Clare County Council

Tradaree Point Sludge Disposal Facility

Annual Environmental Report 2012

Waste Licence Reg. No. W0037-01

Response Group

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1.0 INTRODUCTION

Response Group was commissioned by Clare County Council to compile an Annual Environmental Report (AER) required under Condition 11 of Waste Licence Reg. No. W0037-01 for a Sludge Disposal Facility situated at Tradaree Point, Shannon (Clonmoney South), Co. Clare for the period January 2012 to December 2012.

1.1 Background

The Environmental Protection Agency (EPA) issued Shannon Free Airport Development Company Limited with a Waste Licence on 1st May 2003. The ownership of the facility was subsequently passed onto Clare County Council under the same Waste Licence.

Under Condition 11.6, Section 11 of the W0037-01, an Annual Environmental Report (AER) must be prepared and submitted to the EPA for approval. The AER for the facility includes the information specified in Schedule F of the Waste Licence, Content of the Environmental Report, and has been prepared in accordance with the EPA (1999) Waste Licensing – Draft Guidance Note on Environmental Management Systems and Reporting to the Agency, the EPA Guidance Note for the Annual Environmental Report and the EPA AER/PRTR Guidance Document.

1.2 Reporting Period

This AER details the activities carried out at the facility in the period from January 2012 to December 2012 in accordance with W0037-01.

1.3 Site Description

The site is situated approximately 4.5km south east of Shannon Town to the south-west of Bunratty (OS National Grid Reference 143,600E, 160,100N). The site is located on a peninsula, which extends into Shannon Estuary. A grassland constructed clay embankment, average height 5.0 mOD, lies to the south of the site between Shannon Estuary and the site.

The site location is shown in **Figure 1**.

1.4 Facility Layout

The landfill (sludge disposal facility) is divided into two sections - the capped historic sludge disposal area and the four newly constructed lined cells. The area where the new cells have been constructed has an average elevation of 1.5mOD. The cells are bounded to the south-east and north-east by an open land drain. The average drain bed level is 0.6mOD. This discharges to Shannon Estuary via an outlet pipe under the clay embankment which is controlled by a sluice valve. A 10m wide buffer zone exists along the southern perimeter of the site between the edge of the catchment drain and the capped sludge cells. No sludge or restoration material is stored within this zone.

The layout of the facility is illustrated in **Figure 2**.

Tradaree Point Wastewater Treatment Plant (WWTP) provides treatment of both domestic and industrial effluent from Shannon Town and Shannon Industrial Estate. The sludge facility accepts waste sludge from the Tradaree Point WWTP. Sludge has been disposed on the site since approximately 1981.

2.0 FACILITY INFRASTRUCTURE AND OPERATION

2.1 Waste Activities Carried Out At the Facility

The facility is licensed to handle a maximum of 2,500 tonnes of waste per annum. This comprises 750 tpa (tonnes per annum) treated dewatered non-hazardous domestic sludge (EWC code 19 08 05) and 1,750 tpa of industrial sludge (EWC code 19 08 12, 19 08 14) in engineered cells within the facility boundary. Waste activities licensed at the facility under the Third and Fourth Schedules of the Waste Management Act 1996, are detailed below.

Table 2.1 Licensed Waste Disposal Activities in Accordance with the Third Schedule of the Waste Management Act

Class 1	Deposit on, in or under land (including Landfill)*. This activity is limited to the disposal of treated dewatered non-hazardous domestic and industrial sludge in the existing activity cells within the facility.
Class 4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons
Class 5	Specially engineered landfill, including placement into lined discreet cells which are capped and isolated from one another and the environment.
Class 6	Biological treatment not referred to elsewhere in the Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 5 paragraphs 8 to 10 of this Schedule (including evaporation, drying and calcination).
Class 13	Storage prior to submission to any activity referred to in a preceding paragraph of this schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.

2.2 Methods of Deposition of Sludge

Two different waste effluent streams undergo separate treatment at Tradaree Point WWTP. Industrial wastewater is treated in the Industrial Treatment Plant and domestic wastewater is treated in the Domestic Treatment Plant.

The only waste disposed of at the sludge disposal facility is treated dewatered sludge from the WWTP. No other waste is accepted for disposal at the facility. In the unlikely event of a different waste type being presented for disposal at the facility, a separate storage area is provided to contain the materials separately until such time as it can be removed off site to a suitable facility.

Sludge generated in the WWTP is sent to a dewatering building to the east of the plant. Both domestic and industrial sludge are dewatered using a centrifuge after which the sludge is conveyed into an open trailer. The dewatered sludge is then transported to the landfill area and unloaded using a dumper.

The sludge is further dried naturally in the open air. Older dried sludge are excavated from their initial deposition area and heaped into mounds where they are permitted to re-vegetate by natural succession.

The new cells are being filled sequentially in a similar manner. Cell 1 is currently the active cell and sludge is transported for landfilling on a daily basis between Monday and Friday by a dumper. Transportation to the landfill is facilitated by the provision of a causeway at the cell entrance which provides a dry area for the unloading of the sludge.

2.3 Quantity and Composition of Sludge Disposed

2.3.1 Sludge Disposed 2012

The facility is licensed to handle up to 2,500 tonnes of waste sludge per annum. The quantities of mixed industrial and domestic sludge disposed at the facility between January and December 2012 are presented in Table 2.2 overleaf.

As specified in Condition 1.1 of the Waste Licence, only those categories and quantities listed in Part 1 (Activities Licensed) [See also Schedule A] can be accepted at the facility. During 2012, approximately 1055 tonnes of sludge were accepted at the facility. This quantity is below the maximum 2,500 tonnes of waste per annum permitted.

Table 2.2: Quantities of Sludge Disposed in 2012

Month	Quantity (Kg)
January	62100
February	91000
March	91200
April	16700
May	95200
June	116200
July	90100
August	96900
September	96200
October	105800
November	100000
December	93600
Total (kg)	1055000
TOTAL (tonnes)	1055

2.3.2 Sludge Disposed 2004-2012

Table 2.3 below details the quantities of sludge disposed at the facility between 2004 and 2012.

Year	Quantity (Tonnes) Sludge Disposed/Annum
2004	1,022
2005	954
2006	408
2007	756
2008	548
2009	732
2010	489
2011	228
2012	1055

2.4 Calculated Remaining Capacity of the Facility

In 2006, the quantity of sludge accepted (408 tonnes) was low compared to previous years due to the machinery breakdowns experienced in the WWTP. This increased to 755.5 tonnes in 2007. The volume of sludge disposed during 2008 was 548 tonnes, which was lower than in 2007 – this was due to reduce through put and belt press breakdowns. The quantity of sludge accepted increased to 732 tonnes in 2009 but decreased in 2010 to 489 tonnes. The volume of sludge disposed in 2011 was 228 tonnes. The volume of sludge accepted in 2012 increased to 1055 tonnes.

The total capacity of the four lined cells is 12,029m3. Landfilling in the lined cells commenced in Cell 1 in 2005. In 2012, approximately 1055 tonnes of sludge was disposed of at the facility.

The density of dewatered sludge varies depending on the dry matter concentration. In 2012, the average cake % dry matter reached in the sludge was 26.58%. At this rate, the bulk density is typically calculated at rate of 1.27t/m3 (assuming that the ratio of volatile and fixed sludge is 65%:35%). Therefore, at this density, the volume of waste sludge disposed of at the facility during 2012 was 831m3.

Based on the 2012 figure, it is expected that the landfill should reach its full capacity by 2025. However, if yearly tonnages remain low this figure could be extended.

2.5 Restoration of Former Sludge Disposal Areas and Completed Cells/Phases

A restoration and aftercare management plan for the facility was prepared in consultation with the EPA Restoration and Aftercare Manual and was previously submitted to the Agency in January 2004. The Agency confirmed in a letter (Ref. 37-1/GEN03bd) that the plan was to their satisfaction.

All unlined sludge mounds have been capped along with all unlined cells after EPA approval. Waste sludge continues to be disposed of into the first of the newly lined active cells – Cell 1.

The total capped area occupied by waste in the facility is 15,742m2. Since 2005, a total of 5,170 tonnes of waste has been deposited into Cell 1.

2.6 Topographical Survey

A topographical survey was undertaken during September 2003 as part of Licence Condition 8.10.1. The results of the survey were submitted to the Agency in the 6-month report on Drawing No.1, submitted in October 2003. No additional topographical surveys have taken place at the facility since 2003.

2.7 Leachate Management

2.7.1 Leachate Pumping Records

A total of 48,171 m3 of leachate was pumped during the reporting period. Leachate is collected from the existing sludge disposal area (Cell 1), the inactive cells (Cells 2-4) and the capped unlined area via a network of drains which are connected to a leachate collection sump and from here it is pumped to Tradaree WWTP. The pump has a capacity to pump 75m3 per hour.

The monthly totals of leachate generated during 2012 are detailed in Table 2.4 below.

Table 2.4: the monthly averages of leachate generated in 2011

Month	Flow Rate (m^3/Month)
January	1561
February	1840
March	685
April	846
May	461
June	4869
July	1362
August	2511
September	1651
October	16198
November	9078
December	7109
Total (M^3/Year)	48171

2.8 Estimated Annual and Cumulative Quantities of Landfill Gas Emitted

Landfill gas production is a function of the biodegradable portion of the wastes and other factors including the waste density and moisture content. According to the UK EA, total gas generation depends on the waste type being deposited on site and also the degradable carbon content. However the rate of decomposition depends on the site-specific factors. The time taken to decompose will directly influence the period over which landfill gas is generated.

Emissions through the in situ clay base and side walls of the landfill facility are expected to be small. The capped sludge disposal area does not have an engineered base lining. Site investigation results

indicate that in situ clay has a hydraulic conductivity of less than 1 x 10-9m/s. Gas levels are being measured in monitoring boreholes installed in the ground along the perimeter of the landfill to check if there are any emissions.

The UK Environment Agency's Guidance on the Management of Landfill Gas (November 2002) suggests that biodegradable wastes may be considered to have an approximate gas yield of between 5 - 10 m3/t/yr over the first ten years of a sites life. In this instance, the waste sludge was dried to an average of 26.58% dry matter in 2012. Assuming that the dry matter content would equate to the biodegradable component of the sludge and based on a total input in 2012 of 280 tonnes of biodegradable waste (26.58% of 1,055 total tonnes), this would indicate that the following upper and lower quantities of landfill gas might be generated:

- At 5 m3/t/yr an approximate production rate of 1,400m3 per annum
- At 10 m3/t/yr an approximate production rate of 2,800m3 per annum

There are a number of significant controlling factors relating to landfill gas generation/extraction rates from biodegradable wastes including placement density, moisture content, quality of containment systems, climatic conditions and quantity of degradable cellulose available.

It must also be stressed that the above figure is based upon an estimation of the amount of available degradable waste deposited within the landfill body and therefore must only be considered to be an approximation.

The most recent landfill gas assessment at Tradaree was undertaken by Tobin Consulting Engineers in April 2008. The purpose of the assessment was to determine the total quantity of landfill gas produced at the facility in order to determine the viability of constructing a landfill gas flare on-site.

The assessment was undertaken using a landfill gas generation model GasSim 2.0. Data from previous assessments undertaken in 2004 and 2007 were used in the assessment. The results show a peak in landfill gas production in 2003 (12.5 m3/hr), with decreasing figures since that time. A total of 9.88 m3/hr was predicted for 2007. The report concluded that owing to this low volume of gas being produced from the facility, it would not be considered a viable option to install a gas collection system and flaring unit. A gas collection system to operate successfully requires a volume of gas in the order of 75 m3/hr.

A copy of the assessment report was included in the AER for the 2008 reporting period.

2.9 Estimated Annual and Cumulative Quantity of Indirect Emissions to Groundwater

Potential sources of indirect emissions into groundwater are:

Landfill Base

The naturally occurring low permeability clay underlying the site provides a natural liner for the capped area of the landfill. Previous site investigation results indicate that in situ clay has a hydraulic conductivity of less than 1 X 10m-9m/s. The new area of the landfill (Cells 1-4) is lined with a geotextile membrane as stipulated in the current waste licence consisting of a composite liner consisting of a 1m layer of compacted soil with a hydraulic conductivity of less than or equal to 1x10-9m/s. This is overlain by a geocomposite layer which in turn is overlain by a 2mm thick high density polyethylene (HDPE) layer.

Landfill Capping

The old sludge disposal areas were capped in 2004/2005. A five layer composite permanent capping was placed over all the old sludge cells as per the requirements of Condition 4.4 of the current licence. The five layers are comprised of the following;

a) Geocomposite gas collection layer
b) Barrier/Protection layer
c) Geotextile protection layer
d) Surface water drainage layer
e) Subsoil layer
f) Topsoil Layer

The capped layer is approximately 1 metre in thickness. The geosynthetic barrier has a minimum permeability of 1 x 10-9m/s. This layer prevents surface water seeping into the sludge body and also facilitates the collection of gas. The surface water drainage layer collects surface water and extends to the system of open surface water drains at the base of the slopes from where it discharges to the existing catchment drains.

Surface Water Collection and Treatment System

Clean surface water from the uncapped existing sludge cells, is collected via a network of gravel drains which is then discharged to the perimeter drain. Visual inspection of the surface water locations and drains is conducted weekly.

Leachate Collection

Leachate is collected in the leachate pumping chamber from a series of collection drains at the site. The leachate is pumped via a 100mm diameter pipe to the effluent treatment plant for treatment.

In summary, as the landfill is contained by the provision of the features outlined above, the risk of indirect emissions to groundwater is greatly minimised.

3.0 MONITORING RESULTS

3.1 Summary Report

This summary report has been compiled in accordance with the emission limit values (ELVs) for the following parameters as specified in Condition 6 and Schedule C of W0037-01:

- Dust
- Noise
- Landfill Gas

3.1.1 Dust Deposition

Dust deposition emission limit values as specified in W0037-01 are detailed in Table 3.1 below.

Table 3.1 Dust Deposition ELV

ELV (mg/m2/day) Note 1
350

Note 1: 30 day composite sample

Annual dust monitoring was conducted by BHP at four locations between 18th July and 15th August 2012. Dust monitoring locations are illustrated in Figure 2. 30-day composite samples were collected in accordance with licence requirements and forwarded to the TelLab accredited laboratory for analysis. The monitoring results are summarised in Table 3.2 below. Copies of the dust monitoring results are included in Appendix A.

Table 3.2 Dust Monitoring Results 2012

Location	N1	N3	N5	SS2
	mg/m2/day			
August 2012	106.1	64.4	193.8	202.2

Measured dust levels at all of the monitoring locations were below the ELV of 350 mg/m3/day.

3.1.2 Noise Emissions

Noise emission limit values as specified in W0037-01 are detailed in Table 3.3 below. Day-time and night-time noise monitoring was conducted by Response Group at four boundary locations (N1, N2, N3, N5) on the 15th November 2012. The noise survey report is attached in Appendix B. The monitoring results are summarised in Table 3.4 and 3.5 below.

Table 3.3 Noise ELV's

Day Db(A)L_{Aeq}(30 minutes)	Night Db(A)L_{Aeq}(30 minutes)
55	45

Table 3.4 Day-time Noise Measurements 2012

Location	Date	Sampling Interval	L_{Aeq} 30min Db(A)
N1	15/11/12	30 Minutes	43.7
N2	15/11/12	30 Minutes	41.8
N3	15/11/12	30 Minutes	40.6
N5	15/11/12	30 Minutes	41.3

Table 3.5 Night-time Noise Measurements 2012

Location	Date	Sampling Interval	L_{Aeq} 30min Db(A)
N1	15/11/12	30 Minutes	39.8
N2	15/11/12	30 Minutes	38.3
N3	15/11/12	30 Minutes	40.1
N5	15/11/12	30 Minutes	40.9

The average figures show that there are no noise issues on site. All results obtained from the measurements taken at the four locations by day and night are within the daytime and night-time limits of 55Dba and 45Dba. The noises that were most evident on site were the road traffic and the flow of water. It is clear from carrying out this report that the Waste Water Treatment Plant is having a minimal impact on the local environment in terms of Noise Pollution

3.1.3 Landfill Gas Emissions

The trigger levels for landfill gas emissions from the facility measured in any service duct or manhole on, at, or immediately adjacent to, the facility and/or at any other point located outside the body of the waste stipulated in Condition 6.3.1 of W0037-01 are detailed in Table 3.6 below:

Table 3.6 Landfill Gas Concentrations

Methane	Carbon Dioxide
20% LEL (1% v/v)	1.5% v/v

During 2012, landfill gas concentrations were measured at the following locations: RD1, RD2, RD3, RD4, RD5, RD6, RD7, RD8, L6, L8, L10 and L12.

3.1.3.1 Methane

Monthly methane concentrations measured at gas monitoring location RD1 were all below the threshold level of 1% v/v in 2012.

Methane levels measured at RD2 exceeded the threshold level of 1% v/v in eight of the monthly monitoring rounds. Methane levels above the threshold level ranged from 1.2% (December) to 32.8% (September).

Methane levels measured at RD3 exceeded the threshold level of 1% v/v in five of the monthly monitoring rounds. Methane levels above the threshold level ranged from 1.4% v/v (October) to 7.4% v/v (January).

Methane levels measured at RD4 exceeded the threshold level of 1% v/v in eight of the twelve monthly monitoring rounds. Methane levels above the threshold level ranged from 1.9% (October) to 21.2% (November).

Methane levels measured at RD5 exceeded the threshold level of 1% v/v in eleven of the 12 monthly monitoring rounds. Methane levels above the threshold level ranged from 1.8% (March) to 29.9% (December).

Methane levels measured at RD6 exceeded the threshold level of 1% v/v in all of the 12 monthly monitoring rounds. Methane levels ranged from 34.9% (March) to 71.3% (September).

Methane levels measured at RD8 could not be taken between July and October as it was flooded. The remaining months were all below the threshold level.

Monthly recorded methane levels in the remaining monitoring boreholes (RD7, L6, L8, L10 and L12) were below 1% v/v.

3.1.3.2 Carbon Dioxide

Carbon dioxide concentrations exceeded the limit of 1.5% v/v at RD1 in 9 of the 12 monthly monitoring rounds – January (3.1%), February (4.4%), March (4.2%), April (5.1%), May (3.8%), June (2.3%), July (2.0%), October (2.1%) and December (6.5%).

At RD2, carbon dioxide levels exceeded the threshold level of 1.5% v/v in 10 of the 12 monthly monitoring rounds – January (4.1%), February (3.9%), March (3.6%), April (5.9%), May (2.2%), August (3.1%), September (3.9%), October (4.1%), November (1.9%) and December (2.9%).

In RD3, carbon dioxide concentrations were above the threshold level of 1.5% v/v in 8 of the 12 monthly monitoring rounds – January (3.0%), February (4.4%), March (1.6%), April (2.9%), August (1.7%),October (2.2%), November (2.5%)and December (2.7%).

In RD4, carbon dioxide concentrations were above the threshold level of 1.5% v/v in 11 of the 12 monthly monitoring rounds – January (6.3%), February (5.3%), April (7.4%), May (6.2%), June (7.1%), July (3.4%), August (2.7%), September (4.7%), October (8.1%), November (3.6%) and December (5.3%).

In RD5, carbon dioxide levels exceeded the threshold level of 1.5% in 11 of the 12 monthly monitoring rounds – February (7.0%), March (5.8%), April (13.9%), May (6.9%), June (11.3%), July (7.8%), August (6.2%), September (16.3%), October (17.0%), November (17.3%) and December (17.2%).

In RD6, carbon dioxide levels exceeded the threshold level of 1.5% v/v in all of the monthly monitoring rounds - January (15.7%), February (12.3%), March (8.8%), April (13.0%), May (13.4%), June (13.9%), July (11.5%), August (13.8%), September (15.6%), October (11.3%), November (13.6%) and December (12.0%).

In RD8, carbon dioxide levels could not be taken between July and October as it was flooded, all other months were below the threshold level of 1.5% v/v.

In L6, carbon dioxide levels exceeded the threshold level of 1.5% v/v in 5 of the 12 monthly monitoring rounds – June (3.5%), July (11.6%), August (6.6%), September (1.6%) and November (2.3%).

Monthly recorded carbon dioxide levels in the remaining monitoring boreholes (RD7, L8, L10 and L12) were below 1.5% v/v.

Landfill gas monitoring results are attached in Appendix C.

3.2 MONITORING RESULTS AND INTERPRETATION

3.2.1 Introduction

Environmental monitoring was conducted at the facility during 2012 in accordance with Schedule D of Waste Licence W0037-01. Details of monitoring and reporting frequencies are presented in Table 3.7 below.

The locations of all environmental monitoring points are illustrated on Figure 2. Monitoring results are presented in Appendices A to F. Copies of the laboratory certificates are included in Appendix G.

Table 3.7 Environmental Monitoring and Reporting Frequency

Environmental Monitoring Requirement	Monitoring Frequency	Reporting Frequency
Groundwater Quality	Biannually/Annually	Biannually
Groundwater Levels	Biannually	Biannually
Surface Water Quality	Biannually	Biannually
Surface Water Visual Inspection	Weekly	Biannually
Leachate Quality	Biannually	Biannually
Leachate Levels	Quarterly	Biannually
Landfill Gas	Monthly	Biannually
Dust Deposition	Annually	Annually
Noise Emissions	Annually	Annually
Meteorological Monitoring	Daily	Annually
Ecological Monitoring	Biennial After Yr 1	Biannually

In 2012,
Dust analysis and reporting was carried out by BHP, New Road, Thomondgate, Limerick.

Noise monitoring was carried out by Response Group.

Groundwater and leachate level monitoring, groundwater, leachate, surface water and landfill gas analysis and reporting was carried out by BHP, New Road, Thomondgate, Limerick.

Meteorological monitoring and surface water visual inspection is undertaken by facility management personnel at the facility.

3.2.2 Dust Monitoring

3.2.2.1 Dust Monitoring Locations

Dust monitoring was conducted at four monitoring locations in 2012 in accordance with Tables D.4.1 and D.3.1 of W0037-01. Dust monitoring locations are outlined in Table 3.8 below.

Table 3.8 Dust Monitoring Locations

Location	Easting	Northing
N1	144.001	159.988
N3	143.727	159.831
N5	143.937	160.076
SS2	143.879	159.874

3.2.2.2 Dust Monitoring Methods

Details of the dust monitoring results attached in Appendix A.

3.2.2.3 Dust Monitoring Results

The results of dust monitoring conducted at the facility during 2012 are presented in Table 3.9 below. Dust concentrations and emission limit values as detailed in Schedule C.3 of W0037-01 were discussed in Section 3.1.1.

Table 3.9 Dust Monitoring Results 2012

Location	N1	N3	N5	SS2
	$mg/m^2/day$			
August 2012	106.1	64.4	193.8	202.2

All monitoring results were below the ELV for dust of 350 mg/m2/day.

3.2.3 Groundwater Monitoring

3.2.3.1 Groundwater Monitoring Locations

Groundwater monitoring was conducted at five locations during 2012 in accordance with Schedule D.1.1 and D.6.1 of the current licence. Co-ordinates for all monitoring locations are detailed in Table 3.10 and locations are also illustrated on Figure 2. Monitoring results are attached in Appendix D.

Monitoring location RD2 is located at the southern boundary of the site and RD3 is located at the south-western boundary of the site adjacent to the capped sludge cells. BH3 is located at the north eastern boundary of the site. BH4 and BH5 are both located in the buffer zone adjacent to the southern boundary of the facility and close to Shannon Estuary.

Table 3.10 Groundwater Monitoring Locations

Location	Easting	Northing
RD2	143.866	159.855
RD3	143.799	159.855
BH3	143.952	160.085
BH4	143.935	159.930
BH5	143.984	159.959

3.2.3.2 Groundwater Levels

Groundwater levels were monitored on a biannual basis in accordance with Schedule D.6.1 of W0037-01 and are included in Appendix E with the groundwater monitoring results.
Groundwater levels recorded during 2012 varied between 0.0m below top of casing (BTOC) (in RD3 August 2012) and 2.1m BTOC (in BH3 February 2012).

3.2.3.3 Groundwater Analytical Results

Groundwater monitoring was conducted on a biannual and annual basis in accordance with Schedule D.6.1 of the licence. Monitoring was undertaken in February and August 2012.

Groundwater analytical results are attached in Appendix D.
There are no emission limits stipulated in Waste Licence W0037-01, therefore the groundwater analytical results have been compared to the Interim Guideline Values (IGVs) specified in the EPA document: 'EPA Interim Report – Towards Setting Guideline Values for the Protection of Groundwater in Ireland' (2003).

The Ph in all of the groundwater samples analysed during both monitoring rounds ranged from 6.52 to 7.53, which is within the IGV range of 6.5-9.5.

Electrical conductivity measurements ranged from 2,250 PS/cm in RD3 (August) to 15,140 PS/cm in BH4 (February), which are similar to previous monitoring results. The IGV of 1,000 PS/cm was exceeded in all of the samples analysed.

Ammonia concentrations detected in RD 3 in August was 0.11mg/l. This was the only result below the IGV of 0.2mg/l. The other results were all above the IGV and ranged between 0.23mg/l in BH 5 (February) to 176.1mg/l in BH 3 (February).

Total phosphorus/orthophosphate concentrations in RD2 (0.06mg/l), RD3 (0.09mg/l), BH4 (0.06mg/l) and BH5 (0.11mg/l) exceeded the IGV for orthophosphate of 0.03 mg/l.

Total Oxidised Nitrogen concentrations results ranged between 0.1mg/l RD 3 (February) and 4.5mg/l BH 5 (February).

Total organic carbon concentrations ranged from 1.2mg/l in RD3 (August) to 24.7mg/l in BH5 (February), TOC concentrations were similar to previous monitoring rounds.

Chloride concentrations ranged from 45.3 mg/l in RD3 (August) to 3,470 mg/l in BH5 (February). Chloride concentrations in all of the samples analysed exceeded the IGV of 30 mg/l.

Sodium concentration ranged from 9.07mg/l BH 4 (August) to 13.17mg/l BH 3 (August), which were all below the IGV of 150 mg/l.

Potassium concentrations in all five samples analysed during the August monitoring round were all below the IGV of 5 mg/l. Concentrations ranged from 1.06mg/l in RD3 to 2.96mg/l in RD2.

Iron concentration in RD3 and RD3 was detected at <0.01mg/l (August) which is below the IGV of 0.2mg/l. The Iron concentration measured in BH3 (1.026mg/l), BH4 (1.136mg/l) and BH5 (1.127mg/l) all exceeded the IGV of 0.2 mg/l.

The chromium concentration in BH5 was 0.056 which exceeds the IGV of 0.03mg/l. The remaining samples were below the IGV of 0.03 mg/l, <0.001mg/l in both RD2 and RD3 and 0.016mg/l in both BH3 and BH4.

Total phenol concentrations exceeded the IGV 0.0005mg/l in all the samples analysed during both monitoring rounds. Results ranged from 0.001mg/l RD3 (August) to 0.015mg/l BH3 (February).

Copper concentrations exceeded the IGV of 0.03 in 3 of the samples taken. BH3 was 0.861mg/l, BH4 0.804mg/l and BH5 was 0.606mg/l. RD2 and RD3 were below the IGV with both results reading <0.001mg/l.

Concentrations of arsenic, boron, cadmium, calcium, cyanide, fluoride, lead, magnesium, mercury, nickel, sulphate, tin and zinc were below their respective IGVs and/or laboratory detection limits in all of the samples analysed.

3.2.3.4 Conclusions

Overall, the groundwater results are similar to the 2011 biannual and annual monitoring rounds. This represents an improvement in groundwater quality at the facility since previous monitoring rounds.

Certain parameters such as electrical conductivity, ammonia, chloride, iron, and total phosphorus concentrations remain elevated at most or all monitoring locations compared to the IGV's.

Salinity concentrations measured in December 2010 would appear to confirm that there is saline intrusion into groundwater monitoring wells most notably at location BH4. Measured concentrations ranged from 0.3 ppt in RD3 to 6 ppt in BH4 indicating brackish water (i.e. a mixture of freshwater and seawater with a salinity range of 0.5-30 ppt typical of an estuarine location).

TOC concentrations are broadly similar to those recorded in previous years.

3.2.4 Landfill Gas Monitoring

Measurements of landfill gas were carried out at all gas monitoring boreholes (RD1 to RD8) on a monthly basis in accordance with Table D.2.1 of the Waste Licence. Combined gas and leachate monitoring boreholes (L6, L8, L10, L12) were also monitored on a monthly basis for gas.

All monitoring locations were sampled for methane, carbon dioxide, oxygen, temperature and pressure.

Results are compared against the EPA Guideline Emission Limits for methane (CH4) and carbon dioxide(CO2) at landfills, which are 1% v/v and 1.5% v/v, respectively (EPA Landfill Manuals: Landfill Monitoring, 2nd Edition, 2003). These are also the ELVs specified in Schedule C.2 of Waste Licence W0037-01.

3.2.4.1 Gas Monitoring Locations

Gas monitoring locations are detailed in Table 3.11 below and illustrated in Figure 2. Gas monitoring results are presented in Appendix C.

Table 3.11 Gas Monitoring Locations

Location	Easting	Northing
RD1	143.761	159.997
RD2	143.876	159.883
RD3	143.801	159.851
RD4	143.760	160.092
RD5	143.906	159.999
RD6	143.928	160.071
RD7	144.000	159.979
RD8	143.939	159.938
L6	143.867	159.959
L8	143.924	159.995
L10	143.944	160.015
L12	143.940	160.064

3.2.4.2 Gas Monitoring Boreholes

Landfill gas measurements were undertaken using an Infrared Gas Analyser. The gas emitted is analysed for its content by % volume of the following constituents:

- Methane (CH_4)
- Carbon Dioxide (CO_2)
- Oxygen (O_2)
- Atmospheric Pressure (mBar)

The LEL (lower explosive limit) for methane, atmospheric pressure (millibars) and temperature (Oc) were also recorded by the gas analyzer and relative pressure was calculated.

3.2.5 Leachate Monitoring

3.2.5.1 Leachate Monitoring Locations

In accordance with Schedule D.1 of the licence, leachate composition and level monitoring was conducted at locations detailed in Table 3.12.

Table 3.12 Leachate Monitoring Locations

Parameter	Location	Easting	Northing
Leachate Level	L1	143.795	159.990
	L2	143.796	159.926
	L3	143.843	159.890
	L4	143.797	160.016
	L5	143.821	159.997
	L7	143.895	159.928
	L9	143.939	159.958
	L11	143.991	160.000
	L13	143.976	160.052
Leachate Composition	SS3	143.806	159.951

3.2.5.2 Leachate Composition Results

There are no emission limits stipulated in Waste Licence W0037-01, therefore the leachate analytical results have been compared to the Interim Guideline Values (IGVs) listed in the EPA document: 'EPA Interim Report - Towards Setting Guideline Values for the Protection of Groundwater in Ireland' (2003).

Appendix E contains monthly leachate composition results, annual and biannual leachate analytical results.

Leachate monitoring at SS3 was undertaken in February and August 2012 as per Schedule D of the licence.

The electrical conductivity in SS3 was measured at 1,716 µS/cm in February which exceeds the IGV of 1000 PS/cm. However in August it was 877 µS/cm which is below the IGV.

The chloride concentration in SS3 was detected at 502.5mg/l in February and 161.7mg/l in August, both of which exceeds the IGV of 30 mg/l; however chloride concentrations have been consistently elevated since 2004.

The ammonia concentration in SS3 was detected at 6.29mg/l in February and 0.87mg/l in August, which exceeds the IGV of 0.15 mg/l; Ammonia concentrations have been consistently elevated since 2004.

Nickel and potassium concentrations were <0.001mg/l and 1.32mg/l respectively, which are below their respective IGVs of 0.02 mg/l and 5 mg/l. This is a change from last year when they both exceeded their IGV.

The iron concentration in SS3 was detected at <0.001mg/l in August, which is below the IGV of 0.02 mg/l.

Comparison of results with the results from previous years, indicate that a number of parameters (Conductivity, ammonia, chloride and total phosphorus) remain consistently elevated above their respective IGVs.

3.2.6 Noise Monitoring

3.2.6.1 Noise Monitoring Locations

Day-time and night-time annual noise monitoring was conducted at four boundary locations at the facility (N1, N2, N3, N5) on the 15th November as stipulated in Table D.4.1 of the licence. Noise monitoring locations are illustrated on Figure 2 and detailed in Table 3.13 below.

Table 3.13 Noise Monitoring Locations

Location	Easting	Northing
N1	144.001	159.988
N3	143.727	159.831
N5	143.937	160.076
SS2	143.879	159.874

The noise survey report (including details of the methodology) is attached in Appendix B.

3.2.6.2 Noise Monitoring Results

The noise monitoring results are summarised in Table 3.14 and 3.15.

Table 3.14 Day-time Noise Measurements 2012

Location	Date	Sampling Interval	L_{Aeq} 30min dB(A)
N1	15/11/2012	30	43.7
N3	15/11/2012	30	40.6
N5	15/11/2012	30	41.3
SS2	15/11/2012	30	41.8

Table 3.15 Night-time Noise Measurements 2012

Location	Date	Sampling Interval	L_{Aeq} 30min dB(A)
N1	15/11/2012	30	39.8
N3	15/11/2012	30	40.1
N5	15/11/2012	30	40.9
SS2	15/11/2012	30	38.3

Day-time and night time noise levels at all boundary locations did not exceed the daytime emission limit LAeq of 55dB and 45 dB respectively.

It is noted that the predominant noise source on site were non site related traffic noise and the flow of water.

3.2.7 Surface Water Monitoring

3.2.7.1 Surface Water Monitoring Locations

In total, five surface water locations were monitored in 2012 with differing biannual and annual parameter requirements as outlined in Table D.6.1 of the waste licence (SS1, SS2, SS4, SS6 and SS7).

The surface water monitoring locations are located in the catchment drains along the perimeter of the facility. These drains collect surface water run-off from the site and ultimately discharge to the Shannon Estuary via a sluice gate.

Monitoring location SS1 is located in the catchment drain along the eastern boundary of the facility adjacent to Cell No. 3. Monitoring locations SS2 and SS4 are located in a drain at the southern tip of the landfill. SS6 and SS7 are both estuarine locations. Monitoring location SS6 was dry in August 2012 and SS7 was dry in both February and August, therefore no sample could be collected on the sampling date.

Monitoring locations are listed in Table 3.16 below and are illustrated on Figure 2.

Table 3.16 Surface Water Monitoring Locations

Location	Easting	Northing
SS1	144.000	160.040
SS2	143.879	159.874
SS4	143.936	160.003
SS6	143.907	159.862
SS7	143.927	159.873

3.2.7.2 Surface Water Monitoring

Surface water monitoring was conducted on a biannual basis at the five locations detailed in Table 3.16. Sampling involved the submergence of the designated sample container into the surface water body.

During submergence, every effort was made to keep the container steady so as to prevent sediment disturbance. Samples were collected and submitted to an accredited laboratory for analysis in February and August for the range of parameters outlined in Table D.6.1 of W0037-01.

Surface water analytical results are attached in Appendix F.

There is no surface water emission limits stipulated in waste licence W0037-01. Therefore, all surface water monitoring results have been compared to the Thresholds, AA-EQS's (Annual Average Environmental Quality Standard) and MAC-EQS's (Maximum Admissible Concentration Environmental Quality Standard Thresholds) specified in the Surface Water Quality Regulations SI 272 of 2009 applicable to transitional waters (Shannon Estuary at Shannon).

Ammonia levels exceeded the IGV of 0.02mg/l in all the sampled tested. Results range between 0.14mg/l SS6 (February) to 0.36mg/l SS4 (February).

BOD exceeded the IGV of <4mg/l in 2 of the 7 samples tested this year. SS2 in August read 14mg/l and SS4 in August read 10mg/l. All other results were below the IGV/

Chromium exceeded the IGV of 0.03mg/l in 2 of the 3 samples tested. In August SS1 0.036mg/l and SS4 0.032mg/l. The other sample tested SS2 0.028mg/l.

Cyanide exceeded the IGV of 0.01mg/l in SS4 0.016mg/l in August.

There were no other exceedances of the relevant thresholds or EQS's for any of the parameters analysed during both monitoring rounds undertaken in 2012.

The analytical results indicate that surface water quality is generally good at and beyond the facility boundary.

3.2.7.3 Surface Water Visual Inspections

Visual inspections of surface water drains are carried out on a weekly basis and the visual inspection logs are available for inspection at the facility.

2.8 Meteorological Monitoring

Details of meteorological monitoring conducted at the facility in 2008 are attached in Appendix I. Met Eireann publish meteorological data, which is obtained from their weather station at Shannon Airport.

Meteorological data obtained from the Met Eireann weather station at Shannon Airport is summarised in the first three columns of Table 3.17 below.

Table 3.17 Summary Rainfall Data

Month	Rainfall (mm) Shannon Airport	Evapotranspiration (mm) Shannon Airport	Evaporation (mm)	Estimated Effective Rainfall – Capped Area (mm)	Estimated Effective Rainfall – Active Cell (mm)
JAN	111.8	16.3	21.1	95.5	90.7
FEB	38.6	17.9	24.7	20.7	13.9
MAR	28.3	40.1	56.3	0*	0*
APR	78.2	52.7	79.4	25.5	0*
MAY	38.8	77.8	110.5	0*	0*
JUN	166.9	66.3	94.5	100.6	72.4
JUL	112.8	72.2	103.3	40.6	9.5
AUG	89.1	64.4	88.3	24.7	0.8
SEP	61.9	43.9	62.4	18	0*
OCT	85.6	24.2	34.2	61.4	51.4
NOV	121.0	12.4	16.7	108.6	104.3
DEC	113.7	12.4	15.9	101.3	97.8
TOTAL	1046.7	500.6	707.3	596.9	440.8

***Denotes months where evaporation and/or evapotranspiration exceeded total rainfall**

Rainfall data obtained from the Met Eireann weather station at Shannon Airport estimated that the site received approximately 1046.7 mm of rainfall from January 2012 to December 2012.

Effective rainfall for capped and non-capped/active cells was calculated as follows:
Effective Rainfall (mm) = Net Precipitation (mm) – Loss by Evapotranspiration (mm) (for capped cells)
Effective Rainfall (mm) = Net Precipitation (mm) – Loss by Evaporation (mm) (for active cells)

3.2.9 Annual Water Balance Calculation and Interpretation for Cells

The water balance was calculated using the average monthly figure of sludge disposed in 2012, which was 88 tonnes. A water balance is used to calculate the difference between rainfall on landfilled areas and the various losses prior to leachate generation.
Water balance calculations are attached in Appendix I.

The method used is based on equation developed by Ehring (Quality and Quantity Sanitary Landfill Leachate, 1983). This method is based on the use of a mathematical equation, which provides a conservative estimate, which caters for the worst-case scenarios.

The equation is as follows: L0 = [(ER.a) + LW + IR] – [aW]
Where:

L_0 :	Free Leachate Produced
ER:	Effective Rainfall (net precipitation after loss by evaporation)
A:	Area of Cell(s)
LW:	Liquid waste
IR:	Infiltration from restored areas
aW:	Absorptive capacity of waste
a_A:	Active area
aR:	Restored area
AL:	Lagoon area
WA:	Waste in active area
WR:	Waste in restored area

Based on the calculations it is estimated that approximately 2,856 m3 (upper bound) and 2,104 m3 (lower bound) of leachate was produced on site in 2012. As the majority of the landfill is capped the potential for leachate generation is reduced.

3.2.10 Resource and Energy Consumption Summary

The only consumer of electricity at the facility is the leachate pump, which pumps the leachate from the leachate collection sump to the WWTP. The contribution of this sump to the overall electrical output of the entire WWTP is minor. The leachate pump is in operation for approximately 4 hrs per day.

Diesel is used to fuel the vehicles used on site namely the sludge dumper trucks and the tractor. Diesel is stored in a 5,000 litre capacity bunded tank located on site. Approximately 2050 litres of diesel were used in 2012.

Mains water is provided via the public mains supply, however water usage at the facility is not metered.

3.2.11 Tank, Pipeline and Bund Integrity Testing and Inspection

The facility contains one bunded diesel tank as outlined in Section 3.2.10. The bund was installed in 2006 and the integrity assessment report was forwarded to the Agency as part of the 2006 AER. The bund is regularly inspected and tested by site personnel to verify integrity.

3.2.12 Review of Nuisance Controls

The assistant landfill supervisor conducts daily inspections of the landfill and the facility and records any incidents in daily duty sheets which are stored at the facility. The inspections are undertaken to identify any environmental nuisances caused by vermin, birds, flies, mud, dust, litter, and odours. No complaints or incidents were received by the facility in 2012.

Rentokil carry out pest control in the treatment plant but no incidences of vermin have been reported on the landfill site. Birds and flies do not pose a problem at the site as there is no domestic refuse being deposited in the landfill; therefore there are no nuisance controls in place for birds or flies.

According to facility management:

- No complaints regarding odours were received in 2012.
- There is no problem with litter at the facility and no complaints were received in 2012 in this regard.
- There are no noise sensitive locations in the immediate vicinity of the facility and no complaints regarding noise from the facility were received in 2012.

The only vehicles that use the site roads are a tractor owned by Response Engineering Limited and a 5-tonne sludge dumper truck. These are used to deposit the sludge to the landfill from the WWTP. The vehicles travel on a private road between the two sites and do not travel outside the boundary of the two sites.

In general, dust is not a problem encountered at the facility and thus no dust suppression measures are considered necessary. Dust monitoring is currently undertaken as per Table D.3.1 of the licence and no exceedance was detected in 2012.

4.0 MANAGEMENT OF THE FACILITY

4.1 Management and Staffing Structure

Clare County Council has been responsible for the facility since November 2004. The facility was previously managed by Shannon Development. The facility is under the operational control of the landfill manager – Neil Ronan. The assistant landfill managers are Ailish Johnston, Paul O Keeffe and Michael Lynch. In addition, there is one weighbridge operator, John O Brien. The current management structure is outlined in Table 4.1 below.

Table 4.1 Management and Staffing Structure

Name	Position	Responsibilities	Replacement
Neil Ronan	Landfill Manager	Land Fill Management	Ailish Johnson
Ailish Johnston	Landfill Assistant Manager	Landfill management, monthly reporting, environmental monitoring, nuisance control	Paul O Keeffe
Paul O'Keeffe	Landfill Assistant Manager	Landfill management, monthly reporting, environmental monitoring, nuisance control	Michael Lynch
Michael Lynch	Landfill Assistant Manager	Landfill management, monthly reporting, environmental monitoring, nuisance control	John O Brien
John O Brien	Weighbridge operator	Weighing sludge	Henry Greensmith

4.2 Environmental Management Programme/Environmental Objectives and Targets

The 2011 AER did not specify any environmental objectives and targets for 2012.

4.3 Schedule of Environmental Objectives and Targets for 2012

The licensee conducted a review of the EMS in 2011 and found that no changes to the EMS were required and therefore there are no amendments to the environmental objectives and targets required for the year 2012.

4.4 Facility Procedures

No new procedures were developed or implemented at the site between January 2012 and December 2012.

4.5 Financial Provision

In accordance with Condition 12 of the licence, Charges and Financial Provisions, Clare County Council has the ability to meet any financial commitments or liabilities incurred by the undertaking of the activities relating to the facility. Clare County Council annually in the preparation of the "Book of Estimates" and the passing of these estimates shall make provisions for any capital works and maintenance works required to fulfil the conditions of the waste licence for the facility.

Clare County Council also carries adequate insurance to deal with their liabilities. The type and level of insurance is constantly monitored and updated as required.

4.6 Staff Training

An Environmental Awareness Programme has been developed and implemented at the facility. A copy of the Programme was included in the 2006 AER. The Programme sets out environmental issues relevant to all site staff, contractors and visitors to the facility. Training for all staff involved in the operation of the facility is recorded in the training and awareness programme which includes a sign out section for staff members to record their attendance to courses.

Spill kit and chemical handling training was undertaken for staff employed at the facility in October 2007 and copies of training records were included in the 2007 AER.

No additional environmental training was undertaken in 2012.

4.7 Programme for Public Information

All information and correspondence supplied to the EPA (other than commercially sensitive information) and received from the EPA, is available to the public to view at Tradaree Point WWTP, Shannon (Clonmoney South), Co. Clare. This includes a copy of the waste licence, all reports, monitoring results and interpretations required by the licence and other correspondence between the EPA and the facility. Any member of the public may view the information between the hours of 10.00 and 16.00 and by appointment only, at the below address.

All requests concerning the environmental performance of the facility should be forwarded to:
Mr Neil Ronan,
Facility Manager,
Tradaree Point Sludge Disposal Facility,
Shannon (Clonmoney South),
Co. Clare
Tel: 061 364477

4.8 Facility Notice Board

In compliance with Condition 3.3 of Waste Licence W0037-01, a facility notice is in place at the entrance to the landfill site adjacent to the main gate, and contains all the details outlined in Section 3.3.3 of the licence.

5.0 REPORTED INCIDENTS AND COMPLAINTS SUMMARY

During the reporting period January 2012 to December 2012, no incidents occurred which would require reporting to the relevant authorities. No complaints or incidents were reported to the facility between January and December 2012.

5.1 Incidents

None recorded.

5.2 Non-compliances

No non-compliances were recorded.

5.3 Complaints

None Received.

5.4 Waste Record

Records of the amount and type of sludge (either industrial or domestic) disposed at the facility are kept on file at the facility. Receipts of incoming sludge are recorded at the weighbridge and filed. The weekly records from the weighbridge are then filed and stored in the administration building of the facility. The total quantity of the waste sludge is recorded on a weekly basis and is logged in a waste register that is kept on site at all times. Quantities of waste sludge disposed of to landfill are recorded in the monthly reports for the WWTP and also the AER.

The following information is recorded in the waste register;

- Name of the person transporting the load
- Date of transportation
- Sludge quantity
- Sludge type
- The name of the machine operator
- The cell in which the sludge is to be disposed

The site caretaker signs the logbook to confirm the sludge has been inspected prior to acceptance to the landfill. The records are then transferred to the site office where they are logged on a computer database.

The weighbridge was last calibrated in December 2011.

Section 2 contains further information regarding sludge management.

6.0 FACILITY DEVELOPMENT

6.1 Developments during 2012

There were no other development works of note undertaken at the facility between January and December 2012.

6.2 Proposed Development of the Facility and Associated Timescales

Facility development works planned for 2013.
Cell 1 is currently active and on reaching its full capacity it will be capped and landfilling of Cell 2 will commence. It is expected that this will occur in 2013.

FIGURE 1 – SITE LOCATION MAP

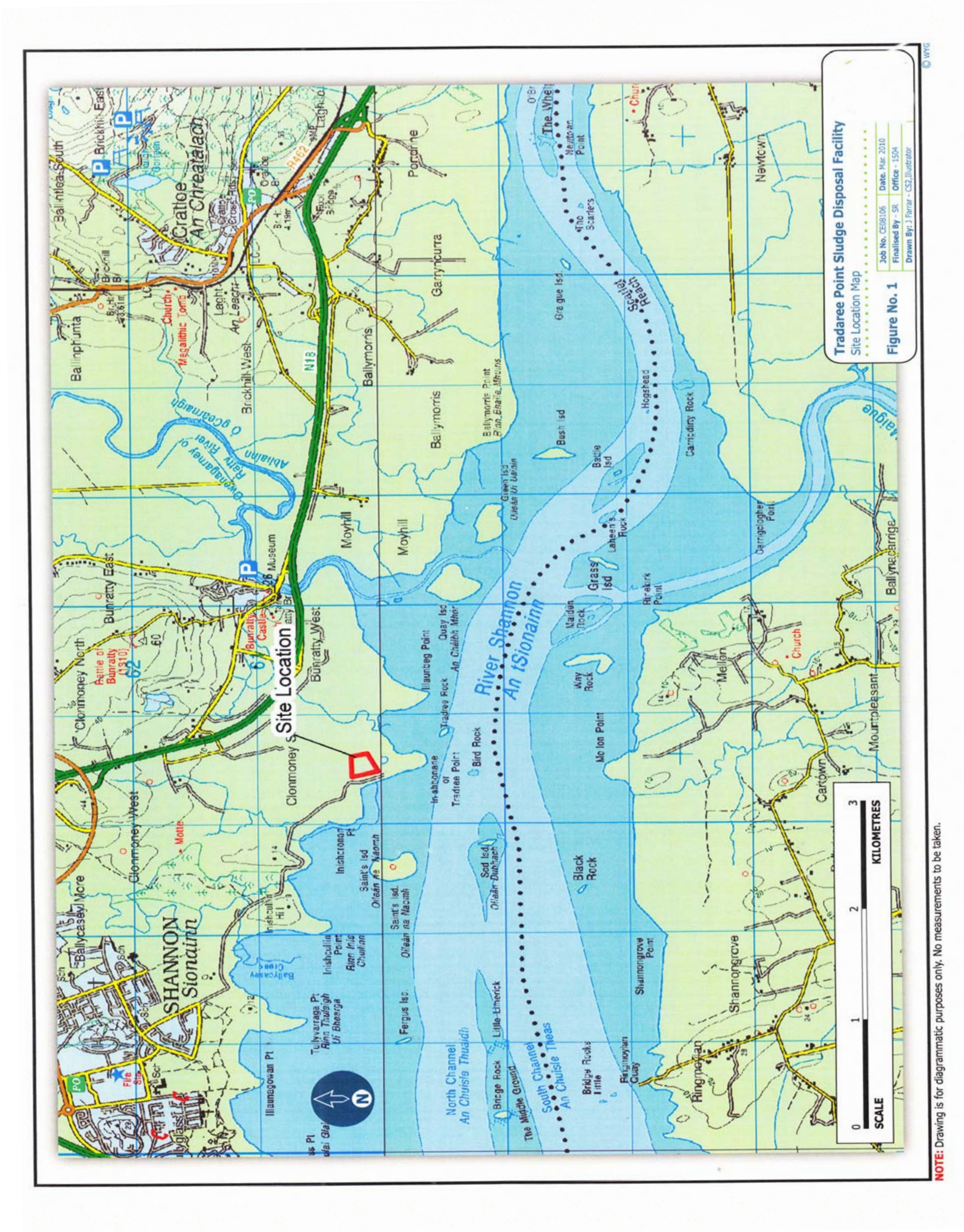
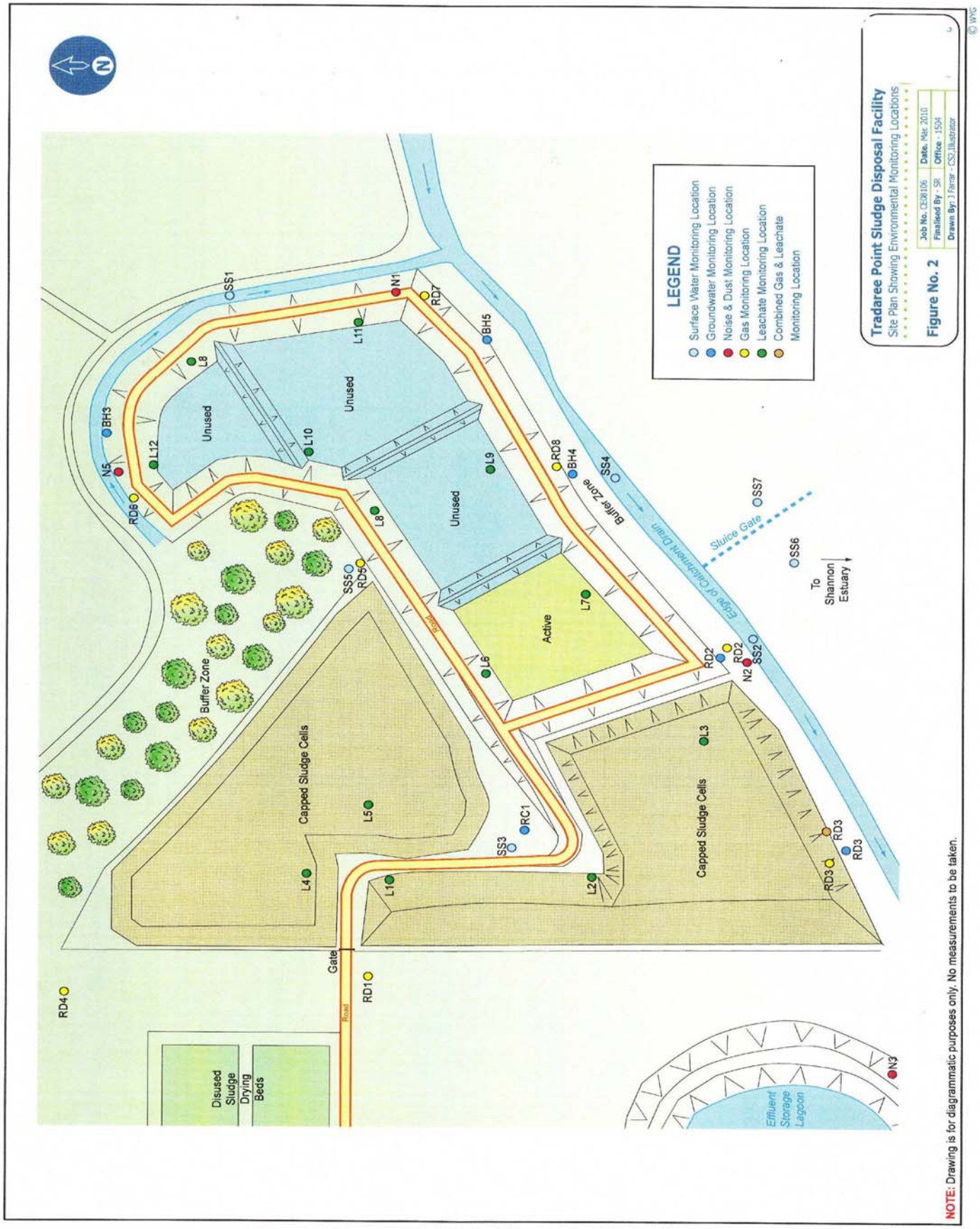

Tradaree Point Sludge Disposal Facility
Site Location Map
Figure No. 1
Job No. CE08106
Date. Mar. 2010
Finalised By - SR
Office - 1504
Drawn By: J Farrar - CS2,Illustrator
Site Location
River Shannon
An tSionainn
SHANNON
Sionainn
North Channel
An Chuisle Thuaidh
South Channel
An Chuisle Theas
Bunratty West
Bunratty East
Clonmoney North
Clonmoney West
Ballycasey More
Cratloe
An Chreatalach
Ballymorris
Moyhill
Garrynurra
Newtown
Mellon
Mountpleasant
Cartown
Shannongrove
Ringmoylan
Ballinphunta
Brickhill West
N18
R462
Museum
Bush Isd
Grass Isd
Black Rock
Bird Rock
Fergus Isd.
Little Limerick
Saint's Isd
Mellon Point
Carrigdirty Rock
Maigue
SCALE
0
1
2
3
KILOMETRES
NOTE: Drawing is for diagrammatic purposes only. No measurements to be taken.

FIGURE 2 – SITE PLAN SHOWING ENVIRONMENTAL MONITORING LOCATIONS


LEGEND
Surface Water Monitoring Location
Groundwater Monitoring Location
Noise & Dust Monitoring Location
Gas Monitoring Location
Leachate Monitoring Location
Combined Gas & Leachate Monitoring Location
Tradaree Point Sludge Disposal Facility
Site Plan Showing Environmental Monitoring Locations
Figure No. 2
Job No. CE08106
Data. Mar 2010
Finalised By - SR
Office - 1504
Drawn By: J Farrar - CS2 Illustrator
NOTE: Drawing is for diagrammatic purposes only. No measurements to be taken.
Unused
Active
Buffer Zone
Capped Sludge Cells
Disused Sludge Drying Beds
Gate
Road
Sluice Gate
To Shannon Estuary
Effluent Storage Lagoon
Echlin Catchment Drain
SS1
SS2
SS3
SS4
SS5
SS6
SS7
RC1
N1
N2
N3
N5
RD1
RD2
RD3
RD4
RD5
RD6
RD7
RD8
BH3
BH4
BH5
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12

APPENDICES

APPENDIX A – DUST MONITORING RESULTS

BHP/CL/02D

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Shannon Town WWTP
Traderee
Shannon
Co.Clare

FTAO: Ailish Johnston

BHP Ref. No.: 105419
Order No:
Date Received: 15/08/12
Date Tested: 12/03/12
Test Specification: Nil
Item :See below

Issue 2

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Tradree Landfill			
Dust Deposition	**N1**	mg/m^2/day	106.1	VDI 2119 Part2
Dust Deposition	**N3**	mg/m^2/day	64.4	VDI 2119 Part2
Dust Deposition	**SS2**	mg/m^2/day	202.2	VDI 2119 Part2
Dust Deposition	**N5**	mg/m^2/day	193.8	VDI 2119 Part2

Additional Information: All samples are inside the EPA Limit of 350 mg/m^2/day.
Sampling occurred during the period 18/07/12-15/08/12

Authorised by:

Joan McCarthy

Date of Issue: 01/03/13

Page 1 of 1

APPENDIX B – NOISE SURVEY REPORT

Tradaree WWTP

Environmental Noise Monitoring 15th November 2012

Code	Location	Time	Range dB	Average dB	Maximum dB	Background Noise	Compliant
N1 Daytime	Boundary @ Landfill Cell 3	10.00 – 10.30	30-90	43.7	53.4	Road Traffic	Yes
N2 Daytime	Boundary @ Landfill Cell 1	10.35 - 11.05	30-90	41.8	56.5	Road Traffic,	Yes
N3 Daytime	Boundary @ Lagoon	11.25 - 11.55	30-90	40.6	58.9	Road Traffic, Flow of Water	Yes
N5 Daytime	Boundary @ Landfill Cell 4	09.20 - 09.50	30-90	41.3	55.4	Road Traffic	Yes
N1 Night-Time	Boundary @ Landfill Cell 3	01.40 - 02.10	30-90	39.8	48.7	Road Traffic	Yes
N2 Night-Time	Boundary @ Landfill Cell 1	02.15 - 02.45	30-90	38.3	48.3	Road Traffic,	Yes
N3 Night-Time	Boundary @ Lagoon	00.20 - 00.50	30-90	40.1	46.2	Road Traffic, Flow of Water	Yes
N5 Night-Time	Boundary @ Landfill Cell 4	01.05 - 01.35	30-90	40.9	49.1	Road Traffic	Yes

The weather was mainly dry with a few light showers throughout the Daytime and Night-Time noise measurements.

The Noise meter was an INFOTECH – SLM – 1352A and was calibrated on the morning of the test.

Conclusion:

The average figures show that there are no noise issues on site. All results obtained from the measurements taken at the four locations by day and night are within the daytime and night-time limits of 55dBA and 45dBA. The noises that were most evident on site were the road traffic and the flow of water. It is clear from carrying out this report that the Waste Water Treatment Plant is having a minimal impact on the local environment in terms of Noise Pollution.

APPENDIX C – Landfill Gas Monitoring Results

Landfill Gas Analysis							
Month	January 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	OC
12/01/2012	RD1	3.1	0.7	20.4	0.1	1019	12
	RD2	4.1	0.9	19.3	0.1	1019	12
	RD3	3	7.4	12.1	0.9	1020	12
	RD4	6.3	7.9	5.9	2.1	1020	12
	RD5	0.2	7.3	16.1	0.1	1019	12
	RD6	15.7	59.5	0.1	2.3	1019	12
	RD7	1	0.1	20.1	0	1019	12
	RD8	0	0	20.2	0	1019	12
	L6	0.1	0.1	20.1	2.8	1019	12
	L8	0	0	20	1.6	1019	12
	L10	0.1	0.1	20.1	1.1	1019	12
	L12	0.1	0.2	19.9	0.8	1019	12
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	February 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
15/02/2012	RD1	4.4	0.2	13.6		1036	12
	RD2	3.9	0.8	17.2		1036	12
	RD3	4.4	0.5	16.9		1037	13
	RD4	5.3	6.1	7.3		1036	13
	RD5	7.0	3.0	6.8		1037	13
	RD6	12.3	45.6	0.5		1036	12
	RD7	0.2	0.0	19.9		1036	12
	RD8	0.2	0.0	19.8		1036	13
	L6	0.1	0.0	20.0		1035	11
	L8	0.0	0.0	20.0		1035	11
	L10	0.0	0.0	20.0		1035	11
	L12	0.0	0.0	20.0		1035	12
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	March 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
07/03/2012	RD1	4.2	0.0	15.2		1030	12.5
	RD2	3.6	8.3	16.1		1030	12.9
	RD3	1.6	0.3	18.2		1030	13.1
	RD4	1.2	1.0	17.5		1031	12.9
	RD5	5.8	1.8	10.5		1031	12.8
	RD6	8.8	34.9	8.6		1030	13.7
	RD7	0.2	0.0	18.5		1030	13.3
	RD8	0.1	0.0	18.5		1030	13.6
	L6	0.8	0.0	16.9		1030	12.6
	L8	0.0	0.0	18.5		1030	12.7
	L10	0.0	0.0	18.5		1030	13.0
	L12	0.0	0.0	18.4		1030	13.2
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	April 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
23/04/2012	RD1	5.1	0.0	15.3		993	13.8
	RD2	5.9	18.8	15.2		993	14.2
	RD3	2.9	2.2	19.5		993	14.0
	RD4	7.4	7.9	0.4		993	13.9
	RD5	13.9	11.0	0.4		993	14.0
	RD6	13.0	58.0	0.7		993	13.4
	RD7	0.2	0.0	20.6		993	13.9
	RD8	0.3	0.2	20.6		993	13.7
	L6	0.2	0.0	20.6		993	13.5
	L8	0.1	0.0	20.3		993	13.3
	L10	0.1	0.0	20.8		993	14.0
	L12	0.1	0.0	20.6		993	13.5
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	May 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
15/05/2012	RD1	3.8	0.1	17.5		1020	13.2
	RD2	2.7	8.1	18.2		1021	12.2
	RD3	1.5	0.1	20.1		1021	12.9
	RD4	6.7	10.8	3.9		1021	13.5
	RD5	6.9	5.3	12.2		1021	12.9
	RD6	13.4	57.4	0.8		1021	14.6
	RD7	0.0	0.0	20.8		1021	13.3
	RD8	0.1	0.0	20.7		1021	12.6
	L6	1.4	0.0	20.0		1020	12.9
	L8	0.1	0.0	20.8		1020	12.4
	L10	0.1	0.0	20.9		1020	13.0
	L12	0.0	0.0	20.8		1020	14.2
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	June 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
19/06/2012	RD1	2.3	0.1	17.9		1017	15.1
	RD2	1.3	2.4	19.3		1018	14.8
	RD3	0.8	0.2	19.9		1018	13.3
	RD4	7.1	10.6	1.3		1018	14.7
	RD5	11.3	13.0	0.6		1018	14.6
	RD6	13.9	65.4	2.1		1017	14.5
	RD7	0.0	0.0	20.5		1018	13.8
	RD8	0.0	0.0	20.3		1018	13.9
	L6	3.5	0.1	16.8		1017	13.6
	L8	0.0	0.0	20.3		1018	13.9
	L10	0.0	0.0	20.2		1017	14.1
	L12	0.0	0.0	20.2		1017	14.0
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	July 2011						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
12/07/2012	RD1	2.0	0.1	18.8		1006	14.8
	RD2	0.3	0.1	20.6		1006	14.6
	RD3	0.4	0.1	20.9		1007	14.8
	RD4	3.4	0.2	13.6		1007	15.1
	RD5	7.8	3.2	8.7		1007	14.9
	RD6	11.5	47.3	6.7		1007	15.2
	RD7	0.1	0.0	21.3		1005	14.7
	RD8	Flooded	Flooded	Flooded		Flooded	Flooded
	L6	11.6	1.0	8.7		1007	14.9
	L8	0.1	0.0	21.0		1007	14.8
	L10	0.1	0.0	21.0		1007	14.9
	L12	0.1	0.0	21.0		1007	14.7
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	August 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
15/08/2012	RD1	1.1	0.0	19.2		985	15.8
	RD2	3.1	18.2	14.7		985	15.6
	RD3	1.7	2.6	18.3		985	15.2
	RD4	2.7	0.0	16.7		985	15.8
	RD5	6.2	0.4	12.3		985	16.1
	RD6	13.8	60.3	4.3		984	16.4
	RD7	0.0	0.0	20.4		984	15.7
	RD8	Flooded	Flooded	Flooded		Flooded	Flooded
	L6	6.6	0.2	14.3		985	16.2
	L8	0.1	0.0	20.4		984	15.9
	L10	0.1	0.0	20.4		984	15.7
	L12	0.0	0.0	20.6		984	16.1
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	September 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
24/09/2012	RD1	1.4	0.2	20.2		993	15.1
	RD2	3.9	32.8	12.2		993	15.7
	RD3	1.5	1.5	19.9		993	14.8
	RD4	4.7	0.3	15.5		993	14.7
	RD5	16.3	15.9	1.0		993	15.5
	RD6	15.6	71.3	1.8		993	15.7
	RD7	0.1	0.2	20.6		993	14.9
	RD8	Flooded	Flooded	Flooded		Flooded	Flooded
	L6	1.6	0.3	19.6		993	15.3
	L8	0.1	0.2	20.8		993	15.1
	L10	0.1	0.3	20.6		993	15.1
	L12	0.1	0.3	20.4		993	14.8
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	October 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
16/10/2012	RD1	2.1	0.3	18.3		997	9.2
	RD2	4.1	28.0	13.1		997	9.1
	RD3	2.2	1.4	19.2		997	9.3
	RD4	8.1	1.9	8.5		997	9.1
	RD5	17.0	24.8	0.2		997	9.4
	RD6	11.3	53.2	5.7		997	9.1
	RD7	0.1	0.2	19.8		997	9.1
	RD8	Flooded	Flooded	Flooded		Flooded	Flooded
	L6	0.6	0.2	19.8		997	9.5
	L8	0.1	0.2	19.9		997	9.3
	L10	0.1	0.2	19.7		997	9.3
	L12	0.1	0.2	19.6		997	9.4
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	November 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
14/11/2012	RD1	0.3	0.3	18.2		1019	14
	RD2	1.9	1.0	19.8		1019	14
	RD3	2.5	0.7	19.7		1019	14
	RD4	3.6	21.2	9.6		1019	14
	RD5	17.3	26.8	0.3		1019	14
	RD6	13.6	62.6	0.8		1019	14
	RD7	0.1	0.3	20.5		1019	14
	RD8	0.4	0.6	19.1		1019	14
	L6	2.3	0.5	17.4		1019	14
	L8	0.1	0.3	20.6		1019	14
	L10	0.1	0.3	20.5		1019	14
	L12	0.1	0.3	20.5		1019	14
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

Landfill Gas Analysis							
Month	December 2012						
Date	Location	CO2	Methane	O2	Pressure	Atmosph	Temp
		%	%	%	mBar	Pressure	oC
06/12/2012	RD1	6.5	0.4	11.3		1007	7
	RD2	2.9	1.2	20.1		1007	7
	RD3	2.7	0.7	20.7		1007	7
	RD4	5.3	7.7	6.8		1007	7
	RD5	17.2	29.9	0.5		1007	7
	RD6	12.0	49.0	2.8		1007	7
	RD7	0.2	0.3	21.0		1007	7
	RD8	0.2	0.3	21.2		1007	7
	L6	0.2	0.6	21.3		1007	7
	L8	0.2	0.3	21.2		1007	7
	L10	0.2	0.3	20.7		1007	7
	L12	0.2	0.3	20.7		1007	7
Trigger Level		1.5% v/v	1% v/v				
Shading indicates trigger level exceeded							

APPENDIX D – GROUNDWATER MONITORING RESULTS

Biannual/Annual Groundwater Monitoring Results 2012

PARAMETER	UNIT	EPA IGV	BH 3		BH 4		BH 5		RD 2		RD 3	
			Feb	Aug	Feb	Aug	Feb	Aug	Feb	Aug	Feb	Aug
pH		≥6.5-≤9.5	6.84	6.80	6.71	6.93	6.79	6.95	6.52	7.48	7.04	7.53
Temperature	°C	25	10.4	12.9	10.8	13.2	10.8	13.5	10.4	12.5	11.2	13.1
Conductivity	µS/cm	1000	14330	10540	15140	14010	11280	10420	4450	3680	2820	2250
Nitrite	mg/l	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate	mg/l	-	3.56	1.67	2.83	1.19	19.84	1.16	3.1	1.65	0.27	1.15
Total Ammonia	NH3-N	0.2	176.1	6.31	146.3	6.26	0.23	6.95	4.99	6.27	1.21	0.11
Chloride	Cl mg/l	30	851.3	38.2	1680.7	52.1	3470	54.3	880.8	93.8	394	45.3
DO	% O_2 sat	NAC		92.3		90.1		87.6		89.6		91.6
Arsenic	As mg/l	0.01		<0.001		<0.001		<0.001		<0.001		<0.001
Boron	B mg/l	1		0.003		0.002		0.002		0.003		0.004
Cadmium	Cd mg/l	0.005		<0.001		<0.001		<0.001		<0.001		<0.001
Calcium	Ca mg/l	200		26.1		19.7		13.6		28.2		22.2
Chromium	Cr mg/l	0.03		0.016		0.016		0.056		<0.001		<0.001
Copper	Cu mg/l	0.03		0.861		0.804		0.606		<0.001		<0.001
Cyanide	Cn mg/l	0.01		<0.001		<0.001		0.009		<0.001		<0.001
Fluoride	F mg/l	1		0.26		0.12		0.39		0.45		0.39
Iron	Fe mg/l	0.2		1.026		1.136		1.127		<0.001		<0.001
Lead	Pb mg/l	0.01		<0.001		<0.001		<0.001		<0.001		<0.001
Magnesium	Mg mg/l	50		1.14		2.05		1.09		1.05		1.12
Mercury	Hg mg/l	0.001		<0.0002		<0.0002		<0.0002		<0.0002		<0.0002
Nickel	Ni mg/l	0.02		<0.001		<0.001		<0.001		<0.001		<0.001
Potassium	K mg/l	5		1.32		1.37		1.12		2.96		1.06
Sodium	Na mg/l	150		13.17		9.07		10.11		12.02		10.05
Sulphate	SO_4 mg/l	200		65.7		10.4		7.5		15.4		61.1
Tin	Sn mg/l	-		<0.001		<0.001		<0.001		<0.001		<0.001
Total Phosphorus	P mg/l	0.03		0.03		0.06		0.11		0.06		0.09
Orthophosphate	P mg/l	0.03		0.01		0.03		0.04		0.05		0.06
Total Organic Carbon	C mg/l	NAC	19.9	12	19.3	14	24.7	18	19.9	16	24.6	1.2
Total Oxidised Nitrogen	N mg/l	NAC	0.8	0.4	0.6	0.3	4.5	0.3	0.7	0.4	0.1	0.3
Total Phenols	mg/l	0.0005	0.015	0.012	0.008	0.008	0.012	0.006	0.004	0.007	0.006	0.001
Zinc	Zn mg/l	0.1		0.056		0.064		0.028		0.028		0.032
Solids Total	mg/l	-		212		213		230		202		181

IGV = Interim Guideline Value – from the EPA document "Towards Setting Guideline Values for the Protection of Groundwater in Ireland

Results are Shaded where they Exceed the EPA IGV

NAC = No Abnormal change

n/a = not analysed

n/r = not recorded

Analysis conducted by BHP Laboratories, New Road, Thomondgate, Limerick on 29th February and 29th August 2012.

APPENDIX E – LEACHATE MONITORING RESULTS AND PUMPING DATA

Biannual / Annual Leachate Monitoring Results 2012

Parameter	Unit	EPA IGV	SS3	
			Feb	Aug
Ammonia	mg/l	0.15	6.29	0.87
Arsenic	mg/l	0.01		<0.001
BOD Total 5 Day with ATU	mg/l	-	57	4
Boron	mg/l	1		0.007
Cadmium	mg/l	0.005		<0.001
Calcium	mg/l	200		18.4
Chloride	mg/l	30	502.5	161.7
Chromium	mg/l	0.03		0.020
COD Total	mg/l	-	105	47
Conductivity	uS/cm	1000	1716	877
Copper	mg/l	0.03		<0.001
Cyanide (Total)	mg/l	0.01		<0.001
Dissolved Oxygen	%	NAC		
Flouride	mgF/l			0.11
Groundwater Level	m	-		
Iron	mg/l	0.2		<0.001
Lead	mg/l	0.01		<0.001
Magnesium	mg/l	50		1.61
Mercury	mg/l	0.001		<0.0002
Mn (Dissolved				
Nickel	mg/l	0.02		<0.001
Nitrate	mg/l		36.1	13.3
Nitrite	mg/l		0.2	<0.1
pH Value	Units	6.5 - 9.5	6.59	7.06
Phenol	ug/l			
Potassium	mg/l	5		1.32
Sodium	mg/l	150		13.12
Solids Suspended		-		
Solids Total	mg/l			
Sulphate	mg/l	200		13.7
Surfactant Anionic	ug/l			
Temperature	°C	25	9.3	11.5
Tin	mg/l			<0.001
Total Organic Carbon	mg/l	NAC		
Total Oxidised Nitrogen (TON)	mg/l	NAC	8.1	3.0
Total Phosphorus	mg/l	0.01		0.06
Zinc	mg/l	0.1		0.021

IGV = Interim Guideline Value - from the EPA Document "Towards Setting Guideline Values for the Protection of Groundwater in Ireland"
Results are shaded where they exceeded the EPA IGV
NAC = No abnormal Change
n/a = not analysed
n/r = not recorded
Analysis conducted by BHP Laboratories, New Road, Thomondgate, Limerick on 29th February and 29th August 2012.

Capped Cells Annual Leachate Monitoring Results 2012

Parameter	Unit	EPA IGV	L 1		L 2		L 3		L 4		L 5	
			Apr	Aug	Apr	Aug	Apr	Aug	Apr	Aug	Apr	Aug
Ammonia	mg/l	0.15	6.31	6.88	6.52	7.09	7.12	6.21	4.21	3.66	6.89	6.26
Arsenic	mg/l	0.01		<0.001		<0.001		<0.001		<0.001		<0.001
BOD Total 5 Day with ATU	mg/l	-	88	83	227	114	140	27	92	27	184	52
Boron	mg/l	1		0.008		0.006		0.005		0.008		0.005
Cadmium	mg/l	0.005		<0.001		<0.001		<0.001		<0.001		<0.001
Calcium	mg/l	200		22.1		20.1		13.2		22.4		20.1
Chloride	mg/l	30	50.6	172.4	740	132.3	36	130.3	60	127.6	56	161.7
Chromium	mg/l	0.03		0.064		0.028		0.060		0.020		0.021
COD Total	mg/l	-	212	163	297	185	265	50	264	63	233	154
Conductivity	uS/cm	1000	2210	1789	4220	3100	1600	1491	1826	1544	2560	2330
Copper	mg/l	0.03		0.712		0.891		0.202		0.312		0.429
Cyanide (Total)	mg/l	0.01		<0.001		0.026		0.017		0.032		0.039
Dissolved Oxygen	%	NAC										
Fluoride	mgF/l			0.29		0.23		0.23		0.35		0.11
Iron	mg/l	0.2		2.041		3.697		1.049		5.204		3.229
Lead	mg/l	0.01		<0.001		<0.001		<0.001		<0.001		<0.001
Magnesium	mg/l	50		2.11		1.81		2.11		1.96		1.35
Mercury	mg/l	0.001		<0.0002		<0.0002		<0.0002		<0.0002		<0.0002
Mn (Dissolved												
Nickel	mg/l	0.02		<0.001		<0.001		<0.001		<0.001		<0.001
Nitrate	mg/l		<0.1	13.7	<0.1	11.7	<0.1	21.9	<0.1	24.5	<0.1	13.3
Nitrite	mg/l		<0.0	<0.1	2.4	<0.1	0.6	<0.1	2.4	<0.1	1.1	<0.1
pH Value	Units	6.5 - 9.5	6.57	6.88	6.38	6.67	6.51	6.75	6.54	6.69	6.55	6.78
Phenol	ug/l											
Potassium	mg/l	5		1.31		1.06		1.13		1.31		1.06
Sodium	mg/l	150		13.12		16.1		18.12		12.01		11.21
Solids Suspended		-										
Solids Total	mg/l											
Sulphate	mg/l	200		10.7		14.2		13.1		11.4		14.6
Surfactant Anionic	ug/l											
Temperature	°C	25	11.1	12.4	11.5	12.8	11.3	13.1	11.6	12.8	11.1	13.5
Tin	mg/l			<0.001		<0.001		<0.001		<0.001		<0.001
Total Organic Carbon	mg/l	NAC										
Total Oxidised Nitrogen	mg/l	NAC	<0.1	3.1	0.5	2.6	0.13	4.9	0.54	5.5	0.25	3.0
Total Phosphorus	mg/l	0.01		0.06		0.07		0.12		0.05		0.08
Zinc	mg/l	0.1		0.032		0.040		0.028		0.032		0.056

IGV = Interim Guideline Value - from the EPA Document "Towards Setting Guideline Values for the Protection of Groundwater in Ireland"

Results are shaded where they exceeded the EPA IGV

NAC = No abnormal Change

n/a = not analysed

n/r = not recorded

Analysis conducted by BHP Laboratories, New Road, Thomondgate, Limerick, on 11th April and 29th August 2012

APPENDIX F – SURFACE WATER MONITORING RESULTS

Biannual/Annual Surface Water Monitoring Results 2012

Parameter	Unit	EPA IGV	SS1		SS2		SS4		SS6		SS7	
			Feb	Aug	Feb	Aug	Feb	Aug	Feb	Aug	Feb	Aug
Ammonia	mg/l	0.02	0.29	0.18	0.19	0.21	0.36	0.21	0.14	n/a	n/a	
Arsenic	mg/l	0.02		<0.001		<0.001		<0.001		n/a		
BOD Total 5 Day with ATU	mg/l	≤4	3	2	2	14	2	10	2	n/a	n/a	
Boron	mg/l	1		0.001		0.002		0.001		n/a		
Cadmium	mg/l	0.005		<0.001		<0.001		<0.001		n/a		
Calcium	mg/l	200		26.1		32.1		30.3		n/a		
Chloride	mg/l	30										
Chromium	mg/l	0.03		0.036		0.028		0.032		n/a		
COD Total	mg/l	-	32	22	29	40	29	24	31	n/a	n/a	
Conductivity	uS/cm	1000		467		504		512		n/a		
Copper	mg/l	0.03		<0.001		<0.001		<0.001		n/a		
Cyanide (Total)	mg/l	0.01		<0.001		0.01		0.016		n/a		
Dissolved Oxygen	%	NAC	96.4	85.5	98.1	76.2	97.6	78.4	92.1	n/a	n/a	
Fluoride	mgF/l	5.0		0.12		0.11		0.12		n/a		
Groundwater Level	m	-										
Iron	mg/l	0.2		<0.001		<0.001		<0.001		n/a		
Lead	mg/l	0.01		<0.001		<0.001		<0.001		n/a		
Magnesium	mg/l	50		2.02		1.99		2.01		n/a		
Mercury	mg/l	0.001		<0.0002		<0.0002		<0.0002		n/a		
Mn (Dissolved	Ug/l											
Nickel	mg/l	0.05		<0.001		<0.001		<0.001		n/a		
Nitrate	mg/l	-		21.1		11.1		14.2		n/a		
Nitrite	mg/l	-		<0.05		<0.05		<0.05		n/a		
pH Value	Units	6.5 - 9.5	7.65	7.66	7.95	7.70	7.96	7.44	8.06	n/a	n/a	
Phenol	ug/l											
Potassium	mg/l	5		1.63		1.71		1.82		n/a		
Sodium	mg/l	150		14.07		12.01		13.67		n/a		
Solids Suspended		50	39	31	23	46	40	86	103	n/a	n/a	
Solids Total	mg/l											
Sulphate	mg/l	200		15.1		28.1		29.3		n/a		
Surfactant Anionic	ug/l											
Temperature	OC	25	8.9	9.9	9.4	10.1	8.8	10.2	9.1	n/a	n/a	
Tin	mg/l	-		<0.001		<0.001		<0.001		n/a		
Total Organic Carbon	mg/l	NAC										
Total Oxidised Nitrogen (TON)	mg/l	NAC		4.74		2.49		3.19		n/a		
Total Phosphorus	mg/l	-		0.03		0.03		0.04		n/a		
Zinc	mg/l	0.1		0.012		0.058		0.060		n/a		

IGV = Interim Guideline Value - from the EPA Document "Towards Setting Guideline Values for the Protection of Groundwater in Ireland"

Results are shaded where they exceeded the EPA IGV

NAC = No abnormal Change

n/a = not analysed Borehole was Dry

n/r = not recorded

Analysis conducted by BHP Laboratories, New Road, Thomondgate, Limerick on 29th February and on 29th August

APPENDIX G – COPIES OF LABORATORY REPORTS

Groundwater Monitoring Test Reports

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102746.3
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring BH3			
pH		-	6.84	APHA - 4500 - H^+
Temperature		^0C	10.4	APHA - 2550 - B
Total Ammonia		mg/l	176.1	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	14330	APHA - 2510 - B
T.O.C		mg/l	19.9	APHA - 5310 - C
Phenols		mg/l	0.015	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	3.56	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.8	APHA - 4110 - B
Chloride		mg/l	851.3	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105680.3
Order No.:
Date Received: 29/08/12
Date Completed: 11/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring BH3			
pH		-	6.80	APHA - 4500 - H^+
Temperature		^0C	12.9	APHA - 2550 - B
Total Ammonia		mg/l	6.31	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	10540	APHA - 2510 - B
T.O.C		mg/l	12	APHA - 5310 - C
Phenols		mg/l	0.012	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	1.67	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.4	APHA - 4110 - B
Chloride		mg/l	38.2	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105683.3
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring BH3			
Dissolved Oxygen		% O_2 sat	92.3	APHA - 4500-O-G
List I Organics		mg/l	<0.01	GC-MS
List II Organics		mg/l	<0.01	GC-MS
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	3	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	26.1	APHA - 3120 - B
Total Chromium		ug/l	16	APHA - 3120 - B
Copper		ug/l	861	APHA - 3120 - B
Cyanide		mg/l	<0.001	APHA - 4500 - CN-E
Fluoride		mg/l	0.26	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105683.3
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring BH3			
Iron		ug/l	1029	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	1.14	APHA - 3120 - B
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.32	APHA - 3120 - B
Sodium		mg/l	13.17	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	56	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	65.7	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.03	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.01	APHA - 4500 - P-E
Residue on Evaporation		mg/l	212	APHA - 2540- B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Page 2 of 2

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102746.4
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring BH4			
pH		-	6.71	APHA - 4500 - H^+
Temperature		^0C	10.8	APHA - 2550 - B
Total Ammonia		mg/l	146.3	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	15140	APHA - 2510 - B
T.O.C		mg/l	19.3	APHA - 5310 - C
Phenols		mg/l	0.008	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	2.83	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.6	APHA - 4110 - B
Chloride		mg/l	1680.7	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105680.4
Order No.:
Date Received: 29/08/12
Date Completed: 11/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring BH4			
pH		-	6.93	APHA - 4500 - H^+
Temperature		^0C	13.2	APHA - 2550 - B
Total Ammonia		mg/l	6.26	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	14010	APHA - 2510 - B
T.O.C		mg/l	14	APHA - 5310 - C
Phenols		mg/l	0.008	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	1.19	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.3	APHA - 4110 - B
Chloride		mg/l	52.1	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105683.4
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring BH4			
Dissolved Oxygen		% O_2 sat	90.1	APHA - 4500-O-G
List I Organics		mg/l	<0.01	GC-MS
List II Organics		mg/l	<0.01	GC-MS
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	2	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	19.7	APHA - 3120 - B
Total Chromium		ug/l	16	APHA - 3120 - B
Copper		ug/l	804	APHA - 3120 - B
Cyanide		mg/l	<0.001	APHA - 4500 - CN-E
Fluoride		mg/l	0.12	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Page 1 of 2

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105683.4
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring BH4			
Iron		ug/l	1136	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	2.05	APHA - 3120 - B
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.37	APHA - 3120 - B
Sodium		mg/l	9.07	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	64	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	10.4	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.06	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.03	APHA - 4500 - P-E
Residue on Evaporation		mg/l	213	APHA - 2540- B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Page 2 of 2

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102746.5
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring BH5			
pH		-	6.79	APHA - 4500 - H^+
Temperature		^0C	10.8	APHA - 2550 - B
Total Ammonia		mg/l	0.23	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	11280	APHA - 2510 - B
T.O.C		mg/l	24.7	APHA - 5310 - C
Phenols		mg/l	0.012	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	19.84	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	4.5	APHA - 4110 - B
Chloride		mg/l	3470	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105680.5
Order No.:
Date Received: 29/08/12
Date Completed: 11/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring BH5			
pH		-	6.95	APHA - 4500 - H^+
Temperature		^0C	13.5	APHA - 2550 - B
Total Ammonia		mg/l	6.95	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	10420	APHA - 2510 - B
T.O.C		mg/l	18	APHA - 5310 - C
Phenols		mg/l	0.006	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	1.16	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.3	APHA - 4110 - B
Chloride		mg/l	54.3	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105683.5
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring BH5			
Dissolved Oxygen		% O_2 sat	87.6	APHA - 4500-O-G
List I Organics		mg/l	<0.01	GC-MS
List II Organics		mg/l	<0.01	GC-MS
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	2	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	13.6	APHA - 3120 - B
Total Chromium		ug/l	56	APHA - 3120 - B
Copper		ug/l	606	APHA - 3120 - B
Cyanide		mg/l	0.009	APHA - 4500 - CN-E
Fluoride		mg/l	0.39	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105683.5
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring BH5			
Iron		ug/l	1127	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	1.09	APHA - 3120 - B
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.12	APHA - 3120 - B
Sodium		mg/l	10.11	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	28	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	7.5	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.11	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.04	APHA - 4500 - P-E
Residue on Evaporation		mg/l	230	APHA - 2540- B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Page 2 of 2

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102746.1
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring RD2			
pH		-	6.52	APHA - 4500 - H^+
Temperature		^0C	10.4	APHA - 2550 - B
Total Ammonia		mg/l	4.99	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	4450	APHA - 2510 - B
T.O.C		mg/l	19.9	APHA - 5310 - C
Phenols		mg/l	0.004	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	3.1	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.7	APHA - 4110 - B
Chloride		mg/l	880.8	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105680.1
Order No.:
Date Received: 29/08/12
Date Completed: 11/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring RD2			
pH		-	7.48	APHA - 4500 - H^+
Temperature		^0C	12.5	APHA - 2550 - B
Total Ammonia		mg/l	6.27	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	3680	APHA - 2510 - B
T.O.C		mg/l	16	APHA - 5310 - C
Phenols		mg/l	0.007	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	1.65	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.4	APHA - 4110 - B
Chloride		mg/l	93.8	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105683.1
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring RD2			
Dissolved Oxygen		% O_2 sat	89.6	APHA - 4500-O-G
List I Organics		mg/l	<0.01	GC-MS
List II Organics		mg/l	<0.01	GC-MS
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	3	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	28.2	APHA - 3120 - B
Total Chromium		ug/l	<1	APHA - 3120 - B
Copper		ug/l	<1	APHA - 3120 - B
Cyanide		mg/l	<0.001	APHA - 4500 - CN'-E
Fluoride		mg/l	0.45	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105683.1
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring RD2			
Iron		ug/l	<1	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	1.05	APHA - 3120 - B
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	2.96	APHA - 3120 - B
Sodium		mg/l	12.02	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	28	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	15.4	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.06	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.05	APHA - 4500 - P-E
Residue on Evaporation		mg/l	202	APHA - 2540- B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
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Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102746.2
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
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Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring RD3			
pH		-	7.04	APHA - 4500 - H^+
Temperature		^0C	11.2	APHA - 2550 - B
Total Ammonia		mg/l	1.21	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	2820	APHA - 2510 - B
T.O.C		mg/l	24.6	APHA - 5310 - C
Phenols		mg/l	0.006	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	0.27	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.1	APHA - 4110 - B
Chloride		mg/l	394	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

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Client: Response Engineering
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FTAO: Ailish Johnson

BHP Ref. No.: 105680.2
Order No.:
Date Received: 29/08/12
Date Completed: 11/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring RD3			
pH		-	7.53	APHA - 4500 - H^+
Temperature		^0C	13.1	APHA - 2550 - B
Total Ammonia		mg/l	0.11	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	2250	APHA - 2510 - B
T.O.C		mg/l	1.2	APHA - 5310 - C
Phenols		mg/l	0.001	APHA - 5530 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	1.15	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.3	APHA - 4110 - B
Chloride		mg/l	45.3	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

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BHP/CL/02C

TEST REPORT

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Client: Response Engineering
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BHP Ref. No.: 105683.2
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring RD3			
Dissolved Oxygen		% O_2 sat	91.6	APHA - 4500-O-G
List I Organics		mg/l	<0.01	GC-MS
List II Organics		mg/l	<0.01	GC-MS
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	4	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	22.2	APHA - 3120 - B
Total Chromium		ug/l	<1	APHA - 3120 - B
Copper		ug/l	<1	APHA - 3120 - B
Cyanide		mg/l	<0.001	APHA - 4500 - CN'-E
Fluoride		mg/l	0.39	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

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Client: Response Engineering
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FTAO: Ailish Johnson

BHP Ref. No.: 105683.2
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring RD3			
Iron		ug/l	<1	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	1.12	APHA - 3120 - B
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.06	APHA - 3120 - B
Sodium		mg/l	10.05	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	32	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	61.1	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.09	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.06	APHA - 4500 - P-E
Residue on Evaporation		mg/l	181	APHA - 2540- B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Leachate Monitoring Test Reports

BHP/CL/02C

TEST REPORT

Analysing
Testing
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Client: Response Engineering
Traderee TP
Shannon
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FTAO: Ailish Johnson

BHP Ref. No.: 102748
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS3-Leachate			
pH		-	6.59	APHA - 4500 - H^+
Temperature		^0C	9.3	APHA - 2550 - B
Total Ammonia		mg/l	6.29	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	1716	APHA - 2510 - B
B.O.D		mg/l	57	APHA - 5210 - B
C.O.D		mg/l	105	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	0.2	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	36.1	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	8.1	APHA - 4110 - B
Chloride		mg/l	502.5	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105681.1
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS3-Leachate			
pH		-	7.06	APHA - 4500 - H^+
Temperature		^0C	11.5	APHA - 2550 - B
Total Ammonia		mg/l	0.87	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	877	APHA - 2510 - B
B.O.D		mg/l	4	APHA - 5210 - B
C.O.D		mg/l	47	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	13.3	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	3.0	APHA - 4110 - B
Chloride		mg/l	161.7	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

BHP/CL/02C

TEST REPORT

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Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105684.6
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

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New Road
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS3			
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	7	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	18.4	APHA - 3120 - B
Total Chromium		ug/l	20	APHA - 3120 - B
Copper		ug/l	<1	APHA - 3120 - B
Cyanide		mg/l	<0.001	APHA - 4500 - CN-E
Fluoride		mg/l	0.11	APHA - 4110 - B
Iron		ug/l	<1	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	1.61	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
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Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105684.6
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS3			
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.32	APHA - 3120 - B
Sodium		mg/l	13.12	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	21	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	13.7	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.06	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.02	APHA - 4500 - P-E

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
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Client: Response Engineering
Traderee TP
Shannon
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FTAO: Ailish Johnson

BHP Ref. No.: 103348.1
Order No.:
Date Received: 11/04/12
Date Completed: 20/04/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L1-Leachate			
pH		-	6.57	APHA - 4500 - H^+
Temperature		^0C	11.1	APHA - 2550 - B
Total Ammonia		mg/l	6.31	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	2210	APHA - 2510 - B
B.O.D		mg/l	88	APHA - 5210 - B
C.O.D		mg/l	212	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	<0.05	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	<0.1	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	<0.1	APHA - 4110 - B
Chloride		mg/l	50.6	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 23/04/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
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Client: Response Engineering
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Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105681.2
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L1-Leachate			
pH		-	6.88	APHA - 4500 - H^+
Temperature		^0C	12.4	APHA - 2550 - B
Total Ammonia		mg/l	6.88	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	1789	APHA - 2510 - B
B.O.D		mg/l	83	APHA - 5210 - B
C.O.D		mg/l	163	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	13.7	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	3.1	APHA - 4110 - B
Chloride		mg/l	172.4	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
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Client: Response Engineering
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FTAO: Ailish Johnson

BHP Ref. No.: 105684.1
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L1			
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	8	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	22.1	APHA - 3120 - B
Total Chromium		ug/l	64	APHA - 3120 - B
Copper		ug/l	712.0	APHA - 3120 - B
Cyanide		mg/l	<0.001	APHA - 4500 - CN-E
Fluoride		mg/l	0.29	APHA - 4110 - B
Iron		ug/l	2041	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	2.11	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
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Client: Response Engineering
Traderee TP
Shannon
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FTAO: Ailish Johnson

BHP Ref. No.: 105684.1
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
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Tel +353 61 455399
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E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L1			
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.31	APHA - 3120 - B
Sodium		mg/l	13.12	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	32	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	10.7	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.06	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.03	APHA - 4500 - P-E

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

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Client: Response Engineering
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FTAO: Ailish Johnson

BHP Ref. No.: 103348.2
Order No.:
Date Received: 11/04/12
Date Completed: 20/04/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L2-Leachate			
pH		-	6.38	APHA - 4500 - H^+
Temperature		^0C	11.5	APHA - 2550 - B
Total Ammonia		mg/l	6.52	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	4220	APHA - 2510 - B
B.O.D		mg/l	227	APHA - 5210 - B
C.O.D		mg/l	297	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	2.4	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	<0.1	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.5	APHA - 4110 - B
Chloride		mg/l	740	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 23/04/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

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Client: Response Engineering
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Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105681.3
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L2-Leachate			
pH		-	6.67	APHA - 4500 - H^+
Temperature		^0C	12.8	APHA - 2550 - B
Total Ammonia		mg/l	7.09	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	3100	APHA - 2510 - B
B.O.D		mg/l	114	APHA - 5210 - B
C.O.D		mg/l	185	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	11.7	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	2.6	APHA - 4110 - B
Chloride		mg/l	132.3	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

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Client: Response Engineering
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Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105684.2
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L2			
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	6	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	20.1	APHA - 3120 - B
Total Chromium		ug/l	28	APHA - 3120 - B
Copper		ug/l	891.0	APHA - 3120 - B
Cyanide		mg/l	0.026	APHA - 4500 - CN-E
Fluoride		mg/l	0.23	APHA - 4110 - B
Iron		ug/l	3697	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	1.81	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
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FTAO: Ailish Johnson

BHP Ref. No.: 105684.2
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L2			
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.06	APHA - 3120 - B
Sodium		mg/l	16.1	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	40	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	14.2	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.07	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.03	APHA - 4500 - P-E

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Page 2 of 2

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 103348.3
Order No.:
Date Received: 11/04/12
Date Completed: 20/04/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L3-Leachate			
pH		-	6.51	APHA - 4500 - H^+
Temperature		^0C	11.3	APHA - 2550 - B
Total Ammonia		mg/l	7.12	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	1600	APHA - 2510 - B
B.O.D		mg/l	140	APHA - 5210 - B
C.O.D		mg/l	265	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	0.6	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	<0.1	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.13	APHA - 4110 - B
Chloride		mg/l	36	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 23/04/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105681.4
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L3-Leachate			
pH		-	6.75	APHA - 4500 - H^+
Temperature		^0C	13.1	APHA - 2550 - B
Total Ammonia		mg/l	6.21	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	1491	APHA - 2510 - B
B.O.D		mg/l	27	APHA - 5210 - B
C.O.D		mg/l	50	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	21.9	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	4.9	APHA - 4110 - B
Chloride		mg/l	130.3	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
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Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105684.3
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L3			
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	5	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	13.2	APHA - 3120 - B
Total Chromium		ug/l	60	APHA - 3120 - B
Copper		ug/l	202	APHA - 3120 - B
Cyanide		mg/l	0.017	APHA - 4500 - CN-E
Fluoride		mg/l	0.23	APHA - 4110 - B
Iron		ug/l	1049	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	2.11	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Page 1 of 2

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105684.3
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L3			
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.13	APHA - 3120 - B
Sodium		mg/l	18.12	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	28	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	13.1	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.12	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.08	APHA - 4500 - P-E

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 103348.4
Order No.:
Date Received: 11/04/12
Date Completed: 20/04/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L4-Leachate			
pH		-	6.54	APHA - 4500 - H^+
Temperature		^0C	11.6	APHA - 2550 - B
Total Ammonia		mg/l	4.21	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	1826	APHA - 2510 - B
B.O.D		mg/l	92	APHA - 5210 - B
C.O.D		mg/l	264	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	2.4	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	<0.1	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.54	APHA - 4110 - B
Chloride		mg/l	60	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 23/04/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105681.5
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L4-Leachate			
pH		-	6.69	APHA - 4500 - H^+
Temperature		^0C	12.8	APHA - 2550 - B
Total Ammonia		mg/l	3.66	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	1544	APHA - 2510 - B
B.O.D		mg/l	27	APHA - 5210 - B
C.O.D		mg/l	63	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	24.5	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	5.5	APHA - 4110 - B
Chloride		mg/l	127.6	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105684.4
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
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Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L4			
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	8	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	22.4	APHA - 3120 - B
Total Chromium		ug/l	20	APHA - 3120 - B
Copper		ug/l	312	APHA - 3120 - B
Cyanide		mg/l	0.032	APHA - 4500 - CN-E
Fluoride		mg/l	0.35	APHA - 4110 - B
Iron		ug/l	5204	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	1.96	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105684.4
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L4			
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.31	APHA - 3120 - B
Sodium		mg/l	12.01	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	32	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	11.4	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.05	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.02	APHA - 4500 - P-E

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 103348.5
Order No.:
Date Received: 11/04/12
Date Completed: 20/04/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L5-Leachate			
pH		-	6.55	APHA - 4500 - H^+
Temperature		^0C	11.1	APHA - 2550 - B
Total Ammonia		mg/l	6.89	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	2560	APHA - 2510 - B
B.O.D		mg/l	184	APHA - 5210 - B
C.O.D		mg/l	233	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	1.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	<0.1	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	0.25	APHA - 4110 - B
Chloride		mg/l	56	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 23/04/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105681.6
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring L5-Leachate			
pH		-	6.78	APHA - 4500 - H^+
Temperature		^0C	13.5	APHA - 2550 - B
Total Ammonia		mg/l	6.26	APHA-4500-NH_3-D
Conductivity		μScm^{-1}	2330	APHA - 2510 - B
B.O.D		mg/l	52	APHA - 5210 - B
C.O.D		mg/l	154	APHA - 5220 - D
Nitrite (as NO_2)		mg/l	<0.1	APHA - 4110 - B
Nitrate (as NO_3)		mg/l	13.3	APHA - 4110 - B
Total oxidised Nitrogen (as N)		mg/l	3.0	APHA - 4110 - B
Chloride		mg/l	161.7	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105684.5
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L5			
Detergents (as MBAS)		mg/l	<0.001	APHA - 5540 - C
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	5	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	20.1	APHA - 3120 - B
Total Chromium		ug/l	21	APHA - 3120 - B
Copper		ug/l	429	APHA - 3120 - B
Cyanide		mg/l	0.039	APHA - 4500 - CN-E
Fluoride		mg/l	0.11	APHA - 4110 - B
Iron		ug/l	3229	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	1.35	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Page 1 of 2

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105684.5
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring L5			
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.06	APHA - 3120 - B
Sodium		mg/l	11.21	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	56	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	14.6	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.08	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.04	APHA - 4500 - P-E

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Page 2 of 2

Surface Water Monitoring Test Reports

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102747.1
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS1			
pH		-	7.65	APHA - 4500 - H^+
Temperature		^0C	8.9	APHA - 2550 - B
Total Ammonia		mg/l	0.29	APHA-4500-NH_3-D
B.O.D		mg/l	3	APHA - 5210 - B
C.O.D		mg/l	32	APHA - 5220 - D
Total Suspended Solids		mg/l	39	APHA - 2540 - B
Dissolved Oxygen		% O_2 sat	96.4	APHA - 4500-O-G

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105682.1
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS1			
pH		-	7.66	APHA - 4500 - H^+
Temperature		^0C	9.9	APHA - 2550 - B
Total Ammonia		mg/l	0.18	APHA-4500-NH_3-D
B.O.D		mg/l	2	APHA - 5210 - B
C.O.D		mg/l	22	APHA - 5220 - D
Total Suspended Solids		mg/l	31	APHA - 2540 - B
Dissolved Oxygen		% O_2 sat	85.5	APHA - 4500-O-G

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105685.1
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS1			
Conductivity		μScm^{-1}	467	APHA - 2510 - B
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	1	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	26.1	APHA - 3120 - B
Total Chromium		ug/l	36	APHA - 3120 - B
Copper		ug/l	<1	APHA - 3120 - B
Cyanide		mg/l	<0.001	APHA - 4500 - CN-E
Fluoride		mg/l	0.12	APHA - 4110 - B
Iron		ug/l	<1	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	2.02	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105685.1
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS1			
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.63	APHA - 3120 - B
Sodium		mg/l	14.07	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	12	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	15.1	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.03	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.01	APHA - 4500 - P-E
Nitrate (as NO_3)		mg/l	21.1	APHA - 4110 - B
Nitrite (as NO_2)		mg/l	<0.05	APHA - 4110 - B
Total Oxidised Nitrogen (as N)		mg/l	4.74	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

Page 2 of 2

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102747.2
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS2			
pH		-	7.95	APHA - 4500 - H^+
Temperature		^0C	9.4	APHA - 2550 - B
Total Ammonia		mg/l	0.19	APHA-4500-NH_3-D
B.O.D		mg/l	2	APHA - 5210 - B
C.O.D		mg/l	29	APHA - 5220 - D
Total Suspended Solids		mg/l	23	APHA - 2540 - B
Dissolved Oxygen		% O_2 sat	98.1	APHA - 4500-O-G

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

Page 1 of 1

BHP/CL/02C

TEST REPORT

Analysing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105682.2
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
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Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS2			
pH		-	7.70	APHA - 4500 - H^+
Temperature		^0C	10.1	APHA - 2550 - B
Total Ammonia		mg/l	0.21	APHA-4500-NH_3-D
B.O.D		mg/l	14	APHA - 5210 - B
C.O.D		mg/l	40	APHA - 5220 - D
Total Suspended Solids		mg/l	46	APHA - 2540 - B
Dissolved Oxygen		% O_2 sat	76.2	APHA - 4500-O-G

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
Consulting
Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105685.2
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS2			
Conductivity		μScm^{-1}	504	APHA - 2510 - B
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	2	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	32.1	APHA - 3120 - B
Total Chromium		ug/l	28	APHA - 3120 - B
Copper		ug/l	<1	APHA - 3120 - B
Cyanide		mg/l	0.01	APHA - 4500 - CN^--E
Fluoride		mg/l	0.11	APHA - 4110 - B
Iron		ug/l	<1	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	1.99	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105685.2
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
Limerick
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Tel +353 61 455399
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E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS2			
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.71	APHA - 3120 - B
Sodium		mg/l	12.01	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	58	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	28.1	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.03	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.01	APHA - 4500 - P-E
Nitrate (as NO_3)		mg/l	11.1	APHA - 4110 - B
Nitrite (as NO_2)		mg/l	<0.05	APHA - 4110 - B
Total Oxidised Nitrogen (as N)		mg/l	2.49	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

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BHP/CL/02C

TEST REPORT

Analysing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102747.3
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS4			
pH		-	7.96	APHA - 4500 - H^+
Temperature		^0C	8.8	APHA - 2550 - B
Total Ammonia		mg/l	0.36	APHA-4500-NH_3-D
B.O.D		mg/l	2	APHA - 5210 - B
C.O.D		mg/l	29	APHA - 5220 - D
Total Suspended Solids		mg/l	40	APHA - 2540 - B
Dissolved Oxygen		% O_2 sat	97.6	APHA - 4500-O-G

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

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TEST REPORT

Analysing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105682.3
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS4			
pH		-	7.44	APHA - 4500 - H^+
Temperature		^0C	10.2	APHA - 2550 - B
Total Ammonia		mg/l	0.21	APHA-4500-NH_3-D
B.O.D		mg/l	10	APHA - 5210 - B
C.O.D		mg/l	24	APHA - 5220 - D
Total Suspended Solids		mg/l	86	APHA - 2540 - B
Dissolved Oxygen		% O_2 sat	78.4	APHA - 4500-O-G

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

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TEST REPORT

Analysing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105685.3
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
Thomondgate
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS4			
Conductivity		μScm^{-1}	512	APHA - 2510 - B
Arsenic		ug/l	<1	APHA - 3120 - B
Boron		ug/l	1	APHA - 3120 - B
Cadmium		ug/l	<1	APHA - 3120 - B
Calcium		mg/l	30.3	APHA - 3120 - B
Total Chromium		ug/l	32	APHA - 3120 - B
Copper		ug/l	<1	APHA - 3120 - B
Cyanide		mg/l	0.016	APHA - 4500 - CN-E
Fluoride		mg/l	0.12	APHA - 4110 - B
Iron		ug/l	<1	APHA - 3120 - B
Lead		ug/l	<1	APHA - 3120 - B
Magnesium		mg/l	2.01	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

Analysing
Testing
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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105685.3
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Limerick
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS4			
Mercury		ug/l	<0.2	APHA - 3120 - B
Nickel		ug/l	<1	APHA - 3120 - B
Potassium		mg/l	1.82	APHA - 3120 - B
Sodium		mg/l	13.67	APHA - 3120 - B
Tin		ug/l	<1	APHA - 3120 - B
Zinc		ug/l	60	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	29.3	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	0.04	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	0.01	APHA - 4500 - P-E
Nitrate (as NO_3)		mg/l	14.2	APHA - 4110 - B
Nitrite (as NO_2)		mg/l	<0.05	APHA - 4110 - B
Total Oxidised Nitrogen (as N)		mg/l	3.19	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

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TEST REPORT

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Client: Response Engineering
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Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102747.5
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
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E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS6			
pH		-	8.06	APHA - 4500 - H^+
Temperature		^0C	9.1	APHA - 2550 - B
Total Ammonia		mg/l	0.14	APHA-4500-NH_3-D
B.O.D		mg/l	2	APHA - 5210 - B
C.O.D		mg/l	31	APHA - 5220 - D
Total Suspended Solids		mg/l	103	APHA - 2540 - B
Dissolved Oxygen		% O_2 sat	92.1	APHA - 4500-O-G

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

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TEST REPORT

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Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105682.5
Order No.:
Date Received: 29/08/12
Date Completed: 10/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS6			
pH		-	Dry	APHA - 4500 - H^+
Temperature		^0C	Dry	APHA - 2550 - B
Total Ammonia		mg/l	Dry	APHA-4500-NH_3-D
B.O.D		mg/l	Dry	APHA - 5210 - B
C.O.D		mg/l	Dry	APHA - 5220 - D
Total Suspended Solids		mg/l	Dry	APHA - 2540 - B
Dissolved Oxygen		% O_2 sat	Dry	APHA - 4500-O-G

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 11/09/2012

Page 1 of 1

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TEST REPORT

Analysing
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Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105685.4
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Tel +353 61 455399
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E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS6			
Conductivity		μScm^{-1}	Dry	APHA - 2510 - B
Arsenic		ug/l	n/a	APHA - 3120 - B
Boron		ug/l	n/a	APHA - 3120 - B
Cadmium		ug/l	n/a	APHA - 3120 - B
Calcium		mg/l	n/a	APHA - 3120 - B
Total Chromium		ug/l	n/a	APHA - 3120 - B
Copper		ug/l	n/a	APHA - 3120 - B
Cyanide		mg/l	n/a	APHA - 4500 - CN^--E
Fluoride		mg/l	n/a	APHA - 4110 - B
Iron		ug/l	n/a	APHA - 3120 - B
Lead		ug/l	n/a	APHA - 3120 - B
Magnesium		mg/l	n/a	APHA - 3120 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

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TEST REPORT

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Calibrating

Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 105685.4
Order No.:
Date Received: 29/08/12
Date Completed: 28/09/12
Test Specification: Nil
Item :See below

BHP
New Road
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Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Annual Landfill Monitoring SS6			
Mercury		ug/l	Dry	APHA - 3120 - B
Nickel		ug/l	n/a	APHA - 3120 - B
Potassium		mg/l	n/a	APHA - 3120 - B
Sodium		mg/l	n/a	APHA - 3120 - B
Tin		ug/l	n/a	APHA - 3120 - B
Zinc		ug/l	n/a	APHA - 3120 - B
Sulphate (as SO_4)		mg/l	n/a	APHA - 4110 - B
Total Phosphorus (as P)		mg/l	n/a	APHA - 4500 - P
OrthoPhosphate (as P)		mg/l	n/a	APHA - 4500 - P-E
Nitrate (as NO_3)		mg/l	n/a	APHA - 4110 - B
Nitrite (as NO_2)		mg/l	n/a	APHA - 4110 - B
Total Oxidised Nitrogen (as N)		mg/l	n/a	APHA - 4110 - B

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 04/10/2012

BHP/CL/02C

TEST REPORT

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Client: Response Engineering
Traderee TP
Shannon
Co. Clare

FTAO: Ailish Johnson

BHP Ref. No.: 102747.6
Order No.:
Date Received: 29/02/12
Date Completed: 06/03/12
Test Specification: Nil
Item :See below

BHP
New Road
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Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail bhpcem2@bhp.ie

TEST	Client Reference	Units	Results	Standard Reference
	Biannual Landfill Monitoring SS7			
pH		-	Dry	APHA - 4500 - H^+
Temperature		^0C	Dry	APHA - 2550 - B
Total Ammonia		mg/l	Dry	APHA-4500-NH_3-D
B.O.D		mg/l	Dry	APHA - 5210 - B
C.O.D		mg/l	Dry	APHA - 5220 - D
Total Suspended Solids		mg/l	Dry	APHA - 2540 - B
Dissolved Oxygen		% O_2 sat	Dry	APHA - 4500-O-G

Additional information : All Methods are from Standard Methods for the Examination of Water and Wastewater, 20th Edition.

For and on behalf of BHP laboratories :

Pat O'Sullivan
Issue Date 06/03/2012

Page 1 of 1

Appendix H – Meteorological Data

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	1	1	83.7	998.7	13	230	0.3	0.2
2012	1	2	83.8	1001.5	14.1	235	0.8	1
2012	1	3	77.5	998.8	23.7	260	1	1.3
2012	1	4	87.5	1014.9	21.2	250	0.6	0.9
2012	1	5	81	1015.8	18.7	285	0.5	0.7
2012	1	6	96.4	1025.6	11	245	0.3	0.4
2012	1	7	83.5	1027	9.1	255	0.6	0.7
2012	1	8	89.7	1028	9.4	235	0.5	0.5
2012	1	9	88.5	1029	7.3	220	0.4	0.5
2012	1	10	95.2	1030	8.7	210	0.3	0.5
2012	1	11	97.5	1030.8	10.9	230	0.3	0.4
2012	1	12	95.2	1031	8.2	245	0.3	0.4
2012	1	13	95	1032.7	4.8	130	0.3	0.4
2012	1	14	78.4	1021.8	13.1	110	0.7	0.9
2012	1	15	72.5	1016.2	13.8	115	1.1	1.3
2012	1	16	85.1	1019.1	10.1	100	0.7	0.9
2012	1	17	88.9	1018.4	12	155	0.5	0.6
2012	1	18	90.2	1021.4	7.2	235	0.3	0.4
2012	1	19	85.8	1021.9	12.8	255	0.7	0.9
2012	1	20	90.7	1023.6	16.1	250	0.6	0.8
2012	1	21	86.3	1018.9	17.4	255	0.6	0.8
2012	1	22	80.4	1019.4	12.8	255	0.7	0.8
2012	1	23	95	1020.8	4.9	250	0.3	0.4
2012	1	24	96.9	1016.4	12.3	235	0.4	0.6
2012	1	25	85.2	1003.1	13.4	175	0.7	1
2012	1	26	84.6	1004.4	12	245	0.6	0.8
2012	1	27	85	1022.1	7.4	270	0.4	0.5
2012	1	28	96.6	1031	5.8	115	0.2	0.3
2012	1	29	97.4	1026.4	4.8	200	0.4	0.6
2012	1	30	96.8	1019.5	10.1	105	0.5	0.7
2012	1	31	82.5	1023.5	10.2	80	0.7	0.9
January							16.3	21.1

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	2	1	74.2	1033.8	7.9	75	0.6	0.8
2012	2	2	77.7	1035.8	8.2	95	0.6	0.8
2012	2	3	82.8	1035.4	9.9	115	0.7	0.9
2012	2	4	92.7	1028.8	6.9	165	0.5	0.6
2012	2	5	92.2	1030.1	5.1	250	0.4	0.5
2012	2	6	97	1034	4.3	270	0.4	0.5
2012	2	7	91.7	1035.4	10.2	120	0.5	0.7
2012	2	8	89.2	1034.9	14.1	140	0.6	0.9
2012	2	9	92	1035.2	5.9	135	0.6	0.8
2012	2	10	94.8	1032.2	1.9	55	0.5	0.6
2012	2	11	93.9	1032.3	4	245	0.4	0.6
2012	2	12	95.9	1037.2	3	235	0.4	0.5
2012	2	13	87.7	1036.5	7.8	300	0.6	0.8
2012	2	14	84.8	1036.5	7.3	295	0.7	0.9
2012	2	15	82.5	1036.3	8.4	285	0.8	1
2012	2	16	88.9	1031.3	10.8	245	0.7	1
2012	2	17	97.5	1022.5	14.5	240	0.5	0.8
2012	2	18	82.5	1014.5	12.7	280	0.5	0.9
2012	2	19	82.1	1028.2	6.1	255	0.7	1.1
2012	2	20	83.9	1025.8	9.2	160	0.7	1
2012	2	21	86	1021.2	9.4	165	0.9	1.2
2012	2	22	94.6	1015.4	16.4	240	0.7	1
2012	2	23	92.9	1022.5	11.5	220	0.7	1
2012	2	24	86.9	1027.9	7.6	295	0.5	0.7
2012	2	25	89	1029.5	2.5	345	0.6	0.8
2012	2	26	92.1	1026.5	6.3	180	0.7	1
2012	2	27	92.1	1023	9.5	205	0.6	0.9
2012	2	28	85	1023	4.7	205	0.8	1
2012	2	29	84.2	1019	10.5		1	1.4
February							17.9	24.7

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	3	1	84	1022.9	6.5	110	1	1.4
2012	3	2	86.8	1018.8	13.7	115	0.9	1.5
2012	3	3	82.9	1011.1	10.4	180	0.8	1.2
2012	3	4	83.9	1023.2	7.5	260	0.9	1.4
2012	3	5	82.7	1030	4.8	250	1	1.5
2012	3	6	90.5	1019.5	10.7	155	0.7	1
2012	3	7	78.5	1017.9	16.5	260	1	1.7
2012	3	8	78	1029.1	10.9	240	1.5	2.1
2012	3	9	90.1	1031.2	11	220	1.2	1.6
2012	3	10	92.9	1038.5	5.9	245	0.8	1.1
2012	3	11	90.4	1039	2.4	280	0.8	1.1
2012	3	12	87.5	1035.2	3.5	155	0.8	1.1
2012	3	13	84.5	1033.4	5.8	125	1	1.3
2012	3	14	82	1028.1	8.6	145	1.3	1.8
2012	3	15	83	1020.6	7.7	155	1	1.4
2012	3	16	88.4	1012	8.2	215	0.7	1
2012	3	17	87	1009.8	5.8	185	1.1	1.5
2012	3	18	80	1022.8	7.6	310	1.5	2.2
2012	3	19	79.1	1031	9.2	200	1.3	1.8
2012	3	20	75.1	1032.2	9.1	180	1.5	2
2012	3	21	76.2	1031.4	8.6	150	1.1	1.5
2012	3	22	80.4	1025	8.5	90	1.4	1.9
2012	3	23	84.8	1021.3	12.1	120	1.2	1.7
2012	3	24	76.7	1021.9	13.1	115	1.7	2.3
2012	3	25	76.7	1029.8	8.5	130	2.4	3.2
2012	3	26	71.4	1033.2	6.4	95	2.2	3.1
2012	3	27	65.2	1034.8	6.2	100	2.6	3.5
2012	3	28	68.8	1034.7	3.1	65	2.2	3.1
2012	3	29	74.7	1033.5	3.5	330	2.2	3
2012	3	30	88.2	1030.1	5.4	330	1	1.5
2012	3	31	76.9	1024.5	6.4	25	1.3	1.8
March							**40.1**	**56.3**

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	4	1	76.6	1022.1	3.6	25	1.6	2.2
2012	4	2	86.6	1013.8	4.2	310	0.9	1.2
2012	4	3	78.8	1010.4	11.5	335	1.4	2.3
2012	4	4	60.1	1021.1	13	350	2	2.8
2012	4	5	65.5	1024.5	7.4	20	1.9	2.9
2012	4	6	85.6	1020.5	6.7	300	1.2	1.8
2012	4	7	85	1018.7	8	325	1.1	1.4
2012	4	8	88.6	1014.8	10.4	255	0.9	1.3
2012	4	9	91	991.5	12.9	235	0.9	1.6
2012	4	10	82	990.2	9.5	255	1.8	2.8
2012	4	11	81.8	1000.5	6.1	290	2	2.9
2012	4	12	80.1	1006.8	7.3	295	1.7	2.4
2012	4	13	75.6	1006.7	4.6	320	1.9	2.6
2012	4	14	70.1	1014	7.8	335	2.2	3.2
2012	4	15	65.5	1026	4.1	340	1.7	2.4
2012	4	16	79.1	1016.7	12.7	155	1.5	2.2
2012	4	17	91	991.5	16.2	240	1.4	2.5
2012	4	18	85.3	986.1	11.2	315	2	3.2
2012	4	19	78	993.3	10.3	285	2.2	3.5
2012	4	20	78.5	994.8	8.5	260	2.1	3.2
2012	4	21	78.3	1000.8	11.1	270	2.1	3.5
2012	4	22	80.5	1002.9	10.8	255	1.9	2.9
2012	4	23	79.7	997.5	8.2	315	1.8	2.6
2012	4	24	78.5	998.2	5.2	140	2.1	3
2012	4	25	85.2	984.7	15.6	15	1	1.5
2012	4	26	78.5	997.8	14.7	340	1.7	2.4
2012	4	27	63.2	1014.8	10	360	2.5	3.7
2012	4	28	67.8	1022	10.6	25	2.5	3.9
2012	4	29	63.9	1015	14.9	15	2.8	4.5
2012	4	30	77	1010.7	16.6	20	1.9	3
April							**52.7**	**79.4**

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	5	1	81.7	1017.5	15.9	30	1.5	2.4
2012	5	2	78.2	1022.6	5.2	35	3	4.3
2012	5	3	75.5	1014.2	5.1	30	2.6	3.4
2012	5	4	82.3	1009.5	8.4	15	1.5	2.1
2012	5	5	66.1	1013.1	7	40	1.9	2.7
2012	5	6	58	1012.7	9.2	100	2.8	4.1
2012	5	7	79.7	1004.2	8.5	190	2.4	3.5
2012	5	8	72.8	1005.5	7.8	330	2.5	3.7
2012	5	9	81.5	1004.9	6.6	40	1.5	2.2
2012	5	10	92.2	1003.8	7.1	300	1.1	1.6
2012	5	11	68.8	1028.7	9.8	295	2	2.7
2012	5	12	73.6	1040.6	7.1	245	2.9	4.4
2012	5	13	78.7	1027.7	15.3	220	2.1	3.7
2012	5	14	72.7	1017.3	14.3	265	2.6	4.5
2012	5	15	66.5	1024.2	10.9	295	3	4.7
2012	5	16	69.8	1026	3.5	270	2	2.8
2012	5	17	76	1014.5	5	90	1.5	2
2012	5	18	75.4	1008.9	8.1	15	2	2.9
2012	5	19	79.2	1012.2	8.8	20	1.4	2
2012	5	20	74.5	1012.4	4	125	2.8	3.7
2012	5	21	77.2	1010.8	8.9	125	2.6	3.5
2012	5	22	84.3	1014.9	11.9	145	2.4	3.4
2012	5	23	80	1023	12.6	120	2.4	3.6
2012	5	24	70.6	1026.9	6.4	110	4.5	5.9
2012	5	25	72	1021.7	6.8	85	2.5	3
2012	5	26	52.2	1017.4	11.8	80	5.7	7.7
2012	5	27	69.3	1017.4	6.5	130	4.4	5.8
2012	5	28	70.3	1016.1	10	120	3.2	4.6
2012	5	29	76.5	1016.6	8.5	135	2.6	3.5
2012	5	30	77.3	1016.9	6.3	180	3.1	4.2
2012	5	31	94.7	1018.9	7.1	225	1.3	1.9
May							**77.8**	**110.5**

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	6	1	84.4	1019.1	3.2	180	2.4	3.2
2012	6	2	87.9	1010.8	6.6	70	1.7	2.3
2012	6	3	89.1	1009	7.8	15	0.9	1.3
2012	6	4	71.6	1016.8	7	120	2.9	4
2012	6	5	87.6	1006.5	9	95	1.4	1.9
2012	6	6	83.5	998.1	4	150	2.3	3.1
2012	6	7	95	988.9	11.5	345	0.8	1.2
2012	6	8	77.8	1000.1	20.8	280	2.1	3.3
2012	6	9	68.8	1010	5.6	245	4.3	6.1
2012	6	10	75.8	1008.1	3.9	310	2.4	3.2
2012	6	11	79	1007	5.1	280	2.6	3.4
2012	6	12	84.4	1012.2	7.4	305	2.1	3
2012	6	13	74.3	1014.7	4.4	310	3.2	4.4
2012	6	14	83.5	1005.4	14	80	1.8	2.9
2012	6	15	90	990.2	14.4	90	1	1.4
2012	6	16	87.2	1001.6	10.4	285	1	1.4
2012	6	17	74.8	1015.6	3.9	265	1.5	1.9
2012	6	18	85.6	1014.5	6.1	130	2.1	2.9
2012	6	19	73.3	1016.3	5.6	130	3.1	4.3
2012	6	20	80.2	1013.9	8.5	105	2.4	3.3
2012	6	21	93.8	1003.3	8.5	250	1.2	1.8
2012	6	22	82.4	1010.2	15	260	3.1	5.1
2012	6	23	86	1013.3	10.7	215	1.9	2.7
2012	6	24	80.9	1014.1	8.6	260	3.6	5.3
2012	6	25	80.7	1016.9	7.2	110	2.3	3.1
2012	6	26	88.8	1015	9	215	2.4	3.5
2012	6	27	86.7	1012.7	8.6	145	2.6	3.7
2012	6	28	87	997.6	9.6	155	2.7	3.9
2012	6	29	87	994.9	12.3	235	2.3	3.5
2012	6	30	85.7	1005.1	11.7	255	2.2	3.4
June							66.3	94.5

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	7	1	88.2	1009.4	9.1	240	1.7	2.4
2012	7	2	88.5	1006.7	7.5	240	2.9	4.1
2012	7	3	94.2	1004.8	8.2	130	1.4	1.9
2012	7	4	84.3	1003.5	6.8	95	2.2	3.1
2012	7	5	80.8	1009.6	4.1	320	2.9	3.9
2012	7	6	89.9	1009.9	5.1	325	1.3	1.7
2012	7	7	86.1	1008.3	9.5	330	2.6	3.6
2012	7	8	85.5	1011.7	8.2	330	1.2	1.7
2012	7	9	84.5	1013.4	9.0	325	1.8	2.5
2012	7	10	83.5	1014.6	10.0	275	2.4	3.4
2012	7	11	78.0	1014.2	7.5	280	3	4.3
2012	7	12	93.4	1007.8	7.0	75	1.5	2.3
2012	7	13	87.3	1003.2	7.4	350	2.1	2.9
2012	7	14	75.3	1010.6	8.3	295	2.6	3.7
2012	7	15	81.8	1015.7	7.7	230	2.4	3.4
2012	7	16	95.8	1016.3	13.1	245	1.4	2.3
2012	7	17	91.8	1019.7	11.0	225	2.5	3.8
2012	7	18	90.7	1012.3	10.0	255	2.3	3.5
2012	7	19	78.5	1014.5	7.0	295	3.2	4.6
2012	7	20	72.0	1020.0	4.6	305	3	4.1
2012	7	21	72.5	1023.2	5.7	200	3.2	4.4
2012	7	22	83.6	1019.6	11.8	170	2.5	3.5
2012	7	23	95.5	1015.9	7.8	190	1.6	2.3
2012	7	24	94.1	1016.9	5.0	320	1.6	2.2
2012	7	25	89.7	1020.7	5.2	355	2.5	3.4
2012	7	26	81.0	1020.5	6.2	300	3.3	4.6
2012	7	27	76.2	1018.6	10.6	285	3.6	5.6
2012	7	28	77.8	1013.5	10.3	275	3	4.4
2012	7	29	77.5	1013.4	9.5	260	3	4.6
2012	7	30	80.8	1014.0	6.5	210	2.1	3
2012	7	31	93.3	1005.8	11.5	145	1.4	2.1
July							**72.2**	**103.3**

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	8	1	82.5	998.1	14.1	160	2.2	3.5
2012	8	2	79.6	1003.2	11.0	145	2.4	3.5
2012	8	3	88.6	1001.3	10.4	125	1.2	1.6
2012	8	4	84.9	1003.1	9.3	15	1.6	2.1
2012	8	5	88.0	1008.3	7.0	335	1.4	1.8
2012	8	6	91.0	1011.3	6.8	240	1.4	2.1
2012	8	7	89.2	1016.6	5.6	110	1.8	2.4
2012	8	8	90.4	1022.8	3.7	200	2.3	3
2012	8	9	87.6	1026.5	2.6	125	3.3	4.3
2012	8	10	73.5	1024.3	7.2	100	4.2	5.6
2012	8	11	77.5	1014.0	11.4	90	2.7	3.8
2012	8	12	88.0	1006.1	8.3	110	2.4	3.3
2012	8	13	85.5	1001.2	8.4	145	1.7	2.1
2012	8	14	77.6	1004.6	9.0	135	2	2.5
2012	8	15	86.3	990.3	18.0	85	1.7	2.6
2012	8	16	82.4	1000.7	12.0	155	2.8	3.2
2012	8	17	90.2	1003.0	5.8	120	2	2.3
2012	8	18	81.3	1009.4	10.3	155	2	2.5
2012	8	19	85.7	1012.8	12.2	135	1.7	2.1
2012	8	20	81.8	1015.8	8.2	240	2.6	3.6
2012	8	21	84.3	1014.1	11.8	230	2.4	3.6
2012	8	22	87.5	1015.9	12.4	240	2.3	3.4
2012	8	23	85.2	1010.7	7.9	155	1.2	1.4
2012	8	24	93.0	998.5	9.8	70	1.1	1.6
2012	8	25	85.1	1006.8	9.3	295	2.4	3.6
2012	8	26	86.8	1012.4	8.8	135	1.7	2.5
2012	8	27	86.0	1001.5	12.4	225	1.8	2.7
2012	8	28	78.2	1006.2	12.0	165	2.3	3.1
2012	8	29	86.1	1002.4	13.3	160	1.9	3
2012	8	30	71.7	1025.1	9.1	295	2.5	3.5
2012	8	31	85.5	1030.5	7.7	235	1.4	2
August							**64.4**	**88.3**

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	9	1	88.2	1024.0	10.8	220	1.9	2.9
2012	9	2	87.4	1025.2	5.4	265	1.1	1.6
2012	9	3	89.8	1025.1	6.4	120	1.7	2.3
2012	9	4	83.2	1027.4	7.2	295	1.8	2.7
2012	9	5	82.5	1031.2	2.7	350	2.1	2.8
2012	9	6	85.1	1027.1	7.0	255	2.4	3.5
2012	9	7	90.7	1024.6	5.4	225	1.4	1.8
2012	9	8	81.7	1017.2	6.8	155	2	2.8
2012	9	9	88.1	1003.7	10.3	215	1.5	2.1
2012	9	10	92.1	1005.8	6.9	225	0.9	1.2
2012	9	11	78.8	1015.6	10.3	265	1.6	2.4
2012	9	12	86.9	1016.9	9.3	290	1.8	2.7
2012	9	13	88.2	1018.8	13.8	240	1.4	2.1
2012	9	14	83.5	1016.9	13.3	270	1.9	2.9
2012	9	15	87.6	1016.5	8.7	245	1.3	1.8
2012	9	16	85.6	1010.3	10.6	250	1.2	1.8
2012	9	17	86.0	1010.3	11.2	230	1.3	1.8
2012	9	18	77.5	1018.8	9.8	285	1.9	2.8
2012	9	19	85.8	1023.2	6.7	230	1.1	1.6
2012	9	20	88.3	1017.2	7.2	205	1.1	1.5
2012	9	21	81.8	1018.4	6.5	25	1.4	2
2012	9	22	80.9	1018.7	6.4	120	1.6	2.2
2012	9	23	84.5	1006.8	7.1	105	1.2	1.7
2012	9	24	94.9	995.0	4.9	315	0.6	0.8
2012	9	25	90.3	990.4	10.9	330	0.9	1.2
2012	9	26	78.7	1000.3	13.8	330	1.9	2.6
2012	9	27	86.0	1010.7	7.0	270	1.1	1.5
2012	9	28	87.2	1012.3	10.0	255	1.4	1.9
2012	9	29	82.8	1019.0	9.0	245	1.3	1.8
2012	9	30	87.0	1010.5	13.7	220	1.1	1.6
September							**43.9**	**62.4**

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	10	1	83.7	1007.0	11.7	190	1.4	1.9
2012	10	2	83.2	1001.1	12.7	195	1.4	2
2012	10	3	83.3	1002.0	12.8	245	1.4	2.1
2012	10	4	90.2	1004.5	6.9	190	0.9	1.3
2012	10	5	86.4	1007.0	4.8	245	0.7	1
2012	10	6	91.3	1015.9	2.7	350	0.9	1.3
2012	10	7	91.9	1019.5	6.1	80	0.7	1
2012	10	8	90.1	1014.3	7.5	50	0.8	1
2012	10	9	88.9	1015.5	4.5	20	0.7	1
2012	10	10	91.9	1009.4	6.5	110	0.7	0.9
2012	10	11	85.9	1004.2	9.9	305	0.6	0.9
2012	10	12	88.8	1006.6	5.2	245	0.7	1.1
2012	10	13	87.3	1006.4	5.8	250	0.9	1.3
2012	10	14	90.9	1005.5	5.7	280	0.7	1
2012	10	15	94.5	998.4	9.2	165	0.4	0.7
2012	10	16	78.1	996.1	11.1	260	1.1	1.6
2012	10	17	92.4	981.7	9.4	60	0.7	1
2012	10	18	95.5	992.1	8.1	285	0.6	0.9
2012	10	19	89.3	1007.1	5.8	340	0.7	1
2012	10	20	86.8	1011.3	8.0	130	1	1.3
2012	10	21	85.3	1015.8	10.5	115	1.1	1.5
2012	10	22	90.5	1021.1	6.2	90	0.7	1
2012	10	23	95.3	1026.0	4.4	25	0.6	0.7
2012	10	24	91.8	1021.9	10.0	30	0.7	0.9
2012	10	25	92.9	1017.7	12.3	30	0.7	0.9
2012	10	26	70.1	1020.3	11.7	30	0.8	1.2
2012	10	27	74.4	1027.5	5.5	290	0.6	0.8
2012	10	28	83.7	1013.4	12.0	245	0.6	0.9
2012	10	29	91.3	1010.4	4.5	325	0.4	0.6
2012	10	30	85.9	1004.2	8.9	215	0.6	0.8
2012	10	31	85.9	980.4	7.6	205	0.4	0.6
October							**24.2**	**34.2**

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	11	1	86.0	980.1	8.6	250	0.6	0.8
2012	11	2	84.3	988.3	9.7	215	0.8	1.1
2012	11	3	82.3	990.5	11.9	195	0.9	1.1
2012	11	4	89.4	989.5	9.6	345	0.5	0.7
2012	11	5	89.1	1013.4	6.6	325	0.6	0.8
2012	11	6	83.1	1025.1	9.6	265	0.6	0.8
2012	11	7	87.3	1023.8	10.5	235	0.6	0.8
2012	11	8	92.5	1018.7	7.2	240	0.4	0.6
2012	11	9	89.5	1002.7	8.4	190	0.5	0.7
2012	11	10	89.2	997.7	7.8	255	0.4	0.6
2012	11	11	88.7	1012.9	6.0	260	0.5	0.6
2012	11	12	96.5	1012.8	9.5	200	0.3	0.5
2012	11	13	94.2	1015.1	9.4	145	0.3	0.5
2012	11	14	92.0	1021.3	5.7	160	0.4	0.5
2012	11	15	97.4	1020.9	4.3	150	0.3	0.4
2012	11	16	93.2	1012.4	3.0	215	0.3	0.4
2012	11	17	88.8	1009.8	6.9	235	0.3	0.4
2012	11	18	92.7	1006.5	12.3	130	0.4	0.6
2012	11	19	89.8	994.6	13.8	170	0.5	0.7
2012	11	20	84.7	996.0	12.6	145	0.3	0.4
2012	11	21	86.3	1002.6	10.4	160	0.3	0.4
2012	11	22	84.3	994.9	12.3	175	0.6	0.8
2012	11	23	86.3	1007.7	7.0	210	0.1	0.1
2012	11	24	95.0	1009.9	3.4	325	0.1	0.2
2012	11	25	93.3	1000.9	7.9	90	0.3	0.4
2012	11	26	80.7	1011.1	13.6	330	0.7	0.8
2012	11	27	81.3	1019.2	8.1	325	0.3	0.3
2012	11	28	89.3	1023.3	3.0	315	0.1	0.2
2012	11	29	96.7	1016.1	5.0	120	0.2	0.2
2012	11	30	96.2	1012.3	5.8	45	0.2	0.3
November							**12.4**	**16.7**

Shannon Airport Weather Records 2012

Year	Month	Day	Mean Realative Humidity (%)	Mean MSL Pressure (hpa)	Mean Wind Speed (kt)	Predominant Wind Direction (degrees)	Potential Evapotranspiration (mm)	Evaporation (mm)
2012	12	1	94.9	1019.9	3.2	255	0.2	0.3
2012	12	2	97.8	1013.7	9.3	220	0.3	0.4
2012	12	3	86.7	1009.5	9.1	255	0.2	0.2
2012	12	4	87.0	1007.7	9.6	260	0.5	0.7
2012	12	5	87.9	1016.2	5.0	280	0.1	0.2
2012	12	6	87.5	1009.9	12.3	215	0.4	0.6
2012	12	7	81.8	1016.4	9.0	290	0.3	0.4
2012	12	8	93.1	1028.0	4.9	235	0.3	0.3
2012	12	9	94.9	1024.9	5.8	250	0.3	0.4
2012	12	10	93.1	1026.8	4.3	75	0	0.1
2012	12	11	82.2	1025.6	10.9	100	0.7	0.8
2012	12	12	84.5	1011.6	11.5	120	0.8	1
2012	12	13	84.7	997.1	12.5	110	0.4	0.4
2012	12	14	91.5	975.9	11.8	225	0.5	0.6
2012	12	15	88.5	984.3	8.7	195	0.3	0.4
2012	12	16	87.5	990.6	10.1	160	0.5	0.7
2012	12	17	89.0	1001.1	12.0	245	0.2	0.2
2012	12	18	93.7	1012.6	9.3	115	0.3	0.3
2012	12	19	94.1	1003.4	11.0	120	0.3	0.4
2012	12	20	99.1	999.9	3.6	115	0.2	0.3
2012	12	21	96.8	1005.6	8.8	120	0.2	0.3
2012	12	22	95.2	992.7	11.7	185	0.4	0.6
2012	12	23	86.1	998.3	13.3	220	0.7	0.8
2012	12	24	88.0	991.7	7.7	150	0.4	0.4
2012	12	25	92.7	994.5	6.5	240	0.2	0.3
2012	12	26	85.7	999.0	13.1	245	0.6	0.8
2012	12	27	91.0	1005.6	7.8	190	0.3	0.4
2012	12	28	85.8	1000.3	16.1	185	0.7	0.9
2012	12	29	80.7	994.3	12.3	205	0.8	1
2012	12	30	83.8	1002.2	19.0	240	0.8	1.1
2012	12	31	91.0	996.0	14.0	250	0.5	0.6
December							**12.4**	**15.9**

Appendix I – Water Balance Calculations

Water Balance Calculations 2012

Upper Bound 10% infiltration of actual rainfall on the area covered with capping and Cell 1

Period (Jan 2012 - Dec 2012)	Active cell (m2)	Effective Rainfall (m) - Active Cell	Volume of waste (t)	Effective Rainfall x Active Area	Absorptive Capacity (m3)	Volume of free leachate	Final Capped Area (m2)	Effective Rainfall (m) - Capped Area	Volume of Leachate Capped (m3)	Total Leachate produced
January	4370	0.0907	88	396.359	3.468	392.89	15742	0.0955	150.34	543.23
February	4370	0.0139	88	60.743	3.468	57.28	15742	0.0207	32.59	89.86
March	4370	0	88	0	3.468	-3.47	15742	0	0	-3.47
April	4370	0	88	0	3.468	-3.47	15742	0.0255	40	36.67
May	4370	0	88	0	3.468	-3.47	15742	0	0.00	-3.47
June	4370	0.0724	88	316.388	3.468	312.92	15742	0.1006	158.36	471.28
July	4370	0.0095	88	41.515	3.468	38.05	15742	0.0406	64	101.96
August	4370	0.0080	88	34.96	3.468	31.49	15742	0.0247	39	70.37
September	4370	0	88	0	3.468	-3.47	15742	0.0180	28.34	24.87
October	4370	0.0514	88	224.618	3.468	221.15	15742	0.0614	96.66	317.81
November	4370	0.1043	88	455.791	3.468	452.32	15742	0.1086	170.96	623.28
December	4370	0.0978	88	427.386	3.468	423.92	15742	0.1013	159.47	583.38
TOTAL						**1916.14**			**939.64**	**2855.78**

Lower Bound 2% infiltration of actual rainfall on the area covered with capping and Cell 1

Period (Jan 2012 - Dec 2012)	Active cell (m2)	Effective Rainfall (m) - Active Cell	Volume of waste (t)	Effective Rainfall x Active Area	Absorptive Capacity (m3)	Volume of free leachate	Final Capped Area (m2)	Effective Rainfall (m) - Capped Area	Volume of Leachate Capped (m3)	Total Leachate produced
January	4370	0.0907	88	396.359	3.468	392.89	15742	0.0955	30.07	422.96
February	4370	0.0139	88	60.743	3.468	57.28	15742	0.0207	6.52	63.79
March	4370	0.0000	88	0	3.468	-3.47	15742	0.0000	0	-3.47
April	4370	0.0000	88	0	3.468	-3.47	15742	0.0255	8	4.56
May	4370	0.0000	88	0	3.468	-3.47	15742	0.0000	0.00	-3.47
June	4370	0.0724	88	316	3.468	312.92	15742	0.1006	31.67	344.59
July	4370	0.0095	88	42	3.468	38.05	15742	0.0406	13	50.83
August	4370	0.0080	88	35	3.468	31.49	15742	0.0247	8	39.27
September	4370	0.0000	88	0.000	3.468	-3.47	15742	0.0180	5.67	2.20
October	4370	0.0514	88	224.618	3.468	221.15	15742	0.0614	19.33	240.48
November	4370	0.1043	88	455.791	3.468	452.32	15742	0.1086	34.19	486.51
December	4370	0.0978	88	427.386	3.468	423.92	15742	0.1013	31.89	455.81
TOTAL						**1916.14**			**187.93**	**2104.07**

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.16

REFERENCE YEAR	2012

1. FACILITY IDENTIFICATION

Parent Company Name	Clare County Council
Facility Name	Tradaree Point E.T.P.
PRTR Identification Number	W0037
Licence Number	W0037-01

Waste or IPPC Classes of Activity

No.	class_name
3.7	Swaging by explosives where the production area exceeds 100 square metres.
3.1	The initial melting or production of iron and steel
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
3.4	The production, recovery or processing of non-ferrous metals, their compounds or other alloys including antimony, arsenic, beryllium, chromium, lead, magnesium, manganese, phosphorus, selenium, cadmium, or mercury, by thermal, chemical, or electrolytic means in installations with a batch capacity exceeding 0.5 tonnes.
3.5	The reaction of aluminium or its alloys with chlorine or its compounds, not included in paragraph 5.13.
3.6	The roasting, sintering or calcining of metallic ores in plants with a capacity exceeding 1,000 tonnes per year.
Address 1	Tradaree Point E.T.P.
Address 2	Shannon, (Clonmoney South)
Address 3	Co. Clare
Address 4	
	Clare
Country	Ireland
Coordinates of Location	-8.83337 52.6899
River Basin District	IEGBNISH
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Ms Ailish Johnston, Response Group
AER Returns Contact Email Address	ajohnston@response-group.ie
AER Returns Contact Position	Environmental Manager
AER Returns Contact Telephone Number	063-33400
AER Returns Contact Mobile Phone Number	086-0400765
AER Returns Contact Fax Number	063-33401
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	1
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
50.1	General
50.1	General

3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

Is it applicable?	
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4. WASTE IMPORTED/ACCEPTED ONTO SITE

Guidance on waste imported/accepted onto site

Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	

This question is only applicable if you are an IPPC or Quarry site

4.1 RELEASES TO AIR Link to previous years emissions data | PRTR# : W0037 | Facility Name : Tradaree Point E.T.P. | Filename : W0037_2012.xls | Return Year : 2012 | 09/07/2013 09:21

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0
03	**Carbon dioxide (CO2)**	E	ESTIMATE		4323.3	4323.3	0.0	0.0
01	Methane (CH4)	E	ESTIMATE		3107.3	3107.3	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
210	Dust	M	ALT	vdi 2119 Part 2	2.3	2.3	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Tradaree Point E.T.P.

Please enter summary data on the quantities of methane flared and / or utilised	**T (Total) kg/Year**	**M/C/E**	**Method Used**		**Facility Total Capacity m3 per hour**	
			Method Code	**Designation or Description**		
Total estimated methane generation (as per site model)	3107.3	E	ESTIMATE	Modelled by Tobin engineers	N/A	
Methane flared	0.0				0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	3107.3	E	ESTIMATE	Modelled by Tobin engineers	N/A	

4.2 RELEASES TO WATERS

Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns Releases from your facility

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

0

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

4.4 RELEASES TO LAND

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

Please enter all quantities on this sheet in Tonnes

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	~~Haz Waste~~ : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	**19 07 03**	**No**	57805.2	landfill leachate other than those mentioned in 19 07 02	D8	M	Volume Calculation	Onsite of generation	Shannon Town Wastewater Treatment Plant,D0045	Tradaree point,Clonmoney South,Shannon,Co. Clare,Ireland		

* Select a row by double-clicking the Description of Waste then click the delete button

Link to previous years waste data
Link to previous years waste summary data & percentage change