Sample No. AA114419 Lab. Sample No. A19/2459
Sample Type: B
Depth (m) 5.00 Customer: Barrett Mahony Consulting Engineers, Sandwith House, 52-54 Sandwith Street Lower, Dublin 2
Date Received 06/06/2019 Date Testing started 07/06/2019
Description: Black silty, sandy, GRAVEL with many cobbles

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
	17/06/19	1 of 1

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

Appendix VI Laboratory

b. Environmental and Chemical

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

UKAS TESTING 2183

Final Report

Report No.:	19-19643-1
Initial Date of Issue:	19-Jun-2019
Client	IGSL
Client Address:	M7 Business Park Naas County Kildare Ireland
Contact(s):	Darren Keogh
Project	21813 Airton Road, Tallaght, Dublin (BMCE)
Quotation No.:	**Date Received:** 11-Jun-2019
Order No.:	**Date Instructed:** 12-Jun-2019
No. of Samples:	28
Turnaround (Wkdays):	5 **Results Due:** 18-Jun-2019
Date Approved:	18-Jun-2019
Approved By:	
Details:	Robert Monk, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL														
Chemtest Job No.:			19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:	Chemtest Sample ID.:		841051	841052	841054	841055	841056	841057	841058	841059	841060	841061	841062	841063
Order No.:	Client Sample Ref.:		36092	117468	10896	11401	114409	114415	AA099227	AA099228	AA113509	AA113510	AA113511	AA113512
	Sample Location:		BH2	BH3	BH4	BH5	BH6	BH7	TP01	TP01	TP02	TP03	TP03	TP04
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		1.00	1.00	1.00	1.00	1.00	1.00	0.50	1.00	0.50	1.00	0.50	1.00
	Bottom Depth (m):		1.00	1.00	1.00	1.00	1.00	1.00	0.50	1.00	0.50	1.00	0.50	1.00
	Date Sampled:		31-May-2019	31-May-2019	30-May-2019	29-May-2019	30-May-2019	27-May-2019	27-May-2019	27-May-2019	27-May-2019	27-May-2019	27-May-2019	27-May-2019
Determinand	Accred.	SOP	Type	Units	LOD									
Ammonium	U	1220	10:1	mg/l	0.050	0.36	0.34	0.079	0.11	0.16	0.19	0.10	0.12	0.12
Ammonium	N	1220	10:1	mg/kg	0.10	3.6	3.4	0.79	1.1	1.6	1.9	1.0	1.2	1.2
Boron (Dissolved)	U	1450	10:1	µg/l	20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL						Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:						Chemtest Sample ID.:	841062	841063	841064	841065	841066	841067	841069	841070	841071
Order No.:						Client Sample Ref.:		AA99943	AA99944	AA99945	AA99938	AA99939	AA113513	AA113514	AA113515
						Sample Location:	TP02	TP03	TP03	TP03	TP04	TP04	TP05	TP05	TP06
						Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
						Top Depth (m):	2.00	0.50	1.00	2.00	0.50	1.00	0.50	1.00	0.50
						Bottom Depth (m):	2.00	0.50	1.00	2.00	0.50	1.00	0.50	1.00	0.50
						Date Sampled:	24-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019	27-May-2019	27-May-2019	27-May-2019
Determinand	Accred.	SOP	Type	Units	LOD										
Ammonium	U	1220	10:1	mg/l	0.050		0.12	0.13	0.17	0.097	0.12	0.17	0.18	0.13	0.16
Ammonium	N	1220	10:1	mg/kg	0.10		1.2	1.3	1.7	0.97	1.2	1.7	1.8	1.3	1.6
Boron (Dissolved)	U	1450	10:1	µg/l	20		< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL						Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:						Chemtest Sample ID.:	841072	841073	841074	841075	841076	841077	841078
Order No.:						Client Sample Ref.:	AA113518	AA99935	AA99936	AA99931	AA99932	AA99927	AA99929
						Sample Location:	TP06	TP07	TP07	TP08	TP08	TP09	TP09
						Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
						Top Depth (m):	2.00	0.50	1.00	0.50	1.00	0.50	2.00
						Bottom Depth (m):	2.00	0.50	1.00	0.50	1.00	0.50	2.00
						Date Sampled:	24-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019
Determinand	Accred.	SOP	Type	Units	LOD								
Ammonium	U	1220	10:1	mg/l	0.050		0.22	0.17	0.17	0.16	0.12	0.12	0.12
Ammonium	N	1220	10:1	mg/kg	0.10		2.2	1.7	1.7	1.6	1.2	1.2	1.2
Boron (Dissolved)	U	1450	10:1	µg/l	20		< 20	< 20	< 20	< 20	< 20	< 20	< 20
Boron (Dissolved)	U	1450	10:1	mg/kg	0.20		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

Results - Soil

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841051	841052	841053	841054	841055	841056	841057	841058
Order No.:					Client Sample Ref.:	38092	117468	117470	10696	11401	114409	114415	AA99927
					Sample Location:	BH2	BH3	BH3	BH4	BH5	BH6	BH7	TP01
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	1.00	3.00	1.00	1.00	1.00	1.00	0.50
					Bottom Depth (m):	1.00	1.00	3.00	1.00	1.00	1.00	1.00	0.50
					Date Sampled:	31-May-2019	31-May-2019	31-May-2019	30-May-2019	29-May-2019	30-May-2019	27-May-2019	27-May-2019
					Asbestos Lab:	COVENTRY	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD									
ACM Type	U	2192		N/A		-	-		-	-	-	-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A		-	-		-	-	-	-	-
Moisture	N	2030	%	0.020		12	10	8.7	12	5.8	8.6	11	11
pH	U	2010		N/A				8.6					
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		< 0.40	< 0.40		< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010				0.078					
Sulphur (Elemental)	U	2180	mg/kg	1.0		1.3	2.0		1.5	1.2	1.4	2.3	1.7
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50	< 0.50		< 0.50	< 0.50	< 0.50	[B] < 0.50	[B] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		2.7	16		2.4	13	14	13	14
Sulphate (Acid Soluble)	U	2430	%	0.010		< 0.010	< 0.010		0.013	0.020	0.026	0.010	0.029
Arsenic	U	2450	mg/kg	1.0		19	30		23	25	26	26	25
Barium	U	2450	mg/kg	10		42	68		42	44	62	37	48
Cadmium	U	2450	mg/kg	0.10		1.9	2.5		1.8	2.1	2.4	2.1	1.8
Chromium	U	2450	mg/kg	1.0		12	13		13	15	16	13	13
Molybdenum	U	2450	mg/kg	2.0		3.2	4.0		3.8	3.1	3.1	2.8	3.2
Antimony	N	2450	mg/kg	2.0		< 2.0	< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50		21	26		23	27	27	19	24
Mercury	U	2450	mg/kg	0.10		< 0.10	< 0.10		< 0.10	0.33	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50		37	52		44	48	51	37	44
Lead	U	2450	mg/kg	0.50		13	16		16	21	23	13	15
Selenium	U	2450	mg/kg	0.20		0.31	0.45		0.89	0.40	< 0.20	0.21	< 0.20
Zinc	U	2450	mg/kg	0.50		57	68		57	72	74	54	53
Chromium (Trivalent)	N	2490	mg/kg	1.0		12	13		13	15	16	13	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	U	2625	%	0.20		0.49	0.40		0.33	0.59	0.44	0.33	0.29
Mineral Oil	N	2670	mg/kg	10		< 10	< 10		< 10	< 10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0	< 5.0		< 5.0	< 5.0	< 5.0	[E] < 5.0	[E] < 5.0

Results - Soil

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841051	841052	841053	841054	841055	841056	841057	841058
Order No.:					Client Sample Ref.:	38092	117468	117470	10696	11401	114409	114415	AA99927
					Sample Location:	BH2	BH3	BH3	BH4	BH5	BH6	BH7	TP01
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	1.00	3.00	1.00	1.00	1.00	1.00	0.50
					Bottom Depth (m):	1.00	1.00	3.00	1.00	1.00	1.00	1.00	0.50
					Date Sampled:	31-May-2019	31-May-2019	31-May-2019	30-May-2019	29-May-2019	30-May-2019	27-May-2019	27-May-2019
					Asbestos Lab:	COVENTRY	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD									
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0	< 5.0		< 5.0	< 5.0	< 5.0	[E] < 5.0	[E] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		< 10	< 10		< 10	< 10	< 10	[B] < 10	[B] < 10
Benzene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Toluene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Ethylbenzene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
m & p-Xylene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
o-Xylene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	[E] < 1.0	[E] < 1.0
Naphthalene	U	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	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	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	U	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	U	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
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		< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841051	841052	841053	841054	841055	841056	841057	841058
Order No.:					Client Sample Ref.:	38092	117468	117470	10696	11401	114409	114415	AA99927
					Sample Location:	BH2	BH3	BH3	BH4	BH5	BH6	BH7	TP01
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	1.00	3.00	1.00	1.00	1.00	1.00	0.50
					Bottom Depth (m):	1.00	-1.00	3.00	1.00	1.00	1.00	1.00	0.50
					Date Sampled:	31-May-2019	31-May-2019	31-May-2019	30-May-2019	29-May-2019	30-May-2019	27-May-2019	27-May-2019
					Asbestos Lab:	COVENTRY	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD									
PCB 118	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10		< 0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Phenols	U	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: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841059	841060	841061	841062	841063	841064	841065	841066
Order No.:					Client Sample Ref.:	AA99928	AA99929	AA113509		AA99943	AA99944	AA99945	AA99938
					Sample Location:	TP01	TP01	TP02	TP02	TP03	TP03	TP03	TP04
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	2.00	0.50	2.00	0.50	1.00	2.00	0.50
					Bottom Depth (m):	1.00	2.00	0.50	2.00	0.50	1.00	2.00	0.50
					Date Sampled:	27-May-2019	27-May-2019	27-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019
					Asbestos Lab:	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD									
ACM Type	U	2192		N/A		-		-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A		-		-	-	-	-	-	-
Moisture	N	2030	%	0.020		7.2	6.5	9.7	10	10	17	12	16
pH	U	2010		N/A			8.6						
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		< 0.40		< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010			< 0.010						
Sulphur (Elemental)	U	2180	mg/kg	1.0		1.2		1.4	1.4	1.2	1.3	2.8	1.2
Cyanide (Total)	U	2300	mg/kg	0.50		[B] < 0.50		[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		2.8		19	16	16	2.7	15	0.93
Sulphate (Acid Soluble)	U	2430	%	0.010		0.010		< 0.010	< 0.010	< 0.010	0.046	< 0.010	0.029
Arsenic	U	2450	mg/kg	1.0		28		26	28	24	20	23	14
Barium	U	2450	mg/kg	10		41		39	61	37	97	41	76
Cadmium	U	2450	mg/kg	0.10		1.8		1.6	1.9	2.9	4.7	1.9	2.1
Chromium	U	2450	mg/kg	1.0		13		14	12	13	26	13	23
Molybdenum	U	2450	mg/kg	2.0		3.5		3.5	3.7	3.6	4.3	3.6	2.3
Antimony	N	2450	mg/kg	2.0		< 2.0		< 2.0	< 2.0	< 2.0	2.5	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50		23		22	31	22	45	23	27
Mercury	U	2450	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50		42		43	48	44	100	46	50
Lead	U	2450	mg/kg	0.50		15		16	14	15	27	19	20
Selenium	U	2450	mg/kg	0.20		< 0.20		0.42	< 0.20	0.30	0.94	2.4	0.51
Zinc	U	2450	mg/kg	0.50		59		58	70	62	120	62	100
Chromium (Trivalent)	N	2490	mg/kg	1.0		13		14	12	13	26	13	23
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	U	2625	%	0.20		0.29		0.34	0.64	0.33	0.87	0.32	0.65
Mineral Oil	N	2670	mg/kg	10		< 10		< 10	< 10	< 10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		[B] < 5.0		[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0

Results - Soil

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841059	841060	841061	841062	841063	841064	841065	841066
Order No.:					Client Sample Ref.:	AA99928	AA99929	AA113909		AA99943	AA99944	AA99945	AA99936
					Sample Location:	TP01	TP01	TP02	TP02	TP03	TP03	TP03	TP04
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	2.00	0.50	2.00	0.50	1.00	2.00	0.50
					Bottom Depth (m):	1.00	2.00	0.50	2.00	0.50	1.00	2.00	0.50
					Date Sampled:	27-May-2019	27-May-2019	27-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019
					Asbestos Lab:	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD									
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[B] < 5.0		[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[E] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[B] < 10		[B] < 10	[B] < 10	[B] < 10	[B] < 10	[B] < 10	[B] < 10	[E] < 10
Benzene	U	2760	µg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Toluene	U	2760	µg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Ethylbenzene	U	2760	µg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
m & p-Xylene	U	2760	µg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
o-Xylene	U	2760	µg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[E] < 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Naphthalene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[ghi]perylene	U	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 90-101	U	2815	mg/kg	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

Results - Soil

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841059	841060	841061	841062	841063	841064	841065	841066
Order No.:					Client Sample Ref.:	AA99928	AA99929	AA113909		AA99943	AA99944	AA99945	AA99936
					Sample Location:	TP01	TP01	TP02	TP02	TP03	TP03	TP03	TP04
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	2.00	0.50	2.00	0.50	1.00	2.00	0.50
					Bottom Depth (m):	1.00	2.00	0.50	2.00	0.50	1.00	2.00	0.50
					Date Sampled:	27-May-2019	27-May-2019	27-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019	24-May-2019
					Asbestos Lab:	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD									
PCB 118	U	2815	mg/kg	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Phenols	U	2920	mg/kg	0.30	< 0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Results - Soil

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841067	841068	841069	841070	841071	841072	841073	841074
Order No.:					Client Sample Ref.:	AA99939	AA99940	AA113513	AA113514	AA113516	AA113518	AA99935	AA99936
					Sample Location:	TP04	TP04	TP05	TP05	TP06	TP06	TP07	TP07
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	2.00	0.50	1.00	0.50	2.00	0.50	1.00
					Bottom Depth (m):	1.00	2.00	0.50	1.00	0.50	2.00	0.50	1.00
					Date Sampled:	24-May-2019	27-May-2019	27-May-2019	27-May-2019	27-May-2019	24-May-2019	24-May-2019	24-May-2019
					Asbestos Lab:	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD									
ACM Type	U	2192		N/A		-		-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A		-		-	-	-	-	-	-
Moisture	N	2030	%	0.020		11	9.7	19	11	10	7.7	39	8.4
pH	U	2010		N/A			8.6						
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		< 0.40		0.43	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010			< 0.010						
Sulphur (Elemental)	U	2180	mg/kg	1.0		1.2		1.3	1.3	5.1	< 1.0	< 1.0	< 1.0
Cyanide (Total)	U	2300	mg/kg	0.50		[B] < 0.50		[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		9.9		4.5	19	9.6	9.7	6.0	11
Sulphate (Acid Soluble)	U	2430	%	0.010		< 0.010		0.035	0.23	0.016	< 0.010	0.046	< 0.010
Arsenic	U	2450	mg/kg	1.0		21		19	14	25	19	25	27
Barium	U	2450	mg/kg	10		44		93	130	57	42	90	36
Cadmium	U	2450	mg/kg	0.10		1.7		3.4	0.39	2.1	1.4	2.8	1.7
Chromium	U	2450	mg/kg	1.0		12		20	42	18	14	23	12
Molybdenum	U	2450	mg/kg	2.0		3.0		3.4	4.6	3.0	2.5	3.8	3.3
Antimony	N	2450	mg/kg	2.0		< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	2.0	5.1
Copper	U	2450	mg/kg	0.50		21		29	27	26	19	38	20
Mercury	U	2450	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50		39		66	51	49	45	69	40
Lead	U	2450	mg/kg	0.50		15		24	23	15	14	28	16
Selenium	U	2450	mg/kg	0.20		< 0.20		0.49	0.67	< 0.20	< 0.20	0.70	< 0.20
Zinc	U	2450	mg/kg	0.50		58		82	100	62	64	120	51
Chromium (Trivalent)	N	2490	mg/kg	1.0		12		20	42	18	14	23	12
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	U	2625	%	0.20		0.33		0.42	0.27	0.38	0.21	0.87	< 0.20
Mineral Oil	N	2670	mg/kg	10		< 10		< 10	< 10	> 10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		[B] < 5.0		[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0

Chemtest
The right chemistry to deliver results
Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Results - Soil

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841067	841068	841069	841070	841071	841072	841073	841074
Order No.:					Client Sample Ref.:	AA99939	AA99940	AA113513	AA113514	AA113516	AA113518	AA99935	AA99936
					Sample Location:	TP04	TP04	TP05	TP05	TP06	TP06	TP07	TP07
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	2.00	0.50	1.00	0.50	2.00	0.50	1.00
					Bottom Depth (m):	1.00	2.00	0.50	1.00	0.50	2.00	0.50	1.00
					Date Sampled:	24-May-2019	27-May-2019	27-May-2019	27-May-2019	27-May-2019	24-May-2019	24-May-2019	24-May-2019
					Asbestos Lab:	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD									
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		[B] < 5.0		[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		[B] < 10		[B] < 10	[B] < 10	[B] < 10	[B] < 10	[B] < 10	[B] < 10
Benzene	U	2760	µg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Toluene	U	2760	µg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Ethylbenzene	U	2760	µg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
m & p-Xylene	U	2760	µg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
o-Xylene	U	2760	µg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0		[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Naphthalene	U	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	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	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	U	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	U	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
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		< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010		< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010		< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

Chemtest
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Results - Soil

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841067	841068	841069	841070	841071	841072	841073	841074
Order No.:					Client Sample Ref.:	AA99939	AA99940	AA113513	AA113514	AA113516	AA113518	AA99935	AA99936
					Sample Location:	TP04	TP04	TP05	TP05	TP06	TP06	TP07	TP07
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	2.00	0.50	1.00	0.50	2.00	0.50	1.00
					Bottom Depth (m):	1.00	2.00	0.50	1.00	0.50	2.00	0.50	1.00
					Date Sampled:	24-May-2019	27-May-2019	27-May-2019	27-May-2019	27-May-2019	24-May-2019	24-May-2019	24-May-2019
					Asbestos Lab:	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD									
PCB 118	U	2815	mg/kg	0.010		< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010		< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010		< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010		< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Phenols	U	2920	mg/kg	0.30		< 0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

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Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841075	841076	841077	841078
Order No.:					Client Sample Ref.:	AA99931	AA99932	AA99927	AA99929
					Sample Location:	TP08	TP08	TP09	TP09
					Sample Type:	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.00	0.50	2.00
					Bottom Depth (m):	0.50	1.00	0.50	2.00
					Date Sampled:	24-May-2019	24-May-2019	24-May-2019	24-May-2019
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD					
ACM Type	U	2192		N/A		-	-	-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A		-	-	-	-
Moisture	N	2030	%	0.020		13	10	13	10
pH	U	2010		N/A					
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		< 0.40	< 0.40	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010					
Sulphur (Elemental)	U	2180	mg/kg	1.0		52	< 1.0	1.0	1.3
Cyanide (Total)	U	2300	mg/kg	0.50		[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		18	15	13	17
Sulphate (Acid Soluble)	U	2430	%	0.010		0.046	0.010	< 0.010	< 0.010
Arsenic	U	2450	mg/kg	1.0		26	26	24	23
Barium	U	2450	mg/kg	10		41	41	39	33
Cadmium	U	2450	mg/kg	0.10		2.0	1.9	1.9	2.0
Chromium	U	2450	mg/kg	1.0		14	15	15	11
Molybdenum	U	2450	mg/kg	2.0		3.7	3.3	2.9	3.3
Antimony	N	2450	mg/kg	2.0		4.0	3.5	3.0	2.3
Copper	U	2450	mg/kg	0.50		24	23	22	16
Mercury	U	2450	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50		43	40	41	31
Lead	U	2450	mg/kg	0.50		16	26	17	13
Selenium	U	2450	mg/kg	0.20		< 0.20	< 0.20	< 0.20	0.48
Zinc	U	2450	mg/kg	0.50		53	59	59	72
Chromium (Trivalent)	N	2490	mg/kg	1.0		14	15	15	11
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20		0.31	0.24	0.36	0.29
Mineral Oil	N	2670	mg/kg	10		< 10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841075	841076	841077	841078
Order No.:					Client Sample Ref.:	AA99931	AA99932	AA99927	AA99929
					Sample Location:	TP08	TP08	TP09	TP09
					Sample Type:	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.00	0.50	2.00
					Bottom Depth (m):	0.50	1.00	0.50	2.00
					Date Sampled:	24-May-2019	24-May-2019	24-May-2019	24-May-2019
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD					
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[B] < 10	[B] < 10	[B] < 10	[B] < 10
Benzene	U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Toluene	U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Ethylbenzene	U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
m & p-Xylene	U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
o-Xylene	U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0
Naphthalene	U	2800	mg/kg	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
Acenaphthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	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
Benzo[g,h,i]perylene	U	2800	mg/kg	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
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Client: IGSL					Chemtest Job No.:	19-19643	19-19643	19-19643	19-19643
Quotation No.:					Chemtest Sample ID.:	841075	841076	841077	841078
Order No.:					Client Sample Ref.:	AA99931	AA99932	AA99927	AA99929
					Sample Location:	TP08	TP08	TP09	TP09
					Sample Type:	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.00	0.50	2.00
					Bottom Depth (m):	0.50	1.00	0.50	2.00
					Date Sampled:	24-May-2019	24-May-2019	24-May-2019	24-May-2019
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD					
PCB 118	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841051						
Sample Ref:	38092						
Sample ID:							
Sample Location:	BH2						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:	31-May-2019				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.40	3	5	6
Loss On Ignition	2610	U	%	2.3	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.095	--	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	0.0020	< 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	3.5	35	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	2.3	23	1000	20000	50000
Total Dissolved Solids	1020	N	53	530	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.8	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Chemtest
The right chemistry to deliver results

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841052						
Sample Ref:	117468						
Sample ID:							
Sample Location:	BH3						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:	31-May-2019				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.40	3	5	6
Loss On Ignition	2610	U	%	2.1	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.097	--	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	0.0018	< 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	1.5	15	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	1.7	17	1000	20000	50000
Total Dissolved Solids	1020	N	57	570	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.7	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841054						
Sample Ref:	10696						
Sample ID:							
Sample Location:	BH4						
Top Depth(m):	1.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	1.00						
Sampling Date:	30-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.33	3	5	6
Loss On Ignition	2610	U	%	2.4	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAHs	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.099	--	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	0.0040	< 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	0.15	1.5	10	150	500
Sulphate	1220	U	1.9	19	1000	20000	50000
Total Dissolved Solids	1020	N	49	490	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.5	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Chemtest
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Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841055						
Sample Ref:	11401						
Sample ID:							
Sample Location:	BH5						
Top Depth(m):	1.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	1.00						
Sampling Date:	29-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.59	3	5	6
Loss On Ignition	2610	U	%	3.1	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAHs	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.049	--	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	< 0.0010	< 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	4.0	40	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	1.2	12	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	4.8	< 50	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.

Results - Single Stage WAC

Project: 21813 Arlton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-15643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841056						
Sample Ref:	114409						
Sample ID:							
Sample Location:	BH6						
Top Depth(m):	1.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	1.00						
Sampling Date:	30-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.44	3	5	6
Loss On Ignition	2610	U	%	2.8	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.17	--	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	0.0012	< 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	< 0.0010	< 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	3.1	31	1000	20000	50000
Total Dissolved Solids	1020	N	53	530	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.0	50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.8

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.

Chemtest
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Results - Single Stage WAC

Project: 21813 Arlton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-15643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841057						
Sample Ref:	114415						
Sample ID:							
Sample Location:	BH7						
Top Depth(m):	1.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	1.00						
Sampling Date:	27-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.33	3	5	6
Loss On Ignition	2610	U	%	2.1	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] 21	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.16	--	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	0.0012	< 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	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.1	11	800	15000	25000
Fluoride	1220	U	0.27	2.7	10	150	500
Sulphate	1220	U	2.4	24	1000	20000	50000
Total Dissolved Solids	1020	N	46	460	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.1	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841058						
Sample Ref:	AA99927						
Sample ID:							
Sample Location:	TP01						
Top Depth(m):	0.50				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	0.50						
Sampling Date:	27-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.29	3	5	6
Loss On Ignition	2610	U	%	2.2	-	-	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	-	-
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	-	-
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	-	-
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	-	-
pH	2010	U		8.6	-	>6	-
Acid Neutralisation Capacity	2015	N	mol/kg	0.092	-	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	0.0031	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	6.8	68	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	8.8	88	1000	20000	50000
Total Dissolved Solids	1020	N	58	580	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.1	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Chemtest
The right chemistry to deliver results

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841059						
Sample Ref:	AA99928						
Sample ID:							
Sample Location:	TP01						
Top Depth(m):	1.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	1.00						
Sampling Date:	27-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.29	3	5	6
Loss On Ignition	2610	U	%	2.2	-	-	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	-	-
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	-	-
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	-	-
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	-	-
pH	2010	U		8.6	-	>6	-
Acid Neutralisation Capacity	2015	N	mol/kg	0.22	-	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	0.0039	< 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	3.4	34	1000	20000	50000
Total Dissolved Solids	1020	N	50	500	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.9	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.2

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841061						
Sample Ref:	AA113509						
Sample ID:							
Sample Location:	TP02						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:	27-May-2019				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.34	3	5	6
Loss On Ignition	2610	U	%	2.3	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAHs	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.098	--	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	0.0011	< 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	0.0023	< 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	1.9	19	1000	20000	50000
Total Dissolved Solids	1020	N	49	490	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.3	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.7

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.

Chemtest
The right chemistry to deliver results

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841062						
Sample Ref:							
Sample ID:							
Sample Location:	TP02						
Top Depth(m):	2.00						
Bottom Depth(m):	2.00						
Sampling Date:	24-May-2019				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.64	3	5	6
Loss On Ignition	2610	U	%	1.8	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.22	--	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	0.0012	< 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	0.0050	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	2.0	20	800	15000	25000
Fluoride	1220	U	0.18	1.8	10	150	500
Sulphate	1220	U	2.1	21	1000	20000	50000
Total Dissolved Solids	1020	N	56	560	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	2.7	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841063						
Sample Ref:	AA99943						
Sample ID:							
Sample Location:	TP03						
Top Depth(m):	0.50				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	0.50						
Sampling Date:	24-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.33	3	5	6
Loss On Ignition	2610	U	%	2.0	-	-	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	-	-
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	-	-
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	-	-
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	-	-
pH	2010	U		8.7	-	>6	-
Acid Neutralisation Capacity	2015	N	mol/kg	0.17	-	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	0.0011	< 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	0.0034	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 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	3.8	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841064						
Sample Ref:	AA99944						
Sample ID:							
Sample Location:	TP03						
Top Depth(m):	1.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	1.00						
Sampling Date:	24-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.57	3	5	6
Loss On Ignition	2610	U	%	4.2	-	-	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	-	-
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	-	-
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	-	-
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	-	-
pH	2010	U		8.3	-	>6	-
Acid Neutralisation Capacity	2015	N	mol/kg	0.049	-	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	0.0021	< 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	0.0011	< 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	0.20	2.0	10	150	500
Sulphate	1220	U	2.6	26	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	4.0	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841065						
Sample Ref:	AA99945						
Sample ID:							
Sample Location:	TP03						
Top Depth(m):	2.00						
Bottom Depth(m):	2.00						
Sampling Date:	24-May-2019				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.32	3	5	6
Loss On Ignition	2610	U	%	2.2	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.20	--	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	0.0011	< 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	0.0037	< 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	0.13	1.3	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	48	480	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.4	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Chemtest
The right chemistry to deliver results

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841066						
Sample Ref:	AA99938						
Sample ID:							
Sample Location:	TP04						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:	24-May-2019				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.85	3	5	6
Loss On Ignition	2610	U	%	2.9	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.037	--	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	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.19	1.9	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	49	490	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.5	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841067						
Sample Ref:	AA99939						
Sample ID:							
Sample Location:	TP04						
Top Depth(m):	1.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	1.00						
Sampling Date:	24-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.33	3	5	6
Loss On Ignition	2610	U	%	1.6	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.085	--	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	0.0016	< 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	1.9	19	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	47	470	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.3	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841069						
Sample Ref:	AA113513						
Sample ID:							
Sample Location:	TP05						
Top Depth(m):	0.50				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	0.50						
Sampling Date:	27-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.42	3	5	6
Loss On Ignition	2610	U	%	2.9	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.5	--	>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	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0021	< 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	< 0.0010	< 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	0.18	1.8	10	150	500
Sulphate	1220	U	7.6	76	1000	20000	50000
Total Dissolved Solids	1020	N	61	610	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.5	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841070						
Sample Ref:	AA113514						
Sample ID:							
Sample Location:	TP06						
Top Depth(m):	1.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	1.00						
Sampling Date:	27-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.27	3	5	6
Loss On Ignition	2610	U	%	1.9	-	-	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	-	-
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	-	-
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	-	-
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	-	-
pH	2010	U		8.5	-	>6	-
Acid Neutralisation Capacity	2015	N	mol/kg	0.15	-	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	0.0015	< 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	0.0041	< 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	34	340	800	15000	25000
Fluoride	1220	U	0.18	1.8	10	150	500
Sulphate	1220	U	3.6	36	1000	20000	50000
Total Dissolved Solids	1020	N	49	490	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.7	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Chemtest
The right chemistry to deliver results

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841071						
Sample Ref:	AA113515						
Sample ID:							
Sample Location:	TP06						
Top Depth(m):	0.50				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	0.50						
Sampling Date:	27-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.38	3	5	6
Loss On Ignition	2610	U	%	2.1	-	-	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	-	-
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	-	-
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	-	-
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	-	-
pH	2010	U		8.8	-	>6	-
Acid Neutralisation Capacity	2015	N	mol/kg	0.095	-	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	0.0015	< 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	5.0	50	800	15000	25000
Fluoride	1220	U	0.18	1.8	10	150	500
Sulphate	1220	U	6.1	61	1000	20000	50000
Total Dissolved Solids	1020	N	55	550	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.9	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841072						
Sample Ref:	AA113518						
Sample ID:							
Sample Location:	TP06						
Top Depth(m):	2.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	2.00						
Sampling Date:	24-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.21	3	5	6
Loss On Ignition	2610	U	%	1.9	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.15	--	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	0.0044	< 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	2.1	21	800	15000	25000
Fluoride	1220	U	0.14	1.4	10	150	500
Sulphate	1220	U	3.6	36	1000	20000	50000
Total Dissolved Solids	1020	N	53	530	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.7	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.7

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.

Chemtest
The right chemistry to deliver results

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841073						
Sample Ref:	AA99935						
Sample ID:							
Sample Location:	TP07						
Top Depth(m):	0.50				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	0.50						
Sampling Date:	24-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.87	3	5	6
Loss On Ignition	2610	U	%	4.0	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.029	--	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	< 0.0010	< 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	0.18	1.8	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	48	480	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.6	56	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841074						
Sample Ref:	AA99936						
Sample ID:							
Sample Location:	TP07						
Top Depth(m):	1.00				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	1.00						
Sampling Date:	24-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	< 0.20	3	5	6
Loss On Ignition	2610	U	%	1.7	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.094	--	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	0.0025	< 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	1.5	15	800	15000	25000
Fluoride	1220	U	0.16	1.6	10	150	500
Sulphate	1220	U	1.4	14	1000	20000	50000
Total Dissolved Solids	1020	N	46	460	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.8	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.4

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: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643				Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID:	841075						
Sample Ref:	AA99931						
Sample ID:							
Sample Location:	TP08						
Top Depth(m):	0.50				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Bottom Depth(m):	0.50						
Sampling Date:	24-May-2019						
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.31	3	5	6
Loss On Ignition	2610	U	%	2.2	--	--	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.15	--	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	0.0019	< 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	0.0031	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.7	17	800	15000	25000
Fluoride	1220	U	0.22	2.2	10	150	500
Sulphate	1220	U	17	170	1000	20000	50000
Total Dissolved Solids	1020	N	72	710	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.0	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	19-19643						
Chemtest Sample ID:	841076						
Sample Ref:	AA99932						
Sample ID:							
Sample Location:	TP08						
Top Depth(m):	1.00						
Bottom Depth(m):	1.00						
Sampling Date:	24-May-2019						
Determinand	SOP	Accred.	Units		Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	U	%	0.24	3	5	6
Loss On Ignition	2610	U	%	1.9	–	–	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	–	–
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	–	–
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	–	–
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	–	–
pH	2010	U		8.7	–	>6	–
Acid Neutralisation Capacity	2015	N	mol/kg	0.18	–	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	0.0027	< 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	1.6	16	800	15000	25000
Fluoride	1220	U	0.15	1.5	10	150	500
Sulphate	1220	U	3.6	36	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	3.5	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	19-19643						
Chemtest Sample ID:	841077						
Sample Ref:	AA99927						
Sample ID:							
Sample Location:	TP09						
Top Depth(m):	0.50						
Bottom Depth(m):	0.50						
Sampling Date:	24-May-2019						
Determinand	SOP	Accred.	Units		Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	U	%	0.36	3	5	6
Loss On Ignition	2610	U	%	2.3	–	–	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	–	–
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	–	–
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	–	–
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	–	–
pH	2010	U		8.7	–	>6	–
Acid Neutralisation Capacity	2015	N	mol/kg	0.075	–	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	0.0014	< 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	2.5	25	800	15000	25000
Fluoride	1220	U	0.27	2.7	10	150	500
Sulphate	1220	U	2.0	20	1000	20000	50000
Total Dissolved Solids	1020	N	51	510	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.1	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Results - Single Stage WAC

Project: 21813 Airton Road, Tallaght, Dublin (BMCE)

Chemtest Job No:	19-19643
Chemtest Sample ID:	841076
Sample Ref:	AA99929
Sample ID:	
Sample Location:	TP09
Top Depth(m):	2.00
Bottom Depth(m):	2.00
Sampling Date:	24-May-2019

Determinand	SOP	Accred.	Units		Landfill Waste Acceptance Criteria Limits		
					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	U	%	0.29	3	5	6
Loss On Ignition	2610	U	%	1.6	-	-	10
Total BTEX	2760	U	mg/kg	[B] < 0.010	6	-	-
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	-	-
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[B] < 10	500	-	-
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	-	-
pH	2010	U		8.8	-	>6	-
Acid Neutralisation Capacity	2015	N	mol/kg	0.14	-	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	0.0012	< 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	0.0021	< 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	26	260	800	15000	25000
Fluoride	1220	U	0.16	1.6	10	150	500
Sulphate	1220	U	8.4	84	1000	20000	50000
Total Dissolved Solids	1020	N	48	480	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.8	< 50	500	800	1000

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

Waste Acceptance Criteria

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

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 53, 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:
841057	114415		BH7	27-May-2019	B	Amber Glass 250ml
841057	114415		BH7	27-May-2019	B	Amber Glass 60ml
841058	AA99927		TP01	27-May-2019	B	Amber Glass 250ml
841058	AA99927		TP01	27-May-2019	B	Amber Glass 60ml
841059	AA99928		TP01	27 May 2019	B	Amber Glass 250ml
841059	AA99928		TP01	27-May-2019	B	Amber Glass 60ml
841061	AA113509		TP02	27-May-2019	B	Amber Glass 250ml
841061	AA113509		TP02	27-May-2019	B	Amber Glass 60ml
841062			TP02	24-May-2019	B	Amber Glass 250ml
841062			TP02	24-May-2019	B	Amber Glass 60ml
841063	AA99943		TP03	24-May-2019	B	Amber Glass 250ml
841063	AA99943		TP03	24-May-2019	B	Amber Glass 60ml
841064	AA99944		TP03	24-May-2019	B	Amber Glass 60ml
841065	AA99945		TP03	24-May-2019	B	Amber Glass 250ml
841065	AA99945		TP03	24-May-2019	B	Amber Glass 60ml
841066	AA99938		TP04	24-May-2019	B	Amber Glass 250ml
841066	AA99938		TP04	24-May-2019	B	Amber Glass 60ml
841067	AA99939		TP04	24-May-2019	B	Amber Glass 250ml
841067	AA99939		TP04	24-May-2019	B	Amber Glass 60ml
841068	AA113513		TP05	27-May-2019	B	Amber Glass 250ml
841069	AA113513		TP05	27-May-2019	B	Amber Glass 60ml

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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:
841070	AA113514		TP05	27-May-2019	B	Amber Glass 250ml
841070	AA113514		TP05	27-May-2019	B	Amber Glass 60ml
841071	AA113516		TP06	27-May-2019	B	Amber Glass 250ml
841071	AA113516		TP06	27-May-2019	B	Amber Glass 60ml
841072	AA113518		TP06	24-May-2019	B	Amber Glass 250ml
841072	AA113518		TP06	24-May-2019	B	Amber Glass 60ml
841073	AA99935		TP07	24-May-2019	B	Amber Glass 250ml
841073	AA99935		TP07	24-May-2019	B	Amber Glass 60ml
841074	AA99936		TP07	24-May-2019	B	Amber Glass 250ml
841074	AA99936		TP07	24-May-2019	B	Amber Glass 60ml
841075	AA99931		TP06	24-May-2019	B	Amber Glass 250ml
841075	AA99931		TP06	24-May-2019	B	Amber Glass 60ml
841076	AA99932		TP08	24-May-2019	B	Amber Glass 250ml
841076	AA99932		TP08	24-May-2019	B	Amber Glass 60ml
841077	AA99927		TP09	24-May-2019	B	Amber Glass 250ml
841077	AA99927		TP09	24-May-2019	B	Amber Glass 60ml
841078	AA99929		TP09	24-May-2019	B	Amber Glass 250ml
841078	AA99929		TP09	24-May-2019	B	Amber Glass 60ml

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Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N-dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C8–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
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

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Test Methods

SOP	Title	Parameters included	Method summary
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.	50:50 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

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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

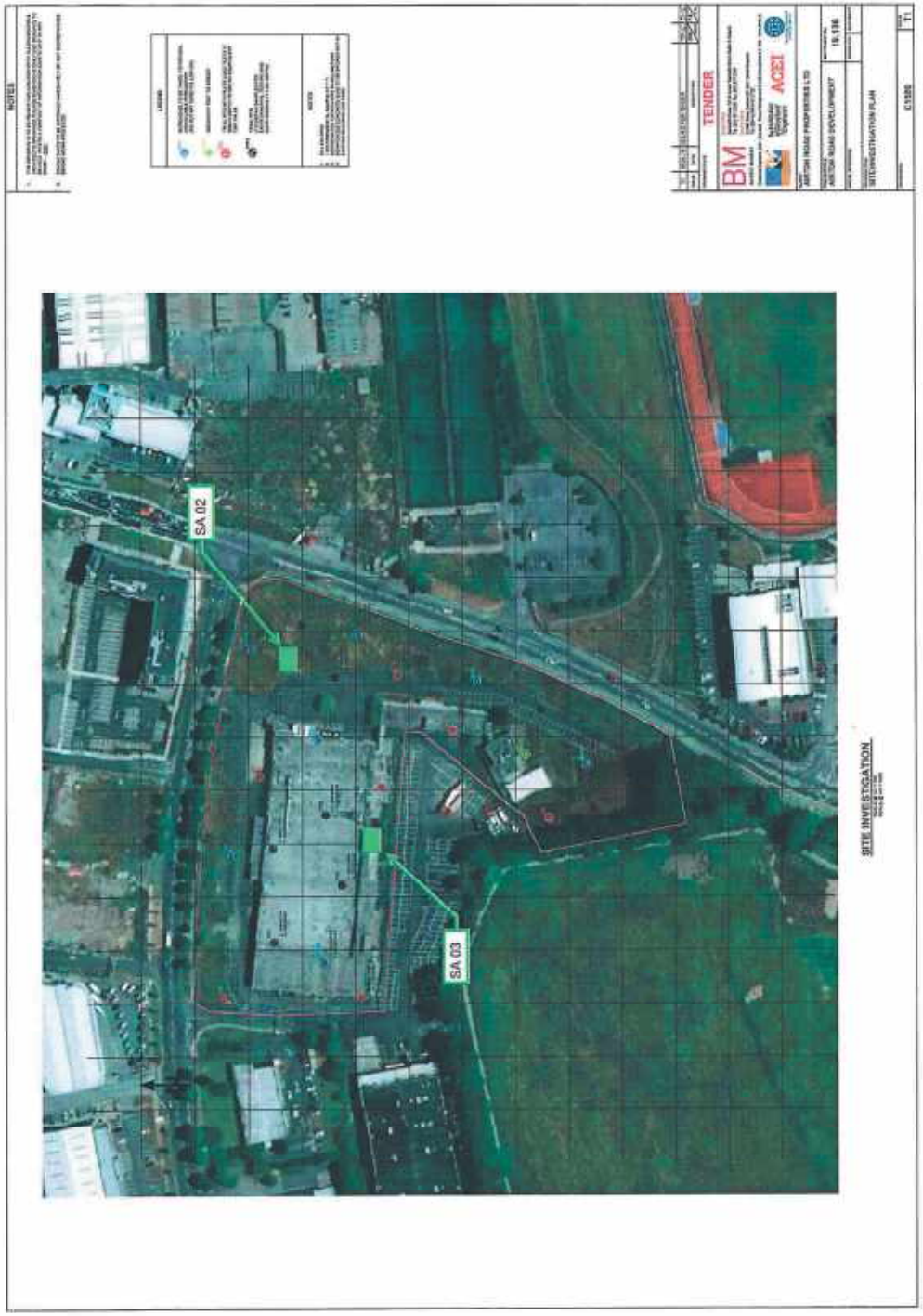
A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

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

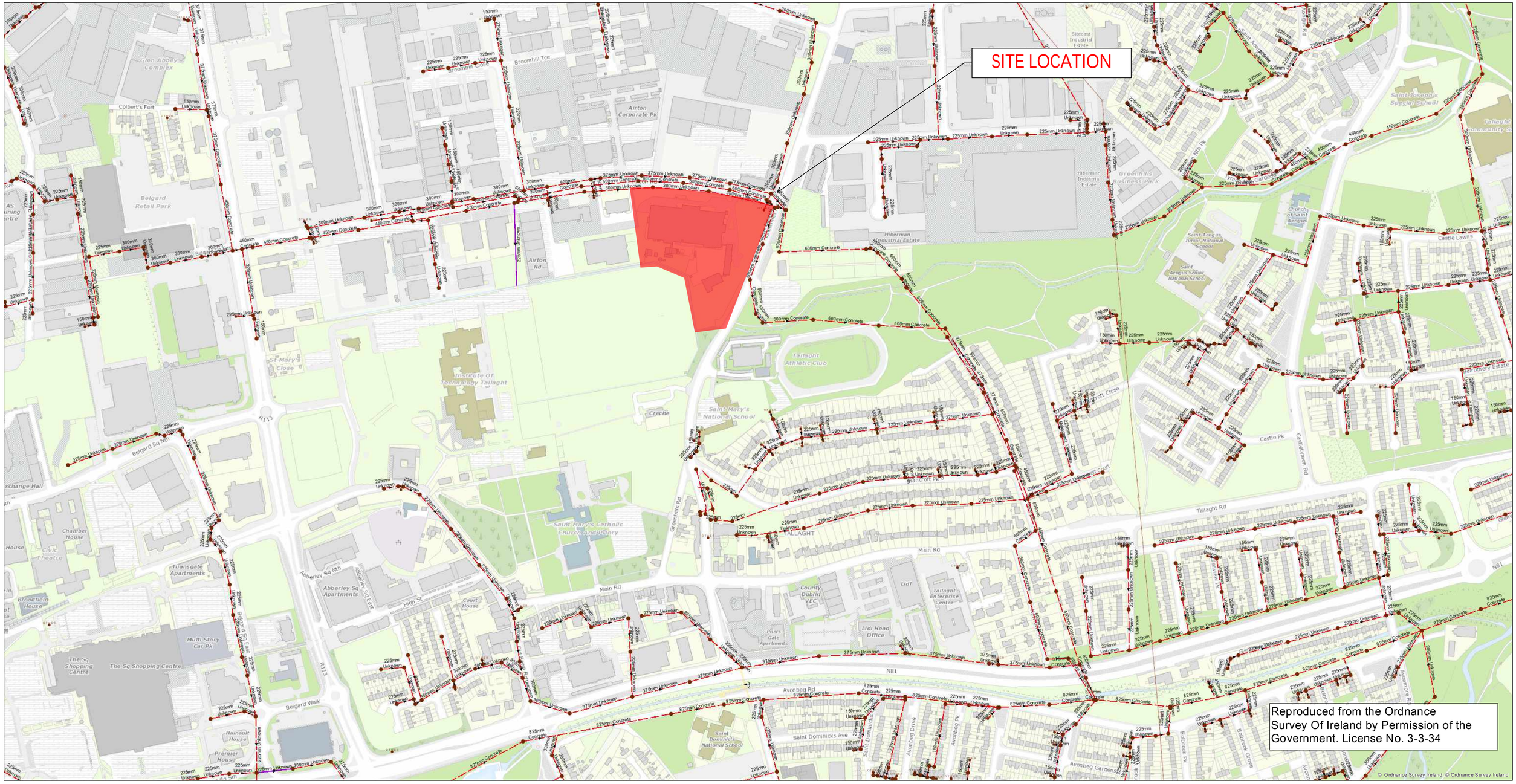
Appendix VII Site Plan



7 HYDROLOGY AND WATER SERVICES - APPENDICES

7.1 EXISTING WATER SUPPLY INFRASTRUCTURE

Irish Water Web Map



July 11, 2019

1:5,000

0 0.125 0.25 0.5 mi

0 0.175 0.35 0.7 km

Legend

Sewer Discharge Points
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Sewer Clean Outs
- Rodding Eye

- Flushing Structure
- Other; Unknown
- Sewer Flow Control Valves
- Treatment plant
- Pump station

Sewer Inlets
- Catchpit

- Gully
- Standard
- Other; Unknown

Sewer Manholes
- Cascade
- Catchpit
- Hatchbox

- Lamphole
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Sewer Gravity Mains (Irish Water owned)
- Combined

- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow

- Unknown

Sewer Pressurized Mains
- Combined
- Foul
- Overflow
- Unknown

Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated. © Irish Water

Irish Water

7.2 MICRO-DRAINAGE CALCULATIONS

NORTH WEST CATCHMENT SIMULATION

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	14.000	Add Flow / Climate Change (%)	0
Ratio R	0.300	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.036	4-8	0.575	8-12	0.081

Total Area Contributing (ha) = 0.692

Total Pipe Volume (m³) = 19.879

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	26.312	0.132	200.0	0.133	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	36.476	0.182	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	42.438	0.386	110.0	0.097	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	51.705	0.259	200.0	0.120	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.48	89.320	0.133	0.0	0.0	0.0	0.92	36.6	18.0
S1.001	50.00	5.14	89.188	0.133	0.0	0.0	0.0	0.92	36.6	18.0
S1.002	50.00	5.70	89.006	0.230	0.0	0.0	0.0	1.25	49.5	31.1
S2.000	50.00	4.94	89.000	0.120	0.0	0.0	0.0	0.92	36.6	16.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.001	29.327	0.147	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	5.523	0.028	200.0	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	14.000	0.070	200.0	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	90.000	0.450	200.0	0.099	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	27.113	0.195	139.0	0.123	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	10.660	0.053	201.1	0.060	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	56.000	0.280	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	6.824	0.034	200.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.007	80.753	0.404	199.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.008	22.822	0.114	200.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.001	50.00	5.47	88.741	0.120	0.0	0.0	0.0	0.92	36.6	16.2
S1.003	50.00	5.80	88.595	0.380	0.0	0.0	0.0	0.92	36.6«	51.5
S1.004	50.00	6.06	88.567	0.410	0.0	0.0	0.0	0.92	36.6«	55.5
S3.000	50.00	5.63	89.255	0.099	0.0	0.0	0.0	0.92	36.6	13.4
S4.000	50.00	4.41	89.000	0.123	0.0	0.0	0.0	1.11	44.0	16.7
S3.001	50.00	5.82	88.805	0.282	0.0	0.0	0.0	0.92	36.5«	38.2
S1.005	50.00	7.07	87.497	0.692	0.0	0.0	0.0	0.92	36.6«	93.7
S1.006	50.00	7.19	87.217	0.692	0.0	0.0	0.0	0.92	36.5«	93.7
S1.007	50.00	8.66	87.183	0.692	0.0	0.0	0.0	0.92	36.6«	93.7
S1.008	50.00	9.07	86.779	0.692	0.0	0.0	0.0	0.92	36.6«	93.7

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SS1.0	91.000	1.680	Open Manhole	1200	S1.000	89.320	225				
SS1.1	90.100	0.912	Open Manhole	1200	S1.001	89.188	225	S1.000	89.188	225	
SS1.2	89.800	0.794	Open Manhole	1200	S1.002	89.006	225	S1.001	89.006	225	
SS2.0	90.125	1.125	Open Manhole	1200	S2.000	89.000	225				
SS2.1	90.000	1.259	Open Manhole	1200	S2.001	88.741	225	S2.000	88.741	225	
SS1.3	90.000	1.405	Open Manhole	1200	S1.003	88.595	225	S1.002	88.620	225	25
								S2.001	88.595	225	
SS1.4	90.000	1.433	Open Manhole	1200	S1.004	88.567	225	S1.003	88.567	225	
SS4.0	91.000	1.745	Open Manhole	1200	S3.000	89.255	225				
SS3.0	90.125	1.125	Open Manhole	1200	S4.000	89.000	225				
SS4.1	90.100	1.295	Open Manhole	1200	S3.001	88.805	225	S3.000	88.805	225	
								S4.000	88.805	225	
SS5.0	89.700	2.203	Open Manhole	1200	S1.005	87.497	225	S1.004	88.497	225	1000
								S3.001	88.752	225	1255
SS5.1	88.850	1.633	Open Manhole	1200	S1.006	87.217	225	S1.005	87.217	225	
SS5.2	88.750	1.567	Open Manhole	1200	S1.007	87.183	225	S1.006	87.183	225	
SS5.3	88.500	1.721	Open Manhole	1200	S1.008	86.779	225	S1.007	86.779	225	
S	88.500	1.835	Open Manhole	0		OUTFALL		S1.008	86.665	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	SS1.0	91.000	89.320	1.455	Open Manhole	1200
S1.001	o	225	SS1.1	90.100	89.188	0.687	Open Manhole	1200
S1.002	o	225	SS1.2	89.800	89.006	0.569	Open Manhole	1200
S2.000	o	225	SS2.0	90.125	89.000	0.900	Open Manhole	1200
S2.001	o	225	SS2.1	90.000	88.741	1.034	Open Manhole	1200
S1.003	o	225	SS1.3	90.000	88.595	1.180	Open Manhole	1200
S1.004	o	225	SS1.4	90.000	88.567	1.208	Open Manhole	1200
S3.000	o	225	SS4.0	91.000	89.255	1.520	Open Manhole	1200
S4.000	o	225	SS3.0	90.125	89.000	0.900	Open Manhole	1200
S3.001	o	225	SS4.1	90.100	88.805	1.070	Open Manhole	1200
S1.005	o	225	SS5.0	89.700	87.497	1.978	Open Manhole	1200
S1.006	o	225	SS5.1	88.850	87.217	1.408	Open Manhole	1200
S1.007	o	225	SS5.2	88.750	87.183	1.342	Open Manhole	1200
S1.008	o	225	SS5.3	88.500	86.779	1.496	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	26.312	200.0	SS1.1	90.100	89.188	0.687	Open Manhole	1200
S1.001	36.476	200.0	SS1.2	89.800	89.006	0.569	Open Manhole	1200
S1.002	42.438	110.0	SS1.3	90.000	88.620	1.155	Open Manhole	1200
S2.000	51.705	200.0	SS2.1	90.000	88.741	1.034	Open Manhole	1200
S2.001	29.327	200.0	SS1.3	90.000	88.595	1.180	Open Manhole	1200
S1.003	5.523	200.0	SS1.4	90.000	88.567	1.208	Open Manhole	1200
S1.004	14.000	200.0	SS5.0	89.700	88.497	0.978	Open Manhole	1200
S3.000	90.000	200.0	SS4.1	90.100	88.805	1.070	Open Manhole	1200
S4.000	27.113	139.0	SS4.1	90.100	88.805	1.070	Open Manhole	1200
S3.001	10.660	201.1	SS5.0	89.700	88.752	0.723	Open Manhole	1200
S1.005	56.000	200.0	SS5.1	88.850	87.217	1.408	Open Manhole	1200
S1.006	6.824	200.7	SS5.2	88.750	87.183	1.342	Open Manhole	1200
S1.007	80.753	199.9	SS5.3	88.500	86.779	1.496	Open Manhole	1200
S1.008	22.822	200.2	S	88.500	86.665	1.610	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.133	0.133	0.133
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.097	0.097	0.097
2.000	-	-	100	0.120	0.120	0.120
2.001	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.030	0.030	0.030
1.004	-	-	100	0.030	0.030	0.030
3.000	-	-	100	0.099	0.099	0.099
4.000	-	-	100	0.123	0.123	0.123
3.001	-	-	100	0.060	0.060	0.060
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.692	0.692	0.692

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.008	S	88.500	86.665	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	8
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	14.000	Storm Duration (mins)	30
Ratio R	0.300		

Online Controls for Storm

Hydro-Brake© Optimum Manhole: SS5.0, DS/PN: S1.005, Volume (m³): 3.4

HYDROBRAKE DESIGN PARAMETERS

Unit Reference	MD-SHE-0072-2500-1200-2500
Design Head (m)	1.200
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	72
Invert Level (m)	87.497
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.5
Flush-Flo™	0.318	2.3
Kick-Flo®	0.644	1.9
Mean Flow over Head Range	-	2.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	1.200	2.5	3.000	3.8	7.000	5.7
0.200	2.2	1.400	2.7	3.500	4.1	7.500	5.9
0.300	2.3	1.600	2.8	4.000	4.4	8.000	6.0
0.400	2.3	1.800	3.0	4.500	4.6	8.500	6.2
0.500	2.2	2.000	3.2	5.000	4.8	9.000	6.4
0.600	2.0	2.200	3.3	5.500	5.1	9.500	6.5
0.800	2.1	2.400	3.4	6.000	5.3		
1.000	2.3	2.600	3.6	6.500	5.5		

Storage Structures for Storm

Cellular Storage Manhole: SS5.0, DS/PN: S1.005

Invert Level (m) 87.497 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	260.0	0.0	1.001	0.0	0.0
1.000	260.0	0.0			

AQUACELL ATTENUATION TANK -
1m dp X 260m²

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 8
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.300
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 14.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 100.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status OFF

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SS1.0	240 Winter	1	+20%				
S1.001	SS1.1	240 Winter	1	+20%				
S1.002	SS1.2	240 Winter	1	+20%	100/1440 Winter			
S2.000	SS2.0	240 Winter	1	+20%	100/1440 Winter			
S2.001	SS2.1	240 Winter	1	+20%	100/720 Winter			
S1.003	SS1.3	240 Winter	1	+20%	100/30 Winter			
S1.004	SS1.4	240 Winter	1	+20%	100/60 Winter			
S3.000	SS4.0	240 Winter	1	+20%				
S4.000	SS3.0	240 Winter	1	+20%	100/1440 Winter			
S3.001	SS4.1	240 Winter	1	+20%	100/960 Winter			
S1.005	SS5.0	1440 Winter	1	+20%	30/60 Winter	100/960 Winter		
S1.006	SS5.1	1440 Winter	1	+20%				
S1.007	SS5.2	1440 Winter	1	+20%				
S1.008	SS5.3	1440 Winter	1	+20%				

RESULTS FOR 1-in-1 YEAR STORM
+20% CLIMATE CHANGE ALLOWANCE

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS1.0	89.362	-0.183	0.000	0.08		2.6	OK	
S1.001	SS1.1	89.228	-0.185	0.000	0.07		2.4	OK	
S1.002	SS1.2	89.052	-0.179	0.000	0.09		4.3	OK	
S2.000	SS2.0	89.038	-0.187	0.000	0.06		2.3	OK	
S2.001	SS2.1	88.779	-0.187	0.000	0.07		2.2	OK	
S1.003	SS1.3	88.674	-0.146	0.000	0.26		7.1	OK	
S1.004	SS1.4	88.642	-0.150	0.000	0.24		7.6	OK	
S3.000	SS4.0	89.286	-0.194	0.000	0.04		1.4	OK	
S4.000	SS3.0	89.036	-0.189	0.000	0.06		2.4	OK	
S3.001	SS4.1	88.865	-0.165	0.000	0.16		4.8	OK	
S1.005	SS5.0	87.699	-0.023	0.000	0.06		2.2	OK	2
S1.006	SS5.1	87.259	-0.183	0.000	0.08		2.2	OK	
S1.007	SS5.2	87.219	-0.189	0.000	0.06		2.2	OK	
S1.008	SS5.3	86.817	-0.187	0.000	0.07		2.2	OK	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	8
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.300
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	14.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	100.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SS1.0	60 Winter	30	+20%			
S1.001	SS1.1	60 Winter	30	+20%			
S1.002	SS1.2	60 Winter	30	+20%	100/1440 Winter		
S2.000	SS2.0	60 Winter	30	+20%	100/1440 Winter		
S2.001	SS2.1	60 Winter	30	+20%	100/720 Winter		
S1.003	SS1.3	120 Winter	30	+20%	100/30 Winter		
S1.004	SS1.4	120 Winter	30	+20%	100/60 Winter		
S3.000	SS4.0	60 Winter	30	+20%			
S4.000	SS3.0	60 Winter	30	+20%	100/1440 Winter		
S3.001	SS4.1	120 Winter	30	+20%	100/960 Winter		
S1.005	SS5.0	1440 Winter	30	+20%	30/60 Winter	100/960 Winter	
S1.006	SS5.1	2880 Winter	30	+20%			
S1.007	SS5.2	10080 Summer	30	+20%			
S1.008	SS5.3	10080 Summer	30	+20%			

RESULTS FOR 1-in-30 YEAR STORM
+20% CLIMATE CHANGE ALLOWANCE

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS1.0		89.402	-0.143	0.000	0.27		9.3	OK	
S1.001	SS1.1		89.269	-0.145	0.000	0.26		9.1	OK	
S1.002	SS1.2		89.096	-0.135	0.000	0.33		15.5	OK	
S2.000	SS2.0		89.076	-0.149	0.000	0.24		8.4	OK	
S2.001	SS2.1		88.817	-0.150	0.000	0.24		8.2	OK	
S1.003	SS1.3		88.767	-0.053	0.000	0.94		25.7	OK	
S1.004	SS1.4		88.729	-0.063	0.000	0.86		27.6	OK	
S3.000	SS4.0		89.315	-0.165	0.000	0.14		5.1	OK	
S4.000	SS3.0		89.071	-0.154	0.000	0.21		8.6	OK	
S3.001	SS4.1		88.927	-0.103	0.000	0.57		17.6	OK	
S1.005	SS5.0		88.283	0.561	0.000	0.07		2.3	SURCHARGED	2
S1.006	SS5.1		87.260	-0.182	0.000	0.08		2.3	OK	
S1.007	SS5.2		87.220	-0.188	0.000	0.06		2.3	OK	
S1.008	SS5.3		86.817	-0.187	0.000	0.07		2.3	OK	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	8
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.300
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	14.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	100.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SS1.0	60 Winter	100	+20%				
S1.001	SS1.1	1440 Winter	100	+20%				
S1.002	SS1.2	1440 Winter	100	+20%	100/1440 Winter			
S2.000	SS2.0	1440 Winter	100	+20%	100/1440 Winter			
S2.001	SS2.1	2160 Winter	100	+20%	100/720 Winter			
S1.003	SS1.3	2160 Winter	100	+20%	100/30 Winter			
S1.004	SS1.4	2160 Winter	100	+20%	100/60 Winter			
S3.000	SS4.0	1440 Winter	100	+20%				
S4.000	SS3.0	1440 Winter	100	+20%	100/1440 Winter			
S3.001	SS4.1	2160 Winter	100	+20%	100/960 Winter			
S1.005	SS5.0	2160 Winter	100	+20%	30/60 Winter	100/960 Winter		
S1.006	SS5.1	1440 Winter	100	+20%				
S1.007	SS5.2	1440 Winter	100	+20%				
S1.008	SS5.3	1440 Winter	100	+20%				

RESULTS FOR 1-in-100 YEAR STORM
+20% CLIMATE CHANGE ALLOWANCE

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS1.0	89.421	-0.124	0.000	0.41		13.8	OK	
S1.001	SS1.1	89.376	-0.037	0.000	0.08		2.7	OK	
S1.002	SS1.2	89.348	0.117	0.000	0.10		4.7	SURCHARGED	
S2.000	SS2.0	89.323	0.098	0.000	0.07		2.4	SURCHARGED	
S2.001	SS2.1	89.583	0.617	0.000	0.05		1.8	SURCHARGED	
S1.003	SS1.3	89.707	0.887	0.000	0.21		5.7	SURCHARGED	
S1.004	SS1.4	89.697	0.905	0.000	0.19		6.2	SURCHARGED	
S3.000	SS4.0	89.364	-0.116	0.000	0.04		1.6	OK	
S4.000	SS3.0	89.368	0.143	0.000	0.06		2.5	SURCHARGED	
S3.001	SS4.1	89.511	0.481	0.000	0.13		4.0	SURCHARGED	
S1.005	SS5.0	89.700	1.978	1.639	0.09		3.0	FLOOD	2
S1.006	SS5.1	87.266	-0.176	0.000	0.11		3.1	OK	
S1.007	SS5.2	87.227	-0.181	0.000	0.09		3.1	OK	
S1.008	SS5.3	86.825	-0.179	0.000	0.09		3.1	OK	

HYDROBRAKE MANHOLE IS LISTED AS FLOODING IN STORMS OF DURATION GREATER THAN 960min - HOWEVER FLOOD DEPTH = 0.00mm -AS SUCH UNLIKELY TO OCCUR IN PRACTICE. ANY OVERFLOW WHICH MAY OCCUR WILL BE CAPTURED ON SITE IN RETENTION BASIN

NORTH EAST CATHCMENT SIMULATION

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	14.000	Add Flow / Climate Change (%)	0
Ratio R	0.300	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.416	4-8	0.421

Total Area Contributing (ha) = 0.837

Total Pipe Volume (m³) = 12.624

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	15.871	0.063	250.0	0.070	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	25.105	0.185	135.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	19.747	0.079	250.0	0.106	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.32	87.775	0.070	0.0	0.0	0.0	0.82	32.7	9.5
S1.001	50.00	4.69	87.712	0.070	0.0	0.0	0.0	1.12	44.6	9.5
S2.000	50.00	4.40	87.625	0.106	0.0	0.0	0.0	0.82	32.7	14.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.002	25.568	0.102	250.0	0.044	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	24.233	0.097	250.0	0.058	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	34.941	0.175	200.0	0.159	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	29.067	0.145	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.002	30.147	0.134	225.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	22.744	0.114	199.5	0.202	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	18.125	0.073	250.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	13.959	0.056	250.0	0.100	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	7.633	0.031	246.2	0.065	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.007	15.533	0.062	250.5	0.033	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.008	12.535	0.050	250.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.002	50.00	5.21	87.526	0.220	0.0	0.0	0.0	0.82	32.7	29.8
S1.003	50.00	5.70	87.424	0.278	0.0	0.0	0.0	0.82	32.7«	37.6
S3.000	50.00	4.63	87.775	0.159	0.0	0.0	0.0	0.92	36.6	21.5
S3.001	50.00	5.16	87.600	0.159	0.0	0.0	0.0	0.92	36.6	21.5
S3.002	50.00	5.74	87.455	0.159	0.0	0.0	0.0	0.87	34.5	21.5
S4.000	50.00	4.41	87.875	0.202	0.0	0.0	0.0	0.92	36.7	27.4
S1.004	50.00	6.10	87.327	0.639	0.0	0.0	0.0	0.82	32.7«	86.5
S1.005	50.00	6.39	87.255	0.739	0.0	0.0	0.0	0.82	32.7«	100.1
S1.006	50.00	6.54	87.199	0.804	0.0	0.0	0.0	0.83	33.0«	108.9
S1.007	50.00	6.86	86.768	0.837	0.0	0.0	0.0	0.82	32.7«	113.3
S1.008	50.00	7.04	86.706	0.837	0.0	0.0	0.0	1.14	125.9	113.3

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SS6.0	88.500	0.725	Open Manhole	1200	S1.000	87.775	225				
SS6.1	89.000	1.288	Open Manhole	1200	S1.001	87.712	225	S1.000	87.712	225	
SS7.0	88.750	1.125	Open Manhole	1200	S2.000	87.625	225				
SS6.2	88.600	1.074	Open Manhole	1200	S1.002	87.526	225	S1.001	87.526	225	
								S2.000	87.546	225	20
SS6.3	88.750	1.326	Open Manhole	1200	S1.003	87.424	225	S1.002	87.424	225	
SS8.0	88.500	0.725	Open Manhole	1200	S3.000	87.775	225				
SS8.1	88.800	1.200	Open Manhole	1200	S3.001	87.600	225	S3.000	87.600	225	
SS8.2	89.000	1.545	Open Manhole	1200	S3.002	87.455	225	S3.001	87.455	225	
SS9.0	89.000	1.125	Open Manhole	1200	S4.000	87.875	225				
SS6.4	88.750	1.429	Open Manhole	1200	S1.004	87.327	225	S1.003	87.327	225	
								S3.002	87.321	225	
								S4.000	87.761	225	434
SS6.5	88.750	1.496	Open Manhole	1200	S1.005	87.255	225	S1.004	87.255	225	
SS6.6	88.750	1.551	Open Manhole	1200	S1.006	87.199	225	S1.005	87.199	225	
SS6.7	88.750	1.982	Open Manhole	1200	S1.007	86.768	225	S1.006	87.168	225	400
SS5.4	88.750	2.044	Open Manhole	1350	S1.008	86.706	375	S1.007	86.706	225	
S	88.000	1.344	Open Manhole	0		OUTFALL		S1.008	86.656	375	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	SS6.0	88.500	87.775	0.500	Open Manhole	1200
S1.001	o	225	SS6.1	89.000	87.712	1.063	Open Manhole	1200
S2.000	o	225	SS7.0	88.750	87.625	0.900	Open Manhole	1200
S1.002	o	225	SS6.2	88.600	87.526	0.849	Open Manhole	1200
S1.003	o	225	SS6.3	88.750	87.424	1.101	Open Manhole	1200
S3.000	o	225	SS8.0	88.500	87.775	0.500	Open Manhole	1200
S3.001	o	225	SS8.1	88.800	87.600	0.975	Open Manhole	1200
S3.002	o	225	SS8.2	89.000	87.455	1.320	Open Manhole	1200
S4.000	o	225	SS9.0	89.000	87.875	0.900	Open Manhole	1200
S1.004	o	225	SS6.4	88.750	87.327	1.198	Open Manhole	1200
S1.005	o	225	SS6.5	88.750	87.255	1.270	Open Manhole	1200
S1.006	o	225	SS6.6	88.750	87.199	1.326	Open Manhole	1200
S1.007	o	225	SS6.7	88.750	86.768	1.757	Open Manhole	1200
S1.008	o	375	SS5.4	88.750	86.706	1.669	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	15.871	250.0	SS6.1	89.000	87.712	1.063	Open Manhole	1200
S1.001	25.105	135.5	SS6.2	88.600	87.526	0.849	Open Manhole	1200
S2.000	19.747	250.0	SS6.2	88.600	87.546	0.829	Open Manhole	1200
S1.002	25.568	250.0	SS6.3	88.750	87.424	1.101	Open Manhole	1200
S1.003	24.233	250.0	SS6.4	88.750	87.327	1.198	Open Manhole	1200
S3.000	34.941	200.0	SS8.1	88.800	87.600	0.975	Open Manhole	1200
S3.001	29.067	200.0	SS8.2	89.000	87.455	1.320	Open Manhole	1200
S3.002	30.147	225.0	SS6.4	88.750	87.321	1.204	Open Manhole	1200
S4.000	22.744	199.5	SS6.4	88.750	87.761	0.764	Open Manhole	1200
S1.004	18.125	250.0	SS6.5	88.750	87.255	1.271	Open Manhole	1200
S1.005	13.959	250.0	SS6.6	88.750	87.199	1.326	Open Manhole	1200
S1.006	7.633	246.2	SS6.7	88.750	87.168	1.357	Open Manhole	1200
S1.007	15.533	250.5	SS5.4	88.750	86.706	1.819	Open Manhole	1350
S1.008	12.535	250.7	S	88.000	86.656	0.969	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.070	0.070	0.070
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.106	0.106	0.106
1.002	-	-	100	0.044	0.044	0.044
1.003	-	-	100	0.058	0.058	0.058
3.000	-	-	100	0.159	0.159	0.159
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.202	0.202	0.202
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.100	0.100	0.100
1.006	-	-	100	0.065	0.065	0.065
1.007	-	-	100	0.033	0.033	0.033
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.837	0.837	0.837

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S1.000	SS6.0	225	0.500	1.063	Unclassified	1200	0	0.500	Unclassified
S1.001	SS6.1	225	0.849	1.063	Unclassified	1200	0	1.063	Unclassified
S2.000	SS7.0	225	0.829	0.900	Unclassified	1200	0	0.900	Unclassified
S1.002	SS6.2	225	0.849	1.101	Unclassified	1200	0	0.849	Unclassified
S1.003	SS6.3	225	1.101	1.198	Unclassified	1200	0	1.101	Unclassified
S3.000	SS8.0	225	0.500	0.975	Unclassified	1200	0	0.500	Unclassified
S3.001	SS8.1	225	0.975	1.320	Unclassified	1200	0	0.975	Unclassified
S3.002	SS8.2	225	1.204	1.320	Unclassified	1200	0	1.320	Unclassified
S4.000	SS9.0	225	0.764	0.900	Unclassified	1200	0	0.900	Unclassified
S1.004	SS6.4	225	1.198	1.271	Unclassified	1200	0	1.198	Unclassified
S1.005	SS6.5	225	1.270	1.326	Unclassified	1200	0	1.270	Unclassified
S1.006	SS6.6	225	1.326	1.357	Unclassified	1200	0	1.326	Unclassified
S1.007	SS6.7	225	1.757	1.819	Unclassified	1200	0	1.757	Unclassified
S1.008	SS5.4	375	0.969	1.669	Unclassified	1350	0	1.669	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.008	S	88.000	86.656	86.700	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	7
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	14.000	Storm Duration (mins)	30
Ratio R	0.300		

Online Controls for Storm

Hydro-Brake© Optimum Manhole: SS6.7, DS/PN: S1.007, Volume (m³): 2.5

HYDROBRAKE OUTFLOW LIMITED TO 2.5L/S

Unit Reference	MD-SHE-0075-2500-1000-2500
Design Head (m)	1.000
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	86.768
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.5
Flush-Flo™	0.307	2.5
Kick-Flo®	0.627	2.0
Mean Flow over Head Range	-	2.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.1	1.200	2.7	3.000	4.1	7.000	6.2
0.200	2.4	1.400	2.9	3.500	4.5	7.500	6.4
0.300	2.5	1.600	3.1	4.000	4.7	8.000	6.6
0.400	2.5	1.800	3.3	4.500	5.0	8.500	6.8
0.500	2.4	2.000	3.4	5.000	5.3	9.000	7.0
0.600	2.1	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.3	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	6.0		

Storage Structures for Storm

Tank or Pond Manhole: SS6.7, DS/PN: S1.007

Invert Level (m) 86.768

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	400.0	0.400	400.0	0.401	0.0

AQUACELL TANK
0.4m X 400m²

Time Area Diagram for Green Roof at Pipe Number S1.000 (Storm)

Area (m³) 390 Evaporation (mm/day) 3
Depression Storage (mm) 10 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.007087	32	36	0.001431	64	68	0.000289	96	100	0.000058
4	8	0.005802	36	40	0.001171	68	72	0.000237	100	104	0.000048
8	12	0.004751	40	44	0.000959	72	76	0.000194	104	108	0.000039
12	16	0.003889	44	48	0.000785	76	80	0.000159	108	112	0.000032
16	20	0.003184	48	52	0.000643	80	84	0.000130	112	116	0.000026
20	24	0.002607	52	56	0.000526	84	88	0.000106	116	120	0.000021
24	28	0.002135	56	60	0.000431	88	92	0.000087			
28	32	0.001748	60	64	0.000353	92	96	0.000071			

Time Area Diagram for Green Roof at Pipe Number S2.000 (Storm)

Area (m³) 1060 Evaporation (mm/day) 3
Depression Storage (mm) 10 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.019262	32	36	0.003889	64	68	0.000785	96	100	0.000159
4	8	0.015771	36	40	0.003184	68	72	0.000643	100	104	0.000130
8	12	0.012912	40	44	0.002607	72	76	0.000526	104	108	0.000106
12	16	0.010571	44	48	0.002134	76	80	0.000431	108	112	0.000087
16	20	0.008655	48	52	0.001747	80	84	0.000353	112	116	0.000071
20	24	0.007086	52	56	0.001431	84	88	0.000289	116	120	0.000058
24	28	0.005802	56	60	0.001171	88	92	0.000236			
28	32	0.004750	60	64	0.000959	92	96	0.000194			

Time Area Diagram for Green Roof at Pipe Number S3.000 (Storm)

Area (m³) 542 Evaporation (mm/day) 3
Depression Storage (mm) 10 Decay Coefficient 0.050

Time Area Diagram for Green Roof at Pipe Number S3.000 (Storm)

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.009849	32	36	0.001989	64	68	0.000401	96	100	0.000081
4	8	0.008064	36	40	0.001628	68	72	0.000329	100	104	0.000066
8	12	0.006602	40	44	0.001333	72	76	0.000269	104	108	0.000054
12	16	0.005405	44	48	0.001091	76	80	0.000220	108	112	0.000044
16	20	0.004426	48	52	0.000893	80	84	0.000180	112	116	0.000036
20	24	0.003623	52	56	0.000732	84	88	0.000148	116	120	0.000030
24	28	0.002967	56	60	0.000599	88	92	0.000121			
28	32	0.002429	60	64	0.000490	92	96	0.000099			

Time Area Diagram for Green Roof at Pipe Number S4.000 (Storm)

Area (m³) 2017 Evaporation (mm/day) 3
Depression Storage (mm) 10 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.036653	32	36	0.007400	64	68	0.001494	96	100	0.000302
4	8	0.030009	36	40	0.006059	68	72	0.001223	100	104	0.000247
8	12	0.024569	40	44	0.004960	72	76	0.001001	104	108	0.000202
12	16	0.020116	44	48	0.004061	76	80	0.000820	108	112	0.000166
16	20	0.016469	48	52	0.003325	80	84	0.000671	112	116	0.000136
20	24	0.013484	52	56	0.002722	84	88	0.000550	116	120	0.000111
24	28	0.011040	56	60	0.002229	88	92	0.000450			
28	32	0.009038	60	64	0.001825	92	96	0.000368			

Time Area Diagram for Green Roof at Pipe Number S1.005 (Storm)

Area (m³) 1000 Evaporation (mm/day) 3
Depression Storage (mm) 10 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.018172	32	36	0.003669	64	68	0.000741	96	100	0.000150
4	8	0.014878	36	40	0.003004	68	72	0.000606	100	104	0.000122
8	12	0.012181	40	44	0.002459	72	76	0.000497	104	108	0.000100
12	16	0.009973	44	48	0.002014	76	80	0.000407	108	112	0.000082
16	20	0.008165	48	52	0.001649	80	84	0.000333	112	116	0.000067
20	24	0.006685	52	56	0.001350	84	88	0.000272	116	120	0.000055
24	28	0.005473	56	60	0.001105	88	92	0.000223			
28	32	0.004481	60	64	0.000905	92	96	0.000183			

Time Area Diagram for Green Roof at Pipe Number S1.006 (Storm)

Area (m³) 570 Evaporation (mm/day) 3
Depression Storage (mm) 10 Decay Coefficient 0.050

Time Area Diagram for Green Roof at Pipe Number S1.006 (Storm)

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.010358	32	36	0.002091	64	68	0.000422	96	100	0.000085
4	8	0.008480	36	40	0.001712	68	72	0.000346	100	104	0.000070
8	12	0.006943	40	44	0.001402	72	76	0.000283	104	108	0.000057
12	16	0.005685	44	48	0.001148	76	80	0.000232	108	112	0.000047
16	20	0.004654	48	52	0.000940	80	84	0.000190	112	116	0.000038
20	24	0.003811	52	56	0.000769	84	88	0.000155	116	120	0.000031
24	28	0.003120	56	60	0.000630	88	92	0.000127			
28	32	0.002554	60	64	0.000516	92	96	0.000104			

Time Area Diagram for Green Roof at Pipe Number S1.007 (Storm)

Area (m³) 330 Evaporation (mm/day) 3
Depression Storage (mm) 10 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.005997	32	36	0.001211	64	68	0.000244	96	100	0.000049
4	8	0.004910	36	40	0.000991	68	72	0.000200	100	104	0.000040
8	12	0.004020	40	44	0.000812	72	76	0.000164	104	108	0.000033
12	16	0.003291	44	48	0.000664	76	80	0.000134	108	112	0.000027
16	20	0.002695	48	52	0.000544	80	84	0.000110	112	116	0.000022
20	24	0.002206	52	56	0.000445	84	88	0.000090	116	120	0.000018
24	28	0.001806	56	60	0.000365	88	92	0.000074			
28	32	0.001479	60	64	0.000299	92	96	0.000060			

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 7
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.300
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 14.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 100.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SS6.0	240 Winter	1	+20%	30/600 Winter	100/240 Winter		
S1.001	SS6.1	240 Winter	1	+20%	30/600 Winter			
S2.000	SS7.0	240 Winter	1	+20%	30/480 Winter			
S1.002	SS6.2	15 Winter	1	+20%	30/480 Winter			
S1.003	SS6.3	15 Winter	1	+20%	30/120 Winter			
S3.000	SS8.0	240 Winter	1	+20%	30/600 Winter	100/240 Winter		
S3.001	SS8.1	240 Winter	1	+20%	30/480 Winter			
S3.002	SS8.2	240 Winter	1	+20%	30/480 Winter			
S4.000	SS9.0	240 Winter	1	+20%	30/720 Winter			
S1.004	SS6.4	15 Winter	1	+20%	30/60 Winter			
S1.005	SS6.5	240 Winter	1	+20%	30/60 Summer			
S1.006	SS6.6	240 Winter	1	+20%	30/60 Winter			
S1.007	SS6.7	1440 Winter	1	+20%	30/120 Summer			
S1.008	SS5.4	1440 Winter	1	+20%				

RESULTS FOR 1-in-1 YEAR STORM
+20% CLIMATE CHANGE ALLOWANCE

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS6.0	87.799	-0.201	0.000	0.03		0.8	OK	18
S1.001	SS6.1	87.730	-0.206	0.000	0.02		0.7	OK	
S2.000	SS7.0	87.664	-0.186	0.000	0.07		2.0	OK	
S1.002	SS6.2	87.583	-0.168	0.000	0.14		4.3	OK	
S1.003	SS6.3	87.513	-0.136	0.000	0.32		9.8	OK	
S3.000	SS8.0	87.801	-0.199	0.000	0.03		1.0	OK	18
S3.001	SS8.1	87.626	-0.199	0.000	0.03		1.0	OK	
S3.002	SS8.2	87.481	-0.199	0.000	0.03		1.0	OK	
S4.000	SS9.0	87.926	-0.174	0.000	0.12		3.9	OK	
S1.004	SS6.4	87.416	-0.136	0.000	0.33		9.7	OK	
S1.005	SS6.5	87.350	-0.130	0.000	0.37		10.6	OK	
S1.006	SS6.6	87.304	-0.120	0.000	0.44		11.6	OK	
S1.007	SS6.7	86.922	-0.071	0.000	0.08		2.3	OK	
S1.008	SS5.4	86.745	-0.336	0.000	0.02		2.3	OK	

NETWORK DOES NOT FLOOD OR SURCHARGE

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	7
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.300
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	14.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	100.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SS6.0	1440 Winter	30	+20%	30/600 Winter	100/240 Winter		
S1.001	SS6.1	1440 Winter	30	+20%	30/600 Winter			
S2.000	SS7.0	1440 Winter	30	+20%	30/480 Winter			
S1.002	SS6.2	1440 Winter	30	+20%	30/480 Winter			
S1.003	SS6.3	1440 Winter	30	+20%	30/120 Winter			
S3.000	SS8.0	1440 Winter	30	+20%	30/600 Winter	100/240 Winter		
S3.001	SS8.1	1440 Winter	30	+20%	30/480 Winter			
S3.002	SS8.2	1440 Winter	30	+20%	30/480 Winter			
S4.000	SS9.0	1440 Winter	30	+20%	30/720 Winter			
S1.004	SS6.4	1440 Winter	30	+20%	30/60 Winter			
S1.005	SS6.5	1440 Winter	30	+20%	30/60 Summer			
S1.006	SS6.6	1440 Winter	30	+20%	30/60 Winter			
S1.007	SS6.7	1440 Winter	30	+20%	30/120 Summer			
S1.008	SS5.4	1440 Winter	30	+20%				

RESULTS FOR 1-in-30 YEAR STORM
+20% CLIMATE CHANGE ALLOWANCE

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS6.0	88.423	0.423	0.000	0.02		0.6	FLOOD RISK	18
S1.001	SS6.1	88.422	0.486	0.000	0.02		0.6	SURCHARGED	
S2.000	SS7.0	88.423	0.573	0.000	0.06		1.7	SURCHARGED	
S1.002	SS6.2	88.422	0.671	0.000	0.10		3.1	SURCHARGED	
S1.003	SS6.3	88.420	0.771	0.000	0.13		4.0	SURCHARGED	
S3.000	SS8.0	88.419	0.419	0.000	0.03		0.9	FLOOD RISK	18
S3.001	SS8.1	88.419	0.594	0.000	0.03		0.9	SURCHARGED	
S3.002	SS8.2	88.418	0.738	0.000	0.03		0.9	SURCHARGED	
S4.000	SS9.0	88.420	0.320	0.000	0.10		3.3	SURCHARGED	
S1.004	SS6.4	88.418	0.866	0.000	0.28		8.2	SURCHARGED	
S1.005	SS6.5	88.413	0.933	0.000	0.34		9.8	SURCHARGED	
S1.006	SS6.6	88.409	0.985	0.000	0.41		10.7	SURCHARGED	
S1.007	SS6.7	88.405	1.412	0.000	0.11		3.1	SURCHARGED	
S1.008	SS5.4	86.750	-0.331	0.000	0.03		3.1	OK	

NETWORK DOES NOT FLOOD, SURCHARGING IS PERMISSIBLE IN THIS STORM SIMULATION

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	7
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.300
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)		14.000 Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	100.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SS6.0	1440 Winter	100	+20%	30/600 Winter	100/240 Winter		
S1.001	SS6.1	1440 Winter	100	+20%	30/600 Winter			
S2.000	SS7.0	600 Winter	100	+20%	30/480 Winter			
S1.002	SS6.2	600 Winter	100	+20%	30/480 Winter			
S1.003	SS6.3	600 Winter	100	+20%	30/120 Winter			
S3.000	SS8.0	1440 Winter	100	+20%	30/600 Winter	100/240 Winter		
S3.001	SS8.1	1440 Winter	100	+20%	30/480 Winter			
S3.002	SS8.2	480 Winter	100	+20%	30/480 Winter			
S4.000	SS9.0	480 Winter	100	+20%	30/720 Winter			
S1.004	SS6.4	480 Winter	100	+20%	30/60 Winter			
S1.005	SS6.5	480 Winter	100	+20%	30/60 Summer			
S1.006	SS6.6	480 Winter	100	+20%	30/60 Winter			
S1.007	SS6.7	480 Winter	100	+20%	30/120 Summer			
S1.008	SS5.4	480 Winter	100	+20%				

RESULTS FOR 1-in-100 YEAR STORM
+20% CLIMATE CHANGE ALLOWANCE

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS6.0	88.537	0.537	37.266	0.10		2.9	FLOOD	18
S1.001	SS6.1	88.538	0.601	0.000	0.07		2.9	SURCHARGED	
S2.000	SS7.0	88.559	0.709	0.000	0.13		4.0	SURCHARGED	
S1.002	SS6.2	88.553	0.802	0.000	0.24		7.1	FLOOD RISK	
S1.003	SS6.3	88.566	0.917	0.000	0.31		9.4	SURCHARGED	
S3.000	SS8.0	88.532	0.532	32.340	0.05		1.6	FLOOD	18
S3.001	SS8.1	88.533	0.707	0.000	0.05		1.6	SURCHARGED	
S3.002	SS8.2	88.549	0.870	0.000	0.07		2.4	SURCHARGED	
S4.000	SS9.0	88.586	0.486	0.000	0.26		8.8	SURCHARGED	
S1.004	SS6.4	88.574	1.022	0.000	0.75		21.9	SURCHARGED	
S1.005	SS6.5	88.581	1.101	0.000	0.92		26.2	SURCHARGED	
S1.006	SS6.6	88.579	1.155	0.000	1.09		28.7	SURCHARGED	
S1.007	SS6.7	88.577	1.584	0.000	0.11		3.3	SURCHARGED	
S1.008	SS5.4	86.750	-0.331	0.000	0.03		3.3	OK	

FLOODING OCCURS AT LOWEST POINT OF NETWORK
IN STORMS OF DURATION GREATER THAN 240min.
OVERFLOW VOLUME TO BE CAPTURED ON SITE IN
RETENTION BASIN.
OUTFLOW REMAINS BELOW QBAR VALUE OF 5L/S

9 CLIMATE AIR QUALITY - APPENDICES

9.1 AMBIENT AIR QUALITY STANDARDS

Ambient Air Quality Standards
National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time which was the issue of acid rain. As a result of this sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.
In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002) and has set limit values which came into operation on 17th June 2002. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002 and started to reduce from 1st January 2003 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, has published limit values for both carbon monoxide and benzene in ambient air. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08 which has been transposed into Irish Law as S.I. 180 of 2011. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5.}$ The margins of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regard to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ was to establish a target value of 25 µg/m^3, as an annual average (to be attained everywhere by 2010) and a limit value of 25 µg/m^3, as an annual average (to be attained everywhere by 2015), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 µg/m^3 to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 µg/m3). Where the AEI is currently greater than 22 µg/m^3 all appropriate measures should be employed to reduce this level to 18 µg/m^3 by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008 - 2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 µg/m^3 was set to be complied with by 2015 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO_X (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_X such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NOX limit for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km^2 of surrounding area.
Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

Air Dispersion Modelling
The inputs to the DMRB model consist of information on road layouts, receptor locations, annual average daily traffic movements, annual average traffic speeds and background concentrations. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data. The DMR B has recently undergone an extensive validation exercise as part of the UK's Review and Assessment Process to designate areas as Air Quality Management Areas (AQMAs). The validation exercise was carried out at 12 monitoring sites within the UK DEFRAs national air quality monitoring network. The validation exercise was carried out for NO_X, NO_2 and PM_{10}, and included urban background and kerbside/roadside locations, "open" and "confined" settings and a variety of geographical locations.

In relation to NO_2, the model generally over-predicts concentrations, with a greater degree of over-prediction at "open" site locations. The performance of the model with respect to NO_2 mirrors that of NO_X showing that the over-prediction is due to NO_X calculations rather than the NO_X:NO_2 conversion. Within most urban situations, the model overestimates annual mean NO_2 concentrations by between 0 to 40% at confined locations and by 20 to

60% at open locations. The performance is considered comparable with that of sophisticated dispersion models when applied to situations where specific local validation corrections have not been carried out.

The model also tends to over-predict PM_{10}. Within most urban situations, the model will over-estimate annual mean PM_{10} concentrations by between 20 to 40%. The performance is comparable to more sophisticated models, which, if not validated locally, can be expected to predict concentrations within the range of 50%. Thus, the validation exercise has confirmed that the model is a useful screening tool for the Second Stage Review and Assessment, for which a conservative approach is applicable.

9.2 TRANSPORT INFRASTRUCTURE IRELAND SIGNIFICANCE CRITERIA

Magnitude of Change	Annual Mean NO_2 / PM_{10}	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥4 µg/m^3	Increase / decrease ≥2.5 µg/m^3
Medium	Increase / decrease 2 - <4 µg/m^3	Increase / decrease 1.25 - <2.5 µg/m^3
Small	Increase / decrease 0.4 - <2 µg/m^3	Increase / decrease 0.25 - <1.25 µg/m^3
Imperceptible	Increase / decrease <0.4 µg/m^3	Increase / decrease <0.25

Table A1: Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration Note 1		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

Note 1 *Well Below Standard = <75% of limit value.*

Table A2: Air Quality Impact Significance Criteria For Annual Mean NO_2 and PM_{10} and $PM_{2.5}$ Concentrations at a Receptor

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration Note 1		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

Note 1 *Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible*

Table A3: Air Quality Impact Significance Criteria For Changes to Number of Days with PM_{10} Concentration Greater than 50 µg/m^3 at a Receptor

9.3 DUST MINIMISATION PLAN

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland and the United Kingdom.

Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.

At the construction/demolition planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 9.1 for the windrose for Casement Aerodrome). As the prevailing wind is predominantly south-westerly, locating construction/demolition compounds and storage piles downwind of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed. The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials. Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods were care will be needed to ensure that dust nuisance does not occur.

The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;

- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;

- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;
- At all times, the procedures put in place will be strictly monitored and assessed.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

Site Roads / Haulage Routes

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80%.

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- Access gates to the site shall be located at least 10m from sensitive receptors where possible;
- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction/demolition period. Research has found that watering can reduce dust emissions by 50%. Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use;
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

Land Clearing / Earth Moving

Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust;
- During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.

Storage Piles

The location and moisture content of storage piles are important factors which determine their potential for dust emissions.

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors;
- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency;
- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads should be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- At the main site traffic exits, a wheel wash facility shall be installed if feasible. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

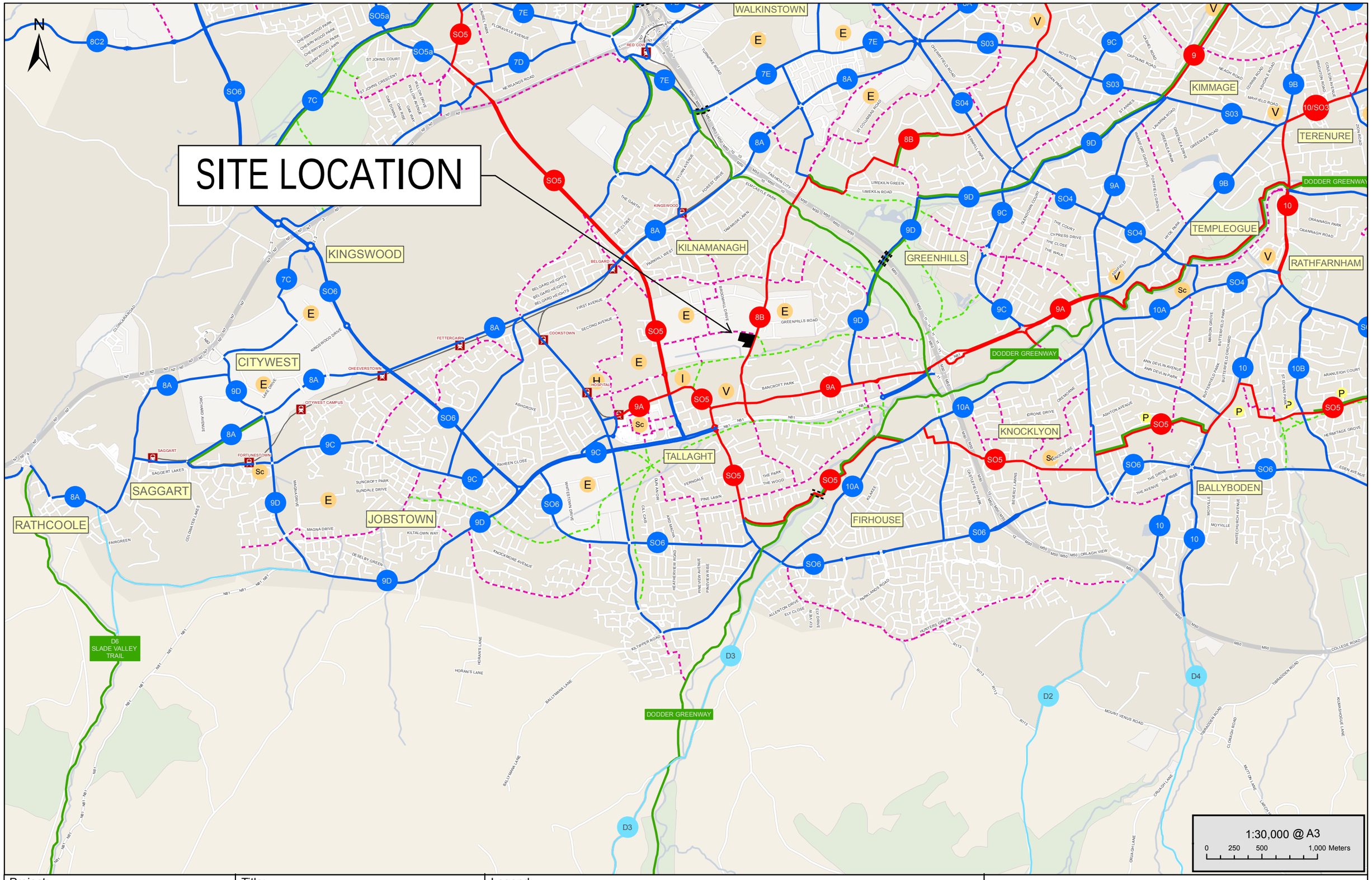
Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;
- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.

11 TRAFFIC & TRANSPORTATION - APPENDICES

11.1CYCLE NETWORK PLAN



Project:	Title:	Legend:					
CYCLE NETWORK PLAN FOR THE GREATER DUBLIN AREA	PROPOSED CYCLE NETWORK DUBLIN SOUTH WEST SHEET N6	Primary Secondary Greenway Primary/Secondary	Inter-Urban Feeder Minor Greenway New Cycle Bridge	P Permeability Link Gateway E Employment Zones H Hospitals	I Institute of Technology Sc Shopping Centre Tc Town Centre U University V Village Centre	Greenline Tram Stops Redline Tram Stops Stations	

Údarás Náisiúnta Iompair National Transport Authority

AECOM
Roughan & O'Donovan

Grand Canal House,
Upper Grand Canal Street,
Dublin 4

Tel: +353 (0)1 238 3100
Fax: +353 (0)1 238 3199
www.aecom.com

11.2BUS CONNECTS PROPOSAL

Greenhills > City Centre

Core Bus Corridor (bus & cycle infrastructure)

9

Key Facts

- Route length **11kms**
- Current bus journey time up to **80mins**
- BusConnects journey time **35-40mins**
- Future bus journey time without BusConnects **100mins+**

Potential Impacts

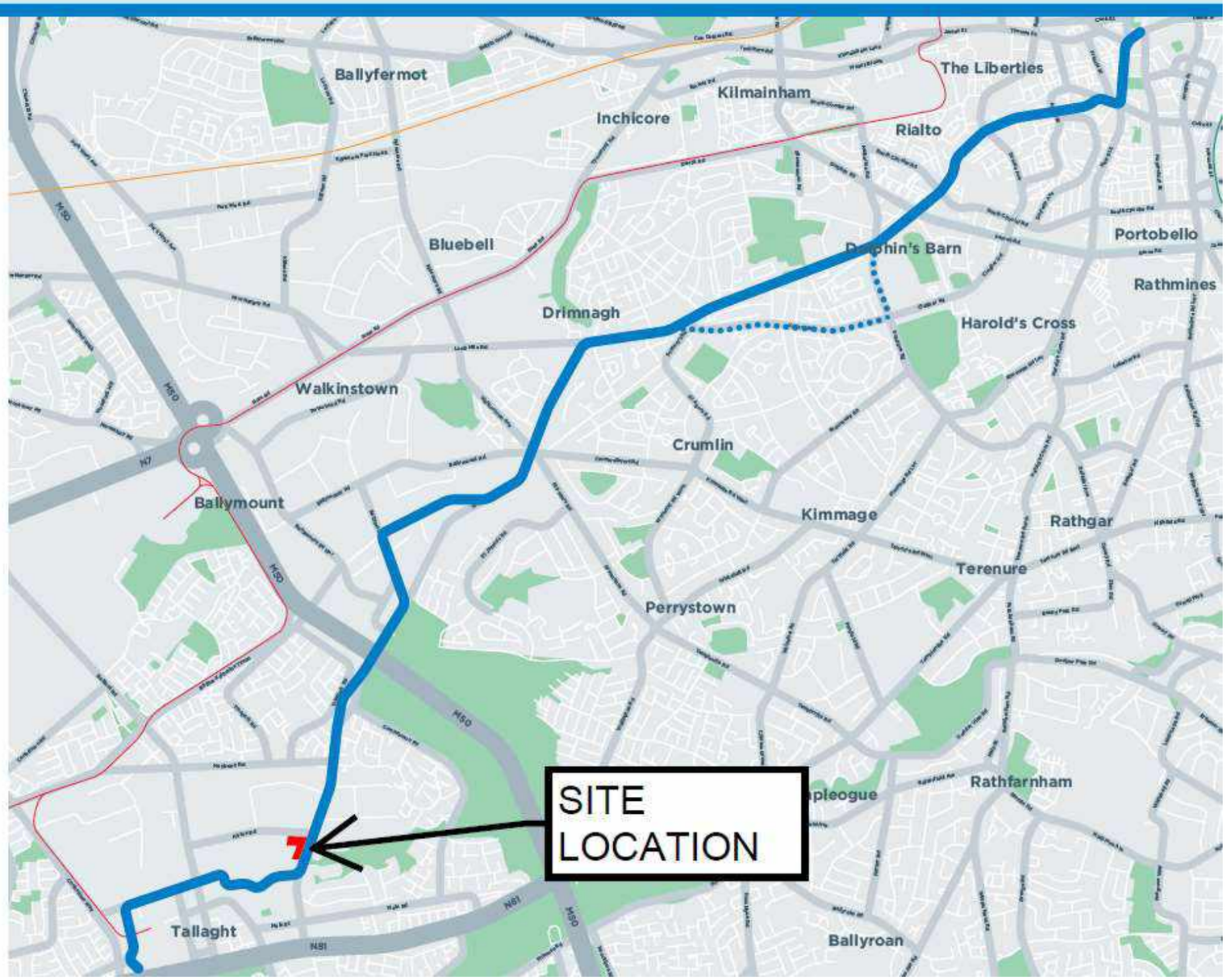
- Parts of front gardens removed
- Loss of parking spaces
- Changes to traffic movements
- Loss of trees

Additional Specific Challenges on Route

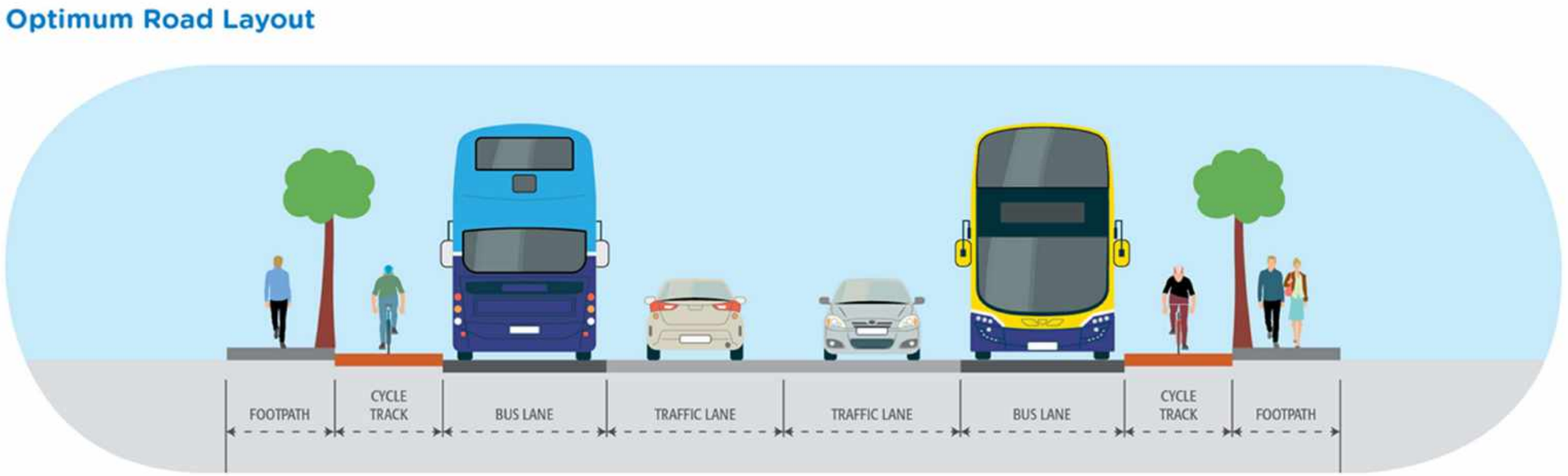
- Restricted width on many roads along this route requiring road widening.
- Walkinstown Roundabout is challenging for both bus and cycle movements.
- A proposal is to construct new link roads to divert all traffic via Calmount Avenue and Calmount Road while still maintaining access to the old section of Greenhills Road.
- A proposal is to realign a section of the Greenhills Road adjoining Castletymon Road junction.

Bus Route

Alternative Cycle Route



11.3 BUS CONNECTS ROAD LAYOUT



13 WASTE MANAGEMENT - APPENDICES

13.1 OPERATIONAL WASTE AND RECYCLING MANAGEMENT PLAN

OPERATIONAL WASTE & RECYCLING MANAGEMENT PLAN

FOR DEVELOPMENT

AT

AIRTON ROAD

TALLAGHT

DUBLIN 24

Prepared for

Greenleaf Homes Ltd.

Prepared by

Traynor Environmental Ltd

Reference Number

19.270 TE

Date of Issue

13th February 2020

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Client: Greenleaf Homes Ltd

Traynor Env Ref: 19.270 TE

Status: Final Report

Date: 13th February 2020

Report Title:	Operational Waste & Recycling Management Plan
Doc Reference:	19.270
Client:	Greenleaf Homes Ltd
Authorised By:	*Nevin Traynor BSc. Env, H.Dip I.T, Cert SHWW, EPA/FAS Cert. Environmental Consultant*

Rev No	Status	Date	Writer	Reviewer
1.	Final	13th February 2020	Angela Kelly	Nevin Traynor

This report refers, within the limitations stated, to the condition of the site at the time of the report. No warranty is given as to the possibility of future changes in the condition of the site. The report as presented is based on the information sources as detailed in this report, and hence maybe subject to review in the future if more information is obtained or scientific understanding changes.

EXECUTIVE SUMMARY

Traynor Environmental Ltd has been appointed by Greenleaf Homes Ltd. (hereafter referred to as the 'Applicant') to prepare an Operational Waste and Recycling Management Plan (OWRMP) (hereafter referred to as the 'Strategy') in support of the proposed development at Airton Road, Tallaght, Dublin 24 (hereafter referred to as the 'Proposed Development') located within the administrative boundary of South Dublin County Council.

The proposed Development consists of:

The proposed mixed-use residential development will consist of 502 No. residential apartment units in 6 no. multi-storey blocks. Parking is provided at under croft level within blocks A/B/C and at basement level in blocks E/F.

The principal aim of this Strategy is to demonstrate how the Proposed Development has taken into account sustainable methods for waste and recycling management during its operation. Furthermore, with regards to waste and recycling management within the Proposed Development, this Strategy has the following aims:

- *To contribute towards achieving current and long-term government targets, Eastern Midlands Region (EMR), South Dublin County Council for waste minimisation, recycling and re-use;*
- *To comply with all applicable legal requirements for handling, storage and collection of operational waste;*
- *To achieve high standards of waste management performance, through giving (and continuing to give) due consideration to the waste generated by the Proposed Development during its operation; and*
- *To provide the Proposed Development with a convenient, clean and efficient waste management strategy that enhances the operation of the Proposed Development and promotes recycling.*

Once operational, the Proposed Development is anticipated to produce approximately 90,222L of waste from all land uses per week. Of this total, 81,136L will be generated by the residential elements and 9,086L will be generated by the commercial/communal/creche elements. Residential waste storage allows for a weekly (seven day) storage capacity for MDR, food, glass and residual (i.e. nonrecyclable). Residential bins will be provided within dedicated storage rooms within the core of each residential block. On the day of collection, bins from the waste storage areas will be brought to the collection point where all bins will be emptied by the approved waste collector. Once emptied the bins will be returned back to the appropriate waste storage areas.

In particular this OWRMP aims to provide a robust strategy for storing, handling, collection and transport of the wastes generated at site. Additionally, all waste infrastructure introduced to the Development will comply with South Dublin County Council's requirements, British Standard 5906:2005 (Waste Management in Buildings Code of Practice) and DoEHLG, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities (2018).

1.0 INTRODUCTION

This Operational Waste and Recycling Management Plan (the 'Strategy') has been prepared by Nevin Traynor BSc.Env, HDIP IT, Cert SHWW, IAH of Traynor Environmental Ltd on behalf of Greenleaf Homes Ltd ('The Applicant') in support of the proposed mixed-use residential development at Airton Road, Tallaght, Dublin 24 (hereafter referred to as the 'Proposed Development') within the South Dublin County Council responsibility.

The principal aim of this Strategy is to demonstrate how the Proposed Development has taken into account sustainable methods for waste and recycling management during its operation. Furthermore, with regards to waste and recycling management within the Proposed Development, this Strategy has the following aims:

- To contribute towards achieving current and long-term government, Eastern Midlands Region (EMR) and South Dublin County Council targets for waste minimisation, recycling and re-use;
- To comply with all legal requirements for handling operational waste;
- To achieve high standards of waste management performance, through giving (and continuing to give) due consideration to the waste generated by the Proposed Development during its operation; and
- To provide the Proposed Development with a convenient, clean and efficient waste management strategy that enhances the operation of the Proposed Development and promotes recycling.

South Dublin County Council is part of the Eastern Midlands Waste Management Region. The Eastern Midlands Waste Management Region comprises of Dublin City Council, Dun Laoghaire – Rathdown, Fingal, South Dublin, Kildare, Louth, Laois, Longford, Meath, Offaly, Westmeath and Wicklow County Council.

This Strategy provides a review of the requirements placed upon the Proposed Development under national legislation and implemented policy at all levels of government (i.e. national (Ireland), regional (EMR), district and local (South Dublin County Council). Consideration has also been given to requirements included in local standards and guidance documents (i.e. DoEHLG, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities (2018) in line with the Regional Waste Management Plan and British Standard Waste Management in Buildings, Code of Practice (BS 5906:2005) so as to comply with relevant objectives and targets.

Estimate volumes of waste generated during operation of the Proposed Development have been provided in the report which also includes a breakdown of the waste management process, which details waste handling, storage area provision, and collection arrangements. All waste reduction measures are compliant with BS 5906:2005, Eastern Midlands Region (EMR) and Sustainable Urban Housing: Design Standards for New Apartments which are also discussed in this strategy.

Figure No. 1 Site Layout

2.0 LEGISLATION/ PLANNING POLICY

A summary of national regional and local planning policy relevant to the Proposed Development is outlined in section 2.1 below. It should be noted that this summary identifies those elements of the policy or guidance applicable to waste management within the Proposed Development.

2.1 National Legislation

The Government issued a policy statement in September 1998 titled as *'Changing Our Ways'* which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. A heavy emphasis was placed on reducing reliance on landfill and finding alternative methods for managing waste. Amongst other things, Changing Our Ways stated a target of at least 35% recycling of municipal (i.e. household, commercial and non-process industrial) waste.

A further policy document *'Preventing and Recycling Waste – Delivering Change'* was published in 2002. This document proposed a number of programmes to increase recycling of waste and allow diversion from landfill. The need for waste minimisation at source was considered a priority.

This view was also supported by a review of sustainable development policy in Ireland and achievements to date, which was conducted in 2002, entitled *'Making Irelands Development Sustainable – Review, Assessment and Future Action'*. This document also stressed the need to break the link between economic growth and waste generation, again through waste minimisation and reuse of discarded material.

In order to establish the progress of the Government policy document *Changing Our Ways*, a review document was published in April 2004 entitled *'Taking Stock and Moving Forward'*. Covering the period 1998 – 2003, the aim of this document was to assess progress to date with regard to waste management in Ireland, to consider developments since the policy framework and the local authority waste management plans were put in place, and to identify measures that could be undertaken to further support progress towards the objectives outlined in *Changing Our Ways*.

In particular, *Taking Stock and Moving Forward* noted a significant increase in the amount of waste being brought to local authority landfills. The report noted that one of the significant challenges in the coming years was the extension of the dry recyclable collection services. The most recent policy document was published in July 2012 titled *'A Resource Opportunity.* The policy document stresses the environmental and economic benefits of better waste management, particularly in relation to waste prevention. The document sets out several actions, including the following:

- A move away from landfill and replacement through prevention, reuse, recycling and recovery.
- A Brown Bin roll-out diverting 'organic waste' towards more productive uses.

- Introducing a new regulatory regime for the existing side-by-side competition model within the household waste collection market;
- New Service Standards to ensure that consumers receive higher customer service standards from their operator;
- Placing responsibility on householders to prove they use an authorised waste collection service.
- The establishment of a team of Waste Enforcement Officers for cases relating to serious criminal activity will be prioritised;
- A review of the producer responsibility model will be initiated to assess and evaluate the operation of the model in Ireland;
- Significant reduction of Waste Management Planning Regions from ten to three.

While a *resource opportunity* covers the period to 2020, it is subject to a mid-term review in 2016 to ensure that the measures are set out properly and to provide an opportunity for additional measures to be adopted in the event of inadequate performance. Since 1998, the Environmental Protection Agency (EPA) has produced periodic *'National Waste (Database) Reports'* detailing among other things estimates for household and commercial (municipal) waste generation in Ireland and the level of recycling, recovery and disposal of these materials. The 2018 National Waste Statistics, which is the most recent study published, reported the following key statistics for 2016:

- 2,763 kilotonnes of municipal waste was managed in 2016 (6% increase compared to 2014).
- 74% of managed municipal waste was recovered (79% in 2014). Recovery includes treatment processes such as recycling, use as a fuel (incineration and co-incineration) and backfilling.
- 41% of managed municipal waste was recycled (41% in 2014). Recycling includes reprocessing of waste materials into products, composting and anaerobic digestion.
- 26% of managed municipal waste was landfilled in 2016.

2.2 Regional Level

The proposed development is located in the Local Authority area of South Dublin County Council. The *EMR Waste Management Plan 2015 – 2021* is the regional waste management plan for the SDCC area which was published in May 2015. This plan replaces the previous Dublin region plan due to changing National policy as set out in *A Resource Opportunity: Waste Management Policy in Ireland* and changes being enacted by the *Waste Framework Directive (2008/98/EC).*

The regional plan sets out the following strategic targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;

- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy. The *South Dublin County Council Development Plan 2016 – 2022* sets out a number of objectives and actions for the South Dublin area in line with the objectives of the waste management plan.

Waste objectives and actions with a particular relevance to this development are:

- ***IE5 Objective 1:*** *To support the implementation of the Eastern–Midlands Region Waste Management Plan 2015-2021 by adhering to overarching performance targets, policies and policy actions.*
- ***IE5 Objective 2:*** *To support waste prevention through behavioural change activities to de-couple economic growth and resource use.*
- ***IE5 Objective 3:*** To encourage the transition from a waste management economy to a green circular economy to enhance employment and increase the vale recovery and recirculation of resources.
- ***IE5 Objective 4:*** To provide, promote and facilitate high quality sustainable waste recovery and disposal infrastructure / technology in keeping with the EU waste hierarchy and to adequately cater for a growing residential population and business sector.
- ***IE5 Objective 5:*** To provide and maintain the network of bring infrastructure (e.g. civic amenity facilities, bring banks) in the county to facilitate the recycling and recovery of hazardous and non – hazardous municipal wastes.
- ***IE5 Objective 6:*** To seek the provision of adequately sized public recycling facilities in association with new commercial developments and in tandem with significant change of use / extensions of existing commercial developments where appropriate.
- ***IE5 Objective 7:*** To develop a countrywide network of green waste centres in suitable locations to expand the collection system for compostable waste.
- ***IE5 Objective 8:*** *To secure appropriate provision for the sustainable management of waste within developments, including the provision of facilities for the storage, separation and collection of such waste.*

Actions:

- *Support and facilitate the separation of waste at source into organic and non-organic streams or other waste management systems that divert waste from landfill and maximise the potential for each waste type to be re-used and recycled or composted and divert organic waste from landfill, in accordance with the National Strategy on Biodegradable Waste (2006).*

- *Implement the objectives of the National Waste Prevention Programme at a local level with businesses, schools, householders, community groups and within the Council's own activities.*
- *Promote an increase in the amount of waste re-used and recycled consistent with the Regional Waste Management Plan*

  and Waste Hierarchy and facilitate recycling of waste through adequate provision of facilities and good design in new developments.
- *Implement the South Dublin Litter Management Plan 2015 – 2019.*

2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

Waste Management Act 1996 (No. 10 of 1996) as amended and associated legislation includes:

- Environmental Protection Act 1992 (S.I. No. 7 of 1992) as amended by the Protection of the Environment Act 2003 (S.I. No. 27 and S.I. No. 413 of 2003) and amended by the Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended;
- Litter Pollution Act 1997 (Act No. 12 of 1997) as amended by the Litter Pollution Regulations 1999 (S.I. No. 359 of 1999) and Protection of the Environment Act 2003;
- European Communities (Transfrontier Shipment of Waste) Regulations, 1994 (S.I. No. 221 of 1994);
- European Union (Properties of Waste Which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015);
- Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended 2004 (S.I. No. 395 of 2004) and 2010 (S.I. No. 350 of 2010);
- European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014);
- Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997);
- Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015);
- European Communities (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014);
- European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended 2011 and 2016 (S.I. No. 323 of 2011);
- Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007) as amended 2008 (S.I No 87 of 2008) and 2016 (S.I. 24 of 2016);
- Waste Management (Facility Permit and Registration) Regulation 2007 (S.I No. 821 of 2007) as amended 2008 (S.I No. 86 of 2008), 2014 (S.I. No. 310 and S.I. No. 546 of 2014) and 2015 (S.I. No. 198 of 2015);

- Waste Management (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended 2014 (S.I. No. 349 of 2014) and 2015 (S.I. No. 347 of 2015);
- Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended 2015 (S.I. No. 190 of 2015);
- European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 191 of 2015);
- Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended 2000 (S.I. No. 73 of 2000); and
- Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended by European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011)

2.4 Responsibilities of the Waste Producer.

The waste producer is responsible for waste from the time it is generated through until its legal disposal (including its method of disposal.) Waste contractors will be employed to physically transport waste to the final waste disposal / recovery site. It is therefore critical that the residents and the proposed management company undertake on-site management of waste in accordance with all legal requirements and employ suitably permitted/licenced contractors to undertake off-site management of their waste in accordance with all legal requirements. This includes the requirement that a waste contactor handle, transport and reuse/recover/recycle/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities. A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended or a waste or IED (Industrial Emissions Directive) licence granted by the EPA. The COR/permit/licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

2.5 South Dublin County Council Bye-Laws 2018

These Bye-Laws for the Segregation, Storage and Presentation of Household and Commercial Waste were designed to repeal South Dublin County Council Household Waste Bye-Laws 2012 and South Dublin County Council (Storage, separation at source, presentation and collection of commercial waste) Bye-Laws 2007. The Bye-Laws commenced on the 3rd December 2018 and place legal obligations on the waste producer in terms of the way waste is stored and managed on a site/premises. Dry recyclables must be segregated at source, and bio-waste (organic) must be segregated if a collection service is available. Waste must be presented in approved containers that are kept in a reasonable state and only presented for collection in approved areas and times by the Council. Key requirements under these bye-laws are:

- Kerbside waste presented for collection shall not be presented for collection earlier than 8.00pm on the day

immediately preceding the designated waste collection day;

- All containers used for the presentation of kerbside waste and any uncollected waste shall be removed from any roadway, footway, footpath or any other public place no later than 8:00am on the day following the designated waste collection day;
- Neither recyclable household kerbside waste nor food waste arising from households shall be contaminated with any other type of waste before or after it has been segregated; and
- A management company, or another person if there is no such company, who exercises control and supervision of residential and/or commercial activities in multi-unit developments, mixed-use developments, flats or apartment blocks, combined living/working spaces or other similar complexes shall ensure that: o separate receptacles of adequate size and number are provided for the proper segregation, storage and collection of recyclable household kerbside waste and residual household kerbside waste;
- additional receptacles are provided for the segregation, storage and collection of food waste where this practice is a requirement of the national legislation on food waste;
- the receptacles referred to in paragraphs (a) and (b) are located both within any individual apartment and at the place where waste is stored prior to its collection;
- any place where waste is to be stored prior to collection is secure, accessible at all times by tenants and other occupiers and is not accessible by any other person other than an authorised waste collector,
- written information is provided to each tenant or other occupier about the arrangements for waste separation, segregation, storage and presentation prior to collection;
- an authorised waste collector is engaged to service the receptacles referred to in this section of these bye-laws, with documentary evidence, such as receipts, statements or other proof of payment, demonstrating the existence of this engagement being retained for a period of no less than two years. Such evidence shall be presented to an authorised person within a time specified in a written request from either that person or from another authorised person employed by South Dublin County Council; and
- receptacles for kerbside waste are presented for collection on the designated waste collection day.

2.6 Regional Waste Management Service Providers & Facilities

Various contractors offer waste collection services for the residential sector in the South Dublin County Council. Details of waste collection permits (granted, pending and withdrawn) for the region are available from the NWCPO. There are a number of other licensed and permitted facilities in operation in the region including waste transfer stations, hazardous waste facilities and integrated waste management facilities. There are two existing thermal treatment facilities, one in Duleek, Co. Meath and a second facility in Poolbeg in Dublin. A copy of all CORs and waste permits issued by the Local Authorities are available from the NWCPO website and all waste/IED licenses issued are available from the EPA.

2.7 Policy Context

Development Plan Policy generally sets out guidelines for waste management which conform to the European Union and National Waste Management Hierarchy as follows:

- Waste Prevention
- Minimisation
- Re-use
- Waste Recycling
- Energy Recovery
- Disposal

This guidance is subject to economic and technical feasibility. Council's Waste Management Strategy is firmly grounded in EU and National policy and can be summarised by the waste hierarchy of prevention, recycling, energy recovery and disposal.

3.0 DESCRIPTION OF THE PROJECT

3.1 Location, Size and Scale of the Development

The proposed site is located at the corner of Airton road and Greenhills road, Tallaght, Dublin 24. The proposed mixed-use residential development will consist of 502 No. residential apartment units in 6no. multi-storey blocks. Parking is provided at under croft level within blocks A/B/C and at basement level in blocks E/F. The total number of car parking spaces provided is 202. At ground floor level of Blocks C and D, there are 3 no. retail units with a combined area of 482sq.m.

Block	Number of Units			Total
	1-Bed	2-Bed	3-Bed	Units
A	38	49	1	88
B	53	36	5	94
C	39	47	7	93
D	36	56	15	107
E-F	31	69	20	120
Total	**197**	**257**	**48**	**502**

Table 1.0 Mixed Use Residential Development

Non-Residential Floor Areas	Location	Area (sq.m)
Communal Facilities	Block C	465
Communal Facilities	Block D	93
Communal Facilities	Block E-F	146
Creche (44 Children)	Block C	329
Retail Unit	Block C	187
Retail Unit	Block D	161
Retail Unit	Block D	134
Total		**1,515**

Table 2.0 Mixed Development Details Non-Residential Floor Areas

3.2 Typical Waste Categories

The predicted waste types that will be generated at the proposed development include the following:

- **Dry Mixed Recyclables (DMR**) – includes Newspaper / General paper Magazines, Cardboard Packaging, Drink (Aluminum) Cans, Washed Food (Steel/Tin) Cans, Washed Tetra Pak Milk & Juice Cartons, Plastic Bottles (Mineral/Milk/Juice/Shampoo/Detergents), Rigid Plastics. (Pots/Tubs/Trays*)
- **Mixed Non-Recyclables (MNR) / All General Waste** – Nappies, soiled food, packaging, old candles, plasters, vacuum cleaner contents, broken delph, contaminated plastics
- **Organic (food) Waste** – Leaves, weeds and mosses (not sprayed with weed killer), Dead plants and flowers, Grass and hedge cuttings (finger sized twigs), Bread, pasta and rice, Meat, fish, poultry bones, Out of date food (no plastic packaging), Tea Bags, Coffee grounds and paper filters**.** Fruit and vegetables (cooked and uncooked). Food soiled cardboard or paper (no coated paper) Eggs and dairy products (no plastic packaging) Paper napkin and paper towels
- **Glass**

In addition to the typical waste materials that will be generated on a daily basis, there will be some additional waste types generated in small quantities that will need to be managed separately including:

- Textiles;
- Batteries;
- Waste electrical and electronic equipment (WEEE);
- Chemicals (solvents, pesticides, paints, adhesives, resins, detergents, etc.);
- Fluorescent tubes and other mercury containing waste;
- Furniture (and from time to time other bulky wastes).

Wastes should be segregated into the above waste types to ensure compliance with waste legislation and guidance while maximising the re-use, recycling and recovery of waste with diversion from landfill wherever possible.

3.3 European Waste Codes

In 1994, the *European Waste Catalogue* and *Hazardous Waste List* were published by the European Commission. In 2002, the EPA published a document titled the *European Waste Catalogue and Hazardous Waste List*, which was a condensed version of the original two documents and their subsequent amendments. This document has been replaced by the EPA '*Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous'* which became valid from the 1st June 2015. This waste classification system applies across the EU and is the basis for all national and international waste reporting, such as those associated with waste collection permits, COR's, permits and licences and EPA National Waste Database.

Under the classification system, different types of wastes are fully defined by a code. The List of Waste (LoW) code (also referred to as European Waste Code or EWC) for typical waste materials expected to be generated during the operation of the proposed development is provided in the Table below.

Waste Material	LoW Code
Paper and Cardboard	20 01 01
Plastic	20 01 39
Metals	20 01 40
Mixed Municipal Waste	20 03 01
Glass	20 01 02
Biodegradable Kitchen Waste	20 01 08
Biodegradable garden and park waste	20 02 01
Textiles	20 01 11
Batteries and accumulators*	20 01 33-34
Waste electrical and electronic equipment*	20 01 35-36
Chemicals (solvents, pesticides, paints & adhesives, detergents etc) *	20 01 13 / 20 0119 / 20 0127 / 20 01 28 /20 01 29 / 20 01 30
Fluorescent tubes and other mercury containing waste*	20 01 21
Bulky wastes	20 03 07

Table 3.0 Typical Waste Types Generated and LoW Codes

3.4 Methodology

3.4.1 Residential Calculation Methodology

Waste arisings were calculated in accordance with BS 5906:2005 and included a provision of 5 litres (L) of food waste per residential unit per week. These guidelines determine the minimum capacity for waste storage space to be allocated and are as follows:

- 30 litres (L) per unit + 70L per bedroom (see Table 4 for further details);
- Split 50:50 between
- MDR and residual waste; and
- 5L per residential unit for food waste.

Number of Bedrooms	Weekly Waste Arisings per Unit (L)			
	MDR	Food Waste	Residual Waste	Total
1 Bedroom	50	5	50	**105**
2 Bedrooms	85	5	85	**175**
3 Bedrooms	120	5	120	**245**

Table 4.0 Weekly Waste Arisings Methodology

3.4.2 Commercial Calculation Methodology

BS 5906:2005 provides a methodology for the calculation of waste arisings from creches, communal areas and retail. These calculation methodologies are outlined within Table 5 of this Strategy. A 50:50 split between MDR and residual waste has been assumed for the creche, retail land uses and community space.

Land Use Class	Waste Storage Requirements	Waste Stream Ratios
A: Retail	10L per m^2 Sales Floor Area (SFA)	MDR: Residual Waste 50: 50
D: Creche	10L per m^2 NIA	50: 50 MDR: Residual
D, E-F – Communal Facility	5L per m^2 NIA	50: 50 MDR: Residual

Table 5.0 Commercial Waste Arising Calculations (Weekly)

4.0 ESTIMATED WASTE ARISINGS

The estimated quantum/volume of waste that will be generated from the units has been determined based on the predicted occupancy of the units and is presented in Table 6 and Table 7 below.

	Waste Volume (L/week)					
Waste type	Block A	Block B	Block C	Block D	Block E-F	Totals
Organic Waste	440	470	465	535	600	**2,510**
Mixed Dry Recyclables	6920	6870	6785	8465	10025	**39,065**
Mixed Municipal Waste	6920	6870	6785	8465	10025	**39,065**
Glass	85	95	92	105	119	**496**
Total	**14,365**	**14,305**	**14,127**	**17,570**	**20,769**	**81,136**

Table 6 Residential Waste Prediction (L/per week)

Non-Residential Floor Areas	Location	Area (sq.)	Area (NIA)	MDR	Food Waste	Residual Waste	Glass	Total
Communal Facilities	Block C	465	357.28	893.2	10	893.2	5	1801.4
Communal Facilities	Block D	93	70.84	177.1	5	177.1	5	364.2
Communal Facilities	Block E-F	146	111.65	279.1	8	279.1	5	571.2
Creche (44 Children)	Block C	329	254.1	1,270.5	50	1,270.5	10	2601
Retail Unit	Block C	187	143.99	719.95	10	719.95	5	1454.9
Retail Unit	Block D	161	123.97	619.85	10	619.85	5	1254.7
Retail Unit	Block D	134	102.41	512.05	10	512.05	5	1039.1
Total		**1,515**	**1,164.24**	**4,471.75**	**103**	**4,471.75**	**40**	**9,086.5**

Table 7 Commercial/Creche/Communal Waste Predictions (L/per week)

4.1 Waste Storage and Collection

This section provides information on how waste generated within the development will be stored and how the waste will be collected from the development. This has been prepared with due consideration of the proposed site layout as well as best practice standards, local and national waste management requirements including those of SDCC. In particular, consideration has been given to the following documents:

- BS 5906:2005 Waste Management in Buildings – Code of Practice;
- EMR Waste Management Plan 2015 – 2021;
- South Dublin County Council, *Bye-Laws 2018;*
- DoEHLG, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities (2018).

It is required that space be provided for recycling bins to accommodate 50% of the total weekly volume. This is in line with the BS5906:2005 requirements. Residual waste (MNR) is required for 87.5% of the total weekly arising. For the purpose of the strategy Glass and Organic Waste is required for 87.5% of the total weekly arising.

Block	Number of Bins Required for a Weekly Collection			
	MNR	Organic	DMR	Glass
A	6 x 1100L	2 x 240L	3 x 1100L	2 x 240L
B	6 x 1100L	2 x 240L	4 x 1100L	2 x 240L
C	5 x 1100L	2 x 240L	3 x 1100L	2 x 240L
D	7 x 1100L	2 x 240L	4 x 1100L	2 x 240L
E & F	10 x 1100L	2 x 240L	6 x 1100L	2 x 240L
Total	**34 x 1100L**	**10 x 240L**	**20 x 1100L**	**10 x 240L**

Table 8: Total Bins Required for the Proposed Development.

Block	Number of Bins Required for a Weekly Collection			
	MNR	Organic	DMR	Glass
Retail (Block C)	1 x 1100L	1 x 240L	1 x 1100L	1 x 240L
Retail Unit 1 (Block D)	1 x 1100L	1 x 240L	1 x 1100L	1 x 240L
Retail Unit 2 (Block D)	1 x 1100L	1 x 240L	1 x 1100L	1 x 240L
Total	**3 x 1100L**	**3 x 240L**	**3 x 1100L**	**3 x 240L**

Table 9: Total Bins Required for Retail

Block	Number of Bins Required for a Weekly Collection			
	MNR	Organic	DMR	Glass
Creche (Block C)	2 x 1100L	2 x 240L	1 x 1100L	1 x 240L

Table 10: Total Bins Required for Creche

Block	Number of Bins Required for a Weekly Collection			
	MNR	Organic	DMR	Glass
Communal Facilities Block C	1 x 1100L	1 x 240L	1 x 1100L	1 x 240L
Communal Facilities Block D	1 x 240L	1 x 240L	1 x 240L	1 x 240L
Communal Facilities Block E-F	1 x 1100L	1 x 240L	1 x 1100L	1 x 240L

Table 11: Total Bins Required for Communal

4.2 Waste Storage Residential Units

4.2.1 Block A

Residents will be expected to take all waste arisings from their units to the appropriate residential waste storage area. Residents will be required to segregate their waste into the following waste categories within their own apartment units:

- DMR;
- MNR;
- Organic waste; and
- Glass.

The proposed Waste Storage Areas for Block A are located on the northern and southern wing as per Figure 1.0. Each WSA is titled "Bin Store". It is recommended that all WSAs should have secure access with either key or fob to ensure only residents may place waste in the respective WSA in Block A.

Figure 1.0 Waste Storage Area (Block A)

4.2.2 Block B

Residents will be expected to take all waste arisings from their units to the appropriate residential waste storage area. Residents will be required to segregate their waste into the following waste categories within their own apartment units:

- DMR;
- MNR;
- Organic waste; and
- Glass.

The proposed Waste Storage Areas are located on the northern wing of the main Block B as per Figure 2.0. It is recommended that all WSAs should have secure access with either key or fob to ensure only residents may place waste in the respective WSA in Block B.

Figure 2.0 Waste Storage Block B

4.2.3 Block C

Residents will be expected to take all waste arisings from their units to the appropriate residential waste storage area. Residents will be required to segregate their waste into the following waste categories within their own apartment units:

- DMR;
- MNR;
- Organic waste; and
- Glass.

The proposed Waste Storage Area is located as per Figure 3.0. It is recommended that all WSA should have secure access with either key or fob to ensure only residents may place waste in the respective WSA in Block C.

Figure 3.0 Waste Storage Block C

4.2.4 Block D

Residents will be expected to take all waste arisings from their units to the appropriate residential waste storage area. Residents will be required to segregate their waste into the following waste categories within their own apartment units:

- DMR;
- MNR;
- Organic waste; and
- Glass.

The proposed Waste Storage Areas are located as per Figure 4.0. It is recommended that all WSAs should have secure access with either key or fob to ensure only residents may place waste in the respective WSA in Block D. It is recommended that all WSAs should have secure access with either key or fob to ensure only residents may place waste in the respective WSA in Block D.

Figure 4.0 Waste Storage Block D

4.2.5 Block E & F

Residents will be expected to take all waste arisings from their units to the appropriate residential waste storage area. Residents will be required to segregate their waste into the following waste categories within their own apartment units:

- DMR;
- MNR;
- Organic waste; and
- Glass.

The proposed Waste Storage Areas are located in the basement level in Block E & F as per Figure 5.0. Residents will use the stairs/lift to access the basement level. It is recommended that all WSAs should have secure access with either key or fob to ensure only residents may place waste in the respective WSA in Block E & F.

Figure 5.0 Waste Storage Block E & F

4.2.6 Waste Storage – Creche/Retail Units/Communal Spaces

The creche/Retail units/communal spaces will be required to segregate their waste into the following waste categories within their own unit:

- DMR;
- MNR;
- Organic waste; and
- Glass

As required, the staff will need to bring segregated DMR, MNR, Organic and Glass waste to the dedicated WSA.

Bins will be strategically located throughout the retail units. It is proposed that each retail unit will have separate waste storage for each unit. As required, the tenants will segregate DMR, MNR, Glass and Organic waste within their own unit. If there is a café/restaurant tenant, organic waste from kitchen areas should be collected in bins as close to food preparation as possible.

All bin/containers should will be clearly labelled, and colour coded to avoid cross contamination of the different waste streams. Signage should be posted on or above the bins to show which wastes can be put in each bin. Suppliers for the retail/non-retail/commercial units should be requested by the tenants to make deliveries in reusable containers, minimize packaging or to remove any packaging after delivery where possible, to reduce waste generated by the development.

Waste materials such as batteries, WEEE and printer toner/cartridges may be generated within the units, but it is anticipated that they will be generated infrequently (if they do arise). Temporary storage areas may be identified within the units for these items pending collection by an authorised waste contractor.

4.3 Waste Collection

There are numerous private contractors that provide waste collection services in the Airton road area who hold a valid waste collection permit for the specific waste types collected. All waste collected must be transported to registered/permitted/licensed facilities only.

All waste requiring collection by the appointed waste contractor will be collected from the WSAs by nominated waste contractors or facilities management depending on the agreement and will be brought to the temporary waste collection area located on North East Road. The empty bins will be promptly returned to the appropriate WSAs.

All waste receptacles presented for collection will be clearly identified as required by waste legislation and the requirements of the SDCC Waste Byelaws. Also, waste will be presented for collection in a manner that will not endanger health, create a risk to traffic, harm the environment or create a nuisance through odours or litter.

4.4 Unique Waste

There is likely to be a small component of the overall waste arisings from the Proposed Development that will comprise other waste streams, such as WEEE, printer and toner cartridges, and fluorescent light tubes. Building maintenance will also give rise to materials such as paints and waste lubricating oils, which will require separate storage in dedicated sealed containers. This type of waste is termed “unique” as it will not be produced on a regular basis and therefore its management will be on special arrangement with a registered waste handler for the specific waste that is produced. However, separate space will be provided within the Proposed Development to handle and manage this waste, through battery recycling boxes, fluorescent lighting tube ‘coffins’, and other applicable storage containers (e.g. if a liquid is to be stored, even within its own container, this will need to be stored within a second container which holds 110% capacity of the volume of the liquid being stored). Separate arrangements will be made for the storage and safe disposal of these waste streams, as covered by the Hazardous Waste Regulations. It is envisioned that unique waste arisings generated by the Proposed Development will be minimal.

4.5 Waste Storage Area Design

In accordance with BS 5906:2005 all waste containers will be stored under cover in specially designed waste storage rooms, or stores, which will be built to the same general standard for both domestic and commercial premises. The walls and roofs of these stores will be formed of non-combustible, robust, secure and impervious material, and have a fire resistance of one hour.

- All containers for waste, including recyclable material, will be easily accessible to both the occupier and waste collector;
- Waste stores will be designed and located in such a way as to limit potential noise disturbance to residents;
- Storage areas for waste and MDR will be clearly designated for this use only, by a suitable door or wall sign and, where appropriate, with floor markings;
- Waste storage sites will include areas for instructional signage detailing correct use of the facilities;
- The entrance of the waste storage room will be free from steps and projections;
- Where the area is to be enclosed in a roofed building, adequate ventilation will be provided. Permanent ventilators will be provided giving a total ventilation area of not less than $0.2m^2$;
- Contain electrical lighting by means of sealed bulkhead fittings (housings rated to IP65 in BS EN 60529:199 for the purpose of cleaning down with hoses and inevitable splashing. Luminaires will be low energy light fittings or low energy lamp bulbs, controlled by proximity detection or a time delay button to prevent lights being left on; and
- Gullies for wash down facilities will be positioned so as not to be in the track of container trolley wheels.

In addition to the above requirements, past experience and best practice for the storage of waste materials will include the following provisions:

- Waste storage facilities will not block any utility service points;
- Waste storage areas will not obstruct sight lines for pedestrians, drivers and cyclists, if doors open outwards they will not open onto a road or highway;
- Waste containers will be inside or at least enclosed. If bins are outside, they will be secured in a compound;
- Information packs will be provided to residents to include full information on available recycling facilities;
- Colour coding will be used for bins of different streams; and Any internal storage areas adjacent to a fire escape route will be fitted with fire doors, automatic fire detection and a sprinkler system and comply with the Building Regs.
- The facilities management company will be required to maintain the bins and their WSAs in good condition. All residents should be made aware of the waste segregation requirements and waste storage arrangements.

5.0. Waste Collection Requirements

In line with BS 5906:2005 and South Dublin Bye Laws 2018 guidance, the following collection requirements have been designed into the Proposed Development in order to comply with all mandatory waste storage requirements:

5.1 South Dublin County Council Bye Laws 2018

- separate receptacles of adequate size and number are provided for the proper segregation, storage and collection of recyclable household kerbside waste and residual household kerbside waste
- additional receptacles are provided for the segregation, storage and collection of food waste where this practice is a requirement of the national legislation on food waste,
- the receptacles referred to in paragraphs (a) and (b) are located both within any individual apartment and at the place where waste is stored prior to its collection,
- any place where waste is to be stored prior to collection is secure, accessible at all times by tenants and other occupiers and is not accessible by any other person other than an authorised waste collector,
- written information is provided to each resident or other occupier about the arrangements for waste separation, segregation, storage and presentation prior to collection,
- an authorised waste collector is engaged to service the receptacles referred to in this section of these bye-laws, with documentary evidence, such as receipts, statements or other proof of payment, demonstrating the existence of this engagement being retained for a period of no less than two years. Such evidence shall be presented to an authorised person within a time specified in a written request from either that person or from another authorised person employed by South Dublin County Council,
- receptacles for kerbside waste are presented for collection on the designated waste collection day,
- adequate access and egress onto and from the premises by waste collection vehicles is maintained.

5.2 BS 5906:2005

- All paths used to transport bins from the storage area to the collection point will have a minimum width of 2m, be free from kerbs or steps, have a solid foundation and be finished with a smooth, continuous finish. Based on the clearance height and tonnage specified by the dimensions of a standard refuse vehicle have been used to undertake the swept path analysis.

Dimensions	
Width	2.53 metres
Gross vehicle weight	26 tonnes
Length	11.2 metres
Clearance Height	4.75m (Any part of a building through which a waste collection vehicle passes must have a minimum clear height of 4.75 m, to allow for overhead fixtures and fittings)
Turning Circle (diameter)	9.5 metres

Table 12 Collection Vehicle Dimensions: Waste/Recycling Collection Vehicle

6.0 CONCLUSION

The Proposed Development will be sustainable with high standards of waste management performance. As such, due consideration has been given to waste generated by the Proposed Development during its operation. Waste management within the Proposed Development has the following aims:

- To contribute towards achieving current and long-term government, South Dublin County Council and EMR targets for waste minimisation, recycling and reuse;
- To allow that all legal requirements for the handling and management of waste during the operation of the Proposed Development are complied with; and
- To provide residents and commercial users with convenient, clean and efficient waste management systems that enhance the operation of the buildings and promote high levels of recycling.

Once operational, the Proposed Development is anticipated to produce approximately 90,222L of waste from all land uses per week. Of this total, 81,136L will be generated by the residential elements and 9,086L will be generated by the commercial/communal/creche elements. Residential waste storage allows for a weekly (seven day) storage capacity for MDR, food, glass and residual (i.e. nonrecyclable). Residential bins will be provided within dedicated storage rooms within the core of each residential block. On the day of collection, the waste collection company will be able to access the Site and collect refuse from dedicated collection areas.

Separate storage will be provided for commercial MDR, glass, food waste (if applicable to final land use) and residual waste within the curtilage of each unit and within dedicated combined bin stores. Additional capacity will also be provided to take into account missed collections due to bank holidays, industrial action, vehicle failure and adverse weather conditions. All waste arisings will be stored in bins proportionate to the volume of waste produced. Furthermore, the commercial waste management element of this Strategy has been developed to allow for a degree of flexibility to address any alterations in future waste arisings as a result of commercial land use changes. These provisions will result in the handling of waste produced by the Proposed Development once it is complete and operational in accordance with SDCC Waste Bye-Laws 2018, *Waste Management (Food Waste) Amendment Regulations 2015 (S.I. No. 190 of 2015)* and the *European Union (Household Food Waste and Bio-Waste) Regulations 2015 (S.I. No. 191 of 2015).*

In summary, this OWRMP presents a waste strategy that complies with all legal requirements, waste policies and best practice guidelines and demonstrates that the required storage areas have been incorporated into the design of the development.

14 ARCHAEOLOGY AND CULTURAL HERITAGE - APPENDICES

14.1 SMR/RMP SITES WITHIN THE SURROUNDING AREA

SMR No.	DU021-037
RMP Status	SMR
Townland	Tallaght
Parish	Tallaght
Barony	Uppercross
I.T.M.	Various
Classification	Historic town of Tallaght
Dist. From Development	c. 120m south
Description	In the twelfth century Tallaght formed part of the See lands of the Archbishop of Dublin and is listed among the lands confirmed to Archbishop Laurence O'Toole by Pope Alexander III in 1179 (Sheehy 1962, I, 27). The archbishops founded a borough here and an extent of 1326 mentions that there were then 15 burgesses rendering 15 shillings per annum (Mc Neill 1950, 181). Apart from the burgesses there were also free tenants, eighteen cottiers and four betaghs residing at Tallaght. It was one of the most important ecclesiastical manors in County Dublin throughout the Middle Ages. By the Sixteenth century it was the Archbishop's principal residence outside the city (Handcock 1899, 11). The street pattern of the medieval borough was linear and appears to have consisted simply of main street which expanded at its west end to form the market place, where the road forked N past St Mael Ruains church and south towards Oldbawn. The archbishop's palace lay on the N side of the road and the long plots on the S side are probably the remains of the medieval burgage plot pattern.
Reference	www.archaeology.ie/ SMR file

SMR No.	DU022-018001
RMP Status	RMP
Townland	Tallaght
Parish	Tallaght
Barony	Uppercross
I.T.M.	709486/727859
Classification	Castle - tower house
Dist. From Development	c. 235m south
Description	This small tower house was located on the former entrance to the village of Tallaght from Dublin. It was demolished in 1952. In 1898 the lower half of the tower was still standing (L 4.1m; Wth 3.6m; T 1.05m). The entrance in the SE led into a partly vaulted ground floor (Mc Dix 1898, 40, 157). The base of the tower was all that remained in 1905 (Ball 1905, 3). There are no visible remains at ground level.
Reference	www.archaeology.ie/ SMR file

SMR No.	DU021-037010/20
RMP Status	RMP
Townland	Tallaght
Parish	Tallaght
Barony	Uppercross
I.T.M.	709261/727754
Classification	Gatehouse/Castle - unclassified
Dist. From Development	c. 405m south-southwest
Description	Gatehouse – Incorporated into the present Dominican Priory, all that survives of the Archbishop's palace of the later medieval period is this gate house (Handcock, 1991, 32, 3rd ed). It is rectangular in plan, rising to four storeys with a stair turret in NW angle and an external base batter visible on the E side. It is built of coursed limestone blocks with hammer dressing on the quoins and windows and was considerably altered in the 19th and 20th centuries. There is a vault over the ground floor, which has been converted into a chapel with Gothic windows inserted. Access to upper floors is from a stair turret, which is entered at ground level on S side and is lit by single slit opes. A fireplace has been inserted into N wall of the first floor. The interior is lit by round-headed windows in the four walls, that in the W serves as a doorway. The third floor has a vaulted roof running on an E-W axis, which is probably modern (Ball 1899, 100; Price 1942, 39-41). A stone head was found reused in one of the walls of the stone stair by Sir John Lentaigne (O'Curry 1837, 31; Ball 1899, 101). The tooling evidence helps assign a sixteenth century date

	to the tower (Bradley & King 1988, 332), although this may just be evidence of later insertions into an earlier building. Castle – The square tower (DU021-037010-) was probably a gate tower to a much larger building (Bradley and King 1988, 320). Monk Mason's (1818) drawing shows a much more extensive castle complex. Handcock states that the parts of this more extensive castle's foundations have been found on occasion, and that there appears to have been an enclosing fosse (Handcock 1899, 29, 35; Bradley & King 1988, 331; O'Curry 1837, 32-3). The original castle was constructed in the first half of the early fourteenth century. Ball states that the castle was used as a garrison in the time of the Geraldine Rebellion (1905, 8).
Reference	www.archaeology.ie/ SMR file

SMR No.	**DU021-037007/12**
RMP Status	RMP
Townland	Tallaght
Parish	Tallaght
Barony	Uppercross
I.T.M.	709238/727649
Classification	Mill – unclassified/Ritual site - holy tree/bush
Dist. From Development	c. 500m south-southwest
Description	Mill – No information available. Ritual site – There is a mature walnut tree on the grounds of the present Dominican Priory in Tallaght village on the site of the Archbishop's palace. It is associated with St. Maelruain (Handcock 1991, 34-5).
Reference	www.archaeology.ie/ SMR file

14.2 STRAY FINDS WITHIN THE SURROUNDING AREA

Information on artefact finds from the study area in County Dublin has been recorded by the National Museum of Ireland since the late 18th century. Location information relating to these finds is important in establishing prehistoric and historic activity in the study area.

A review of the topographical files for the study area of the proposed development revealed that no stray finds have been recovered.

14.3 LEGISLATION PROTECTING THE ARCHAEOLOGICAL RESOURCE

Protection of Cultural Heritage

The cultural heritage in Ireland is safeguarded through national and international policy designed to secure the protection of the cultural heritage resource to the fullest possible extent (Department of Arts, Heritage, Gaeltacht and the Islands 1999, 35). This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention), ratified by Ireland in 1997.

The ARCHAEOLOGICAL RESOURCE

The *National Monuments Act 1930 to 2014* and relevant provisions of the *National Cultural Institutions Act 1997* are the primary means of ensuring the satisfactory protection of archaeological remains, which includes all man-made structures of whatever form or date except buildings habitually used for ecclesiastical purposes. A National Monument is described as 'a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto' (National Monuments Act 1930 Section 2). A number of mechanisms under the National Monuments Act are applied to secure the protection of archaeological monuments. These include the Register of Historic Monuments, the Record of Monuments and Places, and the placing of Preservation Orders and Temporary Preservation Orders on endangered sites.

Ownership and Guardianship of National Monuments

The Minister may acquire national monuments by agreement or by compulsory order. The state or local authority may assume guardianship of any national monument (other than dwellings). The owners of national monuments (other than dwellings) may also appoint the Minister or the local authority as guardian of that monument if the state or local authority agrees. Once the site is in ownership or guardianship of the state, it may not be interfered with without the written consent of the Minister.

Register of Historic Monuments

Section 5 of the 1987 Act requires the Minister to establish and maintain a Register of Historic Monuments. Historic monuments and archaeological areas present on the register are afforded statutory protection under the 1987 Act. Any interference with sites recorded on the register is illegal without the permission of the Minister. Two months' notice in writing is required prior to any work being undertaken on or in the vicinity of a registered monument. The register also includes sites under Preservation Orders and Temporary Preservation Orders. All registered monuments are included in the Record of Monuments and Places.

Preservation Orders and Temporary Preservation Orders

Sites deemed to be in danger of injury or destruction can be allocated Preservation Orders under the 1930 Act. Preservation Orders make any interference with the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister.

Record of Monuments and Places

Section 12(1) of the 1994 Act requires the Minister for Arts, Heritage, Gaeltacht and the Islands (now the Minister for the Department of Culture, Heritage and the Gaeltacht) to establish and maintain a record of monuments and places where the Minister believes that such monuments exist. The record comprises a list of monuments and relevant places and a map/s showing each monument and relevant place in respect of each county in the state. All sites recorded on the Record of Monuments and Places receive statutory protection under the National Monuments Act 1994. All recorded monuments on the proposed development site are represented on the accompanying maps.

Section 12(3) of the 1994 Act provides that 'where the owner or occupier (other than the Minister for Arts, Heritage, Gaeltacht and the Islands) of a monument or place included in the Record, or any other person, proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such a monument or place, he or she shall give notice in writing to the Minister of Arts, Heritage, Gaeltacht and the Islands to carry out work and shall not, except in case of urgent necessity and with the consent of the Minister, commence the work until two months after giving of notice'.

Under the National Monuments (Amendment) Act 2004, anyone who demolishes or in any way interferes with a recorded site is liable to a fine not exceeding €3,000 or imprisonment for up to 6 months. On summary conviction and on conviction of indictment, a fine not exceeding €10,000 or imprisonment for up to 5 years is the penalty. In addition, they are liable for costs for the repair of the damage caused.

In addition to this, under the *European Communities (Environmental Impact Assessment) Regulations 1989,* Environmental Impact Statements (EIS) are required for various classes and sizes of development project to assess the impact the proposed development will have on the existing environment, which includes the cultural, archaeological and built heritage resources. These document's recommendations are typically incorporated into the conditions under which the proposed development must proceed, and thus offer an additional layer of protection for monuments which have not been listed on the RMP.

The Planning and Development Act 2000

Under planning legislation, each local authority is obliged to draw up a Development Plan setting out their aims and policies with regard to the growth of the area over a five-year period. They cover a range of issues including archaeology and built heritage, setting out their policies and objectives with regard to the protection and enhancement of both. These policies can vary from county to county. The Planning and Development Act 2000 recognises that proper planning and sustainable development includes the protection of the archaeological heritage. Conditions relating to archaeology may be attached to individual planning permissions.

South Dublin County Development Plan, 2016-2022

South County Dublin contains a large number of buildings, structures and sites of architectural, historic and/or artistic importance, in addition to numerous archaeological sites. This significant archaeological and architectural heritage is a valuable resource adding to the historical and cultural character of the County. The Development Plan contains policies which are intended to ensure the protection of this heritage. Village Design Statements can be utilised as a tool to guide development in smaller centres. It should be noted that archaeological sites and archaeological zones of interest are identified by a recorded monument reference number on the land use zoning maps. The recorded monument reference numbers are taken from the *Record of Monuments and Places for Dublin*, published by Department of the Environment, Heritage and Local Government.

HCL1 Objective 1:
To protect, conserve and enhance natural, built and cultural heritage features and restrict development that would have a significant negative impact on these assets.

HCL2 Objective 1:
To favour the preservation in-situ of all sites, monuments and features of significant historical or archaeological interest in accordance with the recommendations of the Framework and Principles for the Protection of Archaeological Heritage, DAHGI (1999), or any superseding national policy document.

HCL2 Objective 2:
To ensure that development is designed to avoid impacting on archaeological heritage that is of significant interest including previously unknown sites, features and objects.

HCL2 Objective 3:

To protect and enhance sites listed in the Record of Monuments and Places and ensure that development in the vicinity of a Recorded Monument or Area of Archaeological Potential does not detract from the setting of the site, monument, feature or object and is sited and designed appropriately.

HCL2 Objective 4:
To protect and preserve the archaeological value of underwater archaeological sites including associated features and any discovered battlefield sites of significant archaeological potential within the County.

HCL2 Objective 5:
To protect historical burial grounds within South Dublin County and encourage their maintenance in accordance with conservation principles.

14.4 IMPACT ASSESSMENT AND THE CULTURAL HERITAGE RESOURCE

Potential Impacts on Archaeological and Historical Remains

Impacts are defined as 'the degree of change in an environment resulting from a development' (Environmental Protection Agency 2017). They are described as profound, significant or slight impacts on archaeological remains. They may be negative, positive or neutral, direct, indirect or cumulative, temporary or permanent.

Impacts can be identified from detailed information about a project, the nature of the area affected and the range of archaeological and historical resources potentially affected. Development can affect the archaeological and historical resource of a given landscape in a number of ways.

- Permanent and temporary land-take, associated structures, landscape mounding, and their construction may result in damage to or loss of archaeological remains and deposits, or physical loss to the setting of historic monuments and to the physical coherence of the landscape.
- Archaeological sites can be affected adversely in a number of ways: disturbance by excavation, topsoil stripping and the passage of heavy machinery; disturbance by vehicles working in unsuitable conditions; or burial of sites, limiting accessibility for future archaeological investigation.
- Hydrological changes in groundwater or surface water levels can result from construction activities such as de-watering and spoil disposal, or longer-term changes in drainage patterns. These may desiccate archaeological remains and associated deposits.
- Visual impacts on the historic landscape sometimes arise from construction traffic and facilities, built earthworks and structures, landscape mounding and planting, noise, fences and associated works. These features can impinge directly on historic monuments and historic landscape elements as well as their visual amenity value.
- Landscape measures such as tree planting can damage sub-surface archaeological features, due to topsoil stripping and through the root action of trees and shrubs as they grow.
- Ground consolidation by construction activities or the weight of permanent embankments can cause damage to buried archaeological remains, especially in colluviums or peat deposits.
- Disruption due to construction also offers in general the potential for adversely affecting archaeological remains. This can include machinery, site offices, and service trenches.

Although not widely appreciated, positive impacts can accrue from developments. These can include positive resource management policies, improved maintenance and access to archaeological monuments, and the increased level of knowledge of a site or historic landscape as a result of archaeological assessment and fieldwork.

Predicted Impacts

The severity of a given level of land-take or visual intrusion varies with the type of monument, site or landscape features and its existing environment. Severity of impact can be judged taking the following into account:

- The proportion of the feature affected and how far physical characteristics fundamental to the understanding of the feature would be lost;
- Consideration of the type, date, survival/condition, fragility/vulnerability, rarity, potential and amenity value of the feature affected;
- Assessment of the levels of noise, visual and hydrological impacts, either in general or site-specific terms, as may be provided by other specialists.

14.5 MITIGATION MEASURES AND THE CULTURAL HERITAGE RESOURCE

Potential Mitigation Strategies for Cultural Heritage Remains

Mitigation is defined as features of the design or other measures of the proposed development that can be adopted to avoid, prevent, reduce or offset negative effects.

The best opportunities for avoiding damage to archaeological remains or intrusion on their setting and amenity arise when the site options for the development are being considered. Damage to the archaeological resource immediately adjacent to developments may be prevented by the selection of appropriate construction methods. Reducing adverse effects can be achieved by good design, for example by screening historic buildings or upstanding archaeological monuments or by burying archaeological sites undisturbed rather than destroying them. Offsetting adverse effects is probably best illustrated by the full investigation and recording of archaeological sites that cannot be preserved *in situ*.

Definition of Mitigation Strategies

Archaeological Resource

The ideal mitigation for all archaeological sites is preservation *in situ*. This is not always a practical solution, however. Therefore, a series of recommendations are offered to provide ameliorative measures where avoidance and preservation *in situ* are not possible.

Archaeological Test Trenching can be defined as 'a limited programme of intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site on land, inter-tidal zone or underwater. If such archaeological remains are present field evaluation defines their character, extent, quality and preservation, and enables an assessment of their worth in a local, regional, national or international context as appropriate' (CIfA 2014a).

Full Archaeological Excavation can be defined as 'a programme of controlled, intrusive fieldwork with defined research objectives which examines, records and interprets archaeological deposits, features and structures and, as appropriate, retrieves artefacts, ecofacts and other remains within a specified area or site on land, inter-tidal zone or underwater. The records made and objects gathered during fieldwork are studied and the results of that study published in detail appropriate to the project design' (CIfA 2014b).

Archaeological Monitoring can be defined as 'a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive (CIfA 2014c).

Underwater Archaeological Assessment consists of a programme of works carried out by a specialist underwater archaeologist, which can involve wade surveys, metal detection surveys and the excavation of test pits within the sea or riverbed. These assessments are able to access and assess the potential of an underwater environment to a much higher degree than terrestrial based assessments.