
# EAST GALWAY LANDFILL

# EPA IED LICENCE W0178-02

# ANNUAL ENVIRONMENTAL REPORT

# JANUARY 2016 - DECEMBER 2016

## MARCH 2017

Comhairle Chontae na Gaillimhe
Galway County Council

FEHILY TIMONEY & COMPANY

# EAST GALWAY LANDFILL

# EPA IED LICENCE W0178-02

# ANNUAL ENVIRONMENTAL REPORT

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**Abstract:** This is the annual environment report for East Galway Landfill for 2016 in compliance with the licence.

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# 1 INTRODUCTION

A Waste Licence (Reg. No. W0178-01) was granted to Greenstar Holdings Ltd. by the Environmental Protection Agency (Agency, EPA) on the 26th of July 2004 to construct and operate a landfill at Killagh More, Ballybaun, Ballintober, Ballinasloe. Following a review by the EPA, a revised Waste Licence (Reg. No.W0178-02) was issued on the 23rd of March 2010. The facility accepted waste from December 2005 to March 2013 at a rate of 100,000 tonnes per annum for disposal and up to 27,320 tonnes of engineering materials per annum for recovery purposes.

Waste acceptance ceased in March 2013 and in July 2013 the Environmental Protection Agency exercised powers to enter the site under S.I. No. 547 of 2008 – European Communities (Environmental Liability) Regulations 2008 and appointed Galway County Council as Agents and Authorised Officers on an emergency basis for the ongoing management of liabilities at the site. This decision arose from the decision of the receiver of the Greenstar group of companies to cease operating the facility with effect from May 2013. From July 2013 to June 2016 the East Galway Landfill was managed by a Steering Committee comprised of representatives from the Environmental Protection Agency, the Department of Environment, Community and Local Government, Galway County Council and Tobin Consulting Engineers.

The licence was amended on the 7 January 2014 under Section 76A(11) of the Waste Management Act 1996 as amended to bring it into conformity with the provisions and requirements of Council Directive 2010/75/EU. From the date of the amendment, licence Reg. No. W0187-02 shall be deemed to be an Industrial Emissions Licence (IED).

In late June 2016, the East Galway Landfill and the IED Licence (Reg. No. W0178-02) were transferred to Galway County Council. In August 2016 waste acceptance recommenced at the East Galway Landfill.

From December 2005 to date, approximately 870,000 tonnes of waste has been placed into 9 constructed cells.

The facility is situated in east County Galway, approximately 16km west of the town of Ballinasloe. The landfill is in an area bounded to the north by the Athenry to Ballinasloe road (R348) with local roads immediately to the east and south; the L7442 and the L7439, respectively. A site location map is provided in Appendix A.

This report addresses Condition 11.11 of IED Licence 178-02. Condition 11.11 states that:

11.9.1 – The licensee shall submit to the Agency for its agreement by 31st March each year, an Annual Environmental Report (AER) covering the previous year.

11.9.2 – The AER shall include as a minimum the information specified in Schedule G: Content of Annual Environmental Report of this licence and shall be prepared in accordance with any written relevant guidance issued by the Agency.

This report addresses the items listed in Schedule G: Content of Annual Environmental Report of the licence for the facility and the format follows guidelines set in the "Guidance Note for Annual Environmental Report" issued by the Environmental Protection Agency**.** Account is also taken of the AER Draft Guidance Document and AER Information Templates issued by the Agency in January 2013. This AER covers the reporting period from 1st January 2016 to the 31st December 2016.

# 2 WASTE ACTIVITIES & RECORDS

## 2.1 Waste Activities carried out at the Facility

East Galway Landfill is a fully engineered and contained landfill site. It is licensed to accept 100,000 tonnes per annum of waste, as follows:

### Table 2.1: Tonnage Allowance

| Waste Type | Maximum (Tonnes per Annum) |
|---|---|
| Household | 45,000 |
| Commercial | 27,500 |
| Industrial non-hazardous | 24,500 |
| Asbestos Waste | 3,000 |
| **Total** | **100,000** |

**Note:** The tonnage of household waste, commercial waste and industrial non-hazardous waste may be altered with the prior agreement of the Agency, if the total amount of all wastes accepted at the facility does not exceed the combined tonnage of 100,000 tonnes per annum and the amount of asbestos does not exceed 3,000 tonnes per annum (as specified in Table 2.1 above).

To date no asbestos waste has been accepted at the landfill. It is not intended to accept it in the future.

The facility is also licensed to accept 27,320 tonnes per annum of inert waste for recovery for the purposes of restoration and aftercare.

Waste activities at the facility are restricted to those outlined in Part 1 - Activities Licensed of the Licence. Licensed waste disposal and recovery activities are summarised in Table 2.2 and Table 2.3 below.

### Table 2.2: Licensed Waste Activities (Third Schedule of Waste Management Acts, 1996-2010)

| | |
|---|---|
| **Class 1** | **Deposit on, in or under land (including landfill):**<br><br>This activity is limited to the disposal of non-hazardous waste into lined cells. |
| **Class 4** | **Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons:**<br><br>This activity is limited to the management of leachate and surface water at the facility. |
| **Class 5** | **Specifically engineered landfill, including placement into discrete lined cells which are capped and isolated from one another and the environment:**<br><br>This is the principal activity. This activity is limited to the disposal of non-hazardous waste into lined cells. |
| **Class 6** | **Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule:**<br><br>This activity is limited to potential future treatment of leachate at the facility |
| **Class 13** | **Storage prior to submission of any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced:**<br><br>This activity is limited to the temporary storage of unacceptable wastes in the waste quarantine area prior to dispatch off-site to an alternative facility. |

### Table 2.3: Licensed Waste Recovery Activities (Fourth Schedule of the Waste Management Acts, 1996 – 2010

| | |
|---|---|
| **Class 4** | **Recycling or reclamation of other inorganic materials:**<br><br>This activity is limited to the use of material reclaimed from construction and demolition waste for the purposes of fill, daily cover, road construction and other uses. |
| **Class 11** | **Use of waste obtained from any activity referred to in a preceding paragraph of the Schedule:**<br><br>This activity is limited to the use of material reclaimed from construction and demolition waste for the purposes of fill, daily cover, road construction and other uses. |
| **Class 13** | **Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced:**<br><br>This activity is limited to the temporary storage prior to use of material reclaimed from construction and demolition waste for the purposes of fill, daily cover, road construction and other uses. |

## 2.2 Waste Quantities & Composition 2005 - 2016

The quantities and types of wastes accepted for disposal and recovery at the East Galway Landfill between 2005 and 2016 are summarised in Table 2.4 below. There was no waste accepted at the facility either for disposal or for recovery purposes in the period June 2013 to July 2016.

## Table 2.4: Quantities of waste accepted, disposed of and recovered from 2005 - 2016

| Waste Type Disposed | Total Acepted (tonnes) Description | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 & 2015 | 2016 | Licence Limit | Total Site Intake 2005-2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Household | | - | 44,221 | 46,734 | 66,578 | 61,470 | 43,024 | 50,796 | 42,666 | 194 | - | 31,978 | **45,000** | **387,661** |
| Commercial | | - | 27,024 | 27,495 | 30,730 | 35,500 | 54,984 | 47,347 | 51,809 | 182 | - | 16,220 | **27,500** | **291,291** |
| Industrial non-hazardous | Misc. Non-Hazardous Industrial solid Waste | - | 27,023 | 27,403 | 1,000 | 2,668 | 3,730 | 4,236 | 11,039 | 67 | - | 0 | **27,500** | **77,165** |
| **Total Waste Disposed** | | **162** | **98,268** | **101,631** | **98,308** | **99,638** | **101,737** | **102,379** | **105,515** | **443** | **0** | **48,198** | **100,000** | **756,278** |
| **Waste Type Recovered** | **Description** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2016** | **Licence Limit** | **Total Site Intake 2005-2016** |
| Cover/ Engineering Material | Shredded timber reused on site | - | 2,690 | 4,483 | 6,951 | 4,122 | 2,942 | 3,759 | 3,583 | 0 | - | 329 | - | **28,858** |
| Cover/ Engineering Material | Recovered C&D Rubble reused on site | - | 1,202 | 989 | 255 | - | 1,080 | 1,585 | 70 | 0 | - | 0 | - | **5,181** |
| Cover / Engineering Material | Soil and fine material reused on site for daily and intermediate cover and liner protection | - | 14,538 | 23,692 | 6,711 | 803 | 2,801 | 2,296 | 23,575 | 1,778 | - | 3,883 | - | **80,077** |
| **Total Waste Recovered** | | **-** | **18,430** | **29,164** | **13,917** | **4,925** | **6,823** | **7,639** | **27,227** | **1,778** | **0** | **4,212** | **27,320** | **114,116** |
| **Total Site Intake** | | **161.5** | **116,698** | **130,795** | **112,225** | **104,563** | **108,561** | **110,019** | **132,742** | **2,221** | **0** | **52,409** | **127,320** | **870,394** |

## 2.3 Calculated Remaining Capacity of the Facility

The remaining capacity of the landfill had been calculated to be 387,387 $m^3$ at the end of 2016.

## 2.4 Methods of Deposition of Waste

Waste is delivered to East Galway Landfill facility in heavy goods vehicles (HGVs) with the appropriate covers in place to prevent any loss of load. Each HGV passes over a weighbridge prior to proceeding to the active waste disposal area and the weight of the vehicle plus load is recorded. The weighbridge operator and/or facility manager may, at their discretion, request that the load be tipped in the Waste Inspection Area. Waste vehicles then proceed to the active waste disposal area where waste is deposited under the direction of a banks man.

Waste is deposited directly on a surface of waste close to and above the advancing tipping face. In accordance with Condition 5.3.1 of the IED Licence, the active working face is confined to a height of 2.5 m after compaction, a width of 25 m and a slope no greater than 1 in 3. Deposited waste is spread in shallow layers on the inclined surface and compacted. The steel-wheeled compactor operates on the gradient of the shallower face, pushing thin layers of wastes and applying compaction pressure to them. Light waste is mixed with heavier materials or covered with permeable soil drawn from stockpiles of heavy inert waste or fine sand stockpiles located on the site. Alternative fabric cover systems are also utilised as appropriate.

# 3 REPORT ON ENVIRONMENTAL EMISSIONS

This summary report has been compiled in accordance with emission limit values (ELVs) for the following media as detailed in Condition 6 and Schedule C of the current IED Licence.

- Dust
- Noise
- Landfill Gas
- Surface Water Discharge (measured at SW6 & SW7)
- E-PRTR

## 3.1 Dust Emissions

The dust deposition Emission Limit Value as stipulated in Licence 178-02 is 350 mg/m$^2$/day.

Dust monitoring was conducted at five locations on a quarterly basis during 2016, as illustrated in the Environmental Monitoring Locations Drawing in Appendix A. Dust reports were included in all quarterly environmental monitoring reports issued to the Agency during 2016.

Dust monitoring results were below the required ELV (350 mg/m$^2$/day) during all monitoring events in 2016. Dust deposition ranged between 2.69 mg/m$^2$/day at D4 in Q4 2016 and 95.2 mg/m$^2$/day at D5 in Q1 2016.

## 3.2 Noise Emissions

Noise emission limit values as stipulated in Licence 178-02 are detailed in Table 3.1 below.

### Table 3.1: Noise Emissions

| Day Db(A) LAeq (15 minutes) | Night dB(A) LAeq (15 minutes) |
|---|---|
| 55 | 45 |

Noise monitoring was conducted at five monitoring locations on a quarterly basis during 2016. Results from all noise monitoring events were issued to the Agency as part of the quarterly environmental monitoring reports for 2016.

During 2016, the measured noise levels were, for most the time, within the ELV of 55 dB (A) (daytime) as set out in Schedule D of IED Licence W0178-02. Exceedances and tones observed are summarized in the points below;

- Q1 - Exceedance of 56.5 dB(A) at N5. Passing traffic was the dominant noise source. In addition, forestry thinning activities/ heavy machinery were constantly audible at this location. No tones were recorded. The exceedance was attributable to off-site sources.

- Q2 - Exceedance of 55.1 dB(A) at N5. Passing traffic was the dominant noise source. No tones were recorded. The exceedance was attributable to off-site sources.

- Q4 - Exceedance of 68 dB(A) at N5. The noise was attributable to off-site sources. Passing traffic waste the dominant noise source. Tonal noise was observed at monitoring location N3 but it was attributable to an off-site noise source. Hence, a penalty for tonal noise was not applied.

## 3.3 Landfill Gas Concentrations

Table 3.2 outlines landfill gas emission limit values outside the waste body as stipulated in Schedule C.2 of IED Licence 178-02.

### Table 3.2: Landfill Gas Concentrations

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

### 3.3.1 Landfill Gas Monitoring Wells

Tables 3.3 and 3.4 below outline the wells that exceeded the ELV for methane concentration (20% LEL (1% v/v)) and carbon dioxide concentration (1.5% v/v), respectively, during each quarter during 2016. All exceedance were reported to the Agency in a landfill gas incident report after each monthly monitoring event.

### Table 3.3: Wells in Exceedance of Methane Limit (1% v/v)

| Quarterly Monitoring Period | Wells in Exceedance of Methane Limit |
|---|---|
| Q1 | LG5, LG22 |
| Q2 | LG9, LG19, LG22 |
| Q3 | LG9, LG11, LG19, LG22 |
| Q4 | LG5, LG9, LG11, LG22 |

### Table 3.4: Wells in Exceedance of Carbon Dioxide Limit (1.5% v/v)

| Quarterly Monitoring Period | Wells in Exceedance of Carbon Limit |
|---|---|
| Q1 | LG5, LG6, LG9, LG16, LG23 |
| Q2 | LG5, LG6, LG9, LG18, LG19, LG22, LG23, LG24, LG25,LG28 |
| Q3 | LG4, LG9, LG11, LG15, LG16, LG18, LG21, LG22, LG23, LG24, LG28 |
| Q4 | LG5, LG6, LG6-A, LG9, LG11, LG15, LG18, LG21, LG22, LG23, LG24, LG26, LG28 |

Gas monitoring carried out by White Young & Green (WYG) at the East Galway Landfill in December 2005, prior to waste acceptance at the facility, identified elevated CH4 and CO2 levels at several perimeter boreholes. Their report concluded that the source of elevated methane and/or carbon dioxide in perimeter gas monitoring wells is attributed to the continuous decay of organic peat.

### 3.3.2 Landfill Gas In Buildings

There were no instances of gas levels in Buildings/Offices breaching Landfill Gas Concentration limits specified in Schedule C.2 during 2016.

## 3.4 Surface Water Discharge Limits (Measured at SW6 & SW7)

Surface water discharge emission limit values at monitoring locations SW6 and SW7 as stipulated in Schedule C.4 of IED Licence 178-02 are detailed in Table 3.5 below.

### Table 3.5: Surface Water Discharge Limits

| Level (Suspended Solids mg/l) |
|---|
| 35 mg/l |

Suspended solids concentrations at SW6 complied with the 35mg/L ELVs during all monitoring events throughout 2016. There was a breach of the ELV at SW7 in August 2016, this was likely attributable to the disturbance of sediment when sampling due to very low flows.

## 3.5 E-PRTR

The European Pollutant Release and Transfer Register (E-PRTR) for the East Galway Landfill for 2016 is included in Appendix B.

# 4 SUMMARY OF ENVIRONMENTAL MONITORING RESULTS

Environmental Monitoring was conducted at the East Galway Landfill facility in accordance with Schedule D of the IED Licence throughout the reporting period. All monitoring results from 2016 were presented to the Agency in the quarterly environmental monitoring reports and are summarised below. The locations of all environmental monitoring points are illustrated in Appendix A.

## 4.1 Biological Assessment

### 4.1.1 Electrofishing Survey

EirCo and Stillwaters Consultancy were commissioned to undertake an electro-fishing survey on selected sites (A, B, C, D, E and G) in the environs of the East Galway Landfill facility. The objective of the survey was to characterise fish populations in the streams within the vicinity of the landfill site.

The survey was carried out on the 30th of September and 3rd October 2016. No fish were recorded at site A or B but this was likely due to inhibited access due to overgrown vegetation. While there is normal annual fluctuation in population numbers there are no major changes to species composition at these sites to indicate that the landfill area is impacting on them.

The results were submitted to the Agency as part of the Q3 2016 Surface Water and Electrofishing environmental monitoring report, and are summarised below in Table 4.1 below.

**Table 4.1 Results of Electro Fishing Survey (2011-2016)**

| Site | Location | Site Description | Species Recorded 2012 (Note 1 & 2) | Species Recorded 2013 (Note 1 & 2) | Species Recorded 2014 (Note 1 & 2) | Species Recorded 2015 (Note 1 & 2) | Species Recorded 2016 (Note 1 & 2) |
|---|---|---|---|---|---|---|---|
| A | M708297 | Overgrown bog drain Peaty Substrate | Sticklebacks (c) Gammarus (p) | Stickleback (c) | Stickleback (pl) | No Fish recorded | No Fish recorded |
| B | M712302 | Bog Drain ca. 1.5m deep, very overgrown | No fish recorded due to inhibited access | No fish recorded due to inhibited access | Stickleback (p) | No Fish recorded | No Fish recorded |
| C | M707304 | Shallow Stream ca. 5-10cm. Clean gravely substrate maintained by local farmer. | Sticklebacks (pl) Trout 0+(p) Gammarus (p) | Stickleback (c) Crayfish (p) | Stickleback (p) Stoneloach (p) | Stickleback (c) Stoneloach (p) | Stickleback (p) Stoneloach (p) Crawfish (p) |
| D | M709309 | Channel completely overgrown. Upstream Site Surveyed from 2008 on Site more open in 2010 | Sticklebacks (pl) Gammarus (p) | Stickleback (p) | No Fish recorded | Stickleback (c) | Stickleback (c) |
| E | M699313 | Mainly silt with some rock. Channel overgrown except for stretch fish | Trout 1+(p) Stoneloach (p) Pike (p) Crayfish (p) | Not Fished | Trout 0+(p) Trout 1 + (p) Stickleback (p) Stoneloach (pl) Crayfish(p) | Not Fished | Trout (0+) (p) Trout (1+) (p) Stoneloach (p) Crawfish (c) |

| Site | Location | Site Description | Species Recorded 2012 (Note 1 & 2) | Species Recorded 2013 (Note 1 & 2) | Species Recorded 2014 (Note 1 & 2) | Species Recorded 2015 (Note 1 & 2) | Species Recorded 2016 (Note 1 & 2) |
|---|---|---|---|---|---|---|---|
| G | M682308 | Shaded channel under bank cover. Good gravel and cobble substrate, Suitable salmonid habitat | Trout 0+(p) Trout 1 + (c) Stoneloach (p) Crayfish (p) | Trout 0+ (a) Trout 1+ (c) Stoneloach (c) Crayfish (p) | Trout 0+ (p) Trout 1+ (c) Stoneloach (c) Stickleback (p) | Trout 0+ (a) Trout 1+ (c) Stoneloach (c) Stickleback (p) Crayfish (p) | Crawfish (c) Trout 0+(c) Trout (1+) (c) Stone loach (p) Crawfish (a) |

**Note 1:** (p) = Present, (c) = Common, (pl) = Plentiful, (a) = Abundant.
**Note 2: Trout 0+** = trout in their 1st year but not yet 1 year old, **Trout 1+** = trout in their 2nd year but not yet 2 years old.

### 4.1.2 Small Stream Risk Score (SSRS) Assessment for East Galway Landfill 2016

Biological assessment of the surface water quality was carried out by Openfield Ecological Services at four locations along two streams at the East Galway Landfill at Ballybaun, Kilconnell, Co. Galway. Two locations are upstream of the landfill (IN1 and IN2) and two are located downstream of the landfill (IN3 and IN4). The information obtained was used to determine the SSRS, in accordance with the Western River Basin District Project's methodology (WRBD, 2005). As outlined in previous AER's, the SSRS assessment method replaced the EPA Q-Rating system undertaken historically at the site in 2010.

**Table 4.2: SSRS Assessment Results**

| Sampling code | Small Stream Risk | Score Risk Assessment |
|---|---|---|
| **IN1** | 4.8 | At Risk |
| **IN2** | 3.2 | At Risk |
| **IN3** | 2.4 | At Risk |
| **IN4** | 1.6 | At Risk |

The results of the 2016 assessment provided by the SSRS, which categorises each of the streams monitored as being, "At Risk", are consistent with the previous findings for previous monitoring events (2010 – 2015).

Of note this year was the discovery in two locations of the white-clawed crayfish, a protected species under the EU Habitats Directive. The complete SSRS Report from Openfield Ecological Services was submitted as Appendix C of the Q3 report 2016.

## 4.2 Surface Water Monitoring

Surface water monitoring was conducted at 6 no. monitoring locations (SW1, SW3, SW4, SW5, SW6 and SW7) during 2016. Surface water monitoring locations SW1, SW2, SW3 & SW7 are located up-stream of the landfill, and SW4 & SW5 are located downstream. SW6 is an outlet point from the surface water lagoon. SW7 is downstream of a borrow pit.

It should be noted that sampling was not carried out at SW2 during 2016 as it was dry during all four quarterly monitoring events. In addition, sampling could not be carried out at SW3 and SW4 during the Q3 event in 2016 as they were almost dry. Quarterly surface water samples were analysed for parameters stipulated in Schedule D.5 of IED Licence 178-02 and results were forwarded to the Agency as part of the quarterly environmental monitoring reports Q1 – Q4 2016. The 2016 surface water monitoring results are summarised on Tables 4.3 – 4.7 and Figures 4.1 – 4.5 below.

### 4.2.1 Surface Water Monitoring Results

All pH results were found to be within normal ranges for natural uncontaminated surface waters.

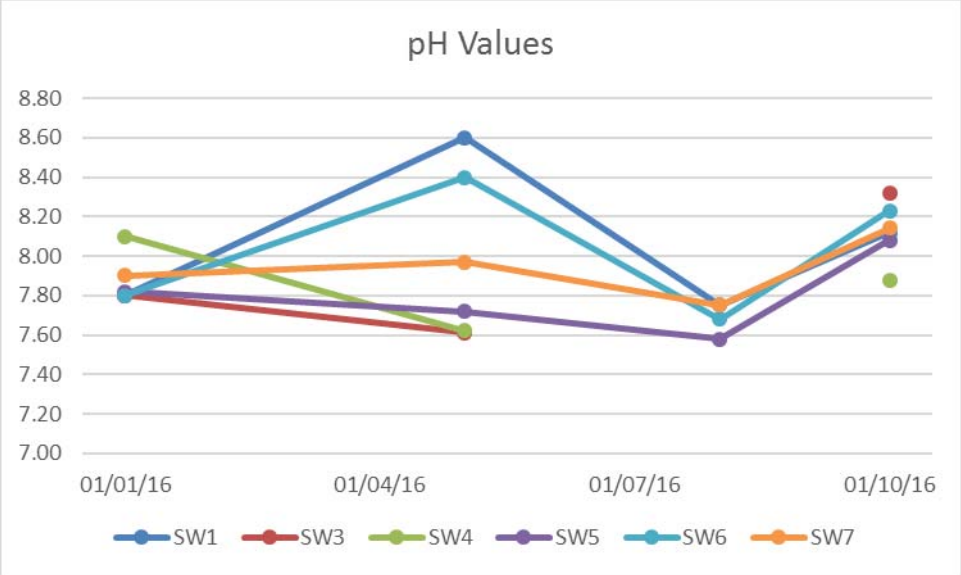
All conductivity results were also found to be within normal ranges for natural uncontaminated surface waters.

Chloride concentrations ranged from 12.6 mg/l (SW7 in Q4) to 29.25 mg/l (SW3 in Q1) during 2016. These results are within the normal range for uncontaminated freshwater (15-35mg/l, EPA).

Ammoniacal nitrogen (total ammonium plus total ammonia) ranged between <0.01 mg/l (SW4 in Q1) to 0.25 mg/l (SW6 in Q1), which is consistent with historical records for the site.

Suspended solid concentrations were below the ELV (35mg/l) at sampling locations during all monitoring events in 2016 except for SW7 in Q3. This was attributed to disturbance of sediment during sampling due to very low flows.

## Figure 4.1: SW pH Results 2016

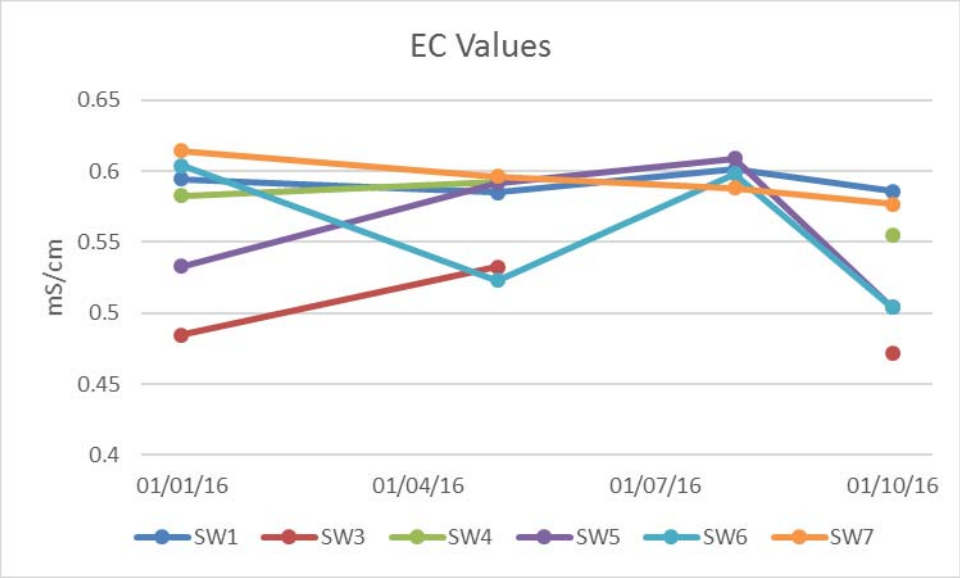



## Table 4.3: SW pH Results – 2016

| pH Units (mg/l) | January | May | August | October |
|---|---|---|---|---|
| **SW1** | 7.80 | 8.60 | 7.75 | 8.12 |
| **SW2*** | * | * | * | * |
| **SW3** | 7.80 | 7.61 | * | 8.32 |
| **SW4** | 8.10 | 7.62 | * | 7.88 |
| **SW5** | 7.82 | 7.72 | 7.58 | 8.08 |
| **SW6** | 7.80 | 8.40 | 7.68 | 8.23 |
| **SW7** | 7.90 | 7.97 | 7.75 | 8.14 |

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

## Figure 4.2: SW Conductivity Results 2016

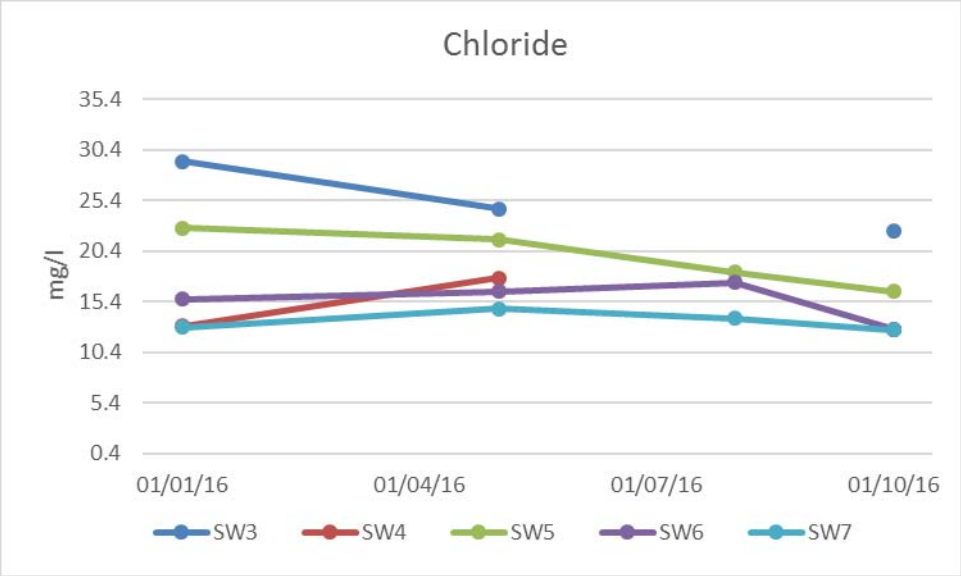



## Table 4.4: SW Conductivity Results 2016

| Electrical Conductivity (mg/l) | January | May | August | October |
|---|---|---|---|---|
| SW1 | 0.5943 | 0.585 | 0.601 | 0.586 |
| SW2* | | | | |
| SW3 | 0.4848 | 0.5326 | | 0.472 |
| SW4 | 0.5826 | 0.5927 | | 0.555 |
| SW5 | 0.5329 | 0.5917 | 0.609 | 0.504 |
| SW6 | 0.604 | 0.5229 | 0.598 | 0.504 |
| SW7 | 0.6142 | 0.5961 | 0.588 | 0.577 |

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

## Figure 4.3: SW Chloride Results 2016

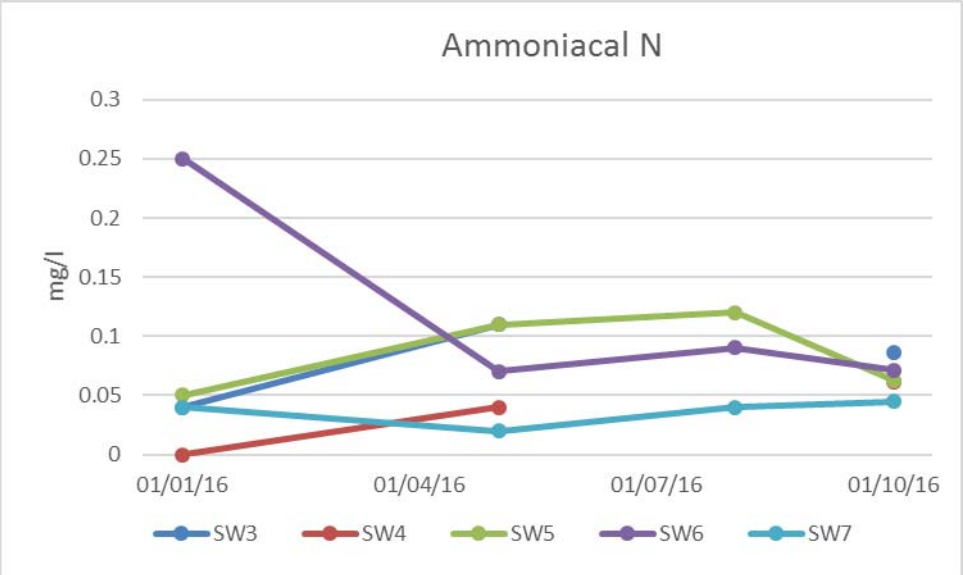



## Table 4.5: SW Chloride Results 2016

| Chloride (mg/l) | January | May | August | October |
|---|---|---|---|---|
| SW1 | 13.39 | 14.12 | 14.95 | 13.4 |
| SW2* | * | * | * | * |
| SW3 | 29.26 | 24.53 | * | 22.4 |
| SW4 | 12.96 | 17.72 | * | 12.6 |
| SW5 | 22.68 | 21.55 | 18.28 | 16.4 |
| SW6 | 15.66 | 16.42 | 17.26 | 12.7 |
| SW7 | 12.87 | 14.7 | 13.72 | 12.6 |

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

## Figure 4.4: SW Ammoniacal Nitrogen Results 2016




## Table 4.6: SW Ammoniacal Nitrogen Results 2016

| Ammoniacal N (mg/l) | January | May | August | October |
|---|---|---|---|---|
| SW1 | 0.02 | 0.03 | 0.07 | 0.0437 |
| SW2* | * | * | * | * |
| SW3 | 0.04 | 0.11 | * | 0.0863 |
| SW4 | <0.01 | 0.04 | * | 0.0611 |
| SW5 | 0.05 | 0.11 | 0.12 | 0.0625 |
| SW6 | 0.25 | 0.07 | 0.09 | 0.0712 |
| SW7 | 0.04 | 0.02 | 0.04 | 0.045 |

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

**Figure 4.5: SW Total Suspended Solids Results 2016**

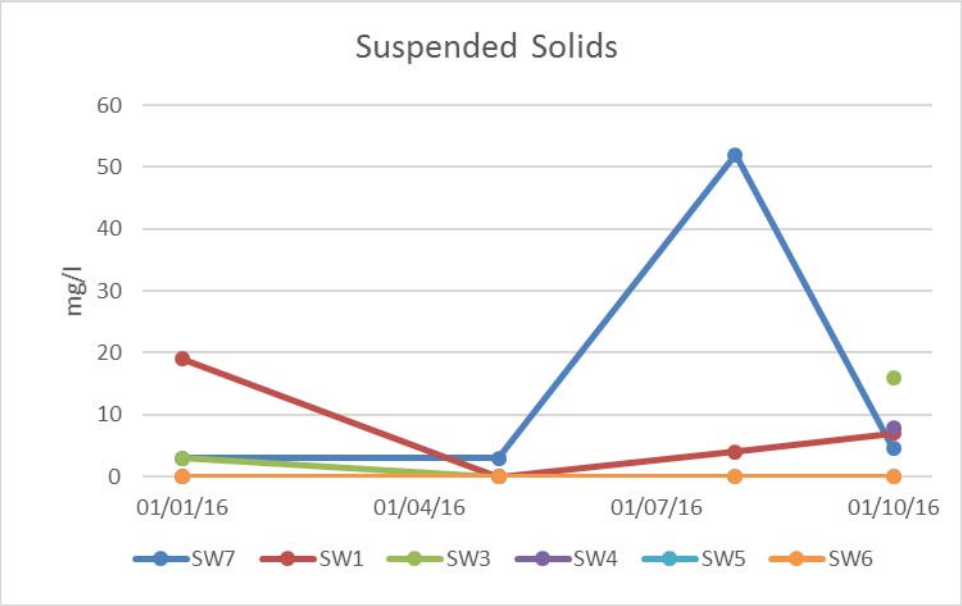



**Table 4.7: SW Suspended Solids Results 2016**

| Suspended Solids (mg/l) | January | May | August | October |
|---|---|---|---|---|
| SW1 | 19 | <2 | 4 | 7 |
| SW2* | * | * | * | * |
| SW3 | 3 | <2 | * | 16 |
| SW4 | <2 | <2 | * | 8 |
| SW5 | <2 | <2 | <2 | <2 |
| SW6 | <2 | <2 | <2 | <2 |
| SW7 | 3 | 3 | 52 | 4.5 |

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

## 4.3 Groundwater Monitoring

Groundwater monitoring was conducted at eight locations during 2016, in accordance with Schedule D.1 and D.5 of IED Licence 178-02.

The trigger levels for groundwater parameters are reviewed annually and were revised in 2008 (as presented in Table 4.8 below). The East Galway Landfill requested Agency agreement of these trigger levels on 8th Dec 2009 in response to a related Agency audit observation. No response was received in relation to this.

In November 2011, the groundwater trigger levels were reviewed and a submission discussing these levels was lodged on behalf of the East Galway Landfill to the Agency following an EPA request for same. Return correspondence was not received in relation to the submission.

A third review of the trigger levels was carried out by GCC in 2016 and has been submitted to the EPA for review. No response has been received to date (March 2017). The trigger levels referenced below remain unchanged and are as have been used between 2008 and the 2016 monitoring period.

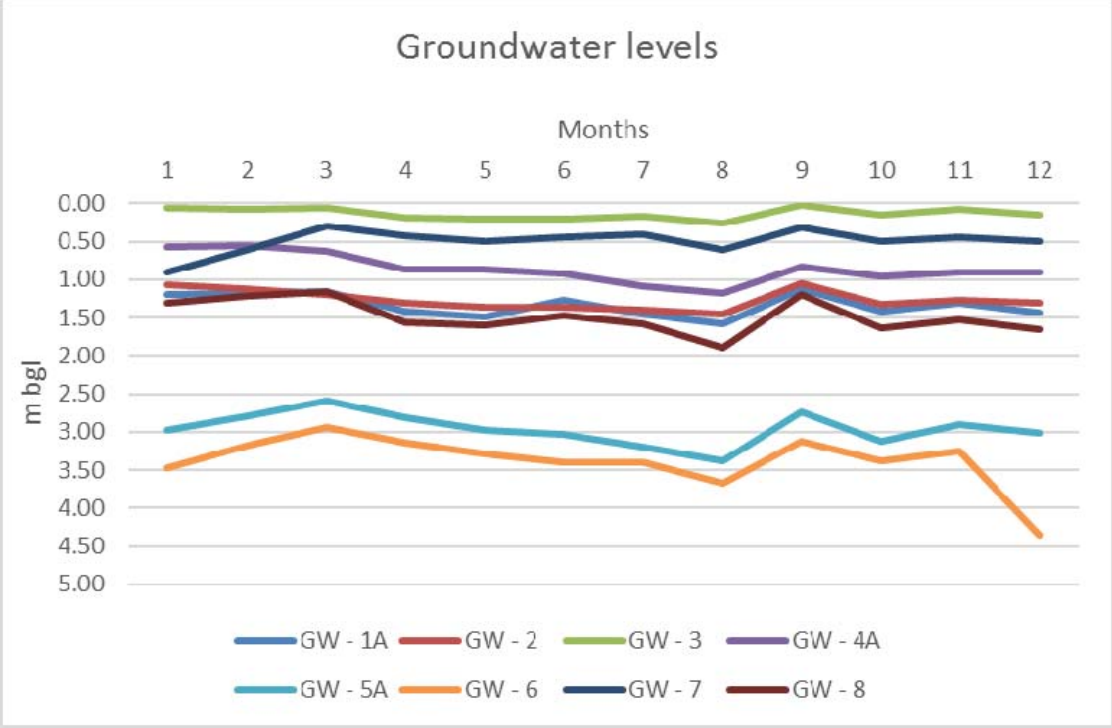
The results of routine licence compliance groundwater monitoring were, for the most part, under the trigger values as revised and submitted in the 2008-2015 AERs. All exceedances were minor and under the limits set in legislation (OTV) and guidance (IGV). This AER report employs the trigger levels for the parameters listed in Condition 6.4.3 of the IED Licence for wells GW1-A, GW2, GW3, GW4-A, GW5-A, GW6, GW7 and GW8.

### Table 4.8: Groundwater Trigger Values (as Revised in 2008)

| Parameter | Units | GW1-A | GW2 | GW3 | GW4-A | GW5-A | GW6 | GW7 | GW8 |
|---|---|---|---|---|---|---|---|---|---|
| Potassium | mg/l | 1.92 | 2.88 | 1.44 | 1.08 | 21.00 | 4.20 | 3.00 | 0.96 |
| Sodium | mg/l | 14.40 | 20.40 | 16.32 | 17.22 | 20.40 | 50.40 | 37.20 | 20.40 |
| pH (lower limit) | pH Units | 5.73 | 5.35 | 5.56 | 5.77 | 5.70 | 5.54 | 5.87 | 5.28 |
| pH | pH Units | 9.02 | 9.79 | 9.38 | 9.14 | 9.22 | 10.56 | 9.53 | 9.61 |
| Chloride | mg/l | 20.40 | 46.80 | 24.00 | 39.60 | 32.40 | 24.00 | 18.00 | 37.20 |
| Ammoniacal Nitrogen | mg/l | 1.92 | 6.36 | 5.40 | 3.60 | 8.52 | 7.44 | 2.40 | 3.72 |
| TOC | mg/l | 60.00 | 55.20 | 27.60 | 60.00 | 74.40 | 48.00 | 21.60 | 39.60 |

Groundwater levels were recorded monthly during 2016 and the results are presented in Figure 4.6 below. The recorded water levels remained relatively constant while allowing for seasonal variation during 2016.

**Figure 4.6: Monthly Groundwater Levels – 2016**




### 4.3.1 Groundwater Results Summary

pH concentrations were within their respective trigger values at all monitoring locations during 2016.

Conductivity measurements were typical of natural uncontaminated groundwater. Conductivity ranged from 0.4 mS/cm to 0.899 mS/cm during 2016. All conductivity results were also found to be within normal ranges for natural uncontaminated waters.

Chloride concentrations were below their respective trigger values for 29 no. of the total 32 no. samples collected and analysed during 2016. Three exceedances above their respective trigger values were recorded from monitoring locations GW1-A in Q2 (results of 23.28 mg/l exceeded limit of 20.4 mg/l) and GW6 in Q1 (results of 25.01 mg/, exceeded limit of 24 mg/l), and GW8 in Q1 (results of 38.32 mg/l exceeded limit of 37.2 mg/l). The range for Chloride in the European Communities Environmental Objectives (Groundwater) Regulations, 2009 is 24-187.5 mg/l. This is referred to an OTV, overall threshold value.

Ammoniacal Nitrogen concentrations were below their respective trigger values at all monitoring locations during 2016.

Total Organic Carbon concentrations were below respective trigger values at all monitoring locations during 2016.

Dissolved Oxygen concentrations ranged from 0.55 mg/l to 5.39 mg/l during 2016 and were consistent with previous recordings at the site albeit at the lower end of the scale for GW4-A and GW5-A during Q1 and Q2, 2016.

As part of the annual suite of parameters analysed in Q3 2016, Potassium and Sodium concentrations were recorded.

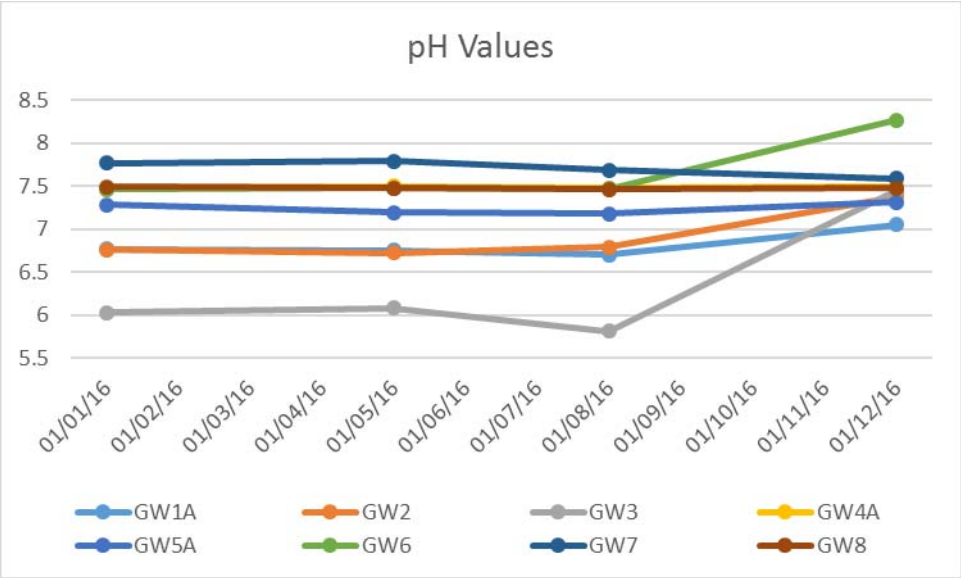
Potassium concentrations were below the trigger value at all locations, except for GW1-A (2.56 mg/l) and GW4-A (1.73 mg/l). Concentrations of potassium did not however exceed the Interim Guideline Values for Potassium (5 mg/l). There is no OTV for potassium.

Sodium concentrations ranged between 11.53 mg/a at GW2 and 22.73 mg/l at GW7. All locations complied with the trigger values.

In general, the results of quarterly parameters are consistent with the data reported for the previous events. All parameters will continue to be monitored closely.

The 2016 groundwater monitoring results are summarised on Tables 4.9 – 4.14 and Figures 4.7 – 4.12 below.

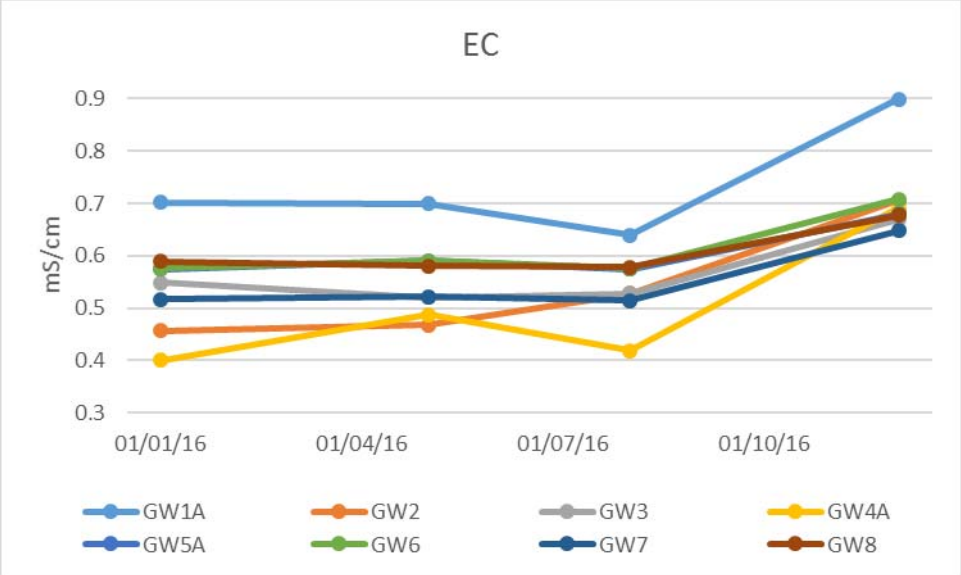
## Figure 4.7: Groundwater pH Laboratory Results– 2016




## Table 4.9: Groundwater pH Laboratory Results– 2016

| pH | *Trigger Values* | | January | May | August | December |
|---|---|---|---|---|---|---|
| (pH Units) | *pH Lower Limit* | *pH Upper Limit* | | | | |
| **GW 1 – A** | *5.73* | *9.02* | 6.77 | 6.75 | 6.7 | 7.05 |
| **GW 2** | *5.35* | *9.79* | 6.76 | 6.72 | 6.79 | 7.38 |
| **GW 3** | *5.56* | *9.38* | 6.03 | 6.08 | 5.81 | 7.45 |
| **GW 4 – A** | *5.77* | *9.14* | 7.48 | 7.5 | 7.48 | 7.5 |
| **GW 5 – A** | *5.7* | *9.22* | 7.28 | 7.19 | 7.18 | 7.31 |
| **GW 6** | *5.54* | *10.56* | 7.46 | 7.48 | 7.47 | 8.27 |
| **GW 7** | *5.87* | *9.53* | 7.77 | 7.79 | 7.69 | 7.59 |
| **GW 8** | *5.28* | *9.61* | 7.49 | 7.48 | 7.46 | 7.48 |

## Figure 4.8: Groundwater Electrical Conductivity Results– 2016

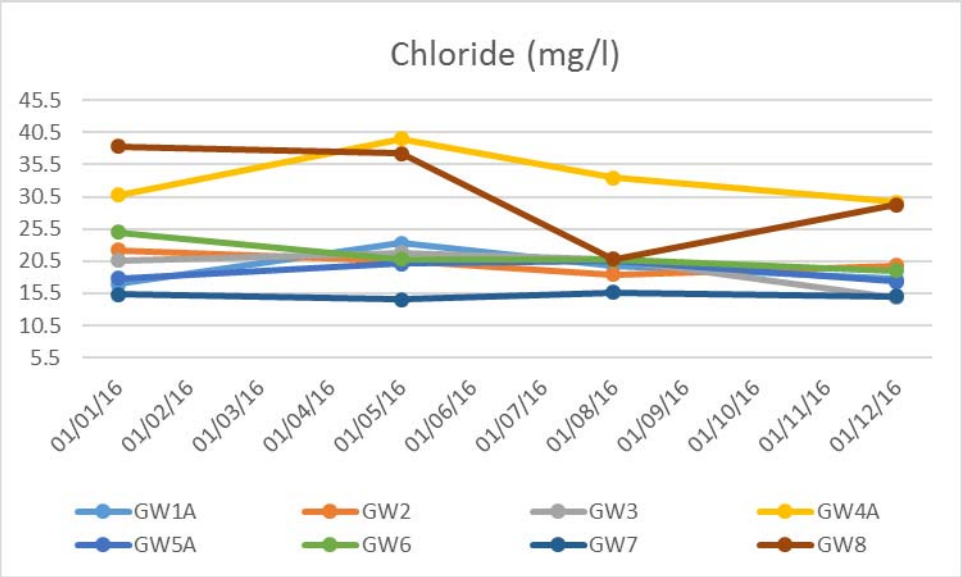



## Table 4.10: Groundwater Electrical Conductivity Results – 2016

| Electrical Conductivity (mS/cm) | *Trigger Values (Note 1)* | January | May | August | December |
|---|---|---|---|---|---|
| **GW 1 – A** | - | 0.702 | 0.699 | 0.639 | 0.899 |
| **GW 2** | - | 0.457 | 0.468 | 0.528 | 0.706 |
| **GW 3** | - | 0.548 | 0.52 | 0.528 | 0.67 |
| **GW 4 – A** | - | 0.4 | 0.487 | 0.419 | 0.691 |
| **GW 5 – A** | - | 0.574 | 0.59 | 0.574 | 0.68 |
| **GW 6** | - | 0.576 | 0.59 | 0.575 | 0.708 |
| **GW 7** | - | 0.517 | 0.522 | 0.514 | 0.648 |
| **GW 8** | - | 0.589 | 0.58 | 0.578 | 0.677 |

Note 1: No Set limit for electrical conductivity in groundwater trigger values.

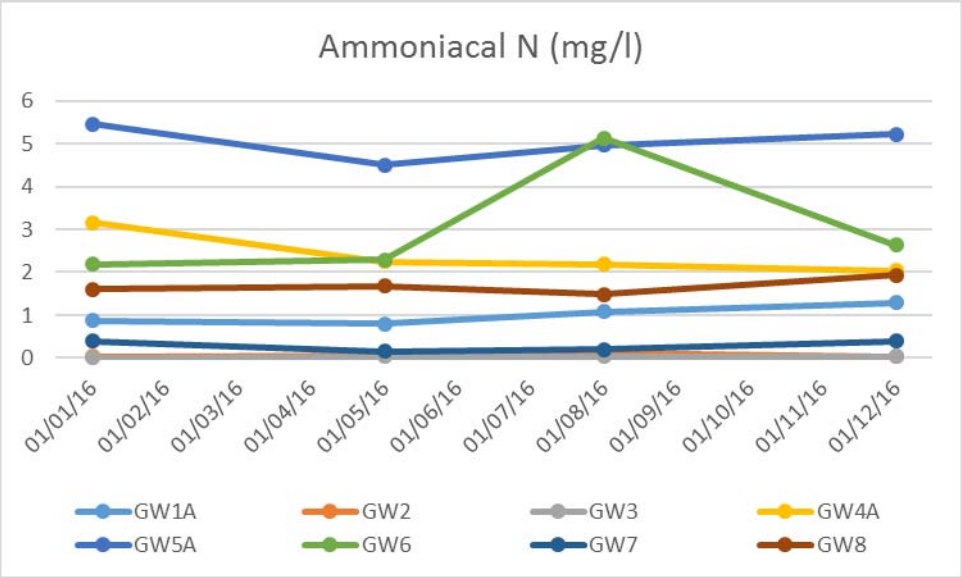
## Figure 4.9: Groundwater Chloride Results– 2016




## Table 4.11: Groundwater Chloride Results– 2016

| Chloride (mg/l) | *Trigger Values* | January | May | August | December |
|---|---|---|---|---|---|
| GW 1 – A | *20.4* | 16.88 | 23.28 | 19.85 | 17.7 |
| GW 2 | *46.8* | 22.19 | 20.64 | 18.44 | 19.8 |
| GW 3 | *24* | 20.58 | 21.84 | 20.68 | 14.8 |
| GW 4 – A | *39.6* | 30.73 | 39.54 | 33.46 | 29.7 |
| GW 5 – A | *32.4* | 17.83 | 20.16 | 20.66 | 17.3 |
| GW 6 | *24* | 25.01 | 20.86 | 20.69 | 19 |
| GW 7 | *18* | 15.29 | 14.57 | 15.68 | 15 |
| GW 8 | *37.2* | 38.32 | 37.24 | 20.85 | 29.3 |

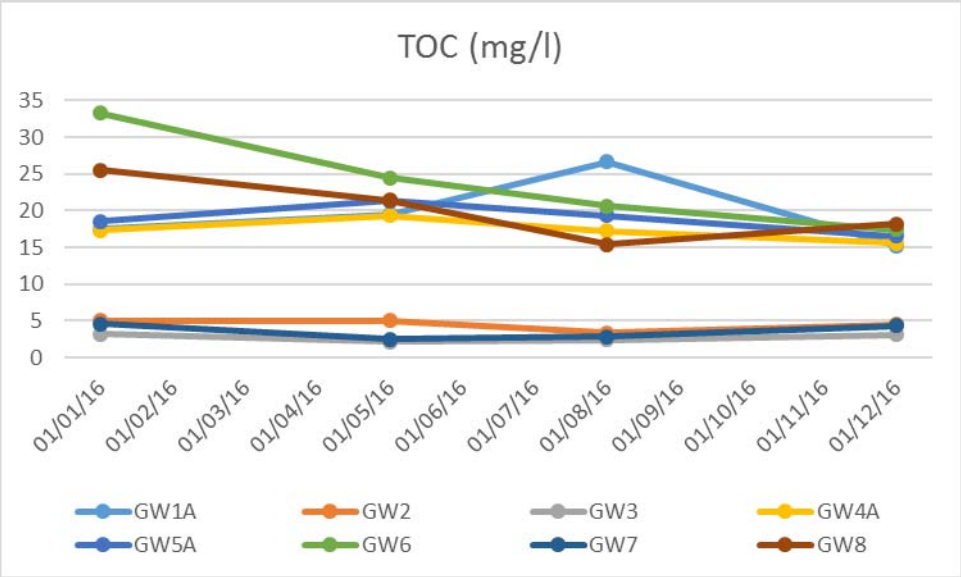
## Figure 4.10: Groundwater Ammoniacal Nitrogen Results– 2016




## Table 4.12: Groundwater Ammoniacal Nitrogen Results– 2016

| Ammoniacal Nitrogen (mg/l) | *Trigger Values* | January | May | August | December |
|---|---|---|---|---|---|
| GW 1 – A | *1.92* | 0.87 | 0.8 | 1.08 | 1.29 |
| GW 2 | *6.36* | 0.032 | 0.066 | 0.13 | 0.0391 |
| GW 3 | *5.4* | 0.011 | 0.039 | 0.04 | 0.0375 |
| GW 4 – A | *3.6* | 3.15 | 2.24 | 2.18 | 2.03 |
| GW 5 – A | *8.52* | 5.45 | 4.5 | 4.96 | 5.22 |
| GW 6 | *7.44* | 2.18 | 2.29 | 5.13 | 2.64 |
| GW 7 | *2.4* | 0.39 | 0.16 | 0.2 | 0.388 |
| GW 8 | *3.72* | 1.61 | 1.68 | 1.48 | 1.94 |

## Figure 4.11: Groundwater TOC Results– 2016




## Table 4.13: Groundwater TOC Results– 2016

| TOC (mg/l) | *Trigger Values* | January | May | August | December |
|---|---|---|---|---|---|
| GW 1 – A | *60* | 17.5 | 19.49 | 26.68 | 15.2 |
| GW 2 | *55.2* | 5.02 | 5.07 | 3.39 | 4.54 |
| GW 3 | *27.6* | 3.2 | 2.2 | 2.41 | 3.08 |
| GW 4 – A | *60* | 17.32 | 19.34 | 17.2 | 15.6 |
| GW 5 – A | *74.4* | 18.5 | 21.3 | 19.36 | 16.5 |
| GW 6 | *48* | 33.23 | 24.49 | 20.63 | 17.4 |
| GW 7 | *21.6* | 4.62 | 2.52 | 2.89 | 4.3 |
| GW 8 | *39.6* | 25.55 | 21.38 | 15.43 | 18.2 |

## 4.4 Dust and PM10 Monitoring

### 4.4.1 Dust Monitoring

As discussed in Section 3.1 above dust monitoring was undertaken at 5 (no.) locations (D1, D2, D3, D4, D5) in accordance with Schedule D.1 and D.3 of IED Licence 178-02. All dust concentrations recorded were below the required ELV of 350 mg/$m^2$/day during all monitoring events in 2016. Dust results from 2016 are summarised in Table 4.15 below.

**Table 4.14 Dust Monitoring Results 2016**

| Date out | Date in | D 1 | D 2 | D 3 | D 4 | D 5 |
|---|---|---|---|---|---|---|
| | | (mg/$m^2$/day) | | | | |
| 21/01/2016 | 22/02/2016 | 17.17 | 11.89 | 31.47 | 16.1 | 95.2 |
| 03/05/2016 | 01/06/2016 | 11 | 17.11 | 29.9 | 6.34 | 12.12 |
| 19/07/2016 | 15/08/2016 | 23.56 | 13.91 | 63.62 | 11.11 | 53.41 |
| 12/10/2016 | 10/11/2016 | 8.6 | 39.8 | 2.69 | 15.6 | 36.6 |

### 4.4.2 PM10 Monitoring

$PM_{10}$ monitoring was conducted quarterly at the facility in accordance with Schedule D of IED Licence 178-02. The $PM_{10}$ monitoring locations are shown in Appendix A. All the $PM_{10}$ results in Q1 to Q3 were below the required limit level of 50 ug/$m^3$ during 2016. There were two exceedances in Q4, both at locations farthest from the landfill. The $PM_{10}$ results for 2016 are summarised in Table 4.16 below.

**Table 4.15: $PM_{10}$ (ug/$m^3$) Monitoring Results for 2016**

| Monitoring Location | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|
| | Average concentration value (µg/$m^3$) | | | |
| *Limit Value* | *50* | *50* | *50* | *50* |
| **D1** | 10 | 9 | 8 | 60 |
| **D2** | 8 | 7 | 8 | 30 |
| **D3** | 9 | 7.5 | 9 | 40 |
| **D4** | 10 | 8.5 | 9 | 30 |
| **D5** | 9 | 8 | 8.5 | 100 |

## 4.5 Leachate Monitoring

As per Schedule D.5 of IED Licence 178-02 temperature readings from each of the leachate cells and the leachate holding tank (LHT) are required to be taken on a quarterly basis. Chemical analysis of the leachate in carried out annually and was undertaken in August 2016. Results were submitted to the Agency as part of the Q3 environmental monitoring report.

### 4.5.1 Leachate Results

Leachate temperature are shown in Table 4.17 below.

**Table 4.16: Leachate Temperatures– 2016**

| Monitoring Location | Q1 Temperature (ºC) | Q2 Temperature (ºC) | Q3 Temperature (ºC) | Q4 Temperature (ºC) |
|---|---|---|---|---|
| Cell 1 | 9.7 | 12.3 | 15.9 | 12.9 |
| Cell 2 | 12.7 | 21.7 | 22.5 | 19.3 |
| Cell 3 | 20.5 | 22.2 | 18.2 | 17.1 |
| Cell 4 | 15.1 | 14.8 | 21 | 13.8 |
| Cell 5 | 12.2 | 15.2 | 21.5 | 12.8 |
| Cell 6 | 22.2 | 23.7 | 18 | 17.2 |
| Cell 7 | 20.3 | 23.5 | 21.5 | 19.8 |
| Cell 8 | - | - | - | 21.1 |
| Leachate Holding Tank | 9.7 | 16.7 | 19.7 | 14.5 |

## 4.6 Noise Monitoring

During 2016, noise monitoring was carried out on a quarterly basis at 5 no. monitoring locations, as indicated on the monitoring locations drawing in Appendix A. All noise monitoring results were submitted to the Agency as part of the quarterly environmental monitoring reports for 2016. Results for noise monitoring conducted at the facility on a quarterly basis during 2016 are summarised in Table 4.19 below.

All noise monitoring locations had LAeq values less than the required ELV of 55dB LAeq during 2016, except for N5. These exceedances were attributable off site noise sources.

**Table 4.17: Noise Monitoring Results– 2016**

| Location | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|
| | $LA_{eq}$ | | | |
| N1* | 32.4 | 33.5 | 32.6 | 43 |
| N2 | 33.8 | 33.4 | 33.1 | 41 |
| N3* | 44.2 | 37.9 | 44.5 | 46 |
| N4 | 33.2 | 33.3 | 33.1 | 35 |
| N5* | 56.5 | 55.1 | 51.8 | 68 |

*Noise Sensitive Receptor

# 5 RESOURCE AND ENERGY CONSUMPTION SUMMARY

The main resources consumed at the facility during the reporting period were electricity, diesel for site plant and water for potable supply & vehicle wheel cleaning. The details are listed in Table 5.1 below.

Electricity consumed from the national grid for 2016 was 15,922 KWHr. A gas utilisation plant (engine) is in operation on site which generated a substantial percentage of the sites electrical demand in 2016. It represents a decrease of 42% on the amount consumed from the national grid in 2015 (27,386 KWHr) due to higher on site electrical generation in 2016.

Total diesel consumption increased substantially from 926 litres in 2015 to 63,018 litres in 2016. This is due to the reopening of the landfill for waste acceptance in August 2016 and related activity of heavy plant.

Total water consumption increased from 156,000 litres in 2015 to 186,000 litres in 2016 (19% Increase) due possibly to an increased in staff numbers on site. Water for dust suppression is obtained from the surface water lagoon and drains back into the surface water lagoon. It is therefore being reused and is not consumed.

Terram, imported aggregates and soil materials from site stockpiles show significant increase in amounts used compared to the previous year due to the reopening of the landfill for waste acceptance in August 2016.

### Table 5.1: Energy and Resource Use 2016

| Resource | 2016 Consumption | 2015 Consumption |
|---|---|---|
| Electricity(KWHr) | 15,922 | 27,386 |
| Water, Potable Supply (Litres) | 181,000 | 156,000 |
| Water, Dust suppression (Litres) | 0 | 0.0 |
| Water, Wheelwash (Litres) | 5,000 | 10,000 |
| Total Water (Litres) | 186,000 | 166,000 |
| Diesel (Including Contractor Plant) (Litres) | 63,018 | 926 |
| Petrol (Litres) | 222 | 40 |
| Terram for road base (m2) | 4,500 | 0 |
| Imported Aggregates (Tonnes) | 1,591 | 0 |
| Soil materials from site stockpiles (Tonnes) | 11,072 | 0 |

# 6 DEVELOPMENT AND RESTORATION WORKS

## 6.1 Development Works Undertaken in 2016

There were no development works undertaken during the reporting period. All development works / enabling works carried out in preparation for recommencement of waste acceptance at the East Galway Landfill were completed prior to the end of 2015.

## 6.2 Restoration of Completed Cells / Phases

There were no restoration works relating to completed cells undertaken during the reporting period. Capping of completed cells is scheduled to be carried out in 2017. A programme for this work was submitted to the EPA on 14th December 2016.

# 7 VOLUME OF LEACHATE TRANSPORTED / DISCHARGED OFF SITE

Volumes of leachate tankered off site monthly are summarised in Table 7.1 below.

## Table 7.1 Volume of Leachate Transported Off Site

| 2016 (Month) | Leachate Consigned Off Site ($m^3$) |
|---|---|
| January | 2,931.44 |
| February | 2,918.44 |
| March | 1,686.38 |
| April | 1,451.82 |
| May | 1,172.20 |
| June | 1,013.86 |
| July | 1,282.90 |
| August | 1,496.50 |
| September | 1,989.30 |
| October | 1,947.00 |
| November | 1,097.06 |
| December | 1,119.80 |
| **Total** | **20,106.70** |

# 8 LANDFILL GAS

Tables 8.1 to 8.3 below present the annual cumulative quantity of landfill gas captured, flared and utilised at the facility during 2016.

## Table 8.1: Landfill Gas collected in 2016 – 2000 Haase Flare

| | Flare No. 1 Connaught 1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Model:** Haase | | | **Type:** HTN 2000 Enclosed | | | **Commissioned:** Apr-08 | | |
| 2016 Monthly | Av. Flow Rate ($m^3$/hr) | Total Runtime Hours | Av. $CH_4$ %v/v | Av. $CO_2$ %v/v | Av. $O_2$ %v/v | Combustion Efficiency (%) | Total $CH_4$ $m^3$ | Total $CH_4$ kgs |
| Jan | 503 | 32 | 37.5 | 25.4 | 1.2 | 99.9 | 6,030 | 4,102 |
| Feb | 467 | 40 | 38.3 | 29 | 1.2 | 99.9 | 7,147 | 4,876 |
| Mar | 455 | 24 | 39.8 | 34.9 | 1.6 | 99.9 | 4,342 | 2,942 |
| Apr | 376 | 36 | 39.4 | 36.1 | 2.1 | 99.9 | 5,328 | 3,610 |
| May | 367 | 51 | 40.5 | 38.8 | 1.5 | 99.9 | 7,573 | 5,136 |
| June | 375 | 13 | 40.5 | 43.6 | 1.3 | 99.9 | 1,972 | 1,338 |
| July | 395 | 13 | 38.7 | 31.7 | 1.5 | 99.9 | 1,985 | 1,345 |
| Aug | 485 | 19 | 39.1 | 28.7 | 1.3 | 99.9 | 3,599 | 2,421 |
| Sept | 392 | 5 | 39.7 | 29.1 | 1.6 | 99.9 | 777 | 522 |
| Oct | 403 | 55 | 37.5 | 27.9 | 1.9 | 99.9 | 8,304 | 5,580 |
| Nov | 420 | 71 | 36.8 | 27.4 | 2 | 99.9 | 10,963 | 7,397 |
| Dec | 456 | 64 | 38.2 | 30.3 | 1.6 | 99.9 | 11,137 | 7,568 |
| **Total** | | 423 | | | | | 69,158 | 46,838 |

## Table 8.2: Landfill Gas collected in 2016 – HT 500 Low Calorific Enclosed Flare

| | Flare No. 2 Low Calorific Value Flare (AFS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Model:** AFS | | **Type:** HT 500 Low Calorific Enclosed Flare | | | | **Commisioned:** Feb-15 | | |
| 2016 Monthly | Average Flow Rate ($m^3$/hr) | Total Runtime Hours | Average $CH_4$ %v/v | Average $CO_2$ %v/v | Average $O_2$ %v/v | Combustion Efficiency (%) | Total $CH_4$ $m^3$ | Total $CH_4$ kgs |
| Jan | 170 | 744 | 22.5 | 17.6 | 9.1 | 99.9 | 28,430 | 19,242 |
| Feb | 171 | 696 | 20.6 | 16.7 | 9.9 | 99.9 | 24,493 | 16,577 |
| Mar | 182 | 744 | 19.7 | 16.3 | 10.3 | 99.9 | 26,649 | 18,055 |
| Apr | 183 | 720 | 19.4 | 21.2 | 9.7 | 99.9 | 25,536 | 17,283 |
| May | 180 | 744 | 20.3 | 17.3 | 8.5 | 99.9 | 27,159 | 18,381 |
| June | 182 | 720 | 20 | 17.6 | 8.6 | 99.9 | 26,182 | 17,721 |
| July | 178 | 744 | 19.8 | 17.2 | 8.7 | 99.9 | 26,195 | 17,730 |
| Aug | 180 | 744 | 19.2 | 16.6 | 9.2 | 99.9 | 25,687 | 17,455 |
| Sept | 187 | 720 | 17.2 | 14.7 | 10.3 | 99.9 | 23,135 | 15,769 |
| Oct | 257 | 744 | 17.5 | 20.8 | 9.5 | 99.9 | 33,428 | 22,807 |
| Nov | 284 | 720 | 21.2 | 23.5 | 9 | 99.9 | 43,306 | 29,576 |
| Dec | 253 | 744 | 21.2 | 22.3 | 8.5 | 99.9 | 39,865 | 27,226 |
| **Total** | | 8,784 | | | | | 350,064 | 237,822 |

### Table 8.3: Landfill Gas collected in 2016 – Engine No. 1

| | Engine No.1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Model:** Deutz | | **Type:** TGB 620 V16 | | | | **Commissioned:** Oct-10 | | |
| **2016 Month** | **Average Flow** | **Total Run-time** | **Average $CH_4$** | **Average $CO_2$** | **Average $O_2$** | **Combustion** | **Total $CH_4$** | **Total $CH_4$** |
| | **Rate ($m^3$/hr)** | **Hours** | **%v/v** | **%v/v** | **%v/v** | **Efficiency (%)** | **$m^3$** | **kgs** |
| Jan | 503 | 712 | 37.50 | 25.40 | 1.20 | 99.9 | 134,167 | 91,264 |
| Feb | 467 | 680 | 38.30 | 29.00 | 1.20 | 99.9 | 121,504 | 82,899 |
| Mar | 455 | 720 | 39.80 | 34.90 | 1.60 | 99.9 | 130,254 | 88,248 |
| Apr | 376 | 684 | 39.40 | 36.10 | 2.10 | 99.9 | 101,229 | 68,583 |
| May | 367 | 693 | 40.50 | 38.80 | 1.50 | 99.9 | 102,901 | 69,786 |
| June | 375 | 707 | 40.50 | 43.60 | 1.30 | 99.9 | 107,268 | 72,748 |
| July | 395 | 725 | 38.70 | 31.70 | 1.50 | 99.9 | 110,716 | 75,011 |
| Aug | 485 | 739 | 39.10 | 28.70 | 1.30 | 99.9 | 140,000 | 94,183 |
| Sept | 392 | 665 | 39.70 | 29.10 | 1.60 | 99.9 | 103,386 | 69,481 |
| Oct | 403 | 673 | 37.50 | 27.90 | 1.90 | 99.9 | 101,605 | 68,284 |
| Nov | 420 | 656 | 36.80 | 27.40 | 2.00 | 99.9 | 101,290 | 68,348 |
| Dec | 456 | 726 | 38.20 | 30.30 | 1.60 | 99.9 | 126,337 | 85,852 |
| **Total** | | 8,380 | | | | | 1,380,659 | 934,685 |

## 8.1 VOC Surface Emissions

Biannual surveys were carried out and the reports were submitted via EDEN. The management team carried out remediation works to mitigate any minor surface emissions detected during the surveys.

# 9 INDIRECT EMISSIONS TO GROUNDWATER

The East Galway Landfill is a fully engineered and contained landfill and there are no indirect emissions to groundwater from the facility.

The potential sources of indirect emissions to groundwater from the facility are:

| | |
|---|---|
| **Landfill Base:** | The landfill site has a composite base lining system comprising a HDPE geomembrane and a 0.5 m thick layer of compacted Bentonite Enhanced Soil. A leak detection survey of the HDPE geomembrane after placement of the drainage stone layer was completed and defects to the HDPE liner were repaired in accordance with industry standards. A CQA report was then completed and submitted to the agency. |
| **Surface Water Collection and Treatment System:** | Surface water from the paved access roads and landfill cell swale drain is collected and discharged into the surface water lagoon along with groundwater collected at the interceptor sump located below the landfill cells. Water from the lagoon is then piped to a reed bed, which further filters the water before it is finally discharged into the nearby stream. |
| **Treated Sewage Effluent:** | There is a BioCycle wastewater treatment plant located adjacent to the weighbridge which treats the canteen and office wastewater prior to being pumped to the leachate holding tank via the foul water sump. Leachate (containing foul water) is tankered off-site to a waste water treatment plant via a vacuum tanker. |
| **Leachate Lagoon and Holding Tank:** | Leachate from the engineered landfill is collected within a Leachate Lagoon and Holding Tank before being tankered offsite to a registered waste recovery facility. |

In accordance with Technical Amendment B, Condition 8.15 of the IED Licence, a risk screening and Tier 3 assessment was carried out in March 2015. The assessment was completed to assess compliance with the Groundwater regulations SI 122 of 2010. This report was submitted to the EPA via the EDEN web portal in March 2015 and is summarised herein.

In general, downgradient water quality was found to be similar to, or slightly improved, in comparison with upgradient wells. The average results indicate good consistency across the site and the monitoring results have been generally consistent over the previous 10 years.

A review of the data plots suggest that the COPCs show a relatively stable to downward trend for almost all parameters and all monitoring points except GW1A located upgradient of the Landfill.

No significant upward trends in downgradient wells were observed since the commencement of landfill operations. Concentrations of chloride and ammonia have significantly decreased since the commencement of activities at the landfill. Concentrations downgradient are generally lower than the background concentrations and the upgradient at the facility, with the reduction of agricultural activities at the site and removal of peat from the footprint of the landfill cited as one possible reason for this observation.

Based on the extensive groundwater data, most parameters appear to be decreasing or stable since 2004, except for the upgradient well GW1A. Statistical analysis of the main quarterly parameters using the Mann-Kendall statistical trend analysis ($p=0.05$) indicated a stable or a statistically significant decreasing trend. In conclusion, based on the site data, the groundwater body is not at risk. No contaminated groundwater plume exists because of the engineered landfill.

# 10 ANNUAL WATER BALANCE

## 10.1 Estimated Liquid In-Waste Liquid Volume

The estimated liquid in-waste liquid volume for 2016 was assessed using rainfall figures obtained from the on-site meteorological station, potential in-waste liquid volume and the assumed absorption capacity of the waste mass (see Table 10.1 below).

### Table 10.1: Estimated Liquid In-Waste Liquid Volume

| 2016 | Total uncapped area (Note 1) | Rainfall (Note 2) | Potential in waste liquid volume | Absorption capacity of Waste (assumed to be 2%) | Balance | Leachate Tankered off site (Note 3) |
|---|---|---|---|---|---|---|
| | ($m^2$) | (m) | ($m^3$) | ($m^3$) | ($m^3$) | ($m^3$) |
| Jan | 300 | 0.1704 | 51.12 | 1.02 | 50.10 | 2,931.44 |
| Feb | 300 | 0.1649 | 49.47 | 0.99 | 48.48 | 2,918.44 |
| Mar | 300 | 0.0898 | 26.94 | 0.54 | 26.40 | 1,686.38 |
| Apr | 300 | 0.0782 | 23.45 | 0.47 | 22.98 | 1,451.82 |
| May | 300 | 0.0664 | 19.93 | 0.40 | 19.53 | 1,172.20 |
| Jun | 300 | 0.1121 | 33.63 | 0.67 | 32.96 | 1,013.86 |
| Jul | 300 | 0.0728 | 21.83 | 0.44 | 21.39 | 1,282.90 |
| Aug | 4300 | 0.1264 | 543.52 | 10.87 | 532.65 | 1,496.50 |
| Sept | 4300 | 0.1436 | 617.48 | 12.35 | 605.13 | 1,989.30 |
| Oct | 8300 | 0.0787 | 653.29 | 13.07 | 640.23 | 1,947.00 |
| Nov | 8300 | 0.0834 | 692.22 | 13.84 | 678.38 | 1,097.06 |
| Dec | 12300 | 0.1022 | 1257.06 | 25.14 | 1231.92 | 1,119.80 |
| | | 1.2889 | 3989.94 | 79.80 | 3910.14 | 20106.70 |

**Note 1:** For the purposes of water balance calculation 'Uncapped Area' = area of landfill which is not under an intermediate cap of impermeable synthetic material preventing ingress of rainfall.

**Note 2:** Rainfall values obtained from on-site meteorological station**.**

**Note 3:** The total volume of leachate tankered off site also includes:

- *Office and weighbridge foulwater;*
- *Run-off from within bunded areas and wheelwash;*
- *Condensate/leachate removed from the landfill gas collection system;*
- *Moisture content held in waste received and cover materials used.*

# 11 FACILITY MANAGEMENT

## 11.1 New Procedures Developed During 2016

The following is a description of the work procedures developed during the reporting period with respect to the operation of the facility.

EGL 43 Cleaning of Wheelwash
Procedure for outlining the process involved in cleaning the exit wheelwash on site.

EGL 44 Cleaning of Weighbridge
Detailed procedure describing process for removing panels and cleaning in, on and around both weighbridges on site. This includes a brief traffic management plan.

EGL 45 Placement of Protective Geotextile on slopes of Cell 8 & 9
The existing sideslope protective geotextile on cells 8 & 9 has been exposed since its construction. Given the exposure time, a second layer of protective was/will be placed over it to provide adequate protection. This procedure outlines the process for installation.

EGL 46 Handling and Unloading Articulated Tipping Vehicles on Site
As articulated tipping vehicles provide an added health and safety risk over normal tipping vehicles, a procedure solely for outlining the process of unloading them was created.

EGL 47 Placing and removing daily cover mats
Procedure detailing process involved in connecting, moving and removing the daily cover mats over waste each morning and evening.

EGL 48 Installation of Horizontal Landfill Gas Extraction Well
Detailed procedure outlining process of installing new horizontal gas wells into recently placed waste.

## 11.2 Site Testing and Inspection Reports

As per Schedule E of the licence, the integrity of the bunds and tanks are carried out every three years. This was carried out in February 2015 and the results were presented in Appendix C of the 2014 AER.

## 11.3 Topographical Survey

As per condition 8.7 of the licence, a survey showing the topography of the facility at the end of the reporting period is included in Appendix C.

## 11.4 Reported Incidents and Complaints Summary

### 11.4.1 Reported Incidents

An open incident is in relation to methane and carbon dioxide detected in the gas migration monitoring boreholes. Concentrations of these gases exceeded the limits set out in IED Licence 178-02.

Previous monitoring at the East Galway Landfill was carried out by White Young & Green (WYG) on the 6th and 13th of December 2005, prior to the facility accepting waste. These two rounds of landfill gas monitoring identified elevated CH4 gas levels at LG14, LG16 and LG18 and elevated CO2 levels at monitoring locations LG6, LG6-A, LG9, LG10, LG14, LG16 and LG18.

The report on LFG monitoring carried out by WYG in December 2005 concluded the slightly high levels of $CH^4$ and $CO^2$ could be attributed to the large quantities of peat deposited in the area where the monitoring wells are located.

A literature search carried out for that report demonstrated that the levels of carbon dioxide and methane measured in the landfill gas monitoring wells could be attributed to the natural background levels from the continuous decay of organic peat. A summary of the reported incidents is presented in Table 11.1 below.

There were two incidents of exceedance of the surface emissions VOC limits.
There were two incidents relating to groundwater, two relating to noise and one relating to surface water but none of these incidents were landfill derived.

## Table 11.1 Summary of Incidents at the East Galway Landfill – 2016

| Incident Reference No. | Date | Description | Action |
|---|---|---|---|
| INCI009685 | 17/02/2016 | Exceedence of VOC surface emission trigger level | Incident Report Submitted. Remedial measures implemented. |
| INCI010153 | 03/05/2016 | Elevated Chloride in Groundwater monitoring boreholes | Incident Report Submitted. Elevation not deemed to be landfill related. |
| INCI010189 | 24/05/2016 | Exceedence of Daytime Noise Limit at N5 Noise Monitoring Point (Off site location) | Incident Report Submitted. Exceedence at N5 attributed to passing traffic on public road (R348) and not related to landfill site activity. |
| INCI010708 | 19/08/2016 | Exceedence of VOC surface emission trigger level | Incident Report Submitted. Remedial measures implemented. |
| INCI010894 | 15/08/2016 | Exceedance of Suspended Solids at SW7 | Incident Report Submitted. Exceedence at SW7 attributed to sample contamination from substrate material from base of stream. Level in stream was very low which made obtaining a sample difficult. |
| INCI010989 | 15/08/2016 | Elevated Potassium in Groundwater monitoring boreholes | Incident Report Submitted. Elevation not deemed to be landfill related. |
| INCI011141 | 10/11/2016 | Exceedence of Daytime Noise Limit at N5 Noise Monitoring Point (Off site location) | Incident Report Submitted. Exceedence at N5 attributed to passing traffic on public road (R348) and not related to landfill site activity. |

### 11.4.2 Complaints Summary

Two complaints were received relating to the East Galway Landfill Facility in 2016.

These are summarised in Table 11.2 below.

**Table 11.2: Summary of Complaints to the East Galway Landfill – 2016**

| Incident Reference No. | Date | Nature of Complaint | Method of Communication |
|---|---|---|---|
| 1 | 19/08/2016 | Odour | Phone via EPA |
| 2 | 22/11/2016 | Noise | Phone Galway Co. Co. |

## 11.5 Nuisance Control

To control potential sources of nuisance at the landfill best available techniques are used to minimise impacts on the environment and local neighbours and all reasonable and practical measures will be implemented to eliminate or minimise any issues or nuisances.

### 11.5.1 Vermin Control

Pestguard was employed throughout the duration of the reporting period to control potential nuisance caused by rodents. Continuous baiting was carried out by Pestguard and adjusted as necessary to prevent any infestation of vermin at the facility.

### 11.5.2 Dust and Mud Control

Dust and mud control measures have been implemented at the facility since the start of the construction phase and continue to be implemented as required. These measures include the use of a wheel wash, road sweeper and the use of a water bowser to dampen access roads and stockpiles during periods of dry weather.

### 11.5.3 Litter Control

Litter is controlled by fencing installed around the landfill footprint as specified in the licence. Portable litter fencing is also used at the working face, which can be moved to various points around the working face depending on the wind direction. As part of the operational controls, all litter is collected at the end of the working day when the facility is actively accepting waste.

Good operational practices on site are the main controls to prevent litter. All deposited waste is covered by the end of the working day. Adequate daily cover reduces the risk of wind-blown litter and aids control of odour, vermin, flies and birds.

### 11.5.4 Bird Control

An integrated approach to bird control is implemented at the landfill. This involves the use of kites, heli-kites, and a mobile distress call unit. These methods are favoured as they are non-destructive to the birds and varying the timing and use of these bird control measures provides an effective method of control. Good waste acceptance practices on site are also a significant tool in terms of bird control. All deposited waste is covered by the end of the working day. Adequate daily cover prevents birds from coming into contact with deposited waste. Good operational practices on site are the main controls to avoid nuisances.

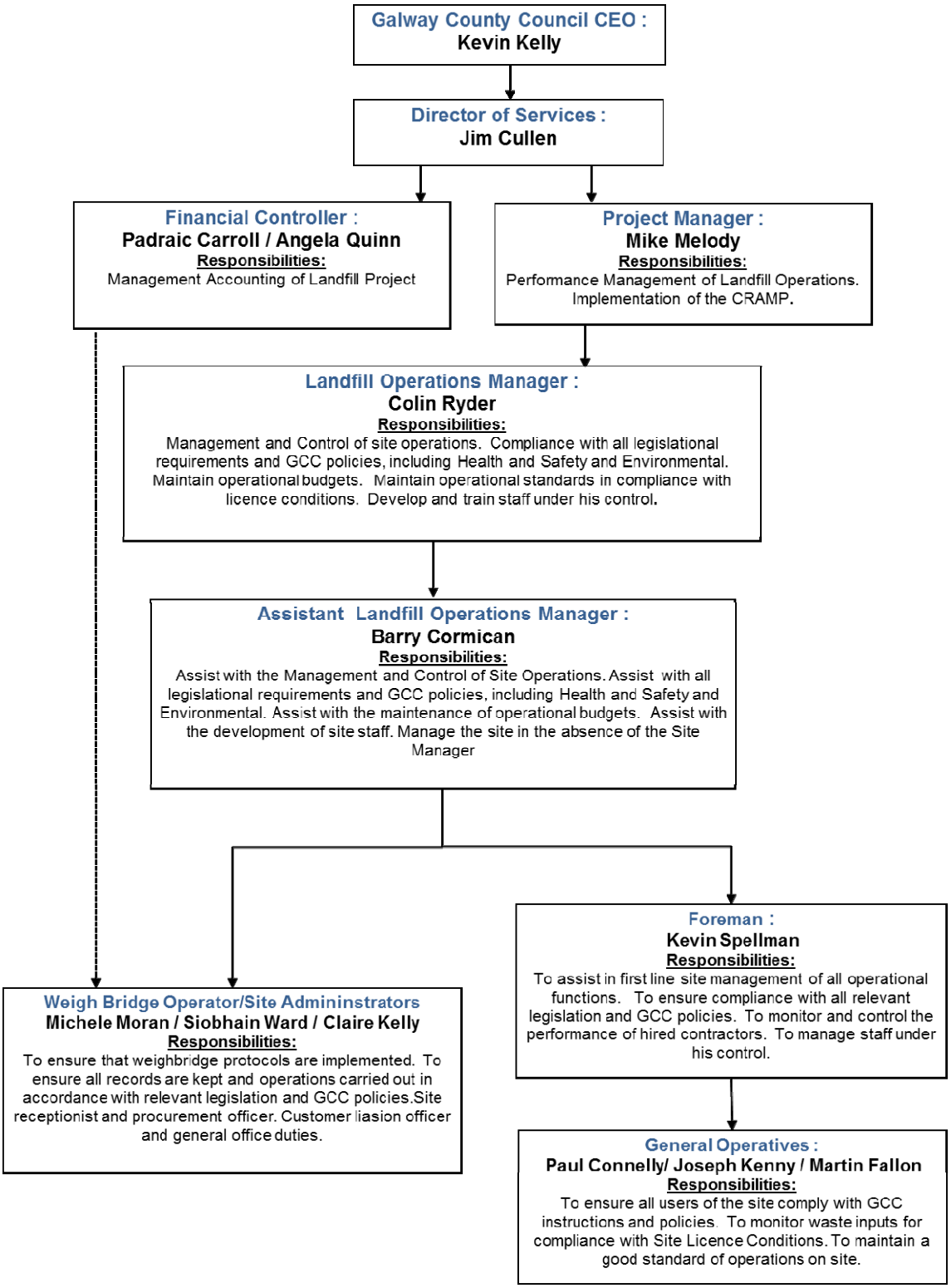
## 11.6 Management and Staffing Structure

In June 2016, the IED licence was transferred to Galway County Council. The staffing structure is as per Figure 11.1.

### 11.6.1 Staff Training

Galway County Council. is committed to providing relevant training for its staff and has developed and implemented a Health & Safety Management System and provides adequate resources to drive continuous improvement. The Landfill Operational Procedures have been developed specifically relating to the tasks carried out at the facility. Training for East Galway Landfill staff is tailored individually based on the tasks each staff member carries out. Further training is carried out in line with statutory requirements. Furthermore, as part of the local authority's Performance Management Development System (PMDS) each employee completes annually a Personal Development Plan which identifies individual training needs and opportunities for improvement.

## Figure 11.1: Management and Staffing Structure



## 11.7 Objectives and Targets

The objectives and targets for 2016 are to undertake the implementation of a site resolution plan in agreement with the DCCAE, EPA and Galway County Council.

The facility was vacated at short notice by the previous operator. The purpose of a site resolution plan is to execute a satisfactory and enduring environmental resolution for the site in the interests of environmental protection.

## 11.8 Environmental Management Plan

In accordance with Condition 2.3 of the IED licence an Environmental Management System is maintained at the facility and updated annually. In accordance with Condition 2.3.2.2 of the licence a Landfill Environmental Management Plan (LEMP) has been prepared. The LEMP is reviewed annually. A copy of the LEMP is enclosed in Appendix D.

# 12 WASTE ACEPTANCE AND TREATMENT OBLIGATIONS

In compliance with Condition 1.12 of the licence and in line with the facility's Environmental Management System (EMS), all waste accepted at this facility is in accordance with comprehensive Waste Acceptance procedures. In compliance with Condition 1.6, only waste that has been subject to treatment is accepted for disposal at the landfill. Furthermore, in compliance with Condition 1.8, quarterly summary reports are submitted to the Agency on the quantity of MSW and BMW accepted at the landfill during the preceding quarter and on a cumulative basis for the calendar year.

# 13 ELRA

In accordance with Condition 12.1.2 a comprehensive and fully costed Environmental Liabilities Risk Assessment (ELRA) was completed in August 2015. The ELRA was submitted to the Agency for agreement on 30th October 2015 and agreed on 11th January 2016.

# 14 PROGRAMME FOR PUBLIC INFORMATION

Galway County Council maintains an active programme for disseminating information on environmental matters to the public.

Communications generally, aims to:

- Promote public awareness of the activities of Galway County Council.
- Provide general information on Waste Management activities and related issues.
- Provide general information on Litter Control activities and related issues.
- Provide specific information on operational Civic Amenity facilities and the range of waste types which they cater for.
- http://www.galway.ie/en/services/environment/

The communications programme of the East Galway Landfill specifically, aims to:

- Maintain the Site Information Notice board.
- Maintain an ongoing dialogue with the various stakeholders relating to the landfill facility.
- Maintain an ongoing dialogue with authorities that have direct involvement with waste disposal activities.
- Make available Environmental Performance Data relating to the site through prompt submission to the EPA, where data is made available online.
- Facilitate enquiries relating to the operation and management of the site as appropriate.
- Encourage liaison between the site and local residents and those who may be affected by the site operations.
- Ensure all users and customers of the site are familiar with the requirements of the Site Licence.
- To ensure that all requests for information relating to the operation of the landfill facility are dealt with in a timely manner.

The objectives of the programme are met through the following elements as appropriate:

- Personal Contact.
- Site Visits (including information presentation and guided tour) for educational organisations, residents and any other interested parties.
- Municipal District meetings.
- Community Liaison Committee Meetings.
- Galway County Council website /Twitter /Published Information.

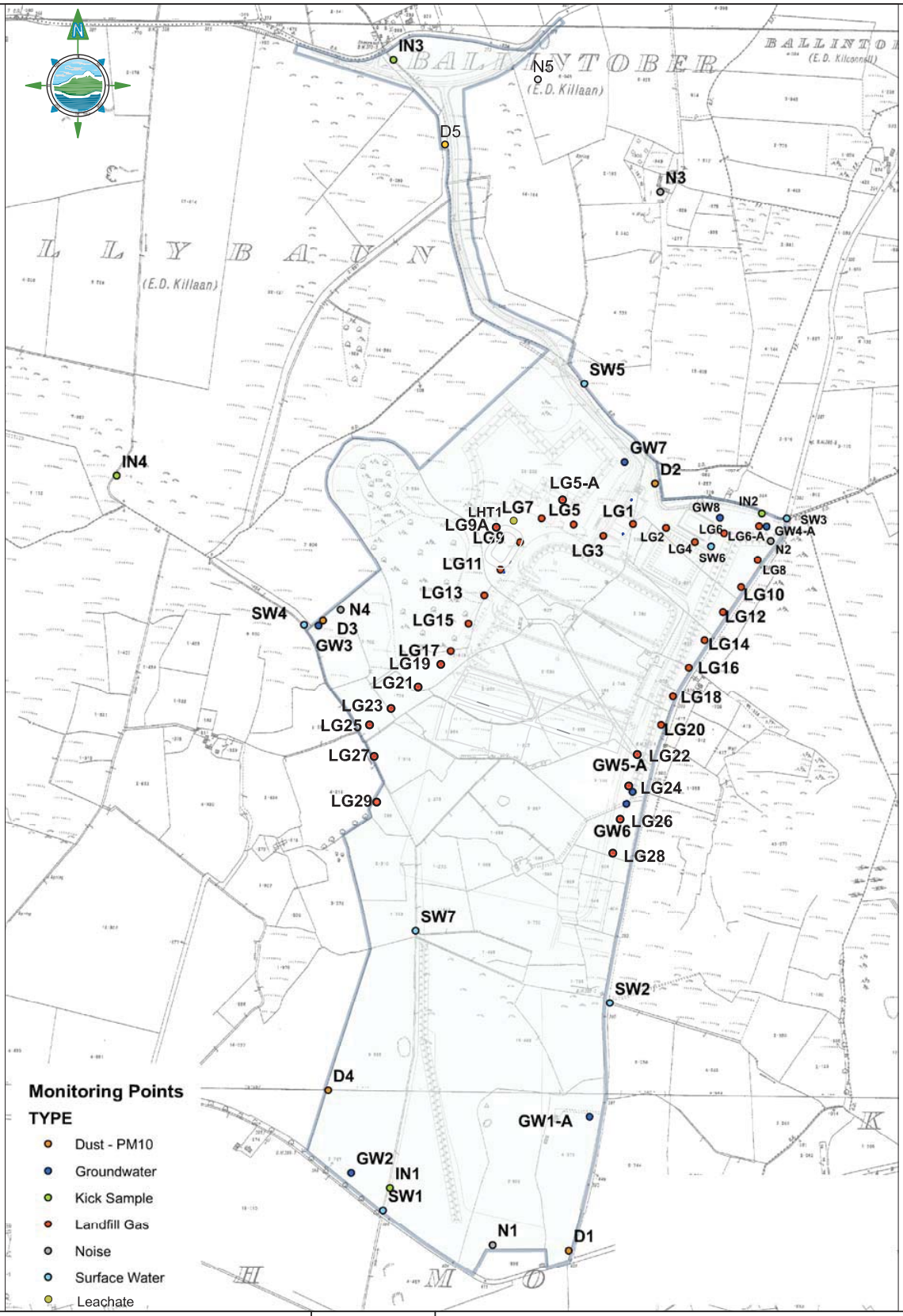






# Appendix A

## Environmental Monitoring Locations Drawing




Client
GREENSTAR LTD

Project
CONNAUGHT REGIONAL RESIDUAL LANDFILL

Title
LANDFILL ENVIRONMENTAL MONITORING LOCATIONS

Prepared by: R.K.
Checked: D.O'S.
Date: 24.09.09
Project Director: M.F.G.
Drawing Status: LG29 ADDED
Scale @ A4: N.T.S.

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Drawing No. 3588-1604

Revision: A







# Appendix B

## PRTR

Guidance to completing the PRTR workbook

# PRTR Returns Workbook

Version 1.1.19

| | |
|---|---|
| **REFERENCE YEAR** | 2016 |

**1. FACILITY IDENTIFICATION**

| | |
|---|---|
| Parent Company Name | Galway County Council |
| Facility Name | East Galway Residual Landfill Site |
| PRTR Identification Number | W0178 |
| Licence Number | W0178-02 |

Classes of Activity

| **No.** | **class_name** |
|---|---|
| - | Refer to PRTR class activities below |

| | |
|---|---|
| Address 1 | Killagh More |
| Address 2 | Ballybaun (E.D. Killaan) |
| Address 3 | Ballintober (E.D. Killaan) |
| Address 4 | Ballinasloe |
| | |
| | Galway |
| Country | Ireland |
| Coordinates of Location | -8.43099 53.31318 |
| River Basin District | IEWE |
| NACE Code | 3821 |
| Main Economic Activity | Treatment and disposal of non-hazardous waste |
| **AER Returns Contact Name** | Colin Ryder |
| **AER Returns Contact Email Address** | cryder@galwaycoco.ie |
| **AER Returns Contact Position** | Landfill Manager |
| **AER Returns Contact Telephone Number** | +353 9096 86023 |
| **AER Returns Contact Mobile Phone Number** | |
| **AER Returns Contact Fax Number** | |
| **Production Volume** | 0.0 |
| **Production Volume Units** | |
| **Number of Installations** | 0 |
| **Number of Operating Hours in Year** | 0 |
| **Number of Employees** | 9 |
| **User Feedback/Comments** | Air: Reduction in net methane emissions due to reduced generation (also reduced flaring and utilisation). New parameters added on air tab this year (Total Particulates and VOC as TOC). Differences in mass emissions from stacks due to different run times in 2016 as compared 2015. Methane point source emission in 2016 is greater than in 2015 but the reading at the stack was complaint with the licence. Capacity in m3/hr LFG. |
| **Web Address** | |

**2. PRTR CLASS ACTIVITIES**

| **Activity Number** | **Activity Name** |
|---|---|
| 5(d) | Landfills |
| 5(c) | Installations for the disposal of non-hazardous waste |
| 5(d) | Landfills |
| 50.1 | General |

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

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

**4. WASTE IMPORTED/ACCEPTED ONTO SITE**

Guidance on waste imported/accepted onto site

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

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

## 4.1 RELEASES TO AIR

Link to previous years emissions data

### SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | | | | QUANTITY | | |
| | | | Method Used | | Connaught Flare 1 | AFS Flare | Engine 1 | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| **01** | **Methane (CH4)** | C | OTH | calculation of net emissions as below | 0.86 | 9.36 | 2704 | 1018804.0 | 0.0 | 1016089.78 |
| 03 | Carbon dioxide (CO2) | M | ALT | measured at stack | 29282.029251326 | 301095.220495931 | ############### | 0.0 | 0.0 | 0.0 |
| 02 | Carbon monoxide (CO) | M | EN 15058:2004 | NCIR by Horiba PG 250 | 2.25890883 | 14.694201965 | 2644.1840961 | 0.0 | 0.0 | 0.0 |
| 08 | Nitrogen oxides (NOx/NO2) | M | EN 14792:2005 | Chemiluminesense | 12.711300165 | 162.006219504 | 1075.0546551 | 0.0 | 0.0 | 0.0 |

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

### SECTION B : REMAINING PRTR POLLUTANTS

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | | | | QUANTITY | | |
| | | | Method Used | | Connaught Flare 1 | AFS Flare | Engine 1 | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 80 | Chlorine and inorganic compounds (as HCl) | M | EN 1911-1 to 3:2003 | Ion chromatography | 0.06105159 | 0.546187363 | <0.6758 | 0.0 | 0.0 | 0.0 |
| 84 | Fluorine and inorganic compounds (as HF) | M | ISO/DIS 15713:2004 | Ion chromatography | 0.19033731 | 0.634282099 | 1.1739123 | 0.0 | 0.0 | 0.0 |

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

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

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | | | | | QUANTITY | | |
| | | | Method Used | | Connaught Flare 1 | AFS Flare | Engine 1 | no stack | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | Emission Point 4 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 237 | Volatile organic compounds (as TOC) | M | ALT | 12619:2013 Flame Ionisation Detection EN13284-1:2002 | 0.860109165 | 9.355660963 | 2703.6623193 | 0.0 | 0.0 | 0.0 | 0.0 |
| 244 | Total Particulates | M | ALT | Gravimetric | 0.0 | 0.0 | 1.6719 | 0.0 | 1.6719 | 0.0 | 0.0 |

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

### Additional Data Requested from Landfill operators

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

**Landfill:** East Galway Residual Landfill Site

| **Please enter summary data on the quantities of methane flared and / or utilised** | T (Total) kg/Year | M/C/E | Method Used: Method Code | Method Used: Designation or Description | Facility Total Capacity m3 per hour | |
|---|---|---|---|---|---|---|
| Total estimated methane generation (as per site model) | 2238148.0 | E | Predicted using a calibra | Landgem | N/A | |
| Methane flared | 284659.0 | M | From landfill gas survey | From landfill gas survey 201 | 11000.0 | (Total Flaring Capacity) |
| Methane utilised in engine/s | 934685.0 | M | From landfill gas survey | From landfill gas survey 201 | 650.0 | (Total Utilising Capacity) |
| Net methane emission (as reported in Section A above) | 1018804.0 | C | Calculated as the difference between predicted gene | | N/A | |

**Please enter all quantities on this sheet in Tonnes**

| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |
| Within the Country | 19 07 03 | No | 14145.94 | landfill leachate other than those mentioned in 19 07 02 | D9 | M | Weighed | Offsite in Ireland | Enva,W0041-01 | Smithstown Industrial Estate,.,Shannon,County Clare,Ireland | | |
| Within the Country | 19 07 03 | No | 2445.12 | landfill leachate other than those mentioned in 19 07 02 | D9 | M | Weighed | Offsite in Ireland | Enva,W0196-01 | JFK Road,JFK Industrial Estate,Naas Road,Dublin 12,Ireland | | |
| Within the Country | 19 07 03 | No | 3186.76 | landfill leachate other than those mentioned in 19 07 02 | D9 | M | Weighed | Offsite in Ireland | Rilta Environmental Limited,W0192-03 | Rilta Environmental Limited ,Block 402 ,Grant's Drive Greenogue Business Park ,Rathcoole County Dublin,Ireland | | |
| Within the Country | 19 07 03 | No | 328.88 | landfill leachate other than those mentioned in 19 07 02 | D9 | M | Weighed | Offsite in Ireland | Irish Water,D0032-01 | Ballinasloe Wastewater Treatment Plant,Pollboy,Ballinsloe,Co. Galway,ireland | | |

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

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







# Appendix C

## Topographical Survey

01

02

03

## LEGEND

### Street furniture & Services

- Over Head Wires (LUAS) - Pylon ESB
- Flowerbed
- Pipe
- Lift
- Barrier
- Pump
- Trial Pit
- Bus/Tram Shelter
- Postbox
- Valve - General
- Water Valve
- Gas Valve
- Sluice Valve
- Air Valve
- Stop Cock
- C P Post
- Marker Post
- Traffic light
- Parking Meter
- Plane Aerial Mark
- Smart Card Validator
- Unknown Valve
- Bus Stop
- Bollard
- Beacon
- Coalhole Cover
- Bore Hole
- Electricity Pole
- Telegraph pole
- OCS Pole
- CCTV Camera Pole
- Lamp Post
- Foul Manhole
- Surface Water MH
- Manholes
- Air Conditioning Vents
- Services Inspection Cover
- Traffic Inspection Cover
- Cable TV Inspection Cover
- ESAT Inspection Cover
- NTL Inspection Cover
- Eircom Inspection Cover
- Rodding Eye
- Road Sign
- Bench Seat
- Kiosk
- Gully
- Waste Bin
- Hydrant
- Fire Hydrant
- ESB Box
- ESB Inspection Cover
- Traffic Control Box
- LUAS Technical Cubicle
- Ticket Vending Machine
- Water Meter Cover
- Telecom Inspection Cover
- Monument / Toilets
- Tank Storage
- Basement: MH, Cover & Pipe
- Dished Aerial Mark
- Stay for pole
- Pipe Protection
- Washout
- Phone Box
- Duct
- Gas Cover
- C P Box
- Ug Car Park Vent

### Natural Features

- Surface Change
- Land Drain
- Bottom of Slope
- Top of Slope
- Ditch
- Water Edge / Lake / Pond
- Hedge / Trees Drip Line / Vegetation
- Tree Coniferous
- Tree Deciduous
- Water Level
- Crown Level
- Invert level
- Bed Level
- Spotheight

### Golf

- Fair Way
- Green
- Tee Box

### Other

- Survey Station
- Photo point
- Top of Tree

### Built Features

### Roads & Road Markings

- Building
- Edge of Road
- Kerb Bottom
- Kerb Top
- Bridge Abutment
- Bridge Deck
- Bridge Parapet
- Building Façade
- Footpath / Platform Train & Tram
- Damp Proof Course / Verge
- Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
- Cycleway / Private Landing Area
- Fence
- Gate
- Road Centreline
- Top of Wall
- Hoarding
- Property Line
- Road Scar
- Top of Fence
- Wall / Retaining Wall
- Railway / Tram Rail / Grating / Ramp
- Building Canopy / Roof / Overhang
- Floor Level
- Apex Height
- Eaves Height
- Parapet Height
- Soffit Elevation
- Step Level
- Concrete Pad
- Track

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North

Site Location

Map Sheet Layout:

| | | | |
|---|---|---|---|
| Surveyed by : VK | Date: December 2016 | Datum : Malin Head | |
| Drawn by : CB | Date: 13.12.2016 | Grid System: | |
| Checked by : MM | Date: 14.12.2016 | Irish National Grid ☐ ITM(15) ☒ | |

Revisions

| No. | Date | Description |
|---|---|---|
| 0 | 14.12.2016 | First Drawing |


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| | |
|---|---|
| **Client :** | Fehily Timoney Cork |
| **Project :** | East Galway Landfill |
| **Date :** 14.13.2016 | **Scale :** NTS |
| **Description :** | Topographical Survey |
| **Drawing Number :** | **MSL18658_T_3D_Rev0_00** |







# Appendix D

## LEMP

# LANDFILL ENVIRONMENTAL MANAGEMENT PLAN

# FOR

# EAST GALWAY RESIDUAL LANDFILL

# IED LICENCE NO.W0178-02

**Prepared By: -**

Galway County Council.,
Killagh More, Ballybaun and Ballintober,
Killconnell,
Co Galway.

**Rev 1: 8th March 2017**

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# 1. INTRODUCTION

This is the Landfill Environmental Management Plan (LEMP) for the East Galway Residual Landfill. The Licence Holder for the facility is Galway County Council. Greenstar Ltd. was granted a Waste Licence (Reg. No.W0178-01) to construct and operate the landfill by the Environmental Protection Agency (Agency) on 26th July 2004. The licence was reviewed by the EPA who issued a revised Waste Licence (Reg. No.W0178-02) on 23rd March 2010. A technical amendment of the licence (Technical Amendment A) was received on 11th January 2011. This amendment related to Schedule A: Waste Acceptance. A second technical amendment of the licence (Technical Amendment B) was received on 15th January 2013. This amendment added condition 8.15 to the licence which relates to Groundwater.

Waste acceptance ceased in March 2013 and in July 2013 the Environmental Protection Agency exercised powers to enter the site under S.I. No. 547 of 2008 – European Communities (Environmental Liability) Regulations 2008 and appointed Galway County Council as Agents and Authorised Officers on an emergency basis for the ongoing management of liabilities at the site. This decision arose from the decision of the receiver of the Greenstar group of companies to cease operating the facility with effect from May 2013. From July 2013 to June 2016 the East Galway Landfill was managed by a Steering Committee comprised of representatives from the Environmental Protection Agency, the Department of Environment, Community and Local Government, Galway County Council and Tobin Consulting Engineers.

The licence was amended on the 7 January 2014 under Section 76A(11) of the Waste Management Act 1996 as amended to bring it into conformity with the provisions and requirements of Council Directive 2010/75/EU. From the date of the amendment, licence Reg. No. W0187-02 shall be deemed to be an Industrial Emissions Licence (IED).

In late June 2016 the East Galway Landfill and the IED Licence (Reg. No.W0178-02) were transferred to Galway County Council. In August 2016 waste acceptance recommenced at the East Galway Landfill.

An initial EMP was prepared before the facility opened in 2006. This document was updated annually to reflect the on-going development of the site, operational experience and the implementation of the Schedule of Objectives and Targets.

## 1.1 Scope

The LEMP is required under Condition 2.3.2.2 of the Licence (Reg. No.W0178-02). The document is based on and contains the information specified in the Agency's Manual on Landfill Operational Practices and the Draft Guidance on Environmental Management and Reporting to the Agency.

The document describes the design and operation of the facility and presents details of the operator, the waste types and volumes that have been and will be accepted for disposal and recovery, engineering details, capacity, operational controls including surface water management, leachate and landfill gas control and management, environmental monitoring programmes and closure and aftercare measures. It contains a revised Schedule of Objectives and Targets with designation of responsibility, methods and timeframes by which those objectives and targets will be achieved as well as a report on the success in meeting agreed targets.

The document is based on information compiled during the preparation of the Waste Licence application, the detailed design of the engineering works and the on-going environmental monitoring programme.

## 1.2 Purpose

The LEMP serves as a guidance document for facility staff and describes operational control and management practices that are applied at the facility. The LEMP is also a core element of the Environmental Management System (EMS) for the facility and is designed to facilitate the management of site activities so as to comply with regulatory requirements and best landfill practice and to effectively implement the EMS.

## 1.3 EMS Documentation

The EMS documentation prepared for the facility in addition to this LEMP includes: -

### *1.3.1 Corrective Action Procedures (CAP)*

The objective of the Procedures (CAP) is to ensure that the appropriate corrective action is taken should the requirements of the Licence and the EMS not be fulfilled. A copy of the procedures are included in Appendix 2.

### *1.3.2 Awareness and Training Procedures*

The objective of the Procedure is to ensure that the awareness and training needs of the facility personnel are identified and the required training provided. A copy of the Procedure is included in Appendix 3.

### *1.3.3 Communications Programme*

Galway County Council has prepared a Communications Programme with the aim of effectively communicating with the public about the environmental performance of the facility.

## 1.4 Annual Review

The LEMP will, as a core element of the EMS, be subject to an annual review throughout the facility's operational life. The review will take account of operational experience, the progressive development of the facility, changes in regulatory requirements and developments in landfill technology and operations.

# 2. SITE DESCRIPTION

## 2.1 Site Location

The site is located in the townlands of Killagh More, Ballybaun and Ballintober, Ballinasloe, Co. Galway and encompasses an area of 60.8 ha. It is approximately 2.5 km southwest of Kilconnell village and 4.5 km northwest of Cappataggle village. The site is located in a segment of land, which is bounded to the north by the Ballinasloe to Athenry Road (R348) with local roads immediately adjacent to the east and south, the L7442 and L7439 respectively. The area consists of low lying undulating topography interspersed with a number of small hills.

Residential use in the surrounding area is predominantly single dwelling with adjacent farmyards. There are only 5 No. residential dwellings within or near a 500 m radius of the landfill cell area, with the nearest being 475 m away, and only a further 13 No. within 1000 m of the footprint. The surrounding land use is mainly low intensity livestock farming, with some commercial forestry on lands to the east, north and north west.

## 2.2 Site Development

The facility will be developed in three phases. Phase 1, which was completed in December 2005, involved the initial site development works, construction of 3 engineered landfill cells and the provision of the supporting infrastructure including the waste reception area, weighbridges, leachate holding tank, ESB substation, site offices, weather station and groundwater and surface water control measures. The layout is shown on Drawing No 2228-2600

Phase 2, also complete, and Phase 3 each involve the construction of 6 smaller engineered cells per phase, i.e. 12 additional cells in total, provision and progressive expansion of an active gas management and flaring system, progressive landscape works and the progressive capping and restoration of completed landfill cells. Construction of Phase 2 commenced in summer 2008 and was completed in winter 2010.

## 2.3 Geology and Hydrogeology

The geology and hydrogeology of the area is described in detail in the EIS submitted with the Waste Licence Application and is summarised below.

### *2.3.1 Bedrock Geology*

The bedrock beneath the site comprises Lower Carboniferous dark limestones and shales belonging to the Calp Formation. The depth to rock ranges from 3 to 9.5 m across the site.

### *2.3.2 Quaternary Geology*

Prior to development the natural ground conditions across the site comprised the higher ground consisting of a series of hillocks composed of 0.2 - 0.3 metres of sandy clay top soil and subsoil overlying a 0.4 - 0.6 m layer of glacial deposits comprising gravelly sandy clays that graded into a silty clayey till. In the lower lying ground the subsoil consisted of peat ranging in thickness from 3 - 4 metres overlying silty clayey tills. The permeability of the till ranges from $1.08x10^{-8}$ m/s to $5.12x10^{-9}$ m/s, which are considered to be low permeability.

### *2.3.3 Aquifer Status*

The bedrock beneath the site is classified as a Locally Important Aquifer using the classification system prepared by the Geological Survey of Ireland (GSI). The direction of groundwater flow is from the south to the north/north west.

A well search identified that there are no beneficial users of groundwater within 500 m of the site and all of the residents within 1 km of the site are connected to the Kilconnell Public Supply, which is more than 2.5 km from the landfill cell footprint.

### *2.3.4 Aquifer Vulnerability*

The vulnerability of the bedrock aquifer is, based on the type and thickness of the subsoil categorised as High to Extreme in accordance with the classification system prepared by the GSI. The response matrix for landfill location as promoted by the GSI indicates that it is acceptable to locate engineered contained landfills in areas underlain by Locally Important Aquifers with this vulnerability rating.

### *2.3.5 Groundwater Quality*

Groundwater monitoring carried out prior to the start of development works established that groundwater beneath the site contains elevated ammonia levels. Such levels are often associated with peat rich environments and agricultural activities. The groundwater monitoring carried out since the facility began accepting waste has confirmed that site activities have not impacted on water quality.

## 2.4 Hydrology

### *2.4.1 Drainage Pattern*

The original drainage pattern comprised a network of dug field boundary drains extending across the site. The Ballintober Stream forms part of the northern boundary and there is a large drain running north to south (Killaghmore Stream) in the western area of the site. The site drainage enters tributaries of the Raford River, which is to the south-west of the site. To compensate for the loss of the internal site drains during site development perimeter drains have been installed around the landfill cell footprint to intercept surface water flow and divert it to the Ballintober Stream via a settlement lagoon.

### *2.4.2 Surface Water Quality*

Water quality monitoring, including biological and chemical assessment, of the surface water drains around the site prior to development established that the drainage system has been impacted by surrounding agricultural land use (animal grazing) and could be classified as Slightly Polluted.

The surface water monitoring carried out since the facility began accepting waste has confirmed that site activities have not impacted on water quality.

## 2.5 Meteorology

The annual average rainfall is of the order of 1091 mm, with average monthly rainfall ranging from 66 mm in the drier months to 110 mm in the wetter winter months. The estimated annual evapotranspiration is approximately 445 mm. The prevailing wind is from the South-southwest, with an average wind speed of 10 knots.

# 3. TYPES OF WASTE ACCEPTED & CONSIGNED

## 3.1 Wastes Accepted

Schedules A and F of the IED Licence (Reg. No.W0178-02) and Technical Amendment A (related to Schedule A: Waste Acceptance) defines the type and maximum quantities of waste that can be accepted for disposal and recovery. A total of 100,000 tonnes of waste can be accepted for disposal annually. The following types and maximum annual quantities of such wastes are: -

- Household 45,000 tonnes
- Commercial 27,500 tonnes
- Industrial Non Hazardous 24,500 tonnes
- Asbestos Waste 3,000 tonnes

The tonnage of household waste, commercial waste and industrial non-hazardous waste may be altered with the prior agreement of the Agency provided that the total amount of all wastes accepted at the facility does not exceed the combined tonnage of 100,000 tonnes per annum and the total amount of asbestos does not exceed 3,000 tonnes per annum (To date no asbestos has ever been accepted for disposal and no plans are in place to ever accept this material).

The following types of inert waste can be accepted for recovery: -

- Concrete,
- Subsoil,
- Stone, Rock and Slate,
- Solid Road Plainings, Solid Tarmacadam and Solid Asphalt,
- Brickwork,
- Clay.
- Other suitable wastes - with the prior approval of the Agency

The following information is recorded for each load of waste arriving at the facility in accordance with the requirements of Condition 10.2: -

(a) The date & time:

(b) The name of the carrier (including if appropriate, the waste carrier registration details);

(c) The vehicle registration number

(d) The trailer, skip or other container unique identification number (where relevant)

(e) The name of the producer(s)/collector(s) of the waste as appropriate;

(f) The name of the waste facility (if appropriate) from which the load originated including the licence or waste permit register number;

(g) The name and the waste collection permit details;

(h) A description of the waste including the associated EWC/HWL codes;

(i) The quantity of the waste, recorded in tonnes;

(j) Details of the treatment(s) to which the waste has been subjected:

(k) The classification and coding of the waste, including whether MSW or otherwise;

(l) Whether the waste is for disposal or recovery and if recovery, for what purpose;

(m) The name of the person checking the load; and

(n) Where loads or wastes are removed or rejected, details of the date of occurrence, the types of waste and the facility to which they were removed (including the licence/permit and/or waste collection permit).

## 3.2 Wastes Consigned

The only waste that is routinely consigned from the facility is leachate generated in the landfill cells, cleanings from the grit and oil interceptors, waste oils/filters generated during the on-site maintenance of the fixed and mobile plant used at the site and small amounts of recyclable office/canteen waste. Unsuitable waste inadvertently delivered to the facility and removed during the waste inspection procedures are consigned on an as needed basis.

Galway county council operate a source segregation policy to maximise the recovery of potential recyclables from the office waste. All recovered materials are transferred off-site to Agency approved and licensed recovery/recycling facilities.

The following information is recorded for each load either consigned, or rejected from the site in accordance with the requirements of Condition 10.2: -

- details of the date of the occurrence,
- the types of waste and the facility to which they were removed (including the licence/permit and waste collection permit).

### 3.3 Waste Records

Galway County Council maintains records of all characterisation testing carried out by waste producers and confirmatory testing conducted by or on behalf of Galway County Council, for a minimum of three years (Ref. Section 5.6.5).

Galway County Council maintains records of all waste received, recovered, consigned and disposed at the facility for three years. The records include details of the type, quantities and EWC codes, as required by Condition 10.3 a) of the Licence (Reg. No.W0178-02).

### 3.4 Site Capacity

The volumes of waste placed and the remaining void space are calculated annually and reported in the Annual Environmental Report (AER).

# 4. SITE DESIGN & DEVELOPMENT

## 4.1 Engineering Details

The engineering design details for the facility are shown on the Drawings listed in Table 4.1 and an overview of the design is presented in this Section.

The construction of the cells; leachate storage tank; groundwater and surface water control measures including the surface water settlement lagoon and wetlands; the installation of landfill gas flares and the final capping are all *Specified Engineering Works*, which must be carried out in accordance with Condition 3.2 of the Licence Reg. No.W0178-02. The prior approval of the Agency must be obtained before any such works are carried out.

The design of the lining and capping systems are specified in Conditions 3.12 and 4.4 of the Licence and are in accordance with the design specifications set in the EU Directive of Landfill of Waste, the Agency's Manual on Landfill Site Design and best industry practice.

## 4.2 Site Development

The initial Phase 1 involved the provision of three (3) landfill cells and all supporting infrastructure required to operate the facility in compliance with the Licence. Phases 2 involved the provision of 6 additional landfill cells half the size of Phase 1 cells, and the associated expansion of leachate, landfill gas and surface water control measures.

The development works require the excavation of suitable materials from designated borrow area(s) for use in the construction of the site infrastructure. Activities in the borrow pit area are managed in accordance with Conditions 3.16.3, 5.7.1 iii) and 5.13 of the Licence (W0178-02), which specify the surface water control, landscaping and nuisance mitigation measures. The borrow area(s) will be restored and landscaped using the natural subsoils and peat removed from the landfill cell footprint.

The Killaghmore Stream traverses the extreme southwest of the landfill footprint. Its position necessitated the diversion of a short length of this stream. Approximately 80 m of the stream was rerouted through a new channel. The diversion occurred during Phase 2 development work.

**Table 4.1** Engineering Design Details (See Appendix 1)

| Drawing No. | Title |
|---|---|
| 2228-2600 | Specified Engineering Works - Overall Site General Arrangement Plan |
| 2228-2601 | Specified Engineering Works General Arrangement Phase 1 - Sheet 1 of 2 |
| 2228-2602 | Specified Engineering Works General Arrangement Phase 1 - Sheet 2 of 2 |
| 2228-2605 | Specified Engineering Works - Basal Lining System Embankment Details and Intercell Bunds |
| 2228-2607 | Specified Engineering Works - Phase I Leachate Collection |
| 2228-2608 | Specified Engineering Works - Site Surfacing Plan |
| 2228-2609 | Specified Engineering Works - Site Fencing Plan |
| 2228-2612 | Specified Engineering Works - Road Construction Details |
| 2228-2614 | Specified Engineering Works - Surface Water Lagoon and Engineered Wetland Layout Plan |
| 2228-2615 | Specified Engineering Works - Leachate Collection Tank Elevation and Section |
| 2228-2618 | Specified Engineering Works - Waste Quarantine Area General Arrangement |
| 2228-2623 | Submission to EPA - Landscaping Implementation Plan - Sheet 1 of 2 |
| 2228-2624 | Submission to EPA - Landscaping Implementation Plan - Sheet 2 of 2 |
| 3588-1604A | Landfill Environmental Monitoring Locations |

A natural gas pipeline runs through the southern portion of the site, approximately 370 m south of the final landfill footprint. The location of the pipeline has been identified in accordance with Condition 3.20 of the Licence (Reg. No.W0178-02) so as to avoid accidental damage during development, landscaping, restoration and maintenance works.

## 4.3 Site Preparation and Services

The preparatory works for Phase 1 involved the clearance of vegetation, excavation of in-situ subsoils and raising to formation levels using imported clean aggregate. The excavated peat and wet silts were stored in the material storage area, constructed at the location shown on Drawing No. 2228-2600. The storage was in accordance with the Conditions 3.16.4 and 5.5 of the Licence (Reg. No.W0178-01).

The facility has a 110 kW electricity supply, a water supply from a local group scheme and phone lines. The surface water drainage system is shown on Drawing Nos. 2228-2600, 2601 & 2602. Wastewater from the offices and canteen is treated in an on-site wastewater treatment plant and the treated effluent is pumped to the leachate storage tank.

## 4.4 Site Facilities

The site facilities include: -

- Waste Reception Area,
- Weighbridges (2 No.),
- Wheel Wash,
- Waste Quarantine & Inspection Areas,
- Landfill Cells,
- Leachate Storage Tank & Leachate Storage Lagoon,
- Landfill Gas flares (4 No.)
- Landfill Gas Utilisation Engine (1 No.)
- Surface Water Pond,
- Administration Block (offices, stores, canteen, toilets and showers),
- ESB Sub-Station,
- Standby Generator (Diesel),
- Oil Storage Tank.

The site layout is shown on Drawing No. 2228-2600. The drawing will be reviewed as required to include any new facilities provided, during the phased development of the site.

## 4.5 Facility Roads, Access Roads & Hardstanding

The Specification for the roads and hardstanding areas is based on 'Specification for Roadworks', published by the National Roads Authority. The various types of surfacing are described on Drawing No. 2228-2608, with details on Drawing No. 2228-2612 and the construction complies with the requirements of Condition 3.5.1.

### *4.5.1 Main Access Road*

The main access road linking the existing R348 to the landfill runs for approximately 820m over existing farmland (see Drawing Nos. 2228-2600 and 2228-2608). It comprises (see Drawing No. 2228-2612): -

| | | |
|---|---|---|
| Wearing Course | - | HSC Hot Rolled Asphalt, 40 mm thick |
| Base Course | - | Dense Bitumen Macadam, 60 mm thick |
| Roadbase | - | Heavy Duty Macadam, 150 mm thick |
| Sub-base | - | Clause 804, 150 mm thick |
| Capping | - | Granular material Grade 6F1/6F2, up to 600 mm thick (to be assessed on CBR test results). |

### *4.5.2 Infrastructure Access Roads & Car Parking Areas*

The infrastructure access road runs for approximately 150 m linking the car park, office, quarantine area and fuel bund (see Drawing No. 2228-2601). The road and car park design is the same as the main access road. Precast concrete kerbs and road gulleys are provided, with a piped gravity drainage system discharging to the surface water lagoon via an alarmed oil/water separator. Isolation joints are provided at all interfaces with concrete structures or concrete hardstanding.

### *4.5.3 Reinforced Concrete Hardstanding*

Reinforced concrete hardstanding has been provided at locations adjacent to the fuel bund, quarantine area and leachate holding tank, where increased wear resistance is required for turning vehicles (see Drawing No. 2228-2601). The hardstand comprises 250 mm thick reinforced concrete slab, to details provided in Drawing No. 2228-2615 and 2228-2618.

### *4.5.4 Jeep Track*

A track, as shown on Drawing No. 2228-2608, and detailed on Drawing No. 2228-2612. has been provided to allow access to the perimeter fence and monitoring infrastructure.
The pavement design of the track is as follows: -

| | | |
|---|---|---|
| Wearing course | - | 200 mm Cl.804 |
| Sub-base | - | depending on ground conditions up to 675 mm fill with two layers of geogrids as per specification. |

## 4.6 Site Buildings

The locations of the administration block, weighbridge maintenance garage and ESB Sub-Station are shown on Drawing No. 2228-2600. The design of all of the buildings took into consideration the guidance given in the DOE publication "Protection of New Buildings and Occupants from Landfill Gas, as specified in Condition 3.15.5 of the original Licence (Reg. No. 178-1).

## 4.7 Waste Inspection and Quarantine Areas

Waste inspection and quarantine areas required under Condition 3.7.1 of the Licence (Reg. No. W0178-02) are located as shown on Drawing No. 2228 – 2600 to the details shown on Drawing No. 2228-2618. The areas are bounded on 3 sides by a 1.5 m high reinforced concrete wall. Both areas are provided with longitudinal falls to allow run-off to drain directly to a sump.

## 4.8 Wheel Wash

A wheel wash is provided in accordance with Condition 3.9.1 of the Licence (Reg. No. W0178-02). Water is supplied to the wheel wash from the on-site surface water lagoon. The wheel wash drains to the leachate collection system, as specified by Condition 3.9.1.

## 4.9 Landfill Cells

The landfill is designed as a containment facility. Waste is only disposed in the engineered landfill cells which comprise a lining system, as specified in Condition 3.12 of the Licence (Reg. No.W0178-02). The basal and side wall lining system design complies with the recommendations in the Agency's Landfill Manual Landfill Design and comprises a minimum of: -

- A composite liner consisting of a 0.5 m layer of Bentonite Enhanced Sand (BES) with a hydraulic conductivity of less than or equal to $5x10^{-10}$ m/s overlain by a 2 mm thick high density polyethylene (HDPE) layer;

- A geotextile protection layer placed over the HDPE layer;

- A 500 mm thick drainage layer placed over the geotextile layer with a minimum hydraulic conductivity of $1x10^{-3}$m/s on the base on the cell and incorporating HDPE collection drains.

Details of the engineering specification for the landfill cells constructed in Phase 1 are shown on Drawing No. 2228-2605. The construction of all the cells is the subject of a comprehensive

construction quality assurance (CQA) programme. Copies of the CQA reports are submitted to the Agency for approval before waste is deposited in the cells.

## 4.10 Leachate

The facility is designed to minimise leachate generation. Surface water run-off and groundwater flow is directed away from the fill area by means of interceptor drains installed outside the landfill cells and an underlying groundwater drainage layer. The landfill cells are designed as fully contained areas and the construction is subject to a comprehensive construction quality assurance and validation process, details of which are submitted to the Agency.

Leachate is collected by means of a series of perforated pipes constructed in drainage stone layer on top of the basal liner which has a fall of 1: 150 towards internal collection sumps. The leachate is pumped from the sumps, using submersible pumps and a sloping shaft side riser, to the leachate transport lines from where it flows by gravity to the leachate pumping station located beside the holding tank. The leachate is pumped from the station into the Leachate Lagoon or holding tank. Details of the collection system are shown on Drawings No. 2228-2607 and 2228-2615.

The precast concrete leachate storage tank has a capacity of 500 $m^3$, which based on water balance calculations prepared as part to the application for the waste licence, provides for more than 80 hours retention when the maximum hourly rate of leachate generation will occur. The water balance calculations were based on guidance presented in the EPA Landfill Manual on Landfill Site Design. In addition to this tank a leachate storage lagoon of 5000m3 capacity was constructed in 2009 for additional leachate storage (3500m3 of storage after freeboard deductions).

Annual water balance calculations will be completed during the preparation of the Annual Environmental Report (AER) and based on recorded rainfall data and the volumes of leachate removed from the site. The calculations will be used to assess the suitability of the existing and proposed leachate management facilities that will be progressively provided in the additional Phases.

The leachate holding tank is provided with a lining system as shown on Drawing No. 2228-2615. A concrete spill pad is provided in the loading bay at the tank. The road tankers used to remove the leachate are parked in the bay while leachate is removed from the tank. The pad is graded to prevent the escape of any spills that may occur during tanker loading.

The leachate is removed off-site for treatment at a waste water treatment plant approved by the Agency in accordance with Condition 11.7 of the Licence (Reg. No.W0178-02).

## 4.11 Landfill Gas

The landfill cells are fully contained by the engineered lining system (Ref. Section 4.1). An active abstraction and flaring system has been provided and gas collection wells are progressively installed in the cells and connected to the abstraction system. In 2010 a Gas Utilisation Plant was installed which produces electricity for use on site as well as for export to the National Grid

The design of the gas abstraction system meets the specifications set in Condition 3.15.2 of Licence (Reg. No. W178-02) and proposals for the gas equipment were agreed with the Agency as required under Condition 3.2.1.

## 4.12 Surface Water

All rainfall on the active landfill cells is characterised as leachate and is collected in the leachate collection system. The surface drainage from all roads, hardstanding areas and all areas of the facility where the surface water has the potential to become contaminated is directed to the surface water lagoon in the north of the site. The surface water in the administration area is directed to an oil interceptor. Run-off from the swale around the perimeter of the landfill cells is collected and discharged directly to the surface water lagoon via a separate inlet.

The lagoon is sized to accommodate run-off from a 12 hour storm event with a return period of 1:50 years. Details of the lagoon are shown on Drawing No. 2228-2614. The inlet to the pond is fitted with a Class 1 Full Oil interceptor, as specified in Condition 3.16.6 of the Licence (Reg. No W178-02). Water from the lagoon outfalls to a reed bed system, as shown on Drawing No. 2228-2614.

## 4.13 Groundwater

To eliminate the potential for groundwater to adversely impact the construction of the landfill cells, the design incorporates a basal groundwater drainage layer. Groundwater intercepted by the drainage layer is directed to a sump from where it is be pumped to the surface water lagoon.

## 4.14 Site Security

The fencing layout is shown on Drawing No. 2228-2609. Anti-intruder fencing and a gateway have been provided at the facility entrance. A remotely monitored CCTV system is employed to monitor the site at all times when the site in not in operation.

## 4.15 Monitoring Infrastructure

The existing groundwater, surface water, noise, dust and $PM_{10}$ monitoring locations are shown on Drawing 3588-1604 A. Additional landfill gas, groundwater and surface water monitoring points will be provided during the progressive development of the facility as specified in Conditions 3.19.1, 3.19.2, 3.19.3 and 3.19.4 of the Licence (Reg. No.W0178-02).

Any monitoring infrastructure which is damaged or proves to be unsuitable for its purpose is replaced within three (3) months of being damaged or identified as being unsuitable, as specified in Condition 3.19.5 of the Licence (Reg. No.W0178-02).

## 4.16 Fire Control

The facility obtains its fire fighting water supply from the surface water lagoon.
Emergency response procedures are in place, which are followed in the event of a fire.

## 4.17 Landscaping

The fill area is sited to maximise the screening value of existing boundary hedgerows. The development phasing sequence is from the north to the south, with the initial phase at the maximum distance from the nearest residence to allow time for maturing of additional screen planting. Landscaping measures are implemented in accordance with the programme prepared in compliance with Condition 5.7.1 of the Licence (Reg. No. W0178-02) and the Drawings submitted 2228-2623 & 2624.

## 4.18 Fuel & Chemical Storage

Diesel for the mobile plant and back-up generator is stored in a 10,000 litre tank provided with a containment bund in the administration area, next to the waste inspection and quarantine areas. The bund design meets the specification in Condition 3.11 of the Licence (Reg. No.W0178-02).

Small quantities of lubricating and hydraulic oils used in plant maintenance are stored on a bunded pallet inside the maintenance shed. The integrity and water tightness of all bunds is confirmed at least once every three years as per Condition 3.11.5 of the Licence (Reg. No.W0178-02).

## 4.19 Capping System

The final profile will be a maximum of 124 mOD Malin and the shape will be as shown on Drawing No 2228-2623. When the final fill levels have been reached, the cells will be capped with a low permeability capping system as specified in Condition 4.4 of the Licence (Reg. No. W0178-02), which includes: -

- Top soil (150 - 300 mm);
- Subsoils such that the total thickness of top soil and subsoils is at least 1 m;
- Drainage layer of 0.5 m thickness having a minimum hydraulic conductivity of $1x10^{-4}$m/s (or equivalent as agreed by the Agency);
- Compacted mineral layer of a minimum 0.6 m thickness with a permeability of less than $1x10^{-9}$m/s or a geosynthetic material (e.g. GCL) or similar that provides equivalent protection; and
- Gas collection layer of natural material (minimum 0.3 m) or a geosynthetic layer.

Final capping at this facility commenced in Phase 1 of the landfill in mid 2012..

## 4.20 Restoration

The fill area will be restored in accordance with detailed Restoration Plans prepared in compliance with Condition 4.1 of the Licence (Reg. No.W0178-02). The Restoration Plans will include details of the planting and reinstatement end use.

# 5. OPERATIONAL MATTERS

## 5.1 General Description of the Operation

The facility is an engineered, non-hazardous landfill, with deposition and covering of treated waste in specially designed and constructed landfill cells. The cells are designed to facilitate the effective control of emissions and are provided with a low permeability composite lining and leachate collection system.

An active landfill gas extraction, flaring and utilisation system has been provided and progressively extended to collect, flare and utilise landfill gas. Construction and Demolition waste is recovered on-site for use in the construction of site roads and restoration works. The only wastes regularly consigned from the facility are leachate and waste oils generated during on-site plant and equipment maintenance.

## 5.2 Operating Procedures

Galway County Council has prepared a comprehensive set of Operating Procedures (OP) that cover all aspects of the day to day management of the facility and contingency measures. The OP's are based on the requirements of the Licence, the Agency's Landfill Manual on Landfill Operations and the Agency's draft BAT for Landfill. The OPs form part of the facility's Environmental Management System and are subject to regular review based on operational experience, legislative changes and improvements in best practice.

## 5.3 Site Management

The Site Management Team comprises: -

- Facility Manager,
- Deputy Facility Manager,
- Foreman,
- Weighbridge Operator,
- Plant operators,
- Administration.

The Facility Manager and Deputy Manager(s) are suitably qualified and experienced and have undergone appropriate training, as specified by Conditions 2.1.1 and 2.1.2 of the Licence (Reg.

No.W0178-02) and the training and awareness requirements of the EMS. Galway County Council maintains records of all training provided to facility personnel.

The roles and responsibilities of all members of facility staff are set out in the Management Structure, which is specified in Condition 2.2 of the Licence (Reg. No.W0178-02). This document is subject to annual review and will be amended to reflect any change in facility personnel.

## 5.4 Operational & Waste Acceptance Hours

The operational and waste acceptance hours are specified in Condition 1.9.1 of the Licence (Reg. No.W0178-02). The facility is open for waste acceptance between 8.00 and 16.30 Monday to Friday. Waste can be accepted at the facility for disposal between 8.00 and 17.45, Monday to Friday and 8.00 to 13.45 on Saturday.

## 5.5 Access Control

The only access point to the facility is off the R348. The internal traffic control system requires all waste vehicles entering the facility to pass the weighbridges. The access gates are locked shut outside of operational hours.

Signage is provided on the eastern approach to the entrance off the R348 identifying the site and the access point. Access to the weighbridges is controlled by means of automated barriers. All visitors must report to the administration building and provide their name, company/organisation, vehicle registration number and purpose of visit.

## 5.6 Waste Acceptance Procedures

### *5.6.1 Treatment of Waste*

Condition 1.6 of the Licence (Reg. No.W0178-02) stipulates that, with the exception of inert waste, only treated waste is accepted at the facility for disposal. The method by which this is achieved is described in the Waste Acceptance Procedures prepared in accordance with Condition 1.12 of the Licence (Reg. No.W0178-02).

### *5.6.2 Biodegradable content of Municipal Waste*

Condition 1.7 of the Licence (Reg. No.W0178-02) outlines limits on the amounts of biodegradable waste which may be accepted at the facility. Condition 1.8 of the Licence

(Reg. No.W0178-02) outlines how the biodegradable content of municipal waste is to be established. Condition 11.2 of the Licence (Reg. No.W0178-02) outlines how the licensee must demonstrate Compliance with Diversion Targets.

In order to comply with this condition a quarterly summary report is submitted to the Agency within one week of the end of each quarter, outlining the quantity of MSW and BMW accepted at the landfill during the preceding quarter and on a cumulative basis for the calendar year to date. The report details the tonnage of MSW and BMW accepted and the basis (including all calculation factors) on which the figures have been calculated.

### *5.6.3 Waste Collection Permits*

Galway County Council only accepts waste from holders of waste collection permits under the Waste Management (Collection) Permit Regulations 2007 (as may be amended) unless exempted, or from licensed/permitted. Galway County Council must be provided with copies of up to date collection permits before waste is accepted from a waste collector.

### *5.6.4 Waste Characterisation*

Galway County Council may require waste producers to characterise the waste prior to acceptance at the facility in accordance with procedures approved by the Agency, as specified in Condition 1.12 of the Licence (Reg. No. W0178-02).

Such waste characterisation must meet all waste acceptance criteria set by Galway County Council including methods to distinguish between inert, non-hazardous and hazardous waste as defined in the European Council Decision of 19th December 2002 establishing the criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of the Directive 1999/31/EC on the landfill of waste. The producer/holder of the waste must, if requested, provide documentation that the waste meets Galway County Council's specification. Waste not conforming to Galway County Council's specification will neither be accepted nor deposited at the site.

### *5.6.5 Waste Inspection*

All documentation accompanying waste delivery records is checked at the weighbridge and the waste is also visually inspected at the weighbridge using overhead CCTV cameras where practical. If the checks identify that the waste does not comply with Galway county councils's specifications it is not accepted.

Where there are doubts about the nature of the waste, the delivery vehicle is directed to the waste inspection area, where it may be off-loaded. If following inspection the waste

is considered to be acceptable it is, where practical, reloaded on to the delivery vehicle and moved to the active fill area. If this is not practical the waste is removed to the fill area by Galway County Council plant.

If the material is identified as not suitable it is, where practical, loaded onto the delivery vehicle and the driver instructed to remove it off-site. If this is not practical the waste is moved to the Waste Quarantine Area for storage pending removal by the waste producer/waste collector.

All waste placed in the landfill cells is inspected by Galway County Council personnel at the waste face to confirm that the wastes are suitable. Where operatives identify unsuitable waste this is, if practical, reloaded onto the delivery vehicle and removed from the facility. If this is not possible the waste is removed from the active fill area and stored in the Waste Quarantine Area, pending removal off-site by the waste producer/waste collector.

### *5.6.6 Waste Records*

The following information on each waste load delivered to the facility is recorded as required by Condition 10.2 of the Licence (Reg. No. W0178-02): -

(a) The date & time:

(b) The name of the carrier (including if appropriate, the waste carrier registration details);

(c) The vehicle registration number

(d) The trailer, skip or other container unique identification number (where relevant)

(e) The name of the producer(s)/collector(s) of the waste as appropriate;

(f) The name of the waste facility (if appropriate) from which the load originated including the Licence or waste permit register number;

(g) The name and the waste collection permit details;

(h) A description of the waste including the associated EWC/HWL codes;

(i) The quantity of the waste, recorded in tonnes;

(j) Details of the treatment(s) to which the waste has been subjected:

(k) The classification and coding of the waste, including whether MSW or otherwise;

(l) Whether the waste is for disposal or recovery and if recovery, for what purpose;

(m) The name of the person checking the load; and

(n) Where loads or wastes are removed or rejected, details of the date of occurrence, the types of waste and the facility to which they were removed (including the Licence/permit and/or waste collection permit).

## 5.7 Phasing of Filling

The facility will be developed in series of Phases and each Phase will involve the construction of a number of landfill cells.

The landfill cells are filled sequentially. For practical reasons it is not be possible to fill to final levels in any one cell without filling in the adjacent cell(s). The progress of the filling and the future development of the phases will be reviewed annually and amendments incorporated into the LEMP.

## 5.8 Equipment

The following plant may be used at the facility for waste activities:

- Landfill Compactors (2: 1 No Duty & 1 No Standby.),
- Excavator (2 No.),
- Articulated Dumper (1 No.),
- Tractor and trailer (1 No.),
- Road sweeper (1 No.),
- Water Bowser (1 No.),
- Landfill Gas flares (5 No.) and Gas Utilisation Engine(s) (1 No.)
- Standby Generator (1 No.),
- Duty and Standby electrical and diesel powered pumps (6 No.).

The plant list will be revised annually to reflect any changes or additions arising from amendments to waste activities. The list does not include plant and equipment used in the phased site development works.

## 5.9 Waste Placement

Unless otherwise agreed with the Agency only one working face is in use in the active landfill cell, as required by Condition 5.3 of the Licence (Reg. No.W0178-02). The working face is limited to 2.5 m in height after compaction, 25 m wide and a slope of 1:3.

The residual household, commercial and industrial waste is deposited directly on the surface of the immediately preceding layer of waste close to the advancing tipping face by the waste delivery vehicle. The waste is spread in shallow layers, on the inclined surface and compacted using a steel wheeled compactor. All large, hollow objects or other large items are crushed or flattened using the compactor. The working face is covered with suitable material at the end of each working day.

The deposited waste is not excavated or disturbed without the prior approval of the Agency, as specified in Condition 5.8.3 of the Licence (Reg. No.W0178-02).

The completed areas of the landfill cells are profiled to mitigate against the presence of depressions where water may accumulate.

## 5.10 Cover Requirements

The waste is covered at the end of every working day as specified in Condition 5.8.3 of the Licence (Reg. No.W0178-02) using suitable material. Adequate stockpiles of cover material are maintained on-site at all times. The daily cover material is either imported or recovered on-site from the Construction and Demolition wastes or taken from the onsite borrow pit.

The active fill area is inspected daily and where the daily and intermediate cover material has been eroded, washed off or otherwise removed this material is replaced by the end of the working day as required by Condition 5.4.2 to the Licence (Reg. No.W0178-02).

## 5.11 Off-Site Disposal and Recovery

Wastes consigned from the facility must be conveyed by waste contractors approved by the Agency, as specified by Condition 5.11.1 of the Licence (Reg. No.W0178-02). Galway County Council maintains and regularly updates a register of approved waste contractors.

All waste transferred from the facility must go to an appropriately licensed/permitted facility agreed by the Agency, as specified in Condition 5.11.2 of the Licence (Reg. No.W0178-02). Galway County Council maintains and regularly updates a register of approved facilities.

All wastes consigned from the facility must be transported in a manner that does not adversely affect the environment, as specified in Condition 5.11.3 of the Licence (Reg. No.W0178-02). Galway County Council personnel inspect each vehicle transporting waste off-site to ensure that it is suitable to transport the particular waste.

## 5.12 Water, Leachate and Gas Control Measures

### *5.12.1 Surface Water Control Measures*

Two inlets to the surface water lagoon are provided, which deliver water from the perimeter swale and site roads. Isolation valves are provided near both inlets to stop inflow where necessary, as specified in Condition 3.16.5 of the Licence (Reg. No. W0178-02). Surface water from impermeable areas of the site where there is the potential for contamination passes through a grit trap and a Class 1 Full Oil interceptor before discharge to the lagoon, as specified in Condition 3.16.6. of the Licence (Reg. No.W0178-02).

The water in the lagoon discharges to the Ballintober Stream via a reed bed system. The reed bed design was based on consultation with the Western Regional Fisheries Board as required by Condition 3.16.5 of the Licence (Reg. No.W0178-02). The outfall from the pond to the wetland area is controlled by an actuated penstock. The penstock also allows the retention of water within the pond in the event that monitoring indicates contamination of the surface water.

### *5.12.2 Leachate Management*

Leachate accumulating in the cells is pumped from collection sumps located inside the cells via side risers to the leachate main from where it flows to a leachate holding tank, (which has a capacity of 500 $m^3$) or to the leachate lagoon, (which has a capacity of 3,500 $m^3$ including freeboard). The pumps are controlled by means of a systems control and data acquisition system (SCADA) that continuously monitors the level in the landfill cells, storage tank and lagoon and activates the pumps to ensure the level does not exceed 1 m above the liner as specified in Condition 5.14.1 of Licence (Reg. No.W0178-02).

High level alarms are fitted in the cells and in the storage tank and lagoon. A freeboard of 0.75m is maintained in the storage tank as required by Condition 5.14.1 of the Licence (Reg. No.W0178-02). The maintenance of the 0.75 m freeboard at all times in the storage tank requires the regular removal of leachate from the tank. The leachate is removed using fully enclosed road tankers operated by a permitted waste collector.

The leachate is treated at an off-site waste water treatment plant (WWTP). WWTP's used by this facility include Irish water Ballinasloe WWTP, Rilta Industrial WWTP (Rathcoole), and Enva Industrial WWTP's (Shannon and Dublin) which were agreed in advance with the Agency, as specified in Condition 5.13.4 and 11.7.1 b) of the Licence (Reg. No.W0178-02).

Galway County Council has prepared written procedures for the proper handling of leachate at the site, as specified in Condition 11.7.1 e) of the Licence (Reg. No.W0178-

02). The procedure specifies the corrective actions to be taken in the event of a spill at the ground surface. Galway County Council maintains an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spill at the facility. Facility personnel have been provided with appropriate training to deal with any such incidents.

At present Leachate is not pre-treated at the facility. If at some time in the future pre-treatment is being considered Galway County Council will submit details to the Agency for prior approval. Leachate may be recirculated in cells that have been capped and restored to the Agency's satisfaction and subject to the Agency's prior approval, as required by Condition 5.14.5 of Licence (Reg. No. W0178-02).

### *5.12.3 Landfill Gas Control Measures*

The primary measures to prevent landfill gas migration and to allow the efficient collection of gases for flaring and utilisation are the landfill lining system, supported by active abstraction. An active abstraction and flaring system has been provided and gas collection wells are progressively installed in the cells and connected to the abstraction system. In 2010 a Gas Utilisation Plant was installed which produces electricity for use on site as well as for export to the National Grid

## 5.13 Noise Emission Controls

Noise emissions are mitigated by the following methods, which are based on the requirements of Condition 7. 6.1 of the Licence (Reg. No.W0178-02): -

- Low sound level plant is used on-site,
- Speed restrictions on all internal site roads,
- Fitting of acoustic panels on the engine bays and exhaust silencers on all heavy machinery used on-site, and
- Compliance with BS 5528 Noise Control on Construction and Open Sites.

## 5.14 Odour Emission Controls

Odour emissions are controlled by means which include the following operational procedures and engineering controls: -

- The daily working area is limited in size,

- Daily covering of waste,

- Provision and progressive expansion of an active gas abstraction and flaring system in operational cells,

- Provision of a low permeability cap incorporating a landfill gas collection system on completed cells.

In compliance with Condition 8.13 of the Licence (Reg. No.W0178-02) an Odour Management Plan (OMP) has been prepared and submitted to the Agency.

### 5.15 Litter Control

Litter control is achieved by the following methods which are specified in Condition 7.3 of the Licence (Reg. No. W0178-02) and also best practice: -

- Daily covering of the waste,

- Suspension of waste disposal during adverse weather conditions,

- Provision and maintenance of permanent and portable litter fencing and netting around the perimeter of all waste disposal areas. The fencing is provided prior to the placement of waste,

- Daily inspection of litter control infrastructure. All defects are repaired by the end of the working day on which the defect was discovered. If it is only possible to effect a temporary repair on the day a permanent repair must be completed within three days,

- Loose litter or other waste occurring on or in the vicinity of the site is collected immediately or no later than 10 am of the next working day after such waste is discovered in compliance with Condition 7.3.4,

- Galway County Council requires all vehicles delivering waste to and removing waste and materials from the facility to be appropriately covered.

### 5.16 Dust Emission Controls

Dust emissions are minimised and controlled by the following, which are specified in Conditions 7.4 and 7.5 of the Licence (Reg. No.W0178-02) and also best practice: -

- Paved roads,

- Mandatory use of the wheel wash by waste vehicles leaving the site except those whose exemption has been approved by the Agency,

- Routine road sweeping,

- Daily cover of the deposited waste,

- Capping and seeding of landfill cells,
- Vegetation of soil stockpiles,
- Use of water bowser to dampen roads and stockpiles as required.

## 5.17 Bird Control

The primary measure for the prevention of birds gathering and feeding at the facility is the appropriate daily covering of waste. Bird scaring equipment and techniques are employed on a daily basis including speakers, balloons and kites, as required by Condition 7.7.1 of the Licence (Reg. No.W0178-02). Gas operated scaring devices are not used.

## 5.18 Vermin and Other Pest Control

Vermin control is carried out in accordance with the Programme for the Control and Eradication of Insect and Rodent Infestations at the Facility, prepared under Condition 11.5 of the Licence (Reg. No.W0178-02). Galway County Council maintains records of the vermin control programme implemented at the facility, as required by Condition 10.5 of the Licence (Reg. No.W0178-02).

The records include: -

- Date and time when spraying of insecticide is carried out;
- Contractor details;
- Contractor logs and inspection reports;
- Details of the rodenticide(s) and insecticide(s) used;
- Operator training details;
- Details of any infestation;
- Mode, frequency, location and quantity of application; and
- Measures to contain sprays within the facility boundary.

## 5.19 Wheel Wash

The wheel wash is inspected daily as specified in Condition 5.15.4 of the Licence (Reg. No.W0178-02). Solid material removed from the wheel wash is disposed of in the landfill. Dirty water is directed to the leachate collection system as specified in Condition 3.9.1 of the Licence (Reg. No.W178-02).

## 5.20 Operational and Safety Rules and Emergency Response Procedures

Galway County Council has prepared operating procedures that cover all aspects of facility operations (Ref. Section 5.2). Galway County Council has prepared a Health & Safety Plan and, as specified in Condition 9.2 of the Licence (Reg. No.W0178-02), has also prepared Emergency Response Procedures (ERP). All Galway County Council personnel and contractors working on-site must be familiar with and adhere to Galway County Council's Health & Safety and ERP requirements.

## 5.21 Environmental Monitoring Programme

Galway County Council implements a comprehensive environmental monitoring programme at the facility in compliance with Conditions 8.1 to 8.14 of the Licence (Reg. No.W0178-02). The type of monitoring, monitoring locations and frequency is set out in Schedule D of the Licence and summarised in Table 5.1. Any amendments to the frequency, locations, methods and scope of the monitoring can only be made with the prior approval of the Agency as specified in Condition 8.2 of the Licence (Reg. No.W0178-02).

Galway County Council maintains records of all the monitoring carried out at the facility. The records include the names and qualifications of all the persons who carry out all sampling and monitoring and who provide the interpretation of the sampling and monitoring results, as specified in Condition 10.3 (e) of the Licence (Reg. No.W0178-02).

**Table 5.1** Environmental Monitoring Programme

| Condition | Monitoring Item | | Frequency |
|---|---|---|---|
| Table D.1. & Table D.3. | Dust samples (5 number) | | Quarterly |
| Table D.1. & Table D.3. | $PM_{10}$ (5 number) | | Quarterly |
| Table D.1. & Table D.4. | Noise (5 number locations) | | Quarterly |
| Table D.1. & Table D.5. | Ground water<br>(8 number) | Levels<br>Analysis<br>Analysis | Monthly<br>Quarterly<br>Annually |
| Table D.1. & Table D.5. | Surface water<br>(7 number) | Inspection<br>Analysis<br>Analysis | Monthly<br>Quarterly<br>Annually |
| Table D.1. & Tables D.2 and D7 | Landfill Gas | | |
| Table D.1. & Table D.5. | Leachate | | |
| 8.8.1 | Biological Assessment (4 locations) | | Annually |
| 8.7 | Topographical Survey | | Annually |
| 8.9 | Archaeological Assessment | | * |
| 8.10 | Stability Assessment | | Annually |
| 8.11.1 | Nuisance Monitoring | | Weekly |
| Table D6 | Meteorological Monitoring | | Daily |
| Table D8 | Waste Monitoring | | |
| Table D9 | Ambient Odour Monitoring | | Monthly |

* To be carried out prior to development of any undisturbed area:

## 5.22 Incidents

Galway County Council will, where an incident occurs, notify the Agency in accordance with Condition 9.1 and Technical Amendment B of the Licence (Reg. No.W0178-02).

An incident is defined as follows: -

- An emergency;
- Any emission that does not comply with the requirements of the licence;
- Any exceedance of the daily duty capacity of the waste handling equipment;
- Any trigger level specified in the licence which is attained or exceeded;
- Any compliance value specified in the licence which is attained or exceeded; and,
- Any indication that environmental pollution has, or may have, taken place.

Galway County Council will, in accordance with Condition 11.2 of the Licence (Reg. No.W0178-02) notify the Agency as soon as is practicable and in any case no later than 10 am the following working day of the occurrence of an incident and submit a written report within 5 days of the occurrence of the incident, or earlier if practicable. Where the incident involves a discharge to surface water Galway County Council will inform the WRFB no later than 10 am the following working day after the incident.

Where follow up actions are taken in response to the incident e.g. clean-up Galway County Council will, as specified in Condition 11.2 of the Licence (Reg. No. W0178-02), prepare and submit a report to the Agency on the actions no later than 10 days after the start of the works.

## 5.23 Complaints

Galway County Council has established a procedure for recording and responding to complaints received in relation to the management and operation of the facility. All complaints are recorded in a Complaint Log, as specified in Condition 10.4 of the Licence (Reg. No.W0178-02). The information recorded includes: -

- Date and time of the complaint;
- Name of the complainant;
- Details of the nature of the complaint;
- Actions taken on foot of the complaint and the results of such actions; and
- The response made to each complainant.

The Facility Manager or nominated Deputy Manager must be informed of the complaint and are responsible for the investigation of the complaint and the implementation of any corrective measures. In the event that corrective actions are required to address the cause of the complaint Galway County Council records the actions on the Complaint log and communications to the complainant.

## 5.24 Reports

The full reporting requirements are set out in Schedule E of the Licence and are summarised in Table 5.2. The reports, in conjunction with the AER, are required under Condition 11 of the Licence (Reg. No. W0178-02) and also meet the reporting requirements of the EMS. The preparation of the AER involves a review of the progress in achieving the EMS Objectives and Targets, reports on site development works, resource consumption, changes to existing or introduction of new operating procedures and an assessment of the impacts of site activities.

**Table 5.2** Reporting Requirements

| **Report** | **Frequency** | **Submission Date** |
|---|---|---|
| EMS Updates | Annually | As Part of AER |
| AER | Annually | By 31st March each calendar year |
| Incidents | As they occur | Within 5 days of the incident |
| Bund, tank, integrity testing | 3 years | 1 month after end of 3 year period |
| Specified Engineering Works | As they arise | 2 months prior to works commencing |
| Landfill Gas monitoring | Quarterly | 10 days after reporting quarter |
| Surface Water Monitoring | Quarterly | 10 days after reporting quarter |
| Groundwater Monitoring | Quarterly | 10 days after reporting quarter |
| Leachate Monitoring | Quarterly | 10 days after reporting quarter |
| Meteorological Monitoring | Annually | 1 month after reporting year |
| Dust Monitoring | Quarterly | 10 days after reporting period |
| Noise Monitoring | Bi-Annually | 1 month after the reporting period |
| Odour Management Plan (OMP) | As Required | Six months after date of grant of licence |
| Environmental Liability Risk Assessment (ELRA) | Every 3 Years | Within 12 months after date of grant of licence and at least every 3 years thereafter as part of AER. |
| Any other monitoring | As they occur | Within 10 days of obtaining results |

# 6. SCHEDULE OF OBJECTIVES & TARGETS

## 6.1 Schedule of Objectives and Target

The objectives and targets for 2016 are to undertake the implementation of a site resolution plan in agreement with the DCCAE, EPA and Galway County Council.

The East Galway Landfill was vacated at short notice by the previous landfill operating company. The purpose of a site resolution plan is to execute a satisfactory and enduring environmental resolution for the site in the interests of environmental protection.

# APPENDIX 1

Engineering Design Maps

Please note, all of these drawings have previously been submitted to the EPA and are not included in the Appendix to the LEMP (as an appendix to the AER) due to file size constraints.

| Drawing No. | Title |
|---|---|
| 2228-2600 | Specified Engineering Works - Overall Site General Arrangement Plan |
| 2228-2601 | Specified Engineering Works General Arrangement Phase 1 - Sheet 1 of 2 |
| 2228-2602 | Specified Engineering Works General Arrangement Phase 1 - Sheet 2 of 2 |
| 2228-2605 | Specified Engineering Works - Basal Lining System Embankment Details and Intercell Bunds |
| 2228-2607 | Specified Engineering Works - Phase I Leachate Collection |
| 2228-2608 | Specified Engineering Works - Site Surfacing Plan |
| 2228-2609 | Specified Engineering Works - Site Fencing Plan |
| 2228-2612 | Specified Engineering Works - Road Construction Details |
| 2228-2614 | Specified Engineering Works - Surface Water Lagoon and Engineered Wetland Layout Plan |
| 2228-2615 | Specified Engineering Works - Leachate Collection Tank Elevation and Section |
| 2228-2618 | Specified Engineering Works - Waste Quarantine Area General Arrangement |
| 2228-2623 | Submission to EPA - Landscaping Implementation Plan - Sheet 1 of 2 |
| 2228-2624 | Submission to EPA - Landscaping Implementation Plan - Sheet 2 of 2 |
| 3588-1604A | Landfill Environmental Monitoring Locations |

# APPENDIX 2

Corrective Action Procedures

# CORRECTIVE ACTION PROCEDURES

## Scope

Galway County Council has prepared Corrective Action Procedures (CAP) to ensure that corrective action is taken should specified requirements of the EMS not be fulfilled. This Procedure describes the content and applicability of the CAPs and assigns responsibility for their implementation, maintenance and update.

### *Content*

The Procedure set out the approach to be taken to identify a non-compliance with the EMS, investigate the root cause, implement corrective actions and report on the non-compliance. They also identify the need to amend Operating Procedures and provide training or retraining to avoid the recurrence of the non compliance. The CAPs deal with: -

| | | |
|---|---|---|
| Facility Operation | : | CAP-2 |
| Environmental Monitoring | : | CAP-3 |
| Reports | : | CAP-4 |

### *Application*

This CAP apply to the Galway County Council Landfill operated under IED Licence Registration No. W0178-02.

## Applicable Documents

The following documents constitute part of the CAP to the extent specified in each Procedure. Unless otherwise specified the latest issue of each document applies.

- IED Licence Registration No. W0178-02,
- Operating Procedures,
- Site Inspection Reports,
- Landfill Environmental Management Plan (LEMP),

- Emergency Response Procedures (ERP),
- Awareness & Training Procedure,
- Document Control Procedure.

## Responsibilities

It shall be the responsibility of Galway County Council to ensure that the CAPs are implemented.

It shall be the responsibility of the Facility Manager to revise and amend the CAP in response to findings of the root cause of a non-compliance.

It shall be the responsibility of the Facility Manager to maintain copies of the most recent CAPs at the facility, ensure that they are available to all relevant site operatives, including Galway County Council sub-contractors, and ensure that all site operatives have a thorough understanding of the CAPs relevant to their roles and areas of responsibilities.

# FACILITY OPERATION

## *Scope*

This Procedure addresses the day to day operation of the facility to ensure that corrective action is taken should the specified requirements of the Environmental Management Plan (EMP) and/or the IED Licence not be fulfilled.

## *Application*

The procedure applies to all site operations covered and includes: -

- Waste acceptance,
- Waste placement,
- Cover material stockpile,
- Condition of landfill cells,
- Condition of site entrance and access roads,
- Litter screens and control,
- Nuisance control, including, dusts, odours, birds, litter and vermin,
- Leachate and Landfill gas management,
- Surface water management,
- Wheel wash,
- Site security and environs,
- Complaints,
- Fires,
- Fuel storage,
- Record keeping.

## *Responsibility*

Galway County Council is responsible for ensuring the facility is operated in accordance with the LEMP, the IED Licence and facility Operating Procedures or any other procedures and plans and reports prepared in compliance with licence conditions.

It is the responsibility of the Facility Manager or nominated Deputy Manager to ensure that all site operatives, including Galway County Council sub-contractors, have a thorough understanding of the LEMP, the IED Licence and the relevant Operating Procedures.

It is the responsibility of all staff, including Galway County Council sub-contractors, to immediately notify the Facility Manager or the nominated Deputy Manager of any actual or potential non-compliance with the EMP and/or IED Licence conditions.

The Facility Manager or nominated Deputy Manager shall be responsible for implementing corrective action where site operations are identified as not meeting the objectives of the LEMP or the IED Licence Conditions. In implementing the corrective actions the Facility Manger or nominated Deputy Manager shall have regard to the facility Emergency Response Procedures to ensure that the proposed actions do not present a risk to Health and Safety.

## *Corrective Action*

Where a non-compliance is identified, either by site personnel during daily operations, routine inspections by the facility personnel or in the investigation of a complaint by a member of the public, the Facility Manager or nominated Deputy Manager will immediately initiate action to bring operations into compliance.

The scope and extent of the corrective actions will be based on the nature and scale of the non-compliance, the objectives of the LEMP and relevant Licence Conditions. The corrective actions will, at a minimum, be sufficient either to immediately rectify the non-compliance or minimise environmental risk pending completion of required works.

If the non-compliance constitutes an incident which might result in environmental pollution the Facility Manager or nominated Deputy Manager shall initiate any environmental monitoring considered necessary to evaluate environmental pollution.

If the non-compliance constitutes an incident requiring notification to the Agency or other regulatory bodies, the Facility Manager or nominated Deputy Manager shall notify the Agency and regulatory bodies in accordance with the Reporting Procedure and the IED Licence Conditions

The Facility Manager or nominated Deputy Manager shall monitor implementation of the corrective action to ensure that actions are carried out and are effective.

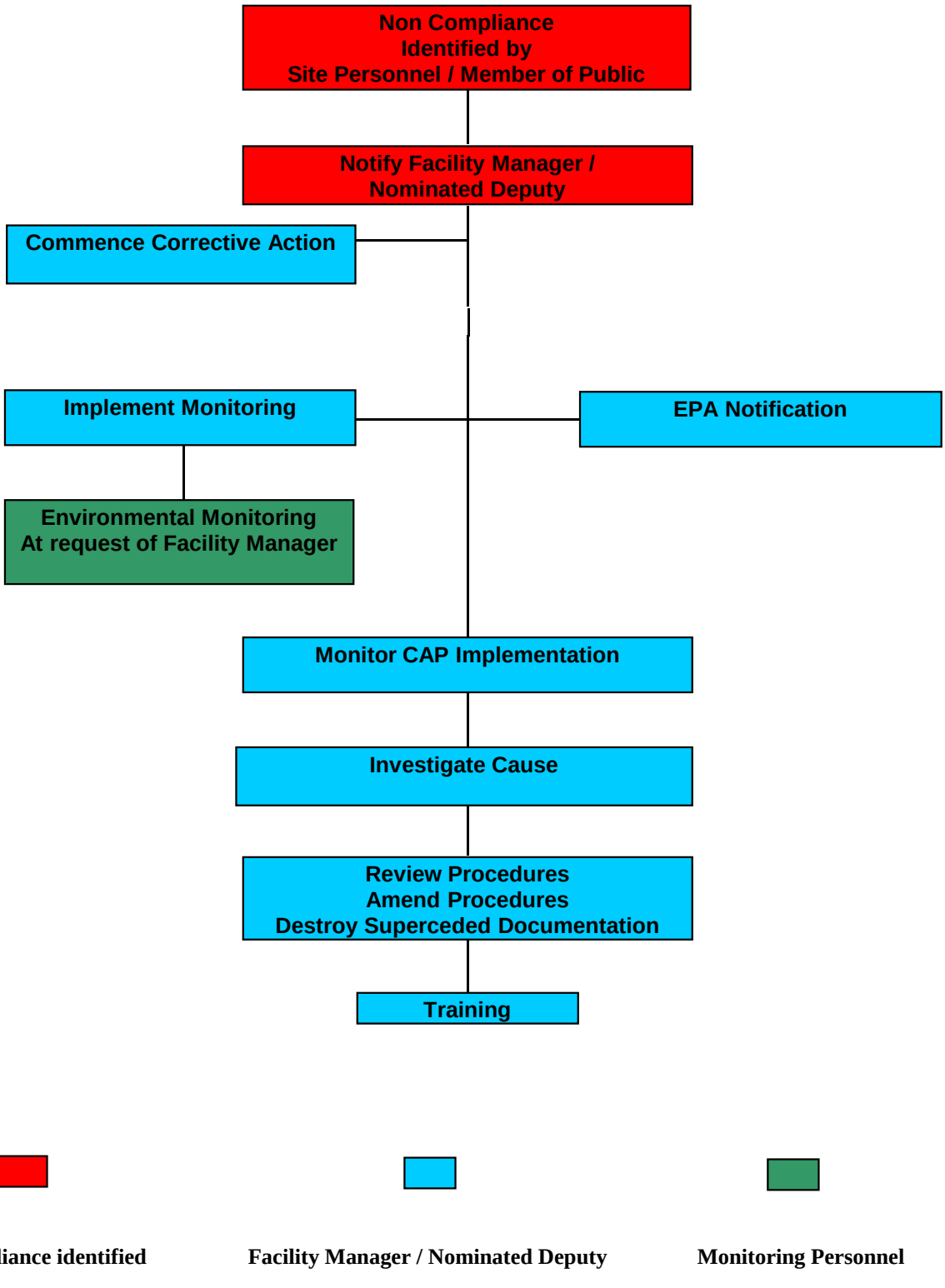
Following the completion of the corrective action the Facility Manager or nominated Deputy Manager will carry out an investigation to identify the root cause of the non-compliance. Where the cause is the result of inadequate or improperly applied procedures or site practices, the Facility Manager or nominated Deputy Manager will review and amend the procedures and practices to avoid a reoccurrence of the non-compliance. If documented procedures or operational practice sheets are amended the Facility Manager shall ensure that the superseded documents are destroyed.

If the cause of the non compliance is due to a lack of understanding of operational practices, the LEMP, or licence conditions the Facility Manager or nominated Deputy Manager shall ensure that the site staff, including Galway County Council sub-contractors, receive the necessary instruction or training to ensure future avoidance of a recurrence of the non compliance.

## *Key Elements*

A flow diagram that summarises the key elements of the CAP is attached.

# CAP-2 Site Operation



# ENVIRONMENTAL MONITORING

## *Scope*

This Procedure addresses the environmental monitoring programme at the facility to ensure that corrective action is taken should specified requirements of the LEMP and or the IED Licence not be fulfilled.

## *Application*

The Procedure applies to all emissions, environmental impacts and monitoring of emissions and environmental media covered under the LEMP and IED Licence Conditions, subject to any written agreements with the Agency and includes: -

- Surface water,
- Groundwater,
- Noise,
- Dust,
- $PM_{10}$,
- VOC, and
- Odours.

## *Responsibility*

Galway County Council shall be responsible for providing the necessary resources to ensure the environmental monitoring programme is carried out in accordance with the EMP and the IED Licence conditions.

It is the responsibility of the Facility Manager or nominated Deputy Manager to have a thorough understanding of the requirements of the LEMP, IED Licence, and Operating Procedures in relation to environmental monitoring.

The Facility Manager or nominated Deputy Manager will be responsible for arranging for the implementation of the specified environmental monitoring programme.

The Facility Manager or nominated Deputy Manager will be responsible for implementing corrective actions in the event that monitoring identifies an emission that exceeds emission limit/trigger level or where operations are identified as impacting on the receiving environment.

### *Corrective Action*

Where in-situ monitoring identifies an impact on the receiving environment, the Facility Manager or nominated Deputy Manager will be immediately informed. The Facility Manager or nominated Deputy will carry out an inspection of the area surrounding the monitoring location to identify the source of the impact.

If the source of the impact is identified as an emission from the waste activities, the Facility Manager or nominated Deputy Manager shall be responsible for taking corrective action to isolate the source and identify and execute measures to minimise the effects of the emission.

The Facility Manager or nominated Deputy Manager may, depending on the nature of the impact, instruct the amendment of the routine monitoring programme to include additional monitoring to determine the extent of the impact. The number and location of these monitoring points will be established in consultation with the monitoring personnel.

The Facility Manager or nominated Deputy Manager will notify the Agency and, in the case of surface water or groundwater impacts, the Western Regional Fisheries Board in accordance with the IED Licence notification requirements.

Where the in-situ monitoring indicates satisfactory conditions, but subsequent laboratory test results indicate an impact by an emission from site activities e.g. surface water or groundwater quality, the Facility Manager or nominated Deputy Manager will carry out a visual inspection of the monitoring points to identify a possible source. If a source cannot be identified the Facility Manager or nominated Deputy Manager may, depending on the nature of the results, either immediately initiate further monitoring or await the following scheduled sampling event to obtain more information on the cause of the impact.

The Facility Manager or nominated Deputy Manager will monitor implementation of the corrective action to ensure that actions are carried out and are effective.

Following the completion of the corrective action the Facility Manager or nominated Deputy Manager will investigate and document the cause of the emission. The Facility Manager or nominated Deputy Manager will submit a report on the investigation to the Agency in accordance with the IED Licence notification and reporting requirements.

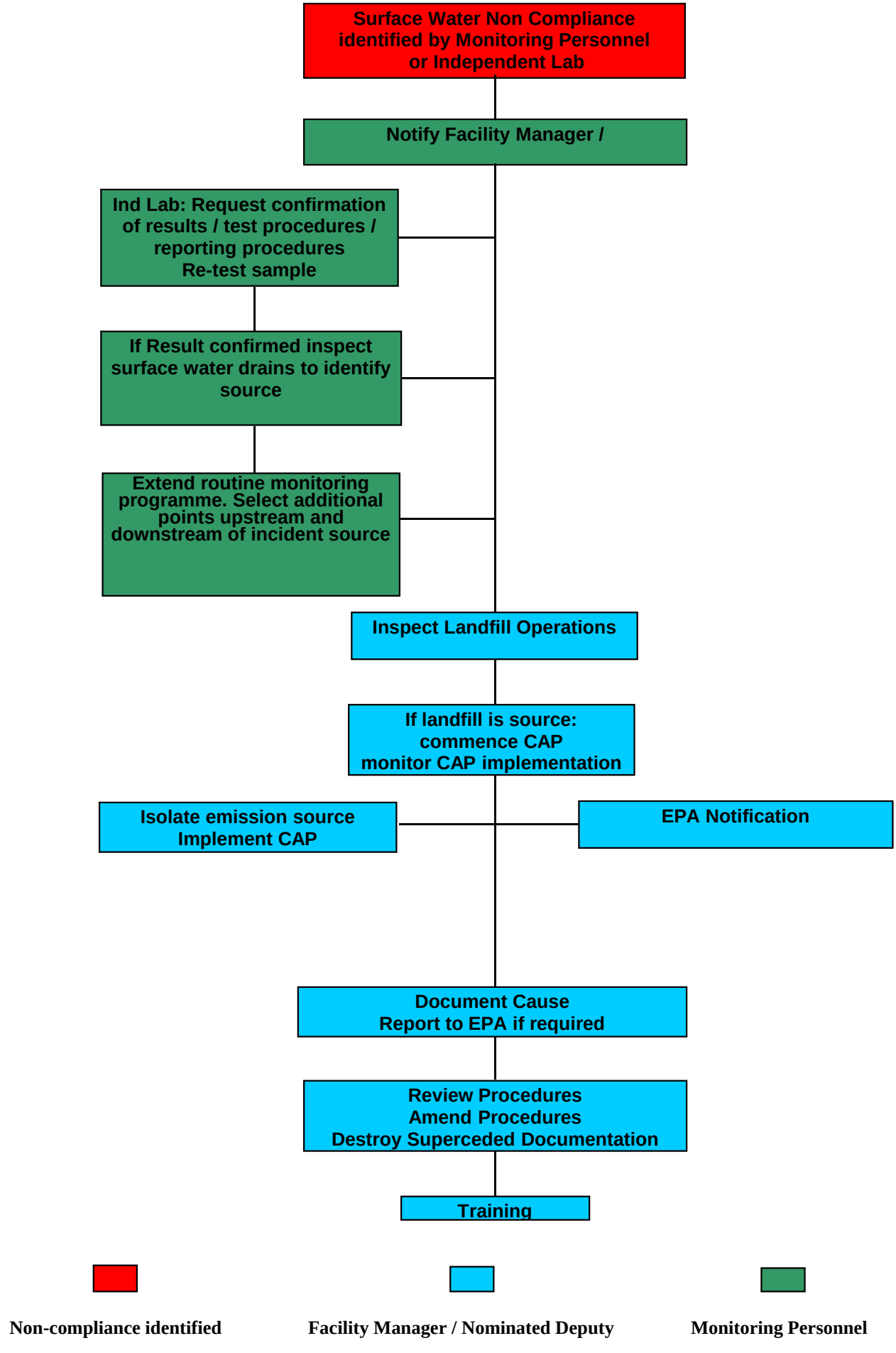
Where the cause is the result of failure or inadequacy of the design or implementation of specified engineering works, Galway County Council shall ensure that the design or construction deficiencies are rectified to avoid a reoccurrence of the non-compliance.

Where the cause is the result of inadequate or improperly applied procedures or site practices the Facility Manager shall review and amend the procedures and practices to avoid a reoccurrence of the non-compliance. If documented procedures or work instructions are amended the Facility Manager shall ensure that the superseded documents are destroyed.

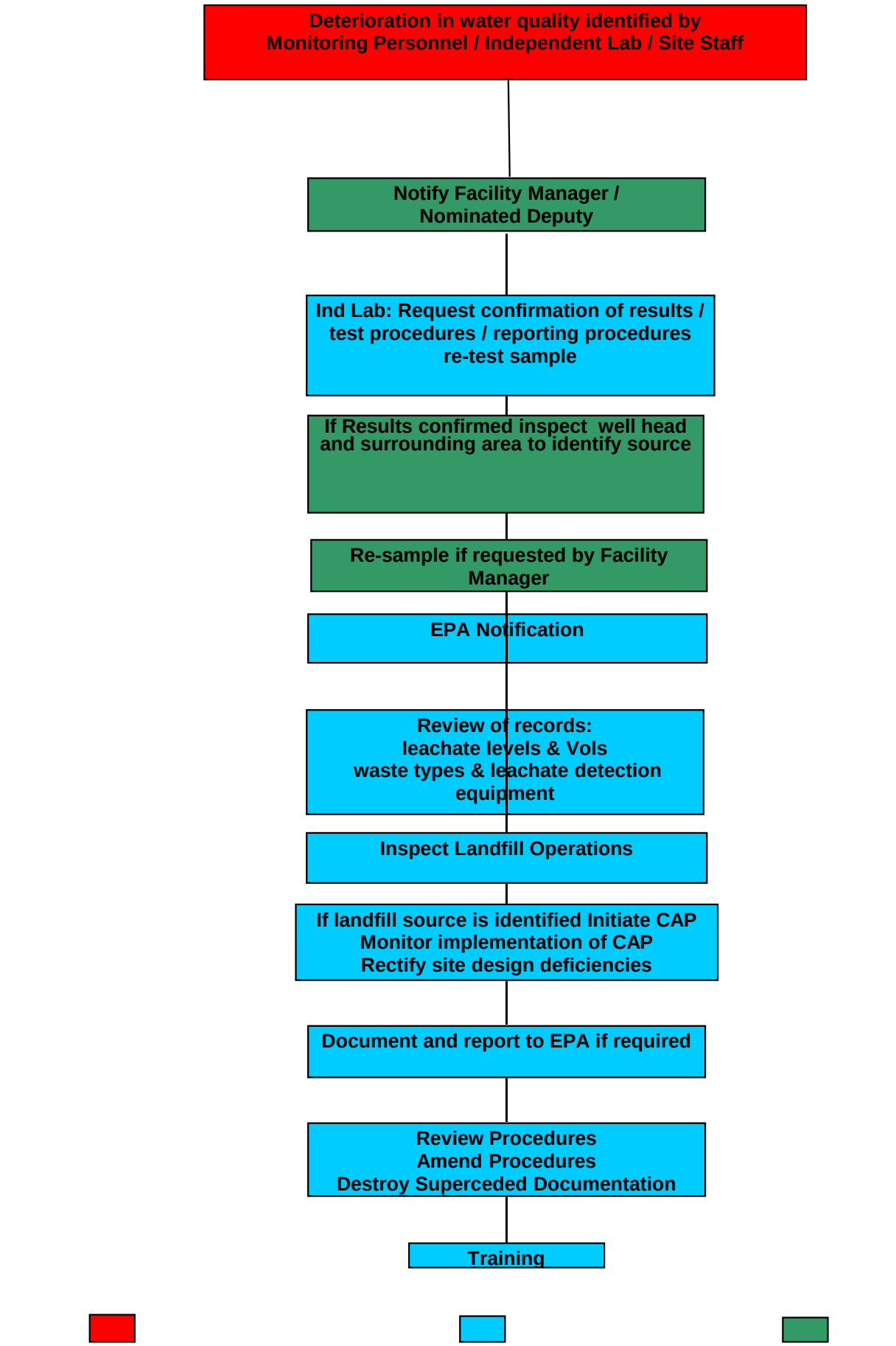
If the cause of the non compliance is due to a lack of understanding of operational practices or licence conditions the Facility Manager or nominated Deputy Manager shall ensure that the site operatives, including Galway County Council sub-contractors, receive the necessary instruction or training to ensure future avoidance of a recurrence of the non compliance.

Flow diagrams showing the actions to be taken in the event of non-compliance identified during the environmental monitoring programme are attached.

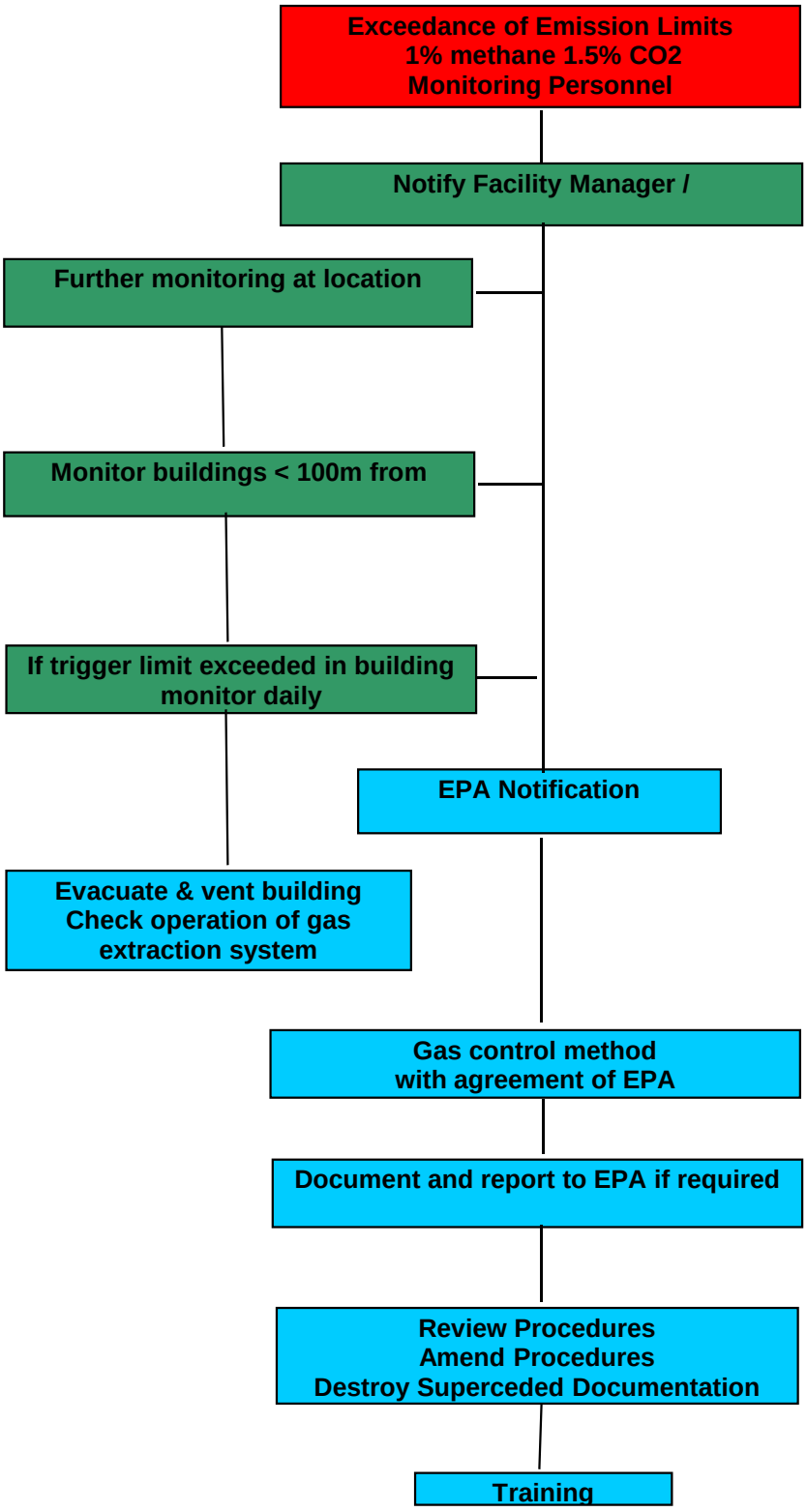
# CAP-3 Surface Water



# CAP- 3 Groundwater



# CAP-3 Landfill Gas

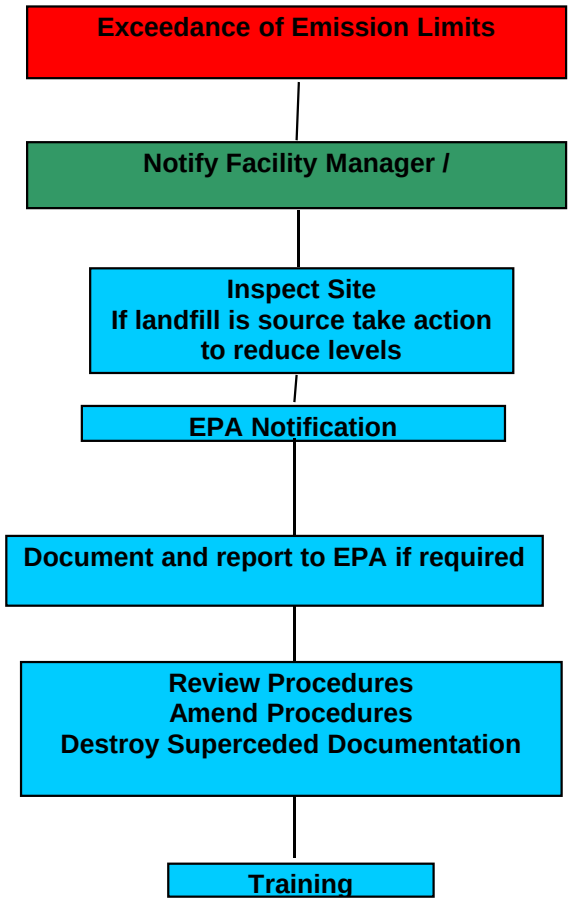



Non-compliance identified

Facility Manager / Nominated Deputy

Monitoring Personnel

# CAP-3 Noise




Non-compliance identified

Facility Manager / Nominated Deputy

Monitoring Personnel

# REPORTS

## *Scope*

This Procedure addresses reporting, to ensure that corrective action is taken should specified requirements of the IED Licence not be fulfilled.

## *Application*

The Procedure applies to all reports and notifications required under the LEMP and the IED Licence, subject to any written agreements with the Agency.

## *Responsibility*

Galway County Council shall be responsible for ensuring the resources are provided to complete the required reports in accordance with the schedules specified in the LEMP and set in the individual conditions and *Schedule E* of the IED Licence.

It is the responsibility of the Facility Manager or nominated Deputy Manager to have a thorough understanding of the LEMP and IED Licence Conditions in relation to reporting requirements.

The Facility Manager or nominated Deputy Manager shall be responsible for arranging the completion of the stipulated reports and submission to the Agency within the timeframe set in the LEMP and the IED Licence.

The Facility Manager or nominated Deputy shall be responsible for implementing corrective actions in the event that reports will not be prepared or submitted to the Agency within the specified timeframe.

## *Corrective Action*

If the Facility Manager or nominated Deputy Manager identifies that a report will not be prepared and submitted to the Agency by the scheduled date he (she) shall identify the cause of the delay.

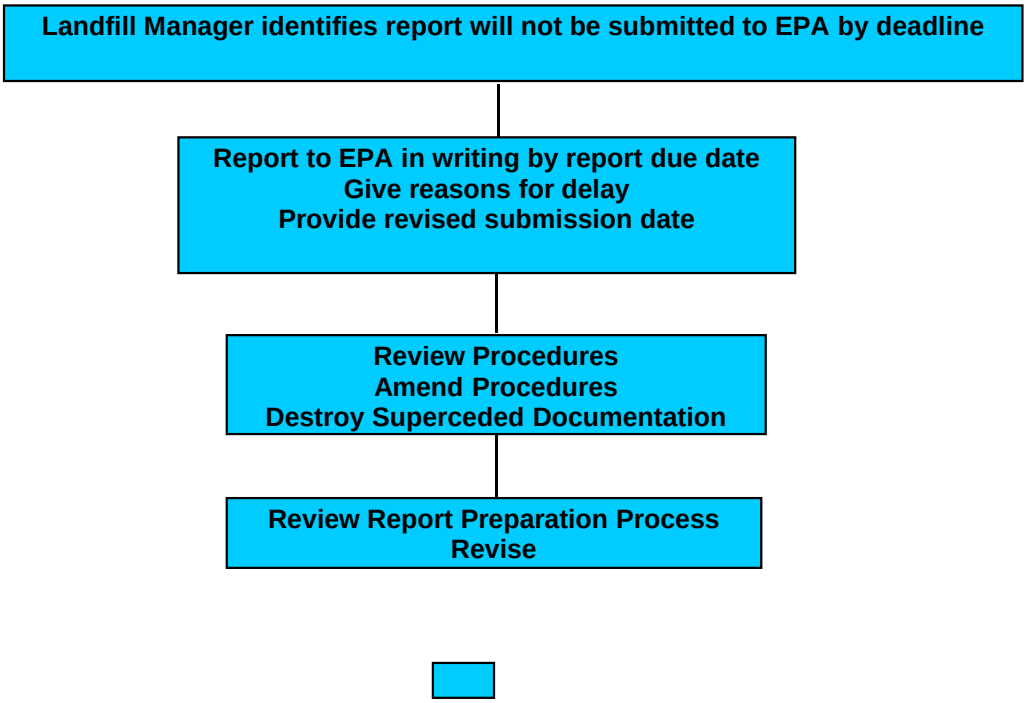
The Facility Manager or nominated Deputy Manager will inform the Agency in writing that the report will not be submitted by the due date. This notification will be submitted to the Agency preferably before, but at a minimum no later than the report due date.

The Facility Manager or nominated Deputy Manager will include in the written notification the reason(s) for the failure to submit the report on time and provide a revised submission date for the Agency's agreement.

Following the submission of the report the Facility Manager or nominated Deputy Manager shall review that particular report preparation process to identify the root cause of failure to meet the deadline. Based on the review the Facility Manager or nominated Deputy shall if necessary revise the report preparation process to avoid a recurrence of the non-compliance.

A flow diagram showing the actions to be taken in the event of non-compliance with the reporting programme is attached.

## CAP-4 Reports



# APPENDIX 3

Awareness & Training Procedures

# AWARENESS AND TRAINING PROCEDURE

## Scope

Galway County Council has prepared this Awareness and Training Procedure to ensure that the awareness and training needs of all relevant facility personnel are identified and the required training provided.

## *Application*

This Procedure applies to all personnel whose work is related to the Galway Landfill, including Galway County Council staff and any subcontractors working at the facility on behalf of the Galway County Council.

## Applicable Documents

The following documents constitute part of the Procedure to the extent specified. Unless otherwise specified the latest issue of each document applies: -

- IED Licence Registration No. W0178-02,
- Operating Procedures,
- Site Inspection Reports,
- Landfill Environmental Management Plan (LEMP),
- Emergency Response Procedures,
- Management Structure,
- Corrective Action Procedures.

## Responsibilities

It shall be the responsibility of Galway County Council to ensure that this Procedure is implemented.

It shall be the responsibility of the Facility Manager and/or nominated Deputy Manager(s) to identify training needs and arrange for the provision of the appropriate awareness and training programmes to all relevant personnel.

It shall be the responsibility of the Facility Manager and/or nominated Deputy Manager(s) to maintain written records of all awareness and training programmes received by site personnel.

### *Programmes*

The Facility Manager shall identify the awareness and training needs of all personnel by means of Management Structure documents and the Training Evaluation Matrix. The Management Structure document assigns responsibilities to site personnel. The Matrix sets out positions, training needs and a programme delivery timeframe.

The Facility Manager or nominated Deputy Manager(s) will arrange for the delivery of the awareness and training programmes. The programme may include internal training provided by Galway County Council personnel who have the necessary skills and experience to deliver the programmes, and external training provided by appropriately experienced and recognised training organisations.

The programmes shall include education and instruction on: -

- Compliance with IED Licence conditions, Operating Procedures and LEMP objectives and targets relating to site operation,
- Awareness of the implications of non compliance with LEMP objectives and Licence conditions,
- Environmental Monitoring Programmes,
- Dealing with Complaints,
- Corrective Action Procedures,
- Health & Safety,
- Emergency Response Procedures.

The Facility Manager or Nominated Deputy Manager(s) shall ensure that all personnel receive the required training and shall maintain records of training provided. The records shall include the names of the trainees, the date of the training and the topics covered.

The Facility Manager shall review and amend the awareness and training programmes based on the corrective action investigation of non-compliances.

# Awareness & Training Matrix

**Date:**

| Programme | Scope | |
|---|---|---|
| | **Person Affected** | **Frequency** |
| Operations | All personnel. | Ongoing. |
| Environmental Awareness | All personnel | Ongoing |
| Environmental Monitoring | Facility Manager, Nominated Deputy. | Initial and following licence review. |
| Complaints | Facility Manager, Nominated Deputy. | Initial and following licence review. |
| Corrective Action Procedures | Facility Manager, Nominated Deputy. | Initial and following any licence amendments. |
| Health & Safety | All personnel. | Initial and following any licence amendments. |
| Emergency Response Procedures | All personnel. | Initially & following any procedure amendments but at least annually. |