7th April 2010

ANNUAL ENVIRONMENTAL REPORT 2009

KTK Landfill, Brownstown, Kilcullen W081-03

Submitted to:
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REPORT

A world of capabilities delivered locally

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1.0 INTRODUCTION

This Annual Environmental Report (AER) has been prepared in accordance with Condition 11.8 of Waste Licence Register No. W0081-03 and contains the information listed in Schedule F of the Licence for the reporting period 1st January 2009 to 31st December 2009.

2.0 SITE HISTORY

KTK Landfill Ltd. (KTK), a wholly owned subsidiary company of Greenstar Ltd., is currently developing and operating the KTK Landfill under Waste Licence Register Number W0081-03. KTK Landfill was granted a Waste Licence (W0081-01) by the Environmental Protection Agency (EPA) in April 1999. In July 2001, KTK Landfill submitted an application for a Review of Waste Licence W0081-01. An amended licence (Register No. W0081-02) was granted by The Agency on 8th April 2002. In November 2004 an application for revision of Waste Licence W0081-02 was submitted. An amended Licence (Register No. W0081-03) was granted 16th February 2006. Acceptance of commercial and industrial wastes and construction material containing asbestos substantially ceased in October 2008. The site is currently being capped. Detailed site maps showing all monitoring locations at the site is presented in Appendix A.

3.0 REPORTING PERIOD

The reporting period for the Annual Environmental Report (AER) is from the 1st of January 2009 to the 31st December 2009. During this reporting period Waste Licence Register No. W0081-03 was in effect.

4.0 WASTE ACTIVITIES CARRIED OUT AT THE SITE DURING THIS PERIOD

KTK Landfill is a fully engineered facility with a composite lining system on the base and side walls of a large excavation. The licensed waste activities are as follows:

Licensed Waste Disposal Activities in Accordance with the Third Schedule of the Waste Management Act, 1996 to 2003

Class 1	Deposit on, in or under land (including landfill).
Class 5	Specially engineered landfill, including placement into lined discrete cells, which are capped and isolated from one another and the environment.
Class 11	Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule.
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.

The licensed waste recovery activities for the site in Accordance with the Fourth Schedule of the Waste Management Act, 1996 to 2003 were as follows:

Class 3	Recycling or reclamation of metals and metal compounds.
Class 4	Recycling or reclamation of other inorganic materials
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.

5.0 QUANTITIY AND COMPOSITION OF WASTE RECEIVED, DISPOSED OF AND RECOVERED DURING THE REPORTING PERIOD AND EACH PREVIOUS YEAR.

Table 1: Wastes Received for the Purpose of Recovery and Disposal during 2009

Waste Type	Description	Total Accepted 2009 (tonnes)	Licence Limit (tonnes)
Commercial and Industrial	Mixed Commercial and Industrial	4,449	222,750
Industrial	Misc. Non-Hazardous Industrial solid wastes	0	24,750
Industrial	Industrial Non-Hazardous sludges and filtercakes	0	13,750
Asbestos	Construction materials containing Asbestos.	0	3,000
Construction and Demolition	Mixed Construction and Demolition Waste.	10,263	10,750
Total Waste Intake		**14,712**	**275,000**

Table 2: Materials used for engineering and restoration purposes 2009

Description	Quantity (Tonnes)
Shredded Timber – Reused on site.	942
Compost – Reused on site.	2,250
Filtercakes from the clarification of water intended for human consumption.	11,868
Soil and Fines material – Reused on site for daily cover, intermediate cover and profiling site for final capping.	113,938
Combined Total of Received and Recovered	**143,710**

6.0 METHODS OF DEPOSITION OF WASTE

The Site substantially closed to acceptance of commercial and industrial wastes and asbestos wastes on the 21st of October 2008. The site is now only accepting soil and other similar material for regulating layer and stockpiling for the final restoration. However the process for waste deposition that has been in operation in the past is outlined below.

Waste was delivered to the site in heavy goods vehicles (HGV) with the appropriate covers to prevent loss of load. Each HGV passed through the weighbridge prior to proceeding to the active waste disposal/recovery areas. The weighbridge operator and/or the facility manager could at their own discretion request the load to be tipped in the Waste Inspection Area. Waste vehicles would then proceed to the active waste disposal/recovery areas where waste was deposited under the direction of waste inspection personnel.

Waste was deposited directly on a surface of waste close to and above the advancing tipping face. In accordance with Condition 6.19.2, the active working face was confined to a height of 3.5 metres after compaction and a width of 35 metres. Deposited waste was spread in shallow layers on the inclined surface and compacted. Steel-wheeled compactors operated on the gradient of the more shallow face, pushing thin layers of wastes and applying compaction pressure to them. Wastes were covered with heavier materials or covered with permeable soil drawn from stockpiles of heavy inert waste or fine sand/silt located on the site. Alternative fabric cover systems were also utilised where appropriate.

Construction waste containing asbestos was deposited in dedicated bays to a minimum depth of 2m in accordance with the licence. Any materials containing asbestos were covered immediately after deposition with at least 250mm of suitable material. At the end of each working day the asbestos trenches were covered with a minimum of 500mm of suitable material. In the event that difficult handling wastes (such as powders) were accepted at the facility, they were also deposited within the above bays to minimise any potential dust generation.

7.0 SUMMARY REPORT ON EMISSIONS

This summary report has been compiled in accordance with Emission Limit Values (ELV's) for the following media as detailed in Condition 6 and Schedule B of the current licence:

- Dust;
- Noise;
- Landfill Gas; and
- Leachate.

Environmental media for which no ELV's have been set under Waste Licence Register No. W0081-03 are discussed in Section 8.0.

7.1 Dust Deposition

Dust deposition emission limit values as established in Schedule B.1 of Waste Licence Register No. W0081-03 are detailed in Table 3 below.

Table 3: Depositional Dust Emission Limit Value

Level (mg/m^2/day) [Note 1]
350

Note 1: 30 day composite sample

Dust Monitoring was conducted at six locations on three occasions during the 2008 reporting period as specified in Schedule C.3 of the waste licence. Geotesting Ltd. conducted the analysis of dust deposition results from the KTK facility. Dust reports were included in the subsequent 1st, 2nd and 3rd Quarterly monitoring reports of 2009.

7.2 Noise Emissions

Noise ELVs as established in Waste Licence Register No. W0081-03 are detailed in Table 4 below:

Table 4: Environmental Noise Emission Limit Values

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

Noise monitoring was conducted by Golder Associates Ireland at six on-site locations and four sensitive receptors in June 2009. The complete noise monitoring report was included in the Quarter 2 2009 submission to the Agency.

The survey revealed a number of sources on site and off site. Levels were detected that were above the specified licence limit of 55 dB(A). However, the levels detected by the sound level metre were a record of the ambient noise levels at the monitoring locations. This means that the levels were a combination of all the noise sources at the monitoring locations and were not as a direct result of operations at the facility. Indeed, the dominant noise sources recorded in the field notes show that road traffic noise was the overarching source.

7.3 Landfill Gas Emissions

Landfill Gas ELV's as established in Waste Licence Register No. W0081-03 are detailed in Table 5 below:

Table 5: Landfill Gas Concentration ELV's (measured in any building on or adjacent to the facility)

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

Landfill Gas Monitoring was conducted at 14 monitoring well locations on a monthly basis during the 2009 reporting period. Golder Associates conducted the sampling on four occasions during this period between January 2009 and April 2009. KTK Landfill staff members conducted the remaining 8 months of landfill gas analysis and reporting of landfill gas emissions. Collated landfill gas emission summary reports were included in the subsequent quarterly monitoring reports for 2009. Category 3 non-urgent incident reports were also forwarded to the Agency not later than 24 hours after a landfill gas emission level value was breeched.

Landfill Gas monitoring was carried out at the facility offices and buildings by on site continuous monitoring system and on a weekly basis by trained facility staff. No measured landfill gas level in any of the facility buildings exceeded the above limits during 2009.

7.4 Fugitive Gas Emission Report 2009

7.4.1 Locations and Methods

Waste Licence Register No. W0081-03 stipulates that Monitoring of any emissions to air is carried out at the enclosed gas Flare No. 1 (HAASE 2500) and No. 2 (HAASE 1500) and at the gas Utilisation Plant Engines GE01, GE02 and GE03 at KTK Landfill. Odour Monitoring Ireland Ltd undertook this monitoring on two occasions during 2009, on the 5th of May 2009 and the 15th of December 2009. These reports are presented in Appendix C. Summary tables are presented below in Tables 6 – 16.

7.4.2 Results

Table 6: Emission Value Results from Landfill gas Flare (750 Enclosed Flare Unit monitored at KTK Landfill

Parameter	05th May 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
Nitrogen oxides (NO_X)	42.74	250
Sulphur Dioxide (SO_2)	2,276	-

Table 7: Emission value results from landfill gas flare No. 1 (2,500 HAASE) monitored at KTK Landfill.

Parameter	05th May 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
Nitrogen oxides (NO_X)	86.29	250
Sulphur Dioxide (SO_2)	4,917	-

Table 8: Emission value results from landfill gas flare No. 2 (1,500 HAASE) monitored at KTK Landfill.

Parameter	05th May 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
Nitrogen oxides ($NO_{X)}$	67.73	250
Sulphur Dioxide ($SO_{2)}$	2,210	-

Table 9: Emission value results from gas utilisation engine GE01 monitored at KTK Landfill.

Parameter	05th May 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
NO_X	485.54	500
CO	778	1,400
TNMVOCs	27.77	75
SO_2	2,780	-
Particulates	82	-

Table 10: Emission value results from gas utilisation engine GE02 monitored at KTK Landfill.

Parameter	05th May 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
NO_X	396.91	500
CO	539	1,400
TNMVOCs	15.38	75
SO_2	2,847	-
Particulates	64	-

Table 11: Emission value results from gas utilisation engine GE03 monitored at KTK Landfill.

Parameter	05th May 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
NO_X	483.03	500
CO	1,135	1,400
TNMVOCs	30.81	75
SO_2	2,547	-
Particulates	79	-

Table 12: Emission value results from landfill gas flare No. 1 (2,500 HAASE) monitored at KTK Landfill.

Parameter	15th December 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
Nitrogen oxides (NO_X)	75.58	250
Sulphur Dioxide (SO_2)	133.83	-

Table 13: Emission value results from landfill gas flare No. 2 (1,500 HAASE) monitored at KTK Landfill.

Parameter	15th December 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
Nitrogen oxides ($NO_{X)}$	87.83	250
Sulphur Dioxide ($SO_{2)}$	1,882.78	-

Table 14: Emission value results from gas utilisation engine GE01 monitored at KTK Landfill.

Parameter	15th December 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
NO_X	468	500
CO	1,100	1,400
TNMVOCs	7.93	75
SO_2	1,857	-
Particulates	-	-

Table 15: Emission value results from gas utilisation engine GE02 monitored at KTK Landfill.

Parameter	15th December 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
NO_X	265	500
CO	933	1,400
TNMVOCs	4.53	75
SO_2	1,946	-
Particulates	-	-

Table 16: Emission value results from gas utilisation engine GE03 monitored at KTK Landfill.

Parameter	15th December 2009	
	Normalised Emission Conc. (mg/Nm^3)	Emission Limit Value (mg/Nm^3)
NO_X	308	500
CO	1,352	1,400
TNMVOCs	6.01	75
SO_2	1,877	-
Particulates	-	-

8.0 SUMMARY OF ALL REMAINING ENVIRONMENTAL MONITORING DATA

8.1 Introduction

Monitoring was conducted at the KTK Landfill in accordance with Schedule D of Waste Licence Register No. W0081-03. However, in some case additional monitoring was carried out at the discretion of KTK, e.g. leachate quality etc. Details of monitoring and reporting frequencies of environmental data are presented in Table 17 below.

The locations of all environmental monitoring points as well as current topographic conditions are illustrated on Drawing KTK/602, Rev X (Appendix A).

Table 17: Environmental Monitoring and Reporting Frequency

Environmental Monitoring Data	Monitoring Frequency	Reporting Frequency
Groundwater Quality	Quarterly	Quarterly
Groundwater Levels	Monthly	Quarterly
Surface Water Quality	Quarterly	Quarterly
Surface Water Visual Inspection	Weekly	Quarterly
Leachate Quality	Monthly*	Quarterly
Leachate Levels	Weekly	Quarterly
Landfill Gas (Boreholes)	Monthly	Quarterly
Landfill Gas (Site Offices)	Weekly	Quarterly
Dust	Three times per year	Subsequent Quarterly
Noise	Annually	Annually
Meteorological Data	Daily	Annually
Asbestos Fibre Monitoring	Annually	Annually

*Schedule C 2.1 of the licence (W0081-03) specifies annual monitoring of leachate quality for all parameters with the exception of BOD and COD which are monitored on a quarterly basis.

8.2 Depositional Dust Monitoring

Dust Monitoring was conducted on three occasions at six monitoring locations in 2009; 21st January 2009 to 19th of February 2009, 10th April 2009 to 10th of May 2009 and 18th of August 2009 to 15th of September 2009 in accordance with Table C.3 of the Licence.

Co-ordinates for all monitoring locations are detailed in Table 18 below with locations illustrated on KTK/602 Rev. X

Table 18: Depositional Dust Monitoring Locations

Monitoring Element	Location	Eastings	Northings
Dust Monitoring	D1A	285663	211440
	D2A	285883	211396
	D3A	286122	211102
	D4A	286032	210960
	D5A	285612	211021
	D6A	285550	211230

8.2.1 Dust monitoring methods

Total dust deposition was measured at the site using Bergerhoff gauges as specified in the Standard Method VDI 2119 (German Engineering Institute). The dust gauges were set up such that the glass containers were approximately 2m above the ground surface. In order to inhibit the growth of algae in the dust jars 20ml of 5% 2-methoxyethanol was added to each jar. The glass jars containing the dust were submitted to Geo Testing Ltd. for analysis.

8.2.2 Dust monitoring results

The results of dust monitoring conducted at KTK landfill during 2009 are presented in Table 19 below. Dust concentrations and ELV's as detailed in Schedule B.1 of Waste Licence W0081-03 are discussed below in Table 19. The Dust ELV of 350mg/m2/day was exceeded at locations D1A and D6A during the measurement period 18th August to 15th September 2009, however, both samples were contaminated with windblown debris and are not representative of actual conditions at the site. Repeat monitoring was carried out at location D1A and D6A during period 30th September to 30th October 2009 and results were 273.3mg/m^2/day and 268.0mg/m^2/day respectively.

Table 19: Dust monitoring results 2009

Monitoring Location	Quarter 1 2009 21/01/09 – 19/02/09	Quarter 2 2009 10/04/09 – 10/05/09	Quarter 3 2009 18/08/09 – 15/09/09	Quarter 3 2009 Re-Sample 30/09/09 / 30/10/09	Quarter 4 2009 3/11/09 – 02/12/09
D1	149.70	-	388.1	273.30	88.70
D2	127.50	-	332.6	294.70	44.40
D3	110.90	-	216.2	182.20	105.30
D4	61.00	32.2	288.3	155.40	49.90
D5	61.00	26.8	304.9	257.20	38.80
D6	38.80	26.8	360.4	268.00	33.30

* - Containers contained too much organic material (Leaves and other vegetation etc.) for analysis to be carried out.

8.3 Groundwater Monitoring

8.3.1 Groundwater Monitoring Locations

Groundwater monitoring was conducted at thirteen locations during 2009 in accordance with Schedule C.3 of the current licence. Co-ordinates for all monitoring locations are detailed in Table 20 with locations illustrated on Drawing KTK/602, Rev X, Appendix A.

Table 20: Groundwater Monitoring Locations

Media	Location	Eastings	Northings
Groundwater	BH4	285743	211444
	BH11d	286157	211305
	97-4	285441	211146
	97-5d	285534	211075
	97-6d	285612	211019
	97-7d	285916	210979
	KTK-10	285787	211045
	KTK-11	285518	211116
	KTK-15d	285884	211394
	KTK-16	285728	211444
	KTK-19	285819	210997
	KTK-20	285665	211078
	KTK-21	286065	210999

8.3.2 Groundwater Levels

Groundwater levels were monitored on a monthly basis in accordance with Schedule C of Waste Licence Register No. W0081-03. The results of water level monitoring were furnished to the Agency in the subsequent quarterly reports (Quarter 1 to Quarter 4, 2009).

8.3.2.1 Groundwater level measurement methodology

Groundwater levels were measured using a standard dip-meter probe, which upon contact with water emits an audible signal. Measurements were made to the nearest centimetre relative to the top of the steel casing that protects each monitoring pipe.

8.3.2.2 Groundwater Level Measurements 2009

Figures 1, 2 and 3 illustrate the annual water level data recorded from groundwater monitoring wells up-gradient and down-gradient of the facility during 2009. KTK Landfill is situated

Figure 1: Static Groundwater Levels at KTK Landfill January - December 2009

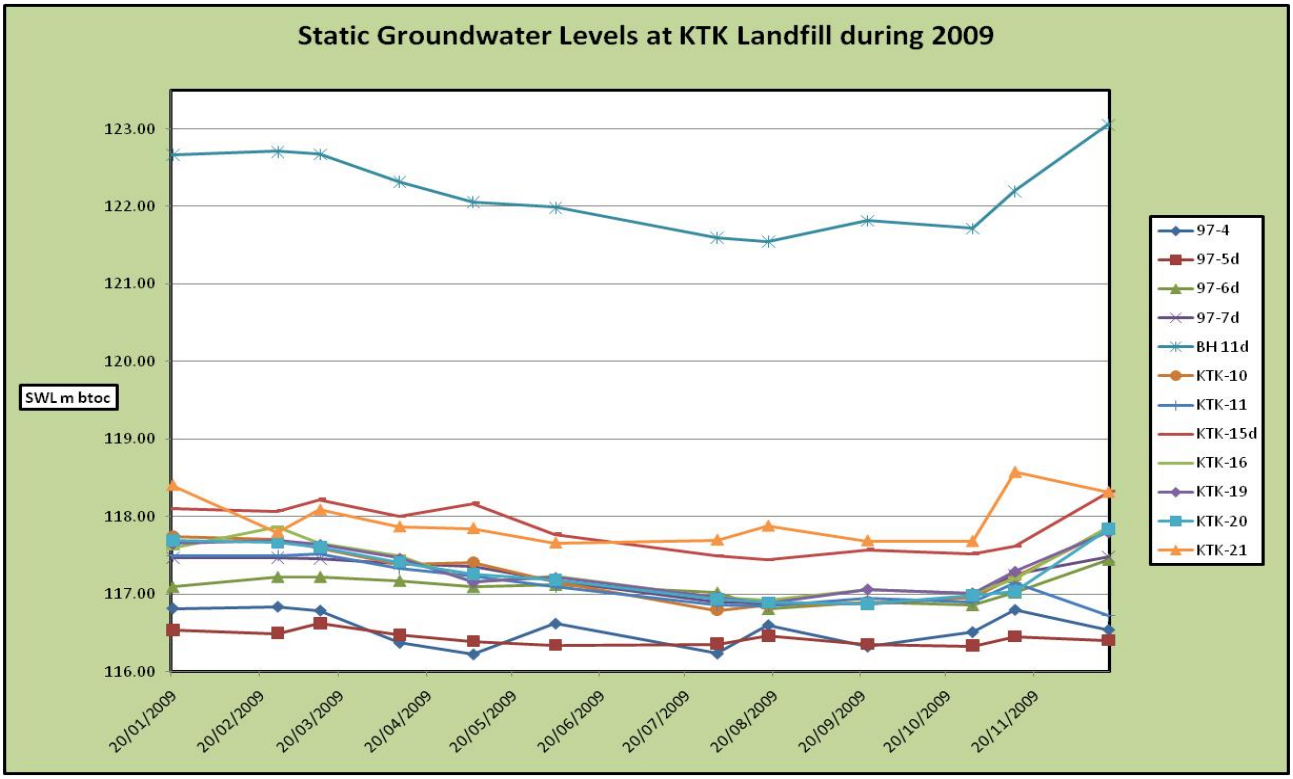


Figure 2: Static Groundwater Levels in Up-Gradient monitoring wells at KTK Landfill during 2009

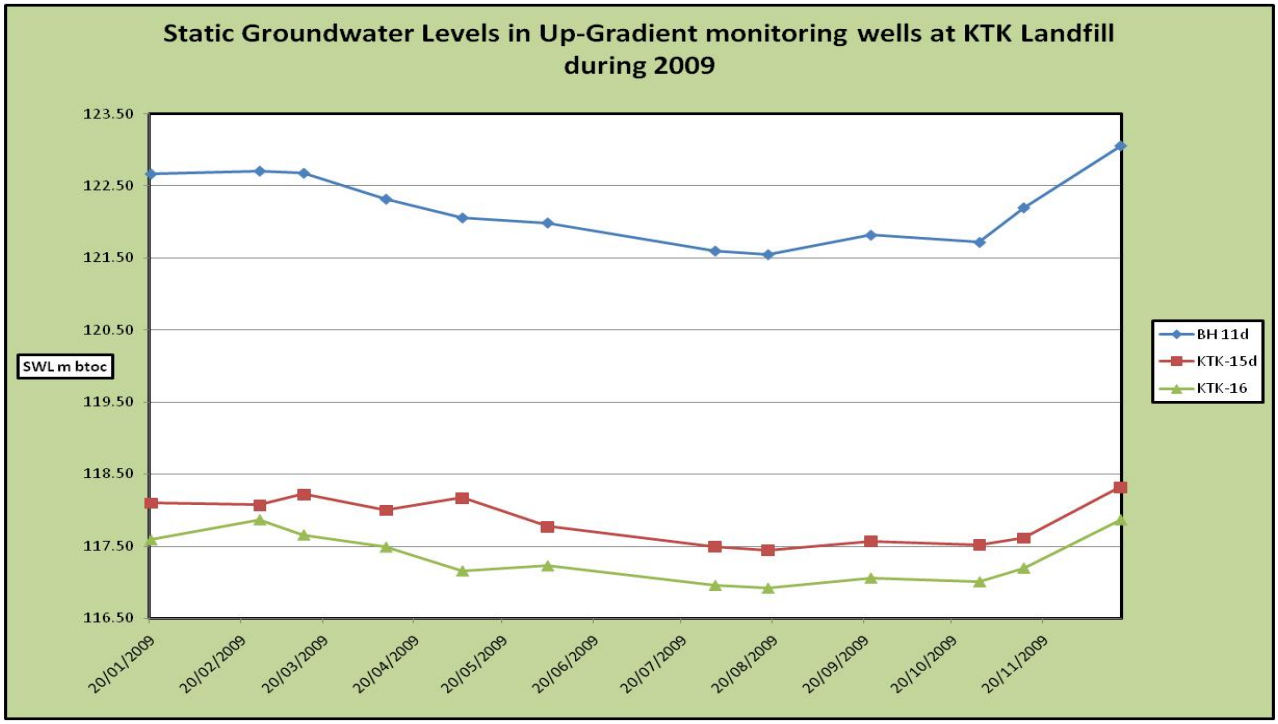
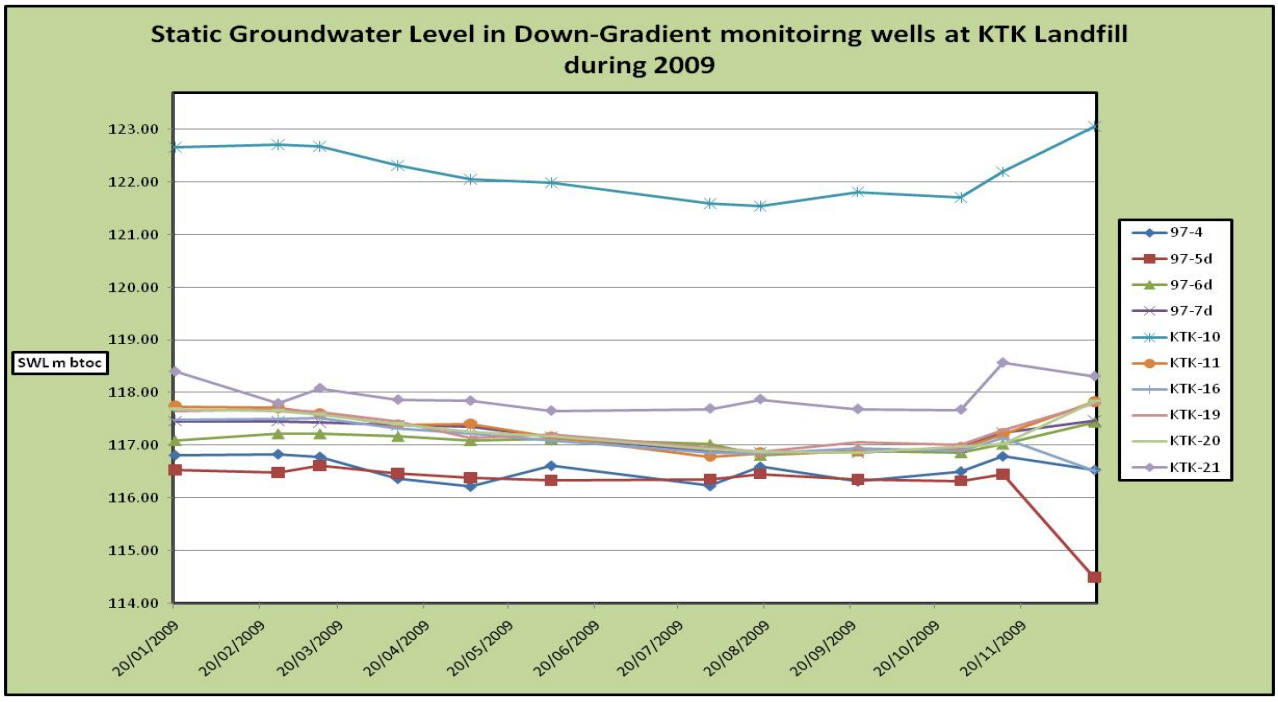


Figure 3: Static Groundwater Level in Down-Gradient monitoring wells at KTK Landfill during 2009



8.3.2.3 Methods for determining groundwater quality

Groundwater samples were collected by purging a minimum 3 borehole volumes prior to sample collection. This allowed stagnant water to be removed and representative groundwater to be drawn into the hole. Dedicated sampling equipment was used to prevent cross contamination between sampling locations. Field measurements of temperature, pH and conductivity were recorded. Samples were decanted into laboratory designated containers and stored in cooler boxes to maintain sample temperature at approximately 4°C. All samples were submitted to the laboratory within 24 hours of sampling.

8.3.2.4 Groundwater Quality Results 2009

Groundwater quality monitoring is carried out at KTK Landfill on a quarterly basis with annual parameters analysed for during one of these quarters. Groundwater quality has been monitored at thirteen locations during 2009 in accordance with Schedule C.3 of the current licence. The results of all quarterly monitoring have been presented to The Agency in reports Quarter 1 to Quarter 4 of 2009. A summary of concentrations from a number of indicator parameters up-gradient and down-gradient of the facility recorded during the reporting period are presented in Figures 4 to 12. It can be seen that up-gradient monitoring locations KTK16 and BH11D continue to be impacted from the groundwater contamination plume from adjacent partially lined Silliot Hill landfill. Both KTK16 and BH11D are deep wells (30m and 44m respectively) located in medium to coarse sand. This contamination plume from Silliot Hill has also been detected, although to a lesser extent, at down gradient monitoring location KTK11 which is located directly down-gradient of Silliot Hill and KTK16 in coarse sands and gravel with screened portion of well to a depth 5m below that of KTK16.

Figure 4: pH levels detected in up-gradient groundwater monitoring wells at KTK Landfill during 2009

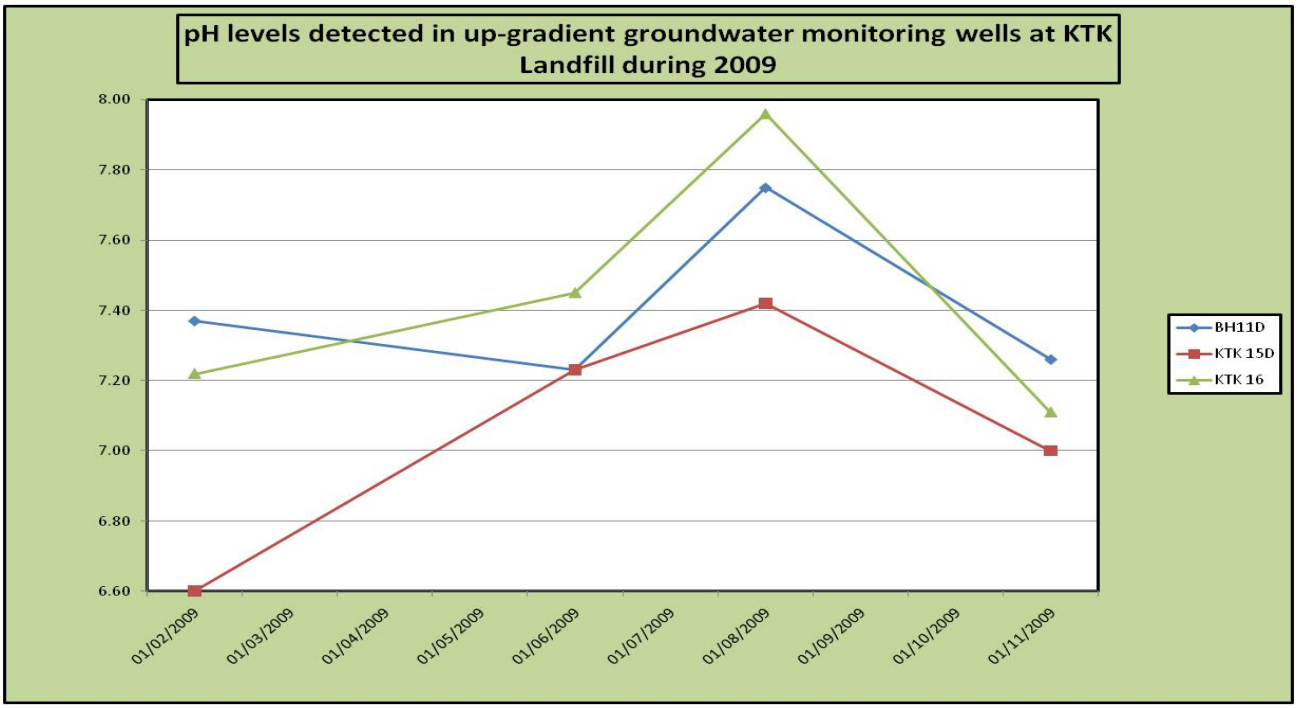


Figure 5: pH levels detected in down-gradient groundwater monitoring wells at KTK Landfill during 2009

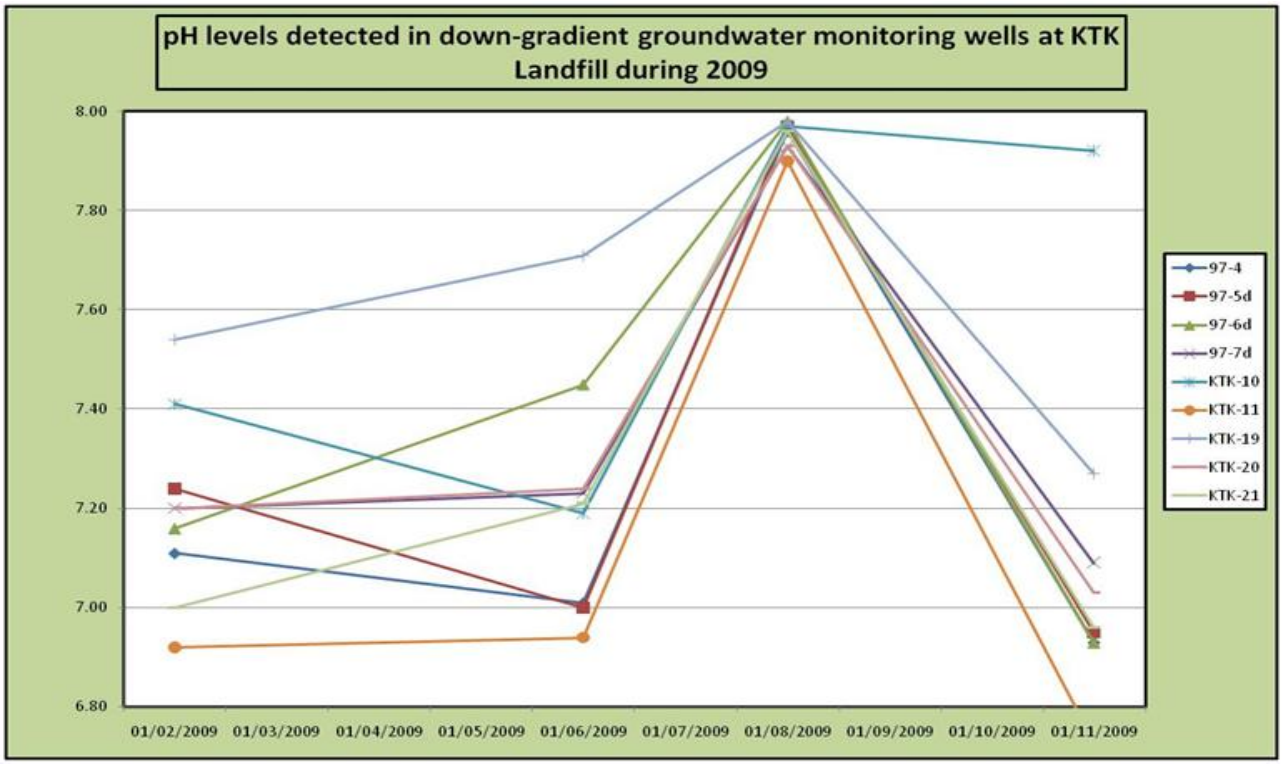


Figure 6: Electrical Conductivity levels detected in up-gradient groundwater monitoring wells at KTK Landfill during 2009

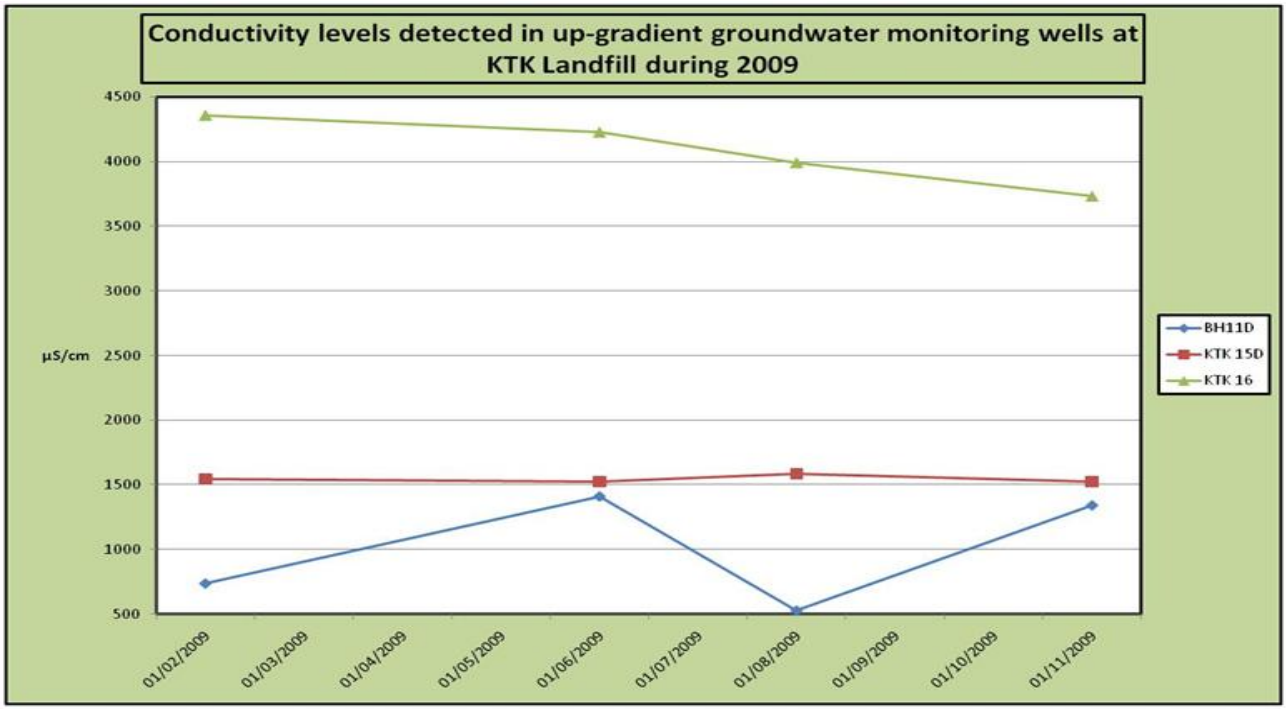


Figure 7: Electrical Conductivity levels detected in down-gradient groundwater monitoring wells at KTK Landfill during 2009

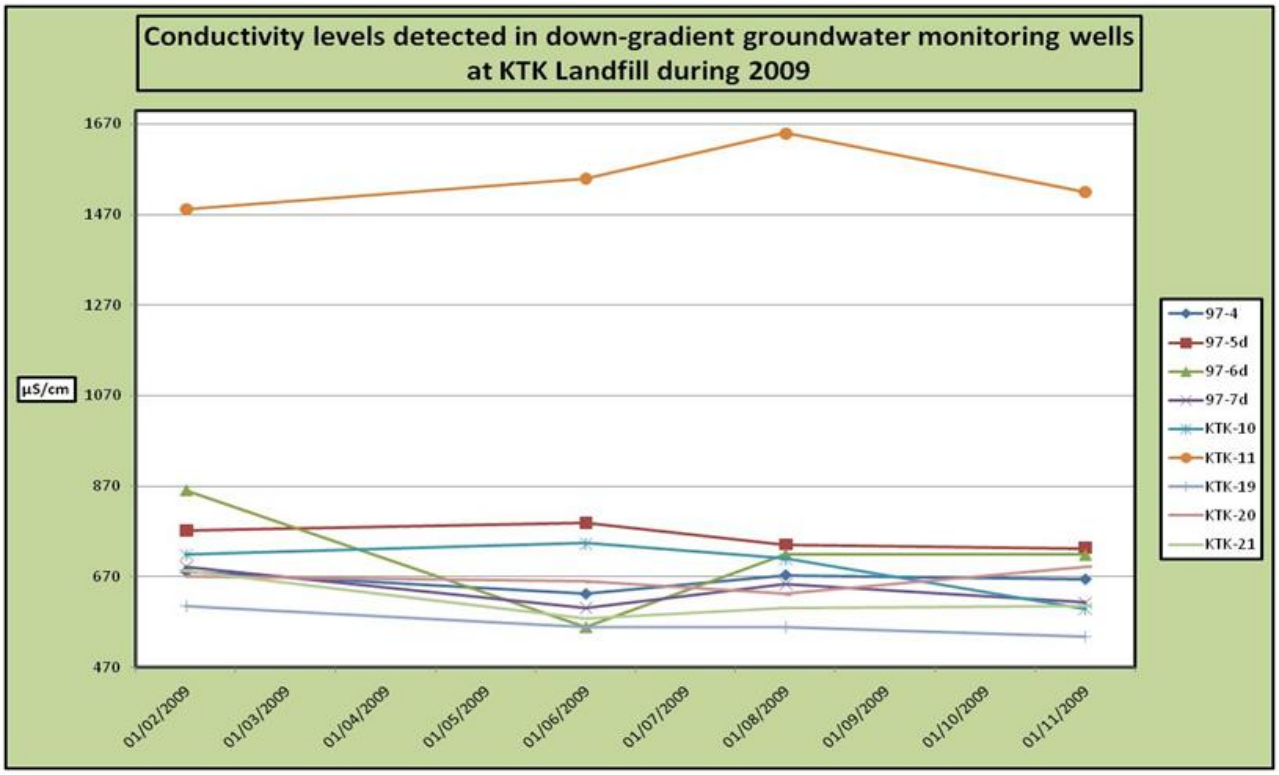


Figure 8: Chloride levels detected in up-gradient groundwater monitoring wells at KTK Landfill during 2009

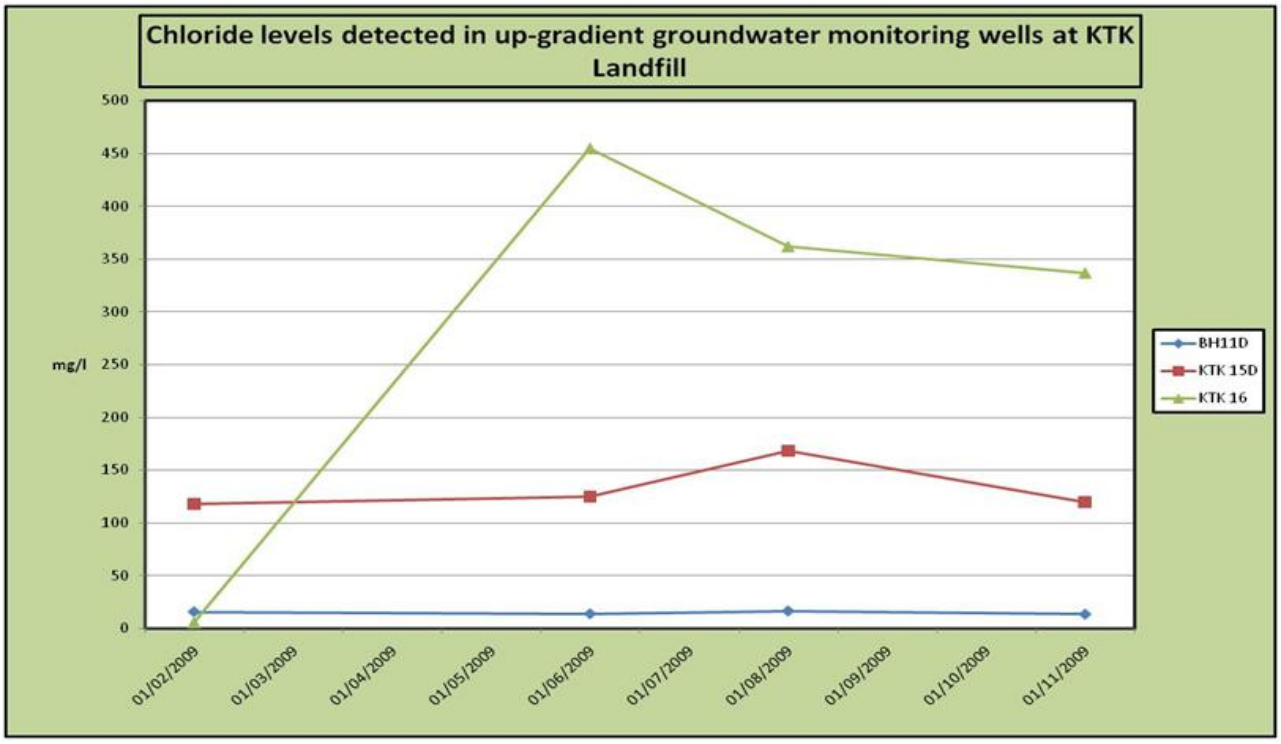


Figure 9: Chloride levels detected in down-gradient groundwater monitoring wells at KTK Landfill during 2009

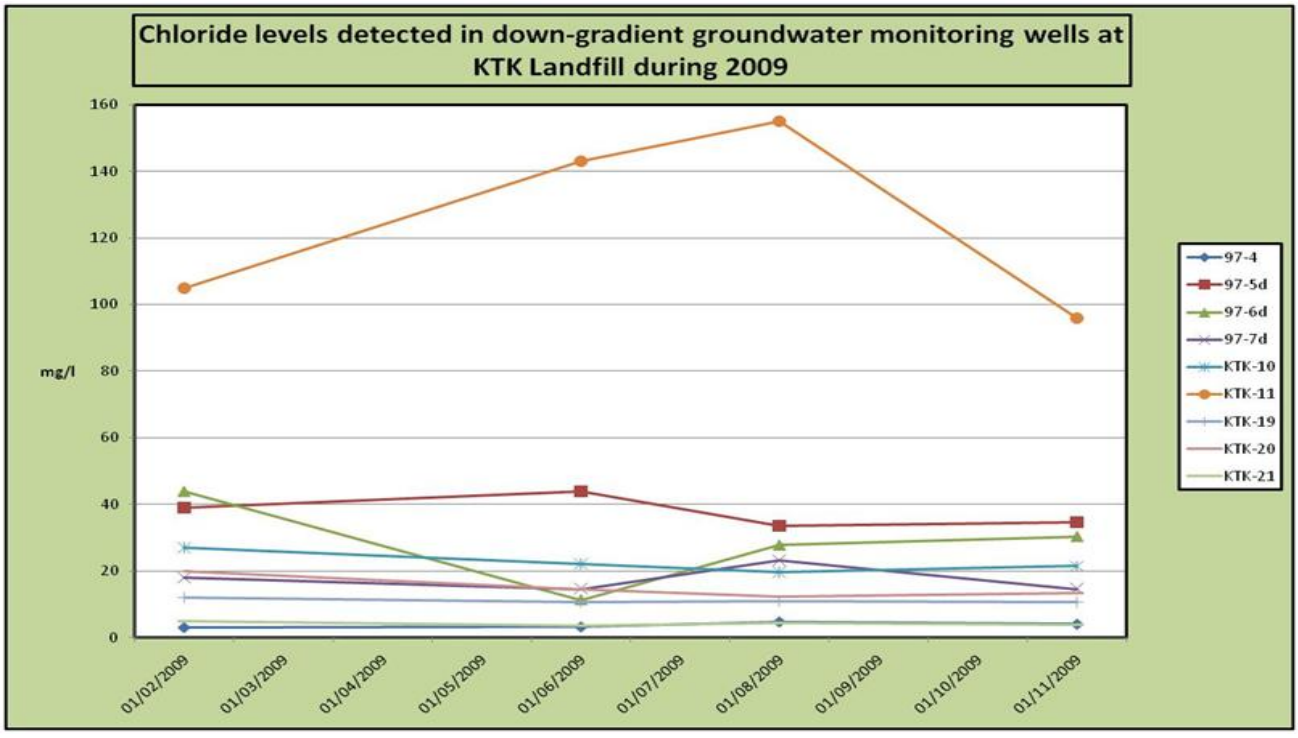


Figure 10: Sulphate levels detected in up-gradient groundwater monitoring wells at KTK Landfill during 2009

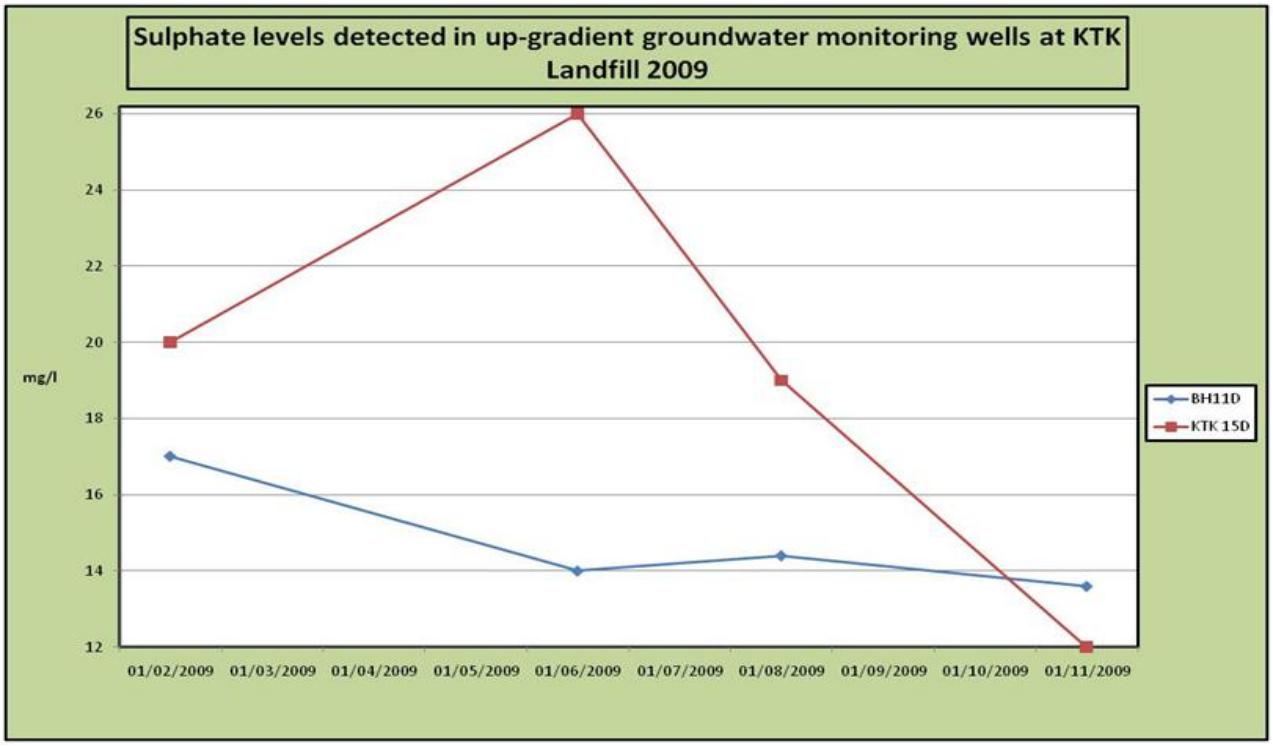
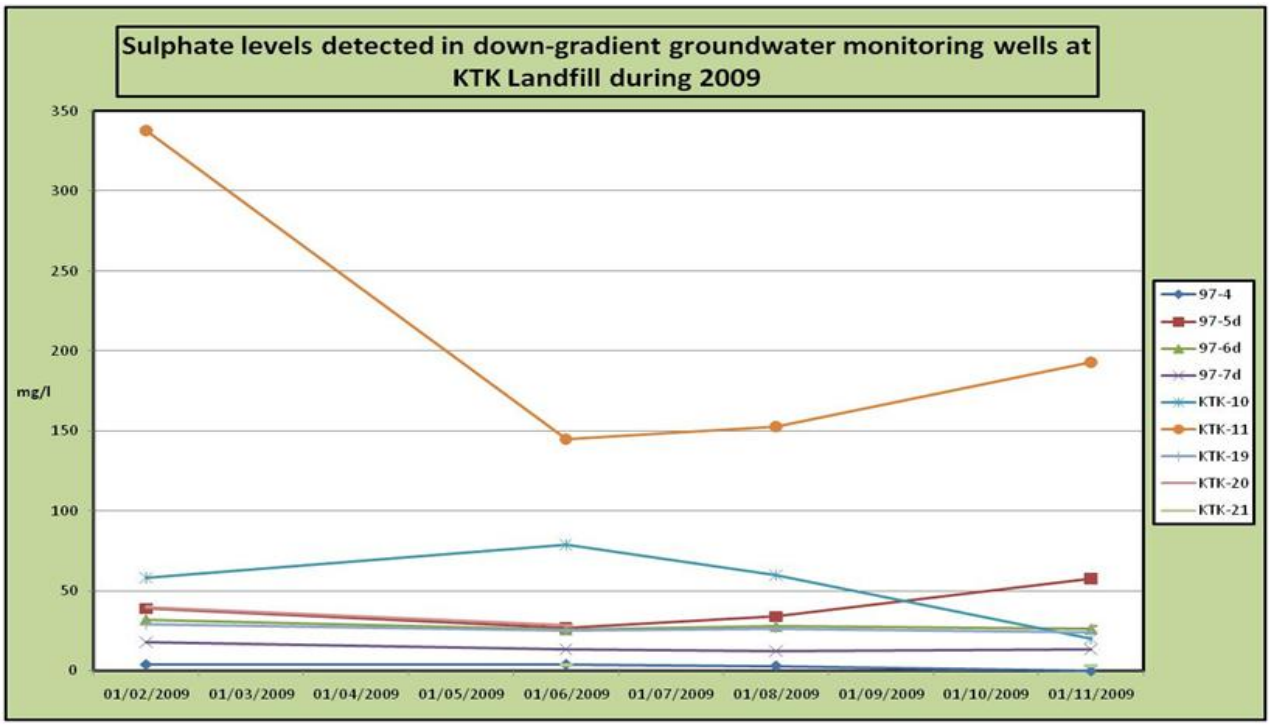


Figure 11: Sulphate levels detected in down-gradient groundwater monitoring wells at KTK Landfill during 2009



8.4 Landfill Gas Monitoring

Gas Monitoring was conducted at the facility in accordance with Table C.1.3 of Schedule C of the current waste licence (W0081-03). Co-ordinates for all monitoring locations are detailed in Table 21 with locations illustrated on Drawing KTK/602, Rev X (Appendix A).

8.4.1 Landfill Gas Monitoring Locations

Monthly gas monitoring was conducted at 14 no. gas monitoring wells. The general site offices are monitoring on a continuous basis via a fixed monitoring system. Details of gas monitoring from the mobile monthly monitoring and continuous fixed systems are discussed below.

Table 21: Landfill Gas Monitoring Locations at KTK Landfill

Media		Location	Eastings	Northings
Landfill Gas	Landfill Gas Monitoring Boreholes	G1	285726	211444
		G2	285695	211452
		G3	285653	211437
		G4	285623	211382
		G5	285591	211330
		G6	285565	211279
		G7	285537	211214
		G8	286116	211093
		G9	286135	211239
		G10	285894	211395
		G11	286160	211305
		G14	285513	211146
		G15	285600	211093
		G16	285720	211060
	Catch Pits	CP1	285623	211158
		CP2	285662	211133
		CP3	285729	211103

8.4.2 Landfill Gas Monitoring Methodologies

Landfill gas measurements were undertaken using a GA2000 Landfill Gas Analyser. The gas is analysed for its content by % volume of the following constituents:

- Methane CH4
- Carbon Dioxide CO2
- Oxygen O2
- Hydrogen Sulphide H2S

The LEL (lower explosive limit of methane), atmospheric pressure (millibars) and temperature (°C) were also recorded by the GA2000 Landfill Gas Analyser. Each gas monitoring location was sampled for 1 minute and the results were then recorded to the units memory for later downloading.

8.4.3 Site Buildings

The main site offices are monitored on a continuous basis by two fixed monitoring systems (GMI Landsurveyor II and Monicon MC4000). Gas monitoring results from the fixed systems have been submitted to the Agency in Quarterly Reports 1 to 4 of 2009.

8.4.4 Landfill Gas Monitoring Results

Gas monitoring results for the reporting periods were forwarded to the Agency at the end of each quarter in the quarterly reports during 2009. A summary of carbon dioxide (CO2) and methane (CH4) monitoring results for 2009 is presented in Figures 12 and 13 respectively. The trigger level breaches were reported to the Agency as category 3 non-urgent incidents as they occurred.

Moreover, as per the recommendations of The Agency inspectors during the audit of KTK Landfill Site on 23 November 2004, a full report on the assessment of landfill gas migration in the vicinity of KTK Landfill and Silliot Hill Landfill was submitted to The Agency on 7 April 2005.

This assessment concluded that the most likely source of elevated landfill gas levels in monitoring wells located outside the body of waste at KTK Landfill are attributable to the historical uncontained landfilling operations at the adjacent Silliot Hill facility and are therefore not in any way connected with KTK Landfill. Full details of landfill gas trigger level breaches can be found in Table 38: Reported Incidents – 2009.

Historical monitoring at KTK Landfill has identified elevated gas levels at monitoring locations on the western and southern boundaries of the site, particularly at G3, G4, G5 and G7. Significant works at Silliot Hill have been carried out during 2009. This work included the capping of that facility and the installation of large diameter gas extraction wells It is concluded that the methane levels recorded in KTK Landfill perimeter gas monitoring wells is attributed to significant interruptions in gas collection during these works. Reductions in gas levels measured in KTK perimeter monitoring wells are expected when gas extraction at these new wells is fully established.

Figure 12: Graph showing Methane concentrations detected in boundary landfill gas monitoring wells at KTK Landfill during 2009

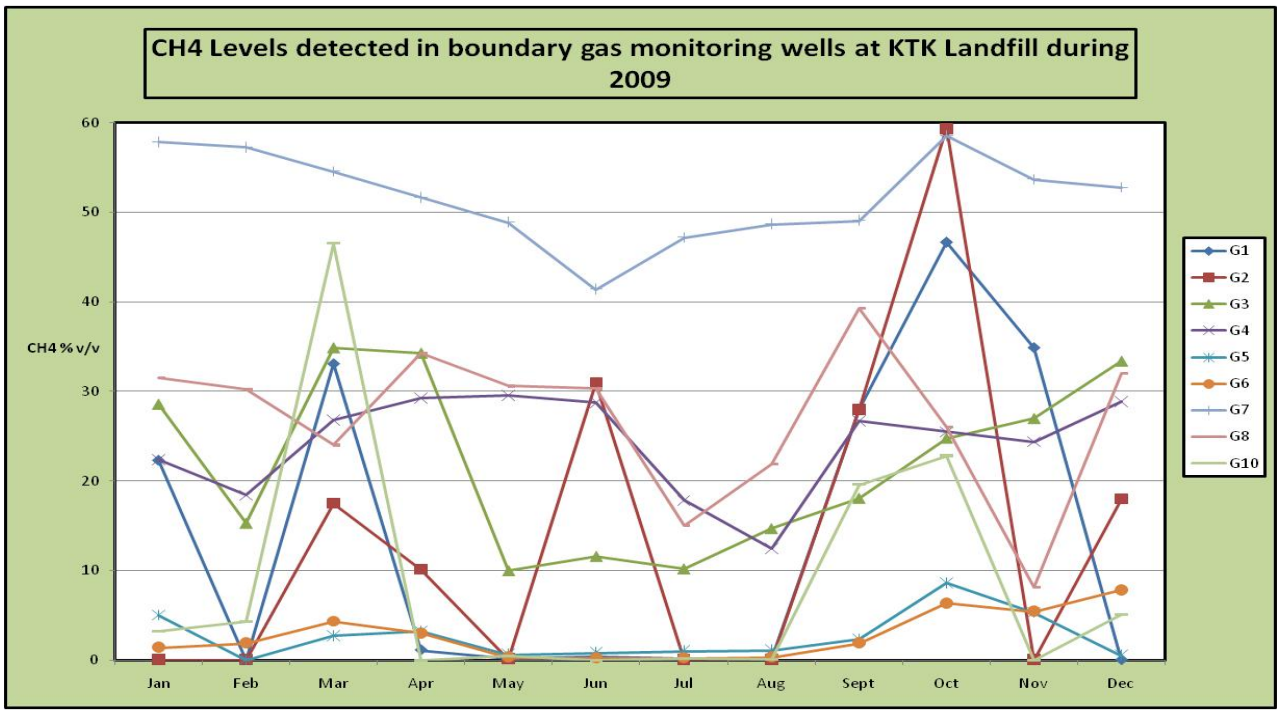
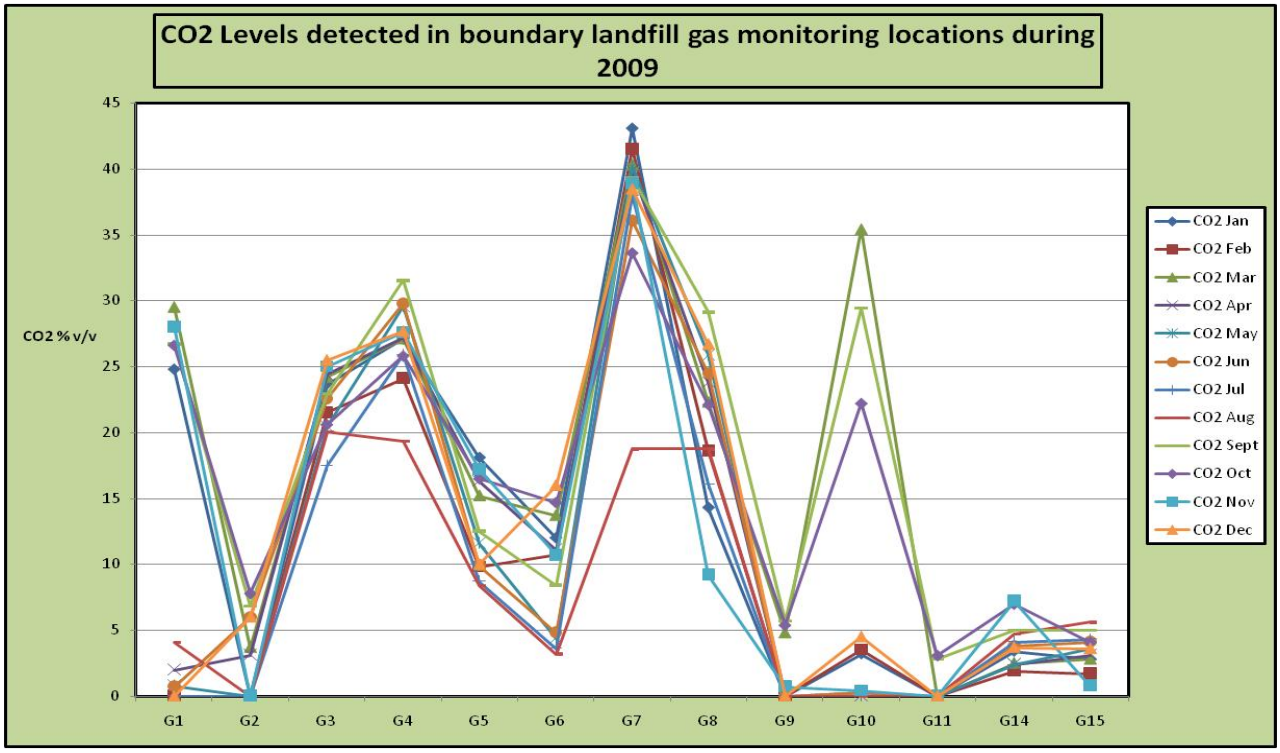


Figure 13: Carbon Dioxide concentrations detected in boundary landfill gas monitoring locations during 2009



8.5 Leachate Monitoring

8.5.1 Leachate Monitoring Locations

In accordance with Conditions 6.13.1 and 6.13.2 and Table C2.1 of Schedule C of the Waste Licence Register No. W0081-03, leachate composition and level monitoring are to be conducted at locations detailed in Table 22 below.

Table 22: Leachate Level and Sampling locations at KTK Landfill

Media	Location	Eastings	Northings
Leachate Sampling Locations	LP1	285761	211123
	LP3	285783	211092
	LP6	285805	211086
	LP7	285844	211080
Leachate Levels	VWP1	285724	211113
	VWP2	285767	211144
	VWP3	285751	211149
	VWP4	285746	211195
	VWP5	285760	211244
	VWP6	285799	211140
	VWP7	285881	211163
	VWP8	285990	211081

8.5.2 Leachate Levels

8.5.2.1 Methods for measuring leachate levels

Leachate levels have been recorded using the data collection method known as DataTaker since the 1st Quarter of 2004. The leachate data aquisation system employs one data logger and three pressure sensors. The pressure sensors measure the pressure of the leachate in three locations, Sump 1 (Phase 1 & 2), Sump 3 (Phase 3, 4 & 5) and Sump 6 (Phase 6). The DataTaker is a data logger, which takes measurements of a number of fundamental parameters from the pressure sensors, such as voltage, current, resistance and frequency; readings are taken every 20 minutes. It then converts the pressure readings into meaningful quantities such as metres depth of leachate. Data recorded from the data logger are sent to a PC, via a radio link where data is stored for later use.

8.5.3 Leachate Level Results during 2009

Leachate levels have been reported to the Agency in each of the monitoring reports from Quarter 1 to Quarter 4 of 2009. A summary of sump 1, sump 3 and sump 6 leachate levels recorded during 2009 is presented in Table 23 below. It is noted that the data presented in Table 23 represents the leachate head over the base of the landfill. Results from leachate monitoring conducted at the facility during the reporting period have been reported to the Agency in the quarterly reports for Quarter 1 to Quarter 4 2009. Data presented for the period January to September should be multiplied by 10 to get true level.

Table 23: Average Leachate Levels recorded at KTK Landfill during 2009

Date	Sump 1 (LP1) Average Level for Month (metres above liner)	Sump 3 (LP3) Average Level for Month (metres above liner)	Sump 6 (LP6) Average Level for Month (metres above liner)
January 2009	0.318	0.708	0.315
February 2009	0.462	0.737	0.299
March 2009	0.400	0.654	0.230
April 2009	0.293	0.511	0.097
May 2009	0.235	0.425	0.034
June 2009	0.230	0.431	0.025
July 2009	0.247	0.452	0.015
August 2009	0.327	0.559	0.088
September 2009	0.439	0.711	0.228
October 2009	0.505	0.801	0.299
November 2009	0.557	0.892	0.374
December 2009	4.73	7.86	3.20

8.5.4 Leachate Composition and Analysis

Monthly leachate monitoring includes sampling to be taken from three sumps (LP1, LP3, LP6) and leachate holding tank (LP7). Monthly monitoring of leachate quality in 2009 was conducted at LP1, LP3, LP6 and LP7. Leachate samples are analysed for parameters as stipulated in Table C 2.1 of Waste Licence Register No. W0081-03. All samples were filled directly into laboratory designated containers and transported to the laboratory.

8.5.4.1 Leachate Analysis Results

Results from leachate monitoring conducted at the facility during the reporting period have been presented to the Agency in each of the quarterly reports. Summary tables for major parameters are presented below in Tables 24 – 27..

Table 24: Summary Table of Parameters recorded at Leachate Location LP1

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
BOD	-	2215	122	312	298	291	278	233	240	195	105	318
COD	3601	10498	3693	4100	4150	4400	4440	4860	4170	4620	4290	4870
Chloride	1763	2123	1574	2430	1867	1593	1213	1419	1427	1497	1770	-
NH4-N	1771	2898	1864	1835	1653	1725	1313	1599	1663	1602	1180	1563

Table 25: Summary Table of Parameters recorded at Leachate Location LP3

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
BOD	-	232	-	261	373	416	308	294	258	390	168	493
COD	3393	3394	3543	3660	3860	4700	4160	4660	3810	4060	3620	3980
Chloride	1532	1287	1584	2033	1542	1779	1063	1592	1446	1323	1480	1471
NH4-N	1511	1669	1775	1655	1484	2213	1235	1843	1513	1383	1060	1425

Table 26: Summary Table of Parameters recorded at Leachate Location LP6

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
BOD	466	283	1001	980	2214	4154	2036	855	621	-	390	548
COD	4240	3683	5530	5310	7140	11580	7540	6000	4550	-	3790	4900
Chloride	1889	1515	1908	2501	1840	1810	1196	1642	1352	1323	1540	-
NH4-N	1779	1797	2165	1899	1848	2167	1496	1744	1335	1383	1200	1588

Table 27: Summary Table of Parameters recorded at Leachate Location LP7

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
BOD	-	-	-	494	492	558	437	531	340	427	369	384
COD	-	-	-	4290	4320	4570	4450	5200	4060	4510	3820	4730
NH4-N	-	-	-	1777	1654	1695	1565	1748	1278	1416	798	1719

8.6 Environmental Noise Monitoring

8.6.1 Environmental Noise Monitoring Locations

Annual noise monitoring was conducted at the facility on the 5th of June 2009 in accordance with Condition 6.11.1 and Schedule B.4 of Waste Licence Register No. W081-03. Monitoring was conducted at six locations on the site; N1, N2, N3, N4, N5 and N6 and at four Noise Sensitive Locations; N8, N12, N14 and N16 as detailed in Table 28 below. The locations of all noise monitoring stations are detailed on Drawing KTK/602, Rev X (Appendix A). The results and interpretations of the monitoring exercise were reported in the Quarter 2 environmental reporting submission to the EPA.

Table 28: Environmental Noise Monitoring Locations including Noise Sensitive Locations in and around KTK Residual Landfill.

Media	Location	Eastings	Northings
Noise Monitoring	N1A	285661	211438
	N2A	285878	211396
	N3A	286123	211106
	N4A	286029	210959
	N5A	285618	211022
	N6A	285550	211230
	N8A	285461	211459
	N12A	285710	210641
	N14A	286258	210888
	N16A	286389	211154

8.6.2 Environmental Noise Monitoring Locations

A Cirrus CR:831A sound level meter was used to take the noise measurements at the facility. This instrument is a Type 1 data logging integrated sound level meter and is in accordance with the requirements of IEC Publication 651. The meter is calibrated annually.

However, prior to monitoring at each location a field calibration is carried out, to calibrate the meter at 97.3 dB, using the Cirrus CR:513A acoustic calibrator. This calibrating instrument was also calibrated in October 2009.

Prior to each measurement the instrument was mounted on a tripod at approximately 1.4 – 1.5 metres above ground level and 3.5m away from any sound reflecting objects as specified in ISO 1996: Acoustics – Description and Measurement of Environmental Noise (Part 1). The Time Weighting used was 'fast' and the Frequency Weighting was 'A' weighted.

In addition, a wind shield was used to reduce potential wind interference during measurements. The wind speed at each location during the monitoring period was less than 5m/s as required in ISO 1996: Acoustics – Description and Measurement of Environmental Noise (Part 2).

Cognisance was given to the following documents during preparation for the noise survey and writing of this report:

- Environmental Noise Survey Guidance Document, 2nd Edition. EPA 2006.
- Integrated Pollution Control Licensing – Guidance Note for Noise in Relation to Scheduled Activities, EPA 1995.
- Landfill Manuals – Landfill Monitoring, 2nd Edition, EPA 2003.
- Landfill Manuals – Manual on Site Selection, Draft for Consultation, December 2006.
- ISO 1996: Acoustics – Description and Measurement of Environmental Noise (Part 1)

The following parameters were measured at the nine monitoring locations in compliance with Schedule 6.1.1 and Table B.4 of waste licence W081-03.

- **LAeq**, 30 min - the equivalent continuous noise level in dB(A) over a specified measurement interval i.e. 30 minutes.
- **LA10**, 30 min - the noise level in dB(A) equalled or exceeded for 10% of the measurement interval i.e. 30 minutes.
- **LA90**, 30 min – the noise level in dB(A) equalled or exceeded for 90% of the measurement interval i.e. 30 minutes.
- Frequency Analysis i.e. 1/3 octave band analysis.

8.6.3 Environmental Noise Monitoring Survey Results

The results of noise monitoring conducted at the KTK Landfill facility in July 2009 are presented in Table 29 below. Interpretation of these results were included as part of the Quarter 3 2009 environmental monitoring report submitted to The Agency. The report concluded that elevated noise levels were attributed to traffic noise on adjacent public roads and not activity within the site.

Table 29: Environmental Noise Monitoring Results from a survey conducted in June 2009 at KTK Landfill

Location	Date & Time	Wind Speed m/s	LAeq dB(A)	LA10 dB(A)	LA90 dB(A)
N1A	03/07/09 13:52pm	1.1 – 2.2	60	58	48
N2A	03/07/09 13:12pm	0.0 – 0.5	53	58	43
N3A	03/07/09 10:30am	0.0 – 0.8	49	52	42
N4A	03/07/09 11:17am	0.0 – 1.2	46	44	42
N5A	03/07/09 12:09pm	0.0 – 0.8	48	62	38
N6A	03/07/09 12:55pm	1.6 – 2.5	52	51	40
N8	03/07/09 14:38pm	1.2 – 1.9	64	61	44
N12	03/07/09 10:37am	0.0 – 0.7	65	58	40
N14	03/07/09 11:28am	0.0 – 0.8	62	72	37
N16	03/07/09 09:35am	0.0 – 0.9	59	35	35

8.7 Surface Water Monitoring

8.7.1 Surface Water Monitoring Locations

Surface water monitoring was conducted at the facility in accordance with Schedule C.3 of Waste Licence Register No. W0081-03. Surface water monitoring locations SW4, SW5, SW6 and SW7 are detailed in Table 30 below with monitoring locations illustrated on Drawing KTK/602 Rev X, (Appendix A). Monitoring of surface water at the facility comprised weekly visual inspections and quarterly sampling and analyses, which are discussed in more detail below.

Table 30: Surface Water Monitoring Locations at KTK Landfill

Media	Location	Eastings	Northings
Surface Water	SW4	285512	211006
	SW5	285612	211014
	SW6	285664	211014
	SW7	285533	211140

8.7.2 Surface Water Quality Sampling Methodology

Surface water monitoring was conducted on a quarterly basis at the four locations detailed in Table 25. Surface water sampling involved the submergence of the designated sample container into the surface water body. During submergence every effort is made to keep the container steady so as to prevent sediment disturbance.

Quarterly surface water samples were analysed for parameters stipulated in Table C.3 Storm Water/Surface Water Monitoring of Waste Licence Register No. W0081-03. Details and analyses of all surface water sampling were forwarded to the Agency in Quarterly reports 1 to 4 of 2009. During 2009, the sampling regime was split between KTK Landfill staff and Golder Associates staff members. Golder sampled and analysed the annual parameters required by the licence. This was conducted in Quarter 3 of 2009. The remaining 3 Quarters of 2009 were monitored by KTK staff members.

A summary of concentrations from a number of indicator parameters up-gradient and down-gradient of the facility recorded during the reporting period are presented in Figures 14 to 17 below.

Figure 14: pH Levels Detected in Surface Water Samples Retrieved from SW4 - SW7 during 2009

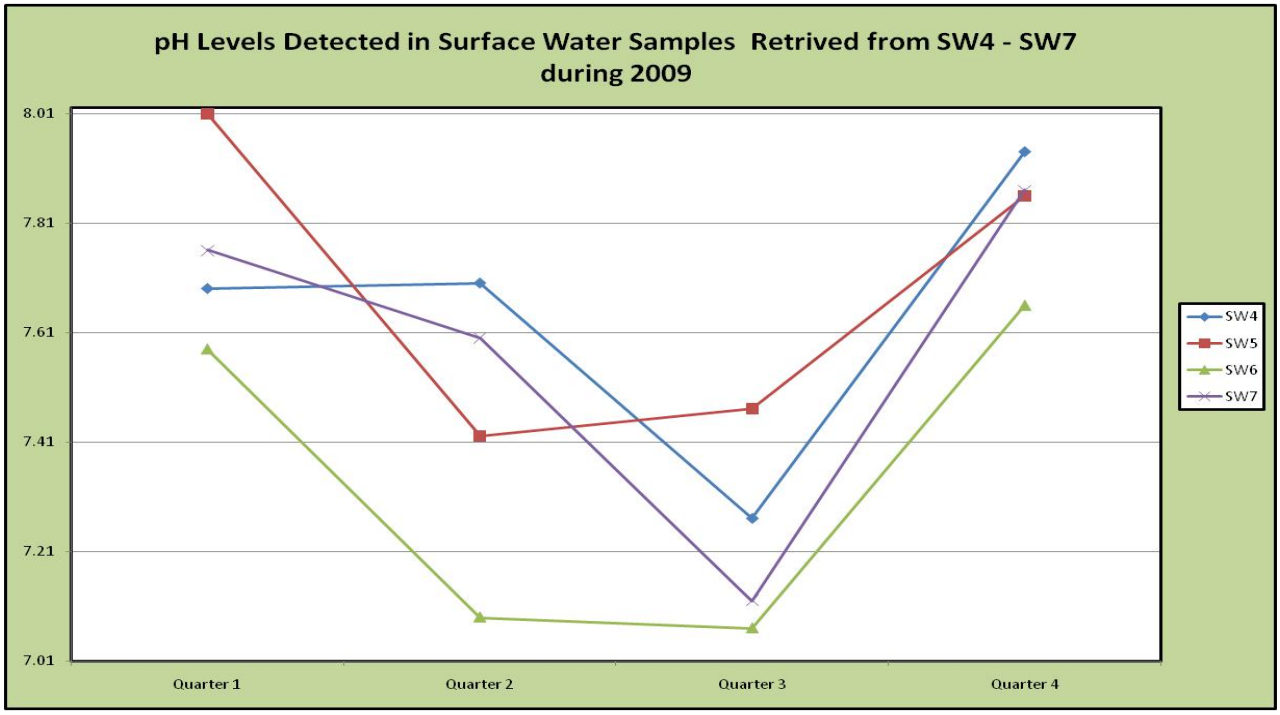


Figure 15: Electrical Conductivity Levels Detected in Surface Water Samples taken from locations at KTK Landfill during 2009

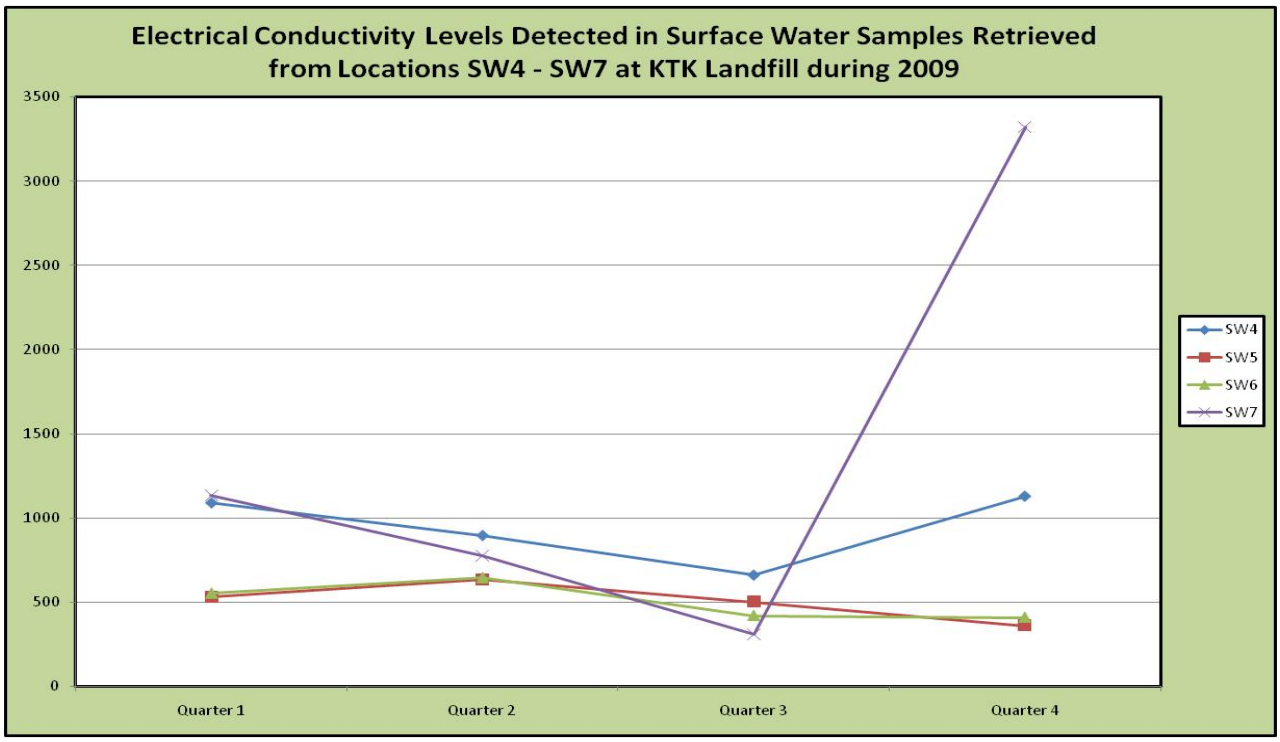


Figure 16: Chloride Levels Detected in Surface Water Samples Retrieved from Monitoring Locations SW4 - SW7 at KTK Landfill during 2009

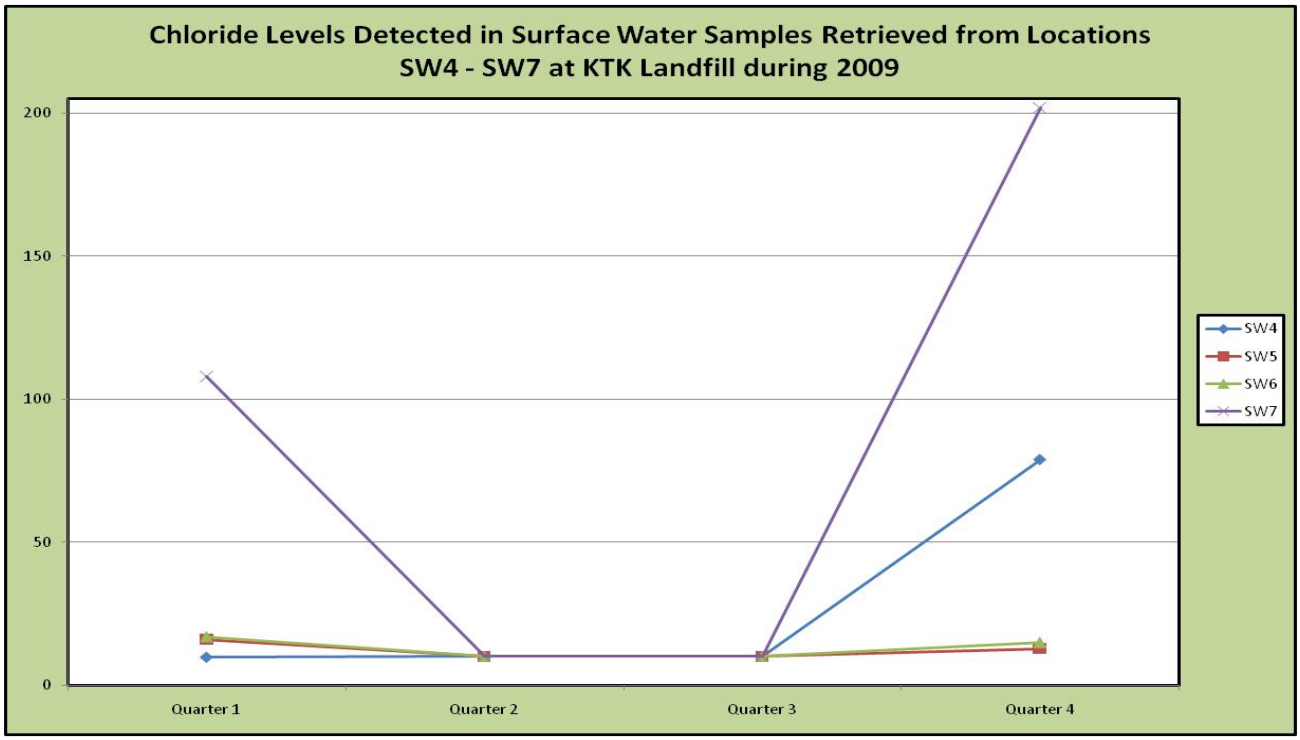
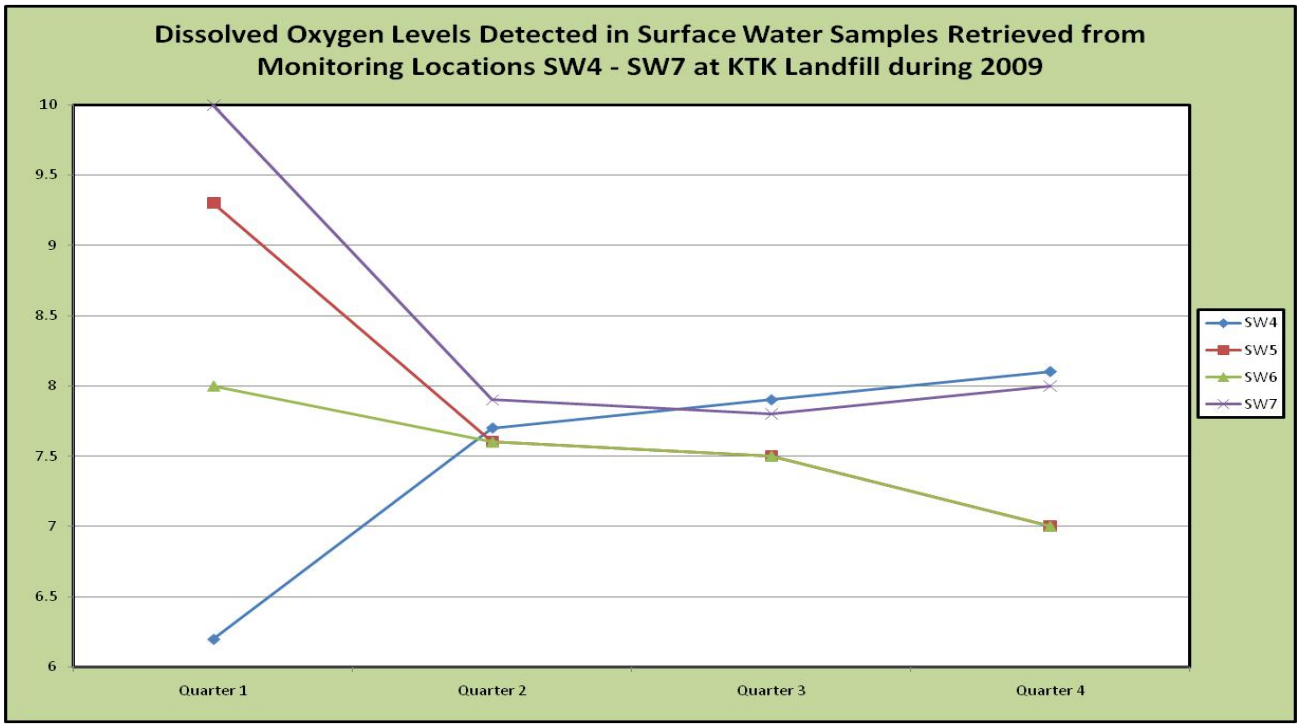


Figure 17: Dissolved Oxygen Levels detected in Surface Water samples retrieved from Monitoring Locations SW4 - SW7 at KTK Landfill during 2009



8.7.3 Surface Water Visual Inspections

A visual inspection of surface water was carried out towards the southern end of the landfill. Surface water visual inspections comprise four locations down-gradient of the landfill (SW4, SW5, SW6 and SW7).

The inspection entailed walking along the stream banks and checking for any signs of potential pollution such as littering, iridescence or odour. To supplement these observations, measurements of pH, conductivity and temperature were taken. Details of all visual inspections have been furnished to the Agency in the subsequent quarterly reports.

8.8 Meteorological Reporting

Details of meteorological monitoring conducted at the facility during 2009 are outlined in Section 18: "Meteorological Report". It is noted that the on-site weather station at KTK was in-operable for some parts of 2009 and data was gathered from Casement Aerodrome during these periods.

8.9 Asbestos Fibre Monitoring

Schedule C.3 Asbestos Fibre Monitoring of the Waste Licence W0081-03, for KTK Landfill, specifies that asbestos fibre monitoring be completed annually. The monitoring was carried out on the 10th of November 2009.

8.9.1 Methodology

Asbestos fibre monitoring was carried out on the 10th of November 2009. The monitoring was carried out by ACS Ltd. Four air tests and one personal sample were taken in accordance with UK Health & Safety Executive procedure MDHS 39/4 (1995).

8.9.2 Results

The results of the asbestos monitoring for the reported period are in full compliance with licence conditions and no fibres were detected in any of the 4 no. samples. A summary of the validated results is presented in Table 31 below.

Table 31: Asbestos Fibre Monitoring Results

Filter ID	Slide Ref.	No. of Fibres Counted	Air Volume (Litres)	Fibre Conc. (Fibres/ml)
Location 1	09/pb/1135	0	500	<0.01
Location 2	09/pb/1136	0	500	<0.01
Location 3	09/pb/1137	0	500	<0.01
Location 4	09/pb/1138	0	500	<0.01

8.10 Pollution Release Transfer Register

The 2009 PRTR is presented in Appendix E.

The data as calculated is significantly less than what has been determined for 2008 and 2007. The reason for this is that previously air mass emissions were determined where inaccurate assumptions were made on the quantity of gas that was combusted in the engines, i.e. no separate flow meter on engines. The landfill gas utilisation plant comprises a blower station with 3 gas engines and 2500m3/hr flare operating in parallel mode. That is, gas in excess of engine demand or during engine shut down is automatically diverted to flare to maintain constant volumetric draw of gas from the landfill. Previous E-PRTR returns were made under the assumption that gas engines were operating constantly and at full load. This is not the case and in reality the

bulk of gas drawn into gas utilisation plant is actually burnt in the flare. While there is no flow meter measuring actual gas volumes to engines KTK Landfill Ltd has developed a methodology to accurately record the gas volumes that are utilised. This is based on a number of trials where flare was turned off and engines ran at fixed load with known fixed methane concentration for a period of time with electrical output and gas volume consumed measurements been taken. The results of these trials show that at a certain % of methane and a certain engine load, a fixed volume of gas will be consumed for every MWhr of electrical energy produced. Therefore, the total quantity of gas consumed by engines each month is determined with a correction applied for the actual average methane for that month.

9.0 RESOURCE AND ENERGY CONSUMPTION SUMMARY 2009

The main resources consumed at the facility during the reporting period were electricity, water for potable supply, vehicle wheel cleaning and dust suppression, diesel fuel and hydraulic oils. The details are listed in Table 32.

Table 32: Usage of Energy and Resources during 2009 at KTK Landfill

Resource	Units	Consumption
Electricity	kWhr	658,340
Water, Potable Supply	Litres	114,128
Water, Dust suppression	Litres	1,500,000
Water, Wheel Cleaning Unit	Litres	3,722,300
Total Water (dust suppression, potable & wheel cleaning)	Litres	5,336,428
Diesel	Litres	62,222
Hydraulic Oils	Litres	247
Grease	kg	45
Imported Aggregates	Tonnes	9,456

Diesel, hydraulic and engine oil consumption has dramatically reduced during 2009 due to the substantial closure of KTK landfill to commercial and industrial wastes thereby eliminating the requirement for the 2 landfill compactors. Water consumption was also down on the 2008 figure due to the wet summer reducing the requirement for dust suppression and reduced traffic movements on site reducing wheel wash operations.

Electricity consumption during 2009 was significantly increased above the 2008 figure of 75% due to significantly increased landfill gas flaring, peaking in April 2009, and increased leachate pumping from October 2009 and the introduction of leachate reverse osmosis treatment plant and methane stripping plant in November 2009.

9.1 Resource Recovery and Energy Production Summary

KTK Landfill Ltd landfill gas utilisation plant exported 21,598,500 kWhr of electricity to the national grid during 2009. This is up 5.2% on 2008 exported energy of 20,531,500 kWhr. It is anticipated that electricity export will be approximately 23,000,000 kWhr in 2010 as reduction in maintenance downtime is expected.

The main materials recovered at the facility during the reporting period were woodchip, soil and stones. The details are listed in Table 33 below.

Table 33: Material Recovery and Electricity Production during 2009

Resource	Units	Recovered
Electricity Produced	kWhr	21,598,500
Waste lubricating oil recovered from landfill gas utilisation engines	Litres	73,550
Woodchip recovered for roadway construction	Tonnes	942
Inert material recovered for internal engineering purposes (daily cover, intermediate cover, berms etc.)	Tonnes	128,056

10.0 VOLUME OF LEACHATE TRANSPORTED / DISCHARGED OFF SITE.

Volumes of leachate removed from the site during 2009 are listed below in Table 34 and detailed information including the final destination of the transported leachate.

Table 34: Volume of leachate transported or discharged off-site during 2009

Month	Volume (m^3)
January 2009	2,861
February 2009	2,731
March 2009	3,094
April 2009	2,159
May 2009	1,735
June 2009	1,825
July 2009	1,851
August 2009	1,781
September 2009	2,478
October 2009	5,037
November 2009	7,380
December 2009	16,445
Total 2009	**49,377**

11.0 REPORT ON DEVELOPMENT WORKS UNDERTAKEN DURING THE REPORTING PERIOD, AND A TIMESCALE FOR THOSE PROPOSED DURING THE COMING YEAR.

11.1 Developments during 2009

The following development work was undertaken during 2009. The key works undertaken during the reporting period 1st January – 31st December 2009 are depicted in Table 35 below.

Table 35: Key works undertaken during 2009

Date	Event
January 2009	Decommissioning site perimeter litter netting
January – December 2009	Placement of site regulating layer to form profile suitable for placement of final capping
July 2009	Installation of 3 No. 500mm diameter gas extraction wells
August 2009	Commenced stage 1 final permanent capping – 70,000m2 of total 160,000m2. Total LDPE placed as of 31st Dec 2009 was 15,000m2.
November 2009	Installation of 80m3/day capacity leachate Reverse Osmosis treatment plant, methane stripping plant and sewer discharge
December 2009	Installation of temp 30m3 methane stripping tank for the partial treatment of leachate
December 2009	Construction of temp lined leachate storage lagoon – 4,200m3 capacity
December 2009	Installation of 8 No. 450mm diameter leachate dewatering wells equipped with pneumatic pumping systems

11.2 Proposed Development during 2010

It is the policy of KTK Landfill to continuously improve the infrastructure and operating standards of the facility where possible. To this end a number of significant improvements are proposed to be undertaken during 2010, subject (where appropriate) to the Agency's approval.

11.3 Landfill Leachate Management

Leachate treatment capacity and sewer discharge of treated effluent will be increased, subject to Agency and Sanitary Authority agreement, to 150m3/day. On-site treatment will comprise Reverse Osmosis and methane stripping.

11.4 Restoration

Continue the placement of site regulating layer to form profile suitable for placement of final capping.

Complete stage 1, 70,000m³ final permanent capping by May 2010. Commence stage 2, 45,000m², of final permanent cap in July/August 2010. Total area with final permanent capping expected to be completed by Dec 2010 is 115,000m2 or 71% of total area of 160,000m².

11.5 Landfill Gas Management and Utilisation

Landfill Gas Management at KTK Landfill comprises collection, flaring and utilisation of gas. It started in 2003 as a joint venture company between G.A.S Energietechnologie GmbH and Greenstar Ltd to form Greenstar Gas Energy. Its aims are to supply, operate and maintain a Landfill Gas Utilisation Plant at the KTK Landfill

Ltd. Site. The electricity produced is sold to a private utility company at pre-agreed rates and the plant burns 1,950 m3/hr of landfill gas at 50% methane and has a maximum electrical output of 3.6MW. Furthermore the site has a total operational flaring capacity of 4,000 m3/hr and back up flaring capacity of 3,000m3/hr.

11.6 Monitoring Infrastructure

No changes to the monitoring infrastructure are planned for 2010.

12.0 SITE SURVEY SHOWING EXISTING LEVELS OF THE FACILITY AT THE END OF THE REPORTING PERIOD.

Please refer to Drawing KTK/602, Rev. X presented in Appendix A. The annual topographical survey was conducted at the site in January 2010.

13.0 ESTIMATED AND ANNUAL CUMULATIVE QUANTITIES OF LANDFILL GAS EMITTED FROM THE FACILITY.

It is estimated that approximately 41,902,535 m³ of landfill gas were extracted during 2009 for utilisation and flaring. Please refer to the summary in Table 36 below. Full details are presented in Appendix B.

Table 36: Summary of Annual Quantities of Landfill Gas Collected for Utilisation and Flaring at KTK Landfill during 2009

Month	Total Quantity of LFG Collected	Quantity of CH4 Collected	Quantity of CO2 Collected	Gas Quality (% v/v) (Total figure is averaged)		
	(m^3)	(kg CH_4)	(kg CO_2)	CH_4	CO_2	O_2
January 2009	4,231,502	1,391,827	3,066,994	45.4	37.1	1.4
February 2009	3,708,699	1,144,080	2,545,454	42.6	35.0	1.7
March 2009	4,279,739	1,339,808	2,982,644	43.4	35.5	1.5
April 2009	4,343,325	1,331,369	3,046,710	41.9	35.1	1.8
May 2009	4,035,634	1,274,409	2,814,591	43.1	34.9	1.9
June 2009	3,883,335	1,212,325	2,611,170	42.5	33.5	2.2
July 2009	3,767,771	1,188,886	2,568,941	42.2	33.7	2.1
August 2009	2,918,546	892,417	2,278,343	41.5	43.9	1.7
September 2009	2,816,146	856,518	2,422,529	38.4	55.9	1.9
October 2009	2,691,346	844,720	1,683,451	42.0	31.5	2.1
November 2009	2,593,946	807,325	1,542,632	42.8	30.9	1.7
December 2009	2,632,546	799,785	1,561,009	41.7	30.6	1.8
Total Collected	**41,902,535**	**13,083,470**	**29,124,470**	**42.3**	**36.5**	**1.8**

14.0 ESTIMATED ANNUAL AND CUMULATIVE QUANTITY OF INDIRECT EMISSIONS TO GROUNDWATER.

The potential sources of indirect emissions into groundwater are:

Landfill Base

The landfill site has a composite base lining system comprising a HDPE geomembrane and one metre thick layer of compacted clay. A leak location 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 & Treatment System

Surface water from the paved access road and service platform is collected and discharged into a surface water infiltration area. However, prior to final discharge into the ground, surface water is conveyed via a buried PVC sewer pipe to a concrete silt settlement tank and a Class 1 Klargester surface water bypass separator. The quality of the surface water discharge downstream of the separator is measured quarterly at the monitoring manhole identified as SW7.

Treated Sewage Effluent

There are two BioCycle waste water treatment units on the site which treat the canteen and office waste water prior to discharge into a percolation area. In summary as the landfill is fully contained there will be minimal to nil indirect emissions to ground water.

15.0 ANNUAL WATER BALANCE CALCULATION AND INTERPRETATION

The weather data, used for the purposes of the annual water balance calculations is derived from the weather station at KTK Landfill, Casement Aerodrome (Evapotranspiration and Evaporation) This data is depicted in the following Table 37 below.

Table 37: Climatological Data (mm) at KTK Landfill during 2009

Month	KTK Rainfall Data (mm)	Evapotranspiration (Casement)	Evaporation (Casement) (mm)
January 2009	96.00	11.90	16.87
February 2009	18.00	16.54	23.43
March 2009	**24.4c**	35.51	54.67
April 2009	**74.1c**	49.28	73.04
May 2009	**53.2c**	74.91	115.42
June 2009	**72.8c**	90.02	126.19
July 2009	76.80	78.46	113.18
August 2009	71.40	68.30	99.97
September 2009	42.60	45.20	64.51
October 2009	87.20	25.58	35.08
November 2009	174.40	14.72	20.46
December 2009	54.20	8.34	11.28
Total 2009	**620.60**	**518.75**	**754.10**

C – Indicates that the rainfall data was taken from Casement Aerodrome. The remaining results are taken directly from the weather station at KTK Landfill.

A water balance is used to calculate the difference between rainfall on landfilled areas and the various losses prior to leachate generation. See Figure 19 for the water balance calculations.

Leachate that is not taken away by tanker, or absorbed initially by the wastes is re-circulated within the waste mass so as to increase the moisture content of the waste and accelerate biodegradation.

Operating experience on the site has revealed that large quantities of the incident rainfall or leachate that is re-circulated from the sumps on the landfill base is and will be absorbed by the dry C&I wastes deposited in the KTK Landfill. Absorption rates are estimated to be in the range of 0.11 and 0.15 cubic metres per tonne of waste.

16.0 METEROLOGICAL REPORT 2009

The site is equipped with a Skyview meteorological station, which produces monthly climatological summaries comprising wind speed (km/hr), rain (mm) and temperature (o C). Other data is collected from the Casement Aerodrome met station. During 2009, data was not available for the months March through June due to a malfunction with the Skyview System. The data for these months was collated from data from Met Eireann at Casement Aerodrome. Monthly Rainfall, Evapotranspiration and Temperature data are depicted in Table 38.

Table 38: Meteorological Data 2009

Month	Rainfall (KTK) (mm)	Evapotranspiration (Casement) (mm)	Evaporation (Casement) (mm)	Average Monthly Temperature (KTK) (^{o}C)
January 2009	96.00	11.90	16.87	4.9
February 2009	18.00	16.54	23.43	2.0
March 2009	**24.4c**	35.51	54.67	6.7c
April 2009	**74.1c**	49.28	73.04	8.8c
May 2009	**53.2c**	74.91	115.42	11.2c
June 2009	**72.8c**	90.02	126.19	14.2c
July 2009	76.80	78.46	113.18	13.8
August 2009	71.40	68.30	99.97	14.5
September 2009	42.60	45.20	64.51	12.2
October 2009	87.20	25.58	35.08	11.1
November 2009	174.40	14.72	20.46	7.0
December 2009	54.20	8.34	11.28	3.1
Total	**620.60**	**518.75**	**754.10**	**8.575**

17.0 SCHEDULE OF ENVIRONMENTAL OBJECTIVES AND TARGETS FOR THE FORTHCOMING YEAR

This Schedule of Objectives and Targets and Environmental Management Programme has been developed by Golder Associates Ireland, in conjunction with KTK Landfill Limited.

The Schedule of Objectives and Targets and the Environmental Management Programme, has been developed in accordance with Conditions 2.2.2.2 and 2.2.2.3 of Waste Licence W0081-3 and, Clause 4.3.3 of ISO 14001:2004 Environmental Management Systems – Requirements with Guidance for Use, and with reference to KTK Landfill's Environmental Management System.

The aim of the Schedule of Objectives and Targets and the Environmental Management Programme, is to outline a set of achievable objectives and targets, aimed at meeting the commitments set out in the KTK Landfill Ltd Environmental Policy (see Appendix F) and to mitigate the significant environmental aspects associated with KTK Landfill Ltd operations.

KTK Landfill Ltd is an ISO 14001: 2004 certified company (Certification No. SGR 05/66145). It is the policy KTK Landfill Ltd to continually seek to improve its environmental performance. This commitment is outlined in the Company's Environmental Policy. This Policy commits the organisation to setting targets and objectives, aimed at improving environmental performance and mitigating the potential impacts that the Facility may have on the environment.

KTK Landfill Ltd is licensed under the Waste Management Act 1996. Conditions 2.2.2.2 and 2.2.2.3 of Waste Licence W0081-3 require that KTK Landfill Ltd maintain a Schedule of Objectives and Targets and an Environmental Management Programme.

The Schedule of Objectives and Targets and the Environmental Management Programme shall *'as a minimum provide for a review of all operations and processes, including an evaluation of practical options, for energy and resource efficiency, the use of cleaner technology cleaner production, and the prevention, reduction and minimisation of waste, and shall include waste reduction targets'.* The Schedule of Objectives and Targets and the Environmental Management Programme *'shall consider a five year period as a minimum.'*

17.1 Definitions

Condition 2.2.2.3 of Waste Licence W0081-3 sets out that an Environmental Management Program shall consist of a timed schedule for achieving the (Licensee's) Environmental Objectives and Targets. The EMP shall include; the designation of responsibility for targets, the means by which they will be achieved, the time within which they will be achieved.

An Environmental Objective; as defined by ISO 14001:2004 is an 'overall environmental goal, consistent with the (Company's) environmental policy, that an organisation sets itself to achieve.'

An Environmental Target; as defined by ISO 14001:2004, is a 'detailed performance requirement, applicable to the organisation or part thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.'

Figure 18: Annual Water Balance

Figure 19 - Leachate Generation Calculations

Actual Rainfall from on-site Weather Station.

Evaporation Data (Class A Pan Totals) from Met Eireann Casement Aerodrome Weather Station

Evapotranspiration Data From Met Eireann Casement Aerodrome Weather Station

Site Name: KTK Landfill Site, Brownstown and Carnalway, Kilcullen, Co. Kildare

Irish National Grid Reference:

East 285680.75

North 211471.37

Annual Environmental Report: From 1st January 2009 to 31st December 2009

Operator: KTK Landfill Ltd

Site Status: Licence No. W081-03

Period	(1)Active Fill Area	Total Area of Active Fill (m2)	Evaporation (m)	Total Penman Potential Evapotranspiration (m)	Actual Rainfall (m)	(2)Infiltration through Active Area (m3)	Vegetated Restored Area	Vegetated Restored Area (m2)	(3)Effective Rainfall (mm)	(2)Infiltration Vegetated Restored Area (m3)	(4)Weight of Material Deposited (Tonnes)	(5)Absorbtive Capacity of the waste (m3/t)	Volume of Water Absorbed (m3)	(6)Volume of Water Consumed in LFG Production (m3)	Volume of Leachate Removed Off-Site (m3)	(7)Leachate Recirculated/Stored Within Site (m3/month)
Jan-09	Phase 1/2/3/4/6	123,227	0.0169	0.0119	0.0596	6,305	Phase 5	36,936	0.048	881	16,785	0.05	839	0	2,861	3,485
Feb-09	Phase 1/2/3/4/6	123,227	0.0234	0.0165	0.0579	5,691	Phase 5	36,936	0.041	765	4,783	0.05	239	0	2,731	3,486
Mar-09	Phase 1/2/3/4/6	123,227	0.0547	0.0355	0.0244	0	Phase 5	36,936	0.000	0	4,962	0.05	248	0	3,094	0
Apr-09	Phase 1/2/3/4/6	123,227	0.0730	0.0493	0.0741	4,631	Phase 5	36,936	0.025	458	4,095	0.05	205	0	2,159	2,725
May-09	Phase 1/2/3/4/6	123,227	0.1154	0.0749	0.0532	0	Phase 5	36,936	0.000	0	4,674	0.05	234	0	1,735	0
Jun-09	Phase 1/2/3/4	110,201	0.1262	0.0900	0.0728	1,070	Phase 5 & 6	49,963	0.000	0	6,742	0.05	337	0	1,825	0
Jul-09	Phase 1/2/3/4	110,201	0.1132	0.0785	0.1110	5,996	Phase 5 & 6	49,963	0.033	812	12,826	0.05	641	0	1,851	4,316
Aug-09	Phase 1/2/3/4	110,201	0.1000	0.0683	0.0682	2,007	Phase 5 & 6	49,963	0.000	0	12,803	0.05	640	0	1,781	0
Sep-09	Phase 1/2/3/4	110,201	0.0645	0.0452	0.0288	0	Phase 5 & 6	49,963	0.000	0	42,584	0.05	2129	0	2,478	0
Oct-09	Phase 1/2/3/4	110,201	0.0351	0.0256	0.0888	7,853	Phase 5 & 6	49,963	0.063	1,579	20,829	0.05	1041	0	5,037	3,354
Nov-09	Phase 1/2/3/4	110,201	0.0205	0.0147	0.1842	19,172	Phase 5 & 6	49,963	0.170	4,234	7,880	0.05	394	0	7,380	15,632
Dec-09	Phase 1/2/3/4	110,201	0.0113	0.0083	0.1025	10,674	Phase 5 & 6	49,963	0.094	2,353	3,362	0.05	168	0	16,445	0
Total			**0.7541**	**0.5187**	**0.9255**	**63,399**			**0.473**	**11,082**	**142,325**		**7,116**	**0**	**49,377**	**32,997**

Notes:

(1) The active area is assumed to be that area of the site where no vegetation has been planted.

(2) The actual rainfall data less 50% of evaporation were used to calculate the infiltration through the active fill area, and 50% of the effective rainfall was assumed to infiltrate through the vegetated restored area.

(3) Effevtive Rainfall is assumed to be actual rainfall minus evapotranspiration

(4) Weight of waste deposited includes all covering and engineering material used, including woodchip.

(5) An absorbtive capacity of 0.15m3/t was used based on site experiences, i.e. dry absorbtive wastes (paper, cardboard) and cover material (woodchip, fines)

(6) Assumes anaerobic fermentation of wastes consumes 27 litres of water for every tonne of waste over the life time of the waste - " *The Engineering of a Sustainable Landfill" Jonathan Derham, MCOS, 1995.*

(7) The storage capacity of the basal area of landfill, assuming level does not exceed 1.0m above liner, is 4,300m ^{3}/hr. Leachate above this volume is continuously recirculated.

Table 39: Schedule of Objectives and Targets for 2010 (2007 to 2012 Program)

Ref. No.	Objective	Ref. No.	Target	ENV Aspect	Resources Required	Person Responsible	Time Frame for Completion
O - 1	Lower the environmental impacts associated with fugitive landfill gas emissions by continually developing the Facility's Gas Utilisation Infrastructure and landfill gas management techniques.	T - 1.1	Undertake quarterly VOC surveys of the waste surface over the next 5 years, to establish the areas were fugitive emissions are most prevalent.	1,9	External Consultant (circa €1,800 per survey)	Site Manager	Ongoing
		T - 1.2	Installation of gas extraction boreholes were fugitive emissions have been identified from the VOC surveys.	1,9	Circa €1,700 per borehole.	Site Manager	Ongoing
		T - 1.3	Achieve 70% utilisation of landfill gas extracted by 2012 by undertake landfill gas modelling of the waste body to establish the most the environmentally beneficial method for managing landfill gas. i.e. By maximising landfill gas utilisation and minimising flaring.	1,9	External Consultant (circa €2,500 per model)	Site Manager	2012

		T - 1.4	Support University College Dublin Research Project commissioned to investigate the most effective cover material for achieving maximum odour neutralisation.	1,9	UCD €10,000	GM Landfill Group	Dec 2009
		T - 1.5	Monitor and review the effectiveness of the perimeter odour neutralising infrastructure installed in 2005 and maintain record of performance.	1,9	Assistant Site Manager (80 man hours)	Site Manager	Ongoing
		T – 1.6	Reduce fugitive emissions by completion of final permanent capping	1, 9	Site management, consultants, contractor (est €4M)	Site Manager	2012
O - 2	Lower the potential environmental impacts (i.e. risk of spillage, CO2 emissions) associated with the off site transport of leachate.	T - 2.1	Divert leachate for tankering to direct discharge to sewer, by on site treatment with agreement of EPA and KCC Achieve 50% diversion rate by 2010 and a 75% diversion rate by 2012	2	External Consultant (€2,500)	Site Manager	Ongoing

		T - 2.2	Design and commission on-site leachate treatment plant to reduce leachate to domestic strength and dissolved methane levels in leachate to below the regulatory requirement of 0.2 mg/l. Increase plant capacity to 150m3/day	2	Circa €600,000	Site Manager	December 2009 July 2010
O - 3	Lower the potential environmental nuisance associated with dust by improving dust management techniques	T - 3.1	Source road washing/sweeping plant for permanent operation on site	7	Circa €8,000 pa	Site Manager	Complete
		T - 3.2	Investigate available technology options for dust suppression activities, that minimises water usage.	7	Assistant Site Manager (20 man hours)	Site Manager	Complete

O - 4	Implement CRAMP	T – 4.1	Complete design, contractor selection, and engineering works associated with stage 1 area of final permanent capping of approx 70,000m^2 Complete design, contractor selection, and engineering works associated with stage 2 area of final permanent capping of approx 45,000m^2	1, 9	External consultants and contractors	Site Manager	June 2010 July 2011
O - 5	Minimise the amount of natural resources (water, power etc) consumed at the Facility.	T - 5.1	Update the existing utilities report on an annual basis so as to identify operational resource consumption	4	External Consultant (circa €1,000 pa)	Site Manager	Ongoing
		T - 5.2	Review Energy Audit of Facility and identify opportunities for improved energy efficiency.	4	Site Manager (20 man hours)	Site Manager	December 2010
		T – 5.3	Carry out assessment of the use of raw material at the Facility and identify opportunities for the improved efficiency in the use of raw materials.	4	Assistant Site Manager (40 man hours)	Site Manager	December 2010

		T - 5.4	Carry out assessment of water usage at the facility and identify opportunities for improved efficiency of water usage.	4	Assistant Site Manager (40 man hours)	Site Manager	Ongoing
		T – 5.5	Use storm water for dust suppression activities when available.	4	Tanker Trailer and bowser	Site Supervisor	Ongoing
O - 6	Improve Health, Safety and Welfare	T - 6.1	Review and amend site safety statement so that it is consistent with other sites within the Greenstar Landfill Group	8	Assistant Site Manager (40 man hours)	Site Manager GM Landfill Group	June 2010
		T - 6.2	Reduce lost time injuries by 5% over the next five years	8		All site Personnel	Ongoing
		T - 6.3	Develop Accident Prevention Plan	8	Assistant Site Manager (80 man hours)	Site Manager GM Landfill Group	June 2007
		T - 6.4	Achieve Certification to OHSAS 18001	8	Assistant Site Manager (160 man hours)	Site Manager GM Landfill Group	June 2010

O-7	Training	T7.1	Continue to train staff on a regular basis in EMS system, waste licence and Emergency Response.		Assistant Site Manager	Site Manager	Ongoing
O-8	Operations	T8.1	Encourage all site hauliers to comply fully with the Waste Collection Permit Regulations		Site Manager	Site Manager	Ongoing

Table 40: Programme of Objective and Targets 2007 to 2012 – Progress Quarter 4 (December) 2009

Ref. No.	Objective	Ref. No.	Target	ENV Aspect	Resources Required	Person Responsible	Time Frame for Completion	Progress as of 31st December 2009
O - 1	Lower the environmental impacts associated with fugitive landfill gas emissions by continually developing the Facility's Gas Utilisation Infrastructure and landfill gas management techniques.	T - 1.1	Undertake quarterly VOC surveys of the waste surface over the next 5 years, to establish the areas were fugitive emissions are most prevalent.	1,9	External Consultant (circa €1,800 per survey)	Site Manager	Ongoing	Surveys carried out on 3rd April 2008, 1st August 2008, 5th of December 2008 , 2nd of April 2009, 17 July 2009 & 22nd December 2009.

		T - 1.2	Installation of gas extraction boreholes were fugitive emissions have been identified from the VOC surveys.	1,9	Circa €1,700 per borehole.	Site Manager	Ongoing	Leakage areas targeted by gas wells & additional cover 15 gas wells installed in March 08, 20 wells in June 08, 16 wells in Aug 08 and 36 wells in for Nov 08. 750 enclosed flare acquired in Nov 08 as site reaches peak gas production. Additional 63mm horizontal wells installed along phase 6 slope. 6 wells installed in phase 5b in Oct 09. 11 No 1m diameter wells installed in Oct and Dec 2009. Purchased FID and regular VOC surveys are been carried out monthly and any leakage detected areas been with added extraction.

		T - 1.3	Achieve 70% utilisation of landfill gas extracted by 2012 by undertake landfill gas modelling of the waste body to establish the most environmentally beneficial method for managing landfill gas. i.e. By maximising landfill gas utilisation and minimising flaring.	1,9	External Consultant (circa €2,500 per model)	Site Manager	2012	Methodology has been developed to calculate quantity of gas been utilised as opposed to flared. Methodology was based on trial of utilisation of gas only whereby the amount of gas to produce know MWhr was determined. 35% of gas was utilised during 2007. By Sept 08 38% of gas is utilised. However due to additional flaring this has reduced by year end. For 2009 28%of landfill gas collected at the site was utilised
		T - 1.4	Support University College Dublin Research Project commissioned to investigate the most effective cover material for achieving maximum odour neutralisation.	1,9	UCD €10,000	GM Landfill Group	Dec 2012	Project ongoing. Site contribution to date includes set up of pilot scheme to determine absorptive capacities of various cover materials been investigated. UCD presented paper on findings to date at Sardinia Waste Symposium in Oct 2007.

		T - 1.5	Monitor and review the effectiveness of the perimeter odour neutralising infrastructure installed in 2005 and maintain record of performance.	1,9	Assistant Site Manager (80 man hours)	Site Manager	Ongoing	Following closure 21st October 2008 no longer in use.
O - 2	Lower the potential environmental impacts (i.e. risk of spillage, CO2 emissions) associated with the off site transport of leachate.	T - 2.1	Divert leachate for tankering to direct discharge to sewer, discussions with Kildare County Council are near completion and discharge limits are been finalised. Achieve 50% diversion rate by 2008 and a 75% diversion rate by 2012	2	External Consultant (€2,500)	Site Manager	Ongoing	Discharge ELV's received from KCC for direct sewer discharge. SEW onsite leachate treatment submitted to the EPA, the EPA have agreed the use of the Technology reverse Osmosis, with the concentrate been re-infiltrated into the landfill. On-site treatment and sewer discharge commenced Nov 2009 discharging 60m3/day. Expect to increase this to 130m3/day by June 2010.

		T - 2.2	Design and commission on-site leachate treatment plant to reduce the dissolved methane levels in leachate to below the regulatory requirement of 0.14 mg/l.	2	Circa €100,000	Site Manager	December 2009	Technology for leachate treatment, reverse osmosis, removes 50% of dissolved methane from leachate. Remainder is removed by site designed and constructed methane stripping plant. Typical dissolved methane discharged to sewer is <0.01mg/l with 99.7% removal.
O - 3	Lower the potential environmental nuisance	T - 3.1	Install groundwater extraction well to aide dust suppression activities.	7	Circa €15,000	Site Manager	June 2007.	Well and holding tank installed. Pump installed in May 07 and system now operational.

	associated with dust by improving dust management techniques	T - 3.2	Investigate available technology options for dust suppression activities, that minimises water usage.	7	Assistant Site Manager (20 man hours)	Site Manager	December 2007	Hard stand surface water now diverted to holding tank for use in dust suppression thereby reducing potable water demand. New 2500 gallon water tanker purchased which utilises spray bar rather than splash plate thereby reducing water consumption. Water consumption continues to be monitored.
O - 4	Implement CRAMP	T - 4.1	Complete design, contractor selection, and engineering works associated with stage 1 area of final permanent capping of approx 70,000m^2	1, 9	Site Management , External consultants and contractors	Site Manager	December 2009	As of 31st Dec 2009 14,000m2 of final capping completed.

O - 5	Minimise the amount of natural resources (water, power etc) consumed at the Facility.	T - 5.1	Update the existing utilities report in light of the development of the Phase 6 cell and other capital expenditure works so as to identify resource required for	4	External Consultant (circa €3,000)	Site Manager	June 2007	Utilities report now complete
		T - 5.2	Carry out Energy Audit of Facility and identify opportunities for improved energy efficiency.	4	External Consultant (circa €5,000)	Site Manager	June 2007	Completed in February 2007. Recommendations to be implemented by December 2009. Electrical meter to be installed on various parts of site by May 2010.
		T – 5.3	Carry out assessment of the use of raw material at the Facility and identify opportunities for the improved efficiency in the use of raw materials.	4	Assistant Site Manager (40 man hours)	Site Manager	June 2007	Commenced usage of a recovered stone produced by Access waste and Greenstar thereby reducing requirement for natural resources. 44% of imported aggregates was recovered stone and crushed concrete during 2009.

		T - 5.4	Carry out assessment of water usage at the facility and identify opportunities for improved efficiency of water usage.	4	Assistant Site Manager (40 man hours)	Site Manager	Ongoing	Water requirements on various sections of site been measured to identify potentials for reductions.
		T – 5.5	Use storm water for dust suppression activities when available.	4	Tanker Trailer and bowser	Site Supervisor	Ongoing	Hard stand surface water now diverted to holding tank for use in dust suppression thereby reducing potable water demand.
O - 6	Improve Health, Safety and Welfare	T - 6.1	Review and amend site safety statement so that it is consistent with other sites within the Greenstar Landfill Group	8	Assistant Site Manager (40 man hours)	Site Manager GM Landfill Group	June 2007	Independent H&S audit carried out on 16th Sept 2008. Safety statement and risk assessments reviewed by Group H&S manager in July 2009 and now incorporated into Group safety statement.
		T - 6.2	Reduce lost time injuries by 5% over the next five years	8		All site Personnel	Ongoing	Ongoing. Data been recorded.
		T - 6.3	Develop Accident Prevention Plan	8	Assistant Site Manager	Site Manager GM Landfill	June 2007	Completed in February 2007.

					(80 man hours)	Group		
		T - 6.4	Achieve Certification to OHSAS 18001	8	Assistant Site Manager (160 man hours)	Site Manager GM Landfill Group	June 2010	Site manager completed IOSH certified 4 day H&S training in Jan 2008. Site supervisor completed IOSH certified 3 day training for supervisors in Nov 2007. Site assistant facility manager completed IOSH certified 4 day training for managers in December 2009.
O-7	Training	T7.1	Continue to train staff on a regular basis in EMS system, waste licence and Emergency Response.		Assistant Site Manager	Site Manager	Ongoing	
O-8	Operations	T8.1	Encourage all site hauliers to comply fully with the Waste Collection Permit Regulations		Site Manager	Site Manager	Ongoing	

18.0 FULL TITLE AND WRITTEN SUMMARY OF ANY PROCEDURES DEVELOPED BY THE LICENSE WHICH RELATES TO THE FACILITY OPERATION

KTK Landfill Ltd achieved ISO 14001:2004 certification on 12th December 2005 (certificate number IE05/66145). The awarding body was SGS Ltd Systems and Service Certification in association with UKAS Environmental Management.

As part of KTK Landfill ISO14001 certification all procedures were reviewed and amended to comply with requirements of ISO 14001. A full list of all procedures is outlined below in Table 41.

Table 41: Procedures and Written Summary of any Procedures Developed by the licensee which relate to the operation of the facility

Ref.	Titles
KTKP 1	Environmental Aspects
KTKP 2	Legislation & Other Requirements
KTKP 3	Training & Awareness
KTKP 4	Communication
KTKP 5	Control of Documents
KTKP 6	Emergency Preparedness & Response
KTKP 7	Monitoring & Measurement
KTKP 8	Objectives, Targets & Programme
KTKP 9	Non-conformance, corrective & preventative action
KTKP 10	Control of Records
KTKP 11	Internal Audit
KTKP 12	Management Review
KTKP 13	Complaints
KTKP 14	Operating in Adverse Wind Conditions
KTKP 15	Control of Contractors & Visitors (Safe Systems of Work)
KTKP 16	Compaction of Waste on site.
KTKP 17	Litter prevention & Assembly/Disassembly of Litter Nets.
KTKP 18	Suppression of Dust
KTKP 19	Construction of Site Roads
KTKP 20	Fuel Storage & Distribution
KTKP 21	Vermin Control
KTKP 22	Handling Tipping Vehicles on site
KTKP 23	Asbestos Disposal
KTKP 24	Handling & Storage of Batteries & Gas Cylinders
KTKP 25	Completion of Daily Site Condition Reports
KTKP 26	Waste Acceptance Procedures
KTKP 27	Recyclable material leaving site
KTKP 28	Maintenance

KTKP 29	Permit To Work Systems
KTKP 30	Record of Disposal Location
KTKP 31	Acceptance of non infectious healthcare waste
KTKP 32	Random Inspection of Waste
KTKP 33	Acceptance of Non-infectious and non risk healthcare waste.
KTKP 37	1500 Haase Flare Operation - Start-up
KTKP 38	1500 Haase Flare Operation - Shutdown
KTKP 39	1500 Haase Flare Operation – Startup Troubleshooting
KTKP 40	2500 Haase Flare Operation – Startup
KTKP 41	2500 Haase Flare Operation - Shutdown
KTKP 42	Deutz Gas Engine TGB 620 – Start Up Procedure
KTKP 43	Deutz Gas Engine TGB 620 – Shut Down Procedure
KTKP 44	Deutz Gas Engine TGB 620 – Start Up Procedure Following Common Fault Acknowledgement
KTKP 45	Blower Station Rosemount Analyser (CH4, CO2 & O2) Calibrations
KTKP 46	Drilling and Installation of a Landfill Gas Extraction Well.
KTKP 47	Gas Collection Pipework Fusion Welding
KTKP 48	Landfill Gas Management Plan
KTKP 49	Odor Management Plan
KTKP 50	Engineering Materials Management Plan
KTKP 51	Ammonia Delivery Procedure
KTKP 53	Acceptance of Soil Material Containing Non-Infectious Sharps
KTKP 100	Accident Prevention Policy/Procedure

19.0 TANK, PIPELINE AND BUND TESTING AND INSPECTION REPORT

During 2009, Golder Associates conducted a series of containment bund integrity tests were carried out over a 24 hour period between 21st May and 22nd May, 2009. The results and parameters of the tests are outlined below. The tests were conducted in compliance with BS 8007:1987 *Code of Practice for the Design of Concrete Structures for Retaining Aqueous Liquids.* . In total, 7 No. bunds/structures were tested at the facility on the 21st May 2009. A bund inspection report is presented in Appendix D and a summary table of results is presented below in Table 42.

Table 42: List of Tanks and Structures Tested at KTK Landfill during 2009

ID	Type	Dimensions (LxWxH)	Sump Capacity Litres	Location
1	Chemstore N2 (twin) IBC Spill Pallet	2660x1470x540	1140	North of site at Gas Compound
2	Chemstore N2 (twin) IBC Spill Pallet	2660x1470x540	1140	South east at Waste Inspection Bay
3	Chemstore PP6000 Low Profile Spill Pallet	1370x1370x300	250	North of site at Gas Compound
4	Chemstore PP6000 Low Profile Spill Pallet	1370x1370x300	250	South east at Waste Inspection Bay
5	Denios IBC Station, Model S	1380x1580x760	1100	North of site at Gas Compound
6	Walk in Diesel Tank	2450x2450x500	3000	South east at Waste Inspection Bay
7	Concrete Bunded Tank	3625x1640x220	1300	North of site at Gas Compound

20.0 REPORTED INCIDENTS AND COMPLAINTS SUMMARY

A record for reported incidents during the 2009 reporting period is presented in Table 42. A total of 15 incidents were recorded during the reporting period. Of the reported incidents for 2009 13 related to elevated levels of landfill gas in perimeter monitoring wells. As per the recommendations of The Agency inspectors during audit of KTK Landfill Site on 23 November 2004 a full report on the assessment of landfill gas migration in the vicinity of KTK Landfill and Silliot Hill Landfill was submitted to the Agency on 7 April 2005. This assessment concluded that the most likely source of elevated landfill gas levels in monitoring wells located outside the body of waste at KTK Landfill is from the historical uncontained landfilling operations at the Silliot Hill facility and are therefore not in any way connected with KTK landfill.

Significant reductions in gas levels measured from April 2007 to June 2008 is attributed to ongoing works at Silliot Hill during 2007 and 2008 including the installation of additional gas extraction wells at that facility. However, the levels detected from the second half of 2008 are unexpectedly higher than gas levels previously. In addition, elevated gas levels are being detected in monitoring wells that historically have not shown gas level breaches.

It is understood that works at Silliot Hill to install large diameter gas extraction wells were completed during 2009. It is expected that elevated gas levels recorded since June 2008 are attributed to some form of interruption, caused by capping works, to gas collection systems at Silliot Hill. It is anticipated that the elevated gas levels being detected currently at KTK Landfill will decrease following draw down of the gas reservoir at Sillot Hill.

One incident related to elevated noise levels at sensitive receptors but the predominant noise source in these areas was from traffic noise on adjacent public roads. One other incident related to the identification on 1st December 2009 of leachate contaminated surface water been discharged to site percolation area. This incident was classified as category 2 urgent and the Agency was notified and interim incident report has been submitted.

A register of complaints recorded during the reporting period is attached in Table 43. A total of 18 complaints were received from 7 complainants during the reporting period. This is substantially down on 2008 with 39 complaints received from 11 complainants. The facility is located in proximity to Silliot Hill Integrated Waste Management Facility which includes a civic amenity area, an open air transfer station and a completed partially lined landfill site with a history of landfill gas migration: all of which have potential to generate odours. Any minor gas infrastructure malfunctions identified at the facility with the potential to generate odours were quickly identified and corrected as part of the site daily monitoring and inspections regime. All complaints were resolved to the satisfaction of complainants.

20.1 Reported Incidents and Complaints Summary

Incidents

The list of Incidents at KTK Landfill for the reporting period 1st January 2009 to 31st December 2009 are outlined in Table 43.

Table 43: List of Incidents during 2009

Number	Date	DESCRIPTION	Action
I 133	20/01/2009	Elevated CH4 levels at G3, G4, G5, G6, G7, G8, & G10. Elevated CO2 levels at G1, G3, G4, G5, G6, G7, G8, G10, G14, & G15.	Incident Report Submitted.
I 134	11/02/2009	Elevated CH4 levels at G3, G4, G5, G6, G7, G8, & G10 Elevated CO2 levels at G3, G4, G5, G6, G7, G8, G10, G14, & G15.	Incident Report Submitted.
I 135	13/03/2009	Elevated CH4 levels at G1, G2, G3, G4, G5, G6, G7, G8, G9, & G10. Elevated CO2 levels at G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G14, & G15.	Incident Report Submitted.
I 136	10/04/2009	Elevated CH4 levels at G1, G2, G3, G4, G5, G6, G7, & G8. Elevated CO2 levels at G1, G3, G4, G5, G6, G7, G8, G9, G10, G14, & G15.	Incident Report Submitted.
I 137	11/05/2009	Elevated CH4 levels at G3, G4, G7, & G8. Elevated CO2 levels at G3, G4, G5, G7, G8, G10, G14, & G15.	Incident Report Submitted.
I 138	09/06/2009	Elevated CH4 levels at G2, G3, G4, G7, & G8. Elevated CO2 levels at G2, G3, G4, G5, G6, G7, G8, G14, & G15.	Incident Report Submitted.

I 139	26/06/2009 03/07/2009	Elevated Noise levels at N1, N8, N12, N14, & N16.	Incident Report Submitted.
I 140	08/07/2009	Elevated CH4 levels at G3, G4, G5, G7, & G8. Elevated CO2 levels atG1, G3, G4, G5, G6, G7, G8, G14, & G15.	Incident Report Submitted.
I 141	11/08/2009	Elevated CH4 levels at G3, G4, G5, G7, & G8. Elevated CO2 levels atG1, G3, G4, G5, G6, G7, G8, G14, & G15.	Incident Report Submitted.
I 142	14/08/2009	Elevated CH4 Levels at G3, G4, G7, & G8. Elevated CO2 levels at G3, G4, G5, G6, G7, G8, G14, & G16.	Incident Report Submitted.
I 143	18/09/2009	Elevated CH4 Levels at G1, G2, G3, G4, G5, G6, G7, G8, & G10. Elevated CO2 levels at G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G11, G14, & G15.	Incident Report Submitted.
I 144	20/10/2009	Elevated CH4 Levels at G1, G2, G3, G4, G5, G6, G7, G8, & G10. Elevated CO2 levels at G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G11, G14, & G15.	Incident Report Submitted.
I 145	23/11/2009	Elevated CH4 levels at G1, G3, G4, G5, G6, G7, & G8. Elevated CO2 levels at G1, G3, G4, G5, G6, G7, G8, & G14.	Incident Report Submitted.
1 146	01/12/2009	Category 2 Urgent Incident – discharge of leachate to surface water management system.	Interim Incident Report Submitted.
I147	17/12/2009	Elevated CH4 levels at G2, G3, G4, G6, G7, G8 & G10. Elevated CO2 levels at G2, G3, G4, G5, G6, G7, G8, G10, G14 & G15.	Incident Report Submitted.

20.2 Complaints

KTK Landfill maintains a register of complaints received in compliance with Condition 10.4 of the waste licence. A total of 18 complaints were received in relation to the operation of the facility for the reporting period. Complaints in relation to the operation of the facility are summarised in Table 44.

Table 44: Record of Complaints Received during 2009

Number	Date	Complainant	Description
2009-01	06/02/2009	Mr Simon Durham	LFG Odour
2009-02	18/02/2009	Mrs Tracey Dunlop	LFG Odour
2009-03	05/03/2009	Mrs Helen Murphy	LFG Odour
2009-04	27/04/2009	Mrs Tracey Dunlop	LFG Odour
2009-05	05/08/2009	Mr Simon Durham	LFG Odour
2009-06	24/08/2009	Mr Simon Durham	LFG Odour
2009-07	10/09/2009	Mr Ger Peacock	LFG Odour
2009-08	15/09/2009	Mrs Helen Murphy	LFG Odour
2009-09	23/09/2009	Mr Simon Durham	LFG Odour
2009-10	02/10/2009	Mr Bill Nowlan	LFG Odour
2009-11	08/11/2009	Mr Simon Durham	LFG Odour
2009-12	30/11/2009	Mr Ger Tynan	LFG Odour
2009-13	30/11/2009	Mrs Helen Murphy	LFG Odour
2009-14	03/12/2009	Mr Simon Durham	LFG Odour
2009-15	12/12/2009	Mr Simon Durham	LFG Odour
2009-16	12/12/2009	Mrs Helen Murphy	LFG Odour
2009-17	12/12/2009	Mr Ger Tynan	LFG Odour
2009-18	15/12/2009	Mrs Helen Murphy	LFG Odour

21.0 REVIEW OF NUISANCE CONTROLS AT KTK LANDFILL DURING 2009

KTK Landfill Ltd is committed to operating KTK landfill in the best possible manner using best available techniques to minimise impacts to the environment and local residential neighbours. KTK Landfill Ltd welcome communications from local residents and any interested parties and all reasonable and practical measures will be implemented to eliminate or minimise any issues or nuisances. The site substantially closed to the acceptance of commercial and industrial and asbestos wastes on 21st October 2008. All nuisance control measures continue to be implemented so as to ensure licence compliance.

21.1 Bird Control

While requirements were substantially reduced with the closure of the site to certain waste types in October 2008 bird control measures at the site continued as necessary to comply with site waste licence conditions. This involved the use of kites, distress calls and flare pistol.

21.2 Vermin Control

Site personnel regularly checked for evidence of vermin on-site during regular routine inspections. Rentokil were employed throughout the duration of the reporting period in order to control potential nuisance caused by rodents. Continuous baiting was carried out by Rentokil and adjusted as necessary to prevent any infestation of vermin.

21.3 Mud Control

A high pressure jet wheel wash system is employed on the site since February 2004 and uses a series of pressure sprayers to power wash vehicles from the wheels up to the cab. A self drive road sweeper is maintained on the site and is utilised as and when necessary to maintain all site roads in a clean condition.

22.0 REPORTS ON FINANCIAL PROVISION MADE UNDER THIS LICENCE, MANAGEMENT AND STAFFING STRUCTURE OF THE FACILITY, AND A PROGRAMME FOR PUBLIC INFORMATION

22.1 Financial Provision

Under condition 12.3.3 of the site licence KTK Landfill is required to maintain a financial provision to cover any liabilities incurred whilst carrying on the activities to which this licence relates. Detailed below are the financial provisions made for the facility.

22.2 Closure Restoration and Aftercare Costs (Known Environmental Liabilities)

A capital provision for closure, restoration and aftercare continued to be deducted from Gate Revenues during 2009. As of the end of this reporting period a total amount of €9,005,949 has been accrued for closure, restoration and aftercare costs.

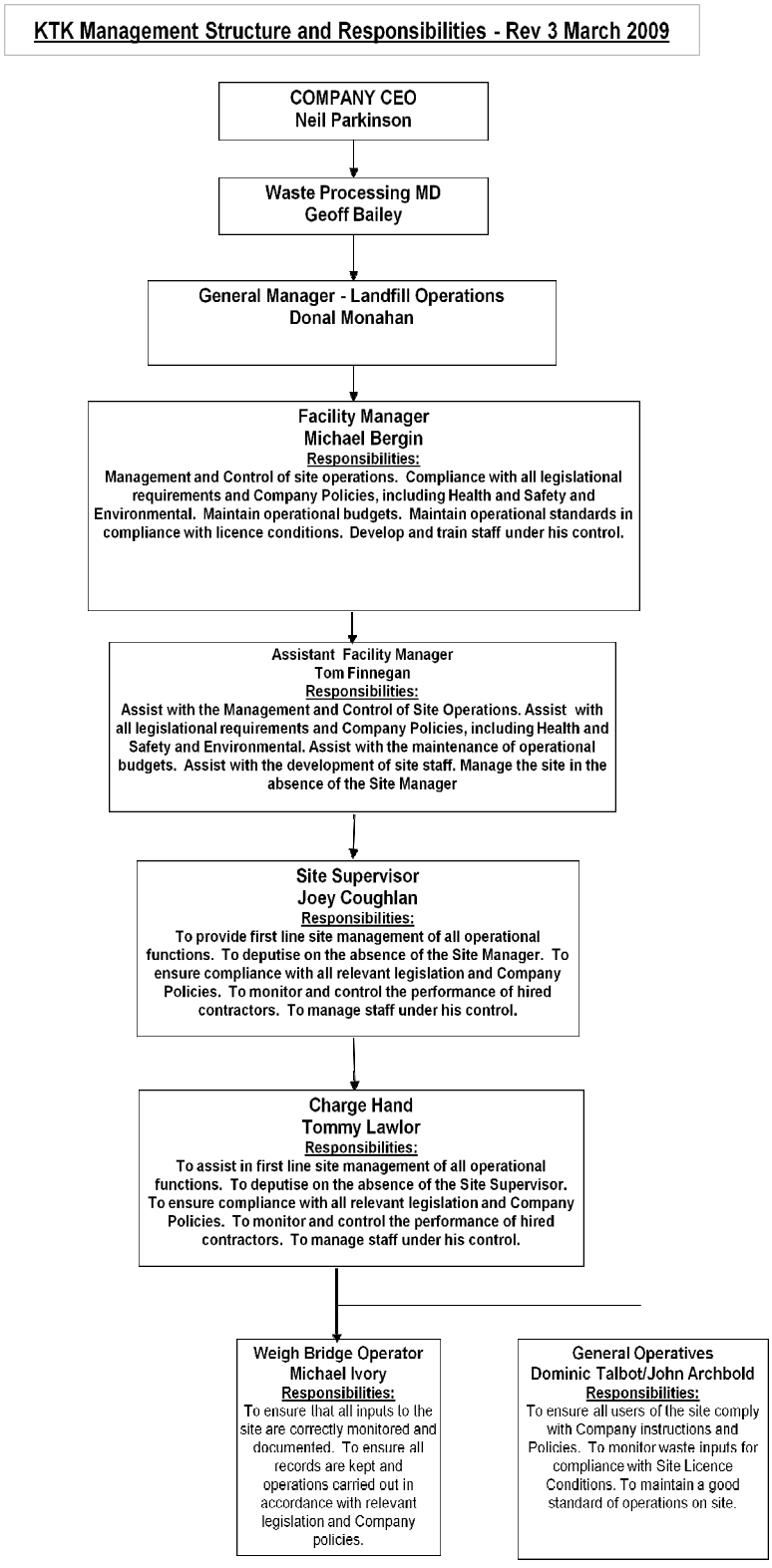
KTK landfill Ltd. is owned through its parent company Greenstar Ltd., by National Toll Roads plc. The company has a secure financial backing.

22.3 Financial provisions for Unknown Environmental Liabilities

As part of Condition 12.3.2, the Licensee has completed fully costed Environmental Liabilities Risk Assessment for the site. This document outlines the potential unknown environmental liabilities associated with the landfill and estimates the possible cost of these liabilities. Greenstar Ltd have accidental pollution liability insurance to the value of €6.5 million, which is well in excess of the cost that may arise from unknown liabilities.

23.0 MANAGEMENT STRUCTURE AT KTK LANDFILL DURING THE REPORTING PERIOD

Figure 19: Management Structure at KTK Landfill



23.1 Programme for Public Information

KTK pursues an active programme of disseminating information on its operations to interested parties. This is undertaken through a variety of means including site tours, the company website, presentations and open days.

KTK's community development fund made significant donations to a number of local groups during the course of 2008 including local schools, scouts, community centre, bowling club, sports facilities and the Kilcullen Christmas lights. A comprehensive public information programme developed in April 2000 continues to be used.

The communications programme contains 8 specific objectives:

- To promote public awareness of the Company's activities and environmental policies.
- To maintain an ongoing dialogue with authorities that have direct involvement with waste disposal activities.
- To make available Environmental Performance Data relating to KTK Landfill Ltd.
- To disseminate information relating to the operational and management of the site as appropriate.
- To encourage liaison between KTK Landfill Ltd, and local residents and those who may be affected by the sites 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 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
- Published Information

24.0 POLLUTION RELEASE TRANSFER RECORD

Under EU Regulation 166/2006, all licensed facilities are obliged to prepare a PRTR which details all releases of pollutants and off-site transfer of pollutants and waste. Figures for releases to air, releases to storm-water and wastes transferred off-site are included. The complete PRTR document was also uploaded to the dedicated EPA PRTR website. A copy of the completed PRTR is presented in Appendix E.

24.1 Discussion

The data as calculated is significantly less than what has been determined for 2008 and 2007. The reason for this is that previously air mass emissions were determined where inaccurate assumptions were made on the quantity of gas that was combusted in the engines, i.e. no separate flow meter on engines. The landfill gas utilisation plant comprises a blower station with 3 gas engines and 2500m3/hr flare operating in parallel mode. That is, gas in excess of engine demand or during engine shut down is automatically diverted to flare to maintain constant volumetric draw of gas from the landfill. Previous E-PRTR returns were made under the assumption that gas engines were operating constantly and at full load. This is not the case and in reality the bulk of gas drawn into gas utilisation plant is actually burnt in the flare.

While there is no flow meter measuring actual gas volumes to engines KTK Landfill Ltd has developed a methodology to accurately record the gas volumes that are utilised. This is based on a number of trials where flare was turned off and engines ran at fixed load with known fixed methane concentration for a period of time with electrical output and gas volume consumed measurements been taken. The results of these trials show that at a certain % of methane and a certain engine load, a fixed volume of gas will be consumed for every MWhr of electrical energy produced. Therefore, the total quantity of gas consumed by engines each month is determined with a correction applied for the actual average methane for that month.

Report Signature Page

VAT NO.: 8297875W

Garrett Byrne Project Manager	Thomas Vainio-Mattila Project Director

GB/BA

Registered in Ireland Registration No. 297875
Town Centre House, Dublin Road, Naas, Co. Kildare
Directors: M. Gilligan, M. L. J. Maher, G.F. Parker, C. Wall, R. White
VAT No.: 8297875W

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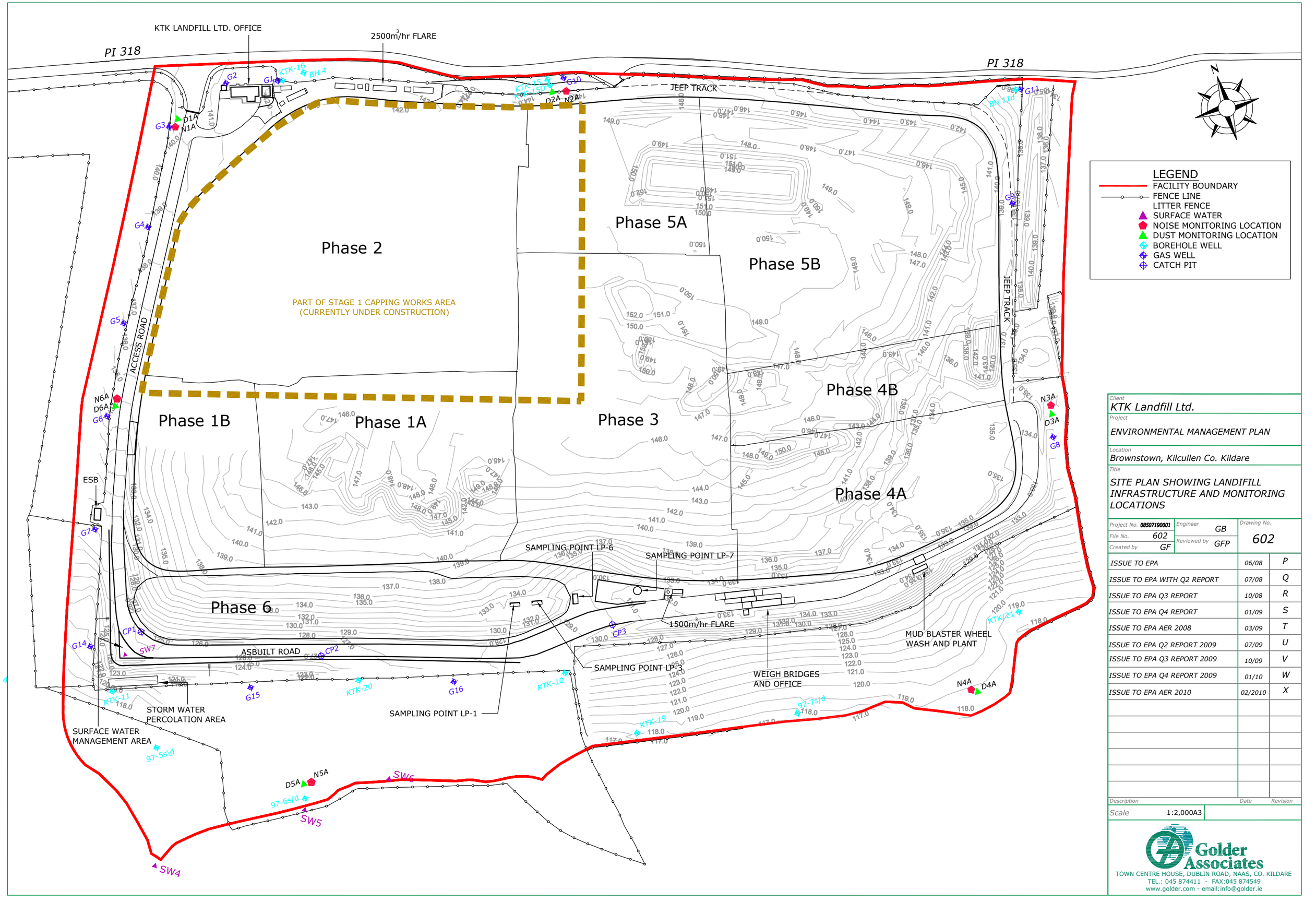
APPENDIX A

Drawing KTK/602 Rev. X.



LEGEND

- FACILITY BOUNDARY
- FENCE LINE
- LITTER FENCE
- SURFACE WATER
- NOISE MONITORING LOCATION
- DUST MONITORING LOCATION
- BOREHOLE WELL
- GAS WELL
- CATCH PIT

Client: *KTK Landfill Ltd.*

Project: *ENVIRONMENTAL MANAGEMENT PLAN*

Location: *Brownstown, Kilcullen Co. Kildare*

Title: *SITE PLAN SHOWING LANDFILL INFRASTRUCTURE AND MONITORING LOCATIONS*

Project No. 08507190001	Engineer GB	Drawing No. 602	
File No. 602	Reviewed by GFP		
Created by GF			

Description	Date	Revision
ISSUE TO EPA	06/08	P
ISSUE TO EPA WITH Q2 REPORT	07/08	Q
ISSUE TO EPA Q3 REPORT	10/08	R
ISSUE TO EPA Q4 REPORT	01/09	S
ISSUE TO EPA AER 2008	03/09	T
ISSUE TO EPA Q2 REPORT 2009	07/09	U
ISSUE TO EPA Q3 REPORT 2009	10/09	V
ISSUE TO EPA Q4 REPORT 2009	01/10	W
ISSUE TO EPA AER 2010	02/2010	X

Scale: 1:2,000A3

Golder Associates
TOWN CENTRE HOUSE, DUBLIN ROAD, NAAS, CO. KILDARE
TEL.: 045 874411 - FAX:045 874549
www.golder.com - email:info@golder.ie

APPENDIX B

Annual Quantities of Landfill Gas Collected for Flaring and Utilisation during 2009

7th April 2010
Report No. 09507190002

Golder Associates

KTK LANDFILL - ANNUAL QUANTITIES OF LANDFILL GAS COLLECTED FOR FLARING/UTILISATION - 2009

MONTH	Utilisation (MWhr)	LFG Utilised (m3)	LFG Utilised (% of total)	Total LFG Collected (m3)	Total LFG Collected (m3/hr)	GAS QUALITY (% v/v) CH4	CO2	O2	Total Methane Collected (kg)	Total Carbon Dioxide Collected (kg)	Total Methane Collected (kg/day)
Jan-09	1182.0	672,043	16	4,231,502	5,713	45.4	37.1	1.4	1,391,827	3,066,994	44,898
Feb-09	1778.1	930,174	25	3,708,699	5,532	42.6	35.0	1.7	1,144,080	2,545,454	40,860
Mar-09	1607.8	880,573	21	4,279,739	5,762	43.4	35.5	1.5	1,339,808	2,982,644	43,220
Apr-09	2016.1	1,086,863	25	4,343,325	6,060	41.9	35.1	1.8	1,331,369	3,046,710	44,379
May-09	2182.5	1,214,090	30	4,035,634	5,427	43.1	34.9	1.9	1,274,409	2,814,591	41,110
Jun-09	1797	993,022	26	3,883,335	5,395	42.5	33.5	2.2	1,212,325	2,611,170	40,411
Jul-09	1616.4	903,147	24	3,767,771	5,554	42.2	33.7	2.1	1,188,886	2,568,941	39,630
Aug-09	1488.6	807,976	28	2,918,546	4,864	41.5	43.9	1.7	892,417	2,278,343	29,747
Sep-09	2168.1	1,232,704	44	2,816,146	4,802	38.4	55.9	1.9	856,518	2,422,529	28,551
Oct-09	2044.6	1,142,400	42	2,691,346	4,547	42.0	31.5	2.1	844,720	1,683,451	28,157
Nov-09	1915.7	1,035,091	40	2,593,946	4,494	42.8	30.9	1.7	807,325	1,542,632	26,911
Dec-09	1800.8	950,894	36	2,632,546	4,467	41.7	30.6	1.8	799,785	1,561,009	26,660
Total Collected:	**21,598**	**11,848,977**	**28**	**41,902,535**	**5,218.3**	**42.3**	**36.5**	**1.8**	**13,083,470**	**29,124,470**	**36,211**

APPENDIX C

Air Emission Testing Reports Prepared by Odour Monitoring Ireland Limited.

APPENDIX D

Bund Inspection Report May 2009

Golder Associates Ireland
Town Centre House,
Dublin Road, Naas,
Co. Kildare, Ireland
Tel: [353] (0)45 874411
Fax: [353] (0)45 874549
http://www.golder.com

Michael Bergin

2nd June 2009
09507190135/L01/V.B.0

General Manager
KTK Landfill
Brownstown & Carnalway
Kilcullen
Co. Kildare

BUND TEST REPORT

Dear Michael,

A series of containment bund integrity tests were carried out over a 24 hour period between 21st May and 22nd May, 2009. The results and parameters of the tests are outlined below. The tests were conducted in compliance with BS 8007:1987 *Code of Practice for the Design of Concrete Structures for Retaining Aqueous Liquids.*

1.0 BUNDS TESTED

In total, 7 No. bunds/structures were tested at the facility on the 21st May. Please refer to the attached Figure 1, for their locations.

ID	Type	Dimensions (LxWxH)	Sump Capacity Litres	Location
1	Chemstore N2 (twin) IBC Spill Pallet	2660x1470x540	1140	North of site at Gas Compound
2	Chemstore N2 (twin) IBC Spill Pallet	2660x1470x540	1140	South east at Waste Inspection Bay
3	Chemstore PP6000 Low Profile Spill Pallet	1370x1370x300	250	North of site at Gas Compound
4	Chemstore PP6000 Low Profile Spill Pallet	1370x1370x300	250	South east at Waste Inspection Bay
5	Denios IBC Station, Model S	1380x1580x760	1100	North of site at Gas Compound
6	Walk in Diesel Tank	2450x2450x500	3000	South east at Waste Inspection Bay
7	Concrete Bunded Tank	3625x1640x220	1300	North of site at Gas Compound

The following photographs show some of the containment bunds tested:

Photo 1: Typical Chemstore PP6000 Low Profile Spill Pallet;

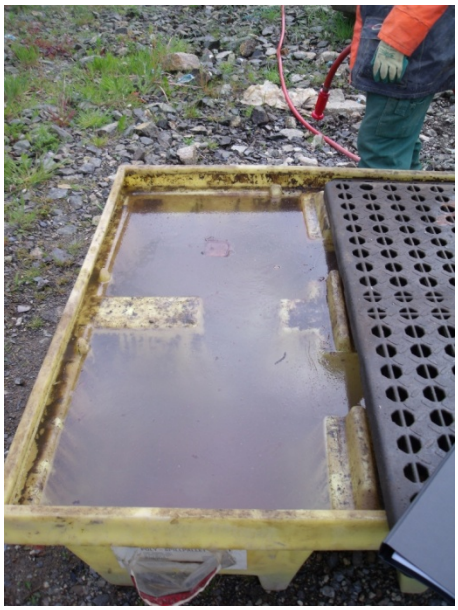


Photo 2: Typical Chemstore N2 (twin) IBC Spill Pallet

Photo 3: Walk in Diesel Tank

Photo 4: Concrete Bunded Tank (GP125 Generator)

2.0 TEST PROCEDURE

The testing of the structures/bunds commenced on the morning of the 21st May, 2009.

1. Prior to commencement of the test, each individual Bund/Structure was thoroughly inspected for any noticeable damage – cracking, splitting, wear and tear. The test commenced with filling the bund/structure to a marked level from a bowser.

2. The height of the water was noted and left for a period of 24 hours.

3. Each bund/structure was checked for leaks and/or drop in water level after a 24 hour period.

3.0 CONCLUSIONS

Under the conditions set out in BS 8007:1987, the bunds/structures tested at KTK Landfill were found to be properly constructed when the test began. No drop in level was detected on any of the bunds/structures.

Idividual Integrity test Certificates areattahced for each of the containment bunds.

Yours sincerely,
GOLDER ASSOCIATES IRELAND

Gerard Finane — Peter Corrigan

Technician — Senior Engineer

Attachments: Figure 1 – Containment Bund Locations

Integrity Test Certificates (x7 No.)

GF/PC/lc

INTEGRITY TEST REPORT

CLIENT & PROJECT DETAILS

Client	*KTK Landfill Ltd.*	Project	KTK Bund Testing	Project No.	*09507190135*

INFRASTRUCTURE TESTED

Type	*N2 IBC Spill Pallet (ID #1) – Refer to Fig 01*

Test Procedure:

The tank (Spill Pallet) was filled with clean water to the brim and allowed settle, then topped up again. During filling, observations were made checking the integrity of the walls etc. The tank was left standing over night and observations the following day showed no loss of water.

RESULT OF TEST

Date of start	*21 May 2009*	Time of start	*10:30 hrs*	Reading	*full*
Date of end	*22 May 2009*	Time of end	*11:30 hrs*	Reading	*full*

Statement of Integrity:

The Spill Pallet (ID #1) was found to have sound integrity with a capacity greater than 110% of the design capacity of an IBC Bund. A visual examination carried out on the spill pallet did not indicate any damage or weakness likely to cause loss of integrity.

APPROVAL DETAILS

Approved by	*Peter Corrigan*	Signed		Date	*02/06/09*

INTEGRITY TEST REPORT

CLIENT & PROJECT DETAILS

Client	*KTK Landfill Ltd.*	Project	KTK Bund Testing	Project No.	*09507190135*

INFRASTRUCTURE TESTED

Type	*N2 IBC Spill Pallet (ID #2) – Refer to Fig 01*

Test Procedure:

The tank (Spill Pallet) was filled with clean water to the brim and allowed settle, then topped up again. During filling, observations were made checking the integrity of the walls etc. The tank was left standing over night and observations the following day showed no loss of water.

RESULT OF TEST

Date of start	*21 May 2009*	Time of start	*11:30 hrs*	Reading	*full*
Date of end	*22 May 2009*	Time of end	*12:30 hrs*	Reading	*full*

Statement of Integrity:

The Spill Pallet (ID #2) was found to have sound integrity with a capacity greater than 110% of the design capacity of an IBC Bund. A visual examination carried out on the spill pallet did not indicate any damage or weakness likely to cause loss of integrity.

APPROVAL DETAILS

Approved by	*Peter Corrigan*	Signed		Date	*02/06/09*

INTEGRITY TEST REPORT

CLIENT & PROJECT DETAILS

Client	*KTK Landfill Ltd.*	Project	KTK Bund Testing	Project No.	*09507190135*

INFRASTRUCTURE TESTED

Type	*PP6000 Low Profile Spill Pallet (ID #3) – Refer to Fig 01*

Test Procedure:

The tank (Spill Pallet) was filled with clean water to the brim and allowed settle, then topped up again. During filling, observations were made checking the integrity of the walls etc. The tank was left standing over night and observations the following day showed no loss of water.

RESULT OF TEST

Date of start	*21 May 2009*	Time of start	*10:45 hrs*	Reading	*full*
Date of end	*22 May 2009*	Time of end	*11:45 hrs*	Reading	*full*

Statement of Integrity:

The Spill Pallet (ID #3) was found to have sound integrity with a capacity of 250L. This capacity is far in excess of the nature of the drums/containers the pallet supports. A visual examination carried out on the spill pallet did not indicate any damage or weakness likely to cause loss of integrity.

APPROVAL DETAILS

Approved by	*Peter Corrigan*	Signed		Date	*02/06/09*

INTEGRITY TEST REPORT

CLIENT & PROJECT DETAILS

Client	*KTK Landfill Ltd.*	Project	KTK Bund Testing	Project No.	*09507190135*

INFRASTRUCTURE TESTED

Type	*PP6000 Low Profile Spill Pallet (ID #4) – Refer to Fig 01*

Test Procedure:

The tank (Spill Pallet) was filled with clean water to the brim and allowed settle, then topped up again. During filling, observations were made checking the integrity of the walls etc. The tank was left standing over night and observations the following day showed no loss of water.

RESULT OF TEST

Date of start	*21 May 2009*	Time of start	*11:45 hrs*	Reading	*full*
Date of end	*22 May 2009*	Time of end	*12:45 hrs*	Reading	*full*

Statement of Integrity:

The Spill Pallet (ID #4) was found to have sound integrity with a capacity of 250L. This capacity is far in excess of the nature of the drums/containers the pallet supports. A visual examination carried out on the spill pallet did not indicate any damage or weakness likely to cause loss of integrity.

APPROVAL DETAILS

Approved by	*Peter Corrigan*	Signed		Date	*02/06/09*

INTEGRITY TEST REPORT

CLIENT & PROJECT DETAILS

Client	*KTK Landfill Ltd.*	Project	KTK Bund Testing	Project No.	*09507190135*

INFRASTRUCTURE TESTED

Type	*Denios IBC Station (ID #5) – Refer to Fig 01*

Test Procedure:

The tank (Spill Pallet) was filled with clean water to the brim and allowed settle, then topped up again. During filling, observations were made checking the integrity of the walls etc. The tank was left standing over night and observations the following day showed no loss of water.

RESULT OF TEST

Date of start	*21 May 2009*	Time of start	*12:30 hrs*	Reading	*full*
Date of end	*22 May 2009*	Time of end	*13:30 hrs*	Reading	*full*

Statement of Integrity:

The Spill Pallet (ID #5) was found to have sound integrity with a capacity greater than 110% of the design capacity of an IBC Bund. A visual examination carried out on the spill pallet did not indicate any damage or weakness likely to cause loss of integrity.

APPROVAL DETAILS

Approved by	*Peter Corrigan*	Signed		Date	*02/06/09*

INTEGRITY TEST REPORT

CLIENT & PROJECT DETAILS

Client	*KTK Landfill Ltd.*	Project	KTK Bund Testing	Project No.	*09507190135*

INFRASTRUCTURE TESTED

Type	*Walk in Diesel Tank (ID #6) – Refer to Fig 01*

Test Procedure:

The tank was filled with clean water to the brim and allowed settle, then topped up again. During filling, observations were made checking the integrity of the walls etc. The tank was left standing over night and observations the following day showed no loss of water.

RESULT OF TEST

Date of start	*21 May 2009*	Time of start	*14:30 hrs*	Reading	*full*
Date of end	*22 May 2009*	Time of end	*14:30 hrs*	Reading	*full*

Statement of Integrity:

The Tank (ID #6) was found to have sound integrity with a capacity greater than 110% of the design capacity of the diesel tank within the unit (2350L). A visual examination carried out on the tank did not indicate any damage or weakness likely to cause loss of integrity.

APPROVAL DETAILS

Approved by	*Peter Corrigan*	Signed		Date	*02/06/09*

INTEGRITY TEST REPORT

CLIENT & PROJECT DETAILS

Client	*KTK Landfill Ltd.*	Project	KTK Bund Testing	Project No.	*09507190135*

INFRASTRUCTURE TESTED

Type	*Concrete Bunded Tank (ID #7) – Refer to Fig 01*

Test Procedure:

The tank was filled with clean water to the brim and allowed settle, then topped up again. During filling, observations were made checking the integrity of the walls etc. The tank was left standing over night and observations the following day showed no loss of water.

RESULT OF TEST

Date of start	*21 May 2009*	Time of start	*15:00 hrs*	Reading	*full*
Date of end	*22 May 2009*	Time of end	*15:30 hrs*	Reading	*full*

Statement of Integrity:

The Tank (ID #7) was found to have sound integrity with a capacity greater than 110% of the design capacity of the diesel tank within the unit (1000L). A visual examination carried out on the tank did not indicate any damage or weakness likely to cause loss of integrity.

APPROVAL DETAILS

Approved by	*Peter Corrigan*	Signed		Date	*02/06/09*

APPENDIX E

2009 Pollution Emission Transfer Register

7th April 2010
Report No. 09507190002

Golder Associates

Environmental Protection Agency

AER Returns Worksheet

Version 1.1.10

REFERENCE YEAR	2009

1. FACILITY IDENTIFICATION

Parent Company Name	KTK Landfill Limited
Facility Name	KTK Landfill Limited
PRTR Identification Number	W0081
Licence Number	W0081-03

Waste or IPPC Classes of Activity

No.	class_name
3.5	Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
3.1	Deposit on, in or under land (including landfill).
3.11	Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
4.13	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.
4.3	Recycling or reclamation of metals and metal compounds.
4.4	Recycling or reclamation of other inorganic materials.

Address 1	Brownstown and Carnalway
Address 2	Kilcullen
Address 3	Co. Kildare
Address 4	
Country	Ireland
Coordinates of Location	-6.71785 53.1451
River Basin District	IEEA
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Michael Bergin
AER Returns Contact Email Address	michael.bergin@greenstar.ie
AER Returns Contact Position	Landfill Operations Manager
AER Returns Contact Telephone Number	045-482600
AER Returns Contact Mobile Phone Number	
AER Returns Contact Fax Number	
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	0
User Feedback/Comments	
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?	No
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 ?	

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR														
POLLUTANT		METHOD											QUANTITY		
			Method Used		2500 Flare	GE1, GE2, GE3	750 Flare	1500 & 2500 Open						
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	Emission Point 2	Emission Point 3	Emission Point 4	Emission Point 5	Emission Point 6	Emission Point 7	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
02	**Carbon monoxide (CO)**	M	EN ISO 10780		45.7	11569.0	5.0	44.0	0.0	0.0	0.0	11663.7	0.0	0.0
08	Nitrogen oxides (NOx/NO2)	M	EN ISO 10780		856.4	4736.0	97.0	1259.0	0.0	0.0	0.0	6948.4	0.0	0.0
11	Sulphur oxides (SOx/SO2)	M	EN ISO 10780		28362.0	27236.0	5139.0	35252.0	0.0	0.0	0.0	95989.0	0.0	0.0
01	Methane (CH4)	E	EN ISO 10780		65.5	7603.0	16.0	108.0	0.0	0.0	0.0	1157792.5	0.0	1150000.0
07	Non-methane volatile organic compounds (NMVOC)	M	EN ISO 10780		41.0	180.0	16.0	77.0	0.0	0.0	0.0	314.0	0.0	0.0
86	Particulate matter (PM10)	M	EN ISO 10780		0.0	889.0	0.0	0.0	0.0	0.0	0.0	889.0	0.0	0.0
03	Carbon dioxide (CO2)	E	EN ISO 10780	Gas Sim Estimate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73200000.0	0.0	73200000.0
					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR								
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								
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: KTK Landfill Limited

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)	14233470.0				N/A	
Methane flared	9288889.0	E	Estimate	GaSSim Estimate	7250.0	(Total Flaring Capacity)
Methane utilised in engine/s	3794581.0	E	Estimate	GaSSim Estimate	2000.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	1157793.0				N/A	

4.2 RELEASES TO WATERS

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

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

RELEASES TO WATERS								
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								
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								
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

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER

POLLUTANT		METHOD			QUANTITY			
			Method Used		LP6			
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
06	Ammonia (NH3)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	20400.0	20400.0	0.0	0.0
79	Chlorides (as Cl)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	11405.0	11405.0	0.0	0.0
83	Fluorides (as total F)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	1.99	1.99	0.0	0.0
13	Total phosphorus	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	12.1	12.1	0.0	0.0
19	Chromium and compounds (as Cr)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	0.39	0.39	0.0	0.0
20	Copper and compounds (as Cu)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	2.41	2.41	0.0	0.0
22	Nickel and compounds (as Ni)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	0.6	0.6	0.0	0.0
23	Lead and compounds (as Pb)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	0.199	0.199	0.0	0.0
24	Zinc and compounds (as Zn)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	0.199	0.199	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

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
306	COD	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	51259.0	51259.0	0.0	0.0

305	Calcium	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	91.59	91.59	0.0	0.0
338	Potassium	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	1738.56	1738.56	0.0	0.0
341	Sodium	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	3518.6	3518.6	0.0	0.0
343	Sulphate	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	1637.83	1637.83	0.0	0.0
332	Ortho-phosphate (as PO4)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	85.66	85.66	0.0	0.0
357	Iron	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	0.335	0.335	0.0	0.0
320	Magnesium	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	109.21	109.21	0.0	0.0
321	Manganese (as Mn)	C	Oth	Figures gathered from lab data during 2009 and site figures on amount of leachate removed off-site during 2009	0.79	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

SECTION A : PRTR POLLUTANTS

RELEASES TO LAND							
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							
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: M/C/E	Method Used: 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)
Within the Country	**19 07 03**	**No**	167.22	Leachate	R3	M	Weighed	Offsite in Ireland	KCC Athy STP,.	.,.,.,Athy,Ireland		
Within the Country	19 07 03	No	2762.021	Leachate	R3	M	Weighed	Onsite in Ireland	Sewer Discharge,na	KTK Landfill,Brownstown,Kilcullen,Co. Kildare,Ireland		
Within the Country	19 07 03	No	1986.98	Leachate	R3	M	Weighed	Offsite in Ireland	Wicklow County Council Registered Facility at Newtown,.	Newtown,Eadestown,Naas,Co. Kildare,Ireland		
Within the Country	19 07 03	No	6818.07	Leachate	R3	M	Weighed	Offsite in Ireland	Meath County Council Navan Sewage Treatment Plant,.	Ferganstown,Navan,Navan,Meath,Ireland		
Within the Country	19 07 03	No	21033.11	Leachate	R3	M	Weighed	Offsite in Ireland	KCC Leixlip STP,.	KCC Leixlip STP,St. Catherines Park,Leixlip,Co. Kildare,Ireland		
Within the Country	19 07 03	No	8331.67	Leachate	R3	M	Weighed	Offsite in Ireland	DCC Ringsend STP,.	Dublin City Council Ringsend Sewage Treatment Plant,Ringsend,Co. Dublin,D4,Ireland		
Within the Country	19 07 03	No	8277.5	Leachate	R3	M	Weighed	Offsite in Ireland	Rilta Greenogue Business Park Rathcoole Co. Dublin,W0192-02	Block 402,Greenogue Business Park,Rathcoole,Co. Dublin,Ireland		

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

At Golder Associates we strive to be the most respected global group of companies specialising in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organisational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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