Waste Acceptance Procedure for Corranure Landfill

1. Scope/Purpose

The purpose of this document is to ensure that only wastes which the licence will permit the landfill to accept are allowed to be deposited onsite. The Waste Acceptance Procedure for Corranure Landfill is to comply with Condition 5 (Facility Operation and Waste Management) of the licence.

2. References

3. Records

Weighbridge Docket

Acceptable Waste List

Complaints Handling/Corrective Action Form

Rejected loads Form

4. Procedures

4.1 Onsite acceptance of the Waste

4.1.1 On entering the site the waste (be it from a household, haulier or commercial transit) is visually inspected by the weighbridge operator. If the materials are acceptable then the weight and the character of the waste is recorded in the GeneSYS Weighbridge Software System. If the waste type and EWC code cannot be determined at the weighbridge confirmation should be sought from the Environmental Manager or Facility Manager.

4.1.2 The waste currently accepted at Corranure Landfill is non-hazardous waste, mostly comprised of municipal or commercial was which is broadly similar to household waste. Inert material accepted on site is used for the construction of internal access roads and as cover material. Waste will only be accepted at the facility as designated by the waste licence.

4.1.3 This waste will only be accepted at the facility, from Local Authority waste collection or transport vehicles or holders of waste collection permits, unless exempted or excluded, issued under the Waste management(Collection Permit) Regulations 2001

4.1.4 The driver will enter the site by the IN weighbridge, the driver will wait on the weighbridge until all relevant information is recorded, such as, waste type, weight, registration.

4.1.5 The driver is then directed to the appropriate disposal point by the Weighbridge Operative, or Facility Manager. The driver will be given the signal to enter the site by the Weighbridge Operative or Facility Manager by lifting the barrier.

4.2 Waste Placement in the Active Cell

4.2.1 All of the waste entering the site at Corranure ends up at the active working face and compacted. Lorry drivers are directed to the appropriate tipping area by the tipface supervisor.

4.2.2 The waste is compacted in layers of about 1 – 1.5m deep.

4.2.3 The working face shall be no more than 2.5m in height after compaction, no more than 25m wide and have a slope no greater than 1 in 3.

4.2.4 After each days operation the waste is covered using an inert material or clay material.

4.2.5 When operations move to a different section of the cell, temporary capping will be provided by a layer of soil of at least 0.5m depth.

4.3 Non Conforming Waste

4.3.1 If the material presented is found to be unacceptable at any time after it has entered the site it is immediately loaded back into the container in which it arrived. If this is not possible, or if the unacceptable waste makes up only a fraction of the load, it shall be separated and placed in the waste quarantine area. The Tipface Supervisor will inform the Environmental Manager/Compliance Officer of any such incident and a Complaints Handling/Corrective Action Form shall be completed by the Weighbridge Operative or Environmental Manager/Compliance Officer and submitted to the Environmental Manager immediately for EPA files.

4.3.2 An appropriate and approved facility for the recovery or disposal of the material will be identified immediately and the materials will be sent there to be properly dealt with at the earliest possible time. Or where possible returned immediately to the customer with a Rejected Load Form.

4.3.3 The customer will be notified as to the offending material that has been found in the skip/container.

5. Persons Responsible

Drivers

Weighbridge Operative

Facility Manager

Environmental Manager

Site Supervisor

Waste Acceptance Procedure for Oxigen Facilities

1 Scope / Purpose

The purpose of this document is to describe the methods involved in ensuring that all waste being received on the site is segregated into appropriate waste streams for recovery/recycling and that any material on the unacceptable waste list is quarantined in the correct manner.

2 References

3 Records

Weighbridge Docket

Acceptable Waste List Doc

Complaints Handling/Corrective Action Form

Rejected Waste Form

4 Procedures

4.1 Delivery of Skip

On delivery of a skip/container to the customer, the List of Acceptable Waste, must be given to the customer by the driver.

4.2 Collection of Skip / Waste Material

4.2.1 The driver arrives on site to collect a full skip /container of waste material.

4.2.2 The driver quickly inspects the skip / waste material to ensure that all the material is acceptable.

4.2.3 If the material is found to be acceptable, he/she will take it back to the Waste Facility.

4.2.4 If the material is unacceptable he/she will inform the customer that the materials must be removed before the skip / waste material are taken away.

4.3 On Site Acceptance of the Waste

4.3.1 On entering the site the waste is visually inspected by the weighbridge operator. If the materials are acceptable then the weight and the character of the waste is recorded in the Genesis Weighbridge Software System. If waste type and EWC code cannot be determined at the weighbridge confirmation should be sought from the Environmental Manager or Facility Manager.

4.3.2 The driver will enter the site by the IN weighbridge, the driver will wait on the weighbridge until all relevant information is recorded, such as, waste type, weight, registration.

4.3.3 The driver is then directed to the correct tipping area by the Weighbridge Operative, Facility Manager or Processing Manager. When this is completed, the driver will be given the signal to enter the site by the Weighbridge Operative, Facility Manager or Processing Manager by lifting the barrier.

4.3.4 Construction and Demolition waste is directed to the Construction and Demolition waste recovery area of the processing building, Construction and Industrial waste to a separate area of the building by the Weighbridge Operative, Facility Manager or Processing Manager.

4.3.6 The waste will be tipped onto the inspection floor as directed by the Processing Manager/Supervisor. The material will be levelled out to view all materials in it. If it is acceptable, it will be processed in accordance with procedure OXEP 02 Receipt, Processing and Dispatch of Waste Procedure. If it is unacceptable it will be dealt with in accordance with Section 4.4 of this procedure.

4.3.7 After tipping, the driver will proceed to the OUT weighbridge with the SAME cab unit and container and will remain on the OUT weighbridge until the empty weight is taken. The driver will be given the signal to leave the site when the Weighbridge Operator, Facility Manager or Processing Manager lifts the barrier.

4.4 Non Conforming Waste.

4.4.1 If the material presented is found to be unacceptable at any time after it has entered the site it is immediately loaded back into the container in which it arrived. If this is not possible, or if the unacceptable waste makes up only a fraction of the load, it shall be separated and placed in the waste quarantine area. The Processing Manager/Supervisor will inform the Environmental Manager/Compliance Officer of any such incident and a Complaints Handling/Corrective Action Form shall be completed by the Weighbridge Operative or Environmental Manager/Compliance Officer and a submitted to the Environmental Manager immediately for EPA files.

4.4.2 An appropriate and approved facility for the recovery or disposal of the material will be identified immediately and the materials will be sent there to be properly dealt with at the earliest possible time. Or where possible returned immediately to the customer with a Rejected Load Form doc.

4.4.3 The customer will be notified as to the offending material that has been found in the skip or bin.

4.4.4 Where non conforming waste types are found in the general waste pile it is not always possible to ascertain which load they originated from. In this case, any offending material shall be removed and quarantined to the appropriate quarantine container. Non conforming waste must never be loaded into the trommel.

5 Persons Responsible

Drivers (HGV/LGV/Machine)
Weighbridge Operative
Facility Manager
Processing Manager
Environmental Manager
Environmental Compliance Officer
Supervisor

Waste Handling - Receipt, Processing and Dispatch of Waste for Corranure Landfill

1. Scope / Purpose

The purpose of this document is to describe the methods involved in waste handling procedures the receipt, processing, despatch and land filling of waste.

2. References

Waste Acceptance Procedure

3. Records

Unacceptable Waste List

Rejected Loads Form

Quarantined Waste Form

Approved Suppliers List

4. Procedures

4.1 Receipt of Waste

4.1.1 Waste may be delivered to Corranure Landfill by Oxigen Environmental drivers, Cavan Waste Disposal drivers or by direct customer delivery.

4.1.2 Waste shall only be received in Cavan Waste Disposal and Oxigen Environmental skips, containers or in approved customer vehicles. Where skips are collected from customers, the driver of the collection vehicle shall perform a cursory inspection of the skip as per the Waste Acceptance Procedure.

4.1.3 Waste shall only be accepted by Corranure Landfill when adequately covered or netted. It is the responsibility of the Driver to ensure this is done and the Weighbridge Operative to ensure that each delivery enters in this manner.

4.1.4 ALL vehicles delivering waste to Corranure Landfill shall park on the weighbridge for docket generation.

4.1.5 Once parked on the weighbridge, the driver of the vehicle or his representative shall report to weighbridge operative to confirm vehicle/customer details and receive further instruction, the driver is required from this point to wear appropriate personal protective equipment on entry to the site.

4.1.6 When initial weighing is completed the weighbridge operator shall direct the driver to the tipping area.

4.1.7 Once the waste material is tipped the supervisor or appointee shall conduct a rudimentary examination of the waste material.

4.1.8 Once tipped the driver shall return to the weighbridge and report to the weighbridge operator for completion of the weighbridge dockets.

4.1.9 Should any materials cited on the Unacceptable Waste List or any other non-conforming material be discovered, the Landfill Manager/Facility Manager/ Compliance Officer shall be notified immediately and either a Rejected Loads Form or a Quarantined Waste Form will be completed and the procedure for this followed.

4.1.10 This unacceptable or hazardous waste will then be placed in the Waste Quarantine Area and subsequently forwarded for authorised disposal. Hazardous waste received at the landfill includes gas cylinders, WEE items and batteries.

4.2 Land filling of Waste

4.2.1 When it has been established at the weighbridge that the waste is designated for landfill the weighbridge operative will direct the driver to the tipping area in the landfill.

4.2.2 The driver will proceed to the tipping area and the lorry drivers will be directed to the tipping area by the tipface supervisor. The tipface supervisor will inspect the waste as the waste is being deposited to ensure that the waste matches the description (usually takes place in the compound area or at the tipface).

4.2.3 The waste is then compacted in layers of about 1 – 1.5m deep. The working face shall be no more than 2.5m in height after compaction, no more than 25m wide and have a slope no greater than 1 in 3.

4.2.4 After each days operation the waste is covered using a bio-degradable cover material, Hessian.

4.2.5 When operations move to a different part of the cell, temporary capping shall be a layer of soil at least 0.5m in depth.

5. Persons Responsible

Weighbridge Operator

Landfill Manager

Facility Manager

All drivers

Compliance Officer

BHP/CEM/23

Analysing
Testing
Consulting
Calibrating

TEST REPORT

Client: Cavan Co. Co

BHP Ref No.: 80994-998-81000
Order No.:
Date Received: 09th April 2008
Date Completed: 29th April 2008
Test Specification: Nil

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

Item: Corranure Landfill Site

Annual Report covering groundwater, surfacewater and private well monitoring at Corranure Landfill

Oxigen Environmental Ltd
Site Office
Corranuare Landfill
Cootehill Road
Cavan
Co.Cavan

FTAO: Joan Harrington

Report on Corranure Landfill for annual parameters for 2008

For and on behalf of BHP Ltd.

Pat O'Sullivan
Date Issued: 28th May 2008

Table of Contents

1.0 Introduction :

BHP were contracted by Cavan County Council to carry out environmental monitoring at Corranure Landfill site which is located outside Cavan town, Co.Cavan. This landfill is operational and is operated under waste license no. 77-1, which was issued to Cavan Co. Co. by the EPA.
This report covers surfacewater, groundwater and private well monitoring for all available samples at Corranure for the annual quarterly monitoring event of 2008. No leachate monitoring points were accessible at the time of sampling.

2.0 Sampling :

This monitoring is a continuation of an established monitoring program at Corranure Landfill. As such, the borehole locations are as on previously drafted site maps. A site map is attached in the appendices showing the borehole locations. BHP sampled at 5 boreholes. Their individual references are as shown in table 1.

Borehole reference	Static water level (m)
GW01 deep	2.26
GW04	13.17
GW01 shallow	2.36
GW05	Full
SA01	12.03

Table 1 : Borehole reference points and levels.

Locations for surfacewaters and private wells are also shown in the map.

In order to ensure correct groundwater monitoring, the following steps were taken.

1. Chemical analysis according to standard testing methods (As shown in table 2).

2. Appropriate on-site sampling techniques were utilised.
    - ISO 5667 ; 'Guidance on sampling of groundwaters' was followed which is appropriate for the objective of monitoring groundwater quality.
    - A Waterra inertial lift pump was utilised which is designed for borehole monitoring in that at no time does the pump come in contact with the water sample. By utilising dedicated hosing at each borehole and new sample containers then any possibility of cross-contamination is eliminated.
    - In order to achieve representative sampling, the method used needs to be capable of withdrawing samples whose composition reflects that of the sub-strata (and not that of stagnant water in the standpipe). In order to achieve this, each borehole is purged of several times its volume before any sample is taken. This is estimated on-site using an electronic dip-meter to measure depth of water and then calculating volume of water present (after measuring radius of borehole).

3. Having taken a representative sample, several analysis parameters are time sensitive and therefore need to be measured on-site i.e. pH, temperature, conductivity and dissolved oxygen. All meters are calibrated before each site-visit.
    - pH and temperature are measured using a Hanna HI 9023 C portable pH meter and thermocouple. The pH meter automatically compensates for temperature variations
    - Dissolved oxygen is measured using a Hanna HI 9142 portable oxygen meter.
    - Conductivity is measured using a Hanna HI 9033 multi-range conductivity meter.

4. BHP operates a chain of custody system. The sample site-sheet / chain of custody form can be found in Appendix B.

5. All samples received by the Laboratory were stored between 0 and 4°C. Subsequent analysis of all samples was carried out in accordance with Standard Methods for the examination of water and wastewater, 20th Edition, 1998, published by the American public health association.
   The methods and limits of detection are listed in the results section.

Parameters for Laboratory Analysis

PARAMETER	Standard Method Reference *** APHA-AWWA-WEF 20th Edition
pH	4500-H^+B
Temperature	2550B
Conductivity	2510B
COD	5220D
Colour	2120B
Turbidity	2130B
Total Suspended Solids	2540D
Alkalinity	2320B
Ammonia	4500-NH_3-D
TOC	5310A
Total Hardness	2340B
Calcium	3120B
Chloride	4110B
Fluoride	4110B
Nitrate	4110B
Magnesium	3120B
Potassium	3120B
Sodium	3120B
Sulphate	4110B
Phosphate	4110B
Iron	3120B
Aluminium	3120B
SiO_2	3120B
Boron	3120B
Barium	3120B
Cadmium	3120B
Chromium	3120B
Copper	3120B
Lead	3120B
Manganese	3120B
Mercury	3112B
Nickel	3120B
Arsenic	3120B
Zinc	3120B
Tin	3120B
Antimony	3120B
Selenium	3120B
Cobalt	3120B
Beryllium	3120B
Silver	3120B

Table 2 : Table of chemical testing methods adopted by BHP Laboratories

*** APHA = American Public Health Association
AWWA = American Water Works Association
WEF = Water Environment Federation

3.0 Quality Assurance :

The Chemical and Environmental Monitoring laboratory (CEM) operates a rigorous approach to quality assurance. The central elements of the quality control system are outlined.

a) Chain of Custody and Client Instruction

Every sample received at BHP laboratories is inspected by the laboratory manager Pat O'Sullivan or by laboratory administrator, Mary Hehir.

A client instruction is required to start analysis.

All samples are then given a unique BHP reference number before storage between 0 and 4^{o}C.

b) Training and Competence

All analysts conducting work at BHP are fully trained. Training involves demonstration of accuracy and precision of analysis. All analysts are subject to periodic reviews in their training. All training is fully documented and retrievable.

c) Validation

BHP procedures are subjected to a rigorous validation which includes the following;

- Evaluation of instrument detection limits and limits of detection.
- Evaluation of operator characteristics including bias, precision and uncertainty of measurement.
- Demonstration of Linearity.
- Evaluation of the standard error on the mean and evaluation of any systematic biases.
- Evaluation of total uncertainty and uncertainty budgets.
- Evaluation of the uncertainty in measurement at a regulatory limit.
- Demonstration of repeatability.
- Evaluation of Matrix effects.

d) Quality Control (Skewhart) Charts

Analysis in the CEM laboratory is monitored using control charts. Each analysis will have at least 3 charts monitoring;

- Certified Reference Material recovery
- Precision of analysis
- Accuracy of analysis

Batchs of analyses are rejected if any of the control charts indicate a loss in control.

e) Interlaboratory Testing

The CEM laboratory are members of the W.R.C Aquacheck Scheme. The Laboratory also participates in the Environmental Protection Agency's Intercalibration Programme and is listed on the Agency's Register of Quality Approved Testing Laboratories.

The Laboratory participates on a bi-annual basis in the British Gas Interlaboratory Proficiency Schemes for the analysis of contaminated soils and waters.

4.0 Results :

The results are presented in the following tables.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____GW01 S_____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/334 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	421				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	17.5				Grab	1 mg/l	Evaporation
Boron B	0.354				Grab	0.05 mg/l	ICP
Sulphate SO_4	1.02				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.005				Grab	0.001 mg/l	ICP
Total Coliforms	31				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____GW01 S _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/334 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	110.3				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.122				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	27.36				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	3.69				Grab	0.10 mg/l	ICP
Sodium Na	22.81				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.23				Grab	0.01 mg/l	Photometric
Fluoride F	0.22				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____GW01 D_____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/335 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	265				Grab	1 mg/l	Titration
Total Cyanide Cn	0.005				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	76.8				Grab	1 mg/l	Evaporation
Boron B	0.289				Grab	0.05 mg/l	ICP
Sulphate SO_4	1.84				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	<0.001				Grab	0.001 mg/l	ICP
Total Coliforms	22				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____GW01 D _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/335				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	62.67				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.097				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	19.43				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	3.12				Grab	0.10 mg/l	ICP
Sodium Na	18.9				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.12				Grab	0.01 mg/l	Photometric
Fluoride F	0.42				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____GW04_____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/336 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	353				Grab	1 mg/l	Titration
Total Cyanide Cn	0.006				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	67.2				Grab	1 mg/l	Evaporation
Boron B	0.284				Grab	0.05 mg/l	ICP
Sulphate SO_4	1.95				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.002				Grab	0.001 mg/l	ICP
Total Coliforms	579				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	112				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____GW04 _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/336				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	146.6				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.066				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	15.27				Grab	0.01 mg/l	ICP
Manganese Mn	0.015				Grab	0.014 mg/l	ICP
Potassium K	2.5				Grab	0.10 mg/l	ICP
Sodium Na	20.63				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.14				Grab	0.01 mg/l	Photometric
Fluoride F	<0.08				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____GW05_____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/337 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	334				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	39.7				Grab	1 mg/l	Evaporation
Boron B	0.312				Grab	0.05 mg/l	ICP
Sulphate SO_4	4.43				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.002				Grab	0.001 mg/l	ICP
Total Coliforms	1				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____GW05 _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/337				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	79.08				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.052				Grab	0.03 mg/l	ICP
Lead Pb	0.003				Grab	0.002 mg/l	ICP
Magnesium Mg	14.17				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	1.23				Grab	0.10 mg/l	ICP
Sodium Na	25.61				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.18				Grab	0.01 mg/l	Photometric
Fluoride F	<0.08				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____SA01_____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/338 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	246				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	198.6				Grab	1 mg/l	Evaporation
Boron B	0.287				Grab	0.05 mg/l	ICP
Sulphate SO_4	39.7				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.013				Grab	0.001 mg/l	ICP
Total Coliforms	504				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____SA01 _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/338				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	157.2				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.042				Grab	0.03 mg/l	ICP
Lead Pb	0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	32.31				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	10.28				Grab	0.10 mg/l	ICP
Sodium Na	16.76				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.14				Grab	0.01 mg/l	Photometric
Fluoride F	<0.08				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____K1 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/354				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Total Oxidised Nitrogen TON	<0.1				Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	50				Grab	1 mg/l	Titration
Nitrite NO_2	<0.1				Grab	0.10 mg/l	IC
Boron B	0.258				Grab	0.05 mg/l	ICP
Nitrate NO_3	<0.1				Grab	0.10 mg/l	IC
Sulphate SO_4	3.06				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	<0.001				Grab	0.001 mg/l	ICP

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____K1 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/354				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	15.03				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.057				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	2.46				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	1.03				Grab	0.10 mg/l	ICP
Sodium Na	8.74				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate	0.06				Grab	0.01 mg/l	Photometric
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____K2 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/355				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Total Oxidised Nitrogen TON	0.94				Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	150				Grab	1 mg/l	Titration
Nitrite NO_2	<0.1				Grab	0.10 mg/l	IC
Boron B	0.312				Grab	0.05 mg/l	ICP
Nitrate NO_3	4.15				Grab	0.10 mg/l	IC
Sulphate SO_4	19.53				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	<0.001				Grab	0.001 mg/l	ICP

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____K2 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/355				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	50.15				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.057				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	7.44				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	3.37				Grab	0.10 mg/l	ICP
Sodium Na	17.83				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate	0.13				Grab	0.01 mg/l	Photometric
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____K3 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/356				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Total Oxidised Nitrogen TON	1.02				Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	133				Grab	1 mg/l	Titration
Nitrite NO_2	<0.1				Grab	0.10 mg/l	IC
Boron B	0.287				Grab	0.05 mg/l	ICP
Nitrate NO_3	4.55				Grab	0.10 mg/l	IC
Sulphate SO_4	27.8				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	<0.001				Grab	0.001 mg/l	ICP

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____K3 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/356				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	47.82				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.076				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	7.00				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	3.31				Grab	0.10 mg/l	ICP
Sodium Na	19.02				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate	0.14				Grab	0.01 mg/l	Photometric
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:**_____**K4** _____ **Surface Water Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/357 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Oxidised Nitrogen TON	0.69				Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	149				Grab	1 mg/l	Titration
Nitrite NO_2	<0.1				Grab	0.10 mg/l	IC
Boron B	0.312				Grab	0.05 mg/l	ICP
Nitrate NO_3	3.09				Grab	0.10 mg/l	IC
Sulphate SO_4	70.5				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.001				Grab	0.001 mg/l	ICP

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____K4 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/357				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	65.83				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.061				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	7.95				Grab	0.01 mg/l	ICP
Manganese Mn	0.059				Grab	0.014 mg/l	ICP
Potassium K	3.46				Grab	0.10 mg/l	ICP
Sodium Na	17.49				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate	0.05				Grab	0.01 mg/l	Photometric
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____A2 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/358 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Oxidised Nitrogen TON	0.34				Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	115				Grab	1 mg/l	Titration
Nitrite NO_2	<0.1				Grab	0.10 mg/l	IC
Boron B	0.289				Grab	0.05 mg/l	ICP
Nitrate NO_3	1.52				Grab	0.10 mg/l	IC
Sulphate SO_4	11.89				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	<0.001				Grab	0.001 mg/l	ICP

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____A2 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/358				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	35.36				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.161				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	4.75				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	2.33				Grab	0.10 mg/l	ICP
Sodium Na	14.18				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate	0.17				Grab	0.01 mg/l	Photometric
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____SW1 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/359 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Oxidised Nitrogen TON	0.52				Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	126				Grab	1 mg/l	Titration
Nitrite NO_2	<0.1				Grab	0.10 mg/l	IC
Boron B	0.314				Grab	0.05 mg/l	ICP
Nitrate NO_3	2.31				Grab	0.10 mg/l	IC
Sulphate SO_4	24.32				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	<0.001				Grab	0.001 mg/l	ICP

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:**_____**SW1** _____ **Surface Water Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/359				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	41.8				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.197				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	4.72				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	3.06				Grab	0.10 mg/l	ICP
Sodium Na	10.81				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate	0.06				Grab	0.01 mg/l	Photometric
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____SW2 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/360				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Total Oxidised Nitrogen TON	0.44				Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	100				Grab	1 mg/l	Titration
Nitrite NO_2	<0.1				Grab	0.10 mg/l	IC
Boron B	0.354				Grab	0.05 mg/l	ICP
Nitrate NO_3	1.96				Grab	0.10 mg/l	IC
Sulphate SO_4	34.1				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.004				Grab	0.001 mg/l	ICP

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____SW2 _____**

Surface Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/360 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	41.63				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.154				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	5.72				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	2.88				Grab	0.10 mg/l	ICP
Sodium Na	15.21				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate	0.05				Grab	0.01 mg/l	Photometric
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____PW 02_____** **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/377 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	105				Grab	1 mg/l	Titration
Total Cyanide Cn	0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	11.7				Grab	1 mg/l	Evaporation
Boron B	0.189				Grab	0.05 mg/l	ICP
Sulphate SO_4	1.02				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.004				Grab	0.001 mg/l	ICP
Total Coliforms	42				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	3				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____PW02 _____**

Private Well Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/377				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	30.72				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.983				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	3.85				Grab	0.01 mg/l	ICP
Manganese Mn	0.435				Grab	0.014 mg/l	ICP
Potassium K	2.16				Grab	0.10 mg/l	ICP
Sodium Na	8.77				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.04				Grab	0.01 mg/l	Photometric
Fluoride F	0.97				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____PW 05BT_____** **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/370 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	281				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	28.4				Grab	1 mg/l	Evaporation
Boron B	0.195				Grab	0.05 mg/l	ICP
Sulphate SO_4	7.15				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.005				Grab	0.001 mg/l	ICP
Total Coliforms	5				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:**_____**PW05BT** _____ **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/370 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	68.72				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.063				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	17.27				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	1.25				Grab	0.10 mg/l	ICP
Sodium Na	19.78				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.06				Grab	0.01 mg/l	Photometric
Fluoride F	0.77				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____PW 08_____**

Private Well Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/374 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	255				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	32				Grab	1 mg/l	Evaporation
Boron B	0.214				Grab	0.05 mg/l	ICP
Sulphate SO_4	7.39				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.003				Grab	0.001 mg/l	ICP
Total Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____PW08 _____**

Private Well Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/374				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	67.94				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.045				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	10.4				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	0.94				Grab	0.10 mg/l	ICP
Sodium Na	14.67				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.03				Grab	0.01 mg/l	Photometric
Fluoride F	0.42				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____PW 09_____** **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/372 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	250				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	36.8				Grab	1 mg/l	Evaporation
Boron B	0.198				Grab	0.05 mg/l	ICP
Sulphate SO_4	13.01				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.004				Grab	0.001 mg/l	ICP
Total Coliforms	3				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____PW09 _____**

Private Well Monitoring

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	08/04/372						
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	8.33				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.022				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	1.15				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	0.54				Grab	0.10 mg/l	ICP
Sodium Na	113.8				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.14				Grab	0.01 mg/l	Photometric
Fluoride F	0.22				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____PW 10_____** **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/371 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	106				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	26.7				Grab	1 mg/l	Evaporation
Boron B	0.254				Grab	0.05 mg/l	ICP
Sulphate SO_4	25.3				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.01				Grab	0.001 mg/l	ICP
Total Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____PW10 _____**

Private Well Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/371 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	62.06				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.027				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	10.79				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	1.15				Grab	0.10 mg/l	ICP
Sodium Na	12.52				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.12				Grab	0.01 mg/l	Photometric
Fluoride F	0.25				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____PW 11_____** **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/378 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	235				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	24.2				Grab	1 mg/l	Evaporation
Boron B	0.198				Grab	0.05 mg/l	ICP
Sulphate SO_4	9.45				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.003				Grab	0.001 mg/l	ICP
Total Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:**_____**PW11** _____ **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/378				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	57.2				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.104				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	10.72				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	0.97				Grab	0.10 mg/l	ICP
Sodium Na	15.38				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.03				Grab	0.01 mg/l	Photometric
Fluoride F	0.27				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____PW 13_____** **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/375 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	162				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	22				Grab	1 mg/l	Evaporation
Boron B	0.217				Grab	0.05 mg/l	ICP
Sulphate SO_4	10.56				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.002				Grab	0.001 mg/l	ICP
Total Coliforms	5				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____PW13 _____**

Private Well Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/375 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	52.45				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.027				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	12.36				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	1.51				Grab	0.10 mg/l	ICP
Sodium Na	15.16				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.02				Grab	0.01 mg/l	Photometric
Fluoride F	0.56				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____PW 15_____** **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/376 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	315				Grab	1 mg/l	Titration
Total Cyanide Cn	0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	24.9				Grab	1 mg/l	Evaporation
Boron B	0.321				Grab	0.05 mg/l	ICP
Sulphate SO_4	4.08				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.003				Grab	0.001 mg/l	ICP
Total Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:**_____**PW15** _____ **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/376 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	31.52				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.034				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	22.79				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	1.26				Grab	0.10 mg/l	ICP
Sodium Na	24.65				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.04				Grab	0.01 mg/l	Photometric
Fluoride F	0.36				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____PW 16_____** **Private Well Monitoring**

Parameter BHP Reference	**Results (mg/l)** 08/04/373 **Date** 2nd Qtr 08	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Total Alkalinity (as $CaCO_3$)	240				Grab	1 mg/l	Titration
Total Cyanide Cn	<0.001				Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	35.6				Grab	1 mg/l	Evaporation
Boron B	0.284				Grab	0.05 mg/l	ICP
Sulphate SO_4	14.85				Grab	0.20 mg/l	IC
Arsenic As	<0.001				Grab	0.001 mg/l	ICP
Nickel Ni	0.003				Grab	0.001 mg/l	ICP
Total Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____PW16 _____**

Private Well Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/04/373				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	Date	**Date**	**Date**	**Date**			
	2nd Qtr 08						
Calcium Ca	76.25				Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	<0.015				Grab	0.015 mg/l	ICP
Iron Fe	0.065				Grab	0.03 mg/l	ICP
Lead Pb	<0.002				Grab	0.002 mg/l	ICP
Magnesium Mg	9.5				Grab	0.01 mg/l	ICP
Manganese Mn	<0.014				Grab	0.014 mg/l	ICP
Potassium K	1.19				Grab	0.10 mg/l	ICP
Sodium Na	14.17				Grab	0.03 mg/l	ICP
Zinc Zn	<0.011				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
OrthoPhosphate (as P)	0.03				Grab	0.01 mg/l	Photometric
Fluoride F	0.71				Grab	0.08 mg/l	IC
List I Organics *	<0.01				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS

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Signed for and on behalf of BHP Laboratories Ltd.

BHP/CEM/23

Analysing
Testing
Consulting
Calibrating

TEST REPORT

Client: Cavan Co. Co

BHP Ref No.: 80268
Order No.:
Date Received: 15th February 2008
Date Completed: 27th February 2008
Test Specification: Nil

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

Item: Corranure Landfill Site

Annual Report covering leachate monitoring at Corranure Landfill

Cavan County Council
Courthouse
Cavan Town
Co. Cavan

FTAO: Sinead Fox

For and on behalf of BHP Ltd.

Pat O'Sullivan
Date Issued: 13th March 2008

Table of Contents

1.0 Introduction :

BHP were contracted by Cavan County Council to carry out annual environmental monitoring of leachate at Corranure Landfill site which is located outside Cavan town, Co.Cavan. This landfill is operational and is operated under waste license no. 77-1, which was issued to Cavan Co. Co. by the EPA.
This report covers leachate monitoring at the leachate tank and a point downstream at Rocklands at Corranure.

2.0 Sampling :

Sampling of the leachate tank and the downstream point at Rocklands occurred on the 15th of February 2008.

1. Having taken a representative sample, several analysis parameters are time sensitive and therefore need to be measured on-site i.e. pH, temperature, conductivity and dissolved oxygen. All meters are calibrated before each site-visit.
    - pH and temperature are measured using a Hanna HI 9023 C portable pH meter and thermocouple. The pH meter automatically compensates for temperature variations
    - Dissolved oxygen is measured using a Hanna HI 9142 portable oxygen meter.
    - Conductivity is measured using a Hanna HI 9033 multi-range conductivity meter.
2. BHP operates a chain of custody system. The sample site-sheet / chain of custody form can be found in Appendix A.
3. All samples received by the Laboratory were stored between 0 and 4°C. Subsequent analysis of all samples was carried out in accordance with Standard Methods for the examination of water and wastewater, 20th Edition, 1998, published by the American public health association.
   The methods and limits of detection are listed in the results section.

Parameters for Laboratory Analysis

PARAMETER	Standard Method Reference *** APHA-AWWA-WEF 20th Edition
pH	4500-H^+B
Temperature	2550B
Conductivity	2510B
COD	5220D
Colour	2120B
Turbidity	2130B
Total Suspended Solids	2540D
Alkalinity	2320B
Ammonia	4500-NH_3-D
TOC	5310A
Total Hardness	2340B
Calcium	3120B
Chloride	4110B
Fluoride	4110B
Nitrate	4110B
Magnesium	3120B
Potassium	3120B
Sodium	3120B
Sulphate	4110B
Phosphate	4110B
Iron	3120B
Aluminium	3120B
SiO_2	3120B
Boron	3120B
Barium	3120B
Cadmium	3120B
Chromium	3120B
Copper	3120B
Lead	3120B
Manganese	3120B
Mercury	3112B
Nickel	3120B
Arsenic	3120B
Zinc	3120B
Tin	3120B
Antimony	3120B
Selenium	3120B
Cobalt	3120B
Beryllium	3120B
Silver	3120B

Table 2 : Table of chemical testing methods adopted by BHP Laboratories

*** APHA = American Public Health Association
AWWA = American Water Works Association
WEF = Water Environment Federation

3.0 Quality Assurance :

The Chemical and Environmental Monitoring laboratory (CEM) operates a rigorous approach to quality assurance. The central elements of the quality control system are outlined.

a) Chain of Custody and Client Instruction

Every sample received at BHP laboratories is inspected by the laboratory manager Pat O'Sullivan or by laboratory administrator, Mary Hehir.

A client instruction is required to start analysis.

All samples are then given a unique BHP reference number before storage between 0 and 4^{o}C.

b) Training and Competence

All analysts conducting work at BHP are fully trained. Training involves demonstration of accuracy and precision of analysis. All analysts are subject to periodic reviews in their training. All training is fully documented and retrievable.

c) Validation

BHP procedures are subjected to a rigorous validation which includes the following;

- Evaluation of instrument detection limits and limits of detection.
- Evaluation of operator characteristics including bias, precision and uncertainty of measurement.
- Demonstration of Linearity.
- Evaluation of the standard error on the mean and evaluation of any systematic biases.
- Evaluation of total uncertainty and uncertainty budgets.
- Evaluation of the uncertainty in measurement at a regulatory limit.
- Demonstration of repeatability.
- Evaluation of Matrix effects.

d) Quality Control (Skewhart) Charts

Analysis in the CEM laboratory is monitored using control charts. Each analysis will have at least 3 charts monitoring;

- Certified Reference Material recovery
- Precision of analysis
- Accuracy of analysis

Batchs of analyses are rejected if any of the control charts indicate a loss in control.

e) Interlaboratory Testing

The CEM laboratory are members of the W.R.C Aquacheck Scheme. The Laboratory also participates in the Environmental Protection Agency's Intercalibration Programme and is listed on the Agency's Register of Quality Approved Testing Laboratories.

The Laboratory participates on a bi-annual basis in the British Gas Interlaboratory Proficiency Schemes for the analysis of contaminated soils and waters.

4.0 Results :

The results are presented in the following tables.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 3) **Monitoring Point / Grid Reference:_____Leachate Tank _____**

Leachate Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/02/526 **Date** 15/02/2008	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
pH	7.41				Grab	0 -14	Electrochemical
Temperature ^{o}C	13.2				Grab	$^{-}5^{o}C$ to $100^{o}C$	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}	5270				Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N	128				Grab	0.01 mg/l	Photometric
Total Oxidised Nitrogen TON	0.18				Grab	0.10 mg/l	Calculated from IC
BOD	818				Grab	1 mg/l	Electrochemical
Total Cyanide Cn	0.11				Grab	0.001 mg/l	Colourimetrically
COD	1500				Grab	1 mg/l	Photometric
Boron B	2.193				Grab	0.05 mg/l	ICP
Chloride Cl	722				Grab	0.22 mg/l	IC
Nitrite NO_2	<0.1				Grab	0.10 mg/l	IC
Leachate Level	-				Grab	M	Dip Meter
Nitrate NO_3	0.8				Grab	0.10 mg/l	IC
Sulphate SO_4	176				Grab	0.20 mg/l	IC
Arsenic As	0.042				Grab	0.001 mg/l	ICP
Total Coliforms	173287				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	6760				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 3) **Monitoring Point / Grid Reference:_____Leachate Tank _____**

Leachate Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/02/526 **Date** 15/02/2008	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	383.4				Grab	0.01 mg/l	ICP
Cadmium Cd	0.077				Grab	0.0035 mg/l	ICP
Total Chromium Cr	0.031				Grab	0.01 mg/l	ICP
Copper Cu	0.477				Grab	0.015 mg/l	ICP
Iron Fe	16.532				Grab	0.03 mg/l	ICP
Lead Pb	0.043				Grab	0.002 mg/l	ICP
Magnesium Mg	103.6				Grab	0.01 mg/l	ICP
Manganese Mn	2.955				Grab	0.014 mg/l	ICP
Potassium K	219.8				Grab	0.10 mg/l	ICP
Sodium Na	419.2				Grab	0.03 mg/l	ICP
Zinc Zn	0.132				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
Total Phosphorus	13				Grab	0.01 mg/l	Photometric
Fluoride F	86				Grab	0.08 mg/l	IC
Odour	H_2S/NH_4^+ odour				Grab	-	Olefactory
Visual Inspection	Turbid, Brown				Grab	-	Visual

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 3 of 3) **Monitoring Point / Grid Reference:_____Leachate Tank _____**

Leachate Monitoring

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	08/02/526						
	Date	**Date**	**Date**	**Date**			
	15/02/2008						
List I Organics *	0.303				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS
Detected Organics							
Benzene	0.026				Grab	0.01 mg/l	GC - MS
Toluene	0.137				Grab	0.01 mg/l	GC - MS
EthylBenzene	0.05				Grab	0.01 mg/l	GC - MS
(o-m-p) Xylenes	0.026				Grab	0.01 mg/l	GC - MS
Diesel Range Organics	0.064				Grab	0.01 mg/l	GC - MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 1 of 3) **Monitoring Point / Grid Reference:_____Rocklands _____**

Leachate Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/02/527 **Date** 15/02/2008	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
pH	7.03				Grab	0 -14	Electrochemical
Temperature ^{o}C	9.6				Grab	$^{-}5^{o}C$ to $100^{o}C$	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}	4310				Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N	157				Grab	0.01 mg/l	Photometric
Total Oxidised Nitrogen TON	0.2				Grab	0.10 mg/l	Calculated from IC
BOD	1279				Grab	1 mg/l	Electrochemical
Total Cyanide Cn	0.169				Grab	0.001 mg/l	Colourimetrically
COD	5900				Grab	1 mg/l	Photometric
Boron B	0.792				Grab	0.05 mg/l	ICP
Chloride Cl	364.9				Grab	0.22 mg/l	IC
Nitrite NO_2	<0.1				Grab	0.10 mg/l	IC
Leachate Level	-				Grab	M	Dip Meter
Nitrate NO_3	0.9				Grab	0.10 mg/l	IC
Sulphate SO_4	33.7				Grab	0.20 mg/l	IC
Arsenic As	0.034				Grab	0.001 mg/l	ICP
Total Coliforms	251920				Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	7940				Grab	1 to 2419 cfu/100ml	Quanti Cult

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Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 2 of 3) **Monitoring Point / Grid Reference:_____Rocklands _____**

Leachate Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/02/527 **Date** 15/02/2008	**Date**	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	482.8				Grab	0.01 mg/l	ICP
Cadmium Cd	0.023				Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01				Grab	0.01 mg/l	ICP
Copper Cu	0.399				Grab	0.015 mg/l	ICP
Iron Fe	7.818				Grab	0.03 mg/l	ICP
Lead Pb	0.052				Grab	0.002 mg/l	ICP
Magnesium Mg	115.2				Grab	0.01 mg/l	ICP
Manganese Mn	2.25				Grab	0.014 mg/l	ICP
Potassium K	219.2				Grab	0.10 mg/l	ICP
Sodium Na	423.7				Grab	0.03 mg/l	ICP
Zinc Zn	0.082				Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005				Grab	0.0005 mg/l	AAS
Total Phosphorus	6				Grab	0.01 mg/l	Photometric
Fluoride F	100.4				Grab	0.08 mg/l	IC
Odour	H_2S/NH_4^+ odour				Grab	-	Olefactory
Visual Inspection	Turbid, Brown				Grab	-	Visual

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Corranure Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Corranure Landfill, Cavan, Co.Cavan

(Sheet 3 of 3) **Monitoring Point / Grid Reference:_____Rocklands _____**

Leachate Monitoring

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	08/02/527						
	Date	**Date**	**Date**	**Date**			
	15/02/2008						
List I Organics *	0.218				Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01				Grab	0.01 mg/l	GC - MS
Detected Organics							
Benzene	0.029				Grab	0.01 mg/l	GC - MS
Toluene	0.078				Grab	0.01 mg/l	GC - MS
EthylBenzene	0.031				Grab	0.01 mg/l	GC - MS
(o-m-p) Xylenes	0.019				Grab	0.01 mg/l	GC - MS
Diesel Range Organics	0.061				Grab	0.01 mg/l	GC - MS

Signed for and on behalf of BHP Laboratories Ltd.

5.0 Discussion/Interpretation

Leachate consists of water that has become contaminated by wastes as it passes through a waste disposal site. It contains waste constituents that are soluble, not retained by soil, and not degraded chemically or biochemically. Some potentially harmful leachate constituents are products of chemical or biochemical transformations of wastes. If this leachate is allowed to migrate from the site, it may pose a threat to surrounding surface and ground waters.
Leachate composition within any landfill is unique. The characteristics of the leachate will depend on the waste types being deposited. The principal factors which can influence the generation of leachate include.

a) Waste composition
b) Phase of waste decomposition
c) Waste density
d) Meteorological conditions
e) Depth of landfill
f) Moisture content
g) Rate of water movement

The chemical composition of leachate will vary depending on the age of the landfill. The locations of the various sampling locations at Corranure landfill site are illustrated in Appendix B.

The results of the chemical analyses for the single available leachate-sampling points are presented in section 5.

Analytical Interpretation:

The biological qualities of leachate will vary with time and can be monitored from assessing the BOD : COD ratio. The results for the 2 leachates are presented in the table.

Leachate I.D	BOD	COD	Ratio
Leachate Tank	818	1500	0.55
Rocklands	1279	5900	0.22

Ratios in the range of 0.4 to 0.6 are indicative that the organic matter in the leachate is readily degradable (young/medium aged landfill). When a BOD:COD ratio is typically in the range 0.05 to 0.2, this suggests a mature landfill.

The results for this monitoring period indicate that the leachate in the tank is typical of a young to medium aged landfill and is readily biodegradable while the leachate sampled from Rocklands is more mature.

Both locations indicted the presence of low levels of Petroleum and Diesel Range Organics. Both were high in Ammonicial Nitrogen and had a typical leachate odour.

Analysing
Testing
Consulting
Calibrating

TEST REPORT

Client:

Oxigen Environmental
Corranuare Landfill
Cootehill Road
Cavan
Co. Cavan

FAO: Joan Harrington

BHP Ref No.: 80988
Order No.:
Date Received: 08th April 2008
Date Tested: 08th April 2008
Test Specification: Noise Monitoring
Issue 3

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

Item: ***Noise survey at Noise Locations near Corranure Landfill located at Corranure, Co. Cavan.***

For and on behalf of BHP Ltd.

Rachel Lenihan
Date Issued: 21st July 2008
Supplement to report No. N/A

Contents

1.0 Scope of survey

At the request of Oxigen Environmental Ltd., BHP undertook noise monitoring at their landfill in Corranure, Co. Cavan. The purpose of this survey was to provide Oxigen Environmental with the noise data and analysis required as part of their licence requirements.

This report deals with nine noise locations in and around the landfill in Corranure.

2.0 Survey approach

A Cirrus 831A Type 1 sound level meter was used to monitor noise levels and to carryout 1/3 octave frequency analysis.

30-minute daytime levels were measured at 9 noise locations. These locations were labelled NSL1, NSL2, NSL3 (B3), NSL4, NSL5 (B1), NSL6, NSL7, B4 and B2, and are identified on the map included in Appendix A.

Appendix B contains photographs of noise monitoring equipment at each monitoring point.

3.0 Date of sampling

Monitoring was carried on the 08th of April 2008. The weather was dry, calm and sunny. Wind speeds were less than 2.0 m/s at all locations.

4.0 Results

4.1 Noise levels:

Levels are presented on the following pages.

Day-time Measurements - Noise Sensitive Locations – Corranure Landfill (08th April 2008)

Location	Sampling Interval	Duration (mins)	L_{AEQ} dB	L_{A10} DB	L_{A90} dB	Wind speed m/s	Sampling notes
NSL1	1708-1738hrs	30	50.7	52.0	41.3	0.1-1.5	Machinery working around landfill is between 40 and 50 dB. Traffic from the main road can be heard intermittently up to 50dB.
NSL2	1400-1430hrs	30	69.8	73.8	45.3	0.1-0.5	Traffic on R188 is main noise source at 60-70dB up to 85dB at times. Little audible activity from the landfill.
NSL3 (B3)	1439-1509hrs	30	68.7	72.6	41.6	0.1-0.5	Traffic on R188 is main noise source~70-85dB. In absence of traffic landfill activity cannot be heard.
NSL4	1321-1351hrs	30	58.1	58.3	45.0	0.1-0.5	Slurry tanker operating near landfill discharging up to 60dB until 1327. 4 trucks (~75dB) passed during monitoring.
NSL5 (B1)	1138-1208hrs	30	57.1	60.4	46.9	0.1-1.0	Road traffic ~60-70dB. 2 horns went off during monitoring period reaching up to 80dB.
NSL6	1526-1556hrs	30	45.8	46.7	39.0	0.1-0.5	Landfill audible in distance between 40-50dB generally. Some bird song up to 45dB.

Day-time Measurements - Boundary Locations – Corranure Landfill (08th April 2008)

Location	Sampling Interval	Duration (mins)	L_{AEQ} dB	L_{A10} DB	L_{A90} dB	Wind speed m/s	Sampling notes
B4	1007-1037hrs	30	39.2	41.7	29.8	0.1-1.5	Landfill activity was not audible at this location. There was no significant noise during monitoring. Birdsong up to 55dB intermittently.
B2	1057-1127hrs	30	57.9	58.9	45.8	0.1-2.0	Landfill activity is audible between 50 and 60dB. A pump housed in a large square container was running between 1114-1116 bringing the level to 62dB.
NSL7	1620-1650hrs	30	47.6	50.2	42.8	0.1-2.0	2 cars passed during monitoring reaching up to 60 dB. Traffic noise from bypass is at a constant 45-50 dB. Landfill activity was not audible at this location.

4.2 Broadband Analysis:

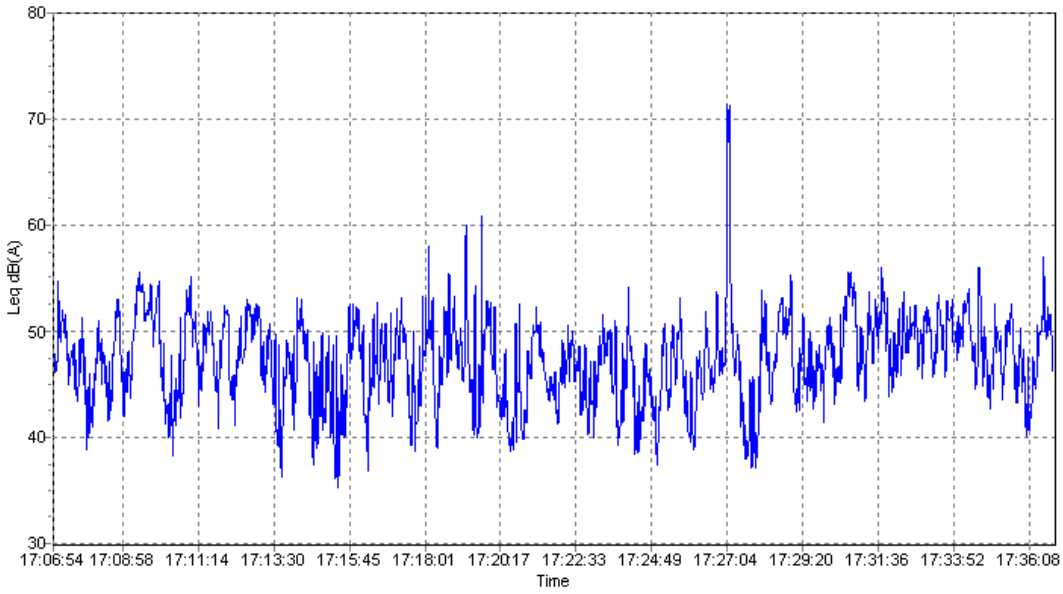


Fig 1: Broadband Analysis for Monitoring location NSL1.

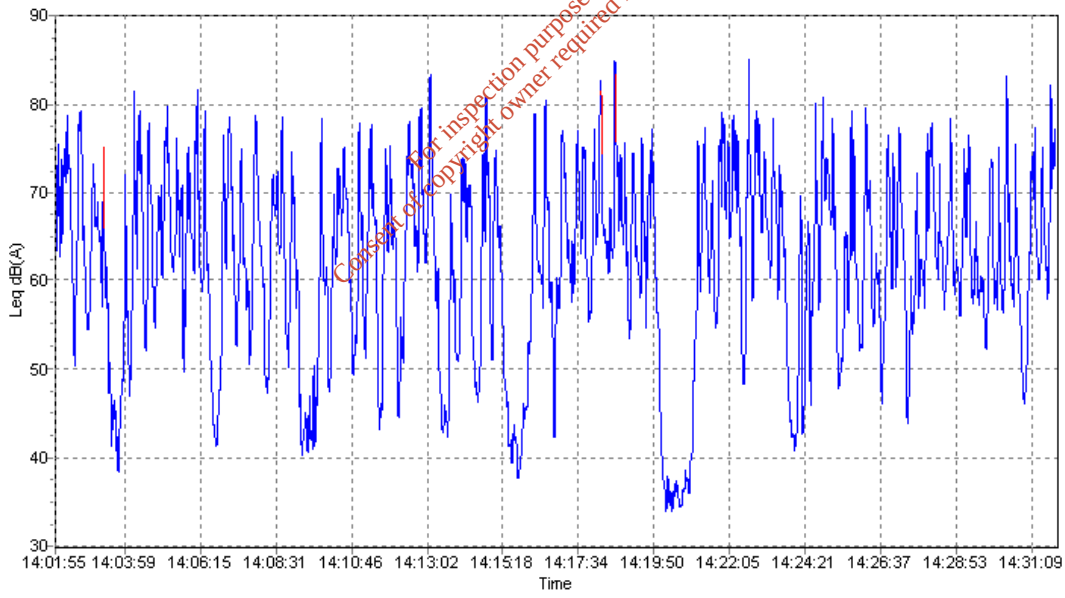


Fig 2: Broadband Analysis for Monitoring location NSL2.

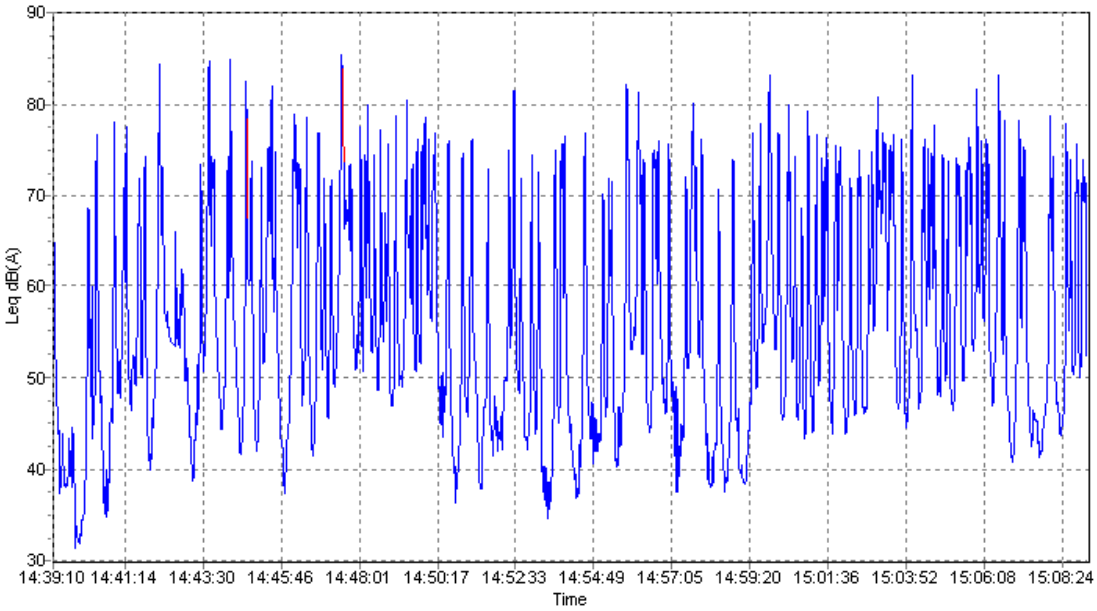


Fig 3: Broadband Analysis for Monitoring location NSL3(B3).

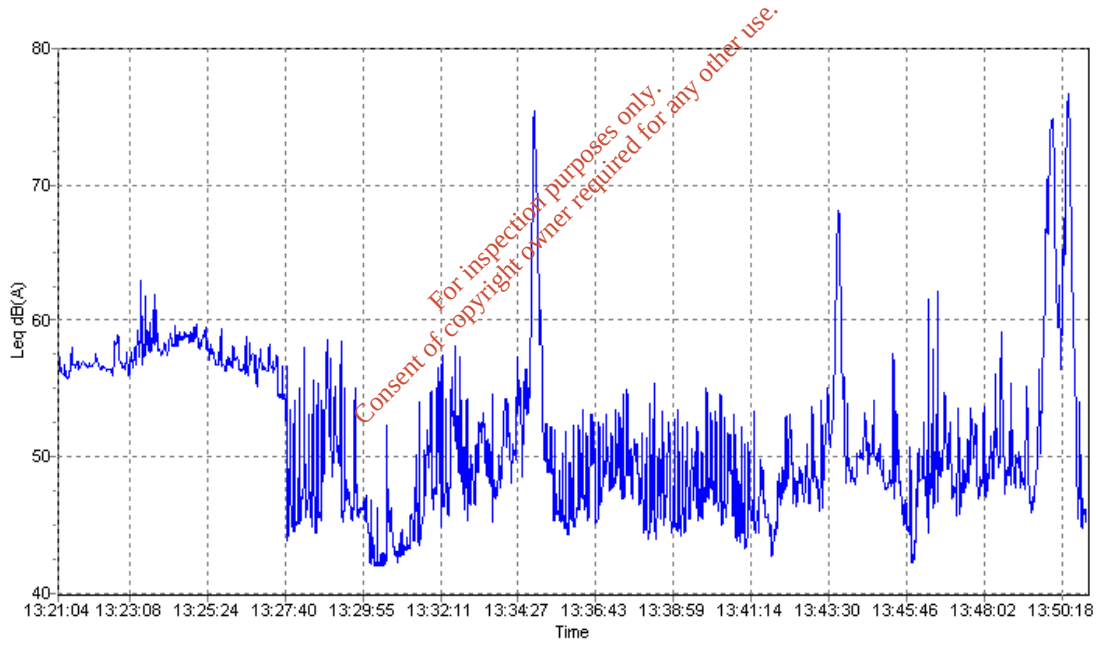


Fig 4: Broadband Analysis for Monitoring location NSL4.

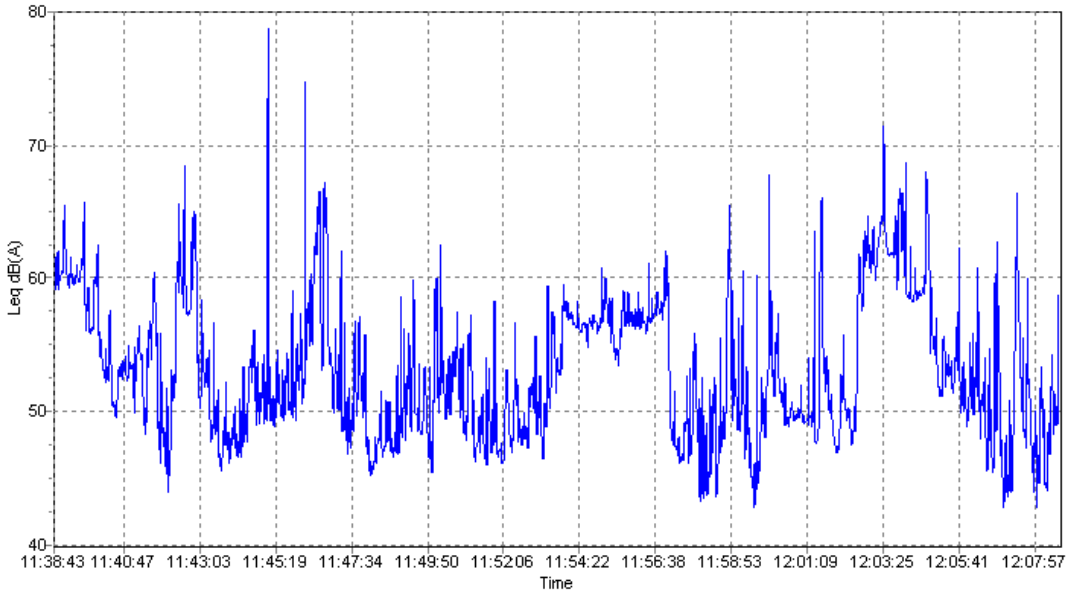


Fig 5: Broadband Analysis for Monitoring location NSL5 (B1).

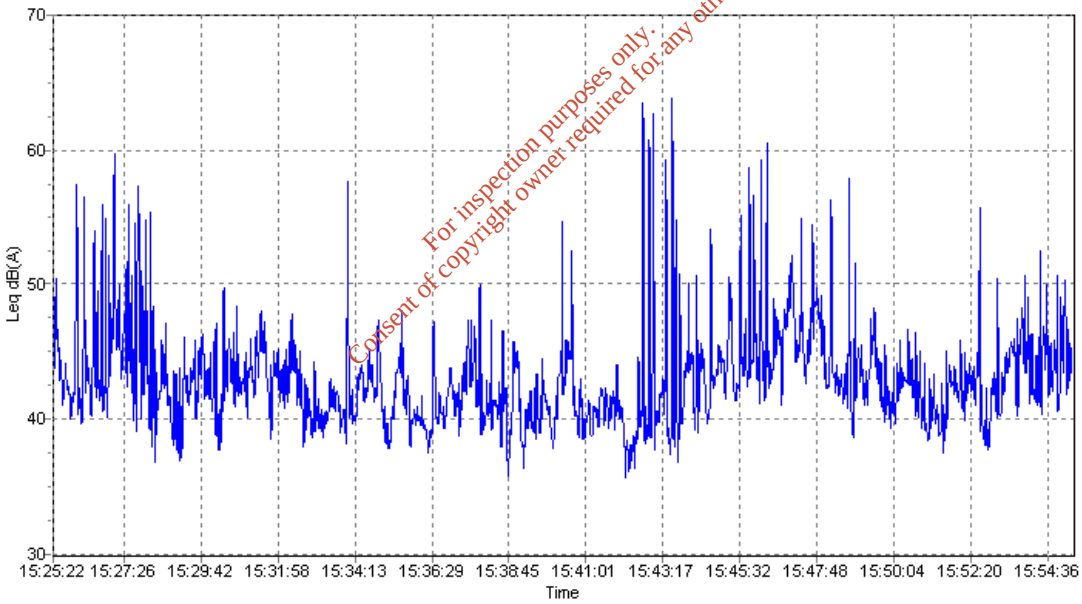


Fig 6: Broadband Analysis for Monitoring location NSL6.

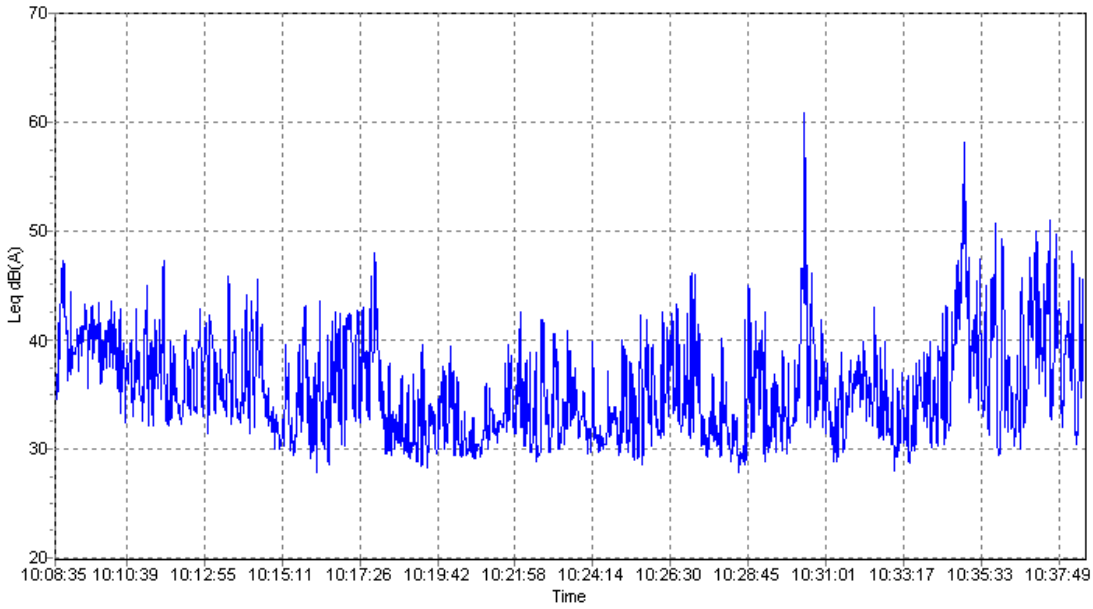


Fig 7: Broadband Analysis for Monitoring location B4.

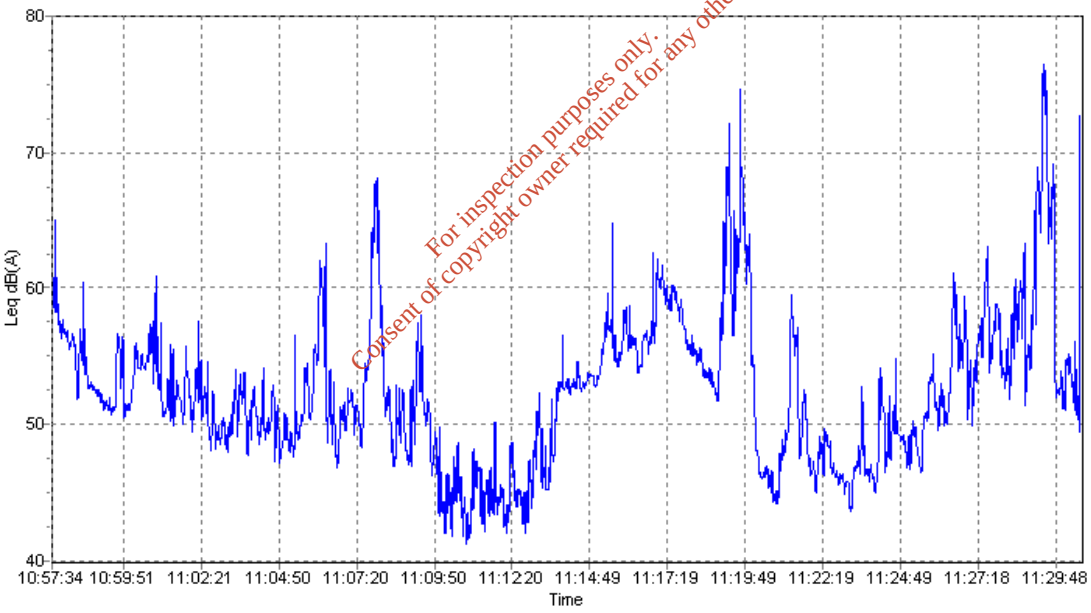


Fig 8: Broadband Analysis for Monitoring location B2.

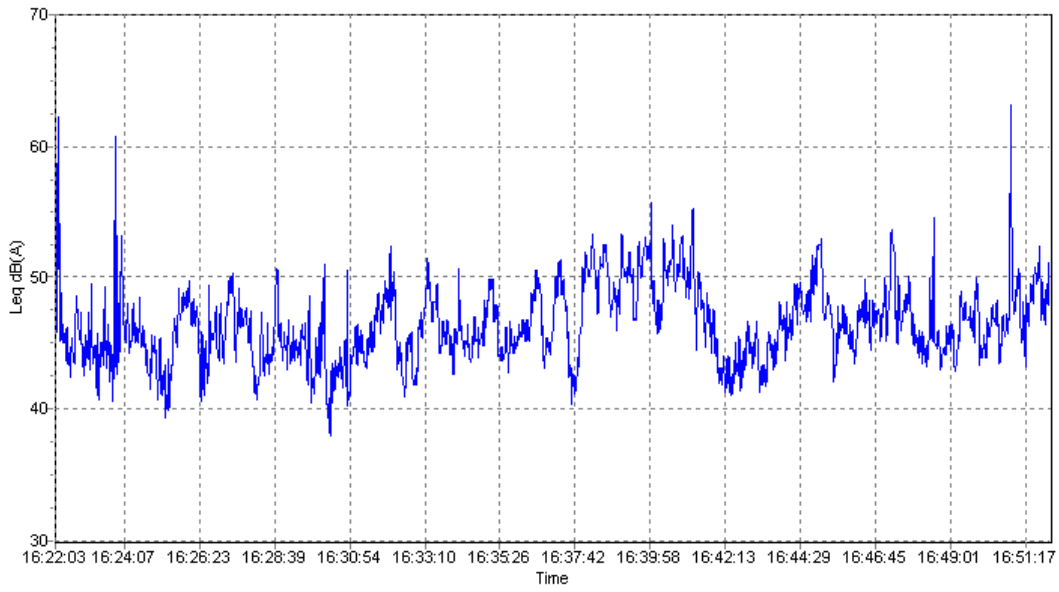


Fig 9: Broadband Analysis for Monitoring location NSL7.

4.3 Frequency (1/3 Octave) Analysis:

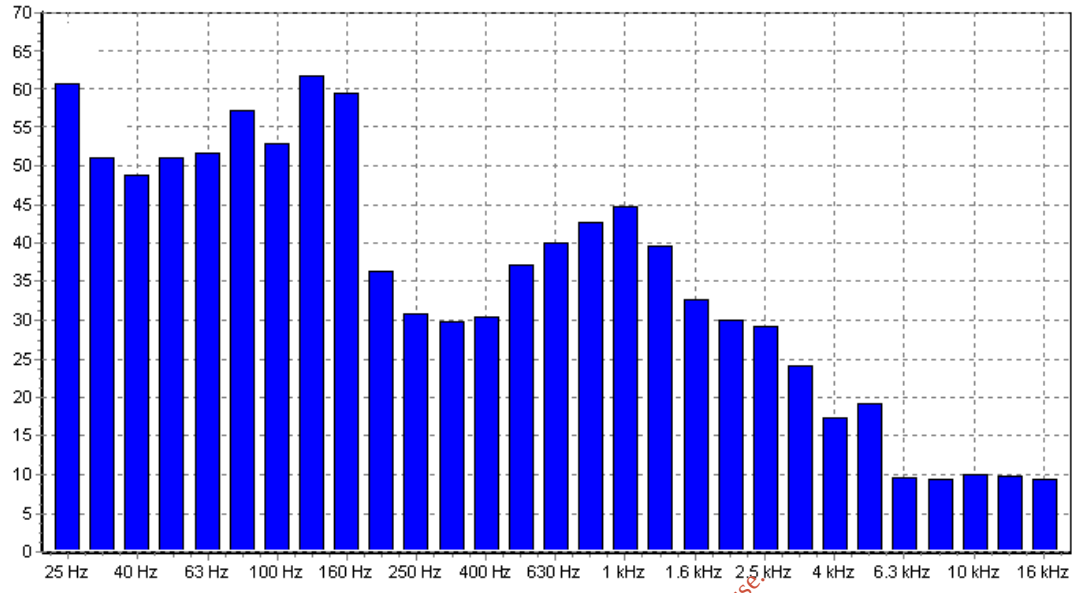


Fig 10: 1/3 Octave Analysis for Monitoring location NSL1.

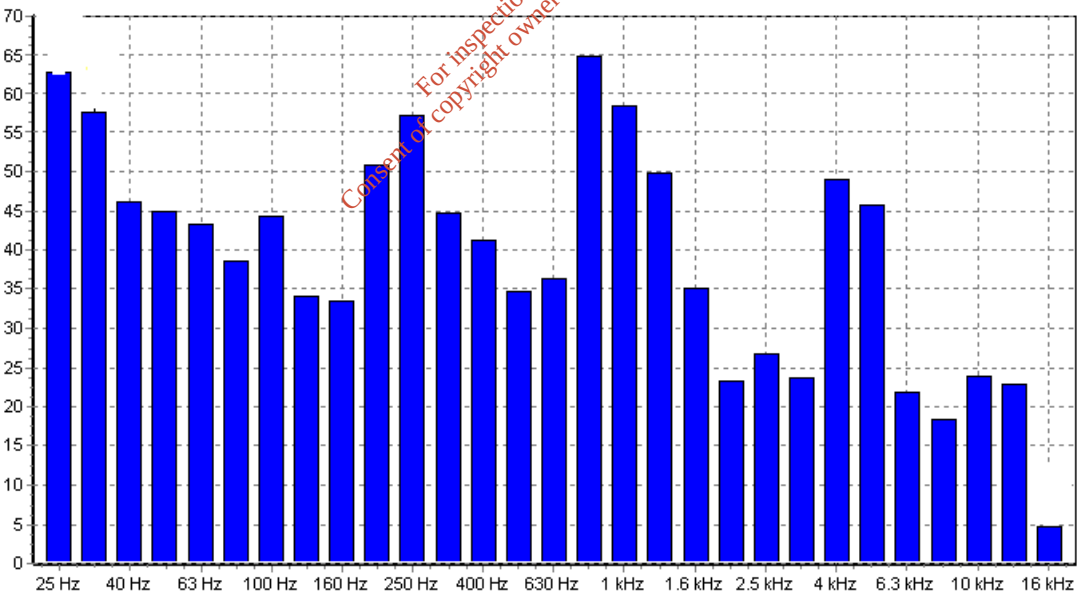


Fig 11: 1/3 Octave Analysis for Monitoring location NSL2.

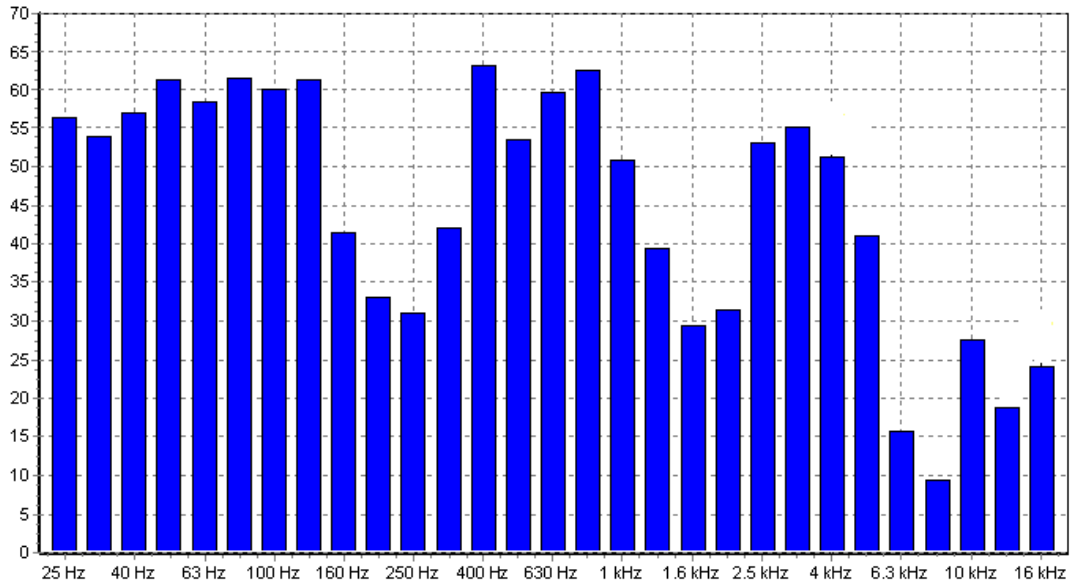


Fig 12: 1/3 Octave Analysis for Monitoring location NSL3(B3).

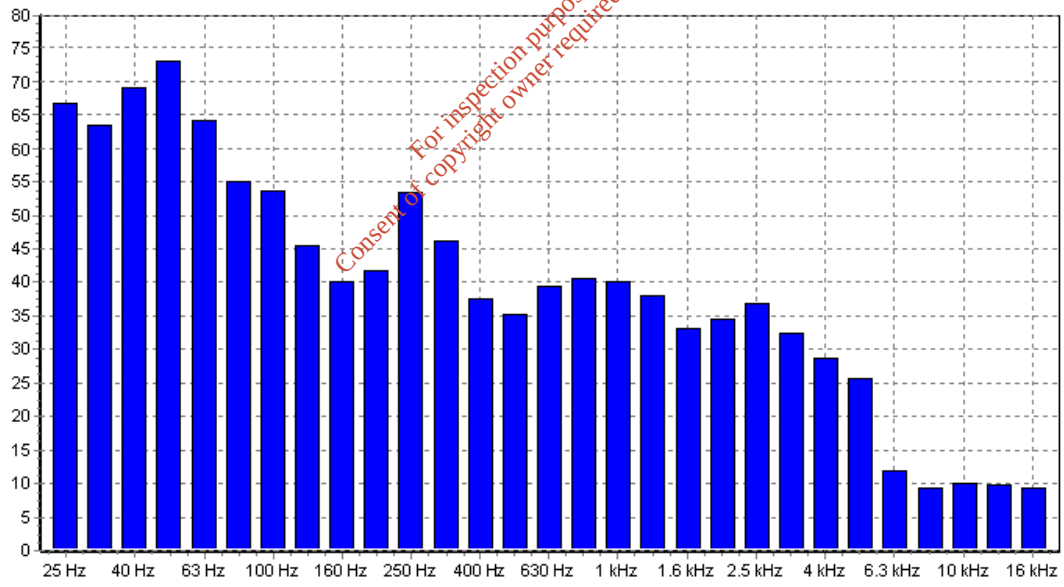


Fig 13: 1/3 Octave Analysis for Monitoring location NSL4.

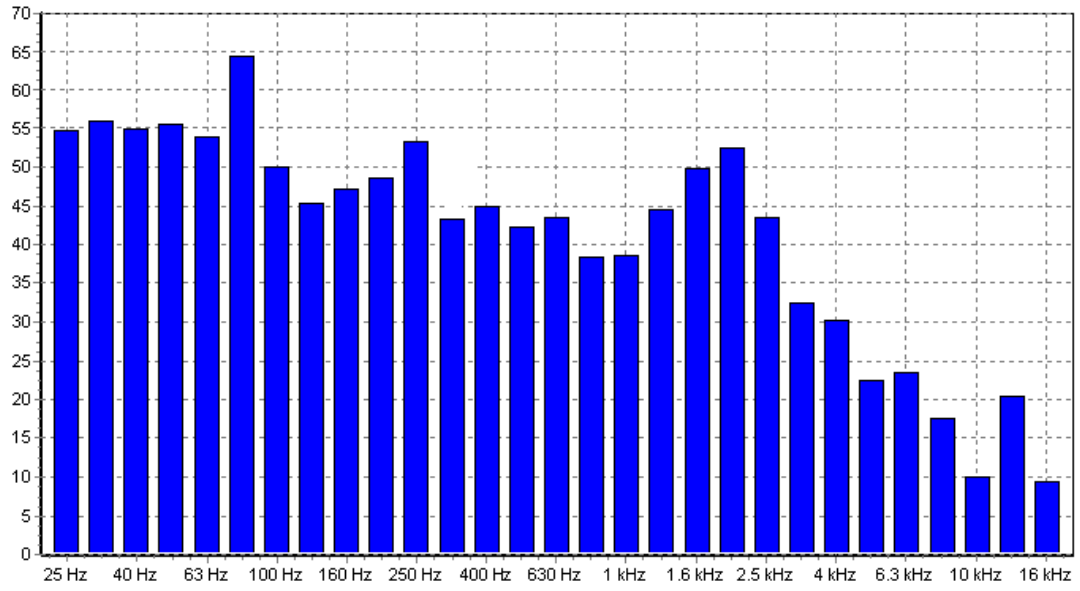


Fig 14: 1/3 Octave Analysis for Monitoring location NSL5 (B1).

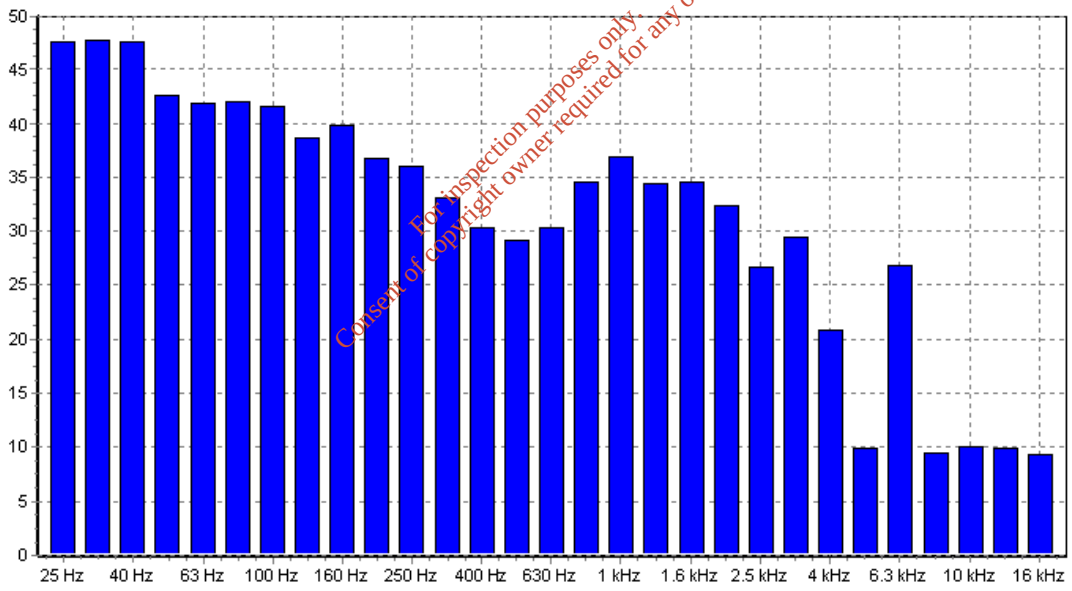


Fig 15: 1/3 Octave Analysis for Monitoring location NSL6.

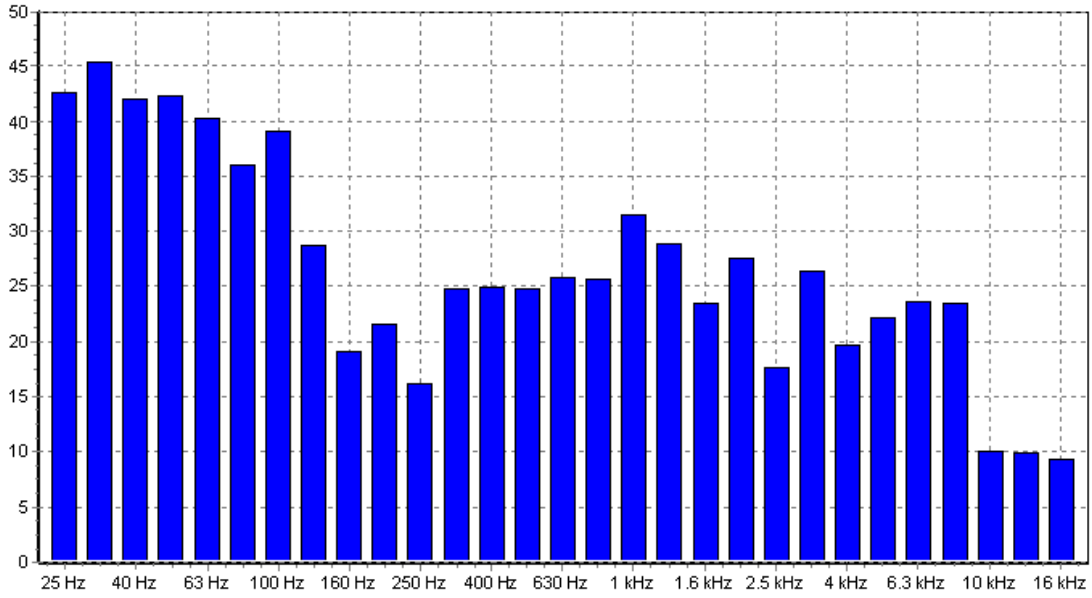


Fig 16: 1/3 Octave Analysis for Monitoring location B4.

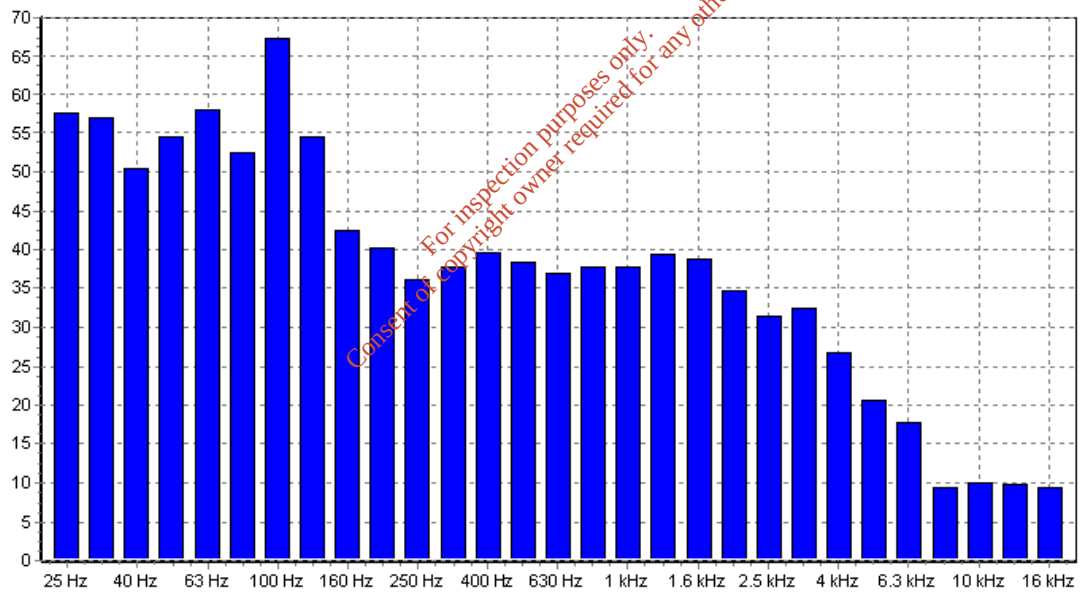


Fig 17: 1/3 Octave Analysis for Monitoring location B2.

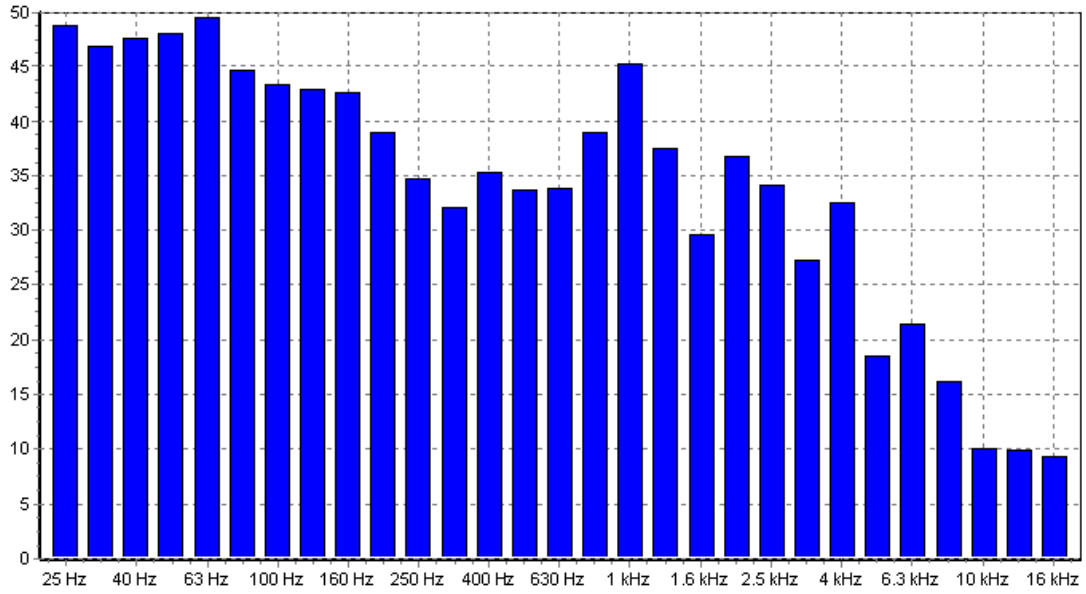


Fig 18: 1/3 Octave Analysis for Monitoring location NSL7.

4.4 Octave Frequency Bands:

Octave Band	NSL1	NSL2	NSL3 (B3)	NSL4	NSL5 (B1)	NSL6	B4	B2	NSL7
31.5	51.2	57.7	54.0	63.7	56.1	47.8	45.5	57.1	47.0
63.0	51.8	43.4	58.5	64.3	54.1	42.0	40.5	58.1	49.5
125	61.9	34.4	61.4	45.8	45.6	38.8	28.8	54.6	43.0
250	31.0	57.3	31.3	53.7	53.5	36.1	16.3	36.4	34.8
500	37.4	34.9	53.6	35.4	42.5	29.4	24.9	38.6	33.9
1K	44.9	58.5	51.1	40.4	38.8	37.0	31.6	38.0	45.3
2K	30.1	23.5	31.7	34.8	52.6	32.5	27.7	34.8	37.0
4K	17.4	49.2	51.4	28.9	30.4	21.0	19.8	26.9	32.7
8K	9.7	18.5	9.7	9.7	17.8	9.7	23.6	9.7	16.4

5.0 Interpretation of results

5.1 Noise levels;

The noise limits for noise sensitive locations near Corranure landfill, Co. Cavan, are as follows:

Daytime Limit $L_{Aeq} < 55dB$

5.1.1 Day-time levels :

As can be seen in section 4.1, L_{Aeq} noise levels for locations NSL1, NSL7, NSL6 and B4 are less than the day time limit of 55dBA. As can be seen in section 4.1, L_{Aeq} noise levels for locations NSL2, NSL3, NSL4, NSL5 (B1) and B2 are greater than the day time limit of 55dBA. Noise monitoring points at both NSL2 and NSL3 are located at the side of a busy road, the R188, with significant traffic passing. As such the L_{A90} values are more representative of the noise emanating from the landfill. The L_{A90} values recorded at both of these locations were below the daytime noise limit of 55dBA.

NSL4, NSL5 (B1) and B2 are located inside the boundary of the landfill, at the weighbridge or at active internal activity, and as such are not noise sensitive locations.

6.0 Conclusions

The noise contribution made by the landfill does not exceed the daytime limit of 55dBA at all noise sensitive locations. There was no evidence or any tonal or impulsive component to the noise recorded.

Appendix A

Site map showing noise locations

Appendix B

Photographs of Noise Monitoring equipment on-site during readings

Noise monitoring equipment at NSL1

Noise monitoring equipment at NSL2

Noise monitoring equipment at NSL3(B3)

Noise monitoring equipment at NSL4

Noise monitoring equipment at NSL5

Noise monitoring equipment at NSL6

Noise monitoring equipment at NSL7

Noise monitoring equipment at B1

Noise monitoring equipment at B2

Noise Monitoring equipment at B4

BHP/CEM/23/A

Analysing
Testing
Consulting
Calibrating

TECHNICAL REPORT

Client:
Oxigen Environmental Ltd
Corranuare Landfill
Cootehill road
Cavan
Co.Cavan

BHP Ref No.: 82224
Order No.:
Date Received: 08th July 2008
Date Tested: 14th July 2008
Test Specification: Nil

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

FAO Joan Harrington

Item: Dust deposition results for monitoring period June-July 2008 using Dust deposit gauges as per VDI 2119 Part 2, at the Corranure Landfill site in Cavan, Co.Cavan.

For and on behalf of BHP Ltd.

Pat O'Sullivan
Date Issued: 15th July 2008
Supplement to report No. N/A

Glossary

1.0 Introduction

At the request of Oxigen Environmental, BHP conducted a dust-monitoring programme at the Corranure Landfill site in Cavan, Co.Cavan.

All sampling and analysis was conducted in accordance with Germany Standard VDI 2119 using Bergerhoff dust deposition gauges. Details of sampling procedures are given in the bulk of the report.

The EPA Publication 'draft guidelines on the information to be contained in environmental impact statements' has been used as a reference for this report.

2.0 Sampling

The sampling was carried out in accordance with VDI 2119 Part 2 using Bergerhoff dust deposition gauges. The gauges were in place from the 13/06/08-08/07/08.

2.1 Sampling Locations

The gauges were all placed at ground level. The locations of the sampling sites are presented in appendix 1. Photographs of the dust gauges on site are presented in appendix 2.

2.2 Quality Control

The Chemical and Environmental Monitoring laboratory (CEM) operates a rigorous approach to quality assurance. The central elements of the quality control system are outlined.

a) Chain of Custody and Client Instruction

Every sample received at BHP laboratories is inspected by the laboratory manager Pat O'Sullivan or by site manager Paul O' Sullivan.

A client instruction is required to start analysis.

All samples are then given a unique BHP reference number before storage between 0 and 4^{o}C.

b) Training and Competence

All analysts conducting work at BHP are fully trained. Training involves demonstration of accuracy and precision of analysis. All analysts are subject to periodic reviews in their training. All training is fully documented and retrievable.

c) Validation

BHP procedures are subjected to a rigorous validation which includes the following;

- Evaluation of instrument detection limits and limits of detection.
- Evaluation of operator characteristics including bias, precision and uncertainty of measurement.
- Demonstration of Linearity.
- Evaluation of the standard error on the mean and evaluation of any systematic biases.
- Evaluation of total uncertainty and uncertainty budgets.
- Evaluation of the uncertainty in measurement at a regulatory limit.
- Demonstration of repeatability.
- Evaluation of Matrix effects.

d) Quality Control (Skewhart) Charts

Analysis in the CEM laboratory is monitored using control charts. Each analysis will have at least 3 charts monitoring;

- Certified Reference Material recovery
- Precision of analysis
- Accuracy of analysis

Batches of analyses are rejected if any of the control charts indicate a loss in control.

e) Interlaboratory Testing

The CEM laboratory are members of the W.R.C Aquacheck Scheme. The Laboratory also participates in the Environmental Protection Agency's Intercalibration Programme and is listed on the Agency's Register of Quality Approved Testing Laboratories.

The Laboratory participates on a bi-annual basis in the British Gas Interlaboratory Proficiency Schemes for the analysis of contaminated soils and waters.

3.0 Results

The results are presented in the following table.

Monitoring Station	Deposition (mg/m^2/day)
1	82.8
2	Jar Missing on Inspection and Replaced
3	252.2
4	327.2
5	73.3

4.0 Conclusions

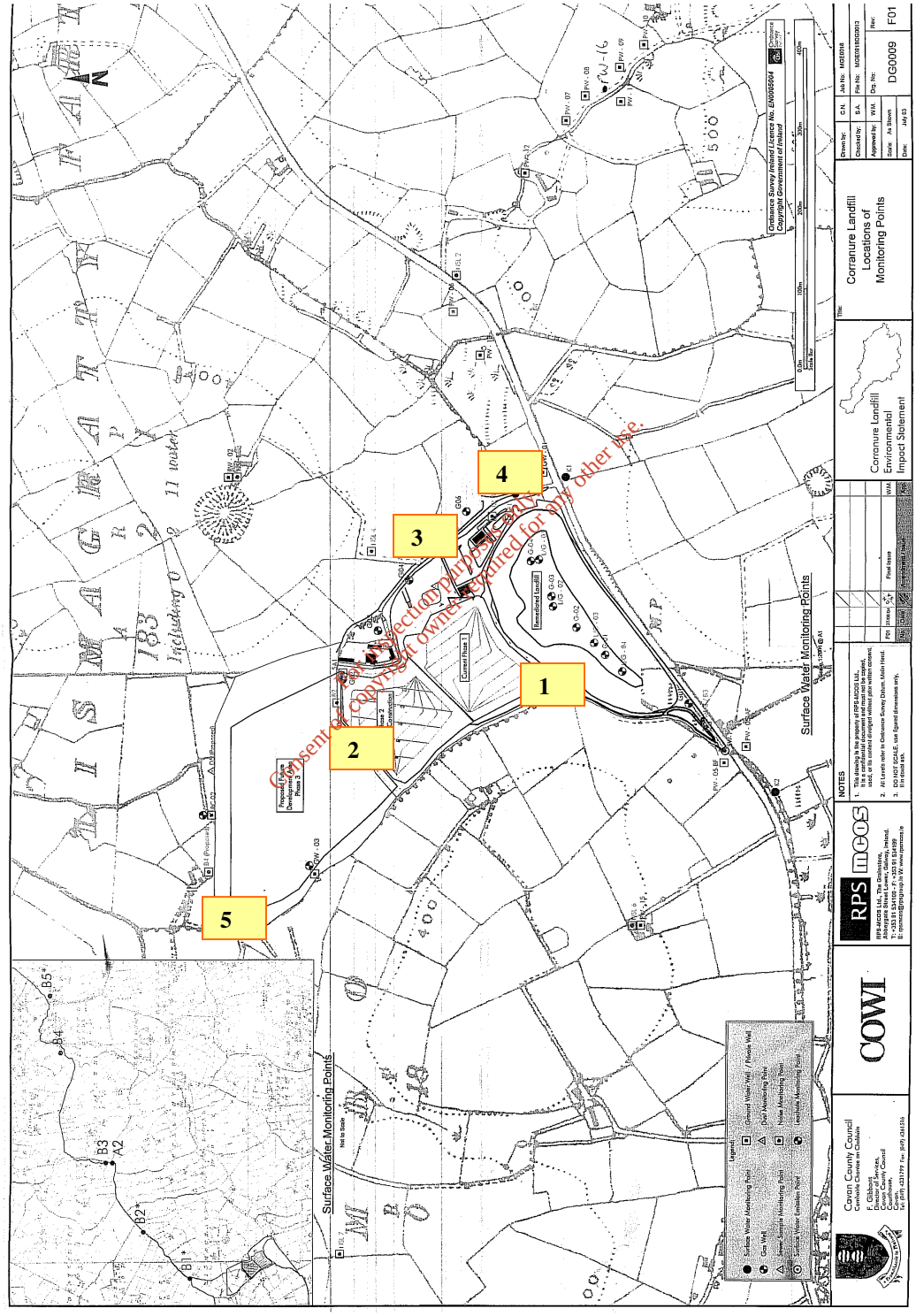
All available dust monitoring locations had a lower level of deposition that the licence limit of 350 mg/m^2/day.

5.0 References

1) Draft Guidelines on the information to be contained in environmental impact statements, 2nd Report 1998, Environmental Protection Agency.
2) Measurement of Particulate Precipitations: Determination of Dust Precipitation with collecting pots made of glass (Bergerhoff Method) or Plastic: VDI 2119: Part 2.
3) Environmental Engineers Handbook, Second Edition, David H.F. Liu and Bela G. Liptak, Lewis, 1996.
4) Standard Methods for the examination of water and wastewater, 20th Edition, published by the American Public Health Association, 1998.

Appendix 1

Site Map showing
Dust Monitoring Locations



Appendix 2

Photographs of

Dust monitoring stations

on site

Dust monitoring location 1.

Dust monitoring location 2.

Dust monitoring location 3.

Dust monitoring location 4.

Dust monitoring location 5.

BHP/CEM/23/A

Analysing
Testing
Consulting
Calibrating

TECHNICAL REPORT

Client:
Oxigen Environmental Ltd
Corranuare Landfill
Cootehill road
Cavan
Co.Cavan

BHP Ref No.: 82224
Order No.:
Date Received: 08th July 2008
Date Tested: 14th July 2008
Test Specification: Nil

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

FAO Joan Harrington

Item: Dust deposition results for monitoring period June-July 2008 using Dust deposit gauges as per VDI 2119 Part 2, at the Corranure Landfill site in Cavan, Co.Cavan.

For and on behalf of BHP Ltd.

Pat O'Sullivan
Date Issued: 15th July 2008
Supplement to report No. N/A

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- Evaluation of total uncertainty and uncertainty budgets.
- Evaluation of the uncertainty in measurement at a regulatory limit.
- Demonstration of repeatability.
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3.0 Results

The results are presented in the following table.

Monitoring Station	Deposition (mg/m^2/day)
1	82.8
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4	327.2
5	73.3

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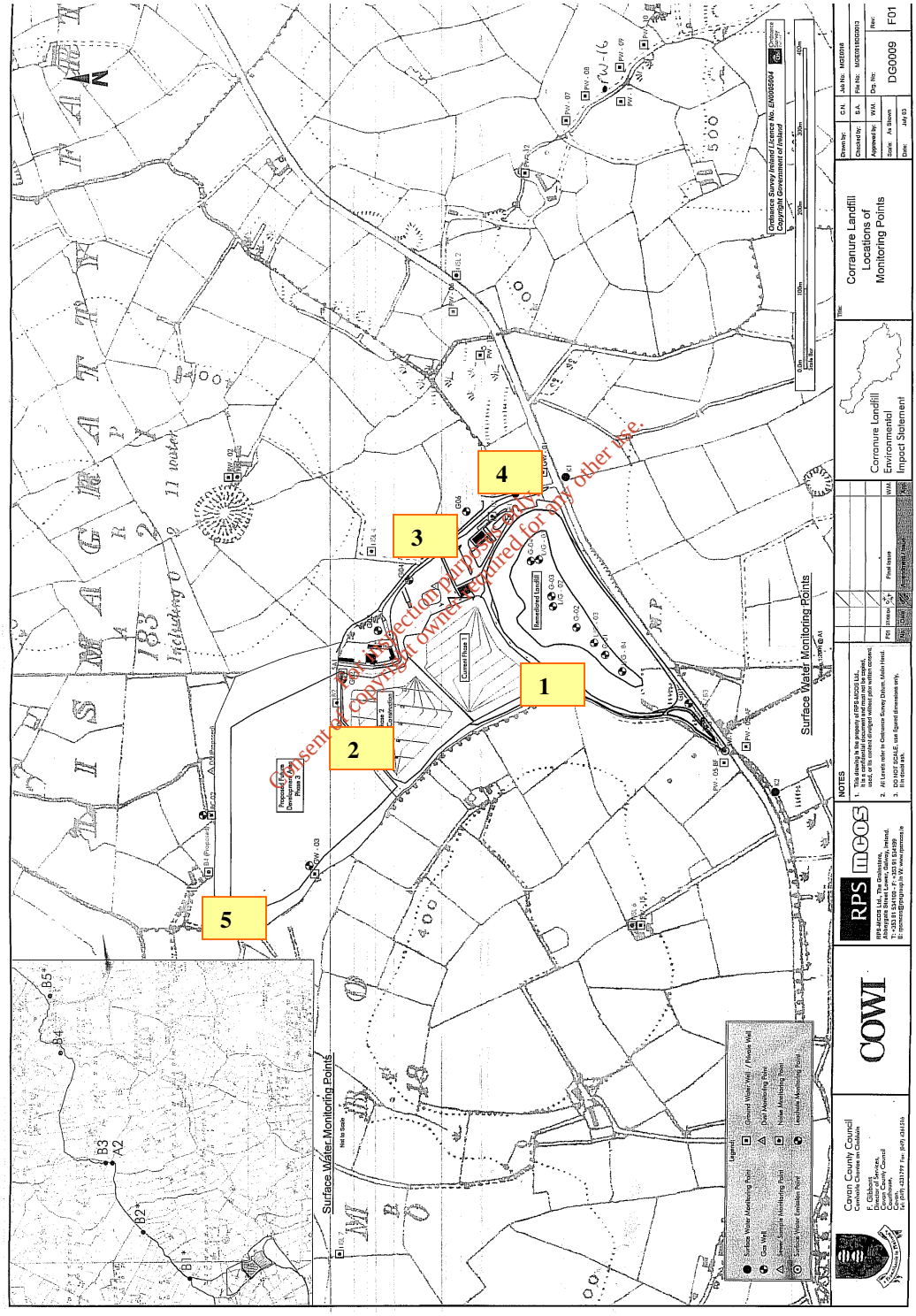
Dust Monitoring Locations



Appendix 2

Photographs of

Dust monitoring stations

on site

Dust monitoring location 1.

Dust monitoring location 2.

Dust monitoring location 3.

Dust monitoring location 4.

Dust monitoring location 5.

BHP/CEM/23/A

Analysing
Testing
Consulting
Calibrating

TEST REPORT

Client:

Oxigen Environmental
Corranuare Landfill
Cootehill Road
Cavan
Co. Cavan

FAO: Joan Harrington

BHP Ref No.: 81665-7 Issue 2
Order No.:
Date Received: 30th May 2008
Date Tested: 3rd June 2008
Test Specification: Nil

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

Item: Air emissions monitoring at the Enclosed Landfill Gas Flare

For and on behalf of BHP Ltd.

Paul O'Sullivan
Date Issued: 11th June 2008
Supplement to report No. N/A

Contents

1.0 Scope of Survey

At the request of Oxigen Environmental, BHP undertook a sampling and analysis programme to monitor air emissions from the Enclosed Landfill Gas Flare in Corranure Landfill, Co. Cavan. The purpose of this survey was to quantify the emissions from the plant as part of the EPA waste licence requirements for Corranure Landfill (WL/77-2).

Particulate sampling, flue gas analysis and Total Organic Carbon (TOC) analysis was carried out on 30th May 2008.

2.0 Survey Protocols

2.1.1 Sampling Protocols

- Temperature and velocity profiles of the emission sources were determined before and after sampling.
- Velocity was measured in accordance with BS 1042 using a pitot tube.
- Particulates were measured by Isokinetic Filtration/Gravimetry in accordance with BS 3405.
- Carbon Monoxide, Sulphur Oxides and nitrous oxides were measured using a flue gas analyser (Hollister GreenLine 8000)
- TOCs were measured using an AutoFim II portable FID.

The reference conditions for concentrations of substances in emissions to air from non-combustion sources are 273K, 101.3kPa, 5% Oxygen.

3.0 Results

Table 3.1 Enclosed Landfill Gas Flare

Emission Parameter	Units	Result	Limit
Diameter	m	1.60	-
Temperature	^{o}C	1033	-
Velocity	m/s	1.5	-
Volume flow	Nm^3/hr	2,269	-
Particulates	mg/Nm^3	<0.1	-
Carbon Monoxide	mg/Nm^3	51	50
Nitrous Oxides	mg/Nm^3	10	150
Sulphur Dioxide	mg/Nm^3	118	-
TOC	mg/Nm^3	<0.5	10

4.0 Conclusions

Air emissions from the Enclosed Landfill Gas Flare at Corranure Landfill are within the parametric limits as set down in EPA Waste Licence WL/77-2 apart from Carbon Monoxide which is just above the limit of $50mg/Nm^3$ at $51mg/Nm^3$.

Appendix 1

Calibration Certificate for Flue Gas Analyser

EUROTRON Instruments S.p.A.
Viale F.lli Casiraghi 409/413
20099 Sesto S. Giovanni (MI) ITALY
Tel. +39 02 248820.1 - Fax +39 02 2440286
e-mail: info@eurotron.com

eurotron CALIBRATION CENTRE

REPORT OF CALIBRATION n. ANRC/38241 page of
CERTIFICATO DI TARATURA

Instrument model: 7848-1-2-4-5-6-Ø-A-BE Serial n. 96919
Strumento

Standards: / Campioni :			
O_2	Certified gas mixture /bombola certificata	Reg. 130817	/
CO	Certified gas mixture /bombola certificata	Reg.	/
NO	Certified gas mixture /bombola certificata	Reg. 132772	/
NO_2	Certified gas mixture /bombola certificata	Reg. 130280	/
SO_2	Certified gas mixture /bombola certificata	Reg. 129265	/
COH_2	Certified gas mixture /bombola certificata	Reg. 130817	/
.....		Reg.	/

Pressure calibrator / Calibratore pressione STD2.2.0006 ☐ STD2.2.0012 ☒ STD2.2.0023 ☐
Temperature calibrator /Calibratore di temperatura STD2.2.0002 ☐ STD2.2.0011 ☒ STD2.2.0022 ☐

Procedura QAP: QAP 3.1.91.5 Data: 31/08/07

Nota : for other gases enclose FE388 or FE547 / se presenti altri gas allegare FE388 oppure FE547 FE486.6

Par. Par.	Unit Unità	Standard Campione	Reading Lettura analizzatore	Actual error Errore attuale	Test limits Limiti di test	Stated Accuracy Limite errore dichiarato
O_2	% vol	0,0	0.1	0.1	0,1 %vol	0.1 %vol
O_2	% vol	10.3	10.4	0.1	± 0,1 %vol	0.1 %vol
O_2	% vol	20,9	20.9	0.0	± 0,1 %vol	0.1 %vol
CO	ppm	0			8 ppm	10 ppm
CO	ppm				±8 ppm	± 10ppm < 300ppm
CO	ppm				(3.2% rdg) ppm	4% rdg
NO	ppm	0	0	0	4 ppm	5 ppm
NO	ppm				± 4 ppm	± 5ppm < 125ppm
NO	ppm	214	211	-3	(3.2% rdg) ppm	± 4% rdg
NO_2	ppm	0	0	0	4 ppm	5 ppm
NO_2	ppm	45	46	1	± 4 ppm	± 5ppm < 125ppm
NO_2	ppm				(3.2% rdg) ppm	± 4% rdg
SO_2	ppm	0	0	0	4 ppm	5 ppm
SO_2	ppm				±4 ppm	± 5ppm < 125ppm
SO_2	ppm	215	220	5	(3.2% rdg) ppm	± 4% rdg
COH_2	ppm	0	0	0	8 ppm	10 ppm
COH_2	ppm	149	155	6	±8 ppm	± 10ppm < 300ppm
COH_2	ppm				(3.2% rdg) ppm	± 4% rdg
P	mm H_2O	0,0	0.0	0.0	0,0 mm H_2O	0
P	mm H_2O	100,0	100.2	0.2	± 0.8 mm H_2O	± 1,0% rdg
P	mm H_2O	200,0	199.7	-0.3	± 1.6 mm H_2O	± 1,0% rdg
Ta	°C	0	0.0	0.0	± 0,1 °C	± (0.2%rdg+ 0.15 °C)
Ta	°C	50	49.8	-0.2	± 0,2 °C	± (0.2%rdg+ 0.15 °C)
Ta	°C	100	100.0	0.0	± 0,3 °C	± (0.2%rdg+ 0.15 °C)
Tf	°C	110	110.2	0.2	± 0,5 °C	± (0.3%rdg+ 0.3 °C)
Tf	°C	200	200.4	0.4	± 0,7 °C	± (0.3%rdg+ 0.3 °C)
Tf	°C	900	900.4	0.4	± 2,4 °C	± (0.3%rdg+ 0.3 °C)

The measurement results reported in this certificate are traceable to E.A.L. and then to S.I.
I risultati di misura riportati nel presente certificato sono riferibili all' E.A.L. e quindi al S.I.

E.A.L. =European cooperation for the Accreditation of Laboratories S.I. = International System of Units / Sistema Internazionale di unità

FE 120.3

Addresse/Destinatario: Operator/Operatore : MC Q.A. Manager/Responsabile

EUROTRON Instruments S.p.A.
Viale F.lli Casiraghi 409/413
20099 Sesto S. Giovanni (MI) ITALY
Tel. +39 02 248820.1 - Fax +39 02 2440286
e-mail: info@eurotron.com

eurotron CALIBRATION CENTRE

REPORT OF CALIBRATION n. ANRC/38241 page 2 of 2
CERTIFICATO DI TARATURA

Instrument model: 7848 Serial n. 96919
Strumento N.serie

Standards: Campioni

CH_4	Certified gas mixture /bombola certificata	Reg.	/
CO%	Certified gas mixture /bombola certificata	Reg.	/
H_2S	Certified gas mixture /bombola certificata	Reg.	/
HC CH_4	Certified gas mixture /bombola certificata	Reg. 133998	/
CO_2	Certified gas mixture /bombola certificata	Reg. 123730	/
CO.LC		Reg. 130815	/
		Reg.	/

barometer sensor S.T.D 1.0.0052

QAP procedure: QAP 3.1.91.5 Date: 31/08/07

FE386.6

Par. Par.	Unit Unità	Standard Campione	Reading Lettura analizzatore	Actual error Errore attuale	Stated error Errore dichiarato	Stated Accuracy Lim. errore dich.
C0%	% vol	0.00			0.01 %	0.01 %
C0%	% vol				±0.01%	±0.01% < 0.2%
C0%	% vol				(3.2%rdg) %	± 5% rdg
CH4	% vol	0.00			0.03 %	± 0.03%
CH4	% vol				± 0.25%	± 5% f.s
H2S	ppm	0			2ppm	± 5ppm
H2S	ppm				±4 ppm	± 5ppm < 100ppm
H2S	ppm				(±3.2%rdg)	± 4% rdg
COir	% vol				± 0.01% abs	± 0.02% abs<10%
COir	% vol	1.01	1.02	0.01	(± 1.5%rdg)	± 3%rdg > 10%
CO2ir	% vol	5.08	5.07	-0.01	± 0.15% abs	± 0.3% abs< 10%
CO2ir	% vol				(± 1.5% rdg)	± 3%rdg > 10%
HC ir	ppm				100 ppm	± 100 ppm <2500ppm
HC ir	ppm	14400	14532	132	(±2%rdg) ppm	± 4% rdg
COir	ppm				± 25ppm	± 2%fs (±50ppm abs)
Aux1	mA	12.00	12.00	0.0	± 0,14mA	± 1% fs
Aux2	mA	12.00	12.01	0.01	± 0,14mA	± 1% fs
T.ret	°C	50.0	50.2	0.2	±0.3 °C	± (0.3%rdg+ 0.3 °C)
T.flow	°C	50.0	50.2	0.2	±0.3 °C	± (0.3%rdg+ 0.3 °C)
T.pelt	°C	5.0	4.5	-0.5	±0.5 °C	±1.0 °C
P.atm	mbar				± 5.7mbar	± 1% fs

HC relative to n-hexane

The measurament results reportated in this certificate are traceable to E.A.L. (European cooperation for the Accreditation of Laboratories) and then to S.I. (International System of Units).

I risultati di misura riportati nel presente certificato sono riferibili all' E.A.L. (European cooperation for the Accreditation of Laboratories) e quindi al S.I. (Sistema Internazionale di unità).

Addresse / Destinatario: Operator / Operatore : MC QA Manager / Responsabile A.Q.

FE 120.3

Certificate of Calibration

Issued by: Kane International Ltd

Certificate No: W4449A

Calibration Report

APPLIED TEMPERATURE (°C)	INSTRUMENT READING (°C)
0.0	-0.8
100.0	99.6
200.0	199.8
300.0	300.0
400.0	400.0
500.0	500.3
600.0	600.4

APPLIED GAS	INSTRUMENT READING
CO 1024 ppm	1026 ppm
O_2 0.0%	0.0 %
O_2 5.05%	5.1 %
NO 983 ppm	985 ppm
SO_2 1543 ppm	1546 ppm
NO2 192 ppm	196 ppm

APPLIED PRESSURE	INSTRUMENT READING
100.00Mbar	100.40Mbar

The uncertainty assigned to the above measurements is 1 deg C for temperature, +/- 2% for Gas measurement and +/- 0.05% for pressure.

Signature: Tom William

Date of Issue:
05/11/2007

Kane International Limited
Kane House • Swallowfield • Welwyn Garden City • Hertfordshire • AL7 1JG • England
Telephone +44 1707 375550 • Facsimile +44 1707 393277
E-mail: sales@kane.co.uk
www.kane.co.uk

Certificate of Calibration

Issued by: Kane International Ltd

Date of Issue: 05/11/2007 Certificate No: W4449A

Ambient Conditions:
Temp 20 +/- 2 Deg C

TEST METHOD
Calibration was carried out by injecting the instrument with a known and traceable DC voltage, through an ice point reference at 0 deg C. The equivalent temperature was obtained by reference to the international thermocouple reference tables to BS4937 (1973). The gas input was calibrated by subjecting the input to known and traceable values of GAS.
The performance of the instrument was determined by comparison with our manufacturers specification as found in the instruments handbook or technical publication.
This is to certify that the below system has been calibrated using equipment traceable to National Standards and that the procedures adopted follow BS5781 and ISO9000.

Traceability Equipment	Certificate No:	Calibrated
1024ppm CO	133986	11/10/2007
0.0% O_2	133986	11/10/2007
5.05% O_2	124467	12/06/2007
0→600 °C	241075	10/07/2007
983ppm NO	99072	02/03/2006
1543 ppm SO_2	117854	30/03/2006
192ppm NO2	143794	28/03/2006
100mbar	238512	22/05/2007

Customer: AGL Airtesting

Description: KM 9106

Serial No./Indent: 52197150

Our ref: RMA10305

Appendix 2

Calibration Certificate for Portable FID

AGL AIRTESTING

Horizon House
London Road Ind. Est.
Baldock, Herts. SG7 6NG
Tel: 01462 896818 / 893870
Fax: 01462 896870 / 895390
Website: www.aglairtesting.co.uk

CALIBRATION CERTIFICATE

Issued By :	AGL Airtesting	**Certificate Number :**	**0000122057**
Customer :	BHP	**Calibrated by :**	Julian Payne
		Date :	27/05/2008

Instrument :	Autofim II	**Ambient Temp :**	22
Serial No. :	5054	**Ambient Pressure :**	1003
Asset No. :	57	**Ref Temp Calibrator :**	CI 23 T-221832 (NIST)
Job No. :	7404	**Calibration Due :**	26th October 07
Service Done :	19 10 07	**Ref Pressure Cal :**	DPI 705 186/98-04 druck
Service Interval (days):	365	**Calibration Due :**	26th October 07
		Linearity Check :	N/A
		Conv. Eff. Check :	N/A

Method :
Gas calibrations-The instrument under test was calibrated by applying known concentration of calibration gases at set flow rates. The results are recorded below after adjustment have been made and a constant reading has been obtained

All calibration processes follow procedures which comply to BS EN ISO 9002:2000

Test Reference	Cert Tracability	Instrument Reading	PASS/FAIL
Methane 201 ppm	17933-1-1	201	Pass

Filter Condition :	OK	**Data logger Works :**	Yes
Pump Operates :	Yes	**Batteries OK :**	Yes
Overall Result :		**PASS**	

HIRE SALES SERVICE

MANUFACTURE, HIRE AND SUPPLY OF AIR MONITORING INSTRUMENTS AND SYSTEMS SINCE 1968

Appendix 3

Extracts from Waste Licence WL/77-2

C.4 Emission Limits Values for Landfill Gas Plant

Emission Point Reference numbers: to be agreed by Agency in advance.
Minimum discharge height: 5m (unless results from modelling suggests otherwise)

Parameter	Flare (enclosed) Emission Limit Value Note 1	Utilisation Plant Emission Limit Value Note 1
Nitrogen oxides (NO_x)	150 mg/m^3	500 mg/m^3
CO	50 mg/m^3	650 mg/m^3
Particulates	Not applicable	130 mg/m^3
Total organic carbon (TOC)	10 mg/m^3	Not applicable

Note 1: Dry gas referenced to 5% oxygen by volume for utilisation plants and 3% oxygen by volume for flares.

D.7 Landfill Gas Combustion Plant/Enclosed Flare

Location: Utilisation plant and enclosed flare

Table D.7.1 Landfill Gas Utilisation Plant/Enclosed Flare Parameters and Monitoring Frequency

Parameter	Flare (enclosed) Monitoring Frequency	Utilisation Plant Monitoring Frequency	Analysis Method[Note 1]/ Technique[Note 2]
Inlet			
Methane (CH_4) % v/v	Continuous	Weekly	Infrared analyser/flame ionisation detector/thermal conductivity
Carbon dioxide (CO_2) % v/v	Continuous	Weekly	Infrared analyser/thermal conductivity
Oxygen (O_2) % v/v	Continuous	Weekly	Electrochemical/thermal conductivity
Total Sulphur	Annually	Annually	Ion chromatography
Process Parameters			
Combustion Temperature	Continuous	Quarterly	Temperature Probe/datalogger
Outlet			
Carbon monoxide (CO)	Continuous	Continuous	Flue gas analyser/datalogger
Nitrogen Oxides (Nox)	Annually	Annually	Flue gas analyser
Sulphur dioxide (SO_2)	Annually	Annually	Flue gas analyser
Particulates	Not applicable	Annually	Isokinetic/Gravimetric
TOC	Annually	Not applicable	Flame ionisation

Note 1: All monitoring equipment used should be intrinsically safe.

Note 2: Or other methods agreed in advance by the Agency.

Cavan County Council

CORRANURE LANDFILL

Odour Management Plan

October 2007

RPS

MGE0068CR0001

Corranure Landfill
Waste Licence No. W0077-02

DOCUMENT CONTROL SHEET

Client	Cavan County Council					
Project Title	Corranure Landfill Waste Licence Compliance					
Document Title	Odour Management Plan					
Document No.	MGE0068RP00010					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	5	1	1	1

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
F01	Final	S.G.	D.C.	W.M.	Galway	03/10/07

Consulting Engineers

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APPENDICES

1 INTRODUCTION

Odour may be defined as that characteristic property of a substance which makes it perceptible to the sense of smell. The perception of odour as a nuisance will depend on a number of factors, such as the concentration of that substance in the atmosphere, the frequency of releases, the form of the release (intermittent or continuous) and the sensitivity of the individuals impacted. For each substance there is a limiting concentration in air below which its odour is not perceptible. This is generally referred to the odour threshold of a substance.

Over one hundred trace constituents have been identified in landfill gas and similarly for leachate. Unpleasant odours are usually associated with the sulphur-containing compounds, primarily mercaptans and sulphides. These compounds also have the lowest odour threshold concentration making them the most likely source of unpleasant odours detected in landfill gas. Organic acids and aldehydes may also be significant contributors to odours at landfills.

2 ODOUR GENERATION

The Waste Licence for the landfill requires that activities be carried out in a manner such that odours do not result in significant impairment of, or significant interference with amenities or the environment beyond the site boundary. Cavan County Council are required to inspect the facility and its immediate surrounds for nuisances caused by odour and maintain a record to those inspections.

Odours from a landfill may be caused by:

- Arriving and queuing refuse vehicles,
- Depositing odourous waste,
- Working face,
- Landfill gas emissions from temporary covered areas,
- Landfill gas emissions from cracked and vents in capped cells,
- Excavated old waste,
- Landfill gas vented without combustion,
- Gas well construction,
- Leaking gas wells and collection piping,
- Malfunctioning flares and utilisation plants,
- Leachate collection and treatment systems (e.g. uncovered lagoons or wells),
- Associated landfill activities (e.g. composting); and
- Odour masking agents.

3 MITIGATION/CONTROL MEASURES

The following mitigation measures should be implemented to eliminate and/or reduce odour generation at Corranure Landfill:

- Minimise the working face,
- Daily and intermediate cover,
- Covering waste lorries delivering waste to site,
- Frequent odour assessments on and off-site,
- Effective landfill gas management system, with effectively sealed wells and pipework and a flaring system that works efficiently,
- Effective leachate management system, with sealed wells, covered leachate storage tank, and odour suppression dosing system, and
- Phased Landfill Restoration Plan to reduce the landfill gas being emitted by capping cells on a phased basis.

The Leachate and Landfill Gas Management Plans for Corranure Landfill should be consulted for further information.

4 MONITORING

Odour assessments are carried out at the landfill and at off-site locations by landfill staff. The frequency of assessments should be agreed with the EPA. An odour patrol record sheet is used when carrying out these assessments, which is located in Appendix A of this Plan and in Appendix 6 of the Operations Plan. Completed sheets are kept on file at the landfill site office.

A “Davis Weather Station II” is used to record the following meterological data at the Coranure Landfill:

- Temperature,
- Sunshine,
- Precipitation,
- Wind force and direction

The following additional data is recorded at Clones Weather Station as per Schedule D of the Waste Licence:

- Humidity,
- Atmospheric Pressure,
- Evapotranspiration.

To carry out the assessment, the inspector uses his own sense of smell to try and detect odours which may arise from the landfill. Two or more inspectors should occasionally carry out assessments together to ensure that assessments continue to be carried out to the same perceptions. If an inspector has a cold, sore throat, sinus trouble etc. they should not carry out the assessment.

Inspectors should not:

- smoke or consume strongly flavoured food or drink, including coffee, for at least half an hour before the assessment is carried out,
- consume confectionary or soft drinks immediately before and during the assessment,
- apply scented toiletries such as perfume/aftershave before or during the assessment,
- have deodorisers in the vehicle that is used for the assessment.

The assessment involves the inspector walking, as far as access allows, from each location point, towards the site boundary of the landfill and then continuing on away from the landfill site again. When arriving to carry out the assessment the inspector should not go straight to the landfill site but straight to the first monitoring location.

In carrying out the assessment, the inspector should walk slowly and breathe normally. If odour cannot be detected in this way, the inspector should periodically stand still and inhale deeply. If odour can only be detected by inhaling deeply, the intensity should be noted as 2 (faint). If odour is detected while walking, the intensity should be recorded as at least 3. A standard timeframe for the assessment should be used for each monitoring point (for example 5 minutes per location).

Following the odour assessment a site inspection should be carried out seeking to trace any observed odour back to source and to evaluate any potential odour producing activities or locations.

Complaints directed at the landfill facility are recorded in the Complaint Form which is contained in Appendix 10 of the Operations Plan for the facility in accordance with Condition 11.4 of the Waste Licence. These record sheets are kept on file in the landfill site office. Complaints relating to odour can be analysed in relation to location of complaint, time and weather conditions.

In addition to the daily odour assessments a general weekly inspection is carried out at the facility. A Weekly Site Inspection Form is located in Appendix 6 of the Operations Plan.

APPENDIX A

CORRANURE LANDFILL WASTE LICENCE 77-2 ODOUR PATROL RECORD SHEET

LOCATION (&Sensitivity) *1	Time	Wind Direction	Wind Speed *2	Weather Conditions *3	Odour Extent *4	Odour Intensity *5	Comments
Landfill							
Anteeduff Road							
Ballyhaise							
Ouley							
Cootehill Road							
Carratober Road							
Cavan By-Pass							
Cavan Town							
Drumalee Cross							

***1 Location & Sensitivity**

0 None Detectable
1 Remote (No housing, commercial/Industrial premises or public area within 100m
2 Low Sensitivity (no housing, business premises or public area within 100m of area affected)
3 Moderate Sensitivity (housing business premises or public area within 100m of affeceted area)
4 High Sensitivity (housing business premises or public area within area affected)
5 Ultra Sensitivity (complaints arising from residents, businesses, and users of public areas within area affected)

***2 Wind Strength**

0	Calm	Smoke rises vertically
1	Light Breeze	Wind felt on face, leaves rustle
2	Moderate Breeze	Raises dust, small branches are moved
3	Strong breeze	Large branches in motion
4	Gale	Twigs break off trees

***3 Weather Conditions**

Precipitation: dry, rained recently, drizzle, raining.
Temperature: cold, cool, warm, hot.

***4 Odour Extent**

0 None
1 Local and Impersistent
2 Impersistent but detected way from sample site
3 Persistent but localised
4 Persistent and pervasive up to 50m from sample site
5 Persistent and widespread

***5 Odour Intensity**

1 No detectable odour
2 Faint odour (inhale facing wind to notice odour)
3 Moderate odour (detectable with normal breathing while walking)
4 Strong odour (bearable but offensive)
5 Very Strong odour (unbearable)

Signed:_____Date:_____