



**Clare County Council**

**Waste Licence W0031-01**

**Annual Environmental Report for 2009**

**Location of facility: Doora Landfill, Bunnow, Ballaghboy,**

**Gaurus, Doora, Co. Clare**

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## 1.0 Introduction

### 1.1 Licence Reference

Condition	Details
<b>Condition 2</b> <b>Management of the activity</b>  <b>Schedule C</b>	2.8 AER: The licensee shall submit to the agency for its agreement, within thirteen months from the date of grant of this licence, or within one month of the end of each year thereafter.  AER Content.

### 1.2 Waste Licence Register Number

The waste license number is W0031-01.

### 1.3 Name of Operator, Name and Address of Facility

Clare County Council  
Doora Landfill Site  
Bunnow/Ballaghboy/Gaurus/Doora  
County Clare

### 1.4 Reporting Period

The reporting period for this AER is the calendar year 2009

### 1.5 Site Description

#### 1.5.1 Site Location

Doora landfill is located in a semi-rural area approximately 1.6km east of Ennis Town.

#### 1.5.2 Area Occupied

The area occupied by the landfill and its ancillaries amounts to 29.8 hectares, of which 18.7 hectares was used for landfilling. No waste has been deposited at the site since June 30<sup>th</sup> 2001.

## 2.0 Waste Activities carried out at the facility.

In accordance with Condition 5.1.2 of the licence, no waste has been accepted for deposition on the site since June 30th 2001.

In accordance with Condition 4.18.1, no waste has been accepted for transfer at the facility since 30th June 2002.

Leachate collection and abstraction began at the site in 2008. This activity was subsequently suspended temporarily for much of 2009 to facilitate groundwork's as part of the remediation project. Leachate tankering off site recommenced in November 2009. Clare County Council personnel monitor the level of leachate stored in the collection tank on a frequent basis, and removed off site to an appropriate facility as required.

### **3.0 Quantity and Composition of Waste Received in 2009.**

No waste was received at the facility since June 2002.

### **4.0 Environmental Monitoring Results and Interpretation.**

Section 4 presents the results of environmental monitoring undertaken from January to December 2009 in accordance with Condition 9 of Waste Licence No.0031-01, as indicated in Table 4.1 below.

During this reporting period, consultants TMS Environment Ltd conducted monthly, quarterly and annual monitoring programmes for surface water, groundwater and leachate. TMS Environment also carried out monitoring for dust, noise and gas flare emissions. Conservation Services carried out biological monitoring on surface water drains and on the R. Fergus. Weekly gas monitoring and leachate level monitoring surveys, together with monthly surface water monitoring were carried out by Clare County Council staff. Monitoring locations are shown on Drawing Number 1 in Appendix I. PRTR emissions data included in Appendix III.

**Table 4.1 :Doora Landfill (W0031-01) Monitoring Schedule**

<b>Schedule</b>	<b>Monitoring Requirement</b>
E.1	Landfill Gas
E.2	Dust
E.3	Noise
E.4	Surface Water, Groundwater and Leachate
E.5	Enclosed Landfill Gas Flare

*Note <sup>1</sup>: The monitoring frequency for surface water visual inspections was reduced to monthly from August 2008, as agreed with the EPA.*

Monitoring was carried out in accordance with Schedule E of the Waste Licence as indicated in Table 4.1 unless otherwise noted in this report. Results for key parameters are summarised in Sections 4.1 to 4.6 of this report. A more detailed discussion of results can be found in the quarterly reports submitted to the Agency during the year.

#### **4.1. Landfill Gas**

Clare County Council staff conducted landfill gas monitoring at weekly and monthly intervals during the reporting period, in accordance with Schedule E.1 of the waste licence. Gas monitoring locations are shown in Drawing No. 1 "Environmental Monitoring Points" in Appendix I. Monitoring was undertaken at forty-two locations across the three zones of Doora landfill. Thirty-five of these locations were tested on a monthly basis primarily to enable field balancing to be carried out to optimise gas collection and flare efficiency. The remaining seven locations are the original gas monitoring wells (LG1 to LG7) that are not connected to the gas network. A number of these wells were damaged in 2008 due to earthworks carried out during the landfill remediation project, these wells are in the process of being repaired/replaced. Undamaged wells were monitored on a weekly basis during the reporting period. Gas monitoring results from January to December 2009 are shown in figures 1a to 1e. As can be seen from these graphs, higher concentrations of landfill gas were detected in LG2, and LG5. Methane levels were higher than CO<sub>2</sub> levels in these wells. Methane and CO<sub>2</sub> levels were similar in LG1, LG3, and LG6, where lower landfill gas levels have been measured. The ratio of CH<sub>4</sub> to CO<sub>2</sub> is related to the age and stage of decomposition of the waste.

The Agency has been notified on a number of occasions during the 2009 period concerning an issue of flare shut down. On going consultation with the contractor/installer AFS Ltd. has resulted in a number of software and sensor changes and improvements. The flare is now returned to a fully operational status, and is monitored on a weekly basis.

Weekly gas monitoring surveys were carried out during the year at offsite gas monitoring wells, OSW1 and OSW2. No methane was detected in either of the wells. Carbon dioxide levels exceeded the 1.5%v/v trigger level in OSW2 on three occasions during the year, due most likely to the presence of peat in the area around the wells. These exceedences were notified to the EPA in incident reports during the year.

Fig. 1a

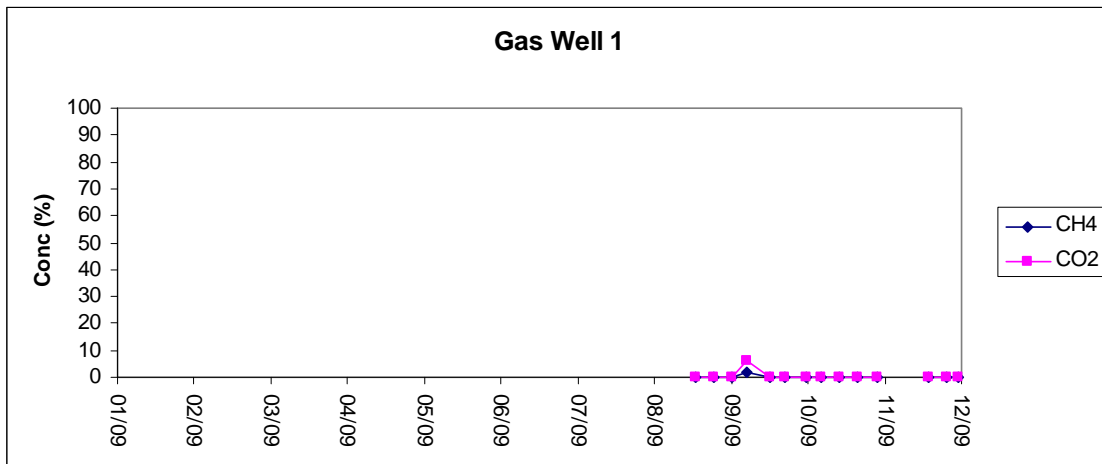


Fig. 1b

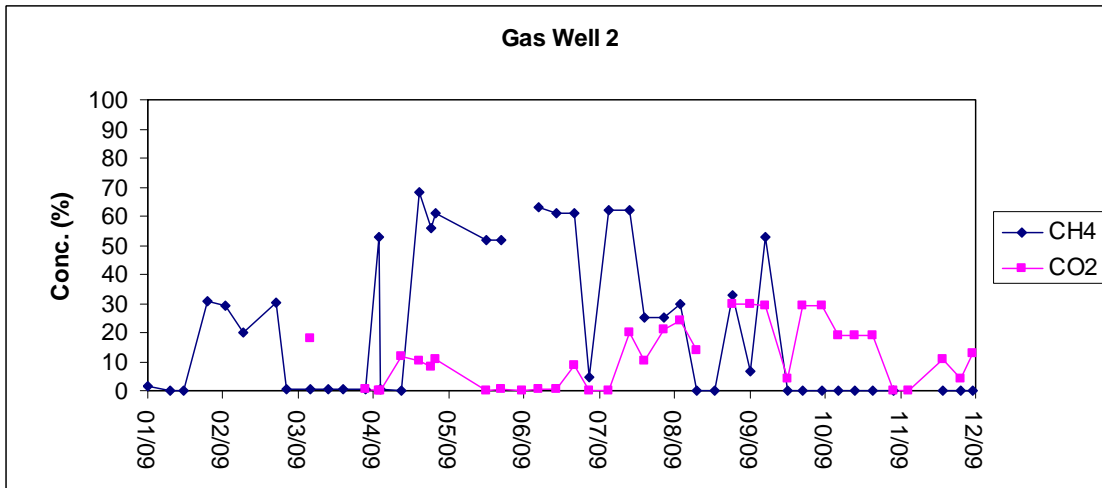


Fig. 1c

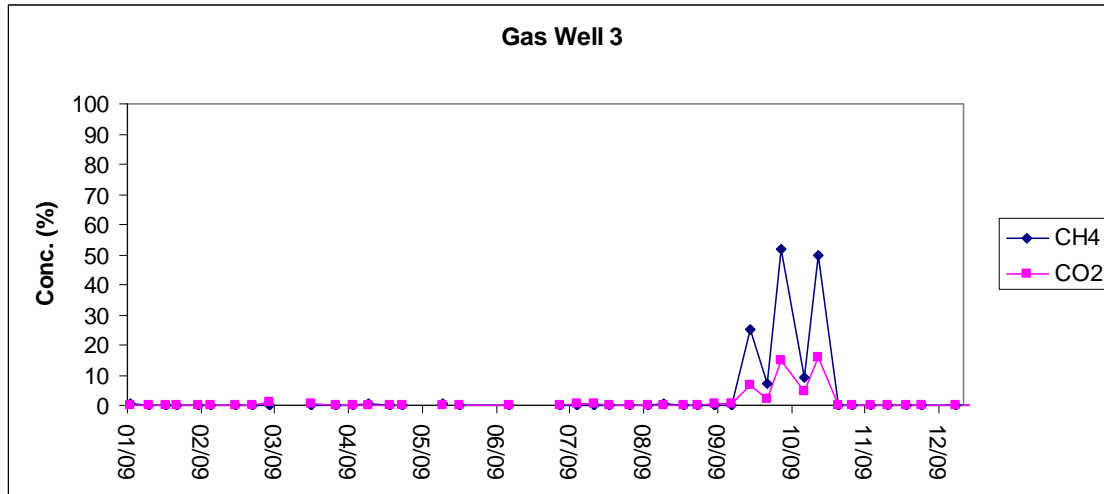


Fig. 1d

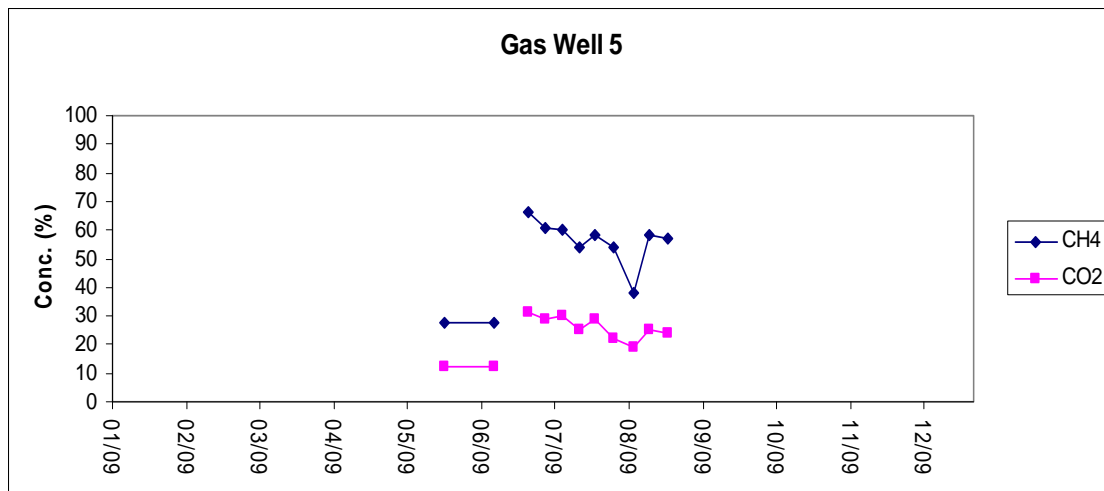
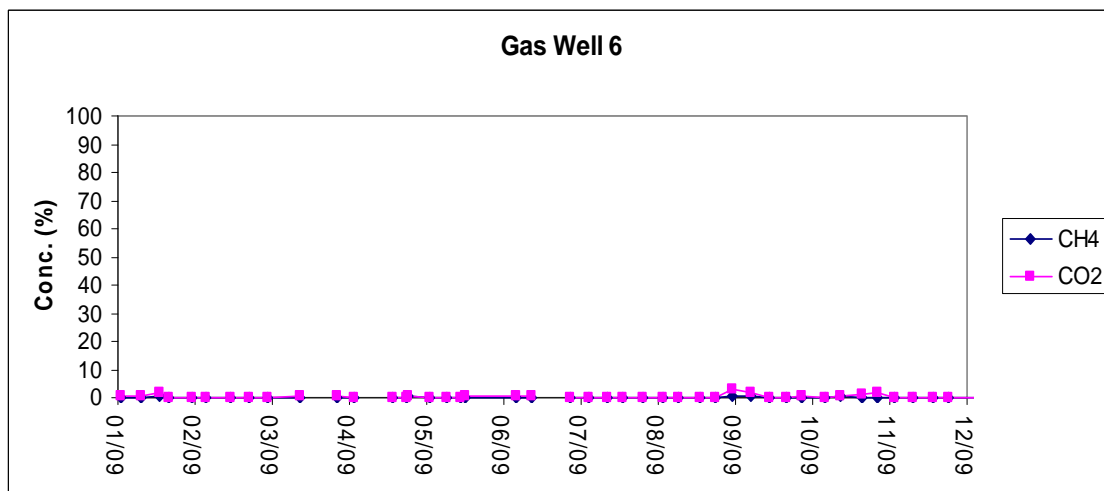


Fig. 1e





## 4.2. Dust

Three ambient dust monitoring surveys were completed during this reporting period 2009. Monitoring locations are shown in Drawing 1 in Appendix I. Results are summarised in Table 4.2 below. These results have previously been submitted to the Agency in the fourth quarter report for the facility.

**Table 4.2: Total Dust Monitoring Results.**

Sample location	Monitoring Period			Dust Deposition Limit (mg/m <sup>2</sup> /day)
	7th July/28th Aug 2009 (mg/m <sup>2</sup> /day)	9th Sept/ 8th Oct 2009 (mg/m <sup>2</sup> /day)	19th Oct/ 25th Nov 2009 (mg/m <sup>2</sup> /day)	
ST1	2344 (Organic Contamination - algal growth)	313	51	350
ST2	77	388 (Organic Contamination - Algal Growth)	127	350
ST3	Damaged	54	84	350
ST4	Damaged	53	Damaged	350
ST5	40	54	165	350

## 4.3 Noise

An annual noise monitoring survey was conducted on the 14<sup>th</sup> December 2009 at noise sensitive locations N1 to N4 and S1 to S4. The daytime noise limit value of 55dB(a) L<sub>L<sub>Aeq, 30 mins</sub></sub> was exceeded at 3 of the 8 monitoring locations. These were noted at monitoring locations S3, N2 and N3 where passing traffic was the main noise source. Excavation activities at the site also influenced the noise levels at locations N2 and N3, however these locations are within the site boundary and are not situated near any private residences.

A detailed report on the noise survey was submitted in the quarterly environmental monitoring report for October to December 2009.

#### 4.4 Groundwater, Surface Water and Leachate.

##### 4.4.1 Groundwater

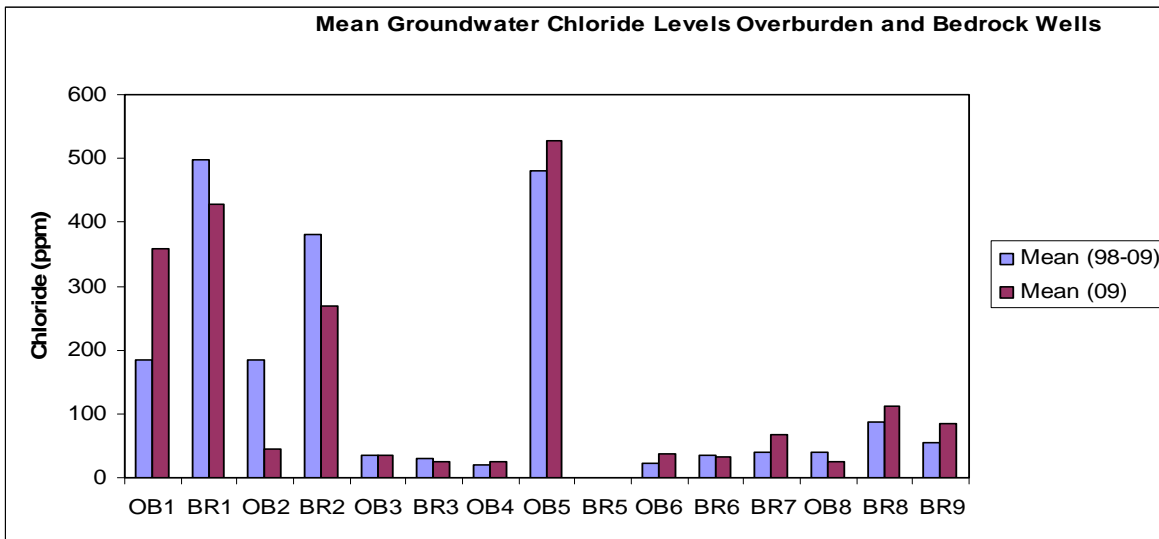
Groundwater monitoring was carried out in accordance with schedule E.4 of Waste Licence W0031-01 for the parameters and at the monitoring frequency specified in Table E.4.1 at locations: OB1, BR1, OB2, BR2, OB3, BR3, OB4, OB5, OB6, OB8, BR6, BR7, BR8 and BR9 (refer to Drawing No. 1 in Appendix I. for locations).

An additional well BR10 was installed in June 2008, but was damaged due to earthworks as part of the remediation project. This well, together with OB1 and OB5 were subsequently repaired in mid 2009, and monitoring at these 3 wells recommenced. Results for key parameters chloride and ammonia at all wells are summarised below.

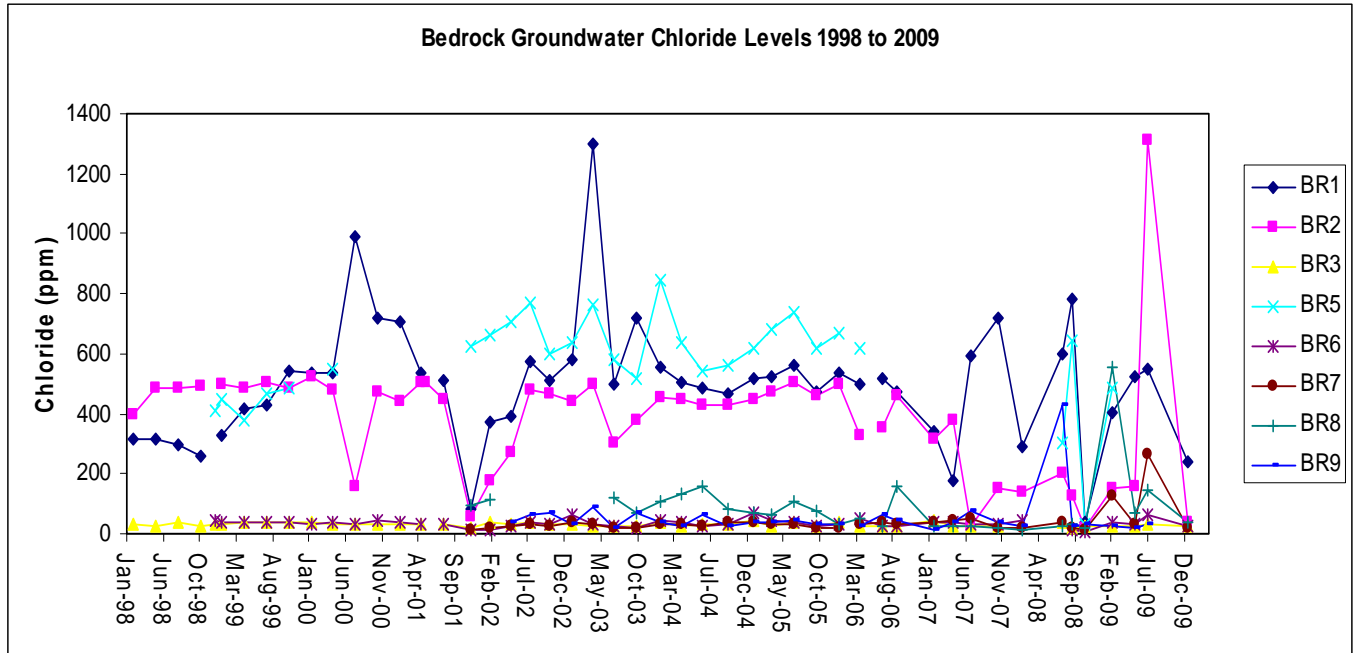
##### Chloride:

Groundwater chloride levels are graphed in figures 2 and 3 below. As can be seen from the graphs, higher chloride levels were observed in wells located close to the R. Fergus (OB1, BR1, OB2, BR2, and OB5). These elevated chloride levels may be in part attributed to the influence of the R. Fergus. Groundwater contamination from landfilling activities at the site may also be a factor (see section on ammonia below).

Fig. 2



**Fig. 3**



**Ammonia:**

Groundwater ammonia levels for the six-year period from January 2004 to December 2009 are graphed below in figures 4 to 12. Mean ammonia levels for the period are graphed in figure 13. As can be seen from the graphs, groundwater ammonia results have been elevated for onsite monitoring wells (OB1/BR1 and OB2/BR2) since monitoring commenced at the site. Highest results for 2009 were obtained at these four wells, particularly at BR2, which is located close to the south-western boundary of the site. Ammonia levels at BR2 had increased gradually in the previous two years, but values for 2009 have seen an overall reduction. BR2 is downgradient of zones 2 and 3 of the landfill. To determine whether the elevated ammonia levels at BR2 are due to a local problem around the well or to migration of leachate from zone 3 of the landfill, a new bedrock well (BR10) was installed upgradient of BR2 and downgradient of zone 3 in May 2008. Monitoring of this well commenced in June 2008 but ceased in November 2008 when the landfill remediation contractors accidentally lost the well when carrying out earthworks in the vicinity. BR10 was repaired mid 2009, and monitoring at BR10 recommenced in July 2009.

Results obtained between July and December 2009 are presented below in figure 12. As can be seen from the graph, BR10 ammonia results were unusually elevated. This indicates that the elevated ammonia levels observed at BR2 (and at BR10) are likely to be due to migration of leachate from Zone 3. Monitoring results for the R. Fergus to date do not indicate that this leachate plume is causing problems in the R. Fergus. However, further investigation is needed to confirm whether the R. Fergus is fed by groundwater flowing from the landfill direction. It is proposed to install 2 additional off site wells at locations as detailed in the 2008 AER by mid 2010. The EPA shall be notified in a separate correspondence on this matter in the near future. As expected, lowest ammonia levels were found in upgradient wells OB3, BR3 and BR7 and in the cross-gradient nested pair of wells OB6 and BR6. Mean ammonia levels at these locations were below 0.5ppm for this twelve-month monitoring period (see figures 9 to 11 and 13)

Fig. 4

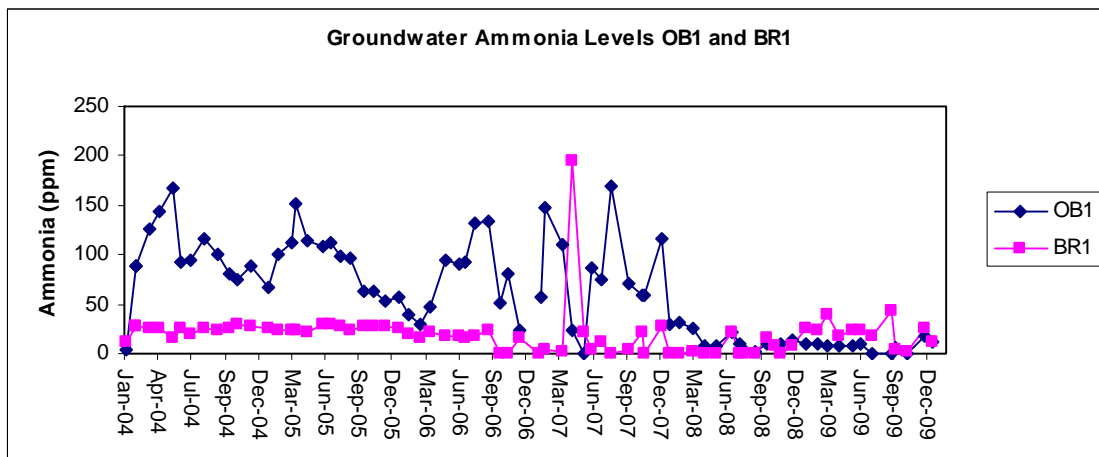


Fig 5.

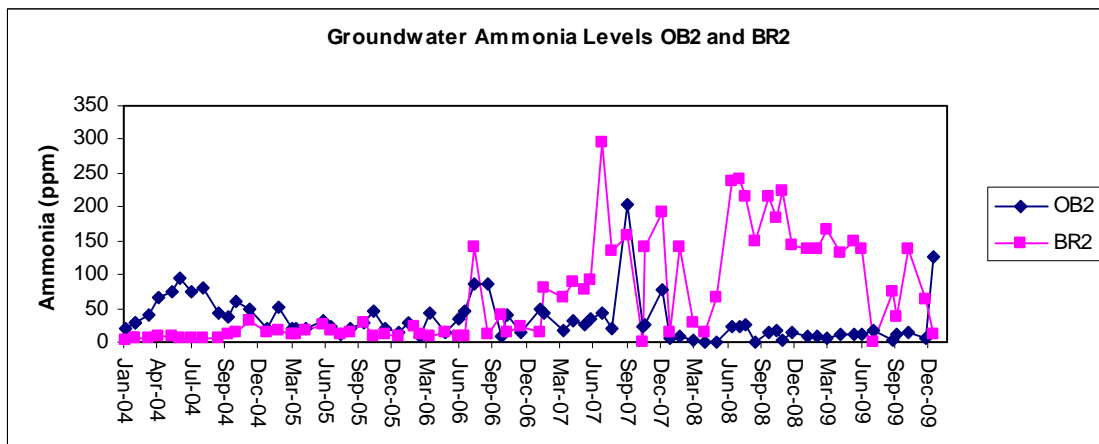


Fig 6.

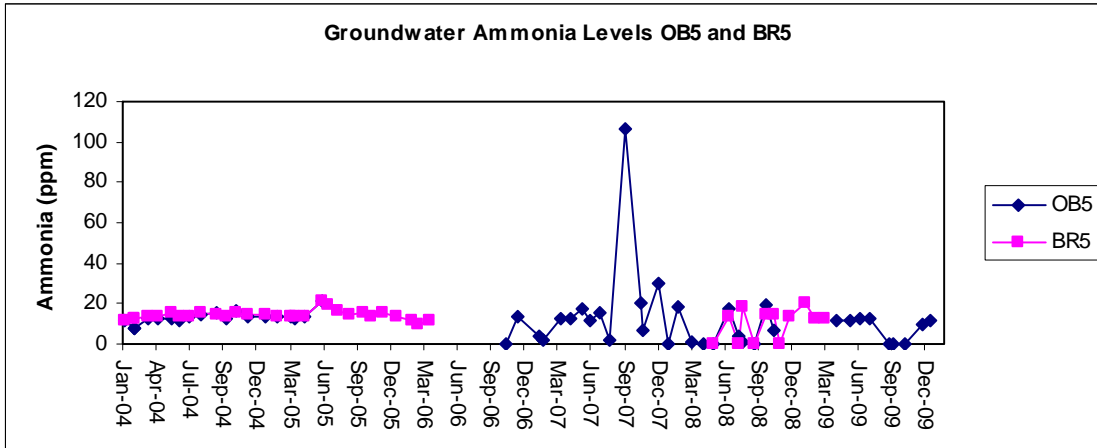


Fig. 7

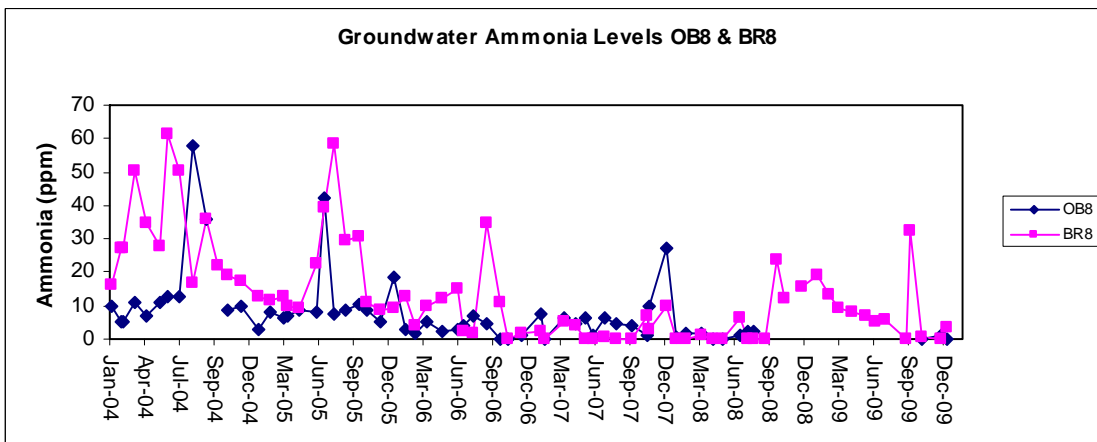


Fig. 8

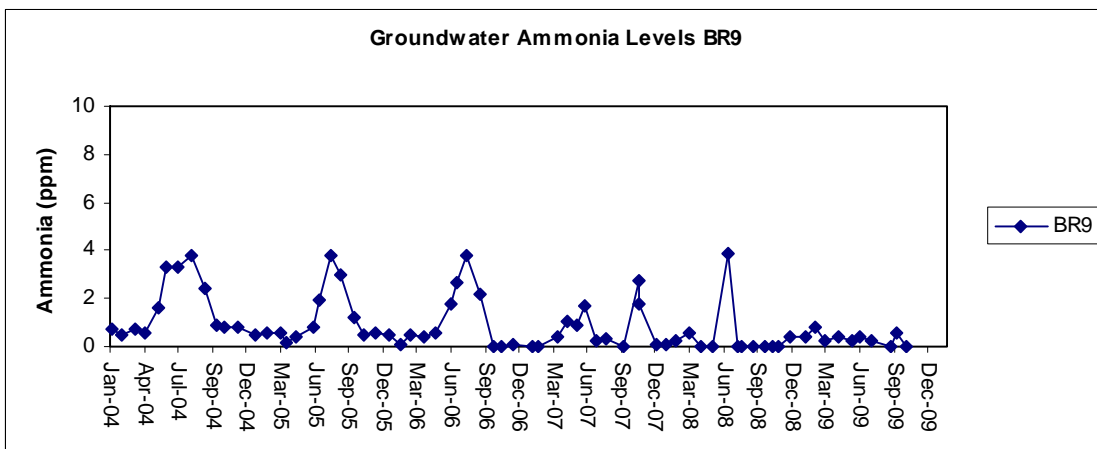


Fig. 9

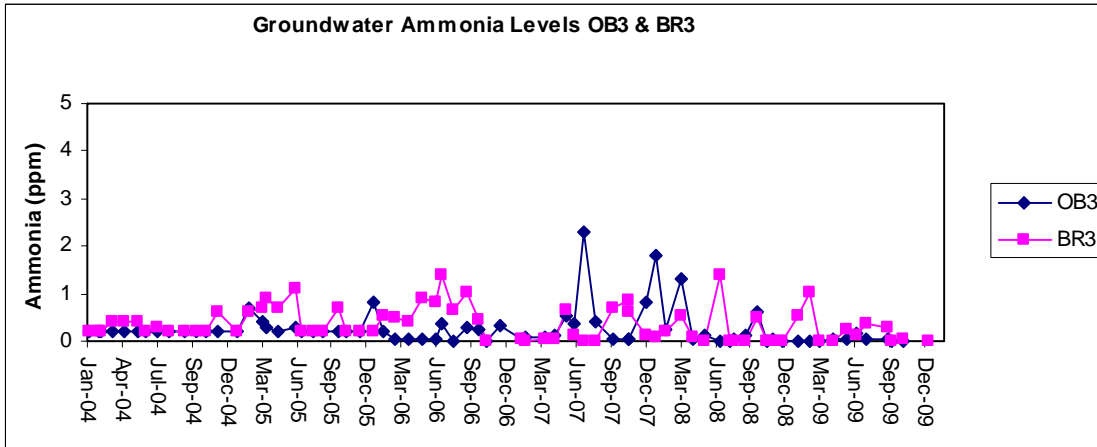


Fig. 10

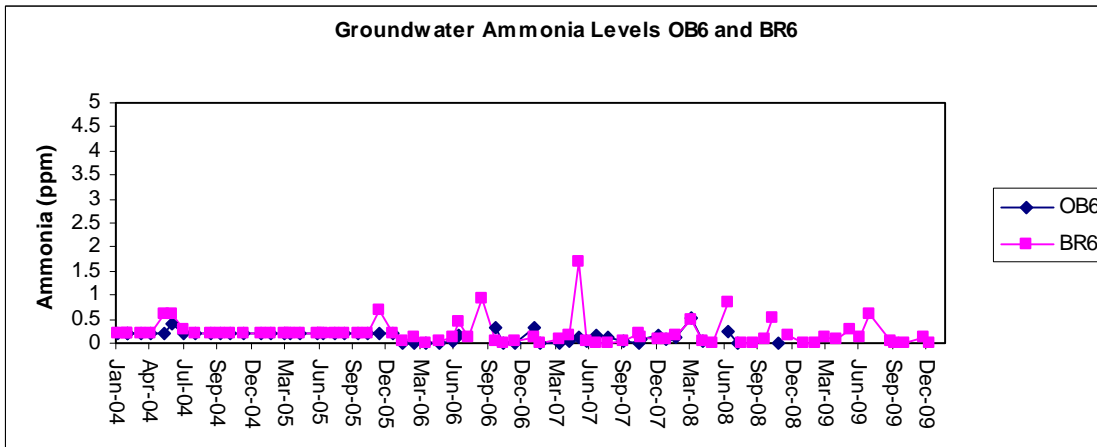
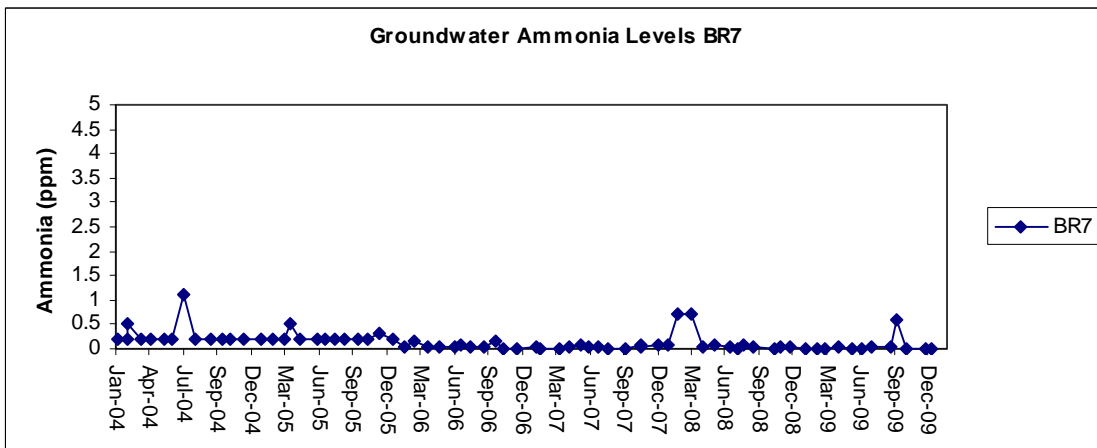
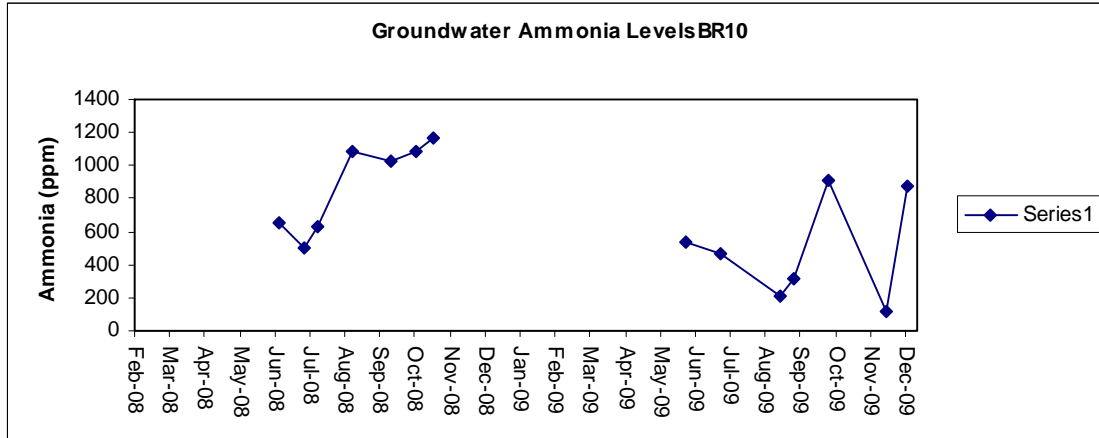


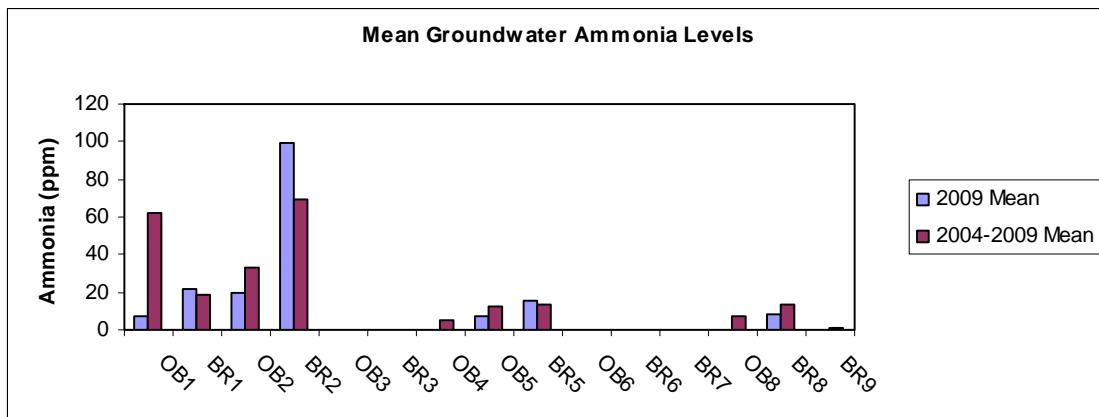
Fig. 11



**Fig. 12**



**Fig. 13**



**4.4.2 Surface Water**

Surface water monitoring was carried out during the year at the following locations: SW1, SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW11, SW12, SW13, SW14 and SW15. Monitoring locations are shown in Drawing no. 1 in Appendix I. Surface water samples were collected for analysis as specified in Table E.4.1 of Waste Licence W0031-01. In addition, monthly monitoring was carried out at SW2, SW3 and SW7 for pH, conductivity and ammonia levels.

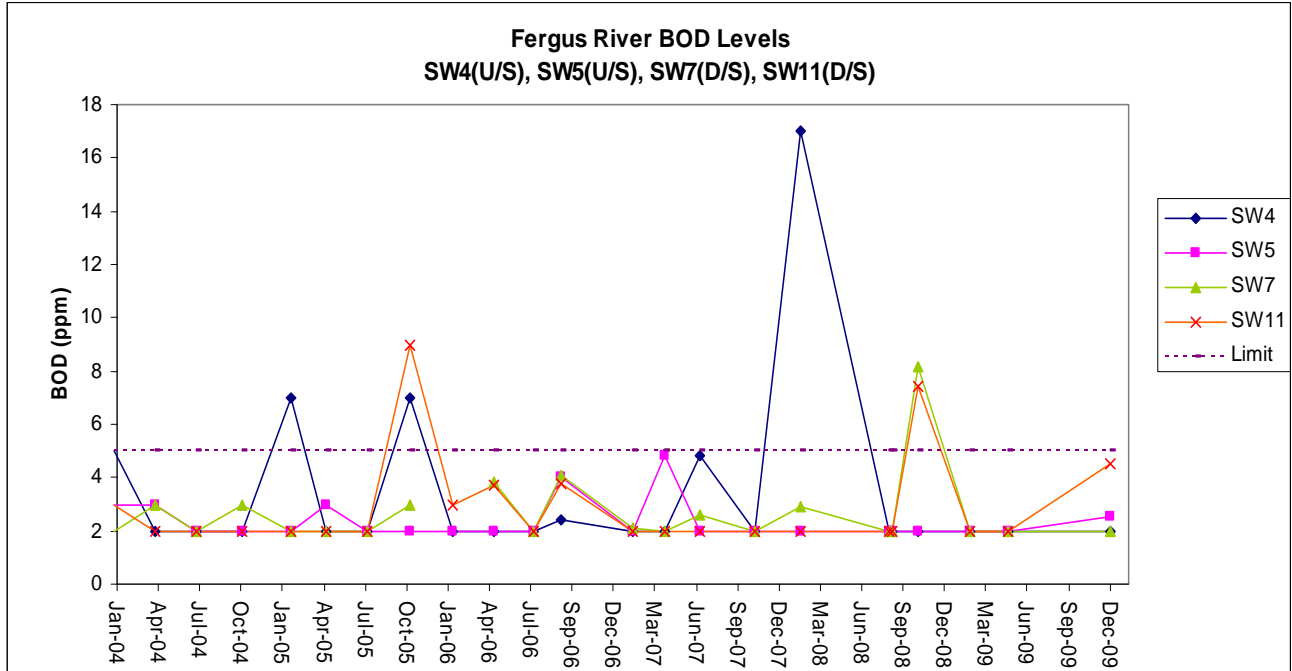
Results for key parameters ammonia and BOD are summarised in this report.

**BOD:**

BOD results for the R. Fergus and R. Gaurus for the six-year period from 2004 to 2009 are graphed in figures 14 and 15 respectively. The R. Fergus is classified as a Salmonid water<sup>1</sup> to which a 5ppm BOD limit applies. This limit is shown in figure 14.

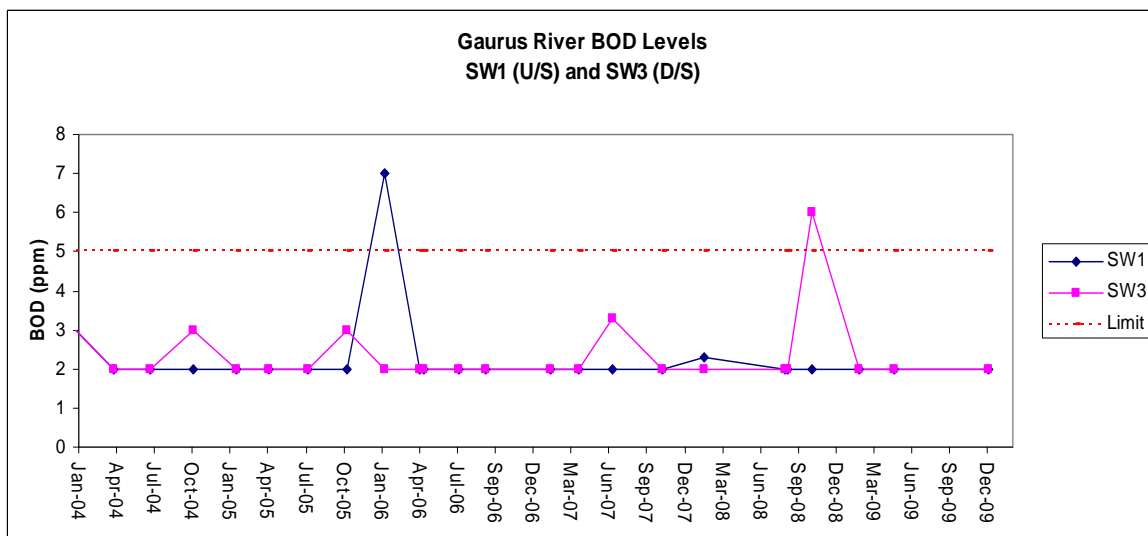
1: From European Communities (Quality of Salmonid Waters) Regulations, 1988 (SI No. 293 of 1988). Note that the freshwater fish directive 2006/44/EC does not include a mandatory BOD limit but does include a guide BOD level of  $\leq 3\text{ppm}$  for salmonid waters.

**Fig. 14**



Gaurus River BOD results are graphed in figure 15. The 5ppm salmonid limit is also shown on this graph for comparative purposes.

**Fig. 15**

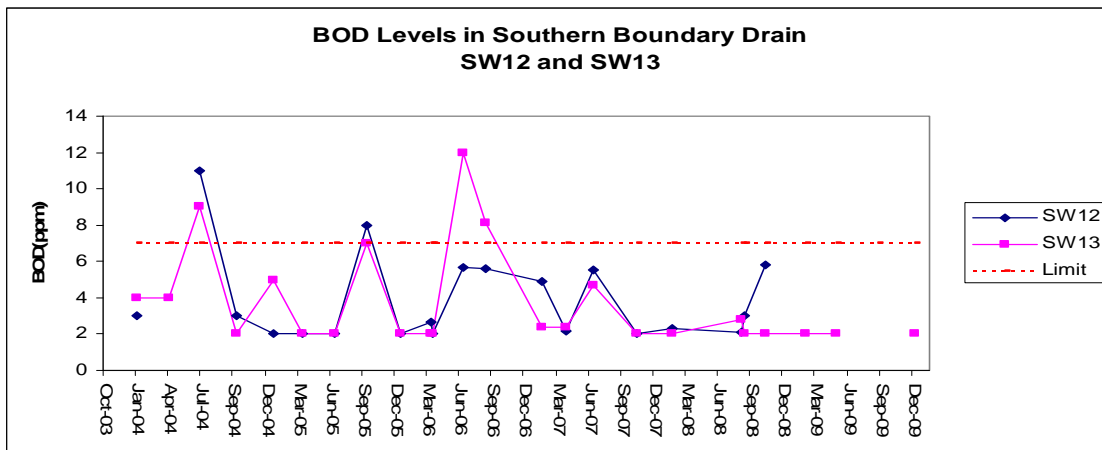




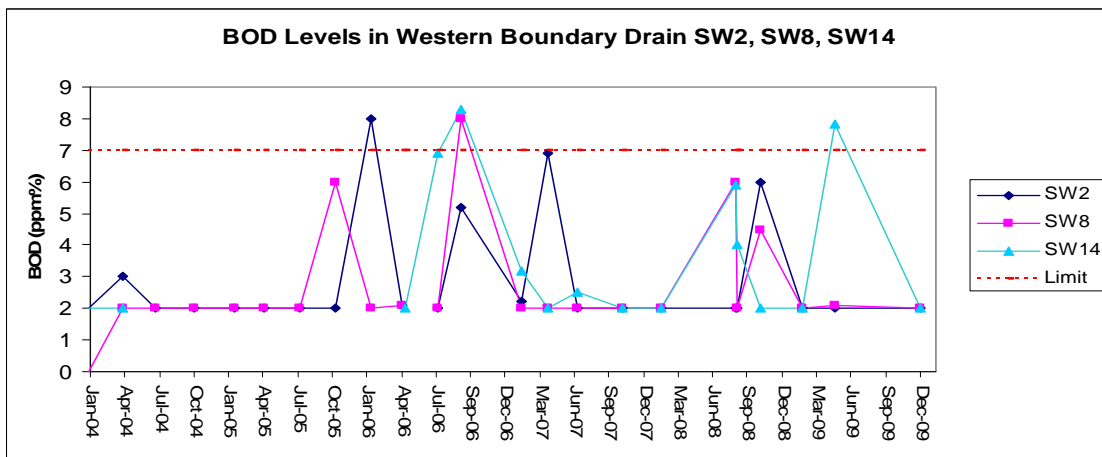
There are two surface water sampling locations (SW12 and SW13) on the eastern boundary drain. This drain runs in a southerly direction along the eastern boundary and is piped underground close to the southern site boundary, feeding into the R. Fergus upstream of Doora Bridge. BOD levels in the eastern boundary drain are graphed in figure 16.

There are three sampling locations on the western boundary drain (SW2, SW8 and SW14) which feeds into the R. Gaurus downstream of SW2. Results for this drain are graphed in figure 17. Also included on the graphs is the 7ppm BOD for A3 waters from the Surface Water Regulations (1989). This limit is included for comparative purposes only; no limits exist for BOD levels in site drains.

**Fig 16.**



**Fig 17.**

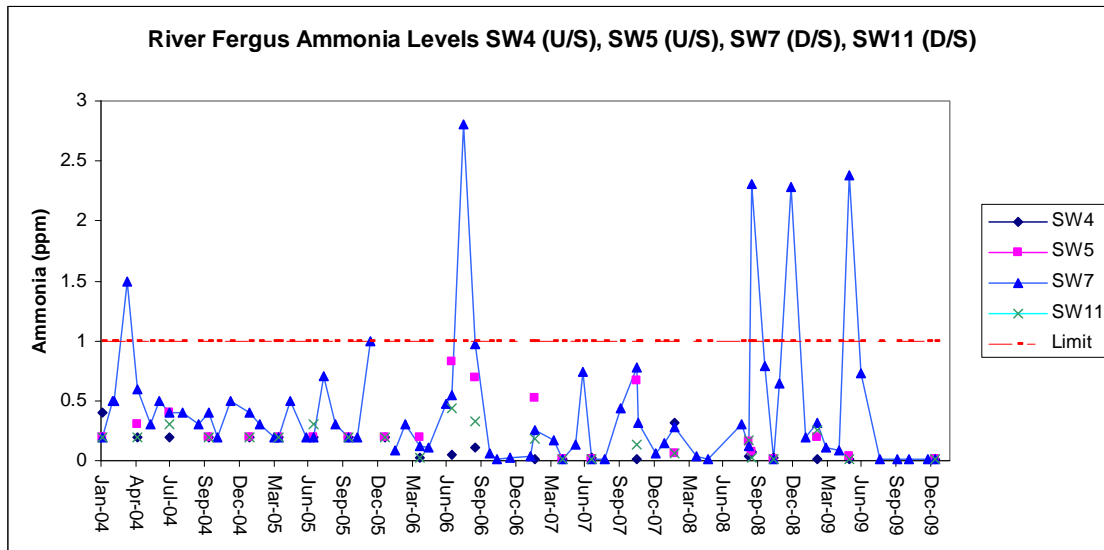


**Ammonia:**

Ammonia results for Gaurus and Fergus river samples for the six-year period from January 2004 to December 2009 are graphed in figures 18 and 19 respectively. Also shown on the graphs is the 1ppm ammonia limit for Salmonid Waters. This limit is included in the Gaurus river graph for comparative purposes only.

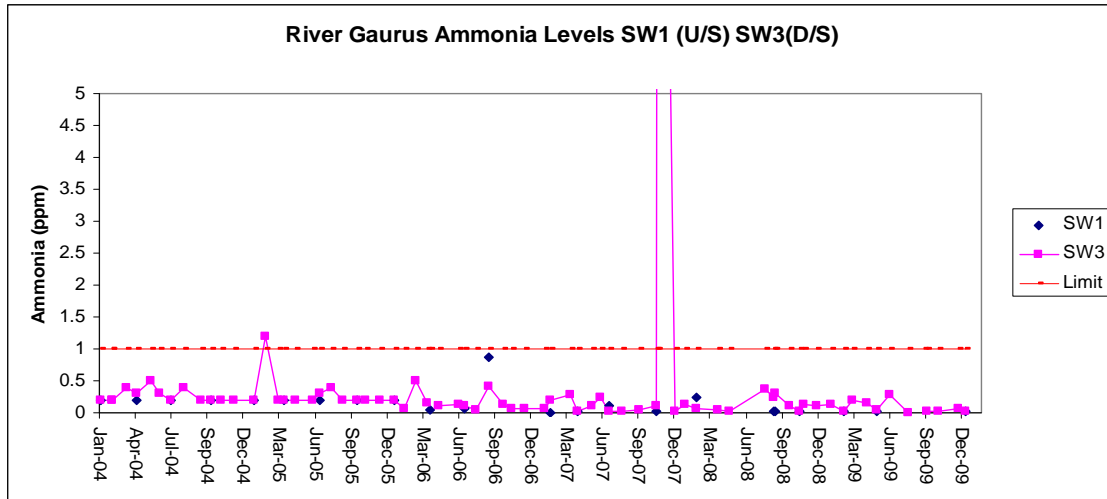
As can be seen from figure 18, ammonia levels at SW7 (Doora Bridge) exceeded the 1ppm salmonid limit on one occasion in 2009, in May 2009 (2.38ppm). The limit was previously exceeded at this location during August and December 2008. The elevated ammonia levels may be associated with discharges to the Fergus from three significant combined storm overflows (CSO's) discharging to the R. Fergus upstream of SW7 and SW11. With the heavy rainfall that occurred during 2008, particularly in August and October, and in May 2009 it is very likely that the discharge from these CSO's is responsible for the intermittent elevated ammonia levels observed at SW7 and at SW11.

**Fig. 18**



Ammonia results for Gaurus river location SW1 (upstream of the landfill) have been below 1ppm for the six year period from January 2004 to December 2009. Ammonia results at SW3 (downstream of the landfill) remained below 1ppm for the 2009 period.

**Fig. 19**



Ammonia results for the western and eastern boundary drains from January 2004 to December 2009 are shown in figures 20 and 21.

**Fig. 20**

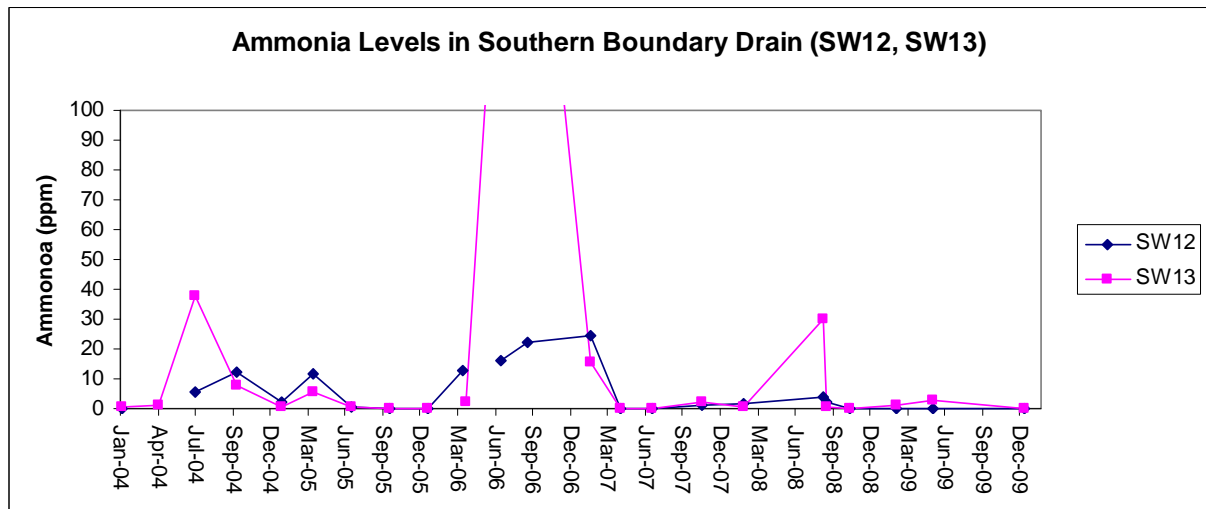
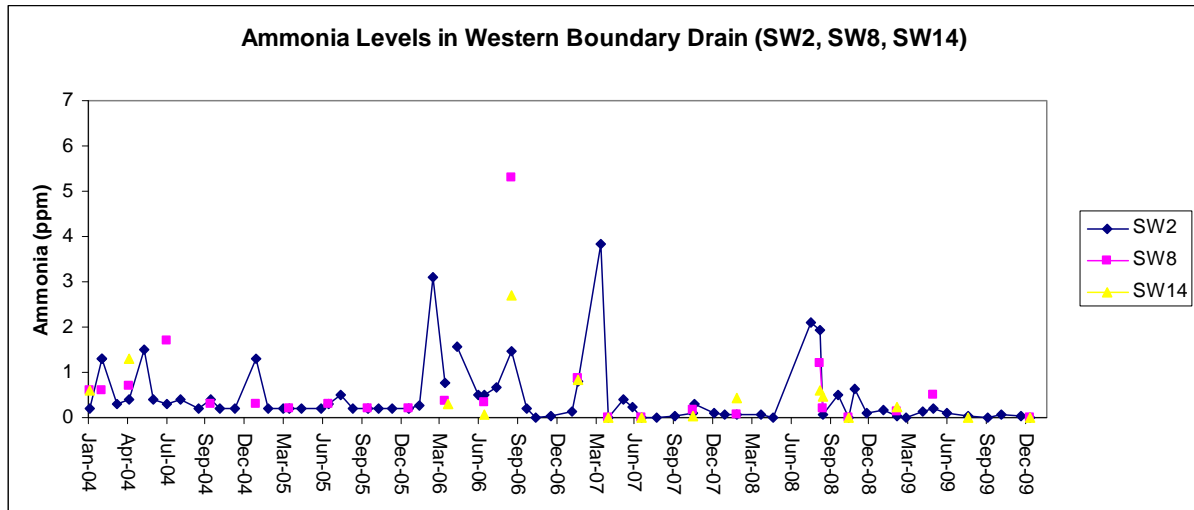


Fig. 21



Ammonia levels at all locations on the Southern and Western boundaries have remained consistently low for the 2009 period. Historical elevated ammonia levels displayed in Figures 20 & 21 are explained in previous AER's and other correspondence to the EPA.

#### 4.4.3 Leachate

Leachate monitoring was conducted in accordance with Schedule E.4 of Waste Licence W0031-01 for the parameters and at the monitoring frequency specified in Table E.4.1 at locations L1, L6, L7, L8 and L9 (see Drawing No. 1 in Appendix I for locations). A new leachate abstraction well (L10) was installed in mid 2008 in zone 3 of the landfill. Monitoring of this well commenced in July 2008.

Ammonia, BOD and COD results for leachate wells are graphed in figures 22 to 25.

As would be expected given the locations of L8, L9 and L10 in Zone 3 (the area of most recent waste deposition) BOD, COD and ammonia levels were higher in these wells than in zone 1 (L1) and zone 2 (L6).

Fig. 22

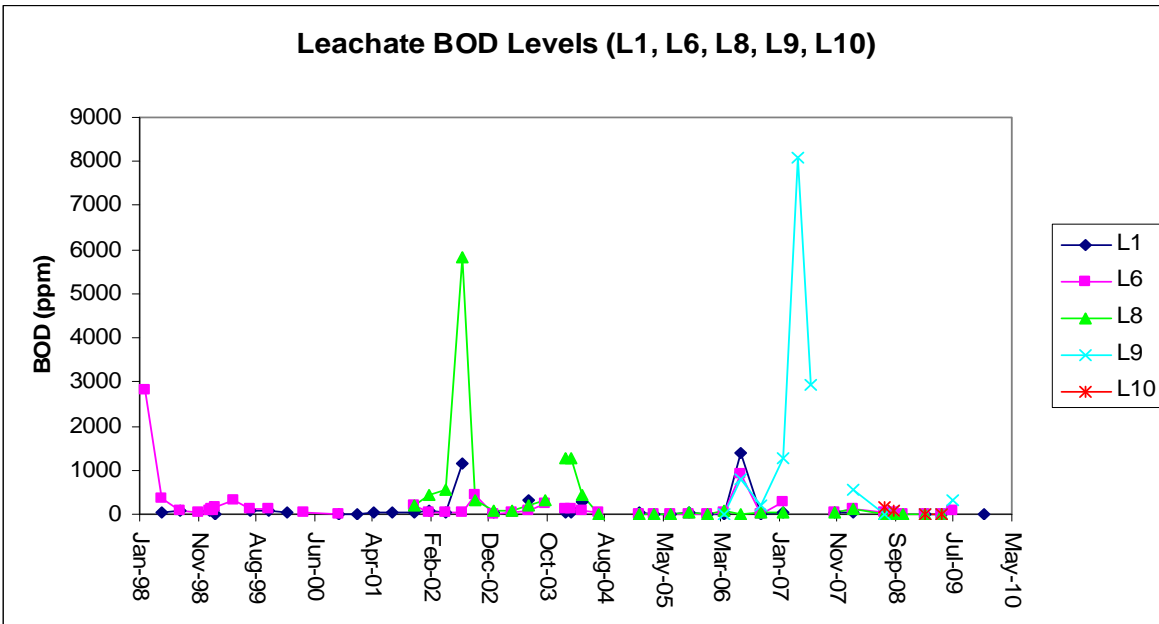
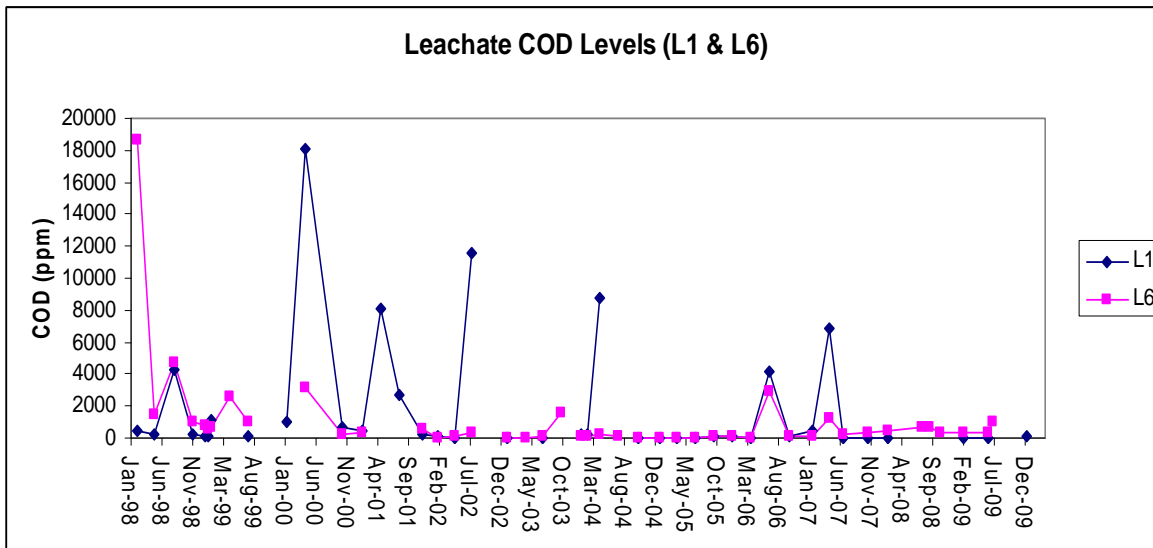
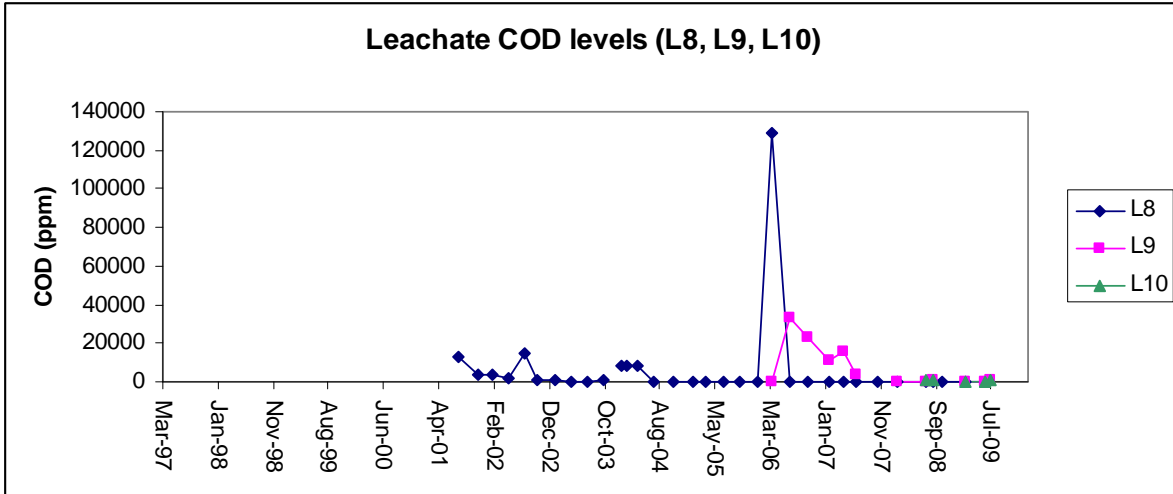


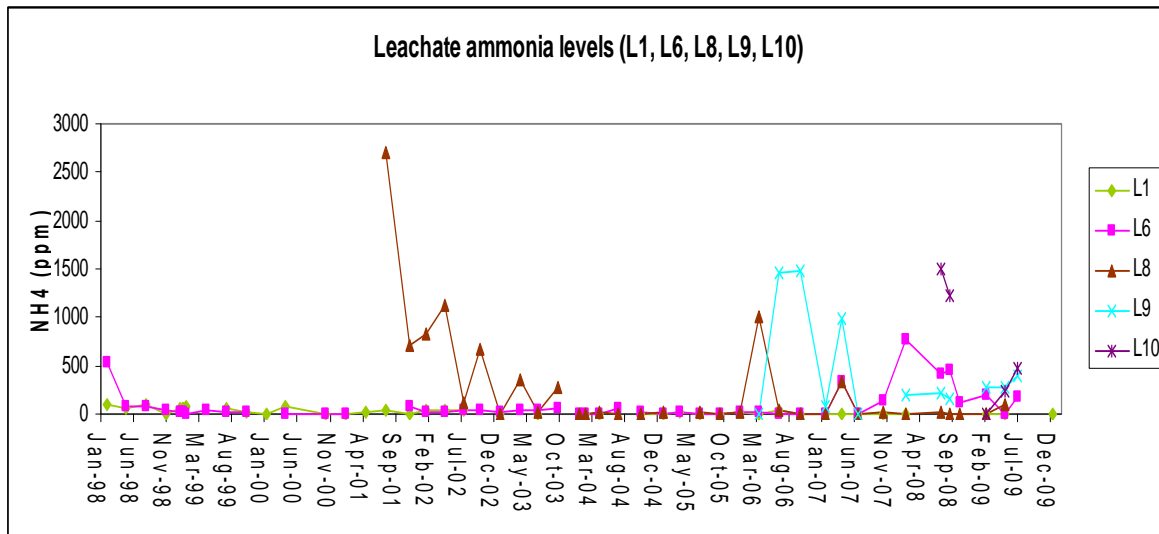
Fig. 23



**Fig. 24**



**Fig. 25**



**4.5 Landfill Gas Flare Unit.**

Emissions to atmosphere from the enclosed landfill gas flare were monitored in accordance with the requirements of Schedule E.5. of Waste Licence W0031-01. This monitoring was carried out by TMS Environment monitoring staff, on the 23<sup>rd</sup> September and the 14<sup>th</sup> December 2009. Monitoring results are presented below in Table 4.3:

Parameter/units	23rd September 2009	14th December 2009	Emission Limit <sup>1</sup>
Nitrogen Oxides (NO <sub>x</sub> ) as NO <sub>2</sub> (mg/Nm <sup>3</sup> )	109.3	<2.1	150 mg/m <sup>3</sup> for Flare Stacks
Carbon Monoxide (CO) (mg/Nm <sup>3</sup> )	<1.9	5.4	50 mg/m <sup>3</sup> for Flare Stacks
Sulphur Dioxide (SO <sub>2</sub> ) (mg/Nm <sup>3</sup> )	<4.4	<2.9	-
Temperature (°C)	1000	1381	-
Volumetric Flow Rate (Nm <sup>3</sup> /hr)	225	111.5	-
Vinyl Chloride (mg/Nm <sup>3</sup> )	<1.56	-	-
Acetonitrile (mg/Nm <sup>3</sup> )	<1.56	-	-
Dichloromethane (mg/Nm <sup>3</sup> )	<1.56	-	-
Tetrachloroethylene (mg/Nm <sup>3</sup> )	<1.56	-	-
TA Luft Class I (mg/Nm <sup>3</sup> )	<1.56	-	20 mg/m <sup>3</sup> (at mass flows >0.1 kg/hr)
TA Luft Class II (mg/Nm <sup>3</sup> )	<1.56	-	100 mg/m <sup>3</sup> (at mass flows >2 kg/hr)
TA Luft Class III (mg/Nm <sup>3</sup> )	<1.56	-	150 mg/m <sup>3</sup> (at mass flows >3 kg/hr)
HCl (mg/Nm <sup>3</sup> )	<4.03	-	50 mg/m <sup>3</sup> (at mass flows >0.3kg/hr)
HF (mg/Nm <sup>3</sup> )	0.58	-	5 mg/m <sup>3</sup> (at mass flows >0.05 kg/hr)

All results were within emission limit values specified in Schedule F.4. of Waste Licence W0031-01.

## **4.6 Biological Monitoring**

A Biological Monitoring survey was carried out in May and October 2009 in accordance with Condition 9, Schedule E of WL 31-1. Results were provided to the Agency under separate cover. Survey conclusions are summarised below:

### **4.6.1 Gaurus River**

The slight deteriorations at WQ1 and WQ3 as observed during the 2008 period have appeared to have reversed in the year 2009. WQ1 saw the 2008 rating (Q3) improve to a Q3-4 rating for 2009. This rating is in line with historic data for the location.

A similar result was observed at WQ3, where the rating returned to a Q3 for 2009, an improvement on the Q2-3 rating reported for 2008.

### **4.6.2 Fergus River**

Three sites are monitored on the R. Fergus: WQ4, WQ5 and WQ6. Sites WQ4 and WQ6 upstream and downstream of the confluence of the Fergus and Gaurus rivers, were given tentative Q-ratings of Q3 in 2008, indicating moderately polluted conditions.

For the 2009 period, a slight deterioration was observed at WQ4, 5, & 6, with results for the October monitoring reporting a tentative rating of Q2-3 for all three locations. The poor water quality in the R. Fergus immediately upstream and downstream of the R. Gaurus confluence would appear to be due to upstream conditions in the Fergus rather than any impact from the Gaurus, however an impact from the R. Gaurus on both sites on incoming and outgoing tides cannot be conclusively ruled out.

The ongoing monitoring since 2002 have shown that the sites monitored on the R. Fergus have a very unstable invertebrate community. This instability is likely due to the tidal and occasional saline conditions at these sites.

It cannot be concluded from the invertebrate data that there is an adverse impact on the Fergus from the landfill, however, given the tentative nature of the Q-ratings at these sites a minor impact cannot be ruled out.



	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6
<b>April 2002</b>	4-5	3-4	3	3	3	3
<b>May 2002</b>	4	3-4	3	3	3	3
<b>April 2003</b>	4	3-4	3	3	3	3
<b>June 2003</b>	3-4	3-4	3	3	3	3
<b>Sept. 2003</b>	3-4	3	3	3	3	3
<b>July 2004</b>	3	3	3	3	3	3
<b>Sept 2004</b>	3-4	3	3	3	3	3
<b>May 2005</b>	3-4	3	3	3	3	3
<b>Sept 2005</b>	3-4	3-4	3	3	2-3	3
<b>May 2006</b>	3-4	3	3	2-3	2-3	2-3
<b>Sept 2006</b>	3-4	3	3	3	3	3
<b>May 2007</b>	3-4	3	3	3	3	3
<b>Aug 2007</b>	3	3	3	3	3	3
<b>May 2008</b>	3-4	3	3	3	3	3
<b>Aug 2008</b>	3	3	2-3	3	3	3
<b>May 2009</b>	3-4	3	3	2-3	3	2-3
<b>Oct 2009</b>	3-4	3	3	2-3	2-3	2-3

#### 4.7 Odours

No odour problems were encountered during the reporting period.

## 5.0 Monthly Water Balance Calculations and Interpretation

Total effective rainfall for the reporting period was calculated using monthly data from the Shannon Airport Meteorological Station. Rainfall details are summarised in Table 5.1:

**Table 5.1 Rainfall Details For Shannon Airport From January to December 2009**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Rainfall	120.4	15.7	64.0	86.5	103.2	58.5	115.3	118.6	58.4	86.6	263.6	72.7
P <sub>1</sub>	13.16	16.62	38.31	52.65	78.09	105.69	86.13	64.42	49.35	28.14	16.13	9.02
E.R. <sub>1</sub>	107.24	-0.92	25.69	33.85	25.11	-47.19	29.17	54.18	9.05	58.46	247.47	63.68

Note<sup>1</sup>: Evapotranspiration values (Penman).

Note<sup>2</sup>: Effective rainfall

The effective rainfall for the period January to December 2009 was **605.79mm**.

The water balance calculation for the period is set out in Table 5.2 below:

**Table 5.2: Water Balance Calculation at Infiltration Rates from 10-30%.**

Capped area infiltration (%)	Active Area	Active area infiltration	Capped Area (m <sup>2</sup> )	Total rainfall (m)	Net Leachate 2009 (m <sup>3</sup> )
30%	0	0	186,900	0.606	33,978.42
20%	0	0	186,900	0.606	22,652.28
10%	0	0	186,900	0.606	11,326.14

As for previous reports, the rainfall infiltration through capping was assessed at three infiltration rates (10%, 20% and 30%), based on a variation in capping thickness throughout the site. At these infiltration rates, the theoretical total leachate production for the period ranged from 11,326.14m<sup>3</sup> to 33,978.42m<sup>3</sup>. Final capping has been in place throughout the site since early November 2008 so in practice, the actual amount of rainfall infiltration will be at the lower end of the range from that time.

## 6.0 Volume of Leachate Produced and Discharged On Site

The theoretical assessment of leachate generation at the Doora site was based on the monthly water balance calculation provided in Table 5.2. As the landfill was operated on the “dilute and disperse” principle, it is not possible to provide an absolute value for leachate volumes arising during the year. The volume of leachate produced is linked to two external factors (in addition to the moisture content of the waste deposited):

- Possible infiltration from tidal movement as the landfill site is below the high water mark.
- Rainfall infiltration.

Infiltration from tidal movement cannot be quantified. An assessment of tidal infiltration was made from two wells in Zones 2 and 3 in January 2004 and no link was found (8m well depth). This assessment was not carried out in Zone 1 so the possibility of tidal infiltration can't be ruled out here but observations from monitoring data indicate that Zone 1 is virtually dry with very little leachate produced.

The most significant factor limiting rainfall infiltration and resultant leachate production at Doora is the extent of capping in place at the facility. Prior to November 2008, there were varying depths of soil cover through the site. Trial pit investigations revealed that the majority of Zone 3 had a capping thickness of >1.5m. The southern part of Zone 3 had up to 6m of cover and in the northeast, the cover ranged from 3.5 to 5m. Less capping was in place in the older landfilled zones - Zones 1 and 2. Areas in each of these zones had between 0.5 and 2m of capping in place but there were sections with less than 0.5m of cover. Since November 2008, the required thickness of final capping material has been in place throughout the site and rainfall infiltration should now be minimal.

Based on the water balance calculations for the period (given in table 5.2), the theoretical minimum daily volume of leachate generated was 31m<sup>3</sup> and the maximum volume generated was 93m<sup>3</sup>. This assumes that the level of rainfall infiltration ranges from 10% to 30%, depending on the level of capping in place.

## **7.0 Cumulative Annual Emissions to Groundwater**

Leachate is the most significant emission to groundwater from the site. Monitoring results indicate that leachate is more likely to be discharging to ground than to surface waters. Theoretical leachate volumes are addressed in Sections 5 and 6 above. In summary, the theoretical leachate generation for 2009 ranged from 31m<sup>3</sup> to 93m<sup>3</sup> per day. The direction of groundwater flow is northeast to southwest across the site, towards the Fergus river. Additional wells will be installed in mid 2010 to establish whether the groundwater flows into the Fergus river. Existing information from investigations on Drumcliffe Springs in the same bedrock body, located approx 3.5km to the northwest of the landfill, indicate that there is no hydrological link between surface and groundwater bodies.

In the latter period of 2009, a dedicated leachate storage tank was commissioned, as planned under the remediation project. Off site tankering has commenced, and shall remain an on going activity at the site.

## **8.0 Resource and energy consumption**

### **8.1 Fuels usage**

All machinery fuel use on site during 2009 was related to the landfill restoration project, which commenced in August 2008 and was ongoing throughout 2009. The estimated fuels usage due to these works can be obtained from the contractor if requested.

### **8.2 Electrical usage:**

The facility is a closed landfill site with no power-consuming equipment in use except for the landfill gas flare and the leachate abstraction pumps. Approximate data on electrical usage for the period is as follows:

Day Units: 13,500

Night Units: 6,129

### **8.3 Water usage**

No full-time staff have been employed at the site since October 2004. Only monitoring personnel access the site at present. Monitoring staff work on site for one to two days per week with occasional use of the toilet facilities, giving an estimated maximum water usage of 60 litres per week (2 x 30litres per day).

Calculated water usage from January to December 2009 3.0m<sup>3</sup>.

## **9.0 Review of nuisance controls**

### **9.1 Site Inspection**

As Doora landfill is a closed facility, site inspections are no longer formally carried out. However Council staff visit the facility once per week at a minimum, to carry out surface water visual inspections and to measure gas and leachate levels. No nuisance was noted during these site visits.

### **9.2 Litter Control**

Doora landfill is a closed facility. The most significant potential issue in relation to fresh litter would be fly tipping outside the site entrance. There was no incidence of fly tipping during this reporting period. Clare County Council personnel carry out informal litter audits as part of the weekly surface water visual inspection surveys. There were no litter problems noted.

### **9.3 Bird Control**

No bird nuisance was observed by Council staff or reported to the Council by any other person during the reporting period. Since closure of the landfill and capping of the waste body birds have not been a problem.

### **9.4 Odour Control**

No odours were observed by Council staff or by our monitoring consultants during this reporting period. The Council received no complaints of odours relating to Doora landfill during the period.

## **10.0 Environmental objectives and targets.**

A copy of the Environmental Objectives and Targets is included in Appendix II.

## **11.0 Summary of procedures developed in 2009.**

No new procedures were developed during this reporting period.

## 12.0 Incidents

Ten incident reports were submitted to the Agency during this reporting period.

Details are provided in Table 12.1 below:

**Table 12.1: Summary of Incident Reports for the period.**

<b><i>Incident Report No.</i></b>	<b><i>Details of Incident</i></b>	<b><i>Follow-up action taken</i></b>
<i>Doora 09/01</i>	<i>Carbon dioxide levels exceeded the CO<sub>2</sub> trigger of 1.5% at OSW2</i>	<i>Weekly monitoring to continue. No other action deemed necessary as this is considered to be a naturally occurring phenomenon-these off-site wells were installed in peat. No methane has been detected in either perimeter well since installation in August 2005.</i>
<i>Doora 09/02</i>	<i>Carbon dioxide levels exceeded the CO<sub>2</sub> trigger of 1.5% at OSW2</i>	<i>See 09/01 above</i>
<i>Doora 09/03</i>	<i>Carbon dioxide levels exceeded the CO<sub>2</sub> trigger of 1.5% at OSW2</i>	<i>See 09/01 above</i>
<i>Doora 09/04</i>	<i>Dust monitoring results at ST1 &amp; ST2 were above the dust deposition limit in August 2009</i>	<i>None considered necessary. Exceedence is not considered to be due to site activities-algal growth in sample</i>
<i>Doora 09/05</i>	<i>Noise limit exceeded at off site noise sensitive location S3</i>	<i>None considered necessary. Copy of noise survey included in 4<sup>th</sup> Quarter report. Primary cause of noise exceedence due to passing road traffic. Activities at facility not responsible.</i>

## 12.2 Complaints

No complaints were received during the reporting period.

## 13.0 Development works undertaken and proposed development of the facility with timescale

Restoration of the landfill completed in latter half 2009. As part of the facility restoration, the site has been developed for recreational purposes. The completed development includes two sports pitches (located in Zone 1). A new entrance has been constructed to the east of the existing entrance, giving access to a public car park. From the car park there is a pedestrian-only access to the sports pitches and to zones 2 and 3, where a network of landscaped scenic walks have been completed.

#### 14.0 Annual and cumulative quantities of landfill gas

The volume of gas production at Doora Landfill was estimated using a computerised gas model called "LandGEM Version 3.20", which was developed by the US EPA. based on weighbridge data for waste tonnage information from 1998 to 2001 and on estimated tonnages for the period prior to 1998. As part of the restoration and aftercare plan for Doora landfill, the Landgem gas generation model was run for the facility in August 2006, with each of the three zones addressed separately. Results from this model for 2009 are shown below in table 15.2:

**Table 15.2: Results from Landgem Gas Model for 2009**

<b>Zone</b>	<b>Landfill Gas m<sup>3</sup>/yr</b>	<b>Methane m<sup>3</sup>/yr</b>
<b>1</b>	<b>2.8X10<sup>5</sup></b>	<b>1.4X10<sup>5</sup></b>
<b>2</b>	<b>9.1X10<sup>5</sup></b>	<b>4.1X10<sup>5</sup></b>
<b>3</b>	<b>3.2X10<sup>6</sup></b>	<b>1.4X10<sup>6</sup></b>
<b>Total</b>	<b>4.39X10<sup>6</sup></b>	<b>1.95X10<sup>6</sup></b>

The final landfill gas production figures derived using the Landgem model were similar to the figures obtained using the 1st Order Decay method. The Landgem model is based on the original first order decay model. The additional information provided from running each zone separately under the Landgem model indicates, as would be expected, that practically all of the theoretical tonnage of landfill gas generated is coming from Zone 3.

## **15.0 Financial provisions, staffing and public information.**

### **15.1 Budgetary allocations for the facility.**

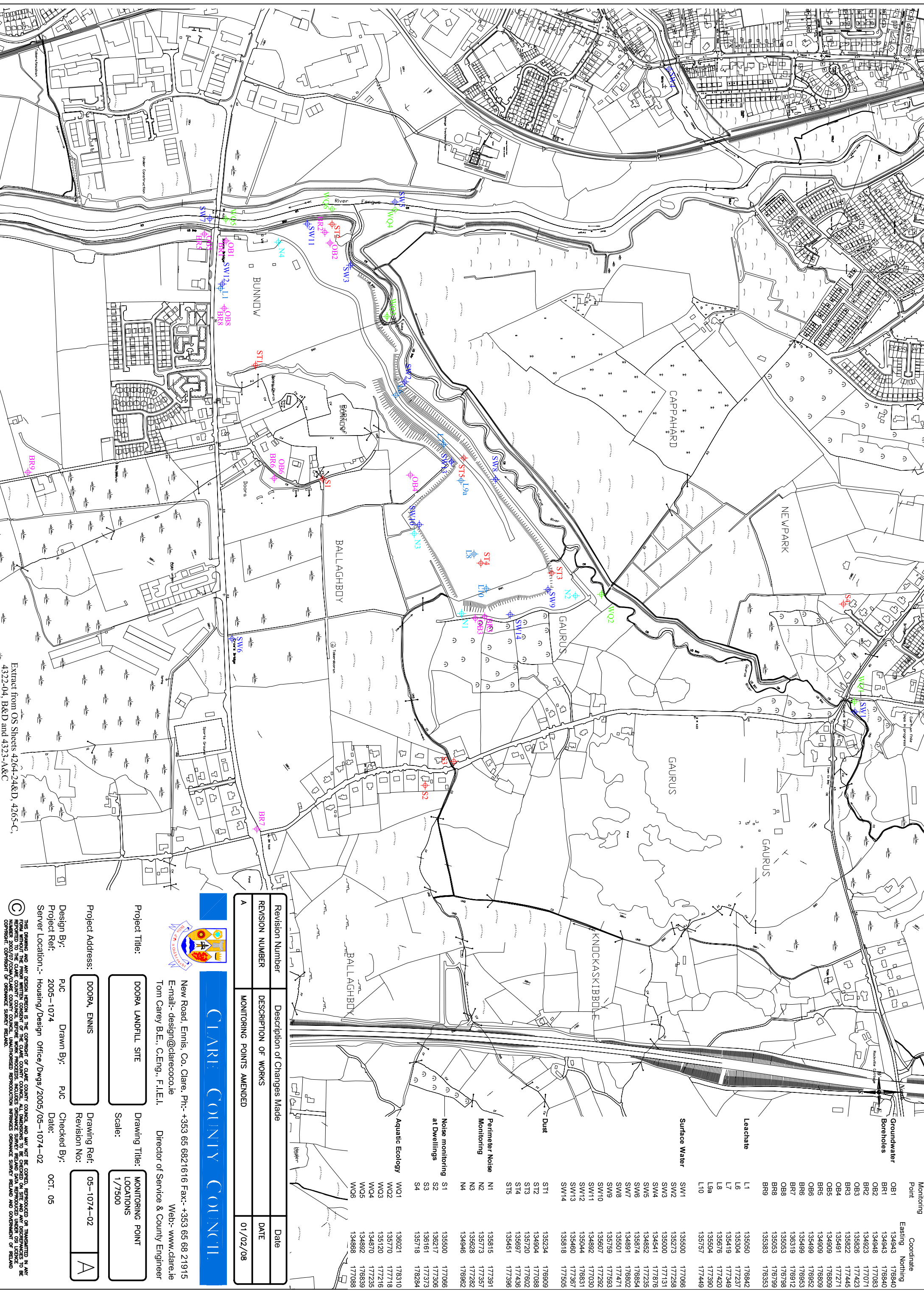
The maintenance budget for the facility for 2009 is €96,000. The cost of permanent restoration and landscaping is €1.3m.

### **15.2 Public Information.**


Information relating to monitoring of the facility and correspondence to/from the EPA is available for inspection at the Environment Section of Clare County Council, Áras Contae An Chláir, New Road, Ennis, County Clare.



## **APPENDIX 1**



Extract from OS Sheets 4264-24&D, 4265-C, 4322-04, B&D and 4323-A&C



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**Project Title:** DOORA LANDFILL SITE MONITORING POINT LOCATIONS

**Project Address:** DOORA, ENNIS

**Design By:** PJC **Drawn By:** PJC **Checked By:** PJC

**Project Ref:** 2005-1074 **Date:** OCT. 05

**Server Location:** Housing/Design Office/Dwgs/2005/05-1074-02

**Drawing Ref:** 05-1074-02 **Revision No:** A

Revision Number	Description of Changes Made	Date
A	MONITORING POINTS AMENDED	01/02/08

Monitoring Point	Coordinate	Category
OB1	134943 176840	Groundwater
BR1	134943 176840	Boreholes
OB2	134948 177083	Groundwater
BR2	134923 177071	Boreholes
OB3	135822 177423	Groundwater
BR3	135826 177423	Boreholes
OB4	135431 177271	Groundwater
BR4	134909 176809	Boreholes
OB5	135499 176953	Groundwater
BR5	134909 176809	Boreholes
OB6	135499 176952	Groundwater
BR6	135499 176953	Boreholes
OB7	136319 176912	Groundwater
BR7	136319 176912	Boreholes
OB8	135053 176798	Groundwater
BR8	135053 176799	Boreholes
OB9	135383 176383	Groundwater
BR9	135383 176383	Boreholes
L1	135050 1776842	Leachate
L6	135304 177237	Leachate
L7	135419 177349	Leachate
L8	135676 177420	Leachate
L9a	135504 177390	Leachate
L10	135757 177449	Leachate
SW1	135500 177086	Surface Water
SW2	135273 177258	Surface Water
SW3	135000 177131	Surface Water
SW4	134541 177876	Surface Water
SW5	134852 177235	Surface Water
SW6	135874 176954	Surface Water
SW7	134891 176802	Surface Water
SW8	135501 177471	Surface Water
SW9	135759 177593	Surface Water
SW10	135607 177292	Surface Water
SW11	134892 177030	Surface Water
SW12	135044 176831	Surface Water
SW13	135460 177367	Surface Water
SW14	135818 177505	Surface Water
ST1	135234 176909	Dust
ST2	134904 177088	Dust
ST3	135720 177802	Dust
ST4	135697 177436	Dust
ST5	135451 177396	Dust
N1	135815 177391	Perimeter Noise
N2	135773 177357	Perimeter Noise
N3	135628 177282	Perimeter Noise
N4	134946 176982	Perimeter Noise
S1	135500 177086	Noise monitoring at Dwellings
S2	136217 177306	Noise monitoring at Dwellings
S3	136161 177373	Noise monitoring at Dwellings
S4	135718 178284	Noise monitoring at Dwellings
WO1	136021 178310	Aquatic Ecology
WO2	135770 177718	Aquatic Ecology
WO3	135120 177216	Aquatic Ecology
WO4	134870 177235	Aquatic Ecology
WO5	134892 176839	Aquatic Ecology
WO6	134868 177088	Aquatic Ecology

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## **APPENDIX II**

**DOORA LANDFILL**

**WASTE LICENCE**

**Ref W0031-01**

**ENVIRONMENTAL OBJECTIVES AND TARGETS**

**FOR PERIOD 2009-2010**

## **Environmental Objectives and Targets**

### **Objective 1**

Comply with all aspects of the licence.

Target 1.1 - Every effort will be made to comply with all conditions of the waste licence by the prescribed dates.

The Senior Engineer, Executive Engineer and various contractors under the supervision of Clare County Council staff have responsibility for implementing this objective.

Performance against Target: - Waste licence requirements have been complied with in a timely manner on all occasions except on occasion in relation to quarterly reports where delay in receipt of reports from consultants resulted in a delay in submission of reports to the Agency.

### **Objective 2**

Ensure that sufficient funds are available to comply with Condition 11 of the licence.

Responsibility for ensuring compliance with this objective lies with the Finance Officer of Clare County Council.

Performance against Target: Satisfactory.

### **Objective 3**

Rehabilitate the closed landfill.

Target 3.1 – Ensure that the site is restored in accordance with a plan submitted to the EPA and ensure good aftercare.

The Senior Engineer, Environmental Services has responsibility for implementing this objective with the assistance of the Executive Engineer in charge and the Environmental Awareness Officer in the Environment Dept.

Performance against Target: On time. Restoration of the facility commenced in summer 2008 and is on target to be completed in August 2009.

### **Objective 4**

Develop the closed Landfill site as an amenity for the public.

Target 4.1 – Restore the site to a green field site and develop playing pitches and facilities for the general public. These facilities to be developed by the year 2009.

The Executive Engineer in charge has responsibility for implementing this objective.

**Performance against Target:** Upon completion of remediation works two playing pitches and a series of public walkways will be assessable from a carpark facility on the site.

### **Objective 5**

Improve correspondence with the E.P.A.

Target 5.1 - Council will make every effort to reply to letters of correspondence received from the Agency by the requested dates.

The Executive Engineer in charge and Senior Staff Officer have responsibility for implementing this objective.

Performance against Target: The Council has responded to EPA communications by prescribed dates

### **Objective 6**

Continue monitoring of site for leachate and landfill gas

Performance against Target: The Council is in compliance with this objective on an ongoing basis. Upon completion of the remediation works improved gas and leachate infrastructure will have been installed on site.

### **Time scale**

The time scale for achieving these objectives is generally outlined in the target description. The others are generally ongoing and the aim is to achieve progress before the next review of the E.M.P.

### **Designation of Responsibilities**

The Senior Engineer, Environmental Services Section of Clare County Council has overall responsibility for the implementation of these objectives. The specific responsibilities for each objective are outlined in the description.

Responsibility for ensuring compliance with objective number 2 lies with the Finance Officer of Clare County Council.