Connaught Regional Residual Landfill

EPA Waste Licence W0178-02

Annual Environmental Report

January 2011 - December 2011

TOBIN
Patrick J. Tobin & Co. Ltd.

greenstar
setting the standard

Document Amendment Record

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1 Introduction

The Environmental Protection Agency (EPA) issued Greenstar with Waste Licence Reg. No. W0178-01 for its landfill at Killagh More, Ballybaun, Ballintober, Ballinasloe, County Galway on 26th July 2004. Following a review of the licence by the Agency, a revised Waste Licence (Reg. No. W0178-02) was issued on 23rd March 2010.

The facility is located approximately 2 km west of Kilconnell village. The facility has been in operation since December 2005. Greenstar commissioned Tobin Consulting Engineers (hereafter referred to as TOBIN) to prepare the Annual Environmental Report (AER) for the facility for the reporting period January 2011 to December 2011. This report has been prepared in accordance with Condition 11.11 and Schedule G of Waste Licence 178-02.

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

This report addresses Condition 11.11 of Waste Licence 178-02.

Condition 11.11 states that:

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

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

This report addresses the items listed in Schedule G: Content of Annual Environmental Report of the waste licence for the facility. This AER covers the reporting period from 1st January 2011 to 31st December 2011.

2 Waste Activities & Records

2.1 Waste Activities Carried out at the Facility

The Connaught Regional Residual Landfill (CRRL) is a fully engineered and contained landfill site. It is licensed to accept 100,000 tonnes per annum of waste, as follows:

Table 2.1 Waste Acceptance Tonnages at CRRL – 2011

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

Note: *The tonnage of household waste, commercial and industrial non-hazardous waste may be altered with the prior agreement of the agency provided that the total amount of these wastes accepted at the facility does not exceed the combined tonnage of 97,000 tonnes (as specified in Table 2-1).*

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

Waste activities at the facility are restricted to those outlined in *Part 1 - Activities Licensed* of the Waste Licence. Licensed waste disposal and recovery activities are summarised in Table 2-2 and Table 2-3 below.

Table 2.2 Licensed Waste Activities (3rd Schedule of Waste Management Acts, 1996 - 2010)

Class 1	**Deposit on, in or under land (including landfill):** This activity is limited to the disposal of non-hazardous waste into lined cells.
Class 4	**Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons:** This activity is limited to the management of leachate and surface water at the facility.
Class 5	**Specifically engineered landfill, including placement into discrete lined cells which are capped and isolated from one another and the environment:** This is the principal activity. This activity is limited to the disposal of non-hazardous waste into lined cells.
Class 6	**Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule:** This activity is limited to potential future treatment of leachate at the facility

Class 13	**Storage prior to submission of any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced:** This activity is limited to the temporary storage of unacceptable wastes in the waste quarantine area prior to dispatch off-site to an alternative facility.

Table 2.3 Licensed Waste Recovery Activities (4th Schedule of Waste Management Acts 1996 - 2010)

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

2.2 Waste Quantities and Composition 2006 - 2011

The quantities and types of wastes accepted for disposal and recovery at CRRL between 2006 and 2011 are summarised in Table 2.4 below.

Table 2.4 Quantities of waste accepted, disposed of and recovered at CRRL from 2005 - 2011

Waste Type Disposed	Description	Total Accepted 2006 (tonnes)	Total Accepted 2007 (tonnes)	Total Accepted 2008 (tonnes)	Total Accepted 2009 (tonnes)	Total Accepted 2010 (tonnes)	Total Accepted 2011 (tonnes)	Licence Limit (tonnes)
Household		44,221.00	46,733.69	66,578.41	61,470.22	43,023.8	50,796.08	**45,000**
Commercial		27,024.00	27,494.63	30,730.16	35,500.04	54,983.7	47,346.73	**27,500**
Industrial non-hazardous	Misc. Non-Hazardous Industrial solid wastes	27,023.00	27,402.73	999.52	2667.85	3,729.9	4,236.37	**27,500**
Total Waste Disposed		**98,268.00**	**101,631.05**	**98,308.09**	**99,638.11**	**101,737.4**	**102,379.18**	**100,000**
Waste Type Recovered	**Description**	**Total Accepted 2006 (tonnes)**	**Total Accepted 2007 (tonnes)**	**Total Accepted 2008 (tonnes)**	**Total Accepted 2009 (tonnes)**	**Total Accepted 2010 (tonnes)**	**Total Accepted 2010 (tonnes)**	**Licence Limit (tonnes)**
Cover / Engineering Material	Shredded timber - reused on site	2,690	4,482.60	6,950.90	4,121.50	2,942.14	3,758.88	
Cover / Engineering Material	Recovered C&D Rubble reused on site	1,202	989.14	255.01	-	1,080.26	1584.78	-
Cover / Engineering Material	Soil and fine material reused on site for daily and intermediate cover and liner protection	14,538	23,692.17	6,711.11	803.32	2,800.92	2295.74	-
Total Waste Recovered		**18,430**	**29,163.91**	**13,917.02**	**4,924.82**	**6,823.32**	**7639.40**	**27,320**
Total Site Intake		**116,698**	**130,794.96**	**112,225.11**	**104,562.93**	**108560.75**	**110018.58**	**127,320**

2.3 CALCULATED REMAINING CAPACITY OF THE FACILITY

It is estimated that the facility accepted approximately 118,000m^3 of waste in 2011. The remaining capacity of the facility has been calculated to be 763,138m^3.

2.4 METHODS OF DEPOSITION OF WASTE

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

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

3 Report on Environmental Emissions

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

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

3.1 DUST DEPOSITION LIMITS

Dust deposition emission limit values as stipulated in Licence 178-02 are detailed in Table 3-1.

Table 3.1 Dust Deposition ELVs

Level (mg/m^2/day)
350

Dust monitoring was conducted at five locations on a quarterly basis during the 2011 reporting period, as illustrated on Drawing 3588 – 1604 (see Appendix A). City Analysts Limited (Dublin) conducted analysis on the dust deposition samples from the facility. Dust reports were included in all quarterly environmental monitoring reports issued to the Agency during 2011.

Dust monitoring results were below the required ELV (350 mg/m^2/day) during all monitoring events in 2011.

3.2 Noise Emissions

Noise emission limit values as stipulated in Licence 178-02 are detailed in Table 3-2 below.

Table 3.2 Noise Emission

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

Noise monitoring was conducted at five monitoring locations on a quarterly basis during 2011. Results from these noise monitoring events were issued to the Agency as part of the quarterly environmental monitoring reports for 2011.

The measured noise levels were all within the ELV of 55 dB (A) (daytime) as set out in Schedule D of Waste Licence W0178-02, with the exception of N5 during all four quarters of 2011. However, these exceedances were as a result of passing traffic on the R348 (see Section 7.7.2) and were not attributable to facility operations.

3.3 Landfill Gas Concentrations (In any buildings on/adjacent to the facility)

Landfill gas emission limit values as stipulated in Schedule C.2 of Waste Licence 178-02 are detailed in Table 3-3 below.

Table 3.3 Landfill Gas Concentrations

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

3.3.1 Landfill Gas Monitoring Wells

Methane concentrations exceeded the ELV in 4 no. monitoring wells during Q1 (LG5, LG9, LG11, LG22), 6 no. monitoring wells during Q2 (LG6, LG9, LG11, LG19, LG22 & LG23), 5 no. during Q3 (LG5, LG9, LG11, LG19, & LG22) and 5 no. monitoring wells during Q4 (LG5, LG9, LG22, & LG23).

Carbon dioxide concentrations exceeded the ELV in 14 no. monitoring wells during Q1 (LG1, LG5, LG6, LG6-A, LG9, LG11, LG16, LG18, LG19, LG22, LG23, LG24, LG25, & LG28), 13 no. monitoring wells during Q2 (LG1, LG5, LG6, LG6A, LG9, LG11, LG16, LG19, LG21, LG23, LG24, LG25, LG28), 8 no. monitoring wells during Q3 (LG5, LG11, LG15, LG18, LG19, LG22, LG23, & LG24) and 10 no. monitoring wells during Q4 (LG1, LG4, LG5, LG6-A, LG9, LG11, LG18, LG19, LG22, & LG23).

Gas monitoring carried out by White Young & Green (WYG) at CRRL in December 2005, prior to waste acceptance at the facility, identified elevated CH_4 and CO_2 levels at several perimeter boreholes. Their report concluded that the source of elevated methane and/or carbon dioxide in perimeter gas monitoring wells is attributed to the continuous decay of organic peat. All exceedances were reported to the Agency in a landfill gas incident report after each monthly monitoring event.

3.3.2 Landfill Gas In Buildings

There were no instances of gas levels in Buildings/Offices breaching Landfill Gas Concentration limits specified in Schedule C.2 during 2011.

3.4 SURFACE WATER DISCHARGE LIMITS (MEASURED AT SW6 & SW7)

Surface water discharge emission limit values at monitoring locations SW6 and SW7 as stipulated in Schedule C.4 of Waste Licence 178-02 are detailed in Table 3-4 below.

Table 3.4 Surface Water Discharge Limits

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

Suspended solids concentrations at SW6, SW7 complied with the 35mg/L ELVs during all monitoring events throughout 2011.

4 Summary of Environmental Monitoring Results

Environmental Monitoring was conducted at the CRRL facility in accordance with Schedule D of the Waste Licence throughout the reporting period. All monitoring results from 2011 were presented to the Agency in the quarterly environmental monitoring reports and are summarised below. The locations of all environmental monitoring points are illustrated on Drawing 1322/01/01 in Appendix A.

4.1 BIOLOGICAL ASSESSMENT

4.1.1 ELECTROFISHING SURVEY

Stillwaters Consultancy was commissioned to undertake an electro-fishing survey on selected sites in the environs of the CRRL Landfill facility. The objective of the survey was to characterise fish populations in the streams within the vicinity of the landfill site.

The survey was carried out on the 28th July 2011. The results were submitted to the Agency as part of the Q3 2011 environmental monitoring report, and are summarised below in Table 4-1 below.

While there is normal annual fluctuation in population numbers there are no major changes to species composition at these sites to indicate that the landfill area is impacting on them. The only exception is site E where stoneloach have become the dominant species. The site is becoming more overgrown and thus water flows are lower and this may explain the stoneloach numbers. The trout population has remained the same with the addition of 0+ trout. Site G has shown a stable and diverse fish populations over the period and is a good indicator of the healthy state of the river.

Table 4.1 Results of Electro Fishing Survey (2009-2011)

Site	Location	Site Description	Species Recorded 2009(Note 1 & 2)	Species Recorded 2010(Note 1 & 2)	Species Recorded 2011(Note 1 & 2)
Site A	M708 297	Overgrown bog drain Peaty Substrate	Sticklebacks (p) Gammarus (p)	Sticklebacks (p)	Sticklebacks (c) Gammarus (p)
Site B	M712 302	Bog Drain ca. 1.5m deep, very overgrown	Stickleback (p)	Stickleback (p)	Sticklebacks (c) Gammarus (p)
Site C	M707 304	Shallow Stream ca. 5-10cm. Clean gravely substrate maintained by local farmer.	Sticklebacks (p) Gammarus (p)	Sticklebacks (p) Gammarus (p)	Sticklebacks (pl) Gammarus (p) Crayfish (p)
Site D	M709 309	Channel completely overgrown. Upstream Site Surveyed from 2008 on Site more open in 2010	No Species Recorded	Sticklebacks (pl)	Sticklebacks (p) Gammarus (p)
Site E	M699 313	Mainly silt with some rock. Channel overgrown except for stretch fish	Trout 1+(p) Sticklebacks (p)	Trout 1+ (p) Sticklebacks (p) Pike (p)	Trout 0+(p) Trout 1 + (p) Stoneloach (c) Stickleback (p)
Site G	M682 308	Shaded channel under bank cover. Good gravel and cobble substrate, Suitable salmonid habitat	Trout 0+ (a) Trout 1+ (c) Stoneloach (p) Sticklebacks (p) Crawfish (p)	Trout 0+(pl) Trout 1 + (c) Stoneloach (p) Sticklebacks (p) Crawfish (p) Pike (p)	Trout 0+(a) Trout 1 + (c) Stoneloach (p) Gudgeon (p) Eel (p) Crayfish (p)

Note 1: (p) = Present, (c) = Common, (pl) = Plentiful, (a) = Abundant.

Note 2: **Trout 0+** = trout in their 1st year but not yet 1 year old, **Trout 1+** = trout in their 2nd year but not yet 2 years old.

4.1.2 Small Stream Risk Score (SSRS) Assessment for CRRL 2011

Biological assessment of the surface water quality was carried out by Openfield Ecological Services at four locations (upstream and downstream locations) along two streams at the Connaught Regional Residual Landfill at Ballybaun, Kilconnell, Co. Galway. This information was then used to determine the SSRS, in accordance with the Western River Basin District Project's methodology (WRBD, 2005). The SSRS assessment method replaces the EPA Q-Rating system undertaken historically at the site. The EPA Q-Rating system was replaced following an EPA observation made in light of a site audit and subsequent report issued on 13th November 2009. The audit report observed *"Given the low flows in the waters concerned, the appropriateness of the EPA Q-Rating system should be considered. A survey system for small catchments has been developed by the EPA in conjunction with the River Basin Districts and provides a tool suitable for pinpointing areas most affected by pollution problems".* Through subsequent consultation with consultants (as advised by the agency) it was deemed that the SSRS assessment method represented a more suitable assessment tool.

The site analysis took place on the 28th of September 2011, after a period of predominantly dry weather. Biological assessment of the surface water quality was carried out by Openfield Ecological Services at four locations, on upstream and downstream locations along two streams at the Connaught Regional Residual Landfill at Ballybaun, Kilconnell, Co. Galway. This information was then used to determine the Small Stream Risk Score (SSRS), in accordance with the Western River Basin District Project's methodology (WRBD, 2005).

Table 4.2 SSRS Assessment Results

Sampling code	Small Stream Risk	Score Risk Assessment
IN1	2.4	At Risk
IN2	0.8	At Risk
IN3	4.0	At Risk
IN4	4.8	At Risk

Although not directly comparable to the EPA Q value methodology, the result of the 2011 assessment provided by the SSRS, which categorises each of the streams monitored as being "At Risk", is broadly in line with the previous findings (IN1, IN2 and IN3 = seriously polluted and IN4 = moderately polluted).

4.2 SURFACE WATER MONITORING

Surface water monitoring was conducted at 6 no. monitoring locations (SW1, SW3, SW4, SW5, SW6 & SW7) during 2011. It should be noted that monitoring was not carried out at SW2 during 2011 as it was dry during all four quarterly monitoring events. Quarterly surface water samples were analysed for parameters stipulated in Schedule D.5 of Waste Licence 178-02. Surface water sampling results were forwarded to the Agency as part of the quarterly environmental monitoring reports Q1 – Q4 2011.

4.2.1 SURFACE WATER MONITORING RESULTS

Suspended solids concentrations were below the ELV at SW6 and SW7 during all monitoring events in 2011. As per Waste Licence 178-02 no ELV for suspended solids applies to any additional surface water monitoring locations. However, suspended solids concentrations from all other surface water monitoring locations were compared to this ELV for guidance. All additional surface water monitoring locations were below the ELV during 2011, with the exception of SW1 (51 mg/l) during Q2, and SW3 (65mg/l) in Q4. It is important to note that both of these sites are upstream of the facility and as such the results are not attributable to the facility.

Due to the extremely low volume and flow of water at that surface water monitoring location on the day of sampling, collection of the sample unavoidably resulted in sediment becoming disturbed and entering the sample. The Suspended solids concentration is indicative of the low volume and low flow of water at that location on the day of sampling. SW1 is not a discharge location from the landfill, however water at SW1 will be closely monitored.

pH and conductivity results were found to be within normal ranges for natural uncontaminated surface waters. Chloride concentrations ranged from <10 mg/l to 19.37 mg/l (SW3) during 2011. Ammoniacal nitrogen was <1mg/l at all locations during monitoring events of 2011. Results for all surface water parameters tested during 2011 are presented below.

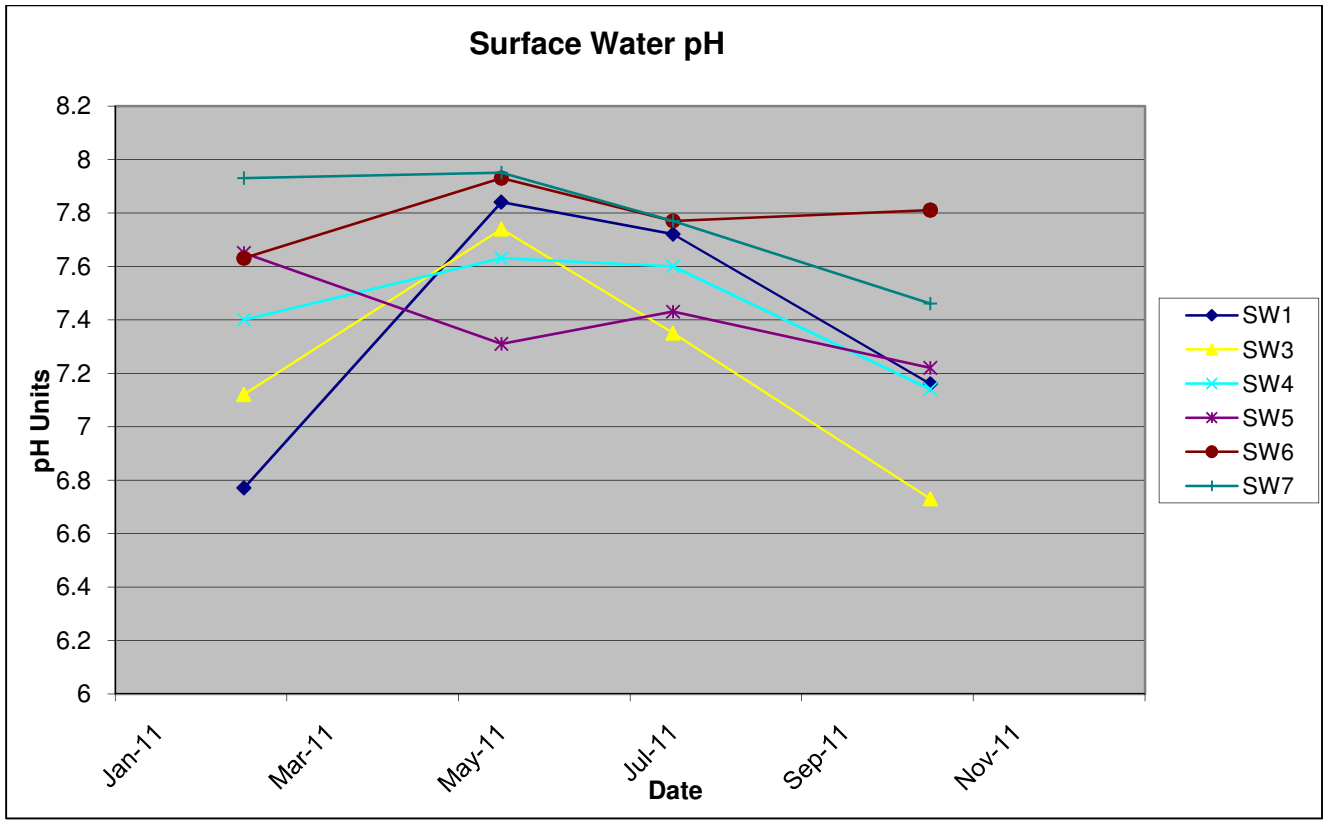


Figure 4-1 SW pH Results at CRRL 2011

Table 4.3 SW pH Results at CRRL 2011

pH Units (mg/l)	February	May	August	October
SW1	6.77	7.84	7.72	7.16
SW2*	*	*	*	*
SW3	7.12	7.74	7.35	6.73
SW4	7.4	7.63	7.6	7.14
SW5	7.65	7.31	7.43	7.22
SW6	7.63	7.93	7.77	7.81
SW7	7.93	7.95	7.77	7.46

*SW2 was dry during all monitoring events.

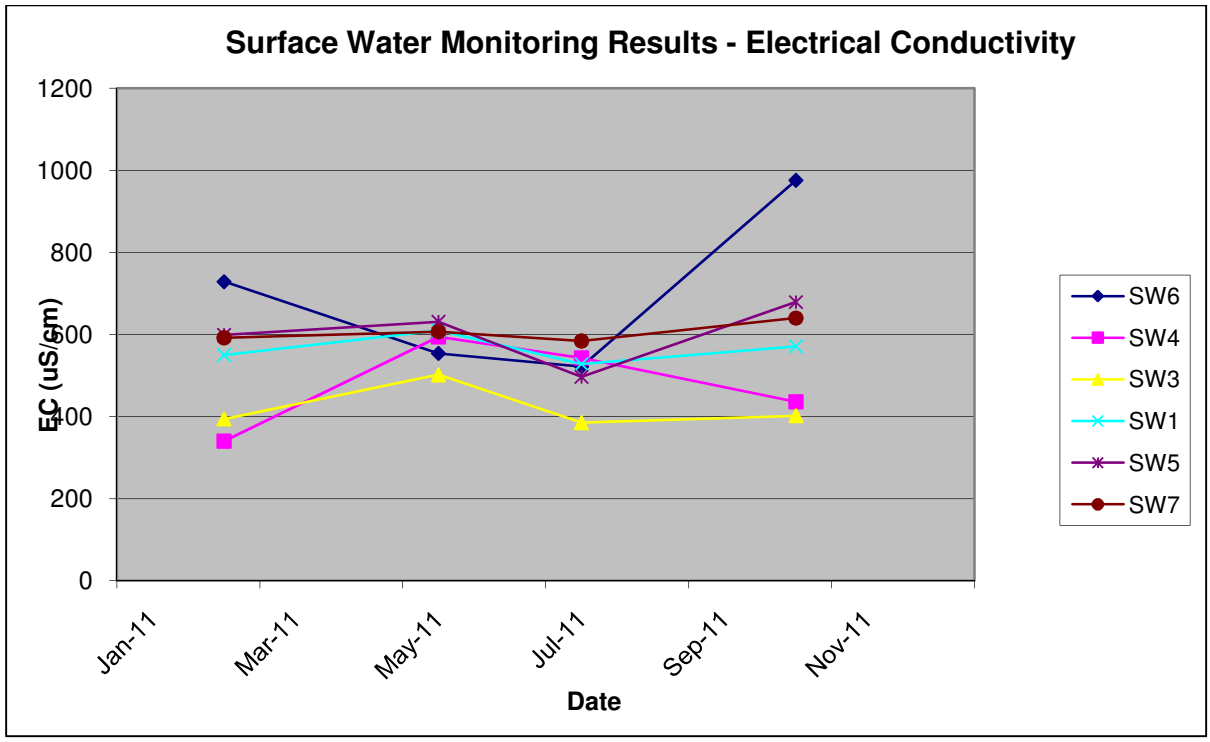


Figure 4-2 SW Conductivity Results at CRRL 2011

Table 4.4 SW Conductivity Results at CRRL 2011

Electrical Conductivity (mg/l)	February	May	August	October
SW1	550	610	528	571
SW2*	*	*	*	*
SW3	394	502	385	402
SW4	340	594	543	436
SW5	599	631	497	679
SW6	729	554	522	976
SW7	592	607	584	640

*SW2 was dry during all monitoring events.

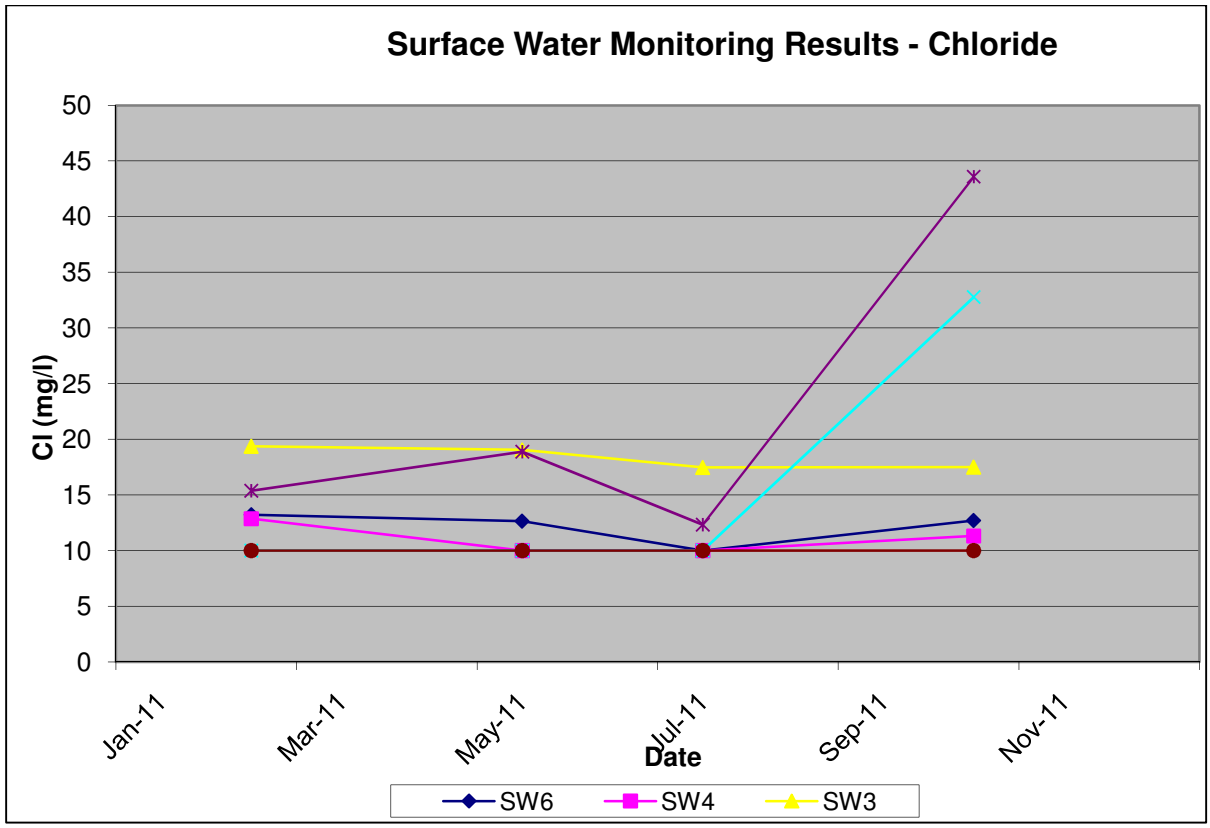


Figure 4-3 SW Chloride Results at CRRL 2011

Table 4.5 SW Chloride Results at CRRL 2011

Chloride (mg/l)	February	May	August	October
SW1	<10	<10	<10	32.78
SW2*	*	*	*	*
SW3	19.37	19.04	17.48	17.5
SW4	12.86	<10	<10	11.31
SW5	15.37	18.89	12.32	43.59
SW6	13.21	12.64	<10	12.69
SW7	<10	<10	<10	<10

*SW2 was dry during all monitoring events.

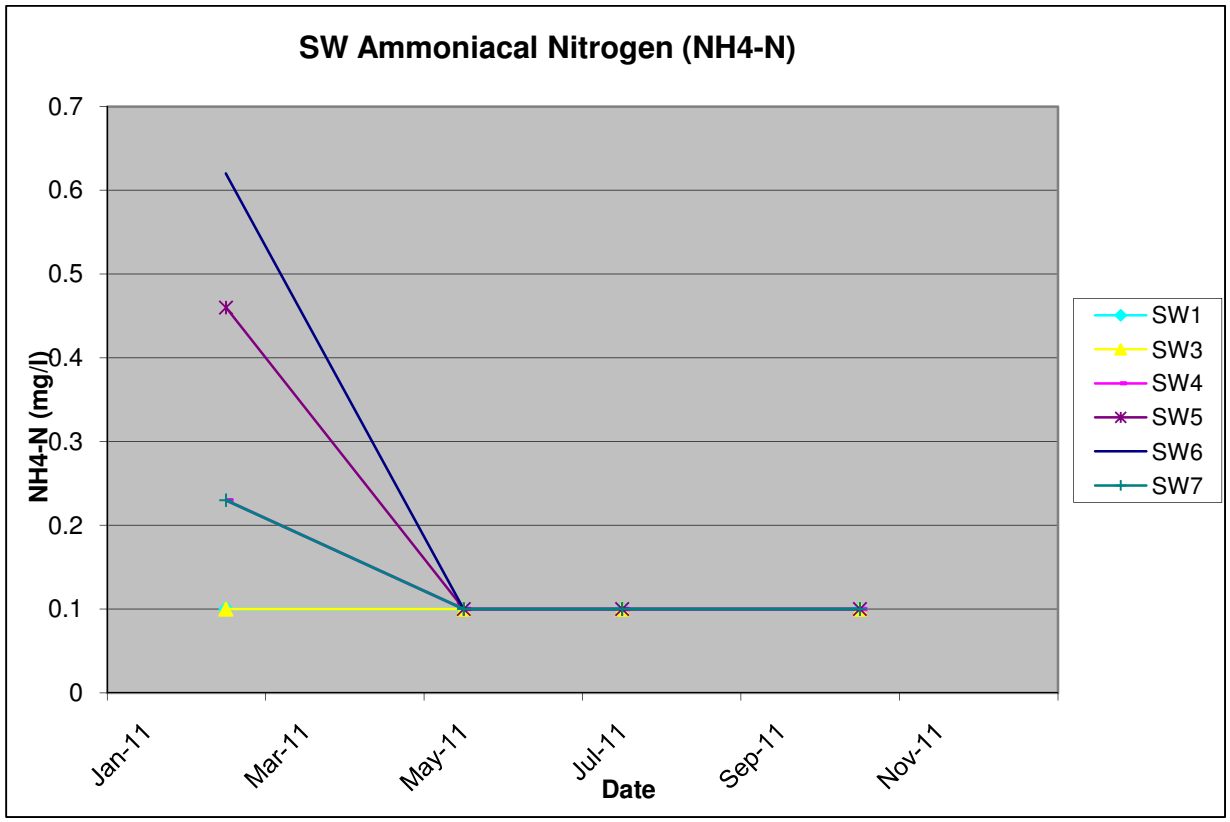


Figure 4-4 SW Ammoniacal Nitrogen Results at CRRL 2011

Table 4.6 SW Ammoniacal Nitrogen Results at CRRL 2011

Ammonical Nitrogen (mg/l)	February	May	August	October
SW1	<0.1	<0.1	<0.1	<0.1
SW2*	*	*	*	*
SW3	<0.1	<0.1	<0.1	<0.1
SW4	0.23	<0.1	<0.1	<0.1
SW5	0.46	<0.1	<0.1	<0.1
SW6	0.62	<0.1	<0.1	<0.1
SW7	0.23	<0.1	<0.1	<0.1

*SW2 was dry during all monitoring events.

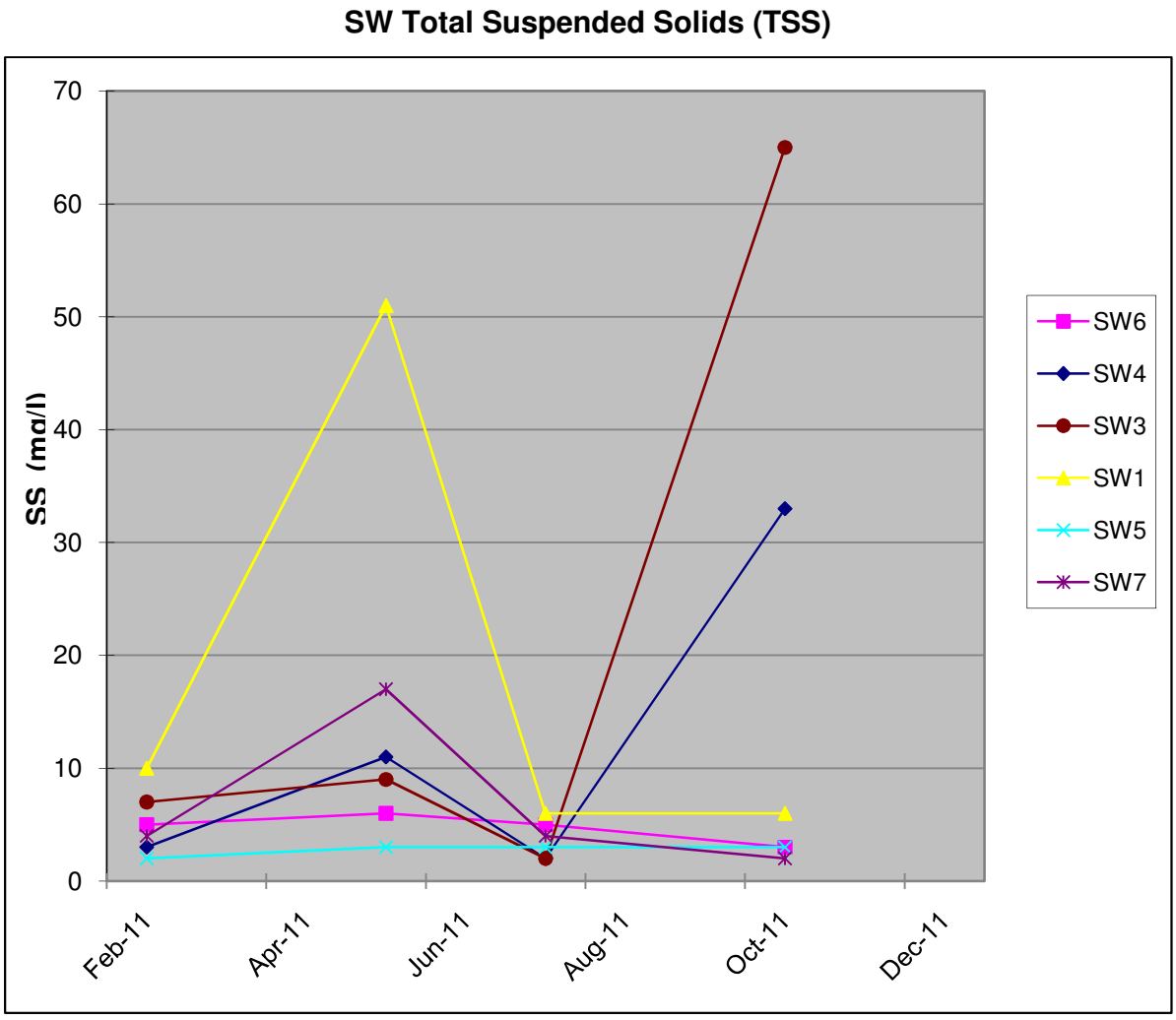


Figure 4-5 SW Total Suspended Solids Results at CRRL 2011

Table 4.7 SW Suspended Solids Results at CRRL 2011

Total Suspended Solids (mg/l)	February	May	August	October
SW1	10	51	6	6
SW2*	*	*	*	*
SW3	7	9	<2	65
SW4	3	11	<2	33
SW5	2	3	3	3
SW6	5	6	5	3
SW7	4	17	4	<2

*SW2 was dry during all monitoring events.

4.3 GROUNDWATER MONITORING

Groundwater monitoring was conducted at eight locations during 2011, in accordance with Schedule D.1 and D.5 of Waste Licence 178-02.

The trigger levels for groundwater parameters are reviewed annually and were last revised in the 2008 AER (as presented in Table 4-8 below). These trigger levels were also used in 2009 and 2010. Greenstar requested Agency agreement of these trigger levels on 8th Dec 2009 in response to a related Agency audit observation. No response was received in relation to this. These trigger levels remain unchanged for the 2011 monitoring period.

In November 2011, the groundwater trigger levels were reviewed and a submission discussing these levels was lodged on behalf of Greenstar to the Agency following an EPA request for same. This was precipitated by a site inspection by the EPA on 09/09/2011. Greenstar is awaiting return correspondence in relation to the submission and therefore this report has continued to refer to the trigger values from the 2008, 2009 and 2010 AER as given in Table 4.8 below.

The results of routine licence compliance groundwater monitoring are all under the trigger values as revised and submitted in the 2008, 2009 and 2010 AER. This AER report employs the aforementioned trigger levels for the parameters listed in Condition 6.4.3 of the Waste Licence for wells GW1-A, GW2, GW3, GW4-A, GW5-A, GW6, GW7 and GW8.

Table 4.8 Groundwater Trigger Values - 2010 Analyses as Revised in the 2008 AER

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

Groundwater levels were recorded on a monthly basis during 2011 and the results are presented in Figure 4-6 below. The recorded water levels remained relatively constant while allowing for seasonal variation during 2011.

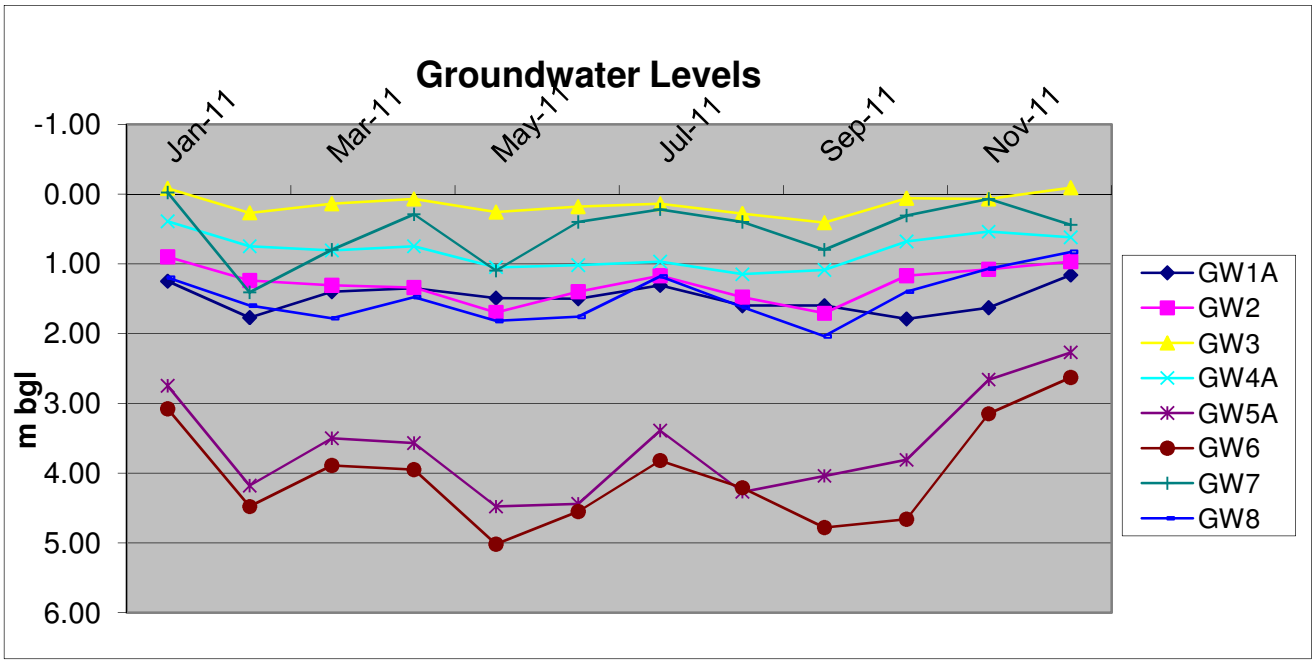


Figure 4-6 Monthly Groundwater Levels at CRRL – 2011

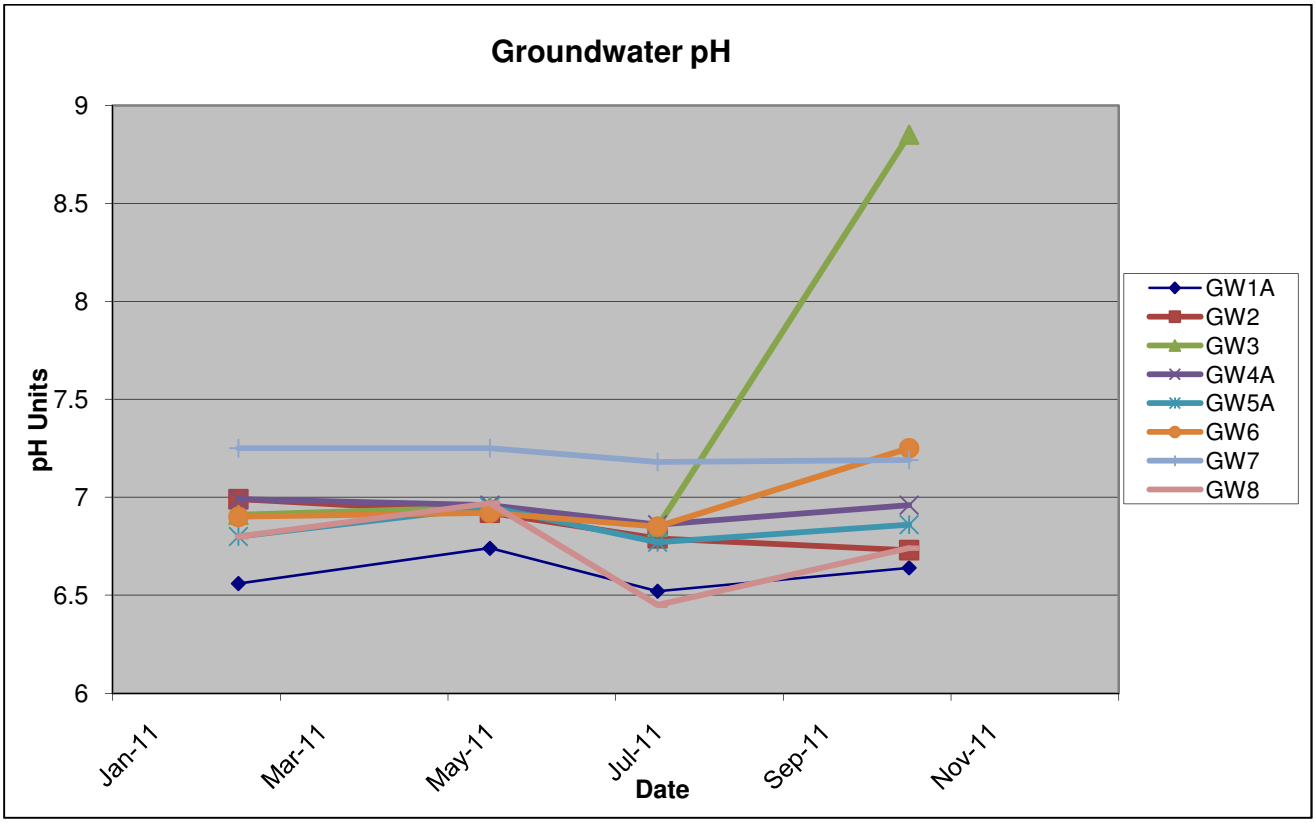


Figure 4-7 Groundwater pH Results at CRRL – 2011

Table 4.9 Groundwater pH Results at CRRL – 2011

pH (pH Units)	*Trigger Values*		February	May	August	October
	pH Lower Limit	*pH Upper Limit*				
GW 1 – A	*5.73*	*9.02*	6.74	6.52	6.64	5.98
GW 2	*5.35*	*9.79*	6.92	6.79	6.73	6.98
GW 3	*5.56*	*9.38*	6.95	6.85	8.85	6.99
GW 4 – A	*5.77*	*9.14*	6.96	6.86	6.96	6.26
GW 5 – A	*5.70*	*9.22*	6.95	6.77	6.86	6.25
GW 6	*5.54*	*10.56*	6.92	6.85	7.25	7.12
GW 7	*5.87*	*9.53*	7.25	7.18	7.19	7.35
GW 8	*5.28*	*9.61*	6.97	6.45	6.74	6.9

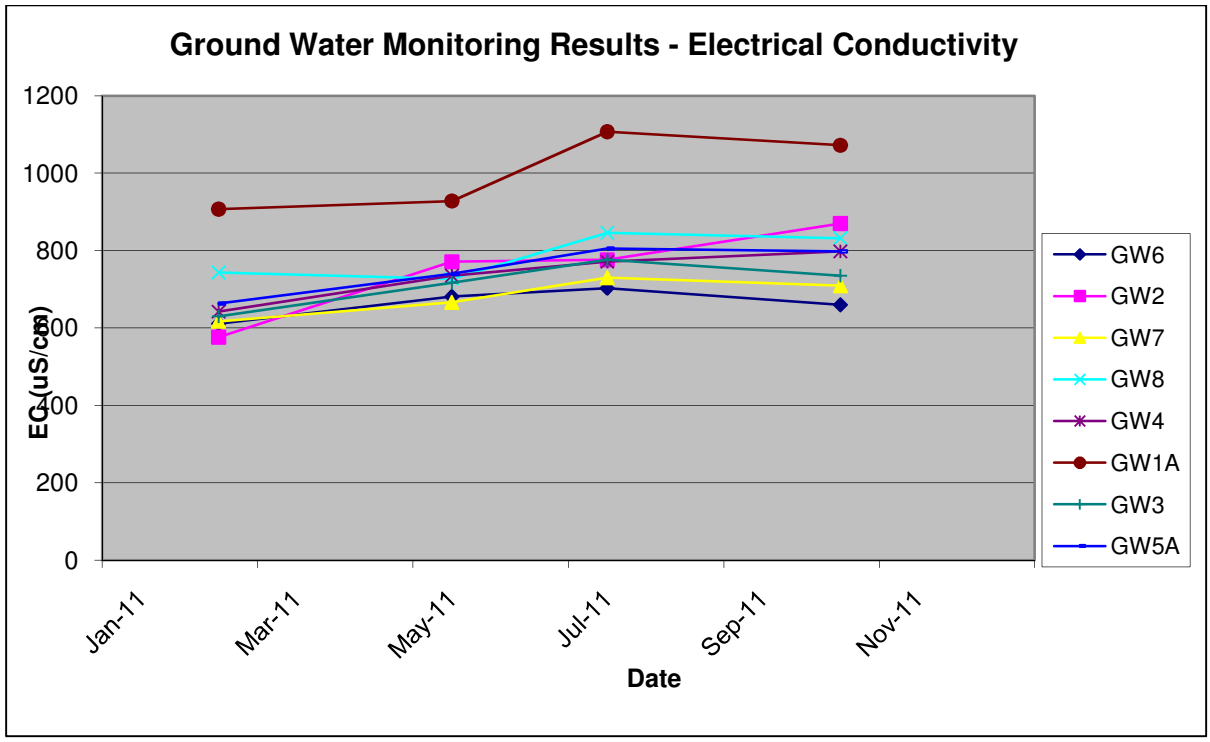


Figure 4-8 Groundwater Electrical Conductivity Results at CRRL – 2011

Table 4.10 Groundwater Electrical Conductivity Results at CRRL – 2011

Electrical Conductivity (uS/cm)	*Trigger Values (Note 1)*	February	May	August	October
GW 1 – A	-	907	928	1107	1072
GW 2	-	576	771	776	870
GW 3	-	630	717	776	735
GW 4 – A	-	642	735	771	798
GW 5 – A	-	663	740	805	798
GW 6	-	611	681	703	660
GW 7	-	617	666	730	709
GW 8	-	743	727	846	832

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

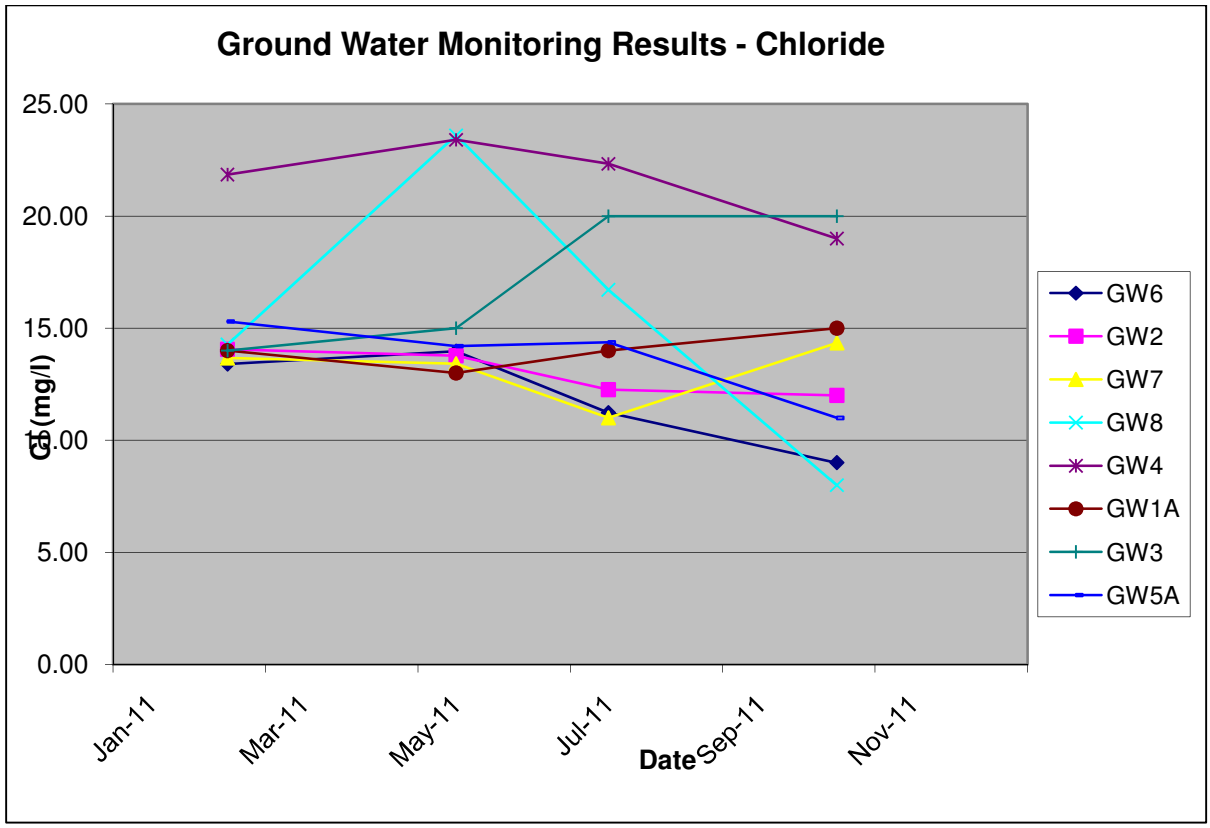


Figure 4-9 Groundwater Chloride Results at CRRL – 2011

Table 4.11 Groundwater Chloride Results at CRRL – 2011

Chloride (mg/l)	*Trigger Values*	February	May	August	October
GW 1 – A	*20.4*	15.01	13.44	15.55	12.0
GW 2	*46.8*	14.06	13.77	12.26	12.0
GW 3	*24.0*	13.26	14.55	13.42	7.0
GW 4 – A	*39.6*	21.85	23.4	22.33	19.0
GW 5 – A	*32.4*	15.3	14.2	14.37	11.0
GW 6	*24.0*	13.41	13.98	11.23	9.0
GW 7	*18.0*	13.62	13.67	13.42	11.0
GW 8	*37.2*	14.27	23.6	16.71	8.0

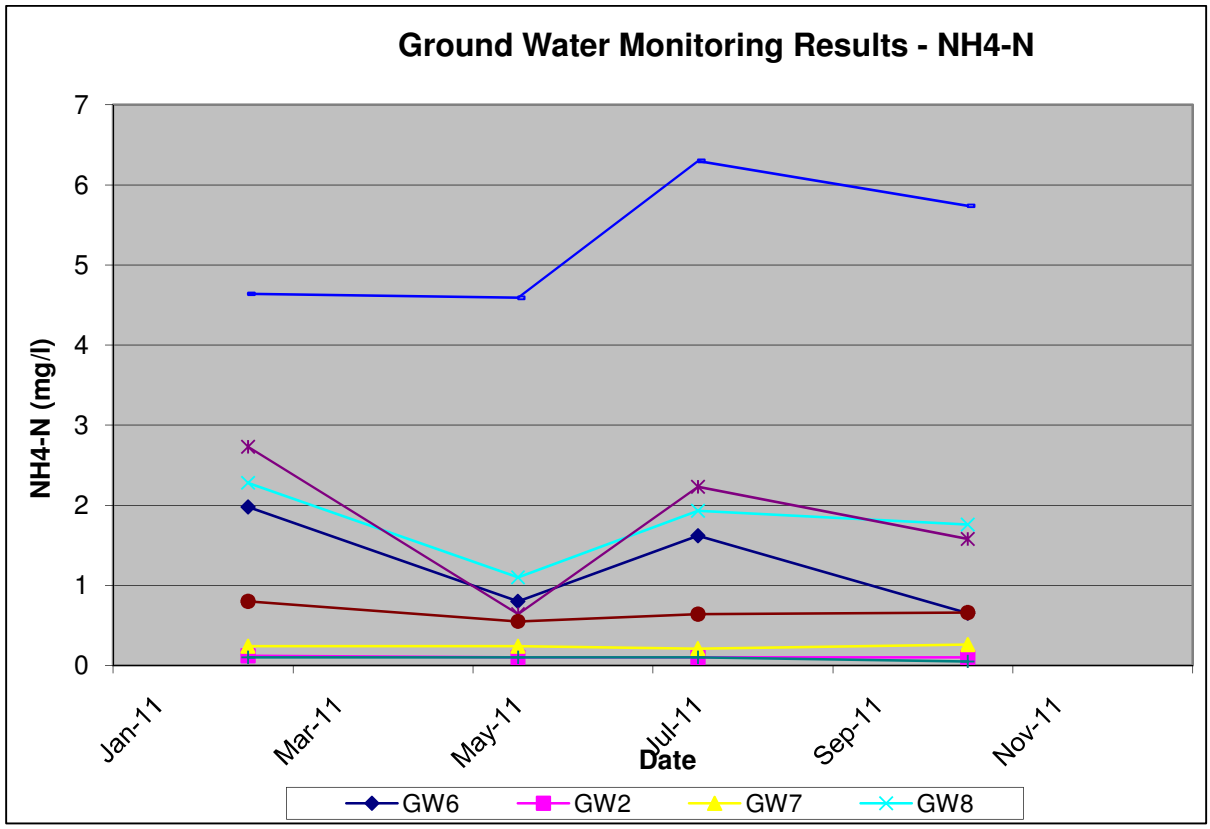


Figure 4-10 Groundwater Ammoniacal Nitrogen Results at CRRL – 2011

Table 4.12 Groundwater Ammoniacal Nitrogen Results at CRRL – 2011

Ammonical Nitrogen (mg/l)	*Trigger Values*	February	May	August	October
GW 1 – A	*1.92*	0.8	0.55	0.64	0.66
GW 2	*6.36*	0.12	<0.1	< 0.1	< 0.1
GW 3	*5.40*	< 0.1	<0.1	< 0.1	0.05
GW 4 – A	*3.60*	2.73	0.64	2.23	1.58
GW 5 – A	*8.52*	4.64	4.59	6.3	5.74
GW 6	*7.44*	1.98	0.8	1.62	0.65
GW 7	*2.40*	0.24	0.24	0.21	0.26
GW 8	*3.72*	2.28	1.1	1.93	1.76

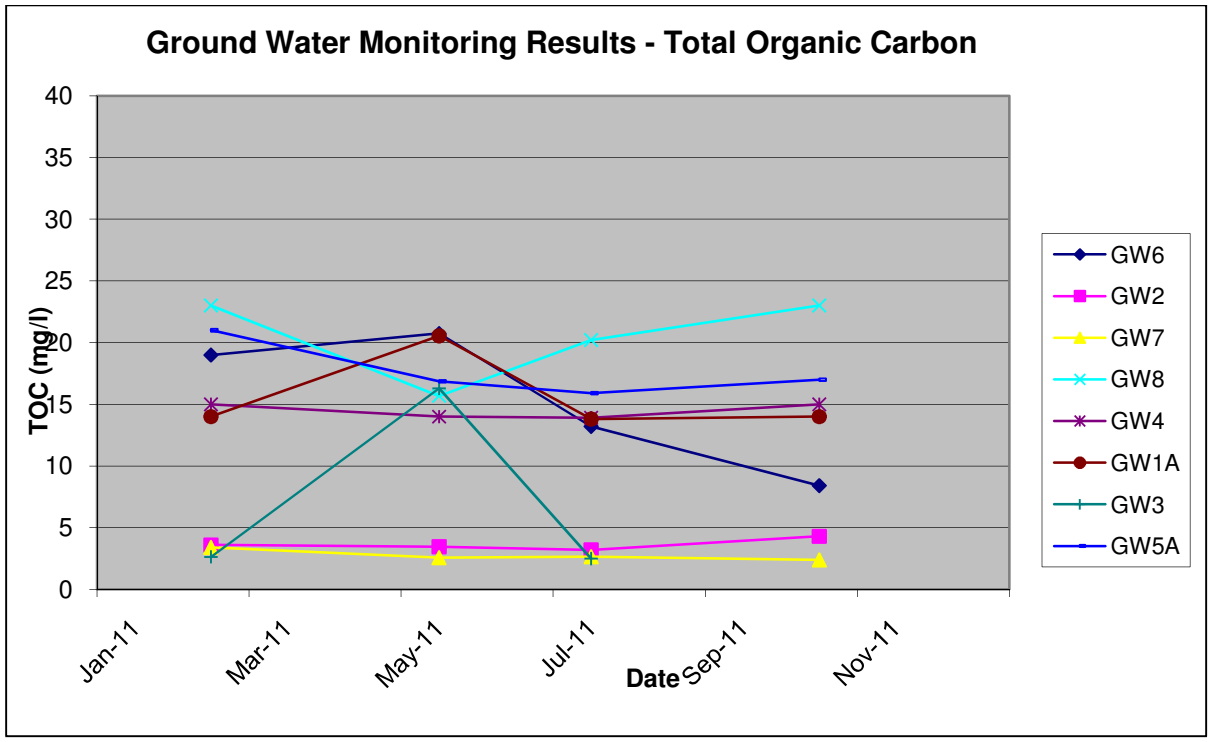


Figure 4-11 Groundwater TOC Results at CRRL – 2011

Table 4.13 Groundwater TOC Results at CRRL – 2011

TOC (mg/l)	*Trigger Values*	February	May	August	October
GW 1 – A	*60.00*	14.0	20.54	13.8	14.0
GW 2	*55.20*	3.6	3.46	3.2	4.3
GW 3	*27.60*	3.0	2.64	16.3	2.5
GW 4 – A	*60.00*	15.0	14.0	13.9	15.0
GW 5 – A	*74.40*	21.0	16.86	15.9	17.0
GW 6	*48.00*	19.0	20.74	13.2	8.4
GW 7	*21.60*	3.4	2.58	2.65	2.4
GW 8	*39.60*	23.0	15.68	20.2	23.0

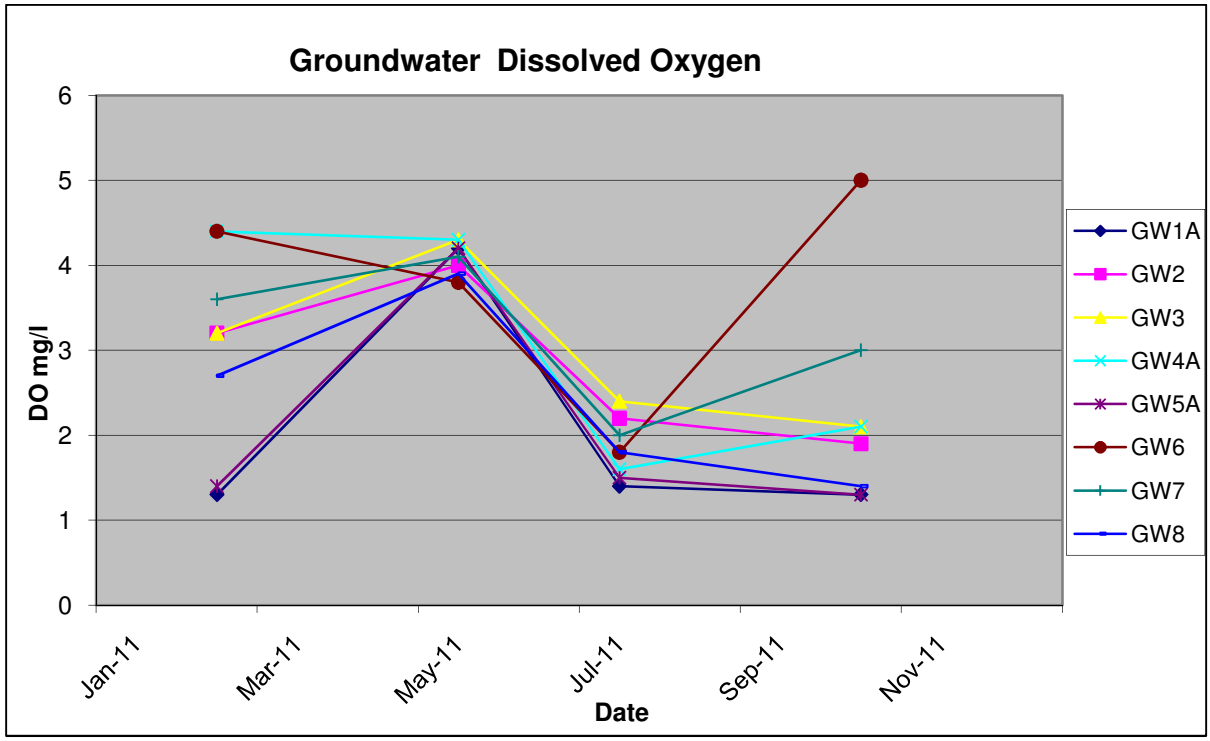


Figure 4-12 Groundwater DO Results at CRRL – 2011

Table 4.14 Groundwater DO Results at CRRL – 2011

DO (mg/l)	*Trigger Values (Note 1)*	February	May	August	October
GW 1 – A	-	1.3	4.2	1.4	1.3
GW 2	-	3.2	4	2.2	1.9
GW 3	-	3.2	4.3	2.4	2.1
GW 4 – A	-	4.4	4.3	1.6	2.1
GW 5 – A	-	1.4	4.2	1.5	1.3
GW 6	-	4.4	3.8	1.8	5.0
GW 7	-	3.6	4.1	2.0	3.0
GW 8	-	2.7	3.9	1.8	1.4

Note 1: No Set limit for dissolved oxygen in groundwater trigger values.

4.3.1 Groundwater Results Summary

pH concentrations were less than the corresponding trigger levels at all monitoring locations during 2011.

All conductivity measurements are typical of natural uncontaminated groundwaters, with all results below 1000uS/cm during 2011.

Chloride and Ammoniacal nitrogen concentrations were below their assigned trigger values at all monitoring locations during 2011.

Total Organic Carbon concentrations ranged from 2.4mg/l to 23mg/l which are also below trigger values at all monitoring locations.

Dissolved Oxygen concentrations ranged from 1.3mg/l to 4.4mg/l during 2011.

4.4 Dust and PM_{10} Monitoring

4.4.1 Dust Monitoring

As discussed in Section 3.1 above dust monitoring was undertaken at 5(no.) locations (D1, D2, D3, D4, D5) in accordance with Schedule D.1 and D.3 of Waste Licence 178-02. Dust concentrations were below the required ELV of 350mg/m^2/day during all monitoring events in 2011. Dust results from 2011 are summarised in Table 4-15 below.

Table 4.15 Dust Monitoring Results 2011

Date out	Date in	D 1 (mg/m^2/day)	D 2 (mg/m^2/day)	D 3 (mg/m^2/day)	D 4 (mg/m^2/day)	D 5 (mg/m^2/day)
18.01.11	15.02.11	10	3.1	2.1	13.6	18.9
18.05.11	15.06.11	7.1	20.30	11.70	14.8	31.4
05.08.11	01.09.11	6.0	22.6	14.7	6.8	36
05.10.11	01.11.11	17.7	19.7	18.0	Not Detectable	35.6

*D4 was not detectable from the analysis completed due to erroneous material in the sample arising from bird faeces soiling of the dust gauge.

4.4.2 PM_{10} Monitoring

PM_{10} monitoring was conducted at the facility in accordance with Schedule D of Waste Licence 178-02. The PM_{10} monitoring locations are shown on Drawing 1322/01/101, Appendix A. All of the PM_{10} results were below the required limit level of 50ug/m^3 during 2011. The PM10 results for 2011 are summarised in Table 4-16 below.

Table 4.16 PM10 (ug/m3) Monitoring Results for 2011

Monitoring Location	Q1 – 2011 Average concentration value (µg/m^3)	Q2 – 2011 Average concentration value (µg/m^3)	Q3 – 2011 Average concentration value (µg/m^3)	Q4 – 2011 Average concentration value (µg/m^3)
Limit Value	***50***	***50***	***50***	***50***
D1	12	14	12	12
D2	11	21	16	18
D3	15	20	23	9
D4	19	29	15	16
D5	18	23	11	15

4.5 Leachate Monitoring

As per Schedule D.5 of Waste Licence 178-02 temperature readings were taken from each of the leachate cells and the leachate holding tank (LHT) on a quarterly basis during 2011. Chemical analysis of the leachate was undertaken in September 2011 and submitted to the Agency as part of the Q3 environmental monitoring report.

4.5.1 Leachate Results

Leachate temperature readings and annual chemical analysis results are summarised in Table 4-17 and Table 4-18 below.

Table 4.17 Leachate Temperatures at CRRL – 2011

Monitoring Location	Q1 2011 Temperature (°C)	Q2 2011 Temperature (°C)	Q3 2011 Temperature (°C)	Q4 2011 Temperature (°C)
Cell 1	14.7	14.4	15.6	16.1
Cell 2	19.8	19.7	20.6	19.9
Cell 3	12.6	15.2	18.6	18.2
Cell 4	21.7	21.7	22.6	21.9
Cell 5	19.2	19.6	18.7	18.2
Cell 6	19.2	20.1	20.6	20.4
Cell 7*	-	-	-	21.0
Leachate Holding Tank (LHT)	10.1	12.3	15.8	15.7

**Cell 7 became active in Q4 2011*

Table 4.18 Annual Chemical Analysis of Leachate at CRRL – 2011

Parameter	Units	L1	L2	L3	L4	L5	LHT
Ammoniacal Nitrogen	mg/l	1783	1609	1282	366.23	1226.78	1371.95
BOD	mg/l	346	135	113	111	105	216
Boron	µg/l	2686	3429	2590	2248	2131	3363
Cadmium	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium	mg/l	54.1	71.8	80.1	82.9	70.4	37.7
Chloride	mg/l	1388	1363	1182	367	1372	1852
Total Chromium	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
COD	mg/l	3060	2290	2170	2150	2040	1970
Copper	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total cyanide	mg/l	0.021	0.022	0.023	0.028	0.016	0.065
Fluoride	mg/l	0.4	0.3	0.3	0.4	0.7	0.5
Iron	mg/l	<1	<1	<1	1.18	<1	<1
Lead	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Magnesium	mg/l	54.1	69.4	59.4	87.6	78.2	283
Manganese	mg/l	<0.2	0.2	0.3	0.2	<0.2	<0.2
Mercury	mg/l	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ortho-phosphate	mg/l	12.3	12	10.3	<2	6	5.2
Potassium	mg/l	680	654	725	843	600	1130
Sodium	mg/l	1150	1230	1100	1340	1100	1800
Sulphate	mg/l	119.4	238.5	149.7	116	34.2	37.4
Total Phosphorus	mg/l	<5	<5	<5	<5	<5	<5
TON as N	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc	mg/l	1783	1609	1282	366.23	1226.78	1371.95

4.6 Noise Monitoring

As discussed in Section 3.2 above noise monitoring was carried out on a quarterly basis at 5 no. monitoring locations, as indicated on Drawing No. 3588 – 1604 (see Appendix A). All noise monitoring results were submitted to the Agency as part of the quarterly environmental monitoring reports for 2011. Results for noise monitoring conducted at the facility on a quarterly basis during 2011 are summarised in Table 4-19 below. All noise monitoring locations had L_{Aeq} values less than the required ELV of 55dB L_{Aeq} during 2011, with the exception of N5 during all for quarters. However these exceedances were attributable to passing traffic on the R348 and not attributable to facility operations.

Table 4.19 Noise Monitoring Results at CRRL – 2011

Location	Q1 2011				Q2 2011				Q3 2011				Q4 2011			
	18/01/11 Time	LAeq dB(A)	LA10 dB(A)	LA90 dB(A)	08/04/11 Time	LAeq dB(A)	LA10 dB(A)	LA90 dB(A)	05/08/11 TIME	LAeq dB(A)	LA10 dB(A)	LA90 dB(A)	21/12/11 TIME	LAeq dB(A)	LA10 dB(A)	LA90 dB(A)
N1 (Noise Sensitive Receptor)	10.50	38.9	36.6	32.4	12.06	42.9	45.36	33.18	12:22	41.4	42.8	32.3	12.21	39.3	39.7	33.4
N2	11.33	45.2	36.7	32.6	11.29	39.3	38.49	33.76	13:10	39	40.7	33.7	13.04	43.8	46.0	40.0
N3 (Noise Sensitive Receptor)	09.26	42.7	45.0	37.2	10.00	39.2	39.94	33.09	10:30	52	45.9	34.9	10.44	41.6	44.4	36.9
N4	10.10	37.9	40.2	33.0	10.45	48.3	51.15	40.90	11:45	43.1	42.9	34	11.39	40.8	43.6	36.6
N5 (Noise Sensitive Receptor)	08.51	64.6	66.7	37.2	09.26	69.7	69.01	35.06	11:05	**68.4**	65.8	35.7	12.21	39.3	39.7	33.4

5 Resource and Energy Consumption Summary

The main resources consumed at the facility during the reporting period were electricity, water for potable supply & vehicle wheel cleaning, diesel fuel and hydraulic oils. The details are listed in Table 5-1 below.

Electricity consumption has decreased by 72.3% from 2010 due largely to the installation of a gas utilisation plant (engine) in Quarter 4 2010 which supplied a substantial percentage of the sites electrical demand for 2011. This decrease in electrical consumption was tempered by increased landfill flaring and leachate pumping as a result of progressive landfilling.

Total water consumption decreased 44.5% from 2010. This is largely as a result of significant site works to identify and fix any leaks on the supply line which was co-ordinated alongside the local group water scheme. Water for dust suppression is obtained from the surface water lagoon and drains back into the surface water lagoon. It is therefore being reused and is not consumed.

Table 5.1: Energy and Resource Use 2011

Resource	Consumption
Electricity(kWhr)	79,478
Water, Potable Supply (Litres)	1,583,000
Water, Dust suppression (Litres)	0.0
Water, Wheelwash (Litres)	150,000
Total Water (Litres)	1,733,000
Diesel (Including Contractor Plant) (Litres)	128,623
Hydraulic & Engine Oils (Litres)	696
Petrol (Litres)	391
Grease (kg)	30
Terram for road base	10,800 m2
Imported Aggregates	2,134 tonnes
Soil materials from site stockpiles	20,868 tonnes

6 Development and Restoration Works

6.1 Development Works Undertaken in 2010

A number of development works were carried out during 2011. The main development works included:

- Completion of M & E work associated with construction of phase 2 of the landfill. (Fitting of leachate pumps and leachate level transducers in cells 7 to 9)
- The Installation of landfill gas management infrastructure. This included the installation of 26 vertical gas extraction wells in cells 3, 4 & 5, 26 Horizontal wells in cells 3, 4 & 5 and an additional 1000m3/hr enclosed 'Uniflare' back-up flare.
- The Installation of Geohess temporary gas barrier in cells 3 & 4.

6.2 Development Works to be Undertaken in 2011

The following development works are planned to be undertaken in 2012:

- Continued installation of landfill gas infrastructure which will include installation of vertical and horizontal wells in Cells 4, 5, 6 & 7 and gas extraction from drainage layer in cell 8.
- The Installation of geohess temporary gas barrier on remainder of cells 3, 4 & 5 & on cells 6 & 7.
- Commencement of final capping works in Cells 1 & 2 Final capping works in Cell 1 and part of Cell 2 is scheduled to be undertaken between 2nd July 2012 and 31st October 2012. The completion of the remainder of Cell 2 as well as the capping of Cell 3 is scheduled between 1st July 2013 and 31st October 2013.

6.3 Restoration of Completed Cells/Phases

Progressive intermediate capping of cells at the landfill is an ongoing practice. The intermediate cap comprises:

1) 0.5m thickness of low permeability soils,
2) An impermeable "Geohess" Gas Barrier
3) A Protective Anchor Mat
4) Effective gas well seals at gas extraction points (Wells).

This cap exceeds temporary capping recommendations stipulated in EPA Landfill Operational Practices Manual. The application of the temporary synthetic cap is regarded as being comparable to the final cap in terms of gas containment and minimizing rainfall infiltration.

The suitability and effectiveness of the cap as a gas containment membrane has been audited on behalf of the EPA by Odour Monitoring Ireland. The effectiveness of this intermediate cap has been proven during similar surveys carried out in 2007, 2008, 2009 and 2010.

The extent of the temporary cap placed at the site to date (as of 31st March 2012) is approximately as

follows:

Table 6.1: Temporary Cap extent

Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
100%	100%	95%	80%	25%	40%

It is planned that the temporary cap will be extended over further portions of cells 5, 6 and 7 in 2012.

Final capping works in Cell 1 and part of Cell 2 is scheduled to be undertaken between 2nd July 2012 and 31st October 2012. The completion of the remainder of Cell 2 as well as the capping of Cell 3 is scheduled between 1st July 2013 and 31st October 2013 A Specified Engineering Works (SEW) report has been submitted and approval has been given by the Agency. The final capping of Cell 3 will be addressed in a separate SEW which will be submitted by 31st January 2013.

7 Volume of Leachate Transported/Discharged Off Site

Volumes of leachate tankered off site on a monthly basis are summarised in Table 7-1 below.

Table 7.1 Volume of Leachate Transported Off Site

2010 (Month)	Leachate Consigned Off Site (m^3)
January	3,394.02
February	3,410.98
March	3,622.08
April	2,383.04
May	2,578.42
June	2,320.02
July	2,243.86
August	2,431.76
September	2,341.26
October	2,289.44
November	3,750.74
December	5,066.48
Total	**35,832.10**

8 Landfill Gas

The data below present the annual cumulative quantity of landfill gas captured, flared and utilised at the facility during the 2011 reporting period from January 2011 to December 2011 as presented in Table 8-1 to Table 8-4 below.

Table 8.1 Landfill Gas collected in 2011 – 2000 Haase Flare

Flare No. 1 Connaught 1							
Model:	Haase						
Type:	HTN 2000 Enclosed						
Commisioned:	Apr-08						
2010 Monthly	**Average Flow**	**Average CH_4**	**Average CO_2**	**Average O_2**	**Combustion**	**Total CH_4**	**Total CH_4**
	Rate (m^3/hr)	**%v/v**	**%v/v**	**%v/v**	**Efficiency (%)**	**m^3**	**kgs**
January	803	41.40	25.80	2.70	99.9	247,090	165,047
February	762	41.00	27.40	1.90	99.9	209,736	138,667
March	795	39.90	26.70	2.20	99.9	235,765	156,197
April	785	40.00	26.60	2.00	99.9	225,854	149,939
May	784	40.80	26.30	1.70	99.9	237,747	157,348
June	748	41.10	28.80	2.00	99.9	221,127	146,499
July	789	42.20	28.20	2.00	99.9	247,473	163,616
August	843	42.10	27.60	2.20	99.9	263,784	174,220
September	800	41.80	25.80	2.20	99.9	240,527	158,369
October	757	40.40	23.50	2.30	99.9	227,308	149,510
November	707	40.10	25.60	2.20	99.9	203,921	133,988
December	647	42.50	26.30	2.40	99.9	203,553	133,330
Total						**2,763,884**	**1,826,730**

Table 8.2 Landfill Gas collected in 2011 – HTN 2000 Enclosed

Flare No. 2 Connaught 2							
Model:	Haase						
Type:	HTN 2000 Enclosed						
Commisioned:	Jan-09						
2010 Monthly	**Average Flow**	**Average CH_4**	**Average CO_2**	**Average O_2**	**Combustion**	**Total CH_4**	**Total CH_4**
	Rate (m^3/hr)	**%v/v**	**%v/v**	**%v/v**	**Efficiency (%)**	**m^3**	**kgs**
January	666	39.30	31.10	3.90	99.9	194,538	130,872
February	770	36.90	32.00	3.20	99.9	190,744	128,320
March	827	36.80	31.60	3.70	99.9	226,200	152,172
April	849	36.60	31.60	3.60	99.9	223,505	150,359
May	842	36.60	30.00	4.20	99.9	229,051	154,090
June	787	37.10	29.40	4.60	99.9	199,513	134,219
July	811	36.30	28.80	4.60	99.9	210,575	141,660
August	850	32.50	29.80	3.70	99.9	204,773	137,757

September	967	32.70	29.20	3.90	99.9	227,443	152,543
October	1121	33.20	28.80	3.90	99.9	276,247	183,393
November	1249	35.60	26.10	4.80	99.9	319,379	209,416
December	1354	29.30	27.70	6.10	99.9	280,598	183,605
Total						**2,782,565**	**1,858,407**

Table 8.3 Landfill Gas collected in 2011 – Uniflare

Flare No. 3 Connaught 3							
Model:	Uniflare						
Type:	1000 Enclosed						
Commisioned:	Jun-10						
2010 Monthly	**Average Flow Rate (m^3/hr)**	**Average CH_4 %v/v**	**Average CO_2 %v/v**	**Average O_2 %v/v**	**Combustion Efficiency (%)**	**Total CH_4 m^3**	**Total CH_4 kgs**
January							
February	400	36.90	32.00	3.20	99.9	3,539	2,443
March	1150	36.80	31.60	3.70	99.9	634	438
April							
May							
June	825	37.10	29.40	4.60	99.9	10,855	7,495
July	850	36.30	28.80	4.60	99.9	8,477	5,853
August	325	32.50	29.80	3.70	99.9	211	146
September							
October	1200	33.20	28.80	3.90	99.9	398	275
November	1150	35.60	26.10	4.80	99.9	409	282
December	1150	29.30	27.70	6.10	99.9	12,118	8,367
Total						**36,641**	**25,298**

Table 8.4 Landfill Gas collected in 2011 – Engine No. 1

Engine No. 1							
Model:	Deutz						
Type:	TGB 620 V16						
Commisioned:	Oct-10						
2010 Monthly	**Average Flow Rate (m^3/hr)**	**Average CH_4 %v/v**	**Average CO_2 %v/v**	**Average O_2 %v/v**	**Combustion Efficiency (%)**	**Total CH_4 m^3**	**Total CH_4 kgs**
2011 AnnualTotal	560	41.00	30.00	1.50	98.8	1,932,718	1,176,405

9 Indirect Emissions to Groundwater

CRRL is a fully engineered and contained landfill and there are no indirect emissions to groundwater from the facility.

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

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

10 Annual Water Balance

10.1 Estimated Liquid In-Waste Liquid Volume

The estimated liquid in-waste liquid volume for 2011 was assessed using rainfall figures obtained from the on site meteorological station, potential in-waste liquid volume and the assumed absorption capacity of the waste mass (see Table 10-1 below).

Table 10.1 Estimated Liquid In-Waste Liquid Volume

2010	Total uncapped area (Note 1)	Rainfall (Note 2)	Potential in waste liquid volume	Absorption capacity of Waste (assumed to be 2%)	Balance	Leachate Tankered off site (Note 3)
	(m^2)	(m)	(m^3)	(m^3)	(m^3)	(m^3)
January	26916	0.0918	2470.89	49.42	2421.47	3394.02
February	26916	0.0370	995.62	19.91	975.71	3410.98
March	18106	0.0557	1009.05	20.18	988.87	3622.08
April	18106	0.0548	992.21	19.84	972.36	2383.04
May	21956	0.1274	2797.19	55.94	2741.25	2578.42
June	21956	0.123	2700.59	54.01	2646.58	2320.02
July	25806	0.092	2374.15	47.48	2326.67	2243.86
August	25806	0.1128	2910.92	58.22	2852.70	2431.76
September	25806	0.15319	3953.22	79.06	3874.16	2341.26
October	25806	0.1578	4072.19	81.44	3990.74	2289.44
November	25806	0.1542	3979.29	79.59	3899.70	3750.74
December	25806	0.1996	5150.88	103.02	5047.86	5066.48
			33406.19	**668.12**	**32738.07**	**35832.10**

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

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

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

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

11 Schedule of Environmental Objectives and Targets

Table 11.1 Programme of Environmental Objectives and Targets for 2011

Programme of Objective and Targets 2012	
Objective	**Target**
Lower the environmental impacts associated with fugitive landfill gas emissions by continually developing the Facility's Gas Utilisation Infrastructure and landfill gas management techniques.	• Installation of gas extraction wells where fugitive emissions have been identified. • Apply impermeable Geohess cover over filled areas of the landfill • Uniflare 2,500m^3 open flare to be installed further enhance back-up flaring capacity on site. This Gas Infrastructure set-up should be altered to provide for the flares use in both Gas the Gas Utilisation and Gas Flaring Systems • Add an impermeable material to the southern flank of Cell 6 & Cell 7 to reduce the potential for fugitive emissions on flanked areas, this is outside of the Geohess application programme and is a pilot project for this site
Lower the potential environmental impacts associated with the generation of leachate.	Reduce leachate generation by: • Progressive application of impermeable Geohess cover over filled areas of the landfill immediately after reaching final filling height • Look to source additional WWTP's for leachate generated, this will potentially reduce the dependence on a smaller number of plants during reduced operational periods (holidays, downtime etc). • Investigate potential for onsite leachate treatment to ensure leachate sent to WWTP's is less concentrated or has been treated to some extent
Improve Health, Safety and Welfare	• Carry out Safety Statement review & Safety Statement training. • Carry out training on Emergency Response Procedure and other SOP's • Carry out training on Escape equipment and confined spaces • Schedule training for site management in ISO18001 (H&S)
Staff Training	• Continue to train staff on a regular basis in EMS system, waste licence and SOP's.
Resource Consumption (Electricity Usage)	• A landfill gas utilisation plant was installed in Quarter 4 2010. It is hoped this will achieve a negative carbon footprint for the facility through providing green energy to national grid. Electricity usage and export should be recorded throughout the year to determine the electrical demand on site which should be used as a benchmark for future years

Resource Consumption (Water Usage)	• Water requirements on various sections of site being monitored to identify potentials for reductions. Water usage was recorded on a monthly basis in 2011 and this will be used as part of a benchmarking exercise in an attempt to reduce the reliance on group water scheme. Waster usage will be addressed in future environmental management meetings (EMS) from Quarter 1 2011 onward
Commence capping of Phase 1 (Cells 1-3)	• Final capping works in Cell 1 and part of Cell 2 is scheduled to be undertaken between 2nd July 2012 and 31st October 2012. The completion of the remainder of Cell 2 as well as the capping of Cell 3 is scheduled between 1st July 2013 and 31st October 2013 A Specified Engineering Works (SEW) report has been submitted and approval has been given by the Agency. The final capping of Cell 3 will be addressed in a separate SEW which will be submitted by 31st January 2013.
Retain ISO 14001 Environmental Management System Certification	• Four audits are scheduled for 2012 with the aim of retaining certification. This will include two internal audits as well as two external audits, one of which will be a recertification audit (carried out every 3 years as per ISO Accreditation • Ensure a member of management receives formal ISO 14001 training and certification. This will aid in the ISO14001 recertification process
Ensure all customers, contractors, site users & visitors are familiar with Greenstar's Environmental Policy	• Circulate policy to all customers & contractors who attend site.
Source more Recovery materials	• To facilitate the capping process as well as reduce the reliance on virgin material onsite for daily cover there is a need to increase the amount of EPA approved recovery material employed at the facility
Reduce BMW content of MSW accepted on site	• Since the introduction of BMW targets for Municipal Solid Waste ion 1st July 2010, there has been a reduction in the BMW content of waste at CRRL. Condition 1.7.1 sets a limit of 47% by weight and this is the target for 2011.
Upgrade CCTV System	• In light of developments on site since the installation of the CCTV system in Phase 1, there has not been an increase in the CCTV coverage. An upgrade of the current system should be carried out in 2012. This will increase control of the site from the administrative area.

Table 11.2 Programme of Objective and Targets – Beginning of 2011 to End of 2015

Ref. No.	Objective	Ref. No.	Target	Resources Required	Person Responsible	Time Frame for Completion	Progress as of 31st December 2011
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 bi-annual VOC surveys of the waste surface over the next 5 years, to establish the areas were fugitive emissions are most prevalent.	External Consultant (circa €1,800 per survey)	Site Manager	Ongoing	Surveys carried out on Thursday 20th April 2011, and 18th October 2011
		T - 1.2	Installation of gas extraction wells where fugitive emissions have been identified from the VOC surveys.	Circa €1,700 per borehole.	Site Manager	Ongoing	Additional vertical & horizontal gas extraction wells installed during 2011. There were 28 horizontal wells added to cells 4, 5, 6 & 7. This brings the total number of gas extraction points on site to approximately 338. An additional 13 extraction wells are to be added to Cell 6 in Quarter1 2012.

		T - 1.4	Apply impermeable Geohess cover over filled areas of the landfill .	€ 7/m2 approx	Site Manager	Ongoing	Geohess installed progressively throughout 2011 and to continue in a similar vein in 2012 over filled areas. 8,810m^2 was applied between the 11th and 18th January 2011 encompassing Cells 3, 4.& 5. Approximately 7500 m^2 of Geohess is scheduled to be applied in Quarter 1 2012.
O - 2	Lower the potential environmental impacts associated with the generation of leachate. by reducing leachate generation	T - 2.1	Reduce leachate generation by incorporating improved leachate reducing design features into construction of Phases 2 and 3 of the Landfill.	External Consultant & Site Manager (60 man hours)	Site Manager	Ongoing	Leachate reducing design features have been incorporated into Phase 2 development by reducing cell area. Their effectiveness will be reviewed and possibly replicated in Phase 3 development.
		T - 2.2	Reduce leachate generation by applying impermeable Geohess cover over filled areas of the landfill .	€ 7/m2 approx	Site Manager	Ongoing	Geohess to be installed progressively over filled areas.
		T - 2.3	Lower the demand on WWTP's, risk of spillage, CO2	External Consultant & Site Manager	Site Manager	Ongoing	Ongoing implementation of site practices (Cell area reduction, Geohess application)

			emissions associated with the off site treatment of leachate	(60 man hours)			
O - 3	Lower the potential environmental impacts associated with litter by improving litter management techniques.	T - 3.1	Investigate potential for construction of wind breaker berms for operation in windy conditions.	Assistant Site Manager (20 man hours)	Site Manager	Ongoing	Not possible due to lack of desirable material available to this facility to be used in the construction of such berms. Continued review of day to day litter reducing management techniques to ensure was completed and as a consequence, an additional 4 litter cages were Obtained/sourced in 2010 these mobile litter cages are employed at working face.
0 - 4	Minimise the amount of natural resources (water, power etc) consumed at the Facility.	T - 4.1	Complete a second Energy Audit of the Facility to identify possibilities to improve energy efficiency and ascertain the facilities performance within an energy management matrix.	External Consultant (circa €5,000)	Site Manager	Sep-12	A second Energy audit was completed by external consultants (OCM) in March 2010. In order to improve the facility's performance and current standing within the energy management matrix the Energy Policy Statement was updated, training has been provided, sub-meters installed in Gas utilisation compound completed in October 2010. Refresher training in Energy Policy and energy saving measures to be completed in 2012.
	Minimise the amount of natural resources (water, power etc) consumed at the Facility.	T – 4.2	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.	Assistant Site Manager (40 man hours)	Site Manager	Ongoing	Facility actively pursues C & D materials, as a substitute for natural material, for engineering purposes. Natural material excavated during Phase 2 development to be reused on site where possible On 15th December 2011, EPA approval was granted for use of C&D fines as a cover material

							Wherever possible look for suitable engineering materials in order to limit the amount of virgin material used on site.
		T – 4.3	Carry out assessment of water usage at the facility and identify opportunities for improved efficiency of water usage.	Assistant Site Manager (40 man hours)	Site Manager	Ongoing	Water requirements on various sections of site being monitored to identify potentials for reductions. Water usage was recorded on a monthly basis in 2010 and 2011 and this will be used as part of a benchmarking exercise in an attempt to reduce the reliance on group water scheme. Waster usage is addressed in EMS Quarterly meetings since Quarter 1 2011
O - 5	Improve Health, Safety and Welfare	T – 5.1	Reduce lost time injuries by 5% over the next five years	Site Manager/ Assistant Site Manager	All site Personnel	Mar-13	Data being recorded and tracked. Manual handling course for all staff to reduce likelihood of back injury (a primary reason for lost time through injury) competed 10th March 2010 and is required every three years. A site Safety Representative was appointed for the site in Quarter 2 2011.
		T – 5.2	Develop Accident Prevention Plan	Assistant Site Manager (80 man hours)	Site Manager GM Landfill Group	Ongoing	A procedure has been developed and incorporated into the EMS since 4th April 2009 with respect to the control and prevention of accidents on the site and any environmental impact of accidents
		T – 5.3	Identify appropriate training courses in Health and Safety for staff who perform a General operative role	Assistant Site Manager (120 man hours)	Site Manager GM Landfill Group	Mar-12	All Safe Pass and CSCS cards were brought up to date in 2011. Other staff are due for training in Safepass in 2012 which will be scheduled for Quarter 1 2012. Chemical Handling training was provided in August 2011.
		T – 5.4	Continue to train staff on a regular basis in EMS system, waste licence and Emergency Response.	Assistant Site Manager	Site Manager	Apr-12	Training to be completed annually, training last carried out on 7th January 2011 (Waste Licence/ EMS/ Emergency Response)

O-6	Training	T – 6.1	Retain ISO 14001 Environmental Management System Certification	Site Manager/Assistant Site Manager	Site Manager	Ongoing	Having attained certification in Q3 2009, there is a need to retain emphasis on the Environmental Management System and retain accreditation through a series of audits both internally and externally each year. Four audits are scheduled for 2012 with the aim of retaining certification. This will include two internal audits as well as two external audits, one of which will be a recertification audit (carried out every 3 years as per ISO 14001 Standard)
O-7	Operations	T – 7.1	Ensure all customers, contractors, site users & visitors are familiar with Greenstar's Environmental Policy	Site Manager/ Assistant Site Manager	Site Manager	Ongoing	Circulate policy to all customers & contractors who attend site. The Environmental Policy was incorporated into site inductions in 2010 having been highlighted in an EMS internal audit.
		T – 7.2	Ensure all waste hauled to the site complies fully with the Waste Collection Permit Regulations	Site Manager	Site Manager	Ongoing	Though only fully licensed and permitted hauliers are accepted at this site, there is a need to ensure permit details held are updated regularly as vehicles on permit, waste types permitted etc are subject to change. This will be achieved through liaising with both customers and permit ting authorities.
		T – 7.3	Review all Site Operational procedures	Site Manager/ Assistant Site Manager	Site Manager	Ongoing	The Site Operational procedures are reviewed annually and any additional procedures introduced or significant amendments to existing procedures are included in the AER on an annual basis.

12 Facility Management

12.1 New Procedures Developed During 2011

The following is a description of the operating procedures for this facility developed during the reporting period:

CRRL 46 – Reporting of Environmental Incidents

This procedure applies to Waste Licence W0178-02 Condition 9.1 concerning the reporting of incidents to the Environmental Protection Agency (EPA) and other stakeholders. It outlines the classification system for incidents and the steps to be taken in reporting of incidents.

The following is a description of the operating procedures for this facility which have been revised during the reporting period:

CRRL 06 - Emergency Response and Preparedness Procedure

The purpose of this procedure is to ensure a consistent approach in dealing with or reacting to emergency situations that may arise at this facility.

CRRL 07- Environmental Monitoring

The purpose of this procedure is to ensure a consistent approach to all environmental monitoring and reporting. This document outlines CRRL'S Environmental Monitoring Protocol with respect to self monitoring of water, gas migration wells and air emissions. This policy complies with Condition 8 of site waste licence W0178-02 and EPA correspondence 'EPA's Requirements on the Quality of Self Monitoring Compliance Data at Licensed Facilities'.

CRRL 14- Operation of the Facility in Adverse Wind Conditions

The purpose of this procedure is to ensure the control of operations at the facility in adverse windy conditions (e.g. litter management)

CRRL 20- Fuel Storage and Distribution

The purpose of this procedure is to ensure that fuel is stored and distributed on site in a manner that does not lead to environmental pollution.

CRRL 21- Fuel Storage and Distribution

The purpose of this procedure is to detail the method of vermin control at CRRL.

CRRL 22- Handling Tipping Vehicles on SIte

The purpose of this procedure is to detail the control measures in place to ensure the safe tipping of all vehicles on site.

CRRL 26 – Waste Acceptance and Characterisation Procedures

This procedure details all aspects related to acceptance of waste at this facility. It focuses on areas such as :

- Waste Characterisation, Testing and Verification
    - Waste Types and Annual Quantities authorised for disposal
    - Limits on acceptance of Biodegradable Municipal Waste
    - Waste Treatment
    - Waste Collection Permits
    - Waste Handling
    - Unacceptable Wastes & Waste Rejection

CRRL 29 – Leachate Management

This procedure describes the handling of Leachate during removal from the leachate holding tank/lagoon and subsequent transport/discharge to a wastewater treatment plant. It also details the monitoring infrastructure and procedures for the monitoring of Leachate levels in the pump sumps, the cells and the holding tank.

CRRL 31-Odour management Plan

This procedure outlines the Odour Management Plan (OMP) implemented at CRRL Landfill. This procedure was written to address Condition 8.13 of licence W0178-02 which replaced licence W0178-01 on 23/03/10. The plan addresses measures such as the control of potential sources of odour nuisance as well as the carrying out of odour patrols and VOC monitoring.

12.2 Site Testing and Inspection Reports

As per condition 8.7 of the waste licence, a survey showing the topography of the facility at the end of the reporting period is included in Appendix B. As per Schedule E of the waste licence, the integrity of the bunds and tanks are carried out every three years and was last carried out in October-November 2011. These tests are included in Appendix D.

12.3 Reported Incidents and Complaints Summary

12.3.1 Reported Incidents

As was the case in 2010, the majority of incidents reported to the Agency during 2010 were in relation to methane and carbon dioxide detected in the gas migration monitoring boreholes. Concentrations of these gases exceeded the limits set out in Waste Licence 178-02 for buildings on or adjacent to the landfill site.

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

The report on LFG monitoring carried out by WYG in December 2005 concluded the slightly high levels of CH4 and CO2 could be attributed to the large quantities of peat deposited in the area where the monitoring wells are located. A literature search carried out for that report demonstrated that the levels of carbon dioxide and methane measured in the landfill gas monitoring wells could be attributed to the natural background levels from the continuous decay of organic peat. A summary of the reported incidents is presented in Table 12-1 below.

Table 12.1 Summary of Incidents at CRRL – 2011

Number	Date	Description	Action
I-11/01	18/01/2011	Exceedence of Daytime Noise Limit at N5 Noise Monitoring Point (Off site location)	Incident Report Submitted. Exceedance is attributed to passing traffic on public road (R348) and not related to site activity. N5 is the furthest noise monitoring point from the facility and is in close proximity to the R348.
I-11/02	26/01/2011	Elevated CH_4 level in landfill gas monitoring borehole LG9 & LG22 Elevated CO_2 levels were recorded at monitoring borehole's LG5, LG6, LG6A, LG9, LG19, LG23, LG25 & LG28.	Incident Report Submitted. Previous monitoring carried out by White Young Green on the 6th and 13th December 2005 prior to facility accepting waste. These two monitoring events identified elevated methane gas levels at LG14, LG16 & LG18. Elevated CO_2 at locations LG6, LG6a, LG9, LG10, LG14, LG16 &LG18. The Report concluded that elevated levels of Methane and Carbon Dioxide could be attributed to large quantities of peat deposited in the area of the monitoring wells.
I-11/03	25/02/2011	Elevated CH_4 level in landfill gas monitoring borehole LG5, LG9, LG11 & LG22 Elevated CO_2 levels were recorded at monitoring borehole's LG1, LG6, LG6A, LG9, LG11, LG16, LG18 & LG23.	Incident Report Submitted.
I-11/04	21/03/2011	Elevated CH_4 level in landfill gas monitoring borehole LG11 & LG22. Elevated CO_2 levels were recorded at monitoring borehole's LG11, LG18, LG22, LG24, LG25	Incident Report Submitted.
I-11/05	08/04/2011	Exceedence of Daytime Noise Limit at N5 Noise Monitoring Point (Off site location)	Incident Report Submitted. Exceedance is attributed to passing traffic on public road (R348) and not related to site activity. N5 is the furthest noise monitoring point from the facility and is in close proximity to the R348.
I-11/06	18/04/2011	Elevated CH_4 level in landfill gas monitoring borehole LG11, LG19 & LG22.	Incident Report Submitted.

		Elevated CO_2 levels were recorded at monitoring borehole's LG11, LG18, LG19, LG22 & LG24	
I-11/07	20/04/2011	Exceedance of surface VOC emission	Incident Report Submitted. Remedial measures implemented.
I-11/08	31/05/2011	Elevated CH_4 level in landfill gas monitoring borehole LG9, LG11, LG19 & LG22 Elevated CO_2 levels were recorded at monitoring borehole's LG9, LG11, LG19, LG23 & LG24.	Incident Report Submitted.
I-11/09	17/06/2011	Elevated CH_4 level in landfill gas monitoring borehole LG6, LG11, LG19, LG22 & LG23. Elevated CO_2 levels were recorded at monitoring borehole's LG11, LG19, LG22, LG23 & LG24.	Incident Report Submitted.
I-11/10	12/07/2011	Elevated CH_4 level in landfill gas monitoring borehole LG11, LG19, LG22 & LG23. Elevated CO_2 levels were recorded at monitoring borehole's LG11, LG18, LG19, LG21, LG22, LG23, LG24, & LG28.	Incident Report Submitted.
I-11/11	05/08/2011	Exceedence of Daytime Noise Limit at N5 Noise Monitoring Point (Off site location)	Incident Report Submitted. Exceedance is attributed to passing traffic on public road (R348) and not related to site activity. N5 is the furthest noise monitoring point from the facility and is in close proximity to the R348.
I-11/12	30/08/2011	Elevated CH_4 level in landfill gas monitoring borehole LG5, LG9, LG11 & LG22. Elevated CO_2 levels at LG5, LG11, LG22, LG23, LG24 & LG25	Incident Report Submitted.
I-11/13	23/09/2011	Elevated CH_4 level in landfill gas monitoring borehole LG11, LG19, LG22 & LG23. Elevated CO_2 levels at LG11, LG15, LG19, LG22, LG23 & LG24.	Incident Report Submitted.
I-11/14	28/10/2011	Elevated CH_4 level in landfill gas monitoring borehole LG5, LG9, LG11, LG22, & LG23.	Incident Report Submitted.

		Elevated CO_2 levels at LG5, LG9, LG11, LG18, LG22& LG23.	
I-11/15	23/11/2011	Elevated CH_4 level in landfill gas monitoring borehole LG5, LG9, LG11 & LG22 Elevated CO_2 levels at LG1, LG4, LG5, LG6A, LG9, LG16, LG18, LG19 & LG22.	Incident Report Submitted
I-11/16	18/10/2011	Exceedance of surface VOC emission	Incident Report Submitted. Remedial measures implemented.
I-11/17	16/12/2011	Flare Failure	Incident Report Submitted. Mitigation measures implemented to prevent recurrence
1-11/18	20/12/2011	Exceedence of Daytime Noise Limit at N5 Noise Monitoring Point (Off site location)	Incident Report Submitted. Exceedance is attributed to passing traffic on public road (R348) and not related to site activity. N5 is the furthest noise monitoring point from the facility and is in close proximity to the R348.
1-11/19	29/12/2011	Elevated CH_4 level in landfill gas monitoring borehole LG5, LG9, LG19 & LG22. Elevated CO_2 levels at LG1, LG4, LG5, LG6A, LG9, LG18, LG19, & LG22.	Incident Report Submitted.
1-11/20	01/01/2012	Leachate level exceeded 1m over the top of the liner at the base of Cell 1	Incident Report Submitted. Remedial measures implemented.

12.3.2 Reported Complaints

The number of complaints to CRRL during the 2011 reporting period was increased when compared to the number received during 2010. The facility management will strive to reduce the number of complaints in 2012 by continuing to implement best practice in the operation of the facility. A summary of the complaints received is presented in Table 12-2 below.

Table 0-2 Summary of Complaints at CRRL – 2011

2011	Date	Nature of Complaint	Complainant	Method of Communication
1	17/01/2011	Odour	Mrs Margaret Lohan	EPA (Phone & Letter)
2	18/01/2011	Odour	Mr Thomas Finn	EPA (Phone & Letter)
3	18/01/2011	Odour	Mrs Carmel Glynn	EPA (Phone & Letter)
4	31/01/2011	Odour	Mrs Brigid Seale	EPA (Letter)
5	31/01/2011	Odour	Mrs Margaret Lohan	EPA (Letter)
6	02/03/2011	Odour	Mrs Margaret Lohan	EPA (Phone & Letter)
7	04/03/2011	Odour	Anonymous	EPA (Phone & Letter)
8	15/03/2011	Odour	Brian Gallagher	Complainant (Phone) direct to Site
9	24/05/2011	Odour	Mrs Bridget Seale	EPA (Phone & Letter)
10	02/06/2011	Odour	Mrs Carmel Glynn	EPA (Letter)
11	07/06/2011	Odour	Mrs Fiona Cawley/Cunningham	EPA (Phone & Letter) & Complainant (Phone) direct to Site
12	07/07/2011	Odour	Mrs Carmel Glynn	EPA (Phone & Letter)
13	07/07/2011	Odour	Mrs Bridget Seale	EPA (Phone & Letter)
14	10/08/2011	Odour	Mrs Margaret Lohan	EPA (Phone & Letter)
15	23/08/2011	Odour	Mrs Bridget Seale	EPA (Phone & Letter)
16	24/08/2011	Odour	Cllr Dermot Connolly	EPA (Phone & Letter)
17	31/08/2011	Odour	Mrs Marella Deeley	Complainant (Phone) direct to Site
18	14/09/2011	Odour	Cllr Tim Broderick	EPA (Phone & Letter)
19	18/09/2011	Odour	Cllr Tim Broderick	EPA (Phone & Letter)
20	03/10/2011	Odour	Mrs Fiona Cawley/Cunningham	EPA (Phone & Letter) & Complainant (Phone) direct to Site
21	11/10/2011	Odour	Mrs Fiona Cawley/Cunningham	EPA (Phone & Letter)
22	12/10/2011	Odour	Mrs Bridget Seale	EPA (Phone & Letter)
23	13/10/2011	Odour	Mr. Joe Kelly	EPA (Phone & Letter)
24	25/10/2011	Odour	Mrs Fiona Cawley/Cunningham	EPA (Phone & Letter)
25	27/10/2011	Odour	Mrs Kathleen Farrell	Complainant (Phone) direct to Site
26	05/11/2011	Odour	Mrs Fiona Cawley/Cunningham	EPA (Phone & Letter)
27	20/11/2011	Odour	Mrs Margaret Lohan	EPA (Phone & Letter)
28	21/11/2011	Odour	Mrs Agnes Ward	EPA (Phone & Letter)
29	22/11/2011	Odour	Mrs Betty Treacy	EPA (Phone & Letter)
30	27/11/2011	Odour	Mrs Bridget Seale	EPA (Phone & Letter)
31	12/11/2011	Odour	Mr Tiernan McKeogh	EPA (Phone & Letter)
32	01/12/2011	Odour	Mr Padraig Cunningham	EPA (Phone & Letter) & Complainant (Phone) direct to Site
33	01/12/2011	Odour	Mr Ambrose Dwyer	EPA (Phone & Letter)
34	01/12/2011	Odour	Cllr Tim Broderick	EPA (Phone & Letter)
35	01/12/2011	Odour	Mr Eamon Costello	EPA (Phone & Letter)
36	01/12/2011	Odour	Mrs Fiona Cawley/Cunningham	EPA (Phone & Letter)
37	06/12/2011	Odour	Mr Ambrose Dwyer	EPA (Phone & Letter)
38	07/12/2011	Odour	Geraldine Cogavin	EPA (Phone & Letter)

39	09/12/2011	Odour	Mr Tom Finn	EPA (Phone & Letter)
40	10/12/2011	Odour	Mr Thomas Lohan	EPA (Phone & Letter)
41	14/12/2011	Odour	Mr Tom Ward	EPA (Phone & Letter)
42	15/12/2011	Odour	Mr Tom Finn	EPA (Phone & Letter)
43	16/12/2011	Odour	Mr Tom Finn	EPA (Phone & Letter)
44	17/12/2011	Odour	Mr Tom Finn	EPA (Phone & Letter)
45	19/12/2011	Odour	Mrs Geraldine Cogavin	EPA (Phone & Letter)
46	17/12/2011	Odour	Mr Thomas Lohan	EPA (Phone & Letter)
47	20/12/2011	Odour	Mr Ambrose Dwyer	EPA (Phone & Letter)
48	20/12/2011	Odour	Mrs Carmel Glynn	EPA (Phone & Letter)
49	21/12/2011	Odour	Mrs Fiona Cawley/Cunningham	EPA (Phone & Letter)
50	21/12/2011	Odour	Ms Pauline Kelly	EPA (Phone & Letter)
51	23/12/2011	Odour	Mr Padraig Cunningham	EPA (Letter)
52	28/12/2011	Litter	Mrs Bridget Seale	EPA (Letter)
53	30/12/2011	Odour	Mr Ambrose Dwyer	EPA (Phone & Letter)

12.4 Nuisance Control

Greenstar Ltd is committed to operating the CRRL in the best possible manner using the best available techniques to minimise impacts on the environment and local neighbours. CRRL welcomes 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.

12.4.1 Bird Control

During the reporting period, the facility employed the services of Falcon Bird Control Services (from 1st January 2011 to 1st September 2011) & West Coast Environmental Solutions Ltd (from 2nd September 2011) to provide an integrated approach to bird control at the site. This involved the use of kites, heli-kites, distress calls and various birds of prey including falcons. This method is preferred as it is non-destructive to the birds and by varying the timing and use of bird control measures it is a very effective method of control.

12.4.2 Vermin Control

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

12.4.3 Dust and Mud Control

Dust and mud control measures have been implemented at the facility since the start of the construction phase and have continued into the operation phase of the facility. These measures include the use of a wheelwash, road sweeper and the use of a water bowser to dampen access roads and stockpiles during periods of dry weather.

12.4.4 Litter Control

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

Good operational practices on site are the main controls to avoid nuisances. All waste deposited must be covered by the end of the working day. Adequate daily cover reduces the risk of odour, windblown litter, vermin, flies and birds.

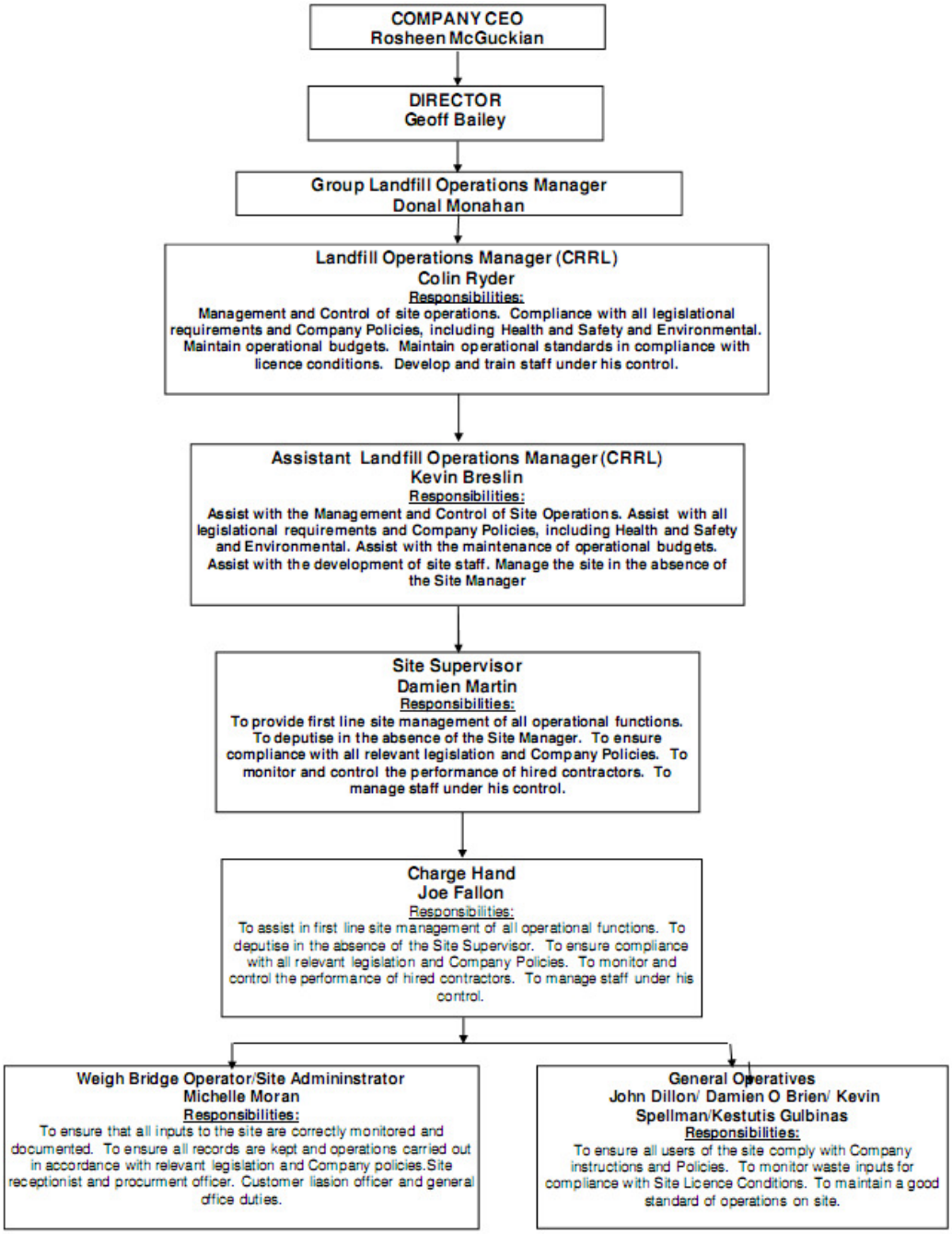
12.5 REPORT ON FINANCIAL PROVISIONS

In compliance with condition 12.1 Greenstar has put in place a Bank Guarantee with Bank of Ireland to the value of €1,831,771. Details of this bank guarantee have been submitted to the EPA.

In compliance with condition 12.1.2 a comprehensive and fully costed Environmental Liabilities Risk Assessment (ELRA) has been completed, which was submitted to the Agency for agreement on 27th January 2011.

Condition 12.3 of the waste licence states, 'In accordance with the provisions of Section 53A of the Waste Management Acts 1996 to 2010, the licensee shall ensure the costs involved in the setting up and operation of the facility, as well as the costs of closure and after-care (including cost of provision of financial security) for a period of at least 30 years (post closure) shall be covered by the price to be charged for the disposal of waste at the facility'
In relation to this matter and subject to the imminent guidance to be issued by the Agency Greenstar acknowledges that the gate fee for the disposal of waste at the Connaught Regional Residual Landfill should be appropriate and include financial provision for the closure, restoration and aftercare of the site.

12.6 MANAGEMENT AND STAFFING STRUCTURE



12.7 PUBLIC INFORMATION PROGRAMME

Connaught Regional Residual Landfill 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.

The communications programme contains the following 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 the site
- To disseminate information relating to the operation and management of the site as appropriate.
- To encourage liaison between the site and local residents and those who may be affected by the site operations.
- To provide general information on Waste Management Issues.
- To ensure all users and customers of the site are conversant with the requirements of the Site 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

12.8 ENVIRONMENTAL MANAGEMENT SYSTEM

In accordance with Condition 2.3 of the waste licence an Environmental Management System (EMS) is maintained at the facility and updated annually.

In accordance with Condition 2.3.2.2 of the waste license a Landfill Environmental Management Plan (LEMP) has been prepared. The LEMP replaces the existing Environmental Management Plan (EMP). A copy of the LEMP is enclosed in Appendix C.

12.9 REPORT ON STAFF TRAINING

Table 12-3 CRRL Landfill Training Programme/Matrix (Last Updated 10/03/2011)

	Colin Ryder	Kevin Breslin	Damien Martin	Michelle Moran	John Dillon	Damien O Brien	Kevin Spellman	Kastus Gulbinas	Paul McDermott	Sean McKendry
Training Unit	**Greenstar**	**Greenstar**	**Greenstar**	**Greenstar**	**Greenstar**	**Greenstar**	**Greenstar**	**Greenstar**	**Peter Donohue Ltd**	**Daly**
Site Induction			12/12/2005	09/10/2006			22/11/2007	14/02/2008	20/04/2007	25/04/2009
Site Safety Statement	19/12/2008	19/12/2008	05/02/2008	24/07/2008	05/02/2008	05/02/2008	05/02/2008		05/02/2008	
VDU Test	08/07/2010	12/07/2010	08/07/2010	06/07/2010						
Fas Waste Management Completed	26/09/2008	02/08/2010	26/09/2008							
Practical Management & Control of Landfill Gas (CIWM)	05/10/2006		05/10/2006							
Supervising/ Managing Safely (IOSH)	30/01/2008	24/02/2010	28/11/2007							
Safe Pass Course (Expiry Date)	Feb. 2014	Jan. 2014	Sep. 2015		Feb. 2015	Nov. 2015	Feb. 2016	Sep. 2015	May. 2013	Sep. 2014
Risk Assessment Workshop	08/07/2009	08/07/2009	08/07/2009	08/07/2009	08/07/2009	08/07/2009	08/07/2009		08/07/2009	08/07/2009
Health & Safety Instructions (Toolbox Talk)	07/07/2010	07/07/2010	07/07/2010		07/07/2010	16/07/2009	07/07/2010	09/02/2010	07/07/2010	07/07/2010
First Aid (Expiry Date)	21/06/2013	21/06/2013	21/06/2013			21/06/2013				
Turbo Flo BA Course		20/02/2009	20/02/2009		04/06/2010	20/02/2009	20/02/2009	04/06/2010		
Fire Safety	23/10/2009	23/10/2009	23/10/2009	23/10/2009	23/10/2009	23/10/2009	23/10/2009		23/10/2009	23/10/2009
Fire Evacuation	19/11/2010	19/11/2010	19/11/2010	22/09/2009	19/11/2010	19/11/2010	19/11/2010	19/11/2010	19/11/2010	19/11/2010
Chemical Handling (3)	04/08/2011	04/08/2011	04/08/2011	04/08/2011	04/08/2011	04/08/2011	04/08/2011	04/08/2011	04/08/2011	04/08/2011
Manual Handling (3)	10/03/2010	10/03/2010	10/03/2010	10/03/2010	10/03/2010	10/03/2010	10/03/2010	10/03/2010	10/03/2010	10/03/2010

Waste Licence	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011
Emergency Response Procedure	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011
Waste Acceptance Procedures	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011
Site Operational Procedures	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011
Pistol Handling/ Bird Control	05/06/2009	05/06/2009				05/06/2009				
Env. Monitoring	04/12/2008	04/12/2008	26/06/2008							
PM10 Monitoring	26/05/2009	26/05/2009	26/05/2009							
Complaints Procedure	07/01/2011	07/01/2011	07/01/2011							
Corrective Action Procedures	23/02/2009	23/02/2009	26/06/2008							
Landfill Compactor (Expiry date)			Feb. 2013						Feb. 2013	
Excavator 360 (Expiry Date)			Feb. 2017				May. 2016			Jul. 2014
Dumper (Expiry Date)			Feb. 2017		Feb. 2017	Nov. 2012	May. 2016	June. 2016		
Dozer			Feb. 2012							
Boom and Scisors Lift (Expiry Date)			Dec. 2011			Nov. 2011	May. 2012			
Welding (CSWIP Plastics Welder Entry Level						14/11/2011	14/11/2011	14/11/2011		
TMS Training	09/09/2009	09/09/2009								
HR Disciplinary & Grievance	23/04/2009	23/04/2009	23/04/2009							
Energy Awareness	06/10/2009	06/10/2009	06/10/2009	06/10/2009	06/10/2009	06/10/2009	06/10/2009		06/10/2009	06/10/2009
EMS Awareness (Annual EMS/ISO 14001 Training)	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011	07/01/2011

Note:

Training Key	Not Applicable	Schedule/Pending

12.10 STATEMENT OF ACHIEVEMENT OF WASTE ACCEPTANCE AND TREATMENT OBLIGATIONS.

In compliance with licence condition 1.12 and in line with the facility's Environmental Management System (EMS) all waste accepted at this facility is in accordance with comprehensive waste acceptance procedures. Following a review of the facility licence in 2010, revised and updated Waste Acceptance Procedures (CRRL 026, CRRL 045) were submitted to the Agency on 23rd September 2010. In compliance with condition 1.6 only waste that has been subject to treatment is accepted for disposal at the facility. Furthermore, this facility submits quarterly summary reports to the Agency on the quantity of MSW and BMW accepted at the landfill during the preceding quarter and on a cumulative basis for the calendar year.

APPENDIX A

Site Maps

GENERAL LEGEND

LANDS UNDER CONTROL OF DEVELOPER

ACTIVITY BOUNDARY

SITE NOTICE LOCATION

[X]

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
5. DISCOVERY MAPPING SHEET NO: M-1622

210m 0 210m 420m 630m

Issue	Date	Description	By	Chkd.
D01	13-07-07	ISSUED FOR REVIEW	MN	MC

Client: greenstar

Project: EAST GALWAY LANDFILL PLANNING APPLICATION 2007

Title: REGIONAL SITE LOCATION MAP

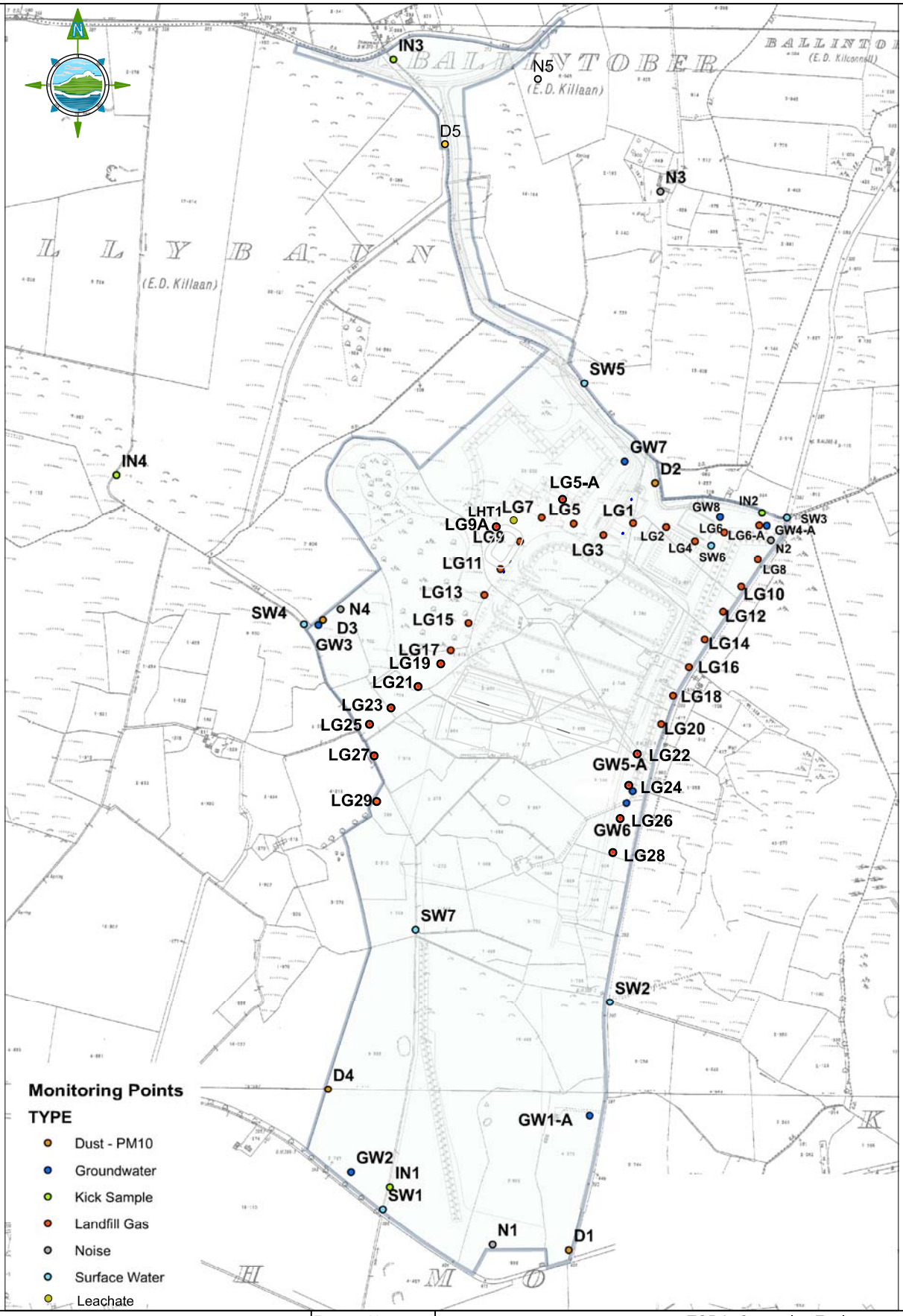
Scale @ A1: 1:10,560

Prepared by:	Checked:	Date:
M. Nolan	M. Conroy	July 2007

Project Director: D. Grehan

TOBIN
Patrick J. Tobin & Co. Ltd.
Consulting, Civil and Structural Engineers,
Block 10-3, Blanchardstown Corporate Park,
Dublin 15, Ireland.
tel: +353-(0)1-8030406
fax:+353-(0)1-8030409
e-mail: info@tobin.ie
www.tobin.ie

Drawing No.: 2228-2200 Issue: D01



Client
GREENSTAR LTD

Project
CONNAUGHT REGIONAL RESIDUAL LANDFILL

Title
LANDFILL ENVIRONMENTAL MONITORING LOCATIONS

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

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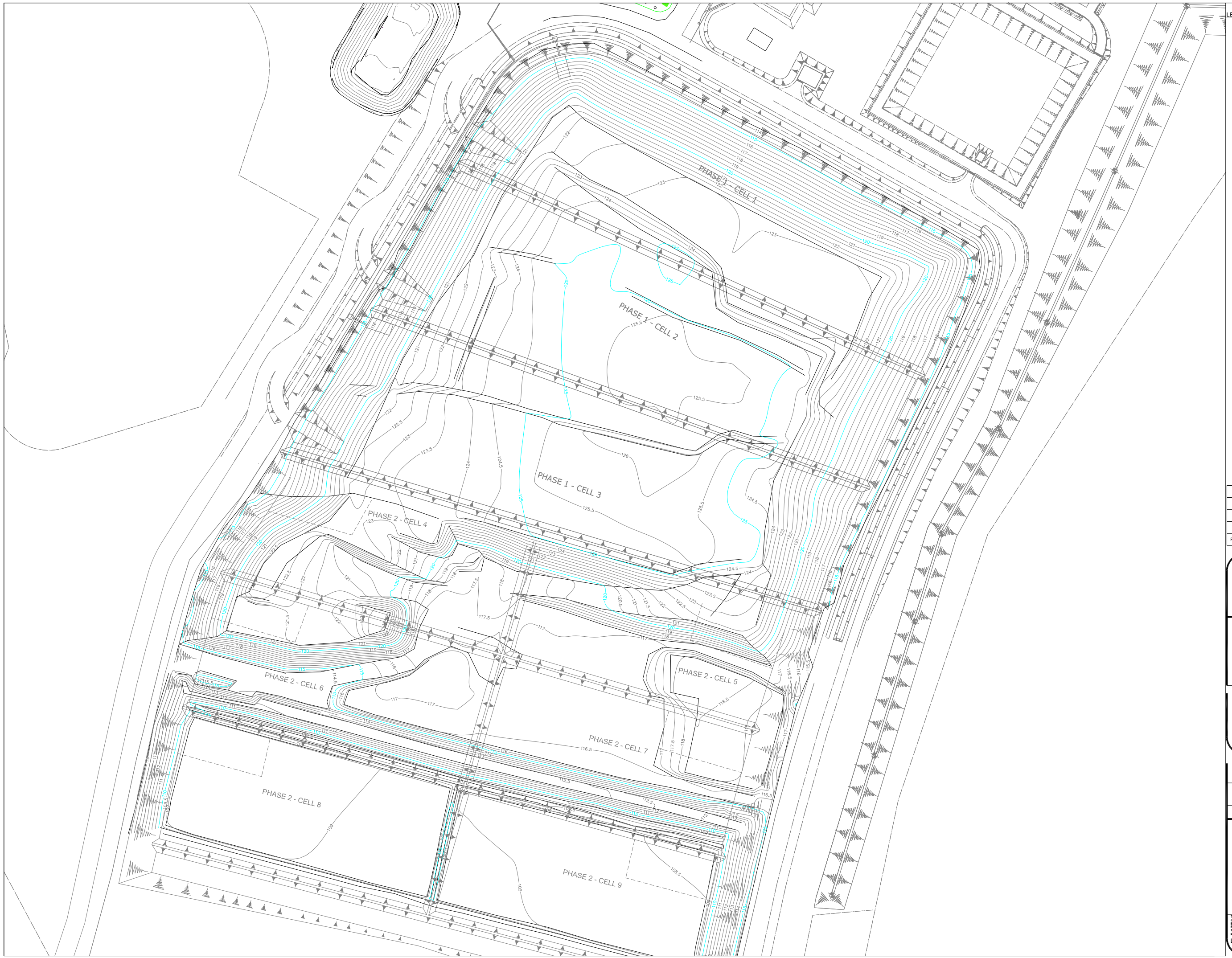
www.tobin.ie

Drawing No. 3588-1604

Revision: A

APPENDIX B

Topographical Site Survey – Jan 2011



LEGEND

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING

2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE

3. ENGINEER TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES

4. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
C	30.01.12	UPDATED CONTOURS	R.K.	C.McG.
B	31.01.11	UPDATED CONTOURS	R.K.	C.McG.
A	16.02.10	ISSUED TO CLIENT	R.K.	C.McG.

Client:
CONNAUGHT REGIONAL RESIDUAL LANDFILL

Project:
QUARTERLY SURVEY

Title:
TOPOGRAPHICAL SITE SURVEY JANUARY 2012

Scale @ A1: 1 : 750

Prepared by:	Checked:	Date:
R.K.	C.McG.	JAN '10

Project Director: MICHAEL F. GARRICK

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Drawing No.: 3588-1607

Revision: C

APPENDIX C

Site LEMP

LANDFILL ENVIRONMENTAL MANAGEMENT PLAN

FOR

EAST GALWAY RESIDUAL LANDFILL

WASTE LICENCE NO.W0178-02

Prepared By: -

Greenstar Ltd.,
Killagh More, Ballybaun and Ballintober,
Killconnell,
Co Galway.

Rev 1: 14th March 2012

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APPENDIX 1 - Engineering Design Maps

APPENDIX 2 - Corrective Action Procedures

APPENDIX 3- Awareness & Training Procedures

1. INTRODUCTION

This is the Landfill Environmental Management Plan (LEMP) for the Connaught Regional Residual Landfill. The operator of the landfill is Greenstar Holdings Ltd. (Greenstar). Greenstar was granted a Waste Licence (Reg. No.W0178-01) to construct and operate the landfill by the Environmental Protection Agency (Agency) on 26th July 2004. The licence was reviewed by the EPA who issued a revised Waste Licence (Reg. No.W0178-02) on 23rd March 2010. A technical amendment of the licence (Technical Amendment A) was received on 11th January 2011. This amendment related to Schedule A: Waste Acceptance.

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

1.1 Scope

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

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

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

1.2 Purpose

The LEMP serves as a guidance document for facility staff and describes operational control and management practices that are applied at the facility. The LEMP is also a core element of the Environmental Management System (EMS) for the facility and is designed to facilitate the management of site activities so as to comply with regulatory requirements and best landfill practice and to effectively implement the EMS. The Environmental Management System (EMS) for the facility is certified to ISO 14001 standard. Certification was received on 16th July 2009.

1.3 EMS Documentation

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

1.3.1 Corrective Action Procedures (CAP)

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

1.3.2 Awareness and Training Procedures

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

1.3.3 Communications Programme

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

1.4 Annual Review

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

2. SITE DESCRIPTION

2.1 Site Location

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

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

2.2 Site Development

The facility will be developed in three phases. Phase 1, which was completed in December 2005, involved the initial site development works, construction of 3 engineered landfill cells and the provision of the supporting infrastructure including the waste reception area, weighbridges, leachate holding tank, ESB substation, site offices, weather station and groundwater and surface water control measures. The layout is shown on Drawing No 2228-2600 and Drawing Number 3588-1751A

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

2.3 Geology and Hydrogeology

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

2.3.1 Bedrock Geology

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

2.3.2 Quaternary Geology

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

2.3.3 Aquifer Status

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

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

2.3.4 Aquifer Vulnerability

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

2.3.5 Groundwater Quality

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

2.4 Hydrology

2.4.1 Drainage Pattern

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

2.4.2 Surface Water Quality

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

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

2.5 Meteorology

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

3. TYPES OF WASTE ACCEPTED & CONSIGNED

3.1 Wastes Accepted

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

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

The tonnage of household waste, commercial waste and industrial non-hazardous waste may be altered with the prior agreement of the Agency provided that the total amount of all wastes accepted at the facility does not exceed the combined tonnage of 100,000 tonnes per annum and the total amount of asbestos does not exceed 3,000 tonnes per annum.

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

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

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

(a) The date & time:

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

(c) The vehicle registration number

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

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

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

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

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

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

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

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

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

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

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

3.2 Wastes Consigned

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

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

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

- details of the date of the occurrence,

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

3.3 Waste Records

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

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

3.4 Site Capacity

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

4. SITE DESIGN & DEVELOPMENT

4.1 Engineering Details

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

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

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

4.2 Site Development

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

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

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

Table 4.1 Engineering Design Details (See Appendix 1)

Drawing No.	Title
3588-1751A	Layout of the 3 Phases of the landfill showing existing features
2228-2600	Specified Engineering Works - Overall Site General Arrangement Plan
2228-2601	Specified Engineering Works General Arrangement Phase 1 - Sheet 1 of 2
2228-2602	Specified Engineering Works General Arrangement Phase 1 - Sheet 2 of 2
2228-2605	Specified Engineering Works - Basal Lining System Embankment Details and Intercell Bunds
2228-2607	Specified Engineering Works - Phase I Leachate Collection
2228-2608	Specified Engineering Works - Site Surfacing Plan
2228-2609	Specified Engineering Works - Site Fencing Plan
2228-2612	Specified Engineering Works - Road Construction Details
2228-2614	Specified Engineering Works - Surface Water Lagoon and Engineered Wetland Layout Plan
2228-2615	Specified Engineering Works - Leachate Collection Tank Elevation and Section
2228-2618	Specified Engineering Works - Waste Quarantine Area General Arrangement
2228-2623	Submission to EPA - Landscaping Implementation Plan - Sheet 1 of 2
2228-2624	Submission to EPA - Landscaping Implementation Plan - Sheet 2 of 2
3588-1604A	Landfill Environmental Monitoring Locations

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

4.3 Site Preparation and Services

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

The facility has a 110 kW electricity supply, a water supply from a local group scheme and phone lines. The surface water drainage system is shown on Drawing Nos. 2228-2600, 2601 & 2602 as well as 3588-1751. A Sanitary wastewater from the offices and canteen is treated in an on-site wastewater treatment plant and the treated effluent is pumped to the leachate storage tank.

4.4 Site Facilities

The site facilities include: -

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

The site layout is shown on Drawing No. 2228-2600 and Drawing No. 3588-1751A. The drawing will be reviewed as required to include any new facilities provided, during the phased development of the site.

4.5 Facility Roads, Access Roads & Hardstanding

The Specification for the roads and hardstanding areas is based on 'Specification for Roadworks', published by the National Roads Authority. The various types of surfacing are

described on Drawing No. 2228-2608, with details on Drawing No. 2228-2612 and the construction complies with the requirements of Condition 3.5.1.

4.5.1 Main Access Road

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

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

4.5.2 Infrastructure Access Roads & Car Parking Areas

The infrastructure access road runs for approximately 150 m linking the car park, office, quarantine area and fuel bund (see Drawing No. 2228-2601 & Drawing No.3588 1751A). The road and car park design is the same as the main access road. Precast concrete kerbs and road gulleys are provided, with a piped gravity drainage system discharging to the surface water lagoon via an alarmed oil/water separator. Isolation joints are provided at all interfaces with concrete structures or concrete hardstanding.

4.5.3 Reinforced Concrete Hardstanding

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

4.5.4 Jeep Track

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

Wearing course - 200 mm Cl.804

Sub-base - depending on ground conditions up to 675 mm fill with two layers of geogrids as per specification.

4.6 Site Buildings

The locations of the administration block, weighbridge maintenance garage and ESB Sub-Station are shown on Drawing No. 2228-2600 & Drawing No.3588 1751A. The design of all of the buildings took into consideration the guidance given in the DOE publication "Protection of New Buildings and Occupants from Landfill Gas, as specified in Condition 3.15.5 of the original Waste Licence (Reg. No. 178-1).

4.7 Waste Inspection and Quarantine Areas

Waste inspection and quarantine areas required under Condition 3.7.1 of the Waste Licence (Reg. No. W0178-02) are located as shown on Drawing No. 2228 – 2600 & Drawing No.3588 1751A to the details shown on Drawing No. 2228-2618. The areas are bounded on 3 sides by a 1.5 m high reinforced concrete wall. Both areas are provided with longitudinal falls to allow run-off to drain directly to a sump.

4.8 Wheel Wash

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

4.9 Landfill Cells

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

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

- A geotextile protection layer placed over the HDPE layer;

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

Details of the engineering specification for the landfill cells constructed in Phase 1 are shown on Drawing No. 2228-2605. The construction of all the cells is the subject of a comprehensive construction quality assurance (CQA) programme. Copies of the CQA reports are submitted to the Agency for approval before waste is deposited in the cells.

4.10 Leachate

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

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

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

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

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

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

4.11 Landfill Gas

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

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

4.12 Surface Water

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

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

4.13 Groundwater

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

4.14 Site Security

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

4.15 Monitoring Infrastructure

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

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

4.16 Fire Control

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

4.17 Landscaping

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

4.18 Fuel & Chemical Storage

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

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

4.19 Capping System

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

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

It is envisaged that final capping at this facility will commence in Summer 2012 in Cell 1

4.20 Restoration

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

5. OPERATIONAL MATTERS

5.1 General Description of the Operation

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

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

5.2 Operating Procedures

Greenstar has prepared a comprehensive set of Operating Procedures (OP) that cover all aspects of the day to day management of the facility and contingency measures. The OP's are based on the requirements of the Waste Licence, the Agency's Landfill Manual on Landfill Operations and the Agency's draft BAT for Landfill. The OPs form part of the facility's ISO 14001 certified EMS and are subject to regular review based on operational experience, legislative changes and improvements in best practice.

5.3 Site Management

The Site Management Team comprises: -

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

The Facility Manager and Deputy Manager(s) are suitably qualified and experienced and have undergone appropriate training, as specified by Conditions 2.1.1 and 2.1.2 of the Waste Licence (Reg. No.W0178-02) and the training and awareness requirements of the EMS. Greenstar maintains training records of all training provided to facility personnel.

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

5.4 Operational & Waste Acceptance Hours

The operational and waste acceptance hours are specified in Condition 1.9.1 of the Waste Licence (Reg. No.W0178-02). The facility is operational between 7.30 and 18.30 Monday to Friday and, on occasion, between 7.30 to 14.30 on Saturday. Waste can be accepted at the facility for disposal between 8.00 and 17.45, Monday to Friday and 8.00 to 13.45 on Saturday.

5.5 Access Control

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

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

5.6 Waste Acceptance Procedures

5.6.1 Treatment of Waste

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

5.6.2 Biodegradable content of Municipal Waste

Condition 1.7 of the Waste Licence (Reg. No.W0178-02) outlines limits on the amounts of biodegradable waste which may be accepted at the facility. Condition 1.8 of the Waste Licence (Reg. No.W0178-02) outlines how the biodegradable content of municipal waste is to be established. Condition 11.2 of the Waste Licence (Reg. No.W0178-02) outlines how the licensee must demonstrate Compliance with Diversion Targets.

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

5.6.3 Waste Collection Permits

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

5.6.4 Waste Characterisation

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

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

5.6.5 Waste Inspection

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

Where there are doubts about the nature of the waste, the delivery vehicle is directed to the waste inspection area, where it may be off-loaded. If following inspection the waste is considered to be acceptable it is, where practical, reloaded on to the delivery vehicle and moved to the active fill area. If this is not practical the waste is removed to the fill area by Greenstar plant.

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

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

5.6.6 Waste Records

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

(a) The date & time:

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

(c) The vehicle registration number

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

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

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

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

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

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

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

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

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

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

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

5.7 Phasing of Filling

The facility will be developed in series of three (3) Phases and each Phase will involve the construction of a number of landfill cells. Phase 1 was completed December 2005 and involved the construction of 3 cells. Phase 2 was completed in December 2010 0and involved the construction of 6 cells. Phase 2 cells are half the size of cells in Phase 1.

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

5.8 Equipment

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

- Landfill Compactors (2: 1 No Duty & 1 No Standby.),
- Back-hoe Excavator (2 No.),
- Dumper, A25 (1 No.),
- Tractor and trailer (1 No.),
- Road sweeper (1 No.),
- Water Bowser (1 No.),
- Landfill Gas flares (4 No.) and Gas Utilisation Engine(s) (1 No.)
- Standby Generator (1 No.),
- Duty and Standby electrical and diesel powered pumps (6 No.).

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

5.9 Waste Placement

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

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

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

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

5.10 Cover Requirements

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

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

5.11 Off-Site Disposal and Recovery

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

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

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

5.12 Water, Leachate and Gas Control Measures

5.12.1 Surface Water Control Measures

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

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

5.12.2 Leachate Management

Leachate accumulating in the cells is pumped from collection sumps located inside the cells via side risers to the leachate main from where it flows to a leachate holding tank, (which has a capacity of 500 m^3) or to the leachate lagoon, (which has a capacity of 5,000 m^3). The pumps are controlled by means of a systems control and data acquisition system (SCADA) that continuously monitors the level in the landfill cells, storage tank and lagoon and activates the pumps to ensure the level does not exceed 1 m above the liner as specified in Condition 5.14.1 of Waste Licence (Reg. No.W0178-02).

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

The leachate is treated at an off-site waste water treatment plant (WWTP). WWTP's used by this facility include Galway County Council Tuam STP, Celtic Anglican Waste WWTP (Ringsend), Rilta Industrial WWTP (Rathcoole), and Enva Industrial WWTP

(Shannon) which were agreed in advance with the Agency, as specified in Condition 5.13.4 and 11.7.1 b) of the Waste Licence (Reg. No.W0178-02).

Greenstar has prepared written procedures for the proper handling of leachate at the site, as specified in Condition 11.7.1 e) of the Waste Licence (Reg. No.W0178-02). The procedure specifies the corrective actions to be taken in the event of a spill at the ground surface. Greenstar maintains an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spill at the facility. Facility personnel have been provided with appropriate training to deal with any such incidents.

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

5.12.3 Landfill Gas Control Measures

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

5.13 Noise Emission Controls

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

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

5.14 Odour Emission Controls

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

- The daily working area is limited in size,
- Daily covering of waste,
- Provision and progressive expansion of an active gas abstraction and flaring system in operational cells,
- Provision of a low permeability cap incorporating a landfill gas collection system on completed cells.

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

5.15 Litter Control

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

- Daily covering of the waste,
- Suspension of waste disposal during adverse weather conditions,
- Provision and maintenance of permanent and portable litter fencing and netting around the perimeter of all waste disposal areas. The fencing is provided prior to the placement of waste,
- Daily inspection of litter control infrastructure. All defects are repaired by the end of the working day on which the defect was discovered. If it is only possible to effect a temporary repair on the day a permanent repair must be completed within three days,
- Loose litter or other waste occurring on or in the vicinity of the site is collected immediately or no later than 10 am of the next working day after such waste is discovered in compliance with Condition 7.3.4,
- Greenstar requires all vehicles delivering waste to and removing waste and materials from the facility to be appropriately covered.

5.16 Dust Emission Controls

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

- Paved roads,

- Mandatory use of the wheel wash by waste vehicles leaving the site except those whose exemption has been approved by the Agency,
- Routine road sweeping,
- Daily cover of the deposited waste,
- Capping and seeding of landfill cells,
- Vegetation of soil stockpiles,
- Use of water bowser to dampen roads and stockpiles as required.

5.17 Bird Control

The primary measure for the prevention of birds gathering and feeding at the facility is the appropriate daily covering of waste. The use of birds of prey and/or other bird scaring techniques are employed on a daily basis, as required by Condition 7.7.1 of the Waste Licence (Reg. No.W0178-02). Gas operated scaring devices are not used.

5.18 Vermin and Other Pest Control

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

The records include: -

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

5.19 Wheel Wash

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

5.20 Operational and Safety Rules and Emergency Response Procedures

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

5.21 Environmental Monitoring Programme

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

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

Table 5.1 Environmental Monitoring Programme

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

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

5.22 Incidents

Greenstar will, where an incident occurs, notify the Agency in accordance with Condition 9.1 of the Waste Licence (Reg. No.W0178-02).

An incident is defined as follows: -

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

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

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

5.23 Complaints

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

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

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

5.24 Reports

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

Table 5.2 Reporting Requirements

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

6. SCHEDULE OF OBJECTIVES & TARGETS

Objectives and Targets should cover both the short, medium and long term and be based on operational experience in order to ensure that they are both realistic and achievable. They should not be confined solely to compliance with regulatory requirement as this is the minimum performance criteria and the aim of the EMS is to achieve continual improvement environmental performance.

The Schedule of Objectives and Targets for 2011 - 2015 is presented in Table 6.1. It includes details of the resources required, responsible person and target completion date.

6.1 Schedule of Objectives and Targets

Programme of Objective and Targets – Beginning of 2011 to End of 2015

Ref. No.	Objective	Ref. No.	Target	Resources Required	Person Responsible	Time Frame for Completion	Progress as of 31st December 2011
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 bi-annual VOC surveys of the waste surface over the next 5 years, to establish the areas were fugitive emissions are most prevalent.	External Consultant (circa €1,800 per survey)	Site Manager	Ongoing	Surveys carried out on Thursday 20th April 2011, and 18th October 2011
		T - 1.2	Installation of gas extraction wells where fugitive emissions have been identified from the VOC surveys.	Circa €1,700 per borehole.	Site Manager	Ongoing	Additional vertical & horizontal gas extraction wells installed during 2011. There were 28 horizontal wells added to cells 4, 5, 6 & 7. This brings the total number of gas extraction points on site to approximately 338. An additional 13 extraction wells are to be added to Cell 6 in Quarter1 2012.
		T - 1.4	Apply impermeable Geohess cover over filled areas of the landfill .	€ 7/m2 approx	Site Manager	Ongoing	Geohess installed progressively throughout 2011 and to continue in a similar vein in 2012 over filled areas. 8,810m^2 was applied between the 11th and 18th January 2011 encompassing Cells 3, 4.& 5. Approximately 7500 m^2 of Geohess is scheduled to be applied in Quarter 1 2012.

O - 2	Lower the potential environmental impacts associated with the generation of leachate. by reducing leachate generation	T - 2.1	Reduce leachate generation by incorporating improved leachate reducing design features into construction of Phases 2 and 3 of the Landfill.	External Consultant & Site Manager (60 man hours)	Site Manager	Ongoing	Leachate reducing design features have been incorporated into Phase 2 development by reducing cell area. Their effectiveness will be reviewed and possibly replicated in Phase 3 development.
		T - 2.2	Reduce leachate generation by applying impermeable Geohess cover over filled areas of the landfill .	€ 7/m2 approx	Site Manager	Ongoing	Geohess to be installed progressively over filled areas.
		T - 2.3	Lower the demand on WWTP's, risk of spillage, CO2 emissions associated with the off site treatment of leachate	External Consultant & Site Manager (60 man hours)	Site Manager	Ongoing	Ongoing implementation of site practices (Cell area reduction, Geohess application)
O - 3	Lower the potential environmental impacts associated with litter by improving litter management techniques.	T - 3.1	Investigate potential for construction of wind breaker berms for operation in windy conditions.	Assistant Site Manager (20 man hours)	Site Manager	Ongoing	Not possible due to lack of desirable material available to this facility to be used in the construction of such berms. Continued review of day to day litter reducing management techniques to ensure was completed and as a consequence, an additional 4 litter cages were Obtained/sourced in 2010 these mobile litter cages are employed at working face.

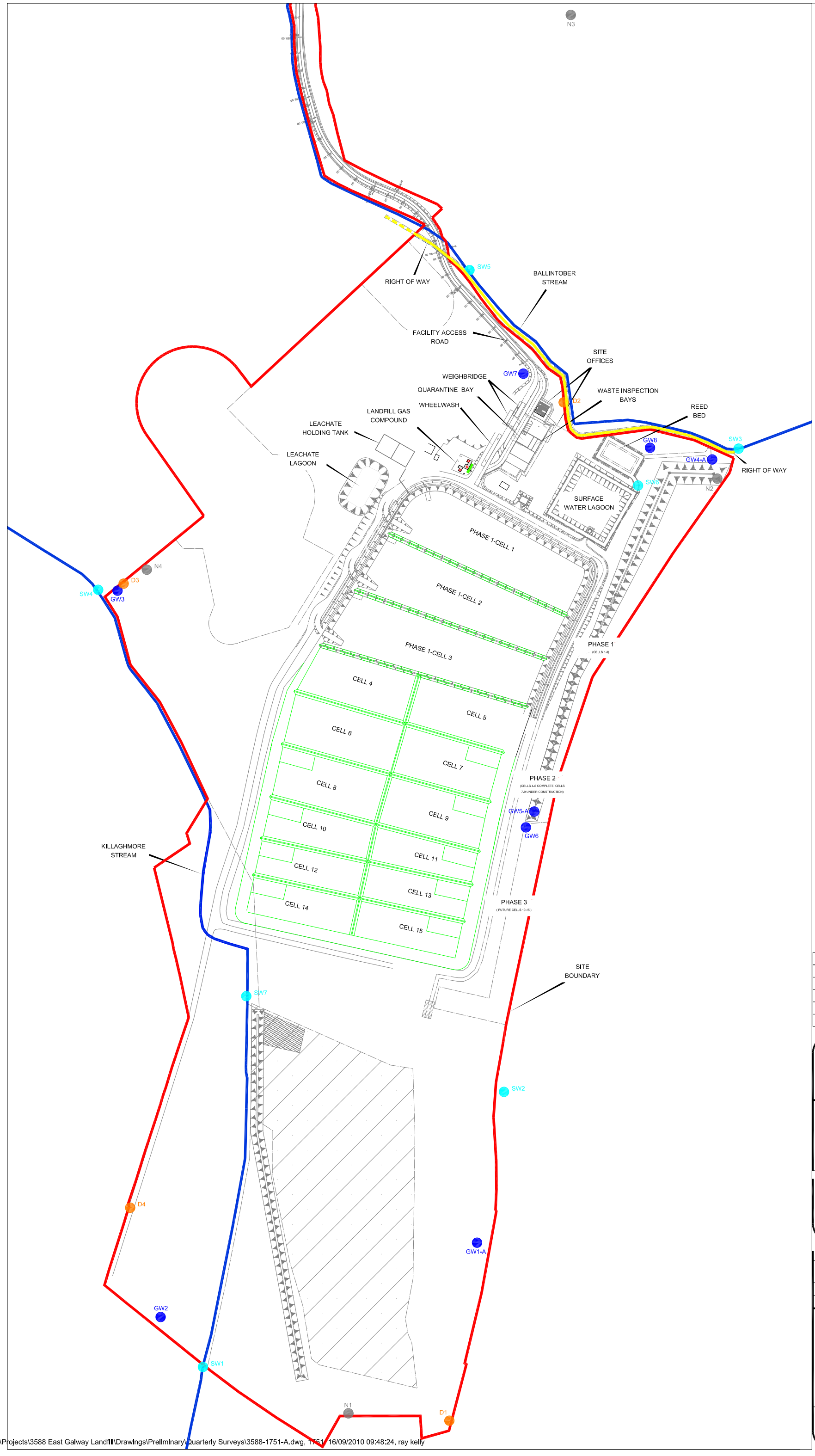
0 - 4	Minimise the amount of natural resources (water, power etc) consumed at the Facility.	T - 4.1	Complete a second Energy Audit of the Facility to identify possibilities to improve energy efficiency and ascertain the facilities performance within an energy management matrix.	External Consultant (circa €5,000)	Site Manager	September 2012	A second Energy audit was completed by external consultants (OCM) in March 2010. In order to improve the facility's performance and current standing within the energy management matrix the Energy Policy Statement was updated, training has been provided, sub-meters installed in Gas utilisation compound completed in October 2010. Refresher training in Energy Policy and energy saving measures to be completed in 2012.
	Minimise the amount of natural resources (water, power etc) consumed at the Facility.	T – 4.2	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.	Assistant Site Manager (40 man hours)	Site Manager	Ongoing	Facility actively pursues C & D materials, as a substitute for natural material, for engineering purposes. Natural material excavated during Phase 2 development to be reused on site where possible On 15th December 2011, EPA approval was granted for use of C&D fines as a cover material Wherever possible look for suitable engineering materials in order to limit the amount of virgin material used on site.
		T – 4.3	Carry out assessment of water usage at the facility and identify opportunities for improved efficiency of water usage.	Assistant Site Manager (40 man hours)	Site Manager	Ongoing	Water requirements on various sections of site being monitored to identify potentials for reductions. Water usage was recorded on a monthly basis in 2010 and 2011 and this will be used as part of a benchmarking exercise in an attempt to reduce the reliance on group water scheme. Waster usage is addressed in EMS Quarterly meetings since Quarter 1 2011

O - 5	Improve Health, Safety and Welfare	T – 5.1	Reduce lost time injuries by 5% over the next five years	Site Manager/ Assistant Site Manager	All site Personnel	March 2013	Data being recorded and tracked. Manual handling course for all staff to reduce likelihood of back injury (a primary reason for lost time through injury) competed 10th March 2010 and is required every three years. A site Safety Representative was appointed for the site in Quarter 2 2011.
		T – 5.2	Develop Accident Prevention Plan	Assistant Site Manager (80 man hours)	Site Manager GM Landfill Group	Ongoing	A procedure has been developed and incorporated into the EMS since 4th April 2009 with respect to the control and prevention of accidents on the site and any environmental impact of accidents
		T – 5.3	Identify appropriate training courses in Health and Safety for staff who perform a General operative role	Assistant Site Manager (120 man hours)	Site Manager GM Landfill Group	March 2012	All Safe Pass and CSCS cards were brought up to date in 2011. Other staff are due for training in Safepass in 2012 which will be scheduled for Quarter 1 2012. Chemical Handling training was provided in August 2011.
		T – 5.4	Continue to train staff on a regular basis in EMS system, waste licence and Emergency Response.	Assistant Site Manager	Site Manager	April 2012	Training to be completed annually, training last carried out on 7th January 2011 (Waste Licence/ EMS/ Emergency Response)

O-6	Training	T – 6.1	Retain ISO 14001 Environmental Management System Certification	Site Manager/Assistant Site Manager	Site Manager	Ongoing	Having attained certification in Q3 2009, there is a need to retain emphasis on the Environmental Management System and retain accreditation through a series of audits both internally and externally each year. Four audits are scheduled for 2012 with the aim of retaining certification. This will include two internal audits as well as two external audits, one of which will be a recertification audit (carried out every 3 years as per ISO 14001 Standard)
O-7	Operations	T – 7.1	Ensure all customers, contractors, site users & visitors are familiar with Greenstar's Environmental Policy	Site Manager/ Assistant Site Manager	Site Manager	Ongoing	Circulate policy to all customers & contractors who attend site. The Environmental Policy was incorporated into site inductions in 2010 having been highlighted in an EMS internal audit.
		T – 7.2	Ensure all waste hauled to the site complies fully with the Waste Collection Permit Regulations	Site Manager	Site Manager	Ongoing	Though only fully licensed and permitted hauliers are accepted at this site, there is a need to ensure permit details held are updated regularly as vehicles on permit, waste types permitted etc are subject to change. This will be achieved through liaising with both customers and permit ting authorities.
		T – 7.3	Review all Site Operational procedures	Site Manager/ Assistant Site Manager	Site Manager	Ongoing	The Site Operational procedures are reviewed annually and any additional procedures introduced or significant amendments to existing procedures are included in the AER on an annual basis.

APPENDIX 1

Engineering Design Maps



Rev	Date	Description	By	Chkd.
A	15.09.10	ISSUED	R.K.	D.O.S.

Client: greenstar setting the standard

Project:
CONNAUGHT REGIONAL RESIDUAL LANDFILL

Title:
LAYOUT OF THE 3 PHASES OF THE LANDFILL SHOWING EXISTING FEATURES

Scale @ A1: 1: 2,000

Prepared by:	Checked:	Date:
R.K.	D.O.S.	SEPT' 10

Project Director: MICHAEL F. GARRICK

Drawing Status:

TOBIN
Patrick J. Tobin & Co. Ltd.
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tel: +353-(0)94-9021401
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Drawing No.: 3588-1751

Revision: A

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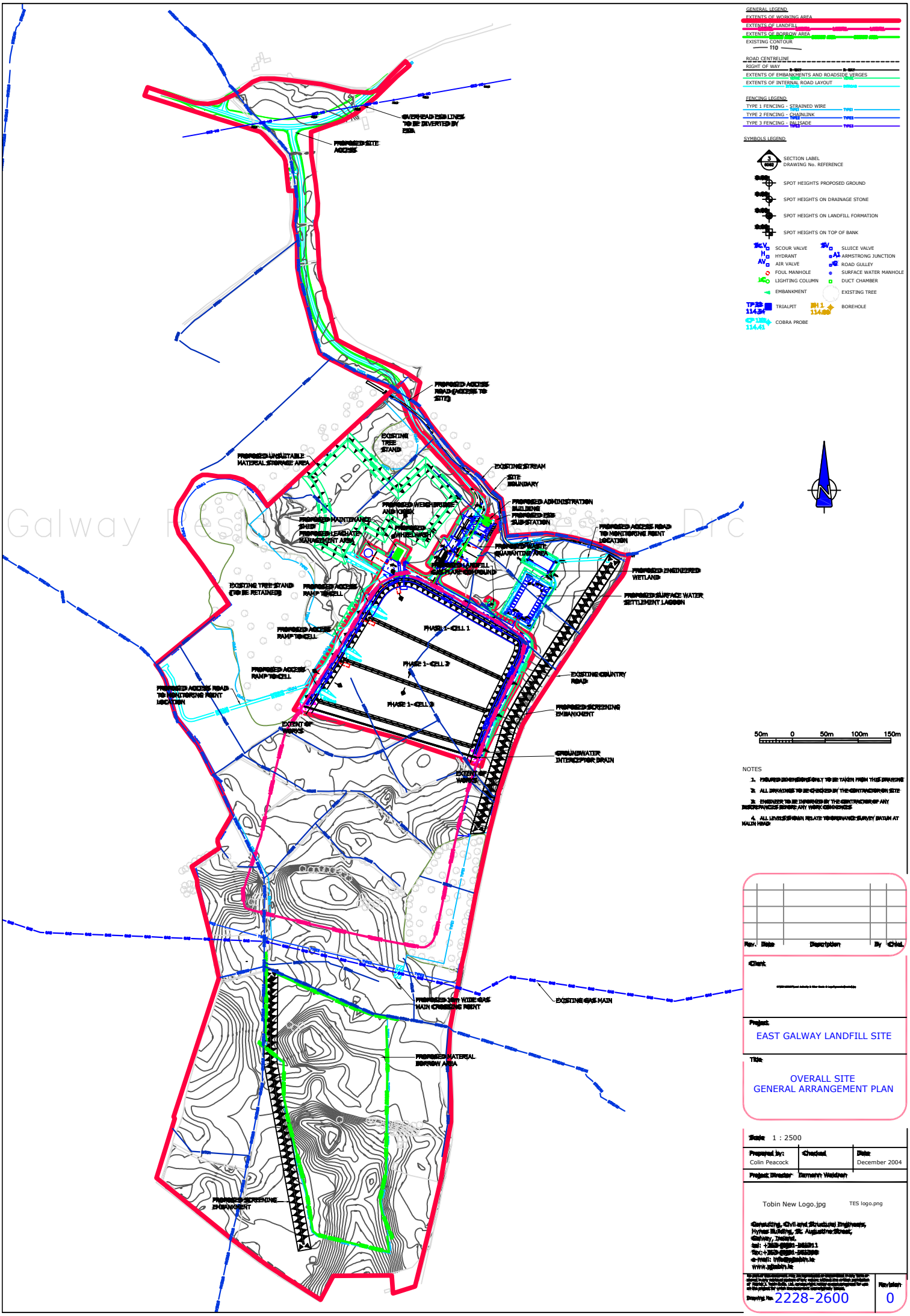
GENERAL LEGEND
EXTENTS OF WORKING AREA
EXTENTS OF LANDFILL
EXTENTS OF BORROW AREA
EXISTING CONTOUR
ROAD CENTRELINE
RIGHT OF WAY
EXTENTS OF EMBANKMENTS AND ROADSIDE VERGES
EXTENTS OF INTERNAL ROAD LAYOUT
FENCING LEGEND
TYPE 1 FENCING - STRAINED WIRE
TYPE 2 FENCING - CHAINLINK
TYPE 3 FENCING - PALISADE
SYMBOLS LEGEND
SECTION LABEL
DRAWING No. REFERENCE
SPOT HEIGHTS PROPOSED GROUND
SPOT HEIGHTS ON DRAINAGE STONE
SPOT HEIGHTS ON LANDFILL FORMATION
SPOT HEIGHTS ON TOP OF BANK
SCOUR VALVE
HYDRANT
AIR VALVE
FOUL MANHOLE
LIGHTING COLUMN
EMBANKMENT
SLUICE VALVE
ARMSTRONG JUNCTION
ROAD GULLEY
SURFACE WATER MANHOLE
DUCT CHAMBER
EXISTING TREE
TRIALPIT
BOREHOLE
COBRA PROBE
OVERHEAD ESB LINES TO BE DIVERTED BY ESB
PROPOSED SITE ACCESS
PROPOSED ACCESS ROAD (ACCESS TO SITE)
EXISTING TREE STAND
PROPOSED UNSUITABLE MATERIAL STORAGE AREA
EXISTING STREAM
SITE BOUNDARY
PROPOSED ADMINISTRATION BUILDING
PROPOSED ESB SUB-STATION
PROPOSED WEIGHBRIDGE AND KIOSK
PROPOSED MAINTENANCE SHED
PROPOSED LEACHATE MANAGEMENT AREA
PROPOSED WHEELWASH
PROPOSED ACCESS ROAD TO MONITORING POINT LOCATION
PROPOSED QUARANTINE QUARANTINE AREA
PROPOSED LANDFILL SURFACE RUN-OFF POND
PROPOSED ENGINEERED WETLAND
PROPOSED SURFACE WATER SETTLEMENT LAGOON
EXISTING TREE STAND (TO BE RETAINED)
PROPOSED ACCESS RAMP TO CELL
PHASE 1 - CELL 1
PHASE 1 - CELL 2
PHASE 1 - CELL 3
EXISTING COUNTRY ROAD
PROPOSED SCREENING EMBANKMENT
EXTENT OF WORKS
GROUNDWATER INTERCEPTOR DRAIN
EXISTING GAS MAIN
PROPOSED 14m WIDE GAS MAIN CROSSING POINT
PROPOSED MATERIAL BORROW AREA
50m 0 50m 100m 150m
NOTES
1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
Rev. Date Description By Chkd.
Client
Project
EAST GALWAY LANDFILL SITE
Title
OVERALL SITE
GENERAL ARRANGEMENT PLAN
Scale 1 : 2500
Prepared by: Colin Peacock
Checked
Date: December 2004
Project Director Eamonn Waldron
Tobin New Logo.jpg
TES logo.png
Consulting, Civil and Structural Engineers,
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Drawing No. 2228-2600
Revision 0

ENTRANCE GATE.

PROPOSED METEROLOGICAL STATION

ADMINISTRATION BUILDING. (See Drawing No. 2228-2610 for details).

PROPOSED ESB SUBSTATION

PROPOSED REPOSITORY FOR UNSUITABLE MATERIALS

WEIGHBRIDGE KIOSK. (See Drawing No. 2228-2611 for details).

WEIGHBRIDGE

WASTE INSPECTION, QUARANTINE AND FUEL STORAGE AREA. (See Drawing No. 2228-2618 for details).

ENGINEERED WETLAND. (See Drawing No. 2228-2614).

PROPOSED REPOSITORY FOR UNSUITABLE MATERIALS

MAINTENANCE SHED. (See Drawing No. 2228-2613 for details).

LEACHATE MANAGEMENT AREA. (See Drawing No. 2228-2615 for details).

WHEELWASH

LANDFILL GAS FLARE COMPOUND. (See Drawing No. 2228-2619 for details).

SURFACE WATER LAGOON. (See Drawing No. 2228-2614).

LEACHATE TANK. (See Drawing No. 2228-2615 for details).

PERFORATED PIPE IN FRENCH DRAIN

RC HEADWALL TO PERFORATED PIPE

PROPOSED 6m WIDE ACCESS TO PROPOSED STORAGE AREA.

PHASE 1 - CELL 1

4m WIDE JEEP TRACK. (See Drawing No. 2228-2612 for details).

RC HEADWALL TO PERFORATED PIPE

6m WIDE ACCESS RAMP TO LANDFILL. SWALE TO BE PIPED UNDER ACCESS RAMP.

1.0m HIGH INTERCELL BUND

PHASE 1 - CELL 2

1.0m HIGH INTERCELL BUND

GENERAL LEGEND

EXTENTS OF LANDFILL

EXTENTS OF BORROW AREA

EXISTING CONTOUR 110

ROAD CENTRELINE

EXTENTS OF EMBANKMENTS AND ROADSIDE VERGES

EXTENTS OF INTERNAL ROAD LAYOUT

FENCING LEGEND

TYPE 1 FENCING - STOCKPROOF TYPE FENCE

TYPE 2 FENCING - CHAINLINK TYPE FENCE

TYPE 3 FENCING - SECURITY TYPE FENCE

SYMBOLS LEGEND

3 / 6062 SECTION LABEL DRAWING No. REFERENCE

SPOT HEIGHTS PROPOSED GROUND

SPOT HEIGHTS ON DRAINAGE STONE

SPOT HEIGHTS ON LANDFILL FORMATION

SPOT HEIGHTS ON TOP OF BANK

SCV SOUR VALVE

SV SLUICE VALVE

H HYDRANT

AI ARMSTRONG JUNCTION

AV AIR VALVE

G ROAD GULLEY

MH FOUL MANHOLE

SURFACE WATER MANHOLE

LC LIGHTING COLUMN

DUCT CHAMBER

EMBANKMENT

EXISTING TREE

TP 33 114.54 TRIALPIT

BH 1 114.80 BOREHOLE

CP 133 114.41 CEDRA PROBE

NOTES

1. FIGURED DIMENSIONS ONLY TO TAKEN FROM THIS DRAWING.

2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev.	Date	Description	By	Chkd.

Client

Project: EAST GALWAY LANDFILL SITE

Title: SPECIFIED ENGINEERING WORKS GENERAL ARRANGEMENT PHASE 1 SHEET 1 OF 2

Scale 1 : 1000 @ A2

Prepared by:	Checked	Date
Colin Peacock		December 2004

Project Director Eamonn Waldron

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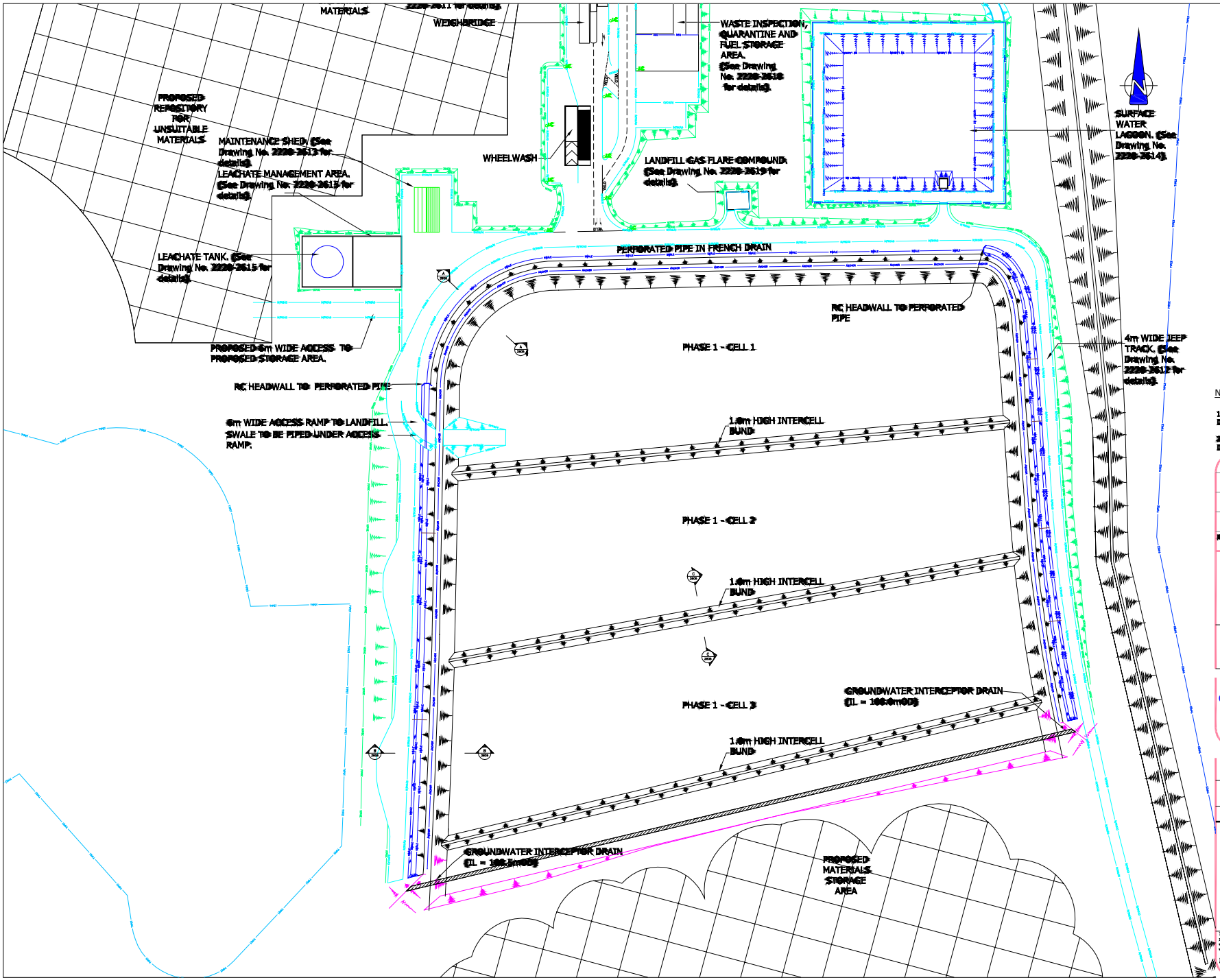
Drawing No. 2228-2601

Revision 1


MATERIALS
WEIGHBRIDGE
WASTE INSPECTION, QUARANTINE AND FUEL STORAGE AREA. (See Drawing No. 2228-2610 for details).
PROPOSED REPOSITORY FOR UNSUITABLE MATERIALS
MAINTENANCE SHED. (See Drawing No. 2228-2613 for details).
LEACHATE MANAGEMENT AREA. (See Drawing No. 2228-2615 for details).
WHEELWASH
LANDFILL GAS FLARE COMPOUND. (See Drawing No. 2228-2619 for details).
SURFACE WATER LAGOON. (See Drawing No. 2228-2614).
PERFORATED PIPE IN FRENCH DRAIN
LEACHATE TANK. (See Drawing No. 2228-2615 for details).
RC HEADWALL TO PERFORATED PIPE
PROPOSED 6m WIDE ACCESS TO PROPOSED STORAGE AREA.
PHASE 1 - CELL 1
4m WIDE JEEP TRACK. (See Drawing No. 2228-2612 for details).
RC HEADWALL TO PERFORATED PIPE
6m WIDE ACCESS RAMP TO LANDFILL. SWALE TO BE PIPED UNDER ACCESS RAMP.
1.8m HIGH INTERCELL BUND
PHASE 1 - CELL 2
1.8m HIGH INTERCELL BUND
PHASE 1 - CELL 3
GROUNDWATER INTERCEPTOR DRAIN (IL = 100.0mOD)
1.8m HIGH INTERCELL BUND
GROUNDWATER INTERCEPTOR DRAIN (IL = 100.5mOD)
PROPOSED MATERIALS STORAGE AREA
GENERAL LEGEND
EXTENTS OF LANDFILL
EXTENTS OF BORROW AREA
EXISTING CONTOUR
110
ROAD CENTRELINE
EXTENTS OF EMBANKMENTS AND ROADSIDE VERGES
EXTENTS OF INTERNAL ROAD LAYOUT
FENCING LEGEND
TYPE 1 FENCING - STOCKPROOF TYPE FENCE
TYPE 2 FENCING - CHAINLINK TYPE FENCE
TYPE 3 FENCING - SECURITY TYPE FENCE
SYMBOLS LEGEND
SECTION LABEL DRAWING No. REFERENCE
SPOT HEIGHTS PROPOSED GROUND
SPOT HEIGHTS ON DRAINAGE SWALE
SPOT HEIGHTS ON LANDFILL PERIMETER
SPOT HEIGHTS ON TOP OF BANK
SCV SCREW VALVE
SV SLUICE VALVE
H HYDRANT
AJ ARMSTRONG JUNCTION
AV AIR VALVE
RG ROAD GULLEY
MH MANHOLE
SURFACE WATER MANHOLE
LC LIGHTING COLUMN
DC DUCT CHAMBER
EMBANKMENT
EXISTING TREE
TP 114.84 TRIALPIT
BH 1 114.00 BOREHOLE
CPT 114.41 CEMPA PROBE
NOTES
1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
Rev. Date Description By Chkd.
Client
Project
EAST GALWAY LANDFILL SITE
Title
SPECIFIED ENGINEERING WORKS GENERAL ARRANGEMENT PHASE 1 SHEET 2 OF 2
Scale 1 : 1000 @ A2
Prepared by: Colin Peacock
Checked
Date December 2004
Project Director Eamonn Waldron
Consulting Civil and Structural Engineers, Hynes Building, St. Augustine Street, Galway, Ireland.
tel: +353-(0)91-565211
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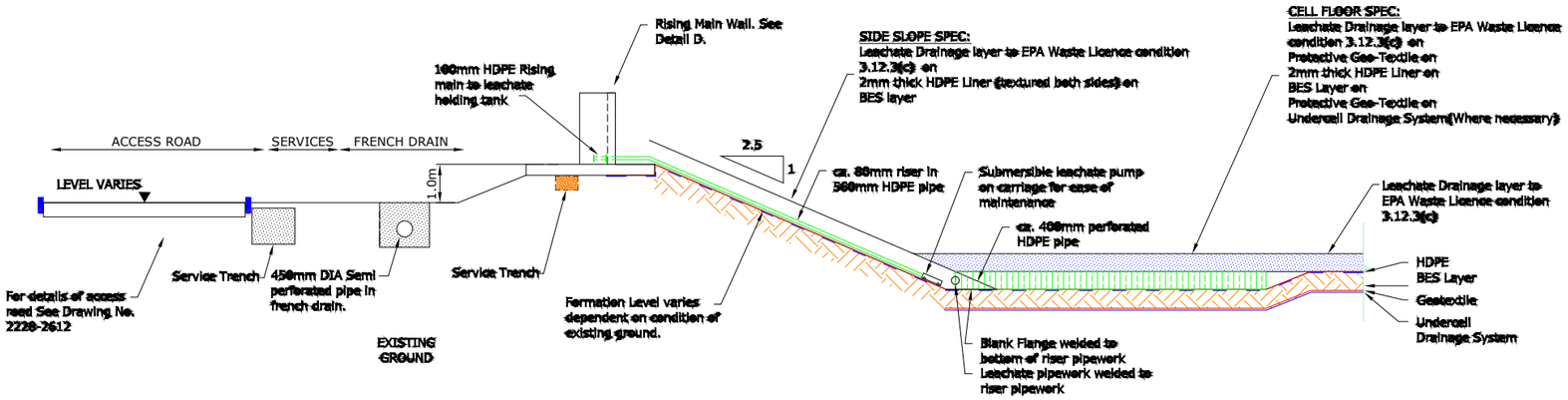
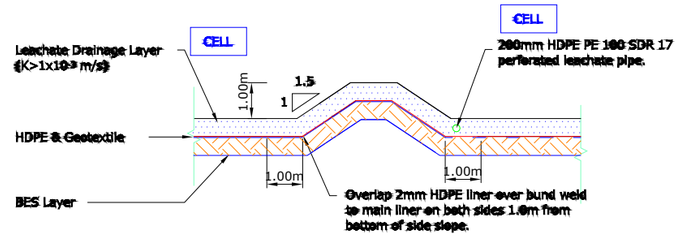
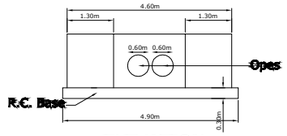
e-mail: info@pjlalin.ie
www.pjlalin.ie
Drawing No. 2228-2602
Revision 0



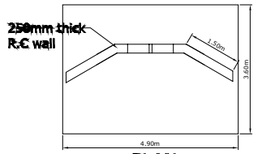
DETAIL A (See Drawing No. 2607)
SECTION THROUGH LEACHATE SUMP AND UPSLOPE RISER



DETAIL C (See Drawing No. 2607)
TYPICAL SECTION THROUGH INTERCELL BERM

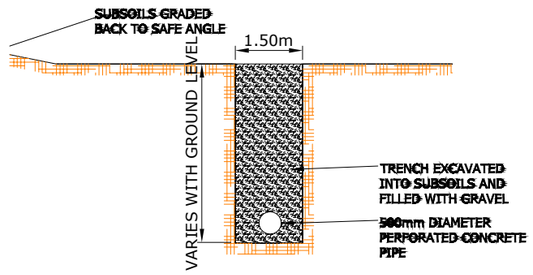


ELEVATION



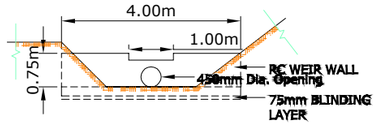
PLAN

DETAIL D
RISING MAIN WALL

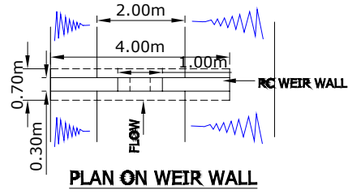


DETAIL 'E' GROUNDWATER INTERCEPTOR DRAIN

SCALE 1:100



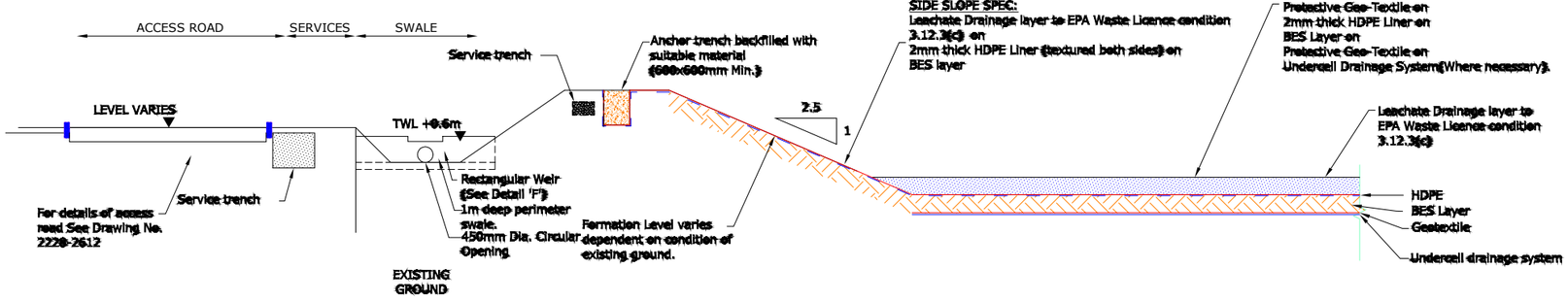
ELEVATION ON WEIR WALL



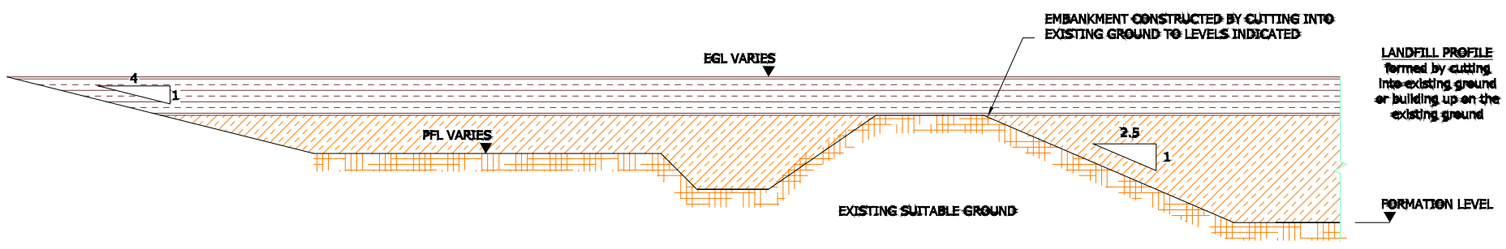
PLAN ON WEIR WALL

DETAIL 'F' RECTANGULAR WEIR

SCALE 1:100



DETAIL B (See Drawing No. 2607)
TYPICAL SECTION THROUGH BERM



SECTION T1 - TYPE 1 EMBANKMENT CONSTRUCTION
SHOWN INDICATIVELY ONLY

NOTES

1. FIGURED DIMENSIONS ONLY TO TAKEN FROM THIS DRAWING.

2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev.	Date:	Description	By	Chkd.

Client:

Project:
EAST GALWAY LANDFILL SITE

Title:
SPECIFIED ENGINEERING WORKS
BASAL LINING SYSTEM
EMBANKMENT DETAILS AND INTERCELL BUNDS

Scale: 1 : 125 @ A2 Unless otherwise stated

Prepared by:	Checked	Date
Colin Peacock		December 2004

Project Director: Eamonn Waldron

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Drawing No. 2228-2605

Revision 1

LEACHATE MANAGEMENT AREA. (See Drawing No. 2228-2615 for details).

LEACHATE TANK. (See Drawing No. 2228-2615 for details).

PUMP HOUSING.

6m WIDE ACCESS TO STORAGE AREA.

RC HEADWALL TO 450mm Ø PERFORATED PIPE

6m WIDE ACCESS RAMP TO LANDFILL.

SWALE TO BE PIPED UNDER ACCESS RAMP.

SURFACE WATER LAGOON.

4m WIDE JEEP TRACK.

PROPOSED 560mm HDPE PE100 SDR11 PUMP SLEEVE.
PROPOSED 100mm Ø HDPE PE 100 SDR 26 PROBE SLEEVE. PIPE TO BE SLOTTED.
LEACHATE COLLECTION SUMP

200mm Ø PERFORATED HDPE PE 100 SDR17 PIPE

LEACHATE COLLECTION PIPEWORK

1.0m HIGH INTERCELL BUND

PHASE 1 - CELL 1

PHASE 1 - CELL 2

PHASE 1 - CELL 3

GENERAL LEGEND

EXTENTS OF LANDFILL
EXTENTS OF BORROW AREA
EXISTING CONTOUR 110

ROAD CENTRELINE
EXTENTS OF EMBANKMENTS AND ROADSIDE VERGES
EXTENTS OF INTERNAL ROAD LAYOUT

DRAINAGE LEGEND
EXTENTS OF SURFACE WATER LAGOON AND ENGINEERED WETLAND
FOUL DRAINAGE AND LEACHATE COLLECTION PIPEWORK
FRENCH DRAIN
SURFACE WATER DRAINAGE
EXTENTS OF SWALE AND PERFORATED PIPE
PERFORATED LEACHATE COLLECTION PIPEWORK

SYMBOLS LEGEND

3 / 6062 SECTION LABEL / DRAWING No. REFERENCE
SPOT HEIGHTS PROPOSED GROUND
SPOT HEIGHTS ON DRAINAGE STONE
SPOT HEIGHTS ON LANDFILL FORMATION
SPOT HEIGHTS ON TOP OF BANK
Sc.V SCOUR VALVE
H HYDRANT
AV AIR VALVE
FOUL MANHOLE
LC LIGHTING COLUMN
EMBANKMENT
SV SLUICE VALVE
AJ ARMSTRONG JUNCTION
RG ROAD GULLEY
SURFACE WATER MANHOLE
DUCT CHAMBER
EXISTING TREE
TP 33 114.54 TRIALPIT
BH 1 114.88 BOREHOLE
CP 133 114.41 COBRA PROBE
DE-WATERING BOREHOLE

NOTES

1. FIGURED DIMENSIONS ONLY TO TAKEN FROM THIS DRAWING.

2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev.	Date:	Description	By	Chkd.

Client:

Project:
EAST GALWAY LANDFILL SITE

Title:
SPECIFIED ENGINEERING WORKS
PHASE 1
LEACHATE COLLECTION PIPEWORK

Scale: 1 : 1000 @ A2

Prepared by:	Checked	Date
Colin Peacock		December 2004

Project Director: Eamonn Waldron

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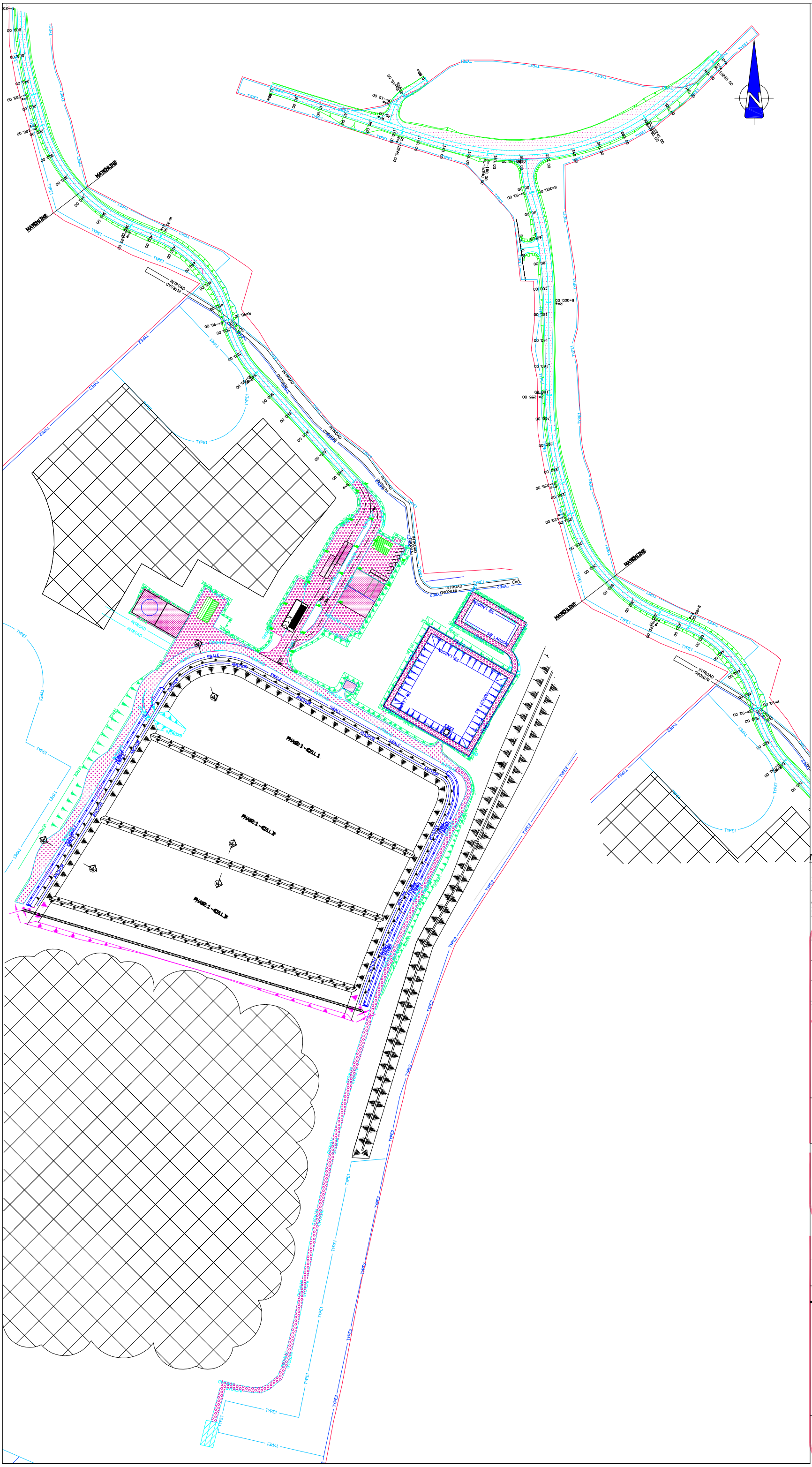
Drawing No. 2228-2607

Revision 1



GENERAL LEGEND

EXTENTS OF LANDFILL
EXTENTS OF BORROW AREA
EXISTING CONTOUR 110

ROAD CENTRELINE
EXTENTS OF EMBANKMENTS AND ROADSIDE VERGES
EXTENTS OF INTERNAL ROAD LAYOUT

SYMBOLS LEGEND

- SECTION LABEL / DRAWING No. REFERENCE (3 / 6062)
- SPOT HEIGHTS PROPOSED GROUND
- SPOT HEIGHTS ON DRAINAGE STONE
- SPOT HEIGHTS ON LANDFILL FORMATION
- SPOT HEIGHTS ON TOP OF BANK
- SCOUR VALVE
- SLUICE VALVE
- HYDRANT
- ARMSTRONG JUNCTION
- AIR VALVE
- ROAD GULLEY
- FOUL MANHOLE
- SURFACE WATER MANHOLE
- LIGHTING COLUMN
- DUCT CHAMBER
- EMBANKMENT
- EXISTING TREE
- TRIALPIT TP 33 114.54
- BOREHOLE BH 1 114.88
- COBRA PROBE CP 133 114.41
- DE-WATERING BOREHOLE

- Road Type 1, Access Road -Regional Road
- Road Type 2, Internal Road
- Road Type 3, Jeep Track
- Road Type 4, Carpark
- Road Type 5, Concreted Areas

NOTES

1. FIGURED DIMENSIONS ONLY TO TAKEN FROM THIS DRAWING.
2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev.	Date	Description	By	Chkd.

Client

Project
EAST GALWAY LANDFILL SITE

Title
SPECIFIED ENGINEERING WORKS
SITE SURFACING PLAN

Scale 1 : 2000 @ A2

Prepared by:	Checked	Date
Colin Peacock		December 2004

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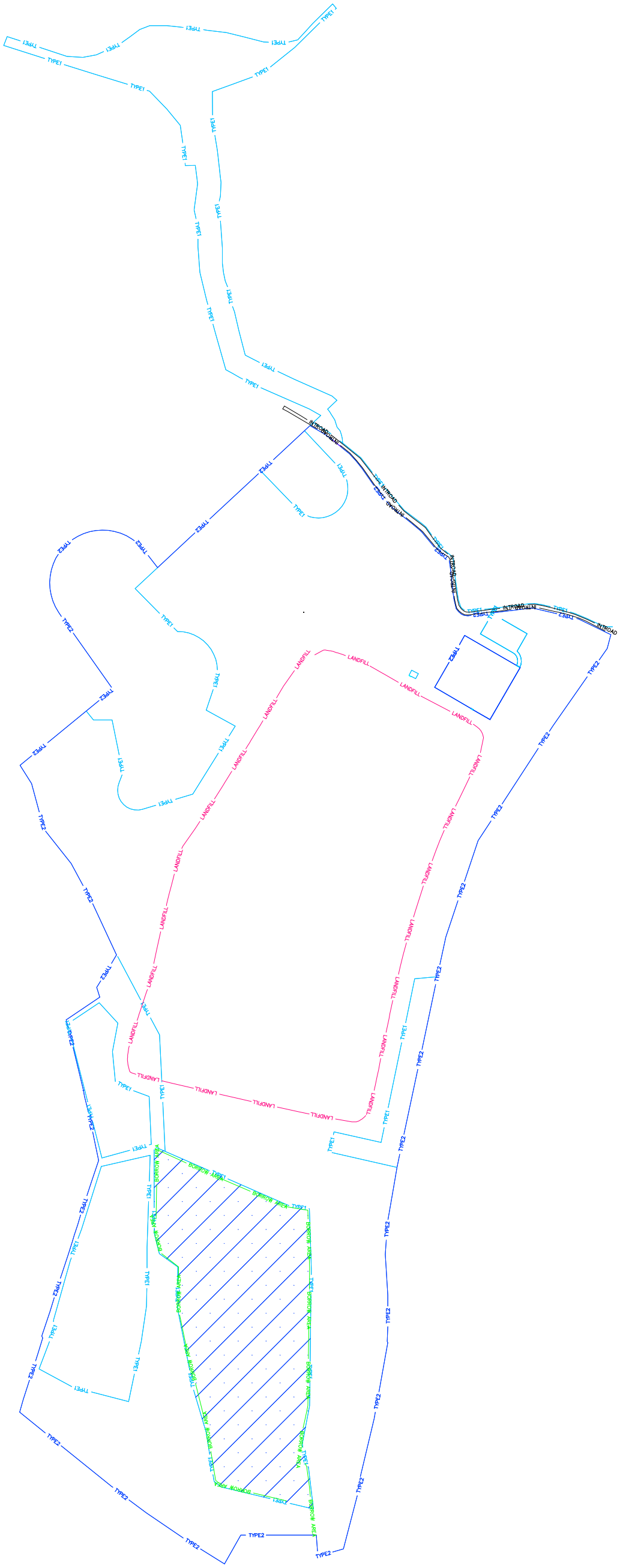
Drawing No. 2228-2608

Revision 1



GENERAL LEGEND

EXTENTS OF LANDFILL

EXTENTS OF BORROW AREA

EXISTING CONTOUR 110

ROAD CENTRELINE

EXTENTS OF EMBANKMENTS AND ROADSIDE VERGES

EXTENTS OF INTERNAL ROAD LAYOUT

FENCING LEGEND

TYPE 1 FENCING - STOCKPROOF TYPE FENCE

TYPE 2 FENCING - CHAINLINK TYPE FENCE

TYPE 3 FENCING - SECURITY TYPE FENCE

SYMBOLS LEGEND

3 / 6062 SECTION LABEL / DRAWING No. REFERENCE

0.00 SPOT HEIGHTS PROPOSED GROUND

0.00 SPOT HEIGHTS ON DRAINAGE STONE

0.00 SPOT HEIGHTS ON LANDFILL FORMATION

0.00 SPOT HEIGHTS ON TOP OF BANK

Sc.V SCOUR VALVE

SV SLUICE VALVE

H HYDRANT

AJ ARMSTRONG JUNCTION

AV AIR VALVE

RG ROAD GULLEY

FOUL MANHOLE

SURFACE WATER MANHOLE

LC LIGHTING COLUMN

DUCT CHAMBER

EMBANKMENT

EXISTING TREE

TP 3
114.54 TRIALPIT

BH 1
114.66 BOREHOLE

CP 13
114.41 COBRA PROBE

DE-WATERING BOREHOLE

NOTES

1. FIGURED DIMENSIONS ONLY TO TAKEN FROM THIS DRAWING.

2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev.	Date	Description	By	Chkd.

Client

Project
EAST GALWAY LANDFILL SITE

Title
SPECIFIED ENGINEERING WORKS
SITE FENCING PLAN

Scale 1 : 4000 @ A2

Prepared by:	Checked	Date
Colin Peacock		December 2004

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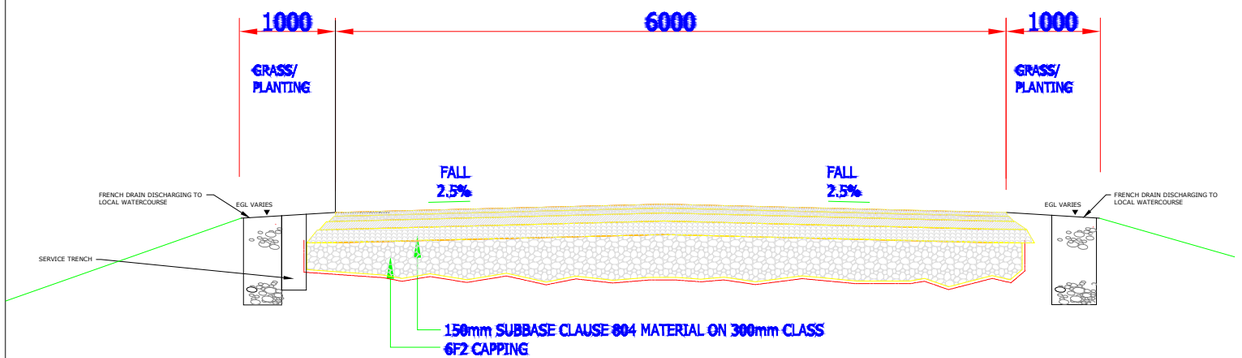
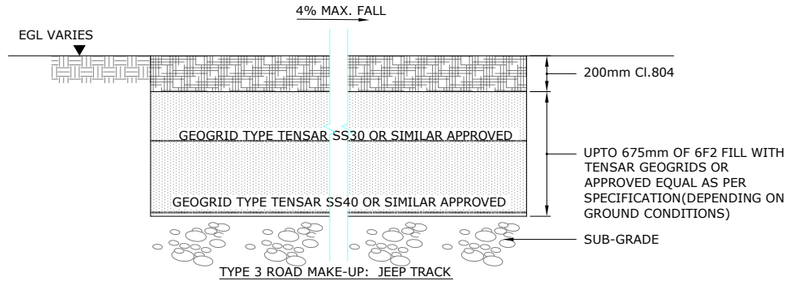
Drawing No. 2228-2609

Revision 1



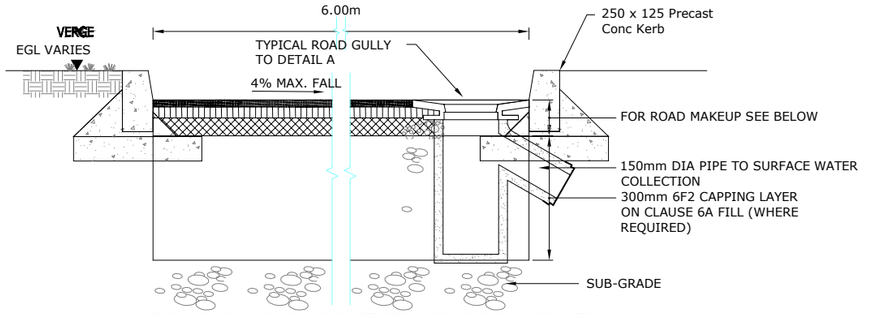
TYPE 1 ROAD MAKE-UP: ACCESS ROAD FROM REGIONAL ROAD.
40mm STONE MASTIC ASPHALT WEARING COURSE ON
60mm DENSE BITUMEN MACADAM BASE COURSE ON
150mm DENSE BITUMEN MACADAM ROAD BASE ON
150mm SUBBASE TO CLAUSE 804 ON
CAPPING LAYER AS SPECIFIED ON
SUITABLE GRANULAR FILL MATERIAL TO CLAUSE 6A (WHERE REQUIRED)

TYPE 1 – ACCESS ROAD FROM REGIONAL ROAD(TYPICAL DETAIL)



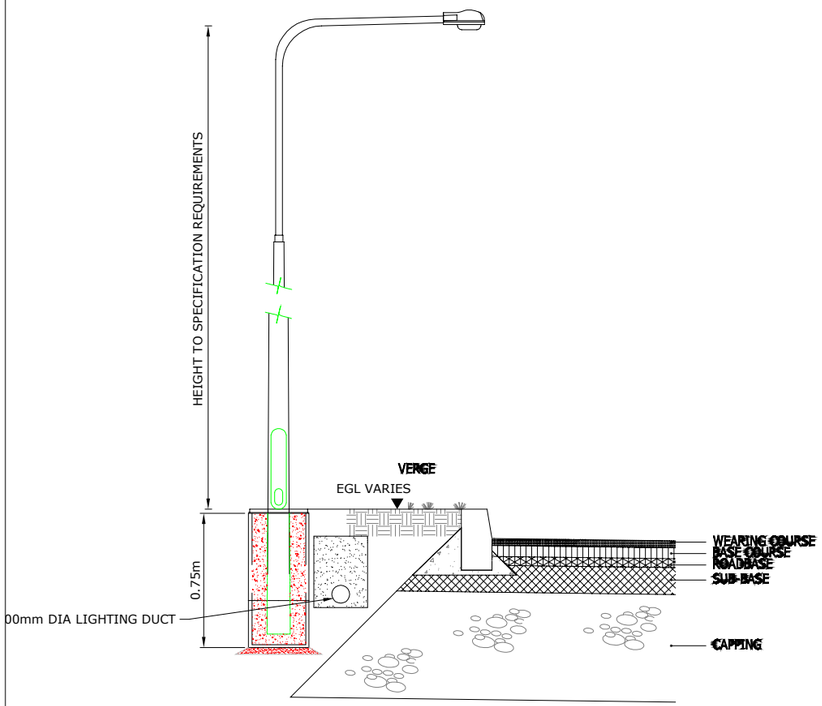
TYPE 3 ROAD MAKE-UP: JEEP TRACK
200mm SUBBASE TO CLAUSE 804 ON
CAPPING LAYER INCORPORATING GEOGRIDS AS SPECIFIED

TYPE 3 – JEEP TRACK (TYPICAL DETAIL)

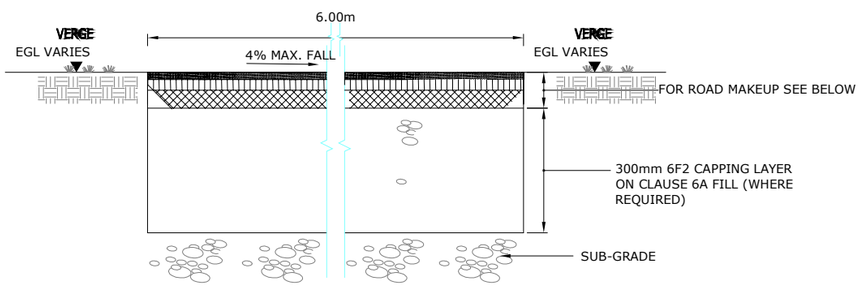


TYPE 2 ROAD MAKE-UP: ADMINISTRATION AREA, PARKING AREAS ETC.
40mm STONE MASTIC ASPHALT WEARING COURSE ON
60mm DENSE BITUMEN MACADAM BASE COURSE ON
150mm DENSE BITUMEN MACADAM ROAD BASE ON
150mm SUBBASE TO CLAUSE 804 ON
CAPPING LAYER AS SPECIFIED ON
SUITABLE GRANULAR FILL MATERIAL (WHERE REQUIRED)

TYPE 2 – ADMINISTRATION AREA & PARKING AREA(TYPICAL DETAIL)



LAMP STANDARD BASE(TYPICAL DETAIL)



TYPE 4 ROAD MAKE-UP: INTERNAL ROAD AROUND LANDFILL
40mm STONE MASTIC ASPHALT WEARING COURSE ON
60mm DENSE BITUMEN MACADAM BASE COURSE ON
100mm DENSE BITUMEN MACADAM ROAD BASE ON
150mm SUBBASE TO CLAUSE 804 ON
CAPPING LAYER AS SPECIFIED ON
SUITABLE GRANULAR FILL MATERIAL (WHERE REQUIRED)

TYPE 4 – INTERNAL ROAD AROUND LANDFILL(TYPICAL DETAIL)

NOTES

1. FIGURED DIMENSIONS ONLY TO TAKEN FROM THIS DRAWING.

2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev.	Date	Description	By	Chkd.

Client

Project
EAST GALWAY LANDFILL SITE

Title
SPECIFIED ENGINEERING WORKS
ROAD CONSTRUCTION
TYPICAL DETAILS

Scale 1 : 25 @ A2

Prepared by:	Checked	Date
Colin Peacock		December 2004

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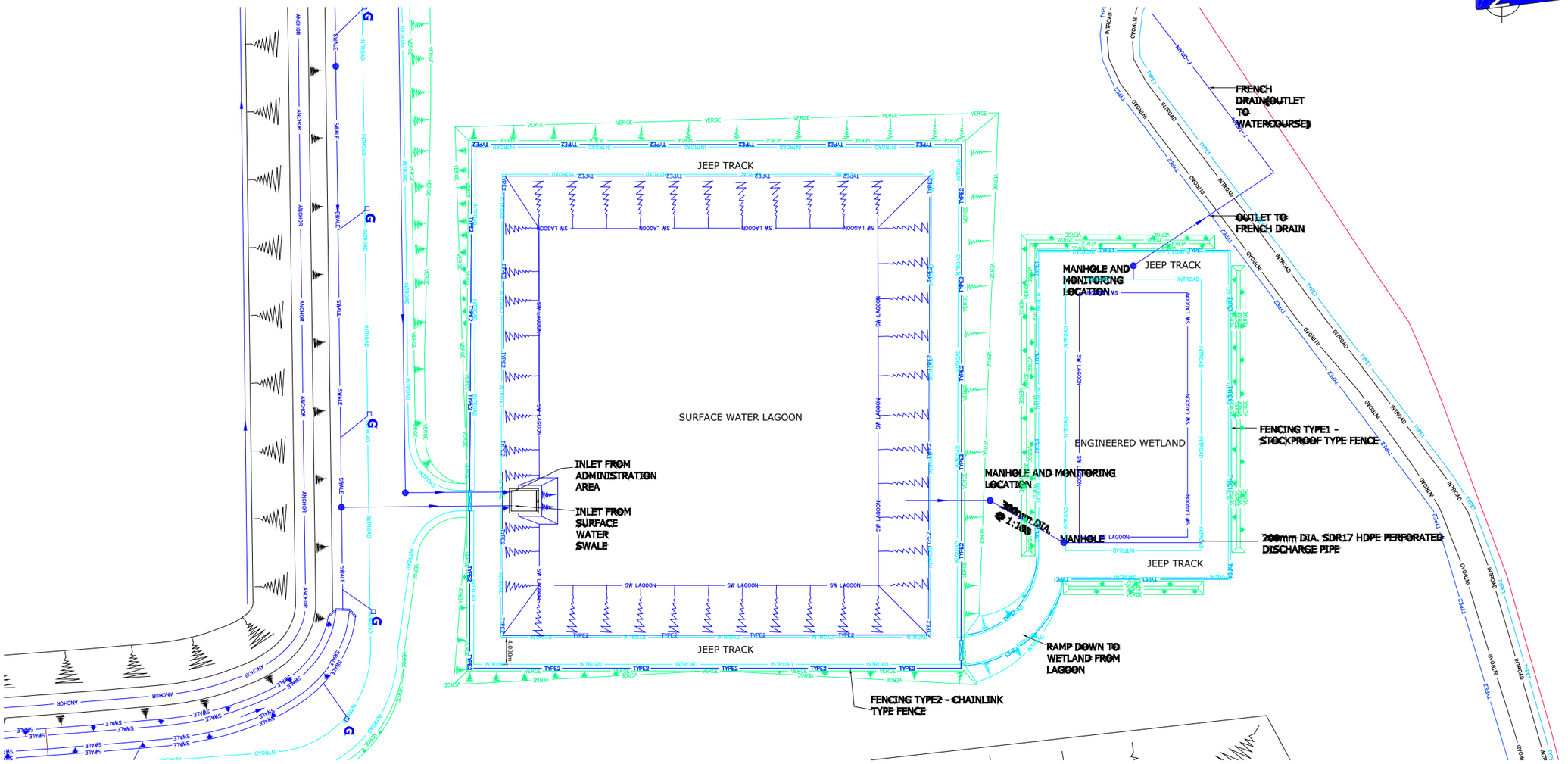
Drawing No. 2228-2612

Revision 1



PLAN ON LAGOON AND ENGINEERED WETLAND

GENERAL LEGEND

EXTENTS OF LANDFILL
EXTENTS OF BORROW AREA
EXISTING CONTOUR 110

ROAD CENTRELINE
EXTENTS OF EMBANKMENTS AND ROADSIDE VERGES
EXTENTS OF INTERNAL ROAD LAYOUT

DUCTING LEGEND
2 No. 150mm DIA. DUCTS
3 No. 150mm DIA. DUCTS
4 No. 150mm DIA. DUCTS
8 No. 150mm DIA. DUCTS
12 No. 150mm DIA. DUCTS
16 No. 150mm DIA. DUCTS
20 No. 150mm DIA. DUCTS
100mm HDPE WATER SUPPLY MAIN

DRAINAGE LEGEND
EXTENTS OF SURFACE WATER LAGOON AND ENGINEERED WETLAND
FOUL DRAINAGE AND LEACHATE COLLECTION PIPEWORK
FRENCH DRAIN
SURFACE WATER DRAINAGE
EXTENTS OF SWALE AND PERFORATED PIPE
PERFORATED LEACHATE COLLECTION PIPEWORK

FENCING LEGEND
TYPE 1 FENCING - STOCKPROOF TYPE FENCE
TYPE 2 FENCING - CHAINLINK TYPE FENCE
TYPE 3 FENCING - SECURITY TYPE FENCE

NOTES

1. FIGURED DIMENSIONS ONLY TO TAKEN FROM THIS DRAWING.
2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev.	Date	Description	By	Chkd.

Client

Project
EAST GALWAY LANDFILL SITE

Title
SPECIFIED ENGINEERING WORKS
SURFACE WATER LAGOON
AND ENGINEERED WETLAND
LAYOUT PLAN

Scale 1 : 500 @ A2

Prepared by:	Checked	Date
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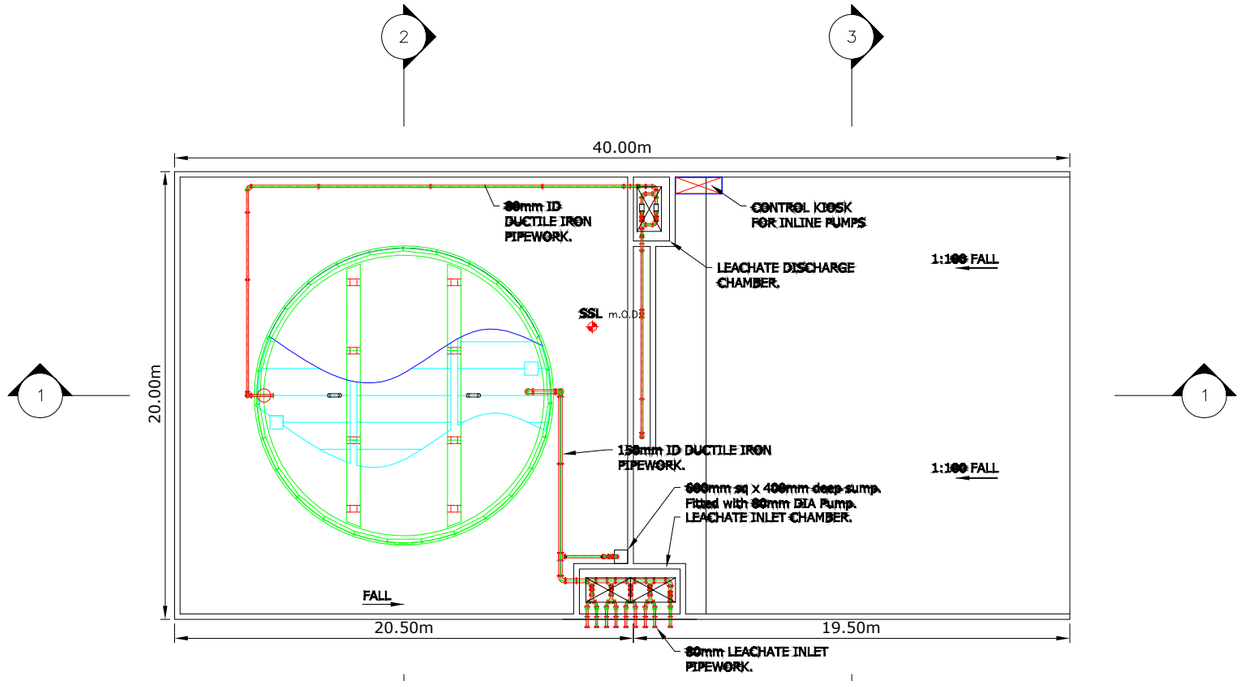
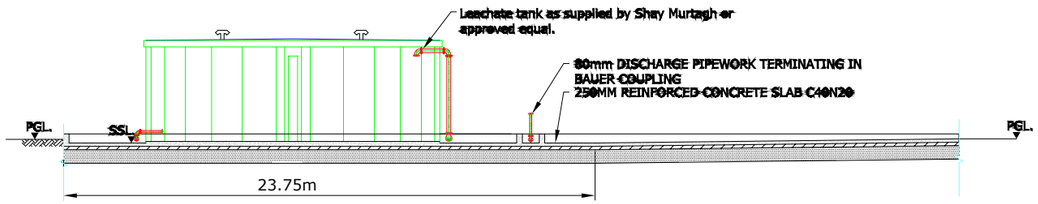
Drawing No. 2228-2614

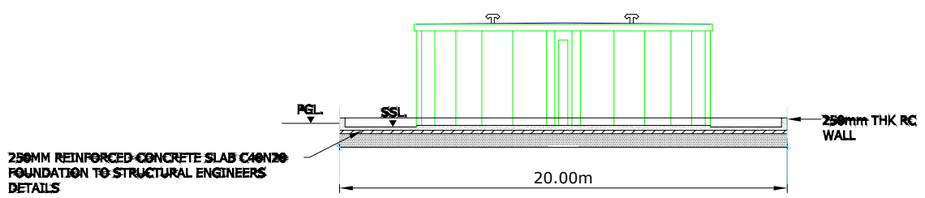
Revision 1



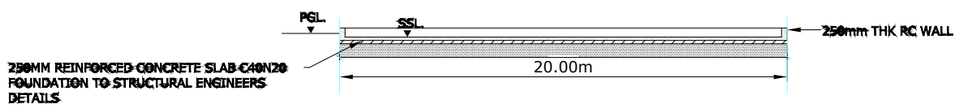
PLAN ON LEACHATE COLLECTION



SECTIONAL ELEVATION 1-1



SECTIONAL ELEVATION 2-2



SECTIONAL ELEVATION 3-3

NOTES

1. FIGURED DIMENSIONS ONLY TO TAKEN FROM THIS DRAWING.

2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev.	Date	Description	By	Chkd.

Client

Project
EAST GALWAY LANDFILL SITE

Title
SPECIFIED ENGINEERING WORKS
LEACHATE COLLECTION TANK
ELEVATION AND SECTION

Scale 1 : 200 @ A2

Prepared by:	Checked	Date
Colin Peacock		December 2004

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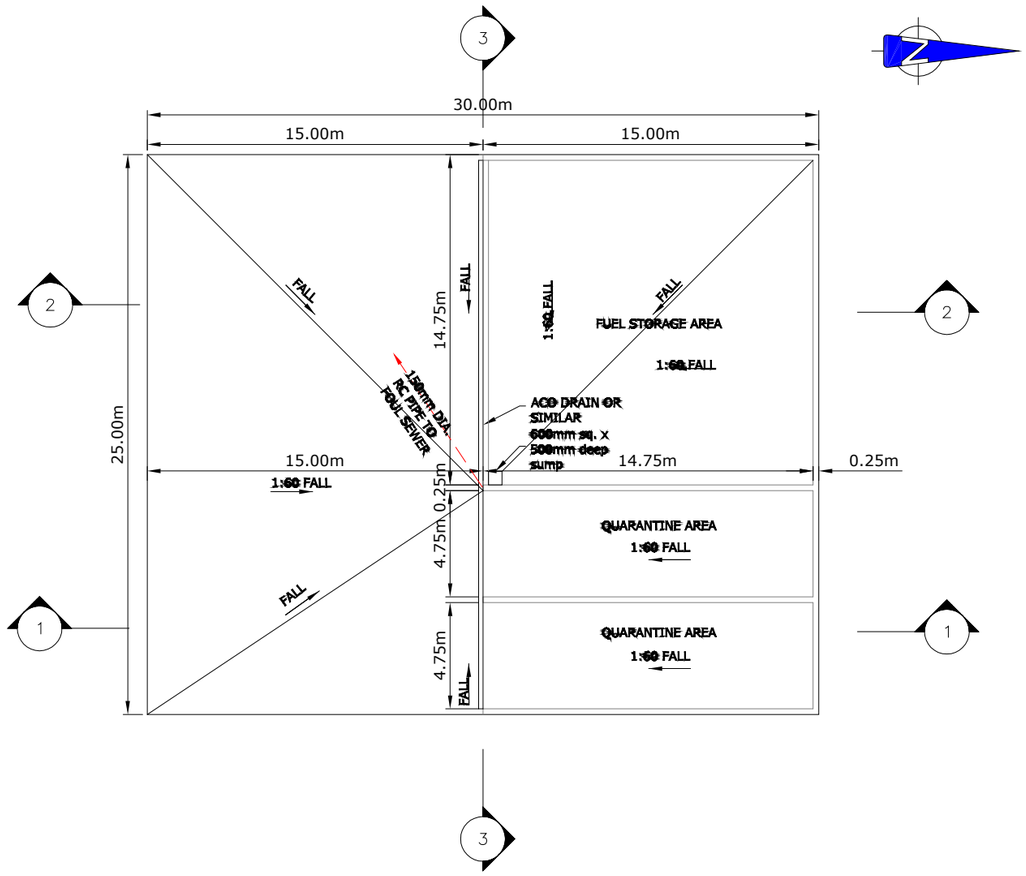
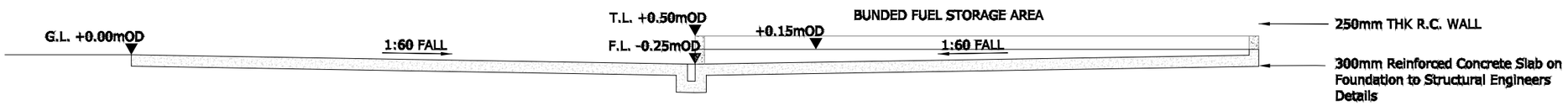
Drawing No. 2228-2615

Revision 1

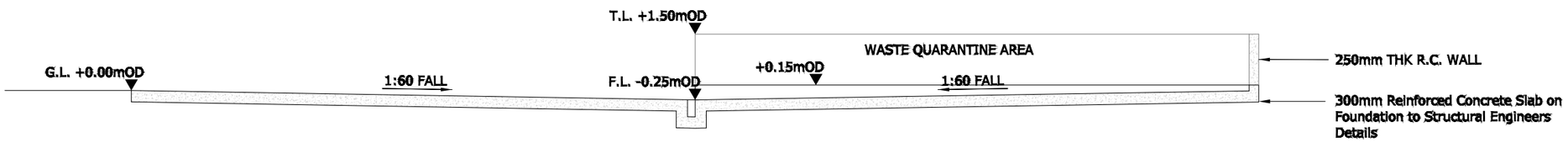


PLAN ON WASTE QUARANTINE AREA

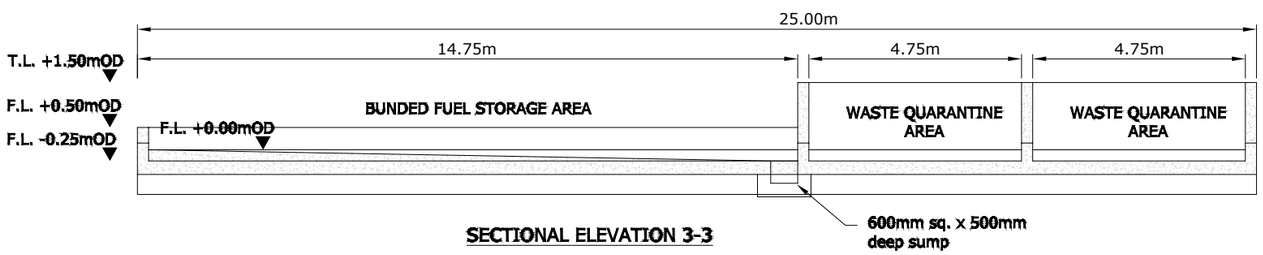
SCALE 1:200



SECTIONAL ELEVATION 1-1



SECTIONAL ELEVATION 2-2



SECTIONAL ELEVATION 3-3

NOTES

1. FIGURED DIMENSIONS ONLY TO TAKEN FROM THIS DRAWING.

2. ALL LEVELS SHOWN RELATIVE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev.	Date	Description	By	Chkd.

Client

Project
EAST GALWAY LANDFILL SITE

Title
SPECIFIED ENGINEERING WORKS
WASTE QUARANTINE AREA
GENERAL ARRANGEMENT

Scale 1 : 100 OR AS SHOWN @ A2

Prepared by:	Checked	Date
Colin Peacock		December 2004

Project Director Eamonn Waldron

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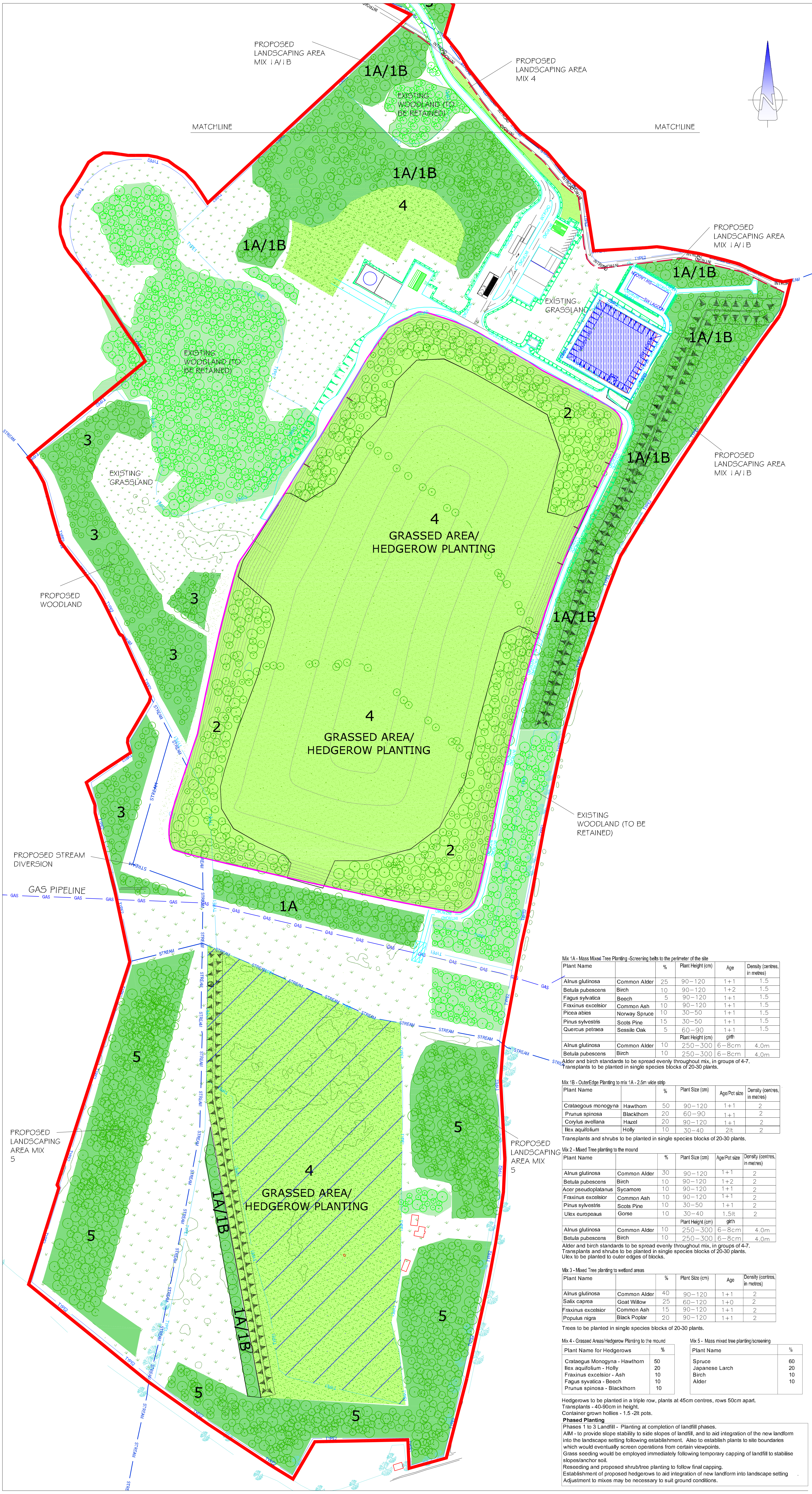
Drawing No. 2228-2618

Revision 1



NOTES

1. LANDSCAPING MEASURES AND PLANTING SCHEDULES FOR THE FACILITY ARE BASED ON DRAWING NO. 1501072/01/336 (REV B) OF THE EIS PREPARED BY FERGUSON MCILVEEN (LANDSCAPE AND ENVIRONMENTAL CONSULTANTS).

Mix 1A - Mass Mixed Tree Planting -Screening belts to the perimeter of the site

Plant Name		%	Plant Height (cm)	Age	Density (centres, in metres)
Alnus glutinosa	Common Alder	25	90-120	1+1	1.5
Betula pubescens	Birch	10	90-120	1+2	1.5
Fagus sylvatica	Beech	5	90-120	1+1	1.5
Fraxinus excelsior	Common Ash	10	90-120	1+1	1.5
Picea abies	Norway Spruce	10	30-50	1+1	1.5
Pinus sylvestris	Scots Pine	15	30-50	1+1	1.5
Quercus petraea	Sessile Oak	5	60-90	1+1	1.5
			Plant Height (cm)	girth	
Alnus glutinosa	Common Alder	10	250-300	6-8cm	4.0m
Betula pubescens	Birch	10	250-300	6-8cm	4.0m

Alder and birch standards to be spread evenly throughout mix, in groups of 4-7.
Transplants to be planted in single species blocks of 20-30 plants.

Mix 1B - OuterEdge Planting to mix 1A - 2.5m wide strip

Plant Name		%	Plant Size (cm)	Age/Pot size	Density (centres, in metres)
Crataegous monogyna	Hawthorn	50	90-120	1+1	2
Prunus spinosa	Blackthorn	20	60-90	1+1	2
Corylus avellana	Hazel	20	90-120	1+1	2
Ilex aquifolium	Holly	10	30-40	2lt	2

Transplants and shrubs to be planted in single species blocks of 20-30 plants.

Mix 2 - Mixed Tree planting to the mound

Plant Name		%	Plant Size (cm)	Age/Pot size	Density (centres, in metres)
Alnus glutinosa	Common Alder	30	90-120	1+1	2
Betula pubescens	Birch	10	90-120	1+2	2
Acer pseudoplatanus	Sycamore	10	90-120	1+1	2
Fraxinus excelsior	Common Ash	10	90-120	1+1	2
Pinus sylvestris	Scots Pine	10	30-50	1+1	2
Ulex europeaus	Gorse	10	30-40	1.5lt	2
			Plant Height (cm)	girth	
Alnus glutinosa	Common Alder	10	250-300	6-8cm	4.0m
Betula pubescens	Birch	10	250-300	6-8cm	4.0m

Alder and birch standards to be spread evenly throughout mix, in groups of 4-7.
Transplants and shrubs to be planted in single species blocks of 20-30 plants.
Ulex to be planted to outer edges of blocks.

Mix 3 - Mixed Tree planting to wetland areas

Plant Name		%	Plant Size (cm)	Age	Density (centres, in metres)
Alnus glutinosa	Common Alder	40	90-120	1+1	2
Salix caprea	Goat Willow	25	60-120	1+0	2
Fraxinus excelsior	Common Ash	15	90-120	1+1	2
Populus nigra	Black Poplar	20	90-120	1+1	2

Trees to be planted in single species blocks of 20-30 plants.

Mix 4 - Grassed Areas/Hedgerow Planting to the mound

Plant Name for Hedgerows	%
Crataegus Monogyna - Hawthorn	50
Ilex aquifolium - Holly	20
Fraxinus excelsior - Ash	10
Fagus syvatica - Beech	10
Prunus spinosa - Blackthorn	10

Mix 5 - Mass mixed tree planting/screening

Plant Name	%
Spruce	60
Japanese Larch	20
Birch	10
Alder	10

Hedgerows to be planted in a triple row, plants at 45cm centres, rows 50cm apart.
Transplants - 40-90cm in height.
Container grown hollies - 1.5 -2lt pots.

Phased Planting

Phases 1 to 3 Landfill - Planting at completion of landfill phases.
AIM - to provide slope stability to side slopes of landfill, and to aid integration of the new landform into the landscape setting following establishment. Also to establish plants to site boundaries which would eventually screen operations from certain viewpoints.
Grass seeding would be employed immediately following temporary capping of landfill to stabilise slopes/anchor soil.
Reseeding and proposed shrub/tree planting to follow final capping.
Establishment of proposed hedgerows to aid integration of new landform into landscape setting
Adjustment to mixes may be necessary to suit ground conditions.

Rev.	Date	Description	By	Chkd.

Client

greenstar
setting the standard

Project

EAST GALWAY LANDFILL SITE

Title

SUBMISSION TO THE EPA LANDSCAPING IMPLEMENTATION PLAN

SHEET 1 OF 2

Scale 1 : 2500 @ A2

Prepared by:	Checked	Date
Mark Murray	Damien Grehan	March 2005

Project Director Eamonn Waldron

TOBIN Patrick J. Tobin & Co. Ltd. TES CONSULTING ENGINEERS

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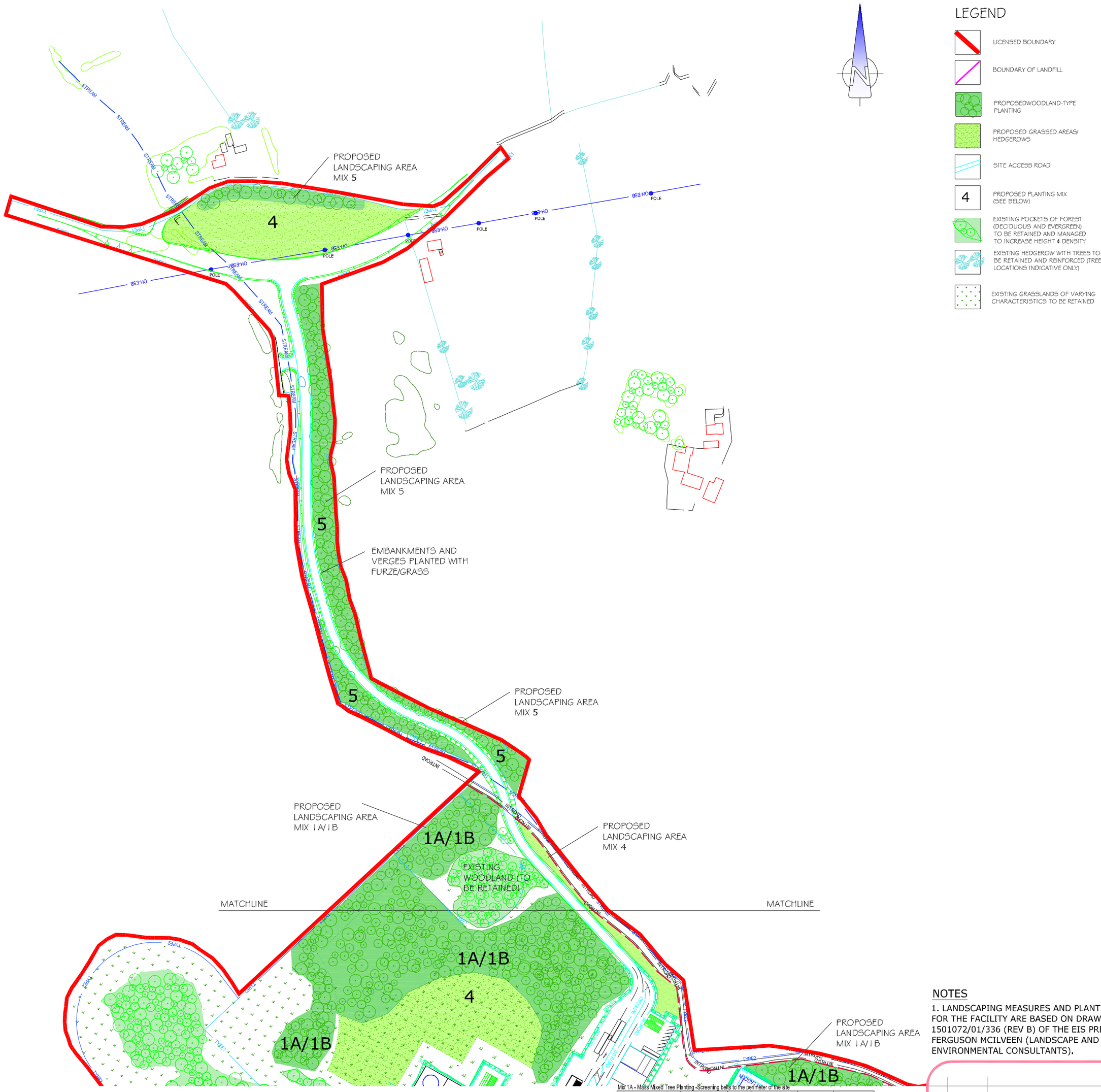
Revision

Drawing No. 2228-2623



LEGEND

- LICENSED BOUNDARY
- BOUNDARY OF LANDFILL
- PROPOSEDWOODLAND-TYPE PLANTING
- PROPOSED GRASSED AREAS/ HEDGEROWS
- SITE ACCESS ROAD
- 4 — PROPOSED PLANTING MIX (SEE BELOW)
- EXISTING POCKETS OF FOREST (DECIDUOUS AND EVERGREEN) TO BE RETAINED AND MANAGED TO INCREASE HEIGHT & DENSITY
- EXISTING HEDGEROW WITH TREES TO BE RETAINED AND REINFORCED (TREE LOCATIONS INDICATIVE ONLY)
- EXISTING GRASSLANDS OF VARYING CHARACTERISTICS TO BE RETAINED

NOTES

1. LANDSCAPING MEASURES AND PLANTING SCHEDULES FOR THE FACILITY ARE BASED ON DRAWING NO. 1501072/01/336 (REV B) OF THE EIS PREPARED BY FERGUSON MCILVEEN (LANDSCAPE AND ENVIRONMENTAL CONSULTANTS).

Mix 1A - Mass Mixed Tree Planting -Screening belts to the perimeter of the site

Plant Name		%	Plant Height (cm)	Age	Density (centres, in metres)
Alnus glutinosa	Common Alder	25	90–120	1+1	1.5
Betula pubescens	Birch	10	90–120	1+2	1.5
Fagus sylvatica	Beech	5	90–120	1+1	1.5
Fraxinus excelsior	Common Ash	10	90–120	1+1	1.5
Picea abies	Norway Spruce	10	30–50	1+1	1.5
Pinus sylvestris	Scots Pine	15	30–50	1+1	1.5
Quercus petraea	Sessile Oak	5	60–90	1+1	1.5
			Plant Height (cm)	girth	
Alnus glutinosa	Common Alder	10	250–300	6–8cm	4.0m
Betula pubescens	Birch	10	250–300	6–8cm	4.0m

Alder and birch standards to be spread evenly throughout mix, in groups of 4-7.
Transplants to be planted in single species blocks of 20-30 plants.

Mix 1B - OuterEdge Planting to mix 1A - 2.5m wide strip

Plant Name		%	Plant Size (cm)	Age/Pot size	Density (centres, in metres)
Crataegous monogyna	Hawthorn	50	90–120	1+1	2
Prunus spinosa	Blackthorn	20	60–90	1+1	2
Corylus avellana	Hazel	20	90–120	1+1	2
Ilex aquifolium	Holly	10	30–40	2lt	2

Transplants and shrubs to be planted in single species blocks of 20-30 plants.

Mix 2 - Mixed Tree planting to the mound

Plant Name		%	Plant Size (cm)	Age/Pot size	Density (centres, in metres)
Alnus glutinosa	Common Alder	30	90–120	1+1	2
Betula pubescens	Birch	10	90–120	1+2	2
Acer pseudoplatanus	Sycamore	10	90–120	1+1	2
Fraxinus excelsior	Common Ash	10	90–120	1+1	2
Pinus sylvestris	Scots Pine	10	30–50	1+1	2
Ulex europeaus	Gorse	10	30–40	1.5lt	2
			Plant Height (cm)	girth	
Alnus glutinosa	Common Alder	10	250–300	6–8cm	4.0m
Betula pubescens	Birch	10	250–300	6–8cm	4.0m

Alder and birch standards to be spread evenly throughout mix, in groups of 4-7.
Transplants and shrubs to be planted in single species blocks of 20-30 plants.
Ulex to be planted to outer edges of blocks.

Mix 3 - Mixed Tree planting to wetland areas

Plant Name		%	Plant Size (cm)	Age	Density (centres, in metres)
Alnus glutinosa	Common Alder	40	90–120	1+1	2
Salix caprea	Goat Willow	25	60–120	1+0	2
Fraxinus excelsior	Common Ash	15	90–120	1+1	2
Populus nigra	Black Poplar	20	90–120	1+1	2

Trees to be planted in single species blocks of 20-30 plants.

Mix 4 - Grassed Areas/Hedgerow Planting to the mound

Plant Name for Hedgerows	%
Crataegus Monogyna - Hawthorn	50
Ilex aquifolium - Holly	20
Fraxinus excelsior - Ash	10
Fagus syvatica - Beech	10
Prunus spinosa - Blackthorn	10

Mix 5 - Mass mixed tree planting/screening

Plant Name	%
Spruce	60
Japanese Larch	20
Birch	10
Alder	10

Hedgerows to be planted in a triple row, plants at 45cm centres, rows 50cm apart.
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Phased Planting

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Adjustment to mixes may be necessary to suit ground conditions.

Rev.	Date	Description	By	Chkd.

Client

greenstar
setting the standard

Project

EAST GALWAY LANDFILL SITE

Title

SUBMISSION TO THE EPA
LANDSCAPING IMPLEMENTATION PLAN

SHEET 2 OF 2

Scale 1 : 2500 @ A2

Prepared by:	Checked	Date
Mark Murray	Damien Grehan	March 2005

Project Director Eamonn Waldron

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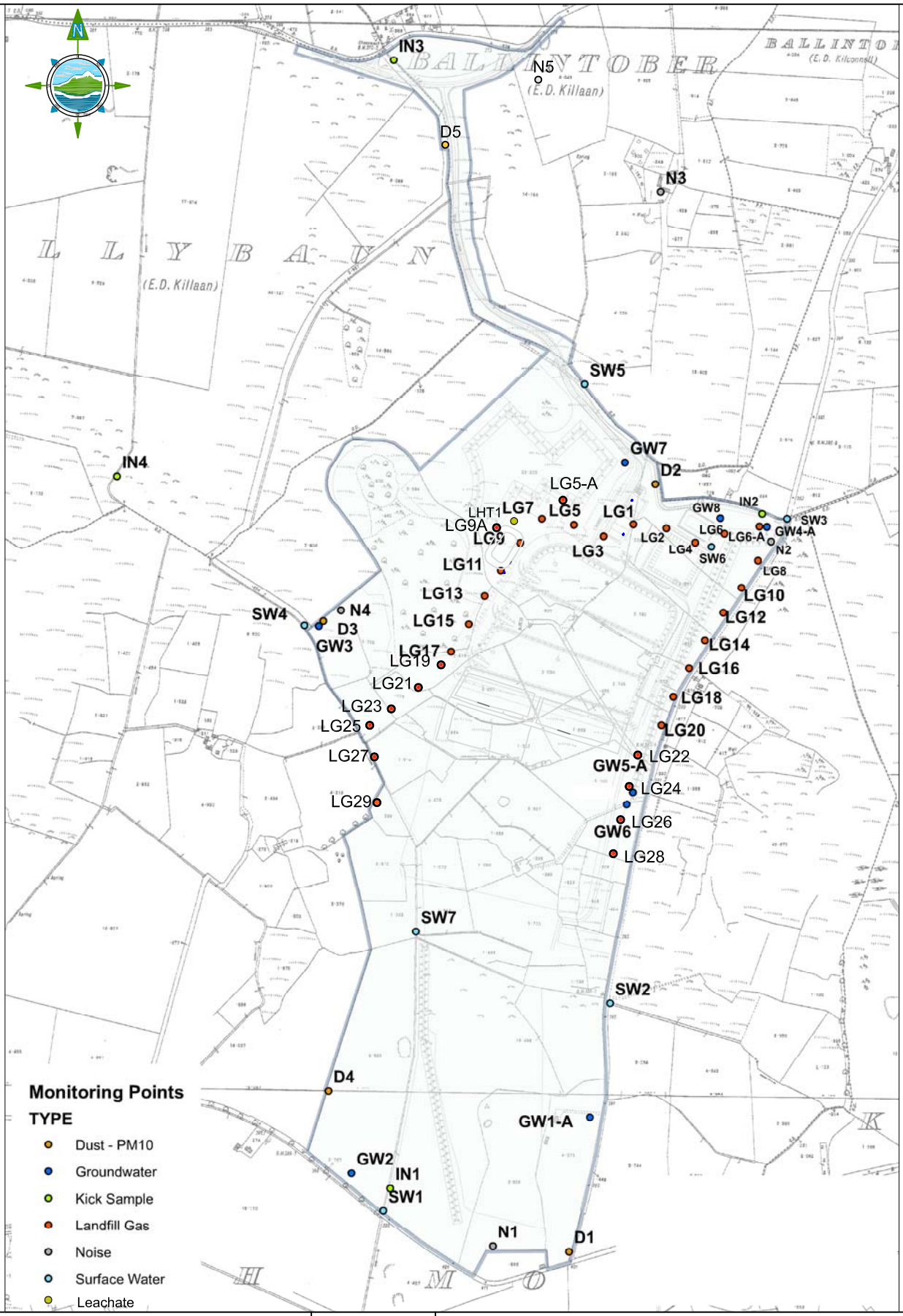
Drawing No. 2228-2624

Revision



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Project CONNAUGHT REGIONAL RESIDUAL LANDFILL	Checked: D.O'S.	TOBIN Patrick J. Tobin & Co. Ltd.
Title LANDFILL ENVIRONMENTAL MONITORING LOCATIONS	Date: 24.09.09	
	Project DIrector: M.F.G.	
	Drawing Status: LG29 ADDED	
	Scale @ A4: N.T.S.	

Drawing No. 3588-1604

Revision: A

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APPENDIX 2

Corrective Action Procedures

CORRECTIVE ACTION PROCEDURES

Scope

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

Content

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

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

Application

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

Applicable Documents

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

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

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

Responsibilities

It shall be the responsibility of Greenstar to ensure that the CAPs are implemented.

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

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

FACILITY OPERATION

Scope

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

Application

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

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

Responsibility

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

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

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

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

Corrective Action

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

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

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

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

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

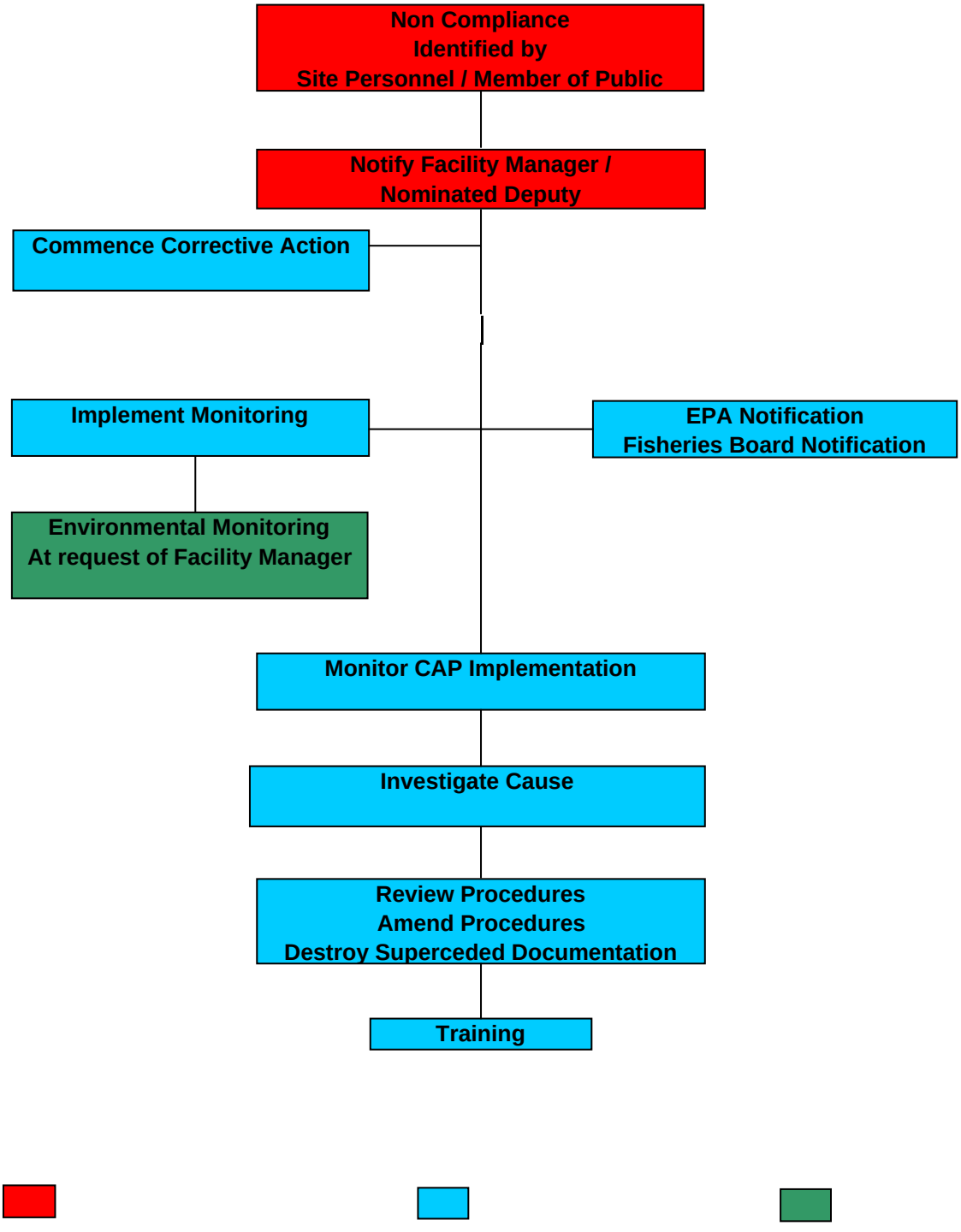
Following the completion of the corrective action the Facility Manager or nominated Deputy Manager will carry out an investigation to identify the root cause of the non-compliance. Where the cause is the result of inadequate or improperly applied procedures or site practices, the Facility Manager or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

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

Key Elements

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

CAP-2 Site Operation



ENVIRONMENTAL MONITORING

Scope

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

Application

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

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

Responsibility

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

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

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

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

Corrective Action

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

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

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

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

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

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

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

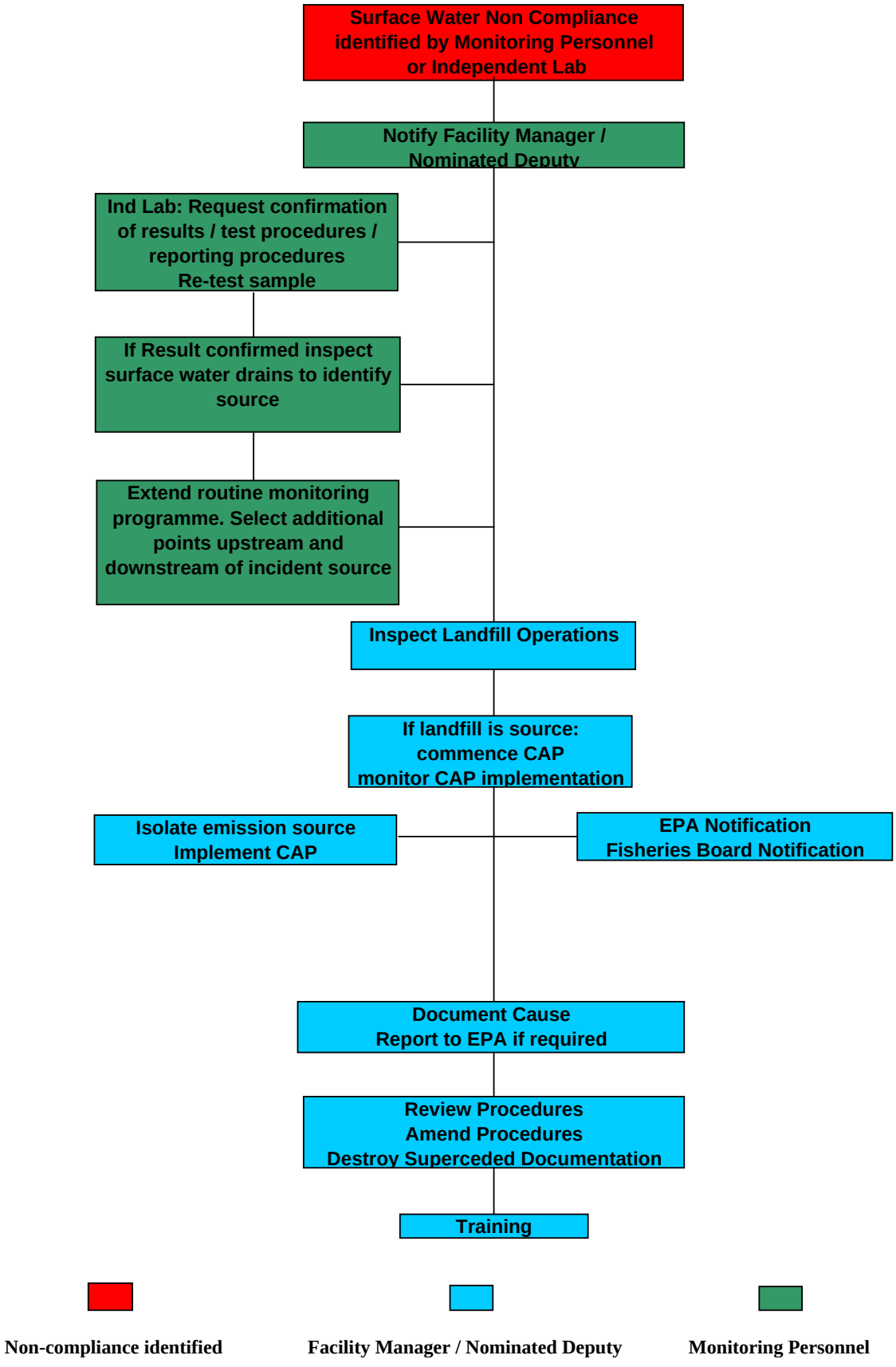
Where the cause is the result of failure or inadequacy of the design or implementation of specified engineering works, Greenstar shall ensure that the design or construction deficiencies are rectified to avoid a reoccurrence of the non-compliance.

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

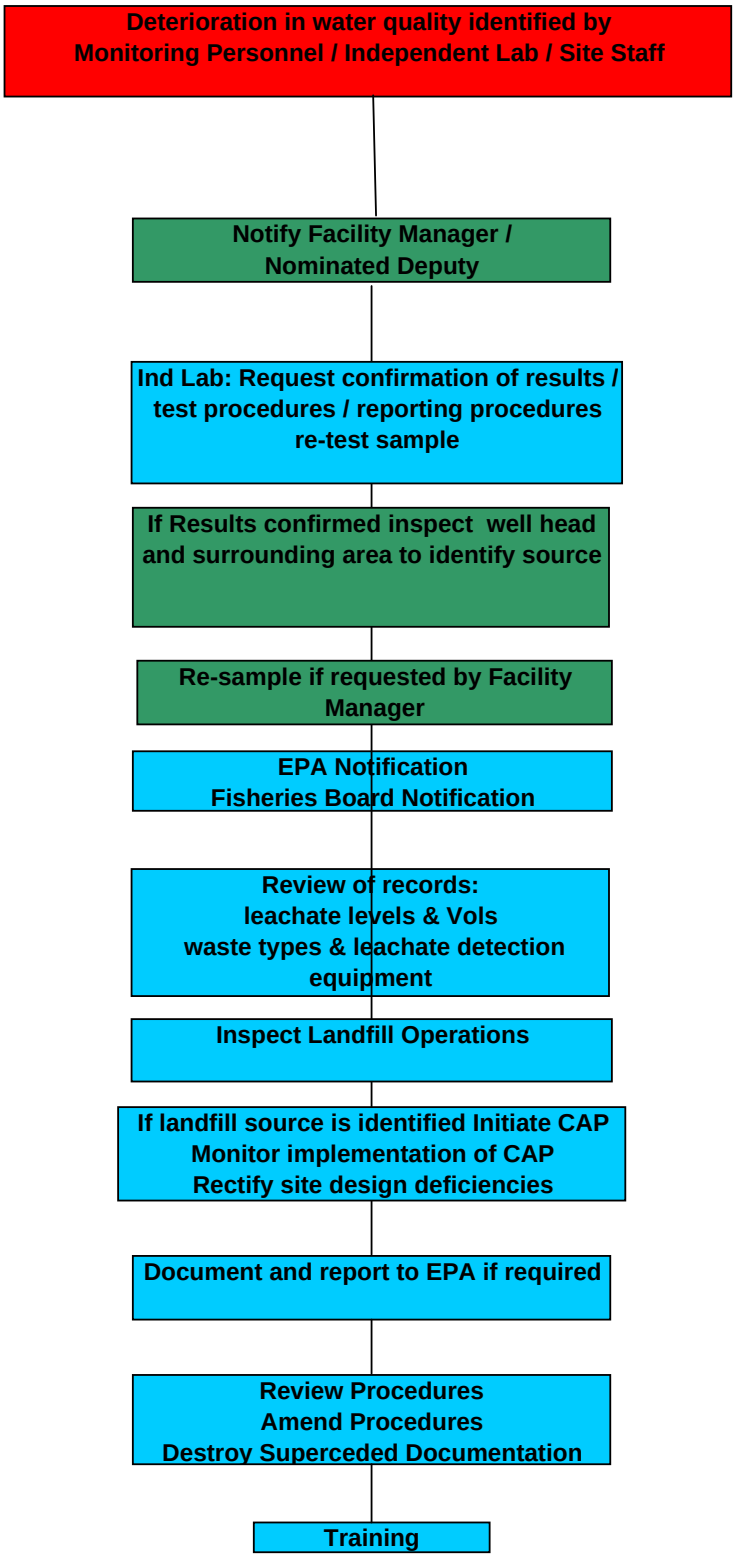
If the cause of the non compliance is due to a lack of understanding of operational practices or licence conditions the Facility Manager or nominated Deputy Manager shall ensure that the site operatives, including Greenstar sub-contractors, receive the necessary instruction or training to ensure future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

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

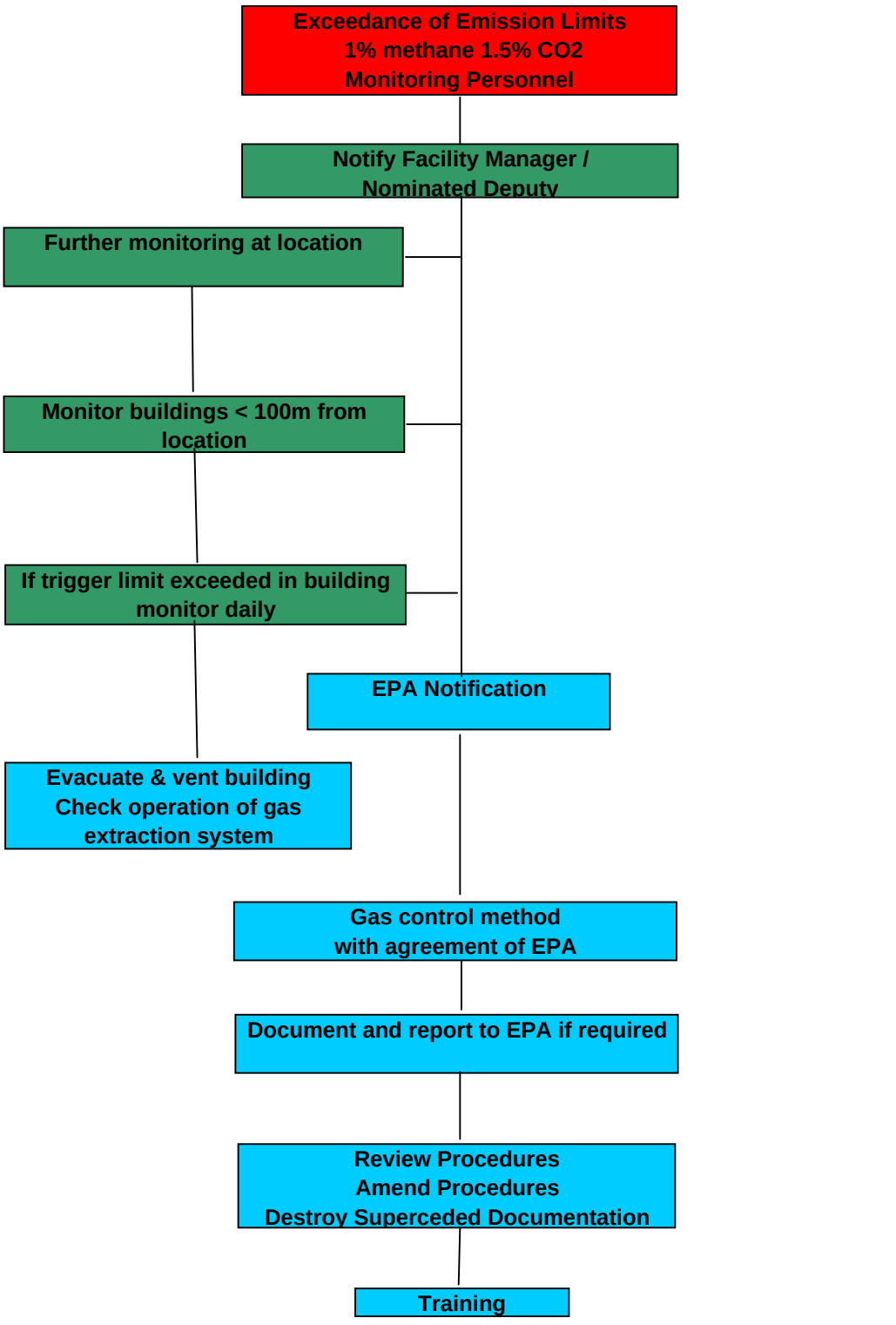
CAP-3 Surface Water



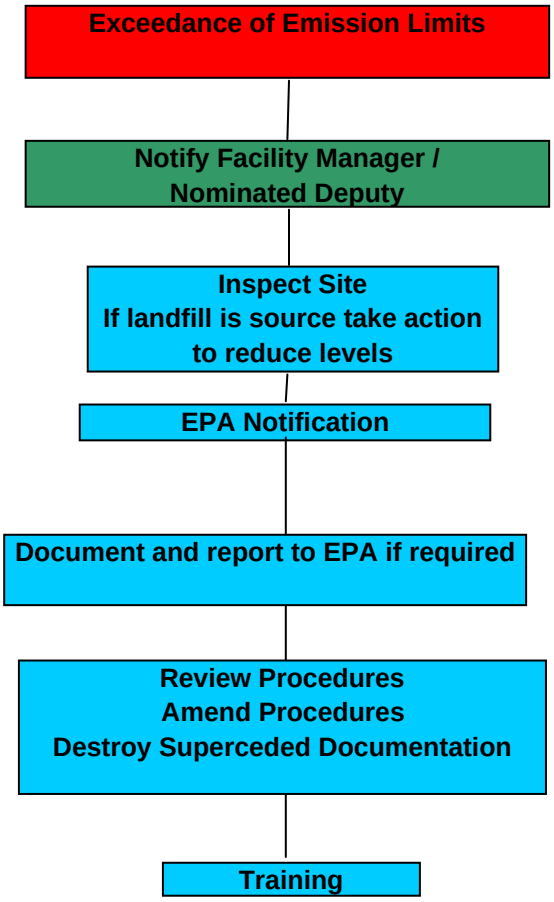
CAP- 3 Groundwater



CAP-3 Landfill Gas



CAP-3 Noise



Non-compliance identified

Facility Manager / Nominated Deputy

Monitoring Personnel

REPORTS

Scope

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

Application

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

Responsibility

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

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

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

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

Corrective Action

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

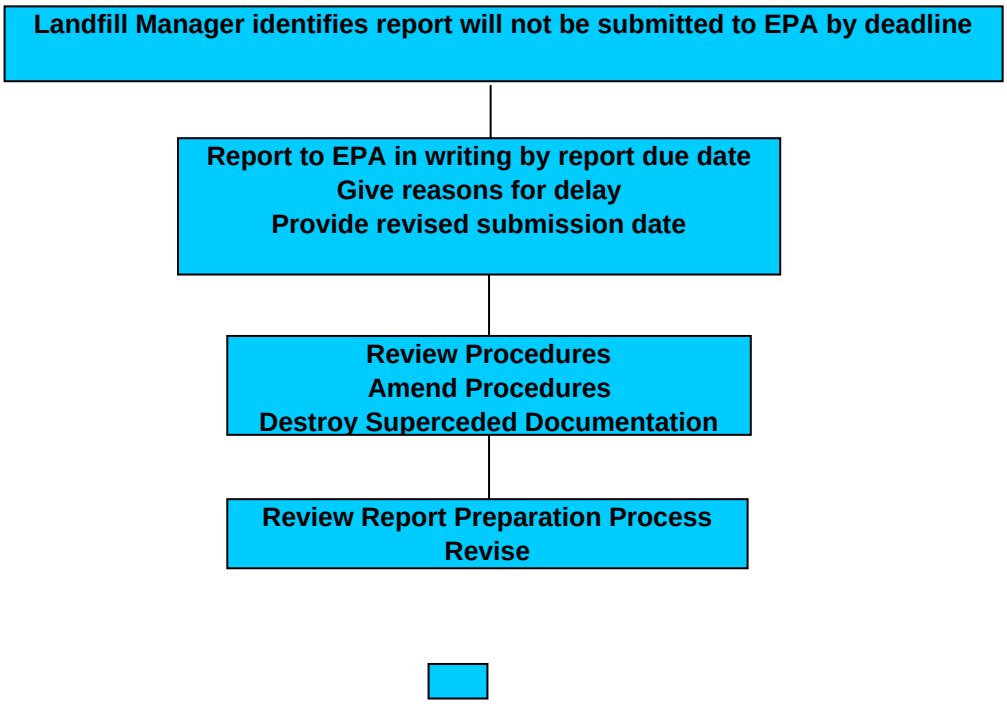
The Facility Manager or nominated Deputy Manager will inform the Agency in writing that the report will not be submitted by the due date. This notification will be submitted to the Agency preferably before, but at a minimum no later than the report due date.

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

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

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

CAP-4 Reports



Facility Manager / Nominated Deputy

APPENDIX 3

Awareness & Training Procedures

AWARENESS AND TRAINING PROCEDURE

Scope

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

Application

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

Applicable Documents

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

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

Responsibilities

It shall be the responsibility of Greenstar to ensure that this Procedure is implemented.

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

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

Programmes

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

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

The programmes shall include education and instruction on: -

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

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

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

Awareness & Training Matrix

Date:

Programme	Scope	
	Person Affected	**Frequency**
Operations	All personnel.	Annual.
Environmental Awareness (EMS, ISO 14001 etc)	All personnel	Annual
Environmental Monitoring	Facility Manager, Nominated Deputy.	Initial and following licence review.
Complaints	Facility Manager, Nominated Deputy.	Initial and following licence review.
Corrective Action Procedures	Facility Manager, Nominated Deputy.	Initial and following any licence amendments.
Health & Safety	All personnel.	Initial and following any licence amendments.
Emergency Response Procedures	All personnel.	Initially & following any procedure amendments but at least annually.

APPENDIX D

Bund Integrity Testing Report

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Our Ref: **DOS/MMcD 3588-02-06**

20 December, 2011

Michelle McKim
Inspector
Environmental Protection Agency
Regional Inspectorate
John Moore Road
CASTLEBAR
County Mayo

Re: **Connaught Regional Residual Landfill, Kilconnell, County Galway**
Waste Licence No. W0178-02

Dear Ms McKim,

We were appointed by Greenstar to perform integrity and water-tightness assessments of the bunds, leachate tank and storage trays at the above facility in accordance with the requirement of Waste Licence W0178-02 Schedule E - "Bund, Tank and Container Integrity Assessment".

1. Tank and Drum Storage Areas

Condition 3.11.5 of the Licence states

> *".....The integrity and water tightness of all the bunds and their resistance to penetration by water or other materials stored therein shall be confirmed by the licensee and shall be reported to the Agency following its installation and prior to its use as a storage area.*
>
> *The confirmation shall be repeated at least once every three years thereafter and reported to the Agency on each occasion."*

The following structures were assessed for integrity and water-tightness by TOBIN Consulting Engineers in accordance with the method outlined in Appendix A-Storage Bunds of the

Environmental Protection Agency publication "Landfill Manuals – Landfill Site Design" on the dates below:

- Leachate Holding Tank 28/10/2011 to 01/11/2011
- Diesel Bunded Area 28/10/2011 to 01/11/2011
- Storage Tray No. 1 28/10/2011 to 01/11/2011
- Storage Tray No. 2 28/10/2011 to 01/11/2011
- Storage Tray No. 3 28/10/2011 to 01/11/2011
- Storage Tray No. 4 28/10/2011 to 01/11/2011
- Storage Tray No. 5 28/10/2011 to 01/11/2011
- Storage Tray No. 6 28/10/2011 to 01/11/2011
- Storage Tray No. 7 28/10/2011 to 01/11/2011
- Generator Tray 28/10/2011 to 01/11/2011
- Wheelwash 28/10/2011 to 01/11/2011

Following our assessment we can confirm the following:

- The integrity and water-tightness of the Leachate Holding Tank and its resistance to penetration by water or other materials stored therein was confirmed by our assessment;
- The integrity and water-tightness of all Storage Trays (No. 1 to No. 7) and their resistance to penetration by water or other materials stored therein was confirmed by our assessment;
- The integrity and water-tightness of the Generator Storage Tray and its resistance to penetration by water or other materials stored therein was confirmed by our assessment;
- The integrity and water-tightness of the Wheelwash and its resistance to penetration by water or other materials stored therein was confirmed by our assessment;
- A drop in water level in the Diesel Bunded Area over the period of our assessment led us to identify a leak in the structure. The water-tightness of a construction joint on the bund wall had failed due to weathering of the joint. It should be noted that the leak would only allow diesel or contaminated water to enter the quarantine bay from where it would be pumped to the leachate holding tank. We have recommended to the licensee that repairs be carried out on the construction joint and for the Diesel Bunded Area to be re-tested. At the time of writing, Greenstar have as of yet been unable to carry out the repair works due to the persistent wet weather experienced since the testing was carried out. The repair works will be carried out as soon as weather conditions allow.

2. *Surface Water lagoon*

Condition 5.15.2 of the Licence states

"The surface water lagoon shall be inspected and certified fit for purpose every three years by an independent and appropriately qualified chartered engineer."

I confirm that I carried out a visual inspection of the surface water lagoon on 28th October November 2011 and I can confirm that I found it fit for purpose.

Yours sincerely,

Darragh O Shaughnessy
Chartered Engineer

Environmental Protection Agency

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.13

REFERENCE YEAR	2011

1. FACILITY IDENTIFICATION

Parent Company Name	Greenstar Holdings Limited
Facility Name	East Galway Residual Landfill Site
PRTR Identification Number	W0178
Licence Number	W0178-02

Waste or IPPC Classes of Activity

No.	class_name
	Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
3.5	
3.1	Deposit on, in or under land (including landfill).
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.
3.4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
3.6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
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.
4.4	Recycling or reclamation of other inorganic materials.
Address 1	Killagh More
Address 2	Ballybaun (E.D. Killaan)
Address 3	Ballintober (E.D. Killaan)
Address 4	Ballinasloe, Co. Galway
	Galway
Country	Ireland
Coordinates of Location	-8.43099 53.31318
River Basin District	IEWE
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Colin Ryder (W0178)
AER Returns Contact Email Address	colin.ryder@greenstar.ie
AER Returns Contact Position	Landfill Operations Manager
AER Returns Contact Telephone Number	090-9686014
AER Returns Contact Mobile Phone Number	086-8586335
AER Returns Contact Fax Number	090-9686026
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 ?	No
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	N/A
Is the reduction scheme compliance route being used ?	N/A

4.1 RELEASES TO AIR

Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs						
POLLUTANT		METHOD							QUANTITY		
			Method Used								
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	Emission Point 2	Emission Point 3	Emission Point 4	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
01	Methane (CH4)	M	OTH	TOC Analyser in Accordance with EN12619:2002	42.35	46.05	0.31	2454.28	2542.99	0.0	0.0
03	Carbon dioxide (CO2)	M	OTH	Flue Gas Analyser Testo 350/454 MXL	3047400.69	1920657.92	23342.85	3429940.77	0.0	0.0	0.0
02	Carbon monoxide (CO)	M	OTH	Flue Gas Analyser Testo 350/454 MXL	44.78	0.0	0.33	10710.82	10755.93	0.0	0.0
08	Nitrogen oxides (NOx/NO2)	M	OTH	Flue Gas Analyser Testo 350/454 MXL	587.64	738.07	8.28	6282.4	7616.39	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					Please enter all quantities in this section in KGs						
POLLUTANT		METHOD							QUANTITY		
			Method Used								
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	Emission Point 2	Emission Point 3	Emission Point 4	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
80	Chlorine and inorganic compounds (as HCl)	M	OTH	Impinger train containing 0.10 Molar sodium hydroxideand deionised water solution in accordance with EN1911 and EPA 26A	162.54	23.4	0.37	37.61	223.92	0.0	0.0
84	**Fluorine and inorganic compounds (as HF)**	M	OTH	Impinger train containing 0.10 Molar sodium hydroxideand deionised water solution in accordance with EN1911 and EPA 26A	53.62	33.56	0.22	11.95	99.35	0.0	0.0

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

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

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

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

Additional Data Requested from Landfill operators

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

Landfill: East Galway Residual Landfill Site

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	4284060.4	C	Gas Sim 2	Golder Associates Report 2008	N/A	
Methane flared	3710435.0	M	Landfill Gas Survey 201	Landfill Gas Survey 2011	7000.0	(Total Flaring Capacity)
Methane utilised in engine/s	1176405.0	M	Landfill Gas Survey 201	Landfill Gas Survey 2011	650.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	2542.99	C	OTH	TOC Analyser in Accordace with EN12619:2002	N/A	

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

Please enter all quantities on this sheet in Tonnes

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	**19 07 03**	**No**	13783.06	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	Galway County Council,D0033-01	Tuam Wastewater Treatment Plant,Tuam Wastewater Treatment Plant,County Galway,Ireland		
Within the Country	19 07 03	No	14772.02	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	Ringsend Wastewater Treatment Works,D0034-01	Pigeon House Road,.,Dublin 4,.,Ireland		
Within the Country	19 07 03	No	1976.26	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	Enva,W0041-01	Smithstown Industrial Estate,.,Shannon,County Clare,Ireland		
Within the Country	19 07 03	No	5300.76	landfill leachate other than those mentioned in 19 07 02	D9	M	Weighed	Offsite in Ireland	Rilta Environmental Ltd,W0192-02	Block 402,Grants Drive Greenhouse Business Park,Rathcoole,County Dublin,Ireland		

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

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