

APPENDIX D
GEOPHYSICAL SURVEY

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AGL18142_01

**REPORT
ON THE
GEOPHYSICAL SURVEY
AT THE
BOHENABREENA LANDFILL, Co. DUBLIN
FOR
RPS GROUP**

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21ST NOVEMBER 2018

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1. EXECUTIVE SUMMARY

APEX Geoservices Ltd. was requested by RPS Group to carry out a geophysical survey at a landfill site in Bohernabreena, County Dublin. The purpose of the investigation is to determine the extent, thickness and type of imported material across the site.

The Bohernabreena historic landfill is located on the east bank of the Dodder River approximately 300m northwest of Bohernabreena. Site topography varies between 110 – 120 mOD. The area to be investigated covers approximately 2.7Ha (Fig. 2.1).

The Teagasc soils map for the area (Fig. 2.2) indicates that the site is underlain by alluvium with gravels and Lower Palaeozoic Till to the east and west.

The Geological Survey of Ireland (GSI) 1:100,000 Bedrock Geology map for the area (Figure 2.3) indicates that the site is underlain by the Aghfarrell Formation which consists of '*thinly-bedded greywacke siltstones and slates*'.

Eight trial pits and 5 boreholes were completed at the site in a previous investigation. Relevant borehole and trial pit data have been incorporated into the geophysical interpretation presented in this report.

The elevated EM conductivity readings show the waste to be present in approximately **2.16 Ha** of the survey area. This zone coincides with the waste recorded on the borehole and trial pit logs. The average thickness of the waste from the combined geophysical and borehole/trial pit data is approximately 5.0m. The volumes of waste calculated using the extents and thicknesses shown above are as follows:

Zone	Extent (sq. m.)	Thickness (m.)	Volume (cu. m.)	Tonnes (@ 1.4 tonnes/cu.m.)
A	21,600	5.0	108,000	151,200

The EM Conductivity and the ERT profiles, together with the borehole and trial pit data, have characterised the waste present as:

TOPSOIL OVER WASTE (PRED. ORGANIC) WITH CLAY – lower resistivity

TOPSOIL OVER MIXED ORGANIC/INERT WASTE WITH CLAY– higher resistivity.

All of the ERT profiles indicate between 4m and 6m of **leachate** beneath the waste body extending into the underlying sandy gravelly clay and gravel.

The average S-wave velocity for the waste from M4 is 120m/s indicating that it is soft to very soft. The underlying sandy gravelly clay material is firm-stiff.

The bedrock resistivity range of 240-1300 Ohm-m indicate a siltstone/greywacke type bedrock rather than a shale. Combined waste and underlying soil thicknesses (depth to bedrock) ranges from 10m to 12m.

As drilling has recently been carried out at this site no recommendations for further investigation have been made at this stage.

2. INTRODUCTION

APEX Geoservices Ltd. was requested by RPS Group to carry out a geophysical survey at a landfill site in Bohernabreena, County Dublin. A Tier 2 environmental risk assessment is being carried out at the site. As part of the risk assessment there is a requirement for a geophysical investigation. The purpose of the investigation is to determine the extent, thickness and type of imported material across the site.

2.1 Project Objectives

The objectives of the survey were to provide information on:

- The extent of the waste body,
- The type of waste present,
- The thickness of the waste and presence of any anomalous features,
- A volume calculation,
- Depth to bedrock (if within limits of the survey),
- Proposed location of direct investigation points.

2.2 Site Background

The Bohernabreena historic landfill is located on the east bank of the Dodder river approximately 300m northwest of Bohernabreena. Site topography varies between 110 – 120 mOD. The area to be investigated covers approximately 2.7 Ha (Fig. 2.1).

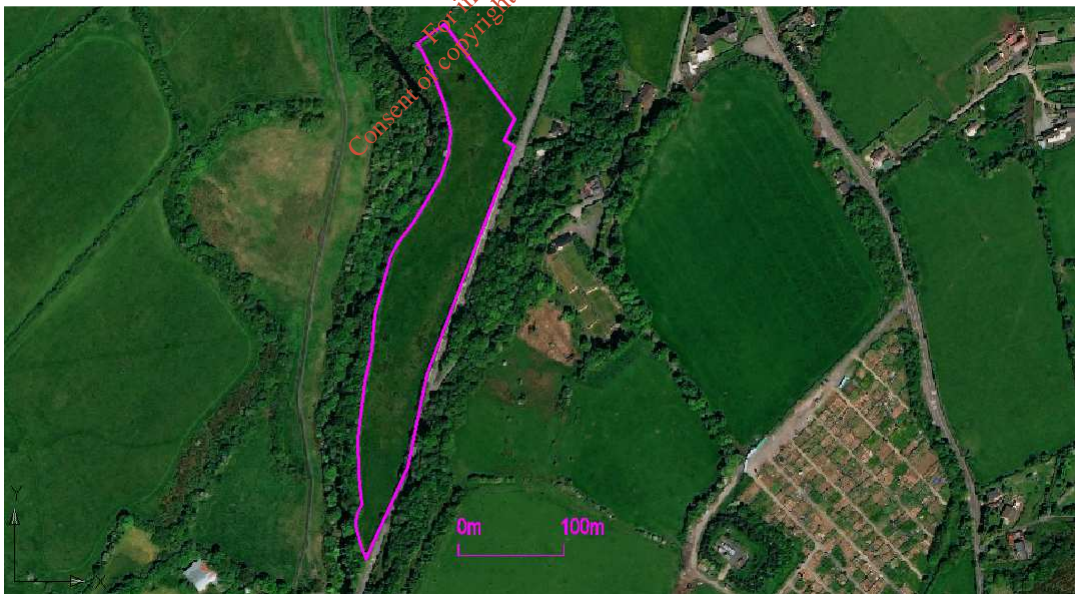


Figure 2.1. Site outline in magenta.

2.3 Geology & Soils

The Teagasc soils map for the area (Fig. 2.2) indicates that the site is underlain by alluvium with gravels and Lower Palaeozoic Till to the east and west.

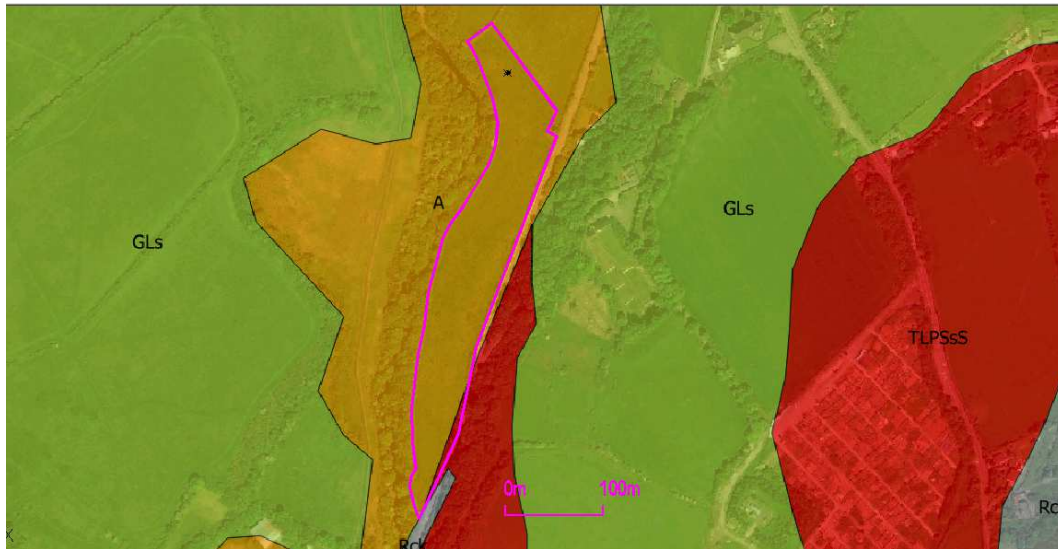


Figure 2.2 – Soils map (A – Alluvium, GLs - Gravel), site outline in magenta.

The Geological Survey of Ireland (GSI) 1:100,000 Bedrock Geology map for the area (Figure 2.3) indicates that the site is underlain by the Aghfarrell Formation which consists of 'thinly-bedded greywacke siltstones and slates'.



Figure 2.3. Bedrock geological map for the survey are, site outline in magenta.

Examination of the GSI 6'' geology sheet for the site (Fig. 2.4) shows slate outcrop recorded at the south of the of the site, at the river. The landfill also appears to be at partially located in what appears to be the backfilled flood plain of the river.

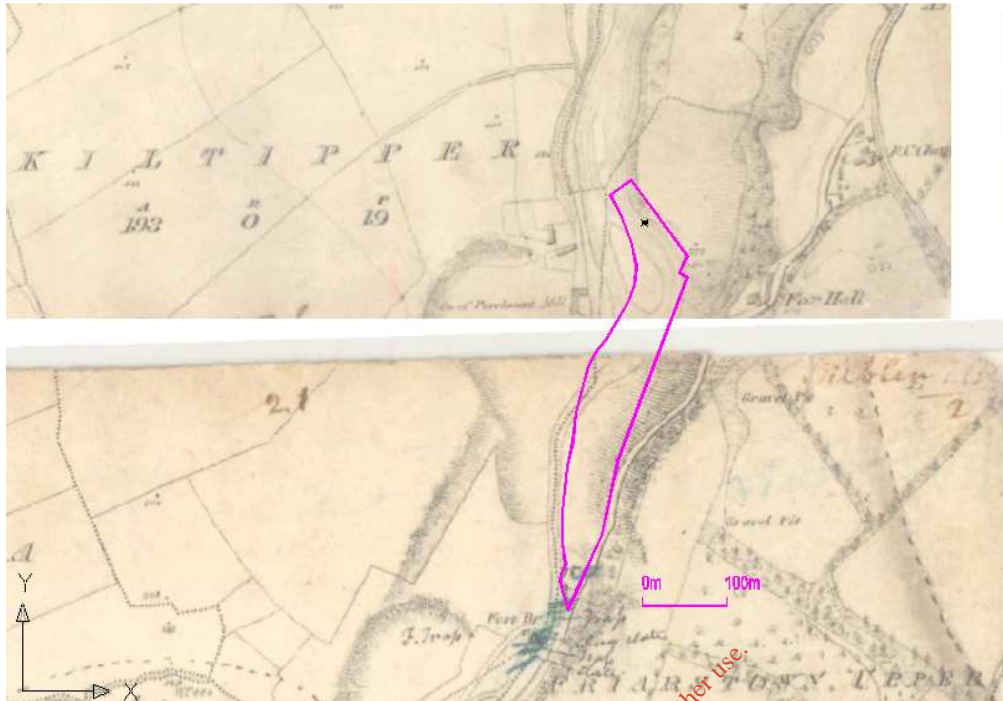


Figure 2.4. Geological Survey of Ireland 6'' sheet for the area, site outline in magenta.

2.4 Site Investigation

Eight trial pits and 5 boreholes were completed at the site in a previous investigation. The trial pit and borehole logs show the following general stratigraphy; thin topsoil (0.1m) over around 1m of a gravelly clay cap over mixed organic and inert waste material to typically between 4.0 and 8.3m bgl or greater. Where bottomed out the waste is underlain by clay or gravel.

Relevant borehole and trial pit data have been incorporated into the geophysical interpretation presented in this report. The location of the boreholes and trial pits are shown on AGL18142_01.

2.5 Survey Rationale

The investigation consisted of reconnaissance EM ground conductivity mapping with follow-up Electrical Resistivity Tomography (ERT), Seismic Refraction profiling and MASW:

EM ground conductivity mapping operates on the principle of inducing currents in conductive substrata and measuring the resultant secondary electro-magnetic field. The strength of this secondary EM field is calibrated to give apparent ground conductivity in milliSiemens/metre (mS/m). This technique will provide information on the shallow (0-6m below ground level) variation of the superficial deposits and outline the extent of any shallow bedrock.

ERT soundings image the resistivity of the materials in the subsurface along a profile to produce a pseudo-section showing the variation in resistivity to depths dependent on the length of the profile. Each pseudo-section is interpreted to determine the material type along the profile based on the typical resistivities returned for Irish ground materials.

Seismic Refraction Profiling measures the P-wave velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities. This method profiles the depth to the top of the stiff soils and bedrock, and provides information on the quality/strength of the bedrock.

The **MASW** method is used to estimate shear-wave velocities (V_s) in the ground material. Overburden material with a $V_s < 175$ m/s is generally classified as soft/loose.

As with all geophysical methods the results are based on indirect readings of the subsurface properties. The effectiveness of the proposed approach will be affected by variations in the ground properties. By combining a number of techniques it is possible to provide a higher quality interpretation and reduce any ambiguities which may otherwise exist. Further information on the detailed methodology of each geophysical method employed in this investigation is given in **APPENDIX A: DETAILED METHODOLOGY.**

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3 RESULTS & INTERPRETATION

The geophysical survey locations are indicated on Drawing AGL18142_01 (Appendix B). The survey area extends to approximately 2.7 Ha.

3.1 EM Ground Conductivity Mapping

The EM31 conductivity survey locations are shown on Drawing AGL18142_01. The recorded EM31 conductivity values are contoured on Drawing AGL18142_02. The conductivity values range from 5-90 milliSiemens/metre (mS/m). The conductivity values have been interpreted as follows:

Conductivity (mS/m)	Interpretation
5 - 30	SANDY GRAVELLY CLAY/W. ROCK
30- 60	TOPSOIL OVER MIXED ORGANIC/INERT WASTE WITH CLAY
60 - 90	TOPSOIL OVER WASTE (PRED. ORGANIC) WITH CLAY

Note: EM31 measurements refer to the bulk electrical conductivity of the upper 6m of ground.

3.2 Electrical Resistivity Tomography

Five resistivity profiles were recorded across the site (Profiles R1 to R5). The locations are shown on Drawing AGL18142_01. Interpreted cross sections were compiled for the profiles and are presented on Drawings AGL18142_R1-R4&5.

In determining the various types of imported material present from the resistivity sections R1-R5 it should be noted that:

- typical resistivities of Irish soils range from 20 Ohm-m (clays) to around 3000 Ohm-m (dry gravel),
- the resistivity generally increases as the sand/gravel content increases,
- silt/clay typically has values in the range 30-50 Ohm-m ,
- silty gravelly clay typically has resistivity values in the range 50-100 Ohm-m,
- deposits of predominantly organic waste such as those occurring in municipal landfills typically have resistivities in the range 5-30 Ohm-m.
- leachate saturated soils originating from predominantly organic waste have a similar resistivity range to organic waste, but will be influenced by the resistivities of the host material and the degree of dilution and dispersion of the leachate,
- inert C & D waste such as concrete, brick and mixed rock fill, stone and clay will usually have resistivities similar to gravelly material (50-500 Ohm-m).

The resistivity values recorded at this site ranged from 10-960 Ohm-m and have been interpreted as follows:

Resistivity (Ohm-m)	Interpretation
10-30	WASTE (PRED. ORGANIC) WITH CLAY
30-60	MIXED ORGANIC/INERT WASTE WITH CLAY
60-240	SANDY GRAVELLY CLAY/W. ROCK
240-1300	GREYWACKE/SILTSTONE/SHALE

3.3 Seismic Refraction Profiling

Three seismic refraction profiles (S1-S3) were recorded across the site. The locations are shown on Drawing AGL18142_01 and the results are included on the interpreted cross sections in Drawings AGL18142_R1-R4&5 and in Appendix C.

The P-wave seismic velocities have been interpreted as follows:

Layer	P-wave Velocity (m/s)	Interpretation
1	200-250	Soft /loose MADE GROUND/WASTE
2	350-800	Soft-firm WASTE/sandy gravelly CLAY
3	2500-3400	Weak to moderately strong GREYWACKE/SILTSTONE/SHALE

NB. Data quality on the seismic refraction profiles was poor over the made ground/waste.

3.4 MASW

A good surface wave signal was obtained over the waste. Shear wave (S-wave) velocity (V_s) and G_{max} values were determined for the waste and soil material (Fig. 3.1). V_s velocities and corresponding soil cohesion ranges are summarised in Figure 3.1.

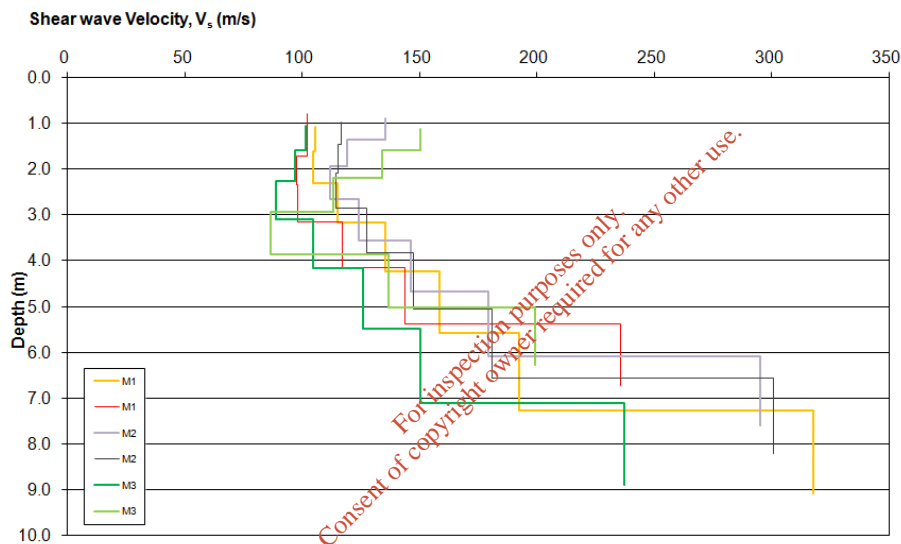


Fig 3.1: V_s velocities across site (M1-M3)

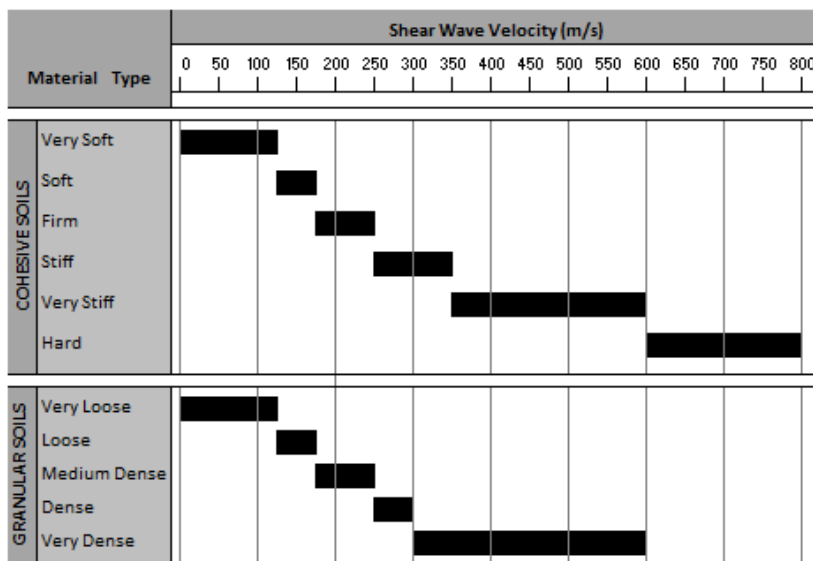


Fig 3.2: V_s velocities and corresponding soil cohesion ranges.

The S-wave seismic velocities from this site have been interpreted as follows:

Layer	S-wave Velocity (m/s)	Interpretation
1	80 - 160	Soft WASTE, sandy gravelly CLAY
2	160 - 300	Firm-stiff waste and sandy gravelly CLAY

3.5 Discussion

The interpretation of the geophysical data is plotted on Drawings AGL18142_R1 to AGL18142_R5 and summarised on Drawing AGL18142_04.

3.5.1 Extent of the waste

The elevated EM conductivity readings show the waste to be present in approximately **2.16 Ha** of the survey area as outlined on Drawing AGL18142_04. This zone coincides with the waste recorded on the borehole and trial pit logs.

3.5.2 Type of waste

The EM Conductivity and the ERT profiles, together with the borehole and trial pit data, have characterised the waste present in these zones as:

- TOPSOIL OVER WASTE (PRED. ORGANIC) WITH CLAY – lower resistivity
- TOPSOIL OVER MIXED ORGANIC/INERT WASTE WITH CLAY – higher resistivity

3.5.3 Thickness of waste and other information

The average thickness of the waste from the combined geophysical and borehole/trial pit data is approximately 5.0m.

All of the ERT profiles show low resistivities to extend up to between 4m and 6m below the bottom of the waste as found on the trial pit logs and MASW. These low resistivities have been interpreted as **leachate** beneath the waste body extending into the underlying sandy gravelly clay and gravel.

The average S-wave velocity for the waste from M4 is 120m/s indicating that it is soft to very soft. The underlying sandy gravelly clay material is firm-stiff.

3.5.4 Volume calculation

The volumes of waste calculated using the extents and thicknesses shown above are as follows:

Zone	Extent (sq. m.)	Thickness (m.)	Volume (cu. m.)	Tonnes (@ 1.4 tonnes/cu.m.)
A	21,600	5.0	108,000	151,200

* based on EM only.

3.5.5 Bedrock

The combined ERT and seismic refraction profiles indicate 6m or more of gravelly clay/possible weathered rock over bedrock. The bedrock resistivity range of 240-1300 Ohm-m indicates a siltstone/greywacke type bedrock rather than a shale.

Bedrock elevation is around 100 mOD in the southern part of the site rising to around 110m in the northern part. Combined waste and underlying soil thicknesses (depth to bedrock) ranges from 10m to 12m.

4 RECOMMENDATIONS

As drilling has recently been carried out at this site no recommendations for further investigation have been made at this stage.

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REFERENCES

- Bell F.G., 1993;
'Engineering Geology', Blackwell Scientific Press.
- Deere, D. U., Hendron, A. J., Patton, F.D., and Cording, E.J. 1967;
Design of surface and near surface construction in rock. Failure and breakage of rocks, proceedings 8th U.S. symposium rock mechanics, New York: Soc. Min Engrs, Am. Inst. Min Metall. Petrolm Engrs.
- Geotomo Software, 2006;
'RES2DINV Users Manual', Malaysia.
- RPS Group June 2018; Tier 1 Environmental Risk Assessment Historic Landfill at Bohernabreena Landfill, Co. Dublin.
- GSI, 2017; Bedrock Geology 1:100,000 Shapefile. <http://www.gsi.ie/Mapping.htm>
- GSI, 2017; GSI Quaternary Deposits Shapefile. <http://www.gsi.ie/Mapping.htm>
- GSI, 2017; Groundwater Vulnerability Shapefile. <http://www.gsi.ie/Mapping.htm>
- Hagedoorn, J.G., 1959;
'The plus - minus method of interpreting seismic refraction sections' Geophysical Prospecting, 7, 158 - 182.
- Heerden, van H. 1987.
'Relation between Static and Dynamic moduli of rocks' Int. Journal of Rock Mech. Min. Sci. and Geomech Abs Vol. 24, No. 6 pp 381-385, Pergamon.
- KGS, 2000;
Surfseis Users Manual, Kansas Geological Survey.
- Palmer, D., 1980;
'The Generalized Reciprocal Method of seismic refraction interpretation', SEG.
- Park, C.B., Miller, R.D., and Xia, J., 1998;
Ground roll as a tool to image near-surface anomaly:SEG Expanded Extracts, 68th Annual Meeting, New Orleans, Louisiana, 874-877.
- Park, C.B., Miller, R.D., and Xia, J., 1999;
Multi-channel analysis of surface waves (MASW): Geophysics, May-June issue.
- Redpath, B.B., 1973;
'Seismic refraction exploration for engineering site investigations', NTIS, U.S. Dept. of Commerce

APPENDIX A: DETAILED METHODOLOGY

A combination of a number of geophysical techniques was used to provide the high quality interpretation and reduce any ambiguities, which may otherwise exist.

A.1 EM Ground Conductivity Mapping

Principles

This method operates on the principle of inducing currents in conductive substrata and measuring the resultant secondary electro-magnetic field. The strength of this secondary EM field is calibrated to give apparent ground conductivity in milliSiemens/metre (mS/m). Readings over material such as organic waste and peat give high conductivity values while readings over dry materials with low clay mineral content such as gravels, limestone or quartzite give low readings. The EM31 survey technique determines the apparent conductivity of the ground material from 0-6m bgl depending on the dipole mode used. Depending on the dipole mode used, the measured conductivity is a function of the different overburden layers and/or rock from 0 to 6m below ground level.

Data collection

The EM31 equipment used was a GF CMD-4 conductivity meter equipped with data logger. This instrument features a real time graphic display of the previous 20 measurement points to monitor data quality and results. Conductivity and in-phase values were recorded across the site. Local conditions and variations were recorded.

Data processing

The conductivity and in-phase field readings were downloaded, contoured and plotted using the SURFER 9 program (Golden Software, 2009). Data which was affected by metallic objects was removed. Assignment of material types and possible anomaly sources was carried out, with cross-reference to other data.

A.2 Electrical Resistivity Tomography

Principles

This surveying technique makes use of the Wenner resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. The 2D-resistivity profiling method involves the use of electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.

Data Collection

The data were recorded using a Tigre resistivity meter, imaging software, a 32 takeout multicore cables and 32 stainless steel electrodes. Saline solution was used at the electrode\ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after the survey.

Data Processing

The field readings were stored in computer files and inverted using the RES2DINV package (Campus Geophysical Instruments, 1997) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-Depth model of the resistivities.

The inverted 2D-Resistivity models and corresponding interpreted geology are displayed on the accompanying drawings. Distance is indicated along the horizontal axis of the profiles. Profiles have been contoured using the same contour intervals and colour codes.

A.3 Seismic Refraction Profiling

Principles

The seismic refraction profiling method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

Data Collection

Seismic spreads were recorded using a Geode high-resolution 24 channel digital seismograph with geophone spacings of 2 m and 3 m. The source of the seismic waves was a sledgehammer. Records from up to seven different positions were taken on each spread (2 x off-end, 2 x end, 3 x middle) to ensure optimum coverage of all refractors.

Data Processing

First break picking in digital format was carried out using the FIRSTPIX software program to construct traveltimes plots for each spread. The recorded data was processed and interpreted using the intercept-time and plus-minus methods, to acquire depths to boundaries and the P-wave velocities of these layers, using the GREMIX programme from INTERPEX.

Approximate errors for velocities are estimated to be +/- 10%. Errors for the calculated layer thicknesses are of the order of +/-20%. Possible errors due to the "hidden layer" and "velocity inversion" effects may also occur (Soske, 1959).

A.4 Multichannel Analysis of Surface Waves

Principles

The Multi-channel Analysis of Surface Waves (MASW) (Park et al., 1998, 1999) utilizes Surface waves (Rayleigh waves) to determine the elastic properties of the shallow subsurface (<15m). Surface waves carry up to two-thirds of the seismic energy but are usually considered as noise in conventional body wave reflection and refraction seismic surveys.

The penetration depth of surface waves changes with wavelength, i.e. longer wavelengths penetrate deeper. When the elastic properties of near surface materials vary with depth, surface waves then become dispersive, i.e. propagation velocity changes with frequency. The propagation (or phase) velocity is determined by the average elastic property of the medium within the penetration depth. Therefore the dispersive nature of surface waves may be used to investigate changes in elastic properties of the shallow subsurface.

The MASW method employs the multi-channel recording and processing techniques (Sheriff and Geldart, 1982) that have similarities to those used in a seismic reflection survey and which allow

better waveform analysis and noise elimination. The following procedure is followed to produce a shear wave velocity (V_s) profile and a stiffness profile of the subsurface using surface waves:

- (i) A point source (eg. a sledgehammer) is used to generate vertical ground motions,
- (ii) the ground motions are measured using low frequency geophones, which are deposited along a straight line directed toward the source,
- (iii) the ground motions are recorded using a seismograph,
- (iv) a dispersion curve is produced from spectral analysis of the data showing the variation of surface wave velocity with wavelength,
- (v) the dispersion curve is inverted using a modelling and least squares minimization process to produce a subsurface profile of the variation of shear wave velocity with depth.

Data Collection

The recording equipment consisted of a Geode 24 channel digital seismograph, 24 no. 4HZ vertical geophones, hammer energy source with mounted trigger and a 24 take-out cable, with geophone spacings of 2 m and 3 m.

Data Processing

MASW processing was carried out using the SURFSEIS processing package developed by Kansas Geological Survey (KGS, 2000). SURFSEIS data processing involves three steps:

- (i) Preparation of the acquired multichannel record. This involves converting data file into the processing format.
- (ii) Production of a dispersion curve from a spectral analysis of the data showing the variation of Raleigh wave phase velocity with wavelength. Confidence in the dispersion curve can be estimated through a measure of signal to noise ratio (S/N), which is obtained from a coherency analysis. Noise includes both body waves and higher mode surface waves. To obtain an accurate dispersion curve the spectral content and phase velocity characteristics are examined through an overtone analysis of the data.
- (iii) Inversion of the dispersion curve is then carried out to produce a subsurface profile of the variation of shear wave velocity with depth. The bedrock P-wave velocities were converted to S-wave velocities using the following equation:

$$V_s = \left(\frac{(V_p^2) - 2 \cdot v \cdot (V_p^2)}{(1 - v) \cdot 2} \right)^{0.5}$$

Where V_s = S-wave velocity in m/s, V_p = P-wave velocity in m/s and v = Poisson's ratio.

A.5 Spatial Relocation

All the geophysical investigation locations were acquired using Trimble Geo 7X high-accuracy GNSS handheld GPS system using the settings listed below. This system allows collecting GPS data with c.20mm accuracy.

Projection:	Irish Transverse Mercator
Datum:	Ordnance
Coordinate units:	Meters
Altitude units:	Meters
Survey altitude reference:	MSL
Geoid model:	Republic of Ireland

APPENDIX B: DRAWINGS

The information derived from the geophysical investigation as well as correlation with the available direct investigation is presented in the following drawings:

AGL18142_01	Geophysical Investigation Locations	Scale 1:2000 @ A4
AGL18142_02	EM Conductivity Contours (mS/m)	Scale 1:2000 @ A4
AGL18142_03	EM Inphase Contours (ratio)	Scale 1:2000 @ A4
AGL18142_04	Summary Interpretation Map	Scale 1:2000 @ A4

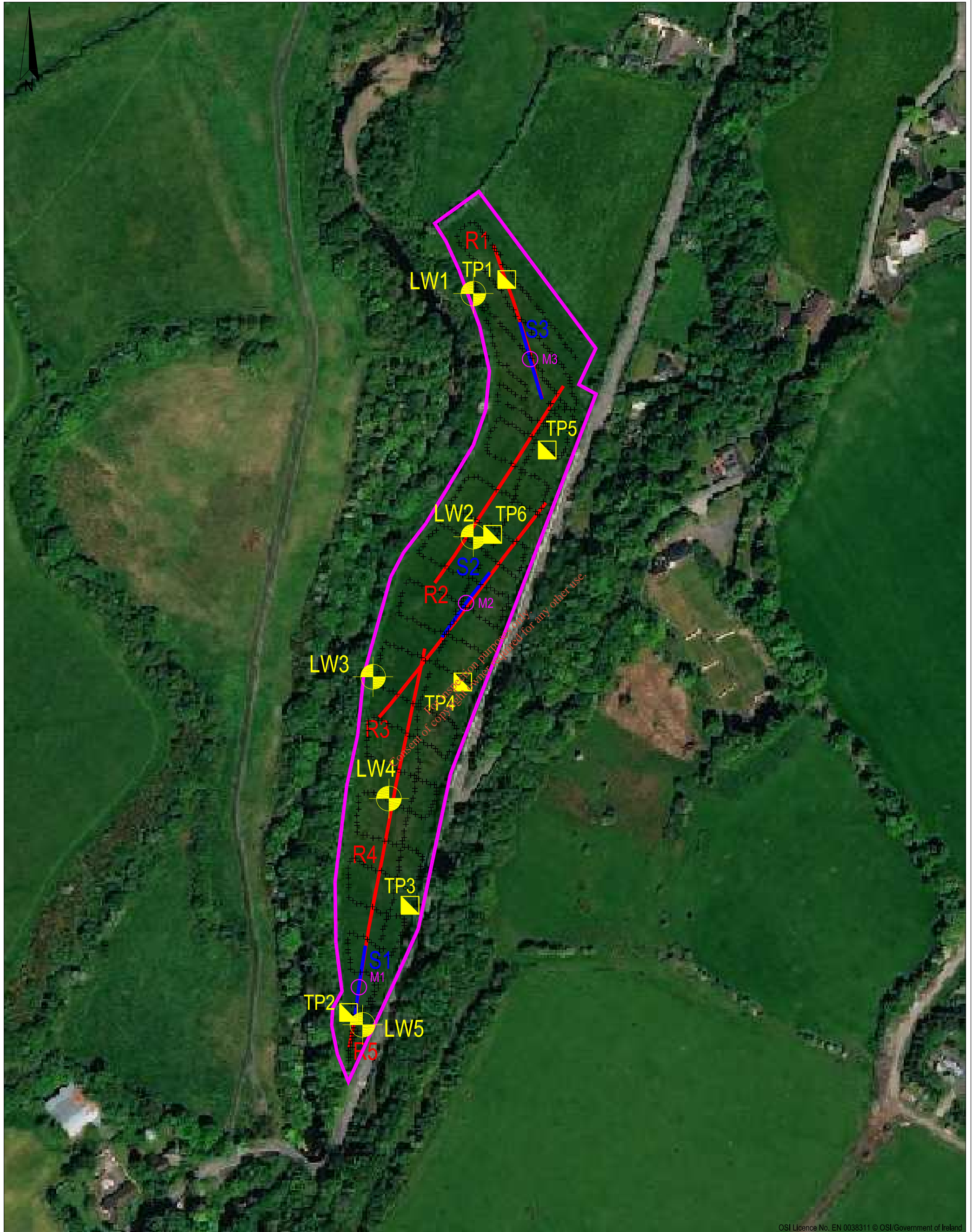
The ERT and seismic refraction data with geological interpretations are presented in the following drawings:

Drawing AGL18142_R1	Results and Interpretation R1	Scale 1: 1000 @ A4
Drawing AGL18142_R2	Results and Interpretation R2	Scale 1: 1000 @ A4
Drawing AGL18142_R3	Results and Interpretation R3	Scale 1: 1000 @ A4
Drawing AGL18142_R4 & R5	Results and Interpretation R4 & R5	Scale 1: 1250 @ A4

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GEOPHYSICAL INVESTIGATION LOCATIONS

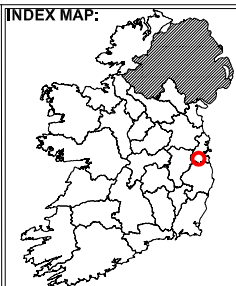
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LEGEND:

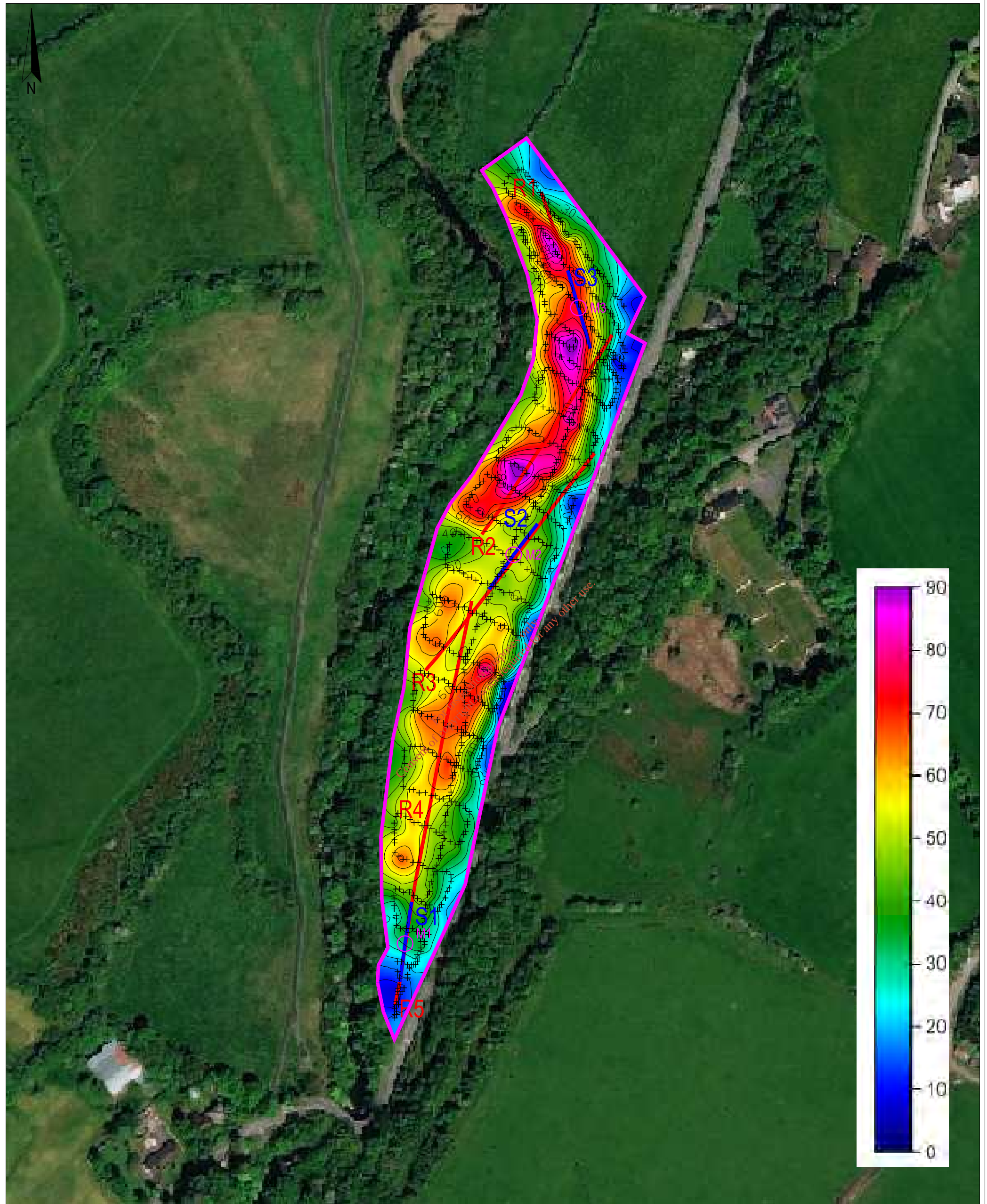
- Site
- + EM conductivity/gravity reading
- R1 2D resistivity profile
- S1 Seismic refraction profile
- M1 MASW sounding
- ◻ TP1 Previous Borehole or Trial Pit
- ◊ LW4 Previous Borehole or Trial Pit

NOTES:
The information displayed here is to be used in conjunction with Report AGL18142_01 Report on the Geophysical Investigation at Bohernabreena Landfill, Co. Dublin, APEX Geoservices Ltd. 21-11-2018.

PROJECT: BOHERNABREENA LANDFILL			
CLIENT: RPS GROUP			
DRAWING NO: AGL18142_01			
SCALE: AS INDICATED @ A3			
DATE: 21-11-2018			
Version:	Date:	Drawn By:	Checked:
01	21-11-2018	POC	YOC

EM CONDUCTIVITY CONTOURS (mS/m)

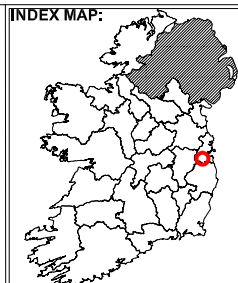
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- LEGEND:
- Site
 - + EM conductivity reading
 - R1 2D resistivity profile
 - S1 Seismic refraction profile

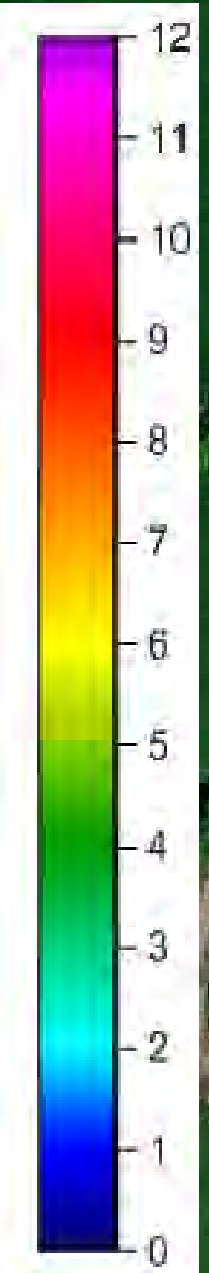
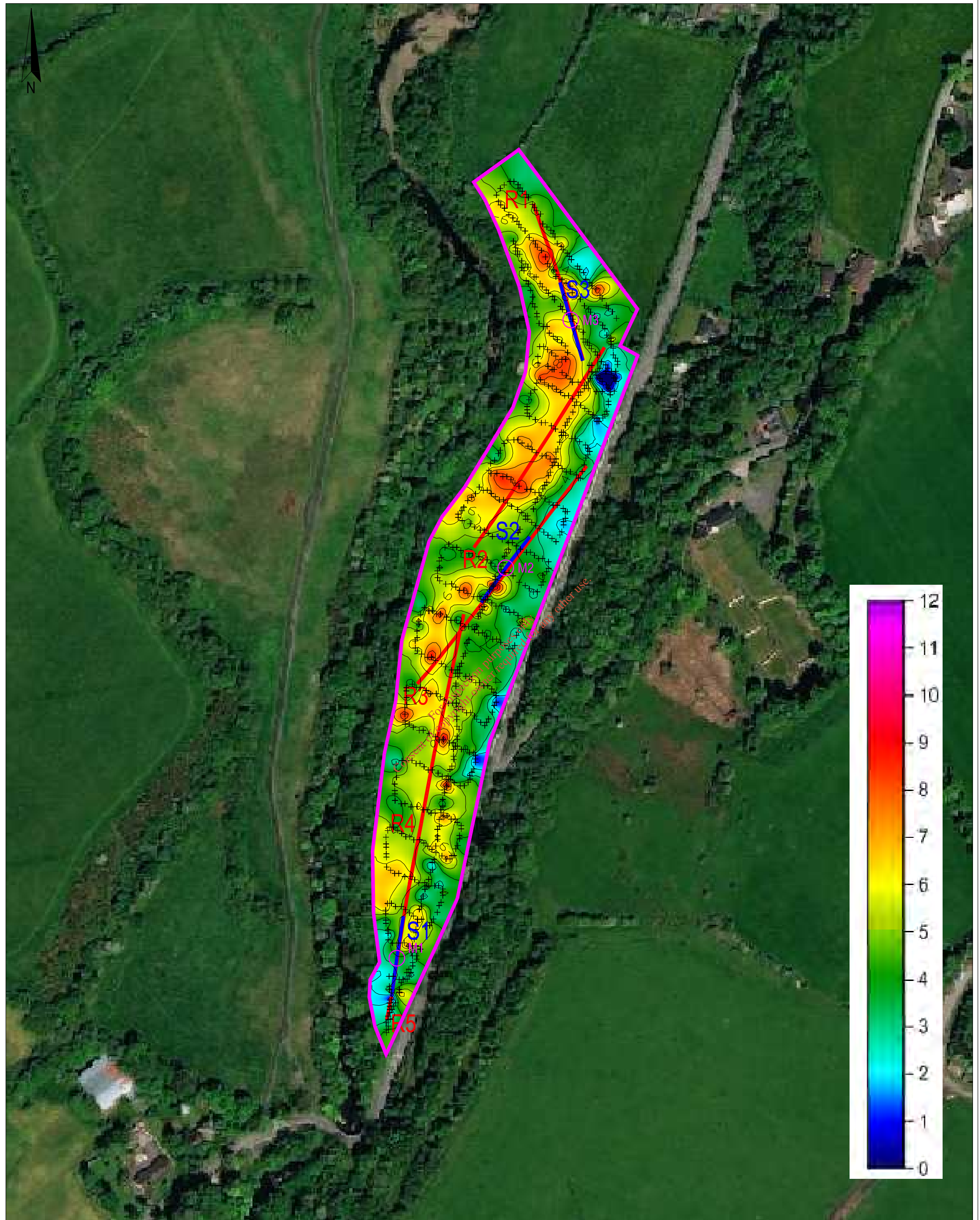
NOTES:

The information displayed here is to be used in conjunction with Report AGL18142_01 Report on the Geophysical Investigation at Bohernabreena Landfill, Co. Dublin, APEX Geoservices Ltd. 21-11-2018.

PROJECT: BOHERNABREENA LANDFILL GEOPHYSICAL INVESTIGATION			
CLIENT: RPS GROUP			
DRAWING NO: AGL18142_02			
SCALE: AS INDICATED @ A3			
DATE: 21-11-2018			
Version:	Date:	Drawn By:	Checked:
01	21-11-2018	POC	YOC

EM INPHASE CONTOURS (ratio)

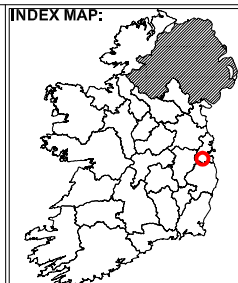
SCALE 1:2000



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- LEGEND:
- Site
 - +
 EM conductivity reading
 - R1 — S1
 2D resistivity profile
 - Seismic refraction profile

NOTES:

The information displayed here is to be used in conjunction with Report AGL18142_01 Report on the Geophysical Investigation at Bohernabreena Landfill, Co. Dublin, APEX Geoservices Ltd. 21-11-2018.

PROJECT: BOHERNABREENA LANDFILL			
GEOPHYSICAL INVESTIGATION			
CLIENT: RPS GROUP			
DRAWING NO: AGL18142_03			
SCALE: AS INDICATED @ A3			
DATE: 21-11-2018			
Version:	Date:	Drawn By:	Checked:
01	21-11-2018	POC	YOC

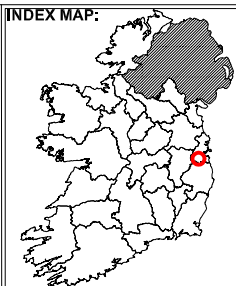
SUMMARY INTERPRETATION MAP
SCALE 1:2000



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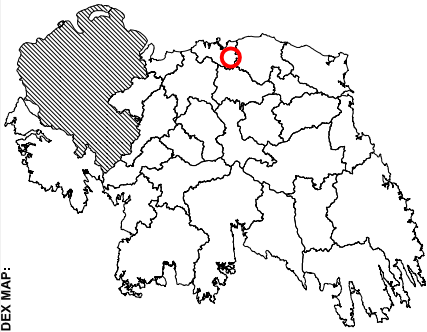
LEGEND:

- SITE
- WASTE (PRED. ORGANIC) OVER SAND/GRAVEL WITH LEACHATE
- MIXED ORGANIC/INERT WASTE WITH CLAY
- SANDY GRAVELLY CLAYW. ROCK

NOTES:

The information displayed here is to be used in conjunction with Report AGL18142_01 Report on the Geophysical Investigation at Bohernabreena Landfill, Co. Dublin, APEX Geoservices Ltd. 21-11-2018.

PROJECT: BOHERNABREENA LANDFILL			
CLIENT: RPS GROUP			
DRAWING NO: AGL18142_04			
SCALE: AS INDICATED @ A3			
DATE: 16-11-2018			
Version:	Date:	Drawn By:	Checked:
01	16-11-2018	POC	YOC



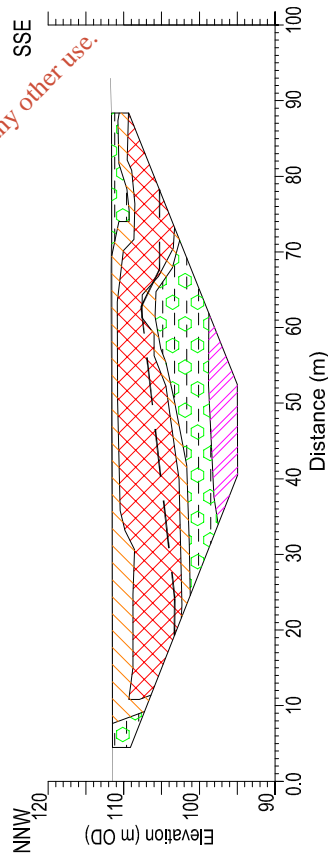
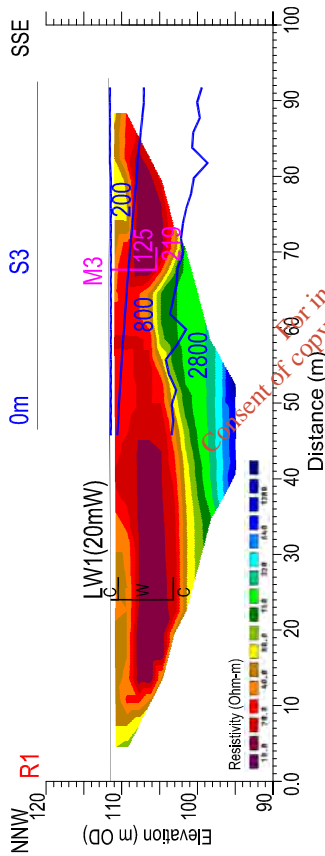
LEGEND:

- WASTE (PRED. ORGANIC) WITH CLAY
- MIXED ORGANIC/INERT WASTE WITH CLAY
- FIRM-STIFF SANDY GRAVELLY CLAY/W. ROCK
- GREYWACKE/SILTSTONE/SHALE
- Previous Borehole and Trial Pit Summary (Waste), G(Gravel), S(Sand), C(Clay) L(Silt)
- Base of waste (from Boreholes & MASW)
- Seismic refraction layer with interpreted P-wave velocity (m/s)
- MASW with S-wave velocity (m/s)

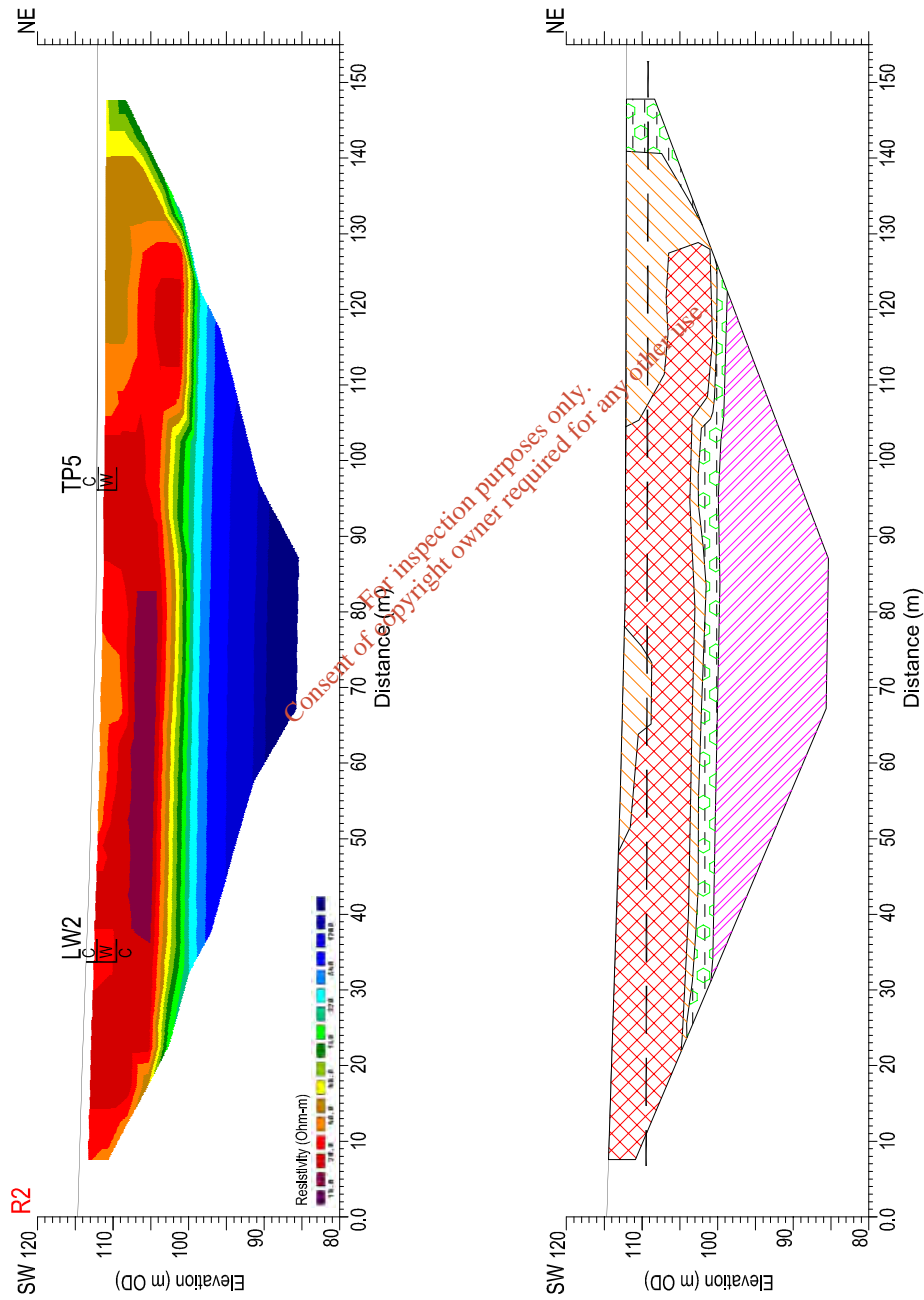
The information displayed here is to be used in conjunction with Report AGL18142_01 Report on the Geophysical Investigation at Bohernabreena Landfill, Co. Dublin, APEX Geoservices Ltd. 21-11-2018.

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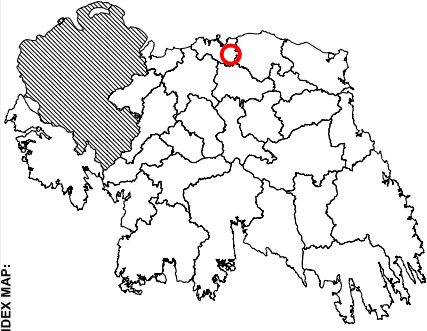
PROJECT:	BOHERNABREENA LANDFILL		
CLIENT:	GEOPHYSICAL INVESTIGATION		
DRAWING NO.:	RPS GROUP		
SCALE:	AGL18142_R1		
DATE:	AS INDICATED @ A4		
Version:	Date:	Drawn By:	Checked:
01	21-11-2018	POC	YOC



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INDEX MAP:



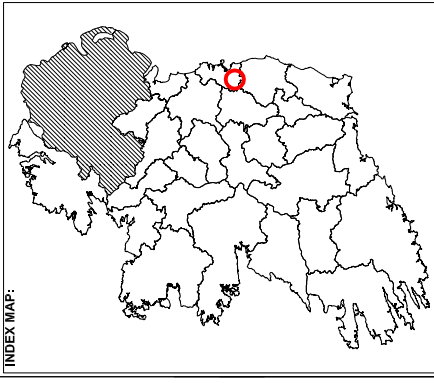
LEGEND:

- WASTE (PRED. ORGANIC) WITH CLAY
- MIXED ORGANIC/INERT WASTE WITH CLAY
- FIRM-STIFF SANDY GRAVELLY CLAY/W. ROCK
- GREYWACKE/SILTSTONE/SHALE
- Previous Borehole and Trial Pit Summary
W(Waste), G(Gravel), S(Sand), C(Clay), L(Liit)
- Base of waste (from Boreholes & MASW)
- Seismic refraction layer with interpreted P-wave velocity (m/s)
- MASW with S-wave velocity (m/s)

The information displayed here is to be used in conjunction with Report AGL18142_01 Report on the Geophysical Investigation at Bohernabreena Landfill, Co. Dublin, APEX Geoservices Ltd. 21-11-2018.

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PROJECT:	BOHERNABREENA LANDFILL		
CLIENT:	RPS GROUP		
DRAWING NO.:	AGL18142_R2		
SCALE:	AS INDICATED @ A4		
DATE:	21-11-2018		
Version:	Date:	Drawn By:	Checked:
01	21-11-2018	POC	YOC



LEGEND:

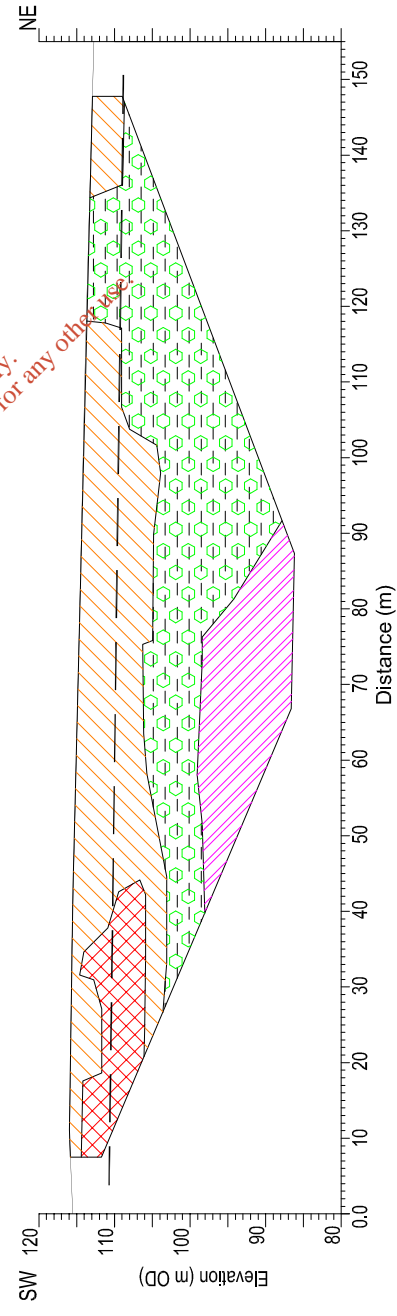
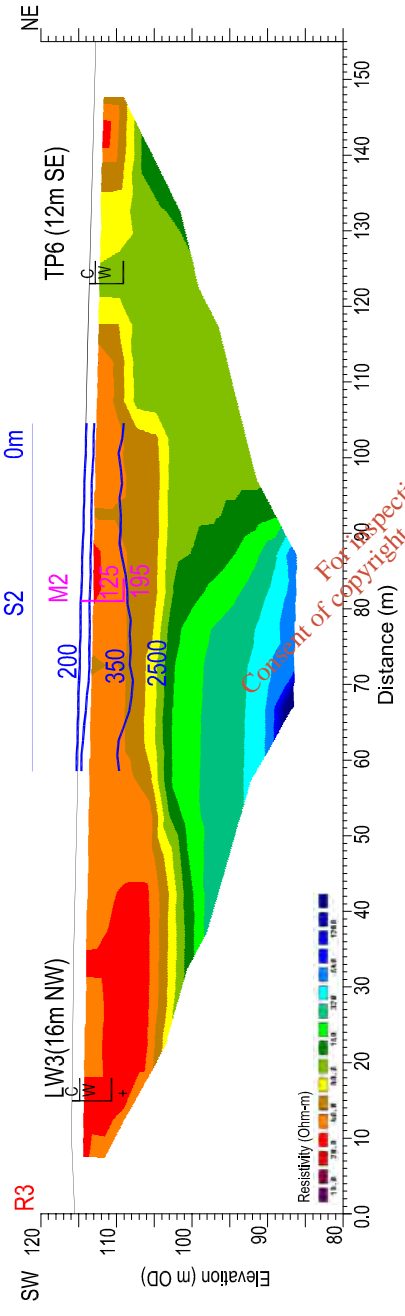
- WASTE (PRED. ORGANIC) WITH CLAY
- MIXED ORGANIC/INERT WASTE WITH CLAY
- FIRM-STIFF SANDY GRAVELLY CLAY/W. ROCK
- GREYWACKES/SILTSTONE/SHALE

Previous Borehole and Trial Pit Summary
W(Waste), **G**(Gravel), **S**(Sand), **C**(Clay) **L**(Lilt)
--- Base of waste (from Boreholes & MASW)
 Seismic refraction layer with interpreted P-wave velocity (m/s)
 MASW with S-wave velocity (m/s)

The information displayed here is to be used in conjunction with Report AGL18142_01 Report on the Geophysical Investigation at Bohernabreena Landfill, Co. Dublin, APEX Geoservices Ltd. 21-11-2018.

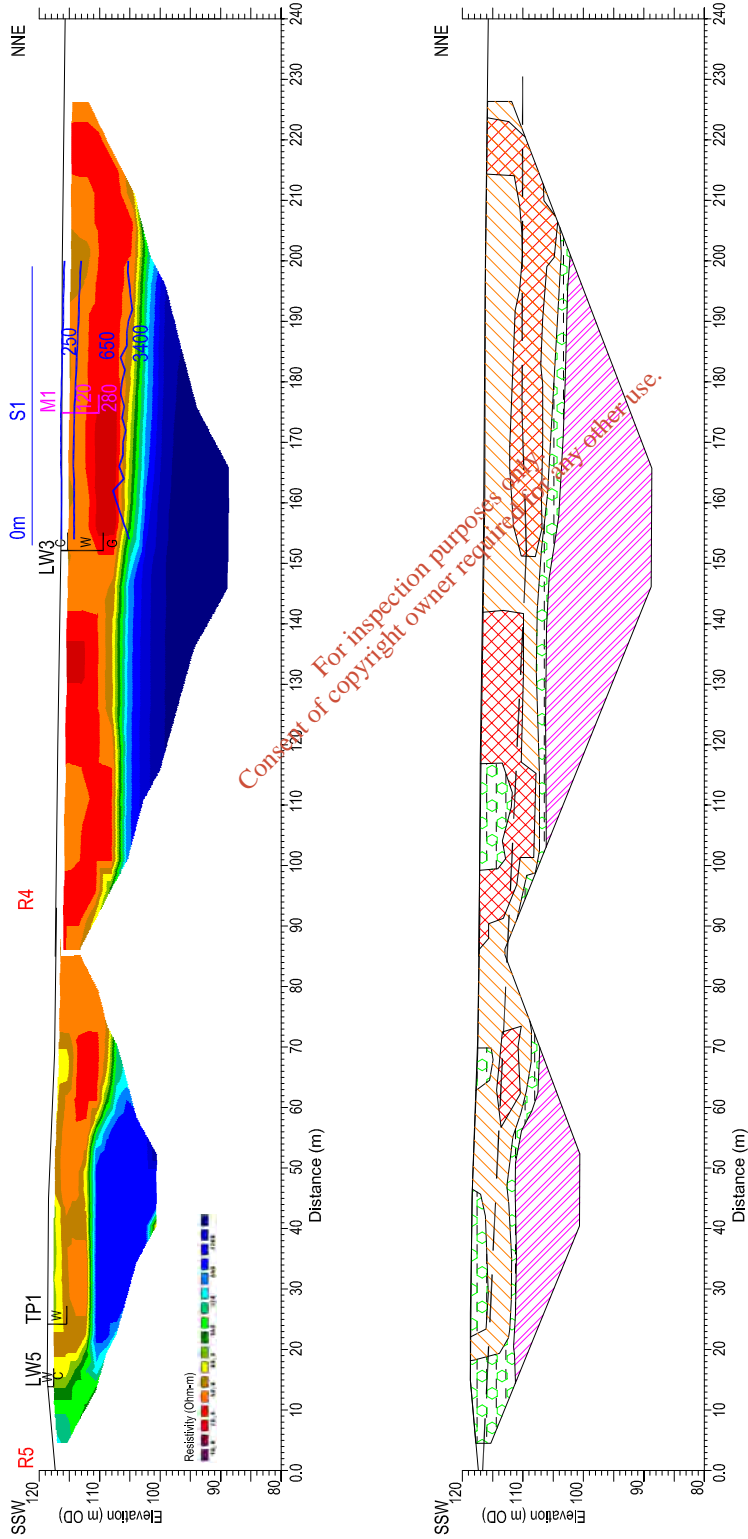
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PROJECT:	BOHERNABREENA LANDFILL		
CLIENT:	RPS GROUP		
DRAWING NO.:	AGL18142_R3		
SCALE:	AS INDICATED @ A4		
DATE:	21-11-2018		
Version:	Date:	Drawn By:	Checked:
01	21-11-2018	POC	YOC

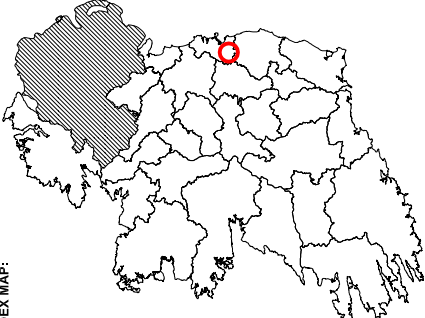


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RESULTS AND INTERPRETATION - R4 & R5
SCALE 1:1250



INDEX MAP:



LEGEND:

- WASTE (PRED. ORGANIC) WITH CLAY
 - MIXED ORGANIC/INERT WASTE WITH CLAY
 - FIRM/STIFF SANDY GRAVELLY CLAY/IN. ROCK
 - GREY/WACKESILT/STONE/SHALE
- TP/IBH: Previous Borehole and Trial Pit Summary
W(Waste), G(Gravel), S(Sand), C(Clay) L(LSH)
- Base of waste (from Boreholes & MASW)
- Seismic refraction layer with interpreted P-wave velocity (ms)
- MASW with S-wave velocity (ms)

The information displayed here is to be used in conjunction with Report AGL18142_01 Report on the Geophysical Investigation at Bohernabreena Landfill, Co. Dublin, APEX Geoservices Ltd. 21-11-2018.

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PROJECT:	BOHERNABREENA LANDFILL		
CLIENT:	RPS GROUP		
DRAWING NO.:	AGL18142_R4		
SCALE:	AS INDICATED @ A4		
DATE:	21-11-2018		
Version:	Date:	Drawn By:	Checked:
01	21-11-2018	POC	YOC

APPENDIX C: SEISMIC PLATES

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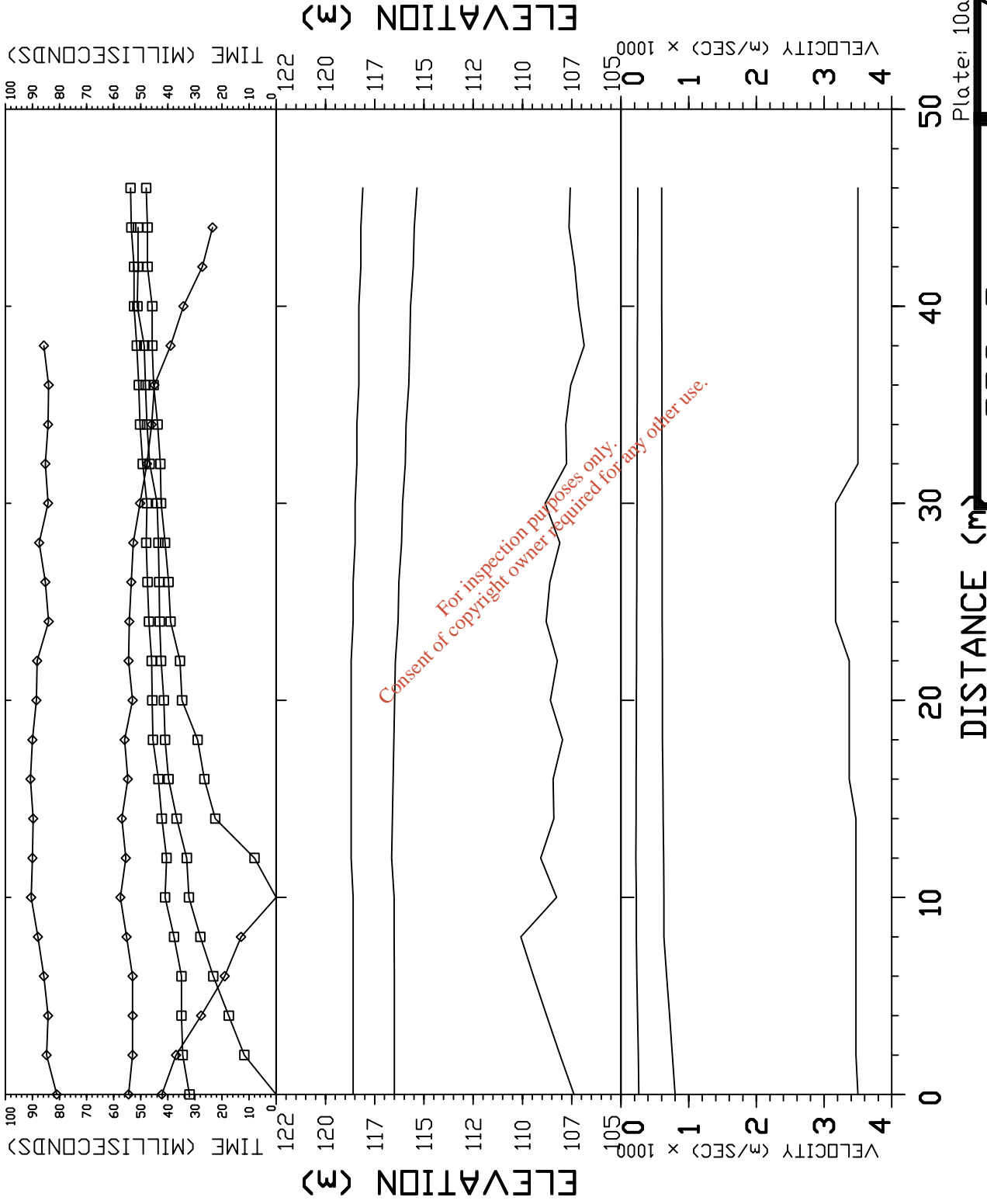
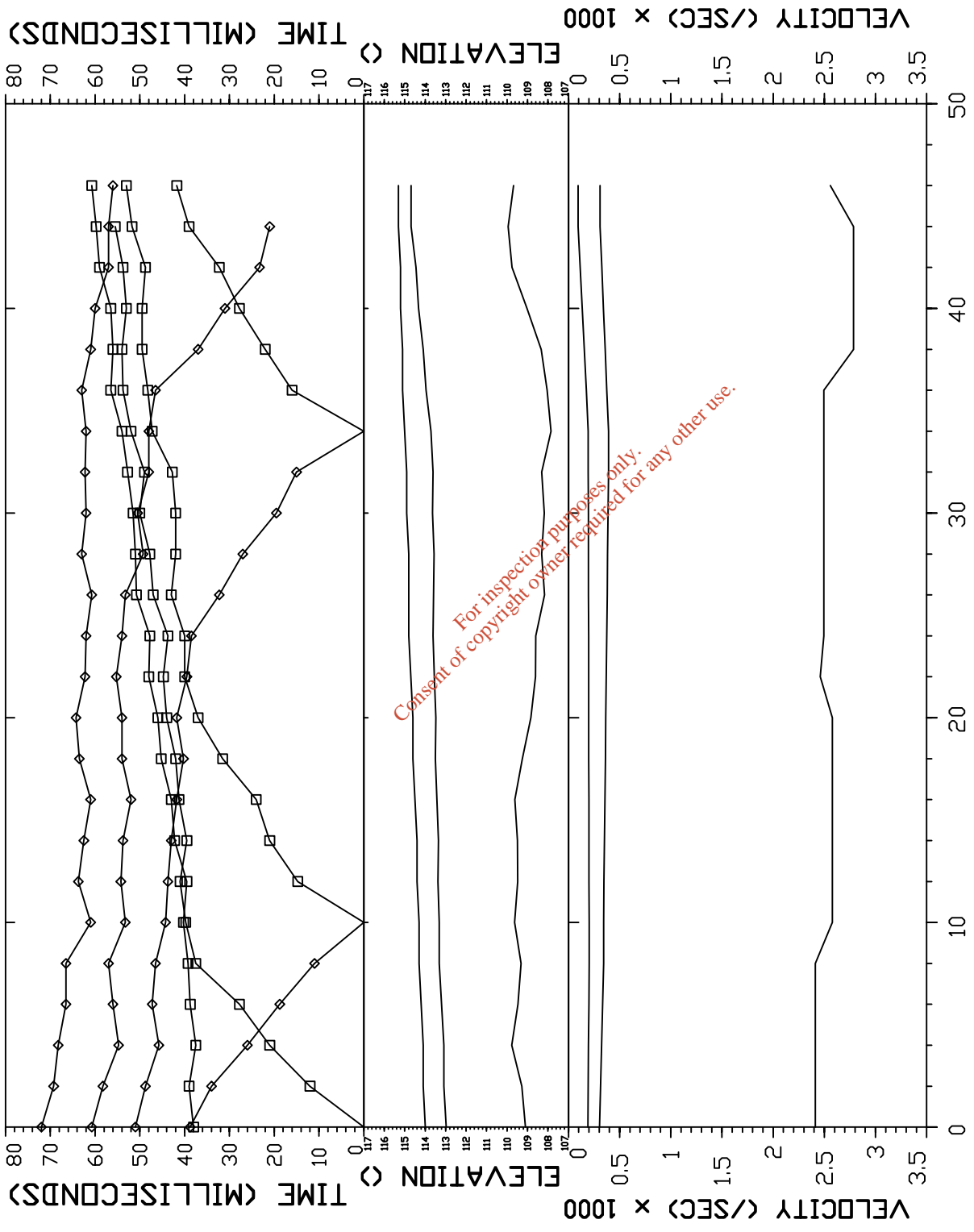


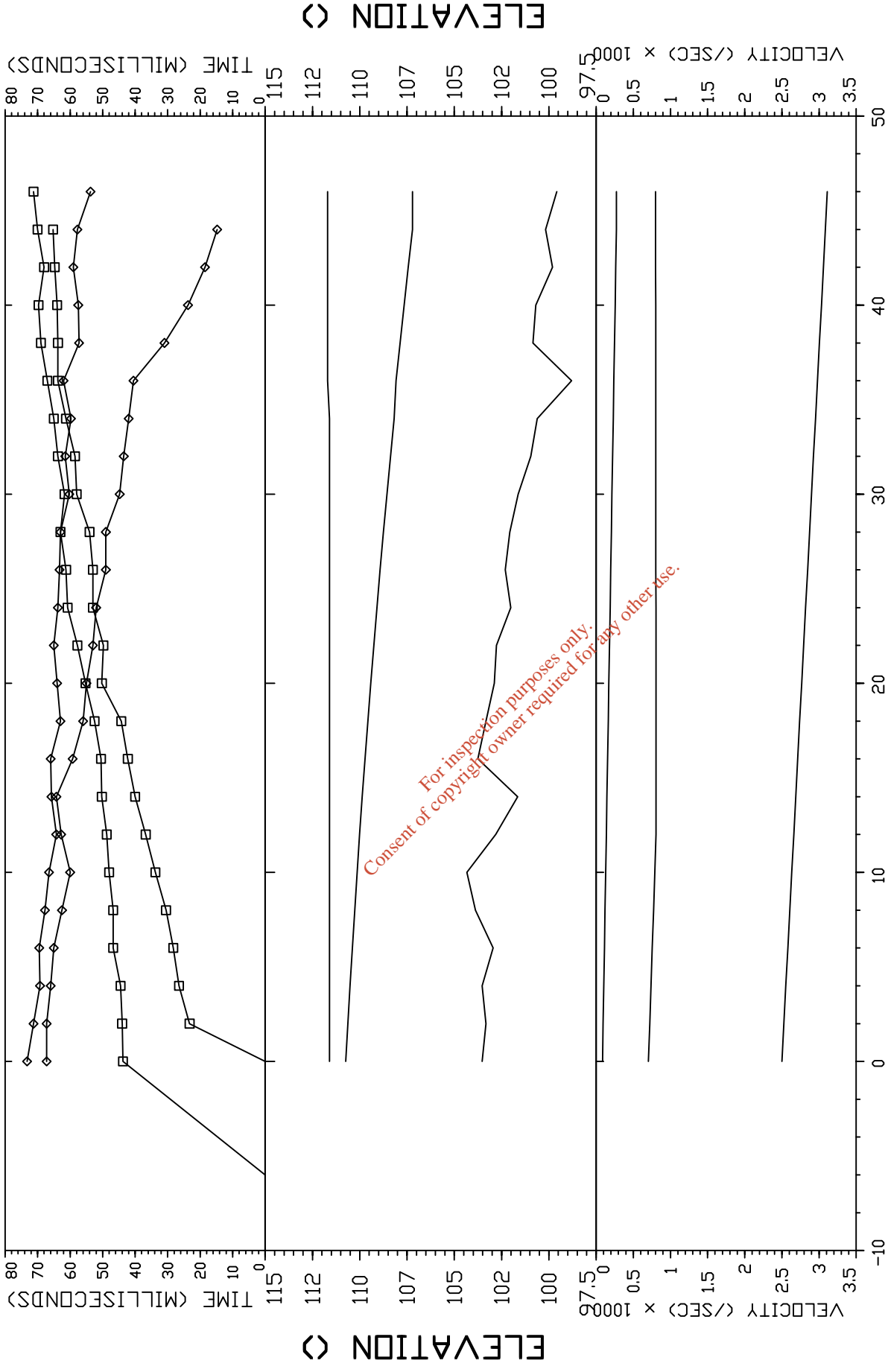
Plate: 10a

for: RPS Group		AGL18142	
by: APEX Geoservices Ltd.		Bohernabreena Monaghan	
Data Set S1	Date: 5-10-18	Azimuth:	
Equipment: Geode	Spread: S1		



DISTANCE (m) Plate: 10a

for: RPS Group		AGL18142	
by: APEX Geoservices Ltd.		Bohernabreena Monaghan	
Data Set: S2	Equipment: Geode	Date: 5-10-18	Azimuth:
Spread: S2			



DISTANCE (m)

Plate: 10a

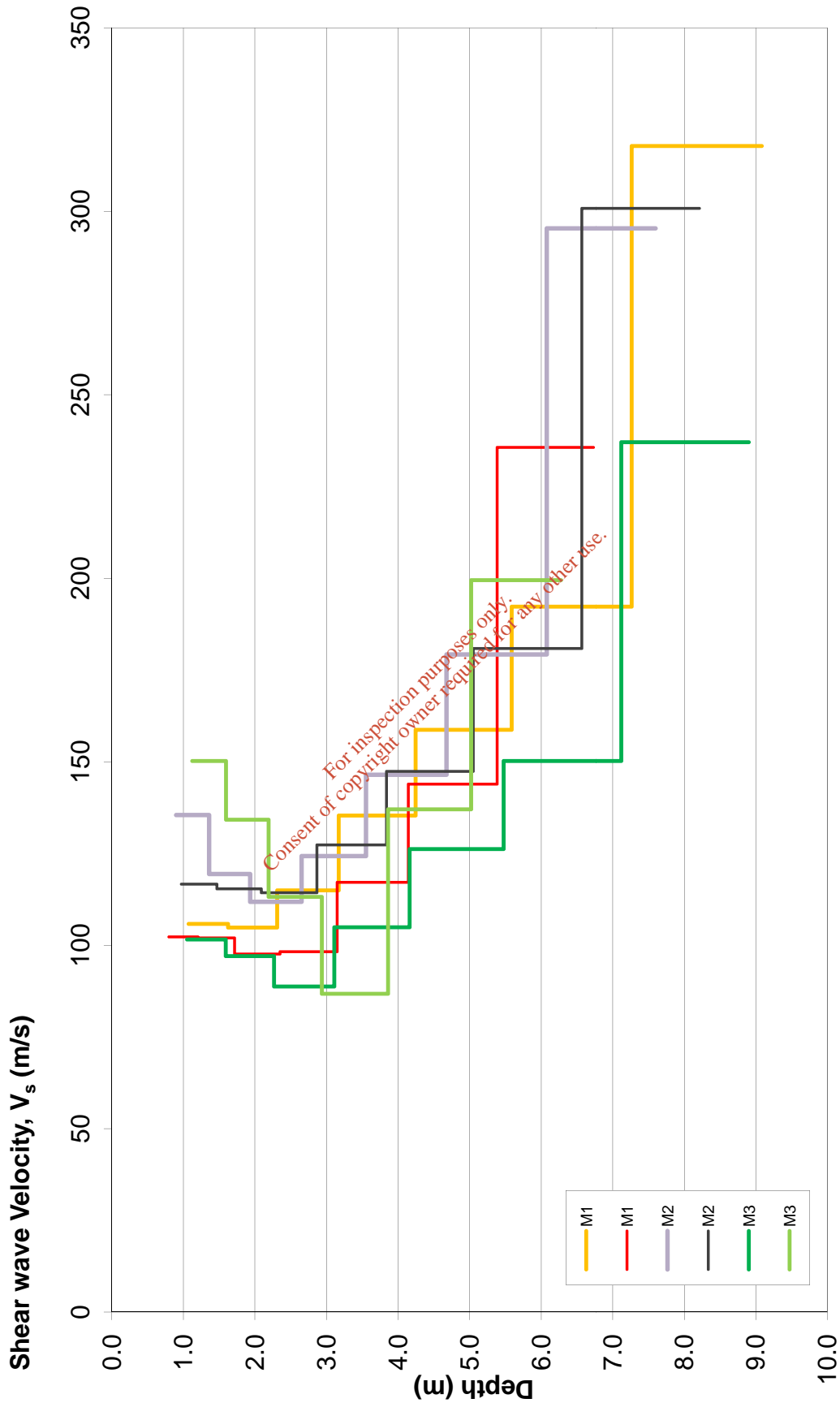
for: RPS Group		AGL18142	
by: APEX Geoservices Ltd.		Bohernabreena Monaghan	
Data Set: S3	Date: 5-10-18	Azimuth:	
Equipment: Geode		Spread: S3	

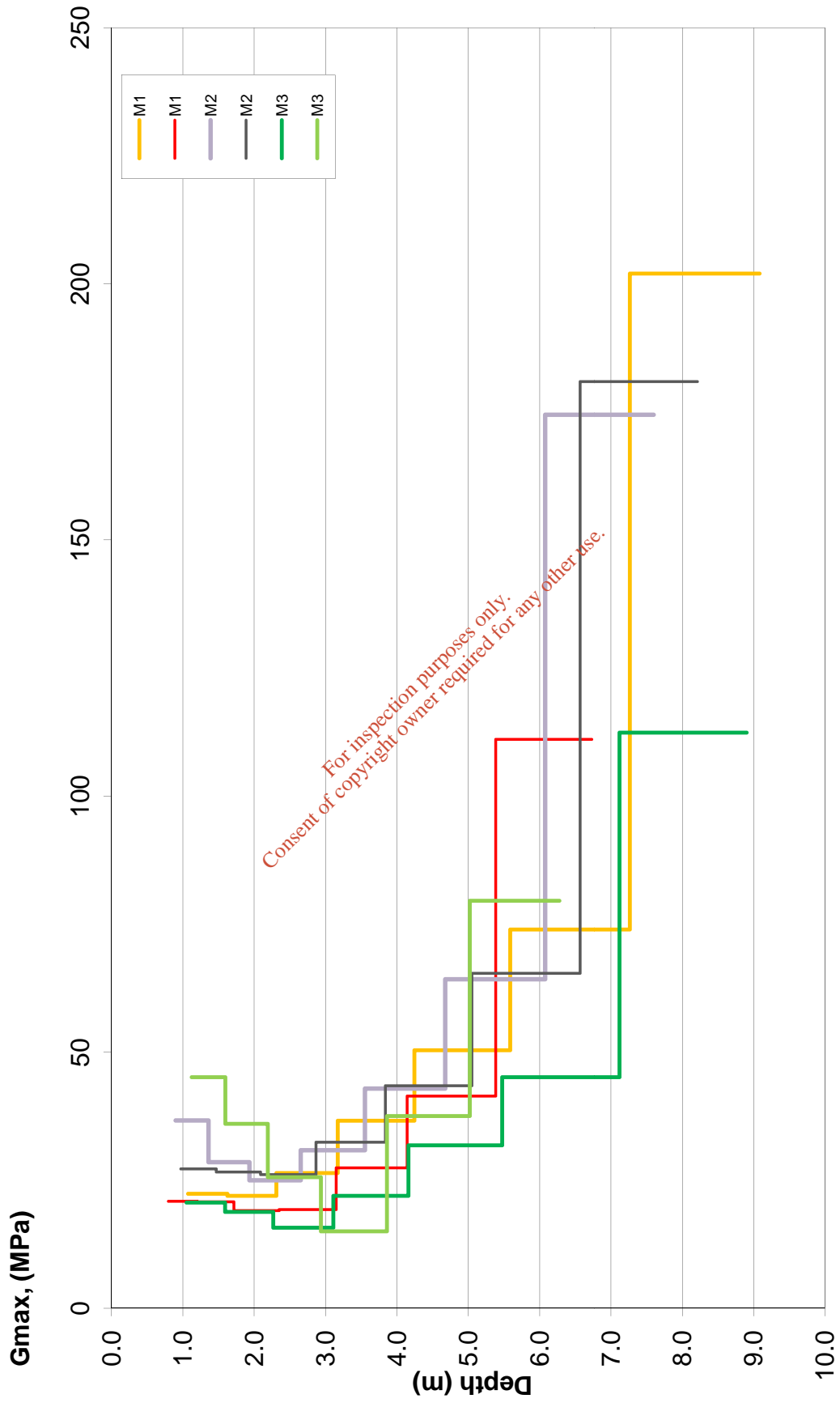
APPENDIX D: MASW DATA

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M1		1014		M1		1003		M2		1029		M2		1017		M3		1043		M3		1033	
Depth	Vs	Gmax	Depth	Vs	Gmax	Depth	Vs	Gmax	Depth	Vs	Gmax	Depth	Vs	Gmax	Depth	Vs	Gmax	Depth	Vs	Gmax	Depth	Vs	Gmax
m	m/s	MPa	m	m/s	MPa	m	m/s	MPa	m	m/s	MPa	m	m/s	MPa	m	m/s	MPa	m	m/s	MPa	m	m/s	MPa
1.1	106	22	0.8	102	21	0.9	135	37	1.0	117	27	1.1	102	21	1.1	150	45	1.1	102	21	1.1	150	45
1.6	106	22	1.2	102	21	1.4	135	37	1.5	117	27	1.6	102	21	1.6	150	45	1.6	102	21	1.6	150	45
1.6	105	22	1.2	102	21	1.4	119	29	1.5	115	27	1.6	97	19	1.6	134	36	1.6	97	19	1.6	134	36
2.3	105	22	1.7	102	21	1.9	119	29	2.1	115	27	2.3	97	19	2.3	134	36	2.3	97	19	2.3	134	36
2.3	115	26	1.7	98	19	1.9	112	25	2.1	114	26	2.3	89	16	2.3	134	36	2.3	89	16	2.3	134	36
3.2	115	26	2.4	98	19	2.7	112	25	2.9	114	26	3.1	89	16	3.1	134	36	3.1	89	16	3.1	134	36
3.2	135	37	2.4	98	19	2.7	124	31	2.9	127	32	3.1	105	22	3.1	134	36	3.1	105	22	3.1	134	36
4.2	135	37	3.1	98	19	3.6	124	31	3.8	127	32	4.2	105	22	4.2	134	36	4.2	105	22	4.2	134	36
4.2	159	50	3.1	117	27	3.6	146	43	3.8	147	43	4.2	126	32	4.2	134	36	4.2	126	32	4.2	134	36
5.6	159	50	4.1	117	27	4.7	146	43	5.1	147	43	5.5	126	32	5.1	134	36	5.5	126	32	5.1	134	36
5.6	192	74	4.1	144	41	4.7	179	64	5.1	181	65	5.5	150	45	5.1	134	36	5.5	150	45	5.1	134	36
7.3	192	74	5.4	144	41	6.1	179	64	6.6	181	65	7.1	150	45	6.6	134	36	7.1	150	45	6.6	134	36
7.3	318	202	5.4	236	111	6.1	295	174	6.6	301	181	7.1	237	112	6.6	134	36	7.1	237	112	6.6	134	36
9.1	318	202	6.7	236	111	7.6	295	174	8.2	301	181	8.9	237	112	8.2	134	36	8.9	237	112	8.2	134	36

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APPENDIX E
TOPOGRAPHICAL SURVEY

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LEGEND

Street Furniture & Services

5.1.3	One-Wheel Wheel (LWS)	5.1.1	Manhole
5.1.4	Two-Wheel Wheel (LWS)	5.1.2	Manhole
5.1.5	Three-Wheel Wheel (LWS)	5.1.3	Manhole
5.1.6	Four-Wheel Wheel (LWS)	5.1.4	Manhole
5.1.7	Five-Wheel Wheel (LWS)	5.1.5	Manhole
5.1.8	Six-Wheel Wheel (LWS)	5.1.6	Manhole
5.1.9	Seven-Wheel Wheel (LWS)	5.1.7	Manhole
5.1.10	Eight-Wheel Wheel (LWS)	5.1.8	Manhole
5.1.11	Nine-Wheel Wheel (LWS)	5.1.9	Manhole
5.1.12	Ten-Wheel Wheel (LWS)	5.1.10	Manhole
5.1.13	Eleven-Wheel Wheel (LWS)	5.1.11	Manhole
5.1.14	Twelve-Wheel Wheel (LWS)	5.1.12	Manhole
5.1.15	Thirteen-Wheel Wheel (LWS)	5.1.13	Manhole
5.1.16	Fourteen-Wheel Wheel (LWS)	5.1.14	Manhole
5.1.17	Fifteen-Wheel Wheel (LWS)	5.1.15	Manhole
5.1.18	Sixteen-Wheel Wheel (LWS)	5.1.16	Manhole
5.1.19	Seventeen-Wheel Wheel (LWS)	5.1.17	Manhole
5.1.20	Eighteen-Wheel Wheel (LWS)	5.1.18	Manhole
5.1.21	Nineteen-Wheel Wheel (LWS)	5.1.19	Manhole
5.1.22	Twenty-Wheel Wheel (LWS)	5.1.20	Manhole
5.1.23	Twenty-One Wheel Wheel (LWS)	5.1.21	Manhole
5.1.24	Twenty-Two Wheel Wheel (LWS)	5.1.22	Manhole
5.1.25	Twenty-Three Wheel Wheel (LWS)	5.1.23	Manhole
5.1.26	Twenty-Four Wheel Wheel (LWS)	5.1.24	Manhole
5.1.27	Twenty-Five Wheel Wheel (LWS)	5.1.25	Manhole
5.1.28	Twenty-Six Wheel Wheel (LWS)	5.1.26	Manhole
5.1.29	Twenty-Seven Wheel Wheel (LWS)	5.1.27	Manhole
5.1.30	Twenty-Eight Wheel Wheel (LWS)	5.1.28	Manhole
5.1.31	Twenty-Nine Wheel Wheel (LWS)	5.1.29	Manhole
5.1.32	Thirty Wheel Wheel (LWS)	5.1.30	Manhole
5.1.33	Thirty-One Wheel Wheel (LWS)	5.1.31	Manhole
5.1.34	Thirty-Two Wheel Wheel (LWS)	5.1.32	Manhole
5.1.35	Thirty-Three Wheel Wheel (LWS)	5.1.33	Manhole
5.1.36	Thirty-Four Wheel Wheel (LWS)	5.1.34	Manhole
5.1.37	Thirty-Five Wheel Wheel (LWS)	5.1.35	Manhole
5.1.38	Thirty-Six Wheel Wheel (LWS)	5.1.36	Manhole
5.1.39	Thirty-Seven Wheel Wheel (LWS)	5.1.37	Manhole
5.1.40	Thirty-Eight Wheel Wheel (LWS)	5.1.38	Manhole
5.1.41	Thirty-Nine Wheel Wheel (LWS)	5.1.39	Manhole
5.1.42	Forty Wheel Wheel (LWS)	5.1.40	Manhole
5.1.43	Forty-One Wheel Wheel (LWS)	5.1.41	Manhole
5.1.44	Forty-Two Wheel Wheel (LWS)	5.1.42	Manhole
5.1.45	Forty-Three Wheel Wheel (LWS)	5.1.43	Manhole
5.1.46	Forty-Four Wheel Wheel (LWS)	5.1.44	Manhole
5.1.47	Forty-Five Wheel Wheel (LWS)	5.1.45	Manhole
5.1.48	Forty-Six Wheel Wheel (LWS)	5.1.46	Manhole
5.1.49	Forty-Seven Wheel Wheel (LWS)	5.1.47	Manhole
5.1.50	Forty-Eight Wheel Wheel (LWS)	5.1.48	Manhole
5.1.51	Forty-Nine Wheel Wheel (LWS)	5.1.49	Manhole
5.1.52	Fifty Wheel Wheel (LWS)	5.1.50	Manhole
5.1.53	Fifty-One Wheel Wheel (LWS)	5.1.51	Manhole
5.1.54	Fifty-Two Wheel Wheel (LWS)	5.1.52	Manhole
5.1.55	Fifty-Three Wheel Wheel (LWS)	5.1.53	Manhole
5.1.56	Fifty-Four Wheel Wheel (LWS)	5.1.54	Manhole
5.1.57	Fifty-Five Wheel Wheel (LWS)	5.1.55	Manhole
5.1.58	Fifty-Six Wheel Wheel (LWS)	5.1.56	Manhole
5.1.59	Fifty-Seven Wheel Wheel (LWS)	5.1.57	Manhole
5.1.60	Fifty-Eight Wheel Wheel (LWS)	5.1.58	Manhole
5.1.61	Fifty-Nine Wheel Wheel (LWS)	5.1.59	Manhole
5.1.62	Sixty Wheel Wheel (LWS)	5.1.60	Manhole
5.1.63	Sixty-One Wheel Wheel (LWS)	5.1.61	Manhole
5.1.64	Sixty-Two Wheel Wheel (LWS)	5.1.62	Manhole
5.1.65	Sixty-Three Wheel Wheel (LWS)	5.1.63	Manhole
5.1.66	Sixty-Four Wheel Wheel (LWS)	5.1.64	Manhole
5.1.67	Sixty-Five Wheel Wheel (LWS)	5.1.65	Manhole
5.1.68	Sixty-Six Wheel Wheel (LWS)	5.1.66	Manhole
5.1.69	Sixty-Seven Wheel Wheel (LWS)	5.1.67	Manhole
5.1.70	Sixty-Eight Wheel Wheel (LWS)	5.1.68	Manhole
5.1.71	Sixty-Nine Wheel Wheel (LWS)	5.1.69	Manhole
5.1.72	Seventy Wheel Wheel (LWS)	5.1.70	Manhole
5.1.73	Seventy-One Wheel Wheel (LWS)	5.1.71	Manhole
5.1.74	Seventy-Two Wheel Wheel (LWS)	5.1.72	Manhole
5.1.75	Seventy-Three Wheel Wheel (LWS)	5.1.73	Manhole
5.1.76	Seventy-Four Wheel Wheel (LWS)	5.1.74	Manhole
5.1.77	Seventy-Five Wheel Wheel (LWS)	5.1.75	Manhole
5.1.78	Seventy-Six Wheel Wheel (LWS)	5.1.76	Manhole
5.1.79	Seventy-Seven Wheel Wheel (LWS)	5.1.77	Manhole
5.1.80	Seventy-Eight Wheel Wheel (LWS)	5.1.78	Manhole
5.1.81	Seventy-Nine Wheel Wheel (LWS)	5.1.79	Manhole
5.1.82	Eighty Wheel Wheel (LWS)	5.1.80	Manhole
5.1.83	Eighty-One Wheel Wheel (LWS)	5.1.81	Manhole
5.1.84	Eighty-Two Wheel Wheel (LWS)	5.1.82	Manhole
5.1.85	Eighty-Three Wheel Wheel (LWS)	5.1.83	Manhole
5.1.86	Eighty-Four Wheel Wheel (LWS)	5.1.84	Manhole
5.1.87	Eighty-Five Wheel Wheel (LWS)	5.1.85	Manhole
5.1.88	Eighty-Six Wheel Wheel (LWS)	5.1.86	Manhole
5.1.89	Eighty-Seven Wheel Wheel (LWS)	5.1.87	Manhole
5.1.90	Eighty-Eight Wheel Wheel (LWS)	5.1.88	Manhole
5.1.91	Eighty-Nine Wheel Wheel (LWS)	5.1.89	Manhole
5.1.92	Ninety Wheel Wheel (LWS)	5.1.90	Manhole
5.1.93	Ninety-One Wheel Wheel (LWS)	5.1.91	Manhole
5.1.94	Ninety-Two Wheel Wheel (LWS)	5.1.92	Manhole
5.1.95	Ninety-Three Wheel Wheel (LWS)	5.1.93	Manhole
5.1.96	Ninety-Four Wheel Wheel (LWS)	5.1.94	Manhole
5.1.97	Ninety-Five Wheel Wheel (LWS)	5.1.95	Manhole
5.1.98	Ninety-Six Wheel Wheel (LWS)	5.1.96	Manhole
5.1.99	Ninety-Seven Wheel Wheel (LWS)	5.1.97	Manhole
5.1.100	Ninety-Eight Wheel Wheel (LWS)	5.1.98	Manhole
5.1.101	Ninety-Nine Wheel Wheel (LWS)	5.1.99	Manhole
5.1.102	Hundred Wheel Wheel (LWS)	5.1.100	Manhole

Built Features

Roads & Road Markings

5.2.1	Building
5.2.2	Edge of Road
5.2.3	Gate
5.2.4	Road Centreline
5.2.5	Top of Wall
5.2.6	Hoarding
5.2.7	Proposed Line
5.2.8	Bridge Deck
5.2.9	Bridge Pier
5.2.10	Footpath
5.2.11	Footpath
5.2.12	Footpath
5.2.13	Footpath
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5.2.100	Footpath

Natural Features

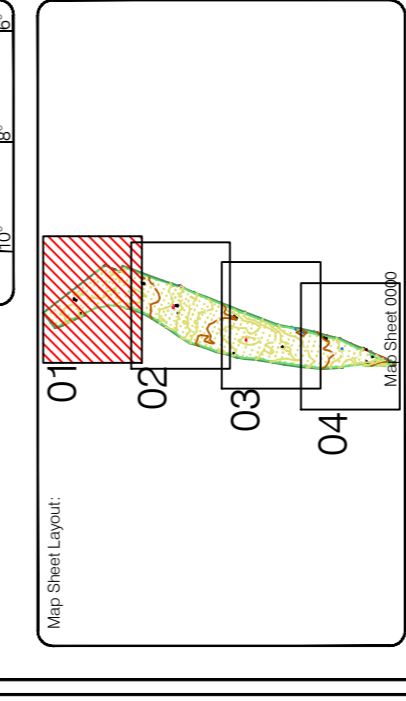
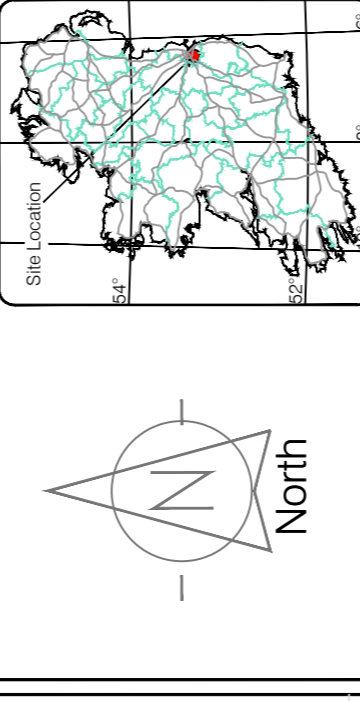
5.3.1	Surface Change
5.3.2	Water Level
5.3.3	Water Level
5.3.4	Water Level
5.3.5	Water Level
5.3.6	Water Level
5.3.7	Water Level
5.3.8	Water Level
5.3.9	Water Level
5.3.10	Water Level
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5.3.100	Water Level

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Project No.	18102018
Client	RPS group
Date	18.10.2018
Scale	1:250@A1
Description	Topographical Survey
Drawing No.	MSL26700_T_ITM_Rev0_01
Scale	1:250@A1
Author	
Checked by	
Date	
Project No.	18102018
Client	RPS group
Date	18.10.2018
Scale	1:250@A1
Description	Topographical Survey
Drawing No.	MSL26700_T_ITM_Rev0_01
Scale	1:250@A1
Author	
Checked by	
Date	

CHARTERED SURVEYORS
THE SURVEY ASSOCIATION
RICS

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Client: RPS group

Project: Topo Survey Bohernabreena Tallaght Dublin

Date: 18.10.2018 **Scale:** 1:250@A1

Description: Topographical Survey

Drawing Number: MSL26700_T_ITM_Rev0_01

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LEGEND

Street Furniture & Services

1.1.1	One Head Wires (LWS)	1.1.2	Two Head Wires (LWS)
1.1.3	Street Light	1.1.4	Street Light
1.1.5	Street Light	1.1.6	Street Light
1.1.7	Street Light	1.1.8	Street Light
1.1.9	Street Light	1.1.10	Street Light
1.1.11	Street Light	1.1.12	Street Light
1.1.13	Street Light	1.1.14	Street Light
1.1.15	Street Light	1.1.16	Street Light
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1.1.29	Street Light	1.1.30	Street Light
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1.1.39	Street Light	1.1.40	Street Light
1.1.41	Street Light	1.1.42	Street Light
1.1.43	Street Light	1.1.44	Street Light
1.1.45	Street Light	1.1.46	Street Light
1.1.47	Street Light	1.1.48	Street Light
1.1.49	Street Light	1.1.50	Street Light
1.1.51	Street Light	1.1.52	Street Light
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1.1.95	Street Light	1.1.96	Street Light
1.1.97	Street Light	1.1.98	Street Light
1.1.99	Street Light	1.1.100	Street Light

Built Features

Roads & Road Markings

2.1.1	Building	2.1.2	Fence
2.1.3	Edge of Road	2.1.4	Gate
2.1.5	Headstone	2.1.6	Manhole
2.1.7	Manhole	2.1.8	Manhole
2.1.9	Manhole	2.1.10	Manhole
2.1.11	Manhole	2.1.12	Manhole
2.1.13	Manhole	2.1.14	Manhole
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2.1.95	Manhole	2.1.96	Manhole
2.1.97	Manhole	2.1.98	Manhole
2.1.99	Manhole	2.1.100	Manhole

Natural Features

3.1.1	Surface Change	3.1.2	Water Level
3.1.3	Surface Change	3.1.4	Water Level
3.1.5	Surface Change	3.1.6	Water Level
3.1.7	Surface Change	3.1.8	Water Level
3.1.9	Surface Change	3.1.10	Water Level
3.1.11	Surface Change	3.1.12	Water Level
3.1.13	Surface Change	3.1.14	Water Level
3.1.15	Surface Change	3.1.16	Water Level
3.1.17	Surface Change	3.1.18	Water Level
3.1.19	Surface Change	3.1.20	Water Level
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3.1.39	Surface Change	3.1.40	Water Level
3.1.41	Surface Change	3.1.42	Water Level
3.1.43	Surface Change	3.1.44	Water Level
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3.1.91	Surface Change	3.1.92	Water Level
3.1.93	Surface Change	3.1.94	Water Level
3.1.95	Surface Change	3.1.96	Water Level
3.1.97	Surface Change	3.1.98	Water Level
3.1.99	Surface Change	3.1.100	Water Level

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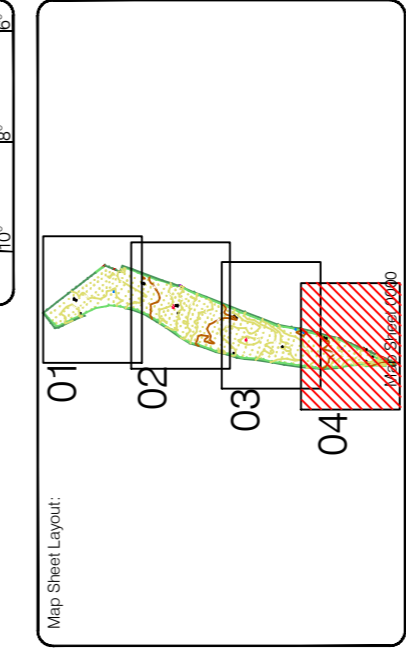
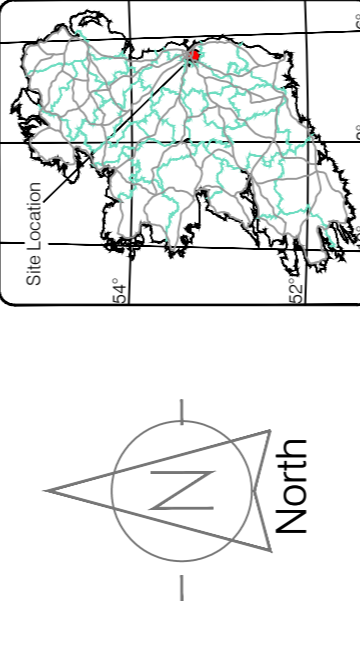
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Project No.	MSL26700
Client	RPS group
Drawn by	PK
Checked by	PK
Date	18.10.2018
Scale	1:250@A1
Project Name	Topo Survey Bohemabreena Tallaght Dublin
Project No.	MSL26700
Client	RPS group
Drawn by	PK
Checked by	PK
Date	18.10.2018
Scale	1:250@A1
Project Name	Topo Survey Bohemabreena Tallaght Dublin

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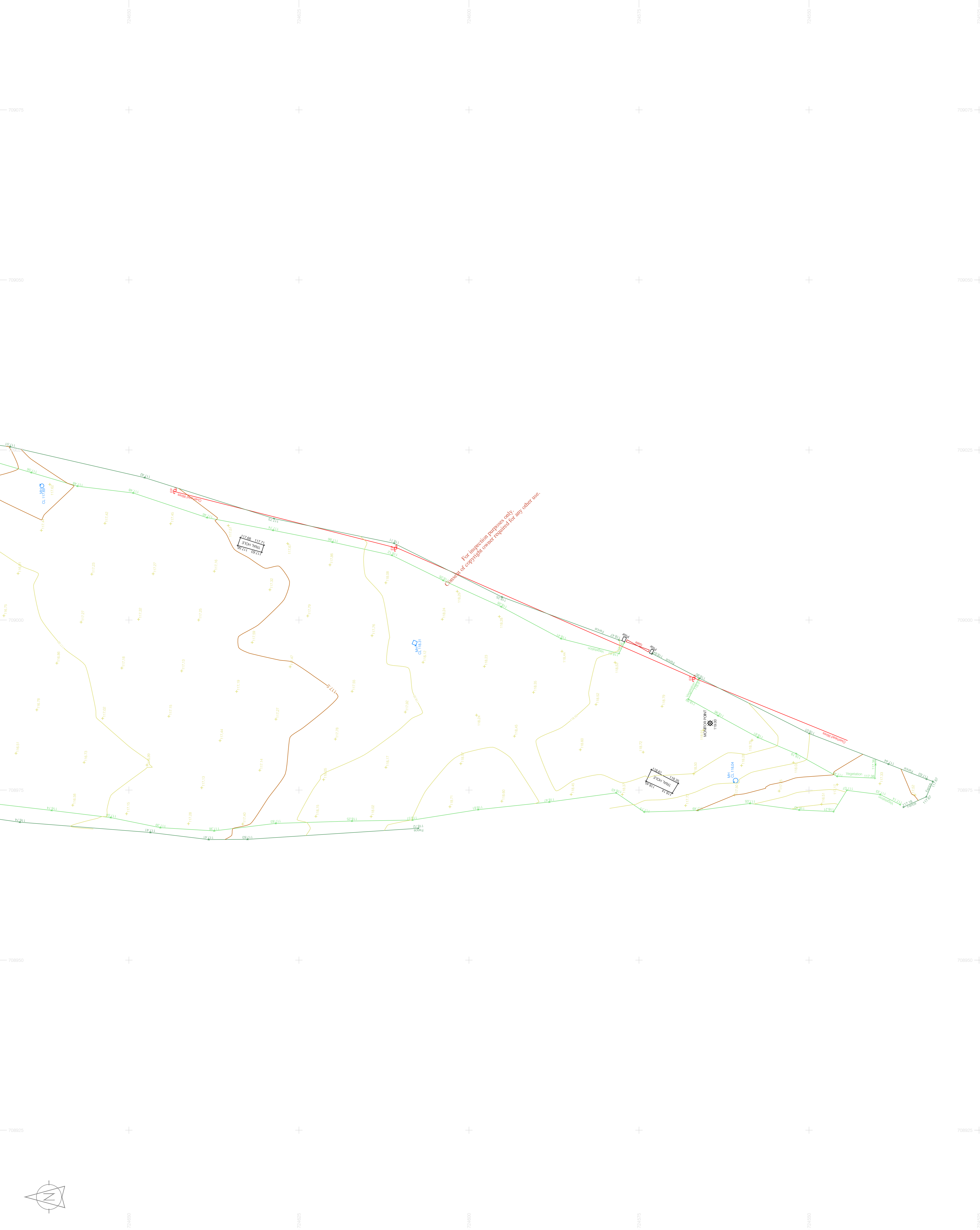
Project: Topo Survey Bohemabreena Tallaght Dublin

Date: 18.10.2018 **Scale:** 1:250@A1

Description: Topographical Survey

Drawing Number: MSL26700_T_ITM_Rev0_04

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APPENDIX F
TRIAL PIT GEOLOGICAL LOGS

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Trial Pit TP1

PROJECT NO. MDR1489	DATE 02/10/2018	COORDINATES 709066.270, 724987.751 (ITM)
PROJECT NAME Bohernabreena Landfill	COMPANY Priority Geotechnical Ltd	SURFACE ELEVATION 111.42 mAOD
CLIENT South Dublin County Council	METHOD JCB Excavator	LOGGED BY Blathnaid McPolin (RPS)
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	TOTAL DEPTH 3.2m	CHECKED BY Janka Nitsche (RPS)

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Water Seepages	Additional Observations	Elevation (MOAD)
			Light brown, slightly stony soil (TOPSOIL)			111.4
0.5			Light brown stony CLAY. Stones are medium to large cobbles		No odour	111.2 111 110.8
1			WASTE Dark mixed waste - plastic, slightly degraded paper. Strong organic odour		Organic odour	110.6 110.4 110.2 110 109.8 109.6
2	TP1_2.0					109.4 109.2
2.5						109 108.8 108.6
3	TP1_3.2					108.4
3.5			Termination Depth at: 3.2m			108.2 108 107.8 107.6
4						107.4 107.2
4.5						107 106.8 106.6

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Trial Pit TP2

PROJECT NO. MDR1489 PROJECT NAME Bohernabreena Landfill CLIENT South Dublin County Council ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	DATE 08/10/2018 COMPANY Priority Geotechnical Ltd METHOD JCB Excavator TOTAL DEPTH 3.0m	COORDINATES 708976.271, 724571.640 (ITM) SURFACE ELEVATION 118.14 mAOD LOGGED BY Blathnaid McPolin (RPS) CHECKED BY Janka Nitsche (RPS)
--	--	--

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Water Seepages	Additional Observations	Elevation (MOAD)
0.5			TOPSOIL			118
			Grey FILL			117.8
			CLAY			117.6
1			WASTE 1.0m black CLAY		Organic smell	117.4
1.5						117.2
2	TP2_2.0		2.0m Black CLAY, high level of plastic		Manure smell	117
2.5			2.2m Mainly plastic			116.8
3			Termination Depth at: 3.0m			116.6
3.5						116.4
4						116.2
4.5						116
						115.8
						115.6
						115.4
						115.2

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Trial Pit TP4

PROJECT NO. MDR1489	DATE 08/10/2018	COORDINATES 709041.081, 724759.821 (ITM)
PROJECT NAME Bohernabreena Landfill	COMPANY Priority Geotechnical Ltd	SURFACE ELEVATION 115.14
CLIENT South Dublin County Council	METHOD JCB Excavator	LOGGED BY Blathnaid McPolin (RPS)
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	TOTAL DEPTH 3.6m	CHECKED BY Janka Nitshe (RPS)

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Water Seepages	Additional Observations	Elevation (MOAD)
0.5			TOPSOIL			112.4
			CLAY			112.2
			WASTE			112
1		<i>For inspection purposes only. Consent of copyright owner required for any other use.</i>			Organic odour Slight hydrocarbon / bitumen odour	111.8
1.5						111.6
2						111.4
2.5						111.2
3						111
3.5						110.8
						110.6
						110.4
						110.2
						110
		109.8				
		109.6				
		109.4				
		109.2				
		109				
		108.8				
4			Termination Depth at: 3.6m			108.6
4.5						108.4
						108.2
						108
						107.8
						107.6

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Trial Pit TP5

PROJECT NO. MDR1489	DATE 08/10/2018	COORDINATES 709089.506, 724891.337 (ITM)
PROJECT NAME Bohernabreena	COMPANY Priority Geotechnical Ltd	SURFACE ELEVATION 112.41 mAOD
CLIENT South Dublin County Council	METHOD JCB Excavator	LOGGED BY Blathnaid McPolin (RPS)
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	TOTAL DEPTH 2.6m	CHECKED BY Janka Nitsche (RPS)

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Water Seepages	Additional Observations	Elevation (MOAD)
			TOPSOIL			60.8
0.5			WASTE Grey CLAY, rubbish, plastic bags			60.6
1						60.4
1.5						60.2
2						60
2.5			Sandy gravel grey CLAY			59.8
			Termination Depth at: 2.6m			59.6
3						59.4
3.5						59.2
4						59
4.5						58.8
						58.6
						58.4
						58.2
						58
						57.8
						57.6
						57.4
						57.2
						57
						56.8
						56.6
						56.4
						56.2
						56

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Trial Pit TP6

PROJECT NO. MDR1489 PROJECT NAME Bohernabreena Landfill CLIENT South Dublin County Council ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	DATE 08/10/2018 COMPANY Priority Geotechnical Ltd METHOD JCB Excavator TOTAL DEPTH 3.8m	COORDINATES 709057.748, 724843.224 (ITM) SURFACE ELEVATION 113.15 mAOD LOGGED BY Blathnaid McPolin (RPS) CHECKED BY Janka Nitsche (RPS)
--	--	--

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Water Seepages	Additional Observations	Elevation (MOAD)
0.5		~ ~ ~ ~ ~	TOPSOIL			113
		- - - - -	CLAY			112.8
1		/ / / / /	WASTE			112.6
		/ / / / /				112.4
1.5		/ / / / /	Mixed waste, black/grey CLAY			112.2
		/ / / / /				112
2		/ / / / /				111.8
		/ / / / /				111.6
2.5		/ / / / /				111.4
		/ / / / /				111.2
3		/ / / / /				111
		/ / / / /				110.8
3.5		/ / / / /				110.6
		/ / / / /				110.4
4		/ / / / /	Termination Depth at: 3.8m Bottom of the waste could not be reached			110.2
		/ / / / /				109.8
4.5		/ / / / /				109.6
		/ / / / /				109.4
		/ / / / /				109.2
		/ / / / /				109
		/ / / / /				108.8
		/ / / / /				108.6
		/ / / / /				108.4
		/ / / / /				108.2

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Trial Pit TP7

PROJECT NO. MDR1489	DATE 08/10/2018	COORDINATES
PROJECT NAME Bohernabreena Landfill	COMPANY Priority Geotechnical Ltd	SURFACE ELEVATION
CLIENT South Dublin County Council	METHOD JCB Excavator	LOGGED BY Blathnaid McPolin (RPS)
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	TOTAL DEPTH 3.50 metres	CHECKED BY

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Water Seepages	Additional Observations	Elevation (MOAD)
0.5			TOPSOIL			60.6
			CLAY			60.4
1			WASTE			60.2
						60
						59.8
						59.6
1.5						59.4
						59.2
						59
2						58.8
						58.6
						58.4
2.5		58.2				
		58				
3		57.8				
		57.6				
		57.4				
3.5		57.2				
		57				
4		56.8				
		56.6				
		56.4				
4.5			(Stiff) Brown/black CLAY with cobbles			56.2
			Termination Depth at: 4.5m			56
						55.8

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Trial Pit TP8

PROJECT NO. MDR1489	DATE 08/10/2018	COORDINATES
PROJECT NAME Bohernabreena Landfill	COMPANY Priority Geotechnical Ltd	SURFACE ELEVATION
CLIENT South Dublin County Council	METHOD JCB Excavator	LOGGED BY Blathnaid McPolin (RPS)
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	TOTAL DEPTH 4.4m	CHECKED BY

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Water Seepages	Additional Observations	Elevation (MOAD)
			TOPSOIL			60.6
0.5			WASTE			60.4
1						60.2
1.5						60
2						59.8
2.5						59.6
3						59.4
3.5						59.2
4						59
4.5			Termination Depth at: 4.4m			58.8
						58.6
						58.4
						58.2
						58
						57.8
						57.6
						57.4
						57.2
						57
						56.8
						56.6
						56.4
						56.2
						56
						55.8

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Trial Pit TP3

PROJECT NO. MDR1489	DATE 02/10/2018	COORDINATES 709011.040, 724632..040 (ITM)
PROJECT NAME Bohernabreena Landfill	COMPANY Priority Geotechnical Ltd	SURFACE ELEVATION 117.68 mAOD
CLIENT South Dublin County Council	METHOD JCB Excavator	LOGGED BY Blathnaid McPolin (RPS)
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	TOTAL DEPTH 3.2m	CHECKED BY Janka Nitsche (RPS)

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Water Seepages	Additional Observations	Elevation (MOAD)
			For inspection purposes only. Consent of copyright owner required for any other use.			117.6
				117.4		
0.5				117.2		
				117		
				116.8		
1				116.6		
				116.4		
1.5				116.2		
				116		
2				115.8		
				115.6		
2.5				115.4		
				115.2		
3				115		
				114.8		
3.5				114.6		
				114.4		
4				114.2		
				114		
4.5				113.8		
			113.6			
			113.4			
			113.2			
			113			
			112.8			

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APPENDIX G
MONITORING BOREHOLE LOGS

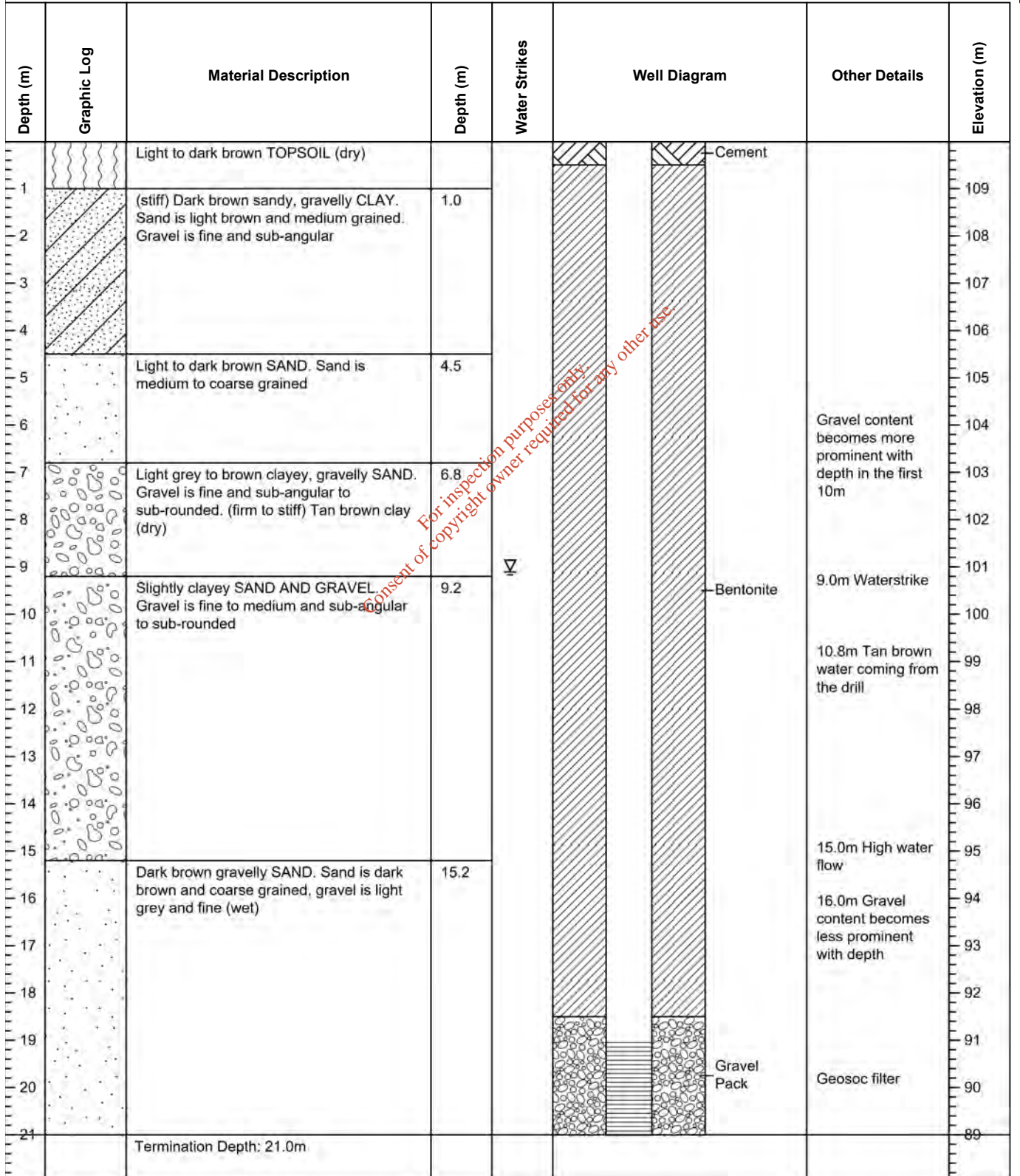
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Groundwater Log GW1

PROJECT NO. MDR1489	DRILLING DATE 25/10/2018	COORDINATES
PROJECT NAME Bohernabreena Landfill	TOTAL DEPTH 21.0m	COMPLETION Flush cover
CLIENT South Dublin County Council	DIAMETER 200mm	SURFACE ELEVATION
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	CASING PVC (50mm)	WELL TOC
	SCREEN PVC Factory Slotted (50mm)	WATER LEVEL 9mbgl on 25/10/2018

COMMENTS Rotary drill - Priority Geotechnical Ltd	LOGGED BY Matthew King (RPS)
	CHECKED BY



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Groundwater Log GW2

PROJECT NO. MDR1489	DRILLING DATE 26/10/2018	COORDINATES
PROJECT NAME Bohernabreena Landfill	TOTAL DEPTH	COMPLETION
CLIENT South Dublin County Council	DIAMETER	SURFACE ELEVATION
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	CASING PVC	WELL TOC
	SCREEN PVC Factory Slotted	WATER LEVEL

COMMENTS	LOGGED BY Blathnaid McPolin (RPS)
	CHECKED BY

Depth (m)	Graphic Log	Material Description	Depth (m)	Water Strikes	Well Diagram	Other Details	Elevation (m)
1							57
2							56
3							55
4							54
5							53
6							52
7							51
8							50
9							49
10							48
11							47
12							46
13							45
14							44
15							43
16							42
17							41
18							40
19							39
20							38
21							37
							36

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Borehole Log LW1

PROJECT NO. MDR1489	DRILLING DATE 02/10/18 - 03/10/18	COORDINATES 709047.220, 724980.325 (ITM)
PROJECT NAME Bohernabreena Landfill	TOTAL DEPTH 8.6m	COMPLETION Flush cover
CLIENT South Dublin County Council	DIAMETER 200mm	SURFACE ELEVATION 111.12 mAOD
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	CASING PVC (50mm)	WELL TOC 111.12 mAOD
	SCREEN PVC Factory Slotted (50mm)	WATER LEVEL Dry on 02/10/2018 - 03/10/2018

COMMENTS Shell and auger - Priority Geotechnical Ltd

LOGGED BY Janka Nitsche (RPS)
CHECKED BY Blathnaid McPolin (RPS)

Depth (m)	Graphic Log	Material Description	Depth (m)	Water Strikes	Well Diagram	Other Details	Elevation (m)
0.2		TOPSOIL				u100 (0.2 - 0.9m) 80% recovery	111
0.5		Cobbley CLAY	0.2			0.0-1.0m Plain 50mm PVC pipe	110.5
1.0		WASTE Detail: 1.0m sandy cobbley CLAY 1.1m waste paper	1.00				110
1.5		1.7m CLAY with plastic, organic odour					109.5
2.0		2.5 - 6.0m Black Clay with plastic, textile and degraded paper WASTE, high organic content with organic odour					109
2.5							108.5
3.0						1.0-8.0m Slotted 50mm PVC pipe	108
3.5		3.5m grey CLAY, bluish fabric, black and an organic odour (wet)					107.5
4.0		4.0m mainly timber with paper and plastic, strong manure odour					107
4.5						Gravel Pack	106.5
5.0							106
5.5						Geosoc Filter	105.5
6.0							105
6.5							104.5
7.0							104
7.5							103.5
8.0						Bentonite	103
8.3		8.3 - 8.6m grey to medium brown slightly sandy gravelly CLAY. Gravel is fine to course, sub-rounded (damp)	8.3				102.5
8.5		Termination Depth at: 8.6m. Bottom of the waste reached					

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Borehole Log LW3

PROJECT NO. MDR1489	DRILLING DATE 03/10/2018	COORDINATES 708990.394, 724762.131 (ITM)
PROJECT NAME Bohernabreena Landfill	TOTAL DEPTH 5.2m	COMPLETION Flush cover
CLIENT South Dublin County Council	DIAMETER 200mm	SURFACE ELEVATION 115.43 mAOD
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	CASING PVC (50mm)	WELL TOC 115.43 mAOD
	SCREEN PVC Factory Slotted (50mm)	WATER LEVEL Dry on 04/10/2018

COMMENTS Shell and auger - Priority Geotechnical Ltd

LOGGED BY Blathnaid McPolin (RPS)
CHECKED BY Janka Nitsche (RPS)

Depth (m)	Graphic Log	Material Description	Depth (m)	Water Strikes	Well Diagram	Other Details	Elevation (mAOD)
0.5		(Stiff) Brown slightly cobbly CLAY (TOPSOIL)	0.2			0.2m u100 40% recovery	115
1		Light brown, slightly gravelly, silty CLAY				0.0 - 1.5m Plain 50mm PVC pipe	114.5
1.5		WASTE in brown to black CLAY, organic odour	1.0			1.5 - 5m Slotted 50mm PVC pipe	114
2		Detail: 1.2m Gravelly, sandy CLAY with an earthy odour					113.5
2.5		1.5m Black pieces of plastic					113
3		1.7m Black CLAY with organic odour					112.5
3.5		2.0m Black CLAY with plastic waste					112
4		3.5m black CLAY, organic odour, plastic, degraded paper and a high organic content (wet)					111.5
4.5							111
5							110.5
5.5		Termination Depth at: 5.2m					110
6							109.5
6.5							109
7							108.5
7.5							108
8							107.5
8.5							107
							106.5

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Borehole Log LW4

PROJECT NO. MDR1489	DRILLING DATE 04/10/2018	COORDINATES 708999.275, 724692.753 (ITM)
PROJECT NAME Bohernabreena Landfill	TOTAL DEPTH 8.6m	COMPLETION Flush cover
CLIENT South Dublin County Council	DIAMETER 200mm	SURFACE ELEVATION 116.58 mAOD
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	CASING PVC (50mm)	WELL TOC 116.58 mAOD
	SCREEN PVC Factory Slotted (50mm)	WATER LEVEL 5.7m bgl on 05/10/2018

COMMENTS Shell and auger - Priority Geotechnical Ltd

LOGGED BY Blathnaid McPolin (RPS)
CHECKED BY Janka Nitsche (RPS)

Depth (m)	Graphic Log	Material Description	Depth (m)	Water Strikes	Well Diagram	Other Details	Elevation (mAOD)
0.2		Light brown, cobblely TOPSOIL	0.2			0.2m u100 50% recovery	116.5
0.5		(Stiff) Light brown, gravelly CLAY				0.0 - 1.6m Plain 50mm PVC pipe	116
1.1		WASTE in black CLAY	1.1				115.5
1.5		1.5m CLAY (dry)					115
1.7		1.7m grey CLAY with waste					114.5
2.0		2.0m Textile and plastic WASTE, high organic content				1.6 - 8.6m Slotted 50mm PVC pipe	114
2.5		2.5m Fabric WASTE, organic odour					113.5
3.0		3.0 - 4.5m Black CLAY with plastic					113
3.5							112.5
4.0						Geosoc Filter	112
4.5							111.5
5.0							111
5.5							110.5
6.0							110
6.5		6.5 - 7.0m Black CLAY with plastic and timber WASTE					109.5
7.0		Grey sandy GRAVEL. Gravel is fine to coarse, angular. Sand is medium grained.	7.0	∇		7.2m Waterstrike	109
7.5							108.5
8.0							108
8.5							108
		Termination Depth at: 8.6m					

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Borehole Log LW5

PROJECT NO. MDR1489	DRILLING DATE 05/10/2018	COORDINATES 708984.830, 724564.542 (ITM)
PROJECT NAME Bohernabreena Landfill	TOTAL DEPTH 4.0m	COMPLETION Flush cover
CLIENT South Dublin County Council	DIAMETER 200mm	SURFACE ELEVATION 119.00 mAOD
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	CASING PVC (50mm)	WELL TOC 119.00 mAOD
	SCREEN PVC Factory Slotted (50mm)	WATER LEVEL Dry on 05/10/2018

COMMENTS Shell and auger - Priority Geotechnical Ltd

LOGGED BY Janka Nitsche (RPS)
CHECKED BY Blathnaid McPolin (RPS)

Depth (m)	Graphic Log	Material Description	Depth (m)	Water Strikes	Well Diagram	Other Details	Elevation (mAOD)
0.5		Light brown, gravelly TOPSOIL (dry) Gravelly CLAY, small fragments of plastic	0.1			0.0 - 1.0m Plain 50mm PVC pipe	118.5
1.5		Cobblely CLAY, cobbles are brown to black	1.0			1.0 - 4.0m Slotted 50mm PVC pipe Geosoc filter	118 117.5 117 116.5
3.5		Light brown, sandy gravelly CLAY	3.0				116 115.5
4.0		Termination Depth at: 4.0m. Bottom of the waste reached					115
4.5							114.5
5.0							114
5.5							113.5
6.0							113
6.5							112.5
7.0							112
7.5							111.5
8.0							111
8.5							110.5

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Borehole Log LW2

PROJECT NO. MDR1489	DRILLING DATE 03/10/2018	COORDINATES 709047.400, 724841.700 (ITM)
PROJECT NAME Bohernabreena Landfill	TOTAL DEPTH 4.5m	COMPLETION Flush cover
CLIENT South Dublin County Council	DIAMETER 200mm	SURFACE ELEVATION 113.49 mAOD
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	CASING PVC (50mm)	WELL TOC 113.49 mAOD
	SCREEN PVC Factory Slotted (50mm)	WATER LEVEL Dry on 03/10/2018

COMMENTS Shell and auger - Priority Geotechnical Ltd

LOGGED BY Janka Nitsche (RPS)
CHECKED BY Blathnaid McPolin (RPS)

Depth (m)	Graphic Log	Material Description	Depth (m)	Water Strikes	Well Diagram	Other Details	Elevation (m)
0.0		Medium brown, gravelly CLAY (TOPSOIL). Gravel is fine to coarse, angular to sub-angular. Occasional cobbles and boulders	0.0			0.0 - 2.0m Plain 50mm PVC pipe	57
0.5			56.5				
1.0		WASTE in grey to black CLAY with plastic, wood, plastic bottles, tin cans, rope, textiles, pens, glass, cardboard, metal strips (damp)	1.4			2.0 - 4.0m Plain 50mm PVC pipe	55.5
1.5			55				
2.0			54.5				
2.5			54				
3.0		Grey slightly sandy gravelly CLAY, gravel is fine to coarse, angular to sub-angular. Sand is medium grained	4.0			Backfilled 0.5m with bentonite	53.5
3.5			53				
4.0			52.5				
4.5		Termination Depth at: 4.5m. Bottom of the waste reached					52
5.0							51.5
5.5							51
6.0							50.5
6.5							50
7.0							49.5
7.5							49
8.0							48.5
8.5							



Borehole Log LW6

PROJECT NO. MDR1489	DRILLING DATE 26/10/2018	COORDINATES (ITM)
PROJECT NAME Bohernabreena Landfill	TOTAL DEPTH	COMPLETION Flush cover
CLIENT South Dublin County Council	DIAMETER 200mm	SURFACE ELEVATION
ADDRESS Bohernabreena Road, Tallaght, Co. Dublin	CASING PVC (50mm)	WELL TOC
	SCREEN PVC (50mm)	WATER LEVEL

COMMENTS Rotary drill - Priority Geotechnical Ltd	LOGGED BY Blathnaid McPolin (RPS)
	CHECKED BY Janka Nitsche (RPS)

Depth (m)	Graphic Log	Material Description	Depth (m)	Water Strikes	Well Diagram	Other Details	Elevation (m)
0.5							57
1							56.5
1.5							56
2							55.5
2.5							55
3							54.5
3.5							54
4							53.5
4.5							53
5							52.5
5.5							52
6							51.5
6.5							51
7							50.5
7.5							50
8							49.5
8.5							49
							48.5

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APPENDIX H
LABORATORY ANALYTICAL RESULTS

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Exova Jones Environmental

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Attention :	Blathnaid Mcpolin
Date :	12th November, 2018
Your reference :	MDR1489
Our reference :	Test Report 18/16111 Batch 1
Location :	Bohernabreena
Date samples received :	8th October, 2018
Status :	Final report
Issue :	1

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Fourteen samples were received for analysis on 8th October, 2018 of which one were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied. All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Lucas Halliwell
Project Co-ordinator

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/16111

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Exova Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution
AB	x20 Dilution

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JE Job No: 18/16111

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM16/PM30/PM69	please refer to PM16/PM30 and PM69 for method details			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM69	Modified BS EN 12457 method. One part soil is mixed with 10 parts water in a vial leaving no headspace. The mixture is shaken and then left to leach for 24 hours before VOC analysis.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM69	Modified BS EN 12457 method. One part soil is mixed with 10 parts water in a vial leaving no headspace. The mixture is shaken and then left to leach for 24 hours before VOC analysis.			AR	
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	Yes
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes

JE Job No: 18/16111

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885:2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-solutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GC/MS.	PM69	Modified BS EN 12457 method. One part soil is mixed with 10 parts water in a vial leaving no headspace. The mixture is shaken and then left to leach for 24 hours before VOC analysis.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.	Yes		AR	Yes
TM57	Modified US EPA Method 410.4. Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by not digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			Yes
TM58	APHA Standard Methods for the extraction of water and waste water (SMEWW) 5210B. Compatible with ISO 5815:1989. Measurement of Biochemical Oxygen Demand. When cBOD (Carbaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060, APHA Standard Methods for Examination of Water and Wastewater 5310B, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM89	Modified USEPA method OJA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes		AR	Yes

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JE Job No: 18/16111

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	PM17	Modified method EN12457-2. As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

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Exova Jones Environmental

Registered Office: Exova Environmental UK Limited, 10 Lower Grosvenor Place, London, SW1W 0EN. Reg No. 11371415

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Dun Laoghaire
Co Dublin
Ireland

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781



Attention :	Blathnaid Mcpolin
Date :	12th November, 2018
Your reference :	
Our reference :	Test Report 18/17215 Batch 1
Location :	Bohernabreena
Date samples received :	25th October, 2018
Status :	Final report
Issue :	1

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Ten samples were received for analysis on 25th October, 2018 of which one were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied. All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Lucas Halliwell
Project Co-ordinator

Client Name: RPS
Reference:
Location: Bohernabreena
Contact: Blathnaid Mcpolin
JE Job No.: 18/17215

Report : CEN 10:1 1 Batch
Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

<table border="1"> <tr><td>J E Sample No.</td><td>7-9</td></tr> <tr><td>Sample ID</td><td>TP7</td></tr> <tr><td>Depth</td><td>4.5</td></tr> <tr><td>COC No / misc</td><td></td></tr> <tr><td>Containers</td><td>V J T</td></tr> <tr><td>Sample Date</td><td>22/10/2018</td></tr> <tr><td>Sample Type</td><td>Soil</td></tr> <tr><td>Batch Number</td><td>1</td></tr> <tr><td>Date of Receipt</td><td>25/10/2018</td></tr> </table>		J E Sample No.	7-9	Sample ID	TP7	Depth	4.5	COC No / misc		Containers	V J T	Sample Date	22/10/2018	Sample Type	Soil	Batch Number	1	Date of Receipt	25/10/2018								Please see attached notes for all abbreviations and acronyms		
J E Sample No.	7-9																												
Sample ID	TP7																												
Depth	4.5																												
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Containers	V J T																												
Sample Date	22/10/2018																												
Sample Type	Soil																												
Batch Number	1																												
Date of Receipt	25/10/2018																												
									LOD/LOR	Units	Method No.																		
Dissolved Antimony #	7								<2	ug/l	TM30/PM14																		
Dissolved Arsenic #	9.0								<2.5	ug/l	TM30/PM14																		
Dissolved Barium #	16								<3	ug/l	TM30/PM14																		
Dissolved Boron #	149								<12	ug/l	TM30/PM14																		
Dissolved Cadmium #	<0.5								<0.5	ug/l	TM30/PM14																		
Dissolved Calcium #	13.3								<0.2	mg/l	TM30/PM14																		
Dissolved Chromium #	<1.5								<1.5	ug/l	TM30/PM14																		
Dissolved Copper #	14								<7	ug/l	TM30/PM14																		
Dissolved Iron #	117								<20	ug/l	TM30/PM14																		
Dissolved Lead #	<5								<5	ug/l	TM30/PM14																		
Dissolved Magnesium #	2.1								<0.1	mg/l	TM30/PM14																		
Dissolved Manganese #	<2								<2	ug/l	TM30/PM14																		
Dissolved Mercury #	<1								<1	ug/l	TM30/PM14																		
Dissolved Molybdenum #	28								<2	ug/l	TM30/PM14																		
Dissolved Nickel #	10								<2	ug/l	TM30/PM14																		
Dissolved Potassium #	13.5								<0.1	mg/l	TM30/PM14																		
Dissolved Selenium #	<3								<3	ug/l	TM30/PM14																		
Dissolved Sodium #	10.1								<0.1	mg/l	TM30/PM14																		
Dissolved Zinc #	<3								<3	ug/l	TM30/PM14																		
PAH MS																													
Naphthalene	0.3								<0.1	ug/l	TM4/PM30																		
Acenaphthylene	0.015								<0.013	ug/l	TM4/PM30																		
Acenaphthene	0.039								<0.013	ug/l	TM4/PM30																		
Fluorene	0.027								<0.014	ug/l	TM4/PM30																		
Phenanthrene	0.056								<0.011	ug/l	TM4/PM30																		
Anthracene	<0.013								<0.013	ug/l	TM4/PM30																		
Fluoranthene	0.090								<0.012	ug/l	TM4/PM30																		
Pyrene	0.084								<0.013	ug/l	TM4/PM30																		
Benzo(a)anthracene	0.046								<0.015	ug/l	TM4/PM30																		
Chrysene	0.040								<0.011	ug/l	TM4/PM30																		
Benzo(bk)fluoranthene	0.060								<0.018	ug/l	TM4/PM30																		
Benzo(a)pyrene	0.027								<0.016	ug/l	TM4/PM30																		
Indeno(123cd)pyrene	<0.011								<0.011	ug/l	TM4/PM30																		
Dibenzo(ah)anthracene	<0.01								<0.01	ug/l	TM4/PM30																		
Benzo(ghi)perylene	<0.011								<0.011	ug/l	TM4/PM30																		
PAH 16 Total	0.784								<0.195	ug/l	TM4/PM30																		
Benzo(b)fluoranthene	0.04								<0.01	ug/l	TM4/PM30																		
Benzo(k)fluoranthene	0.02								<0.01	ug/l	TM4/PM30																		
PAH Surrogate % Recovery	78								<0	%	TM4/PM30																		
Methyl Tertiary Butyl Ether	<1								<1	ug/l	TM15/PM69																		
Benzene	<0.5								<0.5	ug/l	TM15/PM69																		
Toluene	<5								<5	ug/l	TM15/PM69																		

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Client Name: RPS
Reference:
Location: Bohernabreena
Contact: Blathnaid Mcpolin
JE Job No.: 18/17215

VOC Report : CEN 10:1 1 Batch

Table with columns: J E Sample No., Sample ID, Depth, COC No / misc, Containers, Sample Date, Sample Type, Batch Number, Date of Receipt, LOD/LOR, Units, Method No. Includes a list of VOC MS compounds and their concentrations.

Please see attached notes for all abbreviations and acronyms

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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/17215

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Please include all sections of this report if it is reproduced

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+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
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ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x20 Dilution

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JE Job No: 18/17215

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
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TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
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TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM69	Modified BS EN 12457 method. One part soil is mixed with 10 parts water in a vial leaving no headspace. The mixture is shaken and then left to leach for 24 hours before VOC analysis.			AR	Yes
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TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes

JE Job No: 18/17215

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
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TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex C)	PM0	No preparation is required.	Yes		AR	Yes
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TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM89	Modified USEPA method OJA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes		AR	Yes

JE Job No: 18/17215

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	PM17	Modified method EN12457-2. As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

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Exova Jones Environmental

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West Pier Business Campus
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Co Dublin
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Tel: +44 (0) 1244 833780
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Attention :	Blathnaid Mcpolin
Date :	7th November, 2018
Your reference :	
Our reference :	Test Report 18/17577 Batch 1
Location :	Bohernabreena
Date samples received :	1st November, 2018
Status :	Final report
Issue :	1

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Six samples were received for analysis on 1st November, 2018, of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied. All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: RPS
 Reference:
 Location: Bohernabreena
 Contact: Blathnaid Mcpolin
 JE Job No.: 18/17577

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
 H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HNO₃

J E Sample No.	1-9		10-16		17-25		26-32		33-40		LOD/LOR	Units	Method No.
	Sample ID	SW3	SW1	SW2	SPRING 2	PIPE OUTFLOW							
Depth													
COC No / misc													
Containers	V H H N Z P BOD G	V H H N BOD G	V H H N Z P BOD G	V H H N Z BOD G	V H H N Z P BOD G								
Sample Date	31/10/2018 10:30	31/10/2018 15:00	31/10/2018 11:00	31/10/2018 14:00	31/10/2018 15:15								
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water								
Batch Number	1	1	1	1	1								
Date of Receipt	01/11/2018	01/11/2018	01/11/2018	01/11/2018	01/11/2018								
Dissolved Arsenic #	3.3	3.0	3.7	86.4	5.2						<2.5	ug/l	TM30/PM14
Dissolved Boron	<12	<12	<12	73	589						<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM30/PM14
Dissolved Calcium #	35.4	22.3	37.4	165.5	112.0						<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7						<7	ug/l	TM30/PM14
Total Dissolved Iron #	166	195	163	2369	209						<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5						<5	ug/l	TM30/PM14
Dissolved Magnesium #	3.2	2.1	3.4	16.3	40.0						<0.1	mg/l	TM30/PM14
Dissolved Manganese #	39	18	28	9296	184						<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1						<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	8	7						<2	ug/l	TM30/PM14
Dissolved Potassium #	0.6	0.4	0.7	4.6	78.7						<0.1	mg/l	TM30/PM14
Dissolved Sodium #	7.7	6.4	7.7	28.6	111.0						<0.1	mg/l	TM30/PM14
Dissolved Zinc #	21	<3	<3	4	<3						<3	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.013	<0.013	<0.013	<0.013	<0.013						<0.013	ug/l	TM4/PM30
Acenaphthene #	<0.013	<0.013	<0.013	<0.013	<0.013						<0.013	ug/l	TM4/PM30
Fluorene #	<0.014	<0.014	<0.014	<0.014	<0.014						<0.014	ug/l	TM4/PM30
Phenanthrene #	<0.011	<0.011	<0.011	<0.011	<0.011						<0.011	ug/l	TM4/PM30
Anthracene #	<0.013	<0.013	<0.013	<0.013	<0.013						<0.013	ug/l	TM4/PM30
Fluoranthene #	<0.012	<0.012	<0.012	<0.012	<0.012						<0.012	ug/l	TM4/PM30
Pyrene #	<0.013	<0.013	<0.013	<0.013	<0.013						<0.013	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.015	<0.015	<0.015	<0.015	<0.015						<0.015	ug/l	TM4/PM30
Chrysene #	<0.011	<0.011	<0.011	<0.011	<0.011						<0.011	ug/l	TM4/PM30
Benzo(k)fluoranthene #	<0.018	<0.018	<0.018	<0.018	<0.018						<0.018	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.016	<0.016	<0.016	<0.016	<0.016						<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.011	<0.011	<0.011	<0.011	<0.011						<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.011	<0.011	<0.011	<0.011	<0.011						<0.011	ug/l	TM4/PM30
PAH 16 Total #	<0.195	<0.195	<0.195	<0.195	<0.195						<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	71	76	78	79	72						<0	%	TM4/PM30

Please see attached notes for all abbreviations and acronyms

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Client Name: RPS
Reference:
Location: Bohernabreena
Contact: Blathnaid Mcpolin
JE Job No.: 18/17577

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
 H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HNO₃

J E Sample No.	1-9	10-16	17-25	26-32	33-40								
Sample ID	SW3	SW1	SW2	SPRING 2	PIPE OUTFLOW								
Depth													
COC No / misc													
Containers	V H H N Z P BOD G	V H H N BOD G	V H H N Z P BOD G	V H H N Z BOD G	V H H N Z P BOD G								
Sample Date	31/10/2018 10:30	31/10/2018 15:00	31/10/2018 11:00	31/10/2018 14:00	31/10/2018 15:15								
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water								
Batch Number	1	1	1	1	1								
Date of Receipt	01/11/2018	01/11/2018	01/11/2018	01/11/2018	01/11/2018								
						LOD/LOR	Units	Method No.					
Please see attached notes for all abbreviations and acronyms													
Pesticides													
Organochlorine Pesticides													
Aldrin	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Alpha-HCH (BHC)	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Beta-HCH (BHC)	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Delta-HCH (BHC)	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Dieldrin	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Endosulphan I	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Endosulphan II	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Endosulphan sulphate	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Endrin	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Gamma-HCH (BHC)	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Heptachlor	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
o,p'-Methoxychlor	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
p,p'-DDE	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
p,p'-DDT	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
p,p'-Methoxychlor	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
p,p'-TDE	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Organophosphorus Pesticides													
Azinphos methyl	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Diazinon	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Dichlorvos	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Disulfoton	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Ethion	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Ethyl Parathion (Parathion)	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Fenitrothion	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Malathion	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Methyl Parathion	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Mevinphos	<0.01	<0.01	<0.01	<0.03 ^{AA}	<0.03 ^{AA}	<0.01	ug/l	TM149/PM30					
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	mg/l	TM26/PM0					
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM173/PM0					
Sulphate as SO ₄ [#]	7.1	2.9	7.4	3.4	11.6	<0.5	mg/l	TM38/PM0					
Chloride [#]	13.6	9.3	13.6	65.5	187.6	<0.3	mg/l	TM38/PM0					
MRP Ortho Phosphate as P	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/l	TM38/PM0					
Total Oxidised Nitrogen as N [#]	0.4	<0.2	0.4	<0.2	7.4	<0.2	mg/l	TM38/PM0					
Total Cyanide [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM89/PM0					
Ammoniacal Nitrogen as N [#]	0.12	<0.03	0.11	2.94	109.94	<0.03	mg/l	TM38/PM0					

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Client Name: RPS
 Reference:
 Location: Bohernabreena
 Contact: Blathnaid Mcpolin
 JE Job No.: 18/17577

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
 H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HNO₃

J E Sample No.	1-9	10-16	17-25	26-32	33-40														
Sample ID	SW3	SW1	SW2	SPRING 2	PIPE OUTFLOW														
Depth																			
COC No / misc																			
Containers	V H H N Z P BOD G	V H H N BOD G	V H H N Z P BOD G	V H H N Z BOD G	V H H N Z P BOD G														
Sample Date	31/10/2018 10:30	31/10/2018 15:00	31/10/2018 11:00	31/10/2018 14:00	31/10/2018 15:15														
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water														
Batch Number	1	1	1	1	1														
Date of Receipt	01/11/2018	01/11/2018	01/11/2018	01/11/2018	01/11/2018														
														LOD/LOR	Units	Method No.			
Total Alkalinity as CaCO ₃ #	114	68	120	502	802									<1	mg/l	TM75/PM0			
Sulphide	<10	<10	<10	<10	<10									<10	ug/l	TM107/PM0			
BOD (Settled) #	1	1	1	1	30									<1	mg/l	TM58/PM0			
COD (Settled) #	21	28	18	16	71									<7	mg/l	TM57/PM0			
Electrical Conductivity @25C #	219	157	252	1111	2041									<2	uS/cm	TM76/PM0			
pH #	6.56	6.39	7.69	7.25	7.83									<0.01	pH units	TM73/PM0			
Redox	235.47	287.62	289.50	299.74	257.12										mV	TM72/PM0			
Total Organic Carbon #	9	11	9	<2	14									<2	mg/l	TM60/PM0			
Total Dissolved Solids #	187	145	178	586	800									<35	mg/l	TM20/PM0			
Total Suspended Solids #	<10	<10	<10	28	57									<10	mg/l	TM37/PM0			

Please see attached notes for all abbreviations and acronyms

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Client Name: RPS
Reference:
Location: Bohernabreena
Contact: Blathnaid Mcpolin
JE Job No.: 18/17577

VOC Report : Liquid

J E Sample No.	1-9	10-16	17-25	26-32	33-40															
Sample ID	SW3	SW1	SW2	SPRING 2	PIPE OUTFLOW															
Depth																				
COC No / misc																				
Containers	V H H N Z P BOD G	V H H N BOD G	V H H N Z P BOD G	V H H N Z BOD G	V H H N Z P BOD G															
Sample Date	31/10/2018 10:30	31/10/2018 15:00	31/10/2018 11:00	31/10/2018 14:00	31/10/2018 15:15															
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water															
Batch Number	1	1	1	1	1															
Date of Receipt	01/11/2018	01/11/2018	01/11/2018	01/11/2018	01/11/2018															
						LOD/LOR	Units	Method No.												
VOC MS																				
Dichlorodifluoromethane	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1		ug/l	TM15/PM10												
Chloromethane #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1		ug/l	TM15/PM10												
Bromomethane	<1	<1	<1	<1	<1		ug/l	TM15/PM10												
Chloroethane #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
Trichlorofluoromethane #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
Dichloromethane (DCM) #	<5	<5	<5	<5	<5		ug/l	TM15/PM10												
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,1-Dichloroethane #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
2,2-Dichloropropane	<1	<1	<1	<1	<1		ug/l	TM15/PM10												
Bromochloromethane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Chloroform #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
1,1-Dichloropropene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
Carbon tetrachloride #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
1,2-Dichloroethane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5		ug/l	TM15/PM10												
Trichloroethene (TCE) #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,2-Dichloropropane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Dibromomethane #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
Bromodichloromethane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Toluene #	<5	<5	<5	<5	<5		ug/l	TM15/PM10												
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,3-Dichloropropane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Dibromochloromethane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
1,2-Dibromoethane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Chlorobenzene #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Ethylbenzene #	<1	<1	<1	<1	<1		ug/l	TM15/PM10												
p/m-Xylene #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
o-Xylene #	<1	<1	<1	<1	<1		ug/l	TM15/PM10												
Styrene	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Bromoform #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
Isopropylbenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4		ug/l	TM15/PM10												
Bromobenzene #	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
Propylbenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
2-Chlorotoluene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
4-Chlorotoluene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
tert-Butylbenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
sec-Butylbenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
4-Isopropyltoluene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
n-Butylbenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
Hexachlorobutadiene	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
Naphthalene	<2	<2	<2	<2	<2		ug/l	TM15/PM10												
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3		ug/l	TM15/PM10												
Surrogate Recovery Toluene D8	101	103	104	102	104		%	TM15/PM10												
Surrogate Recovery 4-Bromofluorobenzene	100	102	102	100	103		%	TM15/PM10												

Please see attached notes for all abbreviations and acronyms

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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/17577

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Exova Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x3 Dilution

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JE Job No: 18/17577

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM26	Determination of pherols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			

JE Job No: 18/17577

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM37	Modified methods USEPA 160.2, EN872:2005 and SMWW 2540D. Gravimetric determination of Total Suspended Solids. Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	APHA Standard Methods for the extraction of water and waste water (SMEWW) 5210B. Compatible with ISO 5815:1988. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060, APHA Standard Methods for Examination of Water and Wastewater 5310B, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.	Yes			
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

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JE Job No: 18/17577

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OJA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM149	Determination of Pesticides by Large Volume Injection on GC Triple Quad MS, based upon USEPA method 8270	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				

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Exova Jones Environmental

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Attention : Blathnaid Mcpolin
Date : 15th November, 2018
Your reference : MDR 1489
Our reference : Test Report 18/18062 Batch 1
Location :
Date samples received : 9th November, 2018
Status : Final report
Issue : 1

Three samples were received for analysis on 9th November, 2018 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: RPS
 Reference: MDR 1489
 Location:
 Contact: Blathnaid Mcpolin
 JE Job No.: 18/18062

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
 H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HNO₃

J E Sample No.	1-9	10-18	19-27								LOD/LOR	Units	Method No.
	Sample ID	LW4	GW1	GW2									
Depth													
COC No / misc													
Containers	V H H N Z P B O D G	V H H N Z P B O D G	V H H N Z P B O D G										
Sample Date	08/11/2018	08/11/2018	08/11/2018										
Sample Type	Leachate	Ground Water	Ground Water										
Batch Number	1	1	1										
Date of Receipt	09/11/2018	09/11/2018	09/11/2018										
Dissolved Arsenic	7.2	-	-								<2.5	ug/l	TM30/PM14
Dissolved Arsenic #	-	4.9	9.1								<2.5	ug/l	TM30/PM14
Dissolved Boron	21	16	37								<12	ug/l	TM30/PM14
Dissolved Cadmium	<0.5	-	-								<0.5	ug/l	TM30/PM14
Dissolved Cadmium #	-	<0.5	<0.5								<0.5	ug/l	TM30/PM14
Dissolved Calcium	75.0	-	-								<0.2	mg/l	TM30/PM14
Dissolved Calcium #	-	133.7	179.8								<0.2	mg/l	TM30/PM14
Total Dissolved Chromium	<1.5	-	-								<1.5	ug/l	TM30/PM14
Total Dissolved Chromium #	-	<1.5	<1.5								<1.5	ug/l	TM30/PM14
Dissolved Copper	<7	-	-								<7	ug/l	TM30/PM14
Dissolved Copper #	-	<7	<7								<7	ug/l	TM30/PM14
Total Dissolved Iron	11380 _{AB}	-	-								<20	ug/l	TM30/PM14
Total Dissolved Iron #	-	<20	<20								<20	ug/l	TM30/PM14
Dissolved Lead	<5	-	-								<5	ug/l	TM30/PM14
Dissolved Lead #	-	<5	<5								<5	ug/l	TM30/PM14
Dissolved Magnesium	5.0	-	-								<0.1	mg/l	TM30/PM14
Dissolved Magnesium #	-	16.7	14.5								<0.1	mg/l	TM30/PM14
Dissolved Manganese	3637	-	-								<2	ug/l	TM30/PM14
Dissolved Manganese #	-	115	777								<2	ug/l	TM30/PM14
Dissolved Mercury	<1	-	-								<1	ug/l	TM30/PM14
Dissolved Mercury #	-	<1	<1								<1	ug/l	TM30/PM14
Dissolved Nickel	2	-	-								<2	ug/l	TM30/PM14
Dissolved Nickel #	-	<2	3								<2	ug/l	TM30/PM14
Dissolved Potassium	3.2	-	-								<0.1	mg/l	TM30/PM14
Dissolved Potassium #	-	1.3	1.1								<0.1	mg/l	TM30/PM14
Dissolved Sodium	13.7	-	-								<0.1	mg/l	TM30/PM14
Dissolved Sodium #	-	16.3	24.3								<0.1	mg/l	TM30/PM14
Dissolved Zinc	4	-	-								<3	ug/l	TM30/PM14
Dissolved Zinc #	-	4	5								<3	ug/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

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Client Name: RPS
 Reference: MDR 1489
 Location:
 Contact: Blathnaid Mcpolin
 JE Job No.: 18/18062

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
 H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HNO₃

J E Sample No.	1-9	10-18	19-27																				
Sample ID	LW4	GW1	GW2																				
Depth																							
COC No / misc																							
Containers	V H HN Z P BOD G	V H HN Z P BOD G	V H HN Z P BOD G																				
Sample Date	08/11/2018	08/11/2018	08/11/2018																				
Sample Type	Leachate	Ground Water	Ground Water																				
Batch Number	1	1	1																				
Date of Receipt	09/11/2018	09/11/2018	09/11/2018																				
											LOD/LOR	Units	Method No.										
PAH MS																							
Naphthalene	<0.1	-	-																	<0.1	ug/l	TM4/PM30	
Naphthalene #	-	<0.1	<0.1																		<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.013	-	-																		<0.013	ug/l	TM4/PM30
Acenaphthylene #	-	<0.013	<0.013																		<0.013	ug/l	TM4/PM30
Acenaphthene	0.243	-	-																		<0.013	ug/l	TM4/PM30
Acenaphthene #	-	<0.013	<0.013																		<0.013	ug/l	TM4/PM30
Fluorene	0.198	-	-																		<0.014	ug/l	TM4/PM30
Fluorene #	-	<0.014	<0.014																		<0.014	ug/l	TM4/PM30
Phenanthrene	0.063	-	-																		<0.011	ug/l	TM4/PM30
Phenanthrene #	-	<0.011	<0.011																		<0.011	ug/l	TM4/PM30
Anthracene	0.024	-	-																		<0.013	ug/l	TM4/PM30
Anthracene #	-	<0.013	<0.013																		<0.013	ug/l	TM4/PM30
Fluoranthene	0.094	-	-																		<0.012	ug/l	TM4/PM30
Fluoranthene #	-	<0.012	<0.012																		<0.012	ug/l	TM4/PM30
Pyrene	0.068	-	-																		<0.013	ug/l	TM4/PM30
Pyrene #	-	<0.013	<0.013																		<0.013	ug/l	TM4/PM30
Benzo(a)anthracene	<0.015	-	-																		<0.015	ug/l	TM4/PM30
Benzo(a)anthracene #	-	<0.015	<0.015																		<0.015	ug/l	TM4/PM30
Chrysene	<0.011	-	-																		<0.011	ug/l	TM4/PM30
Chrysene #	-	<0.011	<0.011																		<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.018	-	-																		<0.018	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	-	<0.018	<0.018																		<0.018	ug/l	TM4/PM30
Benzo(a)pyrene	<0.016	-	-																		<0.016	ug/l	TM4/PM30
Benzo(a)pyrene #	-	<0.016	<0.016																		<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.011	-	-																		<0.011	ug/l	TM4/PM30
Indeno(123cd)pyrene #	-	<0.011	<0.011																		<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	-	-																		<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	-	<0.01	<0.01																		<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.011	-	-																		<0.011	ug/l	TM4/PM30
Benzo(ghi)perylene #	-	<0.011	<0.011																		<0.011	ug/l	TM4/PM30
PAH 16 Total	0.690	-	-																		<0.195	ug/l	TM4/PM30
PAH 16 Total #	-	<0.195	<0.195																		<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01																		<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01																		<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	93	91	94																		<0	%	TM4/PM30

Please see attached notes for all abbreviations and acronyms

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Client Name: RPS
Reference: MDR 1489
Location:
Contact: Blathnoid Mcpolin
JE Job No.: 18/18062

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
 H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HNO₃

J E Sample No.	1-9	10-18	19-27											Please see attached notes for all abbreviations and acronyms			
														LOD/LOR	Units	Method No.	
Sample ID	LW4	GW1	GW2														
Depth																	
COC No / misc																	
Containers	V H HN Z P BOD G	V H HN Z P BOD G	V H HN Z P BOD G														
Sample Date	08/11/2018	08/11/2018	08/11/2018														
Sample Type	Leachate	Ground Water	Ground Water														
Batch Number	1	1	1														
Date of Receipt	09/11/2018	09/11/2018	09/11/2018														
Total Cyanide #	-	<0.01	<0.01											<0.01	mg/l	TM89/PM0	
Ammoniacal Nitrogen as N	3.60	-	-											<0.03	mg/l	TM38/PM0	
Ammoniacal Nitrogen as N #	-	<0.03	<0.03											<0.03	mg/l	TM38/PM0	
Total Alkalinity as CaCO3	306	-	-											<1	mg/l	TM75/PM0	
Total Alkalinity as CaCO3 #	-	334	436											<1	mg/l	TM75/PM0	
Sulphide	<0.01	<0.01	<0.01											<0.01	mg/l	TM107/PM0	
BOD (Settled)	21	-	-											<1	mg/l	TM58/PM0	
BOD (Settled) #	-	<1	<1											<1	mg/l	TM58/PM0	
COD (Settled)	30	-	-											<7	mg/l	TM57/PM0	
COD (Settled) #	-	<7	11											<7	mg/l	TM57/PM0	
Electrical Conductivity @25C	432	-	-											<2	uS/cm	TM76/PM0	
Electrical Conductivity @25C #	-	696	898											<2	uS/cm	TM76/PM0	
pH	7.23	-	-											<0.01	pH units	TM73/PM0	
pH #	-	7.50	7.28											<0.01	pH units	TM73/PM0	
Redox	13.82	196.73	242.16												mV	TM72/PM0	
Total Organic Carbon	<2	-	-											<2	mg/l	TM60/PM0	
Total Organic Carbon #	-	<2	<2											<2	mg/l	TM60/PM0	
Total Dissolved Solids	352	-	-											<35	mg/l	TM20/PM0	
Total Dissolved Solids #	-	500	642											<35	mg/l	TM20/PM0	
Total Suspended Solids	1539	-	-											<10	mg/l	TM37/PM0	
Total Suspended Solids #	-	601	441											<10	mg/l	TM37/PM0	

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Client Name: RPS
 Reference: MDR 1489
 Location:
 Contact: Blathnaid Mcpolin
 JE Job No.: 18/18062

SVOC Report : Liquid

J E Sample No.	1-9	10-18	19-27																					
Sample ID	LW4	GW1	GW2																					
Depth																								
COC No / misc																								
Containers	V H H N Z P B O D G	V H H N Z P B O D G	V H H N Z P B O D G																					
Sample Date	08/11/2018	08/11/2018	08/11/2018																					
Sample Type	Leachate	Ground Water	Ground Water																					
Batch Number	1	1	1																					
Date of Receipt	09/11/2018	09/11/2018	09/11/2018																					
	LOD/LOR	Units	Method No.	Please see attached notes for all abbreviations and acronyms																				
SVOC MS																								
Phenols																								
2-Chlorophenol	<1	-	-																		<1	ug/l	TM16/PM30	
2-Chlorophenol #	-	<1	<1																			<1	ug/l	TM16/PM30
2-Methylphenol	<0.5	-	-																			<0.5	ug/l	TM16/PM30
2-Methylphenol #	-	<0.5	<0.5																			<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5																			<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol	<0.5	-	-																			<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	-	<0.5	<0.5																			<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1																			<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol	<0.5	-	-																			<0.5	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	-	<0.5	<0.5																			<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1																			<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol	<0.5	-	-																			<0.5	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	-	<0.5	<0.5																			<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1																			<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10																			<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1																			<1	ug/l	TM16/PM30
Phenol	<1	<1	<1																			<1	ug/l	TM16/PM30
PAHs																								
2-Chloronaphthalene	<1	-	-																			<1	ug/l	TM16/PM30
2-Chloronaphthalene #	-	<1	<1																			<1	ug/l	TM16/PM30
2-Methylnaphthalene	<1	-	-																			<1	ug/l	TM16/PM30
2-Methylnaphthalene #	-	<1	<1																			<1	ug/l	TM16/PM30
Phthalates																								
Bis(2-ethylhexyl) phthalate	<5	<5	<5																			<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1																			<1	ug/l	TM16/PM30
Di-n-butyl phthalate	<1.5	-	-																			<1.5	ug/l	TM16/PM30
Di-n-butyl phthalate #	-	<1.5	<1.5																			<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1																			<1	ug/l	TM16/PM30
Diethyl phthalate	<1	-	-																			<1	ug/l	TM16/PM30
Diethyl phthalate #	-	<1	<1																			<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1																			<1	ug/l	TM16/PM30

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Client Name: RPS

Reference: MDR 1489

Location:

Contact: Blathnaid Mcpolin

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 18/18062 For inspection purposes only. Consent of copyright owner required for any other use.						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/18062

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Exova Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x2 Dilution
AB	x5 Dilution

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JE Job No: 18/18062

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885:2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				

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JE Job No: 18/18062

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885:2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM37	Modified methods USEPA 160.2, EN872:2005 and SMWW 25-40D. Gravimetric determination of Total Suspended Solids. Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed.	PM0	No preparation is required.				
TM37	Modified methods USEPA 160.2, EN872:2005 and SMWW 25-40D. Gravimetric determination of Total Suspended Solids. Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			
TM58	APHA Standard Methods for the extraction of water and waste water (SMEWW) 5210B. Compatible with ISO 5815:1989. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.				
TM58	APHA Standard Methods for the extraction of water and waste water (SMEWW) 5210B. Compatible with ISO 5815:1989. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060, APHA Standard Methods for Examination of Water and Wastewater 5310B, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.				

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JE Job No: 18/18062

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060, APHA Standard Methods for Examination of Water and Wastewater 5310B, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.	Yes			
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OJA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.				
TM89	Modified USEPA method OJA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			

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JE Job No: 18/18062

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM149	Determination of Pesticides by Large Volume Injection on GC Triple Quad MS, based upon USEPA method 8270	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				

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Exova Jones Environmental

Registered Office: Exova Environmental UK Limited, 10 Lower Grosvenor Place, London, SW1W 0EN. Reg No. 11371415

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Tel: +44 (0) 1244 833780
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Attention : Blathnaid Mcpolin
Date : 3rd December, 2018
Your reference : MDR1489
Our reference : Test Report 18/18491 Batch 1
Location : Bohernabreena
Date samples received : 16th November, 2018
Status : Final report
Issue : 1

Three samples were received for analysis on 16th November, 2018 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied. All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/18491

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Exova Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

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JE Job No: 18/18491

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM37	Modified methods USEPA 160.2, EN872:2005 and SMWW 2540D. Gravimetric determination of Total Suspended Solids. Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed.	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.				
TM58	APHA Standard Methods for the extraction of water and waste water (SMEWW) 5210B. Compatible with ISO 5815:1989. Measurement of Biochemical Oxygen Demand. When cBOD (Carbaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.				

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JE Job No: 18/18491

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/IS ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060, APHA Standard Methods for Examination of Water and Wastewater 5310B, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.				
TM72	Redox Potential is measured by HI98120 redox meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM89	Modified USEPA method OJA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.				
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM149	Determination of Pesticides by Large Volume Injection on GC Triple Quad MS, based upon USEPA method 8270	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				

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Customer

Blathnaid McPolin
RPS Group
West Pier Business Campus
Dun Laoghaire
Dublin

Certificate Of Analysis

Job Number: 18-49137
Issue Number: 1
Report Date: 12 November 2018

Site: Not Applicable
PO Number: Not Supplied
Date Samples Received: 08/11/2018

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Please find attached the results for the samples received at our laboratory on 08/11/2018.

Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our website at the above address.

Thank you for choosing City Analysts Limited. We look forward to assisting you again.

Authorised By:



Shane Reynolds
Laboratory Manager

Authorised Date: 12 November 2018

Notes:

Results relate only to the items tested.
Information on methods of analysis and performance characteristics is available on request.
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Certificate Of Analysis

Customer

Blathnaid McPolin
RPS Group
West Pier Business Campus
Dun Laoghaire
Dublin

Report Reference: 18-49137

Report Version: 1

Site: Not Applicable

Sample Description: LW1

Date of Sampling: 08/11/2018

Sample Type: Leachate (Land)

Date Sample Received: 08/11/2018

Lab Reference Number: 417875

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1201	08/11/2018	Coliforms	4520.0	MPN/100ml	-
D/D1201	08/11/2018	E.coli	3.1	MPN/100ml	-
D/D3221	08/11/2018	Faecal Coliforms	1400	cfu/100ml	-

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Note:

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NAC & ATC - No abnormal change and acceptable to customers.

TVC - Total viable count

Site D = Analysed at City Analysts Dublin. Site S = Analysed at City Analysts Shannon

Certificate Of Analysis

Customer

Blathnaid McPolin
RPS Group
West Pier Business Campus
Dun Laoghaire
Dublin

Report Reference: 18-49137

Report Version: 1

Site: Not Applicable

Sample Description: GW1

Date of Sampling: 08/11/2018

Sample Type: Ground

Date Sample Received: 08/11/2018

Lab Reference Number: 417876

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1201#	08/11/2018	Coliforms	31230.0	MPN/100ml	-
D/D1201#	08/11/2018	E.coli	11.0	MPN/100ml	-
D/D3221#	08/11/2018	Faecal Coliforms	200	cfu/100ml	-

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TVC - Total viable count

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Dublin

Report Reference: 18-49137

Report Version: 1

Site: Not Applicable

Sample Description: GW2

Date of Sampling: 08/11/2018

Sample Type: Ground

Date Sample Received: 08/11/2018

Lab Reference Number: 417877

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1201#	08/11/2018	Coliforms	3730.0	MPN/100ml	-
D/D1201#	08/11/2018	E.coli	14.6	MPN/100ml	-
D/D3221#	08/11/2018	Faecal Coliforms	1600	cfu/100ml	-

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TVC - Total viable count

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Customer

Blathnaid McPolin
RPS Group
West Pier Business Campus
Dun Laoghaire
Dublin

Certificate Of Analysis

Job Number: 18-49360
Issue Number: 1
Report Date: 22 November 2018

Site: Not Applicable
PO Number: Not Supplied
Date Samples Received: 14/11/2018

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Please find attached the results for the samples received at our laboratory on 14/11/2018.

Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our website at the above address.

Thank you for choosing City Analysts Limited. We look forward to assisting you again.

Authorised By:



Shane Reynolds
Laboratory Manager

Authorised Date: 22 November 2018

Notes:

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Report Reference: 18-49360

Report Version: 1

Site: Not Applicable

Sample Description: GW1

Date of Sampling: 14/11/2018

Sample Type: Ground

Date Sample Received: 14/11/2018

Lab Reference Number: 418701

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1201#	14/11/2018	Coliforms	1046.2	MPN/100ml	-
D/D1201#	14/11/2018	E.coli	< 1.0	MPN/100ml	-
D/D3221#	14/11/2018	Faecal Coliforms	< 1	cfu/100ml	-

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TVC - Total viable count

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Customer

Blathnaid McPolin
RPS Group
West Pier Business Campus
Dun Laoghaire
Dublin

Report Reference: 18-49360

Report Version: 1

Site: Not Applicable

Sample Description: GW2

Date of Sampling: 14/11/2018

Sample Type: Ground

Date Sample Received: 14/11/2018

Lab Reference Number: 418702

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1201#	14/11/2018	Coliforms	1182.0	MPN/100ml	-
D/D1201#	14/11/2018	E.coli	< 1.0	MPN/100ml	-
D/D3221#	14/11/2018	Faecal Coliforms	66	cfu/100ml	-

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Note:

PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.

For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.

NAC & ATC - No abnormal change and acceptable to customers.

TVC - Total viable count

Site D = Analysed at City Analysts Dublin. Site S = Analysed at City Analysts Shannon

Certificate Of Analysis

Customer

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West Pier Business Campus
Dun Laoghaire
Dublin

Report Reference: 18-49360

Report Version: 1

Site: Not Applicable

Sample Description: LW4

Date of Sampling: 14/11/2018

Sample Type: Leachate (Land)

Date Sample Received: 14/11/2018

Lab Reference Number: 418703

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
D/D1201	14/11/2018	Coliforms	6550.0	MPN/100ml	-
D/D1201	14/11/2018	E.coli	77.1	MPN/100ml	-
D/D3221	14/11/2018	Faecal Coliforms	95	cfu/100ml	-

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Note:

PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.

For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.

NAC & ATC - No abnormal change and acceptable to customers.

TVC - Total viable count

Site D = Analysed at City Analysts Dublin. Site S = Analysed at City Analysts Shannon

APPENDIX I
GEOTECHNICAL SOIL REPORT

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KEY TO SYMBOLS ON EXPLORATORY HOLE RECORDS

All linear dimensions are in metres or millimetres

DESCRIPTIONS

** Drillers Description
Friable Easily crumbled

SAMPLES

U() Undisturbed 102mm diameter sample, () denotes number of blows to drive sampler
U()F, U()P F- not recovered, P-partially recovered
U38 Undisturbed 38mm diameter sample
P(F), (P) Piston sample - disturbed
B Bulk sample - disturbed
D Jar Sample - disturbed
W Water Sample
CBR California Bearing Ratio mould sample
ES Chemical Sample for Contamination Analysis
SPTLS Standard Penetration Test S lump sample from split sampler

CORE RECOVERY AND ROCK QUALITY

TCR Total Core Recovery (% of Core Run)
SCR Solid Core Recovery (length of core having at least one full diameter as % of core run)
RQD Rock Quality Designation (length of solid core greater than 100mm as % of core run)
Where there is insufficient space for the TCR, SCR and RQD, the results may be found in the remarks column
lf Fracture Spacing in mm (Minimum/Average/Maximum) NI - non intact, NR - no recovery
AZCL Assumed Zone of Core Loss
NI Non intact

GROUNDWATER

▽ Groundwater strike
▼ Groundwater level after standing period
Date/Water Date of shift (day/month)/Depth to water at end of previous shift shown above the date and depth to water at beginning of shift given below the date

INSITU TESTING

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

MEASURED PROPERTIES

N Standard Penetration Test - blows required to drive 300mm after seating drive
x/y Denotes x blows for y mm within the Standard Penetration Test
x*/y Denotes x blows for y mm within the seating drive
 c_u Undrained Shear Strength (kN/m²)
CBR California Bearing Ratio

ROTARY DRILLING SIZES

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

Project Id: P18228

Title: Site Plan

Project Title: Bohernabreena landfill

Scale: 1:2800

Location: Co. Dublin




Engineer: RPS

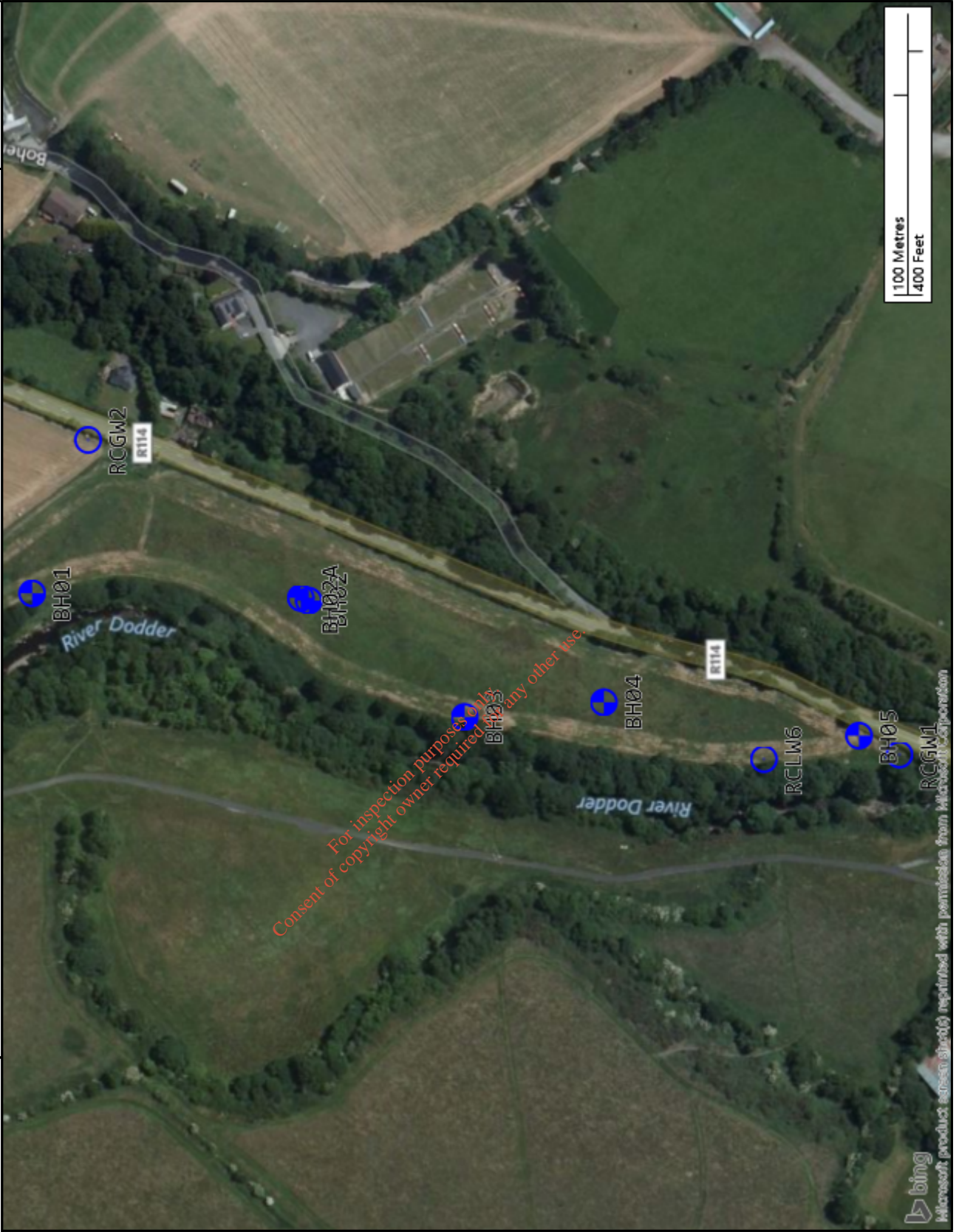
Client: RPS

Contractor: PGL



Legend Key

-  Locations By Type - Empty
-  Locations By Type - CP
-  Locations By Type - RO





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Drilled By:
PC
Logged By:
SR

Borehole No.
BH01
Sheet 1 of 1

Project Name: Bohernabreena landfill Project No. P18228 Co-ords: 709047E - 724980N Hole Type CP

Location: Co. Dublin Level: 111.08m OD Scale 1:50

Client: RPS Date: 02/10/2018 - 03/10/2018

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.10	B				(TOPSOIL) Dark brown, wet, slightly sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is fine to coarse and angular to sub-angular.		
		0.20 - 0.80	U						
		1.10 - 2.00	B		1.10	109.98	(MADE GROUND) Dark brown, gravelly SILT with low cobble content, with paper and plastic. Gravel is fine to coarse and angular to sub-angular. Cobbles are 63mm to 120mm dia and angular.	1	
		2.00 - 3.00	B		2.00	109.08	(MADE GROUND) Dark brown, slightly gravelly SILT with medium cobble content with paper and plastic waste material. Gravel is fine to coarse and angular to sub-angular. Cobbles are 63mm to 150mm dia and angular.	2	
		3.00 - 4.00	B		3.00	108.08	(MADE GROUND) Dark brown, SILT with rubbish, fabric and waste odour.	3	
		4.00 - 5.00	B		4.00			4	
		5.00 - 6.00	B		5.00	106.08	(MADE GROUND) Sandy very silty GRAVEL with waste material.	5	
		6.00 - 7.00	B		6.00			6	
		7.00 - 8.30	B		7.00			7	
					8.30	102.78	Driller described: Natural ground; gravelly CLAY.	8	
					9.00	102.08	End of Borehole at 9.000m	9	

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Groundwater:					Hole Information:			Chiselling Details:			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered.	9.00	200	200				
					Equipment: Dando 2000.						

Remarks: Borehole terminated at 9.00m bgl. Standpipe (50mm dia) installed from GL to 9.00m bgl. Response zone from 1.00m bgl to 8.00m bgl.	Shift Data:	GW (m bgl)	Shift	Depth (m bgl)	Remarks
			02/10/2018 08:00	0.00	Start of shift.
		Dry	02/10/2018 18:00	6.00	End of shift.
		Dry	03/10/2018 08:00	6.00	Start of shift.
		Dry	03/10/2018 18:00	9.00	End of borehole.



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Drilled By:
PC
Logged By:
OD

Borehole No.
BH02A
Sheet 1 of 1

Project Name: Bohernabreena landfill Project No. P18228 Co-ords: 709047E - 724846N Hole Type CP

Location: Co. Dublin Level: 113.53m OD Scale 1:50

Client: RPS Date: 03/10/2018 - 03/10/2018

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.30	B				(TOPSOIL) Light brown, slightly gravelly CLAY.		
		0.30 - 0.90	U						
		1.30 - 2.00	B		1.00	112.53		(MADE GROUND) Light brown black, slightly gravelly SILT with glass, plastic and bituminous material.	1
		2.00 - 3.00	B		2.00	111.53		(MADE GROUND) Brown grey, slightly gravelly SILT with plastic, fabric, wood and glass.	2
		3.00 - 4.00	B		3.00	110.53		(MADE GROUND) Brown grey, silty very sandy GRAVEL with glass, pottery and a hydrocarbon odour.	3
		4.00 - 4.50	B		4.50	109.03		End of Borehole at 4.500m	4
								5	
								6	
								7	
								8	
								9	

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Groundwater:					Hole Information:			Chiselling Details:			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered.	4.50	200	200				
					Equipment: Dando 2000						

Remarks: Borehole terminated at 4.50m bgl. 50mm dia. standpipe installed. Response zone from 2.00m to 4.00m bgl.	Shift Data:			
	GW (m bgl)	Shift	Depth (m bgl)	Remarks
	Dry	03/10/2018 08:00 03/10/2018 18:00	0.00 4.50	Start of shift. End of borehole.



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Drilled By:
PC
Logged By:
EOM

Borehole No.
BH03
Sheet 1 of 1

Project Name: Bohernabreena landfill Project No. P18228 Co-ords: 708990E - 724762N Hole Type CP

Location: Co. Dublin Level: 115.47m OD Scale 1:50

Client: RPS Date: 04/10/2018 - 04/10/2018

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B				(TOPSOIL) Brown, slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium, sub-angular.		
		0.30 - 0.90	U						
		1.00 - 2.00	B		1.00	114.47		(MADE GROUND) Brown, very silty very sandy GRAVEL with high cobble content, plastic waste. Sand is fine to coarse. Gravel is fine to coarse, sub-angular.	1
		2.00 - 3.00	B		2.00	113.47		(MADE GROUND) Black, slightly sandy gravelly CLAY with plastic waste material. Sand is fine to coarse. Gravel is fine to coarse, sub-angular.	2
		3.00 - 4.00	B						3
		4.00 - 5.30	B		4.00	111.47	(MADE GROUND) Slightly sandy gravelly CLAY with plastic waste material. Sand is fine to coarse. Gravel is fine to coarse, sub-angular.	4	
					5.50	109.97		End of Borehole at 5.500m	5
									6
									7
									8
									9

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Groundwater:					Hole Information:			Chiselling Details:			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered.	5.50	200	200				
					Equipment: Dando 2000						

Remarks: Borehole terminated at 5.50m bgl. 50m dia. standpipe installed. Response zone from 1.0m to 3.5m bgl.	Shift Data:			
	GW (m bgl)	Shift	Depth (m bgl)	Remarks
	Dry	04/10/2018 08:00 04/10/2018 18:00	0.00 5.50	Start of shift. End of borehole.



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Drilled By:
P C
Logged By:
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Borehole No.
BH04
Sheet 1 of 1

Project Name: Bohernabreena landfill Project No. P18228 Co-ords: 708999E - 724693N Hole Type CP

Location: Co. Dublin Level: 116.60m OD Scale 1:50

Client: RPS Date: 04/10/2018 - 05/10/2018

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.10	B		1.10	115.50		(TOPSOIL) Black, slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular. Cobbles are 63mm to 100mm dia, sub-angular to angular.	1
		0.30 - 0.90	U						
		1.10 - 2.00	B						
		2.00 - 3.00	B						
		3.00 - 4.00	B						
		4.00 - 5.00	B						
	5.00 - 6.00	B		5.00	111.60		(MADE GROUND) Black, slightly sandy gravelly CLAY with medium to high cobble content and waste material.	2	
				6.00	110.60		(MADE GROUND) Black brown, silty sandy GRAVEL with medium cobble content and waste material. Cobbles are 63mm to 120mm dia, angular to sub-angular.	3	
							Driller described: Natural ground. Clayey GRAVEL.	4	
								5	
								6	
								7	
								8	
								9	
								End of Borehole at 8.000m	

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Groundwater:					Hole Information:			Chiselling Details:			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
5.10	5.4	20		See shift data	8.00	200	200				
					Equipment: Dando 2000						

Remarks: Borehole terminated at 8.00m bgl. Standpipe (50mm dia) installed from GL to 7.50m bgl. Response zone from 1.50-7.50m bgl.	Shift Data:			
	GW (m bgl)	Shift	Depth (m bgl)	Remarks
		04/10/2018 08:00	0.00	Start of shift.
	Dry	04/10/2018 18:00	5.00	End of shift.
		05/10/2018 08:00	5.00	Start of shift.
	5.40	05/10/2018 18:00	8.00	End of borehole.



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Drilled By:
 PC
 Logged By:
 EOM

Borehole No.
BH05
 Sheet 1 of 1

Project Name: Bohernabreena landfill Project No. P18228 Co-ords: 708985E - 724565N Hole Type CP

Location: Co. Dublin Level: 118.95m OD Scale 1:50

Client: RPS Date: 08/10/2018 - 08/10/2018

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 0.80	B		0.80	118.15		(TOPSOIL) Brown, slightly sandy slightly gravelly SILT with medium cobble content. Sand is fine to medium. Gravel is fine to coarse, angular to sub-angular.	
		0.20 - 0.50	U						
					3.00	115.95		(MADE GROUND) Slightly sandy slightly gravelly CLAY with waste material.	1 2
					4.50	114.45		Driller described: Natural ground.	3 4
								End of Borehole at 4.500m	5 6 7 8 9

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Groundwater:					Hole Information:			Chiselling Details:			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered	4.50	200	200				
					Equipment: Dando 2000						

Remarks: Borehole terminated at 4.50m bgl. Standpipe (50mm dia) installed from GL to 4.00m bgl. Response zone from 1.00m bgl to 4.00m bgl.	Shift Data:			
	GW (m bgl)	Shift	Depth (m bgl)	Remarks
	Dry	08/10/2018 08:00 08/10/2018 18:00	0.00 4.50	Start of shift. End of borehole.



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Drilled By:	Borehole No.
AK	RCGW1
Logged By:	

Project Name: Bohernabreena landfill	Project No.: P18228	Co-ords: 708975E - 724544N	Hole Type: Rotary open hole
Location: Co. Dublin		Level: 117.08m OD	Scale: 1:50
Client: RPS		Dates: 25/10/2018	25/10/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%)			Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description	
				TCR	SCR	RQD					
							1.50	115.58		Open hole boring. Driller described: (TOPSOIL)	1
							3.00	114.08		Open hole boring. Driller described: Sandy GRAVEL.	2
							4.50	112.58		Open hole boring. Driller described: Clayey SAND.	3
							6.00	111.08		Open hole boring. Driller described: SAND.	4
							7.50	109.58		Open hole boring. Driller described: Sandy CLAY.	5
							9.00	108.08		Open hole boring. Driller described: Sandy GRAVEL.	6
											7
											8
											9

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Groundwater:				Hole Information:			Equipment: Deltabase 520	
Struck (m bgl)	Rose to	After (min)	Sealed	Comment	Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Method: Compressed air mist
				See shift data.	21.00		131	
Remarks:				Shift Data:		Groundwater (m bgl)		Remarks
Borehole terminated at 21.00m bgl. 50mm dia. standpipe installed. Response zone from 19.0m to 21.0m bgl.						Shift 25/10/2018 08:00 25/10/2018 18:00		Hole Depth (m bgl) 0.00 21.00
								Start of shift. End of borehole.



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Drilled By:	Borehole No.
AK	RCGW1
Logged By:	

Project Name: Bohernabreena landfill	Project No.: P18228	Co-ords: 708975E - 724544N	Hole Type: Rotary open hole
Location: Co. Dublin	Level: 117.08m OD	Scale: 1:50	
Client: RPS	Dates: 25/10/2018		25/10/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%)			Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description	
				TCR	SCR	RQD					
										Open hole boring. Driller described: Sandy CLAY.	10
							10.50	106.58		Open hole boring. Driller described: Wet silty CLAY.	11
							12.00	105.08		Open hole boring. Driller described: CLAY.	12
							13.50	103.58		Open hole boring. Driller described: Wet CLAY. 13.50m - 16.50m: Driller noted high volume of water. Possible second water strike.	13
							16.50	100.58		Open hole boring. Driller described: Coarse SAND.	16
							18.00	99.08			17

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Groundwater:				Hole Information:			Equipment: Deltabase 520
Struck (m bgl)	Rose to	After (min)	Sealed	Comment	Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
				See shift data.	21.00		131
Remarks:				Shift Data:		Method: Compressed air mist	
Borehole terminated at 21.00m bgl. 50mm dia. standpipe installed. Response zone from 19.0m to 21.0m bgl.				Groundwater (m bgl)		Shift	
				9.00		25/10/2018 08:00 25/10/2018 18:00	
						0.00 21.00	
						Remarks Start of shift. End of borehole.	



Priority Geotechnical Ltd.
 Tel: 021 4631600
 Fax: 021 4638690
 www.prioritygeotechnical.ie

Drilled By:
 AK
Logged By:

Borehole No.
RCGW1
 Sheet 3 of 3

Project Name: Bohernabreena landfill **Project No.:** P18228 **Co-ords:** 708975E - 724544N **Hole Type:** Rotary open hole

Location: Co. Dublin **Level:** 117.08m OD **Scale:** 1:50

Client: RPS **Dates:** 25/10/2018 25/10/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%)			Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description	
				TCR	SCR	RQD					
							19.50	97.58		Open hole boring. Driller described: Sandy GRAVEL.	19
										Open hole boring. Driller described: Sandy GRAVEL.	20
							21.00	96.08		End of Borehole at 21.000m	21
											22
											23
											24
											25
											26
											27

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Groundwater:				Hole Information:			Equipment:	Deltabase 520
Struck (m bgl)	Rose to	After (min)	Sealed	Comment	Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Method:
				See shift data.	21.00		131	Compressed air mist

Remarks: Borehole terminated at 21.00m bgl. 50mm dia. standpipe installed. Response zone from 19.0m to 21.0m bgl.	Shift Data:	Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
		9.00	25/10/2018 08:00 25/10/2018 18:00	0.00 21.00	Start of shift. End of borehole.



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Drilled By:	Borehole No.
AK	RCGW2
Logged By:	

Project Name: Bohernabreena landfill	Project No. P18228	Co-ords: 709125E - 724954N	Hole Type: Rotary open hole
--------------------------------------	--------------------	----------------------------	-----------------------------

Location: Co. Dublin	Level: 111.54m OD	Scale: 1:50
----------------------	-------------------	-------------

Client: RPS	Dates: 26/10/2018 - 26/10/2018
-------------	--------------------------------

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%)			Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description	
				TCR	SCR	RQD					
							1.50	110.04		Open hole boring. Driller described: Boulders.	1
										Open hole boring. Driller described: Clay.	2
											3
											4
											5
											6
											7
											8
											9

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Groundwater:				Hole Information:			Equipment: Deltabase 520
Struck (m bgl)	Rose to	After (min)	Sealed	Comment	Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
14.00				See shift data.	18.00		131
							Method: Compressed air mist

Remarks: Borehole terminated at 18.00m bgl. 50mm dia. standpipe installed. Response zone from 16.0m to 18.0m bgl.	Shift Data:	Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
		14.0	26/10/2018 08:00 26/10/2018 18:00	0.00 18.00	Start of shift. End of borehole.



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Drilled By:	Borehole No.
AK	RCGW2
Logged By:	

Project Name: Bohernabreena landfill	Project No.: P18228	Co-ords: 709125E - 724954N	Hole Type: Rotary open hole
Location: Co. Dublin		Level: 111.54m OD	Scale: 1:50
Client: RPS		Dates: 26/10/2018	26/10/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%)			Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description	
				TCR	SCR	RQD					
										Open hole boring. Driller described: Clay.	10
							13.00	98.54		Open hole boring. Driller described: Gravel.	11
											12
											13
											14
											15
											16
											17
							18.00	93.54		End of Borehole at 18.000m	18

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Groundwater:				Hole Information:			Equipment: Deltabase 520	
Struck (m bgl)	Rose to	After (min)	Sealed	Comment	Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Method: Compressed air mist
14.00				See shift data.	18.00		131	
Remarks:				Shift Data:		Groundwater (m bgl)		Remarks
Borehole terminated at 18.00m bgl. 50mm dia. standpipe installed. Response zone from 16.0m to 18.0m bgl.						Shift		Start of shift. End of borehole.
						26/10/2018 08:00 26/10/2018 18:00		
						14.0		



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Drilled By:
 AK
 Logged By:

Borehole No.
RCLW6
 Sheet 1 of 1

Project Name: Bohernabreena landfill Project No. P18228 Co-ords: 708972E - 724612N Hole Type: Rotary open hole

Location: Co. Dublin Level: 117.98m OD Scale: 1:50

Client: RPS Dates: 26/10/2018 26/10/2018

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%)			Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description	
				TCR	SCR	RQD					
							1.00	116.98		Open hole boring. Driller described: (TOPSOIL) With boulder content.	1
										Open hole boring. Driller described: (MADE GROUND) with waste material.	2
											3
											4
							5.50	112.48		Open hole boring. Driller described: Sandy Gravel.	5
											6
							7.30	110.68		End of Borehole at 7.30m	7
											8
											9

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Groundwater:				Hole Information:			Equipment:	
Struck (m bgl)	Rose to	After (min)	Sealed	Comment	Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Deltabase 520
				None encountered.	7.30		131	Compressed air mist.

Remarks: Borehole terminated at 7.30m bgl.	Shift Data:	Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
		Dry	26/10/2018 08:00 26/10/2018 18:00		Start of shift. End of borehole.

KEY TO SYMBOLS - LABORATORY TEST RESULT

U	Undisturbed Sample	
P	Piston Sample	
TWS	Thin Wall Sample	
B	Bulk Sample - Disturbed	
D	Jar Sample - Disturbed	
W	Water Sample	
pH	Acidity/Alkalinity Index	
SO ₃	% - Total Sulphate Content (acid soluble)	
SO ₃	g/ltr - Water Soluble Sulphate (Water or 2:1 Aqueous Soil Extract)	
+	Calcareous Reaction	
Cl	Chloride Content	
PI	Plasticity Index	
<425	% of material in sample passing 425 micron sieve	
LL	Liquid Limit	
PL	Plastic Limit	
MC	Water Content	
NP	Non Plastic	
Y _b	Bulk Density	
Y _d	Dry Density	
Ps	Particle Density	
U/D	Undrained/Drained Triaxial	
U/C	Unconsolidated/Consolidated Triaxial	
T/M	Single Stage/Multistage Triaxial	
100/38	Sample Diameter (mm)	
REM	Remoulded Triaxial Test Specimen	
TST	Triaxial Suction Test	
V	Vane Test	
DSB	Drained Shear Box	
RSB	Residual Shear Box	
RS	Ring Shear	
σ ₃	Cell Pressure	
σ ₁ -σ ₃	Deviator Stress	
c	Cohesion	
c _e	Effective Cohesion Intercept	
φ	Angle of Shearing Resistance - Degrees	
φ _e	Effective Angle of Shearing Resistance	
ε _f	Strain at Failure	
*	Failed under 1 st Load	
**	Failed under 2 nd Load	
#	Untestable	
##	Excessive Strain	
p _o	Effective Overburden Pressure	
m _v	Coefficient of Volume Decrease	
c _v	Coefficient of Consolidation	
Opt	Optimum	
Nat	Natural	
Std	Standard Compaction - 2.5kg Rammer	(¶ CBR)
Hvy	Heavy Compaction - 4.5kg Rammer	(§ CBR)
Vib	Vibratory Compaction	
CBR	California Bearing Ratio	
Sat m.c.	Saturation Moisture Content	
MCV	Moisture Condition Value	

Key sheet





PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

P18228

Borehole / Pit No

BH01

Location

Bohernabreena landfill

Sample No

6

Depth

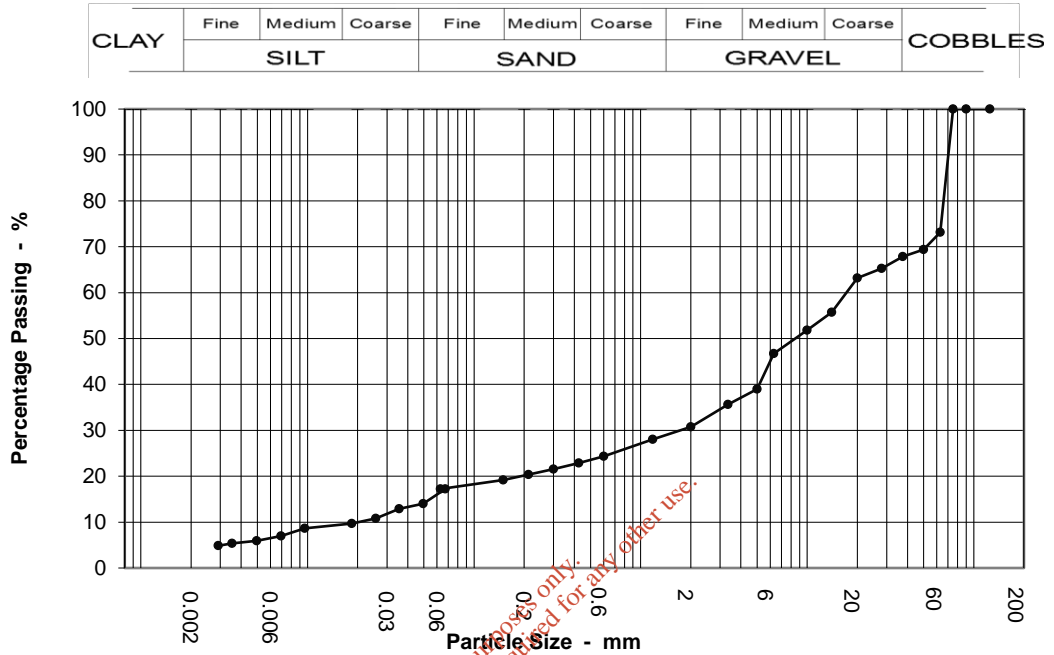
5.00 m

Soil Description

Sandy very silty GRAVEL with high cobble content

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.063	17
90	100	0.050	14
75	100	0.036	13
63	73	0.026	11
50	69	0.018	10
37.5	68	0.010	9
28	65	0.007	7
20	63	0.005	6
14	56	0.004	5
10	52	0.003	5
6.3	47	0.002	4
5	39		
3.35	36		
2	31		
1.18	28		
0.6	24		
0.425	23		
0.3	22		
0.212	20		
0.15	19		
0.063	17		

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

Sample Proportions	
Cobbles	27.0
Gravel	42.0
Sand	14.0
Silt	13.0
Clay	5.0

Grading Analysis	
D100	75.00
D60	17.20
D10	0.02
Uniformity Coefficient	850.00



PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

P18228

Borehole / Pit No

BH02A

Location

Bohernabreena landfill

Sample No

6

Depth

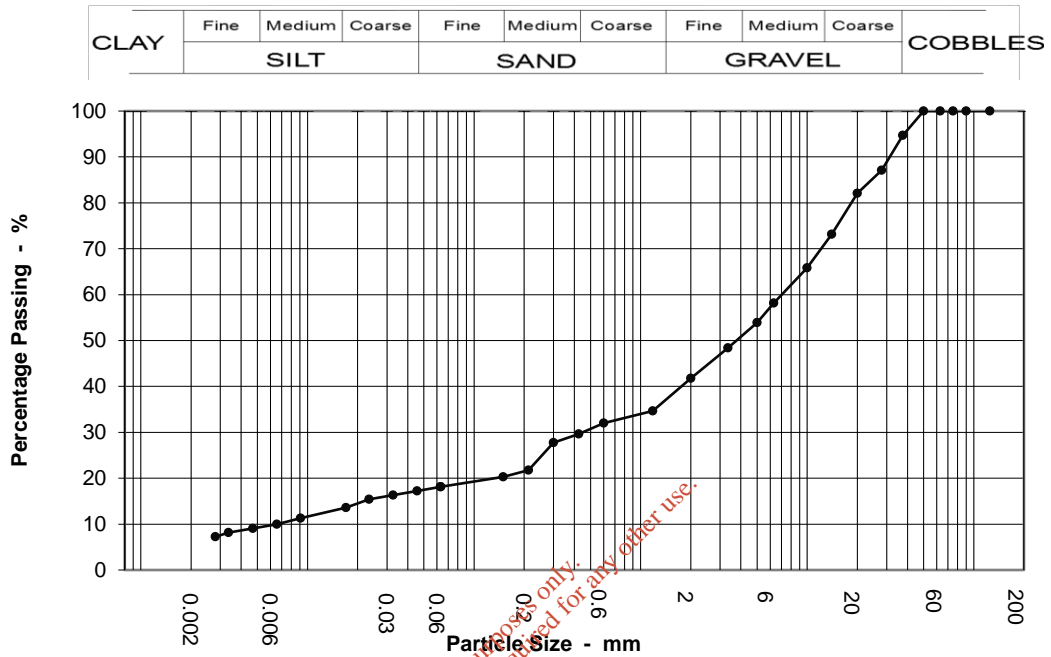
4.00 m

Soil Description

Silty very sandy GRAVEL

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.063	18
90	100	0.045	17
75	100	0.033	16
63	100	0.023	15
50	100	0.017	14
37.5	95	0.009	11
28	87	0.007	10
20	82	0.005	9
14	73	0.003	8
10	66	0.003	7
6.3	58	0.001	6
5	54		
3.35	48		
2	42		
1.18	35		
0.6	32		
0.425	30		
0.3	28		
0.212	22		
0.15	20		
0.063	18		

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

Sample Proportions	
Cobbles	0.0
Gravel	58.0
Sand	24.0
Silt	12.0
Clay	7.0

Grading Analysis	
D100	50.00
D60	7.03
D10	0.01
Uniformity Coefficient	1100.00



PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

P18228

Borehole / Pit No

BH03

Location

Bohernabreena landfill

Sample No

3

Depth

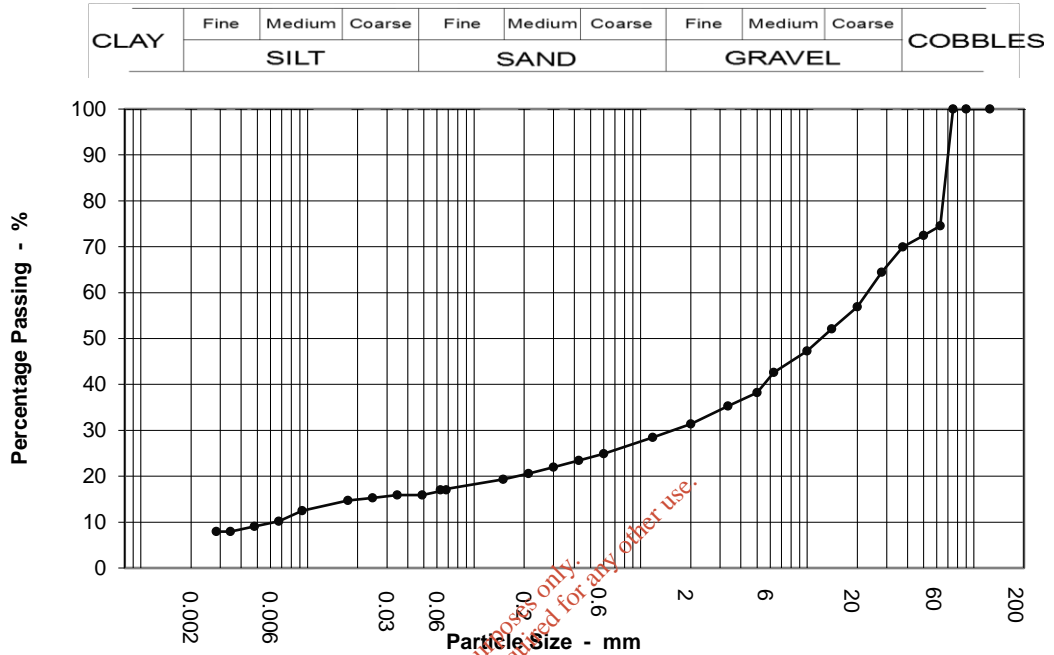
1.00 m

Soil Description

Very silty very sandy GRAVEL with high cobble content

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.068	17
90	100	0.049	16
75	100	0.035	16
63	75	0.025	15
50	72	0.018	15
37.5	70	0.009	12
28	64	0.007	10
20	57	0.005	9
14	52	0.003	8
10	47	0.003	8
6.3	43	0.002	6
5	38		
3.35	35		
2	31		
1.18	28		
0.6	25		
0.425	23		
0.3	22		
0.212	21		
0.15	19		
0.063	17		

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

Sample Proportions	
Cobbles	25.0
Gravel	43.0
Sand	14.0
Silt	10.0
Clay	7.0

Grading Analysis	
D100	75.00
D60	23.00
D10	0.01
Uniformity Coefficient	3600.00



PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

Job Ref

P18228

Borehole / Pit No

BH04

Location

Bohernabreena landfill

Sample No

7

Depth

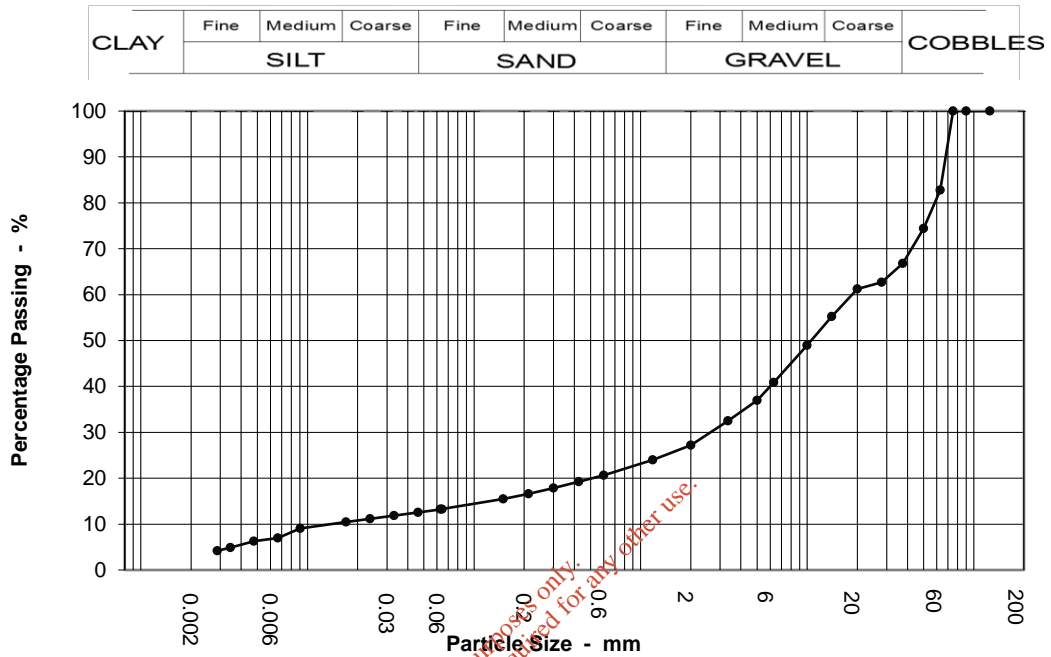
5.00 m

Soil Description

Silty sandy GRAVEL with medium cobble content

Sample type

B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.064	13
90	100	0.046	13
75	100	0.033	12
63	83	0.024	11
50	74	0.017	10
37.5	67	0.009	9
28	63	0.007	7
20	61	0.005	6
14	55	0.003	5
10	49	0.003	4
6.3	41	0.002	3
5	37		
3.35	33		
2	27		
1.18	24		
0.6	21		
0.425	19		
0.3	18		
0.212	17		
0.15	15		
0.063	13		

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

Sample Proportions	
Cobbles	17.0
Gravel	56.0
Sand	14.0
Silt	9.0
Clay	4.0

Grading Analysis	
D100	75.00
D60	18.60
D10	0.01
Uniformity Coefficient	1300.00



PARTICLE SIZE DISTRIBUTION

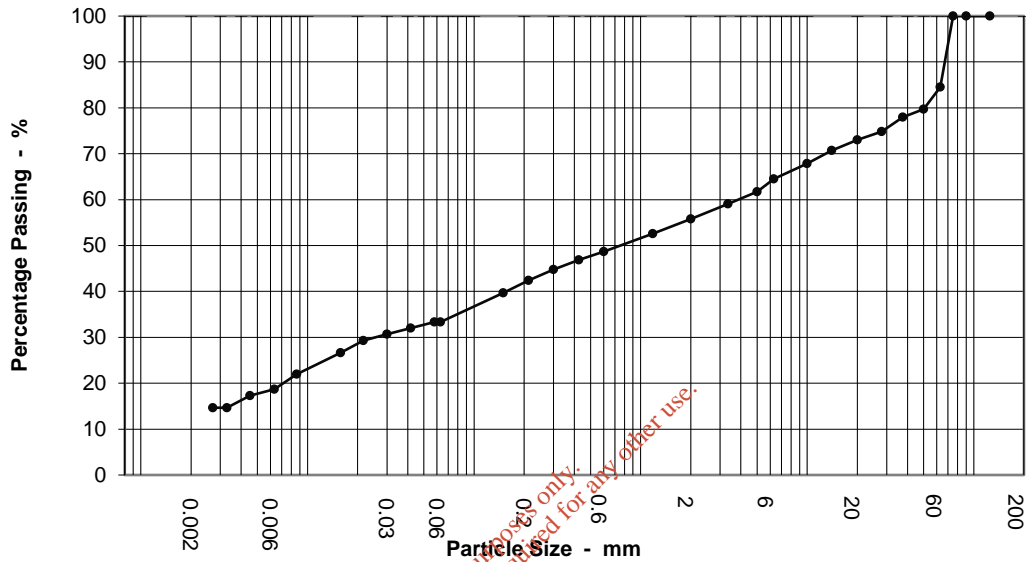
BS 1377 : Part 2 : 1990 : Clause 9

Job Ref	P18228
Borehole / Pit No	BH05
Sample No	1
Depth	0.00 m
Sample type	B

Location Bohernabreena landfill

Soil Description Slightly sandy slightly gravelly SILT with medium cobble content

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.058	33
90	100	0.042	32
75	100	0.030	31
63	84	0.022	29
50	80	0.016	27
37.5	78	0.009	22
28	75	0.006	19
20	73	0.005	17
14	71	0.003	15
10	68	0.003	15
6.3	64	0.001	12
5	62		
3.35	59		
2	56		
1.18	53		
0.6	49		
0.425	47		
0.3	45		
0.212	42		
0.15	40		
0.063	33		

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

Sample Proportions	
Cobbles	16.0
Gravel	29.0
Sand	22.0
Silt	20.0
Clay	13.0

Grading Analysis	
D100	75.00
D60	3.86
D10	
Uniformity Coefficient	



Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 42905

Client Ref: **P18228**

Report Date: **01-03-2019**

Client PO: **11515**

Client **Priority Geotechnical Limited**
Unit 12
Owenacurra Business Park
Midleton
Co. Cork.

Contract Title: **Bohernabreena Landfill**
For the attention of: **Colette Kelly**

Date Received: **18-02-2019**
Date Commenced: **18-02-2019**
Date Completed: **01-03-2019**

Test Description	Qty
Triaxial Permeability Test with One Back Pressure System PLEASE NOTE IT IS LIKELY THIS TEST WILL INCUR EXTRA OVER DAY CHARGES. Head K H, Vol. 3, Clause 20.4.2 - @ Non Accredited Test	2
Extra Over days for Triaxial Permeability tests (4 Days Over)	6
Disposal of samples for job	1

Notes: Observations and Interpretations are outside the UKAS Accreditation
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

Ben Sharp (Contracts Manager) - Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager)
Richard John (Advanced Testing Manager) - Sean Penn (Administrative/Accounts Assistant) - Wayne Honey (Administrative/Quality Assistant)

**Determination of a Permeability in a Triaxial Cell
One Back Pressure Method**

K.H.Head:Volume 3:Section 20.4.2

Date:	01-Mar-19
Sample Number:	BH01
Depth (m):	0.20
Sample Type:	Undisturbed
Sample Preparation:	Undisturbed
Start Date:	22-Feb-19
Completion Date:	01-Mar-19
Test Duration (Days):	7
Operator:	LEE

Initial Conditions:

Diameter (mm):	105.0
Length (mm):	105.0
Bulk Density (Mg/m ³):	2.05
Moisture Content (%):	12
Dry Density (Mg/m ³):	1.84

Final Conditions:

Bulk Density (Mg/m ³):	2.05
Moisture Content (%):	12
Dry Density (Mg/m ³):	1.84

Permeability:

Mean Effective Stress (kPa):	125
Hydraulic Gradient:	145.71
Coefficient of Permeability (k _v) (m/s) @ 20°C:	9.28 × 10 ⁻¹¹

Description:

Brown fine-coarse gravelly slightly sandy slightly silty stiff CLAY

Remarks:

All remaining samples shall be retained for a period of one month from the above date, after which time all samples shall be disposed of.

D P Gnan

Checked by _____
Date 1.3.19

D P Gnan

Approved by _____
Date 1.3.19



Bohernabreena Landfill

Contract No.
42905

Client Ref No.
P18228

**Determination of a Permeability in a Triaxial Cell
One Back Pressure Method**

K.H.Head:Volume 3:Section 20.4.2

Date:	01-Mar-19
Sample Number:	BH03
Depth (m):	0.30
Sample Type:	Undisturbed
Sample Preparation:	Undisturbed
Start Date:	22-Feb-19
Completion Date:	01-Mar-19
Test Duration (Days):	7
Operator:	LEE

Initial Conditions:

Diameter (mm):	105.0
Length (mm):	105.0
Bulk Density (Mg/m ³):	1.82
Moisture Content (%):	18
Dry Density (Mg/m ³):	1.55

Final Conditions:

Bulk Density (Mg/m ³):	1.82
Moisture Content (%):	18
Dry Density (Mg/m ³):	1.55

Permeability:

Mean Effective Stress (kPa):	125
Hydraulic Gradient:	145.71
Coefficient of Permeability (k_v) (m/s) @ 20°C:	1.07×10^{-10}

Description:

Brown fine-coarse gravelly slightly sandy slightly silty stiff CLAY

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Remarks:

All remaining samples shall be retained for a period of one month from the above date, after which time all samples shall be disposed of.



Checked by _____
Date 1.3.19



Approved by _____
Date 1.3.19



Bohernabreena Landfill

Contract No.
42905

Client Ref No.
P18228

APPENDIX D
TABULATED RESULTS

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GROUNDWATER QUALITY RESULTS

Date City Analysis Report Reference Jones Report Reference	Units	GW Regs (2016) TV (*2010 regs)	EPA IGV value (GW)	SW AA EQS (2015)	GW1		GW2	
					09/11/2018 18-49137 18/18062	14/11/2018 18-49360 18/18491	09/11/2018 18-49137 18/18062	##### 18-49360 18/18491
Dissolved Arsenic	ug/l	7.5	10	25	4.9	<2.5	9.1	<2.5
Dissolved Boron	ug/l	(750)*	1000	-	16	20.00	37	39
Dissolved Cadmium	ug/l	(3.75)*	5	0.08	<0.5	<0.5	<0.5	<0.5
Dissolved Calcium	mg/l	-	200	-	133.7	130.50	179.8	175.2
Total Dissolved Chromium	ug/l	37.5	30	4.7	<1.5	<1.5	<1.5	<1.5
Dissolved Copper	ug/l	(1500)*	30	30	<7	<7	<7	<7
Total Dissolved Iron	ug/l	-	200	-	<20	<20	<20	<20
Dissolved Lead	ug/l	7.5	10	1.2	<5	<5	<5	<5
Dissolved Magnesium	mg/l	-	50	-	16.7	14.3	14.5	13.4
Dissolved Manganese	ug/l	-	50	-	115	7	777	741
Dissolved Mercury	ug/l	0.75	1	0.7 (MAC)	<1	<1	<1	<1
Dissolved Nickel	ug/l	-	20	4	<2	<2	3	<2
Dissolved Potassium	mg/l	-	5	-	1.3	0.9	1.1	2.1
Dissolved Sodium	mg/l	(150)*	150	-	16.3	17.2	24.3	24.2
Dissolved Zinc	ug/l	75	100	100	4	<3	5	<3
Coliforms	MPN/100ml	-	0	-	31230	1046.2	3730	1182
Faecal Coliforms	cfu/100ml	-	0	-	200	<1	1600	66
E.coli	MPN/100ml	-	0	-	11	<1	14.6	<1
Fluoride	mg/l	-	1	0.5	<0.3	<0.3	<0.3	<0.3
Sulphate as SO4	mg/l	187.5	200	-	31.5	30.60	6	6.10
Chloride	mg/l	187.5	30	-	36.3	38.40	58.6	61.10
Total Oxidised Nitrogen as N	mg/l	-	NAC	-	1.9	2.40	<0.2	<0.2
MRP Ortho Phosphate as PO4	mg/l	0.035	0.03	0.035	<0.03	<0.03	<0.03	<0.03
Total Cyanide	mg/l	(0.0375)*	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Ammoniacal Nitrogen as N #	mg/l	0.175	-	0.065	<0.03	<0.03	<0.03	<0.03
Total Alkalinity as CaCO3 #	mg/l	-	N.A.C	-	334	334	436	432
Electrical Conductivity @25C #	uS/cm	800-1875	1000	-	696	793	898	868
pH #	pH units	-	6.5-9.5	6.0 - 9.0	7.5	7.39	7.28	7.2
Redox	-	-	-	-	196.73	267.32	242.16	293.61
Total Organic Carbon #	mg/l	-	N.A.C	-	<2	<2	<2	<2
Total Dissolved Solids #	mg/l	-	1000	-	500	481	642	572
Total Suspended Solids	mg/l	-	-	-	601	<10	441	54
BOD (Settled)	mg/l	-	-	-	<1	<1	<1	<1
COD (Settled)	mg/l	-	-	-	<7	7	11	10
Phenols								
2-Chlorophenol #	ug/l	-	2000	-	<1	<1	<1	<1
2-Methylphenol #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
2-Nitrophenol	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l	-	-	-	<1	<1	<1	<1
2,4,5-Trichlorophenol #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	-	200	-	<1	<1	<1	<1
4-Chloro-3-methylphenol #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
4-Methylphenol	ug/l	-	-	-	<1	<1	<1	<1
4-Nitrophenol	ug/l	-	-	-	<10	<10	<10	<10
Pentachlorophenol	ug/l	-	2	-	<1	<1	<1	<1
Phenol	ug/l	-	0.5	8	<1	<1	<1	<1
PAHs								
2-Chloronaphthalene #	ug/l	-	-	-	<1	<1	<1	<1
2-Methylnaphthalene #	ug/l	-	-	-	<1	<1	<1	<1
Naphthalene #	ug/l	-	-	2	<0.1	<0.1	<0.1	<0.1
Acenaphthylene #	ug/l	-	-	-	<0.013	<0.013	<0.013	<0.013
Acenaphthene #	ug/l	-	-	-	<0.013	<0.013	<0.013	<0.013
Fluorene #	ug/l	-	-	-	<0.014	<0.014	<0.014	<0.014
Phenanthrene #	ug/l	-	-	-	<0.011	<0.011	<0.011	<0.011
Anthracene #	ug/l	-	-	0.1	<0.013	<0.013	<0.013	<0.013
Fluoranthene #	ug/l	-	-	0.0063	<0.012	<0.012	<0.012	<0.012
Pyrene #	ug/l	-	-	-	<0.013	<0.013	<0.013	<0.013
Benzo(a)anthracene #	ug/l	-	-	-	<0.015	<0.015	<0.015	<0.015
Chrysene #	ug/l	-	-	-	<0.011	<0.011	<0.011	<0.011
Benzo(b)fluoranthene #	ug/l	-	-	-	<0.018	<0.018	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.0075	-	0.00017	<0.016	<0.016	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	-	-	-	<0.011	<0.011	<0.011	<0.011
Dibenzo(ah)anthracene #	ug/l	-	-	-	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)perylene #	ug/l	-	-	-	<0.011	<0.011	<0.011	<0.011
PAH 16 Total		0.075ug/l	-	-	<0.195	<0.195	<0.195	<0.195
Benzo(b)fluoranthene		-	-	-	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene		-	-	-	<0.01	<0.01	<0.01	<0.01
Phthalates								
Bis(2-ethylhexyl) phthalate	ug/l	-	-	-	<5	<5	<5	<5
Butylbenzyl phthalate	ug/l	-	-	-	<1	<1	<1	<1
Di-n-butyl phthalate #	ug/l	-	2	-	<1.5	<1.5	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	-	-	-	<1	<1	<1	<1
Diethyl phthalate #	ug/l	-	-	-	<1	<1	<1	<1
Dimethyl phthalate	ug/l	-	-	-	<1	<1	<1	<1
SVOC MS								
Other SVOCs								
1,2-Dichlorobenzene #	ug/l	-	-	-	<1	<1	<1	<1
1,2,4-Trichlorobenzene #	ug/l	-	-	0.4	<1	<1	<1	<1
1,3-Dichlorobenzene #	ug/l	-	-	-	<1	<1	<1	<1
1,4-Dichlorobenzene #	ug/l	-	-	-	<1	<1	<1	<1
2-Nitroaniline	ug/l	-	-	-	<1	<1	<1	<1
2,4-Dinitrotoluene #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	-	-	-	<1	<1	<1	<1
3-Nitroaniline	ug/l	-	-	-	<1	<1	<1	<1
4-Bromophenylphenylether #	ug/l	-	-	-	<1	<1	<1	<1
4-Chloroaniline	ug/l	-	-	-	<1	<1	<1	<1
4-Chlorophenylphenylether #	ug/l	-	-	-	<1	<1	<1	<1
4-Nitroaniline	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
Azobenzene #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethoxy)methane #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether #	ug/l	-	-	-	<1	<1	<1	<1
Carbazole #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
Dibenzofuran #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene #	ug/l	-	-	-	<1	<1	<1	<1
Hexachlorobutadiene #	ug/l	-	-	-	<1	<1	<1	<1
Hexachlorocyclopentadiene	ug/l	-	-	-	<1	<1	<1	<1
Hexachloroethane #	ug/l	-	-	-	<1	<1	<1	<1
Isophorone #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
N-nitrosodi-n-propylamine #	ug/l	-	-	-	<0.5	<0.5	<0.5	<0.5
Nitrobenzene #	ug/l	-	-	-	<1	<1	<1	<1

GROUNDWATER QUALITY RESULTS

Date City Analysis Report Reference Jones Report Reference	Units	GW Regs (2016) TV	EPA IG value (GW)	SW AA EQS (2015)	GW1		GW2	
					09/11/2018	14/11/2018	09/11/2018	#####
					18-49137	18-49360	18-49137	18-49360
					18/18062	18/18491	18/18062	18/18491
VOC MS								
Dichlorodifluoromethane	ug/l			-	<2	<2	<2	<2
Methyl Tertiary Butyl Ether #	ug/l	10	30	-	<0.1	<0.1	<0.1	<0.1
Chloromethane #	ug/l			-	<3	<3	<3	<3
Vinyl Chloride #	ug/l	0.375		-	<0.1	<0.1	<0.1	<0.1
Bromomethane	ug/l			-	<1	<1	<1	<1
Chloroethane #	ug/l			-	<3	<3	<3	<3
Trichlorofluoromethane #	ug/l			-	<3	<3	<3	<3
1,1-Dichloroethene (1,1 DCE) #	ug/l			-	<3	<3	<3	<3
Dichloromethane (DCM) #	ug/l	15	10	20	<5	<5	<5	<5
trans-1-2-Dichloroethene #	ug/l	0.375		-	<3	<3	<3	<3
1,1-Dichloroethane #	ug/l			-	<3	<3	<3	<3
cis-1-2-Dichloroethene #	ug/l			-	<3	<3	<3	<3
2,2-Dichloropropane	ug/l			-	<1	<1	<1	<1
Bromochloromethane #	ug/l			-	<2	<2	<2	<2
Chloroform #	ug/l			-	<2	<2	<2	<2
1,1,1-Trichloroethane #	ug/l			-	<2	<2	<2	<2
1,1-Dichloropropene #	ug/l			-	<3	<3	<3	<3
Carbon tetrachloride #	ug/l			-	<2	<2	<2	<2
1,2-Dichloroethane #	ug/l	2.25	3	10	<2	<2	<2	<2
Benzene #	ug/l	0.75	1	10	<0.5	<0.5	<0.5	<0.5
Trichloroethene (TCE) #	ug/l	7.5	10	-	<3	<3	<3	<3
1,2-Dichloropropane #	ug/l			-	<2	<2	<2	<2
Dibromomethane #	ug/l			-	<3	<3	<3	<3
Bromodichloromethane #	ug/l			-	<2	<2	<2	<2
cis-1-3-Dichloropropene	ug/l			-	<2	<2	<2	<2
Toluene #	ug/l	525	10	10	<5	<5	<5	<5
trans-1-3-Dichloropropene	ug/l			-	<2	<2	<2	<2
1,1,2-Trichloroethane #	ug/l			-	<2	<2	<2	<2
Tetrachloroethene (PCE) #	ug/l	7.5	40	-	<3	<3	<3	<3
1,3-Dichloropropane #	ug/l			-	<2	<2	<2	<2
Dibromochloromethane #	ug/l			-	<2	<2	<2	<2
1,2-Dibromoethane #	ug/l			-	<2	<2	<2	<2
Chlorobenzene #	ug/l			-	<2	<2	<2	<2
1,1,1,2-Tetrachloroethane #	ug/l			-	<2	<2	<2	<2
Ethylbenzene #	ug/l			-	<1	<1	<1	<1
p/m-Xylene #	ug/l			10	<2	<2	<2	<2
o-Xylene #	ug/l			10	<1	<1	<1	<1
Styrene	ug/l			-	<2	<2	<2	<2
Bromoform #	ug/l			-	<2	<2	<2	<2
Isopropylbenzene #	ug/l			-	<3	<3	<3	<3
1,1,1,2,2-Tetrachloroethane	ug/l			-	<4	<4	<4	<4
Bromobenzene #	ug/l			-	<2	<2	<2	<2
1,2,3-Trichloropropane #	ug/l			-	<3	<3	<3	<3
Propylbenzene #	ug/l			-	<3	<3	<3	<3
2-Chlorotoluene #	ug/l			-	<3	<3	<3	<3
1,3,5-Trimethylbenzene #	ug/l			-	<3	<3	<3	<3
4-Chlorotoluene #	ug/l			-	<3	<3	<3	<3
tert-Butylbenzene #	ug/l			-	<3	<3	<3	<3
1,2,4-Trimethylbenzene #	ug/l			-	<3	<3	<3	<3
sec-Butylbenzene #	ug/l			-	<3	<3	<3	<3
4-Isopropyltoluene #	ug/l			-	<3	<3	<3	<3
1,3-Dichlorobenzene #	ug/l			-	<3	<3	<3	<3
1,4-Dichlorobenzene #	ug/l			-	<3	<3	<3	<3
n-Butylbenzene #	ug/l			-	<3	<3	<3	<3
1,2-Dichlorobenzene #	ug/l			-	<3	<3	<3	<3
1,2-Dibromo-3-chloropropane	ug/l			-	<2	<2	<2	<2
1,2,4-Trichlorobenzene	ug/l			0.4	<3	<3	<3	<3
Hexachlorobutadiene	ug/l			-	<3	<3	<3	<3
Naphthalene	ug/l			-	<2	<2	<2	<2
1,2,3-Trichlorobenzene	ug/l			0.4	<3	<3	<3	<3
Surrogate Recovery Toluene D8	%				103	92	102	94
Surrogate Recovery 4-Bromofluorobenzene	%				107	102	109	104
Pesticides								
Organochlorine Pesticides								
Aldrin	ug/l		0.01	0.01	<0.01	<0.01	<0.01	<0.01
Alpha-HCH (BHC)	ug/l			-	<0.01	<0.01	<0.01	<0.01
Beta-HCH (BHC)	ug/l			-	<0.01	<0.01	<0.01	<0.01
Delta-HCH (BHC)	ug/l			-	<0.01	<0.01	<0.01	<0.01
Dieldrin	ug/l		0.01	0.01	<0.01	0.01	<0.01	0.01
Endosulphan I	ug/l			-	<0.01	<0.01	<0.01	<0.01
Endosulphan II	ug/l			-	<0.01	<0.01	<0.01	<0.01
Endosulphan sulphate	ug/l			-	<0.01	<0.01	<0.01	<0.01
Endrin	ug/l		0.01	0.01	<0.01	<0.01	<0.01	<0.01
Gamma-HCH (BHC)	ug/l			-	<0.01	<0.01	<0.01	<0.01
Heptachlor	ug/l			-	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	ug/l			-	<0.01	<0.01	<0.01	<0.01
o,p'-Methoxychlor	ug/l			-	<0.01	<0.01	<0.01	<0.01
p,p'-DDE	ug/l			-	<0.01	<0.01	<0.01	<0.01
p,p'-DDT	ug/l		0.01	0.01	<0.01	<0.01	<0.01	<0.01
p,p'-Methoxychlor	ug/l			-	<0.01	<0.01	<0.01	<0.01
p,p'-TDE	ug/l			-	<0.01	<0.01	<0.01	<0.01
Pesticides								
Organophosphorus Pesticides								
Azinphos methyl	ug/l			-	<0.01	<0.01	<0.01	<0.01
Diazinon	ug/l			-	<0.01	<0.01	<0.01	<0.01
Dichlorvos	ug/l			-	<0.01	<0.01	<0.01	<0.01
Disulfoton	ug/l			-	<0.01	<0.01	<0.01	<0.01
Ethion	ug/l			-	<0.01	<0.01	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l			-	<0.01	<0.01	<0.01	<0.01
Fenitrothion	ug/l			-	<0.01	<0.01	<0.01	<0.01
Malathion	ug/l			-	<0.02	<0.01	<0.02	<0.01
Methyl Parathion	ug/l			-	<0.01	<0.01	<0.01	<0.01
Mevinphos	ug/l			-	<0.01	<0.01	<0.01	<0.01

Legend
 GW Regs TV - Groundwater Regulations (S.I. No. 366 of 2016) Groundwater Thresh 10 Exceedance NAC No Abnormal Change
 EPA IG - EPA Interim Guidelines Values for Groundwater (2003) 10 Exceedance above EPA IG
 SW AA EQS - Surface Water Regulation (S.I. No. 386 of 2015) Annual Average EQ 10 Exceedance above SW EQS

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Date	Units	GW Regs (2016) TV	EPA IGW value (GW)	LW4		
				17/10/2018	09/11/2018	14/11/2018
				City Analysis Lab Reference Exova Jones Lab reference	18-49137	18-49360
		(*2010 regs)		18/16725	18/18062	18/18491
Dissolved Arsenic	ug/l	7.5	10	<2.5	7.2	<2.5
Dissolved Boron	mg/l	(0.75)*	1	0.022	0.021	0.023
Dissolved Cadmium	mg/l	(0.00375)*	0.005	<0.0005	<0.0005	<0.0005
Dissolved Calcium	mg/l		200	69.9	75	78.3
Total Dissolved Chromium	mg/l	0.0375	0.03	0.0026	<0.0015	0.018
Dissolved Copper	ug/l	(1500)*	30	<7	<7	<7
Total Dissolved Iron	mg/l		0.2	12.6	11.38	13.3
Dissolved Lead	ug/l	7.5	10	<5	<5	<5
Dissolved Magnesium	mg/l		50	4.2	5	5.1
Dissolved Manganese	mg/l		0.05	3.44	3.637	3.937
Dissolved Mercury	ug/l	0.75	1	<1	<1	<1
Dissolved Nickel	mg/l		0.02	<0.002	0.002	<0.002
Dissolved Potassium	mg/l		5	2.3	3.2	2.8
Dissolved Sodium	mg/l	(150)*	150	10.6	13.7	13
Dissolved Zinc	mg/l		0.1	0.005	0.004	<0.003
Coliforms	MPN/100ml	-	0	-	4520	6550
Faecal Coliforms	cfu/100ml	-	0	-	1400	95
E.coli	MPN/100ml	-	0	-	3.1	77.1
pH	pH units		6.5-9.5	6.93	7.23	6.7
Conductivity- Electrical 25C	uS/cm	800-1875	1000	488	432	507
Redox	mV		-	147.41	13.82	234.46
Ammoniacal Nitrogen as N #	mg/l	0.175	-	3.37	3.6	4.33
Total Oxidised Nitrogen as N	mg/l		NAC	<0.2	<0.2	<0.2
BOD (Settled)	mg/l			10	21	15
COD (Settled)	mg/l			12	30	32
Total Organic Carbon	mg/l		-	<2	<2	<2
Total Dissolved Solids	mg/l		1000	293	352	292
Total Suspended Solids	mg/l		-	1601	1539	1013
Sulphate as SO4	mg/l	187.5	200	5.1	2.5	5.2
Chloride	mg/l	187.5	30	15.9	17	18.2
MRP Ortho Phosphate as PO4	mg/l	0.035	0.03	<0.03	<0.03	<0.03
Total Cyanide	ug/l	(37.5)*	0.01	<0.01	<0.01	<0.01
Fluoride	mg/l	-	1	<0.3	<0.3	<0.3
Total Alkalinity as CaCO3	mg/l	-	NAC	294	306	312
Total Phenols HPLC	mg/l		0.0005	<0.15	<0.15	<0.15
Sulphide	ug/l		-	<10	<10	<10
PAH MS						
Naphthalene	ug/l		1	0.1	<0.1	0.1
Acenaphthylene #	ug/l			<0.013	<0.013	<0.013
Acenaphthene #	ug/l			0.222	0.243	0.193
Fluorene #	ug/l			0.172	0.198	0.14
Phenanthrene #	ug/l			0.076	0.063	0.071
Anthracene #	ug/l		10000	0.023	0.024	0.015
Fluoranthene #	ug/l			0.066	0.094	0.061
Pyrene #	ug/l			0.05	0.068	0.048
Benzo(a)anthracene #	ug/l			<0.015	<0.015	<0.015
Chrysene #	ug/l			<0.011	<0.011	<0.011
Benzo(bk)fluoranthene #	ug/l			<0.018	<0.018	<0.018
Benzo(a)pyrene #	ug/l	0.0075	0.01	<0.016	<0.016	<0.016
Indeno(123cd)pyrene #	ug/l		0.05	<0.011	<0.011	<0.011
Dibenzo(ah)anthracene #	ug/l			<0.01	<0.01	<0.01
Benzo(ghi)perylene #	ug/l			<0.011	<0.011	<0.011
PAH 16 Total #	ug/l			0.709	0.69	0.628
Benzo(b)fluoranthene	ug/l		0.5	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	ug/l		0.05	<0.01	<0.01	<0.01
PAH Surrogate % Recovery	%			87	93	70

Phenols						
2-Chlorophenol	ug/l		2000	<2	<1	3
2-Methylphenol	ug/l			<1.0	<0.5	<0.5
2-Nitrophenol	ug/l			<1.0	<0.5	<0.5
2,4-Dichlorophenol	ug/l			<1.0	<0.5	<0.5
2,4-Dimethylphenol	ug/l			<2	<1	<1
2,4,5-Trichlorophenol	ug/l			<1.0	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l		200	<2	<1	<1
4-Chloro-3-methylphenol	ug/l			<1.0	<0.5	<0.5
4-Methylphenol	ug/l			<2	<1	<1
4-Nitrophenol	ug/l			<20	<10	<10
Pentachlorophenol	ug/l		2	<2	<1	<1
Phenol	ug/l		0.5	<2	<1	<1
PAHs						
2-Chloronaphthalene	ug/l	Total PAH:	Total PAH:	<2	<1	<1
2-Methylnaphthalene	ug/l	0.075ug/l	0.1ug/l	<2	<1	<1
Phthalates						
Bis(2-ethylhexyl) phthalate	ug/l		-	<10	<5	<5
Butylbenzyl phthalate	ug/l		-	<2	<1	<1
Di-n-butyl phthalate	ug/l		2	<3.0	<1.5	<1.5
Di-n-Octyl phthalate	ug/l		-	<2	<1	<1
Diethyl phthalate	ug/l		-	<2	<1	<1
Dimethyl phthalate	ug/l		-	<2	<1	<1
SVOC MS						
Other SVOCs						
1,2-Dichlorobenzene	ug/l			<2	<1	<1
1,2,4-Trichlorobenzene	ug/l			<2	<1	<1
1,3-Dichlorobenzene	ug/l			<2	<1	<1
1,4-Dichlorobenzene	ug/l			11	11	13
2-Nitroaniline	ug/l			<2	<1	<1
2,4-Dinitrotoluene	ug/l			<1.0	<0.5	<0.5
2,6-Dinitrotoluene	ug/l			<2	<1	<1
3-Nitroaniline	ug/l			<2	<1	<1
4-Bromophenylphenylether	ug/l			<2	<1	<1
4-Chloroaniline	ug/l			<2	<1	<1
4-Chlorophenylphenylether	ug/l			<2	<1	<1
4-Nitroaniline	ug/l			<1.0	<0.5	<0.5
Azobenzene	ug/l			<1.0	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l			<1.0	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l			<2	<1	<1
Carbazole	ug/l			<1.0	<0.5	<0.5
Dibenzofuran	ug/l			<1.0	<0.5	<0.5
Hexachlorobenzene	ug/l			<2	<1	<1
Hexachlorobutadiene	ug/l			<2	<1	<1
Hexachlorocyclopentadiene	ug/l			<2	<1	<1
Hexachloroethane	ug/l			<2	<1	<1
Isophorone	ug/l			<1.0	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l			<1.0	<0.5	<0.5
Nitrobenzene	ug/l			<2	<1	<1
Surrogate Recovery 2-Fluorobiphenyl	%			119	118	123
Surrogate Recovery 2-Fluorobiphenyl	%			145	125	126
VOC MS						
Dichlorodifluoromethane	ug/l			<2	<2	<2
Methyl Tertiary Butyl Ether	ug/l	10	30	<0.1	<0.1	<0.1
Chloromethane	ug/l			<3	<3	<3
Vinyl Chloride	ug/l	0.375		0.1	<0.1	<0.1
Bromomethane	ug/l			<1	<1	<1
Chloroethane	ug/l			<3	<3	<3
Trichlorofluoromethane	ug/l			<3	<3	<3
1,1-Dichloroethene (1,1 DCE)	ug/l			<3	<3	<3
Dichloromethane (DCM)	ug/l	15	10	<5	<5	<5
trans-1-2-Dichloroethene	ug/l	0.375		<3	<3	<3
1,1-Dichloroethane	ug/l			<3	<3	<3
cis-1-2-Dichloroethene	ug/l			<3	<3	<3

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p,p'-DDE	ug/l		Total Pesticides: 0.5ug/l	<0.01	<0.01	<0.01
p,p'-DDT	ug/l			<0.01	<0.01	<0.01
p,p'-Methoxychlor	ug/l			<0.01	<0.01	<0.01
p,p'-TDE	ug/l			<0.01	<0.01	<0.01
Organophosphorus Pesticides						
Azinphos methyl	ug/l	Total Pesticides; 0.375ug/l		<0.01	<0.01	<0.01
Diazinon	ug/l		<0.01	<0.01	<0.01	
Dichlorvos	ug/l		<0.01	<0.01	<0.01	
Disulfoton	ug/l		<0.01	<0.01	<0.01	
Ethion	ug/l		<0.01	<0.01	<0.01	
Ethyl Parathion (Parathion)	ug/l		<0.01	<0.01	<0.01	
Fenitrothion	ug/l		<0.01	<0.01	<0.01	
Malathion	ug/l		<0.01	<0.02	<0.01	
Methyl Parathion	ug/l		<0.01	<0.01	<0.01	
Mevinphos	ug/l	<0.01	<0.01	<0.01		

Legend		
GW Regs TV - Groundwater Regulations (S.I. No. 366 of 2016) Groundwater Threshold Values		10
EPA IGV - EPA Interim Guidelines Values for Groundwater (2003)		10
SW AA EQS - Surface Water Regulation (S.I. No. 386 of 2015) Annual Average EQS		

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Hexachlorobutadiene	ug/l	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Naphthalene	ug/l	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,2,3-Trichlorobenzene	ug/l	0.4	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
SVOC MS													
Phenols													
2-Chlorophenol #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Methylphenol #	ug/l	-	<0.5	2.9	<0.5	<0.5	<0.5	<0.5	<0.5	2	<0.5	<0.5	<0.5
2-Nitrophenol	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.8	<0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,5-Trichlorophenol #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chloro-3-methylphenol #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Methylphenol	ug/l	-	<1	3	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Nitrophenol	ug/l	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenol	ug/l	8	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PAHs													
2-Chloronaphthalene #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Methylnaphthalene #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phthalates													
Bis(2-ethylhexyl) phthalate	ug/l	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Butylbenzyl phthalate	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Di-n-butyl phthalate #	ug/l	-	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Diethyl phthalate #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dimethyl phthalate	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Other SVOCs													
1,2-Dichlorobenzene #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene #	ug/l	0.4	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Nitroaniline	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4-Dinitrofluorene #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-Dinitrofluorene	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3-Nitroaniline	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Bromophenylphenylether #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chloroaniline	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chlorophenylphenylether #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Nitroaniline	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azobenzene #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethoxy)methane #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbazole #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzofuran #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorocyclopentadiene	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorothane #	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Isophorone #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
N-nitrosod-n-propylamine #	ug/l	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrobenzene	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Pesticides													
Organochlorine Pesticides													
Aldrin	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Alpha-HCH (BHC)	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03
Beta-HCH (BHC)	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Delta-HCH (BHC)	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Dieldrin	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Endosulphan I	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Endosulphan II	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Endosulphan sulphate	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Endrin	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Gamma-HCH (BHC)	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Heptachlor	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Heptachlor Epoxide	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
o,p'-Methoxychlor	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
p,p'-DDE	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
p,p'-DDT	ug/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
p,p'-Methoxychlor	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
p,p'-TDE	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Organophosphorus Pesticides													
Azinphos methyl	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Diazinon	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Dichlorvos	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Disulfoton	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Ethion	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Ethyl Parathion (Parathion)	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Fenitrothion	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Malathion	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Methyl Parathion	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Mevinphos	ug/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.03	<0.03
Legend													
SW AA EQS - Surface Water Regulation (S.I. No. 272 of 2009) Annual Average EQS													
SW AA EQS - Surface Water Regulation (S.I. No. 386 of 2015) Annual Average EQS													
10 Above Detection Limit													
10 Exceedance above SW EQS													
* Good status indicial or for River water body													

Soil Leachate

Sample ID	Depth	GW Regs (2016) TV	EPA IG V value (GW)	TP1	TP7	TP8
				2.5m	4.5m	2.5m
Sample Date				03/10/2018	09/11/2018	22/10/2018
Exova Jones Lab Reference				18/16111	18/17215	18/17215
Parameter	Units	GW Regs (2010) TV	EPA IG V value (GW)			
Dissolved Antimony	ug/l			9	7	<2
Dissolved Arsenic	ug/l	7.5	10	8.7	9	<2.5
Dissolved Barium	ug/l			83	16	95
Dissolved Boron	mg/l	(0.75)*	1	0.72	0.149	0.143
Dissolved Cadmium	mg/l	(0.00375)*	0.005	<0.0005	<0.0005	<0.0005
Dissolved Calcium	mg/l		200	41.8	13.3	138.8
Dissolved Chromium	mg/l	0.0375	0.03	<0.002	<0.0015	<0.0015
Dissolved Copper	mg/l	(1500)*	30	<0.007	0.0014	<0.007
Dissolved Iron	mg/l		0.2	2.794	0.117	<0.02
Dissolved Lead	mg/l	0.0075	0.01	<0.005	<0.005	<0.005
Dissolved Magnesium	mg/l		50	23.6	2.1	12.2
Dissolved Manganese	mg/l		0.05	151	<0.002	0.108
Dissolved Mercury	ug/l	0.75	1	<1	<1	<1
Dissolved Molybdenum	ug/l		-	78	28	11
Dissolved Nickel	ug/l		20	30	10	5
Dissolved Potassium	mg/l		5	44.6	13.5	8.1
Dissolved Selenium	ug/l		-	<3	<3	<3
Dissolved Sodium	mg/l	(150)*	150	84.6	10.1	3.2
Dissolved Zinc	mg/l		0.1	0.006	<0.003	0.01
PAH MS						
Naphthalene	ug/l			1.8	0.3	<0.1
Acenaphthylene	ug/l			0.022	0.015	<0.013
Acenaphthene	ug/l			0.255	0.039	<0.013
Fluorene	ug/l			0.168	0.027	<0.014
Phenanthrene	ug/l			0.566	0.056	0.022
Anthracene	ug/l			0.136	<0.013	<0.013
Fluoranthene	ug/l			0.639	0.090	0.066
Pyrene	ug/l			0.555	0.084	0.099
Benzo(a)anthracene	ug/l			0.222	0.046	0.042
Chrysene	ug/l			0.257	0.040	0.048
Benzo(b)fluoranthene	ug/l			0.215	0.060	0.088
Benzo(a)pyrene	ug/l	0.0075		0.188	0.027	0.058
Indeno(123cd)pyrene	ug/l			<0.011	<0.011	0.021
Dibenzo(ah)anthracene	ug/l			<0.01	<0.01	<0.01
Benzo(ghi)perylene	ug/l			<0.011	<0.011	0.039
PAH 16 Total	ug/l		0.1	5.023	0.784	0.483
Benzo(b)fluoranthene	ug/l			0.15	0.04	0.06
Benzo(k)fluoranthene	ug/l			0.06	0.02	0.02
PAH Surrogate % Recovery	%			76	78	71
Aliphatics						
>C5-C6	ug/l			<10	<10	<10
>C6-C8	ug/l			<10	<10	<10
>C8-C10	ug/l			<10	<10	<10
>C10-C12	ug/l			<5	<5	<5
>C12-C16	ug/l			<10	<10	<10
>C16-C21	ug/l			<10	<10	<10
>C21-C35	ug/l			<10	<10	<10
Total aliphatics C5-35	ug/l			<10	<10	<10
Aromatics						
>C5-EC7	ug/l			<10	<10	<10
>EC7-EC8	ug/l			<10	<10	<10
>EC8-EC10	ug/l			<10	<10	<10
>EC10-EC12	ug/l			104	<5	<5
>EC12-EC16	ug/l			<10	<10	<10
>EC16-EC21	ug/l			<10	<10	<10
>EC21-EC35	ug/l			<10	<10	<10
Total aromatics C5-35	ug/l			104	<10	<10
Total aliphatics and aromatics(C5-35)	ug/l			104	<10	<10
Fluoride	mg/l		1	<0.3	0.5	<0.3
Sulphate as SO4	mg/l	187.5	200	57.02	19.95	240.57
Chloride	mg/l	187.5	30	64.4	10.0	0.8
Nitrite as NO2	mg/l	0.375	0.375	<0.02	0.07	1.21
MRP Ortho Phosphate as PO4	mg/l	0.035	0.03	<0.06	<0.06	<0.06
Total Oxidised Nitrogen as N	mg/l		NAC	0.2	<0.2	12.7
Total Cyanide	ug/l	(37.5)*	10	20	<10	<10
Ammoniacal Nitrogen as N	mg/l	0.175	-	37.35	23.21	0.11
BOD (Settled)	mg/l	-	-	77	5	8
COD (Settled)	mg/l	-	-	429	906 _{AA}	55
Dissolved Organic Carbon	mg/l			46	11	7
Electrical Conductivity @25C	uS/cm	800-1875	1000	1189	362	685
pH	pH units		6.5-9.5	8.07	8.45	8.04
Total Dissolved Solids	mg/l		1000	623	213	499
Phenols						
2-Chlorophenol	ug/l		200	<1	<1	<1
2-Methylphenol	ug/l			<0.5	<0.5	<0.5
2-Nitrophenol	ug/l			<0.5	<0.5	<0.5
2,4-Dichlorophenol	ug/l			<0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l			<1	<1	<1
2,4,5-Trichlorophenol	ug/l			<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l		200	<1	<1	<1
4-Chloro-3-methylphenol	ug/l			<0.5	<0.5	<0.5
4-Methylphenol	ug/l			<1	<1	<1
4-Nitrophenol	ug/l			<10	<10	<10
Pentachlorophenol	ug/l		2	<1	<1	<1
Phenol	ug/l		0.5	<1	<1	<1
PAHs						
2-Chloronaphthalene	ug/l			<1	<1	<1
2-Methylnaphthalene	ug/l			<1	<1	<1
Phthalates						
Bis(2-ethylhexyl) phthalate	ug/l		-	<5	<5	<5
Butylbenzyl phthalate	ug/l		-	<1	<1	<1
Di-n-butyl phthalate	ug/l		2	<1.5	5.7	<1.5
Di-n-Octyl phthalate	ug/l		-	<1	<1	<1
Diethyl phthalate	ug/l		-	<1	<1	<1
Dimethyl phthalate	ug/l		-	<1	<1	<1

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Other SVOCs						
1,2-Dichlorobenzene	ug/l			<1	<1	<1
1,2,4-Trichlorobenzene	ug/l			<1	<1	<1
1,3-Dichlorobenzene	ug/l			<1	<1	<1
1,4-Dichlorobenzene	ug/l			<1	<1	<1
2-Nitroaniline	ug/l			<1	<1	<1
2,4-Dinitrotoluene	ug/l			<0.5	<0.5	<0.5
2,6-Dinitrotoluene	ug/l			<1	<1	<1
3-Nitroaniline	ug/l			<1	<1	<1
4-Bromophenylphenylether	ug/l			<1	<1	<1
4-Chloroaniline	ug/l			<1	<1	<1
4-Chlorophenylphenylether	ug/l			<1	<1	<1
4-Nitroaniline	ug/l			<0.5	<0.5	<0.5
Azobenzene	ug/l			<0.5	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l			<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l			<1	<1	<1
Carbazole	ug/l			<0.5	<0.5	<0.5
Dibenzofuran	ug/l			<0.5	<0.5	<0.5
Hexachlorobenzene	ug/l			<1	<1	<1
Hexachlorobutadiene	ug/l			<1	<1	<1
Hexachlorocyclopentadiene	ug/l			<1	<1	<1
Hexachloroethane	ug/l			<1	<1	<1
Isophorone	ug/l			<0.5	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l			<0.5	<0.5	<0.5
Nitrobenzene	ug/l			<1	<1	<1
Surrogate Recovery 2-Fluorobiphenyl	%			120	112	101
Surrogate Recovery p-Terphenyl-d14	%			125	127	101
VOC MS						
Dichlorodifluoromethane	ug/l			<2	<2	<2
Methyl Tertiary Butyl Ether	ug/l	10	30	<1	<1	<1
Chloromethane	ug/l			<3	<3	<3
Vinyl Chloride	ug/l	0.375		<0.1	<0.1	<0.1
Bromomethane	ug/l			<1	<1	<1
Chloroethane	ug/l			<3	<3	<3
Trichlorofluoromethane	ug/l			<3	<3	<3
1,1-Dichloroethene (1,1 DCE)	ug/l			<3	<3	<3
Dichloromethane (DCM)	ug/l	15	10	<5	<5	<5
trans-1-2-Dichloroethene	ug/l	0.375		<3	<3	<3
1,1-Dichloroethane	ug/l			<3	<3	<3
cis-1-2-Dichloroethene	ug/l			3	<3	<3
2,2-Dichloropropane	ug/l			<1	<1	<1
Bromochloromethane	ug/l			<2	<2	<2
Chloroform	ug/l			<2	<2	<2
1,1,1-Trichloroethane	ug/l			<2	<2	<2
1,1-Dichloropropene	ug/l			<3	<3	<3
Carbon tetrachloride	ug/l			<2	<2	<2
1,2-Dichloroethane	ug/l	2.25	3	<2	<2	<2
Benzene	ug/l	0.75	1	<0.5	<0.5	<0.5
Trichloroethene (TCE)	ug/l	7.5	10	<3	<3	<3
1,2-Dichloropropane	ug/l			<2	<2	<2
Dibromomethane	ug/l			<3	<3	<3
Bromodichloromethane	ug/l			<2	<2	<2
cis-1-3-Dichloropropene	ug/l			<2	<2	<2
Toluene	ug/l	525	10	<5	<5	<5
trans-1-3-Dichloropropene	ug/l			<2	<2	<2
1,1,2-Trichloroethane	ug/l			<2	<2	<2
Tetrachloroethene (PCE)	ug/l	7.5	40	<3	<3	<3
1,3-Dichloropropane	ug/l			<2	<2	<2
Dibromochloromethane	ug/l			<2	<2	<2
1,2-Dibromoethane	ug/l			<2	<2	<2
Chlorobenzene	ug/l			228	<2	<2
1,1,1,2-Tetrachloroethane	ug/l			<2	<2	<2
Ethylbenzene	ug/l			<1	<1	<1
p/m-Xylene	ug/l		10	<2	<2	<2
o-Xylene	ug/l			2	<1	<1
Styrene	ug/l			<2	<2	<2
Bromoform	ug/l			<2	<2	<2
Isopropylbenzene	ug/l			<3	<3	<3
1,1,2,2-Tetrachloroethane	ug/l			<4	<4	<4
Bromobenzene	ug/l			<2	<2	<2
1,2,3-Trichloropropane	ug/l			<3	<3	<3
Propylbenzene	ug/l			<3	<3	<3
2-Chlorotoluene	ug/l			<3	<3	<3
1,3,5-Trimethylbenzene	ug/l			4	<3	<3
4-Chlorotoluene	ug/l			<3	<3	<3
tert-Butylbenzene	ug/l			<3	<3	<3
1,2,4-Trimethylbenzene	ug/l			<3	<3	<3
sec-Butylbenzene	ug/l			<3	<3	<3
4-Isopropyltoluene	ug/l			<3	<3	<3
1,3-Dichlorobenzene	ug/l			<3	<3	<3
1,4-Dichlorobenzene	ug/l			2475	<3	<3
n-Butylbenzene	ug/l			<3	<3	<3
1,2-Dichlorobenzene	ug/l			<3	<3	<3
1,2-Dibromo-3-chloropropane	ug/l			<2	<2	<2
1,2,4-Trichlorobenzene	ug/l			<3	<3	<3
Hexachlorobutadiene	ug/l			<3	<3	<3
Naphthalene	ug/l		1	<2	<2	<2
1,2,3-Trichlorobenzene	ug/l			<3	<3	<3
Surrogate Recovery Toluene D8	%			105	110	103
Surrogate Recovery 4-Bromofluorobenzene	%			105	100	103

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Legend	GW Regs TV - Groundwater Regulations (S.I. No. 366 of 2016) Groundwater Threshold Values	Exceedance above GW Regs TV	NAC	No Abnormal Change
	EPA IGW - EPA Interim Guidelines Values for Groundwater (2003)	Exceedance above EPA IGW	NDP	No Determination Possible
	SW AA EQS - Surface Water Regulation (S.I. No. 386 of 2015) Annual Average EQS			

Sample ID	UK Soil Guideline Values (SGVs)	CL:AIRE Generic Assessment Criteria	LQM/ClEH Generic Assessment Criteria			1-TP7	2-TP4	3-TP6	4-TP1
Depth						0.2	0.3	0.2	0.4
Sample Date						05/11/2018	05/11/2018	05/11/2018	05/11/2018
JE Sample No	POSresi	POSresi	POSresi						
Parameter				Units	LOD				
Dissolved Arsenic	-	79	79	mg/kg	<0.5	14	21.3	15.9	14.9
Dissolved Cadmium	-	220	120	mg/kg	<0.1	1.8	2	1.9	2
Dissolved Chromium	5900	-	1500	mg/kg	<0.5	89	71.7	58	55.3
Dissolved Copper	12000	-	12000	mg/kg	<1	36	50	40	36
Dissolved Lead	-	630	630	mg/kg	<5	82	111	79	49
Dissolved Mercury	26	-	16	mg/kg	<0.1	<0.1	0.2	0.1	<0.1
Dissolved Nickel	290	-	230	mg/kg	<0.7	38.6	51.5	43.8	40.6
Dissolved Selenium	1300	-	1100	mg/kg	<1	2	2	2	2
Dissolved Zinc	80000	-	81000	mg/kg	<5	157	174	123	133
PAH MS									
Naphthalene [#]	4200	-	4900	mg/kg	<0.04	<0.40	<0.04	<0.40	<0.04
Acenaphthylene	14000	-	15000	mg/kg	<0.03	<0.30	<0.03	<0.30	<0.03
Acenaphthene [#]	14000	-	15000	mg/kg	<0.05	<0.50	<0.05	<0.50	<0.05
Fluorene [#]	9800	-	9900	mg/kg	<0.04	<0.40	<0.04	<0.40	<0.04
Phenanthrene [#]	3000	-	3100	mg/kg	<0.03	<0.30	0.18	<0.40	<0.03
Anthracene [#]	74000	-	74000	mg/kg	<0.04	<0.40	<0.04	<0.40	<0.04
Fluoranthene [#]	3000	-	3100	mg/kg	<0.03	<0.30	0.32	<0.40	<0.03
Pyrene [#]	7400	-	7400	mg/kg	<0.03	<0.30	0.3	<0.40	<0.03
Benzo(a)anthracene [#]	17	-	29	mg/kg	<0.06	<0.60	0.25	<0.40	<0.06
Chrysene [#]	25	-	57	mg/kg	<0.02	<0.20	0.24	<0.40	<0.02
Benzo(b)fluoranthene [#]	18	-	190	mg/kg	<0.07	<0.70	0.46	<0.40	<0.07
Benzo(a)pyrene [#]	-	10	5.7	mg/kg	<0.04	<0.70	0.22	<0.40	<0.04
Indeno(123cd)pyrene [#]	11	-	82	mg/kg	<0.04	<0.70	0.15	<0.40	<0.04
Dibenzo(a,h)anthracene [#]	2.3	-	0.58	mg/kg	<0.04	<0.70	<0.04	<0.40	<0.04
Benzo(ghi)perylene [#]	110	-	640	mg/kg	<0.04	<0.70	0.15	<0.40	<0.04
PAH 16 Total	-	-	-	mg/kg	<0.64	<0.70	2.3	<0.40	<0.6
Benzo(b)fluoranthene	18	-	7.2	mg/kg	<0.05	<0.70	0.33	<0.40	<0.05
Benzo(k)fluoranthene	25	-	190	mg/kg	<0.02	<0.70	0.13	<0.40	<0.02
PAH Surrogate % Recovery	-	-	-	%	<0	<0.70	96	<0.40	98
VOC MS									
Dichlorodifluoromethane	-	-	-	ug/kg	<2	<2	<2	<2	<2
Methyl Tertiary Butyl Ether [#]	-	-	43000000	ug/kg	<2	<2	<2	<2	<2
Chloromethane [#]	-	-	-	ug/kg	<3	15	24	24	21
Vinyl Chloride	-	-	3500	ug/kg	<2	<2	<2	<2	<2
Bromomethane	-	-	-	ug/kg	<1	<1	<1	<1	<1
Chloroethane [#]	-	-	-	ug/kg	<2	<2	<2	<2	<2
Trichlorofluoromethane [#]	-	-	-	ug/kg	<2	<2	<2	<2	<2
1,1-Dichloroethene (1,1 DCE) [#]	-	-	-	ug/kg	<6	<6	<6	<6	<6
Dichloromethane (DCM) [#]	-	-	-	ug/kg	<30	<30	<30	<30	<30
trans-1-2-Dichloroethene [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
1,1-Dichloroethane [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
cis-1-2-Dichloroethene [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
2,2-Dichloropropane	-	-	-	ug/kg	<4	<4	<4	<4	<4
Bromochloromethane [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
Chloroform [#]	-	-	2500000	ug/kg	<3	<3	<3	<3	<3
1,1,1-Trichloroethane [#]	-	-	14000000	ug/kg	<3	<3	<3	<3	<3
1,1-Dichloropropene [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
Carbon tetrachloride [#]	-	-	950000	ug/kg	<4	<4	<4	<4	<4
1,2-Dichloroethane [#]	-	-	29000	ug/kg	<4	<4	<4	<4	<4
Benzene [#]	72000	140000	73000	ug/kg	<3	<3	<3	<3	<3
Trichloroethene (TCE) [#]	-	-	120000	ug/kg	<3	<3	<3	<3	<3
1,2-Dichloropropane [#]	-	-	-	ug/kg	<6	<6	<6	<6	<6
Dibromomethane [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
Bromodichloromethane [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
cis-1-3-Dichloropropene	-	-	-	ug/kg	<4	<4	<4	<4	<4
Toluene [#]	5600000	-	5600000	ug/kg	<3	<3	<3	<3	<3
trans-1-3-Dichloropropene	-	-	-	ug/kg	<3	<3	<3	<3	<3
1,1,2-Trichloroethane [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
Tetrachloroethene (PCE) [#]	-	-	1400000	ug/kg	<3	<3	<3	<3	<3
1,3-Dichloropropane [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
Dibromochloromethane [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
1,2-Dibromoethane [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
Chlorobenzene [#]	-	-	14000000	ug/kg	<3	<3	<3	<3	<3
1,1,1,2-Tetrachloroethane	-	-	1400000	ug/kg	<3	<3	<3	<3	<3
Ethylbenzene [#]	25000000	-	25000000	ug/kg	<3	<3	<3	<3	<3
p/m-Xylene [#]	43000000	-	43000000	ug/kg	<5	<5	<5	<5	<5
o-Xylene [#]	43000000	-	43000000	ug/kg	<3	<3	<3	<3	<3
Styrene	-	-	-	ug/kg	<3	<3	<3	<3	<3
Bromoform	-	-	-	ug/kg	<3	<3	<3	<3	<3
Isopropylbenzene [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
1,1,2,2-Tetrachloroethane [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
Bromobenzene	-	-	-	ug/kg	<2	<2	<2	<2	<2
1,2,3-Trichloropropane [#]	-	-	-	ug/kg	<4	<4	<4	<4	<4
Propylbenzene [#]	-	-	-	ug/kg	<4	<4	<4	<4	<4
2-Chlorotoluene	-	-	-	ug/kg	<3	<3	<3	<3	<3
1,3,5-Trimethylbenzene [#]	-	-	-	ug/kg	<3	<3	<3	<3	<3
4-Chlorotoluene	-	-	-	ug/kg	<3	<3	<3	<3	<3
tert-Butylbenzene [#]	-	-	-	ug/kg	<5	<5	<5	<5	<5

1,2,4-Trimethylbenzene [#]	-	-	-	ug/kg	<6	<6	<6	<6	<6
sec-Butylbenzene [#]	-	-	-	ug/kg	<4	<4	<4	<4	<4
4-Isopropyltoluene [#]	-	-	-	ug/kg	<4	<4	<4	<4	<4
1,3-Dichlorobenzene [#]	-	-	300000	ug/kg	<4	<4	<4	<4	<4
1,4-Dichlorobenzene [#]	-	-	17000000	ug/kg	<4	<4	<4	<4	<4
n-Butylbenzene [#]	-	-	-	ug/kg	<4	<4	<4	<4	<4
1,2-Dichlorobenzene [#]	-	-	98000000	ug/kg	<4	<4	<4	<4	<4
1,2-Dibromo-3-chloropropane [#]	-	-	-	ug/kg	<4	<4	<4	<4	<4
1,2,4-Trichlorobenzene [#]	-	-	1800000	ug/kg	<7	<7	<7	<7	<7
Hexachlorobutadiene	-	-	25000	ug/kg	<4	<4	<4	<4	<4
Naphthalene	4200000	-	4900000	ug/kg	<27	<27	<27	<27	<27
1,2,3-Trichlorobenzene [#]	-	-	1800000	ug/kg	<7	<7	<7	<7	<7
Surrogate Recovery Toluene D8	-	-	-	%	<0	91	95	92	90
Surrogate Recovery 4-Bromofluorobenzene	-	-	-	%	<0	71	76	71	72
SVOC MS									
Phenols									
2-Chlorophenol [#]	-	-	-	ug/kg	<10	<10	<10	<10	<10
2-Methylphenol	-	-	-	ug/kg	<10	<10	<10	<10	<10
2-Nitrophenol	-	-	-	ug/kg	<10	<10	<10	<10	<10
2,4-Dichlorophenol [#]	-	-	-	ug/kg	<10	<10	<10	<10	<10
2,4-Dimethylphenol	-	-	-	ug/kg	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	-	-	-	ug/kg	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	-	-	-	ug/kg	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	-	-	-	ug/kg	<10	<10	<10	<10	<10
4-Methylphenol	-	-	-	ug/kg	<10	<10	<10	<10	<10
4-Nitrophenol	-	-	-	ug/kg	<10	<10	<10	<10	<10
Pentachlorophenol	-	-	60000	ug/kg	<10	<10	<10	<10	<10
Phenol [#]	10000	-	1300000	ug/kg	<10	<10	<10	<10	<10
PAHs									
2-Chloronaphthalene [#]	-	-	-	ug/kg	<10	<10	<10	<10	<10
2-Methylnaphthalene [#]	-	-	-	ug/kg	<10	<10	<10	<10	<10
Phthalates									
Bis(2-ethylhexyl) phthalate	-	-	-	ug/kg	<100	<100	<100	<100	<100
Butylbenzyl phthalate	-	-	-	ug/kg	<100	<100	<100	<100	<100
Di-n-butyl phthalate	-	-	-	ug/kg	<100	<100	<100	<100	<100
Di-n-Octyl phthalate	-	-	-	ug/kg	<100	<100	<100	<100	<100
Diethyl phthalate	-	-	-	ug/kg	<100	<100	<100	<100	<100
Dimethyl phthalate [#]	-	-	-	ug/kg	<100	<100	<100	<100	<100
Other SVOCs									
1,2-Dichlorobenzene	-	-	98000000	ug/kg	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene [#]	-	-	19000000	ug/kg	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	-	-	300000	ug/kg	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	-	-	17000000	ug/kg	<10	<10	<10	<10	<10
2-Nitroaniline	-	-	-	ug/kg	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	-	-	-	ug/kg	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	-	-	-	ug/kg	<10	<10	<10	<10	<10
3-Nitroaniline	-	-	-	ug/kg	<10	<10	<10	<10	<10
4-Bromophenylphenylether [#]	-	-	-	ug/kg	<10	<10	<10	<10	<10
4-Chloroaniline	-	-	-	ug/kg	<10	<10	<10	<10	<10
4-Chlorophenylphenylether	-	-	-	ug/kg	<10	<10	<10	<10	<10
4-Nitroaniline	-	-	-	ug/kg	<10	<10	<10	<10	<10
Azobenzene	-	-	-	ug/kg	<10	<10	<10	<10	<10
Bis(2-chloroethoxy)methane	-	-	-	ug/kg	<10	<10	<10	<10	<10
Bis(2-chloroethyl)ether	-	-	-	ug/kg	<10	<10	<10	<10	<10
Carbazole	-	-	-	ug/kg	<10	<10	<10	<10	<10
Dibenzofuran [#]	-	-	-	ug/kg	<10	<10	<10	<10	<10
Hexachlorobenzene	-	-	16000	ug/kg	<10	<10	<10	<10	<10
Hexachlorobutadiene [#]	-	-	25000	ug/kg	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	-	-	-	ug/kg	<10	<10	<10	<10	<10
Hexachloroethane	-	-	-	ug/kg	<10	<10	<10	<10	<10
Isophorone [#]	-	-	-	ug/kg	<10	<10	<10	<10	<10
N-nitrosodi-n-propylamine [#]	-	-	-	ug/kg	<10	<10	<10	<10	<10
Nitrobenzene [#]	-	-	-	ug/kg	<10	<10	<10	<10	<10
Surrogate Recovery 2-Fluorobiphenyl	-	-	-	%	<0	118	116	118	125
Surrogate Recovery p-Terphenyl-d14	-	-	-	%	<0	123	108	127	129
Total Phenols HPLC	10000	-	1300	mg/kg	<0.15	<0.15	0.19	<0.15	<0.15
Natural Moisture Content	-	-	-	mg/kg	<0.6	52.9	47.6	57.9	64.7
Fraction Organic Carbon	-	-	-	mg/kg	<2	0.074	0.054	0.076	0.072
pH [#]	-	-	-	pH units	<0.01	6.73	6.61	7.36	7.4

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APPENDIX K
TABULATED GAS MONITORING RESULTS

*For inspection purposes only.
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Tier 2 Exploratory

Day Tuesday

Date 16th October 2018

Weather as per Met Eireann:

Location	Wind		Weather	Temp °C	Humidity (%)	Rain (mm)	Pressure (hPa)
	Dir	Speed (kts)					
Met Eireann (Dub Airport)	NW	7.1	Cloudy	10 to 15.4		Trace	1013/1010

997mb at 10am

Location	Flow		CH4 (%)	CO2 (%)	O2 (%)		Hex (%)	H2S (ppm)	CO (ppm)	LEL	PID	Height of standpipe above g.l (cm)	Water level (mbgl)	Total depth of BH (mbgl)	Notes
	Peak	Steady			Peak	Steady									
Clondalkin Site															
<i>Onsite</i>															
LW01	0	0	2.2	5.3		14.2	0.157	0	0	50.9	2.3		Dry	7.61	
LW02	0	0	66.7	32.9		0	1.065	0	0	>>>>	>>>>		Dry	3.87	
LW03	0	0	31.2	26.4		0.2	0.67	0	0	>>>>	>>>>		Dry	4.81	
LW04	0	0	62.5	28.7		0.3	1.017	0	0	>>>>	>>>>		5.98	8.21	
LW05	0	0	0.1	5.6		13.5	0.065	0	0	2.5	1		Dry	3.4	

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Tier 2 exploratory

Day: Friday
Date: 19th October 2018

Weather as per Met Eireann:

Location	Wind		Weather	Temp °C	Humidity (%)	Rain (mm)	Pressure (hPa)
	Dir	Speed (kts)					
Met Eireann (Dublin Airport)	NW	4.9	Cloudy	9.7 to 14.0		0	1027/1023

1009mb at 9am
Note: Dip meter was not taken to site

Location	Temp °C	Humidity (%)	Rain (mm)	Pressure (hPa)
Friday	9.7 to 14.0		0	1027/1023

Location	Flow		CH4 (%)	CO2 (%)	O2 (%)	Hex (%)	H2S (ppm)	CO (ppm)	LEL	PID	Height of standpipe above gl (cm)	Total depth of BH (mbgl)	Notes
	Peak (P) (flw)	Steady (S) (flw)											
Bohernabreena													
<i>Onsite</i>													
LW01	0	-0.3	12.6	20.5	2.9	0.409	0	0	>>>>	>>>>			
LW02	0	-0.4	62.4	33.3	0.3	1.007	0	0	>>>>	>>>>			
LW03	-0.2	-0.7	30.9	26.7	0.3	0.663	0	0	>>>>	>>>>			
LW04	-0.1	-0.3	61.1	27.5	1.1	0.997	0	0	>>>>	>>>>			Organic/HC odour
LW05	0	-0.4	0	5.1	10.5	0.031	0	0	0	1			

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Tier 2 exploratory

Monday
5th November 2018

Weather as per Met Eireann:

Location	Wind Dir	Wind Speed (kts)	Weather	Temp °C	Humidity (%)	Rain (mm)	Pressure (ftPa)
Met Eireann (Dublin Airport)	NW	9.2	Cloudy	10.4 to 11.1		6.6	1002/1001

987mb at 9am
Note: Dip meter not taken to site

Location	Flow (ft ³ /hr)		CH4 (%)	CO2 (%)	O2 (%)	Hex (%)	H ₂ S (ppm)	CO (ppm)	LEL	PID	Height of stand pipe above gl (cm)	Total depth of BH (mbgl)	Notes
	Peak	Steady											
Bohernabreena													
<i>On-site</i>													
GW1	0.1	0	0	0.8		18.6	0.01	0	0	1			DP = 0 Pa
GW2	0	0.1	0	0.6		18.3	0.013	0	0	1			DP = -1 Pa
LW01	0	0	1.9	0.9		18.3	0.161	0	0	1.9			DP = 0 Pa. Gas cap damaged but not replaced due to the height of the plain screen.
LW02	0.6	0.1	63.6	31.3		0.2	1.219	0	>>>>	>>>>			DP = 1 Pa. Original gas cap damaged, replaced with a plug cap (image uploaded).
LW03	0.4	0	43.3	29.2		0	0.966	0	>>>>	>>>>			DP = -1 Pa. Gas cap ok, original cap still in use.
LW04	0	-0.1	47.2	24.7		4.8	1.017	0	>>>>	>>>>			DP = -2 Pa. Egg-like odour. Gas cap very damaged, replaced with a yellow cap, screen too high for a plug cap.
LW05	0.1	0	0	7.5		11.4	0.036	0	0	1			DP = 1 Pa. Gas cap ok, could not be replaced with a plug cap due to the height of the screen.
LW06	0.1	0.1	0	12.1		0.4	0.037	0	-10	0			DP = 1 Pa

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Tier 2 exploratory

Day Thursday
Date 8th November 2018

Weather as per Met Eireann:

Location	Wind		Weather	Temp °C	Humidity (%)	Rain (mm)	Pressure (hPa)
	Dir	Speed (Kts)					
Met Eireann (Dublin Airport)	WNW	6.2	Cloudy	9.2 to 10.1		3.3	1004/1005

989mb at 9:30am

Thursday

	Flow		CH4 (%)	CO2 (%)	O2 (%)		Hex (%)	H ₂ S (ppm)	CO (ppm)	LEL	PID	Standing water level (mbagl)	Total depth of BH (mbagl)	Notes
	Peak (PikFlw)	Steady (L/h)			Peak	Steady								
Bohernabreena														
<i>Onsite</i>														
GW1	0.1	0	0	1.3		17.9	0.013	0	0	0	1	7.31		DP = 0 Pa
GW2	0	0	0	0.7		17.4	0.012	0	0	0	1	5.67		DP = 0 Pa
LW01	0.1	0	0	2		18.3	0.044	0	-10	0	1	Dry		DP = 0 Pa
LW02	0.1	0	60.3	34		0.3	1.179	0	0	>>>>	>>>>	Dry		DP = -1 Pa
LW03	0.1	0	41.7	28.2		0.2	0.944	0	0	>>>>	>>>>	Dry		DP = 2 Pa
LW04	0.1	0.1	60.5	31.2		0	1.182	25	0	>>>>	>>>>	6.0		DP = 0 Pa
LW05	0	0	0	1.8		17.1	0.011	0	-10	0	1	Dry		DP = -1 Pa
LW06	0	0	9.6	19.2		0.3	0.432	0	0	>>>>	8.5	Dry		DP = -1 Pa

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Tier 2 exploratory

Day Wednesday
Date 14th November 2018

Weather as per Met Eireann:

Location	Wind		Weather	Temp °C	Humidity (%)	Rain (mm)	Pressure (hPa)
	Dir	Speed (Kts)					
Met Eireann (Dublin Airport)	NW	12.3	Cloudy	13.2 to 14.2		0.7	1009/1010

995mb at 09:00

Wednesday

	Flow		CH4 (%)	CO2 (%)	O2 (%)		Hex (%)	H ₂ S (ppm)	CO (ppm)	LEL	PID	Depth of standing water (mbgl)	Total depth of BH (mbgl)	Notes
	Peak (pkFlw)	Steady (L/h)			Peak	Steady								
Bohernabreena														
<i>Onsite</i>														
GW1	0.1	0	0	0.8	18.7	0.086	0	0	0	0	1	7.29	20.52	DP = 0
GW2	0.1	0	0	0.9	17.2	0.04	0	0	0	0	1	5.76	17.73	DP = 1
LW01	0	0	19.8	25.1	1.8	0.618	0	0	0	>>>>	>>>>	Dry	7.61	DP = 1
LW02	0.1	0	1	0.8	19.7	0.094	0	0	0	22.7	1.5	Dry	3.92	DP = 1
LW03	0	0	32.6	25	1.8	0.808	0	-1	0	>>>>	>>>>	Dry	4.79	DP = -1
LW04	0	0	56.4	28.5	1.4	1.129	26	0	0	>>>>	>>>>	6.0	7.14	DP = 0, Sulphide odour
LW05	0	0	0	7.4	8.8	0.027	0	-10	0	1	1	Dry	3.39	DP = 0
LW06	0.1	0	12.7	22.5	0	0.498	0	-10	0	>>>>	>>>>	Dry	5.67	DP = 1

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