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ANNUAL ENVIRONMENTAL REPORT

FOR

BALLYNAGRAN LANDFILL LIMITED

LICENCE NO. W0165-02

JANUARY 2014 – DECEMBER 2014

Prepared For: -

Ballynagran Landfill Ltd.,
Ballynagran Landfill,
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Project	Annual Environmental Report 2014			
Client	Ballynagran Landfill Limited W0165-02			
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1. INTRODUCTION

This is the 2014 Annual Environmental Report (AER) for Ballynagran Landfill Limited's non-hazardous residual landfill at Coolbeg & Kilcandra, Ballynagran, County Wicklow. It covers the period from the 1st January 2014 to the 31st December 2014.

In March 2014 the Waste Licence was transferred from Greenstar Holdings Limited to Ballynagran Landfill Limited.

The content of this report is based on Schedule B of the Waste Licence (Reg. No. W0165-02) and the report format follows guidelines set in the "Guidance Note for Annual Environmental Report" issued by the Environmental Protection Agency (Agency)[1]. Account is also taken of the AER Draft Guidance Document and AER Information Templates issued by the Agency in January 2013[2].

[1] EPA (Environmental Protection Agency) 1999 Waste Licensing – Draft Guidance on Environmental Management Systems and Reporting to the Agency

[2] EPA (Environmental Protection Agency) 2012 Draft AER Guidance Document

2. SITE DESCRIPTION

2.1 Site Location & Layout

The site, which encompasses approximately 128 ha, is located on the eastern side of the Wicklow Mountains in the townlands of Ballynagran, Coolbeg and Kilcandra. It is approximately 5 km to the south west of Wicklow Town and 3.5 km to the south east of Glenealy. It is on the southern side of an east-west ridge at an elevation between 52 and 147m Ordnance Datum (OD).

The site layout is shown on the topographical survey drawing included in Appendix 1 and includes: -

- Waste Reception Area;
- Weighbridges (2 No.);
- Wheel Wash;
- Waste Quarantine & Inspection Areas;
- Landfill Cells;
- Leachate Storage lagoon;
- Surface Water Pond;
- Administration Block (offices, stores, canteen, toilets and showers);
- Oil Storage Tank & Bund;
- Security Fencing.
- Landscaped Areas
- Landfill gas utilisation compound

2.2 Site History

The facility was granted a Waste Licence (W0165-01) by the Agency on 5th September 2003 which was reviewed with a revised licence (W0165-02) issued on the 23rd March 2010.

The facility will be developed in five phases. The initial phase involved the provision of five (5) landfill cells (1, 2, 3, 4 and 5A/B), and the entire supporting infrastructure. In 2007 the Agency approved the development of two additional cells (Cells 6 and 7), which were

constructed in 2008 and became active in 2009. An active gas abstraction and flaring system was commissioned in April 2007. Cells 9 and 10 were constructed in 2009 and 2010 respectively and despite being EPA approved for waste placement; they did not receive any waste until 2012 when waste placement commenced in cell 9. In 2014 waste placement commenced in sections of cell 10 and as the waste height increased in cell 10 waste placement recommenced in cell 7 and cell 6 which are adjacent to cell 10.

A landfill gas utilisation plant was commissioned and began operating in January 2011. In 2014 gas infrastructure installation consisting of horizontal and vertical wells was installed in conjunction with placement activities. In addition the development of the gas utilization facility was progressed with the installation of three new engines, which were commissioned in January 2015. Since the installation of the engines all gas is now used for electricity production with flares in stand by back up mode.

The placement of final capping commenced when cells were filled to final profile heights. The first phase of capping took place in 2011 with the placement of 16,000m2 of complete capping to topsoil and grass seeding. This was followed by 6,000m2 in late 2012 and 27,000m2 placement of liner in 2013. The following cells are completely covered cells 1, 2, 3, 4, 5a/b. Parts of cell 6 and cell 7 are also under the permanent cap.

2.3 Waste Activities Carried Out at the Facility

The facility is a full containment landfill, which is designed to accept treated waste for final disposal. The licensed waste activities are summarised in Tables 2.1 and 2.2.

Table 2.1 Licensed Waste Disposal Activities, in accordance with the Third Schedule of the Waste Management Act 1996 as amended

Class 1	Deposit on, in or under land (including landfill).
Class 4	Surface impoundment, including placement of liquids or sludge discards into pits, ponds or lagoons: This activity is limited to the storage and management of leachate and surface water at the facility.
Class 5	Specially engineered landfill, including placement into lines discrete cells which are capped and isolated from one another and the environment: This is the principal activity. This activity is limited to the construction of the landfill in distinct phases consisting of specially engineered lined cells, the deposit of non-hazardous waste into these lined cells and the collection of leachate and landfill gas.

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: This activity is limited to the treatment of leachate at the facility.
Class 13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced. This activity is limited to the storage of unacceptable waste prior to its transport off-site to another facility.

Table 2.2 Licensed Waste Recovery Activities, in accordance with the Fourth Schedule of the Waste Management Act 1996 as amended

Class 4	Recycling or reclamation of other inorganic materials. This activity is limited to the use of recycled construction and demolition waste as cover and/or construction material at the facility.
Class 9	Use of any waste principally as a fuel or other means to generate energy: This activity is limited to the utilisation of landfill gas at the facility.
Class 11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule: This activity is limited to the use of recycled construction and demolition waste at the facility.
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: This activity is limited to the storage of recycled construction and demolition waste prior to reuse.

2.4 Waste Types & Volumes

Only non-hazardous, solid, residual waste is accepted for disposal. Hazardous and liquid wastes are not accepted. All wastes delivered to the facility are subject to Waste Acceptance

Procedures that have been approved by the Agency, as specified in Condition 5.3 of the Waste Licence.

The facility is licensed to accept 175,000 tonnes of waste per annum for disposal. The following waste types and volumes, as specified in Schedule A of the Waste Licence, can be accepted: -

- Household (62,500 tonnes),
- Commercial (67,500 tonnes),
- Industrial (45,000 tonnes),

2.5 Waste Received & Consigned

A breakdown of the different types and quantities of wastes received, consigned & recovered at the facility in 2014 are shown in Tables 2.3, 2.4 and 2.5.

Table 2.3 Waste Received 2014

Description	Tonnes
MSW Mixed	56,613.66
C&D inert Mixed	1,788.98
C&I inert Mixed	46,231.91
Plastics	281.68
Fines (C&D, C&I)	39,805.73
Green biodegradable waste	4.96
CLOR stabilised msw fines	1,498.42
Bottom Ash	3,432.18
Filter Cake	7,005.52
Grits and screenings	1,584.76
Stone	6,378.06
Woodchip	3,567.16
Soil and stone	14,665.69
Greenfield Soils	17,265.27
Total	**200,123.98**

Table 2.4 Waste Consigned 2014

Description	Tonnes	Destination
Leachate	13,714.60	EPS Drogheda
Leachate	11,475.40	Rilta Rathcoole
Leachate	6,349.96	Ringsend WWTP
Leachate	985.70	Kilcullen Landfill Ltd
Total waste consigned	**32,525.66**	

Table 2.5 Waste Recovered 2014

Description	Tonnes
Fines (C&D, C&I)	39,805.73
Filter Cake	7,005.52
Stone	6,378.06
Woodchip	3,567.16
Soil and stone	14,665.69
Total Recovered	**71,422.16**

In addition to the waste recovered 17,265.27 tonnes of Greenfield soils material were received for future restoration works.

2.6 Landfill Capacity

The most recent topographic survey for the landfill cell footprint is included in Appendix 1. The facility has a design capacity of approximately 2,770,000 m³. It is estimated that the remaining void space as of January 2015 is 260,000 m^3.

2.7 Method of Deposition of Wastes

2.7.1 Waste Acceptance

The waste accepted for disposal is residual waste from County Wicklow and adjoining counties from household, commercial and industrial sources. . Waste contractors have systems in place whereby the recyclable fraction is either collected separately, or else separation is carried out mechanically at their facilities.

All waste is delivered to the site in Heavy Goods Vehicles (HGV) and small refuse trucks provided with the appropriate covers to prevent loss of load. Each vehicle first proceeds to the incoming weighbridge where it is weighed and documentation checked and logged. The weighbridge operator and/or the facility manager may at their own discretion request the load to be tipped in the Waste Inspection Area.

The vehicles then proceed to the active waste disposal area where waste is deposited under the direction of a banks man. The vehicles weigh out at the outgoing weighbridge and receive an individual weighbridge docket before exiting the site. Each landfill cell is divided into a number of grids, which are used to identify the areas where waste is deposited. Each load is assigned the relevant grid number.

2.7.2 Working Face

Waste is deposited close to and above the advancing tipping face. In accordance with Condition 5.6.1 the active face is confined to a height of 2.5 metres after compaction, a width of 25 metres and a slope no greater than 1 in 3. Deposited waste is spread in shallow layers on the inclined surface and compacted. Steel-wheeled compactors operate on the gradient of the more shallow face, pushing thin layers of waste and applying compaction pressure to them. The site operatives inspect the deposited waste for items that are not acceptable under the Waste Licence, such as tyres, gas bottles, batteries etc. These are removed and stored in appropriate areas for later removal from the facility to appropriately licence facilities. Each day waste is deposited to form a block, which is compacted and covered as described above. The following day a new block of waste is deposited adjacent to the existing block. The waste is covered at the end of each day with a covering of fines and woodchip.

This ordered method of waste deposition enables areas, which have been filled and are to be left for a period to be progressively restored over the site life, minimising the areas of active waste deposition.

2.8 Report on Development and Restoration at the Site

In 2014 waste placement commenced in cell 10 on a phased bases and as the waste height increased in cell 10 waste placement recommenced in cell 7 and cell 6 adjacent to cell 10. Gas infrastructure installation consisted of horizontal and vertical wells installed in conjunction with placement activities. In addition the development of the gas utilization facility was progressed with the installation of three new engines, which were commissioned in January 2015. Since the installation of the engines all gas is now used for electricity production with flares in stand by back up mode.

There was continued restoration work on the final cap with a drainage geotextile blanket, screened soil and subsoil placed over liner placed previously, as part of the final capping works.

2.9 Progress and Implementation of Landscaping Programme

There was no additional tree planting at the facility during the reporting period. There was maintenance carried out on all existing tress planted, in terms of weeding and pruning.

2.10 Report on Meeting the Requirements of the Landfill Directive

The Agency conducted a site audit on the 1st October 2014with regard to the quarterly Biodegradable Municipal Waste (BMW) returns and the National Waste survey submitted to the EPA in 2013.

The Agency issued a report on the 3rd October with a non-compliance in regard to achieving the BMW target. The Agency also put forward observations and recommendations that would aid the licensee to achieve the landfill directive targets.

2.11 Programme for Public Information

During 2014 the site accommodated all requests for site visits and tours. There was one tour of the site by an international group from Uganda as part of general waste management facilities tour of Ireland. Ballynagran liaison community sat several times during the year and monies from the fund were distributed to various organisations and persons under the community and local schemes.

3. ENVIRONMENTAL MONITORING

There is a comprehensive environmental monitoring programme to assess the significance of emissions from site activities. The programme includes groundwater, surface water, leachate, landfill gas, noise, dust and particulate monitoring and a biological assessment of the three streams (Ballynagran, Ford and Killandra) as well as the Three Mile Water River, Ballynagran Co. Wicklow. The monitoring locations are shown in Appendix 2.

The monitoring results, including the full laboratory reports, were submitted to the Agency at quarterly intervals in the reporting period. This section presents a summary of the monitoring with summary graphs showing trends. A summary of all monitoring data for 2014 is included in Appendix 3.

3.1 Groundwater Monitoring

3.1.1 Groundwater Levels

Up until June 2011 groundwater levels were measured monthly in the sixteen (16 No.) groundwater wells on site. Following approval by the Agency on the 1st June 2011, the monitoring frequency was reduced from monthly to quarterly (Ref Agency Letter W0165-02/AP26DM). There are eight groundwater monitoring locations with one deep and one shallow well at each location. The monitoring confirms that the direction of groundwater flow in the bedrock aquifer is from the north west to the south east.

3.1.2 Groundwater Quality

During 2014, fifteen (15 No.) private groundwater well samples were collected and analysed. These sampling events took place in Q-3 and Q-4 2014. The results of the analysis were reported in the Q-3 and Q-4 quarterly reports. All residents received copies of the results from their respective wells. Groundwater quality in the private wells was good and consistent with previous rounds.

Groundwater quality was monitored in the on-site monitoring wells and reported to the Agency at quarterly intervals. The sampling was carried out in accordance with internationally accepted techniques and control procedures and the analyses were completed by a laboratory using standard and internationally accepted procedures.

The groundwater analysis is compared to the licence specific trigger levels as well as the Interim Guideline Values (IGVs) for groundwater published by the Agency and the Groundwater Regulations Threshold Value (GTV) which were introduced in 2010 (S.I. 9 of 2010).

The IGV represent typical background or unpolluted conditions; however levels higher than the IGV may occur naturally depending on the local geological and hydrogeological conditions. While the GTV's are more appropriate for large scale abstraction wells used for potable supply, they can be used to assess the significance of contamination where present in non-potable groundwater supplies. Because GTVs have not been established for all of the parameters monitored, the relevant IGV was used for comparative purposes.

The 2014 quarterly results were generally consistent with those obtained during the monitoring completed before the start of site development works. The monitoring programme confirms that the site activities are not impacting on groundwater quality. The monitoring detected elevated pH levels in groundwater wells, MW1s, MW1d and MW2s. There were slightly elevated levels of ammonia in MW-2s, MW-3s, MW-7s and MW-7d.

As part of the annual monitoring orthophosphate was detected in a large number of wells upgradient side-gradient and downgradient of the site. Coliforms were detected in a number of wells upgradient, sidegradient and downgradient of the site. These levels of orthophosphate and coliforms are related to local agricultural practices. Elevate levels of manganese were detected in MW-5s and MW-5d. Manganese has been sporadically detected in wells across the site. These levels are believed to be naturally occurring and not related to the site.

The trend of key indicator parameters analysed for between 2011 and 2014 including pH, EC, chloride and ammonia are presented in Figures 3.1 to 3.4 below. These graphical representation of these key parameters are included in the AER following a request by the Agency.

Figure 3.1 Groundwater pH trend data

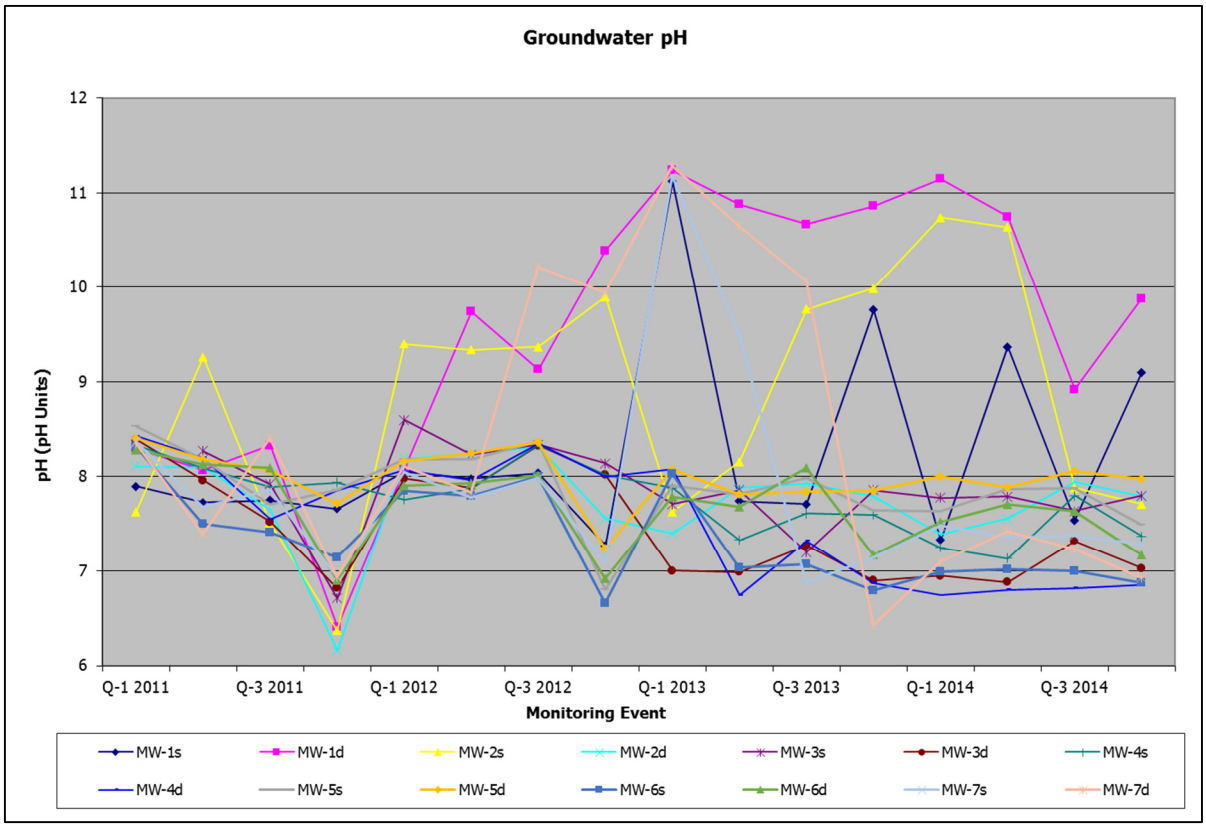


Figure 3.2 Groundwater Electrical Conductivity trend data

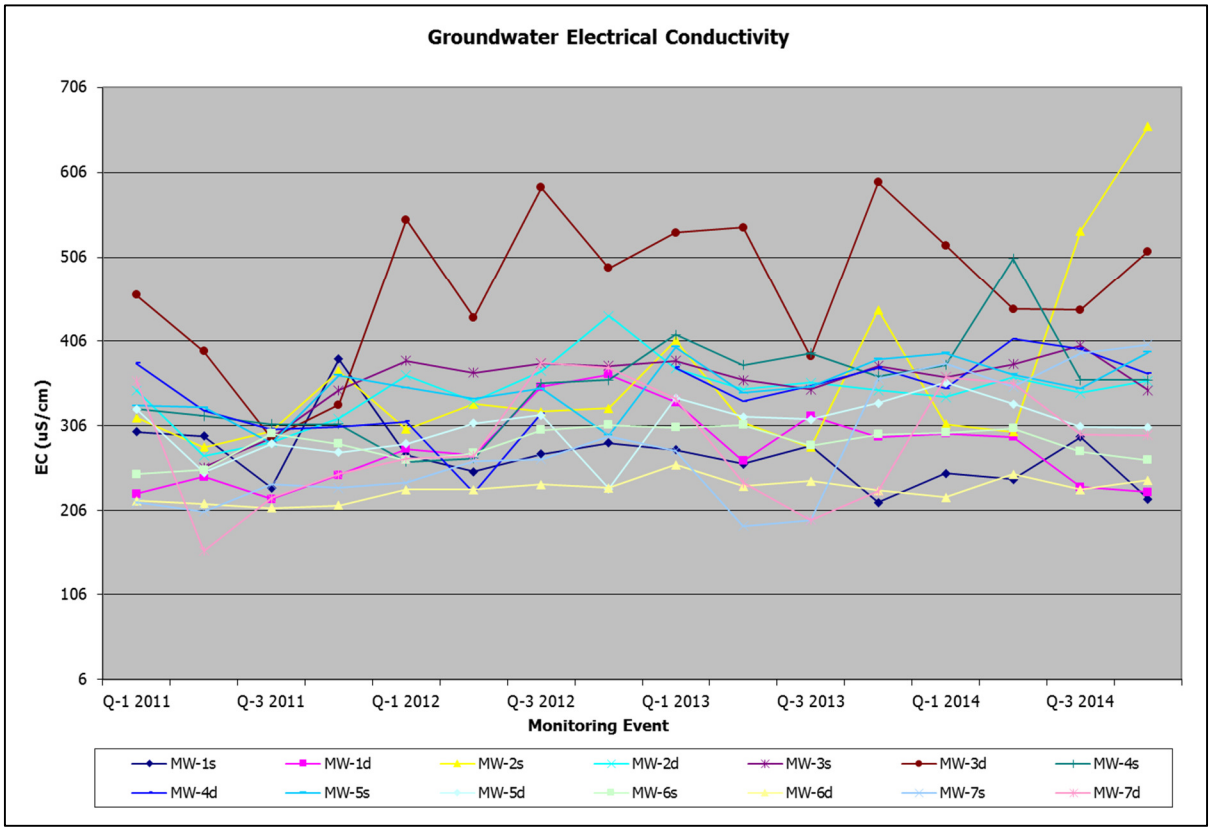


Figure 3.3 Groundwater Chloride trend data

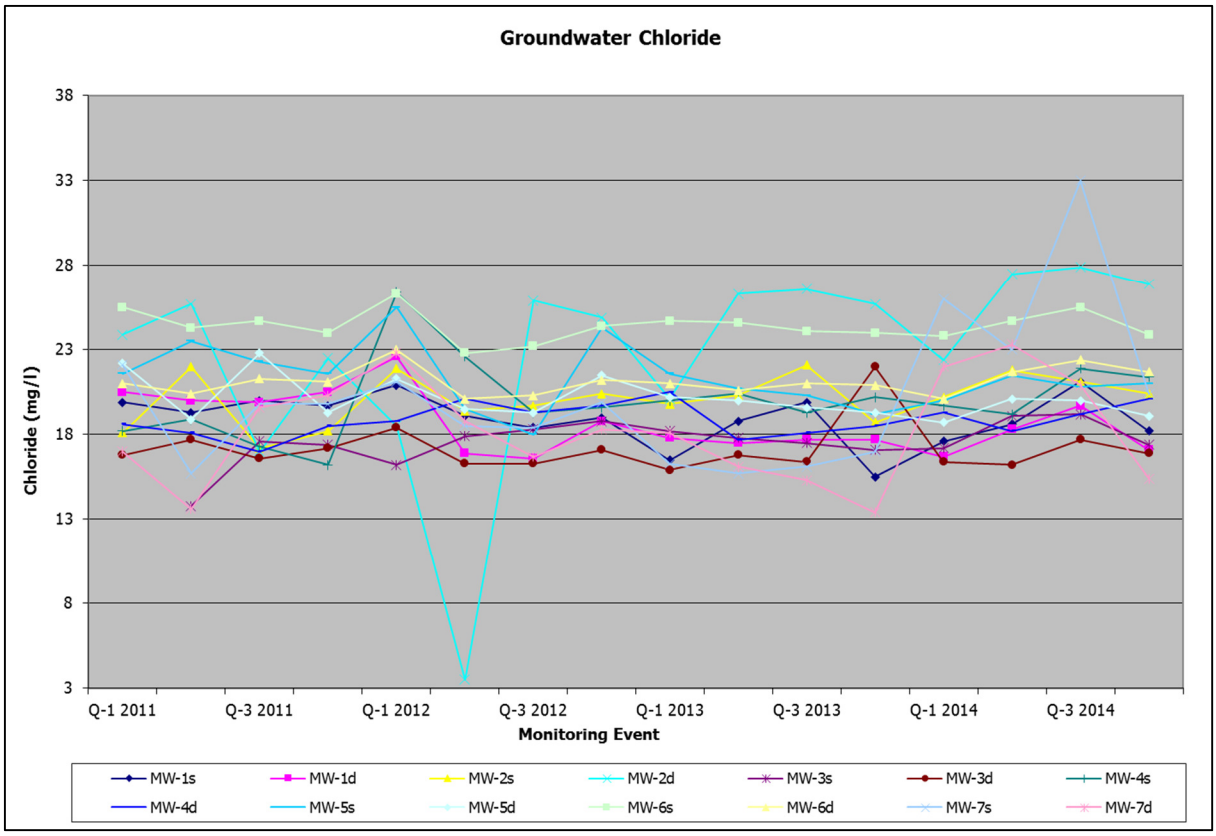
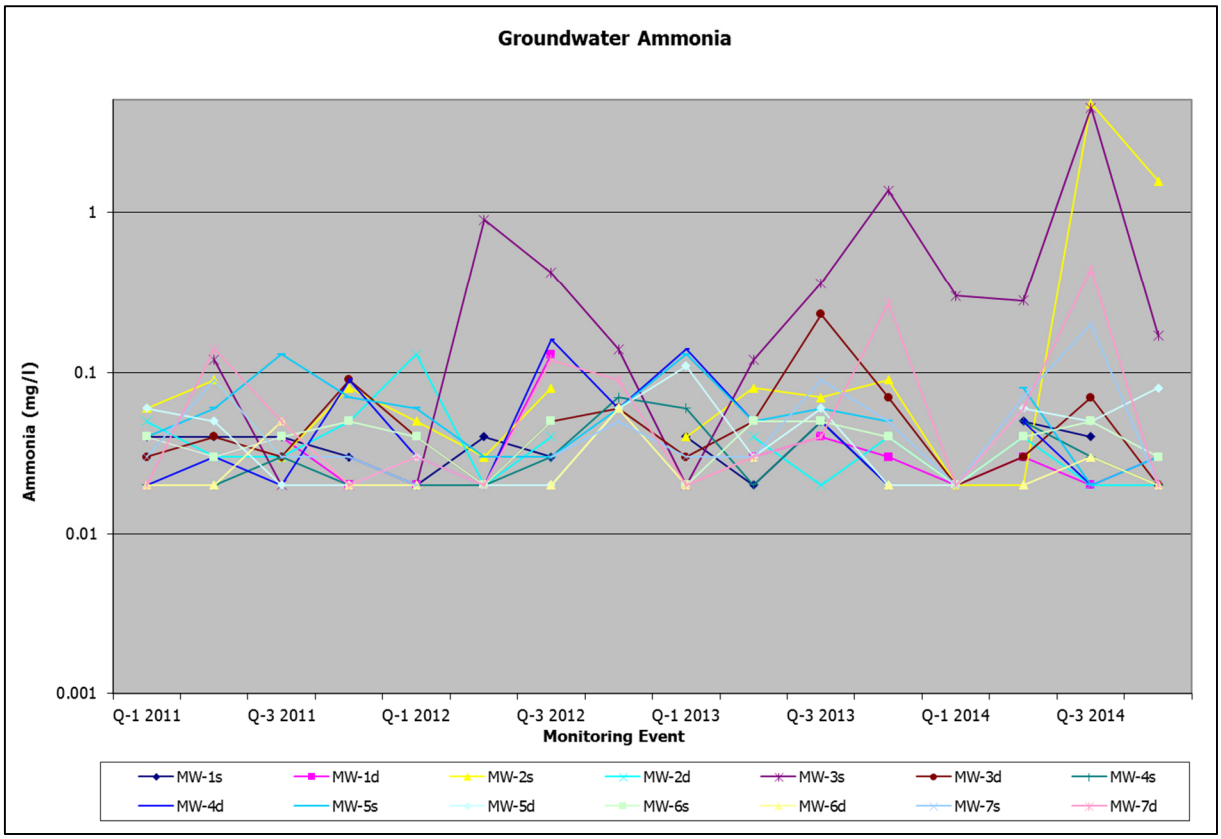


Figure 3.4 Groundwater Ammonia trend data



3.2 Surface Water Monitoring

The site is within the catchment of three streams (Ballynagran, Ford and Killandra) as well as the Three Mile Water River. The catchments are characterised by sudden high flows coinciding with high rainfall periods and particularly low flows in the drier summer months.

3.2.1 Visual Assessment

Greenstar carried out weekly inspections of the surface water drainage system. The inspections did not identify the presence of any impact on the drainage system associated with site activities.

3.2.2 Chemical Assessment

The surface water monitoring was conducted quarterly at the ten monitoring locations specified in the Licence and reported to the Agency on a quarterly basis. The sampling was carried out in accordance with internationally accepted techniques and control procedures, the analyses were completed by a laboratory using standard and internationally accepted procedures.

In February 2014 the level of total suspended solids detected in SW-10 (36mg/l) were marginally higher than the ELV of 35mg/l. Suspended solids were not detected in SW-5 which is directly downstream of SW-10 indicating that the levels of suspended solids detected were not impacting on the surface system. An incident report was submitted through alder in March 2014.

Also in February 2014 ammonia was detected in SW-6, 7, 9 and 10 at elevated levels. The level detected at SW-10 the outfall from the lagoon was elevated at 8.5mg/l. The level at the inlet to the lagoon was significantly lower at 0.72mg/l. The level of ammonia detected at SW-5 which is directly downstream of SW-10 was 0.09mg/l. This indicated that the levels of ammonia detected at SW-10 were not impacting on the surface water system. There was no identifiable source of the ammonia in SW-10. The sample was taken during a period of very high rainfall which would have generated a very high throughput of water in the lagoon which may have caused a disturbance of sediment in the lagoon resulting in elevated ammonia levels.

The 2014 results confirm that site activities are not impacting on surface water quality.

3.3 Leachate

The monitoring programme involves the collection and testing of leachate samples from the collection sumps and the storage lagoon. The 2014 results indicate a sight increase in leachate

strength throughout the monitoring period, which is expected given the age of the facility. Leachate is removed off site to Waste Water Treatment plants (WWPT) as agreed with the Agency.

3.4 Landfill Gas (LFG)

Landfill gas is monitored on a monthly basis in wells located outside the waste body. Ballynagran staff members conducted landfill gas monitoring throughout the reporting period. In total 23 no. landfill gas monitoring wells were monitored monthly at Ballynagran during 2014.

Monthly gas results are sent to OCM for inclusion in each quarterly environmental monitoring report. These were included as an appendix in each report sent to the Agency during 2014.

During 2014, methane levels were detected in levels above the licence trigger levels of 1% at locations MG16, MG17, MG-18 and MG-47. The trigger level was exceeded in six occasions in MG-16 and M-17, on eight occasions in MG-47 and on one occasion in MG-18. The highest level recorded was 46.5% at MG-17 in October 2014. The highest level recorded in MG-16 was 43.8 % in December. The highest levels recorded in MG-47 was 28.2 % in November 2014. Methane was detected above the tiger level once in MG-18 in October (1.9%).

There has been an increase in the levels of methane detected in MG-16 and MG-17 between 2013 and 2014. Methane had not been detected above the trigger level in MG-47 prior to 2014.

Elevated levels of Carbon Dioxide were detected in levels above the licence emission limit value of 1.5% v/v in all monitoring wells bar MG-6 and MG-15 on at least one occasion in 2014. The highest level detected was in MG-17 (15.1%) in October 2014. The next highest level detected was in MG-47 (14.3%) in July 2014. The level of carbon dioxide detected in 2014 are significantly higher than in 2013. Carbon dioxide was detected above the trigger level in only the wells MG-16 and MG-17 in 2013.

Historically, high concentrations of methane and carbon dioxide were recorded in MG15, MG16, MG17 and MG18 in October 2006, which was prior to the placement of any waste in the landfill. Background CH4 and CO2 concentrations continue be elevated outside the perimeter of the landfill active waste area. These concentrations are consistent with baseline levels recorded prior to the period of active landfilling on the site. The concentrations may be as a result of the natural degradation of organic material and historical waste having been placed in the vicinity prior to the current operators being active at the site.

Analysis carried out in the vicinity of Ballynagran on two occasions in 2007and 2010 reported by Odour Monitoring Ireland (OMI), showed a VOC profile that is significantly different when comparing perimeter gas wells with active gas wells. In their report, they state that it is highly

unlikely that methane and carbon dioxide concentrations in the perimeter gas wells are the results of lateral or horizontal landfill gas migration.
The OMI reports indicate that the most likely source of the high measurements is from disturbed ground from the construction phase and results represent natural degradation of organic material.

In the reporting period the Agency requested that Ballynagran Landfill conduct an investigation into the exceedances in the levels of carbon dioxide and methane in a number of the wells (MG-47 in particular) surrounding the landfill. Ballynagran Landfill have begun an investigation, engaged a consultant, which will be completed within 2015.

3.5 Noise Surveys

Noise surveys were conducted on four occasions at the locations specified in Table D.1.1 of the Waste Licence. The surveys were carried out in accordance with International Standards Organisation 1996: Acoustics-description and Measurement of Environmental Noise (Parts 1, 2 and 3).

The results at the noise sensitive locations indicate that noise from the site complied with the licence limits.

3.6 Dust Monitoring

In January elevated levels of dust were detected at AD-11 and in April at AD- 6. The elevated levels were related to tiling of lands adjacent to the dust locations.

In October 2014 elevated levels of dust at AD-8 were detected. The elevated levels were believed to have been related to leaf contamination in the dust jars at the time of collection. This was reflected in the elevated organic fraction (227 $mg/m^2/day$) of the total dust figure.

3.7 PM_{10}

PM_{10} levels were monitored on four occasions at the locations specified in Table D.1.1 in April, July, September and November 2014. All measurements were below the trigger level of 50 μ/m^3.

3.8 Meteorological Monitoring

Climate data for 2014 was collected from the synoptic stations at Casement Aerodrome and Ashford Climatological Station which is located 16 km to the north of the facility. The rainfall data was taken from the Ashford station as it is closer to the landfill site than Casement.

3.9 Biological Monitoring

The annual biological assessment of the three streams (Ballynagran, Ford and Killandra) as well as the Three Mile Water River, Ballynagran Co. Wicklow was carried out on the 13th September 2014.

The Q values assigned in 2014 were the same as those awarded in 2013 and only slight differences in Q value have been recorded since 2008. A Q value of 3-4 was recorded at sites SW-1 and SW-7 in 2009 and at SW-3 and SW-6 in 2008, however in practical terms the difference between a Q3 and Q3 to Q4 is very small and may come down to the presence of a small number of Group A individuals. Therefore despite the slight drop in some Q values since 2008, there is no evidence to indicate that there has been a significant deterioration in water quality.

As there was no significant differences in results from the sites which can be considered up gradient of the landfill (SW-1 to SW-3) and those considered down-gradient of the landfill (SW-4 to SW-10) there are no indications that the landfill development is having any significant impact on water quality in the surrounding watercourses.

4. SITE DEVELOPMENT WORKS

4.1 Summary of Resource & Energy Consumption

The principal energy resources consumed at the site are electricity, water for potable supply oil, vehicle wheel cleaning and dust suppression, diesel fuel and hydraulic oils. All site vehicles are fuelled by diesel. Table 4.1 presents an estimate of the resources used on-site in 2014 and 2013 for comparison. All water used for dust suppression comes from the surface water lagoon on site and the potable water from an onsite well.

Table 4.1 Resources Used On-Site

Resource	Units	Total Consumption in 2013	Total Consumption in 2014
Electricity	kWh	207,850	146,066.67
Diesel Oil	Litres		183,776
Water, potable supply	Litres	52000*	52,000*
Water, dust suppression	Litres	500,000*	500,000*
Water, wheelwash	Litres	100,000*	100,000*
Hydraulic Oils	Litres	1000	1,000
Engine oils	Litres		7,700

* estimate

4.2 Proposed Site Development Works 2015

It is proposed to complete the restoration of phase 2 capping works with the installation of the permanent gas line infrastructure into the subsoil layer, placement of the topsoil layer and grass seeding of same.

5. EMISSIONS

5.1 Leachate

There are no direct emissions from leachate generated on-site as it is collected in the main leachate storage lagoon prior to removal off-site for treatment. The total volume of leachate tankered off-site during the reporting period January 2014 – December 2014 was 32,525.66m³. Detailed figures are presented in Table 5.1 below.

Table 5.1 Leachate taken off site in 2014.

Month 2013	Volume (m3)
January	3,535.34
February	3,410.70
March	2,952.10
April	3,315.77
May	1,079.83
June	2,156.85
July	1,224.88
August	2,365.27
September	3,030.98
October	2,491.38
November	5,153.82
December	1,808.70
Total	**32,525.66**

Water balance calculations were prepared using guidance in the Agency's Landfill Manual-Landfill Site Design and are based on total rainfall data from the Casement and Ashford Met stations and the volumes of waste deposited at the site during the reporting period. The calculations are presented in Table 5.2.

It was assumed that all of the incident rainfall on the active cells had the potential to generate leachate. An absorptive capacity of 0.025 m^3/tonne was used based on a waste density of 0.8 tonnes/m^3.

The calculations indicate that approximately 29,447m^3 of leachate would have been generated in 2014. The calculations take into account the placement of capping on 47,000m^2 of the landfill. The estimated leachate volumes are lower than the 32,525 m^3 of leachate that was removed during the reporting period. This may a result of slightly higher rainfall levels at the exact site location than the weather stations.

5.2 Landfill Gas

A Landfill Utilisation Compound was constructed in late 2010 and one Landfill Gas Engine commissioned. Preparation works for the expansion of the gas utilisation plant commenced in late 2014 with the installation of two engines and a third engine installed in January 2015 making four in total on site. The engines were commissioned in January 2015 following completion of an upgrade of the power line to the existing grid.

In 2014 the facility was exporting 0.75 MWhr to the national grid. The main booster station was extracting on average 2,200m3/hour of landfill gas with 600 m3/hour for the gas engine and the remaining being flares. An additional enclosed Flare in the gas compound first installed on site in 2008 is extracting approximately 1,000m3/hour of slightly poorer quality landfill gas from the active Cells, 7 and cell 10 in 2014**.**

There is one 2,500m3 open flare used as a back –up site flare only located in the compound and there is also a 500m3 open flare on the landfill which was not used in 2014.

Landfill gas is extracted from the cells through a series of constructed wells, vertically drilled wells, installed horizontal wells and extraction on leachate upslope risers.Landfill gas infrastructure is installed progressively as the waste is placed and the different gas extraction types are chosen to meet the specific needs of that particular landfill area.

5.3 Estimated Annual and Cumulative Quantity of Indirect Emissions to Groundwater

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

- **Landfill Base** – The landfill has a composite base lining system comprising a HDPE geomembrane and a half metre thick layer of 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.

- **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 discharges to the reed bed which further filters the water before it is finally discharged to the Ford Stream.

- **Treated Sewage Effluent** – There is a biocycle wastewater treatment plant located adjacent to the weighbridge which treats the canteen and office waste water 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.

In summary, as the landfill is fully contained, there are no indirect emissions to groundwater.

5.4 Surface Water

Rainfall run-off on the undeveloped parts of the site discharges directly to the surface water drainage system. Rainfall on active fill areas is collected in the leachate collection system. The surface drainage from all roads is directed to the surface water retention pond via an oil interceptor. Drainage from the waste inspection and quarantine bays is directed to the leachate lagoon. The retention pond design and capacity meets the requirements of the Waste Licence. The inlet to the pond is fitted with a Class 1 Full Oil interceptor.

Table 5.2 Annual Leachate Volume 2014

Yr.		Active Area Uncapped (m^2)	Waste Input (t)	Active Infiltration (m^3)	Intermediate Restoration Cell No.	Intermediate Restored Area (m^2)	Intermediate Infiltration (m^3)		Restored Area (m^2)	Restored Infiltration (m^3)	Liquid Waste (m^3)	Total Leachate (m^3)	Absorptive Capacity (m^3)	Annual Leachate Generation
2014		40,000	200,123	**30,000**					47,000	**4450.43**	0	34,450	5,003	**29,447**

Cell area ($m^{2)}$	-	Estimated maximum waste input (t/year)	200,000
Total rainfall (m/year)	**0.9469**	Liquid waste input (t/year)	0
Effective Rainfall post vegetation (m/year)	**0.189**	Final Infiltration	**0.09469** 10% of Effective Rainfall per annum
Density of *in-situ* waste ($t/m^{3)}$	0.8	Intermediate Infiltration	**0.56814** 60% of Effective Rainfall per annum
Absorptive capacity (m^3/t)	0.025		
Effective Rainfall before vegetation assumed to be (m)	0.45		

6. NUISANCE CONTROL

In accordance with Condition 7 of the waste licence, the licensee is committed to ensuring that the facility does not give rise to nuisance at the facility or in the immediate area of the facility. The potential sources of nuisance at a landfill facility are odour, vermin, birds, flies, mud, dust and litter. A procedure, (F09j - Completion of Daily Site Condition Reports) has been drawn up to comply with Condition 7 and is being carried out at the facility.

6.1 Odour

In accordance with Condition 8.12.2 of the waste licence, the licensee had submitted a programme to the Agency for the monitoring and assessment of odours emissions arising from the facility. An odour control and monitoring procedure (F 09 r) has been drawn up and carried out.

Good operational practices on site are the main controls to avoid odour nuisances. These include procedures relating to the Operation Start-Up and Shut-Down (F 09 001) and Waste Acceptance (F 09 a (IV)) (dealing with the handling, depositing and covering of waste at the facility). These procedures have been written in accordance with the Landfill Manual. Landfill Operational Practices., published by the Agency and are incorporated into the odour control and monitoring procedure onsite.

A landfill gas extraction system with two enclosed landfill gas flares and one landfill gas engine which is connected to the national grid were in operation in 2014. Landfill gas well drilling was carried out in September 2014 with twelve (12 No.) wells drilled. This active gas extraction system allows for the long term control of any potential odours. An external consultant (Odour Monitoring Ireland) conducted quarterly VOC survey emissions surveys in 2014. The PID/FID survey highlighted areas where there could be potential for VOC escape, by measuring VOC levels around the landfill area. Recommendations from their study of the site have been implemented.

In accordance with site condition reports, odour inspections are carried out on a daily basis by site staff at the facility and also in response to any odour complaints. In the monitoring period there have been complaints in relation to odours and these are dealt more specifically in Reported Incidents and Complaints (Section 7).

6.2 Vermin and Birds

Inspections for vermin are carried out on a weekly basis for rodents and on a daily basis for birds, in particular crows. BNG employs a number of measures and also specialist contractors to control vermin at the facility. Vermin control measures; used as part of this programme, include internal and external bait boxes, rodenticides and insect control measures. The specialist contractor visits the site at regular intervals throughout the year to inspect the control measures and assess their effectiveness. BNG manages bird control internally with a series of control measures used including kits, visual and audible deterrents. These control measures have been found to be successful.

6.3 Flies

Particularly during the warmer months, attention is paid to observations of flies. Any observations are recorded on the Site Condition Report (F09(j)(i)). The Facility Manager or the Site Supervisor is notified immediately in order to take measures to eliminate any significant fly populations from establishing.

6.4 Dust and Mud

The site roads are inspected on a daily basis for mud or dust and any observations recorded on the Site Condition Report ((F09(j)(i)). Special attention is paid to dust during the dry months and mud during the wet months and the Site Supervisor or the Facility Manager is notified immediately in order to take measures to minimise or eliminate any potential nuisances arising from mud or dust accumulating on site roads. Some measures include the use of a wheelwash, road sweeper and the use of a water bowser to dampen access roads and stockpiles during periods of dry weather.

6.5 Litter

Litter is controlled by fencing which was installed around the landfill footprint as specified in the waste 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. Litter inspections are carried out and recorded as part of the daily inspection, which is outlined in the Completion of the Site Condition Reports (F09j (i)) and the Procedure for Litter Prevention & Assembly/Disassembly of Nets (F 09 g). The presence of litter is noted on the Inspection Form and removed immediately if practicable. Any litter noted at or outside the boundary fence, which appears to be illegally dumped, is inspected for any indications of identity if possible and reported to the Facility Manager.

7. ENVIRONMENTAL INCIDENTS AND COMPLAINTS

7.1 Incidents

There were thirty one minor incidents reported via alder during the reporting period.

Twenty eight of these related to breaches of trigger levels or ELVs. One related to small fire that was found on site. Two incidents related to transducer failure in leachate level monitors.

All incidents were reported to the agency as soon as the licensee was aware of them and did not cause any environmental impacts.

7.2 Register of Complaints

The licensee maintained a register of complaints in compliance with Condition 10.4. Details of all complaints received during the reporting period and the action taken by the licencee are available at the facility. The site received 77 complaints during 2014. All complaints received were related to odour with exception of one which related to private well sampling. A summary of the complaints received by month is presented in Table 7.1.

A register of all complaints illustrating the date, the issue, the corrective action taken and date the complaint was closed is maintained on site for inspection.

All complaints were responded to via the complaints procedure.

Table 7.1 Complaints summary 2014

Month (2014)	No of Complaints Received
January	7
February	2
March	9
April	5
May	3
June	10
July	9
August	3
September	16
October	3
November	8
December	2
Total	77

8. ENVIRONMENTAL MANAGEMENT SYSTEM

8.1 Management Structure

The Management Structure as required by Condition 2.2.1 of the waste licence for the year 2014 is presented below. Greenstar holdings limit the licence holder went into receivership in August 2012 and Greenstar South East Ltd were the interim operator of the facility, until a change of licence holder was agreed and approved by the Agency in March 2104. At this time the licence transferred to Ballynagran Landfill Ltd.

8.1.1 Site Management Structure

The day to day management of the facility and supervision of waste activities are the responsibility of the Facility Manager, Site Foreman and the site operatives. The positions and names of the persons who provide management and supervision are set out below: -

- License Holder Greenstar holding Ltd January to March 2014
- License Holder Ballynagran Landfill Ltd April 2014 onwards
- Facility Manager, Tomas Fingleton
- Site Foreman, Michael Macleod
- Site Clerk, Claire Stevenson
- Weight bridge and General Operatives, Michael Noone, Joseph Donohue, Joseph Moore, Mathew Powell and John Kinsella

8.1.2 Responsibilities

On the 4th of March 2014 Licence No.W0165-02 was transferred from Greenstar Holding Ltd to Ballynagran Landfill Ltd. The Licence Holder, was responsible for ensuring that the requisite resources are provided to operate the facility in accordance with the objective of the EMP and the Waste Licence conditions. The Facility Manager or nominated Deputy is responsible for ensuring that the day to day operation of the facility is carried out in accordance with the EMP, the Waste Licence conditions and the Operating Procedures.

The Facility Manager or nominated Deputy is responsible for ensuring that the environmental monitoring programme is carried out and reports submitted to the Agency in accordance with the schedule in the EMP and the Waste Licence conditions.

The Facility Manager or nominated Deputy is responsible for arranging that the specified engineering works, the leachate and landfill gas management programmes and the restoration programmes are properly implemented.

The Facility Manager or nominated Deputy is responsible for ensuring that the Corrective Action Procedures, Emergency Response Procedures and Contingency Arrangements specified in the EMP and the Waste Licence are implemented.

The Facility Manager or nominated Deputy is responsible for arranging appropriate training programmes for all facility personnel and for maintaining training records.

The Facility Manager, nominated Deputy and designated staff are responsible for implementing the waste acceptance procedures, including the assessment of suitability of the waste for disposal and recording the data specified in the Waste Licence. They are responsible for receiving and recording complaints from members of the public at the facility and informing the General Manager or nominated Deputy of the complaints.

The Facility Manager, nominated Deputy, Site Foreman and designated staff are responsible for ensuring compliance with conditions relating to waste inspection, placement and nuisance control (e.g. daily cover, litter, dust, vermin, birds).

8.1.3 Staff Training

All training was carried out as scheduled in the training plan for 2014. A record of all training to date is maintained on site for inspection.

Any facility staff who performs duties which involve interpretation of monitoring results or site inspections, will receive the appropriate training by the General Manager or nominated deputy, prior to carrying out such duties.

All facility staff will receive further training in their individual areas of activity. This training will comprise theoretical sessions as well as practical training. All such training will be recorded and documented in individual training files.

8.2 EMP

Ballynagran Landfill Limited have implemented an Integrated Management System (IMS) in accordance with the requirements of Occupational Health and Safety Assessment Series (OHSAS) 18001:2007 and International Standard Organisation (ISO) 14001:2004 in order to manage the Health, Safety and Environmental performance of their business and to control health and safety risk and to minimise their environmental aspects and impacts. The facility

has ISO14001 and OHSAS 18001 Certification until 2016. The last audit found the facility to be compliant with its conditions for standard certification for both management systems.

The IMS has been developed for the achievement of continual improvement taking into the requirements of the Waste Licence Conditions. The IMS has been prepared and effectively implemented in accordance with the requirements of both the OHSAS 18001:2007 and ISO 14001:2004.

As part of this IMS the licence had developed a list of environmental, management, operating and maintenance procedures. The schedule of Objectives and Targets, including their status for 2014 (Table 8.1), as well as the proposed Objectives and Targets for 2015 (Table 8.2) are presented below.

8.2.1 Schedule of Objectives 2014

Table 8.1 describes the implementation of the objectives and targets in the reporting period.

8.2.2 Schedule of Objectives 2015

Ballynagran Landfill Ltd has set a schedule of targets and objectives for 2015. These are presented in Table 8.2.

8.3 Communications Programme

The Communications Programme required by Condition 2.4 of the waste licence, was established three months before the start of waste activities and has been submitted to the Agency.

Ballynagran Landfill pursues an active programme of disseminating information on its operations to all interested parties. This is undertaken through a variety of means including site tours, the company website, presentations and open days. During 2008, a short film was produced detailing how the facility was constructed and is operated. The film is shown to those visiting the facility.

The overall communications programme contains the following objectives:

- To promote public awareness of Greenstar's activities and environmental policies;
- To maintain an ongoing dialogue with authorities that have direct involvement with waste;
- To make available Environmental Performance Data to all interested parties;

- To disseminate information relating to the operation and management of the site;
- To encourage liaison between the site and local residents and those who may be affected by the site operations,
- To provide general information on waste management issues;
- To ensure all users and customers of the site are conversant with the requirements of the site waste licence;
- To ensure that all objectives are, where possible, measurable and quantifiable;

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

- Personal contact;
- Residents meetings/Liaison groups;
- Information displays;
- Information packs;
- Site visits;
- Web page;
- Educational links; and
- Published information

Table 8.1 Progress Report on Schedule of Objectives and Targets for 2014

Objective	Progress
Develop landfill gas collection infrastructure and gas utilisation plant.	Installed 12 vertical and over 20 horizontal wells during 2014. Realigned gas infrastructure for improved coverage and operational performance. Enabled the installed of 3 new engines for commissioning in 2015.
Minimise risk of potential water pollution from generation of leachate	Minimise leachate generation. In 2014 subsoil placed on all permanent liner cap working towards complete capping restoration with surface water off capped areas to surface water system. Minimised the area of open landfill by selected phased opening of cell 10 for filling.
Reduce dust nuisance on environment and surrounding neighbours	All dust emissions in accordance with Licence (for timescale see project sheet). Not all objectives achieved, grass seeding of cap by end of September 2014 and complete grass seeding of soil deposit area above borrow source levelled by sept 2014 not completed, these are scheduled for summer 2015
Avoid contamination of groundwater after a spillage or emergency situation	Emergency response training undertaken in 2014 spill kit stocks maintained. (for timescale see project sheet)
Reduce risk of wind blown litter when the site is operating in adverse weather conditions	Ensure site remains compliant with Licence conditions which refer to wind blown litter (for timescale see project sheet). New litter fence across capped area to reduce open area for wind blow was targeted for Oct 2014, however this was not achieved but in line for spring 2015 (due to filling sequence)
Review and assess the effectiveness of nuisance control procedures including bird, rats and mice	Reviewed and assessed all nuisance control procedures to ensure minimal impact on surrounding area, ongoing.
Minimise nuisance from vehicle movements and uploading / tipping	Noise, dust, odour from vehicle movements are minimised by correct implementation of relevant operational protocols
Continue to improve relationships with neighbouring communities / reduce environmental complaints	Introduction of a 24 hour complaint on call response line, responded to neighbour complaints and significantly increased visits to households.
Environmental monitoring	Continue to monitor results and ensure they comply with Licence limits and investigate any exceedances of emission limit value. Commenced investigation into Perimeter gas exceedances

Monitor progress of planting programme on a regular basis	Regularly review planted woodland area and ensure the replacement of any failed trees to ensure visual impact of site is minimised (for timescale see project sheet).
Awareness and training programme	Ongoing Environmental and Health and Safety Training undertaken
• Promotion of H&S amongst all employees and the generation of an ethos of continual improvement • Diligent management of operations by employing control mechanisms, procedures and processes that are technologically proven and economically feasible • Fostering of openness, dialogue, enhanced communication and discussion with employees, clients, neighbours, suppliers, contractors and all interested parties regarding our H&S and our O&Ts • Publication and communication of our policy internally and ensuring its availability to the public and interested parties on request so that it is understood implemented and maintained •	• Development of a new company Health and safety policy completed. • Inductions, First aid training , safe pass training and plant training completed in 2014 • Develop H&S training giving more focus on empowering employees to become safety representatives, as applicable • Dialogue with Local residents developed with greater site visits to households commenced of 24hr on call complaint hotline. Facilitated the BNG community development fund meetings encouraging visits and local group participation. • Toolbox talks were conducted regularly. • Policies inductions and safe systems of work issued to all contractors and hauliers using this site.

Table 8.2 Schedule of Objectives and Targets for 2015

Originated from	Objective	Target including timescale
F01 - impact no. 1 / AER 2008, 2009, 2010 & 2011& 2013 &2014	Develop landfill gas collection infrastructure and gas utilisation plant.	• Ensure delivery of high gas quality above 39% methane suitable for use engine. • Target 95% Gas utilisation of all landfill gas generated by the facility, 5% flaring. • Install additional drilled wells when final heights achieved in cell locations • Trial the development of new type constructed well from the cell floor in cell 10 phase 3. • Install the permanent gas infrastructure in the phase 2/3 capping area. • Maintain FID surveys on quarterly.
F01 – impact no. 3 / AER 2009,2010 & 2011& 2013 & 2014	Minimise risk of potential water pollution from generation of leachate	• Maintain the buffer capacity within the leachate lagoon level aim for below 2.3m level. • Review hardstand area for leachate filling and improve where necessary. • Progress intermediate cap for areas above liner height in cell 7 and 10.
F01 – impact no. 5 / AER 2009,2010 & 2011& 2013 &2014	Reduce dust nuisance on environment and surrounding neighbours	• Complete grass seeding of cap by end of September 2015, • Complete grass seeding of soil deposit area above borrow source levelled by sept 2015 • Investigate automatic water spray for newly constructed road May 2015
F01 – impact no. 4 / AER 2009,2010 & 2011	Avoid contamination of groundwater after a spillage or emergency situation	• Continue to carry out spillage and emergency response training
F01 – impact no. 6 and AER 2011 2013&2014	Reduce risk of wind blown litter when the site is operating in adverse weather conditions	• Install new litter fence across capped area to reduce open area for wind blow April 2015 • Repair existing netting on side of cells June 2015 • Review procedure for operating in windy conditions
Risk assessment (hazard no. 4) / AER 2009 H&S incident reviews	To reduce the risk of site personnel being hit by a vehicle	• To significantly reduce this type of incident on site. • Improve the separation of plant and personnel and entry and control of personnel

F01 - impact no. 7 / AER 2007, 2008, 2009, 2010 & 2011& 2013	Review and assess the effectiveness of nuisance control procedures including bird, rats and mice	• Continually review and assess all nuisance control procedures to ensure minimal impact on surrounding area. • Improve use of bird scaring devices and update internal bird control plan and implement measures August 2015.
AER 2007, 2008, 2009, 2010 & 2011 2014	Minimise nuisance from vehicle movements and uploading / tipping	• Ensure noise, dust, odour from vehicle movements are minimised by correct implementation of relevant operational protocols • Ensure new signage and front gate road access installed to
AER 2007, 2008, 2009, 2010 & 2011& 2014	Continue to improve relationships with neighbouring communities / reduce environmental complaints	• Achieve a reduced level in the number and source complaints from previous. • Aim to visit all complainants after complaint lodgement and respond to queries as quickly as reasonably practicable, ensuring that any complaints are followed up in writing as soon as possible after receipt of compliant within 5 working days.
AER 2007, 2008, 2009, 2010 & 2011 &2014	Environmental monitoring	• Ensure monitoring results comply with Licence limits and investigate any exceedances of emission limit value (for timescale see project sheet). • Complete perimeter gas monitoring investigation May 2015
H&S Policy 2014	• Promotion of H&S amongst all employees and the generation of an ethos of continual improvement • Diligent management of operations by employing control mechanisms, procedures and processes that are technologically proven and economically feasible • Promotion of continual improvement, good health and safety work practices through continual review of O&Ts • Fostering of openness, dialogue, enhanced communication and discussion with employees, clients, neighbours, suppliers, contractors and all interested parties regarding our H&S and our O&Ts	• Improvement driven Safety Observation Audit Reports are to be undertaken bi-monthly focussing on swiftly resolving problems as they occur. • Develop H&S training giving more focus on empowering employees to become safety representatives, one employee to be Safety rep by June 2015 • Develop an additional health and safety trained personnel onsite. • Look to develop staff interaction enabling keen spotting of potential problem or hazards through training and communication. • Ensure toolbox talks are conducted on a monthly bases minimum. • Prepare system and procedures for the new OH&S system due in 2016 • Encourage feedback on equipment and resources including adequacy of PPE in protective properties, wear ability and durability and look at alternatives, where appropriate. • Continue to engage with all stakeholder and operate the site in an open and inclusive manner, feeding information into the Community fund community visiting neighbours meeting local groups and operating an open door policy.

	• Publication and communication of our policy internally and ensuring its availability to the public and interested parties on request so that it is understood implemented and maintained • Measurement of performance by conducting regular audits and assessment of compliance with the OHSAS 18001:2007 standards, EHS policy, relevant legislation and regulatory requirements	• Promotion of ISO and OHS system and standards across the site and business. • Conduct internal site and systems audits in 2015 ongoing
Review of audit requirements 2014	Ensure audits are undertaken in compliance with licence and best practise requirements	• Carry out energy efficiency and resource use audit next audit report to be carried out by October 2015

9. OTHER REPORTS

9.1 Financial Provision

The licensee will submit the required financial information to the Agency in Quarter 2 of 2015

9.2 Landscape Programme

There were no changes in the landscaping programme, however the development of the N11 motorway and new link road required the movement of the existing main gate and access roadway. This is still in progress and will require some landscaping works as part of the new entrance completion works to be completed in 2015.

9.3 Surface Water and Leachate Management System Inspection and Slope Stability Assessment Report

A surface water and leachate management system inspection and slope stability assessment report was prepared by Fehily Timoney in April 2014 and filed on site for review as and when required by the Agency. The survey did not highlight any major issues of concern.

9.4 European Pollutant Release and Transfer Register

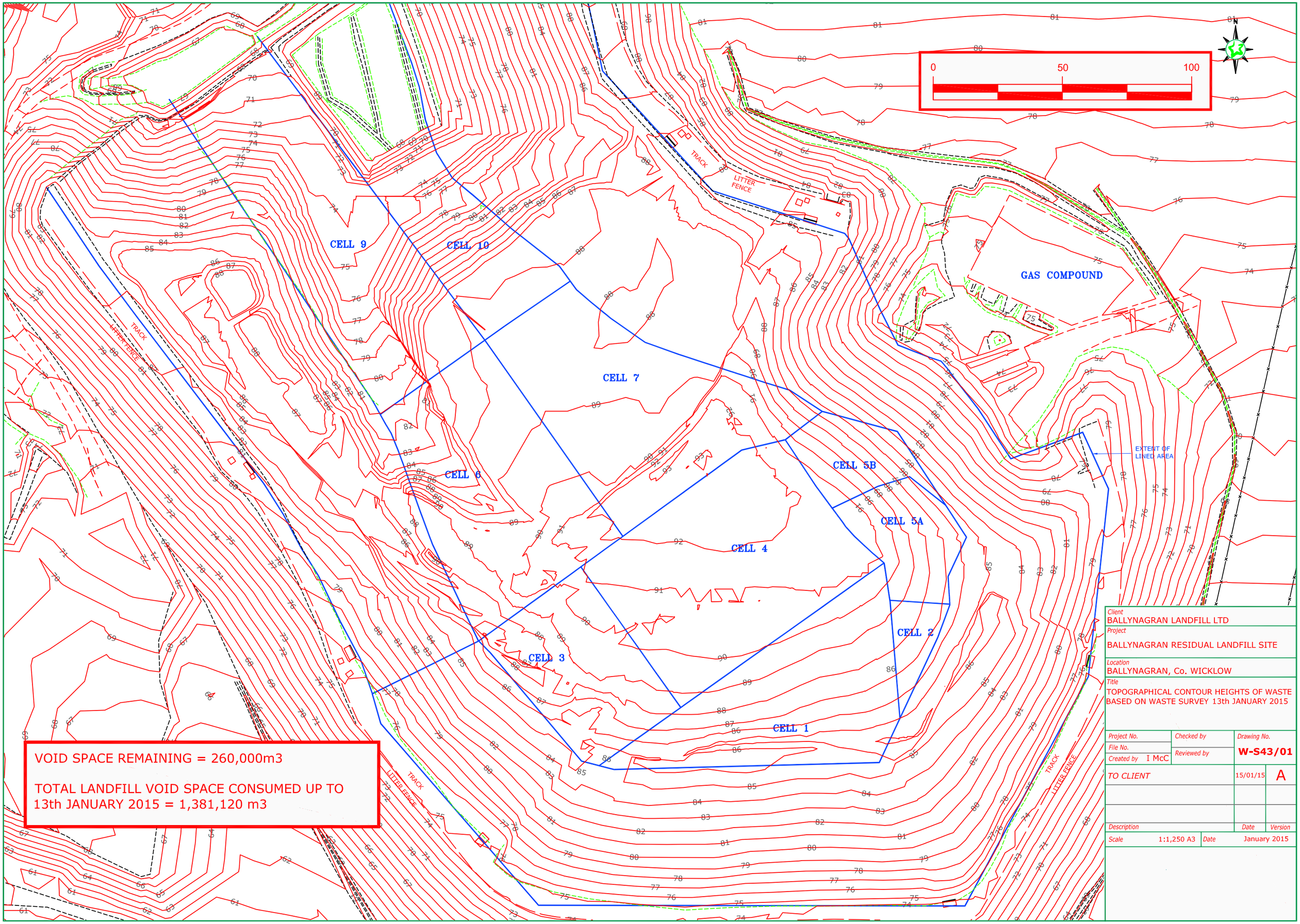
Under the European Pollutant Release and Transfer Register Regulation (EC) No. 166/2006 Greenstar are required to submit information annually to the Agency. A copy of the information submitted to the Agency via the web-based data reporting system is included in Appendix 4.

9.5 Tank, drum, pipeline and bund testing and inspection report

Integrity testing was not undertaken in 2014. A leachate infrastructure inspection was conducted by Fehily Timoney in 2014. The system was found to be in good condition.

APPENDIX 1

Topographic Survey



VOID SPACE REMAINING = 260,000m3

TOTAL LANDFILL VOID SPACE CONSUMED UP TO 13th JANUARY 2015 = 1,381,120 m3

Client	BALLYNAGRAN LANDFILL LTD
Project	BALLYNAGRAN RESIDUAL LANDFILL SITE
Location	BALLYNAGRAN, Co. WICKLOW
Title	TOPOGRAPHICAL CONTOUR HEIGHTS OF WASTE BASED ON WASTE SURVEY 13th JANUARY 2015

Project No.	Checked by	Drawing No.
File No.	Reviewed by	W-S43/01
Created by I McC		

Description	Date	Version
TO CLIENT	15/01/15	A

Scale 1:1,250 A3 Date January 2015

APPENDIX 2

Monitoring Locations

N

NL1

AD6

MW8d
MW8s

PROPOSED
LANDFILL
FOOTPRINT

SW1

MW1d
MW1s

CELL 20
CELL 18
CELL 19
CELL 16
CELL 17
CELL 15
CELL 14
CELL 13
CELL 12
INSIDE TOE
CELL 11
OUTSIDE TOE

EXISTING
LANDFILL
FOOTPRINT

NL3

PM3
AD11

MW7s
MW7d

PW24

PM1

NL4

AD7

KILLANDRA STREAM

BALLYNAGRAN STREAM

MW2s
MW2d

MG20
MG19
MG18
MG17
MG16
MG15
MG14
MG13
MG12
MG11
MG10
MG9
MG8
MG7
MG6
MG5
MG4
MG3
MG2
MG1
MG47
MG48
MG49
PM2

LP/7
LP/6
LP2/5
LP3/4
LP/1

CELL 10
CELL 9
CELL 7
CELL 6
CELL 5B
CELL 5A
CELL 4
C2
CELL 3
CELL 1
INSIDE TOE
OUTSIDE TOE

EXISTING LANDFILL
CONTOURS (FEB'12)

SW3
SW4
NSL1
PW23
PW2
L1111

MW3s
MW3d
AD8
MG6
MG7
MG8
MG9
MG10
NL2
LEACHATE
LAGOON
MW4d
MW4s
SW9

SITE
OFFICE

SURFACE
WATER
LAGOON

SW8
SW5
SW10
MW5d
MW5s
AD9
PM4

MW6s
MW6d
SW2

AD10
AD12
NSL3

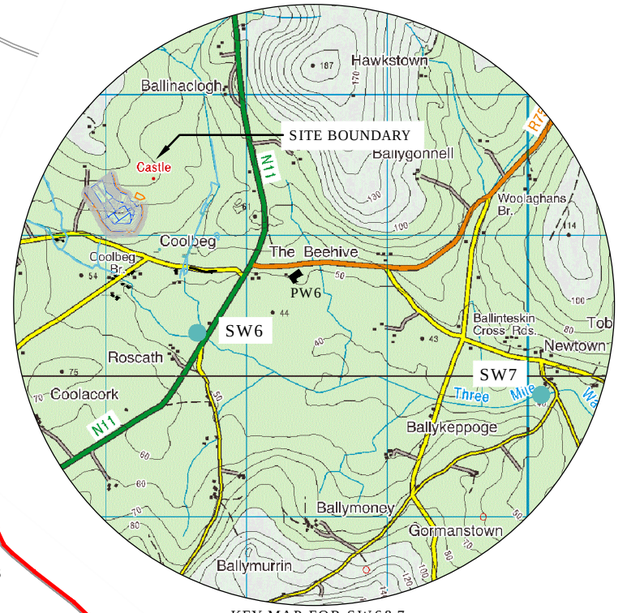
LONGFORD STREAM

L1113

THREE MILE
WATER RIVER

PW22
PW25
PW20
PW4
PW3
PW7
PW11
PW12
NSL2

PW13(2)
PW13



KEY MAP FOR SW6&7
N.T.S

ORDNANCE SURVEY IRELAND
LICENCE NUMBER
AR0056012

LEGEND

SITE BOUNDARY

MONITORING

- NL1 BOUNDARY NOISE LOCATION
- NSL1 NOISE SENSITIVE LOCATION
- AD7 DUST MONITORING LOCATION
- PM10 PM1 MONITORING LOCATION
- SW1 SURFACE WATER MONITORING /KICK SAMPLING LOCATION
- MG1 GAS MONITORING
- MW1d GROUND WATER MONITORING WELL
- LP 1 LEACHATE SAMPLING LOCATION
- PW PRIVATE WELL

Client

Project
BALLYNAGRAN RESIDUAL LANDFILL SITE

Location
BALLYNAGRAN, Co. WICKLOW

Title
Topographical Survey of the Ballynagran Landfill & Environmental Monitoring Locations

Project No. 06719466	Engineer CC	Drawing No. 05	
File No. 05	Reviewed by TVM		
Created by POB			
ISSUE TO CLIENT		JAN. '11	G
ISSUE TO CLIENT		APR. '11	H
ISSUE TO CLIENT		MAR. '12	I
Description		Date	Revision

Scale 1:3,000A1 1:6,000A3 Date March 2012

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CAD\GREENSTAR\BALLYNAGRAN\GOLDER DWGS\05revI

APPENDIX 3

Monitoring Results 2014

Landfill Gas Data 2014

Landfill Gas Results 2014 Ballynagran W0165-02

Sample Station Number	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	CH_4 (% v/v)	**CH_4 (% v/v)**	**CH_4 (% v/v)**	**CH_4 (% v/v)**	**CH_4 (% v/v)**	**CH_4 (% v/v)**	**CH_4 (% v/v)**	**CH_4 (% v/v)**	**CH_4 (% v/v)**	**CH_4 (% v/v)**	**CH_4 (% v/v)**	**CH_4 (% v/v)**
MG000001	Flooded	0	0.1	0	0	0	0	0	0	0	0	0
MG000002	0	0	0	0	0	0	0	0	0	0	0	0
MG000003	0	0.1	0	0	0	0	0	0	0	0	0	0
MG000004	0	0.1	0.1	0	0	0	0	0	0	0.1	0	0
MG000005	0	0	0	0	0	0	0	0	0	0.3	0	0
MG000006	0	0	0	0	0	0	0	0	0	0	0	0
MG000007	Flooded	0	0.1	0	0	0	0	0	0	0	0	0
MG000008	Flooded	0.1	0	0.1	0	0	0	0	0	0.3	0	0
MG000009	0	0.1	0	0	0	0	0	0	0	0.2	0	0
MG000010	0	0	0.1	0	0	0	0	0	0	0	0	0
MG000011	0	0.1	0.1	0	0	0	0	0	0	0.1	0	0
MG000012	0	0	0.1	0	0	0	0	0	0	0	0	0
MG000013	0	0.1	0.1	0	0	0	0	0	0	0	0	0
MG000014	0	0.1	0.1	0	0	0	0	0	0	0.1	0	0
MG000015	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0
MG000016	20	23.1	31.4	0	0	0.2	0.8	5.3	0	0	14	43.8
MG000017	0	0.1	0.1	0	17.1	20	22.1	38.4	27.7	46.5	0	0
MG000018	0	0	0.1	0	0	0	0	0	0	1.9	0	0
MG000019	0	0.1	0.1	0	0	0	0	0	0	0	0	0
MG000020	Flooded	0.1	0.1	0	0	0	0	0	0	0	0	0
MG000046	*	*	*							-		
MG000047	0	0.1	0.1	3.8	9.8	4.1	5.2	0.9	4.6	18.5	28.5	1.2
MG000048	0	0.1	0	0	0	0	0	0	0	0	0	0
MG000049	0	0	0	0		0	0.1	0	0	0	0	0

- Problem with gas meter therefore it was not possible to take

Landfill Gas Results 2014 Ballynagran W0165-02

Sample Station Number	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)	CO_2 (% v/v)
MG000001	Flooded	2.3	0.4	0	0	0	0	0.2	0.1	0.4	1.5	1.2
MG000002	3.9	0	1.7	0	0	0.2	0.1	0	3.2	3.2	0.4	3.7
MG000003	0.8	1.3	1.4	0.7	0.1	0	0	1.6	0	0.1	1.5	2.6
MG000004	0.4	0.9	0.5	0.2	0.3	0.2	0.2	1.1	1.6	2.1	2.3	0.6
MG000005	2.7	1.5	1.6	0.6	2.4	4.5	4.3	0.3	5.1	6.3	7.4	7.1
MG000006	0.6	0.6	0.5	0.3	0.6	0.5	0.2	0.1	0.5	0.2	1.2	0.8
MG000007	Flooded	1.7	1.2	0.2	0.3	0	0	0.9	0.1	0.2	1.4	1.3
MG000008	Flooded	0	0.3	0.2	1.2	0.9	0.2	0.2	1.8	4.1	4.5	3.3
MG000009	4	0	0	0.1	0.6	0.5	3.5	3.8	4.1	3.8	3.7	3.1
MG000010	4.9	0	1.8	0	1.6	1	0	4.3	1.1	3.7	0.1	3.9
MG000011	3.2	0	0	0.8	1.8	2	2.2	2.4	2.4	2	1.6	1.7
MG000012	0.2	0.4	0.2	0.4	0	0.4	0.4	0.9	0.8	1	1.2	1.7
MG000013	0.1	0.8	0.2	0	0	0	0	2.5	0	0.7	0.7	0.4
MG000014	0.8	0.6	0.6	0.2	0.6	1.2	0.8	1.9	2	1.8	1.7	1.3
MG000015	0.4	1.4	0.7	0	0.1	0	0.1	0.2	0.1	0	0.8	1.3
MG000016	0.5	3.2	4	0.1	0	0.3	0.6	8	1.6	0	7.6	6.2
MG000017	0.1	0.6	0.3	0.1	4.9	6	7.1	9.4	14.8	15.1	0.7	0.4
MG000018	2.4	1.5	0.2	0.1	0.4	1.1	0.5	3.4	0.2	6.6	0.6	0.3
MG000019	0.6	0.7	0.3	0	0.1	0.3	0.3	1.1	0.3	0.3	1	2.5
MG000020	Flooded	4.6	2.7	1.2	4.7	3.5	4	5.1	5.3	0.2	1.4	3.3
MG000046	*	*	*									
MG000047	1	1.3	4.2	8.9	12.2	8.2	14.3	3.2	9.8	14	13	1.3
MG000048	0.8	0.3	0.6	0.2	0.3	0	1.4	4.5	2.3	0.4	1.7	1.9
MG000049	0.2	0.1	0.1	0	0.4	0	0.1	0.2	0.5	0.6	2.8	3.3

- Problem with gas meter therefore it was not possible to take

PM10 Data 2014

	PM10 Results 2014 Ballynagran W0165-02			
Location	**April 2014 Concentration (µg/m3)**	**July 2014 Concentration (µg/m3)**	**September 2014 Concentration (µg/m3)**	**November 2014 Concentration (µg/m3)**
Location PM1	6	5	4	5
Location PM2	8	8	9	11
Location PM3	8	7	6	5
Location PM4	6	7	6	8
Limit Value	**50**	**50**	**50**	**50**

Dust Data 2014

	Dust Results 2014 Ballynagran W0165-02									
	Jan	**Feb**	**March – April**	**April – May**	**May - June**	**June – July**	**July - August**	**Sep**	**Oct**	**Nov**
AD6	126.61	141.6	79.85	388	*	193	8.57	271	169	37
AD7	131.13	*	109.32	136	83	198	49.84	93	200	*
AD8	159.77	94.4	219.72	133	36	181	108.25	95	447	182
AD9	151.23	205.91	157.02	88	195	271	5.89	89	268	161
AD10	70.34	126.04	*	*	**	**	**	**	**	**
AD11	661.68	*	137.73	195	113	219	8.57	120	192	37
AD12	120.08	94.4	*	*	**	**	**	**	**	**

*Sample Contaminated - Analysis Not Completed

NS - denoted not sampled

Noise Data 2014

Noise Results 2014 Ballynagran W0165-02 Q1

Location	Time	2x10-5 Pa) L_{Aeq}	L_{A10}	L_{A90}	Specific level*	Comments
NL1	1241-1256	43	40	34	<34	Noise emissions audible occasionally at low level from 6x6 dump truck when climbing haul road, and from reversing alarm. No other site emissions audible. Distant N11 traffic continuously audible at low level. Bird song/calls significant, particularly occasional calls from kestrels or sparrowhawks in trees at 30 m. Aircraft.
NL2	1409-1424	46	48	37	<37	No site emissions audible apart from sporadic 4x4 and truck movements on nearby access road. Distant N11 traffic continuously audible at low level. Sporadic road traffic clearly audible when passing outside boundary, and intermittent road traffic audible on local road to SE and S. Bird song/calls and aircraft.
NL3	1345-1400	50	51	40	39	Gas engine emissions audible continuously at low level, codominant with distant N11 traffic. Sporadic plant reversing alarm slightly audible from cell area. Bird song/calls and aircraft.
NL4	1513-1528	48	43	34	<34	Excavator bucket sporadically audible at low level. No other site emissions audible. Distant road traffic continuously audible at low level in background. Bird song/calls. Occasional bull lowing in nearby field. Bird song/calls and aircraft. Watercourse slightly audible continuously nearby.
NSL1	1452-1507	53	50	39	39	Vibrating roller operating on onsite haul road near SW corner slightly audible continuously throughout interval, with energy at 31.5 Hz. Distant N11 traffic audible at low level continuously, in addition to intermittent traffic on local road to SE. Sporadic local traffic dominant when present. Bird song/calls and aircraft. Dog barking, children calling and car movement at nearby dwelling dominant 1458-1503.
NSL2	1432-1447	64	60	43	<43	No site emissions audible other than sporadic truck movements on access road. Intermittent local road traffic dominant when present. Distant N11 traffic continuously dominant. Bird song/calls and aircraft.
NSL3	1540-1555	62	65	53	<<53	N11 traffic continuously dominant. No other noise audible apart from intermittent vehicle movements on local road to S.

*Specific level: L_{Aeq} level considered attributable to facility during interval, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, spectral statistics and near field correction if applicable.

Noise Results 2014 Ballynagran W0165-02 Q2

Location	Time	Measured Noise Levels (dB re. L_{Aeq}	L_{A10}	L_{A90}	Specific level*	Comments
NL1	1148-1203	40	43	37	<37	No site emissions audible. Distant N11 traffic continuously audible at low level, dominating background. No other noise audible apart from birdsong, aircraft and rustling trees.
NL2	1102-1117	58	56	41	58	Excavator operating on landfill mound clearly audible continuously. Reversing alarms on mound area also clearly audible at intervals. Adjacent haul road traffic (several 6x6 dump truck movements, articulated truck movements, and crew vehicles) dominant when present. Sporadic road traffic movements outside boundary clearly audible when present. Bird song/calls and aircraft.
NL3	1125-1140	46	48	43	39	Excavator and wheeled compactors onsite audible at low level continuously. Dump truck movements x2 at borrow pit area more clearly audible 1136-1140. N11 traffic continuously clearly audible to E/NE, more clearly audible than site plant. Bird song and crow calls. Aircraft and slightly rustling vegetation.
NL4	1025-1040	42	46	36	<36	Excavator on mound audible at low level on occasion on breeze. N11 traffic continuously slightly audible to E/NE. Bird calls and aircraft. Rustling trees nearby significant, at times dominant. Distant dog barking slightly audible from time to time.
NSL1	1005-1020	53	48	35	<35	Site excavator and dump truck activity audible on breeze from time to time, audibility varying from slight to clear. Sporadic local road traffic dominant when present. Distant road traffic to S also audible on occasion. Local bird song/calls significant. Aircraft. Sporadic dog barking at nearby dwelling significant when present.
NSL2	0946-1001	63	61	45	47	Site excavator operation continuously audible at low level on breeze, with frequent reversing alarms audible. Occasional truck movements on access road and at weighbridge clearly audible when present. Intermittent passing road traffic dominant when present. Bird song/calls, aircraft and rustling trees. N11 traffic to NE continuously slightly audible. Leachate removal tanker pump onsite continuously clearly audible from 0957.
NSL3	1223-1238	61	63	55	<<55	No site emissions audible. N11 traffic continuously dominant. No other noise audible apart from intermittent traffic on local road to immediate S, local birdsong, and intermittent truck movements on new road corridor under construction.

*Specific level: LAeq level considered attributable to facility during interval, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, spectral statistics and near field correction if applicable.

Noise Results 2014 Ballynagran W0165-02 Q3

Location	Time	Measured Noise Levels (dB re. L_{Aeq}	L_{A10}	L_{A90}	Specific level*	Comments
NL1	1046-1101	36	38	32	<32	Plant reversing alarms and engines faintly audible in distance, unclear if from landfill site or from M11 works, most likely both. N11 traffic audible at low level continuously. Bird song/calls and aircraft.
NL2	1001-1016	46	43	38	45	No site emissions audible apart from truck movement x1 on adjacent haul road. Dozer and vibrating roller on M11 project several hundred metres to E continuously audible at low level. Reversing alarms on more distant plant also slightly audible. N11 traffic further E audible continuously at low level. Sporadic road traffic audible outside boundary. Bird song/calls and aircraft.
NL3	1025-1040	44	47	39	36	Truck ejector trailers x2 audible at low level in active cell area. Noise environment dominated by continuous N11 traffic clearly audible, and plant engines and reversing alarms on M11 works to NE, SE and S. Bird song/calls and aircraft.
NL4	0838-0853	47	50	36	<<36	No site emissions audible. Distant N11 traffic to E continuously clearly audible in background. Local birdsong significant. Aircraft. M11 works roller 25 Hz hum perceptible on occasion.
NSL1	0819-0834	48	46	37	<42	Sporadic truck movements on nearest stretch of onsite haul road clearly audible when present. Plant reversing alarms in distance to NE slightly audible on occasion, unclear if from site or from M11 works. Sporadic local traffic dominant when present. Distant traffic to NE and SE also continuously slightly audible. Local birdsong significant. Aircraft. M11 works roller 25 Hz hum perceptible on occasion.
NSL2	0800-0815	65	62	50	<<50	No site emissions audible due to masking by (a) continuous M11 dozer and regular vibrating roller activity 100-150 m E and (b) N11 traffic to NE continuously clearly audible in background. Roller generating tone at 25 Hz. No other noise audible apart from occasional passing local traffic, dominant when present, and bird song/calls.
NSL3	1117-1132	63	65	55	<<55	No site emissions audible. N11 traffic continuously dominant. Running generator at nearby M11 works zone continuously clearly audible. Works zone truck and dump truck traffic and grinder use also clearly audible. Local road traffic to S also significant, particularly M11 works trucks. Local birdsong.

*Specific level: L_{Aeq} level considered attributable to facility during interval, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, spectral statistics and near field correction if applicable.

Noise Results 2014 Ballynagran W0165-02 Q4

Location	Time	Measured Noise Levels (dB re. L_{Aeq}	L_{A10}	L_{A90}	Specific level*	Comments
NL1	1433-1448	39	40	35	<35	Onsite wheeled compactor faintly audible in distance. Plant noise emissions also audible in background, unclear if from landfill site or M11 works areas. N11 traffic continuously audible at low level to SE. Bird song/calls and aircraft.
NL2	1347-1402	54	57	38	53	No site emissions audible other than occasional truck movements on adjacent haul road. M11 works plant operating around site entrance area and further S, continuously audible in background. Occasional traffic movements outside site boundary audible. Distant N11 traffic audible at low level. Bird song/calls. Aircraft.
NL3	1412-1427	44	45	42	43	Compactor, excavator and truck movements in active cell clearly audible almost continuously. Angle grinder or similar in occasional use at gas engine compound also audible at low level. Offsite emissions audible from N11 traffic, M11 works plant to SE and aircraft. Bird song/calls.
NL4	1542-1557	42	42	40	<40	Reversing alarms on landfill mound clearly audible from time to time. No other site emissions audible apart from excavator tracks. Distant traffic and construction plant faintly audible to S. Rock breaker slightly audible to SE, at 1 km or more. Watercourse continuously audible at low level nearby. Birdsong decreasing. Aircraft.
NSL1	1522-1537	43	44	42	<42	No site emissions audible apart from sporadic truck movements on nearest haul road. Truck movements also slightly audible further E, although unclear if from landfill facility or M11 works zone. Road traffic audible in distance to S. Sporadic passing road traffic dominant when present. Water flow in nearby stream continuously audible at low level. Birdsong & aircraft.
NSL2	1501-1516	64	61	38	<38	No landfill emissions audible other than occasional vehicle movements on site access road. Construction activity at nearby M11 works zone dominant, particularly regular hammering. Passing road traffic intermittent, and dominant when present. Distant N11 traffic and M11 works plant audible in background. Bird song/calls and aircraft.
NSL3	1608-1623	66	68	60	<<60	No site emissions audible. N11 traffic continuously dominant and intrusive, masking all other noise except plant reversing alarms at nearest M11 works zone, and road sweeper truck pass through area.

*Specific level: L_{Aeq} level considered attributable to facility during interval, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, spectral statistics and near field correction if applicable.

Groundwater Data 2014

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-1S	MW-1S	MW-1S	MW-1S
pH	7.33	9.37	7.54	9.1
Electrical Conductivity	250	243	293	220
Chloride	17.6	18.6	21.1	18.2
Ammonia	<0.01	0.05	0.04	<0.01
Potassium	0.8	1.1	0.6	1.2
Dissolved Oxygen	11	9	10	11
Total Chromium				<1.5
TOC	3	<2	<2	2
Boron				<12
Cadmium				<0.5
Calcium				19.2
Copper				<7
Iron				<20
Lead				<5
Magnesium				2.5
Manganese				<2
Mercury				<1
Nickel				<2
Sodium				18.5
Zinc				<3
Fluoride				<0.3
Sulphate				15
Ortho Phosphate				<0.06
TON				6.4
Total Cyanide				<0.01
Alkalinity				60
Total Solids				278
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				<1
Faecal Coliforms				<1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-1D	MW-1D	MW-1D	MW-1D
pH	11.15	10.75	8.92	9.88
Electrical Conductivity	297	293	234	228
Chloride	16.7	18.3	19.7	17.1
Ammonia	0.02	0.03	0.02	0.03
Potassium	1.1	1.1	1	1.1
Dissolved Oxygen	4	6	10	9
Total Chromium				<1.5
TOC	2	<2	<2	3
Boron				25
Cadmium				<0.5
Calcium				23.1
Copper				<7
Iron				<20
Lead				<5
Magnesium				1
Manganese				<2
Mercury				<1
Nickel				<2
Sodium				19.1
Zinc				<3
Fluoride				<0.3
Sulphate				39.36
Ortho Phosphate				<0.06
TON				0.6
Total Cyanide				<0.01
Alkalinity				58
Total Solids				226
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				<1
Faecal Coliforms				<1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-2S	MW-2S	MW-2S	MW-2S
pH	10.74	10.64	7.88	7.71
Electrical Conductivity	308	299	537	660
Chloride	20.2	21.8	21.1	20.4
Ammonia	0.02	0.02	4.74	1.56
Potassium	1.1	1.3	2.4	2.2
Dissolved Oxygen	11	8	9	5
Total Chromium				<1.5
TOC	4	2	<2	<2
Boron				85
Cadmium				<0.5
Calcium				81
Copper				<7
Iron				<20
Lead				<5
Magnesium				12.6
Manganese				5
Mercury				<1
Nickel				<2
Sodium				42.6
Zinc				<3
Fluoride				<0.3
Sulphate				104.37
Ortho Phosphate				0.34
TON				<0.2
Total Cyanide				<0.01
Alkalinity				242
Total Solids				557
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				1,413.60
Faecal Coliforms				9

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-2D	MW-2D	MW-2D	MW-2D
pH	7.39	7.56	7.95	7.79
Electrical Conductivity	340	364	345	359
Chloride	22.4	27.5	27.9	26.9
Ammonia	0.02	0.04	0.02	0.02
Potassium	0.7	0.7	0.7	0.7
Dissolved Oxygen	10	7	11	9
Total Chromium				<1.5
TOC	5	<2	<2	<2
Boron				14
Cadmium				<0.5
Calcium				32.5
Copper				<7
Iron				<20
Lead				<5
Magnesium				10.3
Manganese				<2
Mercury				<1
Nickel				<2
Sodium				18.1
Zinc				<3
Fluoride				<0.3
Sulphate				8.19
Ortho Phosphate				0.06
TON				10.7
Total Cyanide				<0.01
Alkalinity				106
Total Solids				515
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				271.1
Faecal Coliforms				<1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-3S	MW-3S	MW-3S	MW-3S
pH	7.78	7.79	7.64	7.8
Electrical Conductivity	364	379	401	348
Chloride	17.2	19.1	19.2	17.4
Ammonia	0.3	0.28	4.46	0.17
Potassium	2.2	2.2	2.5	2
Dissolved Oxygen	8	8	9	5
Total Chromium				<1.5
TOC	4	3	<2	<2
Boron				81
Cadmium				0.9
Calcium				37
Copper				<7
Iron				<20
Lead				<5
Magnesium				8.1
Manganese				85
Mercury				<1
Nickel				<2
Sodium				23.2
Zinc				<3
Fluoride				<0.3
Sulphate				8.76
Ortho Phosphate				0.26
TON				0.5
Total Cyanide				<0.01
Alkalinity				140
Total Solids				203
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				648.8
Faecal Coliforms				<1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-3D	MW-3D	MW-3D	MW-3D
pH	6.95	6.88	7.32	7.03
Electrical Conductivity	520	444	443	513
Chloride	16.4	16.2	17.7	16.9
Ammonia	0.02	0.03	0.07	0.02
Potassium	1.6	1.3	2.2	2
Dissolved Oxygen	6	5	9	7
Total Chromium				<1.5
TOC	4	2	2	<2
Boron				26
Cadmium				<0.5
Calcium				73.3
Copper				<7
Iron				<20
Lead				<5
Magnesium				13.6
Manganese				<2
Mercury				<1
Nickel				<2
Sodium				14
Zinc				<3
Fluoride				<0.3
Sulphate				27.77
Ortho Phosphate				0.06
TON				6.5
Total Cyanide				<0.01
Alkalinity				194
Total Solids				298
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				1,986.30
Faecal Coliforms				<1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-4S	MW-4S	MW-4S	MW-4S
pH	7.25	7.13	7.8	7.37
Electrical Conductivity	378	504	360	360
Chloride	19.7	19.2	21.9	21.4
Ammonia	<0.01	0.05	0.03	0.02
Potassium	1.1	1.2	0.9	1.1
Dissolved Oxygen	8	9	9	6
Total Chromium				<1.5
TOC	3	<2	<2	<2
Boron				17
Cadmium				<0.5
Calcium				45.9
Copper				<7
Iron				<20
Lead				<5
Magnesium				9.3
Manganese				<2
Mercury				<1
Nickel				<2
Sodium				16.2
Zinc				<3
Fluoride				<0.3
Sulphate				20.66
Ortho Phosphate				0.14
TON				1.7
Total Cyanide				<0.01
Alkalinity				156
Total Solids				257
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				2,419.60
Faecal Coliforms				<1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-4D	MW-4D	MW-4D	MW-4D
pH	6.74	6.8	6.82	6.85
Electrical Conductivity	350	409	397	368
Chloride	19.3	18.2	19.2	20.1
Ammonia	<0.01	0.05	0.02	<0.01
Potassium	1.1	1.1	1.2	1.2
Dissolved Oxygen	8	8	10	8
Total Chromium				<1.5
TOC	3	<2	<2	<2
Boron				18
Cadmium				<0.5
Calcium				47.5
Copper				<7
Iron				<20
Lead				<5
Magnesium				9.4
Manganese				<2
Mercury				<1
Nickel				<2
Sodium				15.2
Zinc				<3
Fluoride				<0.3
Sulphate				34.34
Ortho Phosphate				0.07
TON				2.4
Total Cyanide				<0.01
Alkalinity				140
Total Solids				227
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				1,046.20
Faecal Coliforms				<1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-5S	MW-5S	MW-5S	MW-5S
pH	7.64	7.87	7.88	7.49
Electrical Conductivity	392	367	350	393
Chloride	20	21.5	20.8	21
Ammonia	<0.01	0.08	0.02	0.03
Potassium	1.2	1.2	1.2	1.7
Dissolved Oxygen	5	6	9	8
Total Chromium				<1.5
TOC	3	<2	<2	<2
Boron				15
Cadmium				<0.5
Calcium				52.4
Copper				<7
Iron				31
Lead				<5
Magnesium				8.3
Manganese				95
Mercury				<1
Nickel				<2
Sodium				14.6
Zinc				<3
Fluoride				<0.3
Sulphate				14.59
Ortho Phosphate				0.11
TON				5
Total Cyanide				<0.01
Alkalinity				140
Total Solids				341
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				1,299.70
Faecal Coliforms				8

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-5D	MW-5D	MW-5D	MW-5D
pH	8	7.89	8.06	7.98
Electrical Conductivity	357	332	305	304
Chloride	18.7	20.1	20	19.1
Ammonia	0.02	0.06	0.05	0.08
Potassium	1.2	1.2	1.3	1.5
Dissolved Oxygen	3	6	8	6
Total Chromium				<1.5
TOC	2	<2	<2	<2
Boron				79
Cadmium				<0.5
Calcium				33.2
Copper				<7
Iron				<20
Lead				<5
Magnesium				9.7
Manganese				139
Mercury				<1
Nickel				<2
Sodium				16.7
Zinc				<3
Fluoride				<0.3
Sulphate				6.87
Ortho Phosphate				0.6
TON				0.3
Total Cyanide				<0.01
Alkalinity				124
Total Solids				189
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				1,732.90
Faecal Coliforms				<1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-6S	MW-6S	MW-6S	MW-6S
pH	6.99	7.02	7	6.87
Electrical Conductivity	298	303	276	266
Chloride	23.8	24.7	25.5	23.9
Ammonia	0.02	0.04	0.05	0.03
Potassium	0.8	0.7	1	0.9
Dissolved Oxygen	10	9	10	9
Total Chromium				<1.5
TOC	<2	<2	<2	<2
Boron				<12
Cadmium				<0.5
Calcium				24.7
Copper				<7
Iron				<20
Lead				<5
Magnesium				7
Manganese				<2
Mercury				<1
Nickel				<2
Sodium				15.2
Zinc				3
Fluoride				<0.3
Sulphate				10.94
Ortho Phosphate				<0.06
TON				3.8
Total Cyanide				<0.01
Alkalinity				62
Total Solids				306
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				1,046.20
Faecal Coliforms				1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-6D	MW-6D	MW-6D	MW-6D
pH	7.52	7.71	7.64	7.17
Electrical Conductivity	222	249	231	242
Chloride	20.1	21.7	22.4	21.7
Ammonia	<0.01	0.02	0.03	0.02
Potassium	0.6	0.6	0.7	0.8
Dissolved Oxygen	7	8	10	9
Total Chromium				<1.5
TOC	<2	<2	<2	<2
Boron				<12
Cadmium				<0.5
Calcium				17.8
Copper				<7
Iron				<20
Lead				<5
Magnesium				6.7
Manganese				<2
Mercury				<1
Nickel				<2
Sodium				18.8
Zinc				<3
Fluoride				<0.3
Sulphate				5.9
Ortho Phosphate				<0.06
TON				4
Total Cyanide				<0.01
Alkalinity				78
Total Solids				911
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				1,299.70
Faecal Coliforms				6

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-7S	MW-7S	MW-7S	MW-7S
pH	7.48	7.36	7.38	7.29
Electrical Conductivity	380	352	392	402
Chloride	26	23	33	20.4
Ammonia	0.02	0.07	0.2	0.02
Potassium	0.5	0.5	1	1
Dissolved Oxygen	6	8	9	9
Total Chromium				<1.5
TOC	7	4	5	<2
Boron				<12
Cadmium				<0.5
Calcium				43.5
Copper				<7
Iron				<20
Lead				<5
Magnesium				12
Manganese				<2
Mercury				<1
Nickel				<2
Sodium				21.9
Zinc				89
Fluoride				<0.3
Sulphate				25.93
Ortho Phosphate				0.44
TON				9
Total Cyanide				<0.01
Alkalinity				114
Total Solids				284
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				980.4
Faecal Coliforms				2

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-7D	MW-7D	MW-7D	MW-7D
pH	7.1	7.42	7.23	6.93
Electrical Conductivity	364	356	296	295
Chloride	22	23.3	20.9	15.4
Ammonia	0.02	0.06	0.44	0.02
Potassium	0.3	0.4	0.7	0.5
Dissolved Oxygen	10	9	10	10
Total Chromium				<1.5
TOC	3	2	22	<2
Boron				<12
Cadmium				<0.5
Calcium				25.9
Copper				<7
Iron				<20
Lead				<5
Magnesium				11.3
Manganese				29
Mercury				<1
Nickel				<2
Sodium				18.2
Zinc				4
Fluoride				<0.3
Sulphate				16.58
Ortho Phosphate				0.09
TON				3.2
Total Cyanide				<0.01
Alkalinity				100
Total Solids				218
VOCs				ND
sVOCs				ND
Pesticides				ND
Total Coliforms				1,986.30
Faecal Coliforms				<1

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-8S	MW-8S	MW-8S	MW-8S
pH	Dry	Dry	Dry	Dry
Electrical Conductivity	Dry	Dry	Dry	Dry
Chloride	Dry	Dry	Dry	Dry
Ammonia	Dry	Dry	Dry	Dry
Potassium	Dry	Dry	Dry	Dry
Dissolved Oxygen	Dry	Dry	Dry	Dry
Total Chromium	Dry	Dry	Dry	Dry
TOC	Dry	Dry	Dry	Dry
Boron				Dry
Cadmium				Dry
Calcium				Dry
Copper				Dry
Iron				Dry
Lead				Dry
Magnesium				Dry
Manganese				Dry
Mercury				Dry
Nickel				Dry
Sodium				Dry
Zinc				Dry
Fluoride				Dry
Sulphate				Dry
Ortho Phosphate				Dry
TON				Dry
Total Cyanide				Dry
Alkalinity				Dry
Total Solids				Dry
VOCs				Dry
sVOCs				Dry
Pesticides				Dry
Total Coliforms				Dry
Faecal Coliforms				Dry

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	MW-8D	MW-8D	MW-8D	MW-8D
pH	Dry	Dry	Dry	Dry
Electrical Conductivity	Dry	Dry	Dry	Dry
Chloride	Dry	Dry	Dry	Dry
Ammonia	Dry	Dry	Dry	Dry
Potassium	Dry	Dry	Dry	Dry
Dissolved Oxygen	Dry	Dry	Dry	Dry
Total Chromium	Dry	Dry	Dry	Dry
TOC	Dry	Dry	Dry	Dry
Boron				Dry
Cadmium				Dry
Calcium				Dry
Copper				Dry
Iron				Dry
Lead				Dry
Magnesium				Dry
Manganese				Dry
Mercury				Dry
Nickel				Dry
Sodium				Dry
Zinc				Dry
Fluoride				Dry
Sulphate				Dry
Ortho Phosphate				Dry
TON				Dry
Total Cyanide				Dry
Alkalinity				Dry
Total Solids				Dry
VOCs				Dry
sVOCs				Dry
Pesticides				Dry
Total Coliforms				Dry
Faecal Coliforms				Dry

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
			PW-2	**PW-2**
pH			7.62	7.27
Electrical Conductivity			234	229
Chloride			23.3	21.8
Ammonia			<0.01	0.02
Potassium			0.8	0.5
Dissolved Oxygen			10	7
TOC			<2	<2
Parameter	**Q-1 2014**	**Q-2 2014**	**Q-3 2014**	**Q-4 2014**
			PW-7	**PW-7**
pH			7.86	7.95
Electrical Conductivity			431	413
Chloride			14.6	14.6
Ammonia			<0.01	0.02
Potassium			0.8	0.8
Dissolved Oxygen			7	7
TOC			<2	<2
Parameter	**Q-1 2014**	**Q-2 2014**	**Q-3 2014**	**Q-4 2014**
			PW-11	**PW-11**
pH			8.25	8.2
Electrical Conductivity			414	416
Chloride			30.9	30.1
Ammonia			<0.01	0.02
Potassium			0.6	0.5
Dissolved Oxygen			9	6
TOC			<2	<2
Parameter	**Q-1 2014**	**Q-2 2014**	**Q-3 2014**	**Q-4 2014**
			PW-12	**PW-12**
pH				7.94
Electrical Conductivity				321
Chloride				20.1
Ammonia				0.02
Potassium				1.1
Dissolved Oxygen				5
TOC				<2

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
			PW-13	**PW-13**
pH			8.16	7.92
Electrical Conductivity			481	461
Chloride			18.5	18.2
Ammonia			0.04	<0.01
Potassium			0.9	1
Dissolved Oxygen			10	5
TOC			<2	<2
Parameter	**Q-1 2014**	**Q-2 2014**	**Q-3 2014**	**Q-4 2014**
			PW-13(2)	**PW-13(2)**
pH			7.94	8.05
Electrical Conductivity			400	383
Chloride			19.9	19.2
Ammonia			<0.01	<0.01
Potassium			0.9	0.9
Dissolved Oxygen			11	6
TOC			<2	<2
Parameter	**Q-1 2014**	**Q-2 2014**	**Q-3 2014**	**Q-4 2014**
			PW-20	**PW-20**
pH			8.5	8.62
Electrical Conductivity			273	258
Chloride			25.3	25.3
Ammonia			0.02	0.02
Potassium			0.9	1
Dissolved Oxygen			10	4
TOC			<2	<2
Parameter	**Q-1 2014**	**Q-2 2014**	**Q-3 2014**	**Q-4 2014**
			PW-25	**PW-25**
pH			7.92	8.18
Electrical Conductivity			304	290
Chloride			22.5	21.2
Ammonia			<0.01	<0.01
Potassium			0.6	0.6
Dissolved Oxygen			8	5
TOC			<2	<2

Leachate Data 2014

Parameter	Units	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
		LP-1	LP-1	LP-1	LP-1
pH	pH Units	7.9	7.99	7.88	7.98
Electrical Conductivity	µS/cm	27621	27,999	28,626	28850
Chloride	mg/l	2166.7	1,901.90	2,320.60	2437.1
Ammoniacal Nitrogen	mg/l	2850.62	3,309.33	3,706.29	3183.95
BOD	mg/l	929	19,500	509	405
COD	mg/l	5600	22,550	5,700	5610
Boron	ug/l				9183
Cadmium	ug/l				<5.0
Calcium	mg/l				31.7
Copper	ug/l				437
Iron	ug/l				2993
Lead	ug/l				<50
Magnesium	mg/l				50.6
Manganese	ug/l				538
Mercury	ug/l				<10
Nickel	ug/l				169
Potassium	mg/l				677
Sodium	mg/l				1459
Zinc	ug/l				610
Total Chromium	ug/l				518.9
Fluoride	mg/l				<0.3
Sulphate	mg/l				51.6
Orthophosphate	mg/l				67.32
Total Oxidised Nitrogen	mg/l				<0.2
Total Cyanide	mg/l				0.04

Parameter	Units	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
		LP-2/5	LP-2/5	LP-2/5	LP-2/5
pH	pH Units				
Electrical Conductivity	µS/cm				
Chloride	mg/l				
Ammoniacal Nitrogen	mg/l				
BOD	mg/l				
COD	mg/l				
Boron	ug/l				
Cadmium	ug/l				
Calcium	mg/l				
Copper	ug/l				
Iron	ug/l				
Lead	ug/l				
Magnesium	mg/l				
Manganese	ug/l				
Mercury	ug/l				
Nickel	ug/l				
Potassium	mg/l				
Sodium	mg/l				
Zinc	ug/l				
Total Chromium	ug/l				
Fluoride	mg/l				
Sulphate	mg/l				
Orthophosphate	mg/l				
Total Oxidised Nitrogen	mg/l				
Total Cyanide	mg/l				

Parameter	Units	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
		LP-3	LP-3	LP-3	LP-3
pH	pH Units		7.94	7.95	8.03
Electrical Conductivity	µS/cm		27,673	27,930	28224
Chloride	mg/l		2,499.90	2,722.10	2686.5
Ammoniacal Nitrogen	mg/l		2,618.17	2,882.38	2967.98
BOD	mg/l		678	701	402
COD	mg/l		5,650	6,050	6790
Boron	ug/l				10630
Cadmium	ug/l				<5.0
Calcium	mg/l				29.9
Copper	ug/l				384
Iron	ug/l				3048
Lead	ug/l				<50
Magnesium	mg/l				54.9
Manganese	ug/l				548
Mercury	ug/l				<10
Nickel	ug/l				207
Potassium	mg/l				842.2
Sodium	mg/l				1827
Zinc	ug/l				273
Total Chromium	ug/l				502.9
Fluoride	mg/l				<0.3
Sulphate	mg/l				18.31
Orthophosphate	mg/l				59.89
Total Oxidised Nitrogen	mg/l				<0.2
Total Cyanide	mg/l				0.03

Parameter	Units	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
		LP-6	LP-6	LP-6	LP-6
pH	pH Units			8.07	8.04
Electrical Conductivity	µS/cm			34,135	35038
Chloride	mg/l			3,291.80	3318.3
Ammoniacal Nitrogen	mg/l			3,487.17	3669.14
BOD	mg/l			4,721	544
COD	mg/l			10,000	11220
Boron	ug/l				16020
Cadmium	ug/l				<5.0
Calcium	mg/l				73.1
Copper	ug/l				891
Iron	ug/l				3110
Lead	ug/l				<50
Magnesium	mg/l				105.5
Manganese	ug/l				688
Mercury	ug/l				<10
Nickel	ug/l				282
Potassium	mg/l				1548
Sodium	mg/l				3086
Zinc	ug/l				406
Total Chromium	ug/l				1083
Fluoride	mg/l				5
Sulphate	mg/l				754.03
Orthophosphate	mg/l				83.39
Total Oxidised Nitrogen	mg/l				<0.2
Total Cyanide	mg/l				0.03

Parameter	Units	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
		LP-7	LP-7	LP-7	LP-7
pH	pH Units	7.61	7.75	7.73	7.81
Electrical Conductivity	µS/cm	18427	23,275	30,780	30068
Chloride	mg/l	1544.1	2,290.10	3,229.20	3103.9
Ammoniacal Nitrogen	mg/l	1587.44	1,812.90	2,973.06	2861.32
BOD	mg/l	547	375	1,049	459
COD	mg/l	3960	3,455	6,160	6420
Boron	ug/l				10540
Cadmium	ug/l				<5.0
Calcium	mg/l				139.9
Copper	ug/l				321
Iron	ug/l				2166
Lead	ug/l				<50
Magnesium	mg/l				130.3
Manganese	ug/l				1200
Mercury	ug/l				<10
Nickel	ug/l				304
Potassium	mg/l				1312
Sodium	mg/l				2755
Zinc	ug/l				364
Total Chromium	ug/l				749.8
Fluoride	mg/l				NDP*
Sulphate	mg/l				165.07
Orthophosphate	mg/l				80.06
Total Oxidised Nitrogen	mg/l				<0.2
Total Cyanide	mg/l				0.03

Parameter	Units	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
		LP-9	LP-9	LP-9	LP-9
pH	pH Units	7.68	7.87		7.85
Electrical Conductivity	µS/cm	18443	26,692		22648
Chloride	mg/l	1593	2656.4		2409.4
Ammoniacal Nitrogen	mg/l	1453.48	2,186.69		1924.85
BOD	mg/l	401	381		345
COD	mg/l	3380	4,700		4460
Boron	ug/l				8855
Cadmium	ug/l				<5.0
Calcium	mg/l				140.2
Copper	ug/l				76
Iron	ug/l				1629
Lead	ug/l				<50
Magnesium	mg/l				98.8
Manganese	ug/l				944
Mercury	ug/l				<10
Nickel	ug/l				238
Potassium	mg/l				947.1
Sodium	mg/l				1835
Zinc	ug/l				55
Total Chromium	ug/l				441.8
Fluoride	mg/l				<0.3
Sulphate	mg/l				10.02
Orthophosphate	mg/l				45.42
Total Oxidised Nitrogen	mg/l				<0.2
Total Cyanide	mg/l				0.05

Parameter	Units	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
		Lagoon	**Lagoon**	**Lagoon**	**Lagoon**
pH	pH Units	7.96	9.33	7.83	9.27
Electrical Conductivity	µS/cm	21562	15,774	19,979	11383
Chloride	mg/l	1810.1	1,995.90	2,210.30	2129.2
Ammoniacal Nitrogen	mg/l	1943.27	1,393.86	1715.99	344.05
BOD	mg/l	401	264	1,067	84
COD	mg/l	3180	3,925	4,770	3820
Boron	ug/l				9704
Cadmium	ug/l				13.4
Calcium	mg/l				11.7
Copper	ug/l				1601
Iron	ug/l				7979
Lead	ug/l				62
Magnesium	mg/l				68.4
Manganese	ug/l				42
Mercury	ug/l				<10
Nickel	ug/l				229
Potassium	mg/l				1018
Sodium	mg/l				1914
Zinc	ug/l				1841
Total Chromium	ug/l				473.6
Fluoride	mg/l				<0.3
Sulphate	mg/l				373.82
Orthophosphate	mg/l				6.07
Total Oxidised Nitrogen	mg/l				<0.2
Total Cyanide	mg/l				0.03

Parameter	Units	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
		LP-10	LP-10	LP-10	LP-10
pH	pH Units			7.88	7.84
Electrical Conductivity	µS/cm			28,977	22521
Chloride	mg/l			4,134.50	3348.4
Ammoniacal Nitrogen	mg/l			2,303.08	1709.71
BOD	mg/l			1,157	543
COD	mg/l			6,360	7150
Boron	ug/l				15040
Cadmium	ug/l				<5.0
Calcium	mg/l				138.8
Copper	ug/l				<70
Iron	ug/l				375
Lead	ug/l				<50
Magnesium	mg/l				112.8
Manganese	ug/l				845
Mercury	ug/l				<10
Nickel	ug/l				218
Potassium	mg/l				686.2
Sodium	mg/l				1921
Zinc	ug/l				34
Total Chromium	ug/l				581.7
Fluoride	mg/l				6
Sulphate	mg/l				<0.05
Orthophosphate	mg/l				12.42
Total Oxidised Nitrogen	mg/l				0.3
Total Cyanide	mg/l				0.12

Surface Water Data 2014

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-1	SW-1	SW-1	SW-1
pH	7	7.65	Dry	7.05
Electrical Conductivity	207	227	Dry	229
Chloride	20.6	24.5	Dry	23.1
Ammoniacal Nitrogen	0.06	0.07	Dry	0.02
Total Suspended Solids	<10	11	Dry	<10
Dissolved Oxygen	10	10	Dry	10
BOD	<1	<1	Dry	21
COD	<7	<7	Dry	<7
Boron				<12
Cadmium				<0.5
Calcium				14
Copper				<7
Iron				<20
Lead				<5
Magnesium				7.1
Manganese				<2
Mercury				<1
Nickel				<2
Potassium				0.8
Sodium				13.9
Zinc				<3
Total Chromium				<1.5
Sulphate				9.6
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				10.2
Total Alkalinity				36

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-2	SW-2	SW-2	SW-2
pH	7.22	7.73	7.76	7.46
Electrical Conductivity	246	283	260	261
Chloride	25.9	27	28.5	27.4
Ammonia	0.06	0.1	0.02	0.04
Potassium	<10	12	<10	<10
Dissolved Oxygen	11	10	10	11
Total Chromium	<1	<1	<1	<1
TOC	8	13	<7	<7
Boron				14
Cadmium				<0.5
Calcium				20.5
Copper				<7
Iron				24
Lead				<5
Magnesium				6.7
Manganese				15
Mercury				<1
Nickel				<2
Potassium				2.3
Sodium				15.9
Zinc				<3
Total Chromium				<1.5
Sulphate				12.45
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				4.8
Total Alkalinity				50

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-3	SW-3	SW-3	SW-3
pH	7.06	8.02	7.62	7.33
Electrical Conductivity	200	381	209	207
Chloride	18.6	24.3	20.1	19.3
Ammonia	0.02	0.09	0.05	0.03
Potassium	<10	22	<10	<10
Dissolved Oxygen	11	10	9	11
Total Chromium	<1	<1	1	<1
TOC	8	16	<7	<7
Boron				<12
Cadmium				<0.5
Calcium				13.4
Copper				<7
Iron				25
Lead				<5
Magnesium				6.8
Manganese				7
Mercury				<1
Nickel				<2
Potassium				1.7
Sodium				11.7
Zinc				<3
Total Chromium				<1.5
Sulphate				12.86
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				4.7
Total Alkalinity				34

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-4	SW-4	SW-4	SW-4
pH	7.16	7.56	7.89	7.28
Electrical Conductivity	181	188	176	183
Chloride	19.7	15.5	19.7	18
Ammonia	0.02	0.09	0.02	0.47
Potassium	<10	<10	<10	<10
Dissolved Oxygen	11	10	9	11
Total Chromium	<1	<1	<1	<1
TOC	10	16	<7	<7
Boron				<12
Cadmium				<0.5
Calcium				12.6
Copper				<7
Iron				90
Lead				<5
Magnesium				5.3
Manganese				17
Mercury				<1
Nickel				<2
Potassium				0.9
Sodium				11
Zinc				<3
Total Chromium				<1.5
Sulphate				10.84
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				3.6
Total Alkalinity				28

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-5	SW-5	SW-5	SW-5
pH	7.29	7.84	7.83	7.44
Electrical Conductivity	243	304	252	264
Chloride	25.7	26.8	28.2	27.6
Ammonia	0.09	0.09	0.02	0.5
Potassium	<10	15	<10	15
Dissolved Oxygen	11	10	10	11
Total Chromium	<1	<1	<1	<1
TOC	9	7	<7	8
Boron				<12
Cadmium				<0.5
Calcium				21
Copper				<7
Iron				<20
Lead				<5
Magnesium				6.6
Manganese				3
Mercury				<1
Nickel				<2
Potassium				2.3
Sodium				15.7
Zinc				<3
Total Chromium				<1.5
Sulphate				12.43
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				4.5
Total Alkalinity				52

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-6	SW-6	SW-6	SW-6
pH	7.31	7.84	7.93	7.79
Electrical Conductivity	250	276	264	349
Chloride	23.7	22.6	25.2	25.5
Ammonia	0.4	0.21	0.02	0.32
Potassium	<10	12	10	<10
Dissolved Oxygen	11	9	10	11
Total Chromium	<1	<1	<1	<1
TOC	10	11	<7	<7
Boron				<12
Cadmium				<0.5
Calcium				43.2
Copper				<7
Iron				47
Lead				<5
Magnesium				8.1
Manganese				72
Mercury				<1
Nickel				<2
Potassium				2
Sodium				14.6
Zinc				<3
Total Chromium				<1.5
Sulphate				16.72
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				4.9
Total Alkalinity				110

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-7	SW-7	SW-7	SW-7
pH	7.72	7.53	8.05	7.83
Electrical Conductivity	297	221	367	356
Chloride	24.5	17.9	26.3	25.4
Ammonia	0.18	0.12	0.02	0.04
Potassium	12	13	10	<10
Dissolved Oxygen	11	10	10	11
Total Chromium	<1	<1	<1	<1
TOC	9	12	<7	<7
Boron				<12
Cadmium				<0.5
Calcium				43.2
Copper				<7
Iron				47
Lead				<5
Magnesium				8.1
Manganese				70
Mercury				<1
Nickel				<2
Potassium				2
Sodium				14.6
Zinc				<3
Total Chromium				<1.5
Sulphate				16.69
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				5.1
Total Alkalinity				110

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-8	SW-8	SW-8	SW-8
pH	6.85	7.79	7.8	7.46
Electrical Conductivity	245	279	251	273
Chloride	25.7	27	28	27.4
Ammonia	0.06	0.24	0.02	0.44
Potassium	<10	<10	<10	<10
Dissolved Oxygen	11	10	10	11
Total Chromium	<1	<1	<1	<1
TOC	10	<7	<7	<7
Boron				<12
Cadmium				<0.5
Calcium				20.8
Copper				<7
Iron				22
Lead				<5
Magnesium				6.6
Manganese				11
Mercury				<1
Nickel				<2
Potassium				2.3
Sodium				15.9
Zinc				<3
Total Chromium				<1.5
Sulphate				12.57
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				4.6
Total Alkalinity				50

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-9	SW-9	SW-9	SW-9
pH	7.9	7.61	7.78	8.06
Electrical Conductivity	469	280	390	406
Chloride	21.1	26.7	17.1	19.3
Ammonia	0.72	0.54	0.03	0.19
Potassium	35	77	<10	<10
Dissolved Oxygen	10	10	8	11
Total Chromium	<1	<1	<1	<1
TOC	16	<7	<7	<7
Boron				26
Cadmium				<0.5
Calcium				55.3
Copper				<7
Iron				<20
Lead				<5
Magnesium				10.8
Manganese				10
Mercury				<1
Nickel				<2
Potassium				2.5
Sodium				15.2
Zinc				<3
Total Chromium				<1.5
Sulphate				35.32
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				1.9
Total Alkalinity				152

Parameter	Q-1 2014	Q-2 2014	Q-3 2014	Q-4 2014
	SW-10	SW-10	SW-10	SW-10
pH	7.43	8.07	7.8	7.48
Electrical Conductivity	586	409	284	264
Chloride	42.1	7.2	27.9	27.3
Ammonia	8.5	0.09	0.02	0.02
Potassium	36	31	<10	<10
Dissolved Oxygen	6	10	10	11
Total Chromium	2	1	<1	<1
TOC	37	15	<7	<7
Boron				12
Cadmium				<0.5
Calcium				21.3
Copper				<7
Iron				24
Lead				<5
Magnesium				6.8
Manganese				10
Mercury				<1
Nickel				<2
Potassium				2.2
Sodium				16
Zinc				<3
Total Chromium				<1.5
Sulphate				12.74
Ortho Phosphate				<0.06
Total Oxidised Nitrogen				4.8
Total Alkalinity				50

APPENDIX 4

E-PRTR Returns

Environmental Protection Agency

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.18

REFERENCE YEAR	2014

1. FACILITY IDENTIFICATION

Parent Company Name	Ballynagran Landfill Limited
Facility Name	Ballynagran Residual Landfill
PRTR Identification Number	W0165
Licence Number	W0165-02

Classes of Activity

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

Address 1	Ballynagran
Address 2	Coolbeg and Kilcandra
Address 3	
Address 4	
	Wicklow
Country	Ireland
Coordinates of Location	-8.41098 51.914
River Basin District	IEEA
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Tomas Fingleton
AER Returns Contact Email Address	tomas.fingleton@landfills.ie
AER Returns Contact Position	Landfill Manager
AER Returns Contact Telephone Number	0867741813
AER Returns Contact Mobile Phone Number	0867741813
AER Returns Contact Fax Number	045 482629
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	10
User Feedback/Comments	Differences in air emission between 2013 and 2014 due to refinement of landfill gas model in 2014.
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		Flares	Engine			
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	Emission Point 2	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
03	Carbon dioxide (CO2)	C	OTH	GasSim2 Calculation	5204173.0	0.0	5204173.0	0.0	0.0
01	Methane (CH4)	C	OTH	GasSim2 Calculation	3836584.0	1127102.0	6898555.0	0.0	1934869.0
08	**Nitrogen oxides (NOx/NO2)**	M	EN 14792:2005	OMI Report	1847.02	2115.85	3962.87	0.0	0.0
11	Sulphur oxides (SOx/SO2)	M	EN 14791:2005	OMI Report	8527.6	2985.06	11512.66	0.0	0.0

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

SECTION B : REMAINING PRTR POLLUTANTS

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

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

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

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

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

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: Ballynagran Residual Landfill

Please enter summary data on the quantities of methane flared and / or utilised	**T (Total) kg/Year**	**M/C/E**	**Method Used**		**Facility Total Capacity m3 per hour**	
			Method Code	**Designation or Description**		
Total estimated methane generation (as per site model)	6898555.0	C	OTH	GasSim2 calcualtion	N/A	
Methane flared	3836584.0	M	OTH	Facility on-site monitoring	0.0	(Total Flaring Capacity)
Methane utilised in engine/s	1127102.0	M	OTH	Facility on-site monitoring	0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	1934869.0	C	OTH	Modelling - Monitoring	N/A	

4.2 RELEASES TO WATERS

Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

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

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

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

SECTION B : REMAINING PRTR POLLUTANTS

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

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

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

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

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

4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

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

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

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

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

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

4.4 RELEASES TO LAND

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

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

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

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

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

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

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	13 07 01	Yes	7.7	fuel oil and diesel	R1	M	Weighed	Offsite in Ireland	Rilta Environmental Ltd,W0192-01	Block 402 ,Grant?s Drive ,Greenogue Business Park. Rathcoole ,Dublin,Ireland	Rilta,W0192-01,Block 402 Grants Drive,Greenogue Business Park,Dublin,.,Ireland	Block 402 Grants Drive,Greenogue Business Park,Dublin,.,Ireland
Within the Country	19 07 03	No	13714.6	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	Drogheda WWTP,D0041-01	Drogheda ,County Louth,-,-,ireland	Enva,184-01	Clonminam Industrial Estate,Portlaoise ,County Laois,Laois,Ireland
Within the Country	19 07 03	No	11475.4	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	Rilta Environmental Ltd,W0192-01	Block 402 ,Grant?s Drive ,Greenogue Business Park. Rathcoole ,Dublin,Ireland		
Within the Country	19 07 03	No	6349.96	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	Ringsend WWTP,D00-34-01	Ringsend ,Dublin,-,-,ireland		
Within the Country	19 07 03	No	985.7	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	Kilcullen Landfill Ltd.,W0081-04	Brownstown,Kilcullen Landfill Ltd.,County Kildare,-,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