October 2016

Tier 2 Risk Assessment:
Main Site Investigation and Testing,

Tier 3 Risk Assessment:
Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation

at Waterstown Landfill, Palmerstown, Dublin 20
South Dublin County Council

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1 INTRODUCTION

Malone O'Regan (MOR) was appointed by South Dublin County Council (SDCC) to undertake a Tier 2 Risk Assessment: Main site investigation and Testing, Tier 3 Risk Assessment: Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation at Waterstown Landfill, Palmerstown, Dublin 20 in accordance with the Environmental Protection Agency's (EPA) published Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites (2007) and Waste Management (Certification of historic unlicensed waste disposal and recovery activity) Regulations, 2008 (S.I. No. 524 of 2008) which were published in December 2008.

Waterstown Landfill is a closed landfill located north of Palmerstown village approximately 10km west of Dublin City Centre (refer to Drawing No.1). It is reported that the landfill was in operation from 1983 to 1987 and was used as a disposal facility for municipal waste as well as solid inert waste from commercial/industrial sources (SDCC, 2011). The former landfill site as delineated on Figure 1 (red boundary) covers an area of approximately 20 hectares (ha) to the south of the River Liffey and is currently in use as a public park.

1.1 Project Understanding

In accordance with the Code of Practice, Waterstown Landfill can be classified as a Category 1 landfill as it was operated by SDCC without a waste licence in the period between 15th July 1977 and the introduction of the Waste Management Licensing Regulations in 1997 (without being in breach of national legislation). In this regard, SDCC has responsibilities under the Code of Practice and Waste Regulations to assess the intrinsic risk of the former landfill.

1.2 Project Objectives

SDCC issued a brief for the appointment of consultants on the 14th July 2014 for the implementation of a Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation of the former landfill.

The overall project objectives at Waterstown Landfill were:

a. To confirm whether there are risks of landfill gas migration to bordering residential homes, and leachate migration to nearby surface water (River Liffey and Mill stream) and groundwater; and,

b. To regularise the Site by applying to the EPA for a Certificate of Authorisation in accordance with Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008.

1.3 Scope of Works

The following works were carried out by MOR for this assessment:

- **Installation of Monitoring Infrastructure**:
    - **Trial Pitting at eleven (11 No) locations** to delineate the extent of the landfill to the east and west of the landfill and further characterise the thickness and permeability of the capping layer, composition of the shallow waste and further validate the geophysical survey that was carried out during the previous Tier 2 site investigations;
    - **Installation of nine (9 No) combined landfill gas / leachate monitoring wells** to determine the potential for landfill gas to migrate offsite and to further characterise leachate quality;

- **Installation of five (5 No) additional landfill gas monitoring wells** within and outside of the subject site to further assess if landfill gas migration is taking place;

- **Installation of five (5 No) groundwater monitoring wells** to further characterise groundwater quality up- and downgradient of the body of waste and offsite at the eastern boundary;

- **Environmental Monitoring:**
  - **Collection of soil/waste samples** from the trial pit locations for laboratory analysis;

  - **Six (6 No) landfill gas surveys** at the existing gas monitoring locations;

  - **Landfill gas survey** utilising a FID (Flame Ionization Detector) to assess if a linkage exists between the observed landfill gas concentrations at the site and the closest residential property;

  - Two (2 No) **groundwater monitoring** events and collection of samples for laboratory analysis;

  - **Monitoring of surface water** on two (2 No) occasions at up- and downstream locations at the River Liffey and the Mill Stream to further characterise the water quality and assess for any potential impacts from the Site;

- **Reporting:**
  - **Preparation of Stage 1 Appropriate Assessment (AA) screening** in accordance with Article 6 of the Habitats Directive 92/43/EEC(EC 2001) (Appendix I);

  - **Preparation of an Environmental Risk Assessment Report** - Tier 2 Risk Assessment: Main site investigation and Testing, Tier 3 Risk Assessment: Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation at Waterstown Landfill, Palmerstown, Dublin 20 in line with the EPA Code of Practice; Environmental Risk Assessment for unregulated Waste Disposal Sites, 2007, in order to regularise the Site; and,

  - **Establish the extent of remedial measures**, if any, that would be warranted.

The Table 1 below depicts the period the site works were undertaken.

Table 1: Scope of Works (between April 2015 and April 2016).

Description of Works	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Site Assessment – GW wells, Leachate/gas wells, trial pitting													
Sampling & Analysis													
Additional Gas Wells													
Gas Monitoring													
FID Survey													

1.4 Background Information Reviewed

A number of relevant documents were reviewed during this assessment that included the following:

- Waterstown Landfill Palmerstown: Report on Risk Assessment Methodology Tier 1: - Conceptual Site Model: Risk Screening and Prioritisation South Dublin County Council (October, 2011);
- Provision of Engineering Consultancy Services for the Implementation of the Tier 2 Risk Assessment: Exploratory Site Investigation and Sampling Analysis at Waterstown Landfill, Palmerstown Dublin 20. South Dublin County Council (June 2012);
- Waterstown Landfill, Palmerstown Dublin 20: Tier 2 Exploratory Site Investigation, Malone O'Regan (May 2013); and,
- Waterstown Landfill, Palmerstown Dublin 20: Detailed Site Assessment Method Statement, Malone O'Regan (March 2015).

1.5 Disclaimer

The conclusions presented in this report are professional opinions based solely on the tasks outlined herein and the information made available to MOR. They are intended for the purpose outlined herein and for the indicated site and project. The report is for the sole use of the Client. This report may not be relied upon by any other party without explicit agreement from MOR. Opinions and recommendations presented herein apply to the site conditions existing at the time of the assessment. They cannot apply to changes at the site of which MOR is not aware of and has not had the opportunity to evaluate. This report is intended for use in its entirety; no excerpt may be taken to be representative of this assessment. All work carried out in preparing this report has utilised and is based on MOR professional knowledge and understanding of the current relevant Irish and European Community standards, codes and legislation.

1.6 Difficulties Encountered

The installation of groundwater monitoring well MW9 located to the north of the Site, between the Mill River and the River Liffey had to be abandoned due to the fact that artesian aquifer conditions were encountered. The borehole was decommissioned in line with best practice guidelines using a mixture of concrete and bentonite slurry.

The extent of the historical body of waste could initially not be delineated towards the south due to access restrictions between the Site and residential properties. These access restrictions comprised wooded areas, protected habitats and uneven ground levels. Further site assessment (installation of additional gas wells into natural ground and subsequent gas monitoring) outside of the Site boundary at south of the Site provided sufficient information for completing the delineation of the waste body.

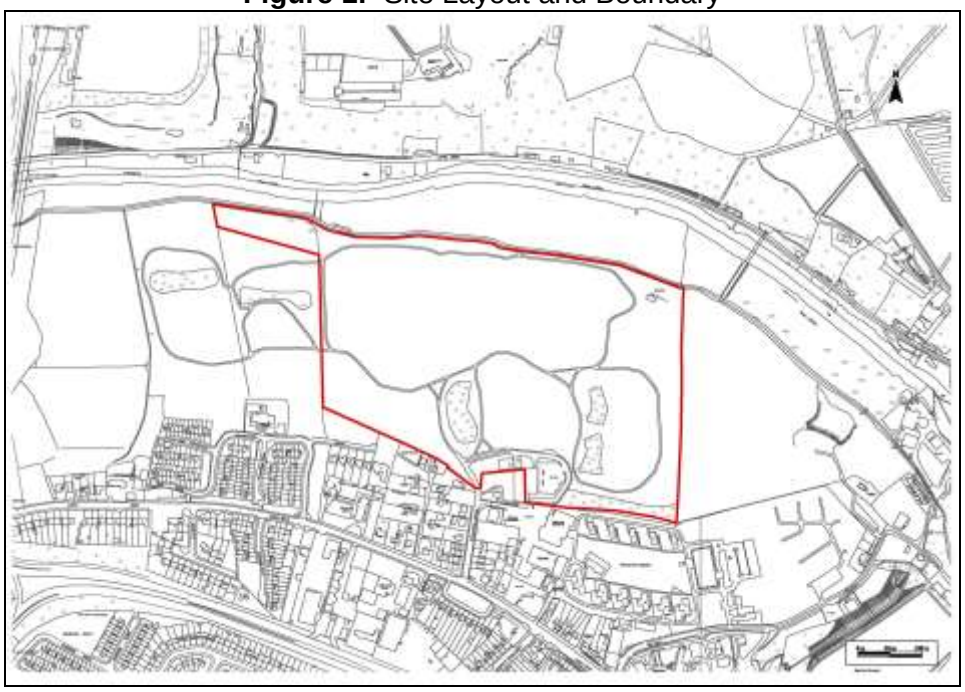
2 BACKGROUND

2.1 Site Location

The Site has been developed over the last thirty years as a public park and ecological conservation area. The Site, for the purpose of this main investigation, is bordered to the (Refer to Figure 1):

- North by a manmade channel - Mill Race and further by the River Liffey;
- West by additional park area and the M50 west link toll bridge;
- South by primarily residential properties with some educational/community and commercial facilities; and,
- East by undeveloped greenfield land and Mill race and the River Liffey

Figure 1: Site Layout and Boundary



2.2 Risk Classification

In accordance with the EPA Code of Practice the risk classification assigned to the former landfill at Waterstown is 'Class A' (High Risk) and represents the intrinsic risk that the former landfill poses to the environment. The linkages (SPR – Source, Pathway, Receptor) of greatest concern include the risk of landfill gas to onsite receptors and its migration to off-site receptors, both with normalised scores of 100%, indicating high risk.

The Tier 1 assessment (SDCC, 2011) identified the following possible SPR linkages:

- SPR 3 – leachate and human presence (private wells) – at 50% - moderate risk;
- SPR 7 – leachate and surface water (via groundwater) – at 50% - moderate risk;
- SPR 10 – landfill gas migration off site (human receptor) – at 100% - high risk; and,
- SPR 11 – landfill gas at the Site (human receptor) – at 100% - high risk.

The site prioritisation process was repeated following the Tier 2 exploratory investigation and assessment process. However, there was no change as outlined in Table 2 below.

Table 2: Identified S-P-R linkages.

SPR	Linkages	Pathway via	SPR Value	Maximum Score	Normalised Score
SPR1	Leachate ⇨Surface Water	Combined groundwater and surface water	120	300	40%
SPR2	Leachate ⇨ SWDTE	Combined groundwater and surface water	120	300	40%
SPR3	Leachate ⇨ Human Presence (private well)	Groundwater Pathway	120	240	50%
SPR4	Leachate ⇨ GWDTE	Groundwater Pathway	0	240	0%
SPR5	Leachate ⇨ Aquifer	Groundwater Pathway	120	400	30%
SPR6	Leachate ⇨ Public Supply	Groundwater Pathway	0	560	0%
SPR7	Leachate ⇨ Surface Water	Groundwater Pathway	120	240	50%
SPR8	Leachate ⇨ Surface Water	Surface Water Pathway	0	60	0%
SPR9	Leachate ⇨ SWDTE	Surface Water Pathway	0	60	0%
SPR10	Landfill Gas ⇨ Human Presence – off-site	Lateral and Vertical	150	150	100%
SPR11	Landfill Gas ⇨ Human Presence – onsite	Lateral and Vertical	250	250	100%
OVERALL RISK SCORE			**HIGH**		

Risk Classification	Range of Risk Scores
HIGH Risk (Class A)	Score greater than or equal to 70% for any individual SPR linkages
MODERATE Risk (Class B)	Score between 40% and 70% for any individual SPR linkages
LOW Risk (Class C)	Score less than 40% for any individual SPR linkages

The site prioritisation and risk classification is discussed again in Section 7 of this report.

According to the EPA COP it is not acceptable to reduce the risk classification purely on the basis that the data indicates that there is no impact. Verification is required to demonstrate that the S-P-R linkage(s) has been broken.

3 TIER 2 - MAIN SITE INVESTIGATION

The following sections will describe the Site works carried out during the Tier 2 Risk Assessment: Main site investigation and Testing, Tier 3 Risk Assessment: Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation at the Waterstown Landfill.

It is noted that care was taken during the Site works to cause as little disturbance as possible to the members of the public.

3.1 Intrusive Investigations

Prior to any intrusive site works, a meeting between MOR and SDCC personnel was undertaken to agree exploratory locations, site access and health and safety requirements. A Method Statement outlining the proposed scope of works and measures to be undertaken, to fully comply with the relevant health and safety regulations and standards, was prepared. All intrusive investigation site works were undertaken under the full time supervision of senior MOR consultants and in accordance with MOR ISO procedures.

3.1.1 Trial Pitting

A total of eleven (11 No.) trial pits (TP07 to TP17) were excavated within the Site during April 2015 using a 13 tonne tracked excavator. The trial pits were excavated into the body of waste except for locations TP07, TP08, TP09, TP10 and TP17 that were located in the field adjacent to the East of the Site. This field is in the ownership of Sun Chemical Ltd. Permission to enter the field was sought from Sun Chemical Ltd prior to the site works. In addition trial pit location TP11 was situated on the western boundary of the Site. No waste was encountered at this location. Refer to Drawing 2 for site investigation locations.

Soil/waste samples were collected by a senior MOR consultant from the trial pits for comprehensive suite of laboratory analysis. Following completion of the works the trial pits were backfilled and reinstated to avoid potential hazards.

The following Table 3 depicts a typical soils profile encountered at the Site during the trial pitting exercise.

Table 3: Typical Soil Profile – Trial Pitting.

Depth	**Profile – Within Landfill**	**Profile – Outside Landfill**
0.0 – 0.2 m bgl	Grass with Topsoil	Grass with Topsoil
0.2 – 0.7 m bgl	Made ground – clay with some stone, no odour, brown	Made ground – clay with some stone, no odour, brown
0.7 – 1.2 m bgl	Made ground – mixed municipal waste	
1.2 – 3.0 m bgl		Limestone bedrock was encountered at depths ranging between 1.5m to 3.0m bgl at locations TP9, TP10, TP11 and TP17. Locations TP7 and TP8 encountered Sand & Gravel with some large boulders, grey, wet in places
3.0 – 5.0 m bgl		Limestone Bedrock

m bgl – meters below ground level

Photos were taken at each trial pit location. There are included in the Plates (see photo views 1 to 21 in Appendix A). Trial pit logs have been included in Appendix F.

3.1.2 Landfill Gas and Leachate Wells

A total of nine (9 No) combined landfill gas and leachate wells (BH04 to BH12) were installed within the Site in April 2015 using the Shell & Auger methodology. The combined landfill gas and leachate wells were installed into the body of waste except for location BH9, which was installed outside of the body of waste – refer to Drawing 2 for locations.

The typical soils profile encountered during the leachate/gas well installation within the Site are depicted in Table 4 below. Due to the homogeneity of the encountered profiles no logs were prepared for the landfill gas/leachate wells.

Table 4: Typical Soil Profile – Landfill Gas/Leachate Well.

Depth	Profile
0.0 – 0.2 m bgl	Grass with Topsoil
0.2 – 0.7 m bgl	Made ground – clay with some stone, stiff, brown
0.7 – 7.0 m bgl	Made ground – mixed municipal waste

Each location was fitted with a landfill gas vent to allow for landfill gas monitoring. Moreover the locations were installed flush to the ground.

As requested by SDCC five (5 No) additional landfill gas monitoring wells were installed within (BH13 and BH14) and outside (BH15, BH16 and BH17) of the Site in November 2015 in order to assess for potential landfill gas migration from the subject site towards the closest receptor locations, i.e. Stewart Hospital grounds towards south and a residential property towards south east of the Site. Refer to Drawing 2 for locations.

In order to ensure that locations BH13 and BH14 were installed outside of the waste body, trial pits were excavated along the southern Site boundary in order to confirm the historical fill boundary prior to selecting these borehole locations.

3.1.3 Groundwater Wells

A total of five (5 No) groundwater wells were installed downgradient of the waste body to depths varying between 5.9 m bgl to 11.9 m bgl. Groundwater wells MW7, MW10, MW11 and MW12 were installed into the bedrock aquifer, whereas groundwater well MW8 was installed into the shallower gravel aquifer. At location GW9 artesian conditions were encountered and the location had to be decommissioned. Refer to Drawing 2 for locations. The following Table 5 depicts details for the groundwater wells.

Table 5: Summary of Groundwater Wells – depths in m bgl.

Location	Final depth	Screened depth	Depth of Bedrock	Static Water Level
MW7	11.8	10 – 11.8	9.2 – 11.8	5.04
MW8	5.9	4.5 – 6.3	Not reached	4.62
MW9	14.5	Artesian Conditions Encountered – installation not completed.		
MW10	11.9	10 - 12	9.7	3.03
MW11	8.6	5 – 8.6	4.5	3.41
MW12	10.3	3 – 10.3	2.0	0.59

3.1.4 Soils

Soils samples collected during the trial pitting exercise were logged to BS5930 and NRA specifications and were analysed by Jones Environmental a UKAS accredited laboratory for Waste Acceptance Criteria (WAC) analytical suite for inert wastes as outlined in the document '*Establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC (2003/33/EC)*', which included the following parameters: total organic carbon (TOC), mineral oil, BTEX (benzene, toluene, ethylbenzene and total xylenes), MTBE, PCB (polychlorinated biphenyls) and PAH (polycyclic aromatic hydrocarbons).

Moreover the samples were analysed for leachability (CEN 10:1) for chloride, fluoride, sulphate, dissolved organic carbon, total dissolved solids, antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc. Soil Analytical Results for Leachate, WAC and GAC are presented in Tables 6, 7 and 8 respectively. Copies of the chain of custody (COCs) filled out during site works are presented in Appendix B. Copies of the certified laboratory reports supplied by Jones Environmental are included in Appendix H.

Two undisturbed samples (U100 core samples) were collected from the capping layer during the Site works in April 2015 and sent to Testconsult Limited, Portlaoise, Co Laois to determine the undrained shear strength in triaxial compression without measurement of pore pressure in accordance with BS 1377:1990 Clause 8. Copies of the laboratory reports are included in Appendix C.

3.1.5 Groundwater

Two (2 No.) groundwater monitoring events were conducted on the 29th and 30th April 2015 and the 5th and 6th of May 2015 respectively. Both events included all seven (7 No.) groundwater monitoring wells. A grab sample from MW9, which encountered artesian conditions, has also been included in the data set. Furthermore results for MW4, MW5 and MW6 from the Tier 2 Exploratory Investigation (MOR, 2012) have been included in the data set to aid trend development. Groundwater analytical results together with the relevant assessment criteria are presented in Table 9. Copies of the chain of custody (COCs) filled out during site works are presented in Appendix B. Copies of the certified laboratory reports supplied by Jones Environmental are included in Appendix C.

The groundwater analytical suite closely followed the parameters as set out in Table C.2 for the EPA Landfill Monitoring Manual (2003) for 'Groundwater Baseline'. The groundwater analytical suite for this Site included the following parameters:

- indicators and inorganics: sulphate, chloride, fluoride and total cyanide;
- ammonia;
- total oxidised nitrogen (TON);
- molybdate-reactive phosphorus (MRP);
- metals including arsenic, boron, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, calcium, magnesium, potassium and sodium;
- volatile organic compounds (VOCs) including dichloromethane;
- semi-volatile organic compounds (SVOCs) including Polycyclic Aromatic Hydrocarbons (PAHs), phenols and phthalates;
- pesticides: atrazine and simazine, organophosphorus pesticides, organochlorine pesticides and acid herbicides;

- total and faecal coliforms;
- total dissolved solids;
- total alkalinity as $CaCO_3$; and,
- total organic carbon (TOC).

Groundwater Levels

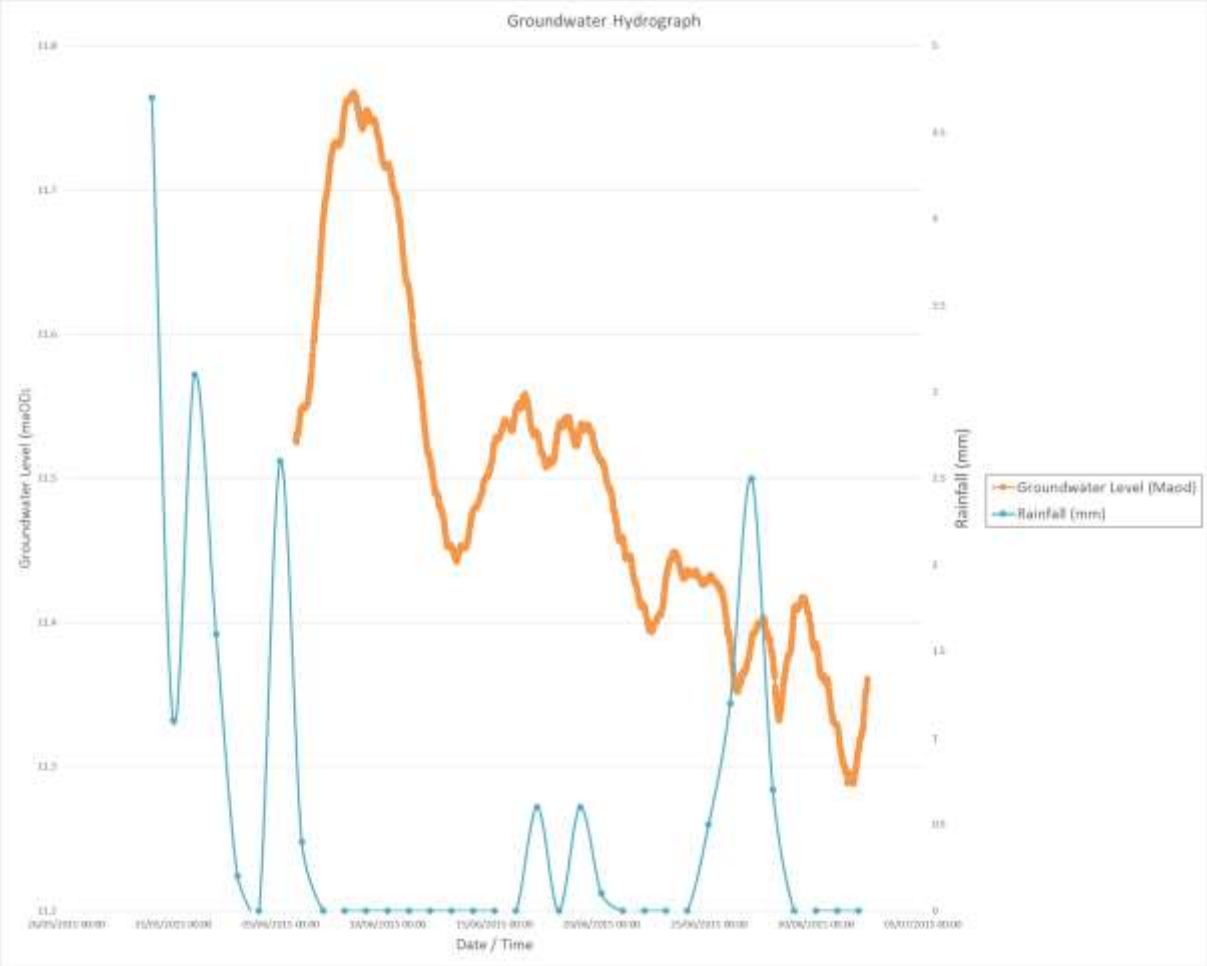
Groundwater levels were monitored during the two monitoring events using a dip meter. Refer to Table 10 for groundwater levels measured during the site visits.

A data-logger (Solinst level-logger) was installed into groundwater well MW10 for a period of approximately one month to monitor groundwater level fluctuations and potential response to rainfall events.

The data obtained during the Tier 2 Exploratory Investigation (MOR, 2012) confirmed that the perched water in the made ground material, the sand and gravel aquifer adjacent to the river and the limestone bedrock aquifer beneath the site, all respond quickly to rainfall.

Groundwater level data collected for the newly installed bedrock well in the north east of the site (MW10), also showed that the limestone bedrock aquifer beneath the site responds quickly to rainfall. Level logger data is included in Appendix D. Refer to Figure 2 below to see this interaction between groundwater levels and rainfall events.

Figure 2: Groundwater Response to Precipitation at MW10.



In-Situ Permeability Test (Slug Test)
Slug tests were carried at four (4 No.) groundwater monitoring well locations (MW4, MW6, MW7 and MW10) on the 12th of May 2015 by two MOR consultants.

The hydraulic conductivity for the tested portions of the bedrock aquifer was calculated to range between 1.26 x 10^{-5} m/s and 1.8 x 10^{-6} m/s. Refer to Appendix E for comprehensive slug test results and hvorslev analysis.

Inferred Groundwater Flow Direction
The groundwater contour diagram (refer to Drawing No. 3 Inferred Groundwater Flow Direction) indicates that the groundwater flow is, as expected, to the north towards the River Liffey.

3.1.6 Surface Water

Surface water quality monitoring was carried out during two (2 No.) events on the 29th April 2015 and the 5th May 2015 at four (4 No.) surface water monitoring locations SW1, SW2, SW5 and SW6. Refer to Drawing 4 Surface Water Monitoring Locations. Data collected during the Tier 2 Exploratory Investigation (MOR, 2012) has also been included to aid trend development. Surface water analytical results together with relevant assessment criteria are presented in Table 11 at the back of this report. Copies of the chain of custody (COCs) filled out during site works are presented in Appendix B. Copies of the certified laboratory reports supplied by Jones Environmental are included in Appendix G.

The scope of laboratory analysis included the following parameters:

- indicators and inorganics: sulphate, chloride, fluoride and total cyanide;
- ammonia;
- TON;
- MRP;
- metals including arsenic, boron, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, calcium, magnesium, potassium and sodium;
- VOCs including BTEX, MTBE and dichloromethane;
- SVOCs including PAHs, phenols and phthalates;
- pesticides: atrazine and simazine, organophosphorus pesticides, organochlorine pesticides and acid herbicides;
- total suspended solids;
- alkalinity as $CaCO_3$; and,
- BOD and COD.

3.1.7 Landfill Gas

In order to determine the potential for landfill gas migration offsite six (6 No) landfill gas monitoring events were carried out at twelve (12 No) gas monitoring locations BH01 to BH12 using a portable landfill gas detector (GA2000).

As described in Section 3.1.2 five (5 No) further landfill gas monitoring locations (BH13 to BH17) were installed south of the Site in November 2015. Two monitoring events were carried out at these locations during November and December 2015.

This monitoring included measurement of methane (CH_4), carbon dioxide (CO_2), oxygen (O_2), carbon monoxide (CO), hydrogen sulphide (H_2S) and flow. Atmospheric pressure and general weather conditions were also recorded during each of the surveys.

Methane and carbon dioxide results (concentrations expressed as a percentage in volume (% v/v)) were assessed relative to the EPA 1997 threshold values outlined in the document 'Landfill Manuals – Landfill Operational Practices' (EPA, 1997) and the Department of the Environment exposure limits (1994). There are no threshold values or DOE exposure limits for hydrogen sulphide or carbon monoxide. Gas monitoring results together with the relevant assessment criteria are presented in Table 12.

3.1.8 Leachate

Leachate samples were taken from four (4 No) leachate wells (BH2, BH8, BH10 and BH11) over two (2 No) monitoring events conducted on the 29th April and 5th May of 2015. Furthermore a leachate sample taken during the Tier 2 Exploratory Investigation was included in the data set to aid trend development. Leachate results together with the relevant assessment criteria are presented in Table 13 at the back of this report. Copies of the chain of custody (COCs) filled out during site works are presented in Appendix B. Copies of the certified laboratory reports supplied by Jones Environmental are included in Appendix G.

3.2 Visual Observations

3.2.1 Surface

No evidence of surface contamination was observed within the Site.

3.2.2 Area Outside of the Waste Body

Trial pitting outside of the waste body (locations TP07, TP08, TP09, TP10 and TP17), i.e. at the field adjacent to the East of the Site (fields owned by Sun Chemicals Ltd) were into native soils. No made ground was encountered at these locations. Sands & gravels were shallow (at approximately 1.5 mbGL) and limestone bedrock was encountered at the southern part of the field at depths varying between 1.5 and 2.5 mbGL.

Location TP11, situated directly west of the main waste body, had only shallow (up to 0.6 mbGL) made ground comprising clays soils with some brick. This made ground was underlain by sands & gravels.

Air rotary drilling utilised for the installation of the bedrock groundwater wells indicated that the upper bedrock zones comprised a compact limestone that was very slow to drill through. The bedrock encountered below 10.0 mbGL was observed to be fractured with good groundwater yields.

Native soils comprising clays with some stone up to 7.0 mbGL was identified at BH09.

Furthermore native clayey soils were encountered at borehole locations BH13 to BH17 that were installed in November 2015 during the additional landfill gas well installation.

3.2.3 Area within the Waste Body

Trial pitting within the Site, i.e. within the waste body (locations TP12 to TP16) encountered made ground to depths up to 5.2 mbGL. No native ground was encountered. The made ground comprised stiff clays generally to depths of 0.8mbGL underlain by mixed municipal wastes. The municipal waste was observed dry, which does indicate that the upper low permeability soils do mitigate against leachate generation within the waste body.

Combined landfill gas and leachate monitoring locations (BH04 to BH08 and BH10 to BH12), were installed utilising a Shell & Auger rig to maximum depths of 7.0 mbGL. Native soils

were not encountered during the installation of the landfill gas leachate locations that were installed to depths of 7.0 mbGL within the waste body.

3.3 Laboratory Results

3.3.1 Soils

Soil analytical results were assessed relative to the criteria for landfills outlined in the document 'Establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC (2003/33/EC)'. The criteria used were as follows:

- Criteria for landfills for inert waste;
- Criteria for landfills for non-hazardous waste; and,
- Criteria for landfills for hazardous waste.

A number of trial pits had parameters that exceeded limits set out for inert waste acceptance criteria. Refer to Table 14 below and Drawing 5a for exceedance locations. However there were no exceedances observed when compared to Criteria for landfills for non-hazardous waste or Criteria for landfills for hazardous waste.

Table 14: Inert Waste Acceptance Criteria (2003/33/EC) Exceedances.

Parameters	Unit	Inert Waste Acceptance Criteria	TP2	TP4	TP17	TP 13
Dissolved Antimony	mg/kg	0.06	<0.02	<0.02	0.08	0.03
Dissolved Molybdenum	mg/kg	0.5	0.23	0.17	0.2	0.63
Sulphate	mg/kg	1,000	7,409.1	560.7	23.1	867
Phenol Index	mg/kg	1	37.1	7.6	<0.1	<0.1
Total Dissolved Solids	mg/kg	4,000	10,542	1,820	950	660

Denotes parameter exceeds inert waste acceptance criteria as per 2003/33/EC.

For the complete set of analytical results together with the relevant waste assessment criteria (WAC) refer to Table 8.

Due to the site's current use as a public park, soil analytical results were also screened against the following criteria to clearly define if there are any potential risks to human health;

- DEFRA and Environment Agency (EA), 2002 to 2005: Soil Guideline Values (SGVs) series for metals and BTEX contamination;
- Contaminated Land: Applications in Real Environments (CL:AIRE), December 2009: The Soil Generic Assessment Criteria for Human Health Risk Assessment; and,
- The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd Edition).

From this process there was one exceedance observed at TP14 which exceeded the SGV for PCB 28. Refer to Table 15 below. Refer to Drawing 5b to observe exceedance location.

Table 15: Soil Value Exceedance when compared against UK Soil Guideline Values (SGVs).

Parameter	Unit	U.K. Soil Guideline Values (SGVs)	TP14
PCB 28	mg/kg	8	27
	denotes parameter exceeds SGV		

Leachate analysis from the soil samples was also analysed and screened against the following criteria to clearly define if there were any risks to human or environmental health;

- European Communities Environmental Objectives (Groundwater) Regulations, 2010. (SI No. 9 of 2010);
- In the absence of Environmental Objectives for certain parameters, the Environmental Protection Agency (EPA) interim groundwater guideline values (IGVs) (EPA, 2003) were used; and,
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations, 2012. (SI No. 327 of 2012).

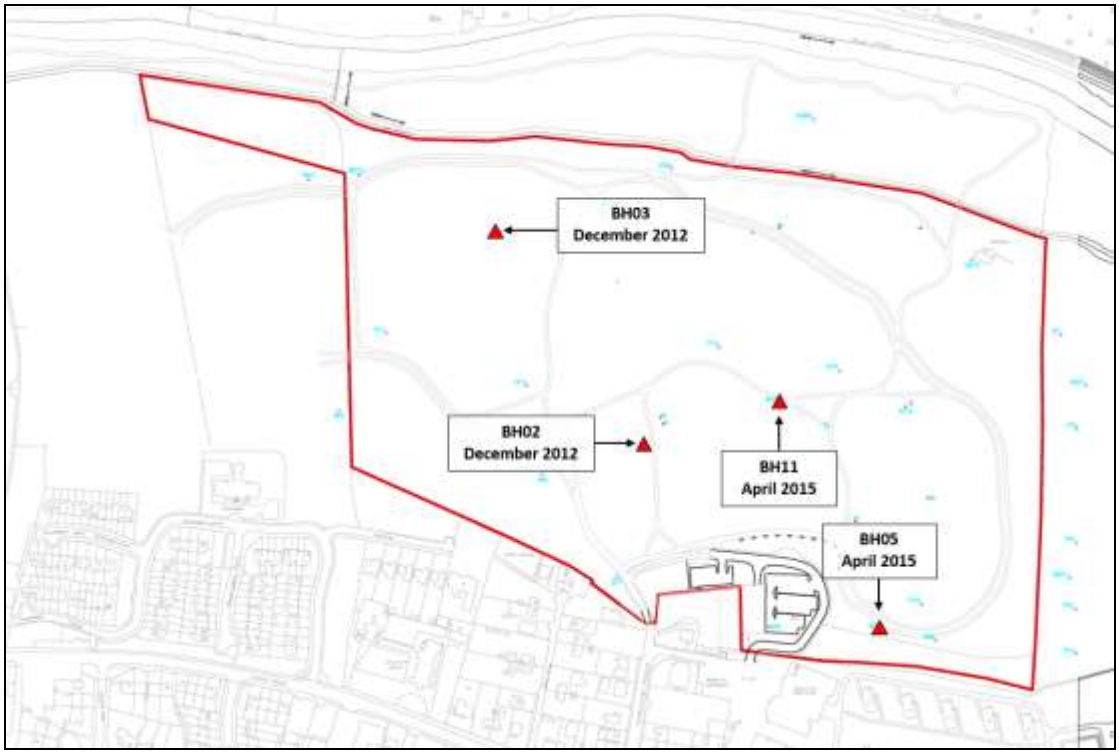
There were no exceedances observed at any of the soil investigation locations when compared to the above screening criteria. For the complete set of analytical results together with the relevant assessment criteria refer to Table 13.

3.3.2 Soil Geotechnical Results

Two (2 No) undisturbed soil samples (Waterstown 1 and 2) were collected from the capping layer during the Site works in April 2015. The samples were collected at locations BH11 (Waterstown 1) and BH5 (Waterstown 2). Both samples were reported by the testing laboratory as clay and the results determined Waterstown 1 as *hard soil* (Shear Strength C_u at 168 kPa) and Waterstown 2 as *stiff soil* (Shear Strength C_u at 77 kPa).

Figure 1 below depicts geotechnical sampling locations for soil samples collected during the Tier 2 Exploratory Investigation (December 2012) and the Tier 2 Main Investigation (April 2015) site investigations.

Figure 1: Soil Sampling Locations for Geotechnical Testing.



The following Table 16 depicts a summary of the laboratory tests and the original laboratory sheets are attached in Appendix F.

Table 16: Summary of Geotechnical testing results.

	Unit	BH02	BH03	BH11	BH05
		Dec 2012	Dec 2012	April 2015	April 2015
Moisture Content	%	-	-	13.30	20.00
Bulk Density	Mg/m^3	-	-	2.146	2.033
Dry Density	Mg/m^3	-	-	1.895	1.694
Shear Strength C_u	kPa	-	-	168	77
Permeability	m/s	$7.70E^{-10}$	$2.70E^{-08}$	-	-

These results indicate that the capping layer overlying the waste material is of low permeability, thus impeding rainfall infiltration into the waste material.

According to the NRA Specifications for Roadworks (NRA SRW) the low permeability soils at the capping layer can be classified as Class 2C stoney cohesive fill.

3.3.3 Groundwater

Groundwater results were assessed relative to available Irish guideline and legislative standards as follows:

- European Communities Environmental Objectives (Groundwater) Regulations, 2010. (SI No. 9 of 2010); and,
- In the absence of Environmental Objectives for certain parameters, the Environmental Protection Agency (EPA) interim groundwater guideline values (IGVs) (EPA, 2003) were used.

Indicators

Field Indicators

Field measured parameters such as pH, Electrical Conductivity (EC), Dissolved Oxygen (DO), temperature and Oxidation Reduction Potential (ORP) were measured onsite. EC values measured ranged from 576.3µS/cm (MW4) to 1,294µS/cm (MW5). The samples collected from MW5, MW6, MW7, MW8, MW9 and MW11 exceeded the Groundwater Regulation value of 800µg/l for the presence of saline or other intrusion stipulated in the groundwater regulations but all samples were below the guideline value of 1,875 µg/l for human use. pH values ranged from 6.30 pH units (MW5) to 11.89 pH units (MW6). MW5 was found to be below the EPA IGV guideline range of 6.5-9.5 pH units, while samples taken from MW6 and MW9 were above the guideline range.

There are no guideline values for DO or ORP. DO concentrations measured on site ranged from 10.1% (MW11) to 76.2% (MW4). ORP measured ranged from a negative ORP value of 270.1mV (MW6) to a positive ORP of 98.3mV (MW4). A negative ORP is indicative of reducing conditions while a positive ORP is indicative of oxidising conditions.

Indicators and inorganics

Ammoniacal Nitrogen

Ammoniacal nitrogen concentrations ranged from below the relevant laboratory Method Detection Limits (MDL) of 0.01mg/l (MW9) to 9.66mg/l (MW5). Ammoniacal Nitrogen concentrations exceeded the relevant groundwater regulation value of 0.065mg/l N at all monitoring locations with the exception of MW9. However MW9 was taken from an artesian well and can only be considered as indicatory. Refer to Drawing 6a for Groundwater Exceedances – Ammoniacal Nitrogen.

Molybdate Reactive Phosphorus (MRP)

MRP concentrations ranged from 32µg/l (MW11) to 1,196µg/l (MW10). All groundwater monitoring locations sampled exceeded the relevant groundwater quality objectives threshold value of 35µg/l during at least one monitoring event. Refer to Drawing 6b for Groundwater Exceedances – Molybdate Reactive Phosphorous.

Total Dissolved Solids (TDS)

TDS concentrations ranged from 386mg/l (MW6) to 2,303mg/l (MW7). All samples analysed were below the relevant EPA IGV guideline value (1,000mg/l) with the exception of MW7.

Total Cyanide

Total Cyanide concentration was observed on one occasion at 0.02mg/l (SW6) and 0.01mg/l (SW10). The IGV guideline value is 0.01mg/l, but the groundwater guideline value is 0.0375mg/l. The remaining concentrations were below the relevant groundwater threshold values.

Reported concentrations of Sulphate, Chloride, Fluoride, TON, Total Alkalinity and TOC were below the relevant groundwater threshold values for all parameters.

Microbiological parameters

Total Coliforms

Total coliforms ranged from below MDL at monitoring locations MW6 and MW9 to >2,419.6 MPN/100ml at monitoring locations MW7, MW8 and MW10. The EPA IGV guideline value (0 MPN/100ml) was exceeded at monitoring locations MW4, MW5, MW7, MW8, MW10, MW11 and MW12. Refer to Appendix G for details.

Faecal Coliforms

Faecal coliforms ranged from below MDL at MW4, MW6, MW9, MW11 and MW12 (<1 colony forming units cfu/100ml) to 200 cfu/100ml at MW10. The EPA IGV guideline value (0

MPN/100ml) was exceeded at monitoring locations MW7, MW8, and MW10. Refer to Appendix G details and Drawing 6c for Groundwater Exceedances – Faecal Coliforms.

Metals

Arsenic

Dissolved arsenic concentrations ranged from below MDL (<2.5µg/l) to 10.3µg/l (MW5). There were exceedances observed at MW5 (10.3µg/l) and MW11 (7.6µg/l) when compared to the Groundwater Regulation value of 7.5µg/l. Refer to Drawing 6d for Groundwater Exceedances – Arsenic.

Nickel

Dissolved nickel concentrations ranged from below the laboratory MDL (<2µg/l) to 61µg/l (MW11). Further exceedances were observed at MW5 (30µg/l), MW6 (23µg/l), MW7 (33µg/l), MW11 (61µg/l & 58µg/l) and MW12 (19µg/l) when compared to the Groundwater Regulation value of 15µg/l. Refer to Drawing 6e for Groundwater Exceedances – Nickel.

Manganese

Dissolved manganese concentrations ranged from below the laboratory MDL (2µg/l) at MW6 to 4344µg/l (MW7). Exceedances were observed at MW4, MW5, MW7, MW8, MW9, MW10, MW11 and MW12 when compared to the relevant EPA IGV of 50µg/l. Refer to Drawing 6f for Groundwater Exceedances – Manganese.

Potassium

Dissolved potassium concentrations ranged from 1.2mg/l (MW12) to 33.9mg/l (MW6). Exceedances were observed at MW5, MW6, MW7, MW8 and MW11 when compared to the relevant EPA IGV value of 5mg/l. Refer to Drawing 6g for Groundwater Exceedances – Potassium.

Calcium

Dissolved calcium concentrations ranged from 60.3mg/l (MW6) to 275.3mg/l (MW7). Exceedances were observed at MW5, MW7, MW8 and MW11 when compared to the relevant groundwater regulation value of 200mg/l. Refer to Drawing 6h for Groundwater Exceedances – Calcium.

Concentrations of the remaining metals – Boron, Mercury, Zinc, Lead, Copper, Chromium, Cadmium, Iron and Sodium were below the relevant groundwater threshold values for all parameters.

sVOCs

Reported concentrations of sVOCs, phthalates, PAHs were below the relevant groundwater threshold values for all parameters.

VOCs

Reported concentrations of VOCs were below the relevant groundwater threshold values for all parameters.

Pesticides

Reported concentrations of atrazine and simazine were below the laboratory MDL for both parameters.

Organochlorine Pesticides

Concentrations of the organochlorine pesticides for all monitoring locations analysed did not exceed their respective laboratory MDL's.

Organophosphorus Pesticides
Concentrations of the organophosphorus pesticides for all monitoring locations analysed did not exceed their respective laboratory MDL's.

Acid Herbicides
Concentrations of all other pesticides for all monitoring locations analysed did not exceed their respective laboratory MDL's.

3.3.4 Surface Water

The surface water results were assessed relative to Irish Surface Water Standards (SI No. 327 of 2012).

Field indicators
Field measured parameters including pH, EC, DO, temperature and ORP were measured onsite for SW1, SW2, SW5 and SW6. pH results ranged from 6.42 pH units in SW2 to 8.28 pH units in SW6. All samples were within the guideline range of 6.0-9.0 pH units. EC concentrations ranged from 245.2µS/cm (SW4) to 462.8µS/cm (SW1). There is no guideline value for EC. DO concentrations ranged from 86.1% in SW5 to 108.5% in SW4. All samples were within relevant standard range. Measurements ranged from 48.9mV in SW6 to 175.1mV in SW2. There is no guideline value for ORP.

Indicators and inorganics
Ammoniacal nitrogen
Ammoniacal nitrogen concentrations ranged from 0.02mg/l (SW2) to 0.1mg/l (SW2). There were exceedances at SW1 (0.08mg/l & 0.08mg/l), SW2 (0.1mg/l), SW5 (0.09mg/l & 0.09mg/l), and SW6 (0.09mg/l) when compared to the relevant surface water regulation value of 0.065mg/l N. Refer to Drawing 7a for Surface Water Exceedances – Ammoniacal Nitrogen.

Molybdate Reactive Phosphorous (MRP)
MRP concentrations ranged from 39µg/l (SW6) to 103µg/l (SW1). All samples analysed exceeded the surface water regulation value of 35µg/l. Refer to Drawing 7b for Surface Water Exceedances – MRP.

Biological Oxygen Demand (BOD)
BOD concentrations ranged from below MDL (<1mg/l) to 2mg/l. There were exceedances observed at SW1 (2mg/l), SW2 (2mg/l & 2mg/l), SW5 (2mg/l, 2mg/l & 2mg/l) and SW6 (2mg/l) when compared to the relevant surface water regulation value of 1.5mg/l. Refer to Drawing 7C for Surface Water Exceedances – BOD.

Metals
There are no reported exceedances for any of the metals analysed when compared to the relevant surface water regulation values.

sVOCs
Reported concentrations of sVOCs, phthalates, PAHs were below the relevant laboratory MDLs for all parameters.

VOCs
Reported concentrations of VOCs were below the relevant laboratory MDLs for all parameters.
Pesticides

Reported concentrations of atrazine and simazine were below the laboratory MDL (1µg/l for both parameters) for all samples. The relevant surface water standard for atrazine (2µg/l) and simazine (4µg/l) were not exceeded.

Organochlorine Pesticides
Concentrations of the organochlorine pesticides for all monitoring locations analysed did not exceed their respective laboratory MDL's.

Organophosphorus Pesticides
Concentrations of the organophosphorus pesticides for all monitoring locations analysed did not exceed their respective laboratory MDL's.

Acid Herbicides
Concentrations of all other pesticides for all monitoring locations analysed did not exceed their respective laboratory MDL's.

3.3.5 Landfill Gas

In total six (6 No) landfill gas monitoring events were completed on site as part of this assessment. There were also two (2 No) monitoring events conducted as part of the Tier 2 Exploratory Investigation (MOR, 2012). These results have been included to aid trend development. Refer to Table 17 for landfill gas monitoring event schedule. Refer to Drawing 8 for Landfill Gas Monitoring Results.

Table 17: Landfill Gas Monitoring Event Schedule.

Well I.D.	Monitoring Event Date										
	20/12/12	16/05/13	6/5/15	12/5/15	20/5/15	28/5/15	5/6/15	12/6/15	27/11/15	4/12/15	20/4/16
BH1	√	√	√	√	√	√	n/a	√	n/a	n/a	n/a
BH2	√	√	√	√	√	√	√	√	n/a	n/a	n/a
BH3	√	√	n/a	√	√	√	n/a	√	n/a	n/a	n/a
BH4			√	√	√	√	√	√	n/a	n/a	n/a
BH5			√	√	√	√	√	√	√	n/a	n/a
BH6			n/a	√	√	√	√	√	n/a	n/a	n/a
BH7			√	√	√	√	√	√	√	√	√
BH8			√	√	√	√	√	√	n/a	n/a	n/a
BH9			√	√	√	√	√	√	√	n/a	n/a
BH10			√	√	n/a	√	n/a	√	n/a	n/a	n/a
BH11			√	√	√	√	√	√	n/a	n/a	n/a
BH12			√	√	√	√	√	√	n/a	√	n/a
BH13									n/a	√	n/a
BH14									√	√	√
BH15									√	√	n/a
BH16									√	√	n/a
BH17									√	√	n/a

√ - denotes successful landfill gas monitoring.
n/a - denotes unsuccessful landfill gas monitoring due to inaccessibility/unit fault

Gas monitoring results together with the relevant assessment criteria are presented in Table 11 at the back of this report.

BH1
Stable methane concentration ranged from 41.3% v/v to 58.1% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 20.7% v/v to 31.4% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was detected at a concentration of 2ppm on one (1 No) occasion only. Carbon monoxide was detected at a concentration of 1ppm on four occasions. The maximum flow observed was 0.2l/h.

BH2
Stable methane concentration ranged from 11.2% v/v to 53.4% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 6.8% v/v to 36.1% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was not detected at this location. Carbon monoxide was detected at a concentration of 2ppm on one occasion and 1ppm on two occasions. The maximum flow recorded was 0.3l/h.

BH3
Stable methane concentration ranged from 24.4% v/v to 30.1% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 16.0% v/v to 19.6% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide and carbon monoxide were not detected at this location during either monitoring event. The maximum flow observed was 0.1l/h.

BH4
Stable methane concentration ranged from 21.4% v/v to 37.5% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 10.8% v/v to 16.1% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was not detected at this location. Carbon monoxide was recorded at a concentration of 2ppm on three occasions and 1ppm on another occasion. The maximum flow observed was 0.7l/h.

BH5
Stable methane concentration ranged from 16.2% v/v to 44.4% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 11.4% v/v to 31.8% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was detected at this location on one occasion at 3ppm. Carbon monoxide concentration ranged from 0 – 7ppm at this location. The maximum flow observed was 0.5l/h.

BH6
Stable methane concentration ranged from 45.4% v/v to 49.4% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 26.8% v/v to 29.2% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was detected at a concentration of 1ppm on one occasion. Carbon monoxide concentration ranged from 1 – 3ppm at this location. The maximum flow observed was 0.7l/h.

BH7
Stable methane concentration ranged from 3.3% v/v to 43.0% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 3.1% v/v to 24.9% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was not detected at this location. Carbon monoxide concentration ranged from 0 - 6ppm at this location. The maximum flow observed was 6.8/h.

BH8
Stable methane concentration ranged from 10.1% v/v to 38.1% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 4.1% v/v to 19% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was not detected at this location. Carbon monoxide was recorded at a concentration of 1ppm on one occasion. The maximum flow observed was 0.1l/h.

BH9
Stable methane concentration ranged from 0.0% v/v to 0.1% v/v. There were no exceedances observed when compared to the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 0.1% v/v to 2.4% v/v. The threshold value of 1.5% v/v and 0.5% v/v was exceeded during one monitoring event. Hydrogen sulphide was not detected at this location. Carbon monoxide was recorded at a concentration of 1ppm on two occasions. The maximum flow observed was 0.3l/h.

BH10
Stable methane concentration ranged from 23.1% v/v to 31.1% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 9.3% v/v to 19.6% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was not detected at this location. Carbon monoxide was recorded at a concentration of 1ppm on one occasion. The maximum flow observed was 0.1l/h.

BH11
Stable methane concentration ranged from 18.9% v/v to 26.6% v/v and exceeded the threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively. Carbon dioxide concentration ranged from 17.1% v/v to 25.0% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was not detected at this location. Carbon monoxide concentrations ranged between 0 – 1ppm at this location. The maximum flow observed was 0.5l/h.

BH12
Stable methane concentration ranged from 0.2% v/v to 7.5% v/v. The threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively were exceeded on three (3 No) occasions. Carbon dioxide concentration ranged from 3.4% v/v to 18.9% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was not detected at this location. Carbon monoxide concentrations ranged between 0 – 1ppm at this location. The maximum flow observed was 0.2l/h.

BH13
Stable methane concentration was observed at 0.1% v/v. The threshold value and exposure limit of 1.0% v/v and 0.5% v/v was not exceeded. Carbon dioxide concentration was observed at 0.2% v/v. The threshold value of 1.5% v/v and 0.5% v/v respectively were not exceeded. Hydrogen sulphide, Carbon monoxide or flow were not detected or recorded at this location.

BH14
Stable methane concentration ranged from 48.1% v/v to 50.9% v/v. The threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively were exceeded on four (4 No) occasions. Carbon dioxide concentration ranged from 24.6% v/v to 31.9% v/v and exceeded the threshold value of 1.5% v/v and 0.5% v/v respectively. Hydrogen sulphide was detected at 7ppm on one occasion at this location. Carbon monoxide concentrations ranged from 0 – 4ppm at this location. No flow was observed at this location.

BH15
Stable methane concentration ranged between 0.0% v/v to 0.1% v/v. The threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively were not exceeded. Carbon dioxide concentration ranged between 0.4% v/v to 0.6% v/v and did not exceed the threshold value but did slightly exceed the exposure limit. Hydrogen sulphide, Carbon monoxide or flow were not detected or recorded at this location.

BH16
Stable methane concentration ranged between 0.0% v/v to 0.1% v/v. The threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively were not exceeded. Carbon dioxide concentration ranged between 0.2% v/v to 0.6% v/v and did not exceed the threshold value but did slightly exceed the exposure limit. Hydrogen sulphide or flow were not detected or recorded at this location. Carbon monoxide was detected at 1ppm on one occasion at this location.

BH17
Stable methane concentration ranged between 0.0% v/v and 0.1% v/v. The threshold value and exposure limit of 1.0% v/v and 0.5% v/v, respectively were not exceeded. Carbon dioxide concentration ranged between 0.0% v/v to 0.1% v/v and did not exceed the threshold values. Hydrogen sulphide was not detected at this location. Carbon monoxide concentrations ranged from 0 – 1ppm at this location. No flow was observed at this location.

3.3.6 Leachate

Leachate results were assessed relative to available Irish guideline and legislative standards. Leachate results were also briefly reviewed in the context of the EPA Landfill Manual Design typical leachate composition values.

- European Communities Environmental Objectives (Groundwater) Regulations, 2010. (SI No. 9 of 2010).
- In the absence of Environmental Objectives for certain parameters, the Environmental Protection Agency (EPA) interim groundwater guideline values (IGVs) (EPA, 2003) were used.
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations, 2012. (SI No. 327 of 2012).
- EPA (2000) Landfill Manuals: Landfill site design. Taken from Table 7.2: Summary of composition of methanogenic leachates sampled from large landfills with a relatively dry high waste input rate.

<u>Indicators</u>
Field Indicators
Similar to the groundwater samples, field measured parameters such as pH, EC, DO, temperature and ORP were measured onsite. EC values measured ranged from 1,012.5µS/cm (BH8) to 2,305.8µS/cm (BH2). All samples were below the Groundwater Regulation value of 1875 µS/cm (human use) with the exception of those collected from BH2 (2007 µS/cm, 2,280.1 µS/cm and 2,305.8 µS/cm). pH values measured ranged between 6.20 (BH2) and 6.94 (BH8) and were within the surface water regulations guideline range of 6.0-9.5 pH units. DO concentration measured range from 9% (BH11) to 54.6% (BH2).There is no assessment criteria available for DO. The ORP reading ranged from -103.9mV (BH2) and 24.3mV (BH8). There is no assessment criteria available for ORP.

<u>Indicators and inorganics</u>
Ammoniacal Nitrogen
Ammoniacal nitrogen concentrations ranged from 2.22mg/l N (BH8) to 48.21mg/l N (BH2). All four leachate wells displayed exceedances across each monitoring round when compared to the groundwater regulation value. However when compared to EPA landfill site design values, the leachate values reported were below the typical range. Refer to Drawing 9a for Leachate Exceedances – Ammoniacal Nitrogen.

Molybdate Reactive Phosphorus (MRP)
MRP was analysed at monitoring wells BH2 and BH11 with concentrations ranging from 61µg/l P - 1307µg/l P. Both locations have seen consistent exceedances for each monitoring

event when compared to the groundwater and surface water regulation values of 35µg/l P. Refer to Drawing 9b for Leachate Exceedances – MRP.

Biochemical Oxygen Demand (BOD)
BOD concentrations ranged from less than MDL (<1mg/l) (BH11) to 199mg/l (BH2). All monitoring locations exceeded the surface water regulation value (1.5mg/l) with the exception of BH11 during the May 2015 monitoring event. Refer to Drawing 9c for Leachate Exceedances – BOD.

Concentrations of the remaining indicators and inorganics – Sulphate, Chloride, Fluoride, Cyanide and TON were below the relevant groundwater threshold values for all parameters.

Samples collected from leachate monitoring wells BH2 and BH11 were additionally analysed for the following parameters;

Metals
Boron
Dissolved Boron concentrations ranged from 661µg/l to 782µg/l. There was one exceedance observed at BH2 (782µg/l) when compared to the relevant groundwater regulation value (750µg/l). Refer to Drawing 9d for Leachate Exceedances – Boron.

Arsenic
Dissolved arsenic concentrations ranged from between 3.4µg/l (BH2) to 22.4µg/l (BH11). There were two exceedances observed at BH2 (22.4µg/l & 12.1µg/l) when compared to the relevant groundwater regulation value of 7.5µg/l. Refer to Drawing 9e for Leachate Exceedances – Arsenic.

Zinc
Dissolved zinc concentrations ranged from below the laboratory MDL (<3µg/l) to 191µg/l. There was one exceedance observed at BH2 (191µg/l) when compared to the relevant interim guideline value of 100µg/l. Refer to Drawing 9f for Leachate Exceedances – Zinc.

Nickel
Dissolved nickel concentrations ranged from 7µg/l (BH2) - 51µg/l (BH11). There were exceedances observed at both BH2 (18µg/l) and BH11 (48µg/l & 51µg/l) when compared to the groundwater regulation value of 15µg/l. Refer to Drawing 9g for Leachate Exceedances – Nickel.

Cadmium
Dissolved cadmium concentrations ranged from below laboratory MDL (<0.5µg/l) to 1.78µg/l. There was one exceedance recorded at BH2 (1.78µg/l) when compared to the relevant surface water regulation value of 1.5 µg/l. Refer to Drawing 9h for Leachate Exceedances – Cadmium.

Manganese
Dissolved manganese concentrations ranged from 840µg/l to 3392µg/l. There were exceedances observed at both BH2 (3392 µg/l, 1365 µg/l & 1151 µg/l) and BH11 (849µg/l & 840µg/l) when compared to the interim guideline value of 50 µg/l. Refer to Drawing 9i for Leachate Exceedances – Manganese.

Iron
Total dissolved iron concentrations ranged from 183µg/l to 1392µg/l. There were exceedances observed at BH2 (1392µg/l) and BH11 (675µg/l) when compared to the relevant groundwater regulation value of 200µg/l. Refer to Drawing 9j for Leachate Exceedances – Ammoniacal Nitrogen.

Calcium
Dissolved calcium concentrations ranged from 175.5mg/l to 383.9mg/l. There were exceedances observed at BH2 (383.9mg/l, 363.5mg/l & 362.1mg/l) when compared to the relevant interim guideline value of 200mg/l. Refer to Drawing 9k for Leachate Exceedances – Calcium.

Magnesium
Dissolved magnesium concentrations ranged from 34.9mg/l to 60.2mg/l. There were exceedances observed at BH2 (59.8mg/l, 60.2mg/l & 57.1mg/l) when compared to the relevant interim guideline value of 50mg/l. Refer to Drawing 9l for Leachate Exceedances – Magnesium.

Samples collected from leachate monitoring wells BH2, BH8, BH10 and BH11 were analysed for the following parameters;

Potassium
Dissolved potassium concentrations ranged from 4.2mg/l to 54.2mg/l. Exceedances were observed at all locations during each of the monitoring rounds when compared to the relevant interim guideline value of 5mg/l with the exception of BH8 during the May 2015 monitoring event (4.2mg/l). Refer to Drawing 9m for Leachate Exceedances – Potassium.

Sodium
Dissolved sodium concentrations ranged from 17.5mg/l to 279.9mg/l. There were exceedances observed at BH2 (279.9mg/l, 260.1mg/l & 240.8mg/l) and BH11 (190.1mg/l & 176.3mg/l) when compared to the relevant groundwater regulation value of 150mg/l. However samples taken from BH8 and BH10 were compliant with the groundwater regulation value. Refer to Drawing 9n for Leachate Exceedances – Sodium.

VOCs
Reported concentrations of Benzene at BH2 (5µg/l, 4.4µg/l & 5.3µg/l) exceeded the relevant groundwater regulation value of 0.75µg/l. However the other leachate monitoring points were compliant with observed exceedances. Refer to Drawing 9n for Leachate Exceedances – Benzene.

SVOCs
There were no exceedances observed for SVOCs, PAHs, phthalates, when compared to the relative groundwater and surface water threshold values with the exception of Phenol (24µg/l) which exceeded the interim guideline value of 0.5µg/l. Refer to Drawing 9o for Leachate Exceedances – Phenol.

Pesticides
Reported concentrations of atrazine and simazine were below the groundwater and surface water threshold values.

Organochlorine Pesticides
Concentrations of the organochlorine pesticides for all monitoring locations analysed did not exceed their respective laboratory MDL's.

Organophosphorus Pesticides
Concentrations of the organophosphorus pesticides for all monitoring locations analysed did not exceed their respective laboratory MDL's.

Acid Herbicides
Concentrations of all other pesticides for all monitoring locations analysed did not exceed their respective laboratory MDL's.

4 TIER 3 - REFINEMENT OF CONCEPTUAL SITE MODEL

Conceptual Site Model (CSM) for the Site was established in the Tier 1 – Conceptual Site Model Risk Screening and Prioritisation and Tier 2 – Exploratory Site Investigation. This section will revisit the existing CSM and refine it where necessary. Refer to Drawing 10 - Conceptual Site Model attached to this report for a schematic CSM of the Site.

The previous assessments (Tier 1 and Tier 2) stated possible linkages between leachate and groundwater (SPR 3 and SPR 5) and migration of landfill gas (SPR 10 and SPR 11) as shown on Table 18 below. The greatest concern included the risk of landfill gas to onsite receptors and its migration to off-site receptors, both with normalised scores of 100% indicating high risk.

Table 18: Identified S-P-R linkages.

Linkage	Source	Pathway	Receptor
SPR 3	Leachate	Vertical and horizontal groundwater migration	Humans / Private Wells
SPR 7	Leachate	Vertical and horizontal groundwater migration	Mill Stream and River Liffey
SPR 10	Landfill Gas	Lateral migration (subsoil)	Human presence
SPR 11	Landfill Gas	Vertical migration (subsoil)	Human presence

The following Sections discuss the identified S-P-R linkages.

4.1 Landfill Material

The analytical results and visual observations of the Tier 2 Main and Exploratory Site Investigations have confirmed that the landfill material was generally composed of inert or non-hazardous material.

4.1.1 Vertical Extent of Waste

The geophysical survey, which was carried out during the Tier 2 Exploratory Site Investigations, indicated a vertical extent of the waste body of 17mbGL at the central part of the waste body. The scope of the Tier 2 Main Site Investigations indicated that the shell & auger drilling methodology has a limited depth. During the Tier 2 Main Site Investigation the installation depth within the waste body did not exceed 7.0 mbGL, i.e. the vertical extent of the waste body could not be verified. The subsequent waste volume calculations are based on the findings of the geophysical survey, i.e. the maximum vertical extent of the waste has been assumed to be circa 17mbGL.

A schematic cross section has been completed (refer to Drawing 10).

4.1.2 Horizontal Extent of Waste

The horizontal extent of waste materials has been approximated from the geophysical survey carried out during the Tier 2 Exploratory Site Investigation (MOR, 2012). The area of the site believed to be underlain by waste is approximately 20ha.

The horizontal extent of the waste body was re-estimated using information collected during the Tier 2 Main Site Investigation:

- It is now evident that wastes were not placed in adjacent fields to the east and the existing hedgerow delineates the eastern boundary of the waste;
- The Mill Stream delineates the northern extent of the waste body;
- The western extent of the waste body has been delineated by four (4 No) locations where no waste were identified, namely BH14, BH09, TP11 and MW07; and,
- The exact extent of the waste body to South could not be delineated, but it is reasonable to assume that the waste body does not extend into the wooded area because of:
    - Pre-existence of residential properties on the southern boundary are visible on aerial photography from 1985; and,
    - Additional gas boreholes were installed outside of the Site to South within the grounds of Stewarts Hospital. No waste materials were encountered during the intrusive works within the grounds of Stewarts Hospital.

The geophysical survey carried out in 2012 (during the Tier 2 Exploratory Site Investigation) indicated that the waste body measured 19.9ha (570m by 350m) and could be subdivided into three areas:

- Mainly gravelly clay and municipal waste mixed with C&D (Construction and Demolition Waste);
- Mainly municipal waste mixed with C&D and clay; and,
- Mixed municipal waste and C&D.

The mainly municipal waste body was estimated to be within the centre of the overall waste body and measured approximately 7.6ha (380m by 200m) and the maximum thickness was interpreted to be circa 17.0m.

The findings of the Tier 2 Main Site Investigation indicated that the mainly municipal waste mixed with C&D and clay extends over a slightly larger area than originally interpreted in the Tier 2 Exploratory Site Investigation. However the difference in the waste volume estimates between the Tier 2 Main and Exploratory Site Investigations is not considered to be significant. Therefore it is considered that there would be no justification to amend the results of the Tier 2 Exploratory Site Investigation. Therefore the volume of waste material within the former landfill is still estimated to be in the region of 1,250,000m^3.

The volume ratio of municipal waste and C&D waste have been estimated at 60% municipal waste and 40% C&D waste. This estimate is based on the results of the geophysical survey and observations made during the intrusive site investigations. The volume of municipal waste has been estimated at 750,000m^3 (1,350,000 tonnes when using a multiplier of 1.8 tonnes/m^3) and the volume of C&D waste at 500,000m^3 (900,000 tonnes when using a multiplier of 1.8 tonnes/m^3).

The quantity of capping material placed onsite was estimated from the geophysical survey and the observations made during the intrusive investigations to be in the region of 300,000m^3. Please refer to Drawing 11 Inferred Horizontal Waste Extent.

4.2 Leachate

The made ground comprising municipal and C&D wastes was observed to be dry at the majority of the locations during the Tier 2 Main and Exploratory Site Investigations. The dry waste and low levels of leachate are due to the low permeable clay layer deposited on top of the waste to depths of up to 1.0 meter. The low permeability clay layer does mitigate against leachate generation.

Leachate levels in the leachate monitoring wells were observed to be on average less than one (1 No) metre within the waste body.

Leachate results were compared against Groundwater Regulations (2010), EPA IGV's (2003) and Surface Water Regulations (2012) for guidance purposes given the receptors identified. A number of parameters analysed exceeded the guideline values set out in the guidance documents used:

- Dissolved oxygen, Cadmium and BOD exceeded the surface water regulations only.
- MRP as total phosphorus and ammoniacal nitrogen exceeded both the Groundwater and Surface Water Regulations.
- Electrical conductivity, dissolved arsenic, dissolved sodium, benzene, and boron exceeded the groundwater regulations only.
- Dissolved calcium, dissolved magnesium, total dissolved Iron, dissolved manganese, dissolved potassium, zinc and phenol exceeded the EPA IGV's only.

In addition to the comparison with the different Surface Water and Groundwater Regulations, the leachate values were also put into context with a comparison with typical leachate values of a methanogenic landfill (EPA, 2000). In general the leachate values were lower than those of a methanogenic landfill and can be considered reasonably typical of leachate concentrations for a former landfill that had been closed in the last 30 years. Refer to Table 19 below.

Table 19: Leachate Analytical Results Comparison.

Parameter	Units	Surface Water Guideline Value	Groundwater Guideline value	Typical leachate chemistry for aged domestic wastes	Waterstown leachate (average)
Ammonia	mg/l	0.065	0.065	370	19.612
Chloride	mg/l	-	187.5	2,080	87.37
MRP	µg/l	35	35		542.6
Potassium	mg/l	-	5	590	21.96

Shaded denotes value exceeds surface water Guideline Value / Groundwater Guideline Value

4.3 Groundwater

Taking into account the site conditions, groundwater flow direction and gradient it can be concluded that the groundwater flow is in a general northerly direction towards both the Mill Stream and River Liffey.

The groundwater quality data does indicate that some parameters are at higher concentrations downstream of the Site, i.e. the upstream concentrations are lower. This suggests that the wastes deposited within the Site are impacting on the downstream groundwater quality, albeit not to any significant extent – refer to Table 20 below for details.

Table 20: Groundwater Analytical Results Compared.

Parameter	Units	Surface Water Guideline Value	Groundwater Guideline value	Typical leachate chemistry for aged domestic wastes	Waterstown leachate (average)	Groundwater	
						Waterstown groundwater (average upgradient)	Waterstown groundwater (average downgradient)
Ammonia	mg/l	0.065	0.065	370	19.612	0.12	3.12
Chloride	mg/l	-	187.5	2,080	87.37	32	58.05
MRP	µg/l	35	35		542.6	53.6	274.73
Potassium	mg/l	-	5	590	21.96	2.5	10.733
shaded denotes value exceeds surface water guideline value/groundwater guideline value							

A GSI well search for private, agricultural and industrial groundwater wells within a 2.0km radius of the Site identified groundwater well locations north of the Site, the closest location being approximately 300 metres north of the Site boundary within a property named as Knockmaroon House. According to information from GSI this well is approximately 60 metres deep and it has been installed into the gravel aquifer. Based on current available information a hydraulic connectivity between the Site and this well is unlikely due to the encountered artesian aquifer conditions between the Site and the River Liffey and an assumption that the groundwater flow direction at the North side of the River Liffey is to South towards the River Liffey. Refer to Drawing 12 for location details.

Data Logger Results

The Data Logger results confirmed a connectivity between rainfall and the limestone bedrock aquifer beneath the Site, i.e. a quick response was observed.

4.4 Surface Water

The water chemistry of the River Liffey both up and down stream of the Site was very similar for the parameters analysed – refer to Table 21 for details. Therefore it can be concluded that the Site is not significantly impacting on the River Liffey.

The only exceedances for the River Liffey samples were MRP and BOD, which both marginally exceeded the Surface Water Regulation Guideline Values.

The exceedances for the Mill Race samples were Ammoniacal Nitrogen, MRP and BOD. All of which marginally exceeded the Surface Water Regulation Guideline Values.

The water chemistry of the Mill Race appears to be influenced to a greater extent than that of the River Liffey. It is not unreasonable to determine that this is likely due to the greater dilution capacity of the River Liffey and the fact that the Mill Race is located in closer proximity to the Site.

Further a potential impact from an upstream industrial facility, agricultural source or point source release of pollution (including spills) cannot be ruled out as a potential contributor to the identified elevated concentrations.

Table 21: Surface Water Results Compared (average results).

Parameter	Units	Surface Water Guideline Value	Groundwater Guideline value	Typical leachate chemistry for aged domestic wastes	Waterstown leachate (average)	Mill Street		Liffey	
						Surface Water (upstream)	Surface Water (downstream)	Surface Water (upstream)	Surface Water (downstream)
Ammonia	mg/l	0.065	0.065	370	19.612	0.07	0.08	0.056	0.063
Chloride	mg/l	-	187.5	2,080	87.37	24.3	24.73	23.06	21.23
MRP	µg/l	35	35		542.6	81.5	73.66	76	61.66
Potassium	mg/l	-	5	590	21.96	1.8	2	2	1.6

shaded denotes value exceeds surface water guideline value/groundwater guideline value

4.5 Landfill Gas

The amount of waste within the Waterstown landfill has been estimated to be 1,250,000 m^3. If it is assumed that 30% of the waste volume is biodegradable, then the amount of gas generating waste would be approximately 375,000 m^3. Further, according to EPA Guidance (Landfill Design Manual, EPA 2000) each tonne of waste will generate approximately 10 m^3 of landfill gas during its lifetime. On this basis the Site would be expected to generate approximately 2,812,500 m^3 of landfill gas (i.e. 375,000 m^3 x 0.75 t/m = 281,250 tonnes biodegradable waste x 10m^3 gas per tonne).

The landfill gas assessment identified methane concentrations within the waste body ranged between 0% (v/v) and 58.1% (v/v) and carbon dioxide ranged between 0% (v/v) and 36.1% (v/v). This includes twelve (12 No) landfill gas monitoring locations located in the waste body.

It was noted that at monitoring location BH14, located approximately 10m north from the closest dwelling, an average methane concentration of 49.1% v/v was recorded. Flow monitoring was carried out at BH14, but no flow was recorded. An internal gas survey utilising a Flame Ionisation Detector (FID) was carried out in April 2016 in and around this dwelling. No landfill gas could was detected during the survey – the results of this survey have been summarised in Table 12 attached to this report.

The following Figure 2 depicts methane (CH_4) concentrations at BH1 to BH12. It can be seen that the methane concentrations were stable and ranged between 20 and 50% (v/v) at locations within the waste body.

Figure 2: Methane Results During 2015 at BH1 to BH12 (in % v/v).

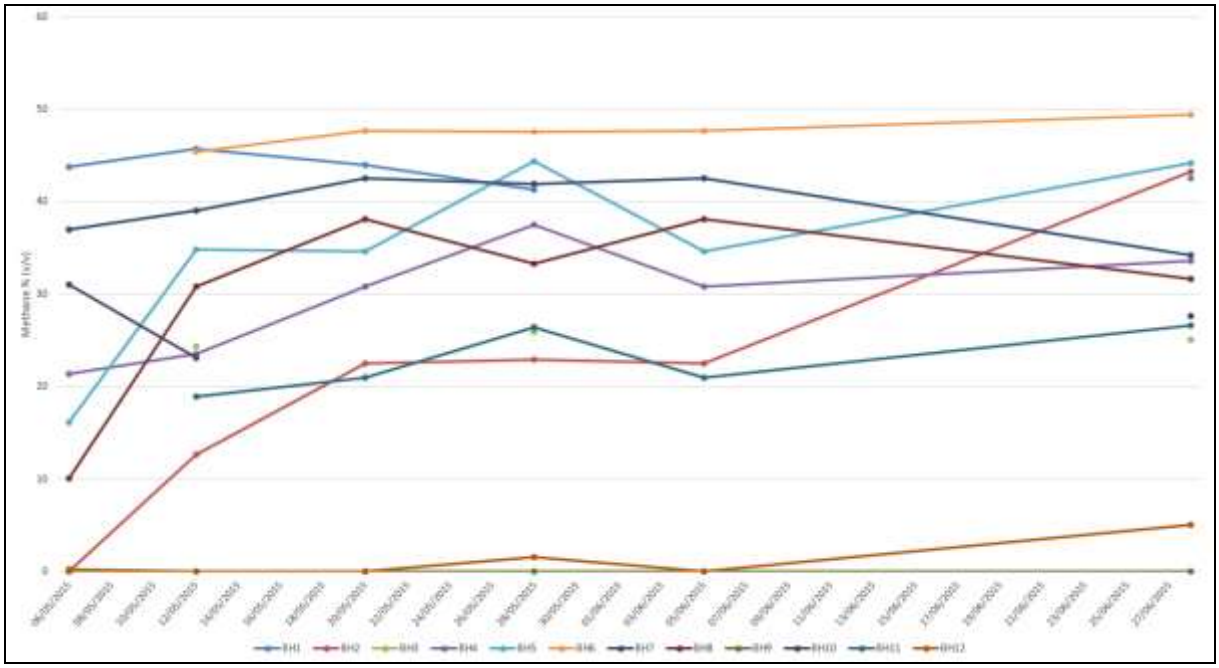
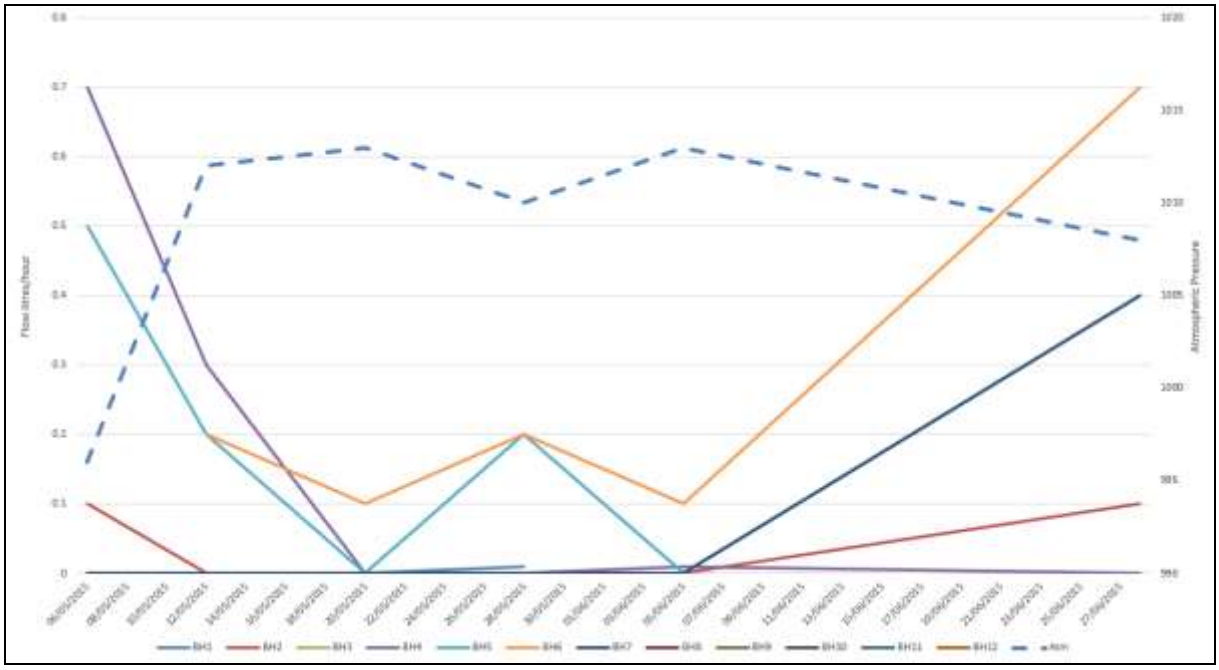


Figure 3 below outlines the impact of a change in atmospheric or barometric pressure to soil gas pressure. The difference between the soil gas pressure and barometric pressure allows gas to move either vertically or laterally, depending on whether the barometric pressure is higher or lower than the soil gas pressure. When barometric pressure is falling, landfill gas will tend to migrate out of the landfill into surrounding areas. As barometric pressure rises, gas may be retained in the landfill temporarily as new pressure balances are established.

The observed borehole flow rates were low with a maximum positive flow of 0.7 l/hr. This tends to suggest that if any gas migration is occurring it is happening slowly by diffusion.

Figure 3: Impact of Atmospheric Pressure to LFG Flow in Wells BH1 to BH12.



Landfill gas monitoring data collected at the additional gas boreholes (BH15 to BH17), installed between the Site and the closest receptors, and the gas survey carried out using a FID (Flame Ionisation Detector) at the closest receptor location allow us to make a conclusion that no landfill gas migration is taking place between the Site and this receptor.

5 TIER 3 - GENERIC QUANTITATIVE RISK ASSESSMENT

In accordance with the EPA COP a quantitative risk assessment is required where the site is deemed, following the risk screening process, to intrinsically pose a high or moderate risk to the environment or human health. There are two basic types of quantitative risk assessments:

- **Generic Quantitative Risk Assessment (Generic QRA)**, which uses relevant generic assessment criteria (GAC)(i.e. values which are generally applicable to an entire class or group e.g. based on proposed future land use) or guidelines, and
- **Detailed Quantitative Risk Assessment (Detailed QRA),** requires the development of site-specific assessment criteria (SSAC) and subsequently the representative site concentrations are compared to the site-specific criteria. Different risk assessment modelling tools and numerical groundwater flow models can be utilised during the process.

The decision on which type of QRA that should be used is site specific and is dependent on the sensitivity of the site and also on the confidence in the available data. In any case the quantitative risk assessment should be detailed enough to allow remedial measures to be proposed with certainty of a successful outcome.

For this Risk Assessment it was considered sufficient to carry out a Generic QRA due to the availability of Site specific environmental quality data, i.e. results of environmental monitoring were compared against existing guideline values and generic assessment criteria.

5.1 Generic Assessment Criteria

According to the EPA COP (Code of Practice (COP) – Environmental Risk Assessment for Unregulated Waste Disposal Sites (EPA, 2007) the potential risk shall be assessed for each identified pollutant linkage by comparing the representative site concentrations with generic assessment criteria (GAC) or screening levels.

In the absence of GAC values for water, the Interim Guideline Values (IGV) (EPA, 2003) have been used as guideline values for parameters with elevated concentrations.

5.2 Results of Generic Risk Assessment

The Tier 1 and Tier 2 Exploratory Investigation (MOR, 2012) concluded the existence of the following SPR (Source-Pathway-Receptor) linkages for the Site:

- The Tier 1 assessment identified a possible linkage between leachate and groundwater (SPR3), leachate and surface water (SPR7) and migration of landfill gas (SPR 10 and SPR 11); and,
- The Tier 2 Exploratory Investigation (MOR, 2012) confirmed the identified SPR linkage between leachate, landfill gas and human receptors and further confirmed the risk classification as High Risk.

This Tier 2 Risk Assessment: Main site investigation and Testing, Tier 3 Risk Assessment: Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation at Waterstown Landfill concluded the following:

- The groundwater quality downgradient of the Site has been impacted by a number of elevated parameters including ammoniacal nitrogen. The presence of ammoniacal nitrogen at downgradient locations provides strong evidence that the former landfill is impacting on groundwater as the leachate within the waste body contains elevated concentrations of ammoniacal nitrogen;

- The surface water monitoring results did not show any clear evidence that the water quality in the River Liffey has been significantly impacted by the former landfill as concentrations were broadly similar both upstream and downstream of the site;
- The surface water monitoring results of the Mill Race, located immediately adjacent to the Site, and in particular ammoniacal nitrogen showed a potential impact of the former landfill on the downgradient surface water chemistry;
- A potential impact from an upstream industrial facility, agricultural or point source release of pollution (including spills) source cannot be ruled out as a potential contributor to the identified elevated concentrations at the surface water monitoring locations; and,
- Landfill gas migration beyond the Site's boundary is not taking place.

6 SUMMARY AND CONCLUSIONS

This Tier 2 Risk Assessment: Main site investigation and Testing, Tier 3 Risk Assessment: Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation (undertaken by MOR in accordance with the EPA Code of Practice) included the following works:

- Installation of eleven (11 No) trial pits, nineteen (19 No) boreholes (of which five (5 No) were converted to groundwater wells and nine (9 No) gas/leachate wells and five (5 No) landfill gas wells);
- Laboratory analysis of ten (10 No) soil, sixteen (16 No) groundwater, eight (8 No) surface water and eight (8 No) leachate samples and the completion of six (6 No) gas monitoring events; and,
- One internal FID gas survey at the closest receptor location.

Based on the results from the site investigations and data assessments carried out by MOR during 2012 and 2015 the following can be concluded:

- The landfill was in operation from 1983 to 1987;
- The Site was formerly a quarry that was filled with waste materials, followed by the progressive raising of site levels as landfilling continued on Site;
- No gas or leachate collection systems have been installed at the Site;
- It is assumed that waste materials were deposited directly onto exposed bedrock;
- Given the location of the site in close proximity to a pNHA (proposed Natural Heritage Area) and within the Liffey Valley SAAO (Special Amenity Area Order), the Site is considered to be located in a sensitive location;
- The type of waste found within the landfill is variable and includes both municipal and C&D wastes. It appears that the majority of the municipal wastes were deposited in the south central portion of the former landfill;
- The boundaries of the former landfill have been delineated;
- The intrusive investigations within the body of waste did not delineate the vertical extent of the waste. The investigation results confirmed that the depth of the waste does extend to over seven (7 No) metres in the central parts of the Site. The geophysical survey carried out during the Tier 2 Exploratory Site Investigation indicated depths of waste of 17.0m in the centre of the Site;
- The area of the former landfill that would fall under the scope of the Code of Practice and associated regulations is approximately 20ha in extent;
- It is estimated that in the region of 1,250,000m^3 of waste materials was accepted into the former landfill during its operational lifespan;
- Materials were imported to the Site to form a capping layer. The depth of the capping layer would appear to vary across the site and it is estimated that in the region of 300,000m^3 of capping material was imported onto the site;
- Soil sample results collected from the trial pits generally complied with Waste Acceptance Criteria for inert landfill;
- Elevated landfill gas concentrations were detected at a number of locations at the Site, in particular along the southern boundary that adjoins residential properties, albeit lower concentrations were recorded in 2015 when compared to the 2012 monitoring results;

- Additional landfill gas monitoring locations were installed south of the Site (within Stewarts Hospital grounds – BH15, BH16 and BH17 - and adjacent to closest residential building – BH14 – refer to Drawing No. 2), outside of the Site boundaries and body of waste. The monitoring data confirmed the absence of landfill gas;
- Landfill gas flow measurements were recorded to be very low, which would indicate that the rate of landfill gas generation at the former landfill is low;
- A landfill gas survey was carried out in and around the closest private dwelling. The survey data confirmed the absence of landfill gas at this location;
- The groundwater quality downgradient of the Site has been impacted by a number of elevated parameters including ammoniacal nitrogen. The presence of ammoniacal nitrogen at downgradient locations provides strong evidence that the former landfill is impacting on groundwater as the leachate within the landfill contains elevated concentrations of ammoniacal nitrogen. There is no known groundwater usage downstream of the site;
- The surface water monitoring results did not show any clear evidence that the water quality in the River Liffey has been significantly impacted by the former landfill as concentrations within the River Liffey were broadly similar both upstream and downstream of the site. Potential impact from an upstream industrial facility or agricultural source cannot be ruled out as a potential contributor to the identified elevated concentrations;
- The surface water monitoring results of the Mill Race, located immediately adjacent to the site, and in particular ammoniacal nitrogen showed a potential impact of the landfill on the downgradient surface water chemistry. As above, potential impact from an upstream industrial facility, agricultural source or point source release of pollution (including spills) cannot be ruled out as a potential contributor to the identified elevated concentrations;
- An Appropriate Assessment (AA) screening exercise (MOR, 2015 – report attached at Appendix A) was undertaken as part of the Tier 3 risk assessment to assess the potential impact on European conservation designations (Natura 2000 sites). In light of the findings of the Tier 2 – Main Site Investigation and Tier 3 Quantitative Risk Assessment, and in the absence of any identifiable contribution of contaminants to the nearby water courses, or the need for relating mitigation, the AA concluded that the site does not adversely affect the integrity and conservation status of any Natura 2000 sites; and,
- According to the EPA COP risk prioritisation calculations prepared for the previous assessments (Tier 1 – Conceptual Site Model Risk Screening and Prioritisation and Tier 2 – Exploratory Site Investigation) the Site has been classified as a Class A – High Risk Site due to the potential risks associated with landfill gas migration. The further site investigation data collected during this Tier 2 – Main Site Investigation and Tier 3 Refinement of CSM and Quantitative Risk Assessment has verified the absence of landfill gas outside of the body of waste.

7 RISK EVALUATION

The following details summarise the risk evaluation of the Site:

- **The End Use of the Site** - The landfill, which is currently used as a public park, was in operation from 1983 to 1987 and was used as a disposal facility for municipal waste as well as solid inert waste from commercial/industrial sources. The Site is capped throughout with approximately 1 metre of low permeability clays and it is assumed that there will be no direct exposure to shallow soils or groundwater within the Site in the near future, i.e. no intrusive groundworks have been planned or proposed within the Site;
- **Source** – Waste deposited within the Site is a potential source of contamination in the form of leachate and landfill gas. The site assessments indicate that the capping layer overlying the waste material is of low permeability, thus impeding rainfall infiltration into the waste material. The trial pitting established that the waste materials are dry, which does confirm that the low permeability cover is effective. Soil/waste sample results collected during the investigations generally complied with Waste Acceptance Criteria for inert landfills and the leachate concentrations can be considered reasonably typical for a historical landfill of this age profile. Further the landfill gas monitoring indicated very low flow rates in the gas boreholes, which indicates that the rate of landfill gas production is low;
- **Pathways** – Shallow permeable wastes and subsoils have been identified as potential pathway for landfill gas and groundwater has been identified as potential pathway for contaminated leachate and water to migrate off Site. The Site investigations have shown that the waste body is relatively dry, i.e. the rate of leachate generation within the Site is considered to be low; and,
- **Receptor** – The surface water bodies River Liffey and Mill Race and the underlying groundwater body can be considered as receptors of potential contamination (e.g. leachate). The previous site investigations (Tier 1 – Conceptual Site Model Risk Screening and Prioritisation and Tier 2 – Exploratory Site Investigation) indicated potential linkages between landfill gas generated within the site and the closest receptor locations south of the site. Gas surveys carried out during this Tier 2 – Main Site Investigation and Tier 3 Quantitative Risk Assessment confirmed that no landfill gas is present at those receptor locations.

According to the EPA COP it is not acceptable to reduce the risk classification purely on the basis that the data indicates that there is no impact. A verification is required to demonstrate that the S-P-R linkage(s) has been broken. In the following a verification is provided for potential leachate and landfill gas migration:

Risk Verification:

- **Leachate** – This Tier 2 – Main Site Investigation and Tier 3 Quantitative Risk Assessment has demonstrated that the downgradient groundwater quality has been impacted by leachate originating from the landfill. There is no proven private well usage within the vicinity of the landfill and further the surface water monitoring results indicate that the landfill site is not adversely impacting on the water quality of the River Liffey. Therefore it would be reasonable to conclude that the landfill does not present a significant environmental or human health risks to the assessed offsite receptors; and,
- **Landfill Gas** – This Tier 2 – Main Site Investigation and Tier 3 Quantitative Risk Assessment has demonstrated that no landfill gas is present at the identified closest receptor locations, therefore it would be reasonable to conclude that landfill does present any significant environmental or human health risks to the assessed offsite receptors.

Revised Site Classification

Site investigation data collected during the Tier 2 – Main Site Investigation and Tier 3 Refinement of the CSM and Quantitative Risk Assessment established that there were no significant environmental or human health risks to the assessed offsite receptors.

Based on this fact the Client consulted with the EPA about lowering the risk classification for the historic landfill. The EPA subsequently confirmed the following: *"I note that the Code of Practice in 4.4.3 notes that, where actions have been taken, the risk classification of the site can be lowered in consultation with the regulatory authority. I am satisfied that it appear to be in order for SDCC to do that."* A copy of the email correspondence dated 14th July 2016, is attached in Appendix J.

Based on this instruction from the EPA, it is considered appropriate that the historic landfill is reclassified from a Class A – High Risk Site to a Class B – Moderate Risk Site in accordance with the Code of Practice. This is based on reducing the SPR linkages 10 and 11 for landfill gas migration from high risk to moderate risk. Albeit the conclusion that the risk classification for SPR linkages 10 and 11 for landfill gas migration have been reduced from high risk to moderate risk further environmental validation sampling is recommended to further confirm that the SPR linkages for landfill gas migration do not exist.

In general terms, former landfill sites that are not generating leachate or Landfill gas or sites where active remediation measures have been undertaken to eliminate potential risks can be classified as low risk sites. Sites that do present potential risks are categorised as high risk sites and typically require some active remedial measures. Sites that have the potential to generate gas and leachate but have been confirmed not to present any current risks that would warrant active remedial measures, would fall into the moderate risk category.

8 REMEDIATION, RISK ATTENUATION AND SITE RESTORATION

We would consider that the Site has been well characterised at this juncture given the comprehensive investigations undertaken in recent years. Based on the evaluation of all available data in accordance with recognised best practice criteria, it is our opinion that there is no evidence to suggest that the historic landfill presents any significant environmental or human health risks.

The key element of the proposed remediation strategy would be the implementation of an annual environmental monitoring programme for groundwater, surface water, leachate and landfill gas to further validate the findings of this risk assessment. The monitoring programme should be undertaken over a three (3 No) year period. A review of the collected data should be undertaken after all data has been collated.

This monitoring programme should include for the following:

- **Landfill Gas Monitoring** – The monitoring should include all monitoring locations, but at a minimum all locations close and outside to the site boundaries. The monitoring should be carried out during low pressure events to obtain more information of the magnitude of the impact low pressure has on the gas flow.

- **Leachate Monitoring** - The monitoring should include all monitoring locations. The leachate quality monitoring should have particular attention to parameters evident within the leachate such as dissolved oxygen, cadmium, BOD, MRP as total phosphorus, ammoniacal nitrogen, electrical conductivity, dissolved arsenic, dissolved sodium, dissolved calcium, dissolved magnesium, total dissolved iron, dissolved manganese, dissolved potassium, benzene, zinc, phenol and boron;

- **Groundwater Monitoring** - groundwater monitoring should include the existing environmental monitoring infrastructure. The groundwater monitoring should have particular attention to parameters evident within the groundwater such as ammonia, microbiological parameters, chloride, MRP as phosphorus, arsenic, nickel, Manganese, potassium, calcium and potassium;

- **Surface Water Monitoring** – surface water monitoring should include the existing environmental monitoring infrastructure, i.e. monitoring at up- and downstream locations at the River Liffey. The surface water monitoring should have particular attention to parameters evident within the groundwater such as BOD, ammonia, chloride, MRP as phosphorus and potassium

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TABLES

Tier III Exploratory Site Investigation

SDCC
Waterstown, Co Dublin
Table 6: Soil Analytical Results - Leachate

Sample ID			**Leachate Screening**			TP7	TP8	TP9	TP10	TP17	TP 11	TP 12	TP 13	TP 14	TP 16
Sample Depth (mbgl)			**Groundwater Regulations 2010 (S.I. No. 9 of 2010)** [1]	EPA Interim Guideline Value (IGV) for Groundwater [2]	Surface Water Regulations 2012 (S.I. No 327 OF 2012)[3]										
Laboratory Report No.						15/5806	15/5806	15/5806	15/5806	15/5806	15/5870	15/5870	15/5870	15/5870	15/5870
Laboratory Sample No.						1-3	4-6	7-10	11-14	15-18	1-4	5-8	9-12	13-16	17-20
Sample Date						07/04/2015	07/04/2015	07/04/2015	07/04/2015	07/04/2015	NA	NA	NA	NA	NA
Parameters	**Unit**	**MDL**													
Indicators and Inorganics															
Phenol	µg/l	<1	~	0.5	~	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/l	<3	~	1	~	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	<0.3
Chloride	mg/l		187.5	30	~	0.4	1.1	0.6	0.7	0.7	0.3	1.2	8.2	3.4	0.6
Sulphate	mg/l	<0.05	187.5	200.0	~	0.72	1.02	1.07	2.22	2.31	3.61	31.84	86.65	94.7	21.15
Dissolved Organic Carbon	mg/l	<20	~	~	~	4	3	5	3	5	3	11	20	11	9
Total Dissolved Solids	mg/l	<100	~	~	~	64	48	<10	<10	95	54	172	66	270	<10
Mass of raw test portion	kg	-	~	~	~	0.1055	0.1101	0.1158	0.1108	0.1188	0.1058	0.1086	0.1129	0.1236	0.1179
Leachate Volume	l	-	~	~	~	0.885	0.88	0.874	0.879	0.871	0.884	0.881	0.878	0.867	0.872
Eluate Volume	l	-	~	~	~	0.85	0.86	0.83	0.72	0.61	0.78	0.74	0.78	0.78	0.76
Metals **															
Dissolved Antimony (Sb)	µg/l		~	~	~	<2	<2	<2	<2	10	<2	<2	3	3	<2
Dissolved Arsenic (As)	µg/l	<2.5	7.5	10	~	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	2.8
Dissolved Barium (Ba)	µg/l	<3	~	100	~	6	<3	4	7	10	<3	41	39	71	78
Dissolved Cadmium (Cd)	µg/l	<0.5	3.75	5	1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved Chromium (Cr)	µg/l	<1.5	37.5	30	~	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Dissolved Copper (Cu)	µg/l	<7	1500	30	~	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7
Dissolved Lead (Pb)	µg/l	<5	18.75	10	~	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dissolved Molybdenum (Mo)	µg/l	<2	~	~	~	3	8	5	5	2	2	27	63	50	44
Dissolved Nickel (Ni)	µg/l	<2	15	20	~	<2	<2	<2	<2	<2	<2	6	9	3	3
Dissolved Selenium (Se)	µg/l	<3	~	~	~	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Dissolved Zinc (Zn)	µg/l	<3	~	100	~	4	<3	6	<3	<3	<3	<3	<3	<3	<3
Dissolved Mercury by CVAF (Hg)	µg/l	<1	0.75	1	0.07	0.03	<0.01	0.03	<0.01	<0.01	0.02	0.03	0.06	0.02	0.02

Notes:

1. European Communities Environmental Objectives (Groundwater) Regulations 2010; S.I No. 9 of 2010. as amended S.I. No. 149 of 2012

2. Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report, EPA, Ireland. Used in the absence of a relevant Groundwater Regulation Screening Value.

3: European Communities Environmental Objectives (Surface water) Regulations 2009; S.I. No. 272 of 2009.

Shaded denotes value exceeds groundwater regulation standards.

Bold denotes value exceeds IGV where no groundwater regulation value is available.

Underline denotes value exceeds surface water regulations

** denotes dissolved metal concentrations were converted for comparison to the assessment criteria values

In the case of Copper the value 30µg/L applies where the water hardness exceeds 100mg/l $CaCO_3$; Surface Water Regulation 2009 (S.I. No 272 of 2009): Alkalinity >100mg/L $CaCO_3$ within CCC data 'Surface Water Trends'

In the case of Zinc the value 100µg/L applies where the water hardness exceeds 100mg/l $CaCO_3$; Surface Water Regulation 2009 (S.I. No 272 of 2009): Alkalinity >100mg/L $CaCO_3$ within CCC data 'Surface Water Trends'

~ denotes water quality standard unavailable

MDL denotes Method Detection Limit

Sample ID			**Assessment Criteria**			**TP2**	**TP3**	**TP4**	**TP5**	**TP7**	**TP8**	**TP9**
Sample Depth (mbgl)						**2.9-3.0**	**1.15**	**1.45-1.55**	**1.2-1.3**	**<>**	**<>**	**<>**
Laboratory Report No.			U.K. Soil Guideline Values (SGVs)[1]	**CL:AIRE Generic Assessment Criteria[2]**	LQM/CIEH Generic Assessment Criteria[3]	**12/9568**	**12/9568**	**12/9568**	**12/9571**	**15/5806**	**15/5806**	**15/5806**
Laboratory Sample No.			Residential	Residential	Residential	**13-15**	**23-25**	**29-31**	**1-3**	**1-3**	**4-6**	**7-10**
Sample Date						**04/12/2012**	**04/12/2012**	**04/12/2012**	**05/12/2012**	**07/04/2015**	**07/04/2015**	**07/04/2015**
Parameters	Unit	LOD										
Total Organic Carbon #	%	<0.2	~	~	~	1.6	2.4	12.9	2.4	0.39	0.55	0.85
Natural Moisture Content	%	<0.1	~	~	~	-	-	-	-	11.6	20.8	25.2
Mineral Oil >C8-C10	mg/kg	<5	~	~	~	-	-	-	-	<5	<5	<5
Mineral Oil >C10-C12	mg/kg	<10	~	~	~	-	-	-	-	<10	<10	<10
Mineral Oil >C12-C16	mg/kg	<10	~	~	~	-	-	-	-	<10	<10	<10
Mineral Oil >C16-C21	mg/kg	<10	~	~	~	-	-	-	-	<10	<10	<10
Mineral Oil >C21-C40	mg/kg	<10	~	~	~	-	-	-	-	<10	<10	<10
Mineral Oil >C8-C40	mg/kg	<45	~	~	~	183	571	7065	331	<45	<45	<45
Petroleum Hydrocarbons												
MTBE	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
Benzene	ug/kg	<5	330	~	~	<5	18	<5	<5	<5	<5	<5
Toluene	ug/kg	<5	610000	~	~	7	66	9	11	<5	<5	<5
Ethylbenzene	ug/kg	<5	350000	~	~	39	107	11	11	<5	<5	<5
m/p-Xylene	ug/kg	<5	230000 (p)	~	~	135	275	8	22	<5	<5	<5
o-Xylene	ug/kg	<5	250000 (o)	~	~	15	95	28	13	<5	<5	<5
Polycyclic Aromatic Hydrocarbons (PAHs) (M-S)												
Naphthalene	mg/kg	<0.04	~	~	8.7	0.23	0.49	<0.40	0.08	<0.04	<0.04	<0.04
Acenaphthylene	mg/kg	<0.03	~	~	850	<0.03	0.17	<0.30	<0.03	<0.03	<0.03	<0.03
Acenaphthene	mg/kg	<0.05	~	~	1000	0.23	0.34	<0.50	<0.05	<0.05	<0.05	<0.05
Fluorene	mg/kg	<0.04	~	~	780	0.23	0.34	<0.40	0.08	<0.04	<0.04	<0.04
Phenanthrene	mg/kg	<0.03	~	~	380	1.45	2.01	<0.30	0.3	<0.03	<0.03	<0.03
Anthracene	mg/kg	<0.04	~	~	9200	0.23	0.61	<0.40	0.05	<0.04	<0.04	<0.04
Fluoranthene	mg/kg	<0.03	~	~	670	1.14	3.32	<0.30	0.4	<0.03	<0.03	<0.03
Pyrene	mg/kg	<0.03	~	~	1600	0.74	2.86	3.18	0.32	<0.03	<0.03	<0.03
Benzo(a)anthracene	mg/kg	<0.06	~	~	5.9	0.32	1.68	<0.60	0.2	<0.06	<0.06	<0.06
Chrysene	mg/kg	<0.02	~	~	9.3	0.2	1.8	0.33	0.22	<0.02	<0.02	<0.02
Benzo(bk)fluoranthene	mg/kg	<0.07	~	~	~	0.4	2.98	<0.70	0.39	<0.07	<0.07	<0.07
Benzo(a)pyrene	mg/kg	<0.04	~	~	1	0.25	1.52	<0.40	0.17	<0.04	<0.04	<0.04
Indeno(123cd)pyrene	mg/kg	<0.04	~	~	4.2	0.12	0.96	<0.40	0.15	<0.04	<0.04	<0.04
Dibenzo(ah)anthracene	mg/kg	<0.04	~	~	0.9	<0.04	0.16	<0.40	<0.04	<0.04	<0.04	<0.04
Benzo(ghi)perylene	mg/kg	<0.04	~	~	47	0.13	0.94	<0.40	0.16	<0.04	<0.04	<0.04
Coronene	mg/kg	<0.04	~	~	~	<0.04	0.09	<0.40	<0.04	<0.04	<0.04	<0.04
PAH 6 Total	mg/kg	<0.22	~	~	~	2.04	9.72	<2.20	1.27	<0.22	<0.22	<0.22
PAH 17 Total	mg/kg	<0.64	~	~	~	5.67	20.27	<6.40	2.52	<0.64	<0.64	<0.64
Benzo(b)fluoranthene	mg/kg	<0.05	~	~	7	0.29	2.15	<0.50	0.28	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	<0.02	~	~	10	0.11	0.83	<0.20	0.11	<0.02	<0.02	<0.02
PAH Surrogate % Recovery	%	<0	~	~	~	100	104	91	98	96	96	92
Polychlorinated Biphenyl (PCBs)												
PCB 28	ug/kg	<5	~	~	~	20	<5	<5	9	<5	<5	<5
PCB 52	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 101	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 118	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 138	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 153	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 180	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
Total 7 PCBs	ug/kg	<35	8	~	~	<35	<35	<35	<35	<35	<35	<35

Notes:
1 DEFRA and Environment Agency (EA), 2002 to 2005: Soil Guideline Values (SGVs) series for metals and BTEX contamination.
2 Contaminated Land: Applications in Real Environments (CL:AIRE), December 2009: The Soil Generic Assessment Criteria for Human Health Risk Assessment.
3 The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd Edition).

Shaded	denotes parameter exceeds SGVs
Bold	denotes parameter exceeds CL:AIRE criteria
Underlined	denotes parameter exceeds LQM/CIEH criteria
LOD	denotes method detection limit of laboratory.
~	denotes no GAC available.
-	denotes parameter not analysed

<> denotes this information was not provided

SDCC
Waterstown, Co. Dublin
Table 7: Soil Analytical Results - General Assessment Criteria

Sample ID			**Assessment Criteria**			**TP10**	**TP 11**	**TP 12**	**TP 13**	**TP 14**	**TP 16**	**TP17**
Sample Depth (mbgl)						**<>**	**<>**	**<>**	**<>**	**<>**	**<>**	**<>**
Laboratory Report No.			U.K. Soil Guideline Values (SGVs)[1]	**CL:AIRE Generic Assessment Criteria[2]**	LQM/CIEH Generic Assessment Criteria[3]	**15/5806**	**15/5870**	**15/5870**	**15/5870**	**15/5870**	**15/5870**	**15/5806**
Laboratory Sample No.			Residential	Residential	Residential	**11-14**	**1-4**	**5-8**	**9-12**	**13-16**	**17-20**	**15-18**
Sample Date						**07/04/2015**	**<>**	**<>**	**<>**	**<>**	**<>**	**07/04/2015**
Parameters	Unit	LOD										
Total Organic Carbon #	%	<0.2	~	~	~	0.68	0.47	1.14	3.51	3.1	2.25	0.6
Natural Moisture Content	%	<0.1	~	~	~	19.9	16.6	17.9	21.9	30.1	23.7	29
Mineral Oil >C8-C10	mg/kg	<5	~	~	~	<5	<5	<5	<5	12	<5	8
Mineral Oil >C10-C12	mg/kg	<10	~	~	~	<10	<10	<10	<10	<10	<10	26
Mineral Oil >C12-C16	mg/kg	<10	~	~	~	18	<10	<10	27	31	<10	157
Mineral Oil >C16-C21	mg/kg	<10	~	~	~	35	<10	26	59	81	33	213
Mineral Oil >C21-C40	mg/kg	<10	~	~	~	<10	<10	153	301	423	319	72
Mineral Oil >C8-C40	mg/kg	<45	~	~	~	53	<45	179	387	547	352	476
Petroleum Hydrocarbons												
MTBE	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
Benzene	ug/kg	<5	330	~	~	<5	<5	<5	11	8	<5	<5
Toluene	ug/kg	<5	610000	~	~	<5	<5	<5	66	25	<5	<5
Ethylbenzene	ug/kg	<5	350000	~	~	<5	<5	87	108	250	11	<5
m/p-Xylene	ug/kg	<5	230000 (p)	~	~	<5	<5	119	275	960	14	<5
o-Xylene	ug/kg	<5	250000 (o)	~	~	<5	<5	18	74	134	10	<5
Polycyclic Aromatic Hydrocarbons (PAHs) (M-S)												
Naphthalene	mg/kg	<0.04	~	~	8.7	<0.04	<0.04	<0.04	<0.04	0.31	<0.04	<0.04
Acenaphthylene	mg/kg	<0.03	~	~	850	<0.03	<0.03	0.05	<0.03	<0.03	<0.03	<0.03
Acenaphthene	mg/kg	<0.05	~	~	1000	<0.05	<0.05	0.06	<0.05	0.09	<0.05	<0.05
Fluorene	mg/kg	<0.04	~	~	780	<0.04	<0.04	0.05	0.06	0.1	<0.04	<0.04
Phenanthrene	mg/kg	<0.03	~	~	380	<0.03	0.06	0.25	0.23	0.47	0.11	<0.03
Anthracene	mg/kg	<0.04	~	~	9200	<0.04	<0.04	0.07	0.05	0.1	<0.04	<0.04
Fluoranthene	mg/kg	<0.03	~	~	670	<0.03	0.08	0.32	0.41	0.35	0.1	<0.03
Pyrene	mg/kg	<0.03	~	~	1600	<0.03	0.07	0.26	0.37	0.36	0.09	<0.03
Benzo(a)anthracene	mg/kg	<0.06	~	~	5.9	<0.06	<0.06	0.18	0.26	0.23	<0.06	<0.06
Chrysene	mg/kg	<0.02	~	~	9.3	<0.02	0.03	0.15	0.26	0.22	0.04	<0.02
Benzo(bk)fluoranthene	mg/kg	<0.07	~	~	~	<0.07	<0.07	0.22	0.37	0.26	<0.07	<0.07
Benzo(a)pyrene	mg/kg	<0.04	~	~	1	<0.04	<0.04	0.13	0.2	0.14	<0.04	<0.04
Indeno(123cd)pyrene	mg/kg	<0.04	~	~	4.2	<0.04	<0.04	0.09	0.17	0.08	<0.04	<0.04
Dibenzo(ah)anthracene	mg/kg	<0.04	~	~	0.9	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(ghi)perylene	mg/kg	<0.04	~	~	47	<0.04	<0.04	0.07	0.11	0.08	<0.04	<0.04
Coronene	mg/kg	<0.04	~	~	~	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
PAH 6 Total	mg/kg	<0.22	~	~	~	<0.22	<0.22	0.83	1.26	0.91	<0.22	<0.22
PAH 17 Total	mg/kg	<0.64	~	~	~	<0.64	<0.64	1.9	2.49	2.79	<0.64	<0.64
Benzo(b)fluoranthene	mg/kg	<0.05	~	~	7	<0.05	<0.05	0.16	0.27	0.19	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	<0.02	~	~	10	<0.02	<0.02	0.06	0.1	0.07	<0.02	<0.02
PAH Surrogate % Recovery	%	<0	~	~	~	96	97	95	92	100	97	95
Polychlorinated Biphenyl (PCBs)												
PCB 28	ug/kg	<5	~	~	~	<5	<5	<5	<5	27	<5	<5
PCB 52	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 101	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 118	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 138	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 153	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
PCB 180	ug/kg	<5	~	~	~	<5	<5	<5	<5	<5	<5	<5
Total 7 PCBs	ug/kg	<35	8	~	~	<35	<35	<35	<35	<35	<35	<35

Notes:
1 DEFRA and Environment Agency (EA), 2002 to 2005: Soil Guideline Values (SGVs) series for metals and BTEX contamination.
2 Contaminated Land: Applications in Real Environments (CL:AIRE), December 2009: The Soil Generic Assessment Criteria for Human Health Risk Assessment.
3 The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd Edition).

Shaded	denotes parameter exceeds SGVs
Bold	denotes parameter exceeds CL:AIRE criteria
Underlined	denotes parameter exceeds LQM/CIEH criteria
LOD	denotes method detection limit of laboratory.
~	denotes no GAC available.
-	denotes parameter not analysed

<> denotes this information was not provided

Total organic Carbon %	1.6	2.4	12.9	2.4	0.39	0.55	0.85	0.68	0.6	Max	Min	Average
SOM %	2.758621	4.137931	22.24138	4.137931	0.672414	0.948276	1.465517	1.172414	1.034483	22.24138	0.672414	4.285441

$_{oc}f$ = SOM/100 x 0.58

% TOC can be converted into SOM by dividing by 0.58.

Choices of SOM criteria	1%	2.50%	6%	
Average SOM = 4.28%	3.28%	1.78%	1.72%	difference between average SOM and choices

4.28% is closest to 6% SOM so Assessment Criteria will be based on 6% SOM soil

Zone:

The Conservation, amenity or buffer space, corridor/belt. landscape protection (G3) sub-category is intended for zones where the main aim is to provide some level of conservation, whether of biodiversity, visual amenity or quiet. Natura 2000 sites or other designations in terms of EU Directives would not be recorded as part of this GZT exercise as this is information which will be available in DevPlanGIS from other sources.

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Table 8: Soil Analytical Results - Waste Acceptance Criteria (WAC)

Sample ID			**Waste Acceptance Criteria (WAC)[1]**			**TP2**	**TP4**	**TP7**	**TP8**	**TP9**	**TP10**	**TP17**	**TP 11**	**TP 12**	**TP 13**	**TP 14**	**TP 16**
Sample Depth (mbgl)			Inert Waste Acceptance Criteria	Non-Hazardous Waste Acceptance Criteria	Hazardous Waste Acceptance Criteria	**2.9-3.0**	**1.45-1.55**										
Laboratory Report No.						**12/9568**	**12/9568**	**15/5806**	**15/5806**	**15/5806**	**15/5806**	**15/5806**	**15/5870**	**15/5870**	**15/5870**	**15/5870**	**15/5870**
Laboratory Sample No.						**13-15**	**29-31**	**1-3**	**4-6**	**7-10**	**11-14**	**15-18**	**1-4**	**5-8**	**9-12**	**13-16**	**17-20**
Sample Date						**04/12/2012**	**04/12/2012**	**07/04/2015**	**07/04/2015**	**07/04/2015**	**07/04/2015**	**07/04/2015**	**-**	**-**	**-**	**-**	**-**
Parameters	Unit	MDL															
Dissolved Antimony	mg/kg	<0.02	0.06	0.7	5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.08	<0.02	<0.02	0.03	0.03	0.02
Dissolved Arsenic	mg/kg	<0.025	0.5	2	25	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.028
Dissolved Barium	mg/kg	<0.03	20	100	300	1	0.31	0.06	<0.03	0.04	0.07	0.1	<0.03	0.41	0.39	0.71	0.78
Dissolved Cadmium	mg/kg	<0.005	0.04	1	5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dissolved Chromium	mg/kg	<0.015	0.5	10	70	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Dissolved Copper	mg/kg	<0.07	2	50	100	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Dissolved Lead	mg/kg	<0.05	0.5	10	50	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dissolved Molybdenum	mg/kg	<0.02	0.5	10	30	0.23	0.17	0.03	0.08	0.05	0.05	0.2	0.02	0.27	0.63	0.5	0.44
Dissolved Nickel	mg/kg	<0.02	0.4	10	40	0.17	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	0.09	0.03	0.03
Dissolved Selenium	mg/kg	<0.03	0.1	0.5	7	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Dissolved Zinc	mg/kg	<0.03	4	50	200	0.11	<0.03	0.04	<0.03	0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Mercury Dissolved by CVAF	mg/kg	<0.0001	0.01	0.2	2	0.0001	0.0001	0.0003	<0.0001	0.0003	<0.0001	<0.0001	0.0002	0.0003	0.0006	0.0002	0.0002
Fluoride	mg/kg	<3	10	150	500	<3	<3	<3	<3	<3	<3	<3	<3	3	<3	<3	<3
Chloride	mg/kg	<3	800	15,000	25,000	118	29	4	11	6	7	7	3	12	82	34	6
Sulphate	mg/kg	<0.5	1,000	20,000	50,000	7409.1	560.7	7.2	10.2	10.7	22.2	23.1	36.1	318.4	867	947.3	211.6
Phenol Index	mg/kg	<0.5	1	~	~	37.1	7.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Organic Carbon	mg/kg	<20	500	800	1,000	190	170	40	30	50	30	50	30	110	200	110	90
Total Dissolved Solids	mg/kg	<350	4,000	60,000	100,000	10542	1820	640	480	<100	<100	950	540	1720	660	2701	<100

Notes:

	denotes parameter exceeds Inert Waste Acceptance Criteria.
	denotes parameter exceeds Non-Hazardous Waste Acceptance Criteria.
	denotes parameter exceeds Hazardous Waste Acceptance Criteria.
MDL	denotes method detection limit of laboratory.
~	denotes no WAC.
1	Council Decision of 19 December 2002 Establishing Criteria and Procedures for the Acceptance of Waste at Landfills Persuant to Article 16 of and Annex II to Directive 1999/31/EC

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Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW4	MW4	MW4
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	12/9860	15/6836	15/7036
Laboratory Sample No.				13-18	1-7	1-7
Sample Date				13/12/2012	30/04/2015	06/05/2015
Parameters						
Field Measured Parameters						
pH	pH units	~	6.5-9.5	6.72	7.23	7.21
Electrical Conductivity	µS/cm	800 # / 1875	1000	628	584.6	576.3
Dissolved Oxygen	%	~	NAC	76.2	14.4	34.9
Dissolved Oxygen	ppm	~	~	8.45	1.56	3.76
Temperature	ºC	~	25ºC	10.6	11.55	10.72
Oxidation Reduction Potential	mV	~	~	98.3	52.5	62.8
Colour	N/A	~	NAC	Clear	Clear	Clear
Odour	N/A	~	~	None	Odourless	odourless
Other observations	N/A	~	~	None	None	None
Metals (dissolved)						
Dissolved Arsenic	ug/l	7.5	10	2.6	<2.5	<2.5
Dissolved Boron	ug/l	750	1000	31	35	31
Dissolved Cadmium	ug/l	3.75	5	<0.5	0.14	0.19
Dissolved Calcium	mg/l	~	200	122.2	128.1	126.9
Total Dissolved Chromium	ug/l	37.5	30	<1.5	<0.2	<1.5
Dissolved Copper	ug/l	1500	30	<7	<7	<7
Total Dissolved Iron	ug/l	~	200	<20	<20	<20
Dissolved Lead	ug/l	18.75	10	6	<5	<5
Dissolved Magnesium	mg/l	~	50	18	16.2	15.9
Dissolved Manganese	ug/l	~	50	**464**	**590**	**574**
Dissolved Mercury	ug/l	0.75	1	<1	<0.5	<0.5
Dissolved Nickel	ug/l	15	20	3	<2	<2
Dissolved Potassium	mg/l	~	5	2.7	2.4	2.4
Dissolved Sodium	mg/l	150	150	22.7	21.8	21.7
Dissolved Zinc	ug/l	~	100	15	3	<3
MRP as Total Phosphorus	ug/l	35	30***	**38**	**43**	**80**
Volatile Organic Compounds (VOCs) MS						
Dichlorodifluoromethane	ug/l	~	~	<2	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	<1	<0.1	<0.1
Chloromethane	ug/l	~	~	<3	<3	<3
Vinyl Chloride	ug/l	0.375	~	<2	<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	ug/l	~	30**	<3	<3	<3
Dichloromethane	ug/l	~	10	<3	<3	<3
trans-1-2-Dichloroethene	ug/l	~	30**	<3	<3	<3
1,1-Dichloroethane	ug/l	~	~	<3	<3	<3
cis-1-2-Dichloroethene	ug/l	~	30**	<3	<3	<3
2,2-Dichloropropane	ug/l	~	~	<1	<1	<1
Bromochloromethane	ug/l	~	~	<2	<2	<2
Chloroform	ug/l	75 Δ1	12	<2	<2	<2
1,1,1-Trichloroethane	ug/l	~	500	<2	<2	<2
1,1-Dichloropropene	ug/l	~	~	<3	<3	<3
Carbon tetrachloride	ug/l	~	2	<2	<2	<2
1,2-Dichloroethane	ug/l	2.25	3	<2	<2	<2
Benzene	ug/l	0.75	1	<1	<0.5	<0.5
Trichloroethene	ug/l	7.5 Δ2	70	<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	~	10	<2	<0.5	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	<2	<2	<2
1,1,2-Trichloroethane	ug/l	~	~	<2	<2	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	<3	<3	<3
1,3-Dichloropropane	ug/l	~	~	<2	<2	<2
Dibromochloromethane	ug/l	75 Δ1	~	<2	<2	<2
1,2-Dibromoethane	ug/l	~	~	<2	<2	<2
Chlorobenzene	ug/l	~	1	<2	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	<2	<2	<2
Ethylbenzene	ug/l	~	10	<2	<0.5	<0.5
p/m-Xylene	ug/l	~	10 Δ3	<3	<1	<1
o-Xylene	ug/l	~	10 Δ3	<2	<0.5	<0.5
Styrene	ug/l	~	~	<2	<2	<2
Bromoform	ug/l	75 Δ1	~	<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	~	~	<3	<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	~	~	<3	<3	<3
n-Butylbenzene	ug/l	~	~	<3	<3	<3
1,2-Dichlorobenzene	ug/l	~	10	<3	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	<2	<2	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	<3	<3	<3
Hexachlorobutadiene	ug/l	~	0.1	<3	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	~	<3	<3	<3

Notes:
1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2012.
2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report. EPA, Ireland.
Bold denotes value exceeds Groundwater regulations.
Underline denotes value exceeds IGV - Only used in the absence of Groundwater regulation value
^ denotes upper threshold value used
Δ1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromethane and bromoform.
Δ2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
Δ3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
** denotes IGV relates to 'dichloroethene'.
*** denotes orthophosphate
NAC - No Abnormal Change
^ denotes alpha-endosulphan
+ denotes permethrin
# denotes non-specific individual pesticide value
++ Result outside calibration range, results should be considered as indicative only and are not accredited

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Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW4	MW4	MW4
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	12/9860	15/6836	15/7036
Laboratory Sample No.				13-18	1-7	1-7
Sample Date				13/12/2012	30/04/2015	06/05/2015
Parameters						
Semi-Volatile Organic Compounds (SVOCs)						
Phenols						
2-Chlorophenol	ug/l	~	200	<10	<1	<1
2-Methylphenol	ug/l	~	~	<10	<0.5	<0.5
2-Nitrophenol	ug/l	~	~	<10	<0.5	<0.5
2,4-Dichlorophenol	ug/l	~	~	<10	<0.5	<0.5
2,4-Dimethylphenol	ug/l	~	~	<10	<1	<1
2,4,5-Trichlorophenol	ug/l	~	~	<10	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	<10	<1	<1
4-Chloro-3-methylphenol	ug/l	~	~	<10	<0.5	<0.5
4-Methylphenol	ug/l	~	~	<10	<1	<1
4-Nitrophenol	ug/l	~	~	<10	<10	<10
Pentachlorophenol	ug/l	~	2	<10	<1	<1
Phenol	ug/l	~	0.5*	<10	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)						
2-Chloronaphthalene	ug/l	~	~	<10	<1	<1
2-Methylnaphthalene	ug/l	~	~	<10	<1	<1
Naphthalene	ug/l	~	1	<10	<0.014	0.02
Acenaphthylene	ug/l	~	~	<10	<0.013	<0.013
Acenaphthene	ug/l	~	~	<10	<0.013	0.08
Fluorene	ug/l	~	~	<10	<0.014	0.04
Phenanthrene	ug/l	~	~	<10	<0.011	0.04
Anthracene	ug/l	~	10000	<10	<0.013	<0.013
Fluoranthene	ug/l	~	1	<10	<0.012	<0.012
Pyrene	ug/l	~	~	<10	<0.013	<0.013
Benzo(a)anthracene	ug/l	~	~	<10	<0.015	<0.015
Chrysene	ug/l	~	~	<10	<0.011	<0.011
Benzo(bk)fluoranthene	ug/l	~	~	<10	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.0075	0.01	<10	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	~	0.05	<10	<0.011	<0.011
Dibenzo(ah)anthracene	ug/l	~	~	<10	<0.01	<0.01
Benzo(ghi)perylene	ug/l	~	0.05	<10	<0.011	<0.011
PAH 16 Total	ug/l	~	~	-	<0.195	<0.195
Benzo(b)fluoranthene	ug/l	~	~	-	<0.01	<0.01
Benzo(k)fluoranthene	ug/l	~	~	-	<0.01	<0.01
Other SVOCs						
1,2-Dichlorobenzene	ug/l	~	10	<10	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	<10	<1	<1
1,3-Dichlorobenzene	ug/l	~	~	<10	<1	<1
1,4-Dichlorobenzene	ug/l	~	~	<10	<1	<1
2-Nitroaniline	ug/l	~	~	<10	<1	<1
2,4-Dinitrotoluene	ug/l	~	~	<10	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	~	~	<10	<1	<1
3-Nitroaniline	ug/l	~	~	<10	<1	<1
4-Bromophenylphenylether	ug/l	~	~	<10	<1	<1
4-Chloroaniline	ug/l	~	~	<10	<1	<1
4-Chlorophenylphenylether	ug/l	~	~	<10	<1	<1
4-Nitroaniline	ug/l	~	~	<10	<0.5	<0.5
Azobenzene	ug/l	~	~	<10	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	<10	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	<10	<1	<1
Carbazole	ug/l	~	~	<10	<0.5	<0.5
Dibenzofuran	ug/l	~	~	<10	<0.5	<0.5
Hexachlorobenzene	ug/l	~	0.03	<10	<1	<1
Hexachlorobutadiene	ug/l	~	0.1	<10	<1	<1
Hexachlorocyclopentadiene	ug/l	~	~	<10	<1	<1
Hexachloroethane	ug/l	~	~	<10	<1	<1
Isophorone	ug/l	~	~	<10	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	<10	<0.5	<0.5
Nitrobenzene	ug/l	~	10	<10	<1	<1
Phthalates						
Bis(2-ethylhexyl) phthalate	ug/l	~	8	<10	<5	<5
Butylbenzyl phthalate	ug/l	~	~	<10	<1	<1
Di-n-butyl phthalate	ug/l	~	2	<10	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	~	~	<10	<1	<1
Diethyl phthalate	ug/l	~	~	<10	<1	<1
Dimethyl phthalate	ug/l	~	~	<10	<1	<1
Pesticides MS						
Organochlorine Pesticides						
Aldrin	ug/l	~	0.01	<0.01	<0.01	<0.01
Alpha-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01
Beta-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01
Delta-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01
Chlorothalonil	ug/l	~	0.1#	<0.01	-	-
cis-Chlordane	ug/l	~	0.1#	<0.01	-	-
Dieldrin	ug/l	0.075	0.01	<0.01	<0.01	<0.01
Endosulphan I	ug/l	~	0.001^	<0.01	<0.01	<0.01
Endosulphan II	ug/l	~	0.001^	<0.01	<0.01	<0.01
Endosulphan sulphate	ug/l	~	0.001^	<0.01	<0.01	<0.01
Endrin	ug/l	~	0.1#	<0.01	<0.01	<0.01
Gamma-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01
Heptachlor	ug/l	~	0.1#	<0.01	<0.01	-
Heptachlor Epoxide	ug/l	~	0.1#	<0.01	<0.01	-
Hexachlorobenzene	ug/l	~	0.1#	<0.01	-	-
Isodrin	ug/l	~	0.1#	<0.01	-	-
o,p'-DDE	ug/l	~	0.1#	<0.01	-	-
o,p'-DDT	ug/l	~	0.1#	<0.01	-	-
o,p'-Methoxychlor	ug/l	~	0.1#	<0.01	-	-
o,p'-TDE	ug/l	~	0.1#	<0.01	-	-
p,p'-DDE	ug/l	~	0.1#	<0.01	<0.01	<0.01
p,p'-DDT	ug/l	0.075	0.1#	<0.01	<0.01	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	<0.01	<0.01	<0.01
p,p'-TDE	ug/l	~	0.1#	<0.01	<0.01	<0.01
Pendimethalin	ug/l	~	0.1#	<0.01	-	-
Permethrin I	ug/l	~	20+	<0.01	-	-
Permethrin II	ug/l	~	20+	<0.01	-	-
Quintozene	ug/l	~	0.1#	<0.01	-	-
Tecnazene	ug/l	~	0.1#	<0.01	-	-
Telodrin	ug/l	~	0.1#	<0.01	-	-
trans-Chlordane	ug/l	~	0.1#	<0.01	-	-
Triadimefon	ug/l	~	0.1#	<0.01	-	-
Triallate	ug/l	~	0.1#	<0.01	-	-
Trifluralin	ug/l	~	0.1	<0.01	-	-

Notes:
1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2012.
2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report. EPA, Ireland.
Bold denotes value exceeds Groundwater regulations.
Underline denotes value exceeds IGV - Only used in the absence of Groundwater regulation value
^ denotes upper threshold value used
Δ1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromethane and bromoform.
Δ2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
Δ3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
** denotes IGV relates to 'dichloroethene'.
*** denotes orthophosphate
NAC - No Abnormal Change
^ denotes alpha-endosulphan
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++ Result outside calibration range, results should be considered as indicative only and are not accredited

Tier III Exploratory Investigation

SDCC
Waterstown, Co. Dublin

Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW4	MW4	MW4
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	12/9860	15/6836	15/7036
Laboratory Sample No.				13-18	1-7	1-7
Sample Date				13/12/2012	30/04/2015	06/05/2015
Parameters						
Organophosphorus Pesticides						
Azinphos ethyl	ug/l	~	0.1#	<0.01	-	-
Azinphos methyl	ug/l	~	0.1#	<0.01	<0.01	0.01
Carbophenothion	ug/l	~	0.1#	<0.01	-	-
Chlorfenvinphos	ug/l	~	5	<0.01	-	-
Chlorpyrifos	ug/l	~	90	<0.01	-	-
Chlorpyrifos-methyl	ug/l	~	0.1#	<0.01	-	-
Diazinon	ug/l	~	0.1#	<0.01	0.04	<0.01
Dichlorvos	ug/l	~	0.001	<0.01	<0.01	<0.01
Disulfoton	ug/l	~	0.001	<0.01	<0.01	<0.01
Dimethoate	ug/l	~	0.1#	<0.01	-	-
Ethion	ug/l	~	0.1#	<0.01	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	<0.01	<0.01	<0.01
Etrimphos	ug/l	~	0.1#	<0.01	-	-
Fenitrothion	ug/l	~	0.1#	<0.01	<0.01	<0.01
Fenthion	ug/l	~	0.1#	<0.01	-	-
Malathion	ug/l	~	0.1#	<0.01	<0.01	<0.01
Methyl Parathion	ug/l	~	0.1#	<0.01	<0.01	<0.01
Mevinphos	ug/l	~	0.1#	<0.01	<0.01	<0.01
Phosalone	ug/l	~	0.1#	<0.01	-	-
Pirimiphos Methyl	ug/l	~	0.1#	<0.01	-	-
Propetamphos	ug/l	~	0.1#	<0.01	-	-
Triazophos	ug/l	~	0.1#	<0.01	-	-
Benazolin	ug/l	~	0.1#	<0.1	<0.1	<0.1
Bentazone	ug/l	0.075	0.1#	<0.1	<0.1	<0.1
Bromoxynil	ug/l	~	5	<0.1	<0.1	<0.1
Clopyralid	ug/l	~	0.1#	<0.1	<0.1	<0.1
4- CPA	ug/l	~	0.1#	<0.1	<0.1	<0.1
2,4 – D	ug/l	~	0.1#	<0.1	<0.1	<0.1
2,4 –DB	ug/l	~	0.1#	<0.1	<0.1	<0.1
Dicamba	ug/l	~	0.1#	<0.1	<0.1	<0.1
Dichloroprop	ug/l	~	100	<0.1	<0.1	<0.1
Diclofop	ug/l	~	0.1#	<0.1	<0.1	<0.1
Fenoprop	ug/l	~	0.1#	<0.1	<0.1	<0.1
Flamprop	ug/l	~	0.1#	<0.1	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	<0.1	<0.1	<0.1
Ioxynil	ug/l	~	0.1#	<0.1	<0.1	<0.1
MCPA	ug/l	~	0.1#	<0.1	<0.1	<0.1
MCPB	ug/l	~	0.1#	<0.1	<0.1	<0.1
Mecoprop	ug/l	0.075	10	<0.1	<0.1	<0.1
Picloram	ug/l	~	0.1#	<0.1	<0.1	<0.1
Pentachlorophenol	ug/l	~	0.1#	<0.1	<0.1	<0.1
2,4,5 – T	ug/l	~	0.1#	<0.1	<0.1	<0.1
2,3,6 – TBA	ug/l	~	0.1#	<0.1	<0.1	<0.1
Triclopyr	ug/l	~	0.1#	<0.1	<0.1	<0.1
Atrazine	ug/l	0.075	1	<1	<1	<1
Simazine	ug/l	0.075	1	<1	<1	<1
Fluoride	mg/l	~	1	<0.3	<0.3	<0.3
Sulphate	mg/l	187.5	200	94.69	87.52	86.67
Chloride	mg/l	187.5^	30	30	33.9	32.1
Total Oxidised Nitrogen as N	mg/l	~	~	<0.2	<0.2	<0.2
Total Cyanide	mg/l	0.0375	0.01	<0.01	<0.01	<0.01
Ammoniacal Nitrogen as N	mg/l	0.065	0.12•	**0.15**	**0.11**	**0.09**
Total Alkalinity as CaCO3	mg/l	~	NAC	188	282	304
Total Organic Carbon	mg/l	~	~	9	<2	<2
Total Dissolved Solids	mg/l	~	1000	488	474	636
Faecal coliforms	cfu/100ml	~	0	<1	<1	<1
Coliforms	MPN/100ml	~	0	43.5	11	980.4

Notes:

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2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report. EPA, Ireland.
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∆1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromethane and bromoform.
∆2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
∆3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
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NAC - No Abnormal Change
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Tier III Exploratory Investigation

SDCC
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Table 9: Groundwater Analytical Results

Sample Identity	**Unit**	**Groundwater Standards**		**MW5**	**MW6**	**MW6**	**MW6**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	**12/9860**	**12/9855**	**15/6836**	**15/6974**
Laboratory Sample No.				**7-12**	**1-6**	**29-35**	**1-7**
Sample Date				**13/12/2012**	**13/12/2012**	**30/04/2015**	**05/05/2015**
Parameters							
Field Measured Parameters							
pH	pH units	~	6.5-9.5	6.30	11.43	11.89	11.75
Electrical Conductivity	µS/cm	800 # / 1875	1000	**1294.0**	771	**1285.8**	**1091.3**
Dissolved Oxygen	%	~	NAC	33.0	48.4	13.5	15.3
Dissolved Oxygen	ppm	~	~	3.63	5.46	1.46	1.6
Temperature	ºC	~	25ºC	10.80	11.4	11.51	11.88
Oxidation Reduction Potential	mV	~	~	8.20	-270.1	-211.9	-218.9
Colour	N/A	~	NAC	Cloudy	Slightly Cloudy	Clear	Clear
Odour	N/A	~	~	None	None	Odourless	Organic Odour
Other observations	N/A	~	~	None	None	Silty	None
Metals (dissolved)							
Dissolved Arsenic	ug/l	7.5	10	**10.3**	3.8	4.4	<2.5
Dissolved Boron	ug/l	750	1000	545	56	85	93
Dissolved Cadmium	ug/l	3.75	5	<0.5	<0.5	<0.03	<0.03
Dissolved Calcium	mg/l	~	200	268.4	60.3	142.7	110
Total Dissolved Chromium	ug/l	37.5	30	<1.5	2	<0.2	<1.5
Dissolved Copper	ug/l	1500	30	<7	<7	<7	<7
Total Dissolved Iron	ug/l	~	200	<20	<20	<20	<20
Dissolved Lead	ug/l	18.75	10	10	6	<5	7
Dissolved Magnesium	mg/l	~	50	32	<0.1	<0.1	<0.1
Dissolved Manganese	ug/l	~	50	**1644**	<2	<2	<2
Dissolved Mercury	ug/l	0.75	1	<1	<1	<0.5	<0.5
Dissolved Nickel	ug/l	15	20	**30**	**23**	10	10
Dissolved Potassium	mg/l	~	5	15.9	26.4	33.9	32.1
Dissolved Sodium	mg/l	150	150	94.5	61.1	46.8	47.9
Dissolved Zinc	ug/l	~	100	49	<3	<3	<3
MRP as Total Phosphorus	ug/l	35	30***	**84**	**111**	**52**	**39**
Volatile Organic Compounds (VOCs) MS							
Dichlorodifluoromethane	ug/l	~	~	<2	<2	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	<1	<1	<0.1	<0.1
Chloromethane	ug/l	~	~	<3	<3	<3	<3
Vinyl Chloride	ug/l	0.375	~	<2	<2	<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	ug/l	~	30**	<3	<3	<3	<3
Dichloromethane	ug/l	~	10	<3	<3	<3	<3
trans-1-2-Dichloroethene	ug/l	~	30**	<3	<3	<3	<3
1,1-Dichloroethane	ug/l	~	~	<3	<3	<3	<3
cis-1-2-Dichloroethene	ug/l	~	30**	<3	<3	<3	<3
2,2-Dichloropropane	ug/l	~	~	<1	<1	<1	<1
Bromochloromethane	ug/l	~	~	<2	<2	<2	<2
Chloroform	ug/l	75 Δ1	12	<2	<2	<2	<2
1,1,1-Trichloroethane	ug/l	~	500	<2	<2	<2	<2
1,1-Dichloropropene	ug/l	~	~	<3	<3	<3	<3
Carbon tetrachloride	ug/l	~	2	<2	<2	<2	<2
1,2-Dichloroethane	ug/l	2.25	3	<2	<2	<2	<2
Benzene	ug/l	0.75	1	<1	<1	<0.5	<0.5
Trichloroethene	ug/l	7.5 Δ2	70	<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	~	10	<2	<2	<0.5	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	<2	<2	<2	<2
1,1,2-Trichloroethane	ug/l	~	~	<2	<2	<2	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	<3	<3	<3	<3
1,3-Dichloropropane	ug/l	~	~	<2	<2	<2	<2
Dibromochloromethane	ug/l	75 Δ1	~	<2	<2	<2	<2
1,2-Dibromoethane	ug/l	~	~	<2	<2	<2	<2
Chlorobenzene	ug/l	~	1	<2	<2	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	<2	<2	<2	<2
Ethylbenzene	ug/l	~	10	<2	<2	<0.5	<0.5
p/m-Xylene	ug/l	~	10 Δ3	<3	<3	<1	<1
o-Xylene	ug/l	~	10 Δ3	<2	<2	<0.5	<0.5
Styrene	ug/l	~	~	<2	<2	<2	<2
Bromoform	ug/l	75 Δ1	~	<2	<2	<2	<2
Isopropylbenzene	ug/l	~	~	<3	<3	<3	<3
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	~	10	<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	~	0.1	<3	<3	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	~	<3	<3	<3	<2

Notes:
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Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW5	MW6	MW6	MW6
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	12/9860	12/9855	15/6836	15/6974
Laboratory Sample No.				7-12	1-6	29-35	1-7
Sample Date				13/12/2012	13/12/2012	30/04/2015	05/05/2015
Parameters							
Semi-Volatile Organic Compounds (SVOCs)							
Phenols							
2-Chlorophenol	ug/l	~	200	<10	<10	<1	<1
2-Methylphenol	ug/l	~	~	<10	<10	<0.5	<0.5
2-Nitrophenol	ug/l	~	~	<10	<10	<0.5	<0.5
2,4-Dichlorophenol	ug/l	~	~	<10	<10	<0.5	<0.5
2,4-Dimethylphenol	ug/l	~	~	<10	<10	<1	<1
2,4,5-Trichlorophenol	ug/l	~	~	<10	<10	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	<10	<10	<1	<1
4-Chloro-3-methylphenol	ug/l	~	~	<10	<10	<0.5	<0.5
4-Methylphenol	ug/l	~	~	<10	<10	<1	<1
4-Nitrophenol	ug/l	~	~	<10	<10	<10	<10
Pentachlorophenol	ug/l	~	2	<10	<10	<1	<1
Phenol	ug/l	~	0.5*	<10	<10	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)							
2-Chloronaphthalene	ug/l	~	~	<10	<10	<1	<1
2-Methylnaphthalene	ug/l	~	~	<10	<10	<1	<1
Naphthalene	ug/l	~	1	<10	<10	0.33	0.31
Acenaphthylene	ug/l	~	~	<10	<10	0.06	0.06
Acenaphthene	ug/l	~	~	<10	<10	0.23	0.2
Fluorene	ug/l	~	~	<10	<10	0.07	0.07
Phenanthrene	ug/l	~	~	<10	<10	0.26	0.27
Anthracene	ug/l	~	10000	<10	<10	<0.013	0.02
Fluoranthene	ug/l	~	1	<10	<10	0.16	0.12
Pyrene	ug/l	~	~	<10	<10	0.12	0.08
Benzo(a)anthracene	ug/l	~	~	<10	<10	0.02	<0.015
Chrysene	ug/l	~	~	<10	<10	0.02	<0.011
Benzo(bk)fluoranthene	ug/l	~	~	<10	<10	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.0075	0.01	<10	<10	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	~	0.05	<10	<10	<0.011	<0.011
Dibenzo(ah)anthracene	ug/l	~	~	<10	<10	<0.01	<0.01
Benzo(ghi)perylene	ug/l	~	0.05	<10	<10	<0.011	<0.011
PAH 16 Total	ug/l	~	~	-	-	1.27	1.13
Benzo(b)fluoranthene	ug/l	~	~	-	-	<0.01	<0.01
Benzo(k)fluoranthene	ug/l	~	~	-	-	<0.01	<0.01
Other SVOCs							
1,2-Dichlorobenzene	ug/l	~	10	<10	<10	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	<10	<10	<1	<1
1,3-Dichlorobenzene	ug/l	~	~	<10	<10	<1	<1
1,4-Dichlorobenzene	ug/l	~	~	<10	<10	<1	<1
2-Nitroaniline	ug/l	~	~	<10	<10	<1	<1
2,4-Dinitrotoluene	ug/l	~	~	<10	<10	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	~	~	<10	<10	<1	<1
3-Nitroaniline	ug/l	~	~	<10	<10	<1	<1
4-Bromophenylphenylether	ug/l	~	~	<10	<10	<1	<1
4-Chloroaniline	ug/l	~	~	<10	<10	<1	<1
4-Chlorophenylphenylether	ug/l	~	~	<10	<10	<1	<1
4-Nitroaniline	ug/l	~	~	<10	<10	<0.5	<0.5
Azobenzene	ug/l	~	~	<10	<10	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	<10	<10	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	<10	<10	<01	1
Carbazole	ug/l	~	~	<10	<10	<0.5	<0.5
Dibenzofuran	ug/l	~	~	<10	<10	<0.5	<0.5
Hexachlorobenzene	ug/l	~	0.03	<10	<10	<1	<1
Hexachlorobutadiene	ug/l	~	0.1	<10	<10	<1	<1
Hexachlorocyclopentadiene	ug/l	~	~	<10	<10	<1	<1
Hexachloroethane	ug/l	~	~	<10	<10	<1	<1
Isophorone	ug/l	~	~	<10	<10	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	<10	<10	<0.5	<0.5
Nitrobenzene	ug/l	~	10	<10	<10	<1	<1
Phthalates							
Bis(2-ethylhexyl) phthalate	ug/l	~	8	<10	<10	<5	<5
Butylbenzyl phthalate	ug/l	~	~	<10	<10	<1	<1
Di-n-butyl phthalate	ug/l	~	2	<10	<10	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	~	~	<10	<10	<1	<1
Diethyl phthalate	ug/l	~	~	<10	<10	<1	<1
Dimethyl phthalate	ug/l	~	~	<10	<10	<1	<1
Pesticides MS							
Organochlorine Pesticides							
Aldrin	ug/l	~	0.01	<0.01	<0.01	<0.01	<0.01
Alpha-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Beta-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Delta-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	ug/l	~	0.1#	<0.01	<0.01	-	-
cis-Chlordane	ug/l	~	0.1#	<0.01	<0.01	-	-
Dieldrin	ug/l	0.075	0.01	<0.01	<0.01	<0.01	<0.01
Endosulphan I	ug/l	~	0.001^	<0.01	<0.01	<0.01	<0.01
Endosulphan II	ug/l	~	0.001^	<0.01	<0.01	<0.01	<0.01
Endosulphan sulphate	ug/l	~	0.001^	<0.01	<0.01	<0.01	<0.01
Endrin	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Gamma-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Heptachlor	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	ug/l	~	0.1#	<0.01	<0.01	-	-
Isodrin	ug/l	~	0.1#	<0.01	<0.01	-	-
o,p'-DDE	ug/l	~	0.1#	<0.01	<0.01	-	-
o,p'-DDT	ug/l	~	0.1#	<0.01	<0.01	-	-
o,p'-Methoxychlor	ug/l	~	0.1#	<0.01	<0.01	-	-
o,p'-TDE	ug/l	~	0.1#	<0.01	<0.01	-	-
p,p'-DDE	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
p,p'-DDT	ug/l	0.075	0.1#	<0.01	<0.01	<0.01	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
p,p'-TDE	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Pendimethalin	ug/l	~	0.1#	<0.01	<0.01	-	-
Permethrin I	ug/l	~	20+	<0.01	<0.01	-	-
Permethrin II	ug/l	~	20+	<0.01	<0.01	-	-
Quintozene	ug/l	~	0.1#	<0.01	<0.01	-	-
Tecnazene	ug/l	~	0.1#	<0.01	<0.01	-	-
Telodrin	ug/l	~	0.1#	<0.01	<0.01	-	-
trans-Chlordane	ug/l	~	0.1#	<0.01	<0.01	-	-
Triadimefon	ug/l	~	0.1#	<0.01	<0.01	-	-
Triallate	ug/l	~	0.1#	<0.01	<0.01	-	-
Trifluralin	ug/l	~	0.1	<0.01	<0.01	-	-

Notes:

1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2(

2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ire

Bold denotes value exceeds Groundwater regulations.

Underline denotes value exceeds IGV - Only used in the absence of Groundwater regulation value

^ denotes upper threshold value used

Δ1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochlorometh

Δ2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.

Δ3 denotes quality standard relates to Xylenes

• denotes value was converted for comparison purposes

* denotes IGV relates to 'phenols'.

** denotes IGV relates to 'dichloroethene'.

*** denotes orthophosphate

NAC - No Abnormal Change

^ denotes alpha-endosulphan

+ denotes permethrin

# denotes non-specific individual pesticide value

++ Result outside calibration range, results should be considered as indicative only and are not accredited

Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW5	MW6	MW6	MW6
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	12/9860	12/9855	15/6836	15/6974
Laboratory Sample No.				7-12	1-6	29-35	1-7
Sample Date				13/12/2012	13/12/2012	30/04/2015	05/05/2015
Parameters							
Organophosphorus Pesticides							
Azinphos ethyl	ug/l	~	0.1#	<0.01	<0.01	-	-
Azinphos methyl	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Carbophenothion	ug/l	~	0.1#	<0.01	<0.01	-	-
Chlorfenvinphos	ug/l	~	5	<0.01	<0.01	-	-
Chlorpyrifos	ug/l	~	90	<0.01	<0.01	-	-
Chlorpyrifos-methyl	ug/l	~	0.1#	<0.01	<0.01	-	-
Diazinon	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Dichlorvos	ug/l	~	0.001	<0.01	<0.01	<0.01	<0.01
Disulfoton	ug/l	~	0.001	<0.01	<0.01	<0.01	<0.01
Dimethoate	ug/l	~	0.1#	<0.01	<0.01	-	-
Ethion	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Etrimphos	ug/l	~	0.1#	<0.01	<0.01	-	-
Fenitrothion	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Fenthion	ug/l	~	0.1#	<0.01	<0.01	-	-
Malathion	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Methyl Parathion	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Mevinphos	ug/l	~	0.1#	<0.01	<0.01	<0.01	<0.01
Phosalone	ug/l	~	0.1#	<0.01	<0.01	-	-
Pirimiphos Methyl	ug/l	~	0.1#	<0.01	<0.01	-	-
Propetamphos	ug/l	~	0.1#	<0.01	<0.01	-	-
Triazophos	ug/l	~	0.1#	<0.01	<0.01	-	-
Benazolin	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Bentazone	ug/l	0.075	0.1#	<0.1	<0.1	<0.1	<0.1
Bromoxynil	ug/l	~	5	<0.1	<0.1	<0.1	<0.1
Clopyralid	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
4- CPA	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
2,4 – D	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
2,4 –DB	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Dicamba	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Dichloroprop	ug/l	~	100	<0.1	<0.1	<0.1	<0.1
Diclofop	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Fenoprop	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Flamprop	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Ioxynil	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
MCPA	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
MCPB	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Mecoprop	ug/l	0.075	10	<0.1	<0.1	<0.1	<0.1
Picloram	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Pentachlorophenol	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
2,4,5 – T	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
2,3,6 – TBA	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Triclopyr	ug/l	~	0.1#	<0.1	<0.1	<0.1	<0.1
Atrazine	ug/l	0.075	1	<1	<1	<1	<1
Simazine	ug/l	0.075	1	<1	<1	<1	<1
Fluoride	mg/l	~	1	<0.3	<0.3	<0.3	<0.3
Sulphate	mg/l	187.5	200	20.61	99.59	113.7	111.81
Chloride	mg/l	187.5^	30	78.3	34.2	32.8	31.1
Total Oxidised Nitrogen as N	mg/l	~	~	1.2	<0.2	<0.2	<0.2
Total Cyanide	mg/l	0.0375	0.01	<0.01	<0.01	0.02	<0.01
Ammoniacal Nitrogen as N	mg/l	0.065	0.12•	**9.66**++	**6.62**	**4.11**	**3.92**
Total Alkalinity as CaCO3	mg/l	~	NAC	404	124	242	260
Total Organic Carbon	mg/l	~	~	14	19	11	10
Total Dissolved Solids	mg/l	~	1000	928	386	510	468
Faecal coliforms	cfu/100ml	~	0	1	<1	<1	<1
Coliforms	MPN/100ml	~	0	28.5	<1	<1	<1

Notes:

1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2(
2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ir
Bold denotes value exceeds Groundwater regulations.
Underline denotes value exceeds IGV - Only used in the absence of Groundwater regulation value
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∆1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromeths
∆2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
∆3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
** denotes IGV relates to 'dichloroethene'.
*** denotes orthophosphate
NAC - No Abnormal Change
^ denotes alpha-endosulphan
+ denotes permethrin
# denotes non-specific individual pesticide value
++ Result outside calibration range, results should be considered as indicative only and are not accredited

Table 9: Groundwater Analytical Results

Sample Identity	**Unit**	**Groundwater Standards**		**MW7**	**MW7**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	**15/6836**	**15/7036**
Laboratory Sample No.				**71-77**	**8-14**
Sample Date				**30/04/2015**	**06/05/2015**
Parameters					
Field Measured Parameters					
pH	pH units	~	6.5-9.5	6.81	6.76
Electrical Conductivity	µS/cm	800 # / 1875	1000	**1034.7**	**1021**
Dissolved Oxygen	%	~	NAC	17	11.3
Dissolved Oxygen	ppm	~	~	1.81	1.23
Temperature	ºC	~	25ºC	12.11	10.42
Oxidation Reduction Potential	mV	~	~	72.3	63.4
Colour	N/A	~	NAC	Clear	Clear
Odour	N/A	~	~	Odourless	Odourless
Other observations	N/A	~	~	NEC	NEC
Metals (dissolved)					
Dissolved Arsenic	ug/l	7.5	10	<2.5	6.4
Dissolved Boron	ug/l	750	1000	208	208
Dissolved Cadmium	ug/l	3.75	5	0.58	0.27
Dissolved Calcium	mg/l	~	200	248.2	275.3
Total Dissolved Chromium	ug/l	37.5	30	<0.2	<1.5
Dissolved Copper	ug/l	1500	30	<7	<7
Total Dissolved Iron	ug/l	~	200	<20	<20
Dissolved Lead	ug/l	18.75	10	<5	<5
Dissolved Magnesium	mg/l	~	50	25	25.3
Dissolved Manganese	ug/l	~	50	**2653**	**4344**
Dissolved Mercury	ug/l	0.75	1	<0.5	<0.5
Dissolved Nickel	ug/l	15	20	**33**	<2
Dissolved Potassium	mg/l	~	5	9.6	10
Dissolved Sodium	mg/l	150	150	43.1	43.3
Dissolved Zinc	ug/l	~	100	4	5
MRP as Total Phosphorus	ug/l	35	30***	**240**	**172**
Volatile Organic Compounds (VOCs) MS					
Dichlorodifluoromethane	ug/l	~	~	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	<0.1	<0.1
Chloromethane	ug/l	~	~	<3	<3
Vinyl Chloride	ug/l	0.375	~	<0.1	<0.1
Bromomethane	ug/l	~	~	<1	<1
Chloroethane	ug/l	~	~	<3	<3
Trichlorofluoromethane	ug/l	~	~	<3	<3
1,1-Dichloroethene	ug/l	~	30**	<3	<3
Dichloromethane	ug/l	~	10	<3	<3
trans-1-2-Dichloroethene	ug/l	~	30**	<3	<3
1,1-Dichloroethane	ug/l	~	~	<3	<3
cis-1-2-Dichloroethene	ug/l	~	30**	<3	<3
2,2-Dichloropropane	ug/l	~	~	<1	<1
Bromochloromethane	ug/l	~	~	<2	<2
Chloroform	ug/l	75 Δ1	12	<2	<2
1,1,1-Trichloroethane	ug/l	~	500	<2	<2
1,1-Dichloropropene	ug/l	~	~	<3	<2
Carbon tetrachloride	ug/l	~	2	<2	<2
1,2-Dichloroethane	ug/l	2.25	3	<2	<2
Benzene	ug/l	0.75	1	<0.5	<0.5
Trichloroethene	ug/l	7.5 Δ2	70	<3	<3
1,2-Dichloropropane	ug/l	~	~	<2	<2
Dibromomethane	ug/l	~	~	<3	<3
Bromodichloromethane	ug/l	~	~	<2	<2
cis-1-3-Dichloropropene	ug/l	~	~	<2	<2
Toluene	ug/l	~	10	<0.5	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	<2	<2
1,1,2-Trichloroethane	ug/l	~	~	<2	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	<3	<3
1,3-Dichloropropane	ug/l	~	~	<2	<2
Dibromochloromethane	ug/l	75 Δ1	~	<2	<2
1,2-Dibromoethane	ug/l	~	~	<2	<2
Chlorobenzene	ug/l	~	1	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	<2	<2
Ethylbenzene	ug/l	~	10	<0.5	<0.5
p/m-Xylene	ug/l	~	10 Δ3	<1	<1
o-Xylene	ug/l	~	10 Δ3	<0.5	<0.5
Styrene	ug/l	~	~	<2	<2
Bromoform	ug/l	75 Δ1	~	<2	<2
Isopropylbenzene	ug/l	~	~	<3	<3
1,1,2,2-Tetrachloroethane	ug/l	~	~	<4	<4
Bromobenzene	ug/l	~	~	<2	<2
1,2,3-Trichloropropane	ug/l	~	~	<3	<3
Propylbenzene	ug/l	~	~	<3	<3
2-Chlorotoluene	ug/l	~	~	<3	<3
1,3,5-Trimethylbenzene	ug/l	~	~	<3	<3
4-Chlorotoluene	ug/l	~	~	<3	<3
tert-Butylbenzene	ug/l	~	~	<3	<3
1,2,4-Trimethylbenzene	ug/l	~	~	<3	<3
sec-Butylbenzene	ug/l	~	~	<3	<3
4-Isopropyltoluene	ug/l	~	~	<3	<3
1,3-Dichlorobenzene	ug/l	~	~	<3	<3
1,4-Dichlorobenzene	ug/l	~	~	<3	<3
n-Butylbenzene	ug/l	~	~	<3	<3
1,2-Dichlorobenzene	ug/l	~	10	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	<2	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	<3	<3
Hexachlorobutadiene	ug/l	~	0.1	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	~	<3	<3

Notes:
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Tier III Exploratory Investigation

SDCC
Waterstown, Co. Dublin

Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW7	MW7
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	15/6836	15/7036
Laboratory Sample No.				71-77	8-14
Sample Date				30/04/2015	06/05/2015
Parameters					
Semi-Volatile Organic Compounds (SVOCs)					
Phenols					
2-Chlorophenol	ug/l	~	200	<1	<1
2-Methylphenol	ug/l	~	~	<0.5	<0.5
2-Nitrophenol	ug/l	~	~	<0.5	<0.5
2,4-Dichlorophenol	ug/l	~	~	<0.5	<0.5
2,4-Dimethylphenol	ug/l	~	~	<1	<1
2,4,5-Trichlorophenol	ug/l	~	~	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	<1	<1
4-Chloro-3-methylphenol	ug/l	~	~	<0.5	<0.5
4-Methylphenol	ug/l	~	~	<1	<1
4-Nitrophenol	ug/l	~	~	<10	<10
Pentachlorophenol	ug/l	~	2	<1	<1
Phenol	ug/l	~	0.5*	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)					
2-Chloronaphthalene	ug/l	~	~	<1	<1
2-Methylnaphthalene	ug/l	~	~	<1	<1
Naphthalene	ug/l	~	1	<0.014	<0.014
Acenaphthylene	ug/l	~	~	<0.013	<0.013
Acenaphthene	ug/l	~	~	<0.013	<0.013
Fluorene	ug/l	~	~	<0.014	<0.014
Phenanthrene	ug/l	~	~	<0.011	0.02
Anthracene	ug/l	~	10000	<0.013	<0.013
Fluoranthene	ug/l	~	1	<0.012	<0.012
Pyrene	ug/l	~	~	<0.013	<0.013
Benzo(a)anthracene	ug/l	~	~	<0.015	<0.015
Chrysene	ug/l	~	~	<0.011	<0.011
Benzo(bk)fluoranthene	ug/l	~	~	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.0075	0.01	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	~	0.05	<0.011	<0.011
Dibenzo(ah)anthracene	ug/l	~	~	<0.01	<0.01
Benzo(ghi)perylene	ug/l	~	0.05	<0.011	<0.011
PAH 16 Total	ug/l	~	~	<0.195	<0.195
Benzo(b)fluoranthene	ug/l	~	~	<0.01	<0.01
Benzo(k)fluoranthene	ug/l	~	~	<0.01	<0.01
Other SVOCs					
1,2-Dichlorobenzene	ug/l	~	10	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	<1	<1
1,3-Dichlorobenzene	ug/l	~	~	<1	<1
1,4-Dichlorobenzene	ug/l	~	~	<1	<1
2-Nitroaniline	ug/l	~	~	<1	<1
2,4-Dinitrotoluene	ug/l	~	~	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	~	~	<1	<1
3-Nitroaniline	ug/l	~	~	<1	<1
4-Bromophenylphenylether	ug/l	~	~	<1	<1
4-Chloroaniline	ug/l	~	~	<1	<1
4-Chlorophenylphenylether	ug/l	~	~	<1	<1
4-Nitroaniline	ug/l	~	~	<0.5	<0.5
Azobenzene	ug/l	~	~	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	<1	<1
Carbazole	ug/l	~	~	<0.5	<0.5
Dibenzofuran	ug/l	~	~	<0.5	<0.5
Hexachlorobenzene	ug/l	~	0.03	<1	<1
Hexachlorobutadiene	ug/l	~	0.1	<1	<1
Hexachlorocyclopentadiene	ug/l	~	~	<1	<1
Hexachloroethane	ug/l	~	~	<1	<1
Isophorone	ug/l	~	~	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	<0.5	<0.5
Nitrobenzene	ug/l	~	10	<1	<1
Phthalates					
Bis(2-ethylhexyl) phthalate	ug/l	~	8	<5	<5
Butylbenzyl phthalate	ug/l	~	~	<1	<1
Di-n-butyl phthalate	ug/l	~	2	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	~	~	<1	<1
Diethyl phthalate	ug/l	~	~	<1	<1
Dimethyl phthalate	ug/l	~	~	<1	<1
Pesticides MS					
Organochlorine Pesticides					
Aldrin	ug/l	~	0.01	<0.01	<0.01
Alpha-BHC	ug/l	~	0.1#	<0.01	<0.01
Beta-BHC	ug/l	~	0.1#	<0.01	<0.01
Delta-BHC	ug/l	~	0.1#	<0.01	<0.01
Chlorothalonil	ug/l	~	0.1#	-	-
cis-Chlordane	ug/l	~	0.1#	-	-
Dieldrin	ug/l	0.075	0.01	<0.01	<0.01
Endosulphan I	ug/l	~	0.001^	<0.01	<0.01
Endosulphan II	ug/l	~	0.001^	<0.01	<0.01
Endosulphan sulphate	ug/l	~	0.001^	<0.01	<0.01
Endrin	ug/l	~	0.1#	<0.01	<0.01
Gamma-BHC	ug/l	~	0.1#	<0.01	<0.01
Heptachlor	ug/l	~	0.1#	<0.01	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	<0.01	<0.01
Hexachlorobenzene	ug/l	~	0.1#	-	-
Isodrin	ug/l	~	0.1#	-	-
o,p'-DDE	ug/l	~	0.1#	-	-
o,p'-DDT	ug/l	~	0.1#	-	-
o,p'-Methoxychlor	ug/l	~	0.1#	-	-
o,p'-TDE	ug/l	~	0.1#	-	-
p,p'-DDE	ug/l	~	0.1#	<0.01	<0.01
p,p'-DDT	ug/l	0.075	0.1#	<0.01	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	<0.01	<0.01
p,p'-TDE	ug/l	~	0.1#	<0.01	<0.01
Pendimethalin	ug/l	~	0.1#	-	-
Permethrin I	ug/l	~	20+	-	-
Permethrin II	ug/l	~	20+	-	-
Quintozene	ug/l	~	0.1#	-	-
Tecnazene	ug/l	~	0.1#	-	-
Telodrin	ug/l	~	0.1#	-	-
trans-Chlordane	ug/l	~	0.1#	-	-
Triadimefon	ug/l	~	0.1#	-	-
Triallate	ug/l	~	0.1#	-	-
Trifluralin	ug/l	~	0.1	-	-

Notes:
1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2(
2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ire
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^ denotes alpha-endosulphan
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Tier III Exploratory Investigation

SDCC
Waterstown, Co. Dublin

Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW7	MW7
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	15/6836	15/7036
Laboratory Sample No.				71-77	8-14
Sample Date				30/04/2015	06/05/2015
Parameters					
Organophosphorus Pesticides					
Azinphos ethyl	ug/l	~	0.1#	-	-
Azinphos methyl	ug/l	~	0.1#	<0.01	<0.01
Carbophenothion	ug/l	~	0.1#	-	-
Chlorfenvinphos	ug/l	~	5	-	-
Chlorpyrifos	ug/l	~	90	-	-
Chlorpyrifos-methyl	ug/l	~	0.1#	-	-
Diazinon	ug/l	~	0.1#	<0.01	<0.01
Dichlorvos	ug/l	~	0.001	<0.01	<0.01
Disulfoton	ug/l	~	0.001	<0.01	<0.01
Dimethoate	ug/l	~	0.1#	-	-
Ethion	ug/l	~	0.1#	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	<0.01	<0.01
Etrimphos	ug/l	~	0.1#	-	-
Fenitrothion	ug/l	~	0.1#	<0.01	<0.01
Fenthion	ug/l	~	0.1#	-	-
Malathion	ug/l	~	0.1#	<0.01	<0.01
Methyl Parathion	ug/l	~	0.1#	<0.01	<0.01
Mevinphos	ug/l	~	0.1#	<0.01	<0.01
Phosalone	ug/l	~	0.1#	-	-
Pirimiphos Methyl	ug/l	~	0.1#	-	-
Propetamphos	ug/l	~	0.1#	-	-
Triazophos	ug/l	~	0.1#	-	-
Benazolin	ug/l	~	0.1#	<0.1	<0.1
Bentazone	ug/l	0.075	0.1#	<0.1	<0.1
Bromoxynil	ug/l	~	5	<0.1	<0.1
Clopyralid	ug/l	~	0.1#	<0.1	<0.1
4- CPA	ug/l	~	0.1#	<0.1	<0.1
2,4 – D	ug/l	~	0.1#	<0.1	<0.1
2,4 –DB	ug/l	~	0.1#	<0.1	<0.1
Dicamba	ug/l	~	0.1#	<0.1	<0.1
Dichloroprop	ug/l	~	100	<0.1	<0.1
Diclofop	ug/l	~	0.1#	<0.1	<0.1
Fenoprop	ug/l	~	0.1#	<0.1	<0.1
Flamprop	ug/l	~	0.1#	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	<0.1	<0.1
Ioxynil	ug/l	~	0.1#	<0.1	<0.1
MCPA	ug/l	~	0.1#	<0.1	<0.1
MCPB	ug/l	~	0.1#	<0.1	<0.1
Mecoprop	ug/l	0.075	10	<0.1	<0.1
Picloram	ug/l	~	0.1#	<0.1	<0.1
Pentachlorophenol	ug/l	~	0.1#	<0.1	<0.1
2,4,5 – T	ug/l	~	0.1#	<0.1	<0.1
2,3,6 – TBA	ug/l	~	0.1#	<0.1	<0.1
Triclopyr	ug/l	~	0.1#	<0.1	<0.1
Atrazine	ug/l	0.075	1	<1	<1
Simazine	ug/l	0.075	1	<1	<1
Fluoride	mg/l	~	1	<0.3	<0.3
Sulphate	mg/l	187.5	200	79.37	65.26
Chloride	mg/l	187.5^	30	45.5	45.7
Total Oxidised Nitrogen as N	mg/l	~	~	0.7	<0.2
Total Cyanide	mg/l	0.0375	0.01	<0.01	<0.01
Ammoniacal Nitrogen as N	mg/l	0.065	0.12•	**5.37**	**6.37**
Total Alkalinity as CaCO3	mg/l	~	NAC	632	678
Total Organic Carbon	mg/l	~	~	9	11
Total Dissolved Solids	mg/l	~	1000	825	2303
Faecal coliforms	cfu/100ml	~	0	77	43
Coliforms	MPN/100ml	~	0	>2419.6	1986.3

Notes:

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2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ire

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Tier III Exploratory Investigation

SDCC
Waterstown, Co. Dublin

Table 9: Groundwater Analytical Results

Sample Identity	**Unit**	**Groundwater Standards**		**MW8**	**MW8**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	**15/6836**	**15/6974**
Laboratory Sample No.				**22-28**	**8-14**
Sample Date				**30/04/2015**	**05/05/2015**
Parameters					
Field Measured Parameters					
pH	pH units	~	6.5-9.5	7.22	6.99
Electrical Conductivity	µS/cm	800 # / 1875	1000	**997.4**	**922**
Dissolved Oxygen	%	~	NAC	16.1	13.8
Dissolved Oxygen	ppm	~	~	1.74	1.48
Temperature	ºC	~	25ºC	11.83	10.65
Oxidation Reduction Potential	mV	~	~	86.1	42.8
Colour	N/A	~	NAC	Very silty	Slightly Silty
Odour	N/A	~	~	Odourless	None
Other observations	N/A	~	~	None	None
Metals (dissolved)					
Dissolved Arsenic	ug/l	7.5	10	<2.5	6.2
Dissolved Boron	ug/l	750	1000	252	180
Dissolved Cadmium	ug/l	3.75	5	0.41	0.33
Dissolved Calcium	mg/l	~	200	258.4	186.5
Total Dissolved Chromium	ug/l	37.5	30	<0.2	<1.5
Dissolved Copper	ug/l	1500	30	<7	<7
Total Dissolved Iron	ug/l	~	200	<20	<20
Dissolved Lead	ug/l	18.75	10	<5	6
Dissolved Magnesium	mg/l	~	50	23.6	19.7
Dissolved Manganese	ug/l	~	50	**953**	**177**
Dissolved Mercury	ug/l	0.75	1	<0.5	<0.5
Dissolved Nickel	ug/l	15	20	7	4
Dissolved Potassium	mg/l	~	5	9.2	5.8
Dissolved Sodium	mg/l	150	150	40.4	27.7
Dissolved Zinc	ug/l	~	100	3	<3
MRP as Total Phosphorus	ug/l	35	30***	**404**	**370**
Volatile Organic Compounds (VOCs) MS					
Dichlorodifluoromethane	ug/l	~	~	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	<0.1	<0.1
Chloromethane	ug/l	~	~	<3	<3
Vinyl Chloride	ug/l	0.375	~	<0.1	<0.1
Bromomethane	ug/l	~	~	<1	<1
Chloroethane	ug/l	~	~	<3	<3
Trichlorofluoromethane	ug/l	~	~	<3	<3
1,1-Dichloroethene	ug/l	~	30**	<3	<3
Dichloromethane	ug/l	~	10	<3	<3
trans-1-2-Dichloroethene	ug/l	~	30**	<3	<3
1,1-Dichloroethane	ug/l	~	~	<3	<3
cis-1-2-Dichloroethene	ug/l	~	30**	<3	<3
2,2-Dichloropropane	ug/l	~	~	<1	<1
Bromochloromethane	ug/l	~	~	<2	<2
Chloroform	ug/l	75 Δ1	12	<2	<2
1,1,1-Trichloroethane	ug/l	~	500	<2	<2
1,1-Dichloropropene	ug/l	~	~	<2	<3
Carbon tetrachloride	ug/l	~	2	<2	<2
1,2-Dichloroethane	ug/l	2.25	3	<2	<2
Benzene	ug/l	0.75	1	<0.5	<0.5
Trichloroethene	ug/l	7.5 Δ2	70	<3	<3
1,2-Dichloropropane	ug/l	~	~	<2	<2
Dibromomethane	ug/l	~	~	<3	<3
Bromodichloromethane	ug/l	~	~	<2	<2
cis-1-3-Dichloropropene	ug/l	~	~	<2	<2
Toluene	ug/l	~	10	<0.5	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	<2	<2
1,1,2-Trichloroethane	ug/l	~	~	<2	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	<3	<3
1,3-Dichloropropane	ug/l	~	~	<2	<2
Dibromochloromethane	ug/l	75 Δ1	~	<2	<2
1,2-Dibromoethane	ug/l	~	~	<2	<2
Chlorobenzene	ug/l	~	1	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	<2	<2
Ethylbenzene	ug/l	~	10	<0.5	<0.5
p/m-Xylene	ug/l	~	10 Δ3	<1	<1
o-Xylene	ug/l	~	10 Δ3	<0.5	<0.5
Styrene	ug/l	~	~	<2	<2
Bromoform	ug/l	75 Δ1	~	<2	<2
Isopropylbenzene	ug/l	~	~	<3	<3
1,1,2,2-Tetrachloroethane	ug/l	~	~	<4	<4
Bromobenzene	ug/l	~	~	<2	<2
1,2,3-Trichloropropane	ug/l	~	~	,3	<3
Propylbenzene	ug/l	~	~	<3	<3
2-Chlorotoluene	ug/l	~	~	<3	<3
1,3,5-Trimethylbenzene	ug/l	~	~	<3	<3
4-Chlorotoluene	ug/l	~	~	<3	<3
tert-Butylbenzene	ug/l	~	~	<3	<3
1,2,4-Trimethylbenzene	ug/l	~	~	<3	<3
sec-Butylbenzene	ug/l	~	~	<3	<3
4-Isopropyltoluene	ug/l	~	~	<3	<3
1,3-Dichlorobenzene	ug/l	~	~	<3	<3
1,4-Dichlorobenzene	ug/l	~	~	<3	<3
n-Butylbenzene	ug/l	~	~	<3	<3
1,2-Dichlorobenzene	ug/l	~	10	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	<2	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	<3	<3
Hexachlorobutadiene	ug/l	~	0.1	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	~	<3	<3

Notes:
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Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW8	MW8
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	15/6836	15/6974
Laboratory Sample No.				22-28	8-14
Sample Date				30/04/2015	05/05/2015
Parameters					
Semi-Volatile Organic Compounds (SVOCs)					
Phenols					
2-Chlorophenol	ug/l	~	200	<1	<1
2-Methylphenol	ug/l	~	~	<0.5	<0.5
2-Nitrophenol	ug/l	~	~	<0.5	<0.5
2,4-Dichlorophenol	ug/l	~	~	<0.5	<0.5
2,4-Dimethylphenol	ug/l	~	~	<1	<1
2,4,5-Trichlorophenol	ug/l	~	~	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	<1	<1
4-Chloro-3-methylphenol	ug/l	~	~	<0.5	<0.5
4-Methylphenol	ug/l	~	~	<1	<1
4-Nitrophenol	ug/l	~	~	<10	<10
Pentachlorophenol	ug/l	~	2	<1	<1
Phenol	ug/l	~	0.5*	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)					
2-Chloronaphthalene	ug/l	~	~	<1	<1
2-Methylnaphthalene	ug/l	~	~	<1	<1
Naphthalene	ug/l	~	1	<0.014	<0.014
Acenaphthylene	ug/l	~	~	<0.013	<0.013
Acenaphthene	ug/l	~	~	<0.013	<0.013
Fluorene	ug/l	~	~	<0.014	<0.014
Phenanthrene	ug/l	~	~	0.05	0.05
Anthracene	ug/l	~	10000	<0.013	<0.013
Fluoranthene	ug/l	~	1	0.02	<0.012
Pyrene	ug/l	~	~	0.03	<0.013
Benzo(a)anthracene	ug/l	~	~	<0.015	<0.015
Chrysene	ug/l	~	~	<0.011	<0.011
Benzo(bk)fluoranthene	ug/l	~	~	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.0075	0.01	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	~	0.05	<0.011	<0.011
Dibenzo(ah)anthracene	ug/l	~	~	<0.01	<0.01
Benzo(ghi)perylene	ug/l	~	0.05	<0.011	<0.011
PAH 16 Total	ug/l	~	~	<0.195	<0.195
Benzo(b)fluoranthene	ug/l	~	~	<0.01	<0.01
Benzo(k)fluoranthene	ug/l	~	~	<0.01	<0.01
Other SVOCs					
1,2-Dichlorobenzene	ug/l	~	10	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	<1	<1
1,3-Dichlorobenzene	ug/l	~	~	<1	<1
1,4-Dichlorobenzene	ug/l	~	~	<1	<1
2-Nitroaniline	ug/l	~	~	<1	<1
2,4-Dinitrotoluene	ug/l	~	~	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	~	~	<1	<1
3-Nitroaniline	ug/l	~	~	<1	<1
4-Bromophenylphenylether	ug/l	~	~	<1	<1
4-Chloroaniline	ug/l	~	~	<1	<1
4-Chlorophenylphenylether	ug/l	~	~	<1	<1
4-Nitroaniline	ug/l	~	~	<0.5	<0.5
Azobenzene	ug/l	~	~	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	<1	<0.1
Carbazole	ug/l	~	~	<0.5	<0.5
Dibenzofuran	ug/l	~	~	<0.5	<0.5
Hexachlorobenzene	ug/l	~	0.03	<1	<1
Hexachlorobutadiene	ug/l	~	0.1	<1	<1
Hexachlorocyclopentadiene	ug/l	~	~	<1	<1
Hexachloroethane	ug/l	~	~	<1	<1
Isophorone	ug/l	~	~	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	<0.5	<0.5
Nitrobenzene	ug/l	~	10	<1	<1
Phthalates					
Bis(2-ethylhexyl) phthalate	ug/l	~	8	<5	<5
Butylbenzyl phthalate	ug/l	~	~	<1	<1
Di-n-butyl phthalate	ug/l	~	2	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	~	~	<1	<1
Diethyl phthalate	ug/l	~	~	<1	<1
Dimethyl phthalate	ug/l	~	~	<1	<1
Pesticides MS					
Organochlorine Pesticides					
Aldrin	ug/l	~	0.01	<0.01	<0.01
Alpha-BHC	ug/l	~	0.1#	<0.01	<0.01
Beta-BHC	ug/l	~	0.1#	<0.01	<0.01
Delta-BHC	ug/l	~	0.1#	<0.01	<0.01
Chlorothalonil	ug/l	~	0.1#	-	-
cis-Chlordane	ug/l	~	0.1#	-	-
Dieldrin	ug/l	0.075	0.01	<0.01	<0.01
Endosulphan I	ug/l	~	0.001^	<0.01	<0.01
Endosulphan II	ug/l	~	0.001^	<0.01	<0.01
Endosulphan sulphate	ug/l	~	0.001^	<0.01	<0.01
Endrin	ug/l	~	0.1#	<0.01	<0.01
Gamma-BHC	ug/l	~	0.1#	<0.01	<0.01
Heptachlor	ug/l	~	0.1#	<0.01	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	<0.01	<0.01
Hexachlorobenzene	ug/l	~	0.1#	-	-
Isodrin	ug/l	~	0.1#	-	-
o,p'-DDE	ug/l	~	0.1#	-	-
o,p'-DDT	ug/l	~	0.1#	-	-
o,p'-Methoxychlor	ug/l	~	0.1#	-	-
o,p'-TDE	ug/l	~	0.1#	-	-
p,p'-DDE	ug/l	~	0.1#	0.01	<0.01
p,p'-DDT	ug/l	0.075	0.1#	<0.01	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	<0.01	<0.01
p,p'-TDE	ug/l	~	0.1#	<0.01	<0.01
Pendimethalin	ug/l	~	0.1#	-	-
Permethrin I	ug/l	~	20+	-	-
Permethrin II	ug/l	~	20+	-	-
Quintozene	ug/l	~	0.1#	-	-
Tecnazene	ug/l	~	0.1#	-	-
Telodrin	ug/l	~	0.1#	-	-
trans-Chlordane	ug/l	~	0.1#	-	-
Triadimefon	ug/l	~	0.1#	-	-
Triallate	ug/l	~	0.1#	-	-
Trifluralin	ug/l	~	0.1	-	-

Notes:

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Sample Date				30/04/2015	05/05/2015
Parameters					
Organophosphorus Pesticides					
Azinphos ethyl	ug/l	~	0.1#	-	-
Azinphos methyl	ug/l	~	0.1#	<0.01	<0.01
Carbophenothion	ug/l	~	0.1#	-	-
Chlorfenvinphos	ug/l	~	5	-	-
Chlorpyrifos	ug/l	~	90	-	-
Chlorpyrifos-methyl	ug/l	~	0.1#	-	-
Diazinon	ug/l	~	0.1#	<0.01	<0.01
Dichlorvos	ug/l	~	0.001	<0.01	<0.01
Disulfoton	ug/l	~	0.001	<0.01	<0.01
Dimethoate	ug/l	~	0.1#	-	-
Ethion	ug/l	~	0.1#	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	<0.01	<0.01
Etrimphos	ug/l	~	0.1#	-	-
Fenitrothion	ug/l	~	0.1#	<0.01	<0.01
Fenthion	ug/l	~	0.1#	-	-
Malathion	ug/l	~	0.1#	<0.01	<0.01
Methyl Parathion	ug/l	~	0.1#	<0.01	<0.01
Mevinphos	ug/l	~	0.1#	<0.01	<0.01
Phosalone	ug/l	~	0.1#	-	-
Pirimiphos Methyl	ug/l	~	0.1#	-	-
Propetamphos	ug/l	~	0.1#	-	-
Triazophos	ug/l	~	0.1#	-	-
Benazolin	ug/l	~	0.1#	<0.1	<0.1
Bentazone	ug/l	0.075	0.1#	<0.1	<0.1
Bromoxynil	ug/l	~	5	<0.1	<0.1
Clopyralid	ug/l	~	0.1#	<0.1	<0.1
4- CPA	ug/l	~	0.1#	<0.1	<0.1
2,4 – D	ug/l	~	0.1#	<0.1	<0.1
2,4 –DB	ug/l	~	0.1#	<0.1	<0.1
Dicamba	ug/l	~	0.1#	<0.1	<0.1
Dichloroprop	ug/l	~	100	<0.1	<0.1
Diclofop	ug/l	~	0.1#	<0.1	<0.1
Fenoprop	ug/l	~	0.1#	<0.1	<0.1
Flamprop	ug/l	~	0.1#	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	<0.1	<0.1
Ioxynil	ug/l	~	0.1#	<0.1	<0.1
MCPA	ug/l	~	0.1#	<0.1	<0.1
MCPB	ug/l	~	0.1#	<0.1	<0.1
Mecoprop	ug/l	0.075	10	<0.1	<0.1
Picloram	ug/l	~	0.1#	<0.1	<0.1
Pentachlorophenol	ug/l	~	0.1#	<0.1	<0.1
2,4,5 – T	ug/l	~	0.1#	<0.1	<0.1
2,3,6 – TBA	ug/l	~	0.1#	<0.1	<0.1
Triclopyr	ug/l	~	0.1#	<0.1	<0.1
Atrazine	ug/l	0.075	1	<1	<1
Simazine	ug/l	0.075	1	<1	<1
Fluoride	mg/l	~	1	<0.3	<0.3
Sulphate	mg/l	187.5	200	70.51	59.51
Chloride	mg/l	187.5^	30	34.8	22.1
Total Oxidised Nitrogen as N	mg/l	~	~	7.3	20.1
Total Cyanide	mg/l	0.0375	0.01	<0.01	<0.01
Ammoniacal Nitrogen as N	mg/l	0.065	0.12•	**4.57**	**1.01**
Total Alkalinity as CaCO3	mg/l	~	NAC	646	578
Total Organic Carbon	mg/l	~	~	6	<2
Total Dissolved Solids	mg/l	~	1000	723	694
Faecal coliforms	cfu/100ml	~	0	2	<1
Coliforms	MPN/100ml	~	0	153.1	>2419.6

Notes:

1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2(

2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ire

Bold denotes value exceeds Groundwater regulations.

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^ denotes upper threshold value used

∆1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochlorometh

∆2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.

∆3 denotes quality standard relates to Xylenes

• denotes value was converted for comparison purposes

* denotes IGV relates to 'phenols'.

** denotes IGV relates to 'dichloroethene'.

*** denotes orthophosphate

NAC - No Abnormal Change

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+ denotes permethrin

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Tier III Exploratory Investigation

SDCC
Waterstown, Co. Dublin

Table 9: Groundwater Analytical Results

Sample Identity	**Unit**	**Groundwater Standards**		**MW9**	**MW10**	**MW10**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	**15/6228**	**15/6836**	**15/7036**
Laboratory Sample No.				**1-7**	**36-42**	**15-21**
Sample Date				**16/04/2015**	**30/04/2015**	**06/05/2015**
Parameters						
Field Measured Parameters						
pH	pH units	~	6.5-9.5	10.54	7.59	7.66
Electrical Conductivity	µS/cm	800 # / 1875	1000	**898.6**	583	614.6
Dissolved Oxygen	%	~	NAC	47.5	15.6	31.6
Dissolved Oxygen	ppm	~	~	5.29	1.65	3.42
Temperature	ºC	~	25ºC	10.54	12.44	10.67
Oxidation Reduction Potential	mV	~	~	47.6	27.7	45.6
Colour	N/A	~	NAC	Clear	Silty	Silty
Odour	N/A	~	~	None	Odourless	Odourless
Other observations	N/A	~	~	None	None	None
Metals (dissolved)						
Dissolved Arsenic	ug/l	7.5	10	<2.5	<2.5	<2.5
Dissolved Boron	ug/l	750	1000	59	164	144
Dissolved Cadmium	ug/l	3.75	5	<0.5	0.28	0.27
Dissolved Calcium	mg/l	~	200	151.1	80.7	75.7
Total Dissolved Chromium	ug/l	37.5	30	<1.5	0.5	<1.5
Dissolved Copper	ug/l	1500	30	<7	<7	<7
Total Dissolved Iron	ug/l	~	200	<20	82	<20
Dissolved Lead	ug/l	18.75	10	<5	<5	<5
Dissolved Magnesium	mg/l	~	50	27.9	21.7	22.1
Dissolved Manganese	ug/l	~	50	28	**441**	**382**
Dissolved Mercury	ug/l	0.75	1	<1	<0.5	<0.5
Dissolved Nickel	ug/l	15	20	<2	8	3
Dissolved Potassium	mg/l	~	5	2	4.4	2.8
Dissolved Sodium	mg/l	150	150	46.7	70.9	67.9
Dissolved Zinc	ug/l	~	100	<3	<3	<3
MRP as Total Phosphorus	ug/l	35	30***	**46**	**695**	**1196**
Volatile Organic Compounds (VOCs) MS						
Dichlorodifluoromethane	ug/l	~	~	<2	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	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	ug/l	~	30**	<3	<3	<3
Dichloromethane	ug/l	~	10	<3	<3	<3
trans-1-2-Dichloroethene	ug/l	~	30**	<3	<3	<3
1,1-Dichloroethane	ug/l	~	~	<3	<3	<3
cis-1-2-Dichloroethene	ug/l	~	30**	<3	<3	<3
2,2-Dichloropropane	ug/l	~	~	<1	<1	<1
Bromochloromethane	ug/l	~	~	<2	<2	<2
Chloroform	ug/l	75 Δ1	12	<2	<2	<2
1,1,1-Trichloroethane	ug/l	~	500	<2	<2	<2
1,1-Dichloropropene	ug/l	~	~	<3	<3	<3
Carbon tetrachloride	ug/l	~	2	<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	ug/l	7.5 Δ2	70	<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	~	10	<0.5	<0.5	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	<2	<2	<2
1,1,2-Trichloroethane	ug/l	~	~	<2	<2	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	<3	<3	<3
1,3-Dichloropropane	ug/l	~	~	<2	<2	<2
Dibromochloromethane	ug/l	75 Δ1	~	<2	<2	<2
1,2-Dibromoethane	ug/l	~	~	<2	<2	<2
Chlorobenzene	ug/l	~	1	<2	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	<2	<2	<2
Ethylbenzene	ug/l	~	10	<0.5	<0.5	<0.5
p/m-Xylene	ug/l	~	10 Δ3	<1	<1	<1
o-Xylene	ug/l	~	10 Δ3	<0.5	<0.5	<0.5
Styrene	ug/l	~	~	<2	<2	<2
Bromoform	ug/l	75 Δ1	~	<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	~	~	<3	<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	~	~	<3	<3	<3
n-Butylbenzene	ug/l	~	~	<3	<3	<3
1,2-Dichlorobenzene	ug/l	~	10	<3	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	<2	<2	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	<3	<3	<3
Hexachlorobutadiene	ug/l	~	0.1	<3	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	~	<3	<3	<3

Notes:
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Δ1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromeths
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• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
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NAC - No Abnormal Change
^ denotes alpha-endosulphan
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Tier III Exploratory Investigation

SDCC
Waterstown, Co. Dublin

Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW9	MW10	MW10
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	15/6228	15/6836	15/7036
Laboratory Sample No.				1-7	36-42	15-21
Sample Date				16/04/2015	30/04/2015	06/05/2015
Parameters						
Semi-Volatile Organic Compounds (SVOCs)						
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
Polycyclic Aromatic Hydrocarbons (PAHs)						
2-Chloronaphthalene	ug/l	~	~	<1	<1	<1
2-Methylnaphthalene	ug/l	~	~	<1	<1	<1
Naphthalene	ug/l	~	1	<0.014	<0.014	<0.014
Acenaphthylene	ug/l	~	~	<0.013	<0.013	<0.013
Acenaphthene	ug/l	~	~	<0.013	<0.013	<0.013
Fluorene	ug/l	~	~	<0.014	<0.014	<0.014
Phenanthrene	ug/l	~	~	<0.011	<0.011	<0.011
Anthracene	ug/l	~	10000	<0.013	<0.013	<0.013
Fluoranthene	ug/l	~	1	<0.012	<0.012	<0.012
Pyrene	ug/l	~	~	<0.013	<0.013	<0.013
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	~	0.05	<0.011	<0.011	<0.011
PAH 16 Total	ug/l	~	~	<0.195	<0.195	<0.195
Benzo(b)fluoranthene	ug/l	~	~	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	ug/l	~	~	<0.01	<0.01	<0.01
Other SVOCs						
1,2-Dichlorobenzene	ug/l	~	10	<1	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	<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	~	0.03	<1	<1	<1
Hexachlorobutadiene	ug/l	~	0.1	<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	~	10	<1	<1	<1
Phthalates						
Bis(2-ethylhexyl) phthalate	ug/l	~	8	<5	<5	<5
Butylbenzyl phthalate	ug/l	~	~	<1	<1	<1
Di-n-butyl phthalate	ug/l	~	2	<1.5	<1.5	<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
Pesticides MS						
Organochlorine Pesticides						
Aldrin	ug/l	~	0.01	<0.01	<0.01	<0.01
Alpha-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01
Beta-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01
Delta-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01
Chlorothalonil	ug/l	~	0.1#	-	-	-
cis-Chlordane	ug/l	~	0.1#	-	-	-
Dieldrin	ug/l	0.075	0.01	<0.01	<0.01	<0.01
Endosulphan I	ug/l	~	0.001^	<0.01	<0.01	<0.01
Endosulphan II	ug/l	~	0.001^	<0.01	<0.01	<0.01
Endosulphan sulphate	ug/l	~	0.001^	<0.01	<0.01	<0.01
Endrin	ug/l	~	0.1#	<0.01	<0.01	<0.01
Gamma-BHC	ug/l	~	0.1#	<0.01	<0.01	<0.01
Heptachlor	ug/l	~	0.1#	<0.01	<0.01	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	<0.01	<0.01	<0.01
Hexachlorobenzene	ug/l	~	0.1#	-	-	-
Isodrin	ug/l	~	0.1#	-	-	-
o,p'-DDE	ug/l	~	0.1#	-	-	-
o,p'-DDT	ug/l	~	0.1#	-	-	-
o,p'-Methoxychlor	ug/l	~	0.1#	-	-	-
o,p'-TDE	ug/l	~	0.1#	-	-	-
p,p'-DDE	ug/l	~	0.1#	<0.01	<0.01	<0.01
p,p'-DDT	ug/l	0.075	0.1#	<0.01	<0.01	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	<0.01	<0.01	<0.01
p,p'-TDE	ug/l	~	0.1#	<0.01	<0.01	
Pendimethalin	ug/l	~	0.1#	-	-	-
Permethrin I	ug/l	~	20+	-	-	-
Permethrin II	ug/l	~	20+	-	-	-
Quintozene	ug/l	~	0.1#	-	-	-
Tecnazene	ug/l	~	0.1#	-	-	-
Telodrin	ug/l	~	0.1#	-	-	-
trans-Chlordane	ug/l	~	0.1#	-	-	-
Triadimefon	ug/l	~	0.1#	-	-	-
Triallate	ug/l	~	0.1#	-	-	-
Trifluralin	ug/l	~	0.1	-	-	-

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Laboratory Sample No.				1-7	36-42	15-21
Sample Date				16/04/2015	30/04/2015	06/05/2015
Parameters						
Organophosphorus Pesticides						
Azinphos ethyl	ug/l	~	0.1#	-	-	-
Azinphos methyl	ug/l	~	0.1#	<0.01	<0.01	<0.01
Carbophenothion	ug/l	~	0.1#	-	-	-
Chlorfenvinphos	ug/l	~	5	-	-	-
Chlorpyrifos	ug/l	~	90	-	-	-
Chlorpyrifos-methyl	ug/l	~	0.1#	-	-	-
Diazinon	ug/l	~	0.1#	<0.01	<0.01	<0.01
Dichlorvos	ug/l	~	0.001	<0.01	<0.01	<0.01
Disulfoton	ug/l	~	0.001	<0.01	<0.01	<0.01
Dimethoate	ug/l	~	0.1#	-	-	-
Ethion	ug/l	~	0.1#	<0.01	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	<0.01	<0.01	<0.01
Etrimphos	ug/l	~	0.1#	-	-	-
Fenitrothion	ug/l	~	0.1#	<0.01	<0.01	<0.01
Fenthion	ug/l	~	0.1#	-	-	-
Malathion	ug/l	~	0.1#	<0.01	<0.01	<0.01
Methyl Parathion	ug/l	~	0.1#	<0.01	<0.01	<0.01
Mevinphos	ug/l	~	0.1#	<0.01	<0.01	<0.01
Phosalone	ug/l	~	0.1#	-	-	-
Pirimiphos Methyl	ug/l	~	0.1#	-	-	-
Propetamphos	ug/l	~	0.1#	-	-	-
Triazophos	ug/l	~	0.1#	-	-	-
Benazolin	ug/l	~	0.1#	<0.1	<0.1	<0.1
Bentazone	ug/l	0.075	0.1#	<0.1	<0.1	<0.1
Bromoxynil	ug/l	~	5	<0.1	<0.1	<0.1
Clopyralid	ug/l	~	0.1#	<0.1	<0.1	<0.1
4- CPA	ug/l	~	0.1#	<0.1	<0.1	<0.1
2,4 – D	ug/l	~	0.1#	<0.1	<0.1	<0.1
2,4 –DB	ug/l	~	0.1#	<0.1	<0.1	<0.1
Dicamba	ug/l	~	0.1#	<0.1	<0.1	<0.1
Dichloroprop	ug/l	~	100	<0.1	<0.1	<0.1
Diclofop	ug/l	~	0.1#	<0.1	<0.1	<0.1
Fenoprop	ug/l	~	0.1#	<0.1	<0.1	<0.1
Flamprop	ug/l	~	0.1#	<0.1	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	<0.1	<0.1	<0.1
Ioxynil	ug/l	~	0.1#	<0.1	<0.1	<0.1
MCPA	ug/l	~	0.1#	<0.1	<0.1	<0.1
MCPB	ug/l	~	0.1#	<0.1	<0.1	<0.1
Mecoprop	ug/l	0.075	10	<0.1	<0.1	<0.1
Picloram	ug/l	~	0.1#	<0.1	<0.1	<0.1
Pentachlorophenol	ug/l	~	0.1#	<0.1	<0.1	<0.1
2,4,5 – T	ug/l	~	0.1#	<0.1	<0.1	<0.1
2,3,6 – TBA	ug/l	~	0.1#	<0.1	<0.1	<0.1
Triclopyr	ug/l	~	0.1#	<0.1	<0.1	<0.1
Atrazine	ug/l	0.075	1	<1	<1	<1
Simazine	ug/l	0.075	1	<1	<1	<1
Fluoride	mg/l	~	1	<0.3	<0.3	0.3
Sulphate	mg/l	187.5	200	62.58	34.76	27.95
Chloride	mg/l	187.5^	30	94	93.6	97.3
Total Oxidised Nitrogen as N	mg/l	~	~	2.6	<0.2	<0.2
Total Cyanide	mg/l	0.0375	0.01	-	0.01	<0.01
Ammoniacal Nitrogen as N	mg/l	0.065	0.12•	<0.01	**0.85**	**0.56**
Total Alkalinity as CaCO3	mg/l	~	NAC	436	384	664
Total Organic Carbon	mg/l	~	~	<2	<2	<2
Total Dissolved Solids	mg/l	~	1000	668	493	777
Faecal coliforms	cfu/100ml	~	0	<1	200	70
Coliforms	MPN/100ml	~	0	<1	>2419.6	>2419.6

Notes:

1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2(

2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ire

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^ denotes upper threshold value used

∆1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochlorometh

∆2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.

∆3 denotes quality standard relates to Xylenes

• denotes value was converted for comparison purposes

* denotes IGV relates to 'phenols'.

** denotes IGV relates to 'dichloroethene'.

*** denotes orthophosphate

NAC - No Abnormal Change

^ denotes alpha-endosulphan

+ denotes permethrin

# denotes non-specific individual pesticide value

++ Result outside calibration range, results should be considered as indicative only and are not accredited

Tier III Exploratory Investigation

SDCC
Waterstown, Co. Dublin

Table 9: Groundwater Analytical Results

Sample Identity	**Unit**	**Groundwater Standards**		**MW11**	**MW11**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	**15/6836**	**15/6974**
Laboratory Sample No.				**8-14**	**15-21**
Sample Date				**30/04/2015**	**05/05/2015**
Parameters					
Field Measured Parameters					
pH	pH units	~	6.5-9.5	6.78	6.73
Electrical Conductivity	µS/cm	800 # / 1875	1000	**1024.7**	**1032**
Dissolved Oxygen	%	~	NAC	13.9	10.1
Dissolved Oxygen	ppm	~	~	1.52	1.08
Temperature	ºC	~	25ºC	11	11.04
Oxidation Reduction Potential	mV	~	~	51.5	48.1
Colour	N/A	~	NAC	Slightly silty	Slightly silty
Odour	N/A	~	~	None	None
Other observations	N/A	~	~	None	None
Metals (dissolved)					
Dissolved Arsenic	ug/l	7.5	10	<2.5	**7.6**
Dissolved Boron	ug/l	750	1000	355	420
Dissolved Cadmium	ug/l	3.75	5	1.81	1.96
Dissolved Calcium	mg/l	~	200	151.8	206.2
Total Dissolved Chromium	ug/l	37.5	30	<0.2	<1.5
Dissolved Copper	ug/l	1500	30	<7	<7
Total Dissolved Iron	ug/l	~	200	<20	81
Dissolved Lead	ug/l	18.75	10	<5	5
Dissolved Magnesium	mg/l	~	50	21.7	21.1
Dissolved Manganese	ug/l	~	50	**783**	**644**
Dissolved Mercury	ug/l	0.75	1	<0.5	<0.5
Dissolved Nickel	ug/l	15	20	**61**	**58**
Dissolved Potassium	mg/l	~	5	4.9	6.3
Dissolved Sodium	mg/l	150	150	65.8	69.7
Dissolved Zinc	ug/l	~	100	7	36
MRP as Total Phosphorus	ug/l	35	30***	32	**106**
Volatile Organic Compounds (VOCs) MS					
Dichlorodifluoromethane	ug/l	~	~	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	<0.1	<0.1
Chloromethane	ug/l	~	~	<3	<3
Vinyl Chloride	ug/l	0.375	~	<0.1	<0.1
Bromomethane	ug/l	~	~	<1	<1
Chloroethane	ug/l	~	~	<3	<3
Trichlorofluoromethane	ug/l	~	~	<3	<3
1,1-Dichloroethene	ug/l	~	30**	<3	<3
Dichloromethane	ug/l	~	10	<3	<3
trans-1-2-Dichloroethene	ug/l	~	30**	<3	<3
1,1-Dichloroethane	ug/l	~	~	<3	<3
cis-1-2-Dichloroethene	ug/l	~	30**	<3	<3
2,2-Dichloropropane	ug/l	~	~	<1	<1
Bromochloromethane	ug/l	~	~	<2	<2
Chloroform	ug/l	75 Δ1	12	<2	<2
1,1,1-Trichloroethane	ug/l	~	500	<2	<2
1,1-Dichloropropene	ug/l	~	~	<3	<3
Carbon tetrachloride	ug/l	~	2	<2	<2
1,2-Dichloroethane	ug/l	2.25	3	<2	<2
Benzene	ug/l	0.75	1	<0.5	<0.5
Trichloroethene	ug/l	7.5 Δ2	70	<3	<3
1,2-Dichloropropane	ug/l	~	~	<2	<2
Dibromomethane	ug/l	~	~	<3	<3
Bromodichloromethane	ug/l	~	~	<2	<2
cis-1-3-Dichloropropene	ug/l	~	~	<2	<2
Toluene	ug/l	~	10	<0.5	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	<2	<2
1,1,2-Trichloroethane	ug/l	~	~	<2	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	<3	<3
1,3-Dichloropropane	ug/l	~	~	<2	<2
Dibromochloromethane	ug/l	75 Δ1	~	<2	<2
1,2-Dibromoethane	ug/l	~	~	<2	<2
Chlorobenzene	ug/l	~	1	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	<2	<2
Ethylbenzene	ug/l	~	10	<0.5	<0.5
p/m-Xylene	ug/l	~	10 Δ3	<1	<1
o-Xylene	ug/l	~	10 Δ3	<0.5	<0.5
Styrene	ug/l	~	~	<2	<2
Bromoform	ug/l	75 Δ1	~	<2	<2
Isopropylbenzene	ug/l	~	~	<3	<3
1,1,2,2-Tetrachloroethane	ug/l	~	~	<4	<4
Bromobenzene	ug/l	~	~	<2	<2
1,2,3-Trichloropropane	ug/l	~	~	<3	<3
Propylbenzene	ug/l	~	~	<3	<3
2-Chlorotoluene	ug/l	~	~	<3	<3
1,3,5-Trimethylbenzene	ug/l	~	~	<3	<3
4-Chlorotoluene	ug/l	~	~	<3	<3
tert-Butylbenzene	ug/l	~	~	<3	<3
1,2,4-Trimethylbenzene	ug/l	~	~	<3	<3
sec-Butylbenzene	ug/l	~	~	<3	<3
4-Isopropyltoluene	ug/l	~	~	<3	<3
1,3-Dichlorobenzene	ug/l	~	~	<3	<3
1,4-Dichlorobenzene	ug/l	~	~	<3	<3
n-Butylbenzene	ug/l	~	~	<3	<3
1,2-Dichlorobenzene	ug/l	~	10	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	<2	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	<3	<3
Hexachlorobutadiene	ug/l	~	0.1	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	~	<3	<3

Notes:
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Bold denotes value exceeds Groundwater regulations.
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Δ1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochlorometh
Δ2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
Δ3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
** denotes IGV relates to 'dichloroethene'.
*** denotes orthophosphate
NAC - No Abnormal Change
^ denotes alpha-endosulphan
+ denotes permethrin
# denotes non-specific individual pesticide value
++ Result outside calibration range, results should be considered as indicative only and are not accredited

Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW11	MW11
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	15/6836	15/6974
Laboratory Sample No.				8-14	15-21
Sample Date				30/04/2015	05/05/2015
Parameters					
Semi-Volatile Organic Compounds (SVOCs)					
Phenols					
2-Chlorophenol	ug/l	~	200	<1	<1
2-Methylphenol	ug/l	~	~	<0.5	<0.5
2-Nitrophenol	ug/l	~	~	<0.5	<0.5
2,4-Dichlorophenol	ug/l	~	~	<0.5	<0.5
2,4-Dimethylphenol	ug/l	~	~	<1	<1
2,4,5-Trichlorophenol	ug/l	~	~	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	<1	<1
4-Chloro-3-methylphenol	ug/l	~	~	<0.5	<0.5
4-Methylphenol	ug/l	~	~	<1	<1
4-Nitrophenol	ug/l	~	~	<10	<10
Pentachlorophenol	ug/l	~	2	<1	<1
Phenol	ug/l	~	0.5*	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)					
2-Chloronaphthalene	ug/l	~	~	<1	<1
2-Methylnaphthalene	ug/l	~	~	<1	<1
Naphthalene	ug/l	~	1	<0.014	<0.014
Acenaphthylene	ug/l	~	~	<0.013	<0.013
Acenaphthene	ug/l	~	~	<0.013	<0.013
Fluorene	ug/l	~	~	<0.014	<0.014
Phenanthrene	ug/l	~	~	<0.011	0.02
Anthracene	ug/l	~	10000	<0.013	<0.013
Fluoranthene	ug/l	~	1	<0.012	<0.012
Pyrene	ug/l	~	~	<0.013	<0.013
Benzo(a)anthracene	ug/l	~	~	<0.015	<0.015
Chrysene	ug/l	~	~	<0.011	<0.011
Benzo(bk)fluoranthene	ug/l	~	~	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.0075	0.01	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	~	0.05	<0.011	<0.011
Dibenzo(ah)anthracene	ug/l	~	~	<0.01	<0.01
Benzo(ghi)perylene	ug/l	~	0.05	<0.011	<0.011
PAH 16 Total	ug/l	~	~	<0.195	<0.195
Benzo(b)fluoranthene	ug/l	~	~	<0.01	<0.01
Benzo(k)fluoranthene	ug/l	~	~	<0.01	<0.01
Other SVOCs					
1,2-Dichlorobenzene	ug/l	~	10	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	<1	<1
1,3-Dichlorobenzene	ug/l	~	~	<1	<1
1,4-Dichlorobenzene	ug/l	~	~	<1	<1
2-Nitroaniline	ug/l	~	~	<1	<1
2,4-Dinitrotoluene	ug/l	~	~	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	~	~	<1	<1
3-Nitroaniline	ug/l	~	~	<1	<1
4-Bromophenylphenylether	ug/l	~	~	<1	<1
4-Chloroaniline	ug/l	~	~	<1	<1
4-Chlorophenylphenylether	ug/l	~	~	<1	<1
4-Nitroaniline	ug/l	~	~	<0.5	<0.5
Azobenzene	ug/l	~	~	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	<1	<1
Carbazole	ug/l	~	~	<0.5	<0.5
Dibenzofuran	ug/l	~	~	<0.5	<0.5
Hexachlorobenzene	ug/l	~	0.03	<0.1	<1
Hexachlorobutadiene	ug/l	~	0.1	<1	<1
Hexachlorocyclopentadiene	ug/l	~	~	<1	<1
Hexachloroethane	ug/l	~	~	<1	<1
Isophorone	ug/l	~	~	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	<0.5	<0.5
Nitrobenzene	ug/l	~	10	<1	<1
Phthalates					
Bis(2-ethylhexyl) phthalate	ug/l	~	8	<5	<5
Butylbenzyl phthalate	ug/l	~	~	<1	<1
Di-n-butyl phthalate	ug/l	~	2	>1.5	<1.5
Di-n-Octyl phthalate	ug/l	~	~	<1	<1
Diethyl phthalate	ug/l	~	~	<1	<1
Dimethyl phthalate	ug/l	~	~	<1	<1
Pesticides MS					
Organochlorine Pesticides					
Aldrin	ug/l	~	0.01	<0.01	<0.01
Alpha-BHC	ug/l	~	0.1#	<0.01	<0.01
Beta-BHC	ug/l	~	0.1#	<0.01	<0.01
Delta-BHC	ug/l	~	0.1#	<0.01	<0.01
Chlorothalonil	ug/l	~	0.1#	-	-
cis-Chlordane	ug/l	~	0.1#	-	-
Dieldrin	ug/l	0.075	0.01	<0.01	<0.01
Endosulphan I	ug/l	~	0.001^	<0.01	<0.01
Endosulphan II	ug/l	~	0.001^	<0.01	<0.01
Endosulphan sulphate	ug/l	~	0.001^	<0.01	<0.01
Endrin	ug/l	~	0.1#	<0.01	<0.01
Gamma-BHC	ug/l	~	0.1#	<0.01	<0.01
Heptachlor	ug/l	~	0.1#	<0.01	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	<0.1	<0.01
Hexachlorobenzene	ug/l	~	0.1#	-	-
Isodrin	ug/l	~	0.1#	-	-
o,p'-DDE	ug/l	~	0.1#	-	-
o,p'-DDT	ug/l	~	0.1#	-	-
o,p'-Methoxychlor	ug/l	~	0.1#	-	-
o,p'-TDE	ug/l	~	0.1#	-	-
p,p'-DDE	ug/l	~	0.1#	<0.01	<0.01
p,p'-DDT	ug/l	0.075	0.1#	<0.01	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	<0.01	<0.01
p,p'-TDE	ug/l	~	0.1#	<0.01	<0.01
Pendimethalin	ug/l	~	0.1#	-	-
Permethrin I	ug/l	~	20+	-	-
Permethrin II	ug/l	~	20+	-	-
Quintozene	ug/l	~	0.1#	-	-
Tecnazene	ug/l	~	0.1#	-	-
Telodrin	ug/l	~	0.1#	-	-
trans-Chlordane	ug/l	~	0.1#	-	-
Triadimefon	ug/l	~	0.1#	-	-
Triallate	ug/l	~	0.1#	-	-
Trifluralin	ug/l	~	0.1	-	-

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Laboratory Sample No.				8-14	15-21
Sample Date				30/04/2015	05/05/2015
Parameters					
Organophosphorus Pesticides					
Azinphos ethyl	ug/l	~	0.1#	-	-
Azinphos methyl	ug/l	~	0.1#	<0.01	<0.01
Carbophenothion	ug/l	~	0.1#	-	-
Chlorfenvinphos	ug/l	~	5	-	-
Chlorpyrifos	ug/l	~	90	-	-
Chlorpyrifos-methyl	ug/l	~	0.1#	-	-
Diazinon	ug/l	~	0.1#	<0.01	<0.01
Dichlorvos	ug/l	~	0.001	<0.01	<0.01
Disulfoton	ug/l	~	0.001	<0.01	<0.01
Dimethoate	ug/l	~	0.1#	-	-
Ethion	ug/l	~	0.1#	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	<0.01	<0.01
Etrimphos	ug/l	~	0.1#	-	-
Fenitrothion	ug/l	~	0.1#	<0.01	<0.01
Fenthion	ug/l	~	0.1#	-	-
Malathion	ug/l	~	0.1#	<0.01	<0.01
Methyl Parathion	ug/l	~	0.1#	<0.01	<0.01
Mevinphos	ug/l	~	0.1#	<0.01	<0.01
Phosalone	ug/l	~	0.1#	-	-
Pirimiphos Methyl	ug/l	~	0.1#	-	-
Propetamphos	ug/l	~	0.1#	-	-
Triazophos	ug/l	~	0.1#	-	-
Benazolin	ug/l	~	0.1#	<0.1	<0.1
Bentazone	ug/l	0.075	0.1#	<0.1	<0.1
Bromoxynil	ug/l	~	5	<0.1	<0.1
Clopyralid	ug/l	~	0.1#	<0.1	<0.1
4- CPA	ug/l	~	0.1#	<0.1	<0.1
2,4 – D	ug/l	~	0.1#	<0.1	<0.1
2,4 –DB	ug/l	~	0.1#	<0.1	<0.1
Dicamba	ug/l	~	0.1#	<0.1	<0.1
Dichloroprop	ug/l	~	100	<0.1	<0.1
Diclofop	ug/l	~	0.1#	<0.1	<0.1
Fenoprop	ug/l	~	0.1#	<0.1	<0.1
Flamprop	ug/l	~	0.1#	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	<0.1	<0.1
Ioxynil	ug/l	~	0.1#	<0.1	<0.1
MCPA	ug/l	~	0.1#	<0.1	<0.1
MCPB	ug/l	~	0.1#	<0.1	<0.1
Mecoprop	ug/l	0.075	10	<0.1	<0.1
Picloram	ug/l	~	0.1#	<0.1	<0.1
Pentachlorophenol	ug/l	~	0.1#	<0.1	<0.1
2,4,5 – T	ug/l	~	0.1#	<0.1	<0.1
2,3,6 – TBA	ug/l	~	0.1#	<0.1	<0.1
Triclopyr	ug/l	~	0.1#	<0.1	<0.1
Atrazine	ug/l	0.075	1	<1	<1
Simazine	ug/l	0.075	1	<1	<1
Fluoride	mg/l	~	1	<0.3	<0.3
Sulphate	mg/l	187.5	200	30.43	22.94
Chloride	mg/l	187.5^	30	87.6	73.4
Total Oxidised Nitrogen as N	mg/l	~	~	0.9	5.8
Total Cyanide	mg/l	0.0375	0.01	<0.01	<0.01
Ammoniacal Nitrogen as N	mg/l	0.065	0.12•	**1.45**	**1.86**
Total Alkalinity as CaCO3	mg/l	~	NAC	644	648
Total Organic Carbon	mg/l	~	~	6	9
Total Dissolved Solids	mg/l	~	1000	756	800
Faecal coliforms	cfu/100ml	~	0	<1	<1
Coliforms	MPN/100ml	~	0	343.5	579.4

Notes:

1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2(

2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ire

Bold denotes value exceeds Groundwater regulations.

Underline denotes value exceeds IGV - Only used in the absence of Groundwater regulation value

^ denotes upper threshold value used

∆1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochlorometh

∆2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.

∆3 denotes quality standard relates to Xylenes

• denotes value was converted for comparison purposes

* denotes IGV relates to 'phenols'.

** denotes IGV relates to 'dichloroethene'.

*** denotes orthophosphate

NAC - No Abnormal Change

^ denotes alpha-endosulphan

+ denotes permethrin

# denotes non-specific individual pesticide value

++ Result outside calibration range, results should be considered as indicative only and are not accredited

Tier III Exploratory Investigation

SDCC
Waterstown, Co. Dublin

Table 9: Groundwater Analytical Results

Sample Identity	**Unit**	**Groundwater Standards**		**MW12**	**MW12**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	**15/6836**	**15/6974**
Laboratory Sample No.				**15-21**	**22-28**
Sample Date				**30/04/2015**	**05/05/2015**
Parameters					
Field Measured Parameters					
pH	pH units	~	6.5-9.5	6.85	6.97
Electrical Conductivity	µS/cm	800 # / 1875	1000	761.9	656.5
Dissolved Oxygen	%	~	NAC	16.7	16.6
Dissolved Oxygen	ppm	~	~	1.88	1.76
Temperature	ºC	~	25°C	9.88	11.05
Oxidation Reduction Potential	mV	~	~	-60.7	-62.9
Colour	N/A	~	NAC	Silty	Slightly siltty
Odour	N/A	~	~	Odourless	Odourless
Other observations	N/A	~	~	NEC	None
Metals (dissolved)					
Dissolved Arsenic	ug/l	7.5	10	<2.5	2.8
Dissolved Boron	ug/l	750	1000	68	56
Dissolved Cadmium	ug/l	3.75	5	0.6	0.09
Dissolved Calcium	mg/l	~	200	191.7	151.1
Total Dissolved Chromium	ug/l	37.5	30	<0.2	<1.5
Dissolved Copper	ug/l	1500	30	<7	<7
Total Dissolved Iron	ug/l	~	200	20	<20
Dissolved Lead	ug/l	18.75	10	<5	<5
Dissolved Magnesium	mg/l	~	50	15	11.7
Dissolved Manganese	ug/l	~	50	**1813**	**1379**
Dissolved Mercury	ug/l	0.75	1	<0.5	<0.5
Dissolved Nickel	ug/l	15	20	**19**	10
Dissolved Potassium	mg/l	~	5	1.6	1.2
Dissolved Sodium	mg/l	150	150	30.3	22.7
Dissolved Zinc	ug/l	~	100	<3	<3
MRP as Total Phosphorus	ug/l	35	30***	**441**	**133**
Volatile Organic Compounds (VOCs) MS					
Dichlorodifluoromethane	ug/l	~	~	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	<0.1	<0.1
Chloromethane	ug/l	~	~	<3	<3
Vinyl Chloride	ug/l	0.375	~	<0.1	<0.1
Bromomethane	ug/l	~	~	<1	<1
Chloroethane	ug/l	~	~	<3	<3
Trichlorofluoromethane	ug/l	~	~	<3	<3
1,1-Dichloroethene	ug/l	~	30**	<3	<3
Dichloromethane	ug/l	~	10	<3	<3
trans-1-2-Dichloroethene	ug/l	~	30**	<3	<3
1,1-Dichloroethane	ug/l	~	~	<3	<3
cis-1-2-Dichloroethene	ug/l	~	30**	<3	<3
2,2-Dichloropropane	ug/l	~	~	<1	<1
Bromochloromethane	ug/l	~	~	<2	<2
Chloroform	ug/l	75 $^{\Delta 1}$	12	<2	<2
1,1,1-Trichloroethane	ug/l	~	500	<2	<2
1,1-Dichloropropene	ug/l	~	~	<3	<3
Carbon tetrachloride	ug/l	~	2	<2	<2
1,2-Dichloroethane	ug/l	2.25	3	<2	<2
Benzene	ug/l	0.75	1	<0.5	<0.5
Trichloroethene	ug/l	7.5 $^{\Delta 2}$	70	<3	<3
1,2-Dichloropropane	ug/l	~	~	<2	<2
Dibromomethane	ug/l	~	~	<3	<3
Bromodichloromethane	ug/l	~	~	<2	<2
cis-1-3-Dichloropropene	ug/l	~	~	<2	<2
Toluene	ug/l	~	10	<0.5	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	<2	<2
1,1,2-Trichloroethane	ug/l	~	~	<2	<2
Tetrachloroethene	ug/l	7.5 $^{\Delta 2}$	40	<3	<3
1,3-Dichloropropane	ug/l	~	~	<2	<2
Dibromochloromethane	ug/l	75 $^{\Delta 1}$	~	<2	<2
1,2-Dibromoethane	ug/l	~	~	<2	<2
Chlorobenzene	ug/l	~	1	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	<2	<2
Ethylbenzene	ug/l	~	10	<0.5	<0.5
p/m-Xylene	ug/l	~	10 $^{\Delta 3}$	<1	<1
o-Xylene	ug/l	~	10 $^{\Delta 3}$	<0.5	<0.5
Styrene	ug/l	~	~	<2	<2
Bromoform	ug/l	75 $^{\Delta 1}$	~	<2	<2
Isopropylbenzene	ug/l	~	~	<3	<3
1,1,2,2-Tetrachloroethane	ug/l	~	~	<4	<4
Bromobenzene	ug/l	~	~	<2	<2
1,2,3-Trichloropropane	ug/l	~	~	<3	<3
Propylbenzene	ug/l	~	~	<3	<3
2-Chlorotoluene	ug/l	~	~	<3	<3
1,3,5-Trimethylbenzene	ug/l	~	~	<3	<3
4-Chlorotoluene	ug/l	~	~	<3	<3
tert-Butylbenzene	ug/l	~	~	<3	<3
1,2,4-Trimethylbenzene	ug/l	~	~	<3	<3
sec-Butylbenzene	ug/l	~	~	<3	<3
4-Isopropyltoluene	ug/l	~	~	<3	<3
1,3-Dichlorobenzene	ug/l	~	~	<3	<3
1,4-Dichlorobenzene	ug/l	~	~	<3	<3
n-Butylbenzene	ug/l	~	~	<3	<3
1,2-Dichlorobenzene	ug/l	~	10	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	<2	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	<3	<3
Hexachlorobutadiene	ug/l	~	0.1	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	~	<3	<3

Notes:
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Δ3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
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*** denotes orthophosphate
NAC - No Abnormal Change
^ denotes alpha-endosulphan
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++ Result outside calibration range, results should be considered as indicative only and are not accredited

Table 9: Groundwater Analytical Results

Sample Identity	Unit	Groundwater Standards		MW12	MW12
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	15/6836	15/6974
Laboratory Sample No.				15-21	22-28
Sample Date				30/04/2015	05/05/2015
Parameters					
Semi-Volatile Organic Compounds (SVOCs)					
Phenols					
2-Chlorophenol	ug/l	~	200	<1	<1
2-Methylphenol	ug/l	~	~	<0.5	<0.5
2-Nitrophenol	ug/l	~	~	<0.5	<0.5
2,4-Dichlorophenol	ug/l	~	~	<0.5	<0.5
2,4-Dimethylphenol	ug/l	~	~	<1	<1
2,4,5-Trichlorophenol	ug/l	~	~	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	<1	<1
4-Chloro-3-methylphenol	ug/l	~	~	<0.5	<0.5
4-Methylphenol	ug/l	~	~	<1	<1
4-Nitrophenol	ug/l	~	~	<10	<10
Pentachlorophenol	ug/l	~	2	<1	<1
Phenol	ug/l	~	0.5*	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)					
2-Chloronaphthalene	ug/l	~	~	<1	<1
2-Methylnaphthalene	ug/l	~	~	<1	<1
Naphthalene	ug/l	~	1	<0.014	<0.014
Acenaphthylene	ug/l	~	~	<0.013	<0.013
Acenaphthene	ug/l	~	~	0.04	0.03
Fluorene	ug/l	~	~	<0.014	0.02
Phenanthrene	ug/l	~	~	0.02	0.03
Anthracene	ug/l	~	10000	<0.013	<0.013
Fluoranthene	ug/l	~	1	<0.012	<0.012
Pyrene	ug/l	~	~	0.02	<0.013
Benzo(a)anthracene	ug/l	~	~	<0.015	<0.015
Chrysene	ug/l	~	~	<0.011	<0.011
Benzo(bk)fluoranthene	ug/l	~	~	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.0075	0.01	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	~	0.05	<0.011	<0.011
Dibenzo(ah)anthracene	ug/l	~	~	<0.01	<0.01
Benzo(ghi)perylene	ug/l	~	0.05	<0.011	<0.011
PAH 16 Total	ug/l	~	~	<0.195	<0.195
Benzo(b)fluoranthene	ug/l	~	~	<0.01	<0.01
Benzo(k)fluoranthene	ug/l	~	~	<0.01	<0.01
Other SVOCs					
1,2-Dichlorobenzene	ug/l	~	10	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	<1	<1
1,3-Dichlorobenzene	ug/l	~	~	<1	<1
1,4-Dichlorobenzene	ug/l	~	~	<1	<1
2-Nitroaniline	ug/l	~	~	<1	<1
2,4-Dinitrotoluene	ug/l	~	~	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	~	~	<1	<1
3-Nitroaniline	ug/l	~	~	<1	<1
4-Bromophenylphenylether	ug/l	~	~	<1	<1
4-Chloroaniline	ug/l	~	~	<1	<1
4-Chlorophenylphenylether	ug/l	~	~	<1	<1
4-Nitroaniline	ug/l	~	~	<0.5	<0.5
Azobenzene	ug/l	~	~	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	<1	<1
Carbazole	ug/l	~	~	<0.5	<0.5
Dibenzofuran	ug/l	~	~	<0.5	<0.5
Hexachlorobenzene	ug/l	~	0.03	<1	<1
Hexachlorobutadiene	ug/l	~	0.1	<1	<1
Hexachlorocyclopentadiene	ug/l	~	~	<1	<1
Hexachloroethane	ug/l	~	~	<1	<1
Isophorone	ug/l	~	~	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	<0.5	<0.5
Nitrobenzene	ug/l	~	10	<1	<1
Phthalates					
Bis(2-ethylhexyl) phthalate	ug/l	~	8	<5	<5
Butylbenzyl phthalate	ug/l	~	~	<1	<1
Di-n-butyl phthalate	ug/l	~	2	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	~	~	<1	<1
Diethyl phthalate	ug/l	~	~	<1	<1
Dimethyl phthalate	ug/l	~	~	<1	<1
Pesticides MS					
Organochlorine Pesticides					
Aldrin	ug/l	~	0.01	<0.01	<0.01
Alpha-BHC	ug/l	~	0.1#	<0.01	<0.01
Beta-BHC	ug/l	~	0.1#	<0.01	<0.01
Delta-BHC	ug/l	~	0.1#	<0.01	<0.01
Chlorothalonil	ug/l	~	0.1#	-	-
cis-Chlordane	ug/l	~	0.1#	-	-
Dieldrin	ug/l	0.075	0.01	<0.01	<0.01
Endosulphan I	ug/l	~	0.001^	<0.01	<0.01
Endosulphan II	ug/l	~	0.001^	<0.01	
Endosulphan sulphate	ug/l	~	0.001^	<0.01	<0.01
Endrin	ug/l	~	0.1#	<0.01	<0.01
Gamma-BHC	ug/l	~	0.1#	<0.01	<0.01
Heptachlor	ug/l	~	0.1#	<0.01	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	<0.01	<0.01
Hexachlorobenzene	ug/l	~	0.1#	-	-
Isodrin	ug/l	~	0.1#	-	-
o,p'-DDE	ug/l	~	0.1#	-	-
o,p'-DDT	ug/l	~	0.1#	-	-
o,p'-Methoxychlor	ug/l	~	0.1#	-	-
o,p'-TDE	ug/l	~	0.1#	-	-
p,p'-DDE	ug/l	~	0.1#	<0.01	<0.01
p,p'-DDT	ug/l	0.075	0.1#	<0.01	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	<0.01	<0.01
p,p'-TDE	ug/l	~	0.1#	<0.01	
Pendimethalin	ug/l	~	0.1#	-	-
Permethrin I	ug/l	~	20+	-	-
Permethrin II	ug/l	~	20+	-	-
Quintozene	ug/l	~	0.1#	-	-
Tecnazene	ug/l	~	0.1#	-	-
Telodrin	ug/l	~	0.1#	-	-
trans-Chlordane	ug/l	~	0.1#	-	-
Triadimefon	ug/l	~	0.1#	-	-
Triallate	ug/l	~	0.1#	-	-
Trifluralin	ug/l	~	0.1	-	-

Notes:

1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2(

2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ire

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Tier III Exploratory Investigation

SDCC
Waterstown, Co. Dublin

Table 9: Groundwater Analytical Results

Sample Identity	**Unit**	**Groundwater Standards**		**MW12**	**MW12**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	**15/6836**	**15/6974**
Laboratory Sample No.				**15-21**	**22-28**
Sample Date				**30/04/2015**	**05/05/2015**
Parameters					
Organophosphorus Pesticides					
Azinphos ethyl	ug/l	~	0.1#	-	-
Azinphos methyl	ug/l	~	0.1#	<0.01	<0.01
Carbophenothion	ug/l	~	0.1#	-	-
Chlorfenvinphos	ug/l	~	5	-	-
Chlorpyrifos	ug/l	~	90	-	-
Chlorpyrifos-methyl	ug/l	~	0.1#	-	-
Diazinon	ug/l	~	0.1#	<0.01	<0.01
Dichlorvos	ug/l	~	0.001	<0.01	<0.01
Disulfoton	ug/l	~	0.001	<0.01	<0.01
Dimethoate	ug/l	~	0.1#	-	-
Ethion	ug/l	~	0.1#	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	<0.01	<0.01
Etrimphos	ug/l	~	0.1#	-	-
Fenitrothion	ug/l	~	0.1#	<0.01	<0.01
Fenthion	ug/l	~	0.1#	-	-
Malathion	ug/l	~	0.1#	<0.01	<0.01
Methyl Parathion	ug/l	~	0.1#	<0.01	<0.01
Mevinphos	ug/l	~	0.1#	<0.01	<0.01
Phosalone	ug/l	~	0.1#	-	-
Pirimiphos Methyl	ug/l	~	0.1#	-	-
Propetamphos	ug/l	~	0.1#	-	-
Triazophos	ug/l	~	0.1#	-	-
Benazolin	ug/l	~	0.1#	<0.1	<0.1
Bentazone	ug/l	0.075	0.1#	<0.1	<0.1
Bromoxynil	ug/l	~	5	<0.1	<0.1
Clopyralid	ug/l	~	0.1#	<0.1	<0.1
4- CPA	ug/l	~	0.1#	<0.1	<0.1
2,4 – D	ug/l	~	0.1#	<0.1	<0.1
2,4 –DB	ug/l	~	0.1#	<0.1	<0.1
Dicamba	ug/l	~	0.1#	<0.1	<0.1
Dichloroprop	ug/l	~	100	<0.1	<0.1
Diclofop	ug/l	~	0.1#	<0.1	<0.1
Fenoprop	ug/l	~	0.1#	<0.1	<0.1
Flamprop	ug/l	~	0.1#	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	<0.1	<0.1
Ioxynil	ug/l	~	0.1#	<0.1	<0.1
MCPA	ug/l	~	0.1#	<0.1	<0.1
MCPB	ug/l	~	0.1#	<0.1	<0.1
Mecoprop	ug/l	0.075	10	<0.1	<0.1
Picloram	ug/l	~	0.1#	<0.1	<0.1
Pentachlorophenol	ug/l	~	0.1#	<0.1	<0.1
2,4,5 – T	ug/l	~	0.1#	<0.1	<0.1
2,3,6 – TBA	ug/l	~	0.1#	<0.1	<0.1
Triclopyr	ug/l	~	0.1#	<0.1	<0.1
Atrazine	ug/l	0.075	1	<1	<1
Simazine	ug/l	0.075	1	<1	<1
Fluoride	mg/l	~	1	<0.3	<0.3
Sulphate	mg/l	187.5	200	46.48	36.52
Chloride	mg/l	187.5^	30	58.1	42.3
Total Oxidised Nitrogen as N	mg/l	~	~	<0.2	<0.2
Total Cyanide	mg/l	0.0375	0.01	<0.01	<0.01
Ammoniacal Nitrogen as N	mg/l	0.065	0.12•	**0.75**	**0.51**
Total Alkalinity as CaCO3	mg/l	~	NAC	572	432
Total Organic Carbon	mg/l	~	~	<2	<2
Total Dissolved Solids	mg/l	~	1000	614	490
Faecal coliforms	cfu/100ml	~	0	<1	<1
Coliforms	MPN/100ml	~	0	34.1	235.9

Notes:

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Table 10: Static Groundwater Level

Monitoring Well I.D.	Strata opposite Screen	TOCi Elevation (maOD)	Ground level Elevation (maOD)	Final Depth (mbtoici)	Static Water Level (mbtoici) (29/04/2015)	Static Water Level (maOD) (29/04/2015)	Static Water Level (mbtoici) (05/05/2015)	Static Water Level (maOD) (05/05/2015)
BH1	MADEGROUND / LANDFILL	33.77	-	7.325	DRY	DRY	DRY	DRY
BH2	MADEGROUND / LANDFILL	32.73	-	7	5.58	27.15	6.847	25.883
BH3	MADEGROUND / LANDFILL	18.35	-	7.082	6.82	11.53	6.756	11.594
BH4	MADEGROUND / LANDFILL	35.51	35.53	6.52	6.47	29.04	6.258	29.252
BH5	MADEGROUND / LANDFILL	36.23	36.32	7.33	6.74	29.49	5.715	30.515
BH6	MADEGROUND / LANDFILL	39.84	39.95	3.546	DRY	DRY	DRY	DRY
BH7	MADEGROUND / LANDFILL	40.48	40.57	7.005	6.185	34.295	4.045	36.435
BH8	MADEGROUND / LANDFILL	36.4	36.5	6.995	6.44	29.96	5.895	30.505
BH9	MADEGROUND / LANDFILL	34.39	34.48	6.965	6.235	28.155	6.2	28.19
BH10	MADEGROUND / LANDFILL	17.12	17.21	6.41	5.677	11.443	6.41	10.71
BH11	MADEGROUND / LANDFILL	29.06	29.15	6.336	4.422	24.638	4.42	24.64
BH12	MADEGROUND / LANDFILL	24.29	24.38	5.085	DRY	DRY	4.872	19.418
MW4	BEDROCK	36.39	-	14.09	8.802	27.588	8.645	27.745
MW6	SAND/SILT	18.56	-	9.93	7.7	10.86	6.93	11.63
MW7	BEDROCK	16.39	16.46	11.815	5.04	11.35	4.938	11.452
MW8	SAND/SILT			5.85	4.625	-4.625	5.85	-5.85
MW9**	SAND/SILT	16.08	16.11	14.5	-	-	-	-
MW10	BEDROCK	14.46	14.49	11.94	3.027	11.433	2.805	11.655
MW11	BEDROCK	16.15	16.17	8.6	3.41	12.74	8.6	7.55
MW12	BEDROCK	25.59	25.63	10.275	0.59	25	0.09	25.5

Notes:
TOCi denotes top of inner casing
mbTOC denotes metres below top of casing.
mAOD denotes metres above ordnance datum.
** denotes MW9 was drilled to 14.5mbgl approximately before artesian well conditions were encountered, It was sampled and subsequently decommissioned

Tier III Exploratory Investigation

SDCC
Waterstown Co. Dublin

Table 11: Surface Water Analytical Results

Sample Identity		Surface Water Standards	SW1	SW1	SW1	SW2	SW2	SW2	SW3
Laboratory Report No.		Surfacewater Regulations 2012 (S.I. No. 327 of 2012) [1]	12/9793	15/6836	15/7029	12/9793	15/6836	15/7029	12/9793
Laboratory Sample No.			1-8	43-49	1-7	9-16	50-56	8-14	-
Sample Date			12/12/2012	30/04/2015	06/05/2015	12/12/2012	30/04/2015	06/05/2015	12/12/2012
Sample Location			Mill Race	Mill Race	Mill Race	River Liffey	River Liffey	River Liffey	Mill Race
Parameters	Unit								
Field Measured Parameters									
pH	pH units	6.0-9.0*	6.86	8.14	8.11	6.42	8.24	8.15	7.38
Electrical Conductivity	µS/cm	~	269.9	462.8	414.5	253.9	449.8	409.7	261.6
Dissolved Oxygen	%	80-120	98.3	97.1	89.4	102.7	103.7	94.5	106.8
Dissolved Oxygen	ppm	~	13.03	10.87	9.79	13.57	11.43	10.35	14.17
Temperature	ºC	~	3.6	11.4	10.3	3.6	10.86	10.34	3.5
Oxidation Reduction Potential	mV	~	102.50	54.10	56.20	175.1	55.7	57.5	73.8
Colour	N/A	~	Brown	Clear	Clear	Brown	Clear	Clear	Brown
Odour	N/A	~	None	None	None	None	None	None	None
Other observations	N/A	~	None	None	None	None	None	None	None
Metals (dissolved)									
Dissolved Arsenic	ug/l	~	-	<2.5	<2.5	-	<2.5	<2.5	-
Dissolved Boron	ug/l	~	-	25	17	-	25	14	-
Dissolved Cadmium	ug/l	1.5	-	0.05	0.24	-	0.04	0.18	-
Dissolved Calcium	mg/l	~	-	-	-	-	-	-	-
Total Dissolved Chromium	ug/l	~	-	<0.2	<0.2	-	<0.2	<0.2	-
Dissolved Copper	ug/l	~	-	<7	<7	-	<7	<7	-
Total Dissolved Iron	ug/l	~	-	<20	212	-	<20	123	-
Dissolved Lead	ug/l	~	-	<5	<5	-	<5	<5	-
Dissolved Magnesium	mg/l	~	-	-	-	-	-	-	-
Dissolved Manganese	ug/l	~	-	<2	<2	-	<2	<2	-
Dissolved Mercury	ug/l	0.07	-	<0.5	<0.5	-	<0.5	<0.5	-
Dissolved Nickel	ug/l	~	-	<2	<2	-	<2	<2	-
Dissolved Potassium	mg/l	~	1.8	-	-	2	-		-
Dissolved Sodium	mg/l	~	11.6	-	-	11.1	-		-
Dissolved Zinc	ug/l	~	-	<3	19	-	3	9	-
MRP as Total Phosphorus	ug/l	35**	-	60	103	-	57	95	-
Methyl Tertiary Butyl Ether #	ug/l	~	-	-	-	-	-	-	-
Benzene #	ug/l	50	-	-	-	-	-	-	-
Toluene #	ug/l	~	-	-	-	-	-	-	-
Ethylbenzene #	ug/l	~	-	-	-	-	-	-	-
p/m-Xylene #	ug/l	~	-	-	-	-	-	-	-
o-Xylene #	ug/l	~	-	-	-	-	-	-	-
Surrogate Recovery Toluene D8	%	~	-	-	-	-	-	-	-
Surrogate Recovery 4-Bromofluorobenzene	%	~	-	-	-	-	-	-	-
Volatile Organic Compounds (VOCs) MS									
Dichlorodifluoromethane	ug/l	~	-	<2	<2	-	<2	<2	-
Methyl Tertiary Butyl Ether	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Chloromethane	ug/l	~	-	<3	<3	-	<3	<3	-
Vinyl Chloride	ug/l	~	-	<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	ug/l	~	-	<3	<3	-	<3	<3	-
Dichloromethane	ug/l	~	-	<3	<3	-	<3	<3	-
trans-1-2-Dichloroethene	ug/l	~	-	<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	<2	-	<2	<2	-
Benzene	ug/l	50	-	<0.5	<0.5	-	<0.5	<0.5	-
Trichloroethene	ug/l	~	-	<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	~	-	<0.5	<0.5	-	<0.5	<0.5	-
trans-1-3-Dichloropropene	ug/l	~	-	<2	<2	-	<2	<2	-
1,1,2-Trichloroethane	ug/l	~	-	<2	<2	-	<2	<2	-
Tetrachloroethene	ug/l	~	-	<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	~	-	<0.5	<0.5	-	<0.5	<0.5	-
p/m-Xylene	ug/l	~	-	<1	<1	-	<1	<1	-
o-Xylene	ug/l	~	-	<0.5	<0.5	-	<0.5	<0.5	-
Styrene	ug/l	~	-	<2	<2	-	<2	<2	-
Bromoform	ug/l	~	-	<2	<2	-	<2	<2	-
Isopropylbenzene	ug/l	~	-	<3	<3	-	<3	<3	-
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	~	-	<3	<3	-	<3	<3	-
Hexachlorobutadiene	ug/l	~	-	<3	<3	-	<3	<3	-
1,2,3-Trichlorobenzene	ug/l	~	-	<3	<3	-	<3	<3	-
Surrogate Recovery Toluene D8	%	~	-	100	73	-	98	97	-
Surrogate Recovery 4-Bromofluorobenzene	%	~	-	102	88	-	101	98	-

Notes:
1 European Communities Environmental Objectives (Surface Water) Regulations 2009; S.I. No 272 of 2009 and as amended S.I. No 327 of 2012
All EQS derived from Surface Water regulations are concerned with waterbodies achieveing "Good Status"
Shaded denotes value exceeds Surface Water EQS (MAC inland surface waters)
~ denotes surface water quality standard unavailable.
^ denotes alpha-endosulphan
* denotes EQS dependant on water hardness (>100mg/l Ca CO^3)
** denotes values converted for comparison purposes
* denotes value EQS dependant on water hardness

Table 11: Surface Water Analytical Results

Sample Identity		Surface Water Standards	SW1	SW1	SW1	SW2	SW2	SW2	SW3
Laboratory Report No.		Surfacewater Regulations 2012 (S.I. No. 327 of 2012) [1]	12/9793	15/6836	15/7029	12/9793	15/6836	15/7029	12/9793
Laboratory Sample No.			1-8	43-49	1-7	9-16	50-56	8-14	-
Sample Date			12/12/2012	30/04/2015	06/05/2015	12/12/2012	30/04/2015	06/05/2015	12/12/2012
Sample Location			Mill Race	Mill Race	Mill Race	River Liffey	River Liffey	River Liffey	Mill Race
Parameters	Unit								
Semi-Volatile Organic Compounds (SVOCs)									
Phenols									
2-Chlorophenol	ug/l	~	-	<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	~	-	<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	1	-	<1	<1	-	<1	<1	-
Phenol	ug/l	46	-	<1	<1	-	<1	<1	-
Polycyclic Aromatic Hydrocarbons (PAHs)									
2-Chloronaphthalene	ug/l	~	-	<1	<1	-	<1	<1	-
2-Methylnaphthalene	ug/l	~	-	<1	<1	-	<1	<1	-
Naphthalene	ug/l	~	-	<0.014	<0.014	-	<0.014	0.59	-
Acenaphthylene	ug/l	~	-	<0.013	<0.013	-	<0.013	0.02	-
Acenaphthene	ug/l	~	-	<0.013	<0.013	-	<0.013	0.04	-
Fluorene	ug/l	~	-	<0.014	<0.014	-	<0.014	0.03	-
Phenanthrene	ug/l	~	-	<0.011	0.02	-	<0.011	0.03	-
Anthracene	ug/l	0.4	-	<0.013	<0.013	-	<0.013	<0.013	-
Fluoranthene	ug/l	1	-	<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(bk)fluoranthene	ug/l	~	-	<0.018	<0.018	-	<0.018	<0.018	-
Benzo(a)pyrene	ug/l	0.1	-	<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 #	ug/l		-	<0.195	<0.195	-	<0.195	0.71	-
Benzo(b)fluoranthene	ug/l		-	<0.01	<0.01	-	<0.01	<0.01	-
Benzo(k)fluoranthene	ug/l		-	<0.01	<0.01	-	<0.01	<0.01	-
Other SVOCs									
1,2-Dichlorobenzene	ug/l	~	-	<1	<1	-	<1	<1	-
1,2,4-Trichlorobenzene	ug/l	~	-	<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	0.05	-	<1	<1	-	<1	<1	-
Hexachlorobutadiene	ug/l	0.6	-	<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	-
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	~	-	<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	-
Pesticides MS									
Organochlorine Pesticides									
Aldrin	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Alpha-BHC	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Beta-BHC	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Chlorothalonil	ug/l	~	-	-	-	-	-	-	-
cis-Chlordane	ug/l	~	-	-	-	-	-	-	-
Dieldrin	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Endosulphan I	ug/l	0.01^	-	<0.01	<0.01	-	<0.01	<0.01	-
Endosulphan II	ug/l	0.01^	-	<0.01	<0.01	-	<0.01	<0.01	-
Endosulphan sulphate	ug/l	0.01^	-	<0.01	<0.01	-	<0.01	<0.01	-
Endrin	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Gamma-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	-
Hexachlorobenzene	ug/l	0.05	-	-	-	-	-	-	-
Isodrin	ug/l	~	-	-	-	-	-	-	-
o,p'-DDE	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
o,p'-DDT	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
o,p'-Methoxychlor	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
o,p'-TDE	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
p,p'-DDE	ug/l	~	-	-	-	-	-	-	-
p,p'-DDT	ug/l	~	-	-	-	-	-	-	-
p,p'-Methoxychlor	ug/l	~	-	-	-	-	-	-	-
p,p'-TDE	ug/l	~	-	-	-	-	-	-	-
Pendimethalin	ug/l	~	-	-	-	-	-	-	-
Permethrin I	ug/l	~	-	-	-	-	-	-	-
Permethrin II	ug/l	~	-	-	-	-	-	-	-
Quintozene	ug/l	~	-	-	-	-	-	-	-
Tecnazene	ug/l	~	-	-	-	-	-	-	-
Telodrin	ug/l	~	-	-	-	-	-	-	-
trans-Chlordane	ug/l	~	-	-	-	-	-	-	-
Triadimefon	ug/l	~	-	-	-	-	-	-	-
Triallate	ug/l	~	-	-	-	-	-	-	-
Trifluralin	ug/l	~	-	-	-	-	-	-	-

Notes:

1 European Communities Environmental Objectives (Surface Water) Regulations 2009; S.I. No 272 of 2009 and as amended S.I. No 327 of 2012

All EQS derived from Surface Water regulations are concerned with waterbodies achieveing "Good Status"

Shaded denotes value exceeds Surface Water EQS (MAC inland surface waters)

~ denotes surface water quality standard unavailable.

^ denotes alpha-endosulphan

* denotes EQS dependant on water hardness (>100mg/l Ca CO^3)

** denotes values converted for comparison purposes

* denotes value EQS dependant on water hardness

Tier III Exploratory Investigation

SDCC
Waterstown Co. Dublin

Table 11: Surface Water Analytical Results

Sample Identity		Surface Water Standards	SW1	SW1	SW1	SW2	SW2	SW2	SW3
Laboratory Report No.		Surfacewater Regulations 2012 (S.I. No. 327 of 2012) [1]	**12/9793**	**15/6836**	**15/7029**	**12/9793**	**15/6836**	**15/7029**	**12/9793**
Laboratory Sample No.			**1-8**	**43-49**	**1-7**	**9-16**	**50-56**	**8-14**	**-**
Sample Date			**12/12/2012**	**30/04/2015**	**06/05/2015**	**12/12/2012**	**30/04/2015**	**06/05/2015**	**12/12/2012**
Sample Location			**Mill Race**	**Mill Race**	**Mill Race**	**River Liffey**	**River Liffey**	**River Liffey**	**Mill Race**
Parameters	**Unit**								
Organophosphorus Pesticides									
Azinphos ethyl	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Azinphos methyl	ug/l	~	-	-	-	-	-	-	-
Carbophenothion	ug/l	~	-	-	-	-	-	-	-
Chlorfenvinphos	ug/l	0.3	-	-	-	-	-	-	-
Chlorpyrifos	ug/l	0.1	-	-	-	-	-	-	-
Chlorpyrifos-methyl	ug/l	~	-	-	-	-	-	-	-
Diazinon	ug/l	0.02	-	<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	-
Dimethoate	ug/l	4	-	-	-	-	-	-	-
Ethion	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Ethyl Parathion (Parathion)	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Etrimphos	ug/l	~	-	-	-	-	-	-	-
Fenitrothion	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Fenthion	ug/l	~	-	-	-	-	-	-	-
Malathion	ug/l	~	-	<0.01	<0.01		<0.01	<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	-
Phosalone	ug/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
Pirimiphos Methyl	ug/l	~	-	-	-	-	-	-	-
Propetamphos	ug/l	~	-	-	-	-	-	-	-
Triazophos	ug/l	~	-	-	-	-	-	-	-
Benazolin	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Bentazone	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Bromoxynil	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Clopyralid	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
4- CPA	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
2,4 – D	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
2,4 –DB	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Dicamba	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Dichloroprop	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Diclofop	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Fenoprop	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Flamprop	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Flamprop – isopropyl	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Ioxynil	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
MCPA	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
MCPB	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Mecoprop	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Picloram	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Pentachlorophenol	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
2,4,5 – T	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
2,3,6 – TBA	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Triclopyr	ug/l	~	-	<0.1	<0.1	-	<0.1	<0.1	-
Atrazine	ug/l	2	-	-	<1	-	-	<1	-
Simazine	ug/l	4	-	-	<1	-	-	<1	-
Fluoride	mg/l	~	-	<0.3	<0.3	-	<0.3	<0.3	
Sulphate	mg/l	~	16.7	49.23	30.26	17.34	49.54	27.17	-
Chloride	mg/l	~	16.5	32.1	24.3	16.6	31.8	20.8	-
Total Oxidised Nitrogen as N	mg/l	~	-	3	2.3	-	2.9	2.3	-
Total Cyanide	mg/l	~	-	<0.01	<0.01	-	<0.01	<0.01	-
EPH (C8-C40)	ug/l	~	-	-	-	-	-	-	-
Ammoniacal Nitrogen as N	mg/l	0.065	0.05	0.08	0.08	0.05	0.02	0.1	-
Total Alkalinity as CaCO3	mg/l	~	-	222	244	-	216	246	-
COD (Settled)	mg/l	~	-	<7	13	-	<7	43	-
Total Susspended Solids	mg/l	~	-	<10	<10	-	<10	<10	-
BOD	mg/l	1.5	<1	1	2	1	2	2	-

Notes:
1 European Communities Environmental Objectives (Surface Water) Regulations 2009; S.I. No 272 of 2009 and as amended S.I. No 327 of 2012
All EQS derived from Surface Water regulations are concerned with waterbodies achieveing "Good Status"
Shaded denotes value exceeds Surface Water EQS (MAC inland surface waters)
~ denotes surface water quality standard unavailable.
^ denotes alpha-endosulphan
* denotes EQS dependant on water hardness (>100mg/l Ca CO^3)
** denotes values converted for comparison purposes
* denotes value EQS dependant on water hardness

Tier III Exploratory Investigation

SDCC
Waterstown Co. Dublin

Table 11: Surface Water Analytical Results

Sample Identity		Surface Water Standards	SW4	SW5	SW5	SW5	SW6	SW6	SW6
Laboratory Report No.		Surfacewater Regulations 2012 (S.I. No. 327 of 2012) [1]	12/9793	12/9793	15/6836	15/7029	12/9793	15/6836	15/7029
Laboratory Sample No.			-	33-40	57-63	15-21	41-48	64-70	22-28
Sample Date			12/12/2012	12/12/2012	30/04/2015	15-21	12/12/2012	30/04/2015	22-28
Sample Location			River Liffey	Mill Race	Mill Race	Mill Race	River Liffey	River Liffey	River Liffey
Parameters	Unit								
Field Measured Parameters									
pH	pH units	6.0-9.0*	7.21	7.44	8.21	8.11	7.48	8.28	8.2
Electrical Conductivity	µS/cm	~	245.2	287.6	441.3	422.5	248.5	425.2	409.2
Dissolved Oxygen	%	80-120	108.5	97	97.6	86.1	95.8	104.5	94
Dissolved Oxygen	ppm	~	14.31	12.84	10.65	9.41	12.74	11.26	10.32
Temperature	ºC	~	3.7	3.6	11.3	10.44	3.7	11.87	10.25
Oxidation Reduction Potential	mV	~	78.7	79.6	53.8	56.3	48.9	55.7	56
Colour	N/A	~	Brown	Brown	Clear	Clear	Brown	Clear	Clear
Odour	N/A	~	None	None	None	None	None	None	None
Other observations	N/A	~	None	None	None	None	None	None	None
Metals (dissolved)									
Dissolved Arsenic	ug/l	~	-	5.8	<2.5	<2.5	4.2	<2.5	<2.5
Dissolved Boron	ug/l	~	-	16	25	16	<12	21	16
Dissolved Cadmium	ug/l	1.5	-	<0.5	0.03	0.19	<0.5	0.18	0.12
Dissolved Calcium	mg/l	~	-	81.5	-	-	70.2	-	-
Total Dissolved Chromium	ug/l	~	-	8.4	<0.2	<0.2	8.6	<0.2	0.2
Dissolved Copper	ug/l	~	-	<7	<7	<7	<7	<7	<7
Total Dissolved Iron	ug/l	~	-	84	23	78	53	<20	87
Dissolved Lead	ug/l	~	-	7	<5	<5	6	<5	<5
Dissolved Magnesium	mg/l	~	-	6.8	-	-	5.8	-	-
Dissolved Manganese	ug/l	~	-	3	<2	<2	4	<2	<2
Dissolved Mercury	ug/l	0.07	-	<1	<0.5	<0.5	<1	<0.5	<0.5
Dissolved Nickel	ug/l	~	-	<2	<2	<2	<2	<2	<2
Dissolved Potassium	mg/l	~	-	2	-	-	1.6	-	-
Dissolved Sodium	mg/l	~	-	12.1	-	-	9.9	-	-
Dissolved Zinc	ug/l	~	-	<3	<3	5	<3	<3	6
MRP as Total Phosphorus	ug/l	35**	-	69	57	95	39	54	92
Methyl Tertiary Butyl Ether [#]	ug/l	~	-	<1	-	-	<1	-	-
Benzene [#]	ug/l	50	-	<1	-	-	<1	-	-
Toluene [#]	ug/l	~	-	<2	-	-	<2	-	-
Ethylbenzene [#]	ug/l	~	-	<2	-	-	<2	-	-
p/m-Xylene [#]	ug/l	~	-	<3	-	-	<3	-	-
o-Xylene [#]	ug/l	~	-	<2	-	-	<2	-	-
Surrogate Recovery Toluene D8	%	~	-	103	-	-	103	-	-
Surrogate Recovery 4-Bromofluorobenzene	%	~	-	118	-	-	114	-	-
Volatile Organic Compounds (VOCs) MS									
Dichlorodifluoromethane	ug/l	~	-	<2	<2	<2	<2	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	-	<1	<0.1	<0.1	<1	<0.1	<0.1
Chloromethane	ug/l	~	-	<3	<3	<3	<3	<3	<3
Vinyl Chloride	ug/l	~	-	<2	<0.1	<0.1	<2	<0.1	<0.1
Bromomethane	ug/l	~	-	<1	<1	<1	<1	<1	<1
Chloroethane	ug/l	~	-	<3	<3	<3	<3	<3	<3
Trichlorofluoromethane	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,1-Dichloroethene	ug/l	~	-	<3	<3	<3	<3	<3	<3
Dichloromethane	ug/l	~	-	<3	<3	<3	<3	<3	<3
trans-1-2-Dichloroethene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,1-Dichloroethane	ug/l	~	-	<3	<3	<3	<3	<3	<3
cis-1-2-Dichloroethene	ug/l	~	-	<3	<3	<3	<3	<3	<3
2,2-Dichloropropane	ug/l	~	-	<1	<1	<1	<1	<1	<1
Bromochloromethane	ug/l	~	-	<2	<2	<2	<2	<2	<2
Chloroform	ug/l	~	-	<2	<2	<2	<2	<2	<2
1,1,1-Trichloroethane	ug/l	~	-	<2	<2	<2	<2	<2	<2
1,1-Dichloropropene	ug/l	~	-	<3	<3	<3	<3	<3	<3
Carbon tetrachloride	ug/l	~	-	<2	<2	<2	<2	<2	<2
1,2-Dichloroethane	ug/l	~	-	<2	<2	<2	<2	<2	<2
Benzene	ug/l	50	-	<1	<0.5	<0.5	<1	<0.5	<0.5
Trichloroethene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,2-Dichloropropane	ug/l	~	-	<2	<2	<2	<2	<2	<2
Dibromomethane	ug/l	~	-	<3	<3	<3	<3	<3	<3
Bromodichloromethane	ug/l	~	-	<2	<2	<2	<2	<2	<2
cis-1-3-Dichloropropene	ug/l	~	-	<2	<2	<2	<2	<2	<2
Toluene	ug/l	~	-	<2	<0.5	<0.5	<2	<0.5	<0.5
trans-1-3-Dichloropropene	ug/l	~	-	<2	<2	<2	<2	<2	<2
1,1,2-Trichloroethane	ug/l	~	-	<2	<2	<2	<2	<2	<2
Tetrachloroethene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,3-Dichloropropane	ug/l	~	-	<2	<2	<2	<2	<2	<2
Dibromochloromethane	ug/l	~	-	<2	<2	<2	<2	<2	<2
1,2-Dibromoethane	ug/l	~	-	<2	<2	<2	<2	<2	<2
Chlorobenzene	ug/l	~	-	<2	<2	<2	<2	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	-	<2	<2	<2	<2	<2	<2
Ethylbenzene	ug/l	~	-	<2	<0.5	<0.5	<2	<0.5	<0.5
p/m-Xylene	ug/l	~	-	<3	<1	<1	<3	<1	<1
o-Xylene	ug/l	~	-	<2	<0.5	<0.5	<2	<0.5	<0.5
Styrene	ug/l	~	-	<2	<2	<2	<2	<2	<2
Bromoform	ug/l	~	-	<2	<2	<2	<2	<2	<2
Isopropylbenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,1,2,2-Tetrachloroethane	ug/l	~	-	<4	<4	<4	<4	<4	<4
Bromobenzene	ug/l	~	-	<2	<2	<2	<2	<2	<2
1,2,3-Trichloropropane	ug/l	~	-	<3	<3	<3	<3	<3	<3
Propylbenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
2-Chlorotoluene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,3,5-Trimethylbenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
4-Chlorotoluene	ug/l	~	-	<3	<3	<3	<3	<3	<3
tert-Butylbenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,2,4-Trimethylbenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
sec-Butylbenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
4-Isopropyltoluene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,3-Dichlorobenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,4-Dichlorobenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
n-Butylbenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	~	-	<2	<2	<2	<2	<2	<2
1,2,4-Trichlorobenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
Hexachlorobutadiene	ug/l	~	-	<3	<3	<3	<3	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	-	<3	<3	<3	<3	<3	<3
Surrogate Recovery Toluene D8	%	~	-	103	100	76	103	99	79
Surrogate Recovery 4-Bromofluorobenzene	%	~	-	118	100	82	114	101	88

Notes:
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All EQS derived from Surface Water regulations are concerned with waterbodies achieveing "Good S
Shaded denotes value exceeds Surface Water EQS (MAC inland surface waters)
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Table 11: Surface Water Analytical Results

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Laboratory Sample No.			-	33-40	57-63	15-21	41-48	64-70	22-28
Sample Date			12/12/2012	12/12/2012	30/04/2015	15-21	12/12/2012	30/04/2015	22-28
Sample Location			River Liffey	Mill Race	Mill Race	Mill Race	River Liffey	River Liffey	River Liffey
Parameters	Unit								
Semi-Volatile Organic Compounds (SVOCs)									
Phenols									
2-Chlorophenol	ug/l	~	-	<10	<1	<1	<10	<1	<1
2-Methylphenol	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
2-Nitrophenol	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
2,4-Dichlorophenol	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
2,4-Dimethylphenol	ug/l	~	-	<10	<1	<1	<10	<1	<1
2,4,5-Trichlorophenol	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	~	-	<10	<1	<1	<10	<1	<1
4-Chloro-3-methylphenol	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
4-Methylphenol	ug/l	~	-	<10	<1	<1	<10	<1	<1
4-Nitrophenol	ug/l	~	-	<10	<10	<10	<10	<10	<10
Pentachlorophenol	ug/l	1	-	<10	<1	<1	<10	<1	<1
Phenol	ug/l	46	-	<10	<1	<1	<10	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)									
2-Chloronaphthalene	ug/l	~	-	<10	<1	<1	<10	<1	<1
2-Methylnaphthalene	ug/l	~	-	<10	<1	<1	<10	<1	<1
Naphthalene	ug/l	~	-	<10	<0.014	<0.014	<10	<0.014	<0.014
Acenaphthylene	ug/l	~	-	<10	<0.013	<0.013	<10	<0.013	<0.013
Acenaphthene	ug/l	~	-	<10	<0.013	<0.013	<10	<0.013	<0.013
Fluorene	ug/l	~	-	<10	<0.014	<0.014	<10	<0.014	<0.014
Phenanthrene	ug/l	~	-	<10	<0.011	<0.011	<10	<0.011	<0.011
Anthracene	ug/l	0.4	-	<10	<0.013	<0.013	<10	<0.013	<0.013
Fluoranthene	ug/l	1	-	<10	<0.012	<0.012	<10	<0.012	<0.012
Pyrene	ug/l	~	-	<10	<0.013	<0.013	<10	<0.013	<0.013
Benzo(a)anthracene	ug/l	~	-	<10	<0.015	<0.015	<10	<0.015	<0.015
Chrysene	ug/l	~	-	<10	<0.011	<0.011	<10	<0.011	<0.011
Benzo(bk)fluoranthene	ug/l	~	-	<10	<0.018	<0.018	<10	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.1	-	<10	<0.016	<0.016	<10	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	~	-	<10	<0.011	<0.011	<10	<0.011	<0.011
Dibenzo(ah)anthracene	ug/l	~	-	<10	<0.01	<0.01	<10	<0.01	<0.01
Benzo(ghi)perylene	ug/l	~	-	<10	<0.011	<0.011	<10	<0.011	<0.011
PAH 16 Total #	ug/l		-	-	<0.195	<0.195	-	<0.195	<0.195
Benzo(b)fluoranthene	ug/l		-	-	<0.01	<0.01	-	<0.01	<0.01
Benzo(k)fluoranthene	ug/l		-	-	<0.01	<0.01	-	<0.01	<0.01
Other SVOCs									
1,2-Dichlorobenzene	ug/l	~	-	<10	<1	<1	<10	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	-	<10	<1	<1	<10	<1	<1
1,3-Dichlorobenzene	ug/l	~	-	<10	<1	<1	<10	<1	<1
1,4-Dichlorobenzene	ug/l	~	-	<10	<1	<1	<10	<1	<1
2-Nitroaniline	ug/l	~	-	<10	<1	<1	<10	<1	<1
2,4-Dinitrotoluene	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	~	-	<10	<1	<1	<10	<1	<1
3-Nitroaniline	ug/l	~	-	<10	<1	<1	<10	<1	<1
4-Bromophenylphenylether	ug/l	~	-	<10	<1	<1	<10	<1	<1
4-Chloroaniline	ug/l	~	-	<10	<1	<1	<10	<1	<1
4-Chlorophenylphenylether	ug/l	~	-	<10	<1	<1	<10	<1	<1
4-Nitroaniline	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
Azobenzene	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l	~	-	<10	<1	<1	<10	<1	<1
Carbazole	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
Dibenzofuran	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
Hexachlorobenzene	ug/l	0.05	-	<10	<1	<1	<10	<1	<1
Hexachlorobutadiene	ug/l	0.6	-	<10	<1	<1	<10	<1	<1
Hexachlorocyclopentadiene	ug/l	~	-	<10	<1	<1	<10	<1	<1
Hexachloroethane	ug/l	~	-	<10	<1	<1	<10	<1	<1
Isophorone	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l	~	-	<10	<0.5	<0.5	<10	<0.5	<0.5
Nitrobenzene	ug/l	~	-	<10	<1	<1	<10	<1	<1
Phthalates									
Bis(2-ethylhexyl) phthalate	ug/l	~	-	<10	<5	<5	<10	<5	<5
Butylbenzyl phthalate	ug/l	~	-	<10	<1	<1	<10	<1	<1
Di-n-butyl phthalate	ug/l	~	-	<10	<1.5	<1.5	<10	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	~	-	<10	<1	<1	<10	<1	<1
Diethyl phthalate	ug/l	~	-	<10	<1	<1	<10	<1	<1
Dimethyl phthalate	ug/l	~	-	<10	<1	<1	<10	<1	<1
Pesticides MS									
Organochlorine Pesticides									
Aldrin	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Alpha-BHC	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Beta-BHC	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	ug/l	~	-	<0.01	-	-	<0.01	-	-
cis-Chlordane	ug/l	~	-	<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	<0.01	<0.01	<0.01
Endosulphan II	ug/l	0.01^	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulphan sulphate	ug/l	0.01^	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Gamma-BHC	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	ug/l	0.05	-	<0.01	-	-	<0.01	-	-
Isodrin	ug/l	~	-	<0.01	-	-	<0.01	-	-
o,p'-DDE	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o,p'-DDT	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o,p'-Methoxychlor	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o,p'-TDE	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
p,p'-DDE	ug/l	~	-	<0.01	-	-	<0.01	-	-
p,p'-DDT	ug/l	~	-	<0.01	-	-	<0.01	-	-
p,p'-Methoxychlor	ug/l	~	-	<0.01	-	-	<0.01	-	-
p,p'-TDE	ug/l	~	-	<0.01	-	-	<0.01	-	-
Pendimethalin	ug/l	~	-	<0.01	-	-	<0.01	-	-
Permethrin I	ug/l	~	-	<0.01	-	-	<0.01	-	-
Permethrin II	ug/l	~	-	<0.01	-	-	<0.01	-	-
Quintozene	ug/l	~	-	<0.01	-	-	<0.01	-	-
Tecnazene	ug/l	~	-	<0.01	-	-	<0.01	-	-
Telodrin	ug/l	~	-	<0.01	-	-	<0.01	-	-
trans-Chlordane	ug/l	~	-	<0.01	-	-	<0.01	-	-
Triadimefon	ug/l	~	-	<0.01	-	-	<0.01	-	-
Triallate	ug/l	~	-	<0.01	-	-	<0.01	-	-
Trifluralin	ug/l	~	-	<0.01	-	-	<0.01	-	-

Notes:
1 European Communities Environmental Objectives (Surface Water) Regulations 2009; S.I. No 272 of
All EQS derived from Surface Water regulations are concerned with waterbodies achieveing "Good S
Shaded denotes value exceeds Surface Water EQS (MAC inland surface waters)
~ denotes surface water quality standard unavailable.
^ denotes alpha-endosulphan
* denotes EQS dependant on water hardness (>100mg/l Ca CO^3)
** denotes values converted for comparison purposes
* denotes value EQS dependant on water hardness

Table 11: Surface Water Analytical Results

Sample Identity		Surface Water Standards	SW4	SW5	SW5	SW5	SW6	SW6	SW6
Laboratory Report No.		Surfacewater Regulations 2012 (S.I. No. 327 of 2012) [1]	12/9793	12/9793	15/6836	15/7029	12/9793	15/6836	15/7029
Laboratory Sample No.			-	33-40	57-63	15-21	41-48	64-70	22-28
Sample Date			12/12/2012	12/12/2012	30/04/2015	15-21	12/12/2012	30/04/2015	22-28
Sample Location			River Liffey	Mill Race	Mill Race	Mill Race	River Liffey	River Liffey	River Liffey
Parameters	**Unit**								
Organophosphorus Pesticides									
Azinphos ethyl	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Azinphos methyl	ug/l	~	-	<0.01	-	-	<0.01	-	-
Carbophenothion	ug/l	~	-	<0.01	-	-	<0.01	-	-
Chlorfenvinphos	ug/l	0.3	-	<0.01	-	-	<0.01	-	-
Chlorpyrifos	ug/l	0.1	-	<0.01	-	-	<0.01	-	-
Chlorpyrifos-methyl	ug/l	~	-	<0.01	-	-	<0.01	-	-
Diazinon	ug/l	0.02	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dichlorvos	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Disulfoton	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dimethoate	ug/l	4	-	<0.01	-	-	<0.01	-	-
Ethion	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Etrimphos	ug/l	~	-	<0.01	-	-	<0.01	-	-
Fenitrothion	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fenthion	ug/l	~	-	<0.01	-	-	<0.01	-	-
Malathion	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Methyl Parathion	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mevinphos	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phosalone	ug/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pirimiphos Methyl	ug/l	~	-	<0.01	-	-	<0.01	-	-
Propetamphos	ug/l	~	-	<0.01	-	-	<0.01	-	-
Triazophos	ug/l	~	-	<0.01	-	-	<0.01	-	-
Benazolin	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bentazone	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromoxynil	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Clopyralid	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4- CPA	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4 – D	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4 –DB	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dicamba	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dichloroprop	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Diclofop	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fenoprop	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Flamprop	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ioxynil	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MCPA	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MCPB	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mecoprop	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Picloram	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pentachlorophenol	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5 – T	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,3,6 – TBA	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Triclopyr	ug/l	~	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Atrazine	ug/l	2	-	<1	-	<1	<1	-	<1
Simazine	ug/l	4	-	<1	-	<1	<1	-	<1
Fluoride	mg/l	~		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Sulphate	mg/l	~	-	15.78	42.58	32.92	13.14	39.28	26.84
Chloride	mg/l	~	-	17.1	30.9	26.2	13.9	29.2	20.6
Total Oxidised Nitrogen as N	mg/l	~	-	1.7	2.8	2.1	1.6	2.7	2.3
Total Cyanide	mg/l	~	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH (C8-C40)	ug/l	~	-	<10			<10		
Ammoniacal Nitrogen as N	mg/l	0.065	-	0.09	0.06	0.09	0.05	0.05	0.09
Total Alkalinity as CaCO3	mg/l	~	-	220	230	238	200	204	238
COD (Settled)	mg/l	~	-	<7	<7	13	<7	<7	10
Total Susspended Solids	mg/l	~	-	<10	<10	<10	<10	<10	<10
BOD	mg/l	1.5	-	2	2	2	1	1	2

Notes:
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Tier III Exploratory Site Investigation

SDCC
Waterstown, Co Dublin

Table 12: Landfill Gas Monitoring Results

Monitoring Well I.D.	Monitoring Event Date	Monitoring Time (24 hr)	Stable Methane (CH_4)	Peak Methane (CH_4)	LEL	Carbon Dioxide (CO_2)	Oxygen (O_2)	Balance	Hydrogen Sulphide (H_2S)	Carbon Monoxide (CO)	Flow Measurement	Atmospheric Pressure	Relative Pressure
		Units	%	%	%	%	%	%	ppm	ppm	l/h	mb	mb
BH1	20/12/2012	11:00	***58.1***	***58.2***	>>>	***31.4***	0	10.5	2	1	0.2	996	0
	16/05/2013	15:10	***53.3***	***53.3***	>>>	***27.2***	0	19.5	0	0	-0.1	995	0.17
	06/05/2015	12:50	***43.8***	***43.8***	>>>	***21.8***	0	34.4	0	1	0	992	0.17
	12/05/2015	14:00	***45.7***	***45.7***	>>>	***20.7***	0	33.6	0	1	0	1012	0.17
	20/05/2015	10:03	***44***	***44.1***	>>>	***21.7***	0	34	0	1	-0.01	1013	-0.02
	28/05/2015	14:00	***41.3***	***41.3***	>>>	***22***	0.2	36.5	0	0	0.01	1010	0
	05/06/2015												
	12/06/2015	14:28	***42.6***	***42.6***	>>>	**23.6**	0	33.8	0	0	0.1	1008	0.07
	27/11/2015												
BH2	20/12/2012	11:31	***53.4***	***53.5***	>>>	***36.1***	0	10.5	0	2	0.3	996	0.3
	16/05/2013	15:45	***11.2***	***11.5***	>>>	***6.8***	14.5	67.4	0	0	0	995	0.3
	06/05/2015	13:47	0	0.2	0	0	21.1	78.9	0	0	0.1	996	0.29
	12/05/2015	14:40	***12.7***	***23.7***	>>>	***11.6***	10	65.7	0	1	0	1012	0.17
	20/05/2015	09:20	***22.5***	***23.0***	>>>	***14.5***	4.7	57.9	0	0	0	1013	-0.12
	28/05/2015	09:35	***22.9***	***24.2***	>>>	***19.6***	4.1	53.4	0	0	0	1010	-0.05
	05/06/2015	09:20	***22.5***	***23.0***	>>>	***14.5***	4.7	57.9	0	0	0	1013	-0.12
	12/06/2015	15:39	***43.3***	***44.3***	>>>	***32.6***	2.8	21.3	0	1	0.1	1008	0.19
BH3	20/12/2012	10:33	***30.1***	***30.1***	>>>	***19.6***	0	50.3	0	0	0.1	998	0
	16/05/2013	14:45	***25.3***	***25.4***	>>>	***16.0***	16.0	57.2	0	0	-0.1	995	0.05
	06/05/2015												
	12/05/2015	14:29	***24.4***	***24.3***	>>>	***16.6***	1.5	57.5	0	0	0.0	1012	0.42
	28/05/2015	08:29	***25.9***	***25.9***	>>>	***17.7***	0.7	50.7	0	0	0.0	1012	-0.06
	05/06/2015												
	12/06/2015	15:09	***25.1***	***25.1***	>>>	***17.2***	1.3	56.4	0	0	0.0	1010	0.44
BH4	06/05/2015	13:15	***21.4***	***21.4***	>>>	***12.5***	4.7	61.4	0	2	0.7	992	0.36
	12/05/2015	13:43	***23.6***	***27.8***	>>>	***10.8***	5.6	60.0	0	1	0.3	1012	0.48
	20/05/2015	10:20	***30.8***	***30.8***	>>>	***13.1***	4.0	52.1	0	0	0.0	1015	-0.13
	28/05/2015	10:19	***37.5***	***37.5***	>>>	***16.1***	0.0	46.4	0	2	0.0	1010	0.02
	05/06/2015	11:20	***30.8***	***30.8***	>>>	***13.1***	4.0	52.1	0	0	0.0	1015	0.01
	12/06/2015	15:30	***33.6***	***33.6***	>>>	***15.5***	0.3	50.6	0	2	0.0	1008	4.99
	27/11/2015												
BH5	06/05/2015	13:06	***16.2***	***39.8***	>>>	***11.4***	11.9	60.5	0	7	0.5	992	0.28
	12/05/2015	13:50	***34.9***	***34.9***	>>>	***21.3***	3.3	40.5	0	2	0.2	1012	0.31
	20/05/2015	10:17	***34.7***	***34.9***	>>>	***31.8***	2.4	40.8	0	3	0.0	1013	0.02
	28/05/2015	11:04	***44.4***	***44.5***	>>>	***23.5***	0.1	32.0	3	1	0.2	1010	0.08
	05/06/2015	10:17	***34.7***	***34.9***	>>>	***22.1***	2.4	40.8	0	3	-0.1	1013	0.02
	12/06/2015	13:57	***44.2***	***44.2***	>>>	***23.5***	0.0	32.3	0	0	0.4	1000	0.40
	27/11/2015	10:23	***39.1***	***39.1***	>>>	***25.5***	0.0	35.4	0	0	0.1	997	-0.23
BH6													
	12/05/2015	15:13	***45.4***	***45.6***	>>>	***26.8***	0.2	27.6	0	3	0.2	1012	0.72
	20/05/2015	12:03	***47.7***	***47.7***	>>>	***27.8***	0.0	24.6	0	2	0.1	1016	0.02
	28/05/2015	10:49	***47.6***	***47.6***	>>>	***28.1***	0.0	24.3	0	2	0.2	1009	0.05
	05/06/2015	12:03	***47.7***	***47.7***	>>>	***27.8***	0.0	24.6	0	2	0.1	1016	0.02
	12/06/2015	13:44	***49.4***	***49.4***	>>>	***29.2***	0.0	21.4	1	1	0.7	1000	5.45
BH7	06/05/2015	13:56	***37.0***	***42.1***	>>>	***22.2***	2.5	38.3	0	6	0.0	996	0.88
	12/05/2015	14:40	***39.1***	***39.2***	>>>	***21.1***	0.4	39.4	0	4	0.0	1012	0.15
	20/05/2015	08:22	***42.6***	***42.6***	>>>	***24.1***	0.0	32.8	0	1	0.0	1013	-0.85
	28/05/2015	09:18	***41.9***	***41.9***	>>>	***24.4***	0.0	33.7	0	1	0.0	1009	-0.13
	05/06/2015	08:22	***42.6***	***42.6***	>>>	***24.1***	0.0	32.8	0	1	0.0	1013	-0.85
	12/06/2015	13:49	***34.2***	***34.3***	>>>	***24.5***	0.0	41.2	0	0	0.4	1000	-0.30
	27/11/2015	10:50	***38.1***	***38.2***	>>>	***19.9***	0.0	41.9	0	1	0.0	997	-0.11
	04/12/2015	09:20	***3.3***	***10.2***	>>>	***3.1***	19.2	74.8	0	0	4.6	1014	-0.56
	20/04/2016	10:11	***43.0***	***45.9***	>>>	***24.9***	0.0	29.3	0	0	16.8	1026	-0.66
BH8	06/05/2015	14:05	***10.1***	***37.6***	>>>	***4.1***	15.6	70.2	0	0	0.1	996	0.16
	12/05/2015	14:54	***30.8***	***36.7***	>>>	***12.5***	3.8	52.9	0	1	0.1	1012	0.12
	20/05/2015	08:41	***38.1***	***38.2***	>>>	***15.3***	0.8	45.7	0	0	0.0	1013	-1.22
	28/05/2015	09:03	***33.3***	***33.4***	>>>	***19.0***	0.0	47.7	0	0	0.0	1010	-0.09
	05/06/2015	09:50	***38.1***	***38.2***	>>>	***15.3***	0.8	45.7	0	0	0.0	1013	0.22
	12/06/2015	14:40	***31.7***	***31.7***	>>>	***18.9***	0.2	49.2	0	0	0.0	1000	0.04
BH9	06/05/2015	14:16	0.0	0.3	0.0	0.2	20.9	78.9	0	1	0.3	996	0.11
	12/05/2015	15:06	0.0	***30.6***	>>>	0.1	20.7	79.2	0	1	0.2	1012	0.14
	20/05/2015	09:00	0.0	0.1	1.0	0.2	21.0	78.8	0	0	0.0	1013	-0.16
	28/05/2015	08:45	0.0	0.1	0.0	0.1	20.9	79.0	0	0	0.0	1010	-0.09
	05/06/2015	09:00	0.0	0.1	1.0	0.2	21.0	78.8	0	0	0.0	1013	-0.16
	12/06/2015	14:50	0.0	0.1	0.0	***2.4***	18.0	79.6	0	0	0.0	1008	0.28
	27/11/2015	11:15	0.1	0.6	1.0	***1.7***	19.0	79.2	0	0	0.0	997	-0.11
	04/12/2015												
BH10	06/05/2015	14:26	***31.1***	***38.5***	>>>	***9.5***	3.1	56.3	0	0	0.1	996	0.06
	12/05/2015	14:19	***23.1***	***24.0***	>>>	***9.3***	3.5	64.1	0	0	0.0	1012	0.24
	20/05/2015												
	28/05/2015	08:10	***26.4***	***26.4***	>>>	***17.9***	0.3	55.4	0	0	0.0	1013	-0.26
	05/06/2015												
	12/06/2015	15:20	***27.7***	***27.7***	>>>	***19.6***	0.1	52.6	0	1	0.1	1010	1.14
BH11													
	12/05/2015	11:09	***18.9***	***18.9***	>>>	***17.1***	6.3	57.7	0	1	0.5	1011	0.54
	20/05/2015	09:42	***21.0***	***21.2***	>>>	***19.7***	4.4	54.9	0	1	0.0	1013	-0.05
	28/05/2015	09:55	***26.4***	***26.4***	>>>	***23.8***	0.5	49.3	0	1	0.0	1011	-0.02
	05/06/2015	09:42	***21.0***	***21.2***	>>>	***19.7***	4.4	54.9	0	1	0.0	1013	-0.05
	12/06/2015	14:20	***26.6***	***26.7***	>>>	***25.0***	0.1	48.3	0	1	0.1	1009	-0.09
	04/12/2015												
BH12	06/05/2015	13:33	0.2	0.2	4.0	***7.7***	11.4	80.7	0	0	0.1	996	0.33
	12/05/2015	14:09	0.0	***44.4***	0.0	***6.5***	13.0	80.5	0	0	0.0	1012	0.41
	20/05/2015	10:35	0.0	0.0	0.0	***3.4***	18.3	78.3	0	0	0.0	1013	0.00
	28/05/2015	10:04	***1.6***	***3.3***	32.0	***12.6***	7.7	78.1	0	1	0.0	1011	0.00
	05/06/2015	10:35	0.0	***3.4***	0.0	***3.4***	18.3	78.3	0	0	0.1	1013	0.01
	12/06/2015	14:12	***5.1***	***5.2***	>>>	***18.9***	1.3	74.7	0	1	0.2	1009	-0.17
	04/12/2015	09:35	***7.5***	***7.5***	>>>	***17.5***	0.0	75.0	0	0	0.0	1014	-2.12
BH13	27/11/2015												
	04/12/2015	10:10	0.1	0.1	1.0	0.2	20.5	79.2	0	0	0.0	1014	-0.36
BH14	27/11/2015	10:39	***50.9***	***51.0***	>>>	***31.9***	0.0	17.1	7	1	0.0	997	-0.21
	04/12/2015	10:40	***48.2***	***48.2***	>>>	***24.6***	1.4	25.3	0	4	0.0	1014	-0.55
	20/04/2016	10:45	***48.1***	***48.1***	>>>	***28.1***	0.7	23.1	0	0	0.0	1025	0.00
BH15	27/11/2015	09:45	0.0	0.0	0.0	0.4	20.4	79.2	0	0	0.2	997	-0.32
	04/12/2015	08:25	0.1	0.7	1.0	*0.6*	19.7	79.6	0	0	0.0	1014	-0.33
BH16	27/11/2015	09:54	0.1	0.1	1.0	*0.6*	19.7	79.6	0	1	0.0	997	-0.22
	04/12/2015	08:45	0.0	0.0	>>>	0.2	19.9	76.4	0	0	0.0	1014	-0.23
BH17	27/11/2015	10:03	0.1	0.1	1.0	0.0	21.1	78.8	0	1	0.0	997	-0.16
	04/12/2015	08:55	0.0	0.0	>>>	0.1	19.8	76.5	0	0	0.0	1014	-0.27
EPA 1997 Thresholds[1]			1.0	1.0	~	1.5	~	~	~	~	~	~	~
DOE Exposure Limits[2]			1.0	1.0	~	0.5	~	~	~	~	~	~	~

Notes:
LEL denotes Lower Explosive Limit (expressed as percentage of 5% v/v methane).
>>> denotes exceeds the LEL.
~ denotes no threshold available.
Bold denotes level exceeds EPA threshold.
Italics denotes level exceeds DOE exposure limit.
1: Environmental Protection Agency (EPA) 1997: Landfill Manuals - Landfill operational Practices. EPA, Ireland.
2: Department of the Environment (1994): Protection of New Buildings and Occupants from Landfill Gas. DOE, Ireland
Shaded denotes data unavailable for this date
denotes landfill gas volumes not measured due to battery fail of the GA2000

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Table 13: Leachate Analytical Results

Sample Identity		Groundwater Standards		Surface Water Standards	Comparison Study		BH2	BH2	BH2
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	EPA, (2000). Landfill Manuals: Landfill Site Design[4]		Jones 12/9860	Jones 15/6769	Jones 15/6977
Laboratory Sample No.							1-6	8-14	1-7
Sample Date							13/12/2012	29/04/2015	03/05/2015
Parameters	**Unit**				**Minimum**	**Maximum**			
Field Measured Parameters									
pH	pH units	~	6.5-9.5	6.0-9.0	6.80	8.20	6.20	6.64	6.66
Electrical Conductivity	µS/cm	800 # / 1875	~	~	5990	19300	**2007**	**2280.1**	**2305.8**
Dissolved Oxygen	%	~	NAC	80-120	~	~	54.6	29.9	13.2
Dissolved Oxygen	ppm	~	NAC	~	~	~	5.45	3.15	1.38
Temperature	ºC	~	25ºC	~	~	~	11.1	12.06	11.37
Oxidation Reduction Potential	mV	~	~	~	~	~	-45.3	-85.1	-103.8
Colour	N/A	~	NAC	~	~	~	Dark Grey	Dark,silty colour	Silty
Odour	N/A	~	~	~	~	~	acidic	Organic odour	Strong leachate odour
Other observations	N/A	~	~	~	~	~	None	None	None
Metals (dissolved)									
Dissolved Arsenic	ug/l	7.5	10	~	<1	485	**22.4**	6.4	**12.1**
Dissolved Boron	ug/l	750	1000	~	~	~	740	741	**782**
Dissolved Cadmium	ug/l	3.75	5	1.5	10	80	<0.5	0.71	1.78
Dissolved Calcium	mg/l	~	200	~	23	501	383.9	363.5	362.1
Total Dissolved Chromium	ug/l	37.5	30	~	<30	560	3.1	1.1	<1.5
Dissolved Copper	ug/l	1500	30	~	<20	620	<7	<7	53
Total Dissolved Iron	ug/l	~	200	~	1600	160000	1392	183	
Dissolved Lead	ug/l	18.75	10	~	<40	1900	15	<5	7
Dissolved Magnesium	mg/l	~	50	~	40	1580	59.8	60.2	57.1
Dissolved Manganese	ug/l	~	50	~	40	3590	3392	1365	1151
Dissolved Mercury	ug/l	0.75	1	0.07	<0.1	0.8	<1	<0.5	<0.5
Dissolved Nickel	ug/l	15	20	~	<30	600	14	**18**	7
Dissolved Potassium	mg/l	~	5	~	100	1580	54.2	49.2	45.2
Dissolved Sodium	mg/l	150	150	~	474	3650	**279.9**	**260.1**	**240.8**
Dissolved Zinc	ug/l	~	100	~	30	6700	10	<3	191
MRP as Total Phosphorus	ug/l	35	30***	35	~	~	**161**	**986**	**198**
Total Aluminium	ug/l	~	~	~	~	~	~	~	~
Total Iron	ug/l	~	~	~	~	~	~	~	~
Total Manganese	ug/l	~	~	~	~	~	~	~	~
Volatile Organic Compounds (VOCs) MS									
Dichlorodifluoromethane	ug/l	~	~	~	~	~	<2	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	~	~	~	<1	<0.1	<0.1
Chloromethane	ug/l	~	~	~	~	~	<3	<3	<3
Vinyl Chloride	ug/l	0.375	~	~	~	~	<2	<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	ug/l	~	30**	~	~	~	<3	<3	<3
Dichloromethane	ug/l	~	10	~	~	~	<3	<3	<3
trans-1-2-Dichloroethene	ug/l	~	30**	~	~	~	<3	<3	<3
1,1-Dichloroethane	ug/l	~	~	~	~	~	<3	<3	<3
cis-1-2-Dichloroethene	ug/l	~	30**	~	~	~	<3	<3	<3
2,2-Dichloropropane	ug/l	~	~	~	~	~	<1	<1	<1
Bromochloromethane	ug/l	~	~	~	~	~	<2	<2	<2
Chloroform	ug/l	75 Δ1	~	~	~	~	<2	<2	<2
1,1,1-Trichloroethane	ug/l	~	500	~	~	~	<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	50	~	~	**5**	**4.4**	**5.3**
Trichloroethene	ug/l	7.5 Δ2	70	~	~	~	<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	~	10	~	~	~	<2	2.2	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	~	~	~	<2	<2	<2
1,1,2-Trichloroethane	ug/l	~	~	~	~	~	<2	<2	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	~	~	~	<3	<3	<3
1,3-Dichloropropane	ug/l	~	~	~	~	~	<2	<2	<2
Dibromochloromethane	ug/l	75 Δ1	~	~	~	~	<2	<2	<2
1,2-Dibromoethane	ug/l	~	~	~	~	~	<2	<2	<2
Chlorobenzene	ug/l	~	1	~	~	~	<2	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	~	~	~	<2	<2	<2
Ethylbenzene	ug/l	~	10	~	~	~	3	<0.5	3.4
p/m-Xylene	ug/l	~	10 Δ3	~	~	~	7	<1	9
o-Xylene	ug/l	~	10 Δ3	~	~	~	<2	<0.5	2.5
Styrene	ug/l	~	~	~	~	~	<2	<2	<2
Bromoform	ug/l	75 Δ1	~	~	~	~	<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	~	~	~	~	~	<3	<3	5
4-Chlorotoluene	ug/l	~	~	~	~	~	<3	<3	<3
tert-Butylbenzene	ug/l	~	~	~	~	~	<3	<3	<3
1,2,4-Trimethylbenzene	ug/l	~	~	~	~	~	26	5	23
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	~	~	~	~	~	<3	<3	<3
n-Butylbenzene	ug/l	~	~	~	~	~	<3	<3	<3
1,2-Dichlorobenzene	ug/l	~	10	~	~	~	<3	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	~	~	~	<2	<2	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	~	~	~	<3	<3	<3
Hexachlorobutadiene	ug/l	~	0.1	~	~	~	<3	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	~	~	~	~	<3	<3	<3
Surrogate Recovery Toluene D8	%	~	~	~	~	~	97	104	92
Surrogate Recovery 4-Bromofluorobenzene	%	~	~	~	~	~	111	95	91

Notes:

1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2012.
2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report. EPA, Ireland.
3; European Communities Environmental Objectives (Surface Water) Regulations 2009; S.I. No 272 of 2009 and as amended S.I. No 327 of 2012
Bold denotes value exceeds Groundwater regulations.
Underline denotes value exceeds IGV - Only used in the absence of Groundwater regulation value
Shaded denotes value exceeds Surface Water EQS (MAC inland surface waters)
^ denotes upper threshold value used
Δ1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromethane and bromoform.
Δ2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
Δ3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
** denotes IGV relates to 'dichloroethene'.
*** denotes orthophosphate
NAC - No Abnormal Change
^ denotes alpha-endosulphan
+ denotes permethrin
# denotes non-specific individual pesticide value
++ Result outside calibration range, results should be considered as indicative only and are not accredited

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Table 13: Leachate Analytical Results

Sample Identity		Groundwater Standards		Surface Water Standards	Comparison Study		BH2	BH2	BH2
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	EPA, (2000). Landfill Manuals: Landfill Site Design[4]		Jones 12/9860	Jones 15/6769	Jones 15/6977
Laboratory Sample No.							1-6	8-14	1-7
Sample Date							13/12/2012	29/04/2015	03/05/2015
Parameters	**Unit**				**Minimum**	**Maximum**			
Semi-Volatile Organic Compounds (SVOCs)									
Phenols									
2-Chlorophenol	ug/l	~	200	~	~	~	<10	<1	<1
2-Methylphenol	ug/l	~	~	~	~	~	<10	<0.5	<0.5
2-Nitrophenol	ug/l	~	~	~	~	~	<10	<0.5	<0.5
2,4-Dichlorophenol	ug/l	~	~	~	~	~	<10	<0.5	<0.5
2,4-Dimethylphenol	ug/l	~	~	~	~	~	<10	<1	<1
2,4,5-Trichlorophenol	ug/l	~	~	~	~	~	<10	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	~	~	~	<10	<1	<1
4-Chloro-3-methylphenol	ug/l	~	~	~	~	~	<10	<0.5	<0.5
4-Methylphenol	ug/l	~	~	~	~	~	41	<1	<1
4-Nitrophenol	ug/l	~	~	~	~	~	<10	<10	<10
Pentachlorophenol	ug/l	~	2	1	~	~	<10	<1	<1
Phenol	ug/l	~	0.5*	46	~	~	24	<1	<1
					~	~			
Polycyclic Aromatic Hydrocarbons (PAHs)					~	~			
2-Chloronaphthalene	ug/l	~	~	~	~	~	<10	<1	<1
2-Methylnaphthalene	ug/l	~	~	~	~	~	<10	<1	<1
Naphthalene	ug/l	~	1	~	~	~	<10	0.140	1.360
Acenaphthylene	ug/l	~	~	~	~	~	<10	0.050	0.050
Acenaphthene	ug/l	~	~	~	~	~	<10	0.020	0.420
Fluorene	ug/l	~	~	~	~	~	<10	<0.014	0.240
Phenanthrene	ug/l	~	~	~	~	~	<10	<0.011	0.230
Anthracene	ug/l	~	10000	0.4	~	~	<10	<0.013	0.040
Fluoranthene	ug/l	~	1	1	~	~	<10	<0.012	0.140
Pyrene	ug/l	~	~	~	~	~	<10	<0.013	0.120
Benzo(a)anthracene	ug/l	~	~	~	~	~	<10	<0.015	0.060
Chrysene	ug/l	~	~	~	~	~	<10	<0.011	0.060
Benzo(bk)fluoranthene	ug/l	~	~	~	~	~	<10	<0.018	0.100
Benzo(a)pyrene	ug/l	0.0075	0.01	0.1	~	~	<10	<0.016	0.060
Indeno(123cd)pyrene	ug/l	~	~	~	~	~	<10	<0.011	0.030
Dibenzo(ah)anthracene	ug/l	~	~	~	~	~	<10	<0.01	<0.01
Benzo(ghi)perylene	ug/l	~	0.05	~	~	~	<10	<0.011	0.030
PAH 16 Total		~	~	~	~	~	-	0.210	2.940
Benzo(b)flouranthene		~	~	~	~	~	-	<0.01	0.07
Benzo(k)flouranthene		~	~	~	~	~	-	<0.01	0.03
Other SVOCs									
1,2-Dichlorobenzene	ug/l	~	10	~	~	~	<10	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	~	~	~	<10	<1	<1
1,3-Dichlorobenzene	ug/l	~	~	~	~	~	<10	<1	<1
1,4-Dichlorobenzene	ug/l	~	~	~	~	~	<10	2	2
2-Nitroaniline	ug/l	~	~	~	~	~	<10	<1	<1
2,4-Dinitrotoluene	ug/l	~	~	~	~	~	<10	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	~	~	~	~	~	<10	<1	<1
3-Nitroaniline	ug/l	~	~	~	~	~	<10	<1	<1
4-Bromophenylphenylether	ug/l	~	~	~	~	~	<10	<1	<1
4-Chloroaniline	ug/l	~	~	~	~	~	<10	<1	<1
4-Chlorophenylphenylether	ug/l	~	~	~	~	~	<10	<1	<1
4-Nitroaniline	ug/l	~	~	~	~	~	<10	<0.5	<0.5
Azobenzene	ug/l	~	~	~	~	~	<10	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	~	~	~	<10	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	~	~	~	<10	<1	<1
Carbazole	ug/l	~	~	~	~	~	<10	<0.5	<0.5
Dibenzofuran	ug/l	~	~	~	~	~	<10	<0.5	<0.5
Hexachlorobenzene	ug/l	~	0.03	0.05	~	~	<10	<1	<1
Hexachlorobutadiene	ug/l	~	0.1	0.6	~	~	<10	<1	<1
Hexachlorocyclopentadiene	ug/l	~	~	~	~	~	<10	<1	<1
Hexachloroethane	ug/l	~	~	~	~	~	<10	<1	<1
Isophorone	ug/l	~	~	~	~	~	<10	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	~	~	~	<10	<0.5	<0.5
Nitrobenzene	ug/l	~	10	~	~	~	<10	<1	<1
					~	~			
Phthalates					~	~			
Bis(2-ethylhexyl) phthalate	ug/l	~	8	~	~	~	<10	<5	<5
Butylbenzyl phthalate	ug/l	~	~	~	~	~	<10	<1	<1
Di-n-butyl phthalate	ug/l	~	2	~	~	~	<10	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	~	~	~	~	~	<10	<1	<1
Diethyl phthalate	ug/l	~	~	~	~	~	<10	<1	<1
Dimethyl phthalate	ug/l	~	~	~	~	~	<10	<1	<1
					~	~			
Pesticides MS					~	~			
Organochlorine Pesticides					~	~			
Aldrin	ug/l	~	0.01	~	~	~	<0.01	<0.01	<0.01
Alpha-BHC	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Beta-BHC	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Chlorothalonil	ug/l	~	0.1#	~	~	~	<0.01	~	~
cis-Chlordane	ug/l	~	0.1#	~	~	~	<0.01	~	~
Dieldrin	ug/l	0.075	0.01	~	~	~	<0.01	<0.01	<0.01
Endosulphan I	ug/l	~	0.001^	0.01^	~	~	<0.01	<0.01	<0.01
Endosulphan II	ug/l	~	0.001^	0.01^	~	~	<0.01	<0.01	<0.01
Endosulphan sulphate	ug/l	~	0.001^	0.01^	~	~	<0.01	<0.01	<0.01
Endrin	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Gamma-BHC	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Heptachlor	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Hexachlorobenzene	ug/l	~	0.1#	0.05	~	~	<0.01	~	~
Isodrin	ug/l	~	0.1#	~	~	~	<0.01	~	~
o,p'-DDE	ug/l	~	0.1#	~	~	~	<0.01	~	~
o,p'-DDT	ug/l	~	0.1#	~	~	~	<0.01	~	~
o,p'-Methoxychlor	ug/l	~	0.1#	~	~	~	<0.01	~	~
o,p'-TDE	ug/l	~	0.1#	~	~	~	<0.01	~	~
p,p'-DDE	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
p,p'-DDT	ug/l	0.075	0.1#	~	~	~	<0.01	<0.01	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
p,p'-TDE	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Pendimethalin	ug/l	~	0.1#	~	~	~	<0.01	~	~
Permethrin I	ug/l	~	20+	~	~	~	<0.01	~	~
Permethrin II	ug/l	~	20+	~	~	~	<0.01	~	~
Quintozene	ug/l	~	0.1#	~	~	~	<0.01	~	~
Tecnazene	ug/l	~	0.1#	~	~	~	<0.01	~	~
Telodrin	ug/l	~	0.1#	~	~	~	<0.01	~	~
trans-Chlordane	ug/l	~	0.1#	~	~	~	<0.01	~	~
Triadimefon	ug/l	~	0.1#	~	~	~	<0.01	~	~
Triallate	ug/l	~	0.1#	~	~	~	<0.01	~	~
Trifluralin	ug/l	~	0.1	~	~	~	<0.01	~	~

Notes:
1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2012.
2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report. EPA, Ireland.
3; European Communities Environmental Objectives (Surface Water) Regulations 2009; S.I. No 272 of 2009 and as amended S.I. No 327 of 2012
Bold denotes value exceeds Groundwater regulations.
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Shaded denotes value exceeds Surface Water EQS (MAC inland surface waters)
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∆1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromethane and bromoform.
∆2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
∆3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
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NAC - No Abnormal Change
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Tier III Exploratory Investigation

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Table 13: Leachate Analytical Results

Sample Identity		Groundwater Standards		Surface Water Standards	Comparison Study		BH2	BH2	BH2
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	EPA, (2000). Landfill Manuals: Landfill Site Design[4]		Jones 12/9860	Jones 15/6769	Jones 15/6977
Laboratory Sample No.							1-6	8-14	1-7
Sample Date							13/12/2012	29/04/2015	03/05/2015
Parameters	**Unit**				**Minimum**	**Maximum**			
Organophosphorus Pesticides									
Azinphos ethyl	ug/l	~	0.1#	~	~	~	<0.01	-	-
Azinphos methyl	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Carbophenothion	ug/l	~	0.1#	~	~	~	<0.01	~	~
Chlorfenvinphos	ug/l	~	5	0.3	~	~	<0.01	~	~
Chlorpyrifos	ug/l	~	90	0.1	~	~	<0.01	~	~
Chlorpyrifos-methyl	ug/l	~	0.1#	~	~	~	<0.01	~	~
Diazinon	ug/l	~	0.1#	0.02	~	~	<0.01	<0.01	<0.01
Dichlorvos	ug/l	~	0.001	~	~	~	<0.01	<0.01	<0.01
Dimethoate	ug/l	~	0.1#	4	~	~	<0.01	-	-
Ethion	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Etrimphos	ug/l	~	0.1#	~	~	~	<0.01	-	-
Fenitrothion	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Fenthion	ug/l	~	0.1#	~	~	~	<0.01	-	-
Malathion	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Methyl Parathion	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Mevinphos	ug/l	~	0.1#	~	~	~	<0.01	<0.01	<0.01
Phosalone	ug/l	~	0.1#	~	~	~	<0.01	~	~
Pirimiphos Methyl	ug/l	~	0.1#	~	~	~	<0.01	~	~
Propetamphos	ug/l	~	0.1#	~	~	~	<0.01	~	~
Triazophos	ug/l	~	0.1#	~	~	~	<0.01	~	~
					~	~		~	~
Benazolin	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Bentazone	ug/l	0.075	0.1#	~	~	~	<0.1	<0.1	<0.1
Bromoxynil	ug/l	~	5	~	~	~	<0.1	<0.1	<0.1
Clopyralid	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
4- CPA	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
2,4 – D	ug/l	0.075	0.1#	~	~	~	<0.1	<0.1	<0.1
2,4 –DB	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Dicamba	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Dichloroprop	ug/l	~	100	~	~	~	<0.1	<0.1	<0.1
Diclofop	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Fenoprop	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Flamprop	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Ioxynil	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
MCPA	ug/l	0.075	0.1#	~	~	~	<0.1	<0.1	<0.1
MCPB	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Mecoprop	ug/l	0.075	10	~	~	~	<0.1	<0.1	<0.1
Picloram	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Pentachlorophenol	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
2,4,5 – T	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
2,3,6 – TBA	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
Triclopyr	ug/l	~	0.1#	~	~	~	<0.1	<0.1	<0.1
					~	~			
Atrazine	ug/l	0.075	1	2	~	~	<1	<1	<1
Simazine	ug/l	0.075	1	4	~	~	<1	<1	<1
					~	~			
Fluoride	mg/l	~	1	~	~	~	<0.3	<0.3	<0.3
Sulphate	mg/l	187.5	~	~	<5	322	16.24	0.06	0.82
Chloride	mg/l	187.5	30	~	570	4710	135.3	113.6	105.1
Total Oxidised Nitrogen as N	mg/l	~	~	~	~	~	<0.2	<0.2	<0.2
Total Cyanide	mg/l	0.0375	0.01	~	~	~	<0.01	<0.01	0.01
Ammoniacal Nitrogen as N	mg/l	0.175	0.12	0.065	283	2040	**45.46**	**47.72**	**48.21**
COD (Settled)	mg/l	~	~	~	622	8000	328	153	89
Total Organic Carbon	mg/l	~	~	~	~	~	~	~	~
BOD	mg/l	~	~	1.5	110	1900	199	40	74

Notes:
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Tier III Exploratory Investigation

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Table 13: Leachate Analytical Results

Sample Identity		**Groundwater Standards**		Surface Water Standards	**BH8**	**BH8**
Laboratory Report No.					**Jones 15/6769**	**Jones 15/6977**
Laboratory Sample No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	**15-21**	**15-21**
Sample Date					**29/04/2015**	**05/05/2015**
Parameters	**Unit**					
Field Measured Parameters						
pH	pH units	~	6.5-9.5	6.0-9.0	6.94	6.47
Electrical Conductivity	µS/cm	800 # / 1875	~	~	1012.5	1030.4
Dissolved Oxygen	%	~	NAC	80-120	19.5	25.7
Dissolved Oxygen	ppm	~	NAC	~	2.09	2.77
Temperature	ºC	~	25ºC	~	11.69	10.37
Oxidation Reduction Potential	mV	~	~	~	24.3	19.6
Colour	N/A	~	NAC	~	Very silty	Silty
Odour	N/A	~	~	~	Organic odour	Odourless
Other observations	N/A	~	~	~	None	None
Metals (dissolved)						
Dissolved Arsenic	ug/l	7.5	10	~	~	~
Dissolved Boron	ug/l	750	1000	~	~	~
Dissolved Cadmium	ug/l	3.75	5	1.5	~	~
Dissolved Calcium	mg/l	~	200	~	~	~
Total Dissolved Chromium	ug/l	37.5	30	~	~	~
Dissolved Copper	ug/l	1500	30	~	~	~
Total Dissolved Iron	ug/l	~	200	~	~	~
Dissolved Lead	ug/l	18.75	10	~	~	~
Dissolved Magnesium	mg/l	~	50	~	~	~
Dissolved Manganese	ug/l	~	50	~	~	~
Dissolved Mercury	ug/l	0.75	1	0.07	~	~
Dissolved Nickel	ug/l	15	20	~	~	~
Dissolved Potassium	mg/l	~	5	~	6.6	4.2
Dissolved Sodium	mg/l	150	150	~	22.7	17.5
Dissolved Zinc	ug/l	~	100	~	~	~
MRP as Total Phosphorus	ug/l	35	30***	35	~	~
Total Aluminium	ug/l	~	~	~	1118	23820
Total Iron	ug/l	~	~	~	3669	62380
Total Manganese	ug/l	~	~	~	3878	6414
Volatile Organic Compounds (VOCs) MS						
Dichlorodifluoromethane	ug/l	~	~	~	~	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	~	~	<0.1
Chloromethane	ug/l	~	~	~	~	<3
Vinyl Chloride	ug/l	0.375	~	~	~	<0.1
Bromomethane	ug/l	~	~	~	~	<1
Chloroethane	ug/l	~	~	~	~	<3
Trichlorofluoromethane	ug/l	~	~	~	~	<3
1,1-Dichloroethene	ug/l	~	30**	~	~	<3
Dichloromethane	ug/l	~	10	~	~	<3
trans-1-2-Dichloroethene	ug/l	~	30**	~	~	<3
1,1-Dichloroethane	ug/l	~	~	~	~	<3
cis-1-2-Dichloroethene	ug/l	~	30**	~	~	<3
2,2-Dichloropropane	ug/l	~	~	~	~	<1
Bromochloromethane	ug/l	~	~	~	~	<2
Chloroform	ug/l	75 Δ1	~	~	~	<2
1,1,1-Trichloroethane	ug/l	~	500	~	~	<2
1,1-Dichloropropene	ug/l	~	~	~	~	<3
Carbon tetrachloride	ug/l	~	~	~	~	<2
1,2-Dichloroethane	ug/l	2.25	3	~	~	<2
Benzene	ug/l	0.75	1	50	~	<0.5
Trichloroethene	ug/l	7.5 Δ2	70	~	~	<3
1,2-Dichloropropane	ug/l	~	~	~	~	<2
Dibromomethane	ug/l	~	~	~	~	<3
Bromodichloromethane	ug/l	~	~	~	~	<2
cis-1-3-Dichloropropene	ug/l	~	~	~	~	<2
Toluene	ug/l	~	10	~	~	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	~	~	<2
1,1,2-Trichloroethane	ug/l	~	~	~	~	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	~	~	<3
1,3-Dichloropropane	ug/l	~	~	~	~	<2
Dibromochloromethane	ug/l	75 Δ1	~	~	~	<2
1,2-Dibromoethane	ug/l	~	~	~	~	<2
Chlorobenzene	ug/l	~	1	~	~	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	~	~	<2
Ethylbenzene	ug/l	~	10	~	~	<0.5
p/m-Xylene	ug/l	~	10 Δ3	~	~	<1
o-Xylene	ug/l	~	10 Δ3	~	~	<0.5
Styrene	ug/l	~	~	~	~	<2
Bromoform	ug/l	75 Δ1	~	~	~	<2
Isopropylbenzene	ug/l	~	~	~	~	<3
1,1,2,2-Tetrachloroethane	ug/l	~	~	~	~	<4
Bromobenzene	ug/l	~	~	~	~	<2
1,2,3-Trichloropropane	ug/l	~	~	~	~	<3
Propylbenzene	ug/l	~	~	~	~	<3
2-Chlorotoluene	ug/l	~	~	~	~	<3
1,3,5-Trimethylbenzene	ug/l	~	~	~	~	<3
4-Chlorotoluene	ug/l	~	~	~	~	<3
tert-Butylbenzene	ug/l	~	~	~	~	<3
1,2,4-Trimethylbenzene	ug/l	~	~	~	~	<3
sec-Butylbenzene	ug/l	~	~	~	~	<3
4-Isopropyltoluene	ug/l	~	~	~	~	<3
1,3-Dichlorobenzene	ug/l	~	~	~	~	<3
1,4-Dichlorobenzene	ug/l	~	~	~	~	<3
n-Butylbenzene	ug/l	~	~	~	~	<3
1,2-Dichlorobenzene	ug/l	~	10	~	~	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	~	~	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	~	~	<3
Hexachlorobutadiene	ug/l	~	0.1	~	~	<3
1,2,3-Trichlorobenzene	ug/l	~	~	~	~	<3
Surrogate Recovery Toluene D8	%	~	~	~	~	101
Surrogate Recovery 4-Bromofluorobenzene	%	~	~	~	~	99

Notes:

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Table 13: Leachate Analytical Results

Sample Identity		Groundwater Standards		Surface Water Standards	BH8	BH8
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	Jones 15/6769	Jones 15/6977
Laboratory Sample No.					15-21	15-21
Sample Date					29/04/2015	05/05/2015
Parameters	**Unit**					
Semi-Volatile Organic Compounds (SVOCs)						
Phenols						
2-Chlorophenol	ug/l	~	200	~	~	<1
2-Methylphenol	ug/l	~	~	~	~	<0.5
2-Nitrophenol	ug/l	~	~	~	~	<0.5
2,4-Dichlorophenol	ug/l	~	~	~	~	<0.5
2,4-Dimethylphenol	ug/l	~	~	~	~	<1
2,4,5-Trichlorophenol	ug/l	~	~	~	~	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	~	~	<1
4-Chloro-3-methylphenol	ug/l	~	~	~	~	<0.5
4-Methylphenol	ug/l	~	~	~	~	<1
4-Nitrophenol	ug/l	~	~	~	~	<10
Pentachlorophenol	ug/l	~	2	1	~	<1
Phenol	ug/l	~	0.5*	46	~	<1
Polycyclic Aromatic Hydrocarbons (PAHs)						
2-Chloronaphthalene	ug/l	~	~	~		<1
2-Methylnaphthalene	ug/l	~	~	~		<1
Naphthalene	ug/l	~	1	~	~	<1
Acenaphthylene	ug/l	~	~	~	~	<0.5
Acenaphthene	ug/l	~	~	~	~	<1
Fluorene	ug/l	~	~	~	~	<0.5
Phenanthrene	ug/l	~	~	~	~	<0.5
Anthracene	ug/l	~	10000	0.4	~	<0.5
Fluoranthene	ug/l	~	1	1	~	<0.5
Pyrene	ug/l	~	~	~	~	<0.5
Benzo(a)anthracene	ug/l	~	~	~	~	<0.5
Chrysene	ug/l	~	~	~	~	<0.5
Benzo(bk)fluoranthene	ug/l	~	~	~	~	<1
Benzo(a)pyrene	ug/l	0.0075	0.01	0.1	~	<1
Indeno(123cd)pyrene	ug/l	~	~	~	~	<1
Dibenzo(ah)anthracene	ug/l	~	~	~	~	<0.5
Benzo(ghi)perylene	ug/l	~	0.05	~	~	<0.5
PAH 16 Total		~	~	~	~	~
Benzo(b)flouranthene		~	~	~	~	~
Benzo(k)flouranthene		~	~	~	~	~
Other SVOCs						
1,2-Dichlorobenzene	ug/l	~	10	~	~	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	~	~	<1
1,3-Dichlorobenzene	ug/l	~	~	~	~	<1
1,4-Dichlorobenzene	ug/l	~	~	~	~	<1
2-Nitroaniline	ug/l	~	~	~	~	<1
2,4-Dinitrotoluene	ug/l	~	~	~	~	<0.5
2,6-Dinitrotoluene	ug/l	~	~	~	~	<1
3-Nitroaniline	ug/l	~	~	~	~	<1
4-Bromophenylphenylether	ug/l	~	~	~	~	<1
4-Chloroaniline	ug/l	~	~	~	~	<1
4-Chlorophenylphenylether	ug/l	~	~	~	~	<1
4-Nitroaniline	ug/l	~	~	~	~	<0.5
Azobenzene	ug/l	~	~	~	~	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	~	~	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	~	~	<1
Carbazole	ug/l	~	~	~	~	<0.5
Dibenzofuran	ug/l	~	~	~	~	<0.5
Hexachlorobenzene	ug/l	~	0.03	0.05	~	<1
Hexachlorobutadiene	ug/l	~	0.1	0.6	~	<1
Hexachlorocyclopentadiene	ug/l	~	~	~	~	<1
Hexachloroethane	ug/l	~	~	~	~	<1
Isophorone	ug/l	~	~	~	~	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	~	~	<0.5
Nitrobenzene	ug/l	~	10	~	~	<1
Phthalates						
Bis(2-ethylhexyl) phthalate	ug/l	~	8	~	~	<5
Butylbenzyl phthalate	ug/l	~	~	~	~	<1
Di-n-butyl phthalate	ug/l	~	2	~	~	<1.5
Di-n-Octyl phthalate	ug/l	~	~	~	~	<1
Diethyl phthalate	ug/l	~	~	~	~	<1
Dimethyl phthalate	ug/l	~	~	~	~	<1
Pesticides MS						
Organochlorine Pesticides						
Aldrin	ug/l	~	0.01	~	~	<0.01
Alpha-BHC	ug/l	~	0.1#	~	~	<0.01
Beta-BHC	ug/l	~	0.1#	~	~	<0.01
Chlorothalonil	ug/l	~	0.1#	~	~	~
cis-Chlordane	ug/l	~	0.1#	~	~	~
Dieldrin	ug/l	0.075	0.01	~	~	<0.01
Endosulphan I	ug/l	~	0.001^	0.01^	~	<0.01
Endosulphan II	ug/l	~	0.001^	0.01^	~	<0.01
Endosulphan sulphate	ug/l	~	0.001^	0.01^	~	<0.01
Endrin	ug/l	~	0.1#	~	~	<0.01
Gamma-BHC	ug/l	~	0.1#	~	~	<0.01
Heptachlor	ug/l	~	0.1#	~	~	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	~	~	<0.01
Hexachlorobenzene	ug/l	~	0.1#	0.05	~	~
Isodrin	ug/l	~	0.1#	~	~	~
o,p'-DDE	ug/l	~	0.1#	~	~	~
o,p'-DDT	ug/l	~	0.1#	~	~	~
o,p'-Methoxychlor	ug/l	~	0.1#	~	~	~
o,p'-TDE	ug/l	~	0.1#	~	~	~
p,p'-DDE	ug/l	~	0.1#	~	~	<0.01
p,p'-DDT	ug/l	0.075	0.1#	~	~	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	~	~	<0.01
p,p'-TDE	ug/l	~	0.1#	~	~	<0.01
Pendimethalin	ug/l	~	0.1#	~	~	~
Permethrin I	ug/l	~	20+	~	~	~
Permethrin II	ug/l	~	20+	~	~	~
Quintozene	ug/l	~	0.1#	~	~	~
Tecnazene	ug/l	~	0.1#	~	~	~
Telodrin	ug/l	~	0.1#	~	~	~
trans-Chlordane	ug/l	~	0.1#	~	~	~
Triadimefon	ug/l	~	0.1#	~	~	~
Triallate	ug/l	~	0.1#	~	~	~
Trifluralin	ug/l	~	0.1	~	~	~

Notes:

1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2012.
2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report. EPA, Ireland.
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∆1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromethane and bromoform.
∆2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
∆3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
** denotes IGV relates to 'dichloroethene'.
*** denotes orthophosphate
NAC - No Abnormal Change
^ denotes alpha-endosulphan
+ denotes permethrin
# denotes non-specific individual pesticide value
++ Result outside calibration range, results should be considered as indicative only and are not accredited

Tier III Exploratory Investigation

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Table 13: Leachate Analytical Results

Sample Identity		**Groundwater Standards**		Surface Water Standards	**BH8**	**BH8**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	**Jones 15/6769**	**Jones 15/6977**
Laboratory Sample No.					**15-21**	**15-21**
Sample Date					**29/04/2015**	**05/05/2015**
Parameters	**Unit**					
Organophosphorus Pesticides						
Azinphos ethyl	ug/l	~	0.1#	~	-	-
Azinphos methyl	ug/l	~	0.1#	~	~	<0.01
Carbophenothion	ug/l	~	0.1#	~	~	~
Chlorfenvinphos	ug/l	~	5	0.3	~	~
Chlorpyrifos	ug/l	~	90	0.1	~	~
Chlorpyrifos-methyl	ug/l	~	0.1#	~	~	~
Diazinon	ug/l	~	0.1#	0.02	~	<0.01
Dichlorvos	ug/l	~	0.001	~	~	<0.01
Dimethoate	ug/l	~	0.1#	4	-	-
Ethion	ug/l	~	0.1#	~	~	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	~	~	<0.01
Etrimphos	ug/l	~	0.1#	~	-	-
Fenitrothion	ug/l	~	0.1#	~	~	<0.01
Fenthion	ug/l	~	0.1#	~	-	-
Malathion	ug/l	~	0.1#	~	~	<0.01
Methyl Parathion	ug/l	~	0.1#	~	~	<0.01
Mevinphos	ug/l	~	0.1#	~	~	<0.01
Phosalone	ug/l	~	0.1#	~	~	~
Pirimiphos Methyl	ug/l	~	0.1#	~	~	~
Propetamphos	ug/l	~	0.1#	~	~	~
Triazophos	ug/l	~	0.1#	~	~	~
					~	~
Benazolin	ug/l	~	0.1#	~	~	<0.1
Bentazone	ug/l	0.075	0.1#	~	~	<0.1
Bromoxynil	ug/l	~	5	~	~	<0.1
Clopyralid	ug/l	~	0.1#	~	~	<0.1
4- CPA	ug/l	~	0.1#	~	~	<0.1
2,4 – D	ug/l	0.075	0.1#	~	~	<0.1
2,4 –DB	ug/l	~	0.1#	~	~	<0.1
Dicamba	ug/l	~	0.1#	~	~	<0.1
Dichloroprop	ug/l	~	100	~	~	<0.1
Diclofop	ug/l	~	0.1#	~	~	<0.1
Fenoprop	ug/l	~	0.1#	~	~	<0.1
Flamprop	ug/l	~	0.1#	~	~	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	~	~	<0.1
loxynil	ug/l	~	0.1#	~	~	<0.1
MCPA	ug/l	0.075	0.1#	~	~	<0.1
MCPB	ug/l	~	0.1#	~	~	<0.1
Mecoprop	ug/l	0.075	10	~	~	<0.1
Picloram	ug/l	~	0.1#	~	~	<0.1
Pentachlorophenol	ug/l	~	0.1#	~	~	<0.1
2,4,5 – T	ug/l	~	0.1#	~	~	<0.1
2,3,6 – TBA	ug/l	~	0.1#	~	~	<0.1
Triclopyr	ug/l	~	0.1#	~	~	<0.1
Atrazine	ug/l	0.075	1	2	~	<1
Simazine	ug/l	0.075	1	4	~	<1
Fluoride	mg/l	~	1	~	~	~
Sulphate	mg/l	187.5	~	~	98.15	54.21
Chloride	mg/l	187.5	30	~	31.7	26.0
Total Oxidised Nitrogen as N	mg/l	~	~	~	~	
Total Cyanide	mg/l	0.0375	0.01	~	~	
Ammoniacal Nitrogen as N	mg/l	0.175	0.12	0.065	**2.22**	**2.54**
COD (Settled)	mg/l	~	~	~	~	~
Total Organic Carbon	mg/l	~	~	~	12	14
BOD	mg/l	~	~	1.5	8	27

Notes:
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Tier III Exploratory Investigation

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Table 13: Leachate Analytical Results

Sample Identity		**Groundwater Standards**		Surface Water Standards	**BH10**	**BH10**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	**Jones 15/6769**	**Jones 15/6977**
Laboratory Sample No.					**22-28**	**22-28**
Sample Date					**29/04/2015**	**05/05/2015**
Parameters	**Unit**					
Field Measured Parameters						
pH	pH units	~	6.5-9.5	6.0-9.0	6.61	6.81
Electrical Conductivity	µS/cm	800 # / 1875	~	~	1245.6	1051.5
Dissolved Oxygen	%	~	NAC	80-120	9.3	22.3
Dissolved Oxygen	ppm	~	NAC	~	1.02	2.5
Temperature	ºC	~	25ºC	~	10.91	9.02
Oxidation Reduction Potential	mV	~	~	~	-71.1	-60.3
Colour	N/A	~	NAC	~	Very silty	Silty
Odour	N/A	~	~	~	Slight organic odour	No odour
Other observations	N/A	~	~	~	None	None
Metals (dissolved)						
Dissolved Arsenic	ug/l	7.5	10	~	~	~
Dissolved Boron	ug/l	750	1000	~	~	~
Dissolved Cadmium	ug/l	3.75	5	1.5	~	~
Dissolved Calcium	mg/l	~	200	~	~	~
Total Dissolved Chromium	ug/l	37.5	30	~	~	~
Dissolved Copper	ug/l	1500	30	~	~	~
Total Dissolved Iron	ug/l	~	200	~	~	~
Dissolved Lead	ug/l	18.75	10	~	~	~
Dissolved Magnesium	mg/l	~	50	~	~	~
Dissolved Manganese	ug/l	~	50	~	~	~
Dissolved Mercury	ug/l	0.75	1	0.07	~	~
Dissolved Nickel	ug/l	15	20	~	~	~
Dissolved Potassium	mg/l	~	5	~	7	7.7
Dissolved Sodium	mg/l	150	150	~	64.4	19.5
Dissolved Zinc	ug/l	~	100	~	~	~
MRP as Total Phosphorus	ug/l	35	30***	35	~	~
Total Aluminium	ug/l	~	~	~	20180	5796
Total Iron	ug/l	~	~	~	96040	29420
Total Manganese	ug/l	~	~	~	5377	2489
Volatile Organic Compounds (VOCs) MS						
Dichlorodifluoromethane	ug/l	~	~	~	~	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	~	~	<0.1
Chloromethane	ug/l	~	~	~	~	<3
Vinyl Chloride	ug/l	0.375	~	~	~	<0.1
Bromomethane	ug/l	~	~	~	~	<1
Chloroethane	ug/l	~	~	~	~	<3
Trichlorofluoromethane	ug/l	~	~	~	~	<3
1,1-Dichloroethene	ug/l	~	30**	~	~	<3
Dichloromethane	ug/l	~	10	~	~	<3
trans-1-2-Dichloroethene	ug/l	~	30**	~	~	<3
1,1-Dichloroethane	ug/l	~	~	~	~	<3
cis-1-2-Dichloroethene	ug/l	~	30**	~	~	<3
2,2-Dichloropropane	ug/l	~	~	~	~	<1
Bromochloromethane	ug/l	~	~	~	~	<2
Chloroform	ug/l	75 Δ1	~	~	~	<2
1,1,1-Trichloroethane	ug/l	~	500	~	~	<2
1,1-Dichloropropene	ug/l	~	~	~	~	<3
Carbon tetrachloride	ug/l	~	~	~	~	<2
1,2-Dichloroethane	ug/l	2.25	3	~	~	<2
Benzene	ug/l	0.75	1	50	~	<0.5
Trichloroethene	ug/l	7.5 Δ2	70	~	~	<3
1,2-Dichloropropane	ug/l	~	~	~	~	<2
Dibromomethane	ug/l	~	~	~	~	<3
Bromodichloromethane	ug/l	~	~	~	~	<2
cis-1-3-Dichloropropene	ug/l	~	~	~	~	<2
Toluene	ug/l	~	10	~	~	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	~	~	<2
1,1,2-Trichloroethane	ug/l	~	~	~	~	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	~	~	<3
1,3-Dichloropropane	ug/l	~	~	~	~	<2
Dibromochloromethane	ug/l	75 Δ1	~	~	~	<2
1,2-Dibromoethane	ug/l	~	~	~	~	<2
Chlorobenzene	ug/l	~	1	~	~	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	~	~	<2
Ethylbenzene	ug/l	~	10	~	~	<0.5
p/m-Xylene	ug/l	~	10 Δ3	~	~	<1
o-Xylene	ug/l	~	10 Δ3	~	~	<0.5
Styrene	ug/l	~	~	~	~	<2
Bromoform	ug/l	75 Δ1	~	~	~	<2
Isopropylbenzene	ug/l	~	~	~	~	<3
1,1,2,2-Tetrachloroethane	ug/l	~	~	~	~	<4
Bromobenzene	ug/l	~	~	~	~	<2
1,2,3-Trichloropropane	ug/l	~	~	~	~	<3
Propylbenzene	ug/l	~	~	~	~	<3
2-Chlorotoluene	ug/l	~	~	~	~	<3
1,3,5-Trimethylbenzene	ug/l	~	~	~	~	<3
4-Chlorotoluene	ug/l	~	~	~	~	<3
tert-Butylbenzene	ug/l	~	~	~	~	<3
1,2,4-Trimethylbenzene	ug/l	~	~	~	~	<3
sec-Butylbenzene	ug/l	~	~	~	~	<3
4-Isopropyltoluene	ug/l	~	~	~	~	<3
1,3-Dichlorobenzene	ug/l	~	~	~	~	<3
1,4-Dichlorobenzene	ug/l	~	~	~	~	<3
n-Butylbenzene	ug/l	~	~	~	~	<3
1,2-Dichlorobenzene	ug/l	~	10	~	~	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	~	~	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	~	~	<3
Hexachlorobutadiene	ug/l	~	0.1	~	~	<3
1,2,3-Trichlorobenzene	ug/l	~	~	~	~	<3
Surrogate Recovery Toluene D8	%	~	~	~	~	86
Surrogate Recovery 4-Bromofluorobenzene	%	~	~	~	~	87

Notes:

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Tier III Exploratory Investigation

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Table 13: Leachate Analytical Results

Sample Identity		Groundwater Standards		Surface Water Standards	BH10	BH10
Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	Jones 15/6769	Jones 15/6977
Laboratory Sample No.					22-28	22-28
Sample Date					29/04/2015	05/05/2015
Parameters	**Unit**					
Semi-Volatile Organic Compounds (SVOCs)						
Phenols						
2-Chlorophenol	ug/l	~	200	~	~	<1
2-Methylphenol	ug/l	~	~	~	~	<0.5
2-Nitrophenol	ug/l	~	~	~	~	<0.5
2,4-Dichlorophenol	ug/l	~	~	~	~	<0.5
2,4-Dimethylphenol	ug/l	~	~	~	~	<1
2,4,5-Trichlorophenol	ug/l	~	~	~	~	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	~	~	<1
4-Chloro-3-methylphenol	ug/l	~	~	~	~	<0.5
4-Methylphenol	ug/l	~	~	~	~	<1
4-Nitrophenol	ug/l	~	~	~	~	<10
Pentachlorophenol	ug/l	~	2	1	~	<1
Phenol	ug/l	~	0.5*	46	~	<1
Polycyclic Aromatic Hydrocarbons (PAHs)						
2-Chloronaphthalene	ug/l	~	~	~	-	<1
2-Methylnaphthalene	ug/l	~	~	~	-	<1
Naphthalene	ug/l	~	1	~	-	<1
Acenaphthylene	ug/l	~	~	~	-	<0.5
Acenaphthene	ug/l	~	~	~	-	<1
Fluorene	ug/l	~	~	~	-	<0.5
Phenanthrene	ug/l	~	~	~	-	<0.5
Anthracene	ug/l	~	10000	0.4	-	<0.5
Fluoranthene	ug/l	~	1	1	-	<0.5
Pyrene	ug/l	~	~	~	-	<0.5
Benzo(a)anthracene	ug/l	~	~	~	-	<0.5
Chrysene	ug/l	~	~	~	-	<0.5
Benzo(bk)fluoranthene	ug/l	~	~	~	-	<1
Benzo(a)pyrene	ug/l	0.0075	0.01	0.1	-	<1
Indeno(123cd)pyrene	ug/l	~	~	~	-	<1
Dibenzo(ah)anthracene	ug/l	~	~	~	-	<0.5
Benzo(ghi)perylene	ug/l	~	0.05	~	-	<0.5
PAH 16 Total		~	~	~	-	-
Benzo(b)flouranthene		~	~	~	-	-
Benzo(k)flouranthene		~	~	~	-	-
Other SVOCs						
1,2-Dichlorobenzene	ug/l	~	10	~	~	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	~	~	<1
1,3-Dichlorobenzene	ug/l	~	~	~	~	<1
1,4-Dichlorobenzene	ug/l	~	~	~	~	<1
2-Nitroaniline	ug/l	~	~	~	~	<1
2,4-Dinitrotoluene	ug/l	~	~	~	~	<0.5
2,6-Dinitrotoluene	ug/l	~	~	~	~	<1
3-Nitroaniline	ug/l	~	~	~	~	<1
4-Bromophenylphenylether	ug/l	~	~	~	~	<1
4-Chloroaniline	ug/l	~	~	~	~	<1
4-Chlorophenylphenylether	ug/l	~	~	~	~	<1
4-Nitroaniline	ug/l	~	~	~	~	<0.5
Azobenzene	ug/l	~	~	~	~	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	~	~	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	~	~	<1
Carbazole	ug/l	~	~	~	~	<0.5
Dibenzofuran	ug/l	~	~	~	~	<0.5
Hexachlorobenzene	ug/l	~	0.03	0.05	~	<1
Hexachlorobutadiene	ug/l	~	0.1	0.6	~	<1
Hexachlorocyclopentadiene	ug/l	~	~	~	~	<1
Hexachloroethane	ug/l	~	~	~	~	<1
Isophorone	ug/l	~	~	~	~	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	~	~	<0.5
Nitrobenzene	ug/l	~	10	~	~	<1
Phthalates						
Bis(2-ethylhexyl) phthalate	ug/l	~	8	~	~	<5
Butylbenzyl phthalate	ug/l	~	~	~	~	<1
Di-n-butyl phthalate	ug/l	~	2	~	~	<1.5
Di-n-Octyl phthalate	ug/l	~	~	~	~	<1
Diethyl phthalate	ug/l	~	~	~	~	<1
Dimethyl phthalate	ug/l	~	~	~	~	<1
Pesticides MS						
Organochlorine Pesticides						
Aldrin	ug/l	~	0.01	~	~	<0.01
Alpha-BHC	ug/l	~	0.1#	~	~	<0.01
Beta-BHC	ug/l	~	0.1#	~	~	<0.01
Chlorothalonil	ug/l	~	0.1#	~	~	~
cis-Chlordane	ug/l	~	0.1#	~	~	~
Dieldrin	ug/l	0.075	0.01	~	~	<0.01
Endosulphan I	ug/l	~	0.001^	0.01^	~	<0.01
Endosulphan II	ug/l	~	0.001^	0.01^	~	<0.01
Endosulphan sulphate	ug/l	~	0.001^	0.01^	~	<0.01
Endrin	ug/l	~	0.1#	~	~	<0.01
Gamma-BHC	ug/l	~	0.1#	~	~	<0.01
Heptachlor	ug/l	~	0.1#	~	~	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	~	~	<0.01
Hexachlorobenzene	ug/l	~	0.1#	0.05	~	~
Isodrin	ug/l	~	0.1#	~	~	~
o,p'-DDE	ug/l	~	0.1#	~	~	~
o,p'-DDT	ug/l	~	0.1#	~	~	~
o,p'-Methoxychlor	ug/l	~	0.1#	~	~	~
o,p'-TDE	ug/l	~	0.1#	~	~	~
p,p'-DDE	ug/l	~	0.1#	~	~	<0.01
p,p'-DDT	ug/l	0.075	0.1#	~	~	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	~	~	<0.01
p,p'-TDE	ug/l	~	0.1#	~	~	<0.01
Pendimethalin	ug/l	~	0.1#	~	~	~
Permethrin I	ug/l	~	20+	~	~	~
Permethrin II	ug/l	~	20+	~	~	~
Quintozene	ug/l	~	0.1#	~	~	~
Tecnazene	ug/l	~	0.1#	~	~	~
Telodrin	ug/l	~	0.1#	~	~	~
trans-Chlordane	ug/l	~	0.1#	~	~	~
Triadimefon	ug/l	~	0.1#	~	~	~
Triallate	ug/l	~	0.1#	~	~	~
Trifluralin	ug/l	~	0.1	~	~	~

Notes:

1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2012.
2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report. EPA, Ireland.
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∆3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
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*** denotes orthophosphate
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^ denotes alpha-endosulphan
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Tier III Exploratory Investigation

SDCC
Watesrtown Co. Dublin,

Table 13: Leachate Analytical Results

Sample Identity		**Groundwater Standards**		Surface Water Standards	**BH10**	**BH10**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	**Jones 15/6769**	**Jones 15/6977**
Laboratory Sample No.					**22-28**	**22-28**
Sample Date					**29/04/2015**	**05/05/2015**
Parameters	**Unit**					
Organophosphorus Pesticides						
Azinphos ethyl	ug/l	~	0.1#	~	-	-
Azinphos methyl	ug/l	~	0.1#	~	~	<0.01
Carbophenothion	ug/l	~	0.1#	~	~	~
Chlorfenvinphos	ug/l	~	5	0.3	~	~
Chlorpyrifos	ug/l	~	90	0.1	~	~
Chlorpyrifos-methyl	ug/l	~	0.1#	~	~	~
Diazinon	ug/l	~	0.1#	0.02	~	<0.01
Dichlorvos	ug/l	~	0.001	~	~	<0.01
Dimethoate	ug/l	~	0.1#	4	-	-
Ethion	ug/l	~	0.1#	~	~	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	~	~	<0.01
Etrimphos	ug/l	~	0.1#	~	-	-
Fenitrothion	ug/l	~	0.1#	~	~	<0.01
Fenthion	ug/l	~	0.1#	~	-	-
Malathion	ug/l	~	0.1#	~	~	<0.01
Methyl Parathion	ug/l	~	0.1#	~	~	<0.01
Mevinphos	ug/l	~	0.1#	~	~	<0.01
Phosalone	ug/l	~	0.1#	~	~	~
Pirimiphos Methyl	ug/l	~	0.1#	~	~	~
Propetamphos	ug/l	~	0.1#	~	~	~
Triazophos	ug/l	~	0.1#	~	~	~
					~	~
Benazolin	ug/l	~	0.1#	~	~	<0.1
Bentazone	ug/l	0.075	0.1#	~	~	<0.1
Bromoxynil	ug/l	~	5	~	~	<0.1
Clopyralid	ug/l	~	0.1#	~	~	<0.1
4- CPA	ug/l	~	0.1#	~	~	<0.1
2,4 – D	ug/l	0.075	0.1#	~	~	<0.1
2,4 –DB	ug/l	~	0.1#	~	~	<0.1
Dicamba	ug/l	~	0.1#	~	~	<0.1
Dichloroprop	ug/l	~	100	~	~	<0.1
Diclofop	ug/l	~	0.1#	~	~	<0.1
Fenoprop	ug/l	~	0.1#	~	~	<0.1
Flamprop	ug/l	~	0.1#	~	~	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	~	~	<0.1
Ioxynil	ug/l	~	0.1#	~	~	<0.1
MCPA	ug/l	0.075	0.1#	~	~	<0.1
MCPB	ug/l	~	0.1#	~	~	<0.1
Mecoprop	ug/l	0.075	10	~	~	<0.1
Picloram	ug/l	~	0.1#	~	~	<0.1
Pentachlorophenol	ug/l	~	0.1#	~	~	<0.1
2,4,5 – T	ug/l	~	0.1#	~	~	<0.1
2,3,6 – TBA	ug/l	~	0.1#	~	~	<0.1
Triclopyr	ug/l	~	0.1#	~	~	<0.1
Atrazine	ug/l	0.075	1	2	~	<1
Simazine	ug/l	0.075	1	4	~	<1
Fluoride	mg/l	~	1	~	~	~
Sulphate	mg/l	187.5	~	~	20.07	49.45
Chloride	mg/l	187.5	30	~	93.3	22.9
Total Oxidised Nitrogen as N	mg/l	~	~	~	~	
Total Cyanide	mg/l	0.0375	0.01	~	~	
Ammoniacal Nitrogen as N	mg/l	0.175	0.12	0.065	**8.38**	**6.37**
COD (Settled)	mg/l	~	~	~	~	~
Total Organic Carbon	mg/l	~	~	~	50	18
BOD	mg/l	~	~	1.5	63	29

Notes:
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NAC - No Abnormal Change
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# denotes non-specific individual pesticide value
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Table 13: Leachate Analytical Results

Sample Identity		**Groundwater Standards**		Surface Water Standards	**BH11**	**BH11**
Laboratory Report No.					**Jones 15/6769**	**Jones 15/6977**
Laboratory Sample No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	**1-7**	**8-14**
Sample Date					**29/04/2015**	**03/05/2015**
Parameters	**Unit**					
Field Measured Parameters						
pH	pH units	~	6.5-9.5	6.0-9.0	6.61	6.71
Electrical Conductivity	µS/cm	800 # / 1875	~	~	1358.4	1388.6
Dissolved Oxygen	%	~	NAC	80-120	11.6	9
Dissolved Oxygen	ppm	~	NAC	~	1.26	0.96
Temperature	ºC	~	25ºC	~	10.9	10.7
Oxidation Reduction Potential	mV	~	~	~	-76.3	-79.9
Colour	N/A	~	NAC	~	Very silty	Silty
Odour	N/A	~	~	~	Organic odour	Odourless
Other observations	N/A	~	~	~	None	None
Metals (dissolved)						
Dissolved Arsenic	ug/l	7.5	10	~	3.4	6
Dissolved Boron	ug/l	750	1000	~	674	661
Dissolved Cadmium	ug/l	3.75	5	1.5	0.44	0.31
Dissolved Calcium	mg/l	~	200	~	182.7	175.5
Total Dissolved Chromium	ug/l	37.5	30	~	<0.2	<1.5
Dissolved Copper	ug/l	1500	30	~	<7	15
Total Dissolved Iron	ug/l	~	200	~	675	
Dissolved Lead	ug/l	18.75	10	~	<5	<5
Dissolved Magnesium	mg/l	~	50	~	38.4	34.9
Dissolved Manganese	ug/l	~	50	~	849	840
Dissolved Mercury	ug/l	0.75	1	0.07	<0.5	<0.5
Dissolved Nickel	ug/l	15	20	~	**48**	**51**
Dissolved Potassium	mg/l	~	5	~	12.1	11.5
Dissolved Sodium	mg/l	150	150	~	**190.1**	**176.3**
Dissolved Zinc	ug/l	~	100	~	19	57
MRP as Total Phosphorus	ug/l	35	30***	35	**61**	**1307**
Total Aluminium	ug/l	~	~	~	~	~
Total Iron	ug/l	~	~	~	~	~
Total Manganese	ug/l	~	~	~	~	~
Volatile Organic Compounds (VOCs) MS						
Dichlorodifluoromethane	ug/l	~	~	~	<2	<2
Methyl Tertiary Butyl Ether	ug/l	~	30	~	<0.1	<0.1
Chloromethane	ug/l	~	~	~	<3	<3
Vinyl Chloride	ug/l	0.375	~	~	<0.1	<0.1
Bromomethane	ug/l	~	~	~	<1	<1
Chloroethane	ug/l	~	~	~	<3	<3
Trichlorofluoromethane	ug/l	~	~	~	<3	<3
1,1-Dichloroethene	ug/l	~	30**	~	<3	<3
Dichloromethane	ug/l	~	10	~	<3	<3
trans-1-2-Dichloroethene	ug/l	~	30**	~	<3	<3
1,1-Dichloroethane	ug/l	~	~	~	<3	<3
cis-1-2-Dichloroethene	ug/l	~	30**	~	<3	<3
2,2-Dichloropropane	ug/l	~	~	~	<1	<1
Bromochloromethane	ug/l	~	~	~	<2	<2
Chloroform	ug/l	75 Δ1	~	~	<2	<2
1,1,1-Trichloroethane	ug/l	~	500	~	<2	<2
1,1-Dichloropropene	ug/l	~	~	~	<2	<3
Carbon tetrachloride	ug/l	~	~	~	<2	<2
1,2-Dichloroethane	ug/l	2.25	3	~	<2	<2
Benzene	ug/l	0.75	1	50	<0.5	<0.5
Trichloroethene	ug/l	7.5 Δ2	70	~	<3	<3
1,2-Dichloropropane	ug/l	~	~	~	<2	<2
Dibromomethane	ug/l	~	~	~	<3	<3
Bromodichloromethane	ug/l	~	~	~	<2	<2
cis-1-3-Dichloropropene	ug/l	~	~	~	<2	<2
Toluene	ug/l	~	10	~	<0.5	<0.5
trans-1-3-Dichloropropene	ug/l	~	~	~	<2	<2
1,1,2-Trichloroethane	ug/l	~	~	~	<2	<2
Tetrachloroethene	ug/l	7.5 Δ2	40	~	<3	<3
1,3-Dichloropropane	ug/l	~	~	~	<2	<2
Dibromochloromethane	ug/l	75 Δ1	~	~	<2	<2
1,2-Dibromoethane	ug/l	~	~	~	<2	<2
Chlorobenzene	ug/l	~	1	~	<2	<2
1,1,1,2-Tetrachloroethane	ug/l	~	~	~	<2	<2
Ethylbenzene	ug/l	~	10	~	<0.5	<0.5
p/m-Xylene	ug/l	~	10 Δ3	~	<1	<1
o-Xylene	ug/l	~	10 Δ3	~	<0.5	<0.5
Styrene	ug/l	~	~	~	<2	<2
Bromoform	ug/l	75 Δ1	~	~	<2	<2
Isopropylbenzene	ug/l	~	~	~	<3	<3
1,1,2,2-Tetrachloroethane	ug/l	~	~	~	<4	<4
Bromobenzene	ug/l	~	~	~	<2	<2
1,2,3-Trichloropropane	ug/l	~	~	~	<3	<3
Propylbenzene	ug/l	~	~	~	<3	<3
2-Chlorotoluene	ug/l	~	~	~	<3	<3
1,3,5-Trimethylbenzene	ug/l	~	~	~	<3	<3
4-Chlorotoluene	ug/l	~	~	~	<3	<3
tert-Butylbenzene	ug/l	~	~	~	<3	<3
1,2,4-Trimethylbenzene	ug/l	~	~	~	<3	<3
sec-Butylbenzene	ug/l	~	~	~	<3	<3
4-Isopropyltoluene	ug/l	~	~	~	<3	<3
1,3-Dichlorobenzene	ug/l	~	~	~	<3	<3
1,4-Dichlorobenzene	ug/l	~	~	~	<3	<3
n-Butylbenzene	ug/l	~	~	~	<3	<3
1,2-Dichlorobenzene	ug/l	~	10	~	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	~	~	~	<2	<2
1,2,4-Trichlorobenzene	ug/l	~	0.4	~	<3	<3
Hexachlorobutadiene	ug/l	~	0.1	~	<3	<3
1,2,3-Trichlorobenzene	ug/l	~	~	~	<3	<3
Surrogate Recovery Toluene D8	%	~	~	~	97	93
Surrogate Recovery 4-Bromofluorobenzene	%	~	~	~	96	99

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Tier III Exploratory Investigation

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Watesrtown Co. Dublin,

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Laboratory Report No.		Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	Jones 15/6769	Jones 15/6977
Laboratory Sample No.					1-7	8-14
Sample Date					29/04/2015	03/05/2015
Parameters	**Unit**					
Semi-Volatile Organic Compounds (SVOCs)						
Phenols						
2-Chlorophenol	ug/l	~	200	~	<1	<1
2-Methylphenol	ug/l	~	~	~	<0.5	<0.5
2-Nitrophenol	ug/l	~	~	~	<0.5	<0.5
2,4-Dichlorophenol	ug/l	~	~	~	<0.5	<0.5
2,4-Dimethylphenol	ug/l	~	~	~	<1	<1
2,4,5-Trichlorophenol	ug/l	~	~	~	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	~	200	~	<1	<1
4-Chloro-3-methylphenol	ug/l	~	~	~	<0.5	<0.5
4-Methylphenol	ug/l	~	~	~	<1	<1
4-Nitrophenol	ug/l	~	~	~	<10	<10
Pentachlorophenol	ug/l	~	2	1	<1	<1
Phenol	ug/l	~	0.5*	46	<1	<1
Polycyclic Aromatic Hydrocarbons (PAHs)						
2-Chloronaphthalene	ug/l	~	~	~	<1	<1
2-Methylnaphthalene	ug/l	~	~	~	<1	<1
Naphthalene	ug/l	~	1	~	0.490	0.100
Acenaphthylene	ug/l	~	~	~	0.020	0.020
Acenaphthene	ug/l	~	~	~	<0.013	0.060
Fluorene	ug/l	~	~	~	0.020	0.050
Phenanthrene	ug/l	~	~	~	0.070	0.130
Anthracene	ug/l	~	10000	0.4	<0.013	0.020
Fluoranthene	ug/l	~	1	1	0.040	0.030
Pyrene	ug/l	~	~	~	0.040	0.030
Benzo(a)anthracene	ug/l	~	~	~	0.030	<0.015
Chrysene	ug/l	~	~	~	0.020	<0.011
Benzo(bk)fluoranthene	ug/l	~	~	~	<0.018	<0.018
Benzo(a)pyrene	ug/l	0.0075	0.01	0.1	<0.016	<0.016
Indeno(123cd)pyrene	ug/l	~	~	~	<0.011	<0.011
Dibenzo(ah)anthracene	ug/l	~	~	~	<0.01	<0.01
Benzo(ghi)perylene	ug/l	~	0.05	~	<0.011	<0.011
PAH 16 Total		~	~	~	0.730	0.440
Benzo(b)flouranthene		~	~	~	<0.01	<0.01
Benzo(k)flouranthene		~	~	~	<0.01	<0.01
Other SVOCs						
1,2-Dichlorobenzene	ug/l	~	10	~	<1	<1
1,2,4-Trichlorobenzene	ug/l	~	0.4	~	<1	<1
1,3-Dichlorobenzene	ug/l	~	~	~	<1	<1
1,4-Dichlorobenzene	ug/l	~	~	~	<1	<1
2-Nitroaniline	ug/l	~	~	~	<1	<1
2,4-Dinitrotoluene	ug/l	~	~	~	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	~	~	~	<1	<1
3-Nitroaniline	ug/l	~	~	~	<1	<1
4-Bromophenylphenylether	ug/l	~	~	~	<1	<1
4-Chloroaniline	ug/l	~	~	~	<1	<1
4-Chlorophenylphenylether	ug/l	~	~	~	<1	<1
4-Nitroaniline	ug/l	~	~	~	<0.5	<0.5
Azobenzene	ug/l	~	~	~	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	~	~	~	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l	~	~	~	<1	<1
Carbazole	ug/l	~	~	~	<0.5	<0.5
Dibenzofuran	ug/l	~	~	~	<0.5	<0.5
Hexachlorobenzene	ug/l	~	0.03	0.05	<1	<1
Hexachlorobutadiene	ug/l	~	0.1	0.6	<1	<1
Hexachlorocyclopentadiene	ug/l	~	~	~	<1	<1
Hexachloroethane	ug/l	~	~	~	<1	<1
Isophorone	ug/l	~	~	~	<0.5	<0.5
N-nitrosodi-n-propylamine	ug/l	~	~	~	<0.5	<0.5
Nitrobenzene	ug/l	~	10	~	<1	<1
Phthalates						
Bis(2-ethylhexyl) phthalate	ug/l	~	8	~	<5	<5
Butylbenzyl phthalate	ug/l	~	~	~	<1	<1
Di-n-butyl phthalate	ug/l	~	2	~	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	~	~	~	<1	<1
Diethyl phthalate	ug/l	~	~	~	<1	<1
Dimethyl phthalate	ug/l	~	~	~	<1	<1
Pesticides MS						
Organochlorine Pesticides						
Aldrin	ug/l	~	0.01	~	<0.01	<0.01
Alpha-BHC	ug/l	~	0.1#	~	<0.01	<0.01
Beta-BHC	ug/l	~	0.1#	~	<0.01	<0.01
Chlorothalonil	ug/l	~	0.1#	~	<0.01	~
cis-Chlordane	ug/l	~	0.1#	~	<0.01	~
Dieldrin	ug/l	0.075	0.01	~	<0.01	<0.01
Endosulphan I	ug/l	~	0.001^	0.01^	<0.01	<0.01
Endosulphan II	ug/l	~	0.001^	0.01^	<0.01	<0.01
Endosulphan sulphate	ug/l	~	0.001^	0.01^	<0.01	<0.01
Endrin	ug/l	~	0.1#	~	<0.01	<0.01
Gamma-BHC	ug/l	~	0.1#	~	<0.01	<0.01
Heptachlor	ug/l	~	0.1#	~	<0.01	<0.01
Heptachlor Epoxide	ug/l	~	0.1#	~	<0.01	<0.01
Hexachlorobenzene	ug/l	~	0.1#	0.05	~	~
Isodrin	ug/l	~	0.1#	~	~	~
o,p'-DDE	ug/l	~	0.1#	~	~	~
o,p'-DDT	ug/l	~	0.1#	~	~	~
o,p'-Methoxychlor	ug/l	~	0.1#	~	~	~
o,p'-TDE	ug/l	~	0.1#	~	~	~
p,p'-DDE	ug/l	~	0.1#	~	<0.01	<0.01
p,p'-DDT	ug/l	0.075	0.1#	~	<0.01	<0.01
p,p'-Methoxychlor	ug/l	~	0.1#	~	<0.01	<0.01
p,p'-TDE	ug/l	~	0.1#	~	<0.01	<0.01
Pendimethalin	ug/l	~	0.1#	~	~	~
Permethrin I	ug/l	~	20+	~	~	~
Permethrin II	ug/l	~	20+	~	~	~
Quintozene	ug/l	~	0.1#	~	~	~
Tecnazene	ug/l	~	0.1#	~	~	~
Telodrin	ug/l	~	0.1#	~	~	~
trans-Chlordane	ug/l	~	0.1#	~	~	~
Triadimefon	ug/l	~	0.1#	~	~	~
Triallate	ug/l	~	0.1#	~	~	~
Trifluralin	ug/l	~	0.1	~	~	~

Notes:

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Shaded denotes value exceeds Surface Water EQS (MAC inland surface waters)
^ denotes upper threshold value used
Δ1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromethane and bromoform.
Δ2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
Δ3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
** denotes IGV relates to 'dichloroethene'.
*** denotes orthophosphate
NAC - No Abnormal Change
^ denotes alpha-endosulphan
+ denotes permethrin
# denotes non-specific individual pesticide value
++ Result outside calibration range, results should be considered as indicative only and are not accredited

Tier III Exploratory Investigation

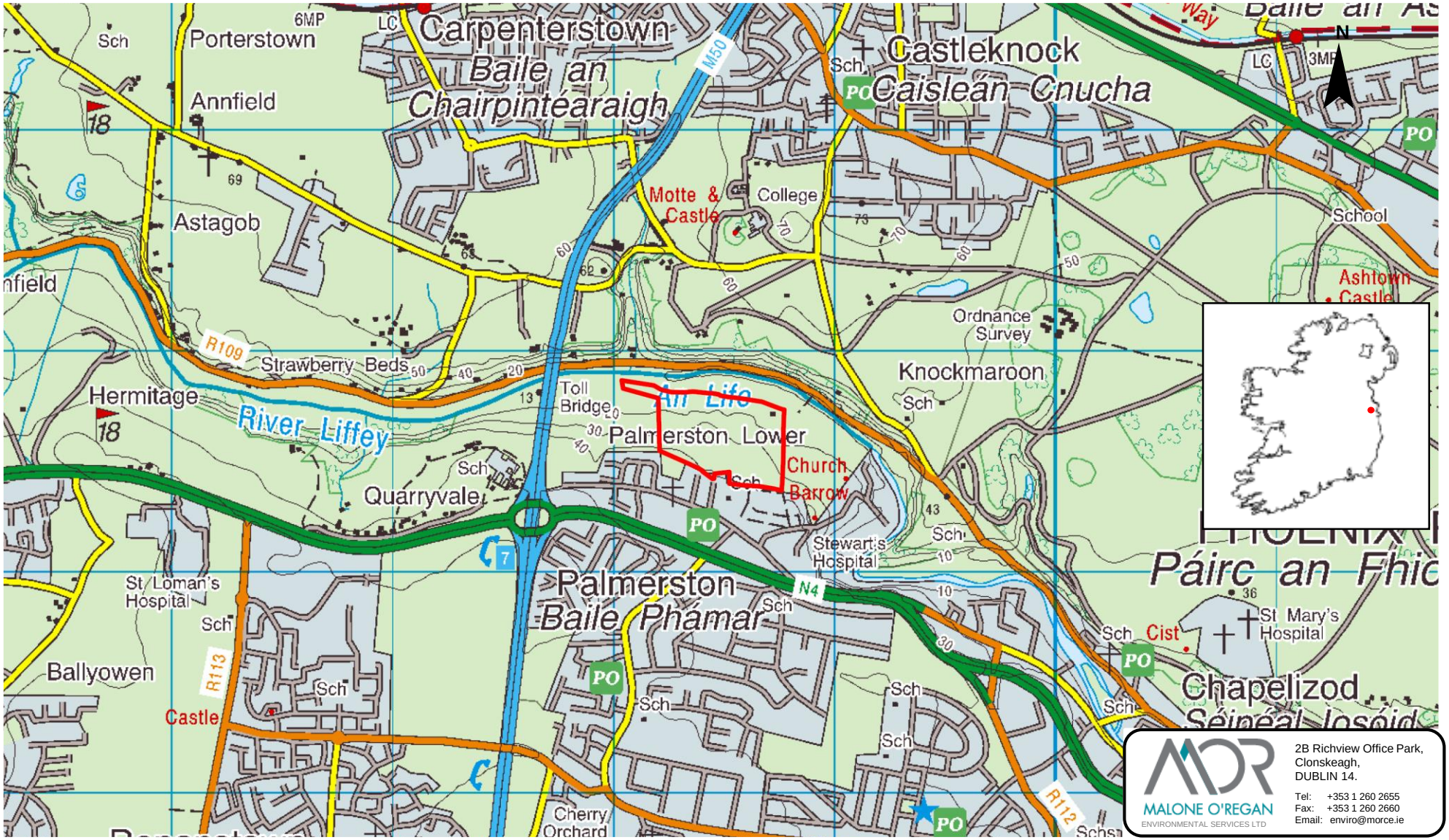
SDCC
Watesrtown Co. Dublin,

Table 13: Leachate Analytical Results

Sample Identity		**Groundwater Standards**		Surface Water Standards	**BH11**	**BH11**
Laboratory Report No.		**Groundwater Regulations 2010 (S.I. No. 9 of 2010)[1]**	EPA Interim Guideline Value (IGV) for Groundwater[2]	Surfacewater Regulations 2012 (S.I. No. 327 of 2012)	**Jones 15/6769**	**Jones 15/6977**
Laboratory Sample No.					**1-7**	**8-14**
Sample Date					**29/04/2015**	**03/05/2015**
Parameters	**Unit**					
Organophosphorus Pesticides						
Azinphos ethyl	ug/l	~	0.1#	~	-	-
Azinphos methyl	ug/l	~	0.1#	~	<0.01	<0.01
Carbophenothion	ug/l	~	0.1#	~	~	~
Chlorfenvinphos	ug/l	~	5	0.3	~	~
Chlorpyrifos	ug/l	~	90	0.1	~	~
Chlorpyrifos-methyl	ug/l	~	0.1#	~	~	~
Diazinon	ug/l	~	0.1#	0.02	<0.01	<0.01
Dichlorvos	ug/l	~	0.001	~	<0.01	<0.01
Dimethoate	ug/l	~	0.1#	4	-	-
Ethion	ug/l	~	0.1#	~	<0.01	<0.01
Ethyl Parathion (Parathion)	ug/l	~	0.1#	~	<0.01	<0.01
Etrimphos	ug/l	~	0.1#	~	-	-
Fenitrothion	ug/l	~	0.1#	~	<0.01	<0.01
Fenthion	ug/l	~	0.1#	~	-	-
Malathion	ug/l	~	0.1#	~	<0.01	<0.01
Methyl Parathion	ug/l	~	0.1#	~	<0.01	<0.01
Mevinphos	ug/l	~	0.1#	~	<0.01	<0.01
Phosalone	ug/l	~	0.1#	~	~	~
Pirimiphos Methyl	ug/l	~	0.1#	~	~	~
Propetamphos	ug/l	~	0.1#	~	~	~
Triazophos	ug/l	~	0.1#	~	~	~
					~	~
Benazolin	ug/l	~	0.1#	~	<0.1	<0.1
Bentazone	ug/l	0.075	0.1#	~	<0.1	<0.1
Bromoxynil	ug/l	~	5	~	<0.1	<0.1
Clopyralid	ug/l	~	0.1#	~	<0.1	<0.1
4- CPA	ug/l	~	0.1#	~	<0.1	<0.1
2,4 – D	ug/l	0.075	0.1#	~	<0.1	<0.1
2,4 –DB	ug/l	~	0.1#	~	<0.1	<0.1
Dicamba	ug/l	~	0.1#	~	<0.1	<0.1
Dichloroprop	ug/l	~	100	~	<0.1	<0.1
Diclofop	ug/l	~	0.1#	~	<0.1	<0.1
Fenoprop	ug/l	~	0.1#	~	<0.1	<0.1
Flamprop	ug/l	~	0.1#	~	<0.1	<0.1
Flamprop – isopropyl	ug/l	~	0.1#	~	<0.1	<0.1
Ioxynil	ug/l	~	0.1#	~	<0.1	<0.1
MCPA	ug/l	0.075	0.1#	~	<0.1	<0.1
MCPB	ug/l	~	0.1#	~	<0.1	<0.1
Mecoprop	ug/l	0.075	10	~	<0.1	<0.1
Picloram	ug/l	~	0.1#	~	<0.1	<0.1
Pentachlorophenol	ug/l	~	0.1#	~	<0.1	<0.1
2,4,5 – T	ug/l	~	0.1#	~	<0.1	<0.1
2,3,6 – TBA	ug/l	~	0.1#	~	<0.1	<0.1
Triclopyr	ug/l	~	0.1#	~	<0.1	<0.1
Atrazine	ug/l	0.075	1	2	<1	<1
Simazine	ug/l	0.075	1	4	<1	<1
Fluoride	mg/l	~	1	~	<0.3	0.5
Sulphate	mg/l	187.5	~	~	0.58	10.15
Chloride	mg/l	187.5	30	~	131.1	127.4
Total Oxidised Nitrogen as N	mg/l	~	~	~	<0.2	<0.2
Total Cyanide	mg/l	0.0375	0.01	~	0.02	0.03
Ammoniacal Nitrogen as N	mg/l	0.175	0.12	0.065	**7.29**	**8.32**
COD (Settled)	mg/l	~	~	~	64	201
Total Organic Carbon	mg/l	~	~	~	~	~
BOD	mg/l	~	~	1.5	30	<1

Notes:
1; European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as ammended 2012.
2; Environmental Protection Agency (EPA), 2003. Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report. EPA, Ireland.
3; European Communities Environmental Objectives (Surface Water) Regulations 2009; S.I. No 272 of 2009 and as amended S.I. No 327 of 2012
Bold denotes value exceeds Groundwater regulations.
Underline denotes value exceeds IGV - Only used in the absence of Groundwater regulation value
Shaded denotes value exceeds Surface Water EQS (MAC inland surface waters)
^ denotes upper threshold value used
∆1 denotes quality standard relates Total Trihalomethanes. Total Trihalomethanes includes chloroform, dibromochloromethane and bromoform.
∆2 denotes quality standard relates to the sum of Trichloroethene & Tetrachloroethene.
∆3 denotes quality standard relates to Xylenes
• denotes value was converted for comparison purposes
* denotes IGV relates to 'phenols'.
** denotes IGV relates to 'dichloroethene'.
*** denotes orthophosphate
NAC - No Abnormal Change
^ denotes alpha-endosulphan
+ denotes permethrin
# denotes non-specific individual pesticide value
++ Result outside calibration range, results should be considered as indicative only and are not accredited

DRAWINGS



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Legend

Approximate site boundary

0m 500m 1000m

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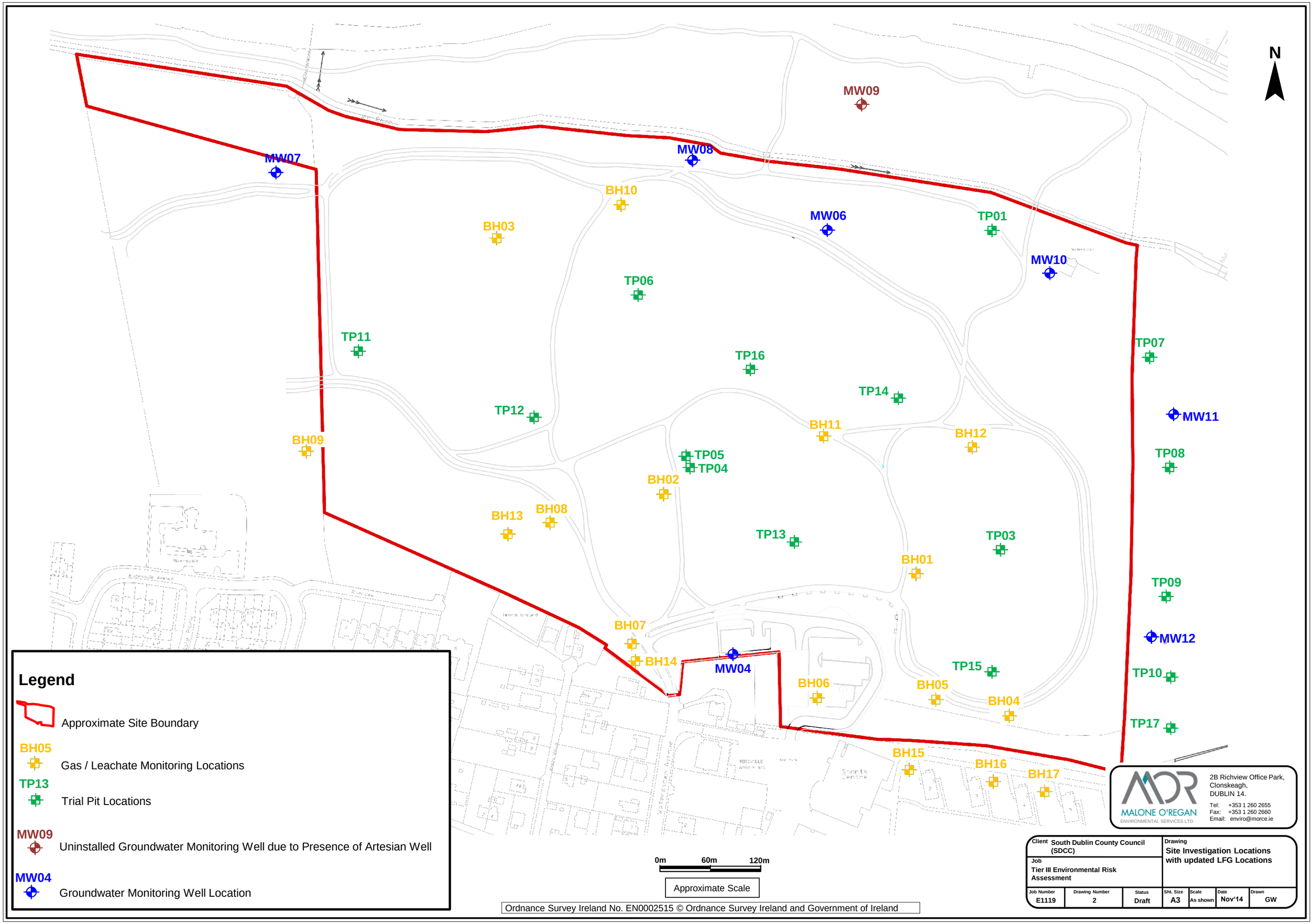
Client: South Dublin County Council (SDCC)			Drawing: Site Location			
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 1	Status: Final	Sht. Size: A4	Scale: As Shown	Date: April'16	Drawn: DD


N
MW09
MW08
MW07
BH10
BH03
MW06
TP01
MW10
TP06
TP11
TP16
TP07
TP14
TP12
MW11
BH11
BH12
BH09
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17
Legend
Approximate Site Boundary
BH05
Gas / Leachate Monitoring Locations
TP13
Trial Pit Locations
MW09
Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
MW04
Groundwater Monitoring Well Location
0m
60m
120m
Approximate Scale
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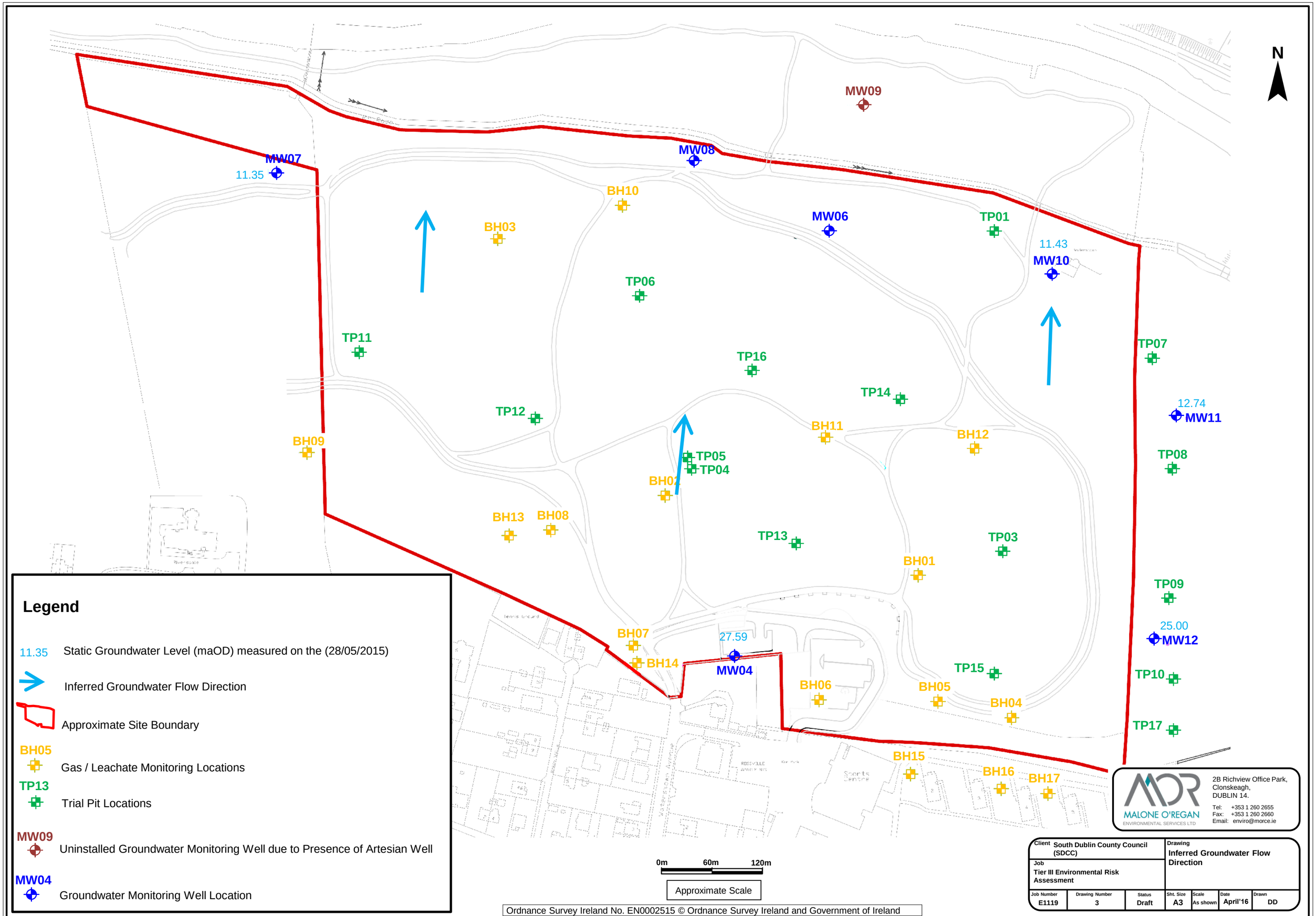
Client South Dublin County Council (SDCC)
Job Tier III Environmental Risk Assessment
Drawing Site Investigation Locations with updated LFG Locations
Job Number E1119
Drawing Number 2
Status Draft
Sht. Size A3
Scale As shown
Date Nov'14
Drawn GW



Legend

- 11.35 — Static Groundwater Level (maOD) measured on the (28/05/2015)
- Inferred Groundwater Flow Direction
- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

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Client	South Dublin County Council (SDCC)
Job	Tier III Environmental Risk Assessment
Drawing	Inferred Groundwater Flow Direction

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	3	Draft	A3	As shown	April'16	DD

N

River Liffey

Mill Stream

SW1

SW2

SW3

SW4

SW5

SW6

Legend

- Approximate River Boundary
- Approximate Site Boundary
- SW2 — Upstream Sampling Points
- SW3 — Sampling Points not used during Tier III Assessment
- SW6 — Downstream Sampling Points

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)			Drawing: Surface Water Monitoring Locations				
Job: Tier 3 Environmental Risk Assessment							
Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn	
E1119	4	Final	A3	As shown	April'16	DD	

WAC Exceedances

N

MW09
MW08
MW07
BH10
MW06
TP01
BH03
MW10
TP06
TP11
TP16
TP14
TP12
BH12
TP02
BH09
TP05
TP04
BH02
BH13
BH08
TP13
BH01
TP03
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

TP4		
Parameter	Criteria	Value
Phenol Index	Inert Waste Acceptance 1mg/kg	7.6mg/kg

TP13		
Parameter	Criteria	Value
Dissolved Molybdenum	Inert Waste Acceptance 0.5mg/kg	0.6mg/kg

TP2		
Parameter	Criteria	Value
Sulphate	Inert Waste Acceptance 1,000mg/kg	7409.1mg/kg
Phenol Index	Inert Waste Acceptance 1mg/kg	37.1mg/kg
Total Dissolved Solids	Inert Waste Acceptance 4,000mg/kg	10542mg/kg

TP17		
Parameter	Criteria	Value
Dissolved Antimony	Inert Waste Acceptance 0.06mg/kg	0.08mg/kg

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Well conditions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)					Drawing: Soil results - WAC Exceedance	
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 5a	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April 16	Drawn: LM

PCB 28

NB: The total 7 PCBs UK SGV assessment criteria of 8ug/kg has been used for this parameter and is the only exceedance in this monitoring event.

N

MW09
MW07
MW08
BH10
MW06
TP01
BH03
MW10
TP06
TP14
December 2012: 27 ug/kg
TP11
TP16
TP07
TP14
TP12
MW11
BH11
BH12
BH09
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Well conditions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)			Drawing: Soil Results Exceedance – PCB 28			
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 5b	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April '16	Drawn: LM

•EPA Interim Guideline Value (IGV) for Groundwater - 0.12 mg/l
•Groundwater Regulations 2010 (S.I. No.9 of 2010) - 0.065mg/l

Ammoniacal Nitrogen as N

N

MW09

MW09
December 2012: N/A
April 2015: <0.01mg/l
May 2015: N/A

MW10
December 2012:N/A
April 2015: 0.85mg/l
May 2015: 0.56mg/l

MW07

MW07
December 2012: N/A
April 2015: 5.37mg/l
May 2015: 6.37mg/l

MW08

MW08
December 2012: N/A
April 2015: 4.57mg/l
May 2015: 1.01mg/l

MW06

MW06
December 2012: 6.62mg/l
April 2015: 4.11mg/l
May 2015: 3.92mg/l

MW11
December 2012: N/A
April 2015: 1.45mg/l
May 2015: 1.86mg/l

MW04
December 2012: 0.15mg/l
April 2015: 0.11mg/l
May 2015: 0.09mg/l

MW12
December 2012: N/A
April 2015: 0.75mg/l
May 2015: 0.51mg/l

BH03 BH09 BH13 BH08 BH02 BH11 BH12 BH01 BH07 BH14 BH06 BH05 BH04 BH15 BH16 BH17

TP01 TP06 TP11 TP16 TP14 TP12 TP05 TP04 TP13 TP03 TP08 TP15 TP10 TP17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Well conditions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client	South Dublin County Council (SDCC)
Job	Tier III Environmental Risk Assessment
Drawing	Groundwater Monitoring Exceedances – Ammoniacal Nitrogen as N

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	6a	Draft	A3	As shown	April'16	DD

Molybdate Reactive Phosphorous (MRP)

- EPA Interim Guideline Value (IGV) for Groundwater - 30µg/l
- Groundwater Regulations 2010 (S.I. No.9 of 2010) - 35µg/l

N

MW09
December 2012:N/A
April 2015: 46µg/l
May 2015: N/A

MW10
December 2012:N/A
April 2015: 695µg/l
May 2015: 1196µg/l

MW08
December 2012: N/A
April 2015: 404µg/l
May 2015: 370µg/l

MW07
December 2012: N/A
April 2015: 240µg/l
May 2015: 172µg/l

MW06
December 2012: 111µg/l
April 2015: 52µg/l
May 2015: 39µg/l

MW11
December 2012:N/A
April 2015: 32µg/l
May 2015: 106µg/l

MW04
December 2012: 38µg/l
April 2015: 43µg/l
May 2015: 80µg/l

MW12
December 2012:N/A
April 2015: 441µg/l
May 2015: 133µg/l

MW07 MW08 MW09 MW10 MW11 MW12 MW04 MW06

BH01 BH02 BH03 BH04 BH05 BH06 BH07 BH08 BH09 BH11 BH12 BH13 BH14 BH15 BH16 BH17

TP01 TP03 TP04 TP05 TP06 TP08 TP10 TP11 TP12 TP13 TP14 TP15 TP16 TP17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Well conditions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)					Drawing: Groundwater Monitoring Exceedances – Molybdate Reactive Phosphorous (MRP)	
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 6b	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: DD

•EPA Interim Guideline Value (IGV) for Groundwater - 0 CFU/100ml

Faecal Coliforms

N

MW09

MW09 (CFU/100ml)
December N/A
April 2015: <1
May 2015: N/A

MW10 (CFU/100ml)
December N/A
April 2015: 200
May 2015: 70

MW07

MW07 (CFU/100ml)
December 2012: N/A
April 2015: 77
May 2015: 43

MW08

MW08 (CFU/100ml)
December N/A
April 2015: 2
May 2015: <1

MW06

MW06 (CFU/100ml)
December 2012: <1
April 2015: <1
May 2015: <1

MW10

MW11 (CFU/100ml)
December N/A
April 2015: <1
May 2015: <1

MW11

MW04 (CFU/100ml)
December 2012: <1
April 2015: <1
May 2015: <1

MW04

MW12 (CFU/100ml)
December N/A
April 2015: <1
May 2015: <1

MW12

BH03 BH09 BH13 BH08 BH02 BH11 BH12 BH01 BH07 BH14 BH06 BH05 BH04 BH15 BH16 BH17

TP01 TP06 TP11 TP16 TP12 TP14 TP05 TP04 TP08 TP13 TP03 TP15 TP10 TP17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Well conditions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)					Drawing: Groundwater Monitoring Exceedances – Faecal Coliforms	
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 6c	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: DD

Arsenic

- EPA Interim Guideline Value (IGV) for Groundwater - 10µg/l
- Groundwater Regulations 2010 (S.I. No.9 of 2010) - 7.5µg/l

N

MW07
December 2012: N/A
April 2015: <2.5µg/l
May 2015: 6.4µg/l

MW08
December 2012: N/A
April 2015: <2.5µg/l
May 2015: 6.2µg/l

MW09
December 2012: N/A
April 2015: <2.5µg/l
May 2015: N/A

MW10
December 2012: N/A
April 2015: <2.5µg/l
May 2015: <2.5µg/l

MW06
December 2012: 3.8µg/l
April 2015:4.4 µg/l
May 2015: <2.5µg/l

MW11
December 2012: N/A
April 2015: <2.5µg/l
May 2015: 7.6µg/l

MW04
December 2012: 2.6µg/l
April 2015: <2.5µg/l
May 2015: <2.5µg/l

MW12
December 2012: N/A
April 2015: <2.5µg/l
May 2015: 2.8µg/l

MW07 MW08 MW09 MW10 MW06 MW11 MW04 MW12

BH01 BH02 BH03 BH04 BH05 BH06 BH07 BH08 BH09 BH11 BH12 BH13 BH14 BH15 BH16 BH17

TP01 TP03 TP04 TP05 TP06 TP08 TP10 TP11 TP12 TP13 TP14 TP15 TP16 TP17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Well conditions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client	South Dublin County Council (SDCC)
Job	Tier III Environmental Risk Assessment
Drawing	Groundwater Monitoring Exceedances – Arsenic

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	6d	Draft	A3	As shown	April'16	LM

Nickel

- EPA Interim Guideline Value (IGV) for Groundwater - 20µg/l
- Groundwater Regulations 2010 (S.I. No.9 of 2010) - 15µg/l

N

MW07
December 2012: N/A
April 2015: 33µg/l
May 2015: <2µg/l

MW08
December 2012: N/A
April 2015: 7µg/l
May 2015: 4µg/l

MW09
December 2012: N/A
April 2015: <2µg/l
May 2015: N/A

MW10
December 2012: N/A
April 2015: 8µg/l
May 2015: 3µg/l

MW06
December 2012: 23µg/l
April 2015: 10 µg/l
May 2015: 10µg/l

MW11
December 2012: N/A
April 2015: 61µg/l
May 2015: 58µg/l

MW04
December 2012: 3µg/l
April 2015: <2µg/l
May 2015: <2µg/l

MW12
December 2012: N/A
April 2015: 19µg/l
May 2015: 10µg/l

MW09 MW07 MW08 MW06 TP01 MW10 BH03 TP06 TP11 TP16 TP14 TP12 BH11 BH12 BH09 TP05 TP04 TP08 BH02 BH13 BH08 TP13 TP03 BH01 BH07 BH14 MW04 MW12 TP15 TP10 BH06 BH05 BH04 TP17 BH15 BH16 BH17 MW11

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Wells conditions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)			Drawing: Groundwater Monitoring Exceedances – Nickel			
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 6e	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: LM

•EPA Interim Guideline Value (IGV) for Groundwater - 50 µg/l

Manganese

N

MW09

MW09
December 2012: N/A
April 2015: 28µg/l
May 2015: N/A

MW10
December 2012: N/A
April 2015: 441µg/l
May 2015: 382µg/l

MW07

MW07
December 2012: N/A
April 2015: 2653µg/l
May 2015: 4344µg/l

MW08

MW08
December 2012: N/A
April 2015: 953µg/l
May 2015: 177µg/l

MW06

MW06
December 2012:<2µg/l
April 2015:<2 µg/l
May 2015: <2µg/l

MW11
December 2012:N/A
April 2015: 783µg/l
May 2015: 644µg/l

MW04
December 2012: 464µg/l
April 2015: 590µg/l
May 2015: 574µg/l

MW12
December 2012:N/A
April 2015: 1813µg/l
May 2015: 1379µg/l

BH03 BH09 BH13 BH08 BH02 BH11 BH12 BH07 BH14 BH06 BH05 BH04 BH01 BH15 BH16 BH17

TP01 TP06 TP11 TP16 TP14 TP12 TP05 TP04 TP13 TP03 TP08 TP15 TP10 TP17

MW07 MW08 MW09 MW06 MW10 MW11 MW04 MW12

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Well condtions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)			Drawing: Groundwater Monitoring Exceedances – Manganese			
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 6f	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: LM

•EPA Interim Guideline Value (IGV) for Groundwater - 5 µg/l

Potassium

N

MW09

MW09
December 2012: N/A
April 2015: 2µg/l
May 2015: N/A

MW10
December 2012: N/A
April 2015: 4.4µg/l
May 2015: 2.8µg/l

MW08

MW08
December 2012: N/A
April 2015: 9.2µg/l
May 2015: 5.8µg/l

MW07

MW07
December 2012: N/A
April 2015: 9.6µg/l
May 2015: 10µg/l

MW06

MW06
December 2012: 26.4µg/l
April 2015: 33.9 µg/l
May 2015: 32.1µg/l

MW11
December 2012: N/A
April 2015: 4.9µg/l
May 2015: 6.3µg/l

MW04
December 2012: 2.7µg/l
April 2015: 2.4µg/l
May 2015: 2.4µg/l

MW12
December 2012: N/A
April 2015: 1.6µg/l
May 2015: 1.2µg/l

BH03 BH09 BH02 BH13 BH08 BH07 BH14 BH06 BH05 BH04 BH01 BH11 BH12 BH15 BH16 BH17

TP01 TP03 TP04 TP05 TP06 TP08 TP10 TP11 TP12 TP13 TP14 TP15 TP16 TP17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Wells conditions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)			Drawing: Groundwater Monitoring Exceedances – Potassium			
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 6g	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: LM

•EPA Interim Guideline Value (IGV) for Groundwater - 200 µg/l

Calcium

N

MW07
December 2012: N/A
April 2015: 248.2µg/l
May 2015: 275.3µg/l

MW08
December 2012: N/A
April 2015: 258.4µg/l
May 2015: 186.5µg/l

MW09
December 2012: N/A
April 2015: 151.1µg/l
May 2015: N/A

MW10
December 2012: N/A
April 2015: 80.7µg/l
May 2015: 75.7µg/l

MW06
December 2012: 60.3µg/l
April 2015: 142.7µg/l
May 2015: 110µg/l

MW11
December 2012:N/A
April 2015: 151.8µg/l
May 2015: 206.2µg/l

MW04
December 2012: 122.2µg/l
April 2015: 128.1µg/l
May 2015: 126.9µg/l

MW12
December 2012: N/A
April 2015: 191.7µg/l
May 2015: 151.1µg/l

MW09 MW07 MW08 MW06 MW10 MW11 MW04 MW12

BH03 BH09 BH02 BH13 BH08 BH11 BH12 BH01 BH07 BH14 BH06 BH05 BH04 BH15 BH16 BH17

TP01 TP06 TP11 TP16 TP14 TP12 TP05 TP04 TP08 TP13 TP03 TP15 TP10 TP17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Well conditions
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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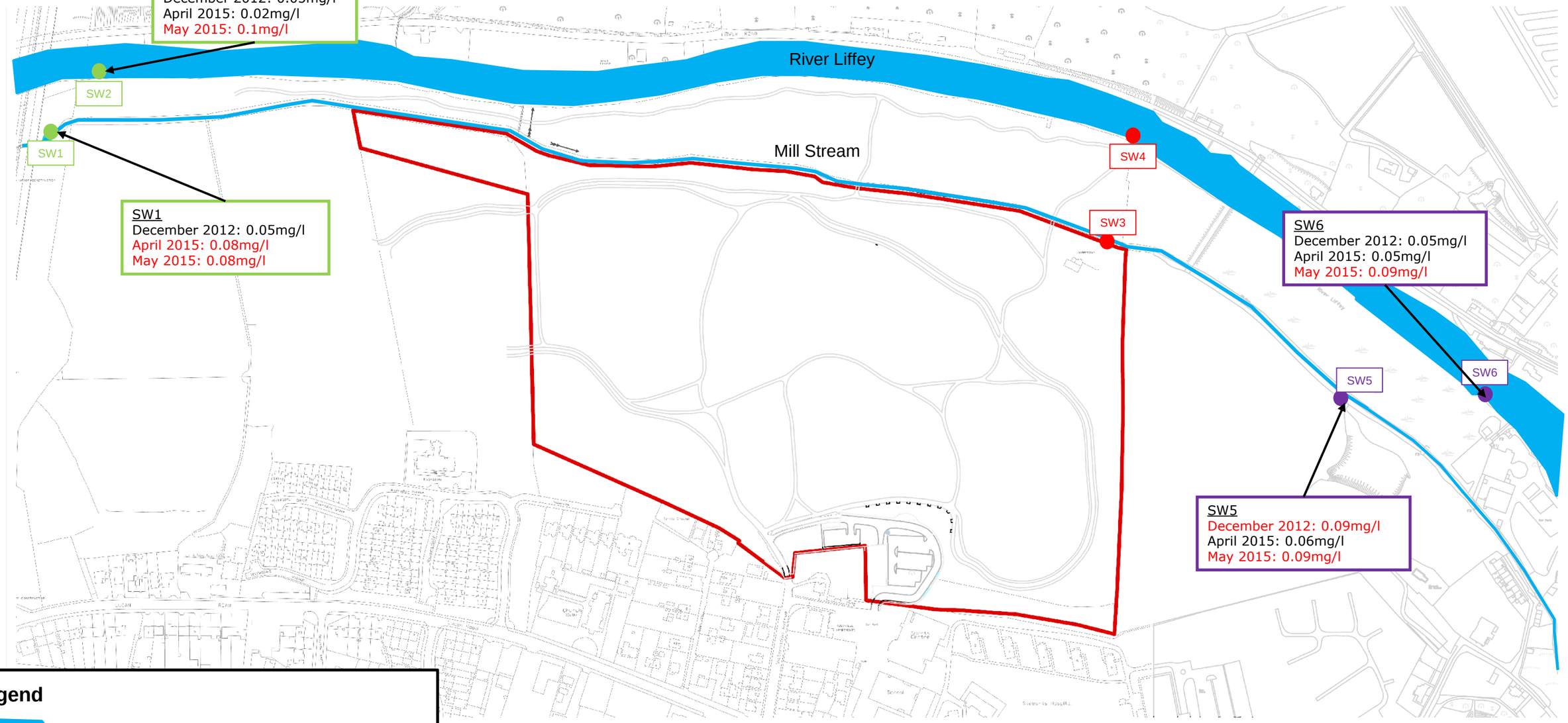
Client: South Dublin County Council (SDCC)					Drawing: Groundwater Monitoring Exceedances – Calcium	
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 6h	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: LM

Surface Water Regulations 2012
(S.I. No. 327 of 2012) - 0.065mg/l

Ammoniacal Nitrogen as (N)

N



Legend

- Approximate River Boundary
- Approximate Site Boundary
- SW2 — Upstream Sampling Points
- SW3 — Sampling Points not used during Tier III Assessment
- SW6 — Downstream Sampling Points

0m 60m 120m

Approximate Scale

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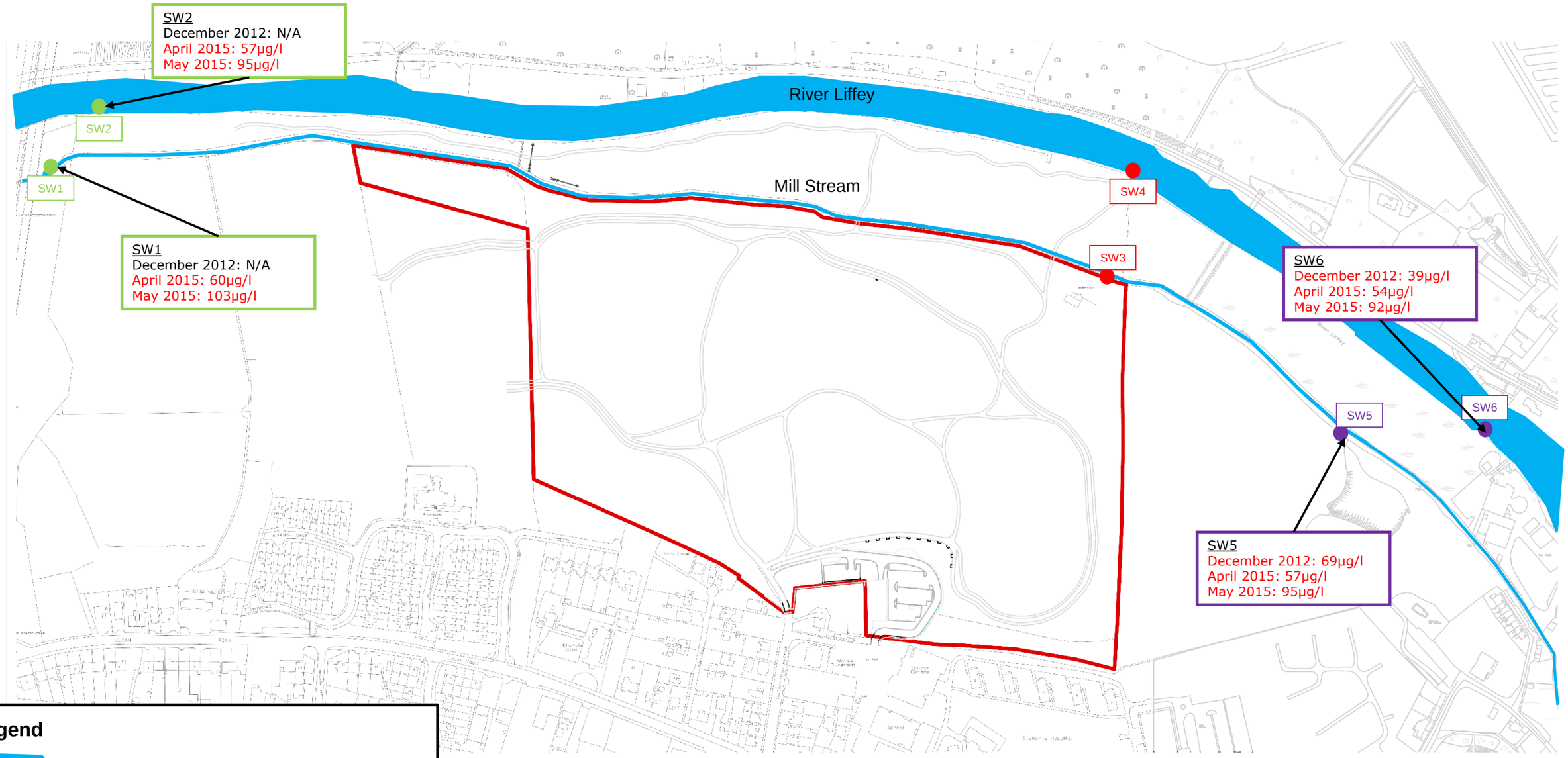
Client: South Dublin County Council (SDCC)			Drawing: Surface Water Exceedances – Ammoniacal Nitrogen as N				
Job: Tier 3 Environmental Risk Assessment							
Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn	
E1119	7a	Draft	A3	As shown	April'16	DD	

Surface Water Regulations 2012 (S.I. No. 327 of 2012) - 35mg/l

Molybdate Reactive Phosphorous (MRP)

N



Legend

- Approximate River Boundary
- Approximate Site Boundary
- SW2 — Upstream Sampling Points
- SW3 — Sampling Points not used during Tier III Assessment
- SW6 — Downstream Sampling Points

0m 60m 120m

Approximate Scale

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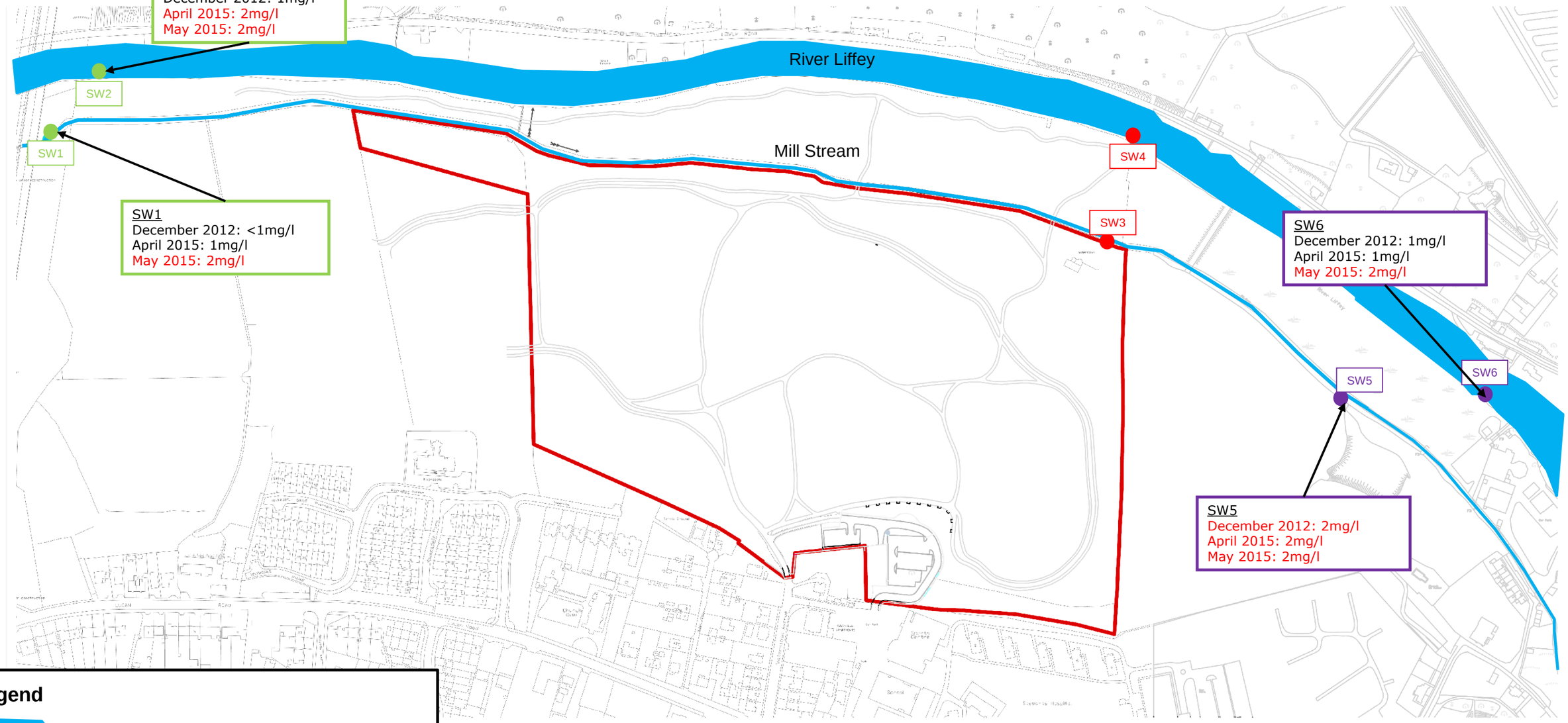
Client: South Dublin County Council (SDCC)			Drawing: Surface Water Exceedances – Molybdate Reactive Phophorous (MRP)				
Job: Tier 3 Environmental Risk Assessment							
Job Number: E1119	Drawing Number: 7b	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: DD	

Surface Water Regulations 2012
(S.I. No. 327 of 2012) - 1.5mg/l

Biological Oxygen Demand (BOD)

N



Legend

- Approximate River Boundary
- Approximate Site Boundary
- SW2 — Upstream Sampling Points
- SW3 — Sampling Points not used during Tier III Assessment
- SW6 — Downstream Sampling Points

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)			Drawing: Surface Water Exceedances – Biological Oxygen Demand (BOD)			
Job: Tier 3 Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 7c	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: DD

Gas Monitoring

N

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
20/12/12	***30.1***	***30.1***	***19.6***	0
16/05/13	***25.3***	***25.4***	***16.0***	16
06/05/15	-	-	-	-
12/05/15	***24.4***	***24.3***	***16.6***	1.5
28/05/15	***25.9***	***25.9***	***17.7***	0.7
05/06/15	-	-	-	--
15/06/15	***25.1***	***25.1***	***17.2***	1.3

MW07

BH03

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
06/05/15	***31.1***	***38.5***	***9.5***	3.1
12/05/15	***23.1***	***24.0***	***9.3***	3.5
20/05/15	-	-	-	-
28/05/15	***26.4***	***26.4***	***17.9***	0.3
05/06/15	-	-	-	-
12/06/15	***27.7***	***27.7***	***19.6***	0.1

MW09

BH10

MW06

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
06/05/15	0.2	0.2	***7.7***	11.4
12/05/15	0.0	***44.4***	***6.5***	13
20/05/15	0.0	0.0	***3.4***	18.3
28/05/15	***1.6***	***3.3***	***12.6***	7.7
05/06/15	0.0	***3.4***	***3.4***	18.3
12/06/15	***5.1***	***5.2***	***18.9***	1.3

MW10

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
06/05/15	0.0	0.3	0.2	20.9
12/05/15	0.0	***30.6***	0.1	20.7
20/05/15	0.0	0.1	0.2	21
28/05/15	0.0	0.1	0.1	20.9
05/06/15	0.0	0.1	0.2	21
12/06/15	0.0	0.1	***2.4***	18

TP11

TP06

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
20/12/12	***53.4***	***53.5***	***36.1***	0
16/05/13	***11.2***	***11.5***	***6.8***	14.5
06/05/15	0	0.2	0	21.1
12/05/15	***12.7***	***23.7***	***11.6***	10
20/05/15	***22.5***	***23.0***	***14.5***	4.7
25/05/15	***22.9***	***24.2***	***19.6***	4.1
05/06/15	***22.5***	***23.0***	***14.5***	4.7
12/06/15	***43.3***	***44.3***	***32.6***	2.8

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
12/05/15	***18.9***	***18.9***	***17.1***	6.3
20/05/15	***21.0***	***21.2***	***19.7***	4.4
20/05/15	***26.4***	***26.4***	***23.8***	0.5
05/06/15	***21.0***	***21.2***	***19.7***	4.4
12/06/15	***26.6***	***26.7***	***25.0***	0.1

TP14

BH11

BH12

Date	CH4 (stable)	CH4 (peak)	CO2	O_2
20/12/12	58.1	58.2	31.4	0
06/05/15	53.3	53.3	27.2	0
06/05/15	43.8	43.8	21.8	0
12/05/15	45.7	45.7	20.7	0
20/05/15	44	44.1	21.7	0
28/05/15	41.3	41.3	22	0.2
05/06/15	-	-	-	0
28/06/15	42.6	42.6	23.6	0

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
27/11/15	-	-	-	-
04/12/15	0.1	0.1	0.2	0.0

BH09

TP05
TP04

BH02

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
06/05/15	***16.2***	***39.8***	***11.4***	11.9
12/05/15	***34.9***	***34.9***	***21.3***	3.3
20/05/15	***34.7***	***34.9***	***31.8***	2.4
28/05/15	***44.4***	***44.5***	***23.5***	0.1
05/06/15	***34.7***	***34.9***	***22.1***	2.4
12/06/15	***44.2***	***44.2***	***23.5***	0

BH13

BH08

TP03

BH01

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
06/05/15	***10.1***	***37.6***	***4.1***	15.6
12/05/15	***30.8***	***36.7***	***12.5***	3.8
20/05/15	***38.1***	***38.2***	***15.3***	0.8
28/05/15	***33.3***	***33.4***	***19.0***	0
05/06/15	***38.1***	***38.2***	***15.3***	0.8
12/06/15	***31.7***	***31.7***	***18.9***	0.2

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
27/11/15	***50.9***	***51.0***	***31.9***	0.0
04/12/15	***48.2***	***48.2***	***24.6***	1.4
20/04/16	***48.1***	***48.1***	***28.1***	0.7

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
27/11/15	*0.0*	*0.0*	*0.4*	20.4
04/12/15	*0.1*	*0.7*	*0.6*	19.7

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
06/05/15	***21.4***	***21.4***	***12.5***	4.7
12/05/15	***23.6***	***27.8***	***10.8***	5.6
20/05/15	***30.8***	***30.8***	***13.1***	4
28/05/15	***37.5***	***37.5***	***16.1***	0
05/06/15	***30.8***	***30.8***	***13.1***	4
12/06/15	***33.6***	***33.6***	***15.5***	0.3

BH07

BH14

MW04

TP15

BH05

BH04

BH06

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
06/05/15	***37.0***	***42.1***	***22.2***	2.5
20/05/15	***39.1***	***39.2***	***21.1***	0.4
20/05/15	***42.6***	***42.6***	***24.1***	0
28/05/15	***41.9***	***41.9***	***24.4***	0
05/06/15	***42.6***	***42.6***	***24.1***	0
12/06/15	***34.2***	***34.3***	***24.5***	0

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
27/11/15	0.1	0.1	0.0	21.1
04/12/15	0.0	0.0	0.1	19.8

BH15

BH16

BH17

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
12/05/15	***45.4***	***45.6***	***26.8***	0.2
20/05/15	***47.7***	***47.7***	***27.8***	0
28/05/15	***47.6***	***47.6***	***28.1***	0
05/06/15	***47.7***	***47.7***	***27.8***	0
12/06/15	***49.4***	***49.4***	***29.2***	0

Date	CH_4 (stable)	CH_4 (peak)	CO_2	O_2
27/11/15	0.1	0.1	0.6	19.7
04/12/15	0.0	0.0	0.2	19.9

0m 60m 120m

Approximate Scale

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uncompleted Groundwater Monitoring Well due to Presence of Artesian Well conditions
- MW04 — Groundwater Monitoring Well Location

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Client	South Dublin County Council (SDCC)
Job	Tier III Environmental Risk Assessment
Drawing	Gas Monitoring results

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	8	Final	A3	As shown	June'16	CMcV

Ammoniacal Nitrogen as N

- EPA Interim Guideline Value (IGV) for Groundwater - 0.12 mg/l
- Groundwater Regulations 2010 (S.I. No. 9 of 2010) - 0.175 mg/l
- Surface Water Regulation 2012 (S.I. No. 327 of 2012) - 0.065mg/l

N

MW09
MW07
MW08
BH10
BH03
MW06
TP01
MW10
TP06
TP11
TP16
TP07
TP14
TP12
MW11
BH11
BH12
BH09
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

BH10
December 2012: N/A
April 2015: 8.38mg/l
May 2015: 6.37mg/l

BH08
December 2012: N/A
April 2015: 2.22mg/l
May 2015: 2.54mg/l

BH11
December 2012: N/A
April 2015: 7.29mg/l
May 2015: 8.32mg/l

BH02
December 2012: 45.46mg/l
April 2015: 47.72mg/l
May 2015: 48.21mg/l

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)	Drawing: Leachate Monitoring Exceedances – Ammoniacal Nitrogen as N
Job: Tier III Environmental Risk Assessment	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9a	Draft	A3	As shown	April'16	DD

Molybdate Reactive Phosphorous (MRP)

- EPA Interim Guideline Value (IGV) for Groundwater - 30 µg/l
- Groundwater Regulations 2010 (S.I. No. 9 of 2010) - 35 µg/l
- Surface Water Regulation 2012 (S.I. No. 327 of 2012 - 35µg/l

N

MW09
MW07
MW08
BH10
BH03
MW06
TP01
MW10
TP06
TP11
TP16
TP07
TP14
TP12
MW11
BH11
BH12
BH09
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

BH10
December 2012: N/A
April 2015: N/A
May 2015: N/A

BH08
December 2012: N/A
April 2015: N/A
May 2015: N/A

BH11
December 2012: N/A
April 2015: 61µg/l
May 2015: 1307ug/l

BH02
December 2012: 161µg/l
April 2015: 986µg/l
May 2015: 198µg/l

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)	Drawing: Leachate Monitoring Exceedances – Molybdate Reactive Phosphorous (MRP)
Job: Tier III Environmental Risk Assessment	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9b	Draft	A3	As shown	April'16	DD

•Surface Water Regulation 2012 (S.I. No. 327 of 2012– 1.5mg/l

Biological Oxygen Demand (BOD)

N

MW09
MW07
MW08
BH10
BH03
MW06
TP01
MW10
TP06
TP11
TP16
TP07
TP14
TP12
BH11
MW11
BH09
BH12
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

BH10
December 2012: N/A
April 2015: 63mg/l
May 2015: 29mg/l

BH08
December 2012: N/A
April 2015: 8mg/l
May 2015: 27mg/l

BH11
December 2012: N/A
April 2015: 30mg/l
May 2015: <1

BH02
December 2012: 199mg/l
April 2015: 40mg/l
May 2015: 74mg/l

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)	Drawing: Leachate Monitoring Exceedances – Biological Oxygen Demand(BOD)
Job: Tier III Environmental Risk Assessment	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9c	Draft	A3	As shown	April'16	DD

- Groundwater Regulations 2010 (S.I. No. 9 of 2010) – 750ug/l
- EPA Interim Guideline Value (IGV) for Groundwater – 1000ug/l

Boron

N

MW09
MW07
MW08
BH10
BH03
MW06
TP01
BH010
December 2012: N/A
April: N/A
May: N/A
TP06
MW10
TP11
TP16
TP07
TP14
TP12
MW11
BH11
BH12
BH09
BH08
December 2012: N/A
April 2015: N/A
May: N/A
TP05
TP04
TP08
BH02
BH11
December 2012: N/A
April 2015: 674ug/l
May 2015: 661ug/l
BH13
BH08
TP13
TP03
BH02
December 2012: 740ug/l
April 2015: 741ug/l
May 2015: 782ug/l
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)	Drawing: Leachate Monitoring Exceedances – Boron
Job: Tier III Environmental Risk Assessment	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9d	Draft	A3	As shown	April'16	LM

Arsenic

- EPA Interim Guideline Value (IGV) for Groundwater - 10µg/l
- Groundwater Regulations 2010 (S.I. No. 9 of 2010) – 7.5µg/l

N

MW09

MW07

MW08

BH10

BH10
December: 2012 N/A
April 2015: N/A
May 2015: N/A

BH03

MW06

TP01

MW10

TP06

TP11

TP16

TP07

TP14

TP12

BH11

MW11

BH09

BH08
December 2012: N/A
April 2015: N/A
May 2015: N/A

BH12

TP05

TP04

TP08

BH02

BH11
December 2012: N/A
April 2015: 3.4 µg/l
May 2015: 6 µg/l

BH13

BH08

TP13

TP03

BH01

BH02
December 2012: 22.4 µg/l
April 2015: 6.4 µg/l
May 2015: 12.1 µg/l

TP09

BH07

MW12

BH14

MW04

TP15

TP10

BH06

BH05

BH04

TP17

BH15

BH16

BH17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client	South Dublin County Council (SDCC)
Job	Tier III Environmental Risk Assessment
Drawing	Leachate Monitoring Exceedances – Arsenic

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9e	Draft	A3	As shown	April'16	DD

•EPA Interim Guideline Value (IGV) for Groundwater – 100µg/l

Zinc

N

MW09

MW07

MW08

BH10

BH03

MW06

TP01

BH10
December 2012: N/A
April 2015: N/A
May 2015: N/A

TP06

MW10

TP11

TP16

TP07

TP14

BH02
December 2012: 10µg/l
April 2015: <3µg/l
May 2015: 191µg/l

BH11

BH12

MW11

BH09

TP05
TP04

TP08

BH02

BH11
December 2012: N/A
April 2015: 19µg/l
May 2015:57µg/l

BH13
BH08

TP13

TP03

BH01

TP09

BH08
December 2012: N/A
April 2015: N/A
May 2015: N/A

BH07

MW12

BH14

MW04

TP15

TP10

BH06

BH05

BH04

TP17

BH15

BH16

BH17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)	Drawing: Leachate Monitoring Exceedances – Dissolved Zinc
Job: Tier III Environmental Risk Assessment	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9f	Draft	A3	As shown	April'16	LM

Nickel

- EPA Interim Guideline Value (IGV) for Groundwater - 20 µg/l
- Groundwater Regulations 2010 (S.I. No. 9 of 2010) - 15µg/l

N

MW09
MW07
MW08
BH10
BH03
MW06
TP01
MW10
TP06
TP11
TP16
TP07
TP14
TP12
MW11
BH11
BH09
BH12
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

BH10
December 2012: N/A
April 2015: N/A
May 2015: N/A

BH08
December 2012: N/A
April 2015: N/A
May 2015: N/A

BH11
December 2012: N/A
April 2015: 48µg/l
May 2015: 51µg/l

BH02
December 2012: 14µg/l
April 2015: 18µg/l
May 2015: 7µg/l

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)					Drawing: Leachate Monitoring Exceedances – Nickel	
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 9g	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: DD

Sodium

•EPA Interim Guideline Value (IGV) for Groundwater - 150 mg/l
• Groundwater Regulations 2010 (S.I. No. 9 of 2010) - 150 mg/l

N

MW09
MW07
MW08
BH10
BH03
MW06
TP01
MW10
TP06
TP11
TP16
TP07
TP14
TP12
MW11
BH11
BH12
BH09
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

BH10
December 2012: N/A
April 2015: 64.4 mg/l
May 2015: 19.5 mg/l

BH08
December 2012: N/A
April 2015: 22.7 mg/l
May 2015: 17.5 mg/l

BH11
December 2012: N/A
April 2015: 190.1 mg/l
May 2015: 176.3 mg/l

BH02
December 2012: 279.9mg/l
April 2015: 260.1mg/l
May 2015: 240.8mg/l

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)	Drawing: Leachate Monitoring Exceedances – Sodium
Job: Tier III Environmental Risk Assessment	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9h	Draft	A3	As shown	April'16	DD

•EPA Interim Guideline Value (IGV) for Groundwater - 50 µg/l

Manganese

N

MW09

MW07

MW08

BH10

BH10
December 2012: N/A
April 2015: N/A
May 2015: N/A

BH03

MW06

TP01

MW10

TP06

TP11

TP16

TP07

TP14

TP12

BH11

BH12

MW11

BH09

BH08
December 2012: N/A
April 2015: N/A
May 2015: N/A

TP05
TP04

TP08

BH02

BH11
December 2012: N/A
April 2015: 849µg/l
May 2015: 840µg/l

BH13

BH08

TP13

TP03

BH01

BH02
December 2012: 3392µg/l
April 2015: 1365µg/l
May 2015: 1151µg/l

TP09

BH07

MW12

BH14

MW04

TP15

TP10

BH06

BH05

BH04

TP17

BH15

BH16

BH17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client	South Dublin County Council (SDCC)
Job	Tier III Environmental Risk Assessment
Drawing	Leachate Monitoring Exceedances – Manganese

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9i	Draft	A3	As shown	April'16	DD

•EPA Interim Guideline Value (IGV) for Groundwater - 200 µg/l

Dissolved Iron

N

MW09

MW07

MW08

BH10

BH03

BH10
December 2012: N/A
April 2015: N/A
May 2015: N/A

MW06

TP01

MW10

TP06

TP11

TP16

TP07

TP14

TP12

MW11

BH11

BH12

BH09

BH08
December 2012: N/A
April 2015: N/A
May 2015: N/A

TP05
TP04

TP08

BH02

BH11
December 2012: N/A
April 2015: 675ug/l
May 2015: N/A

BH13
BH08

TP13

TP03

BH02
December 2012: 1392ug/l
April 2015: 183ug/l
May 2015: N/A

BH01

TP09

BH07

MW12

BH14

MW04

TP15

TP10

BH06

BH05

BH04

TP17

BH15

BH16

BH17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)	Drawing: Leachate Monitoring Exceedances – Dissolved Iron
Job: Tier III Environmental Risk Assessment	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9j	Draft	A3	As shown	April'16	DD

•EPA Interim Guideline Value (IGV) for Groundwater – 200mg/l

Calcium

N

MW09
MW07
MW08
BH10
BH03
MW06
TP01
TP06
MW10
TP11
TP16
TP07
TP14
TP12
MW11
BH09
BH11
BH12
TP05
TP08
TP04
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

BH10
December 2012: N/A
April 2015: N/A
May 2015:N/A

BH08
December 2012: N/A
April 2015: N/A
May 2015: N/A

BH11
December 2012: N/A
April 2015: 182.7mg/l
May 2015:175.5mg/l

BH02
December 2012: 383.9mg/l
April 2015: 363.5mg/l
May 2015: 362.1mg/l

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)			Drawing: Leachate Monitoring Exceedances – Calcium			
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 9k	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: LM

•EPA Interim Guideline Value (IGV) for Groundwater - 50mg/l

Magnesium

N

MW09

MW07

MW08

BH10

BH03

BH10
December 2012: N/A
April 2015: N/A
May 2015: N/A

MW06

TP01

MW10

TP11

TP16

TP07

TP14

TP12

BH11

BH12

MW11

BH09

BH08
December 2012: N/A
April 2015: N/A
May 2015: N/A

TP05
TP04

BH02

BH11
December 2012: N/A
April 2015: 38.4mg/l
May 2015: 34.9mg/l

TP08

BH13

BH08

TP13

TP03

BH02
December 2012: 59.8mg/l
April 2015: 60.2mg/l
May 2015: 57.1mg/l

BH01

TP09

BH07

MW12

BH14

MW04

TP15

TP10

BH06

BH05

BH04

TP17

BH15

BH16

BH17

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client	South Dublin County Council (SDCC)
Job	Tier III Environmental Risk Assessment
Drawing	Leachate Monitoring Exceedances – Magnesium

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9I	Draft	A3	As shown	April'16	DD

•EPA Interim Guideline Value (IGV) for Groundwater - 5 mg/l

Potassium

N

MW09
MW07
MW08
BH10
BH03
MW06
TP01
MW10
TP06
TP11
TP16
TP07
TP14
TP12
MW11
BH11
BH09
BH12
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

BH10
December 2012: N/A
April 2015: 7 mg/l
May 2015: 7.7 mg/l

BH08
December 2012: N/A
April 2015: 6.6 mg/l
May 2015: 4.2mg/l

BH11
December 2012: N/A
April 2015: 12.1mg/l
May 2015: 11.5mg/l

BH02
December 2012: 54.2mg/l
April 2015: 49.2mg/l
May 2015: 45.2mg/l

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)					Drawing: Leachate Monitoring Exceedances – Potassium	
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 9m	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: DD

Benzene

- Groundwater Regulations 2010 (S.I. No. 9 of 2010) – 0.75ug/l
- EPA Interim Guideline Value (IGV) for Groundwater – 1ug/l

N

MW09
MW07
MW08
BH10
BH03
TP01
MW10
TP06
TP11
TP16
TP07
TP14
MW11
BH09
BH11
BH12
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

BH10
December 2012: N/A
April 2015: N/A
May 2015:<0.5ug/l

BH02
December 2012: 5ug/l
April 2015: 4.4ug/l
May 2015: 5.3ug/l

BH11
December 2012: N/A
April 2015: <0.5ug/l
May 2015:<0.5ug/l

BH08
December 2012: N/A
April 2015: N/A
May 2015: <0.5ug/l

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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Client: South Dublin County Council (SDCC)	Drawing: Leachate Monitoring Exceedances – Benzene
Job: Tier III Environmental Risk Assessment	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E1119	9n	Draft	A3	As shown	April'16	LM

•EPA Interim Guideline Value (IGV) for Groundwater – 0.5ug/l

Phenol

N

MW09
MW07
MW08
BH10
BH03
TP01
MW10
TP06
TP11
TP16
TP07
TP14
MW11
BH09
BH11
BH12
TP05
TP04
TP08
BH02
BH13
BH08
TP13
TP03
BH01
TP09
BH07
MW12
BH14
MW04
TP15
TP10
BH06
BH05
BH04
TP17
BH15
BH16
BH17

BH10
December 2012: N/A
April 2015: N/A
May 2015:<1ug/l

BH02
December 2012: 24ug/l
April 2015: <1ug/l
May 2015: <1ug/l

BH11
December 2012: N/A
April 2015: <1ug/l
May 2015:<1ug/l

BH08
December 2012: N/A
April 2015: N/A
May 2015: <1ug/l

Legend

- Approximate Site Boundary
- BH05 — Gas / Leachate Monitoring Locations
- TP13 — Trial Pit Locations
- MW09 — Uninstalled Groundwater Monitoring Well due to Presence of Artesian Well
- MW04 — Groundwater Monitoring Well Location

0m 60m 120m

Approximate Scale

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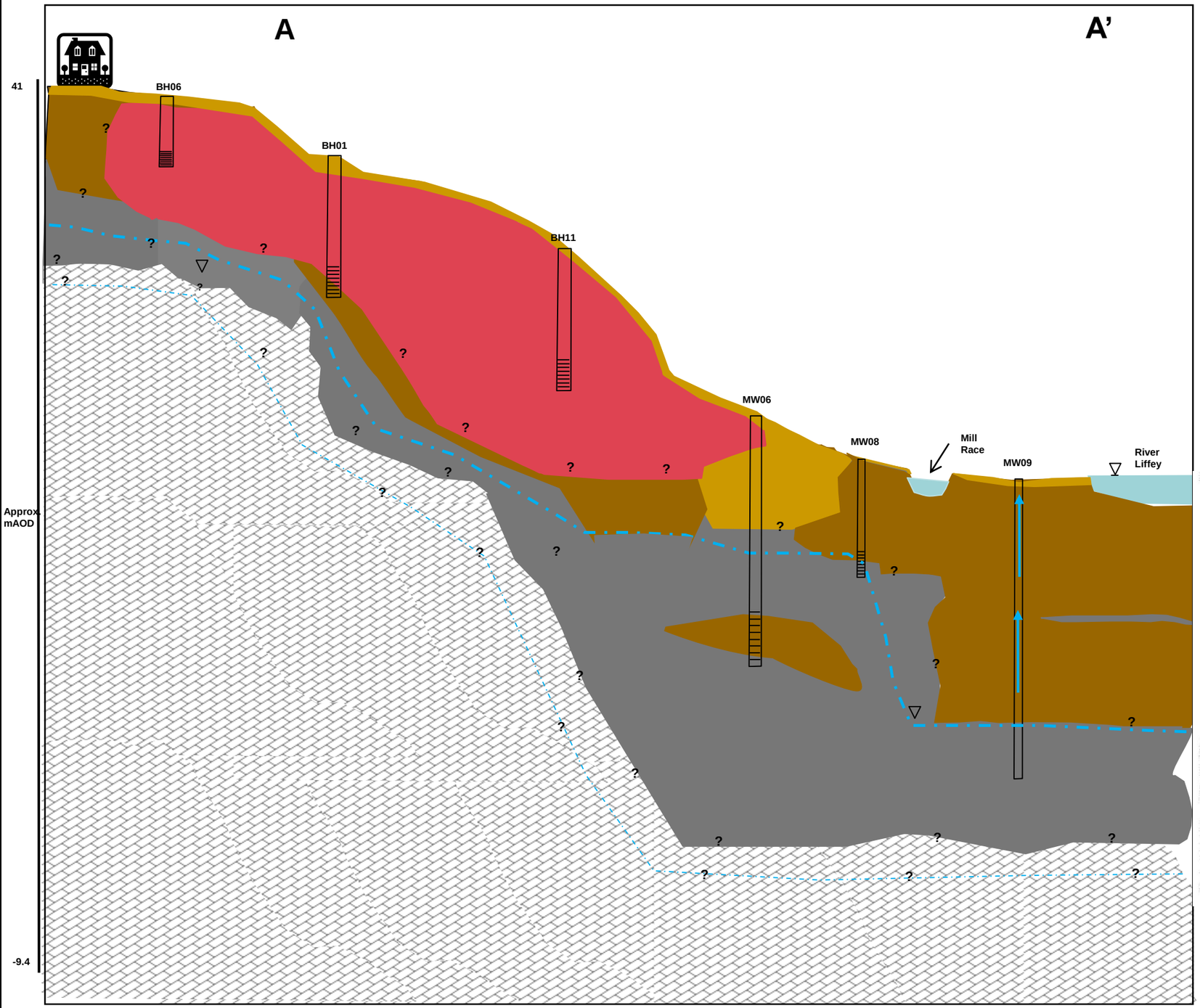
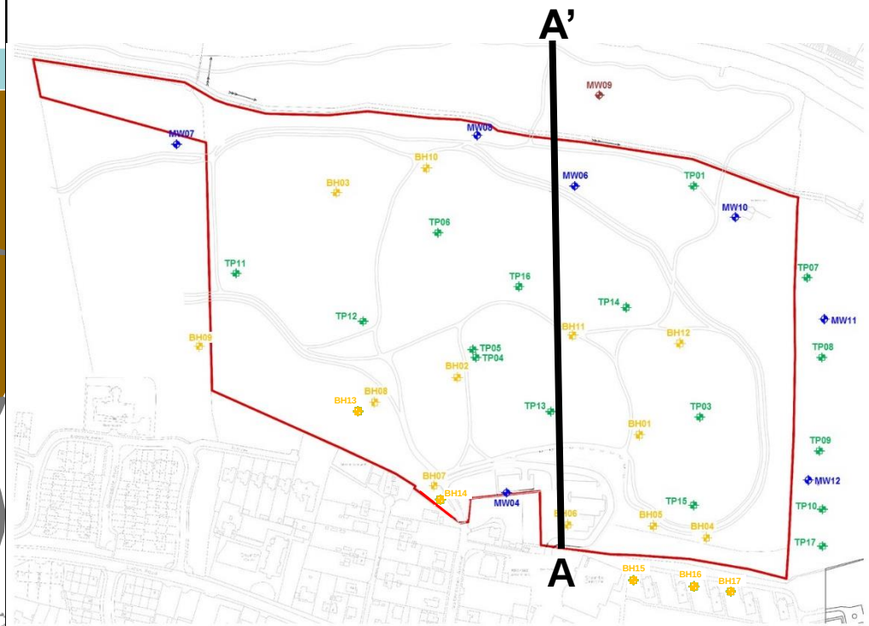
Client: South Dublin County Council (SDCC)					Drawing: Leachate Monitoring Exceedances – Phenol	
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 9o	Status: Draft	Sht. Size: A3	Scale: As shown	Date: April'16	Drawn: LM

Section A-A’



Legend:

- Made ground (Clay)
- Gravelly clay/silt
- Landfill material
- Sand and Gravel
- Calp limestone
- Surface water level
- Water forced up due to artesian conditions
- Groundwater level
- Residential
- ? Inferred lithological contact
- Monitoring well
- Attempted monitoring well but impossible due to artesian conditions



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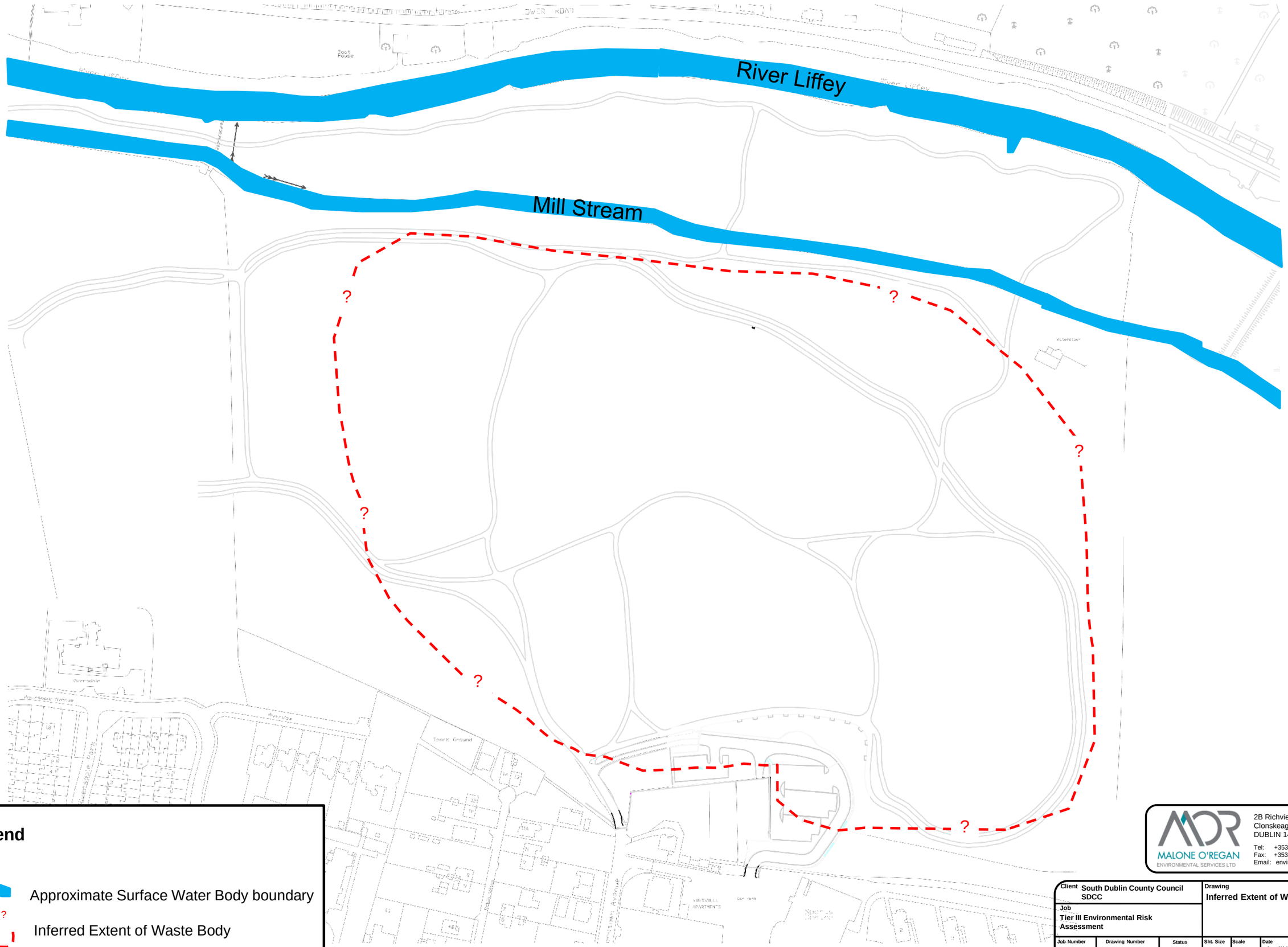
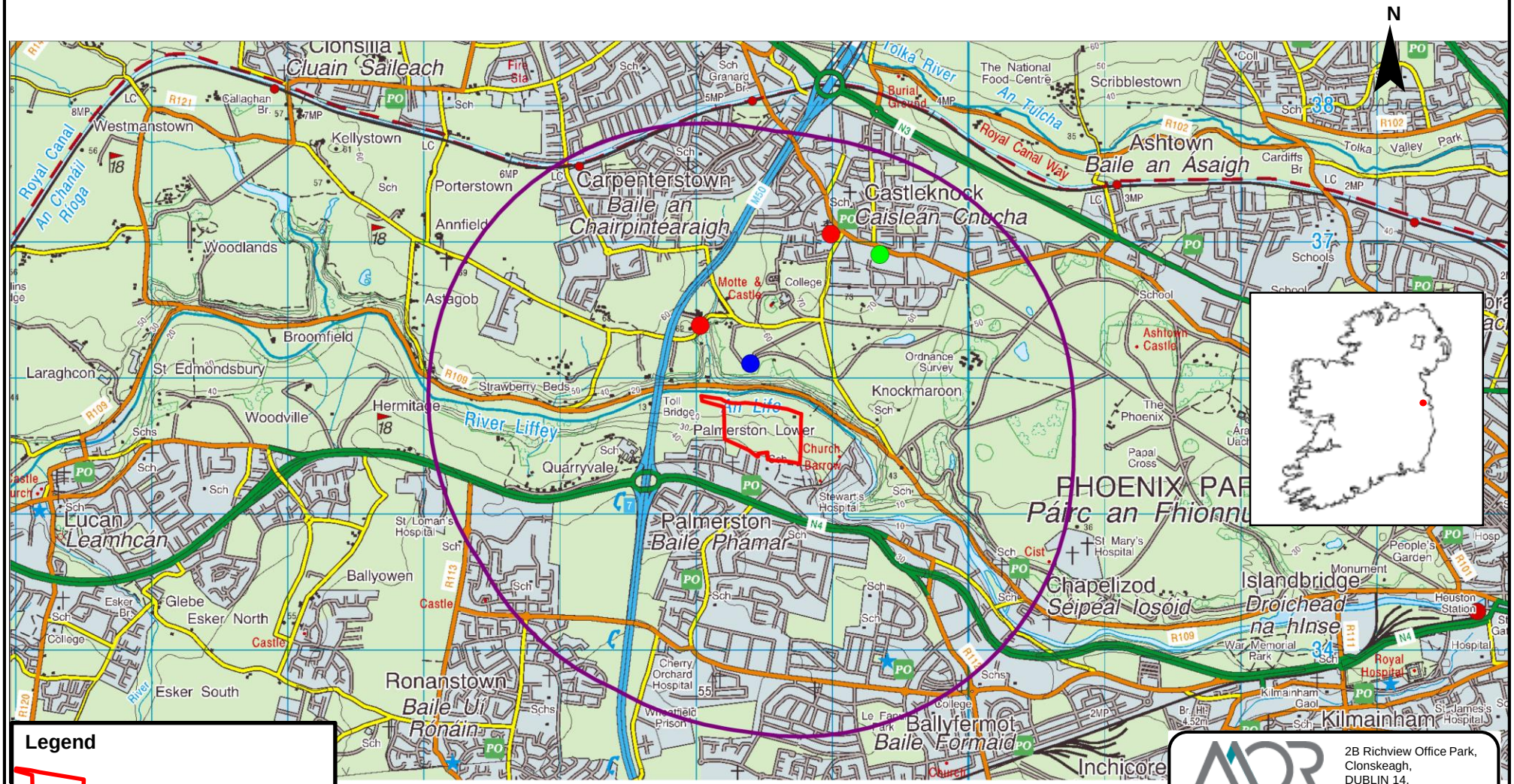
Client: SOUTH DUBLIN COUNTY COUNCIL			Drawing: Approx. Schematic Diagram Showing Cross-Section Of The Site			
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 10	Status: Draft	Sht. Size: A3	Scale: NTS	Date: April’16	Drawn: DD


River Liffey
Mill Stream
?
?
?
?
?
N
Toonic Ground
Silverdale
Silverdale Avenue
Silverdale Close
Silverdale Drive
Silverdale Park
Silverdale Road
Silverdale Terrace
Silverdale Walk
Silverdale Way
Victorian Cottage
Victorian Villa
Victorian Villa
Victorian Villa



Legend

- Approximate site boundary
- Approximate 2km radius
- Industrial use
- Agri use only
- Unknown use

0m 500m 1000m

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Client: South Dublin County Council (SDCC)			Drawing: GSI Well Search			
Job: Tier III Environmental Risk Assessment						
Job Number: E1119	Drawing Number: 12	Status: Final	Sht. Size: A4	Scale: As Shown	Date: April'16	Drawn: DD

APPENDICES

APPENDIX A



Photo View 1: Trial Pit – TP07.



Photo View 2: Trial Pit – TP07.



Photo View 3: Trial Pit – TP08.



Photo View 4: Trial Pit – TP08.



Photo View 5: Trial Pit – TP09.



Photo View 6: Trial Pit – TP09.



Photo View 7: Trial Pit – TP10.



Photo View 8: Trial Pit – TP10.



Photo View 9: Trial Pit – TP11.



Photo View 10: Trial Pit – TP11.



Photo View 11: Trial Pit – TP12.



Photo View 12: Trial Pit – TP12.



Photo View 13: Trial Pit – TP13.



Photo View 14: Trial Pit – TP13.



Photo View 15: Trial Pit – TP14.



Photo View 16: Trial Pit – TP14.



Photo View 17: Trail Pit – TP15.



Photo View 18: Trial Pit – TP15.



Photo View 19: Trial Pit – TP16.



Photo View 20: trial Pit – TP16.



Photo View 21: Trial Pit – TP17.

APPENDIX B

City Analysts Limited

City Analysts Limited, Pigeon House Rd, Ringsend, Dublin 4.Tel: +353 (01) 6136003
Email labreception@cityanalysts.ie
Website:www.cityanalysts .ie

Project Reference: F1119
(Office Use only)

City Analysts Limited,Shannon Town Centre, Shannon Co Clare. Tel: +353 (061) 718300.
Email labreceptionshannon@cityanalysts.ie
Website:www.cityanalysts .ie

CHAIN OF CUSTODY

Client ..Malone O Regan
Client's Contact...David Dwyer
Client Address...Unit 2B Richview
....Office Park, Clonskeagh Dublin 14.....
.....

Quote Ref.....

Purchase Order No. .....(Required)

Sample Date	Sample Reference I.D	Sample Type	Number of Containers	Analysis/ Suites Required
15/04/15	MW9	G.W	1	Total Coliforms, Faecal Coliforms

Samples Submitted by: David Dwyer
Date/Time: 15:50

SPECIAL INSTRUCTIONS: e.g. Fast turnaround, report format required, other?

Received at Lab by (Sign): RR
Date/Time: 15/4
Sample Condition:
Comments:

Notification sent to office and Lab re special instruction
Sign/Date:

Form 1099
Rev 003

Issue Date: 24-04-14

City Analysts Limited, Pigeon House Rd, Ringsend,
Dublin 4.
tel: +353 (0)6136003 6136006 fax: 6136008.
website:www@cityanalysts .ie
email info@cityanalysts .ie

CITY ANALYSTS LIMITED
CHAIN OF CUSTODY FORM

Client M.O.R. ..... Quote Ref: .....
Client's Contact Jason McCann ..... Fax No. .....
Client Address. Unit 28 Richview ..... Purchase Order No. ... .
Office Park, Clonskeagh, Dublin 14. email: Jmccann@more.ie
..... Phone: 01 260 2655

Sample Turnaround Required: 1 –10 days (specify)____ **Report Format Required (specify):**

CA Lab.Ref	Sample Date	Sample Reference I.D	Sample Type	Number of Containers	Analysis/ Suites Required
	05/05/15	BH2	Leachate	1	Faecal Coliforms / Total Coliforms
	"	BH 11	Leachate	1	" "
	"	MW8	Groundwater	1	" "
	"	MW 11	"	1	" "
	"	MW 12	"	1	" "
	"	MW 6	"	1	" "

Special Instructions:

Samples Submitted By: Jason McCann / David Dwyer
Date/Time: 05/05/15
Courier: .....
.....
.....

City Analysts Ltd Use Only
Received At Lab(sign): TC
Date/Time: 515
Sample Condition: ✓
Comments: .....

City Analysts Limited, Pigeon House Rd, Ringsend,
Dublin 4.
tel: +353 (0)6136003 6136006 fax: 6136008.
website:www@cityanalysts .ie
email info@cityanalysts .ie

Melove or Regen

CITY ANALYSTS LIMITED
CHAIN OF CUSTODY FORM

Client MOR **Quote Ref:** .....
Client's Contact Jason Mc Cann
Client Address Unit 2B, Parkview Office Park, Clonskeagh, Dublin 14
.....

Fax No.....
Purchase Order No. ... .

Sample Turnaround Required: 1 –10 days (specify)____ **Report Format Required (specify):**

CA Lab.Ref	Sample Date	Sample Reference I.D	Sample Type	Number of Containers	Analysis/ Suites Required
	6/5/2015	MW 4	GW	1	Total Coliforms / Faecal Coliforms on all samples submitted
	"	MW 10	GW	1	
	"	MW 7	GW	1	

Special Instructions:

Samples Submitted By: Jason Mc Cann
Date/Time: 6/5/2015
Courier:
.....
.....

City Analysts Ltd Use Only
Received At Lab(sign): TC
Date/Time: 6/5
Sample Condition:
Comments:

Email: jmccann@more.ie
ddwyer@more.ie

City Analysts Limited

nalysts Limited, Pigeon House Rd, Ringsend, Dublin +353 (01) 6136003 labreception@cityanalysts.ie :e:www.cityanalysts .ie	Project Reference: Elna (Office Use only)	City Analysts Limited,Shannon Town Centre, Shannon Co Clare. Tel: +353 (061) 718300. Email labreceptionshannon@cityanalysts.ie Website:www.cityanalysts .ie

CHAIN OF CUSTODY

t Malone O'Regan

t's Contact David Dwyer email : ddwyer@morce.ie

t Address Unit 2B Richview office

ark, Clonskeagh Dublin 14.

Quote Ref.....

Purchase Order No. .....(Required)

le Date	Sample Reference I.D	Sample Type	Number of Containers	Analysis/ Suites Required
/15	BH 11	leachate	1	Total Coliforms / Faecal coliforms
	BH 2	" "	1	" " " "

es Submitted by: David Dwyer ime: 29/04/15	**SPECIAL INSTRUCTIONS: e.g. Fast turnaround, report format required, other?**	Received at Lab by (Sign): TC Date/Time: 29/4 Sample Condition: Comments: Notification sent to office and Lab re special instruction Sign/Date:

099
003

Issue Date: 24-04-14

City Analysts Limited
Environmental Laboratories
Pigeon House Rd, Ringsend, Dublin 4
Tel: + 353 (01) 613 6003/613 6006
Email: labreception@cityanalysts.ie
Website: www.cityanalysts .ie

Project Reference: E1119

(Office Use only)

City Analysts Limited
Shannon Town Centre, Shannon, Co. Clare
Tel: + 353 (01) 613 6003
Email: labreceptionshannon@cityanalysts.ie
Website: www.cityanalysts .ie

CHAIN OF CUSTODY

21342

Client: Malone O'Regan
email: ddwyer@morce.ie / jmccann@morce.ie
Client's Contact: David Dwyer
Client Address: Unit 20 Richview
phone : 01 260 2655
Office Park, Clonskeagh, Dublin 14

Quote Ref: .....

Purchase Order No.: .....(Required)

Sample Date	Sample Reference I.D	Sample Type	Number of Containers	Analysis/Suites Required
30/04/15	MW 11	Gw	1	Total coliforms / Faecal Coliforms
"	MW 4	"	"	"
"	MW 7	"	"	"
"	MW 6	"	"	"
"	MW 8	"	"	"
"	MW 10	"	"	"
"	MW 12	"	"	"

Samples Submitted by: David Dwyer

Date/Time: 30/04/15

SPECIAL INSTRUCTIONS:
e.g. Fast turnaround, report format required, other?

Received at Lab by (Sign): TC

Date/Time: 30/4

Sample Condition: .....

Commets: .....

Notification sent to office and Lab re special instruction

Date/Time: .....

CHAIN OF CUSTODY

CLIENT: David Dwyer	If Electronic File Required please select file format below	SAMPLER: David Dwyer	
ADDRESS: Unit 28 Richview Office Park, Clonskeagh, Dublin 14.		MOBILE: 01 260 2655	
	EQUIS	EMAIL REPORT TO: thomasvm@morce.ie	
PROJECT MANAGER (PM): Thomas Vainio Matilla	CROSSTAB	cc REPORT TO: ddwyer@morce.ie	
MOBILE: 01 260 2655	CLIENT	INVOICE TO: (if different to report)	
PROJECT ID: E1179	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	QUOTE NUMBER:	P.O No:
SITE: E1179			

Jones Environmental Laboratory

Chain of Custody sheet page 1 of 2

TURNAROUND - please tick

10 DAY	✓	4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	Total Dissolved Solids	Ammonia/Nitrate	TOxN	TOC	Earth metals	Metals	Tot Alkalis CaCO3	Sulphate	Chloride	Molybdate Reactive	Phosphorus	Total Cyanide	Fluoride	PAH 16	SVOC	VOC	
MW9					GW	15/04/15							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	metals + gold metals
																													> dissolved
																													AS

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name: David Dwyer	Date:	Name:	Date: 16/4/15	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 75323

CHAIN OF CUSTODY

CLIENT: David Dwyer	If Electronic File Required please select file format below		SAMPLER: David Dwyer
ADDRESS: Unit 18 Richview Office Park, Clonskeagh Dublin 14			MOBILE: 086 263 2655
	EQUIS		EMAIL REPORT TO: thomasvmahilla@gmail.com
PROJECT MANAGER (PM): Thomas Veijo Mahilla	CROSSTAB		cc REPORT TO: davidjdwyer@eircom.net
MOBILE: 086 263 2655	CLIENT		INVOICE TO: (if different to report)
PROJECT ID: Finn	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)		QUOTE NUMBER: P.O No:
SITE: Finn			ANALYSIS REQUIRED including SUITE names

Jones Environmental Laboratory

Chain of Custody sheet page 2 of 2

| | | |

CHAIN OF CUSTODY

CLIENT: See COC 1 for these details	If Electronic File Required please select file format below	SAMPLER:	
ADDRESS:		MOBILE:	
	EQUIS	EMAIL REPORT TO:	
PROJECT MANAGER (PM):	CROSSTAB	cc REPORT TO:	
MOBILE:	CLIENT	INVOICE TO: (if different to report)	
PROJECT ID:	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	QUOTE NUMBER: 5549 BP	P.O No:
SITE:			

Jones Environmental Laboratory

Chain of Custody sheet page 2 of 2

TURNAROUND - please tick

10 DAY		4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	GOD	Ammoniacal Nitrogen	Chloride	SO4	Na	K	T Iron	T Manganese	T Aluminium	TOC	VOC	SVOC	Comb Pest	Al/SIM			SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples
BH8					L	05/05/15																							Total: Iron, Manganese
BH10					L	05/05/15																							Aluminium
																													dissolved: Na, K
																													Ammoniacal Nitrogen
																													as N

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 82870

CHAIN OF CUSTODY

CLIENT: Malone O'Regan	If Electronic File Required please select file format below	SAMPLER: JMCK / DD	
ADDRESS: Unit 2B, Rainview Office Park, Clonsleagh Dublin 14		MOBILE: 01 260 2655	
	EQUIS	EMAIL REPORT TO: jmccann@morce.ie	
PROJECT MANAGER (PM): Thomas Vamio Mattilla	CROSSTAB	cc REPORT TO: ddwyer@morce.ie	
MOBILE: 01 260 2655	CLIENT	INVOICE TO: (if different to report)	
PROJECT ID: E1119	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	QUOTE NUMBER: 5549 BP	P.O No:
SITE: E1119			

Jones Environmental Laboratory

Chain of Custody sheet page 2 of 2

TURNAROUND - please tick

10 DAY	✓	4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	Comb Tests	Acid Herbs
SW1 mill					SW	6/5/2015								
SW2 LIFF					SW	"								
SW5 mill					SW	"								
SW6 LIFF					SW	"								

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date: 6/5/2015	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.

Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 82876

CHAIN OF CUSTODY

CLIENT:	If Electronic File Required please select file format below		SAMPLER:
ADDRESS:			MOBILE:
	EQUIS		EMAIL REPORT TO:
PROJECT MANAGER (PM):	CROSSTAB		cc REPORT TO:
MOBILE:	CLIENT		INVOICE TO: (if different to report)
PROJECT ID:	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)		QUOTE NUMBER: P.O No:
SITE:			ANALYSIS REQUIRED including SUITE names

Jones Environmental Laboratory

Chain of Custody sheet page ..... of .....

TURNAROUND - please tick

10 DAY | 4 DAY | Other

5 DAY | 3 DAY

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

Sample ID	AGS SAMPT YPE	AGS SAMPR EF	Shaken	Settled	S/GW/SW/ L/E/OW/P	Date	Time	Depth in Metres	Preserv ation	Asbestos risk: High	Medium	Low
BH3					L	29/04/15						
BH10					L	29/04/15						

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 76572

CHAIN OF CUSTODY

CLIENT: Malone O'Regan	If Electronic File Required please select file format below	SAMPLER: DDwyer / JMcCann	
ADDRESS: Unit 28 Richview office Park, Clonskeagh, Dublin 14	EQUIS	MOBILE: 01 260 2655	
PROJECT MANAGER (PM):	CROSSTAB	EMAIL REPORT TO: ddwyer@morce.ie	
MOBILE: 01 260 2655	CLIENT	cc REPORT TO: jmccann@morce.ie	
PROJECT ID: E1119	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	INVOICE TO: (if different to report)	
SITE: E1119		QUOTE NUMBER: 5549 BP	P.O No:

Jones Environmental Laboratory

Chain of Custody sheet page 2 of 4

TURNAROUND - please tick

10 DAY	✓	4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	Comb Pest	Acid Herb	At/Sim														
MW4					GW	30/04/15																							Comb Pesticide: 25
MW11					"	"																							OP + OC compounds
MW12					"	"																							
MW5					"	"																							
MW8					"	"																							
MW6					"	"																							
MW10					"	"																							

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.

Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 76574

CHAIN OF CUSTODY

CLIENT: Malone Oregon	If Electronic File Required please select file format below		SAMPLER: DW JMcC
ADDRESS: Unit 28 Kilvinton office Park Chandlesgate Oxford UK	EQUIS		MOBILE: 01 260 2655
			EMAIL REPORT TO:
PROJECT MANAGER (PM): Thomas Vaan Marshall	CROSSTAB		cc REPORT TO:
MOBILE: 01 260 2655	CLIENT		INVOICE TO: (if different to report)
PROJECT ID: E1119	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)		QUOTE NUMBER: 5549 BP P.O No:
SITE: E1119			ANALYSIS REQUIRED including SUITE names

Jones Environmental Laboratory

Chain of Custody sheet page ..... of .....

TURNAROUND - please tick							
10 DAY	✓	4 DAY		Other		All waters - tick for samples to be tested shaken or settled	FOR LABORATORY USE ONLY
5 DAY		3 DAY					AVERAGE COOL BOX TEMP.(if required):
							SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

Sample ID	AGS SAMPT YPE	AGS SAMPR EF	Shaken	Settled	S/GW/SW/ L/E/OW/P	Date	Time	Depth in Metres	Preserv ation	Asbestos risk: High	Medium	Low	TPHCWG	Ammonical N as N	COD as O2	TOC	Boron water soluble	Metals	Alk as CaCO3	SO4	Cl	Phenols (monohydric)	Total Cyanide	Fluoride	PAH 16	SVOC	VOC	Ammonical N (high level)
MWC					GW																							
MW1					"																							
MW12					"																							
MW5					"																							
MW8					"																							
MW6					"																							
MW10					"																							

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Ammonical N (high & low level)
Boron water soluble
Metals: Ca, Mg, K, Na
Metals: Sb, As, Cd, Cr, Cu, Pb, Hg, Ni, Zn
B, Fe, Mn
Hg, Cd, Cr: low level
VOC: BTEX / MBTE
SVOC: PAH, Phenol, Chlorinated Phenols

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 76573

CHAIN OF CUSTODY

CLIENT: MOR	If Electronic File Required please select file format below	SAMPLER: DDwyer / JmcCann	
ADDRESS: Unit 2B Richview office Park, Clonskeagh Dublin 14.	EQUIS	MOBILE: 01 260 2655	
PROJECT MANAGER (PM): Thomas Vannio Matilla	CROSSTAB	EMAIL REPORT TO: ddwyer@moree.ie jmccann@moree.ie	
MOBILE: 01 260 2655	CLIENT	cc REPORT TO: thomasvm@moree.ie	
PROJECT ID: E1119	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	INVOICE TO: (if different to report)	
SITE: Event 2 E1119		QUOTE NUMBER: C544 BP	P.O No:

Jones Environmental Laboratory

Chain of Custody sheet page 1 of 1

TURNAROUND - please tick

10 DAY		4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	TOC	TOS	Ammoniacal Nitrogen	TOxN	Earth Metals	Metals	Alkalinity	SO4	Cl	MRP as P	Total Cyanide	Fluoride	PAH 16	SVOC	VOC	Pesticides
MW6					GW	05/05/15																						
MW8					"	"																						
MW11					"	"																						
MW12					"	"																						

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Ammoniacal Nitrogen as N low level
Earth Metals: Ca, Mg, K, Na (dissolved)
metals diss: As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, B, Fe, Mn
Hg, Cd: low level
VOC: BTEX/MBTE
SVOC: PAH, Phenols
Chlorinated Phenols,
Pesticides to Incld:
Acid Herbicides, Atrazine + Simazine, Combined Pesticide suite

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 82871

CHAIN OF CUSTODY

CLIENT: Malone O Regan	If Electronic File Required please select file format below	SAMPLER: DDwyer / JMcCann	
ADDRESS: Unit 2B Richview office Park, Clonsheagh, Dublin 14	EQUIS	MOBILE: 01 260 2655	
PROJECT MANAGER (PM): Thomas Vartiis Mattilla	CROSSTAB	EMAIL REPORT TO: ddwyer@morce.ie / jmccann@morce.ie	
MOBILE: 01 260 2655	CLIENT	cc REPORT TO: thomasvm@morce.ie	
PROJECT ID: Ellis	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	INVOICE TO: (if different to report)	
SITE: Event 2		QUOTE NUMBER: 5549 BP	P.O No:

Jones Environmental Laboratory

Chain of Custody sheet page 1 of 2

TURNAROUND - please tick

10 DAY	✓	4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	Ammoniacal Nitrogen	TON	BOD	COD	Earth Metals	Metals	SO4	Chloride	MRP as P	Total Cyanide	Fluoride	PAH 16	SVOC	VOC	Comb Pest	AT/SIM
BH2					L	05/03/15																						
BH11					L																							

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Ammoniacal Nitrogen as N (low level)
mercury, cadmium, low level
Earth Metals / Metals dissolved
Ca, Mg, Na, K, P, Mn, Cd, Cr, Cu, N, Pb, Zn, As, B, Hg

VOC to incl - MCBE - BTEX
SVOC to incl - PAH, Phenol, Chlorinated Phenols

Pesticides to incl: Acid Herbicide, Atrazine + Simazine, Combined Pesticide Suite

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 82869

CHAIN OF CUSTODY

CLIENT: Malone O'Regan

ADDRESS: Unit 28 Rathmore Grove Creg Clondalkin, Dublin 22

PROJECT MANAGER (PM): Thomas Vanno Mattetta

MOBILE: 01 260 2600

PROJECT ID: E1119

SITE: E1119

If Electronic File Required please select file format below

EQUIS	
CROSSTAB	
CLIENT	
AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	

SAMPLER: Joce / DD

MOBILE: 01 260 2656

EMAIL REPORT TO: jmccann@rpsgroup.ie

cc REPORT TO: ddwyer@rpsgroup.ie

INVOICE TO: (if different to report)

QUOTE NUMBER: 55449SP

P.O No:

Jones Environmental Laboratory

Chain of Custody sheet page 1 of 2

TURNAROUND - please tick

10 DAY		4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	TSS	Ammonia as N	TOxN	BOD	COD	Alkalinity	SO4	Chloride	MRP as P	Total Cyanide	Fluoride	PAH 16	SVOC	VOC	Extractable
SW1 Mill					SW	6/5/2015																					
SW2 Upp					SW	"																					
SW5 Mill					SW	"																					
SW6 Upp					SW	"																					

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Ammonia as N (low level)

metals suite (Dissolved)

As Cd Cr Cu Pb Hg Ni Zn B Fe Mn Cd Cr Hg (low level)

SVOC inc → PAHs, phenols & chlorinated phenols

VOC → inc BTEX/MTBE

RELINQUISHED BY:

Name:

Of:

Date: 6/5/2015

Time:

RECIEVED BY:

Name:

Of:

Date:

Time:

METHOD of SHIPMENT

Consignment note No:

Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.

Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 82875

CHAIN OF CUSTODY

CLIENT: Mdore DT Pegen	If Electronic File Required please select file format below		SAMPLER: TMC / DD
ADDRESS: Unit 2B, Pathwen office Park, Clonshaugh, Dublin 17		EQUIS	MOBILE: 01 260 2655
PROJECT MANAGER (PM): Thomas Vanno Mattitta		CROSSTAB	EMAIL REPORT TO: jmccann@roreg.ie / ddwyer@roreg.ie
MOBILE: 01 260 2655		CLIENT	cc REPORT TO:
PROJECT ID: E1119		AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	INVOICE TO: (if different to report)
SITE: E1119			QUOTE NUMBER: 5549 BD P.O No:

Jones Environmental Laboratory

Chain of Custody sheet page 4 of 4

TURNAROUND - please tick: 10 DAY ✓ | 5 DAY | 4 DAY | 3 DAY | Other

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY
AVERAGE COOL BOX TEMP.(if required):
SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

Sample ID	AGS SAMPT YPE	AGS SAMPR EF	Shaken	Settled	S/GW/SW/ L/E/OW/P	Date	Time	Depth in Metres	Preserv ation	Asbestos risk: High	Medium	Low	Coms Pest	All Heavy
SW 1 Mill					Sw	30/4/15								
SW 2 Lffr					"	"								
SW 5 Mill					"	"								
SW 6 Mill					"	"								

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

RELINQUISHED BY:		RECIEVED BY:	METHOD of SHIPMENT
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 76576

CHAIN OF CUSTODY

CLIENT: MOR

ADDRESS: Unit 2B Redview Office Park, Stratford Oubga 14,1

PROJECT MANAGER (PM): Thomas Vanic Mattiu

MOBILE: 07 260 2655

PROJECT ID: E1119

SITE: E1119

If Electronic File Required please select file format below

EQUIS	
CROSSTAB	
CLIENT	
AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	

SAMPLER: BOnga / SMorgan

MOBILE: 07 260 2655

EMAIL REPORT TO: ddavies@mor.co.nz

cc REPORT TO: mccullough@mor.co.nz

INVOICE TO: (if different to report)

QUOTE NUMBER: 554 / 80 P.O No:

Jones Environmental Laboratory

Chain of Custody sheet page 2 of 4

ANALYSIS REQUIRED including SUITE names

TURNAROUND - please tick

10 DAY	✓	4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	SVOC	VOC	Comments
SW1 mill					SW	5/10/23									Ammoniacal Nitrogen as N, low level
SW2 Ikit															metals dissolved: As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, B, Fe, Mn, Cd, Cr, Hg low level
SW5 mill															SVOC PAHs plus carbazole and pleads
SW6 Ikit															VOC BTEX/MTBE

RELINQUISHED BY:

Name:

Of:

Date:

Time:

RECIEVED BY:

Name:

Of:

Date:

Time:

METHOD of SHIPMENT

Consignment note No:

Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Jones Environmental Forensics Ltd.

Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 76575

CHAIN OF CUSTODY

CLIENT: Malone O'Regan	If Electronic File Required please select file format below	SAMPLER: JMC / DD	
ADDRESS: Unit 2B, Richview, Oppice Park, Clonsleagh Dublin 14	EQUIS	MOBILE: 01 260 2655	
PROJECT MANAGER (PM): Thomas Vainio Mabilla	CROSSTAB	EMAIL REPORT TO: jmccann@morce.ie	
MOBILE: 01 260 2655	CLIENT	cc REPORT TO: ddwyer@morce.ie	
PROJECT ID: E1119	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	INVOICE TO: (if different to report)	
SITE: E1119		QUOTE NUMBER: 5549 BP	P.O No:

Jones Environmental Laboratory

Chain of Custody sheet page 1 of 2

TURNAROUND - please tick

10 DAY	✓	4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	TOC	TOS	Ammonia/Nitrogen as N	TO+N	Alkalinity	SO4	Cl	MRP as P	Total Cyanide	Fluoride	PAH 16	SVOC	VOC	Earth Metals	Metals
MW4						6/5/2015																					
MW7						"																					
MW10						"																					

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

→ Earth Metals (Diss) Ca, Mg, K, Na

→ Metals (Diss) As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, B, Fe, Mn, Hg, Cd → Low level

VOC → BTEX/MTBE

SVOC: PAH, Phenols, Chlorinated Phenols

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date: 6/5/2015	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.

Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 82877

CHAIN OF CUSTODY

CLIENT: Malone & Regan	If Electronic File Required please select file format below	SAMPLER: JMCC / DD	
ADDRESS: Unit 2B Richview Office Park, Clonsteagh, Dublin 14	EQUIS	MOBILE: 01 260 2655	
PROJECT MANAGER (PM): Thomas Vainio Matilla	CROSSTAB	EMAIL REPORT TO: jmccann@more.ie	
MOBILE: 01 260 2655	CLIENT	cc REPORT TO: ddwyer@more.ie	
PROJECT ID: E1119	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	INVOICE TO: (if different to report)	
SITE: E1119		QUOTE NUMBER: 5549 BP	P.O No:

Jones Environmental Laboratory

Chain of Custody sheet page 2 of 2

TURNAROUND - please tick

10 DAY	✓	4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Sample ID	AGS SAMPTYPE	AGS SAMPREF	Shaken	Settled	S/GW/SW/L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Medium	Low	Comb Pesticides	Acid Herbs	Alt/Sim
MW4					GW	6/5/2015									
MW7					GW	"									
MW10					GW	"									

RELINQUISHED BY: Jason McCann		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date: 6/5/2015	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 82878

CHAIN OF CUSTODY

CLIENT: Malone O'Regan	If Electronic File Required please select file format below	SAMPLER: DOwyer / JMcLann	
ADDRESS: Unit 2B Richview office Park, Clonskeagh, Dublin 14	EQUIS	MOBILE: 01 260 2655	
PROJECT MANAGER (PM): Thomas Vaird Mallilly	CROSSTAB	EMAIL REPORT TO: ddwyer@gmoreile, jmccann@gmoreile	
MOBILE: 01 260 2655	CLIENT	cc REPORT TO: thomasvm@gmoreile	
PROJECT ID: E1119	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	INVOICE TO: (if different to report)	
SITE: E1119		QUOTE NUMBER: 5541 BP	P.O No:

Jones Environmental Laboratory

Chain of Custody sheet page 1 of 2

ANALYSIS REQUIRED including SUITE names

TURNAROUND - please tick

10 DAY ✓ | 4 DAY | Other

5 DAY | 3 DAY

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

Sample ID	AGS SAMPT YPE	AGS SAMPR EF	Shaken	Settled	S/GW/SW/ L/E/OW/P	Date	Time	Depth in Metres	Preserv ation	Asbestos risk: High	Medium	Low	Asbestos screen	TPH CWG	BTEX	COD	Hexavalent Chromium	Metals	SO4	Chloride	PRB as Total Cyanide	Fluoride	PAH 16	SVOC	VOC	Comb Test
BH1					L	21/07/15							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH2					L	"							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Ammoniacal Nitrogen as N : low level

Mercury, Cadmium, Chromium, Copper, Nickel, Lead, Zinc, Arsenic, Boron, Selenium low level, Both methyl/metals dissolved

Chromium III, Chromium VI, Molybdenum, Antimony, Barium, Beryllium, Cobalt, Manganese, Silver, Thallium, Vanadium

Chloride, Fluoride, Sulphate as SO4, Total Cyanide, Phenol, Nitrite, Nitrate as N, Ammoniacal Nitrogen as N

Total Organic Carbon, Total Dissolved Solids, Total Suspended Solids, Total Phosphorus as P, Sulphide, Sulphur, Magnesium, Calcium, Sodium, Potassium

* VOC to include = mtbe/Benzene/Toluene/Ethylbenzene/m&p-Xylene/o-Xylene

** SVOC to include PAH, Phenol, Chlorinated Phenols

Pesticides to include: Acid Herbicides, Atrazine, Simazine, Combined Pesticide suite

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

JEL 76571

APPENDIX C

TESTCONSULT LIMITED

40A Hardwick Grange, Warrington, WA1 4RF
Tested at Testconsult Ireland Ltd.
Clonminam Industrial Estate, Portlaoise, Co. Laois

LABORATORY TEST REPORT

TO DETERMINE THE UNDRAINED SHEAR STRENGHT IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE IN ACCORDANCE WITH BS 1377-7: 1990 CLAUSE 8

Project:	JS Drilling Ltd	**Job No**	PL
Client:	J.S. Drilling Ltd.	**Lab Ref No**	ST 64014
	Thomastown	**Date Received**	30/04/2015
	Co. Kilkenny	**Date Reported**	21/05/2015
		Material	U-Tube Clay
Order No.:	N/A		
Originator:	Jim Stephenson	**Specification**	Client

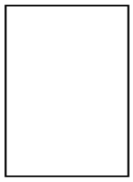
SAMPLE DETAILS

Sample Ref :	Waterstown 1	***Date Sampled :***	Client Info
Supplier:	Client Info	***Sample Type:***	Bulk
Source:	Client Info	***Sampled By:***	Client
Location:	Waterstown 1	***Sampling Cert.:***	No

Results

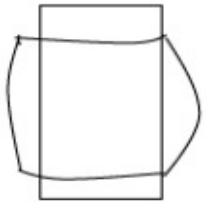
Undisturbed/~~Remoulded~~*
2.5kg rammer/~~4.5kg rammer~~*
* Delete as appropriate

ORIENTATION AND POSITION OF UNDISTURBED SAMPLE WITHIN SAMPLING CONTAINER



Initial Specimen Length	201mm
Initial Specimen Diameter	101mm
Initial Moisture Content	13.30%
Bulk Density	2.146 Mg/m^3
Dry Density	1.895 Mg/m^3
Rate of Strain	1.5%/min
Latex Membrane Thickness	0.6mm
Membrance Correction	2.2kPa
Cell Pressure	200 kPa
Corrected Maximum Deviator Stress at failure	336 kPa
Strain at Failure	19.50%
Shear Strenght C_u	**168 kPa**

Mode of Failure: Plastic Failure-(Barrelling)*
~~Brittle Failure (Shear Plane)*~~
~~Intermediate Type*~~
* Delete as appropriate



Tested in accordance with the above specifications
Subcontracted to a laboratory UKAS accredited in this testing

Approved Signature
TESTCONSULT IRELAND LIMITED
☐ Mark Dawkins, Director; ☐ Michael Robinson, Director & Lab. Manager
☐ James Ward, Senior Technician

TESTCONSULT LIMITED

40A Hardwick Grange, Warrington, WA1 4RF
Tested at Testconsult Ireland Ltd.
Clonminam Industrial Estate, Portlaoise, Co. Laois

LABORATORY TEST REPORT

TO DETERMINE THE UNDRAINED SHEAR STRENGHT IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE IN ACCORDANCE WITH BS 1377-7: 1990 CLAUSE 8

Project:	JS Drilling Ltd	**Job No**	PL
Client:	J.S. Drilling Ltd.	**Lab Ref No**	ST 64014
	Thomastown	**Date Received**	30/04/2015
	Co. Kilkenny	**Date Reported**	21/05/2015
		Material	U-Tube Clay
Order No.:	N/A		
Originator:	Jim Stephenson	**Specification**	Client

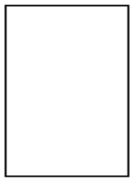
SAMPLE DETAILS

Sample Ref :	Waterstown 2	***Date Sampled :***	Client Info
Supplier:	Client Info	***Sample Type:***	Bulk
Source:	Client Info	***Sampled By:***	Client
Location:	Waterstown 2	***Sampling Cert.:***	No

Results

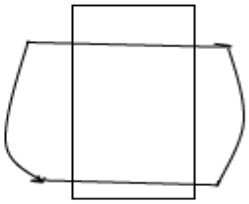
Undisturbed/~~Remoulded~~*
2.5kg rammer/~~4.5kg rammer~~*
* Delete as appropriate

ORIENTATION AND POSITION OF UNDISTURBED SAMPLE WITHIN SAMPLING CONTAINER



Initial Specimen Length	201mm
Initial Specimen Diameter	101mm
Initial Moisture Content	20.00%
Bulk Density	2.033 Mg/m^3
Dry Density	1.694 Mg/m^3
Rate of Strain	1.5%/min
Latex Membrane Thickness	0.6mm
Membrance Correction	2.1kPa
Cell Pressure	200 kPa
Corrected Maximum Deviator Stress at failure	155 kPa
Strain at Failure	19.00%
Shear Strenght C_u	**77 kPa**

Mode of Failure: Plastic Failure-(Barrelling)*
~~Brittle Failure (Shear Plane)*~~
~~Intermediate Type*~~
* Delete as appropriate



Tested in accordance with the above specifications
Subcontracted to a laboratory UKAS accredited in this testing

Approved Signature
TESTCONSULT IRELAND LIMITED
☐ Mark Dawkins, Director; ☐ Michael Robinson, Director & Lab. Manager
☐ James Ward, Senior Technician

APPENDIX D

Environmental Risk Assessment
Waterstown Landfill
South Dublin County Council

Slug Test Results Summary Table - Hvorslev Analysis

Test Well ID		Test Type	Test Date	Comment	Hydraulic Conductivity		
					m/sec	m/day	mm/hr
MW4	Slug Test 1	Falling Head Test	12/05/2015	1 x slug added	1.32E-06	0.11	4.76
	Slug Test 2	Rising Head Test	12/05/2015	1 x slug removed	1.80E-06	0.16	6.49
	Max Result				1.80E-06	0.16	6.49
	Min Result				1.32E-06	0.11	4.76
	Average K				1.56E-06	0.14	5.63
MW10	Slug Test 1	Falling Head Test	12/05/2015	1 x slug added	7.21E-06	0.62	25.95
	Slug Test 2	Rising Head Test	12/05/2015	1 x slug removed	1.80E-05	1.56	64.87
	Max Result				1.80E-05	1.56	64.87
	Min Result				7.21E-06	0.62	25.95
	Average K				1.26E-05	1.09	45.41
MW06	Slug Test 1	Falling Head Test	12/05/2015	3 x slug added	Failed Slug Test	Failed Slug Test	Failed Slug Test
MW07	Slug Test 1	Falling Head Test	12/05/2015	4 x slug added	Failed Slug Test	Failed Slug Test	Failed Slug Test

Malone O'Regan

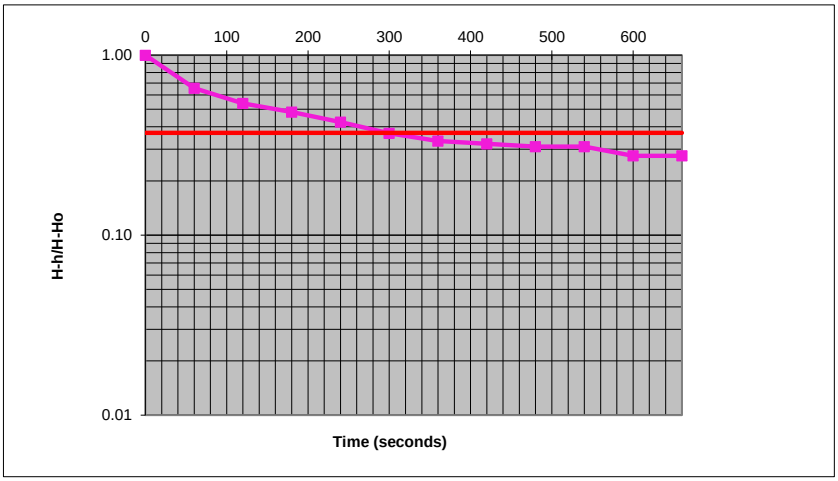
Slug Test-Hvorslev Analysis

Client:	**South Dublin County Council**	Job Number:	E1119	Analysed by:	DD
Test Well Number:	**MW4**	Date of Test:	12/05/15	Checked by:	DL
Type of Test:	**No. 1**	**Falling Head**			

Inputs:

DTW,the depth to water table:	8.482	Do,depth to water at t=0, slugs added:	8.395
d, diameter of piezometer:	0.05	L, length of well screen:	4.00
		D, diameter of test interval/casing:	0.05

Time (sec)	Depth to Water (m)	Water Head (m)	H/Ho
0	8.395	0.09	1.00
60	8.425	0.06	0.66
120	8.435	0.05	0.54
180	8.440	0.04	0.48
240	8.445	0.04	0.43
300	8.450	0.03	0.37
360	8.453	0.03	0.33
420	8.454	0.03	0.32
480	8.455	0.03	0.31
540	8.455	0.03	0.31
600	8.458	0.02	0.28
660	8.458	0.02	0.28



Relative Water Head -vs- Time

Instructions:

1.Enter in intial input and drawdowns altering the time column when necessary.

2. Plot results, Time (sec) and Depth to Water (m).

3. Approximate line of best fit and solve

Hvorslev Analysis

Basic Time Lag To (sec) =	300.00	
(when H/Ho=0.37)		
Hydraulic =	1.32E-06	m/sec
Conductivity=	0.114	m/day
=	4.76	mm/hr

Malone O'Regan

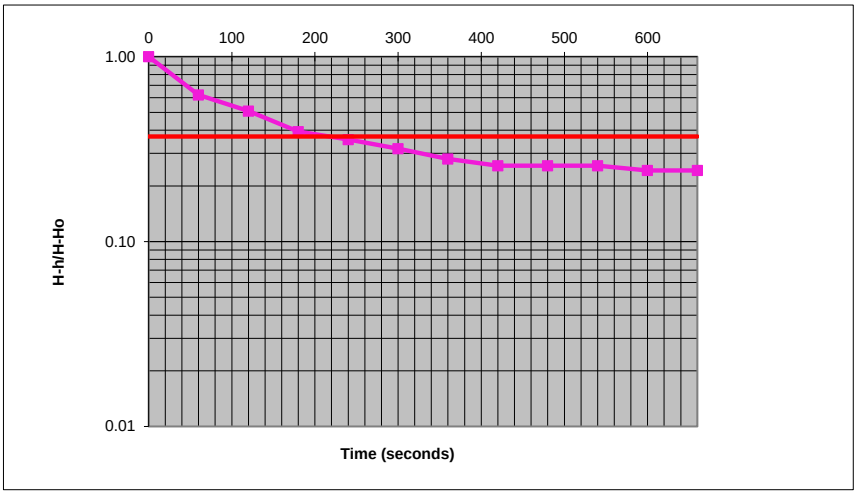
Slug Test-Hvorslev Analysis

Client:	**South Dublin County Council**	Job Number:	E1119	Analysed by:	DD
Test Well Number:	**MW4**	Date of Test:	12/05/15	Checked by:	DL
Type of Test:	**No. 2**	**Rising Head**			

Inputs:

DTW,the depth to water table:	8.458	Do,depth to water at t=0, slugs removed:	8.590
d, diameter of piezometer:	0.05	L, length of well screen:	4.00
		D, diameter of test interval/casing:	0.05

Time (sec)	Depth to Water (m)	Water Head (m)	H/Ho
0	8.590	-0.13	1.00
60	8.540	-0.08	0.62
120	8.525	-0.07	0.51
180	8.510	-0.05	0.39
240	8.505	-0.05	0.36
300	8.500	-0.04	0.32
360	8.495	-0.04	0.28
420	8.492	-0.03	0.26
480	8.492	-0.03	0.26
540	8.492	-0.03	0.26
600	8.490	-0.03	0.24
660	8.490	-0.03	0.24



Relative Water Head -vs- Time

Instructions:

1.Enter in intial input and drawdowns altering the time column when necessary.

2. Plot results, Time (sec) and Depth to Water (m).

3. Approximate line of best fit and solve

Hvorslev Analysis

Basic Time Lag To (sec) =	220.00	
(when H/Ho=0.37)		
Hydraulic =	1.80E-06	m/sec
Conductivity=	0.156	m/day
=	6.49	mm/hr

Malone O'Regan

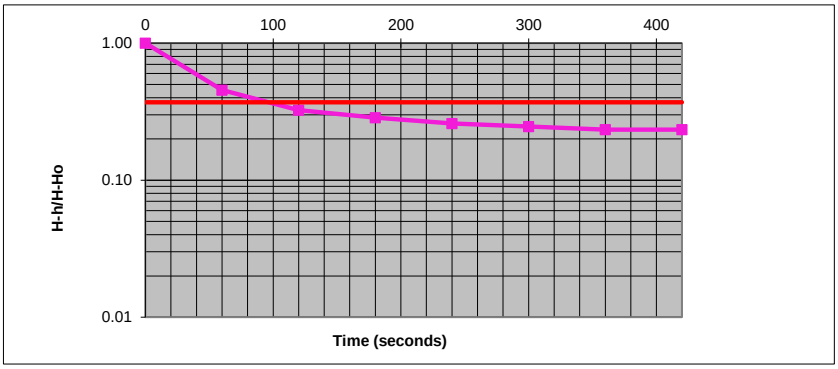
Slug Test-Hvorslev Analysis

Client:	**South Dublin County Council**	Job Number:	E1119	Analysed by:	DD
Test Well Number:	**MW10**	Date of Test:	12/05/15	Checked by:	DL
Type of Test:	**No. 1**	**Falling Head**			

Inputs:

DTW,the depth to water table:	2.682	Do,depth to water at t=0, slugs added:	2.605
d, diameter of piezometer:	0.05	L, length of well screen:	2.00
		D, diameter of test interval/casing:	0.05

Time (sec)	Depth to Water (m)	Water Head (m)	H/Ho
0	2.605	0.08	1.00
60	2.647	0.04	0.45
120	2.657	0.02	0.32
180	2.660	0.02	0.29
240	2.662	0.02	0.26
300	2.663	0.02	0.25
360	2.664	0.02	0.23
420	2.664	0.02	0.23



Relative Water Head -vs- Time

Instructions:

1.Enter in intial input and drawdowns altering the time column when necessary.

2. Plot results, Time (sec) and Depth to Water (m).

3. Approximate line of best fit and solve

Hvorslev Analysis

Basic Time Lag To (sec) =	95.00	
(when H/Ho=0.37)		
Hydraulic =	7.21E-06	m/sec
Conductivity=	0.623	m/day
=	25.95	mm/hr

Malone O'Regan

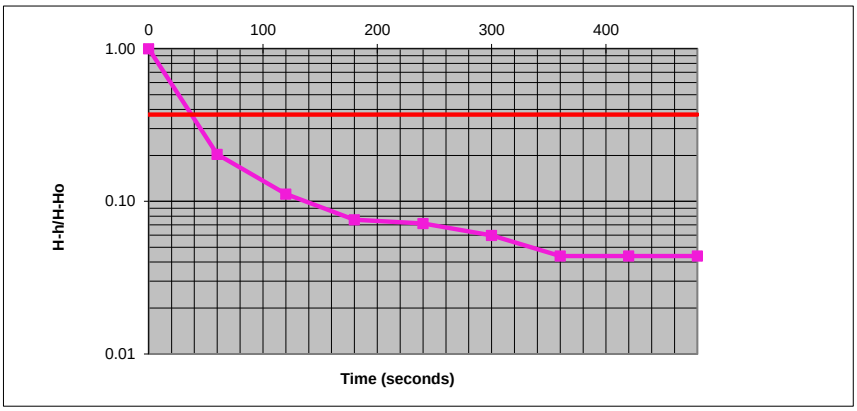
Slug Test-Hvorslev Analysis

Client:	**South Dublin County Council**	Job Number:	E1119	Analysed by:	DD
Test Well Number:	**MW10**	Date of Test:	12/05/15	Checked by:	DL
Type of Test:	**No. 2**	**Rising Head**			

Inputs:

DTW,the depth to water table:	2.664	Do,depth to water at t=0, slugs removed:	2.915
d, diameter of piezometer:	0.05	L, length of well screen:	2.00
		D, diameter of test interval/casing:	0.05

Time (sec)	Depth to Water (m)	Water Head (m)	H/Ho
0	2.915	-0.25	1.00
60	2.715	-0.05	0.20
120	2.692	-0.03	0.11
180	2.683	-0.02	0.08
240	2.682	-0.02	0.07
300	2.679	-0.01	0.06
360	2.675	-0.01	0.04
420	2.675	-0.01	0.04
480	2.675	-0.01	0.04



Relative Water Head -vs- Time

Instructions:

1.Enter in intial input and drawdowns altering the time column when necessary.

2. Plot results, Time (sec) and Depth to Water (m).

3. Approximate line of best fit and solve

Hvorslev Analysis

Basic Time Lag To (sec) =	38.00	
(when H/Ho=0.37)		
Hydraulic =	1.80E-05	m/sec
Conductivity=	1.557	m/day
=	64.87	mm/hr

APPENDIX E

BOREHOLE LOG

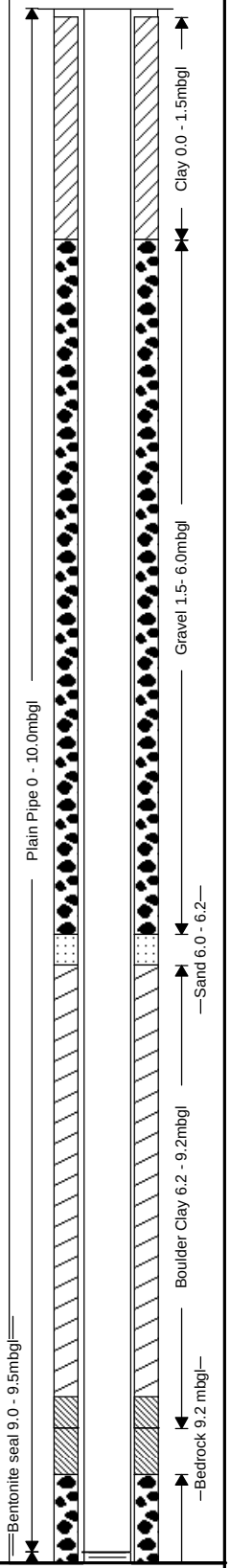
MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: MW7

Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	SAMPLE Depth (mbgl)	SAMPLE PID (ppm)
0		TOPSOIL Brown clay, damp, coming up in clumps	No evidence of physical contaminatiom			
1		LIMESTONE				
		CLAYS				
		GRAVELS Small - medium, dry, some clay				
2						
3						
4						
		GRAVELS Dry, NEC, medium shaped				
5						
6		SAND Gravelly SAND, medium sized, slightly clayey. Damp, light brown - tan NEC.				
		Gravel getting damp, slight water seepage.				
		Limestone fragments (medium) harder to drill, no bedrock - big boulder.				
7						
		Water seepage. No water but gravels coming up wet.				
		Wet clay and gravels. Water seepage. Wet boulder clay.				
8		Still in gravels and clas, strong water strike. A lot of water.				
9		Still a lot of water, Boulders Clays NEC				
		Bedrock - Limestone V.slow water still coming up				
10						



Drill Date: 24/4/15
Drill Method: Air Rotary
Drilled By: JS Drilling

Logged By: TVM
Checked By: TVM

Reference Datum: Above ground level
Elevation: 16.39
Easting: 708102.733
Northing: 735802.625

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 2

DISCLAIMER: This log is for environmental purposes only.

BOREHOLE LOG

2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119

Client: SDCC

Project Title: SDCC - Waterstown Phase II

Site Location: Waterstown, Dublin

BOREHOLE NO: MW7

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
11							Screened Pipe 10.0 - 12.0
12							Gravel 9.5 - 12.0 mbgl
13							
14							
15							
16							
17							
18							
19							
20							

Drill Date: 24/4/15
Drill Method: Air Rotary
Drilled By: JS Drilling

Logged By: TVM
Checked By: TVM

Reference Datum: Above ground level
Elevation: 16.39
Easting: 708102.733
Northing: 735802.625

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 2 of 2

DISCLAIMER: This log is for environmental purposes only.

BOREHOLE LOG

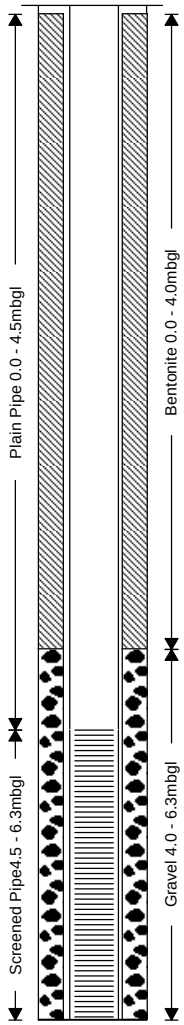
MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: MW8

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	



Drill Date:
Drill Method: Air Rotary
Drilled By: JS Drilling

Logged By: TVM
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: **Level:**

Revision: Final **Page:** 1 of 1

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BOREHOLE LOG

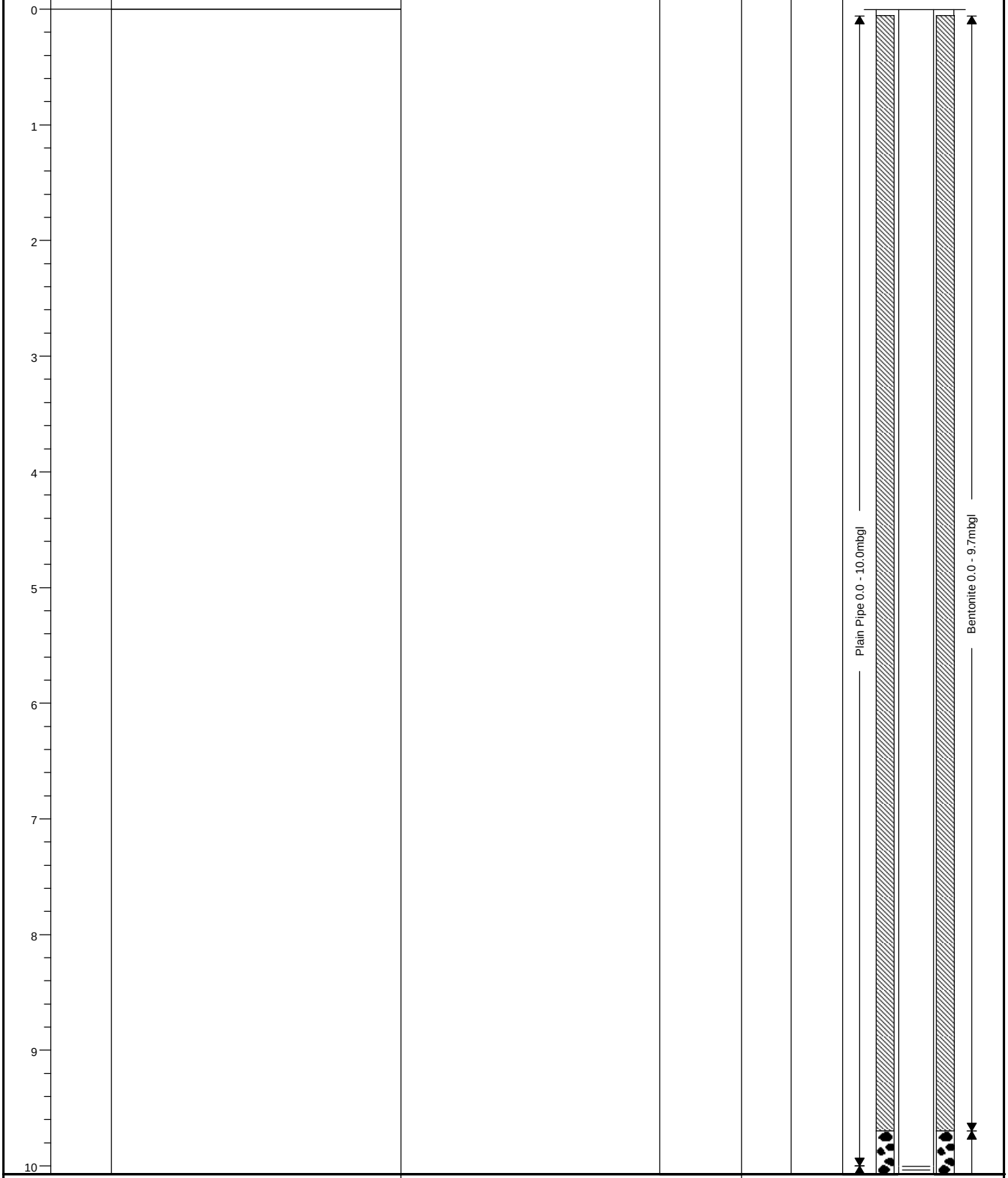
MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: MW10b

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	



Drill Date:
Drill Method: Air Rotary
Drilled By: JS Drilling

Logged By: TVM
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: **Level:**

Revision: **Final** **Page:** 1 of 2

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BOREHOLE LOG

2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: MW10b

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
11							Screened Pipe10.0 - 12.0mbgl; Gravel 9.7 - 12.0mbgl
12							
13							
14							
15							
16							
17							
18							
19							
20							

Drill Date:
Drill Method: Air Rotary
Drilled By: JS Drilling

Logged By: TVM
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 2 of 2

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BOREHOLE LOG

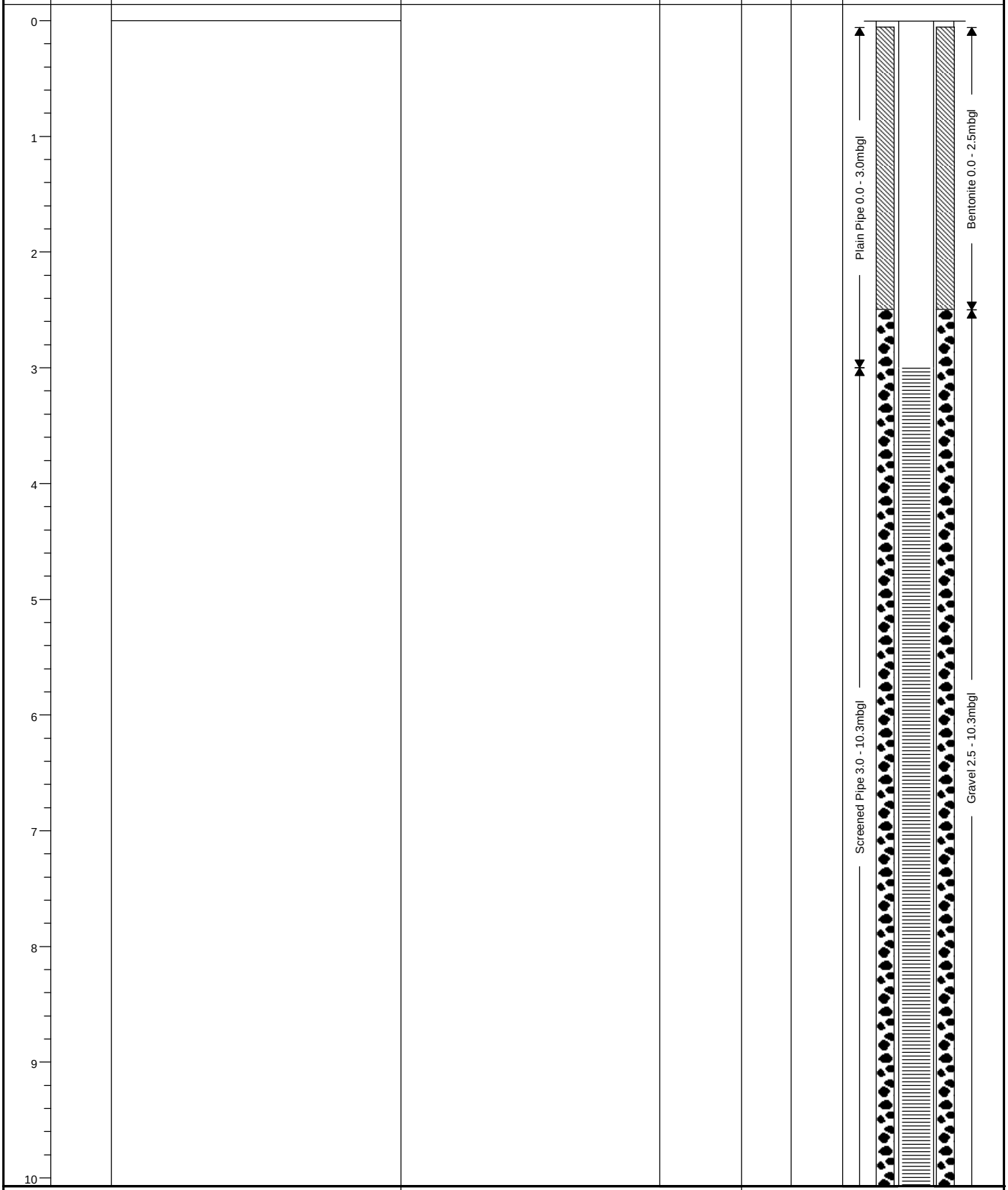
MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: MW12

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	



Drill Date:
Drill Method: Air Rotary
Drilled By: JS Drilling

Logged By: TVM
Checked By: TVM

Reference Datum:
Elevation: 25.59
Easting: 708720.681
Northing: 735480.296

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 7

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BOREHOLE LOG

2B Richview Office Park,
Clonskeagh,
Dublin 14

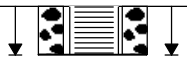
Project Number: E1119

Client: SDCC

Project Title: SDCC - Waterstown Phase II

Site Location: Waterstown, Dublin

BOREHOLE NO: MW12

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Drill Date:
Drill Method: Air Rotary
Drilled By: JS Drilling

Logged By: TVM
Checked By: TVM

Reference Datum:
Elevation: 25.59
Easting: 708720.681
Northing: 735480.296

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 2 of 7

DISCLAIMER: This log is for environmental purposes only.

APPENDIX F

BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP7

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL					
		CLAY Brown, stiff CLAY with stone and some boulders, no odour.					
1							
		SAND and GRAVEL With large limestone bouldersm dark grey, wet, no odour. No waste, no odour, after 10 minutes app. 20cm of water at the trial pit base. Sample from 3 to 4.5mbgl.					
2							
3							
4							
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

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BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP8

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL					
		CLAY Brown, stiff CLAY with stone and some boulders, no odour.					
1							
		SAND and GRAVEL Some clay,brown, no odour.					
2							
		WET					
		SAND AND GRAVEL With some large limestone bouldersm dark grey, wet, no odour. No waste, no odour, after 10 minutes app. 20cm of water at the trial pit base. Sample from 3 to 4.5mbg					
3							
4							
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

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BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP9

SUBSURFACE CONDITIONS				WATER	SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	(mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL 0.0 - 0.10mbgl					
		CLAY 0.10 - 1.2mbgl Brown, stiff CLAY with stone and some boulders, no odour.Wet					
1		SAND and GRAVEL 1.2 - 1.7mbgl Some clay,brown, no odour. Wet. Sample from 1.2 to 1.7mbgl.					
		BEDROCK 1.7 - 2.5mbgl Weathered bedrock with shale and limestone, loose, wet, no odour.					
2		LIMESTONE 2.5 - 2.51mbgl Limestone bedroc. No waste, no odour, some waterat the trial pit base. Sample form 1.0 to1.5mbgl.					
3							
4							
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

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BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP10

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL 0.0 - 0.10mbgl					
		CLAY 0.10 - 1.2mbgl Brown, stiff CLAY with stone and some boulders, no odour.					
1		SAND and GRAVEL 1.0 - 1.5mbgl. Dark grey, slight waste/HC odour, wet					
		BEDROCK 1.5-1.7mbgl. Limestone BEDROCK. No waste,slight HC odour, some water at the trial pit base. Sample from 1.0 to 1.5mbgl.					
2							
3							
4							
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

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BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP11

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL 0.0 - 0.2mbgl					
		CLAY 0.2 - 0.6mbgl MADEGROUND brown to dark brown stiff CLAY with some minor bricks, no odour, dry.					
1		SAND and GRAVEL 0.6 - 3.0mbgl SAND and GRAVEL with some large limestone boulders, no odour, dry.					
2							
3		BEDROCK 3.0 mbgl. Only minor C&D at top layers, dry, no odour, sample collected between 0.6 - 3.0mbgl.					
4							
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

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BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP12

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL 0.0 - 0.2mbgl					
		CLAY 0.2 - 0.8mbgl MADEGROUND brown to dark brown stiff CLAY no odour, dry.					
1		CLAY 0.8 - 2.5mbgl Clay with C&D watse comprising mainly bricks and stone, waste odour, dry.					
2							
		MADEGROUND 2.5 - 4.00mbgl. Well compacted black and decomposed municipal waste comprising plastic, textiles, paper, wood, metal, strong waste odour, dry.					
3							
4		MADEGROUND 4.0 - 5.0mbgl. Decomposed municipal waste comprising of plastic, paper, wood, textiles, vrick and metal, strong waste odour, dry. Waste more decomposed at depth, dry, sample collected between 0.8 - 2.5mbgl.					
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

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BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP13

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL 0.0 - 0.2mbgl					
		CLAY 0.2 - 0.6mbgl MADEGROUND brown stiff CLAY with some stone, no odour					
1		CLAY 0.6 - 2.0mbgl MADEGROUND brown stiff CLAY with some stone,minor waste odour.					
2		MADEGROUND 2.0- 2.5mbgl. clay with app 30% municipal waste comprising mainly of plastic with some wood, textiles, brick and metal, waste odour, dry					
		MADEGROUND 2.5 -3.0mbgl MADEGROUND clay with app 80% municipal waste comprising of plastic, paper, wood, textiles, brick and metal, strong waste odour, dry					
3		MADEGROUND 3.0-5.0mbgl MADEGROUNDclay with app 50% municipal waste comprising of plastic, paper, wood, textiles, brick and metal, strong waste odour, dry waste more decomposed at depth, dry all the way, sample collected between 4.5m to 5.0m bgl					
4							
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

DISCLAIMER: This log is for environmental purposes only.

BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP14

Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	SAMPLE Depth (mbgl)	SAMPLE PID (ppm)	INSTALLATION DETAILS
0		TOPSOIL 0.0 - 0.2mbgl					
		CLAY 0.2 - 0.4mbgl MADEGROUND brown stiff CLAY with some stone, no odour					
		CLAY 0.4 - 0.8mbgl MADEGROUND dark brown stiff CLAY with some (20%) municipal waste, minor waste odour					
1		MADEGROUND 0.8-2.5mbgl. MADEGROUND clay with C&D waste comprising mainly bricks and stone, waste odour, dry					
2							
		MADEGROUND 2.5 -4.0mbgl MADEGROUND clay with mainly municipal waste comprising of plastic, paper, wood, textiles, brick and metal, strong waste odour, wet					
3							
4		MADEGROUND 4.0-5.2mbgl MADEGROUND decomposed municipal waste comprising of plastic, paper, wood, textiles, brick and metal, strong waste odour, wet Waste more decomposed at depth, wet from 4m bgl, sample collected between 4.5m to 5.2m bgl					
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

DISCLAIMER: This log is for environmental purposes only.

BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP15

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL 0.0 - 0.2mbgl					
		MADEGROUND 0.2 - 0.8mbgl MADEGROUND brown CLAY with some stone, no odour.					
1		MADEGROUND 0.8 - 1.2mbgl MADEGROUND municipal waste with wood, plastic, textiles, wire, stone and some brick and metal, waste odour dry.					
		MADEGROUND 1.2 - 5.0mbgl. MADEGROUND municipal waste, volume of plastic increases towards depth, waste odour, dry. No sample collected at this location due to the oresence of mainly municipal waste.					
2							
3							
4							
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

DISCLAIMER: This log is for environmental purposes only.

BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP16

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL 0.0 - 0.2mbgl					
		MADEGROUND 0.2 - 2.0mbgl MADEGROUND brown to dark brown stiff CLAY with some (10%) municipal waste, minor odour.					
2		MADEGROUND 2.0 - 4.5mbgl MADEGROUND black and decomposed municipal waste comprising plastic, paper, wood, metal, strong waste odour, dry.					
4		MADEGROUND 4.5 - 5.0mbgl. MADEGROUND decomposed municipal waste comprising of plastic, paper, wood, textiles, bricks and metal, strong waste odour, wet. Waste more decomposed at depth, wet from 4.5mbgl, sample collected between 3.0 - 5.0mbgl					
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

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BOREHOLE LOG

MALONE O'REGAN ENVIRONMENTAL SERVICES Ltd.
2B Richview Office Park,
Clonskeagh,
Dublin 14

Project Number: E1119 | **Client:** SDCC

Project Title: SDCC - Waterstown Phase II | **Site Location:** Waterstown, Dublin

BOREHOLE NO: TP17

SUBSURFACE CONDITIONS					SAMPLE		INSTALLATION DETAILS
Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)	
0		TOPSOIL 0.0 - 0.1mbgl					
		CLAY 0.1 - 1.7mbgl. Brown stiff CLAY with stone and gravel, no odour.					
1							
2		SAND AND GRAVEL 1.7 - 2.0mbgl SAND AND GRAVEL, dark grey, HC/BTEX odour, wet.					
		LIMESTONE 2.0 - 2.2mbgl. LIMESTONE bedrock. No waste, slight HC odour, some water at the trial pit base. Sample from 1.7 - 2.0mbgl.					
3							
4							
5							
6							
7							
8							
9							
10							

Drill Date: 07 04 2015
Drill Method: Rotary
Drilled By: JS Drilling

Logged By: BMcP
Checked By: TVM

Reference Datum: 39.95
Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: ▽ **Level:** ▼

Revision: Final **Page:** 1 of 1

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APPENDIX G

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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

Malone O'Regan
2b Richview Office Park
Clonskeagh
Dublin 14
Ireland

4225

Attention :	Thomas Vainio-Mattila
Date :	29th April, 2015
Your reference :	E1119
Our reference :	Test Report 15/6228 Batch 1
Location :	
Date samples received :	17th April, 2015
Status :	Final report
Issue :	1

One sample was received for analysis on 17th April, 2015 of which one was 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

Bob Millward BSc FRSC
Principal Chemist

Client Name: Malone O'Regan
Reference: E1119
Location:
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6228

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7												
Sample ID	MW9												
Depth													
COC No / misc													
Containers	V H P BOD G												
Sample Date	15/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	17/04/2015												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Arsenic #	<2.5										<2.5	ug/l	TM30/PM14
Dissolved Boron	59										<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5										<0.5	ug/l	TM30/PM14
Dissolved Calcium #	151.1										<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5										<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7										<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20										<20	ug/l	TM30/PM14
Dissolved Lead #	<5										<5	ug/l	TM30/PM14
Dissolved Magnesium #	27.9										<0.1	mg/l	TM30/PM14
Dissolved Manganese #	28										<2	ug/l	TM30/PM14
Dissolved Mercury #	<1										<1	ug/l	TM30/PM14
Dissolved Nickel #	<2										<2	ug/l	TM30/PM14
Dissolved Potassium #	2.0										<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3										<3	ug/l	TM30/PM14
Dissolved Sodium #	46.7										<0.1	mg/l	TM30/PM14
Dissolved Zinc #	<3										<3	ug/l	TM30/PM14
MRP as Total Phosphorus	46										<5	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.014										<0.014	ug/l	TM4/PM30
Acenaphthylene #	<0.013										<0.013	ug/l	TM4/PM30
Acenaphthene #	<0.013										<0.013	ug/l	TM4/PM30
Fluorene #	<0.014										<0.014	ug/l	TM4/PM30
Phenanthrene #	<0.011										<0.011	ug/l	TM4/PM30
Anthracene #	<0.013										<0.013	ug/l	TM4/PM30
Fluoranthene #	<0.012										<0.012	ug/l	TM4/PM30
Pyrene #	<0.013										<0.013	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.015										<0.015	ug/l	TM4/PM30
Chrysene #	<0.011										<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.018										<0.018	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.016										<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 #	<0.195										<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	74										<0	%	TM4/PM30

Client Name: Malone O'Regan
Reference: E1119
Location:
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6228

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-7												
Sample ID	MW9												
Depth													
COC No / misc													
Containers	V H P BOD G												
Sample Date	15/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	17/04/2015												
Pesticides MS													
Organochlorine Pesticides													
Aldrin	<0.01											<0.01	ug/l	TM42/PM30
Alpha-HCH (BHC)	<0.01											<0.01	ug/l	TM42/PM30
Beta-HCH (BHC)	<0.01											<0.01	ug/l	TM42/PM30
Delta-HCH (BHC)	<0.01											<0.01	ug/l	TM42/PM30
Dieldrin	<0.01											<0.01	ug/l	TM42/PM30
Endosulphan I	<0.01											<0.01	ug/l	TM42/PM30
Endosulphan II	<0.01											<0.01	ug/l	TM42/PM30
Endosulphan sulphate	<0.01											<0.01	ug/l	TM42/PM30
Endrin	<0.01											<0.01	ug/l	TM42/PM30
Gamma-HCH (BHC)	<0.01											<0.01	ug/l	TM42/PM30
Heptachlor	<0.01											<0.01	ug/l	TM42/PM30
Heptachlor Epoxide	<0.01											<0.01	ug/l	TM42/PM30
p,p'-DDE	<0.01											<0.01	ug/l	TM42/PM30
p,p'-DDT	<0.01											<0.01	ug/l	TM42/PM30
p,p'-TDE	<0.01											<0.01	ug/l	TM42/PM30
Total Methoxychlor	<0.01											<0.01	ug/l	TM42/PM30
Organophosphorus Pesticides														
Azinphos methyl	<0.01											<0.01	ug/l	TM42/PM30
Diazinon	<0.01											<0.01	ug/l	TM42/PM30
Dichlorvos	<0.01											<0.01	ug/l	TM42/PM30
Disulfoton	<0.01											<0.01	ug/l	TM42/PM30
Ethion	<0.01											<0.01	ug/l	TM42/PM30
Ethyl Parathion (Parathion)	<0.01											<0.01	ug/l	TM42/PM30
Fenitrothion	<0.01											<0.01	ug/l	TM42/PM30
Malathion	<0.01											<0.01	ug/l	TM42/PM30
Methyl Parathion	<0.01											<0.01	ug/l	TM42/PM30
Mevinphos	<0.01											<0.01	ug/l	TM42/PM30
Benazolin	<0.1											<0.1	ug/l	TM42/PM30
Bentazone	<0.1											<0.1	ug/l	TM42/PM30
Bromoxynil	<0.1											<0.1	ug/l	TM42/PM30
Clopyralid	<0.1											<0.1	ug/l	TM42/PM30
4- CPA	<0.1											<0.1	ug/l	TM42/PM30
2,4 – D	<0.1											<0.1	ug/l	TM42/PM30
2,4 –DB	<0.1											<0.1	ug/l	TM42/PM30
Dicamba	<0.1											<0.1	ug/l	TM42/PM30
Dichloroprop	<0.1											<0.1	ug/l	TM42/PM30
Diclofop	<0.1											<0.1	ug/l	TM42/PM30
Fenoprop	<0.1											<0.1	ug/l	TM42/PM30
Flamprop	<0.1											<0.1	ug/l	TM42/PM30
Flamprop – isopropyl	<0.1											<0.1	ug/l	TM42/PM30
loxynil	<0.1											<0.1	ug/l	TM42/PM30

Client Name: Malone O'Regan
Reference: E1119
Location:
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6228

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-7												
Sample ID	MW9												
Depth													
COC No / misc													
Containers	V H P BOD G												
Sample Date	15/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	17/04/2015												
											LOD/LOR	Units	Method No.
MCPA	<0.1										<0.1	ug/l	TM42/PM30
MCPB	<0.1										<0.1	ug/l	TM42/PM30
Mecoprop	<0.1										<0.1	ug/l	TM42/PM30
Picloram	<0.1										<0.1	ug/l	TM42/PM30
Pentachlorophenol	<0.1										<0.1	ug/l	TM42/PM30
2,4,5 – T	<0.1										<0.1	ug/l	TM42/PM30
2,3,6 – TBA	<0.1										<0.1	ug/l	TM42/PM30
Triclopyr	<0.1										<0.1	ug/l	TM42/PM30
Atrazine	<1										<1	ug/l	TM39/PM30
Simazine	<1										<1	ug/l	TM39/PM30
Fluoride	<0.3										<0.3	mg/l	TM27/PM0
Sulphate #	62.58										<0.05	mg/l	TM38/PM0
Chloride #	94.0										<0.3	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	2.6										<0.2	mg/l	TM38/PM0
Ammoniacal Nitrogen as N	<0.01										<0.01	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	436										<1	mg/l	TM75/PM0
Total Organic Carbon #	<2										<2	mg/l	TM60/PM0
Total Dissolved Solids #	668										<10	mg/l	TM20/PM0

Client Name: Malone O'Regan
Reference: E1119
Location:
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6228

SVOC Report : **Liquid**

J E Sample No.	1-7												
Sample ID	MW9												
Depth													
COC No / misc													
Containers	V H P BOD G												
Sample Date	15/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	17/04/2015												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<1										<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5										<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5										<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5										<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1										<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5										<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1										<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5										<0.5	ug/l	TM16/PM30
4-Methylphenol	<1										<1	ug/l	TM16/PM30
4-Nitrophenol	<10										<10	ug/l	TM16/PM30
Pentachlorophenol	<1										<1	ug/l	TM16/PM30
Phenol	<1										<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1										<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1										<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5										<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1										<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5										<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1										<1	ug/l	TM16/PM30
Diethyl phthalate #	<1										<1	ug/l	TM16/PM30
Dimethyl phthalate	<1										<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1										<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1										<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1										<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1										<1	ug/l	TM16/PM30
2-Nitroaniline	<1										<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5										<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1										<1	ug/l	TM16/PM30
3-Nitroaniline	<1										<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1										<1	ug/l	TM16/PM30
4-Chloroaniline	<1										<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1										<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5										<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5										<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5										<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1										<1	ug/l	TM16/PM30
Carbazole #	<0.5										<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5										<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1										<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1										<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1										<1	ug/l	TM16/PM30
Hexachloroethane #	<1										<1	ug/l	TM16/PM30
Isophorone #	<0.5										<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5										<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1										<1	ug/l	TM16/PM30
Surrogate Recovery 2-Fluorobiphenyl	89										<0	%	TM16/PM30
Surrogate Recovery p-Terphenyl-d14	120										<0	%	TM16/PM30

Client Name: Malone O'Regan
Reference: E1119
Location:
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6228

VOC Report : **Liquid**

J E Sample No.	1-7												
Sample ID	MW9												
Depth													
COC No / misc													
Containers	V H P BOD G												
Sample Date	15/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	17/04/2015												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2										<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1										<0.1	ug/l	TM15/PM10
Chloromethane #	<3										<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1										<0.1	ug/l	TM15/PM10
Bromomethane	<1										<1	ug/l	TM15/PM10
Chloroethane #	<3										<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3										<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3										<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3										<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3										<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3										<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3										<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1										<1	ug/l	TM15/PM10
Bromochloromethane #	<2										<2	ug/l	TM15/PM10
Chloroform #	<2										<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2										<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3										<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2										<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2										<2	ug/l	TM15/PM10
Benzene #	<0.5										<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3										<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2										<2	ug/l	TM15/PM10
Dibromomethane #	<3										<3	ug/l	TM15/PM10
Bromodichloromethane #	<2										<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2										<2	ug/l	TM15/PM10
Toluene #	<0.5										<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2										<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2										<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3										<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2										<2	ug/l	TM15/PM10
Dibromochloromethane #	<2										<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2										<2	ug/l	TM15/PM10
Chlorobenzene #	<2										<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2										<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5										<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1										<1	ug/l	TM15/PM10
o-Xylene #	<0.5										<0.5	ug/l	TM15/PM10
Styrene	<2										<2	ug/l	TM15/PM10
Bromoform #	<2										<2	ug/l	TM15/PM10
Isopropylbenzene #	<3										<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4										<4	ug/l	TM15/PM10
Bromobenzene #	<2										<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3										<3	ug/l	TM15/PM10
Propylbenzene #	<3										<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3										<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3										<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3										<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3										<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3										<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3										<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3										<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
n-Butylbenzene #	<3										<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2										<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3										<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3										<3	ug/l	TM15/PM10
Naphthalene	<2										<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3										<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	97										<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	100										<0	%	TM15/PM10

Client Name: Malone O'Regan
Reference: E1119
Location:
Contact: Thomas Vainio-Mattila

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 15-6228						

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.: 15/6228

SOILS

Please note we are only MCERTS accredited 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 we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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 a 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

JE Job No: 15/6228

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (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 USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	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	PM14	Analysis of waters and leachates for metals by ICP OES. 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	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			

JE Job No: 15/6228

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM39	Modified US EPA method 8270. Determination of Atrazine and Simazine by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM42	Modified US EPA method 8270. Pesticides and herbicdes by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	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			

Jones Environmental Laboratory

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Malone O'Regan
2b Richview Office Park
Clonskeagh
Dublin 14
Ireland

4225

Attention :	Thomas Vainio-Mattila
Date :	14th May, 2015
Your reference :	E1119
Our reference :	Test Report 15/6769 Batch 1
Location :	E1119
Date samples received :	30th April, 2015
Status :	Final report
Issue :	1

Four samples were received for analysis on 30th April, 2015 of which four 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

Bob Millward BSc FRSC
Principal Chemist

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6769

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	BH11	BH2	BH8	BH10									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	29/04/2015	29/04/2015	29/04/2015	29/04/2015									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	30/04/2015	30/04/2015	30/04/2015	30/04/2015									
Dissolved Arsenic #	3.4	6.4	-	-							<2.5	ug/l	TM30/PM14
Dissolved Boron	674	741	-	-							<12	ug/l	TM30/PM14
Dissolved Cadmium #	0.44	0.71	-	-							<0.03	ug/l	TM30/PM14
Dissolved Calcium #	182.7	363.5$_{AA}$	-	-							<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2	1.1	-	-							<0.2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	-	-							<7	ug/l	TM30/PM14
Total Dissolved Iron #	675	183	-	-							<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	-	-							<5	ug/l	TM30/PM14
Dissolved Magnesium #	38.4	60.2	-	-							<0.1	mg/l	TM30/PM14
Dissolved Manganese #	849	1365	-	-							<2	ug/l	TM30/PM14
Dissolved Mercury #	<0.5	<0.5	-	-							<0.5	ug/l	TM30/PM14
Dissolved Nickel #	48	18	-	-							<2	ug/l	TM30/PM14
Dissolved Potassium #	12.1	49.2	6.6	7.0							<0.1	mg/l	TM30/PM14
Dissolved Sodium #	190.1	260.1$_{AA}$	22.7	64.4							<0.1	mg/l	TM30/PM14
Dissolved Zinc #	19	<3	-	-							<3	ug/l	TM30/PM14
Total Aluminium	-	-	1118	20180$_{AB}$							<20	ug/l	TM30/PM14
Total Iron	-	-	3669	96040$_{AB}$							<20	ug/l	TM30/PM14
Total Manganese	-	-	3878	5377							<2	ug/l	TM30/PM14
MRP as Total Phosphorus	61	986	-	-							<5	ug/l	TM30/PM14
PAH MS													
Naphthalene #	0.490	0.140	-	-							<0.014	ug/l	TM4/PM30
Acenaphthylene #	0.020	0.050	-	-							<0.013	ug/l	TM4/PM30
Acenaphthene #	<0.013	0.020	-	-							<0.013	ug/l	TM4/PM30
Fluorene #	0.020	<0.014	-	-							<0.014	ug/l	TM4/PM30
Phenanthrene #	0.070	<0.011	-	-							<0.011	ug/l	TM4/PM30
Anthracene #	<0.013	<0.013	-	-							<0.013	ug/l	TM4/PM30
Fluoranthene #	0.040	<0.012	-	-							<0.012	ug/l	TM4/PM30
Pyrene #	0.040	<0.013	-	-							<0.013	ug/l	TM4/PM30
Benzo(a)anthracene #	0.030	<0.015	-	-							<0.015	ug/l	TM4/PM30
Chrysene #	0.020	<0.011	-	-							<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.018	<0.018	-	-							<0.018	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.016	<0.016	-	-							<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.011	<0.011	-	-							<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.01	<0.01	-	-							<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.011	<0.011	-	-							<0.011	ug/l	TM4/PM30
PAH 16 Total #	0.730	0.210	-	-							<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	-	-							<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	-	-							<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	97	95	-	-							<0	%	TM4/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6769

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	BH11	BH2	BH8	BH10									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	29/04/2015	29/04/2015	29/04/2015	29/04/2015									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	30/04/2015	30/04/2015	30/04/2015	30/04/2015									
Pesticides MS													
Organochlorine Pesticides													
Aldrin	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Alpha-HCH (BHC)	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Beta-HCH (BHC)	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Delta-HCH (BHC)	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Dieldrin	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Endosulphan I	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Endosulphan II	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Endosulphan sulphate	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Endrin	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Gamma-HCH (BHC)	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Heptachlor	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Heptachlor Epoxide	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
p,p'-DDE	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
p,p'-DDT	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
p,p'-TDE	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Total Methoxychlor	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Organophosphorus Pesticides													
Azinphos methyl	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Diazinon	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Dichlorvos	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Disulfoton	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Ethion	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Ethyl Parathion (Parathion)	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Fenitrothion	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Malathion	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Methyl Parathion	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Mevinphos	<0.01	<0.01	-	-							<0.01	ug/l	TM42/PM30
Benazolin	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Bentazone	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Bromoxynil	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Clopyralid	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
4- CPA	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
2,4 – D	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
2,4 –DB	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Dicamba	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Dichloroprop	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Diclofop	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Fenoprop	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Flamprop	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Flamprop – isopropyl	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
loxynil	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6769

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	BH11	BH2	BH8	BH10									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	29/04/2015	29/04/2015	29/04/2015	29/04/2015									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	30/04/2015	30/04/2015	30/04/2015	30/04/2015									
MCPA	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
MCPB	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Mecoprop	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Picloram	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Pentachlorophenol	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
2,4,5 – T	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
2,3,6 – TBA	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Triclopyr	<0.1	<0.1	-	-							<0.1	ug/l	TM42/PM30
Atrazine	<1	<1	-	-							<1	ug/l	TM39/PM30
Simazine	<1	<1	-	-							<1	ug/l	TM39/PM30
Fluoride	<0.3	<0.3	-	-							<0.3	mg/l	TM27/PM0
Sulphate #	0.58	0.06	98.15	20.07							<0.05	mg/l	TM38/PM0
Chloride #	131.1	113.6	31.7	93.3							<0.3	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	<0.2	<0.2	-	-							<0.2	mg/l	TM38/PM0
Total Cyanide #	0.02	<0.01	-	-							<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N	7.29	47.72	2.22	8.38							<0.01	mg/l	TM38/PM0
BOD (Settled) #	-	-	8	-							<1	mg/l	TM58/PM0
BOD (Settled) #	30	40	-	63							<1	mg/l	TM58/PM0
COD (Settled) #	64	153	-	-							<7	mg/l	TM57/PM0
Total Organic Carbon #	-	-	12	50							<2	mg/l	TM60/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6769

SVOC Report : **Liquid**

J E Sample No.	1-7	8-14											
Sample ID	BH11	BH2											
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G											
Sample Date	29/04/2015	29/04/2015											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	30/04/2015	30/04/2015									LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1									<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<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	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	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1									<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10									<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1									<1	ug/l	TM16/PM30
Phenol	<1	<1									<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1									<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1									<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5									<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1									<1	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	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1									<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1									<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	2									<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1									<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1									<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1									<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1									<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1									<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1									<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1									<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1									<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1									<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1									<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1									<1	ug/l	TM16/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6769

VOC Report : **Liquid**

J E Sample No.	1-7	8-14											
Sample ID	BH11	BH2											
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G											
Sample Date	29/04/2015	29/04/2015											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	30/04/2015	30/04/2015											
VOC MS											LOD/LOR	Units	Method No.
Dichlorodifluoromethane	<2	<2									<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1									<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3									<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1									<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1									<1	ug/l	TM15/PM10
Chloroethane #	<3	<3									<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3									<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3									<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3									<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3									<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3									<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3									<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1									<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2									<2	ug/l	TM15/PM10
Chloroform #	<2	<2									<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2									<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3									<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2									<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2									<2	ug/l	TM15/PM10
Benzene #	<0.5	4.4									<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3									<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2									<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3									<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2									<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2									<2	ug/l	TM15/PM10
Toluene #	<0.5	2.2									<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2									<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2									<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3									<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2									<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2									<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2									<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2									<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2									<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1									<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
Styrene	<2	<2									<2	ug/l	TM15/PM10
Bromoform #	<2	<2									<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3									<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4									<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2									<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3									<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3									<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3									<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3									<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3									<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3									<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	5									<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3									<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3									<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3									<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3									<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3									<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3									<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2									<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3									<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3									<3	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3									<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	97	104									<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	96	95									<0	%	TM15/PM10

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 15/6769						

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.: 15/6769

SOILS

Please note we are only MCERTS accredited 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 we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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 a 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
AB	x20 Dilution

JE Job No: 15/6769

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (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			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	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	PM14	Analysis of waters and leachates for metals by ICP OES. 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	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				

JE Job No: 15/6769

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM39	Modified US EPA method 8270. Determination of Atrazine and Simazine by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM42	Modified US EPA method 8270. Pesticides and herbicdes by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
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Malone O'Regan
2b Richview Office Park
Clonskeagh
Dublin 14
Ireland

4225

Attention :	Thomas Vainio-Mattila
Date :	19th May, 2015
Your reference :	E1119
Our reference :	Test Report 15/6836 Batch 1
Location :	E1119
Date samples received :	1st May, 2015
Status :	Final report
Issue :	1

Eleven samples were received for analysis on 1st May, 2015 of which eleven 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

Bob Millward BSc FRSC
Principal Chemist

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70	LOD/LOR	Units	Method No.
Sample ID	MW4	MW11	MW12	MW8	MW6	MW10	SW1	SW2	SW5	SW6			
Depth													
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G			
Sample Date	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015			
Dissolved Arsenic #	<2.5	<2.5	<2.5	<2.5	4.4	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	ug/l	TM30/PM14
Dissolved Boron	35	355	68	252	85	164	25	25	25	21	<12	ug/l	TM30/PM14
Dissolved Cadmium #	0.14	1.81	0.60	0.41	<0.03	0.28	0.05	0.04	0.03	0.18	<0.03	ug/l	TM30/PM14
Dissolved Calcium #	128.1	151.8 AA	191.7	258.4 AA	142.7	80.7	-	-	-	-	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	<0.2	<0.2	<0.2	<0.2	<0.2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	<20	20	<20	<20	82	<20	<20	23	<20	<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Magnesium #	16.2	21.7	15.0	23.6	<0.1	21.7	-	-	-	-	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	590	783	1813	953	<2	441	<2	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Mercury #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Nickel #	<2	61	19	7	10	8	<2	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Potassium #	2.4	4.9	1.6	9.2	33.9	4.4	-	-	-	-	<0.1	mg/l	TM30/PM14
Dissolved Sodium #	21.8	65.8	30.3	40.4	46.8	70.9	-	-	-	-	<0.1	mg/l	TM30/PM14
Dissolved Zinc #	3	7	<3	3	<3	<3	<3	3	<3	<3	<3	ug/l	TM30/PM14
MRP as Total Phosphorus	43	32	441	404	52	695	60	57	57	54	<5	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.014	<0.014	<0.014	<0.014	0.330	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	ug/l	TM4/PM30
Acenaphthylene #	<0.013	<0.013	<0.013	<0.013	0.060	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	ug/l	TM4/PM30
Acenaphthene #	<0.013	<0.013	0.040	<0.013	0.230	<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	0.070	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	ug/l	TM4/PM30
Phenanthrene #	<0.011	<0.011	0.020	0.050	0.260	<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	<0.013	<0.013	<0.013	<0.013	<0.013	ug/l	TM4/PM30
Fluoranthene #	<0.012	<0.012	<0.012	0.020	0.160	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	ug/l	TM4/PM30
Pyrene #	<0.013	<0.013	0.020	0.030	0.120	<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	0.020	<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	0.020	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.018	<0.018	<0.018	<0.018	<0.018	<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	<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	<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	<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	<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	1.270	<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	<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	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	100	104	105	107	102	106	109	107	113	107	<0	%	TM4/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70	LOD/LOR	Units	Method No.
Sample ID	MW4	MW11	MW12	MW8	MW6	MW10	SW1	SW2	SW5	SW6			
Depth													
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G			
Sample Date	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015			
Pesticides MS													
Organochlorine Pesticides													
Aldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Alpha-HCH (BHC)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Beta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Delta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Dieldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Endosulphan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Endosulphan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Endosulphan sulphate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Endrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Gamma-HCH (BHC)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Heptachlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
p,p'-DDE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
p,p'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
p,p'-TDE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Total Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Organophosphorus Pesticides													
Azinphos methyl	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Diazinon	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Dichlorvos	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Disulfoton	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Ethion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Ethyl Parathion (Parathion)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Fenitrothion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Malathion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Methyl Parathion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Mevinphos	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM42/PM30
Benazolin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Bentazone	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Bromoxynil	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Clopyralid	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
4- CPA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
2,4 – D	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
2,4 –DB	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Dicamba	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Dichloroprop	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Diclofop	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Fenoprop	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Flamprop	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Flamprop – isopropyl	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
loxynil	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70	LOD/LOR	Units	Method No.
Sample ID	MW4	MW11	MW12	MW8	MW6	MW10	SW1	SW2	SW5	SW6			
Depth													
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G			
Sample Date	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015			
MCPA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
MCPB	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Mecoprop	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Picloram	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
2,4,5 – T	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
2,3,6 – TBA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Triclopyr	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM42/PM30
Atrazine	<1	<1	<1	<1	<1	<1	-	-	-	-	<1	ug/l	TM39/PM30
Simazine	<1	<1	<1	<1	<1	<1	-	-	-	-	<1	ug/l	TM39/PM30
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM27/PM0
Sulphate #	87.52	30.43	46.48	70.51	113.07	34.76	49.23	49.54	42.58	39.28	<0.05	mg/l	TM38/PM0
Chloride #	33.9	87.6	58.1	34.8	32.8	93.6	32.1	31.8	30.9	29.2	<0.3	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	<0.2	0.9	<0.2	7.3	<0.2	<0.2	3.0	2.9	2.8	2.7	<0.2	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N	0.11	1.45	0.75	4.57	4.11	0.85	0.08	0.02	0.06	0.05	<0.01	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	282	644	572	646	242	384	222	216	230	204	<1	mg/l	TM75/PM0
BOD (Settled) #	-	-	-	-	-	-	1	2	2	1	<1	mg/l	TM58/PM0
COD (Settled) #	-	-	-	-	-	-	<7	<7	<7	<7	<7	mg/l	TM57/PM0
Total Organic Carbon #	<2	6	<2	6	11	<2	-	-	-	-	<2	mg/l	TM60/PM0
Total Dissolved Solids #	474	756	614	723	510	493	-	-	-	-	<10	mg/l	TM20/PM0
Total Suspended Solids #	-	-	-	-	-	-	<10	<10	<10	<10	<10	mg/l	TM37/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	71-77										LOD/LOR	Units	Method No.
Sample ID	MW7												
Depth													
COC No / misc													
Containers	V H N P G												
Sample Date	30/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	01/05/2015												
Dissolved Arsenic #	<2.5										<2.5	ug/l	TM30/PM14
Dissolved Boron	208										<12	ug/l	TM30/PM14
Dissolved Cadmium #	0.51										<0.03	ug/l	TM30/PM14
Dissolved Calcium #	248.2_{AA}										<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2										<0.2	ug/l	TM30/PM14
Dissolved Copper #	<7										<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20										<20	ug/l	TM30/PM14
Dissolved Lead #	<5										<5	ug/l	TM30/PM14
Dissolved Magnesium #	25.0										<0.1	mg/l	TM30/PM14
Dissolved Manganese #	2653										<2	ug/l	TM30/PM14
Dissolved Mercury #	<0.5										<0.5	ug/l	TM30/PM14
Dissolved Nickel #	26										<2	ug/l	TM30/PM14
Dissolved Potassium #	9.6										<0.1	mg/l	TM30/PM14
Dissolved Sodium #	43.1										<0.1	mg/l	TM30/PM14
Dissolved Zinc #	4										<3	ug/l	TM30/PM14
MRP as Total Phosphorus	240										<5	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.014										<0.014	ug/l	TM4/PM30
Acenaphthylene #	<0.013										<0.013	ug/l	TM4/PM30
Acenaphthene #	<0.013										<0.013	ug/l	TM4/PM30
Fluorene #	<0.014										<0.014	ug/l	TM4/PM30
Phenanthrene #	<0.011										<0.011	ug/l	TM4/PM30
Anthracene #	<0.013										<0.013	ug/l	TM4/PM30
Fluoranthene #	<0.012										<0.012	ug/l	TM4/PM30
Pyrene #	<0.013										<0.013	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.015										<0.015	ug/l	TM4/PM30
Chrysene #	<0.011										<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.018										<0.018	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.016										<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 #	<0.195										<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	102										<0	%	TM4/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	71-77										LOD/LOR	Units	Method No.
Sample ID	MW7												
Depth													
COC No / misc													
Containers	V H N P G												
Sample Date	30/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	01/05/2015												
Pesticides MS													
Organochlorine Pesticides													
Aldrin	<0.01										<0.01	ug/l	TM42/PM30
Alpha-HCH (BHC)	<0.01										<0.01	ug/l	TM42/PM30
Beta-HCH (BHC)	<0.01										<0.01	ug/l	TM42/PM30
Delta-HCH (BHC)	<0.01										<0.01	ug/l	TM42/PM30
Dieldrin	<0.01										<0.01	ug/l	TM42/PM30
Endosulphan I	<0.01										<0.01	ug/l	TM42/PM30
Endosulphan II	<0.01										<0.01	ug/l	TM42/PM30
Endosulphan sulphate	<0.01										<0.01	ug/l	TM42/PM30
Endrin	<0.01										<0.01	ug/l	TM42/PM30
Gamma-HCH (BHC)	<0.01										<0.01	ug/l	TM42/PM30
Heptachlor	<0.01										<0.01	ug/l	TM42/PM30
Heptachlor Epoxide	<0.01										<0.01	ug/l	TM42/PM30
p,p'-DDE	<0.01										<0.01	ug/l	TM42/PM30
p,p'-DDT	<0.01										<0.01	ug/l	TM42/PM30
p,p'-TDE	<0.01										<0.01	ug/l	TM42/PM30
Total Methoxychlor	<0.01										<0.01	ug/l	TM42/PM30
Organophosphorus Pesticides													
Azinphos methyl	<0.01										<0.01	ug/l	TM42/PM30
Diazinon	<0.01										<0.01	ug/l	TM42/PM30
Dichlorvos	<0.01										<0.01	ug/l	TM42/PM30
Disulfoton	<0.01										<0.01	ug/l	TM42/PM30
Ethion	<0.01										<0.01	ug/l	TM42/PM30
Ethyl Parathion (Parathion)	<0.01										<0.01	ug/l	TM42/PM30
Fenitrothion	<0.01										<0.01	ug/l	TM42/PM30
Malathion	<0.01										<0.01	ug/l	TM42/PM30
Methyl Parathion	<0.01										<0.01	ug/l	TM42/PM30
Mevinphos	<0.01										<0.01	ug/l	TM42/PM30
Benazolin	<0.1										<0.1	ug/l	TM42/PM30
Bentazone	<0.1										<0.1	ug/l	TM42/PM30
Bromoxynil	<0.1										<0.1	ug/l	TM42/PM30
Clopyralid	<0.1										<0.1	ug/l	TM42/PM30
4- CPA	<0.1										<0.1	ug/l	TM42/PM30
2,4 – D	<0.1										<0.1	ug/l	TM42/PM30
2,4 –DB	<0.1										<0.1	ug/l	TM42/PM30
Dicamba	<0.1										<0.1	ug/l	TM42/PM30
Dichloroprop	<0.1										<0.1	ug/l	TM42/PM30
Diclofop	<0.1										<0.1	ug/l	TM42/PM30
Fenoprop	<0.1										<0.1	ug/l	TM42/PM30
Flamprop	<0.1										<0.1	ug/l	TM42/PM30
Flamprop – isopropyl	<0.1										<0.1	ug/l	TM42/PM30
Ioxynil	<0.1										<0.1	ug/l	TM42/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	71-77										LOD/LOR	Units	Method No.
Sample ID	MW7												
Depth													
COC No / misc													
Containers	V H N P G												
Sample Date	30/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	01/05/2015												
MCPA	<0.1										<0.1	ug/l	TM42/PM30
MCPB	<0.1										<0.1	ug/l	TM42/PM30
Mecoprop	<0.1										<0.1	ug/l	TM42/PM30
Picloram	<0.1										<0.1	ug/l	TM42/PM30
Pentachlorophenol	<0.1										<0.1	ug/l	TM42/PM30
2,4,5 – T	<0.1										<0.1	ug/l	TM42/PM30
2,3,6 – TBA	<0.1										<0.1	ug/l	TM42/PM30
Triclopyr	<0.1										<0.1	ug/l	TM42/PM30
Atrazine	<1										<1	ug/l	TM39/PM30
Simazine	<1										<1	ug/l	TM39/PM30
Fluoride	<0.3										<0.3	mg/l	TM27/PM0
Sulphate #	79.37										<0.05	mg/l	TM38/PM0
Chloride #	45.5										<0.3	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	0.7										<0.2	mg/l	TM38/PM0
Total Cyanide #	<0.01										<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N	5.37										<0.01	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	632										<1	mg/l	TM75/PM0
BOD (Settled) #	-										<1	mg/l	TM58/PM0
COD (Settled) #	-										<7	mg/l	TM57/PM0
Total Organic Carbon #	9										<2	mg/l	TM60/PM0
Total Dissolved Solids #	825										<10	mg/l	TM20/PM0
Total Suspended Solids #	-										<10	mg/l	TM37/PM0

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

SVOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70			
Sample ID	MW4	MW11	MW12	MW8	MW6	MW10	SW1	SW2	SW5	SW6			
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G			
Sample Date	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

SVOC Report : **Liquid**

J E Sample No.	71-77												
Sample ID	MW7												
Depth													
COC No / misc													
Containers	V H N P G												
Sample Date	30/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	01/05/2015												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<1										<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5										<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5										<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5										<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1										<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5										<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1										<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5										<0.5	ug/l	TM16/PM30
4-Methylphenol	<1										<1	ug/l	TM16/PM30
4-Nitrophenol	<10										<10	ug/l	TM16/PM30
Pentachlorophenol	<1										<1	ug/l	TM16/PM30
Phenol	<1										<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1										<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1										<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5										<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1										<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5										<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1										<1	ug/l	TM16/PM30
Diethyl phthalate #	<1										<1	ug/l	TM16/PM30
Dimethyl phthalate	<1										<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1										<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1										<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1										<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1										<1	ug/l	TM16/PM30
2-Nitroaniline	<1										<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5										<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1										<1	ug/l	TM16/PM30
3-Nitroaniline	<1										<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1										<1	ug/l	TM16/PM30
4-Chloroaniline	<1										<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1										<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5										<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5										<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5										<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1										<1	ug/l	TM16/PM30
Carbazole #	<0.5										<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5										<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1										<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1										<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1										<1	ug/l	TM16/PM30
Hexachloroethane #	<1										<1	ug/l	TM16/PM30
Isophorone #	<0.5										<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5										<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1										<1	ug/l	TM16/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

VOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70			
Sample ID	MW4	MW11	MW12	MW8	MW6	MW10	SW1	SW2	SW5	SW6			
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P G	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G			
Sample Date	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015	30/04/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	01/05/2015	LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	100	100	98	100	99	100	100	98	100	99	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	103	104	100	102	100	101	102	101	100	101	<0	%	TM15/PM10

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6836

VOC Report : **Liquid**

J E Sample No.	71-77												
Sample ID	MW7												
Depth													
COC No / misc													
Containers	V H N P G												
Sample Date	30/04/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	01/05/2015												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2										<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1										<0.1	ug/l	TM15/PM10
Chloromethane #	<3										<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1										<0.1	ug/l	TM15/PM10
Bromomethane	<1										<1	ug/l	TM15/PM10
Chloroethane #	<3										<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3										<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3										<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3										<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3										<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3										<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3										<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1										<1	ug/l	TM15/PM10
Bromochloromethane #	<2										<2	ug/l	TM15/PM10
Chloroform #	<2										<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2										<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3										<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2										<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2										<2	ug/l	TM15/PM10
Benzene #	<0.5										<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3										<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2										<2	ug/l	TM15/PM10
Dibromomethane #	<3										<3	ug/l	TM15/PM10
Bromodichloromethane #	<2										<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2										<2	ug/l	TM15/PM10
Toluene #	<0.5										<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2										<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2										<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3										<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2										<2	ug/l	TM15/PM10
Dibromochloromethane #	<2										<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2										<2	ug/l	TM15/PM10
Chlorobenzene #	<2										<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2										<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5										<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1										<1	ug/l	TM15/PM10
o-Xylene #	<0.5										<0.5	ug/l	TM15/PM10
Styrene	<2										<2	ug/l	TM15/PM10
Bromoform #	<2										<2	ug/l	TM15/PM10
Isopropylbenzene #	<3										<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4										<4	ug/l	TM15/PM10
Bromobenzene #	<2										<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3										<3	ug/l	TM15/PM10
Propylbenzene #	<3										<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3										<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3										<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3										<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3										<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3										<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3										<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3										<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
n-Butylbenzene #	<3										<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2										<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3										<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3										<3	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3										<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	100										<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	102										<0	%	TM15/PM10

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/6836

SOILS

Please note we are only MCERTS accredited 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 we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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 a 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

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

JE Job No: 15/6836

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (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 USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	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	PM14	Analysis of waters and leachates for metals by ICP OES. 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	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			

JE Job No: 15/6836

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM39	Modified US EPA method 8270. Determination of Atrazine and Simazine by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM42	Modified US EPA method 8270. Pesticides and herbicdes by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	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			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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Malone O'Regan
2b Richview Office Park
Clonskeagh
Dublin 14
Ireland

4225

Attention :	Thomas Vainio-Mattila
Date :	19th May, 2015
Your reference :	E1119
Our reference :	Test Report 15/6974 Batch 1
Location :	E1119
Date samples received :	6th May, 2015
Status :	Final report
Issue :	1

Four samples were received for analysis on 6th May, 2015 of which four 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

Bob Millward BSc FRSC
Principal Chemist

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6974

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	MW6	MW8	MW11	MW12									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	05/05/2015	05/05/2015	05/05/2015	05/05/2015									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
Dissolved Arsenic #	<2.5	6.2	7.6	2.8							<2.5	ug/l	TM30/PM14
Dissolved Boron	93	180	420	56							<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.03	0.33	1.96	0.09							<0.03	ug/l	TM30/PM14
Dissolved Calcium #	110.0	186.5	206.2	151.1							<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5							<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7							<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	<20	81	<20							<20	ug/l	TM30/PM14
Dissolved Lead #	7	6	5	<5							<5	ug/l	TM30/PM14
Dissolved Magnesium #	<0.1	19.7	21.1	11.7							<0.1	mg/l	TM30/PM14
Dissolved Manganese #	<2	177	644	1379							<2	ug/l	TM30/PM14
Dissolved Mercury #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM30/PM14
Dissolved Nickel #	10	4	58	10							<2	ug/l	TM30/PM14
Dissolved Potassium #	32.1	5.8	6.3	1.2							<0.1	mg/l	TM30/PM14
Dissolved Sodium #	47.9	27.7	69.7	22.7							<0.1	mg/l	TM30/PM14
Dissolved Zinc #	<3	<3	36	<3							<3	ug/l	TM30/PM14
MRP as Total Phosphorus	39	370	106	133							<5	ug/l	TM30/PM14
PAH MS													
Naphthalene #	0.310	<0.014	<0.014	<0.014							<0.014	ug/l	TM4/PM30
Acenaphthylene #	0.060	<0.013	<0.013	<0.013							<0.013	ug/l	TM4/PM30
Acenaphthene #	0.200	<0.013	<0.013	0.030							<0.013	ug/l	TM4/PM30
Fluorene #	0.070	<0.014	<0.014	0.020							<0.014	ug/l	TM4/PM30
Phenanthrene #	0.270	0.050	0.020	0.030							<0.011	ug/l	TM4/PM30
Anthracene #	0.020	<0.013	<0.013	<0.013							<0.013	ug/l	TM4/PM30
Fluoranthene #	0.120	<0.012	<0.012	<0.012							<0.012	ug/l	TM4/PM30
Pyrene #	0.080	<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	ug/l	TM4/PM30
Chrysene #	<0.011	<0.011	<0.011	<0.011							<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<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	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<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	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.011	<0.011	<0.011	<0.011							<0.011	ug/l	TM4/PM30
PAH 16 Total #	1.130	<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	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	109	106	104	106							<0	%	TM4/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6974

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	MW6	MW8	MW11	MW12									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	05/05/2015	05/05/2015	05/05/2015	05/05/2015									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
Pesticides MS													
Organochlorine Pesticides													
Aldrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Alpha-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Beta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Delta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Dieldrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endosulphan I	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endosulphan II	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endosulphan sulphate	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Gamma-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Heptachlor	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
p,p'-DDE	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
p,p'-DDT	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
p,p'-TDE	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Total Methoxychlor	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Organophosphorus Pesticides													
Azinphos methyl	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Diazinon	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Dichlorvos	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Disulfoton	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Ethion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Ethyl Parathion (Parathion)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Fenitrothion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Malathion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Methyl Parathion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Mevinphos	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Benazolin	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Bentazone	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Bromoxynil	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Clopyralid	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
4- CPA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4 – D	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4 –DB	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Dicamba	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Dichloroprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Diclofop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Fenoprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Flamprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Flamprop – isopropyl	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Ioxynil	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6974

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	MW6	MW8	MW11	MW12									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	05/05/2015	05/05/2015	05/05/2015	05/05/2015									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
MCPA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
MCPB	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Mecoprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Picloram	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4,5 – T	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,3,6 – TBA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Triclopyr	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Atrazine	<1	<1	<1	<1							<1	ug/l	TM39/PM30
Simazine	<1	<1	<1	<1							<1	ug/l	TM39/PM30
Fluoride	<0.3	<0.3	<0.3	<0.3							<0.3	mg/l	TM27/PM0
Sulphate #	111.81	59.51	22.94	36.52							<0.05	mg/l	TM38/PM0
Chloride #	31.1	22.1	73.4	42.3							<0.3	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	<0.2	20.1	5.8	<0.2							<0.2	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01							<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N	3.92	1.01	1.86	0.51							<0.01	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	260	578	648	432							<1	mg/l	TM75/PM0
Total Organic Carbon #	10	<2	9	<2							<2	mg/l	TM60/PM0
Total Dissolved Solids #	468	694	800	490							<10	mg/l	TM20/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6974

SVOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21	22-28									
Sample ID	MW6	MW8	MW11	MW12									
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	05/05/2015	05/05/2015	05/05/2015	05/05/2015									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
SVOC MS											LOD/LOR	Units	Method No.
Phenols													
2-Chlorophenol #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10							<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5							<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5							<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6974

VOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21	22-28								
Sample ID	MW6	MW8	MW11	MW12								
Depth												
COC No / misc												
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G								
Sample Date	05/05/2015	05/05/2015	05/05/2015	05/05/2015								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	1	1	1	1								
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015								

Please see attached notes for all abbreviations and acronyms

											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) #	<3	<3	<3	<3							<3	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 #	<0.5	<0.5	<0.5	<0.5							<0.5	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 #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5							<0.5	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	97	97	94	99							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	100	109	108	109							<0	%	TM15/PM10

Client Name: Malone O'Regan

Reference: E1119

Location: E1119

Contact: Thomas Vainio-Mattila

Matrix : Liquid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
15/6974	1					Liquid Samples were received at a temperature above 9°C.

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.: 15/6974

SOILS

Please note we are only MCERTS accredited 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 we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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 a 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

JE Job No: 15/6974

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (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 USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	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	PM14	Analysis of waters and leachates for metals by ICP OES. 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	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			

JE Job No: 15/6974

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM39	Modified US EPA method 8270. Determination of Atrazine and Simazine by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM42	Modified US EPA method 8270. Pesticides and herbicdes by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	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			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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Malone O'Regan
2b Richview Office Park
Clonskeagh
Dublin 14
Ireland

Attention :	Thomas Vainio-Mattila
Date :	19th May, 2015
Your reference :	E1119
Our reference :	Test Report 15/6977 Batch 1
Location :	E1119
Date samples received :	6th May, 2015
Status :	Final report
Issue :	1

Four samples were received for analysis on 6th May, 2015 of which four 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

Bob Millward BSc FRSC
Principal Chemist

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6977

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	BH2	BH11	BH8	BH10									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	03/05/2015	03/05/2015	05/05/2015	05/05/2015									
Sample Type	Liquid	Liquid	Liquid	Liquid									
Batch Number	1	1	1	1									
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
Dissolved Arsenic	12.1	6.0	-	-							<2.5	ug/l	TM30/PM14
Dissolved Boron	782	661	-	-							<12	ug/l	TM30/PM14
Dissolved Cadmium	1.78	0.31	-	-							<0.03	ug/l	TM30/PM14
Dissolved Calcium	362.1_{AA}	175.5	-	-							<0.2	mg/l	TM30/PM14
Total Dissolved Chromium	<1.5	<1.5	-	-							<1.5	ug/l	TM30/PM14
Dissolved Copper	53	15	-	-							<7	ug/l	TM30/PM14
Dissolved Lead	7	<5	-	-							<5	ug/l	TM30/PM14
Dissolved Magnesium	57.1	34.9	-	-							<0.1	mg/l	TM30/PM14
Dissolved Manganese	1151	840	-	-							<2	ug/l	TM30/PM14
Dissolved Mercury	<0.5	<0.5	-	-							<0.5	ug/l	TM30/PM14
Dissolved Nickel	7	51	-	-							<2	ug/l	TM30/PM14
Dissolved Phosphorus	37	14	-	-							<5	ug/l	TM30/PM14
Dissolved Potassium	45.2	11.5	4.2	7.7							<0.1	mg/l	TM30/PM14
Dissolved Sodium	240.8_{AA}	176.3	17.5	19.5							<0.1	mg/l	TM30/PM14
Dissolved Zinc	191	57	-	-							<3	ug/l	TM30/PM14
Total Aluminium	-	-	23820_{AC}	5796							<20	ug/l	TM30/PM14
Total Iron	-	-	62380_{AC}	29420_{AB}							<20	ug/l	TM30/PM14
Total Manganese	-	-	6414	2489							<2	ug/l	TM30/PM14
MRP as Total Phosphorus	198	1307	-	-							<5	ug/l	TM30/PM14
PAH MS													
Naphthalene	1.360	0.100	-	-							<0.014	ug/l	TM4/PM30
Acenaphthylene	0.050	0.020	-	-							<0.013	ug/l	TM4/PM30
Acenaphthene	0.420	0.060	-	-							<0.013	ug/l	TM4/PM30
Fluorene	0.240	0.050	-	-							<0.014	ug/l	TM4/PM30
Phenanthrene	0.230	0.130	-	-							<0.011	ug/l	TM4/PM30
Anthracene	0.040	0.020	-	-							<0.013	ug/l	TM4/PM30
Fluoranthene	0.140	0.030	-	-							<0.012	ug/l	TM4/PM30
Pyrene	0.120	0.030	-	-							<0.013	ug/l	TM4/PM30
Benzo(a)anthracene	0.060	<0.015	-	-							<0.015	ug/l	TM4/PM30
Chrysene	0.060	<0.011	-	-							<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene	0.100	<0.018	-	-							<0.018	ug/l	TM4/PM30
Benzo(a)pyrene	0.060	<0.016	-	-							<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene	0.030	<0.011	-	-							<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	-	-							<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	0.030	<0.011	-	-							<0.011	ug/l	TM4/PM30
PAH 16 Total	2.940	0.440	-	-							<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	0.07	<0.01	-	-							<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	0.03	<0.01	-	-							<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	102	100	-	-							<0	%	TM4/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6977

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28									
Sample ID	BH2	BH11	BH8	BH10									
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	03/05/2015	03/05/2015	05/05/2015	05/05/2015									
Sample Type	Liquid	Liquid	Liquid	Liquid									
Batch Number	1	1	1	1							LOD/LOR	Units	Method No.
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
Pesticides MS													
Organochlorine Pesticides													
Aldrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Alpha-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Beta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Delta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Dieldrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endosulphan I	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endosulphan II	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endosulphan sulphate	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Gamma-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Heptachlor	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
p,p'-DDE	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
p,p'-DDT	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
p,p'-TDE	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Total Methoxychlor	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Organophosphorus Pesticides													
Azinphos methyl	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Diazinon	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Dichlorvos	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Disulfoton	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Ethion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Ethyl Parathion (Parathion)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Fenitrothion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Malathion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Methyl Parathion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Mevinphos	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Benazolin	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Bentazone	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Bromoxynil	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Clopyralid	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
4- CPA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4 – D	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4 –DB	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Dicamba	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Dichloroprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Diclofop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Fenoprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Flamprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Flamprop – isopropyl	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Ioxynil	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6977

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	BH2	BH11	BH8	BH10									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	03/05/2015	03/05/2015	05/05/2015	05/05/2015									
Sample Type	Liquid	Liquid	Liquid	Liquid									
Batch Number	1	1	1	1									
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
MCPA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
MCPB	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Mecoprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Picloram	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4,5 – T	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,3,6 – TBA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Triclopyr	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Atrazine	<1	<1	<1	<1							<1	ug/l	TM39/PM30
Simazine	<1	<1	<1	<1							<1	ug/l	TM39/PM30
Fluoride	<0.3	0.5	-	-							<0.3	mg/l	TM27/PM0
Sulphate	0.82	10.15	54.21	49.45							<0.05	mg/l	TM38/PM0
Chloride	105.1	127.4	26.0	22.9							<0.3	mg/l	TM38/PM0
Total Oxidised Nitrogen as N	<0.2	<0.2	-	-							<0.2	mg/l	TM38/PM0
Total Cyanide	0.01	0.03	-	-							<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N	48.21	8.32	2.54	6.37							<0.01	mg/l	TM38/PM0
BOD (Settled)	74	<1	27	29							<1	mg/l	TM58/PM0
COD (Settled)	89	201	-	-							<7	mg/l	TM57/PM0
Total Organic Carbon	-	-	14	18							<2	mg/l	TM60/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6977

SVOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21	22-28									
Sample ID	BH2	BH11	BH8	BH10									
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	03/05/2015	03/05/2015	05/05/2015	05/05/2015									
Sample Type	Liquid	Liquid	Liquid	Liquid									
Batch Number	1	1	1	1									
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
SVOC MS											LOD/LOR	Units	Method No.
Phenols													
2-Chlorophenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2-Methylphenol	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10							<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2-Methylnaphthalene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Naphthalene	-	-	<1	<1							<1	ug/l	TM16/PM30
Acenaphthylene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Acenaphthene	-	-	<1	<1							<1	ug/l	TM16/PM30
Fluorene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Phenanthrene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Anthracene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Fluoranthene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Pyrene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Benzo(a)anthracene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Chrysene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Benzo(bk)fluoranthene	-	-	<1	<1							<1	ug/l	TM16/PM30
Benzo(a)pyrene	-	-	<1	<1							<1	ug/l	TM16/PM30
Indeno(123cd)pyrene	-	-	<1	<1							<1	ug/l	TM16/PM30
Dibenzo(ah)anthracene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Benzo(ghi)perylene	-	-	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5							<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Di-n-butyl phthalate	<1.5	<1.5	<1.5	<1.5							<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Diethyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6977

SVOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21	22-28									
Sample ID	BH2	BH11	BH8	BH10									
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	03/05/2015	03/05/2015	05/05/2015	05/05/2015									
Sample Type	Liquid	Liquid	Liquid	Liquid									
Batch Number	1	1	1	1									
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
SVOC MS											LOD/LOR	Units	Method No.
Other SVOCs													
1,2-Dichlorobenzene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
1,3-Dichlorobenzene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
1,4-Dichlorobenzene	2	<1	<1	<1							<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2,4-Dinitrotoluene	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Bromophenylphenylether	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chlorophenylphenylether	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Azobenzene	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Carbazole	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Dibenzofuran	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Hexachlorobenzene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorobutadiene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachloroethane	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Isophorone	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Nitrobenzene	<1	<1	<1	<1							<1	ug/l	TM16/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/6977

VOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21	22-28									
Sample ID	BH2	BH11	BH8	BH10									
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	03/05/2015	03/05/2015	05/05/2015	05/05/2015									
Sample Type	Liquid	Liquid	Liquid	Liquid									
Batch Number	1	1	1	1									
Date of Receipt	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
											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)	<3	<3	<3	<3							<3	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	5.3	<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	<0.5	<0.5	<0.5	<0.5							<0.5	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	3.4	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene	9	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene	2.5	<0.5	<0.5	<0.5							<0.5	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	5	<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	23	<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
1,2,3-Trichlorobenzene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	92	93	101	86							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	91	99	99	87							<0	%	TM15/PM10

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 15/6977						

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.: 15/6977

SOILS

Please note we are only MCERTS accredited 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 we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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 a 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
AB	x10 Dilution
AC	x20 Dilution

JE Job No: 15/6977

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (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.				
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	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	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM39	Modified US EPA method 8270. Determination of Atrazine and Simazine by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM42	Modified US EPA method 8270. Pesticides and herbicdes by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.				

JE Job No: 15/6977

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.				
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
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Malone O'Regan
2b Richview Office Park
Clonskeagh
Dublin 14
Ireland

4225

Attention :	Thomas Vainio-Mattila
Date :	20th May, 2015
Your reference :	E1119
Our reference :	Test Report 15/7029 Batch 1
Location :	E1119
Date samples received :	7th May, 2015
Status :	Final report
Issue :	1

Four samples were received for analysis on 7th May, 2015 of which four 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

Bob Millward BSc FRSC
Principal Chemist

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7029

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	SW1 MILL	SW2 LIFF	SW5 MILL	SW6 LIFF									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water									
Batch Number	1	1	1	1									
Date of Receipt	07/05/2015	07/05/2015	07/05/2015	07/05/2015									
Dissolved Arsenic #	<2.5	<2.5	<2.5	<2.5							<2.5	ug/l	TM30/PM14
Dissolved Boron	17	14	16	16							<12	ug/l	TM30/PM14
Dissolved Cadmium #	0.24	0.18	0.19	0.12							<0.03	ug/l	TM30/PM14
Total Dissolved Chromium #	<0.2	<0.2	<0.2	0.2							<0.2	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7							<7	ug/l	TM30/PM14
Total Dissolved Iron #	212	123	78	87							<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5							<5	ug/l	TM30/PM14
Dissolved Manganese #	<2	<2	<2	<2							<2	ug/l	TM30/PM14
Dissolved Mercury #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	<2							<2	ug/l	TM30/PM14
Dissolved Zinc #	19	9	5	6							<3	ug/l	TM30/PM14
MRP as Total Phosphorus	103	95	95	92							<5	ug/l	TM30/PM14
PAH MS													
Naphthalene #	<0.014	0.590	<0.014	<0.014							<0.014	ug/l	TM4/PM30
Acenaphthylene #	<0.013	0.020	<0.013	<0.013							<0.013	ug/l	TM4/PM30
Acenaphthene #	<0.013	0.040	<0.013	<0.013							<0.013	ug/l	TM4/PM30
Fluorene #	<0.014	0.030	<0.014	<0.014							<0.014	ug/l	TM4/PM30
Phenanthrene #	0.020	0.030	<0.011	<0.011							<0.011	ug/l	TM4/PM30
Anthracene #	<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	ug/l	TM4/PM30
Pyrene #	<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	ug/l	TM4/PM30
Chrysene #	<0.011	<0.011	<0.011	<0.011							<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<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	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<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	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.011	<0.011	<0.011	<0.011							<0.011	ug/l	TM4/PM30
PAH 16 Total #	<0.195	0.710	<0.195	<0.195							<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<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	ug/l	TM4/PM30
PAH Surrogate % Recovery	110	109	112	111							<0	%	TM4/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7029

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	SW1 MILL	SW2 LIFF	SW5 MILL	SW6 LIFF									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water									
Batch Number	1	1	1	1									
Date of Receipt	07/05/2015	07/05/2015	07/05/2015	07/05/2015									
Pesticides MS													
Organochlorine Pesticides													
Aldrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Alpha-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Beta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Delta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Dieldrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endosulphan I	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endosulphan II	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endosulphan sulphate	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Endrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Gamma-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Heptachlor	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
p,p'-DDE	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
p,p'-DDT	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
p,p'-TDE	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Total Methoxychlor	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Organophosphorus Pesticides													
Azinphos methyl	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Diazinon	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Dichlorvos	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Disulfoton	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Ethion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Ethyl Parathion (Parathion)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Fenitrothion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Malathion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Methyl Parathion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Mevinphos	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM42/PM30
Benazolin	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Bentazone	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Bromoxynil	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Clopyralid	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
4- CPA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4 – D	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4 –DB	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Dicamba	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Dichloroprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Diclofop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Fenoprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Flamprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Flamprop – isopropyl	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
loxynil	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7029

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-7	8-14	15-21	22-28							LOD/LOR	Units	Method No.
Sample ID	SW1 MILL	SW2 LIFF	SW5 MILL	SW6 LIFF									
Depth													
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water									
Batch Number	1	1	1	1									
Date of Receipt	07/05/2015	07/05/2015	07/05/2015	07/05/2015									
MCPA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
MCPB	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Mecoprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Picloram	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4,5 – T	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,3,6 – TBA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Triclopyr	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Atrazine	<1	<1	<1	<1							<1	ug/l	TM39/PM30
Simazine	<1	<1	<1	<1							<1	ug/l	TM39/PM30
Fluoride	<0.3	<0.3	<0.3	<0.3							<0.3	mg/l	TM27/PM0
Sulphate #	30.26	27.17	32.92	26.84							<0.05	mg/l	TM38/PM0
Chloride #	24.3	20.8	26.2	20.6							<0.3	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	2.3	2.3	2.1	2.3							<0.2	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01							<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N	0.08	0.10	0.09	0.09							<0.01	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	244	246	238	238							<1	mg/l	TM75/PM0
BOD (Settled) #	2	2	2	2							<1	mg/l	TM58/PM0
COD (Settled) #	13	43	13	10							<7	mg/l	TM57/PM0
Total Suspended Solids #	<10	<10	<10	<10							<10	mg/l	TM37/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7029

SVOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21	22-28									
Sample ID	SW1 MILL	SW2 LIFF	SW5 MILL	SW6 LIFF									
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G									
Sample Date	06/05/2015	06/05/2015	06/05/2015	06/05/2015									
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water									
Batch Number	1	1	1	1									
Date of Receipt	07/05/2015	07/05/2015	07/05/2015	07/05/2015									
SVOC MS											LOD/LOR	Units	Method No.
Phenols													
2-Chlorophenol #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10							<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1							<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5							<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5							<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1							<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1							<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1							<1	ug/l	TM16/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7029

VOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21	22-28								
Sample ID	SW1 MILL	SW2 LIFF	SW5 MILL	SW6 LIFF								
Depth										Please see attached notes for all abbreviations and acronyms		
COC No / misc												
Containers	V H N P BOD G	V H N P BOD G	V H N P BOD G	V H N P BOD G								
Sample Date	06/05/2015	06/05/2015	06/05/2015	06/05/2015								
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water								
Batch Number	1	1	1	1								
Date of Receipt	07/05/2015	07/05/2015	07/05/2015	07/05/2015								
VOC MS										LOD/LOR	Units	Method No.
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) #	<3	<3	<3	<3						<3	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 #	<0.5	<0.5	<0.5	<0.5						<0.5	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 #	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1						<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5						<0.5	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
1,2,3-Trichlorobenzene	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	73	97	76	79						<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	88	98	82	88						<0	%	TM15/PM10

Client Name: Malone O'Regan

Matrix : Liquid

Reference: E1119

Location: E1119

Contact: Thomas Vainio-Mattila

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
15/7029	1					Liquid Samples were received at a temperature above 9°C.

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.: 15/7029

SOILS

Please note we are only MCERTS accredited 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 we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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 a 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

JE Job No: 15/7029

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (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			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	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	PM14	Analysis of waters and leachates for metals by ICP OES. 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	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			

JE Job No: 15/7029

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM39	Modified US EPA method 8270. Determination of Atrazine and Simazine by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM42	Modified US EPA method 8270. Pesticides and herbicdes by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	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			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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Malone O'Regan
2b Richview Office Park
Clonskeagh
Dublin 14
Ireland

4225

Attention :	Thomas Vainio-Mattila
Date :	19th May, 2015
Your reference :	E1119
Our reference :	Test Report 15/7036
Location :	E1119
Date samples received :	7th May, 2015
Status :	Final report
Issue :	1

Three samples were received for analysis on 7th May, 2015 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:

Belinda Lewsley BA
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7036

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-7	8-14	15-21									
Sample ID	MW4	MW7	MW10									
Depth												
COC No / misc												
Containers	V H N P G	V H N P G	V H N P G									
Sample Date	06/05/2015	06/05/2015	06/05/2015									
Sample Type	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1									
Date of Receipt	07/05/2015	07/05/2015	07/05/2015									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Arsenic #	<2.5	6.4	<2.5								<2.5	ug/l	TM30/PM14
Dissolved Boron	31	208	144								<12	ug/l	TM30/PM14
Dissolved Cadmium #	0.19	0.58	0.27								<0.03	ug/l	TM30/PM14
Dissolved Calcium #	126.9	275.3_{AA}	75.7								<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5								<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7								<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	<20	<20								<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5								<5	ug/l	TM30/PM14
Dissolved Magnesium #	15.9	25.3	22.1								<0.1	mg/l	TM30/PM14
Dissolved Manganese #	574	4344	382								<2	ug/l	TM30/PM14
Dissolved Mercury #	<0.5	<0.5	<0.5								<0.5	ug/l	TM30/PM14
Dissolved Nickel #	<2	33	3								<2	ug/l	TM30/PM14
Dissolved Potassium #	2.4	10.0	2.8								<0.1	mg/l	TM30/PM14
Dissolved Sodium #	21.7	43.3	67.9								<0.1	mg/l	TM30/PM14
Dissolved Zinc #	<3	5	<3								<3	ug/l	TM30/PM14
MRP as Total Phosphorus	80	172	1196								<5	ug/l	TM30/PM14
PAH MS													
Naphthalene #	0.020	<0.014	<0.014								<0.014	ug/l	TM4/PM30
Acenaphthylene #	<0.013	<0.013	<0.013								<0.013	ug/l	TM4/PM30
Acenaphthene #	0.080	<0.013	<0.013								<0.013	ug/l	TM4/PM30
Fluorene #	0.040	<0.014	<0.014								<0.014	ug/l	TM4/PM30
Phenanthrene #	0.040	0.020	<0.011								<0.011	ug/l	TM4/PM30
Anthracene #	<0.013	<0.013	<0.013								<0.013	ug/l	TM4/PM30
Fluoranthene #	<0.012	<0.012	<0.012								<0.012	ug/l	TM4/PM30
Pyrene #	<0.013	<0.013	<0.013								<0.013	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.015	<0.015	<0.015								<0.015	ug/l	TM4/PM30
Chrysene #	<0.011	<0.011	<0.011								<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.018	<0.018	<0.018								<0.018	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.016	<0.016	<0.016								<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.011	<0.011	<0.011								<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.011	<0.011	<0.011								<0.011	ug/l	TM4/PM30
PAH 16 Total #	<0.195	<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	104	109	105								<0	%	TM4/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7036

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-7	8-14	15-21									
Sample ID	MW4	MW7	MW10									
Depth												
COC No / misc												
Containers	V H N P G	V H N P G	V H N P G									
Sample Date	06/05/2015	06/05/2015	06/05/2015									
Sample Type	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1									
Date of Receipt	07/05/2015	07/05/2015	07/05/2015									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Pesticides MS													
Organochlorine Pesticides													
Aldrin	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Alpha-HCH (BHC)	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Beta-HCH (BHC)	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Delta-HCH (BHC)	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Dieldrin	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Endosulphan I	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Endosulphan II	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Endosulphan sulphate	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Endrin	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Gamma-HCH (BHC)	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Heptachlor	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Heptachlor Epoxide	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
p,p'-DDE	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
p,p'-DDT	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
p,p'-TDE	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Total Methoxychlor	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Organophosphorus Pesticides													
Azinphos methyl	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Diazinon	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Dichlorvos	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Disulfoton	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Ethion	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Ethyl Parathion (Parathion)	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Fenitrothion	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Malathion	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Methyl Parathion	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Mevinphos	<0.01	<0.01	<0.01								<0.01	ug/l	TM42/PM30
Benazolin	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Bentazone	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Bromoxynil	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Clopyralid	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
4- CPA	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
2,4 – D	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
2,4 –DB	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Dicamba	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Dichloroprop	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Diclofop	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Fenoprop	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Flamprop	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Flamprop – isopropyl	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
loxynil	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7036

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-7	8-14	15-21								LOD/LOR	Units	Method No.
Sample ID	MW4	MW7	MW10										
Depth													
COC No / misc													
Containers	V H N P G	V H N P G	V H N P G										
Sample Date	06/05/2015	06/05/2015	06/05/2015										
Sample Type	Ground Water	Ground Water	Ground Water										
Batch Number	1	1	1										
Date of Receipt	07/05/2015	07/05/2015	07/05/2015										
MCPA	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
MCPB	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Mecoprop	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Picloram	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Pentachlorophenol	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
2,4,5 – T	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
2,3,6 – TBA	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Triclopyr	<0.1	<0.1	<0.1								<0.1	ug/l	TM42/PM30
Atrazine	<1	<1	<1								<1	ug/l	TM39/PM30
Simazine	<1	<1	<1								<1	ug/l	TM39/PM30
Fluoride	<0.3	<0.3	0.3								<0.3	mg/l	TM27/PM0
Sulphate #	86.67	65.26	27.95								<0.05	mg/l	TM38/PM0
Chloride #	32.1	45.7	97.3								<0.3	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	<0.2	<0.2	<0.2								<0.2	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01								<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N	0.09	6.37	0.56								<0.01	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	304	678	664								<1	mg/l	TM75/PM0
Total Organic Carbon #	<2	11	<2								<2	mg/l	TM60/PM0
Total Dissolved Solids #	636	2303	777								<10	mg/l	TM20/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7036

SVOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21									
Sample ID	MW4	MW7	MW10									
Depth										Please see attached notes for all abbreviations and acronyms		
COC No / misc												
Containers	V H N P G	V H N P G	V H N P G									
Sample Date	06/05/2015	06/05/2015	06/05/2015									
Sample Type	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1									
Date of Receipt	07/05/2015	07/05/2015	07/05/2015									
SVOC MS										LOD/LOR	Units	Method No.
Phenols												
2-Chlorophenol #	<1	<1	<1							<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<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	<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	<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	<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	<1							<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<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	<1.5							<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1							<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1							<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1							<1	ug/l	TM16/PM30
Other SVOCs												
1,2-Dichlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1							<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1							<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1							<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1							<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1							<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1							<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1							<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1							<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5							<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1							<1	ug/l	TM16/PM30

Client Name: Malone O'Regan
Reference: E1119
Location: E1119
Contact: Thomas Vainio-Mattila
JE Job No.: 15/7036

VOC Report : **Liquid**

J E Sample No.	1-7	8-14	15-21									
Sample ID	MW4	MW7	MW10									
Depth										Please see attached notes for all abbreviations and acronyms		
COC No / misc												
Containers	V H N P G	V H N P G	V H N P G									
Sample Date	06/05/2015	06/05/2015	06/05/2015									
Sample Type	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1									
Date of Receipt	07/05/2015	07/05/2015	07/05/2015									
VOC MS										LOD/LOR	Units	Method No.
Dichlorodifluoromethane	<2	<2	<2							<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3							<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1							<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3							<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3							<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3							<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3							<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3							<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1							<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2							<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2							<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3							<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2							<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3							<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2							<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2							<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2							<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2							<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2							<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2							<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2							<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4							<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3							<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3							<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3							<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3							<3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3							<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	101	100	101							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	102	103	101							<0	%	TM15/PM10

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/7036

SOILS

Please note we are only MCERTS accredited 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 we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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 a 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

JE Job No: 15/7036

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (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 USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	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	PM14	Analysis of waters and leachates for metals by ICP OES. 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	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			

JE Job No: 15/7036

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM39	Modified US EPA method 8270. Determination of Atrazine and Simazine by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM42	Modified US EPA method 8270. Pesticides and herbicdes by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	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			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			

APPENDIX H

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
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Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

Malone O'Regan
2b Richview Office Park
Clonskeagh
Dublin 14
Ireland

4225

Attention :	Thomas Vainio-Mattila
Date :	21st April, 2015
Your reference :	
Our reference :	Test Report 15/5806 Batch 1
Location :	Waterstown
Date samples received :	8th April, 2015
Status :	Final report
Issue :	1

Five samples were received for analysis on 8th April, 2015 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.

Where Waste Acceptance Criteria Suite (EC Decision of 19 December 2002 (2003/33/EC)) has been requested, all analyses have been performed using the relevant EN methods where they exist.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Client Name: Malone O'Regan
Reference:
Location: Waterstown
Contact: Thomas Vainio-Mattila
JE Job No.: 15/5806

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-3	4-6	7-10	11-14	15-18						LOD/LOR	Units	Method No.
Sample ID	TP7	TP8	TP9	TP10	TP17								
Depth													
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	07/04/2015	07/04/2015	07/04/2015	07/04/2015	07/04/2015								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	08/04/2015	08/04/2015	08/04/2015	08/04/2015	08/04/2015								
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	<0.06	<0.06	<0.06						<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07	<0.07	<0.07						<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
PAH 6 Total #	<0.22	<0.22	<0.22	<0.22	<0.22						<0.22	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<0.64	<0.64	<0.64	<0.64						<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	96	96	92	96	95						<0	%	TM4/PM8
Mineral Oil >C8-C10	<5	<5	<5	<5	8						<5	mg/kg	TM5/PM16
Mineral Oil >C10-C12	<10	<10	<10	<10	26						<10	mg/kg	TM5/PM16
Mineral Oil >C12-C16	<10	<10	<10	18	157						<10	mg/kg	TM5/PM16
Mineral Oil >C16-C21	<10	<10	<10	35	213						<10	mg/kg	TM5/PM16
Mineral Oil >C21-C40	<10	<10	<10	<10	72						<10	mg/kg	TM5/PM16
Mineral Oil >C8-C40	<45	<45	<45	53	476						<45	mg/kg	TM5/PM16
MTBE #	<5	<5	<5	<5	<5						<5	ug/kg	TM31/PM12
Benzene #	<5	<5	<5	<5	<5						<5	ug/kg	TM31/PM12
Toluene #	<5	<5	<5	<5	<5						<5	ug/kg	TM31/PM12
Ethylbenzene #	<5	<5	<5	<5	<5						<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	<5	<5	<5	<5						<5	ug/kg	TM31/PM12
o-Xylene #	<5	<5	<5	<5	<5						<5	ug/kg	TM31/PM12
PCB 28 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8

Client Name: Malone O'Regan
Reference:
Location: Waterstown
Contact: Thomas Vainio-Mattila
JE Job No.: 15/5806

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-10	11-14	15-18						LOD/LOR	Units	Method No.
Sample ID	TP7	TP8	TP9	TP10	TP17								
Depth													
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	07/04/2015	07/04/2015	07/04/2015	07/04/2015	07/04/2015								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	08/04/2015	08/04/2015	08/04/2015	08/04/2015	08/04/2015								
Total 7 PCBs #	<35	<35	<35	<35	<35						<35	ug/kg	TM17/PM8
Natural Moisture Content	11.6	20.8	25.2	19.9	29.0						<0.1	%	PM4/PM0
% Dry Matter 105°C	85.3	81.6	77.6	81.1	75.6						<0.1	%	NONE/PM4
Total Organic Carbon #	0.39	0.55	0.85	0.68	0.60						<0.02	%	TM21/PM24
Mass of raw test portion	0.1055	0.1101	0.1158	0.1108	0.1188							kg	NONE/PM17
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09							kg	NONE/PM17

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference:
Location: Waterstown
Contact: Thomas Vainio-Mattila
JE Job No.: 15/5806

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-3	4-6	7-10	11-14	15-18						LOD/LOR	Units	Method No.
Sample ID	TP7	TP8	TP9	TP10	TP17								
Depth													
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	07/04/2015	07/04/2015	07/04/2015	07/04/2015	07/04/2015								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	08/04/2015	08/04/2015	08/04/2015	08/04/2015	08/04/2015								
Dissolved Antimony #	<0.002	<0.002	<0.002	<0.002	0.008						<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	<0.02	<0.02	<0.02	<0.02	0.08						<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025						<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	<0.025	<0.025	<0.025	<0.025	<0.025						<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.006	<0.003	0.004	0.007	0.010						<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.06	<0.03	0.04	0.07	0.10						<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005						<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015						<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015	<0.015						<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007						<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07						<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.003	0.008	0.005	0.005	0.020						<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.03	0.08	0.05	0.05	0.20						<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	<0.002	<0.002	<0.002	<0.002	<0.002						<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	<0.003	<0.003						<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	0.004	<0.003	0.006	<0.003	<0.003						<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	0.04	<0.03	0.06	<0.03	<0.03						<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	0.00003	<0.00001	0.00003	<0.00001	<0.00001						<0.00001	mg/l	TM61/PM38
Mercury Dissolved by CVAF #	0.0003	<0.0001	0.0003	<0.0001	<0.0001						<0.0001	mg/kg	TM61/PM38
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	TM26/PM0
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3						<0.3	mg/l	TM27/PM0
Fluoride	<3	<3	<3	<3	<3						<3	mg/kg	TM27/PM0
Chloride	0.4	1.1	0.6	0.7	0.7						<0.3	mg/l	TM27/PM0
Chloride	4	11	6	7	7						<3	mg/kg	TM27/PM0
Sulphate	0.72	1.02	1.07	2.22	2.31						<0.05	mg/l	TM27/PM0
Sulphate	7.2	10.2	10.7	22.2	23.1						<0.5	mg/kg	TM27/PM0
Mass of raw test portion	0.1055	0.1101	0.1158	0.1108	0.1188							kg	NONE/PM17
Leachant Volume	0.885	0.88	0.874	0.879	0.871							l	NONE/PM17
Eluate Volume	0.85	0.86	0.83	0.72	0.61							l	NONE/PM17
Dissolved Organic Carbon	4	3	5	3	5						<2	mg/l	TM60/PM0
Dissolved Organic Carbon	40	30	50	30	50						<20	mg/kg	TM60/PM0
Total Dissolved Solids #	64	48	<10	<10	95						<10	mg/l	TM20/PM0
Total Dissolved Solids #	640	480	<100	<100	950						<100	mg/kg	TM20/PM0

Mass of sample taken (kg)	0.1055	Dry Matter Content Ratio (%) =	85.3
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.885
Particle Size <4mm =	>95%	Eluate Volume (l)	0.85

JEFL Job No	**15/5806**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**3**			
Client Sample No	**TP7**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**07/04/2015**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.39	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	<0.22	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.06	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	0.0003	0.01	0.2	2
Molybdenum	0.03	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	0.04	4	50	200
Chloride	4	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	7.2	1000	20000	50000
Total Dissolved Solids	640	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	40	500	800	1000

Mass of sample taken (kg)	0.1101	Dry Matter Content Ratio (%) =	81.6
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.88
Particle Size <4mm =	>95%	Eluate Volume (l)	0.86

JEFL Job No	**15/5806**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**6**			
Client Sample No	**TP8**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**07/04/2015**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.55	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	<0.22	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	<0.03	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.08	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	11	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	10.2	1000	20000	50000
Total Dissolved Solids	480	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	30	500	800	1000

Mass of sample taken (kg)	0.1158	Dry Matter Content Ratio (%) =	77.6
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.874
Particle Size <4mm =	>95%	Eluate Volume (l)	0.83

JEFL Job No	**15/5806**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**10**			
Client Sample No	**TP9**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**07/04/2015**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.85	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	<0.22	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.04	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	0.0003	0.01	0.2	2
Molybdenum	0.05	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	0.06	4	50	200
Chloride	6	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	10.7	1000	20000	50000
Total Dissolved Solids	<100	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	50	500	800	1000

Mass of sample taken (kg)	0.1108	Dry Matter Content Ratio (%) =	81.1
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.879
Particle Size <4mm =	>95%	Eluate Volume (l)	0.72

JEFL Job No	**15/5806**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**14**			
Client Sample No	**TP10**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**07/04/2015**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.68	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	53	500	-	-
PAH Sum of 6 (mg/kg)	<0.22	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.07	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.05	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	7	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	22.2	1000	20000	50000
Total Dissolved Solids	<100	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	30	500	800	1000

Mass of sample taken (kg)	0.1188	Dry Matter Content Ratio (%) =	75.6
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.871
Particle Size <4mm =	>95%	Eluate Volume (l)	0.61

JEFL Job No	**15/5806**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**18**			
Client Sample No	**TP17**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**07/04/2015**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.60	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	476	500	-	-
PAH Sum of 6 (mg/kg)	<0.22	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.10	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.20	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.08	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	7	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	23.1	1000	20000	50000
Total Dissolved Solids	950	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	50	500	800	1000

Client Name: Malone O'Regan
Reference:
Location: Waterstown
Contact: Thomas Vainio-Mattila

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 15/5806						

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.: 15/5806

SOILS

Please note we are only MCERTS accredited 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 we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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 a 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

JE Job No: 15/5806

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (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.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
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	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	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.	Yes		AR	Yes

JE Job No: 15/5806

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.			AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes		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	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.			AR	
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	

Appendix - Methods used for WAC (2003/33/EC)

Leachate tests	
10l/kg; 4mm	I.S. EN 12457-2:2002 Specified particle size; water added to L/S ratio; capped; agitated for 24 ± 0.5 hours; eluate settled and filtered over 0.45 µm membrane filter.
Eluate analysis	
As	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ba	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cd	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cr total	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cu	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Hg	I.S. EN 13370 rec. EN 1483 (CVAAS)
Mo	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ni	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Pb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Sb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Se	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Zn	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Chloride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Fluoride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Sulphate	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Phenol index	I.S. EN 13370 rec. ISO 6439 (4-Aminoantipyrine spectrometic methods after distillation)* (BY HPLC - Jones Env)
DOC	I.S. EN 1484
TDS	I.S. EN 15216
Compositional analysis	
TOC	I.S. EN 13137 Method B: carbonates removed with acid; TOC by combustion.
BTEX	GC-FID
PCB7**	I.S. EN 15308 analysis by GC-ECD.
Mineral oil	I.S. EN 14039 C10 to C40 analysis by GC-FID.
PAH17***	I.S. EN 15527 PAH17 analysis by GC-MS
Metals	I.S. EN 13657 - Aqua regia digestion: EN ISO 11885 (ICP-OES)
Other	
Dry matter	I.S. EN 14346 sample is dried to a constant mass in an oven at 105 ± 3 °C; Method B Water content by direct Karl-Fischer-titration and either volumetric or coulometric detection.
LOI	I.S. EN 15169 Difference in mass after heating in a furnace up to 550 ± 25 °C.
ANC	CEN/TS 15364 Determined by amouns of acid or base needed to cover the pH range

Notes:

*If not suitable due to LOD, precision, etc., any other suitable method can be used, e.g. AFS, ICP-MS

**PCB-28, PCB-52, PCB-101, PCB-118, PCB-138, PCB-153 and PCB-180

***Naphthalene, Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Coronene, Dibenzo(a,h)anthracene, Fluorene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene and Pyrene.

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Malone O'Regan
2b Richview Office Park
Clonskeagh
Dublin 14
Ireland

4225

Attention :	Thomas Vainio-Mattila
Date :	22nd April, 2015
Your reference :	
Our reference :	Test Report 15/5870 Batch 1
Location :	Waterstown Landfill
Date samples received :	9th April, 2015
Status :	Final report
Issue :	1

Five samples were received for analysis on 9th April, 2015 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.

Where Waste Acceptance Criteria Suite (EC Decision of 19 December 2002 (2003/33/EC)) has been requested, all analyses have been performed using the relevant EN methods where they exist.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Client Name: Malone O'Regan
Reference:
Location: Waterstown Landfill
Contact: Thomas Vainio-Mattila
JE Job No.: 15/5870

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-4	5-8	9-12	13-16	17-20						LOD/LOR	Units	Method No.
Sample ID	TP 11	TP 12	TP 13	TP 14	TP 16								
Depth													
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	<>	<>	<>	<>	<>								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	09/04/2015	09/04/2015	09/04/2015	09/04/2015	09/04/2015								
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	0.31	<0.04						<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	0.05	<0.03	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	0.06	<0.05	0.09	<0.05						<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	0.05	0.06	0.10	<0.04						<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.06	0.25	0.23	0.47	0.11						<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	0.07	0.05	0.10	<0.04						<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.08	0.32	0.41	0.35	0.10						<0.03	mg/kg	TM4/PM8
Pyrene #	0.07	0.26	0.37	0.36	0.09						<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	0.18	0.26	0.23	<0.06						<0.06	mg/kg	TM4/PM8
Chrysene #	0.03	0.15	0.26	0.22	0.04						<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	0.22	0.37	0.26	<0.07						<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	0.13	0.20	0.14	<0.04						<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	0.09	0.17	0.08	<0.04						<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	0.07	0.11	0.08	<0.04						<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
PAH 6 Total #	<0.22	0.83	1.26	0.91	<0.22						<0.22	mg/kg	TM4/PM8
PAH 17 Total	<0.64	1.90	2.49	2.79	<0.64						<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	0.16	0.27	0.19	<0.05						<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	0.06	0.10	0.07	<0.02						<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	97	95	92	100	97						<0	%	TM4/PM8
Mineral Oil >C8-C10	<5	<5	<5	12	<5						<5	mg/kg	TM5/PM16
Mineral Oil >C10-C12	<10	<10	<10	<10	<10						<10	mg/kg	TM5/PM16
Mineral Oil >C12-C16	<10	<10	27	31	<10						<10	mg/kg	TM5/PM16
Mineral Oil >C16-C21	<10	26	59	81	33						<10	mg/kg	TM5/PM16
Mineral Oil >C21-C40	<10	153	301	423	319						<10	mg/kg	TM5/PM16
Mineral Oil >C8-C40	<45	179	387	547	352						<45	mg/kg	TM5/PM16
MTBE #	<5	<5	<5	<5	<5						<5	ug/kg	TM31/PM12
Benzene #	<5	<5	11	8	<5						<5	ug/kg	TM31/PM12
Toluene #	<5	<5	66	25	<5						<5	ug/kg	TM31/PM12
Ethylbenzene #	<5	87	108	250	11						<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	119	275	960	14						<5	ug/kg	TM31/PM12
o-Xylene #	<5	18	74	134	10						<5	ug/kg	TM31/PM12
PCB 28 #	<5	<5	<5	27	<5						<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8

Client Name: Malone O'Regan
Reference:
Location: Waterstown Landfill
Contact: Thomas Vainio-Mattila
JE Job No.: 15/5870

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-4	5-8	9-12	13-16	17-20						LOD/LOR	Units	Method No.
Sample ID	TP 11	TP 12	TP 13	TP 14	TP 16								
Depth													
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	<>	<>	<>	<>	<>								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	09/04/2015	09/04/2015	09/04/2015	09/04/2015	09/04/2015								
Total 7 PCBs #	<35	<35	<35	<35	<35						<35	ug/kg	TM17/PM8
Natural Moisture Content	16.6	17.9	21.9	30.1	23.7						<0.1	%	PM4/PM0
% Dry Matter 105°C	84.9	82.5	80.0	73.0	76.1						<0.1	%	NONE/PM4
Total Organic Carbon #	0.47	1.14	3.51	3.10	2.25						<0.02	%	TM21/PM24
Mass of raw test portion	0.1058	0.1086	0.1129	0.1236	0.1179							kg	NONE/PM17
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09							kg	NONE/PM17

Please see attached notes for all abbreviations and acronyms

Client Name: Malone O'Regan
Reference:
Location: Waterstown Landfill
Contact: Thomas Vainio-Mattila
JE Job No.: 15/5870

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-4	5-8	9-12	13-16	17-20						LOD/LOR	Units	Method No.
Sample ID	TP 11	TP 12	TP 13	TP 14	TP 16								
Depth													
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	<>	<>	<>	<>	<>								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	09/04/2015	09/04/2015	09/04/2015	09/04/2015	09/04/2015								
Dissolved Antimony #	<0.002	<0.002	0.003	0.003	0.002						<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	<0.02	<0.02	0.03	0.03	0.02						<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	<0.0025	<0.0025	<0.0025	<0.0025	0.0028						<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	<0.025	<0.025	<0.025	<0.025	0.028						<0.025	mg/kg	TM30/PM17
Dissolved Barium #	<0.003	0.041	0.039	0.071	0.078						<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	<0.03	0.41	0.39	0.71	0.78						<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005						<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015						<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015	<0.015						<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007						<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07						<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.002	0.027	0.063	0.050	0.044						<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.02	0.27	0.63	0.50	0.44						<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	<0.002	0.006	0.009	0.003	0.003						<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	<0.02	0.06	0.09	0.03	0.03						<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	<0.003	<0.003						<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	<0.003	<0.003	<0.003	<0.003	<0.003						<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	0.00002	0.00003	0.00006	0.00002	0.00002						<0.00001	mg/l	TM61/PM38
Mercury Dissolved by CVAF #	0.0002	0.0003	0.0006	0.0002	0.0002						<0.0001	mg/kg	TM61/PM38
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	TM26/PM0
Fluoride	<0.3	0.3	<0.3	<0.3	<0.3						<0.3	mg/l	TM27/PM0
Fluoride	<3	3	<3	<3	<3						<3	mg/kg	TM27/PM0
Chloride	0.3	1.2	8.2	3.4	0.6						<0.3	mg/l	TM27/PM0
Chloride	3	12	82	34	6						<3	mg/kg	TM27/PM0
Sulphate	3.61	31.84	86.65$_A$	94.70$_A$	21.15						<0.05	mg/l	TM27/PM0
Sulphate	36.1	318.4	867.0$_A$	947.3$_A$	211.6						<0.5	mg/kg	TM27/PM0
Mass of raw test portion	0.1058	0.1086	0.1129	0.1236	0.1179							kg	NONE/PM17
Leachant Volume	0.884	0.881	0.878	0.867	0.872							l	NONE/PM17
Eluate Volume	0.78	0.74	0.78	0.78	0.76							l	NONE/PM17
Dissolved Organic Carbon	3	11	20	11	9						<2	mg/l	TM60/PM0
Dissolved Organic Carbon	30	110	200	110	90						<20	mg/kg	TM60/PM0
Total Dissolved Solids #	54	172	66	270	<10						<10	mg/l	TM20/PM0
Total Dissolved Solids #	540	1720	660	2701	<100						<100	mg/kg	TM20/PM0

Mass of sample taken (kg)	0.1058	Dry Matter Content Ratio (%) =	84.9
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.884
Particle Size <4mm =	>95%	Eluate Volume (l)	0.78

JEFL Job No	**15/5870**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**4**			
Client Sample No	**TP 11**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**<>**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.47	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	<0.22	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	<0.03	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	0.0002	0.01	0.2	2
Molybdenum	0.02	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	3	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	36.1	1000	20000	50000
Total Dissolved Solids	540	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	30	500	800	1000

Mass of sample taken (kg)	0.1086	Dry Matter Content Ratio (%) =	82.5
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.881
Particle Size <4mm =	>95%	Eluate Volume (l)	0.74

		Landfill Waste Acceptance Criteria Limits		
JEFL Job No	**15/5870**			
Sample No	**8**			
Client Sample No	**TP 12**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**<>**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	1.14	3	5	6
Sum of BTEX (mg/kg)	0.224	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	179	500	-	-
PAH Sum of 6 (mg/kg)	0.83	-	-	-
PAH Sum of 17 (mg/kg)	1.90	100	-	-
Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.41	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	0.0003	0.01	0.2	2
Molybdenum	0.27	0.5	10	30
Nickel	0.06	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	12	800	15000	25000
Fluoride	3	10	150	500
Sulphate as SO4	318.4	1000	20000	50000
Total Dissolved Solids	1720	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	110	500	800	1000

Mass of sample taken (kg)	0.1129	Dry Matter Content Ratio (%) =	80.0
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.878
Particle Size <4mm =	>95%	Eluate Volume (l)	0.78

JEFL Job No	**15/5870**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**12**			
Client Sample No	**TP 13**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**<>**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	3.51	3	5	6
Sum of BTEX (mg/kg)	0.534	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	387	500	-	-
PAH Sum of 6 (mg/kg)	1.26	-	-	-
PAH Sum of 17 (mg/kg)	2.49	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.39	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	0.0006	0.01	0.2	2
Molybdenum	0.63	0.5	10	30
Nickel	0.09	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.03	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	82	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	867.0	1000	20000	50000
Total Dissolved Solids	660	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	200	500	800	1000

Mass of sample taken (kg)	0.1236	Dry Matter Content Ratio (%) =	73.0
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.867
Particle Size <4mm =	>95%	Eluate Volume (l)	0.78

JEFL Job No	**15/5870**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**16**			
Client Sample No	**TP 14**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**<>**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	3.10	3	5	6
Sum of BTEX (mg/kg)	1.377	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	547	500	-	-
PAH Sum of 6 (mg/kg)	0.91	-	-	-
PAH Sum of 17 (mg/kg)	2.79	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.71	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	0.0002	0.01	0.2	2
Molybdenum	0.50	0.5	10	30
Nickel	0.03	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.03	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	34	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	947.3	1000	20000	50000
Total Dissolved Solids	2701	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	110	500	800	1000

Mass of sample taken (kg)	0.1179	Dry Matter Content Ratio (%) =	76.1
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.872
Particle Size <4mm =	>95%	Eluate Volume (l)	0.76

JEFL Job No	**15/5870**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**20**			
Client Sample No	**TP 16**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other				
Sample Date	**<>**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	2.25	3	5	6
Sum of BTEX (mg/kg)	0.035	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	352	500	-	-
PAH Sum of 6 (mg/kg)	<0.22	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.028	0.5	2	25
Barium	0.78	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	0.0002	0.01	0.2	2
Molybdenum	0.44	0.5	10	30
Nickel	0.03	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	6	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	211.6	1000	20000	50000
Total Dissolved Solids	<100	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	90	500	800	1000

Client Name: Malone O'Regan **Matrix : Solid**
Reference:
Location: Waterstown Landfill
Contact: Thomas Vainio-Mattila

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
15/5870	1	TP 11		1-4	All analyses	No sampling date given
15/5870	1	TP 12		5-8	All analyses	No sampling date given
15/5870	1	TP 13		9-12	All analyses	No sampling date given
15/5870	1	TP 14		13-16	All analyses	No sampling date given
15/5870	1	TP 16		17-20	All analyses	No sampling date given

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.: 15/5870

SOILS

Please note we are only MCERTS accredited 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 we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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 a 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
A	x5 Dilution

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Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (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.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
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	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	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.	Yes		AR	Yes

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Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.			AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes		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	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.			AR	
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	

Appendix - Methods used for WAC (2003/33/EC)

Leachate tests	
10l/kg; 4mm	I.S. EN 12457-2:2002 Specified particle size; water added to L/S ratio; capped; agitated for 24 ± 0.5 hours; eluate settled and filtered over 0.45 µm membrane filter.
Eluate analysis	
As	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ba	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cd	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cr total	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cu	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Hg	I.S. EN 13370 rec. EN 1483 (CVAAS)
Mo	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ni	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Pb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Sb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Se	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Zn	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Chloride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Fluoride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Sulphate	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Phenol index	I.S. EN 13370 rec. ISO 6439 (4-Aminoantipyrine spectrometic methods after distillation)* (BY HPLC - Jones Env)
DOC	I.S. EN 1484
TDS	I.S. EN 15216
Compositional analysis	
TOC	I.S. EN 13137 Method B: carbonates removed with acid; TOC by combustion.
BTEX	GC-FID
PCB7**	I.S. EN 15308 analysis by GC-ECD.
Mineral oil	I.S. EN 14039 C10 to C40 analysis by GC-FID.
PAH17***	I.S. EN 15527 PAH17 analysis by GC-MS
Metals	I.S. EN 13657 - Aqua regia digestion: EN ISO 11885 (ICP-OES)
Other	
Dry matter	I.S. EN 14346 sample is dried to a constant mass in an oven at 105 ± 3 °C; Method B Water content by direct Karl-Fischer-titration and either volumetric or coulometric detection.
LOI	I.S. EN 15169 Difference in mass after heating in a furnace up to 550 ± 25 °C.
ANC	CEN/TS 15364 Determined by amouns of acid or base needed to cover the pH range

Notes:

*If not suitable due to LOD, precision, etc., any other suitable method can be used, e.g. AFS, ICP-MS

**PCB-28, PCB-52, PCB-101, PCB-118, PCB-138, PCB-153 and PCB-180

***Naphthalene, Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Coronene, Dibenzo(a,h)anthracene, Fluorene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene and Pyrene.

APPENDIX I

Appropriate Assessment Stage 1 Screening Report

Comhairle Contae Átha Cliath Theas
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Title: Waterstown Landfill, Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation of the former landfill, Palmerstown, Co. Dublin

Job Number: E1119

Prepared By: Dyfrig Hubble **Signed:**

Checked By: Thomas Vainio-Mattila **Signed:**

Approved By: Thomas Vainio-Mattila **Signed:**

Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
1	05/05/16	Report	Draft	DH	TVM	TVM
2	06/09/16	Report	Final	DH	TVM	TVM
3	30/09/16	Report	Final V1	DH	TVM	TVM

Waterstown Landfill, Palmerstown, Co Dublin

Appropriate Assessment Stage 1 Screening Report

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Table 7. Qualifying Habitats for the South Dublin Bay and River Tolka Estuary SPA
Table 8. Qualifying Bird Species for the South Dublin Bay and River Tolka Estuary SPA

Figures

Figure 1 Site layout and Location of Natura 2000 sites.

Appendices

Appendix A Conservation Objectives of the North Dublin Bay SAC
Appendix B Conservation Objectives of the South Dublin Bay SAC
Appendix C Conservation Objectives of the North Bull Island SPA
Appendix D Conservation Objectives of the South Dublin Bay and River Tolka Estuary SPA

1.0 Introduction

1.1 Background and purpose of this report

Malone O'Regan (MOR) was appointed by South Dublin County Council (SDCC) to prepare an Appropriate Assessment (AA) as part of a Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation of the former landfill located at Waterstown, Palmerstown, Co. Dublin (Irish Grid reference O 08471 35544), see Figure 1.

This report has been prepared to determine potential impacts, if any, of the historic landfill site, on nearby sites with European conservation designations (i.e. Natura 2000 sites). This report also considers the need and or appropriateness, or otherwise, of the recommendations in the Tier 3 Risk Assessment in the context of the conservation objectives of the Natura 2000 sites.

1.2 Regulatory Context

This AA was prepared in accordance with Article 33 of the Planning and Development Regulations 2001 and with the following directives:

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna better known as "The Habitats Directive" provides the framework for legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000. These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/EEC) (better known as "The Birds Directive").

Article 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect Natura 2000 sites (Annex 1.1). Article 6(3) establishes the requirement for Appropriate Assessment (now termed Natura Impact Statement):

> "*Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans and projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implication for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public"*

The Habitats Directive promotes a hierarchy of avoidance, mitigation and compensatory measures. First, the project should aim to avoid any negative impacts on European sites by identifying possible impacts early in the planning stage, and designing the project in order to avoid such impacts. Second, mitigation measures should be applied, if necessary, during the AA process to the point, where no adverse impacts on the site(s) remain. If the project is still likely to result in adverse effects, and no further practicable mitigation is possible, it is rejected. If no alternative solutions are identified and the project is required for imperative reasons of overriding public interest (IROPI test) under Article 6 (4) of the Habitats Directive, then compensation measures are required for any remaining adverse effect.

1.3 Stages of the Appropriate Assessment

This Appropriate Assessment Screening Report has been undertaken in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC 2001) and the European Commission Guidance 'Managing Natura 2000 Sites'. The Guidance for Planning Authorities issued by the Department of Environment, Heritage and Local Government (December 2009) is also adhered to.

There are four distinct stages to undertaking an AA as outlined in current EU and DOEHLG guidance:

1. Appropriate Assessment Screening.
2. Appropriate Assessment.
3. Assessment of Alternatives in cases where significant impact cannot be prevented.
4. Where no alternatives exist, an assessment of compensatory issues in the case of projects or plans which can be considered to be necessary for imperative reasons of overriding public interest (IROPI).

This report comprises a Stage 1 Screening Report, which seeks to determine whether the subject site will, on its own or in combination with other plans/projects have a significant effect on Natura 2000 sites within a defined radius of the subject site.

2.0 Screening for Appropriate Assessment

Screening determines whether Appropriate Assessment is necessary by examining:

1. Whether a plan or project can be excluded from AA requirements because it is directly connected with or necessary to the management of a Natura 2000 site.
2. Whether the project will have a potentially significant effect on a Natura 2000 site, either alone or in combination with other projects or plans, in view of the site's conservation objectives.

Screening involves the following:

i. Description of plan or project;

ii. Identification of relevant Natura 2000 sites, and compilation of information on their qualifying interests and conservation objectives;

iii. Assessment of likely effects – direct, indirect and cumulative – undertaken on the basis of available information as a desk study or field survey or primary research as necessary; and,

iv. Screening Statement with conclusions.

3.0 Description of the Project

Malone O'Regan (MOR) was appointed by SDCC to undertake a Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation of the former landfill in accordance with the Environmental Protection Agency's (EPA) published Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites (2007) and Waste Management (Certificate of historic unlicensed waste disposal and recovery activity) Regulations, 2008 (S.I. No. 524 of 2008) which were published in December 2008.

Waterstown Landfill is a closed landfill located north of Palmerstown village approximately 10km west of Dublin City Centre (See Figure 1). It is reported that the landfill was in operation from 1983 to 1987 and was used as a disposal facility for municipal waste as well as solid inert waste from commercial/industrial sources (SDCC, 2011). The former landfill site covers an area of approximately 20ha to the south of the River Liffey and is currently in use as a public park.

As part of the Tier 2 and Tier 3 Risk Assessment there is a requirement to complete an AA to determine potential impacts, if any, of the historic landfill site, on nearby Natura 2000 sites. The report also considers the need and or appropriateness, or otherwise, of the recommendations made in the Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation of the former landfill, in the context of the conservation objectives of the Natura 2000 sites.

3.1 Findings of the Tier 2 and Tier 3 Assessments

Based on the Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation of the former landfill (MOR, 2015) the following conclusions have been made:

- *The landfill was in operation from 1983 to 1987;*
- *The Site was formerly a quarry that was filled with waste materials, followed by the progressive raising of site levels as landfilling continued on Site;*
- *No gas or leachate collection systems have been installed at the Site;*
- *It is assumed that waste materials were deposited directly onto exposed bedrock;*
- *Given the location of the site in close proximity to a pNHA (proposed Natural Heritage Area) and within the Liffey Valley SAAO (Special Amenity Area Order), the Site is considered to be located in a sensitive location;*
- *The type of waste found within the landfill is variable and includes both municipal and C&D wastes. It appears that the majority of the municipal wastes were deposited in the south central portion of the former landfill;*
- *The boundaries of the former landfill have been delineated;*
- *The intrusive investigations within the body of waste did not delineate the vertical extent of the waste. This does indicate that the depth of the waste does extend to over seven (7 No) metres depth in the central parts of the Site. The geophysical survey carried out during the Tier 2 Site assessment indicated depths of waste at 17.0m in the centre of the Site;*
- *The area of the former landfill that would fall under the scope of the Code of Practice and associated regulations is approximately 20ha in extent;*
- *It is estimated that in the region of 1,250,000m^3 of waste materials was accepted into the former landfill during its operational lifespan;*

- *Materials were imported to the Site to form a capping layer. The depth of the capping layer would appear to vary across the site and it is estimated that in the region of 300,000m^3 of capping material was imported onto the site;*
- *Soil sample results collected from the trial pits generally complied with Waste Acceptance Criteria for inert landfill;*
- *Elevated landfill gas concentrations were detected at a number of locations at the Site, in particular along the southern boundary that adjoins residential properties, albeit lower concentrations were recorded in 2015 when compared to the 2012 monitoring results;*
- *Additional landfill gas monitoring locations were installed south of the Site, outside of the site boundaries and body of waste. The monitoring data confirmed the absence of landfill gas;*
- *Landfill gas flow measurements were recorded to be very low, which would indicate that the rate of landfill gas generation at the former landfill is low;*
- *A landfill gas survey was carried out in and around the closest private dwelling. The survey data confirmed the absence of landfill gas at this location;*
- *The groundwater quality downgradient of the Site has been impacted by a number of elevated parameters including ammoniacal nitrogen. The presence of ammoniacal nitrogen at downgradient locations provides strong evidence that the former landfill is impacting on groundwater as the leachate within the landfill contains elevated concentrations of ammoniacal nitrogen. There is no known groundwater usage downstream of the site;*
- *The surface water monitoring results did not show any clear evidence that the water quality in the River Liffey has been significantly impacted by the former landfill as concentrations within the River Liffey were broadly similar both upstream and downstream of the site;*
- *The surface water monitoring results of the Mill Race, located immediately adjacent to the site, and in particular ammoniacal nitrogen showed a potential impact of the landfill on the downgradient surface water chemistry; and,*
- *According to the EPA COP risk prioritisation calculations prepared for the previous assessments (Tier 1 and Tier 2) the Site was classified as a Class A – High Risk Site due to the potential risks associated with landfill gas migration. The site investigation data collected during the Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation verified the absence of landfill gas outside of the body of waste. Based on an instruction from the EPA it was considered appropriate to reclassify the Site as Class B – Moderate Risk Site.*

3.2 Recommendations

Based on the site investigation completed at the site and in order to ensure that the site is in strict accordance with the relevant legislation, it has been recommended that testing of the groundwater, surface water and leachate boreholes is continued on an annual basis, with particular attention to observed elevated parameters.

The further monitoring works at the site will use the existing monitoring boreholes and therefore there will be no requirement for any drilling or intrusive ground works at the site, which could potentially result in emissions from the site. The proposed monitoring works will also provide an early indication if conditions on the site change, which result in emission from the site that could potentially impact the Natura 2000 sites within Dublin Bay. Should the findings of the further monitoring works identify any harmful emissions from the site or the need for the implantation of remediation works be identified, then further consideration to potential impacts on Natura 2000 sites will be required and the AA will require updating to determine potential impacts.

4.0 Identification of Natura 2000 Sites

In accordance with the European Commission Methodological Guidance (EC2001), a list of European Sites that could be potentially affected by the historic landfill site at Waterstown has been compiled (See Table 1). Adopting the precautionary principle in identifying these sites, all SAC and SPA sites within a 15km radius of the site have been identified, see figure 1.

Table 1. Designated Sites within 5km & 15km of the SmartPly Facility

Site Name	Code	Distance from site boundary (km) & direction
Special Areas of Conservation		
North Dublin Bay	000206	12.25 E
South Dublin Bay	000210	11.25 SE
Glenasmole Valley	001209	11.5 S
Rye Water Valley / Carton	001398	7.3 W
Wicklow Mountains	002122	13.85 S
Special Protection Areas		
North Bull Island	004006	12.25 E
South Dublin and River Tolka Estuary	004024	9.8 E
Wicklow Mountains	004040	14.6 S

Taking into account the urban location of the site, nature and scale of the project, lack of hydraulic connectivity, absence of any impact pathway and the distance separating the site from the following sites: Glenasmole Valley SAC, Rye Water Valley / Carton SAC and Wicklow Mountains SAC & SPA, it is considered highly unlikely that these protected sites or any of its quality features of interest could be affected in any way by the historic landfill site or the recommendations made in the Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation (MOR, 2015). As a result these sites have been screened out and will not be taken forward for further consideration in this assessment.

North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA; and South Dublin and River Tolka Estuary have been taken forward for further consideration on the basis that there may be hydraulic connectivity between the site and these protected areas. All of these sites are located within Dublin bay at the mouth of the River Liffey. The River Liffey is located within 50m of the north site boundary and flows west to east through the centre of Dublin City before discharging into Dublin bay.

4.1 North Dublin Bay SAC (site code: 000206)

The North Dublin SAC is located approximately 12.25km east of the site (Approx. 15.5km following the River Liffey). The area covers the inner part of north Dublin Bay where the seaward boundary extends from the Bull Wall lighthouse across to the Martello Tower at Howth Head. North Bull Island is the focal point of this site. The island is a sandy spit which formed after the construction of the South Wall and Bull Wall in the 18th and 19th centuries. It extends approximately 5 km in length and up to 1 km wide in some areas.

The North Dublin Bay is an excellent example of a coastal site with the main habitats represented. It contains good examples of ten habitats which are listed on Annex I of the E.U. Habitats Directive; one of which is listed with priority status. Several of the wintering bird species have populations of

international importance, with some of the invertebrates being of national importance. The site contains a numbers of rare plants including some which are legally protected.

The main species of conservation interest include a rare liverwort (*Petalophyllum ralfsii*) which is of high conservation value as it is listed on Annex II of the E.U. Habitats Directive. The North Bull is the only known site for the species in Ireland away from the western seaboard.

The main land uses of this site are primarily for amenity activities (including 2 No. golf courses) and nature conservation. The North Bull Island is the main recreational beach in Co. Dublin and is used throughout the year. Two separate Statutory Nature Reserves take up most of the island's eastern side of the Bull Wall and the surrounding intertidal flats. The site is used regularly for educational purposes. North Bull Island has been designated a Special Protection Area under the E.U. Birds Directive and it is also a statutory Wildfowl Sanctuary, a Ramsar Convention site, a Biogenetic Reserve, a Biosphere Reserve and a Special Area Amenity Order site.

Qualifying Interests for the North Dublin Bay SAC

The site has been selected for the following Annex I habitats and Annex II species, see tables 2 and 3 below:

Table 2. Qualifying Annex I Habitats for the North Dublin Bay SAC

***Qualifying Habitats* (* denotes Priority Habitat)**	**Code**
Tidal Mudflats and Sandflats	1140
Annual Vegetation of Drift Lines	1210
Salicornia Mud	1310
Atlantic Salt Meadows	1330
Mediterranean Salt Meadows	1410
Embryonic Shifting Dunes	2110
Marram Dunes (White Dunes)	2120
Fixed Dunes (Grey Dunes)*	2130
Humid Dune Slacks	2190

Table 3. Qualifying Annex II Species for the North Dublin Bay SAC

Common Name	***Scientific Name***	***Code***
Petalwort	*Petalophyllum ralfsii*	1395

Conservation Objectives for the North Dublin Bay SAC

The main objective of the SAC is to maintain or restore the favourable conservation conditions of the existing Annex I habitats and Annex II species for which the SAC has been designated. Specific objectives as presented in Appendix A.

4.2 South Dublin Bay SAC (code 000210)

The South Dublin SAC is located approximately 11.25 km south east of the site (Approx. 13.75km following the River Liffey). . The SAC extends from the South Wall to the west pier at Dun Laoghaire. It is an intertidal site with large areas of sand and mudflats, a habitat listed on Annex I of the E.U.

Habitats Directive. The sediments are predominantly sands but grade to sandy muds near the shore at Merrion gates. The main channel which drains the area is Cockle Lake.

The SAC is a great example of a coastal system with extensive sand and mudflats, a habitat listed on Annex I of the E.U. Habitats Directive. South Dublin Bay is also an internationally important bird site. South Dublin Bay is an important site for waterfowl. Recent studies have shown that certain populations which occur in the south bay spend most of their time there.

During low tide, the inner sections of the south bay are used for amenity purposes. Bait digging is a common activity in the sandy flats. During high tide, wind surfing and jet skiing are a common activity within the area.

Qualifying Interests for South Dublin Bay SAC

The site has been selected for the following Annex I habitat, see Table 4 below:

Table 4. Qualifying Annex I Habitats for South Dublin Bay SAC

***Qualifying Habitats* (* denotes Priority Habitat)**	**Code**
Tidal Mudflats and Sandflats	1140

Conservation Objectives for South Dublin Bay SAC

The main objective of the SAC is to maintain the favourable conservation condition of Mudflats and sand flats not covered by seawater at low tide in South Dublin Bay SAC and SPA. This objective is defined by the list of attributes and targets presented in Appendix B.

4.3 North Bull Island SPA (code 004006)

North Bull Island SPA is located approximately 12.25km east of the site (Approx. 15.5km following the River Liffey). This site covers all of the inner part of north Dublin Bay, with the seaward boundary extending from the Bull Wall lighthouse across to Drumleck Point at Howth Head. The North Bull Island sand spit is a relatively recent depositional feature, formed as a result of improvements to Dublin Port during the 18th and 19th centuries. It is almost 5km long and 1km wide and runs parallel to the coast between Clontarf and Sutton.

North Bull Island SPA covers much of the same area as the Dublin Bay SAC. The North Bull Island SPA is a regular site for passage waders, especially Ruff, Curlew Sandpiper and Spotted Redshank. The rare liverwort, *Petalophyllum ralfsii*, was first recorded from the North Bull Island in 1874 and its presence here has recently been re-confirmed. This species is of high conservation value as it is listed on Annex II of the E.U. Habitats Directive. A well-known population of Irish Hare is resident on the island.

The North Bull Island SPA is of international importance for waterfowl on the basis that it regularly supports in excess of 20,000 waterfowl. A further 14 species have populations of national importance. The main land uses of this site are amenity activities and nature conservation. Part of the interior of the island has been converted to golf courses. The North Bull Island is one of the main recreational beaches in Co. Dublin and is used throughout the year. Two separate Statutory Nature Reserves cover much of the island east of the Bull Wall and the surrounding intertidal flats. North Bull Island is also a Wildfowl Sanctuary, a Ramsar Convention site, a Biogenetic Reserve, a Biosphere Reserve and a Special Area Amenity Order site. Much of the SPA is also a candidate Special Area of Conservation. The site is used regularly for educational purposes and there is a manned interpretative centre on the island.

Qualifying Interests for the North Bull Island SPA

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species and habitats see tables 5 and 6 below:

Table 5. Qualifying Habitats for the North Bull Island SPA

Qualifying Habitats	Code
Wetlands and Wetland birds	A999

Table 6. Qualifying Bird Species for the North Bull Island SPA

Species Name	Scientific Name	Code
Light-bellied Brent Goose	*Branta bernicla hrota*	A046
Shelduck	*Tadorna tadorna*	A048
Teal	*Anas crecca*	A052
Pintail	*Anas acuta*	A054
Shoveler	*Anas clypeata*	A056
Oystercatcher	*Haematopus ostralegus*	A130
Golden Plover	*Pluvialis apricaria*	A140
Grey Plover	*Pluvialis squatarola*	A141
Knot	*Calidris canutus*	A143
Sanderling	*Calidris alba*	A144
Dunlin	*Calidris alpina*	A149
Black-tailed Godwit	*Limosa limosa*	A156
Bar-tailed Godwit	*Limosa lapponica*	A157
Curlew	*Numenius arquata*	A160
Redshank	*Tringa totanus*	A162
Turnstone	*Arenaria interpres*	A169
Black-headed Gull	*Chroicocephalus ridibundus*	A179

Conservation Objectives for the North Bull Island SPA

The main conservation objective for this SPA is to maintain or restore the favourable condition of the species listed above and in Appendix C, and the wetland habitat of the SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

4.4 South Dublin Bay and River Tolka Estuary SPA (code 004024)

The South Dublin Bay SPA is located approximately 9.8km east of the site (Approx. 13.5km following the River Liffey). and comprises of a substantial part of Dublin Bay. It includes the intertidal area between the River Liffey and Dun Laoghaire, and the estuary of the River Tolka to the north of the River Liffey, as well as Booterstown Marsh. A portion of the shallow marine waters of the bay is also part of the protected area.

The site is a Special Protection Area (SPA) under the EU Birds Directive, of special conservation interest for the several species listed in Annex I. The EU Birds Directive pays particular attention to wetlands, and as these form part of the SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds. The site is an important site for wintering waterfowl, being an integral part of the internationally important Dublin Bay complex.

Booterstown Marsh supports an important population of Borrer's Saltmarsh-grass (Puccinellia fasciculata), a rare, Red Data Book species that is listed on the Flora (Protection) Order, 1999. Sediments in the Tolka Estuary vary from soft thixotrophic muds with a high organic content in the inner estuary to exposed, well-aerated sands off the Bull Wall.

During low tide, the inner sections of the south bay are used for amenity purposes. Bait digging is a common activity in the sandy flats. During high tide, wind surfing and jet skiing are a common activity within the area.

Qualifying Interests of the South Dublin Bay and River Tolka Estuary SPA

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species and habitats, see tables 7 and 8 below:

Table 7. Qualifying Habitats for the South Dublin Bay and River Tolka Estuary SPA

Qualifying Habitats	**Code**
Wetlands and Wetland birds	A999

Table 8. Qualifying Bird Species for the South Dublin Bay and River Tolka Estuary SPA

Species Name	**Scientific Name**	**Code**
Light-bellied Brent Goose	*Branta bernicla hrota*	A046
Oystercatcher	*Haematopus ostralegus*	A130
Ringed Plover	*Charadrius hiaticula*	A147
Grey Plover	*Pluvialis squatarola*	A141
Knot	*Calidris canutus*	A143
Sanderling	*Calidris alba*	A144
Dunlin	*Calidris alpina*	A149
Bar-tailed Godwit	*Limosa lapponica*	A157
Redshank	*Tringa totanus*	A162
Black-headed Gull	*Chroicocephalus ridibundus*	A179
Roseate Tern	*Sterna dougallii*	A192
Common Tern	*Sterna hirundo*	A193
Arctic Tern	*Sterna paradisaea*	A194

Conservation Objectives of the South Dublin Bay and River Tolka Estuary SPA

The main conservation objective for this SPA is to maintain or restore the favourable condition of the species listed above and in Appendix D, and the wetland habitat of the SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

4.5 Overall Conservation Objectives

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status, areas designated as SACs and SPAs. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site's conservation objectives are a statement of the overall nature conservation requirements for a site, expressed in terms of the favourable conditions required for the qualifying features. According to the EU Habitats Directive, favourable conservation status of a habitat is achieved when:

- Its natural range, and area it covers within that range, is stable or increasing;
- The ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is favorable as defined below.

The favourable conservation status of a species is achieved when:

- Population data on the species concerned indicate that it is maintaining itself;
- The natural range of the species is neither being reduced or likely to be reduced for the foreseeable future; and,
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

5.0 Identification and Assessment of Potential Impacts

Potential impacts, if any, on the European sites identified within a 15 km radius of the site were considered.

Only those features of the project that have the potential to impact on the conservation objectives of the identified Natura 2000 sites are considered. A number of factors were examined at this stage and dismissed due to the very low risk associated with them. The following areas were examined in relation to potential impacts from the proposed projects:

- Loss of, or disturbance to habitats or species; and
- Potential impairment of water quality.

Given that all of the protected sites that have been brought forward for further assessment are located with Dublin Bay and are interconnected with each other and in some case cover the same areas, the sites will be considered collectively.

5.1 Loss of, or disturbance to habitats species

Direct habitat loss is caused where there is complete removal of a habitat type. Habitat loss can also occur through the reduction of habitat quality and a loss of important habitat functions.

There are no designated sites, or qualifying habitats as listed in section 4 within the vicinity of the site. In addition, the nearest designated site within Dublin Bay is located almost 10km away from the site and the fact that the site is separated from this areas by Dublin City, it can be stated that any activates associated with the recommendations for further monitoring will not have an impact on any of the designated habitats within Dublin Bay.

It is considered that the proposed monitoring works will not have any impact on any of the qualifying species of interest listed in the tables in section 4. This assumption is based on the localised nature of the proposed works and on the distance separating the site from the Natura 2000 sites. Furthermore, the onsite habitats are considered to be sub-optimal for the species listed, as they provide little in the way of foraging opportunities or shelter. In addition the site is separated from Dublin Bay by Dublin City, which also reduces the potential for any of the designated species to move between the two areas.

Accordingly it can be stated that there will be no loss or disturbance on either habitats or species and hence there will be no likely significant indirect impact on any of the protected sites with Dublin Bay.

5.2 Potential impairment of water quality

The Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation (MOR, 2015) did not identify any significant levels of emissions of pollutions to either groundwater or surface water from the Site. The water quality at the sampling points both in the River Liffey and the Mill race (Located between the site and the River Liffey), above and below the site remained unchanged. There was no significant change in any of the parameters measured at these locations. It can therefore be stated that in its current state of the historic landfill at the site is not contributing to a detrition in water quality within either the River Liffey or Mill Race. In the absence of any impact on the water quality within these waterbodies, it can also be stated that the historic landfill is not currently causing any loss or disturbance as a result of emissions from the site to either habitats or species for which the Natura 2000 sites are designated.

Accordingly there will be no impact on water quality and hence there will be no likely significant indirect impact on any of the protected sites within Dublin Bay.

5.3 Assessment of In-Combination Effects

The Habitats Directive requires competent authorities to undertake an appropriate assessment of any plan or project which is likely to have a significant effect alone or in-combination with other plans and projects.

The assessment has considered the possibility for impacts on North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA; and South Dublin and River Tolka Estuary. While it can be objectively demonstrated that the historic landfill and the proposed recommendations will not have any impacts, direct or indirect, on the conservation objectives of these designated European sites, it is noted that other land use activities within and around this site and along the banks of the River Liffey such as agricultural practices, industrial practices, other commercial activities, residential properties, transport infrastructure and both commercial and leisure activities within Dublin Bay have the potential to affect, its conservation objectives.

The conclusions of this assessment are that the historic landfill site in its current state will not, either alone or in combination with other activities and project, will not have significant impacts on the designated SAC's or SPA's within Dublin Bay.

6.0 Screening Conclusions and Statement

The screening process has examined the information available for the historic landfill site and the findings of the Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation (MOR, 2015) for the site and considered the potential for the site to cause impacts on Natura 2000 sites and qualifying features of interest within a 15km radius of the site located at Waterstown, Palmerstown Co Dublin.

Taking into consideration the findings of Tier 2 Risk Assessment; Main Site Investigation and Testing, Tier 3 Risk Assessment; Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation (MOR, 2015), it has been concluded that that the historic landfill is currently not resulting in the direct loss or disturbance of any Annex I habitats or Annex II species for which the SAC is designated. Furthermore it is considered that the implementation of further monitoring works at the site will also not have any significant impact on the Natura 2000 sites with Dublin Bay. The proposed monitoring of surface water and groundwater at the site will also provide an early indication to any changes at the site that could potential result in impacts to designated sites.

Taking into account all of the matters discussed, it can be concluded that the historic landfill site or the proposed monitoring works, alone or in-combination with other projects, will not adversely affect the integrity and conservation status of any of the Natura 2000 sites of their qualifying features of interest. Accordingly, progression to Stage 2 of the Appropriate Assessment process (i.e. preparation of a Natura Impact Statement) is not considered necessary.

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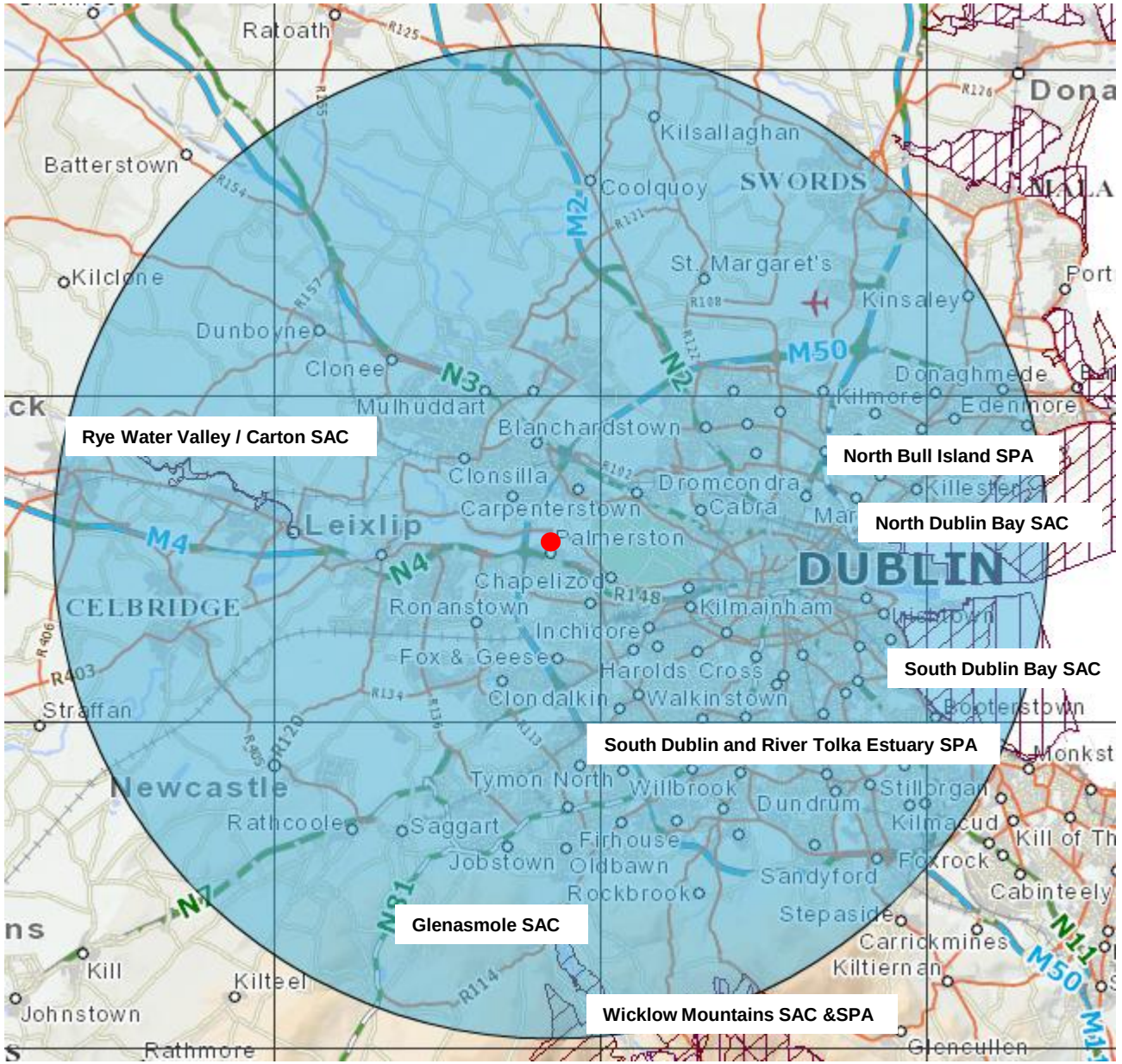
FIGURES



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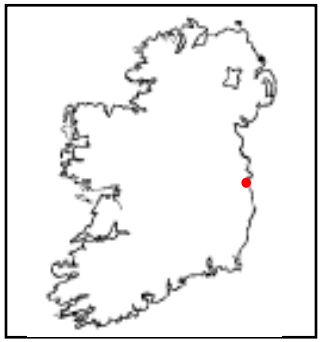

Legend

- Site location
- 15km search area

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Client: South Dublin County Council			Drawing: Site Location and Natura 2000 Sites with 15km			
Job: Appropriate Assessment Stage 1 Screening Report						
Job Number: E1119	Drawing Number: Figure 1	Status: Issue	Sht. Size: A3	Scale: NTS	Date: May 16	Drawn: DH

APPENDIX A

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National Parks and Wildlife Service

Conservation Objectives Series

North Dublin Bay SAC 000206

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000206	North Dublin Bay SAC
1140	Mudflats and sandflats not covered by seawater at low tide
1210	Annual vegetation of drift lines
1310	*Salicornia* and other annuals colonising mud and sand
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
1395	Petalwort *Petalophyllum ralfsii*
1410	Mediterranean salt meadows (Juncetalia maritimi)
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
2190	Humid dune slacks

Please note that this SAC overlaps with North Bull Island SPA (004006) and adjoins Howth Head SAC (000203) and South Dublin Bay and River Tolka Estuary SPA (004024). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2007
Title :	Saltmarsh Monitoring Project 2006
Author :	McCorry, M.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Saltmarsh monitoring project 2007-2008
Author :	McCorry, M; Ryle, T.
Series :	Unpublished report to NPWS
Year :	2013
Title :	North Dublin Bay SAC (site code 206) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2013
Title :	North Dublin Bay SAC (site code 206) Conservation objectives supporting document- marine habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2013
Title :	Monitoring survey of Annex I sand dune habitats in Ireland
Author :	Delaney, A.; Devaney, F.M.; Martin, J.M.; Barron, S.J.
Series :	Irish Wildlife Manual No. 75

Other References

Year :	2008
Title :	The phytosociology and conservation value of Irish sand dunes
Author :	Gaynor, K.
Series :	Unpublished PhD thesis, National University of Ireland, Dublin
Year :	2011
Title :	A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of North Dublin Bay
Author :	Aquatic Services Unit
Series :	Unpublished report to the Marine Institute and NPWS
Year :	2012
Title :	Rare and threatened bryophytes of Ireland
Author :	Lockhart, N; Hodgetts, N; Holyoak, D.
Series :	National Museums Northern Ireland

Year :	2013
Title :	Conservation of selected legally protected and Red Listed bryophytes in Ireland
Author :	Campbell, C.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin

Spatial data sources

Year :	Interpolated 2013
Title :	2010 intertidal survey
GIS Operations :	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used For :	1140, Marine community types (maps 3 and 4)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used For :	Marine community types base data (map 4)
Year :	Revision 2010
Title :	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary; overlapping regions with Coastal CO data investigated and resolved with expert opinion used
Used For :	1310, 1330, 1410 (map 5)
Year :	2013
Title :	Sand Dune Monitoring Project 2011. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary; overlapping regions with Saltmarsh CO data investigated and resolved with expert opinion used
Used For :	2110, 2120, 2130, 2190 (map 6)
Year :	2013
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used For :	1395 (map 6)

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated using OSi data as 578ha
Community extent	Hectares	Maintain the extent of the *Mytilus edulis*-dominated community, subject to natural processes. See map 4	Estimated during site walkover in March 2012. See marine supporting document for further information
Community structure: *Mytilus edulis* density	Individuals/m²	Conserve the high quality of the *Mytilus edulis*-dominated community, subject to natural processes	Observed during site walkover in March 2012. See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Fine sand to sandy mud with *Pygospio elegans* and *Crangon crangon* community complex; Fine sand with *Spio martinensis* community complex. See map 4	Based on an intertidal survey undertaken in 2010 (ASU, 2011). See marine supporting document for further information

1210 Annual vegetation of drift lines

To restore the favourable conservation condition of Annual vegetation of drift lines in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes, including erosion and succession. Total area mapped: South Bull - 0.11ha. See map 6	Based on data from the Sand Dune Monitoring Project (SDM) (Delaney et al., 2013). Habitat is very difficult to measure in view of its dynamic nature, which means that it can appear and disappear within a site from year to year. This habitat was recorded from both North Bull and South Bull sub-sites by the Coastal Monitoring Project (CMP) (Ryle et al., 2009) but was only recorded in South Bull by the SDM. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6	Based on data from Delaney et al., (2013). Strandline is more extensive at South Bull sub-site than at North Bull. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Delaney et al., (2013). As well as the transitions between sand dune habitats, the transitions from sand dune to saltmarsh communities at Bull Island are of significant value. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali)* and oraches (*Atriplex* spp.)	Based on data from Delaney et al., (2013). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details

1310 *Salicornia* and other annuals colonising mud and sand

To restore the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: North Bull Island - 29.10ha. See map 5	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry, 2007). Habitat surveyed and mapped at a single sub-site, giving a total estimated area of 29.10ha, including mosaics. NB some further small unsurveyed areas may be present within this site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 5 for known distribution	Based on data from McCorry (2007). *Salicornia* is an annual species, so its distribution can vary significantly from year to year. The largest area of *Salicornia* flats occurs north of the central causeway. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain, or where necessary restore, natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry (2007). Sediment supply is particularly important for this pioneer saltmarsh community, as its distribution depends on accretion rates. It appears that the extent of the *Salicornia* flats was much lower before the construction of the causeway. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry (2007). Creeks deliver sediment throughout the saltmarsh system. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Based on data from McCorry (2007). This pioneer saltmarsh community requires regular tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry (2007). At Bull Island there are transitional communities between the *Salicornia* flats, Atlantic salt meadows and Mediterranean salt meadows. These saltmarsh habitats also form transitional communities with a range of sand dune habitats. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry (2007). Wildfowl and water birds graze and forage on the *Salicornia* flats at Bull Island. See coastal habitats supporting document for details
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry (2007). See coastal habitats supporting document for details
Vegetation composition: typical species and sub-communities	Percentage cover	Maintain the presence of species-poor communities listed in SMP (McCorry and Ryle, 2009)	Based on data from McCorry (2007). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry (2007). *Spartina* is frequent at Bull Island. While it occurs within a mosaic with *Salicornia* flats, it generally does not dominate the vegetation cover and only forms small swards. See coastal habitats supporting document for further details

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

To maintain the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: North Bull Island - 81.84ha. See map 5	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry, 2007). Atlantic salt meadow (ASM) surveyed and mapped at a single site, giving an estimated area of 81.84ha, including mosaics. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 5 for known distribution	Based on data from McCorry (2007). The ASM at Bull Island was the largest single section of saltmarsh surveyed by the SMP in 2006. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry (2007). The construction of the causeway had a significant impact on the saltmarsh at Bull Island. Within the ASM there is some erosion at a slow rate at the seaward side of the northern tip. This erosion is offset by accretion along the northside of the causeway. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry (2007). Within Bull Island, the ASM topography is well developed and there is a very complex creek and salt pan structure. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry (2007). At Bull Island there are transitional communities between the *Salicornia* flats, Atlantic salt meadows and Mediterranean salt meadows. These saltmarsh habitats also form transitional communities with a range of sand dune habitats. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry (2007).There is some light grazing by hares (*Lepus timidus hibernicus*) and wildfowl. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% area outside creeks vegetated	Based on data from McCorry (2007). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from from McCorry (2007). *Spartina* is widely distributed on ASM though found at low cover values. See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (Juncetalia maritimi)

To maintain the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: North Bull Island - 7.98ha. See map 5	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry, 2007). One sub-site that supports Mediterranean Salt Meadow (MSM) was surveyed and mapped, giving an estimated area of 7.98ha, including mosaics. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 5 for known distribution	Based on data from McCorry (2007). The MSM is restricted to the area north of the causeway along the boundary with dune habitats and of St Annes Golf Course; the extent of the habitat here is likely to have been greater in the past. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry (2007). See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry (2007). The MSM at North Bull Island not as well developed as the ASM. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	MSM is found high up in the saltmarsh but requires occasional tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry (2007). At Bull Island there are transitional communities between the *Salicornia* flats, Atlantic salt meadows and Mediterranean salt meadows. These saltmarsh habitats also form transitional communities with a range of sand dune habitats. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward	Based on data from McCorry (2007). There is some light grazing by hares (*Lepus timidus hibernicus*) and wildfowl. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry (2007). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with characteristic species listed in SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry (2007). *Spartina* is widely distributed at this site. See coastal habitats supporting document for further details

2110 Embryonic shifting dunes

To restore the favourable conservation condition of Embryonic shifting dunes in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: North Bull - 2.64ha; South Bull - 3.43ha. See map 6	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Embryo dunes were surveyed and mapped at two sub-sites, giving a total estimated area of 6.07ha. Habitat is very difficult to measure in view of its dynamic nature and is more extensive on North Bull than South Bull. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from Delaney et al. (2013). Mechanical beach cleaning may be contributing to limited distribution of this habitat, particularly at South Bull. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. At North Bull, movement of sediment towards the recurved northern tip of the dune has resulted in the formation of a wide area of foredune habitat. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Delaney et al. (2013). As well as the transitions between sand dune habitats, the transitions from sand dune to saltmarsh communities at Bull Island are of significant value. See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of sand couch (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sand couch (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Delaney et al. (2013). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)

To restore the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. North Bull - 2.20ha; South Bull - 0.97ha. See map 6	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). These dunes were surveyed and mapped at two sub-sites, giving a total estimated area of 3.18ha. Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on Delaney et al. (2013). At South Bull and North Bull this habitat forms a continuous strip at or near the seaward edge of the dunes. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Marram grass (*Ammophila arenaria)* reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth encouraging further accretion. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Gaynor (2008) and Delaney et al. (2013). As well as the transitions between sand dune habitats, the transitions from sand dune to saltmarsh communities at Bull Island are of significant value. See coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	95% of marram grass (*Ammophila arenaria*) and/or lyme-grass *(Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities dominated by marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Delaney et al. (2013). Negative indicators include non-native species; species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation ('grey dunes') in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For sub-sites mapped: North Bull - 40.29ha; South Bull - 64.56ha. See map 6	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was surveyed and mapped at two sub-sites to give a total estimated area of 104.85ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from Delaney et al. (2013). See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Delaney et al. (2013). As well as the transitions between sand dune habitats, the transitions from sand dune to saltmarsh communities at Bull Island are of significant value. See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes	Based on data from Gaynor (2008) and Delaney et al. (2013). Pedestrian tracks that are devoid of vegetation occur throughout the island. See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Delaney et al. (2013). Grazing by livestock is absent from the island. However, the dunes are grazed by rabbits (*Oryctolagus cuniculus*) and hares (*Lepus timidus hibernicus*). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from Gaynor (2008) and Delaney et al. (2013). The protected and Red Data Book species red hemp nettle (*Galeopsis angustifolia*), meadow saxifrage (*Saxifraga granulata*), wild clary (*Salvia verbenaca*) and spring vetch (*Vicia lathyroides*) represent indicators of local distinctiveness. See coastal habitats supporting document for further details.
Vegetation composition: negative indicator species (including *Hippophae rhamnoides*)	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Delaney et al. (2013). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. It occurs as occasional patches at this site. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Delaney et al. (2013). There are numerous small trees and shrubs throughout the site but are not currently a significant management issue. See coastal habitats supporting document for further details

2190 Humid dune slacks

To restore the favourable conservation condition of Humid dune slacks in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

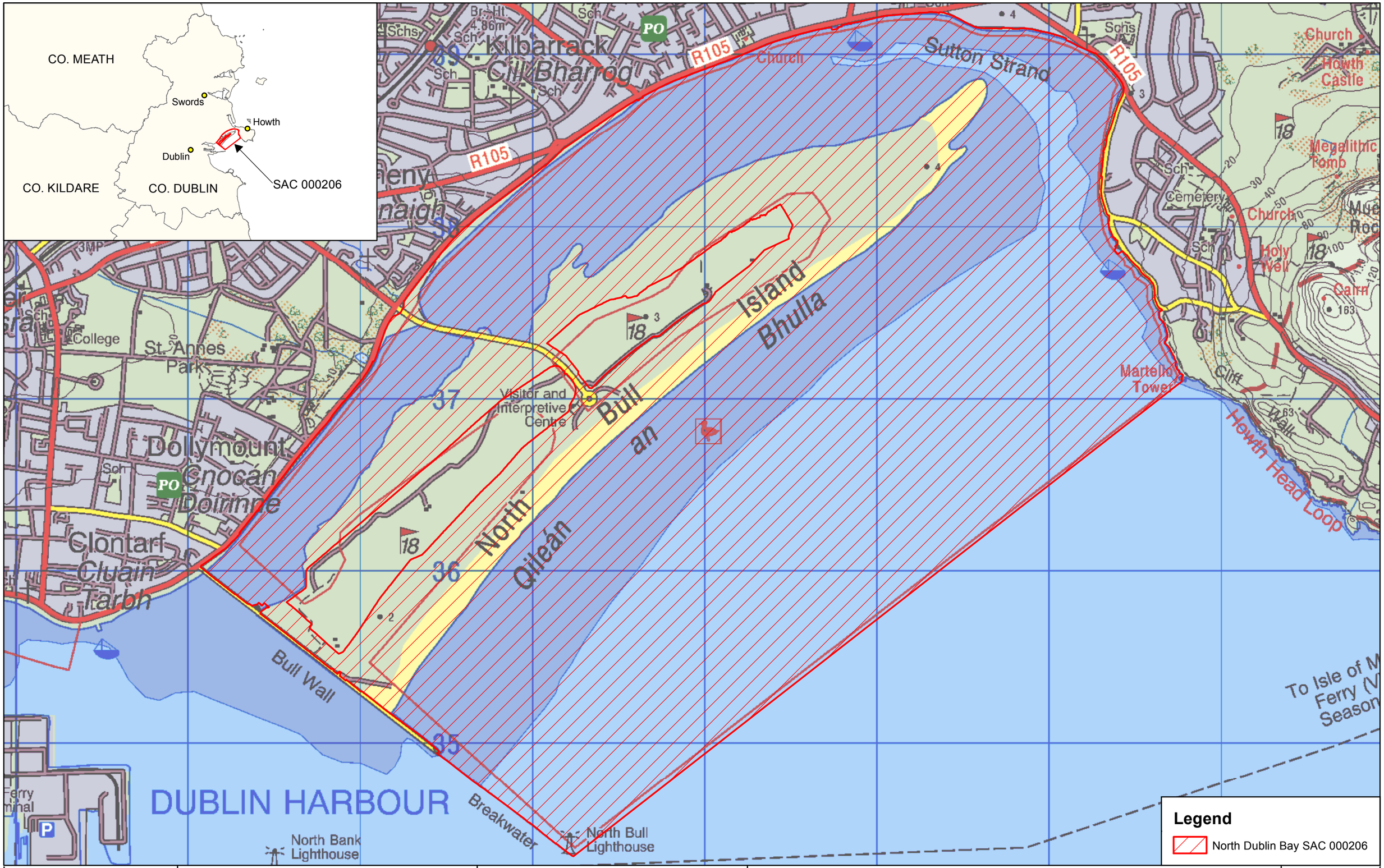
Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes including erosion and succession. For sub-sites mapped: North Bull - 2.96ha; South Bull - 9.15ha. See map 6	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was surveyed and mapped at two sub-sites to give a total estimated area of 12.11ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from Delaney et al. (2013). The dune slack on North Bull consists of a long stretch of habitat that lies between successive dune ridges over a distance of approx. 700m. The dune slack topography is similar on South Bull with a number of individual long slacks between dune ridges. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation, resulting in increased rates of erosion. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations (metres)	Maintain natural hydrological regime	Based on data from Delaney et al. (2013). On Bull Island there is some concern that the alder marsh at the North Bull is becoming increasingly brackish in nature. There is also the potential problem of fertiliser run-off, leading to an increase in nutrient levels. Water abstraction could result in a lowering of the water table, negatively affecting the dune slacks. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Gaynor (2008) and Delaney et al. (2013). As well as the transitions between sand dune habitats, the transitions from sand dune to saltmarsh communities at Bull Island are of significant value. The transitional area between the fixed dunes and dune slacks are particularly important for a range of rare bryophytes (Lockhart et al., 2012). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 5% of dune slack habitat, with the exception of pioneer slacks which can have up to 20% bare ground	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Walking tracks traverse the dune slack at North Bull and have led to some erosion and poaching of soil. The slacks at the South Bull are close to the main access points to the island and pedestrian tracks have been created, leading to some erosion of vegetation cover. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Grazing by livestock is absent from the island. However, the dunes are grazed by rabbits (*Oryctolagus cuniculus*) and hares (*Lepus timidus hibernicus*). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from Gaynor (2008) and Delaney et al. (2013). The Annex II liverwort, petalwort (*Petalophyllum ralfsii*) has its only station away from the western seaboard at this site. See coastal habitats supporting document and conservation objective for 1395 for further details. See coastal habitats supporting document for further details

Vegetation composition: cover of *Salix repens*	Percentage cover; centimetres	Maintain less than 40% cover of creeping willow (*Salix repens*)	Based on data from Delaney et al. (2013). Cover of creeping willow (*Salix repens*) needs to be controlled (e.g. by an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Delaney et al. (2013). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. Patches of the shrub, particularly near the golf course boundaries, need to be kept in check on both the North and South Bull. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Delaney et al. (2013). There are numerous shrubs and small trees throughout both sub-sites, but not to an extent that would require intensive management. See coastal habitats supporting document for further details

1395 Petalwort *Petalophyllum ralfsii*

To maintain the favourable conservation condition of Petalwort in North Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution of populations	Number and geographical spread of populations	No decline. See map 6	The known population of *Petalophyllum ralfsii* at Bull Island occurs along the track that cuts through the Alder marsh, south and east of St. Anne's Golf Club. Data from NPWS surveys and Campbell (2013)
Population size	Number of individuals	No decline. Population at Bull Island estimated at a maximum of 5,824 thalli. Actual population is more likely to be 5% of this, or c. 300 thalli	Counts of thalli are based on the mean of number of thalli in three 1 x 1m plots, averaged for 12 counts from February 2009 to March 2012: = 7.9 thalli per m² (Campbell, 2013). Maximum estimated population at Bull Island is therefore 7.86 x 741 = 5,824 thalli. As not all the habitat within the area of occupancy is suitable habitat, the actual number of thalli is likely to be much less, perhaps 5% of this figure, i.e. 291 (or c. 300)
Area of suitable habitat	Hectares	No decline. Area of suitable habitat at Bull Island is estimated at c. 0.04ha. See map 6	The area of occupancy is along the track through the Alder marsh, south and east of St. Anne's Golf Club. The width of the track is estimated to be about 1m. The length, measured by GPS co-ordinates, is 741m. The maximum area is thus 741m² (= 0.0741 ha). Not all the track is actually suitable habitat for *Petalophyllum ralfii*. Some sections are too dry, some too permanently wet, and some sections too overgrown with coarse vegetation. Therefore c. 5% is suitable i.e. c. 37m² (=0.0037ha). See also conservation objectives for humid dune slacks (2190)
Hydrological conditions: soil moisture	Occurrence	Maintain hydrological conditions so that substrate is kept moist and damp throughout the year, but not subject to prolonged inundation by flooding in winter	*Petalophyllum ralfsii* grows in damp conditions. Attribute and target based on Campbell (2013)
Vegetation structure: height and cover	Centimetres and percentage	Maintain open, low vegetation with a high percentage of bryophytes (small acrocarps and liverwort turf) and bare ground	*Petalophyllum ralfsii* grows in compacted, sandy ground, maintained at this site by rabbit (*Oryctolagus cuniculus*) grazing and trampling (by walkers). Campbell (2013) recorded a mean height of vegetation of 3.3cm, with bryophyte cover c. 30% and bare ground c. 15% (based on three 1 x 1m plots between 2009 and 2011)



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
NORTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000206; version 3.
CO. DUBLIN

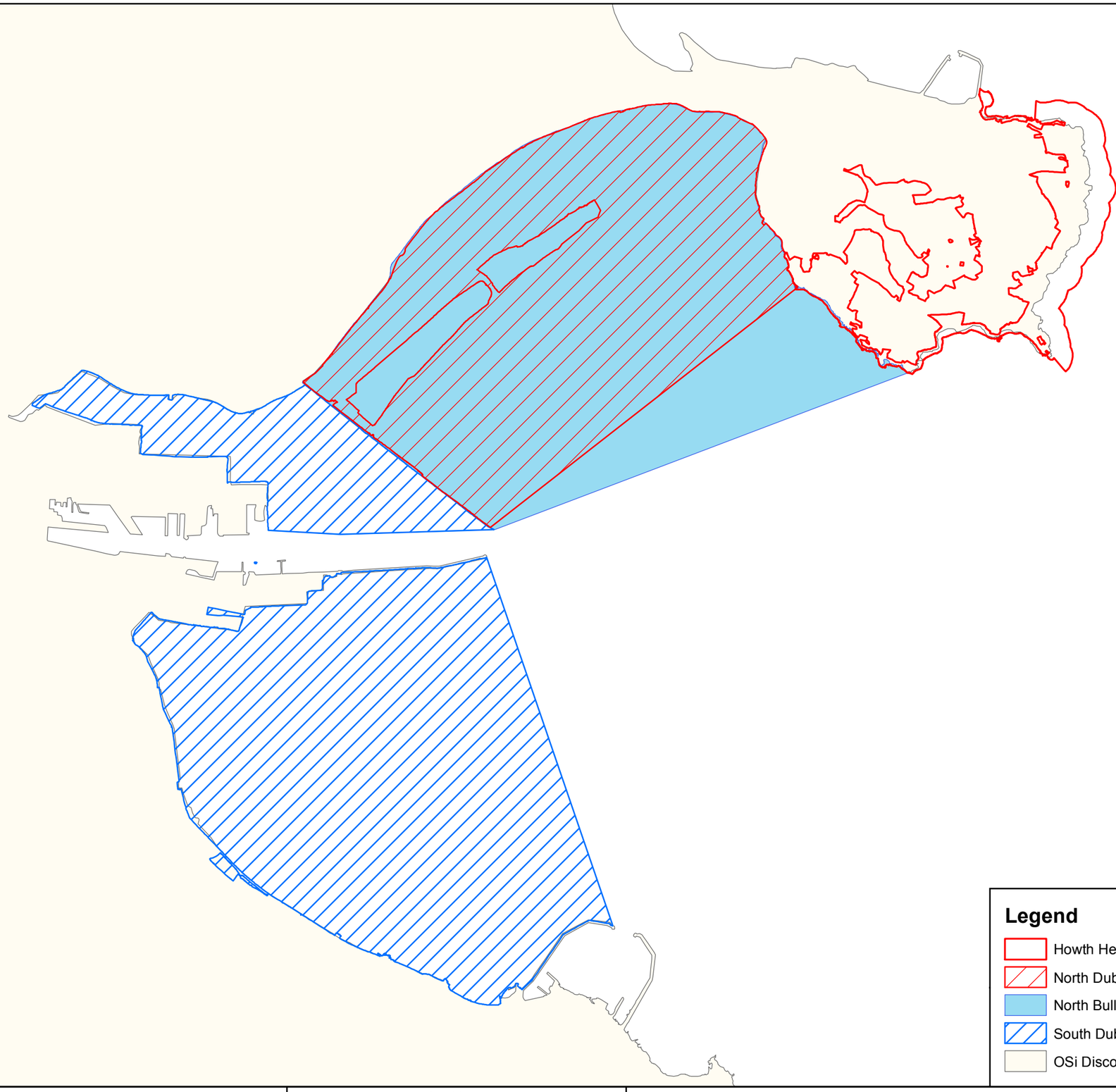
0 0.25 0.5 0.75 1 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059212).

Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

N

Map Version 1
Date: Sept 2013



Legend

- Howth Head SAC 000202
- North Dublin Bay SAC 000206
- North Bull Island SPA 004006
- South Dublin Bay and River Tolka Estuary SPA 004024
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
NORTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000206; version 3, SAC 000202; version 3.
SPA 004006; version 2, SPA 004024; version 2.
CO. DUBLIN

0 1 2 3 km

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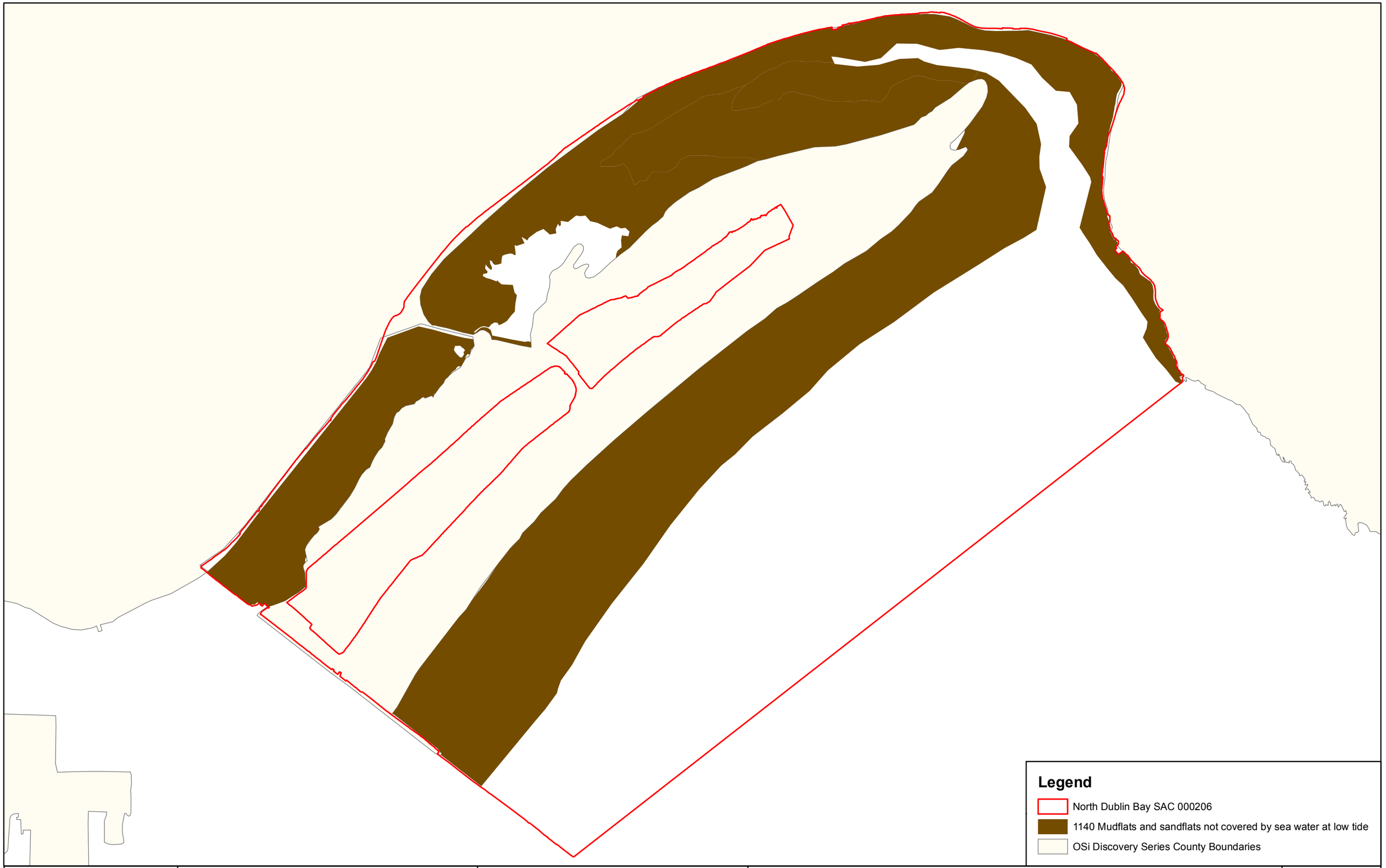
N

Map Version 1
Date: Sept 2013



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 3:
NORTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000206; version 3.
CO. DUBLIN

0 0.5 1 km

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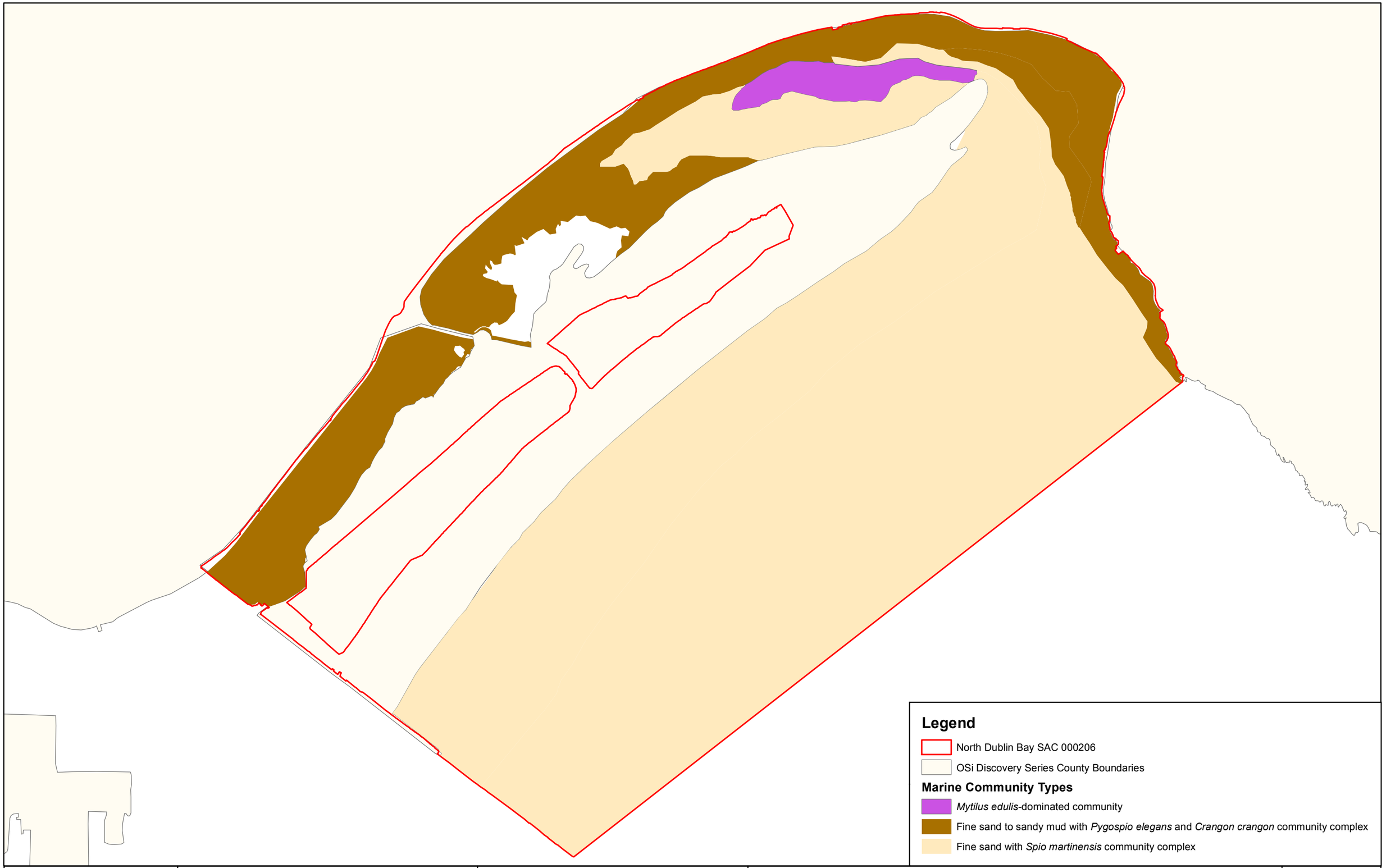
Map Version 1
Date: Sept 2013



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 4:
NORTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000206; version 3.
CO. DUBLIN

0 0.5 1 km

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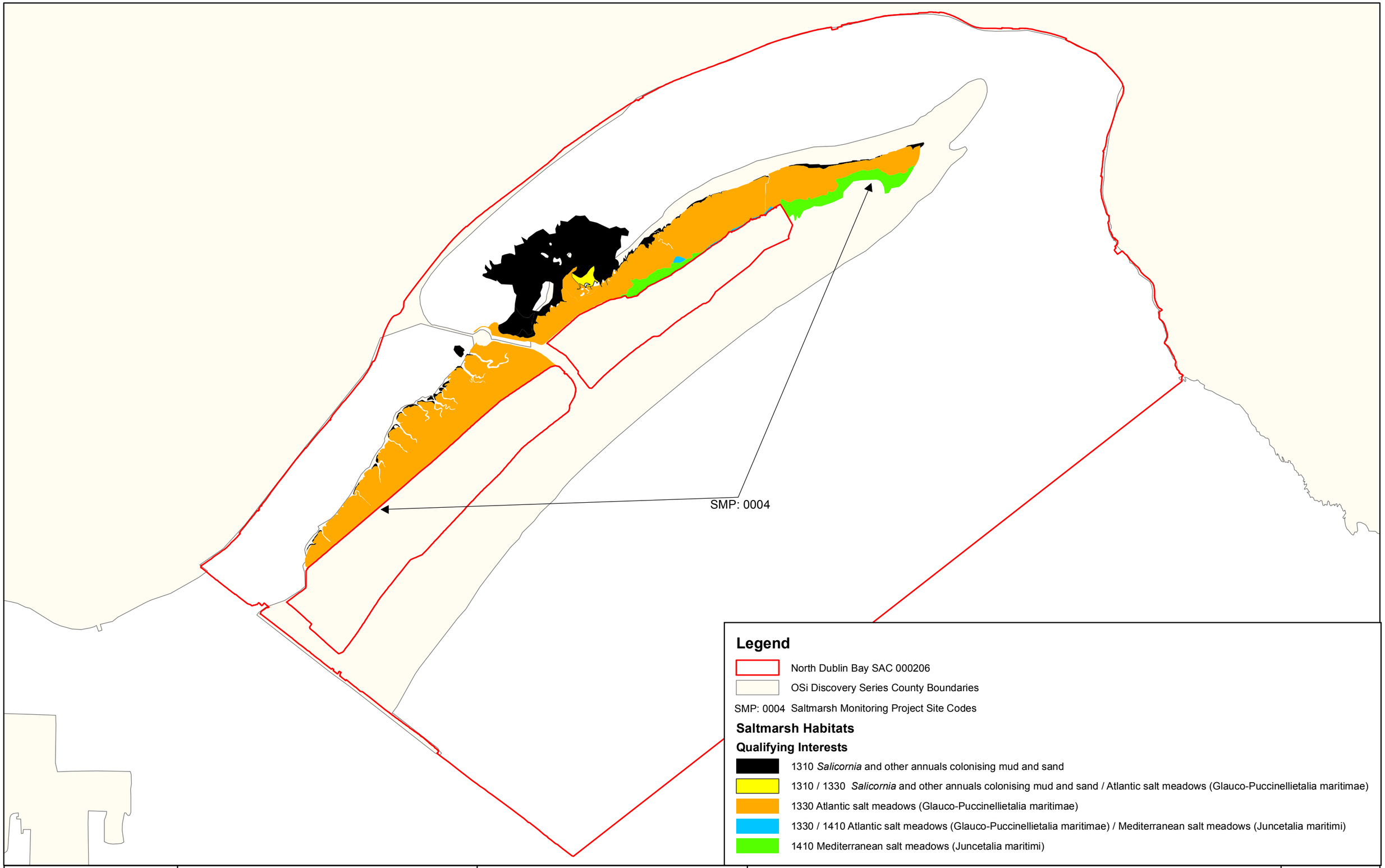
N

Map Version 1
Date: Sept 2013



Legend

North Dublin Bay SAC 000206

OSi Discovery Series County Boundaries

SMP: 0004 Saltmarsh Monitoring Project Site Codes

Saltmarsh Habitats

Qualifying Interests

1310 *Salicornia* and other annuals colonising mud and sand

1310 / 1330 *Salicornia* and other annuals colonising mud and sand / Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)

1410 Mediterranean salt meadows (Juncetalia maritimi)

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Department of Arts, Heritage and the Gaeltacht

MAP 5:
NORTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
SALTMARSH HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000206; version 3.
CO. DUBLIN

0 0.5 1 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059212).

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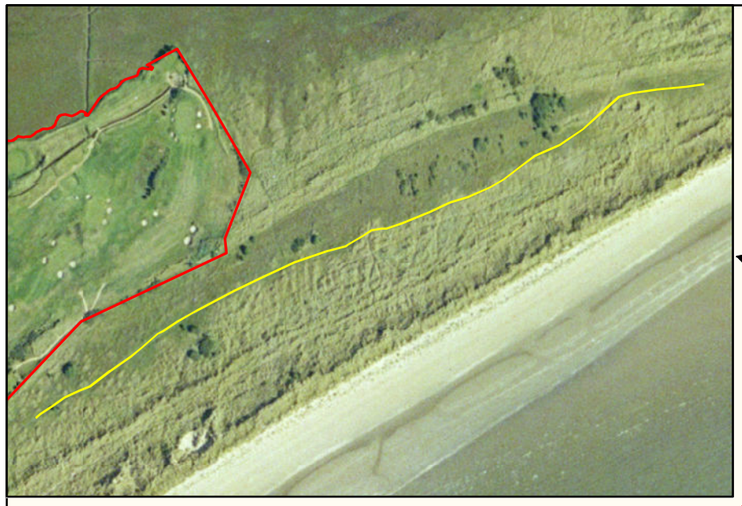
N

Map Version 1
Date: Sept 2012



SDM: 010

SDM: 011

Legend

- North Dublin Bay SAC 000206
- OSi Discovery Series County Boundaries
- 1395 Petalwort - *Petalphyllum ralfsii*
- SDM: 010 Sand Dune Monitoring Project Site Codes

Sand Dune Habitats

Qualifying Interests

- 1210 Annual vegetation of drift lines
- 2110 Embryonic shifting dunes
- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')
- 2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')
- 2190 Humid dune slacks

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Department of Arts, Heritage and the Gaeltacht

MAP 6:
NORTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS &
PETALWORT

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000206; version 3.
CO. DUBLIN

0 0.5 1 km

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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

N

Map Version 1
Date: Sept 2013

APPENDIX B

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

South Dublin Bay SAC 000210

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht



National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2013) Conservation Objectives: South Dublin Bay SAC 000210. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey

ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000210	South Dublin Bay SAC
1140	Mudflats and sandflats not covered by seawater at low tide

Please note that this SAC overlaps with South Dublin Bay and River Tolka Estuary SPA (004024). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2006
Title :	A survey of intertidal mudflats and sandflats in Ireland
Author :	Aquafact
Series :	Unpublished report to NPWS
Year :	2013
Title :	South Dublin Bay SAC (site code 210) Conservation objectives supporting document- marine habitat V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2012
Title :	Intertidal survey of South Dublin Bay SAC and South Dublin Bay and River Tolka Estuary SPA
Author :	MERC
Series :	Unpublished report to the Marine Institute and NPWS

Spatial data sources

Year :	Interpolated 2013
Title :	2006, 2011 intertidal surveys
GIS Operations :	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used For :	1140, marine community types (maps 3 and 4)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used For :	Marine community types base data (map 4)

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in South Dublin Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated using OSi data as 720ha
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community, subject to natural processes. See map 4	Based on an intertidal survey undertaken in 2011 (MERC, 2012). See marine supporting document for further information
Community structure: *Zostera* density	Shoots/m²	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Based on an intertidal survey undertaken in 2011 (MERC, 2012). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community type in a natural condition: Fine sands with *Angulus tenuis* community complex. See map 4	Based on intertidal surveys undertaken in 2006 (Aquafact, 2006) and 2011 (MERC, 2012). See marine supporting document for further information

DUBLIN HARBOUR

Ferry Terminal

Alexandra Basin

North Bank Lighthouse

Breakwater

North Bull Lighthouse

Poolbeg Lighthouse

Irishtown

Sean Moore Park

Irishtown Park

Sandymount Strand

South Bull

DUBLIN

Baile Átha Cliath

Martello Tower

Merrion Gates

St Vincent's Hospital

Merrion

Muirfin

Merrion Strand

Booterstown

Baile an Bhóthair

University College Dublin

Belfield

Blackrock

An Charraig Dhubh

West Pier

Monkstown

Baile na Manach

College

Carysfort

R118

R131

N11

N31

R113

R119

CO. MEATH

CO. DUBLIN

CO. KILDARE

CO. WICKLOW

Howth

Dublin

Dalkey

Killiney

SAC 000210

Legend

SAC 000210

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
SOUTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000210; version 3
County Dublin

0 0.25 0.5 0.75 1 km

The mapped boundaries are of an indicative and general nature only.
Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta.
Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

N

Map Version 1
Date: Aug 2013

SPA 004024

SAC 000210

SPA 004024

Legend

- South Dublin Bay SAC 000210
- South Dublin Bay and River Tolka Estuary SPA 004024
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
SOUTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING
DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 000210; version 3
SPA 004025; version 2
County Dublin

0 0.25 0.5 0.75 1 km

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Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta.
Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

N

Map Version 1
Date: Aug 2013

Legend

- SAC 000210
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundaries

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

MAP 3:
SOUTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000210; version 3
County Dublin

0 0.25 0.5 0.75 1 km

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Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar
comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis
le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

N

Map Version 1
Date: Aug 2013

Legend

SAC 000210

OSi Discovery Series County Boundaries

Marine Community Types

Fine sands with *Angulus tenuis* community complex

Intertidal reef community

Zostera-dominated community

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 4:
SOUTH DUBLIN BAY SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000210; version 3
County Dublin

0 0.25 0.5 0.75 1 km

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N

Map Version 1
Date: Aug 2013

APPENDIX C

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

North Bull Island SPA 004006

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht



National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

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Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

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- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
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4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

004006 North Bull Island SPA

A046	Light-bellied Brent Goose *Branta bernicla hrota*
A048	Shelduck *Tadorna tadorna*
A052	Teal *Anas crecca*
A054	Pintail *Anas acuta*
A056	Shoveler *Anas clypeata*
A130	Oystercatcher *Haematopus ostralegus*
A140	Golden Plover *Pluvialis apricaria*
A141	Grey Plover *Pluvialis squatarola*
A143	Knot *Calidris canutus*
A144	Sanderling *Calidris alba*
A149	Dunlin *Calidris alpina alpina*
A156	Black-tailed Godwit *Limosa limosa*
A157	Bar-tailed Godwit *Limosa lapponica*
A160	Curlew *Numenius arquata*
A162	Redshank *Tringa totanus*
A169	Turnstone *Arenaria interpres*
A179	Black-headed Gull *Chroicocephalus ridibundus*
A999	Wetlands

Please note that this SPA overlaps with North Dublin Bay SAC (000206) and Rockabill to Dalkey Island SAC (003000). It adjoins Howth Head SAC (000202) and South Dublin Bay and River Tolka Estuary SPA (004024). See map 2. The conservation objectives for this site should be used in conjunction with those for overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2014
Title :	North Bull Island SPA (site code: 4006) and South Dublin Bay and River Tolka Estuary SPA (site code: 4024) Conservation objectives supporting document V1
Author :	NPWS
Series :	Conservation objectives supporting document

Spatial data sources

Year :	2014
Title :	NPWS SPA boundary data
GIS Operations :	SPA boundary polygons divided into two classifications (wetlands, terrestrial) based on line identified by expert judgement. Expert opinion used as necessary to resolve any issues arising
Used For :	Wetlands (map 3)

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by light-bellied brent goose, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part fiveof the conservation objectives supporting document

A048 **Shelduck *Tadorna tadorna***

To maintain the favourable conservation condition of Shelduck in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by shelduck, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A052 Teal *Anas crecca*

To maintain the favourable conservation condition of Teal in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by teal, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A054 Pintail *Anas acuta*

To maintain the favourable conservation condition of Pintail in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by pintail, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A056 Shoveler *Anas clypeata*

To maintain the favourable conservation condition of Shoveler in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by shoveler, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : North Bull Island SPA [004006]

A130 Oystercatcher *Haematopus ostralegus*

To maintain the favourable conservation condition of Oystercatcher in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by oystercatcher, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part four of the conservation objectives supporting document

A140 Golden Plover *Pluvialis apricaria*

To maintain the favourable conservation condition of Golden Plover in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by golden plover, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : North Bull Island SPA [004006]

A141 Grey Plover *Pluvialis squatarola*

To maintain the favourable conservation condition of Grey Plover in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by grey plover, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : North Bull Island SPA [004006]

A143 **Knot *Calidris canutus***

To maintain the favourable conservation condition of Knot in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by knot, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A144 Sanderling *Calidris alba*

To maintain the favourable conservation condition of Sanderling in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by sanderling, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A149 Dunlin *Calidris alpina alpina*

To maintain the favourable conservation condition of Dunlin in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by dunlin, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : North Bull Island SPA [004006]

A156 Black-tailed Godwit *Limosa limosa*

To maintain the favourable conservation condition of Black-tailed Godwit in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by black-tailed godwit, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by bar-tailed godwit, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : North Bull Island SPA [004006]

A160 Curlew *Numenius arquata*

To maintain the favourable conservation condition of Curlew in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by curlew, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by redshank, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A169 Turnstone *Arenaria interpres*

To maintain the favourable conservation condition of Turnstone in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by turnstone, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A179 Black-headed Gull *Chroicocephalus ridibundus*

To maintain the favourable conservation condition of Black-headed Gull in North Bull Island SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by black-headed gull other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : North Bull Island SPA [004006]

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in North Bull Island SPA as a resource for the regularly occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 1,713 hectares, other than that occurring from natural patterns of variation. See map 3	The wetland habitat area was estimated as 1,713ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document



Legend

North Bull Island SPA 004006

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
NORTH BULL ISLAND SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004006; version 2. CO. DUBLIN

0 0.25 0.5 0.75 1 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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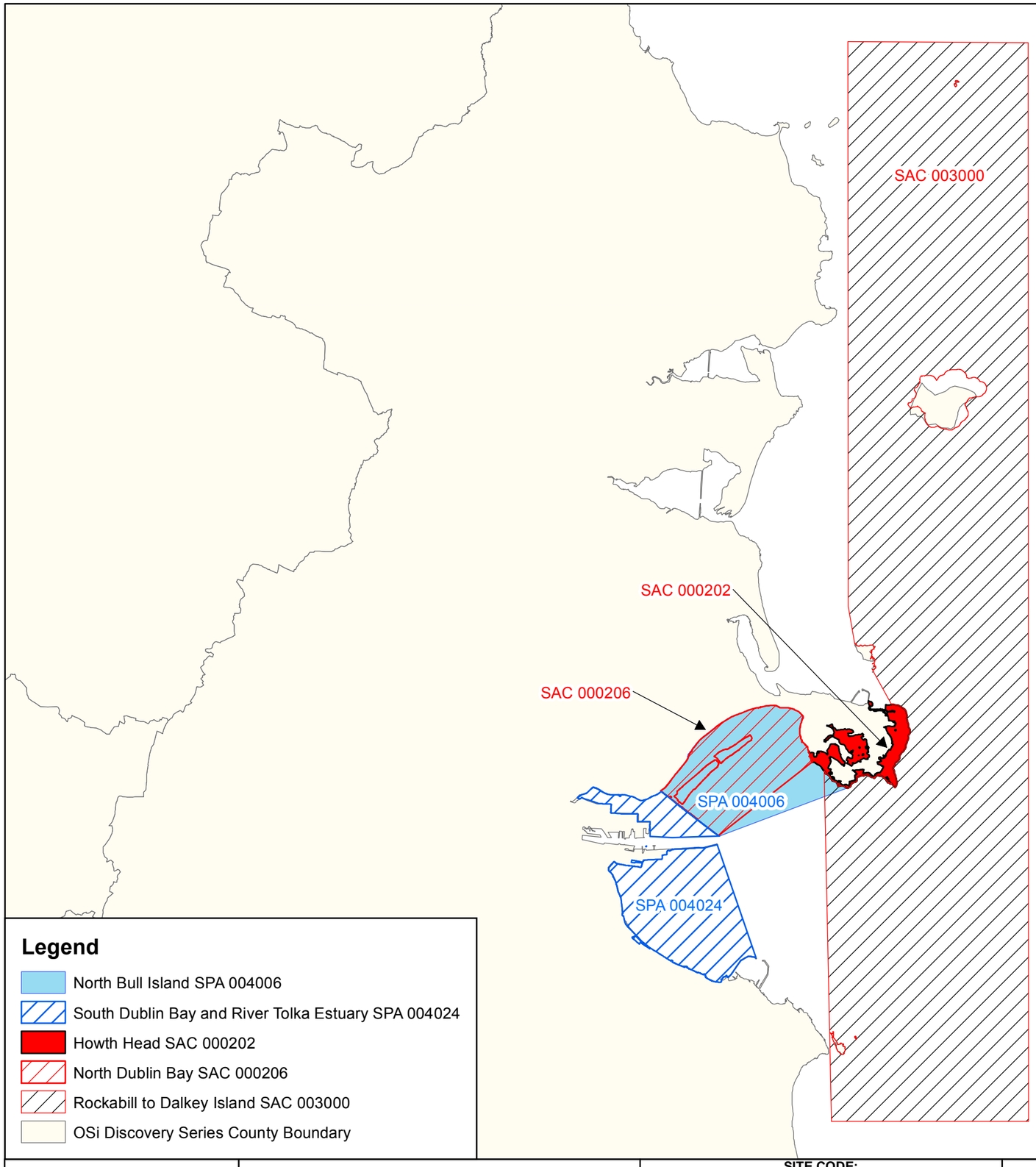
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059214. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

N

Map Version 1
Date: Sep 2014



Legend

- North Bull Island SPA 004006
- South Dublin Bay and River Tolka Estuary SPA 004024
- Howth Head SAC 000202
- North Dublin Bay SAC 000206
- Rockabill to Dalkey Island SAC 003000
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
NORTH BULL ISLAND SPA
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004006; version 2, SPA 004024; version 2.
SAC 000202; version 3, SAC 000206; version 3,
SAC 003000; version 3. CO. DUBLIN

0 2 4 6 8 10 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059214. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

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Map Version 1
Date: Sep 2014

Legend

North Bull Island SPA 004006

OSi Discovery Series County Boundary

Wetlands and Waterbirds

Wetlands

Terrestrial

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

MAP 3:
NORTH BULL ISLAND SPA
CONSERVATION OBJECTIVES
WETLANDS AND WATERBIRDS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004006; version 2. CO. DUBLIN

0 0.25 0.5 0.75 1 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059214. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

N

Map Version 1
Date: Sep 2014

APPENDIX D

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

South Dublin Bay and River Tolka Estuary SPA 004024

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht



National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
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Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

004024	South Dublin Bay and River Tolka Estuary SPA
A046	Light-bellied Brent Goose *Branta bernicla hrota*
A130	Oystercatcher *Haematopus ostralegus*
A137	Ringed Plover *Charadrius hiaticula*
A141	Grey Plover *Pluvialis squatarola*
A143	Knot *Calidris canutus*
A144	Sanderling *Calidris alba*
A149	Dunlin *Calidris alpina alpina*
A157	Bar-tailed Godwit *Limosa lapponica*
A162	Redshank *Tringa totanus*
A179	Black-headed Gull *Chroicocephalus ridibundus*
A192	Roseate Tern *Sterna dougallii*
A193	Common Tern *Sterna hirundo*
A194	Arctic Tern *Sterna paradisaea*
A999	Wetlands

Please note that this SPA overlaps with South Dublin Bay SAC (000210). It adjoins North Bull Island SPA (004006) and North Dublin Bay SAC (000206). See map 2. The conservation objectives for this site should be used in conjunction with those for overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2014
Title :	North Bull Island SPA (site code: 4006) and South Dublin Bay and River Tolka Estuary SPA (site code: 4024) Conservation objectives supporting document V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1995
Title :	Seabird monitoring handbook for Britain and Ireland: a compilation of methods for survey and monitoring of breeding seabirds
Author :	Walsh, P.; Halley, D.J.; Harris, M.P.; del Nevo, A.; Sim, I.M.W.; Tasker, M.L.
Series :	JNCC, Peterborough
Year :	2008
Title :	Autumn roosting by terns in south Dublin Bay
Author :	Merne, O.J.; Madden, B.; Archer, E.; Porter, B.
Series :	Irish Birds 8: 335-340
Year :	2010
Title :	Terns roosting in Dublin Bay, autumn 2010
Author :	Merne, O.J.
Series :	Irish Birds 9: 126-128
Year :	2014
Title :	BirdLife International Seabird Ecology and Foraging Range Database
Author :	BirdLife International
Series :	http://seabird.wikispaces.com
Year :	2014
Title :	Dublin Bay Birds Project - Dublin Port Tern Conservation Project; report for the 2014 season
Author :	Newton S.; Tierney N.; Whelan R.
Series :	BirdWatch Ireland and Dublin Port Company

Spatial data sources

Year :	2014
Title :	NPWS SPA boundary data
GIS Operations :	SPA boundary polygons divided into two classifications (wetlands, terrestrial) based on line identified by expert judgement. Expert opinion used as necessary to resolve any issues arising
Used For :	Wetlands (map 3)

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by light-bellied brent goose, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A130 Oystercatcher *Haematopus ostralegus*

To maintain the favourable conservation condition of Oystercatcher in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by oystercatcher, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part four of the conservation objectives supporting document

A137 Ringed Plover *Charadrius hiaticula*

To maintain the favourable conservation condition of Ringed Plover in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by ringed plover, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of conservation objectives supporting document

Conservation Objectives for : South Dublin Bay and River Tolka Estuary SPA [004024]

A141 **Grey Plover *Pluvialis squatarola***

Grey Plover is proposed for removal from the list of Special Conservation Interests for South Dublin Bay and River Tolka Estuary SPA. As a result, a site-specific conservation objective has not been set for this species.

Attribute	Measure	Target	Notes

A143 Knot *Calidris canutus*

To maintain the favourable conservation condition of Knot in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by knot, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A144 Sanderling *Calidris alba*

To maintain the favourable conservation condition of Sanderling in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by sanderling, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A149 Dunlin *Calidris alpina alpina*

To maintain the favourable conservation condition of Dunlin in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by dunlin, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by bar-tailed godwit, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by redshank, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A179 Black-headed Gull *Chroicocephalus ridibundus*

To maintain the favourable conservation condition of Black-headed Gull in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by black-headed gull other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A192 Roseate Tern *Sterna dougallii*

To maintain the favourable conservation condition of Roseate Tern in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Passage population: individuals	Number	No significant decline	Evening surveys of roosting terns in South Dublin Bay and River Tolka Estuary SPA confirm the conservation importance of the south Dublin Bay area during the post-breeding/pre-migration period. Up to 11,700, 9,025 and 8,020 terns were recorded in 2006, 2007 and 2010 respectively. Given the counting conditions (i.e. low light levels and long distance recording) it was rarely possible to identify the terns to species level but the majority of the birds appear to have been common terns (*Sterna hirundo*), with smaller numbers of Arctic and roseate terns (*S. paradisaea, S. dougallii*) (sandwich, little and black terns (*S. sandvicensis, S. albifrons, Chlidonias niger*) were also recorded) (Merne et al., 2008; Merne 2010). At least 645 roseate tern have been recorded here during the aforementioned survey years. This estimate does not factor in turnover rates and therefore the total number of roseate tern using this SPA may be significantly higher
Distribution: roosting areas	Number; location; area (hectares)	No significant decline	Merne et al. (2008) describe the main roosting area as the exposed sand banks in south Dublin Bay primarily between the Martello Towers at Sandymount (319524, 232021) and Williamstown (320796, 229979). Terns have been occasionally recorded outside of this area on adjacent sandflats extending to Irishtown/South Bull Wall and to Blackrock but these birds eventually join the birds roosting in the main area (Merne et al., 2008)
Prey biomass available	Kilogrammes	No significant decline	Terns associated with the roost are thought to feed during the day in the wider Dublin Bay area but direct survey evidence is incomplete. Evening observations of terns arriving to the roosting area indicated that most flew in from an easterly and southeasterly direction leading the authors to suggest they were feeding in the shallow waters of the Kish/Bray and Burford Banks (Merne et al., 2008). During the breeding season, roseate terns can make extensive use of marine waters adjacent to their breeding colonies. Key prey items: Small, schooling marine fish, very rarely small crustaceans. Key habitats: roseate tern forage in/over shallow and upwelling areas, including tide rips and shoals and over sandy bottoms. Foraging range: max. 30km, mean max. 18.28km, mean 12.3km (Birdlife International, 2014). As these foraging range estimates relate to birds during the breeding season, the distances between post-breeding roost sites and feeding areas may be greater

Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	Terns associated with the roost are thought to feed during the day in the wider Dublin Bay area but direct survey evidence is incomplete. Evening observations of terns arriving to the roosting area indicated that most flew in from an easterly and southeasterly direction leading the authors to suggest they were feeding in the shallow waters of the Kish/Bray and Burford Banks (Merne et al., 2008). During the breeding season roseate terns can make extensive use of marine waters adjacent to their breeding colonies. Key habitats: roseate tern forage in/over shallow and upwelling areas, including tide rips and shoals and over sandy bottoms. Foraging range: max. 30km, mean max. 18.28km, mean 12.3km (Birdlife International, 2014). As these foraging range estimates relate to birds during the breeding season, the distances between post-breeding roost sites and feeding areas may be greater
Disturbance at roosting site	Level of impact	Human activities should occur at levels that do not adversely affect the numbers of roseate tern among the post-breeding aggregation of terns	Merne et al. (2008) describes the main roosting area as the exposed sand banks in south Dublin Bay primarily between the Martello Towers at Sandymount (319524, 232021) and Williamstown (320796, 229979). Although principally used as a night roost, birds begin to roost at least one hour before sunset during the period July - September with peak activity occurring between mid-August and mid-September (Merne et al., 2008; Merne, 2010). Merne (2010) recorded significant disturbance events to the roosting terns caused by people with dogs off the leash and kite surfing

A193 Common Tern *Sterna hirundo*

To maintain the favourable conservation condition of Common Tern in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). For more information on the history and recent population estimates of the tern colony at this SPA see Newton et al. (2014)
Productivity rate: fledged young per breeding pair	Mean number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). For more information on the history and recent population estimates of the tern colony at this SPA see Newton et al. (2014)
Passage population: individuals	Number	No significant decline	Evening surveys of roosting terns in South Dublin Bay and River Tolka Estuary SPA confirm the conservation importance of the south Dublin Bay area during the post-breeding/pre-migration period. Up to 11,700, 9,025 and 8,020 terns were recorded in 2006, 2007 and 2010 respectively. Given the counting conditions (i.e. low light levels and long distance recording), it was rarely possible to identify terns to species level but the majority of the birds appear to have been common terns (*Sterna hirundo*), with smaller numbers of Arctic and roseate terns (*S. paradisaea, S. dougallii*); (sandwich, little and black terns (*S. sandvicensis, S. albifrons, Chlidonias niger*) were also recorded) (Merne et al., 2008; Merne 2010). At least 4,887 common tern have been recorded here during the aforementioned survey years. This estimate does not factor in turnover rates and therefore the total number of common tern using this SPA may be significantly higher
Distribution: breeding colonies	Number; location; area (Hectares)	No significant decline	The common tern breeding colony in Dublin Bay is primarily sited on an artificial structure known as the 'ESB Dolphin' (see Newton et al., 2014)
Distribution: roosting areas	Number; location; area (Hectares)	No significant decline	Merne et al. (2008) describe the main roosting area as the exposed sand banks in south Dublin Bay, primarily between the Martello Towers of at Sandymount (319524, 232021) and Williamstown (320796, 229979). Terns have been occasionally recorded outside of this area on adjacent sandflats extending to Irishtown/South Bull Wall and to Blackrock but these birds eventually joined the birds roosting in the main area (Merne et al 2008)
Prey biomass available	Kilogrammes	No significant decline	During the breeding season, common terns can make extensive use of marine waters adjacent to their breeding colonies. Key prey items: Small fish, crustaceans, insects and occasionally squid. Key habitats: forage in/over shallow coastal waters, bays, inlets, shoals, tidal-rips, drift lines, beaches, saltmarsh creeks, lakes, ponds or rivers. Foraging range: max. 37km; mean max. 33.81km; mean 8.67km (Birdlife International, 2014). Terns associated with the roost are thought to feed during the day in the wider Dublin Bay area but direct survey evidence is incomplete. Evening observations of arriving terns to the primary roosting area indicated that most flew into Dublin Bay from an easterly and southeasterly direction leading the authors to suggest they were feeding in the shallow waters of the Kish/Bray and Burford Banks (Merne et al., 2008). Foraging ranges between post-breeding roost sites and feeding areas may be greater than the estimates given for the breeding season

Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	During the breeding season, common terns can make extensive use of marine waters adjacent to their breeding colonies. Foraging range: max. 37km; mean max. 33.81km; mean 8.67km (Birdlife International, 2014). Terns associated with the roost are thought to feed during the day in the wider Dublin Bay area but direct survey evidence is incomplete. Evening observations of arriving terns to the primary roosting area indicated that most flew into Dublin Bay from an easterly and southeasterly direction leading the authors to suggest the bird were feeding in the shallow waters of the Kish/Bray and Burford Banks (Merne et al., 2008). Foraging ranges between post-breeding roost sites and feeding areas may be greater than the estimates given for the breeding season
Disturbance at breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding common tern population	The common tern breeding colony in Dublin Bay is primarily sited on an artificial structure known as the 'ESB Dolphin' (see Newton et al., 2014)
Disturbance at roosting site	Level of impact	Human activities should occur at levels that do not adversely affect the numbers of common tern among the post-breeding aggregation of terns	Merne et al (2008) describes the main roosting area as the exposed sand banks in south Dublin Bay primarily between the Martello Towers at Sandymount (319524, 232021) and Williamstown (320796, 229979). Although principally used as a night roost, birds begin to roost at least one hour before sunset during the period July - September with peak activity occurring between mid-August and mid-September (Merne et al 2008; Merne 2010). Merne (2010) recorded significant disturbance events to the roosting terns caused by people with dogs off the leash and kite surfing

A194 Arctic Tern *Sterna paradisaea*

To maintain the favourable conservation condition of Arctic Tern in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Passage population	Number of individuals	No significant decline	Evening surveys of roosting terns in South Dublin Bay and River Tolka Estuary SPA confirm the conservation importance of the south Dublin Bay area during the post-breeding/pre-migration period. Up to 11,700, 9,025 and 8,020 terns were recorded in 2006, 2007 and 2010 respectively. Given the counting conditions (i.e. low light levels and long distance recording) it was rarely possible to identify the terns to species level but the majority of the birds appear to have been common terns (*Sterna hirundo*), with smaller numbers of Arctic and roseate terns (*S. paradisaea, S. dougallii*); (sandwich, little and black terns (*S. sandvicensis, S. albifrons, Chlidonias niger*) were also recorded) (Merne et al., 2008; Merne 2010). At least 200 Arctic tern have been recorded here during the aforementioned survey years. This estimate does not factor in turnover rates and therefore the total number of Arctic tern using this SPA may be significantly higher
Distribution: roosting areas	Number; location; area (hectares)	No significant decline	Merne et al. (2008) describe the main roosting area as the exposed sand banks in south Dublin Bay primarily between the Martello Towers at Sandymount (319524, 232021) and Williamstown (320796, 229979). Terns have been occasionally recorded outside of this area on adjacent sandflats extending to Irishtown/South Bull Wall and to Blackrock but these birds eventually join the birds roosting in the main area (Merne et al., 2008)
Prey biomass available	Kilogrammes	No significant decline	Terns associated with the roost are thought to feed during the day in the wider Dublin Bay area but direct survey evidence is incomplete. Evening observations of terns arriving to the roosting area indicated that most flew in from an easterly and southeasterly direction leading the authors to suggest they were feeding in the shallow waters of the Kish/Bray and Burford Banks (Merne et al., 2008). During the breeding season Arctic terns can make extensive use of marine waters adjacent to their breeding colonies. Key prey items: Small fish, crustaceans and other invertebrates. Key habitats: forage in/over open waters and shallow bays, rocky shores, tidal flats, shoals, tide rips and ocean fronts. Foraging range: max. 20.6km, mean max. 12.24km, mean 11.75km (Birdlife International, 2014). As these foraging range estimates relate to birds during the breeding season, the distances between post-breeding roost sites and feeding areas may be greater

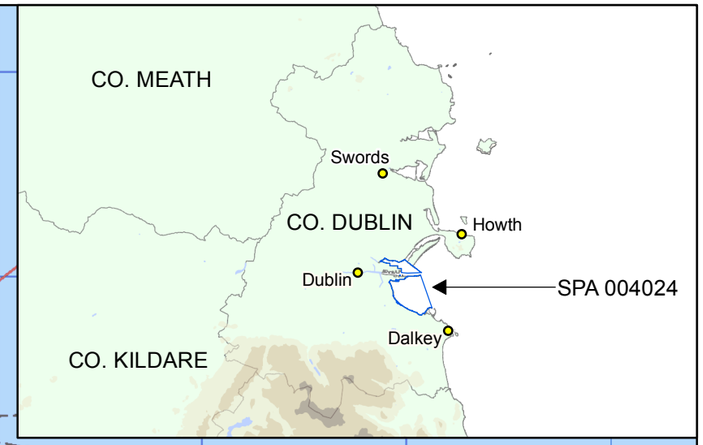
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	Terns associated with the roost are thought to feed during the day in the wider Dublin Bay area but direct survey evidence is incomplete. Evening observations of arriving terns to the primary roosting area indicated that most flew into Dublin Bay from an easterly and southeasterly direction leading the authors to suggest the birds were feeding in the shallow waters of the Kish/Bray and Burford Banks (Merne et al., 2008). During the breeding season Arctic terns can make extensive use of marine waters adjacent to their breeding colonies. Foraging range: max. 20.6km, mean max. 12.24km, mean 11.75km (Birdlife International, 2014). As these foraging range estimates relate to birds during the breeding season, the distances between post-breeding roost sites and feeding areas may be greater
Disturbance at roosting site	Level of impact	Human activities should occur at levels that do not adversely affect the numbers of Arctic tern among the post-breeding aggregation of terns	Merne et al. (2008) describes the main roosting area as the exposed sand banks in south Dublin Bay primarily between the Martello Towers at Sandymount (319524, 232021) and Williamstown (320796, 229979). Although principally used as a night roost, birds begin to roost at least one hour before sunset during the period July - September with peak activity occurring between mid-August and mid-September (Merne et al., 2008; Merne, 2010). Merne (2010) recorded significant disturbance events to the roosting terns caused by people with dogs off the leash and kite surfing

Conservation Objectives for : South Dublin Bay and River Tolka Estuary SPA [004024]

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in South Dublin Bay and River Tolka Estuary SPA as a resource for the regularly occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 2,192 hectares, other than that occurring from natural patterns of variation. See map 3	The wetland habitat area was estimated as 2,192ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document



Legend

South Dublin Bay and River Tolka Estuary SPA 004024

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
SOUTH DUBLIN BAY AND RIVER TOLKA ESTUARY SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004024; version 2. CO. DUBLIN

0 0.5 1 1.5 2 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059214. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

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Map Version 1
Date: Sep 2014

SAC 000206

SPA 004006

SAC 000210

SPA 004024

Legend

- South Dublin Bay and River Tolka Estuary SPA 004024
- North Bull Island SPA 004006
- North Dublin Bay SAC 000206
- South Dublin Bay SAC 000210
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
SOUTH DUBLIN BAY AND RIVER TOLKA ESTUARY SPA CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004006; version 2, SPA 004024: version 2.
SAC 000206: version 3, SAC 000210: version 3.
CO. DUBLIN

0 1 2 3 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059214. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

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Map Version 1
Date: Sep 2014

Legend

South Dublin Bay and River Tolka Estuary SPA 004024

OSi Discovery Series County Boundary

Wetlands and Waterbirds

Wetlands

Terrestrial

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

MAP 3:
SOUTH DUBLIN BAY AND RIVER TOLKA ESTUARY SPA CONSERVATION OBJECTIVES WETLANDS AND WATERBIRDS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004024; version 2. CO. DUBLIN

0 0.5 1 1.5 2 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059214. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

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Map Version 1
Date: Sep 2014

APPENDIX J

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Tel: +353-1-260 2655 Fax: +353-1-260 2660

29th September 2016

Director of the Department of Environment
Water and Climate Change
South Dublin County Council
County Hall
Tallaght
Dublin 24

MOR Ref: E1119

Risk Assessment on an historic landfill in support of an application for a certificate of authorisation in accordance with Regulation 7 of the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008

Dear Sir,

As a person who is qualified, trained and experienced to the standard set out in section 2.3 of Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites (EPA, 2007), it is my opinion that the risk assessment carried out by Malone O'Regan Environmental Services Ltd (MOR) on behalf of South Dublin County Council in relation to Waterstown former landfill Site located at Palmerstown, Dublin 20 is adequate and complete.

The risk assessment complies with all of the requirements of the Code of Practice. MOR has followed and completed the steps set out in the Code of Practice and associated guidance (Matrix 1 and Matrix 2 – as published) in carrying out the risk assessment.

The following items:

- The risk assessment;
- The findings and conclusions of the risk assessment; and
- The environmental monitoring proposed to be carried out,

are, in my opinion, appropriate and adequate to:

- Identify the instances and risks of environmental pollution arising from the closed landfill to which this application refers;
- Proportionately address any and all such instances and risks of environmental pollution; and
- Confirm that any future instances of environmental pollution will be detected in a timely manner, subject to all monitoring being undertaken as highlighted in the risk assessment, which includes validation monitoring to confirm the findings of the risk assessment.

MOR have carried out and managed the following aspects of the project on behalf of South Dublin County Council:

- Tier 2 Risk Assessment: Exploratory site investigation (MOR, May 2013); and
- Tier 2 Risk Assessment: Main site investigation and Testing, Tier 3 Risk Assessment: Refinement of Conceptual Site Model and Quantitative Risk Assessment and Remediation at Waterstown Landfill, Palmerstown, Dublin 20 (MOR, September 2016).

Yours sincerely,
for **Malone O'Regan**



Thomas Vainio-Mattila

EurGeol. T. Vainio-Mattila, P.Geo
6, Fountain Hil
Mell
Drogheda
Co. Louth

15th January, 2015

Re: Credentials in accordance with section 2.3 of *Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites* (EPA, 2007)

Dear Thomas,

The Institute of Geologists of Ireland is satisfied to state that you are a person who is qualified, trained and experienced to the standard set out in section 2.3 of *Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites* (EPA, 2007) and are a Professional Member of the Institute of Geologists of Ireland. Your specialism, as detailed by you, in Section C of your Application Form are:

1. Environmental geology

I can confirm that you have been formally entered to the IGI's Register of Professionally Qualified Geoscientists / Competent Persons (*in respect of environmental risk assessment for regulated and unregulated waste disposal and contaminated land*). Please see www.igi.ie for current Register.

This letter of accreditation is valid until 31 December 2016.

Yours sincerely
Institute of Geologists of Ireland

Gerard A Stanley

EurGeol Gerard A. Stanley PGeo
President, IGI
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