BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED
Derrygreenagh, Rochfortbridge, Mullingar, Co-Westmeath.

Annual Environmental Report 2011
Clonbullogue Ash Repository
Waste Licence W0049-02

March 2012

Bord na Móna today operates 5 main subsidiary companies in more than 20 locations throughout Ireland, the UK and USA. The principal businesses are in the Energy, Resource Recovery, Horticulture, Home Heating and Wastewater Treatment and Air Pollution Abatement markets. The company also engages in an extensive rehabilitation program to develop its peat lands in an environmentally sustainable manner.

Bord na Móna has long recognised the need to diversify its activities in order to secure a sustainable future. In this context we identified the energy and resource recovery sectors as appropriate areas of growth and development, given our assets, strengths and skills.
Significant challenges face Ireland in meeting the country's needs to provide secure sustainable energy and manage waste while minimising the impact on the environment.

Bord na Móna is in a strong position to contribute to dealing with these challenges. We have a unique mixture of assets, experience and innovation which will enable us to cross-link our activities in energy, water and resource recovery to provide products and services which will meet Ireland's needs. We also have the capacity to become an exemplar for others to follow in these fields.
With this background we have scoped out a new vision for the future sustainable development of Bord na Móna.

Following on from our vision, we have developed a new mission for Bord na Móna which the Company is committed to achieving.
In 1934 the Turf Development Board was formed to ‘develop and improve the turf industry.' The experience of fuel shortages during the war re-enforced the Irish State's commitment to developing the country's bogs. In 1944 the TDB was asked to devise and submit a comprehensive programme, the outcome was the transformation in 1946 of the TDB into Bord na Móna. The Board was given a mandate to increase the use of peat as a fuel and in energy production. Markets for the use of moss peat in horticulture were also developed.
In 1990 Bord na Móna implemented a divisionalised and decentralised structure, designed to delegate responsibility downwards ensuring a sharper focus on each profit centre and a greater spirit of enterprise.

Group Vision

We conduct our affairs with openness, honesty and integrity.
We are Ireland's leading environmentally responsible integrated utility service provider encompassing electricity, heating solutions, resource recovery, water, horticulture and related services.

We capitalise on international opportunities where we have a competitive advantage.
We achieve continuing growth through superior customer service, outstanding quality and innovation delivered through the excellence and commitment of our people.
We engage in sustainable profitable business in the communities we serve, which is rewarding and challenging for employees and other stakeholders.

Group Mission

The vision statement defines the Company's purpose, in terms of its values.
Values are guiding beliefs about how things should be done.
The vision statement communicates both the purpose and values of Bord na Móna.
For employees, it gives direction about how they are expected to behave and inspires them to give their best. Shared with customers, it shapes the customers' understanding of why they should work with Bord na Móna.

Bord na Móna will seek solutions that optimise the creative energy and potential of the organisation, driven by long term goals and the organisation's vision and mission.
In this context our devolved business units will align their vision and strategic planning with the global direction provided.

Consistent with our vision, innovation will once again return to the core of everything we do. We will capitalise on opportunities to cross fertilise our unique range of skills and technologies that add value and are socially and environmentally sustainable.
Greater focus will be placed on managing and developing our land assets in a responsible and sustainable manner. Our award winning initiatives at Lough Boora (Co. Offaly) and Oweninny (Co Mayo), provide shining examples of what can be achieved

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Section 1.

1.1 Introduction

The following is the Annual Environmental Report for the Clonbullogue Ash Repository, located at Cloncreen, Clonbullogue, Co Offaly. It covers the period from 1st Jan 2011 to 31st December 2011.

1.1.1. Environmental Policy

BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

Environmental Policy Statement

Bord Na Mona Energy Limited is a commercial semi-state body with responsibility to develop Ireland's peat resources in the national interest.
Bord Na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and of the importance of Irish peatlands.

Bord Na Mona Energy Limited recognises the importance of peatland conservation.
Bord Na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of high environmental value.
Bord Na Mona Energy Limited seeks to conduct all aspects of its business in an environmentally sensitive manner.

Bord Na Mona Energy Limited operates an environmental management system specifically addressing the following impacts:

- Discharges to water
- Emissions to atmosphere
- Waste disposal
- Use of natural resources
- Noise, vibration, odour, dust and visual effects
- Natural environmental and eco-system

The environmental management system will be monitored, maintained and continually improved.
A system of regular environmental audits will be put in place.
Bord Na Mona Energy Limited will continue research and development (R&D) into all aspects of its environmental impact.
This statement is published and is available at all locations within the section and its contents are brought to the attention of all employees.

1.2 Site Description

The Clonbullogue Ash Repository is located approximately 8 km South West of the Town of Edenderry and 2 km North West of Clonbullogue village. The facility is located approximately 0.75 km from the Clonbullogue to Daingean road (third class road which links the Edenderry to Tullamore Regional Road – R402). It is located on Cloncreen bog, a cut-away peatland area within the Allen Group of Bogs. The Northern, Western and Eastern sides of the landfill are bounded by raised and/or cut-away peatlands, while the Southern side is bounded by a tree line, which is subsequently bound by pastural land.

Topographically, the Allen Group of Bogs consists of raised bogs of the Central Lowlands which have been extensively harvested by mechanised cutting. Drainage ditches evacuated in the surrounding peatlands by Bord na Mona are orientated in an East – West axis and essentially divert any seepage or drainage water from the peatlands. Drainage from the site is along a West – East drainage ditch which discharges ultimately to the Figile River. The geology of the Cloncreen site is dominated by the Upper Palaeozoic Lower Carboniferous Allenwood formation (Edenderry Limestone).

1.3 Waste Activities carried out at the Clonbullogue Ash Facility.

The functional element of the Bord na Mona Energy Ltd, Clonbullogue Ash Repository is to dispose of inert waste products (fly ash and bottom ash), arising from peat combustion within the boiler of the Edenderry Power Ltd., Peat Fired Power Station.
Further to this, Bord na Mona was successful in 2006, in a review process of the facility licence. This review was carried out as a result of Edenderry Power Ltd gaining permission to co-fuel peat with biomass and or meat and bonemeal.
The main aspect of the review was to allow a change in the type of ash that could be accepted because the previous licence only allowed for the acceptance of peat ash.
During 2011 there was 121,030 tonnes of biomass co fuelled in the station. This produced approximately 605,150 tonnes of biomass ash, which was transported to the repository and deposited in cell 3 B.

The relevant waste disposal and waste recovery activities, as per the Third and Fourth Schedules of the Waste Management Act 1996 to which this activity applies are:

Third Schedule – Waste Disposal Activities:

Activities on the site can be categorised as “deposit on, in or under land”

Fourth Schedule – waste Recovery Activities:

No activities as defined by the Fourth Schedule of the Waste Management Act 1996 will take place on-site.

Section 2: Environmental Data

2.1 Waste Quantity & Composition

Quantity

During the reporting period (1st Jan 2011 to 31st December 2011) a total of 5,475 tonnes of Bottom Ash and 29,188 tonnes of Fly Ash were disposed of in the Ash Repository.
This gives a total of 34,663 tonnes for the period.
Domestic waste on site extended to a wheelie bin which is emptied on a fortnightly basis and extended to approximately 905 kg for the year.

Composition

Bottom Ash & Fly Ash Composition – Mineralogy: Furnace bottom ash is a solid, coarse grained, granular ash. White fly ash is lighter and fine grained and accounts for – 80% of the ash produced from peat combustion. Compositional analysis of the fly ash indicates the presence of a large quantity of inerts which are calcium, magnesium, iron, silica and sulphur based (Calcite – $CaCCO_3$, Hydrated Lime – $Ca(OH)_2$, Quartz – SiO_2 Brucite – $Mg(OH)_2$ and Magnesium Carbonate $MgCO_3$, are typically the main phases present) and trace amounts of heavy metals (Zn, Cu, Pb, B Ni, V Mo, Cr, As, Sr).

Bottom Ash & Fly Ash Leachate Composition: In general, the chemical quality (BOD, COD, Phosphorous – P, NH_3 – N, NO_3 – N) of the leachate associated with the fly and bottom ash samples are good. The leachate generated from peat fly ash, dominated by admixed and surface adsorbed alkali and alkaline salts, is slightly acidic due to the dissolution of the absorbed SO_2 onto the surface of dissolved organic salts. However, thereafter, the solution becomes quickly alkaline due to the hydrolysis of CaO flecks and the dissolution of $Ca(OH)_2$. A significantly elevated pH is, therefore noted for both leachate samples. Only trace amounts of heavy metals (As, Sn, Hg, Cr, Zn, Cd, Pb, Co, Ni, Fe, B, Cu, Al, Ba) were detected in both leachate samples.

2.2 Remaining Capacity at Ash Site

At present the facility has just completed its eleventh year of operation. At current ash volumes being accepted at the facility and experiences to date in cells 1, 2 and 3, it is estimated that the remaining capacity for peat ash is approximately 777,203 tonnes, to be deposited in five future cells.
Under current conditions cell 3 B is expected to receive approximately three more months of ash.

2.3 Emission Data

2.3.1 Pollution Emission Register Report

There are no materials used in the operation of this facility which come within the remit of the pollution emission register.

2.3.2 Pollution Emission Register Proposal

Should operations at the facility require the use of materials on the pollution emission register, a report on such materials will be included in future AER's.

2.3.3 Dust

Dust monitoring was carried out between April and September 2011. Monitoring took place at four locations: DM01, DM02, DM03 and DM04. The Bergerhoff method of collection was used. During the period the dust monitoring was compliant and no complaints of a dust nuisance were received. Dust suppression was deployed as required during the reporting period. Suppression was carried out using a tractor drawn water bauser, which wetted down the surface area of exposed ash. There were no non-compliances in relation to dust during the reporting period. Dust monitoring will be carried out at the same locations in 2012.
The results of dust monitoring are attached in Appendix 1.

2.3.4 Noise

Noise monitoring is no longer scheduled as a parameter of the Licence monitoring regime, unless requested by the Agency.

2.3.5 Ground Water

Groundwater monitoring took place on a monthly basis, at bore wells MW02 – MW11. As was the case in 2010, due to cell development works, MW04 has become redundant. Wells MW08 – MW11 are bedrock wells, with 8 and 10 being up gradient and 9 and 11 down gradient. The remaining wells are overburden and only extend into the overburden peat.
Appendix 2 contains graphs of monitoring results.

Comment:

In general ground water quality at the facility showed no great variation during the period. Elevated **ammonia** at MW2, MW3, MW5 & MW6 can be expected as these are overburden wells located in peat. These four wells are located up gradient of the facility. Ammonia at the four bed rock wells was below I/PV of 4 mg/l.
Conductivity at the four bedrock wells was consistently below 1000 µS/cm, with only slightly elevated results in the overburden well MW-03. The highest being 1027 µS/cm which is up gradient of the facility and representative of background levels. Although elevated in comparison with other groundwater monitoring locations, results were still within the I/PV of 2500 mg/l,- Drinking Water Directive.

pH values at all wells have been satisfactory, with the more acidic overburden wells giving expected slightly lower pH values. The pH values ranged from 6.5 to 7.8 pH units during the reporting period. In general pH values have been consistent since sampling began.

Sulphate results were elevated at MW03 as was the case in 2010. As mentioned above this is an overburden well up gradient of the facility. However the highest recorded result of 164 mg/l is still within the I/PV of 250 mg/l,- Drinking Water Directive.

Ground water **levels** have remained constant, with an expected season dip occurring in July. Following representations from the Agency all results are now demonstrated in tabular form with graphs showing trends from 2008 to 2011 also attached.
The tables and graphs are attached in appendix 2

2.3.6 **Surfacewaters**

Surface water monitoring took place on a quarterly basis with visual inspections carried out weekly. The monitoring locations were at SW4, SW5, SW6, SW7 and SW8.
SW4 is immediately downstream of the leachate lagoon outlet L2, SW8 is half way to the confluence of the East / West drain with the river and SW7 is at the confluence. SW5 and SW6 are up and down stream of the confluence respectively.

Comment:

Due to leachate dilution and discharge, **pH** levels are slightly elevated at SW4, although still within emission limit values. The graph clearly demonstrates that this had no adverse effect on pH immediately downstream at SW 8 or indeed at SW7 and SW6. Additional monitoring at SW4 also took place during discharge events from the leachate lagoon at L2 the results of which were fully compliant and retained on file at the site office.

Suspended solids with the exception of SW5 and SW6 remained within emission limit values during the monitoring period. The two elevated results recorded upstream and downstream of the East/West drains confluence with the Figile river it is believed can be attributed to levels in the river and not to any discharges from the facility as during the same monitoring event suspended solids at SW4, SW8 and SW7 were all 5mg/l.

Ammonia results were all below the I/PV of 4mg/l for A3 Waters. Results were of the range 0.57 mg/l and 0.13 mg/l.

COD results, with the exception, of SW5 and SW6 remained within Bord na Mona set trigger levels of 100 mg/l. The I/PV is 40 mg/l for A3 Waters. Similarly to the suspended solids situation the two elevated results recorded upstream and downstream of the East/West drains confluence with the Figile river it is believed can be attributed to levels in the river and not to any discharges from the facility as during the same monitoring event COD at SW4, SW8 and SW7 were 25mg/l, 28mg/l and 46mg/l respectively.

Following representations from the Agency all results are now demonstrated in tabular form with graphs showing trends from 2008 to 2011 also attached.
The tables and graphs are attached in appendix 2

2.3.7 **Discharges To Surfacewater**

Discharge to surfacewater monitoring took place at SWR1. This is located at the exit to the surface water runoff silt settlement pond and the frequency was quarterly.

Comment:

As is evident from the graph attached, **pH** values have remained constant, with all results being within the emission limit values of 6 – 10 pH units.

COD results were below Bord na Mona set trigger levels of 100 mg/l and showed a marked reduction during the reporting period to previous years.

Ammonia results were all below the I/PV of 4mg/l for A3 Waters and again showed a marked reduction during the reporting period.

Suspended Solid results we all within the emission limit value of 35 mg/l.

Following representations from the Agency all results are now demonstrated in tabular form with graphs showing trends from 2008 to 2011 also attached.
The tables and graphs are attached in appendix 2

2.3.8 **Leachate**

Leachate monitoring took place at the sumps, LC1A, LC2A , LC3A and LC3B. Monitoring also took place at the leachate lagoon L1. The monitoring frequency was bi-annual. All locations are afforded the protection of a 2mm thick high density polyethylene lining system.

Comment:

As is normal, all parameters were elevated at each of the monitoring locations. LC1A, LC2A, LC3A and LC3B, which are located within fully lined cells and are contained. A similar situation pertains to L1, which is a fully lined Lagoon and is also designed for total containment. However, the management of leachate at the site again proved difficult due to the limits on leachate discharge rates. Additional capping does appear to have reduced the ingress of surface water into the body of the waste, however further investigations as to how best to further reduce the ingress commenced in 2011. In addition to this a proposal was submitted to the Agency to insert a network of land drainage pipes into the body of the capping material in cells 1 and 2. This it is believed will further reduce the ingress of surface water into the body of ash, thus reducing the amounts of leachate generated in the sumps LC1A and LC2A. Should this prove successful the possibility of carrying out the same exercise in future cells will be considered. Bord na Mona Innovation are also looking at the leachate to establish the full extent of its properties and possible alternative leachate treatments.

2.3.9 **Leachate Discharge:**

Leachate discharge monitoring took place at L2. This is the outlet point of the leachate lagoon and the monitoring frequency was quarterly.

Comment:

COD values were below Bord na Mona set trigger levels of 100 mg/l. With the exception of one peak of 80 mg/l results showed a downward trend on previous years.
Ammonia also showed a decrease over the period, with results well below the I/PV of 4mg/l for A3 Waters. Results were of the range 0.02 mg/l and 0.97 mg/l.

Conductivity remained constant over the five monitoring events with all results below 1000 µS/cm.

pH values ranged from 8.4 to 9.4 pH units. This has remained constant over the past two reporting periods.

Suspended Solids have also been consistent over the past two reporting periods with results being below 20 mg/l.

Dissolved Oxygen % showed a downward trend over the period while **Dissolved Oxygen mg/l** appeared to be constant during monitoring events.

Outside of the scheduled leachate discharge monitoring, additional leachate discharge monitoring also took place during all discharge events as per the Leachate Management Plan.
This monitoring took place both before and during each leachate discharge event from L2.
During these discharge events, all emission limit values had to be satisfied prior to any discharge.
The estimated total volume of leachate generated was approximately 4,400 m^3 which following dilution resulted in a discharged volume of 31,815 m^3 of treated effluent.
The results of additional discharge monitoring are retained on file at the site office.

Following representations from the Agency all results are now demonstrated in tabular form with graphs showing trends from 2008 to 2011 also attached.

The tables and graphs are attached in appendix 2

Monitoring Locations are attached in appendix 3

2.3.10 **Meteorology**

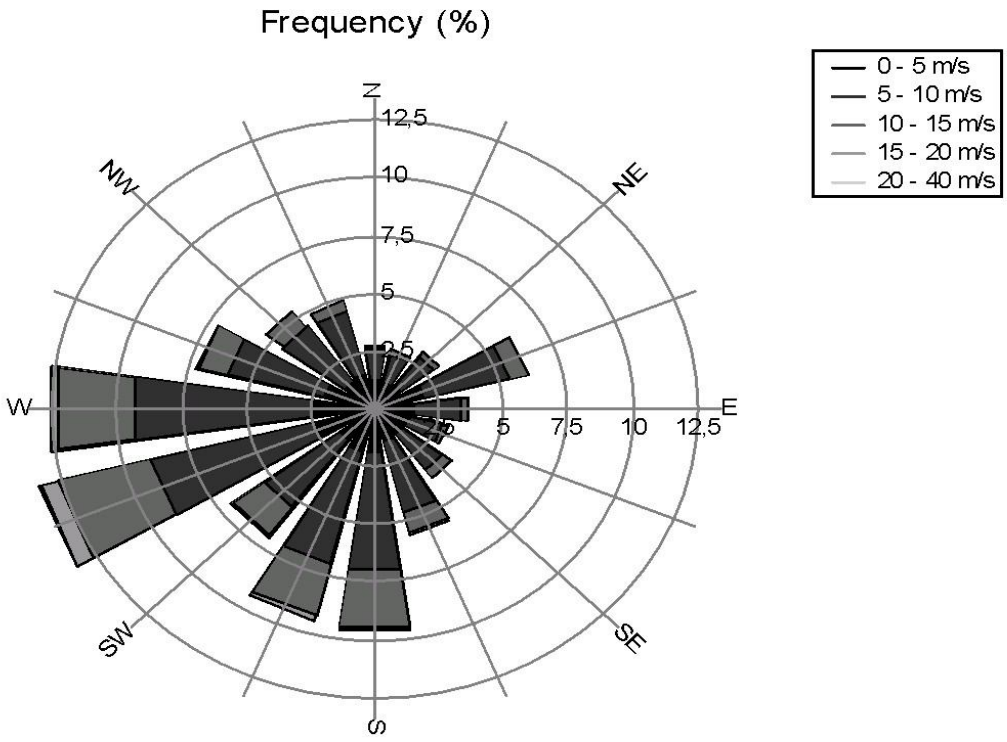
Meteorological data was gathered from the Agency agreed weather station at Derrygreenagh Works, 10 km from the facility. October proved to be the wettest month, with 123.5mm of rainfall recorded and March proved to be the driest, with 29.4mm.
Below is a table containing all the gathered met data for 2011.

MONTHLY VALUES OF ELEMENTS AT MIDLAND SITES IN 2011

		air temperature		MSL	CBL	
	rainfall	mean max.	mean min.	mean pressure	mean pressure	mean R.H.
January	61	6.323	-0.326	1017.802	1005.172	91.125
February	116.4	10.268	2.325	1008.357	996.006	91.442
March	29.4	11.732	1.329	1021.269	1008.736	85.047
April	32.8	16.643	5.283	1018.351	1006.057	80.49
May	53.9	15.51	7.61	1013.909	1001.672	80
June	71	17.593	7.753	1013.686	1001.5	83.401
July	70.7	18.923	10.829	1013.064	1000.982	83.228
August	49.9	18.413	9.732	1012.001	999.89	82.95
September	86.6	17.28	10.39	1007.914	995.849	84.886
October	123.5	14.806	8.271	1012.14	999.941	88.856
November	97.6	12.72	5.327	1010.657	998.387	88.028
December	91.2	8.419	2.584	1008.578	996.166	88.417
	mm.	degrees Celsius		hectoPascals		%

Rainfall and temperature from Derrygreenagh
Pressure and humidity from Mullingar
MSL: corrected to mean sea level
CBL: barometer level

Wind Atlas for the Cloncreen Area



Comment:

A wind-rose for the period was unavailable for inclusion in this report. The image above is generated from a wind atlas of Ireland and is representative of the Cloncreen area. It is not directly based on any measurements; rather it is based on a predictive model of the wind regime for the country, which has been checked against actual data when its accuracy was being assessed.

2.4 Energy Consumption

Machine Type	Consumption Litres/Week	Annual Consumption Megawatt/ Hours	Annual Consumption Litres
Locomotive	600	305.52	31200
Frontend Loader	954	485.78	49608
Tractor	272	138.50	14144
Bulldozer	480	244.42	24960
Excavator	480	244.42	24960
Diesel Pump	50	25.46	2600
Totals	**2836**	**1444.10**	**147472**

Diesel is used in the every day operation, of ash transportation, placement and dust suppression. It is envisaged that these figures will remain constant as long as there isn't a change in the plant used at the facility. The electricity usage at the facility extends to approximately 1300 kwh/year.

2.4.1 **Energy Efficiency Audit Report**

An energy efficiency audit was carried out at the facility in 2007. As operations at the facility and the ash transportation and placement equipment are unchanged, all aspects of energy efficiency remain the same. Should there be a change in operations, the most efficient means of carrying out such operations will be reassessed and included in future AER's.

2.5 Environmental Expenditure.

Environmental Expenditure 2011	
Description	**Cost €**
Operating Costs	
Material	€12,472
Wages	€167,286
Cell development costs	€0
Monitoring Costs	
Analysis & Reports	€16,851
EPA Contribution	
Fee Payable to EPA	€12,280
Total	**€208,889**

2.6 Environmental Incidents & Complaints.

Environmental Incidents 2011	
Licence: W0049-02	
Works: Clonbullogue Ash Repository	
	Number
Incidents	1
Requiring corrective action	1
Category	
Water	1
Air	
Procedural	
Miscellaneous	
Total	**1**

Note: The above incident is in relation to the leachate levels in the sumps LC1A and LC2A being above 1 meter and therefore non-compliant. The Agency was informed of this ongoing problem which is currently being addressed as mentioned in the Leachate section above.

Environmental Complaints 2011		
Licence:W0049-02		
Works: Clonbullogue Ash Repository		
		Number
Complaints		0
Requiring corrective action		0
Category		
Water		
Air		
Procedural		
Miscellaneous		
	Total	0

Note: No complaints of an environmental nature were received during the reporting period.

Section 3: Environmental Management

3.1 Management & Staffing Structure

Environmental Management System
Management Structure (Condition 2.6)
Management Structure (including Environmental Emergency Response Team)

Resource Manager (1)

(Resource Assistant) (2)
Transport / Quality Manager **Environmental Co-ordinator (3)**

(1) Overall responsibility rests with the Resource Manager.
(2) Day to Day Transport Management (Based at the Power Station Office)
(3) Site Management, Monitoring, Records, Reports and Inspections

Position	*Duties & Responsibilities*	*Experience/Qualifications*
Resource Manager	Overall responsibility for the ongoing management of the site and maintenance of the waste licence. Delegation of authority and responsibility to ensure the effective management of the facility.	Resource Manager since 2007 Previously held other management positions. With Bord na Mona since 1977.
Resource Assistant Transport / Quality Manager	Responsibility for the transportation of ash to the facility as directed by the Resource Manager. The transport manager is based at the Power Station for the majority of the time.	Quality Manager, Derrygreenagh Works for 22 years with responsibility for transport of peat / ash and peat quality.
Environmental Co-Coordinator	Responsibility for the day to day implementation of routine compliance monitoring, maintenance of all environmental records and the environmental file and preparation of environmental reports as directed by the Resource Manager.	Environmental Co-ordinator Derrygreenagh for 5½ years. Previous experience as a supervisor in Bord na Mona for 5 years. Holder of National Skills Cert- Waste Management.

3.2 Raw Material / Waste Management Efficiency

The only raw materials used on site are those used in the construction of cell embankments as they are required.

3.3 Water Demand / Trade Effluent Management

The only water used on site is collected surface water runoff which is used in the management of leachate and dust suppression.
There is no domestic water connection at the facility.
Leachate quantities are being reduced by the placement of additional capping as per project 4 of the Environmental Management Programme.

3.4 Site Development Works.

3.4.1 Development Works Undertaken during the Reporting period

Cell 4 Floor Formation.

The cell floor was developed during 2010 to the specification set out in the licence review application documentation as submitted to the Agency.

Cell 4 Embankments

The placement of cell embankment material was 98% completed during 2011 to the specification outlined and submitted to the Agency.

Capping.

No capping took place during the reporting period however some additional capping material was stockpiled on cell 2 in preparation for capping works in cell 3.

3.4.2 Proposed Development Works for 2012

It is proposed to continue with the development of cell 4. Works will include the completion of the cells embankments. Following this lining works will commence to allow for the placement of ash in that cell. The Agency will be informed nearer the time. Capping will also commence on a portion of cell 3.

3.5 Restoration of Completed Cells/Phases

An ecological survey of the capped cell 1 and cell 2 was carried out by Bord na Mona's ecology department, the findings of which are attached in appendix 4.

3.5.1 Topographical Survey

Site Survey
A site survey was carried out in early 2009. This survey formed part of the Specified Engineering Works proposal sent to the Agency in relation to the lining of the remaining half of cell 3.
A follow up topographical survey was carried at the site the results of which were attached in the 2010 AER. It is proposed to carry out another survey at the site on completion of the lining works at cell 4 and the completion of cell3.

3.6 Achievement of Objectives & Targets 2011

Project	Description & Status
Project 1: **Conduct all operations on site in accordance with the schedules and conditions of the waste licence and also in conjunction with the restoration and aftercare programme**	Achieved. All operations on site were carried out in accordance with the schedules and conditions of the waste licence and also in conjunction with the Restoration & Aftercare programme.
Project 2: **Future cell development**	Achieved The embankments of cell 4 were 98% constructed to the required specification.
Project 3: **Seed the remainder of capped cell 2**	Not Achieved This work was delayed due to the ongoing issues of trying to achieve compliance with leachate levels in the leachate sumps.
Project 4: **Leachate Management Plan**	Ongoing A concerted effort was made to address the ingress of surface water into the landfill body and subsequent generation of additional leachate. A plan was submitted to the Agency for approval which proposed the introduction of a network of drainage pipes into the caps of cell 1 and 2. In addition to this Bord Na Mona's research and development department are currently looking at alternative leachate management options.
Project 5: **Alternative Use**	Ongoing. As part of project 4, an alternative use for the ash is also being investigated.

Proposed Environmental Objectives & Targets for 2012

Project	Description & Status
Project 1: **Conduct all operations on site in accordance with the schedules and conditions of the waste licence and also in conjunction with the restoration and aftercare programme**	Continue to conduct all operations on site in accordance with the schedules and conditions of the waste licence and also in conjunction with the Restoration & Aftercare programme.
Project 2: **Future cell development**	Continue with the development of cell 4, works to include lining and rail access infrastructure.
Project 3: **Implement cap drainage proposal**	Install network of drainage pipes in the cap as per the Agency's specification.
Project 4: **Leachate Management Plan**	Continue with investigations into a more efficient leachate treatment system. Works to include analysis and dilution trials. In addition to this the leachate lagoon is scheduled for cleaning, with deposited material placed back in active cell 3B.
Project 5: **Alternative ash / leachate use**	Continue with research for alternative use's / re-use's of ash waste and leachate.

3.7 C.R.A.M.P. / E.L.R.A. Review

Under the current Bord Na Mona Energy Ltd, Cloncreen Waste Licence, the licencee is required to undertake an Environmental Liabilities Risk Assessment.
A Closure Restoration and Aftercare Management Plan has been detailed. Closure plan costing were evaluated for the Ash Repository resulting in a requirement of €503,820. Unknown liabilities were also assessed resulting in a further requirement of €91,620 – total required €595,440.

Financial Implications.
The capping of the final cell is budgeted to take place in 2026 at a cost of €73,700.
From 2027 it is planned to put in place a monitoring cost of €8,865 per annum for 20 years.
Also from 2027 there will be an annual spend of €12,426 in relation to EPA Waste Licence and a further annual spend €4,581 for 20 years in relation to unknown risks.

Financial Treatment

Annual inflation is assumed at 2.0% per annum from year 2011 and Bord Na Mona Energy cost of capital is assumed at 5.0% per annum.

3.8 Mass Balance of Construction Material

Cell embankments were constructed to approximately 98% of final finished profile. The material used was sourced from the material excavated in the formation of the cell floors with some additional material being sourced to the west of cell 4 on the footprint of cell 5.

3.9 Slope Stability Assessment Report

A follow up assessment of the slope stability markers was carried out the result of which are attached in appendix 5.

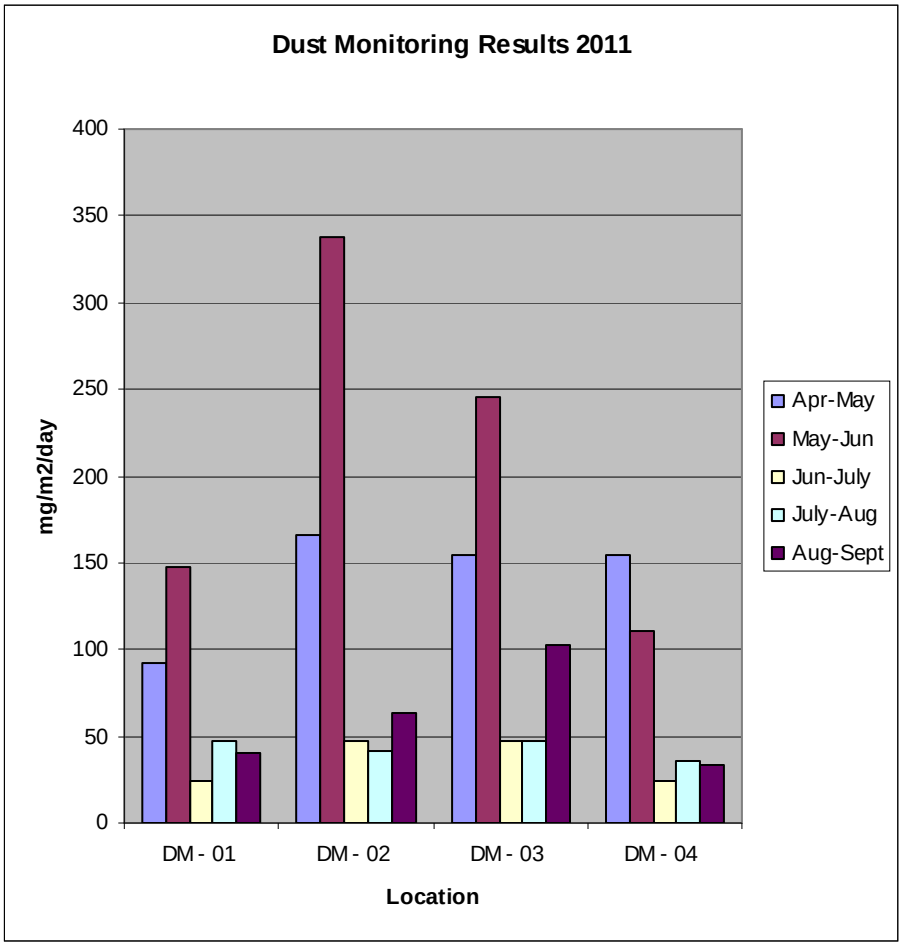
3.10 Programme for Public Information

The Bord na Mona Energy Ltd site office at the Power Station, is the main ash site office for keeping all the records associated with the ordinary day to day operation of the landfill and the Waste Licence. Documents kept here include the Annual Environmental Report, Environmental Management Programme, Schedule of Objectives and Targets, all Monitoring Data, ash tonnages and volumes, Emergency Response Procedure, Bord na Mona Energy LTD's, Environmental Policy. Any individual wishing to view these documents may call to the office during working hours.

Appendix 1

Dust Monitoring Results

Dust Monitoring Results 2011				
Sample Period	**DM - 01**	**DM - 02**	**DM - 03**	**DM - 04**
Apr-May	92	166	155	155
May-Jun	148	338	246	111
Jun-July	24	47	47	24
July-Aug	47	42	47	36
Aug-Sept	40	63	103	34



Note: Emission Limit Value = 350 mg/m²/day. There were no dust non-compliances or complaints of a dust nuisance during the reporting period.

Appendix 2

Water Monitoring Results

Ground Water

Monitoring Location: MW02													
Parameter	**Date**	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Groundwater level (m AOD)	**Monthly**	68.552	68.552	68.352	68.402	67.902	67.406	68.002	67.652	68.052	68.652	68.652	68.702
pH (pH units)	**Monthly**	7.5	7.4	7.2	7.5	7.3	7.3	7.4	7.4	7.4	7.4	7.8	7.3
Electrical Conductivity (µS/cm)	**Monthly**	722	627	656	664	666	660	687	690	725	673	680	664
Total Ammonia mg/l	**Monthly**	5.9	6	5.9	5.8	6	6	6.1	6.4	6.6	6.6	6.4	6.2
Sulphate(SO4) mg/l	**Monthly**	2.07	3.44	1.79	1.77	1.45	1.16	1.58	2	1.58	3.56	2.58	2.7

Monitoring Location: MW03													
Parameter	**Date**	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Groundwater level (m AOD)	**Monthly**	68.206	68.456	67.556	67.506	67.256	67.406	67.406	67.206	67.356	68.606	68.106	68.256
pH (pH units)	**Monthly**	6.9	7.3	6.7	6.8	6.5	6.8	6.8	6.7	6.9	7.3	7.5	7.4
Electrical Conductivity (µS/cm)	**Monthly**	917	542	985	1003	1024	1001	1009	1015	1027	639	846	602
Total Ammonia mg/l	**Monthly**	0.76	0.13	2.94	2.63	3.48	3.46	3.1	3.76	3.76	0.14	0.04	0.02
Sulphate(SO4) mg/l	**Monthly**	116.71	73.54	156.32	155.44	156.42	147.94	154.33	121.79	164.53	87.2	140.98	75.27

Monitoring Location: MW05													
Parameter	**Date**	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Groundwater level (m AOD)	**Monthly**	66.634	66.634	66.484	66.384	66.184	67.852	66.434	66.134	66.434	66.584	66.534	66.584
pH (pH units)	**Monthly**	7.1	7	6.8	7.1	6.9	7.1	7.1	7.1	7.1	7.2	7.5	7.2
Electrical Conductivity (µS/cm)	**Monthly**	723	643	672	671	694	650	609	641	605	578	573	564
Total Ammonia mg/l	**Monthly**	6.3	6	6.1	6	6.4	6.1	6	6.1	6	5.8	5.9	5.8
Sulphate(SO4) mg/l	**Monthl**	0.71	0.59	0.86	0.5	0.86	1.02	0.5	0.5	0.5	0.5	0.5	0.5

	y												

Monitoring Location: MW06													
Parameter	**Date**	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Groundwater level (m AOD)	**Monthly**	68.213	67.313	68.113	68.063	67.913	67.863	67.913	67.813	67.963	68.263	68.163	67.313
pH (pH units)	**Monthly**	6.9	7	6.7	6.9	6.8	6.8	6.8	6.7	6.8	7	7.3	6.7
Electrical Conductivity (µS/cm)	**Monthly**	560	530	543	548	548	657	688	678	611	577	618	639
Total Ammonia mg/l	**Monthly**	6.2	6.3	6.4	6.5	6.6	7.5	7.5	8	7.5	7.2	7.5	7.5
Sulphate(SO4) mg/l	**Monthly**	0.5	0.5	0.5	10.72	0.5	0.5	0.5	0.5	0.5	0.77	0.81	1.29

Monitoring Location: MW07													
Parameter	**Date**	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Groundwater level (m AOD)	**Monthly**	66.266	66.466	67.166	66.616	66.966	66.066	67.016	66.516	66.716	67.116	66.666	67.266
pH (pH units)	**Monthly**	6.8	6.9	6.7	6.8	6.7	6.8	6.8	6.8	7	7	7.3	6.7
Electrical Conductivity (µS/cm)	**Monthly**	862	740	732	751	786	760	845	772	790	818	781	750
Total Ammonia mg/l	**Monthly**	1.89	1.72	1.88	1.83	2.2	2.2	2.73	2.34	2.38	1.8	2.05	1.69
Sulphate(SO4) mg/l	**Monthly**	133.59	14.86	10.25	7.57	4.07	5.44	0.99	2.18	1.18	22.13	9.5	17.09

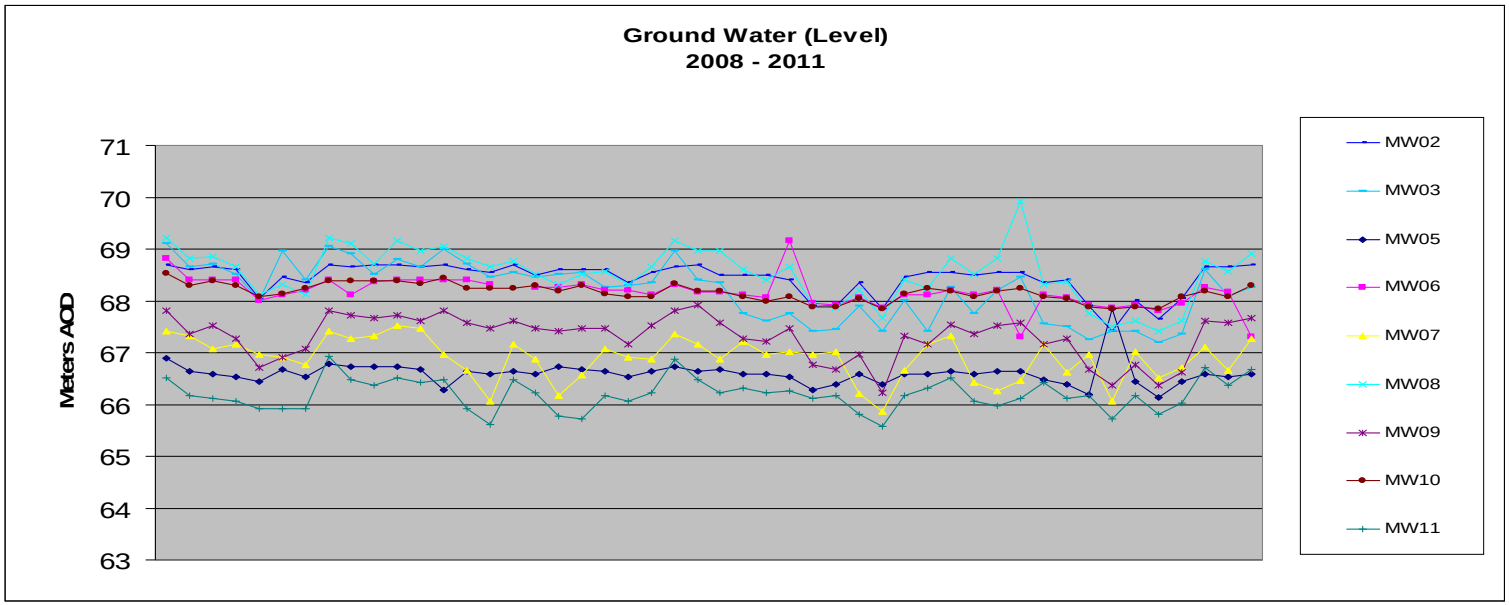
Monitoring Location: MW08													
Parameter	**Date**	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Groundwater level (m AOD)	**Monthly**	68.812	69.912	68.312	68.362	67.762	67.512	67.612	67.412	67.612	68.762	68.562	68.912
pH (pH units)	**Monthly**	6.8	6.9	6.8	6.9	6.7	6.9	7	7.1	7.1	6.7	7.2	6.8
Electrical Conductivity (µS/cm)	**Monthly**	836	780	779	797	838	803	812	826	833	868	868	849

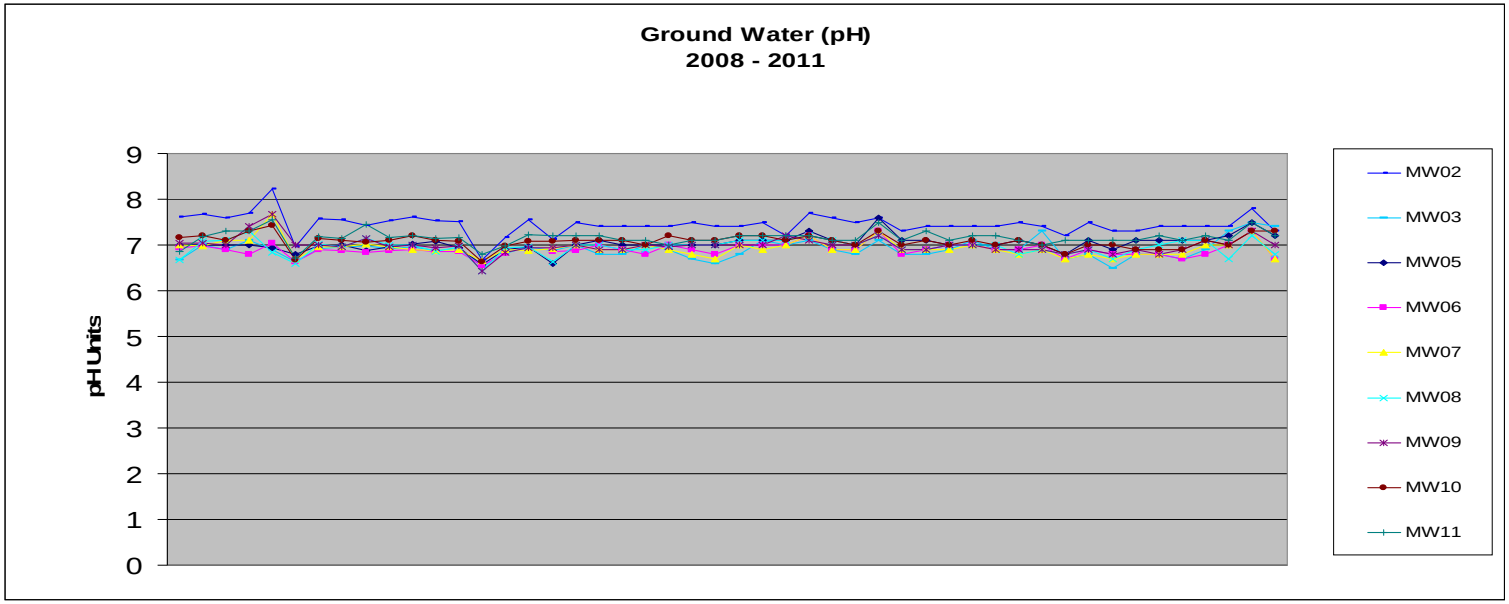
Total Ammonia mg/l	**Monthly**	0.64	0.49	1.42	1.56	1.86	3.18	3.17	3.6	3.65	2.02	2.18	1.1
Sulphate(SO4) mg/l	**Monthly**	75.53	93.19	70.44	69.21	69.42	52.54	52.69	44.96	43.75	76.37	66.94	88.88

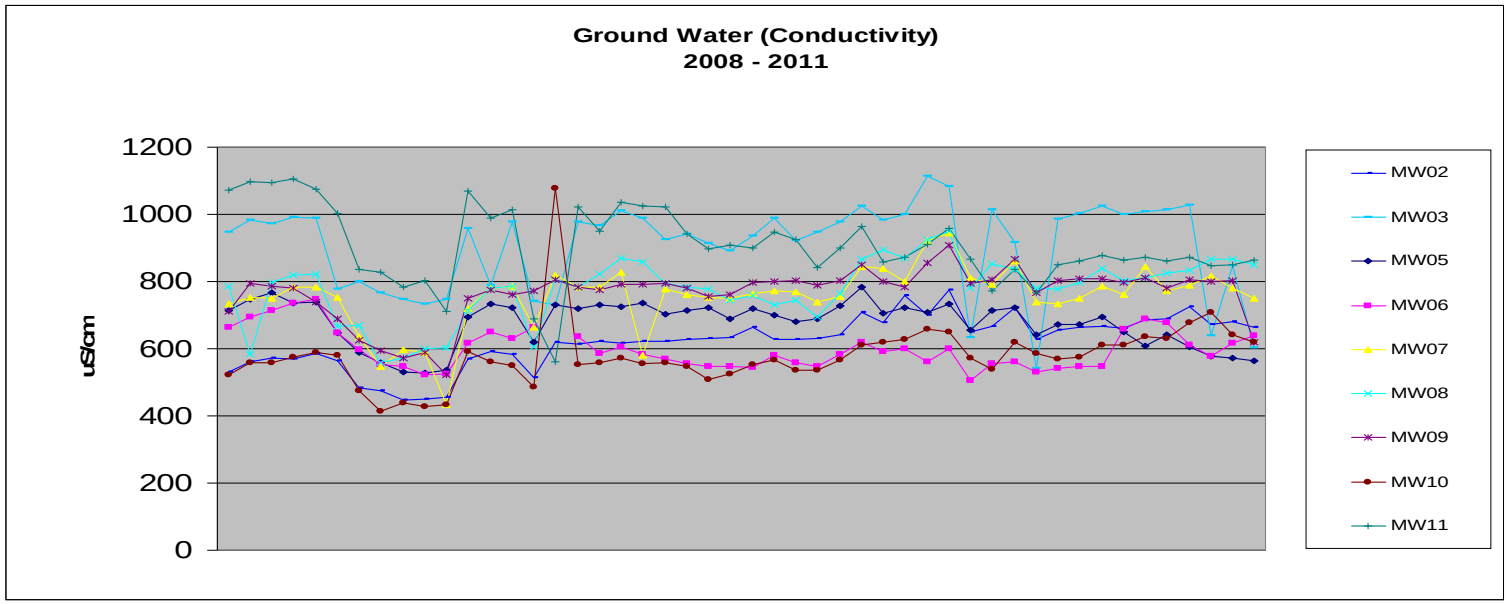
Monitoring Location: MW09													
Parameter	**Date**	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Groundwater level (m AOD)	**Monthly**	67.518	67.568	67.168	67.268	66.668	66.368	66.768	66.368	66.618	67.618	67.568	67.668
pH (pH units)	**Monthly**	6.9	6.9	6.8	6.9	6.8	6.9	6.8	6.9	7.1	7	7.3	7
Electrical Conductivity(µS/cm)	**Monthly**	868	768	803	809	809	796	811	781	806	799	804	619
Total Ammonia mg/l	**Monthly**	2.22	2.52	2.26	2.18	2.42	2.59	2.42	2.62	2.42	2.28	2.12	1.18
Sulphate(SO4) mg/l	**Monthly**	14.11	9.57	14.9	15.07	11.86	11.71	13.74	10.59	13.45	15.96	14.37	8.84

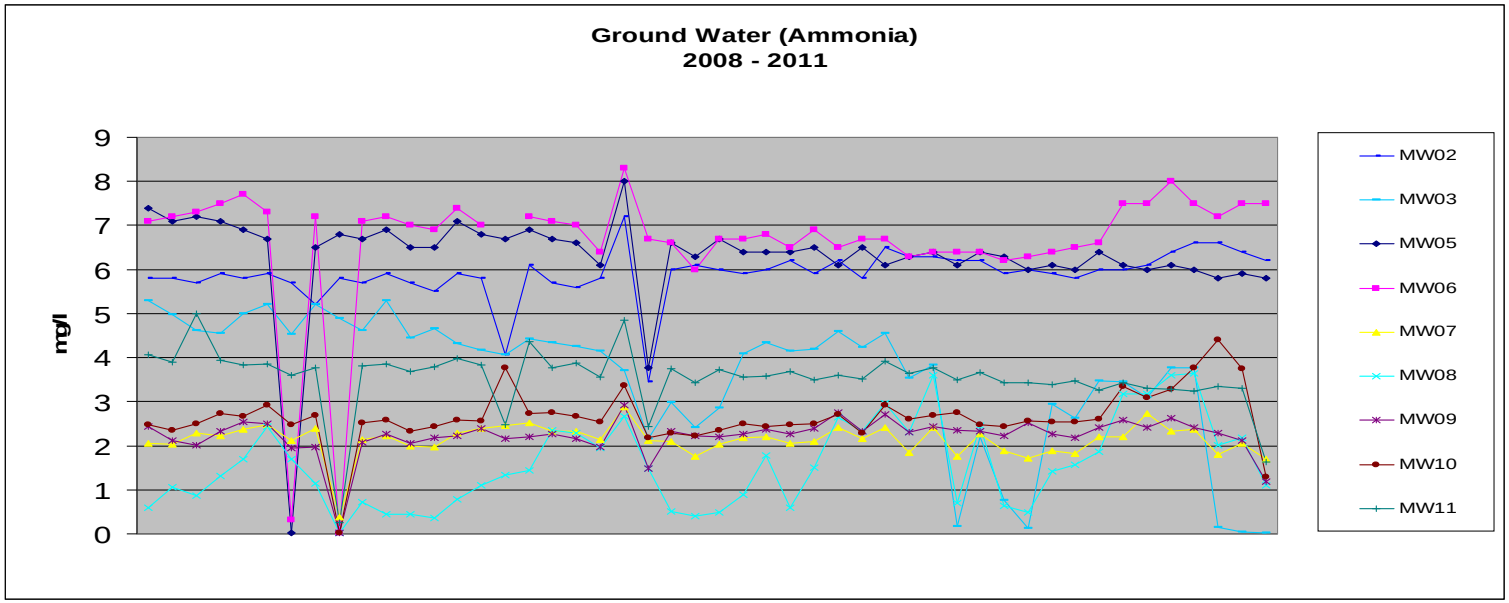
Monitoring Location: MW10													
Parameter	**Date**	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Groundwater level (m AOD)	**Monthly**	68.19	68.24	68.09	68.04	67.89	67.84	67.89	67.84	68.09	68.19	68.09	68.29
pH (pH units)	**Monthly**	7.1	7	6.8	7	7	6.9	6.9	6.9	7.1	7	7.3	7.3
Electrical Conductivity (µS/cm)	**Monthly**	619	587	570	575	610	610	636	630	679	709	642	619
Total Ammonia mg/l	**Monthly**	2.44	2.56	2.54	2.55	2.6	3.34	3.1	3.28	3.78	4.4	3.74	1.29
Sulphate(SO4) mg/l	**Monthly**	0.5	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

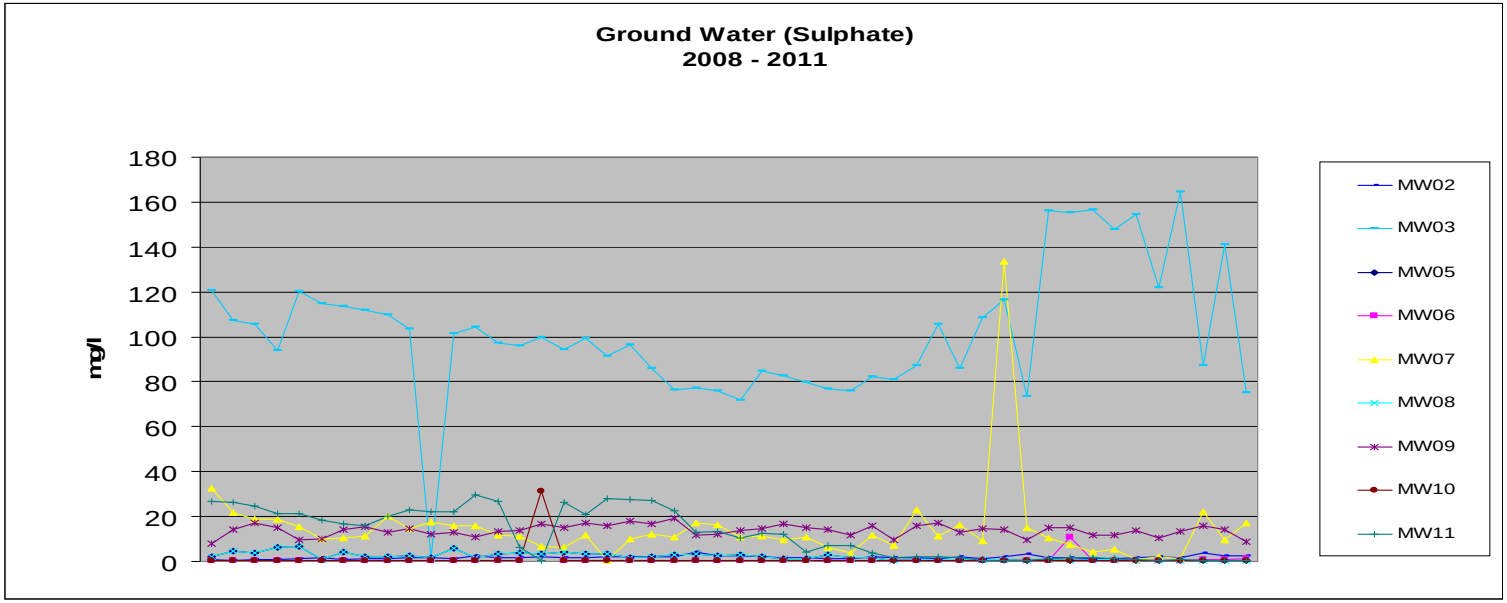
Monitoring Location: MW11													
Parameter	**Date**	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Groundwater level (m AOD)	**Monthly**	65.969	66.119	66.419	66.119	66.169	65.719	66.169	65.819	66.019	66.719	66.37	66.669
pH (pH units)	**Monthly**	7.1	7	7.1	7.1	7.1	7.1	7.2	7.1	7.2	7.1	7.5	7.2
Electrical Conductivity (µS/cm)	**Monthly**	836	768	850	862	877	864	871	861	872	846	850	864
Total Ammonia mg/l	**Monthly**	3.43	3.44	3.39	3.47	3.26	3.44	3.3	3.28	3.25	3.34	3.3	1.64
sulphate(SO4) mg/l	**Monthly**	0.5	0.5	1.21	1.69	1.66	1.08	0.98	0.5	0.64	0.5	0.5	0.5


Ground Water (Level)
2008 - 2011
Meters AOD
71
70
69
68
67
66
65
64
63
MW02
MW03
MW05
MW06
MW07
MW08
MW09
MW10
MW11


Ground Water (pH)
2008 - 2011
pH Units
9
8
7
6
5
4
3
2
1
0
MW02
MW03
MW05
MW06
MW07
MW08
MW09
MW10
MW11


Ground Water (Conductivity)
2008 - 2011
uS/cm
1200
1000
800
600
400
200
0
MW02
MW03
MW05
MW06
MW07
MW08
MW09
MW10
MW11


Ground Water (Ammonia)
2008 - 2011
mg/l
9
8
7
6
5
4
3
2
1
0
MW02
MW03
MW05
MW06
MW07
MW08
MW09
MW10
MW11



SurfaceWater.

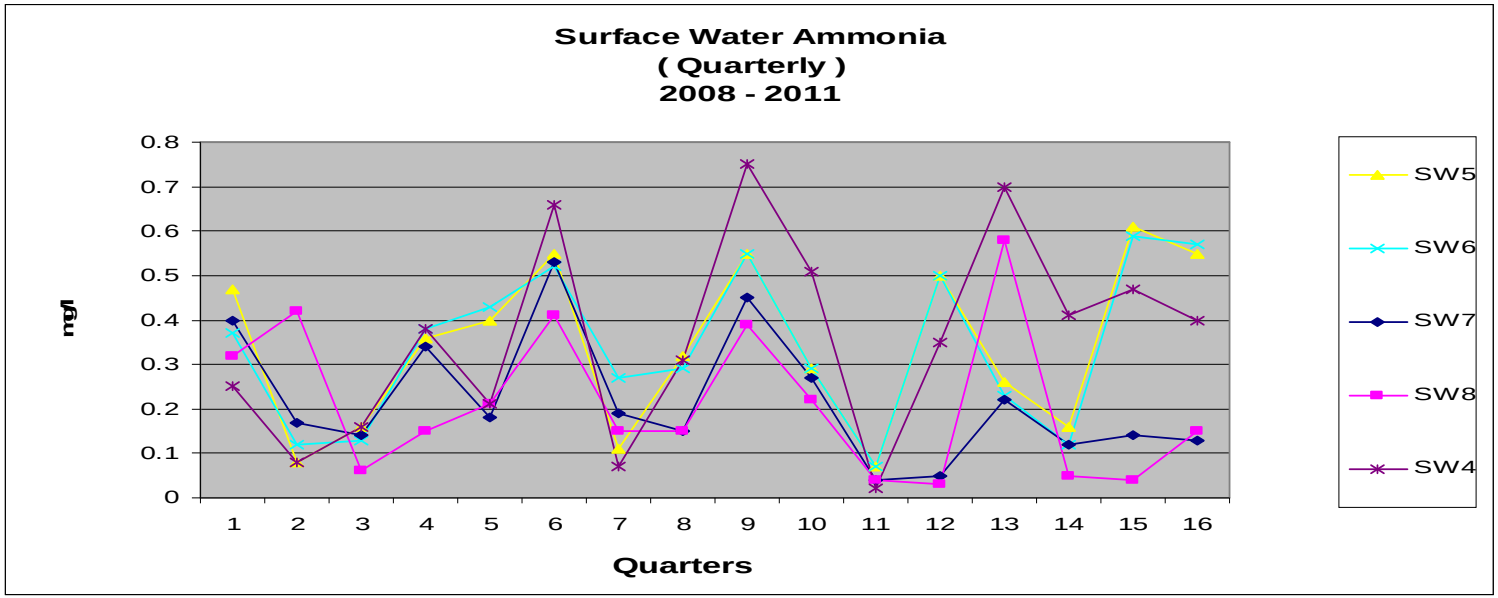
Monitoring Location: SW4					
Parameter	**Date**	24/02/2011	16/05/2011	18/07/2011	25/11/2011
Ammonia mg/l	**Quarterly**	0.7	0.41	0.47	0.4
COD (mg/l)	**Quarterly**	41	64	67	25
pH (pH units)	**Quarterly**	7.3	8.3	9.3	7.3
Total Suspended Solids (mg/l)	**Quarterly**	5	5	5	5

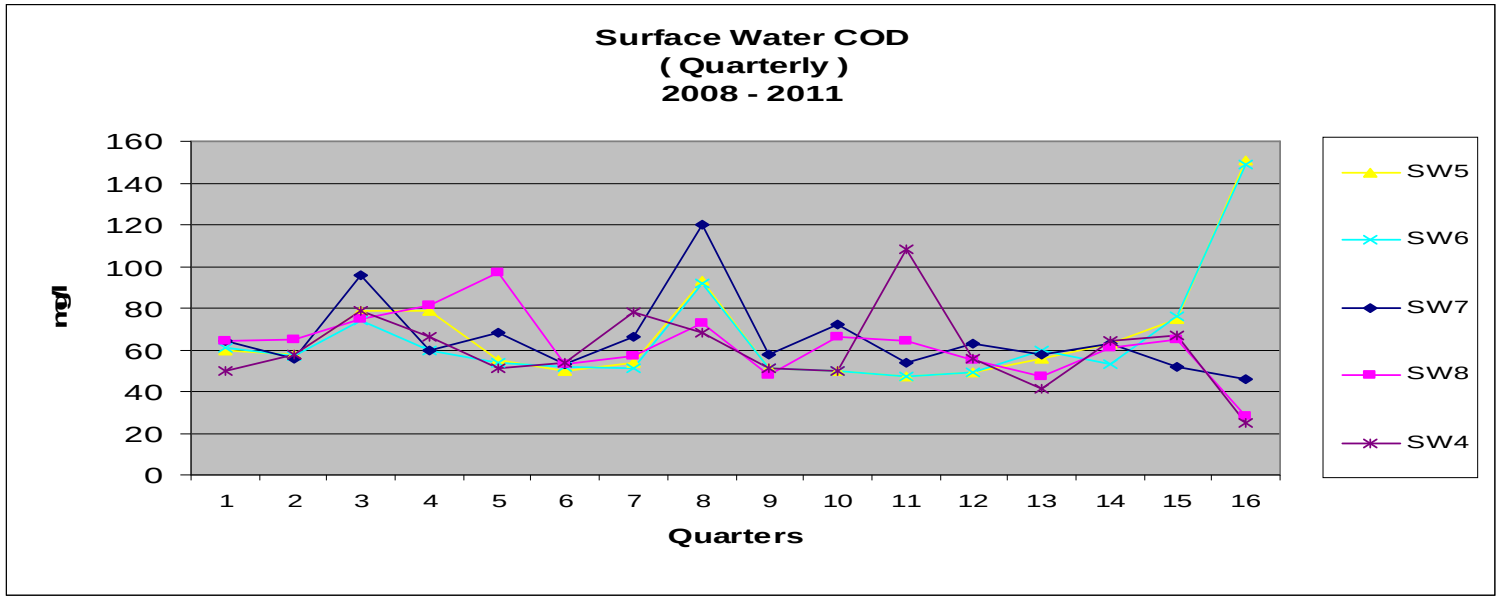
Monitoring Location: SW5					
Parameter	**Date**	28/02/2011	16/05/2011	18/07/2011	25/11/2011
Ammonia mg/l	**Quarterly**	0.26	0.16	0.61	0.55
COD (mg/l)	**Quarterly**	56	63	75	151
pH (pH units)	**Quarterly**	7.8	8.2	7.8	7.5
Total Suspended Solids (mg/l)	**Quarterly**	14	5	5	89

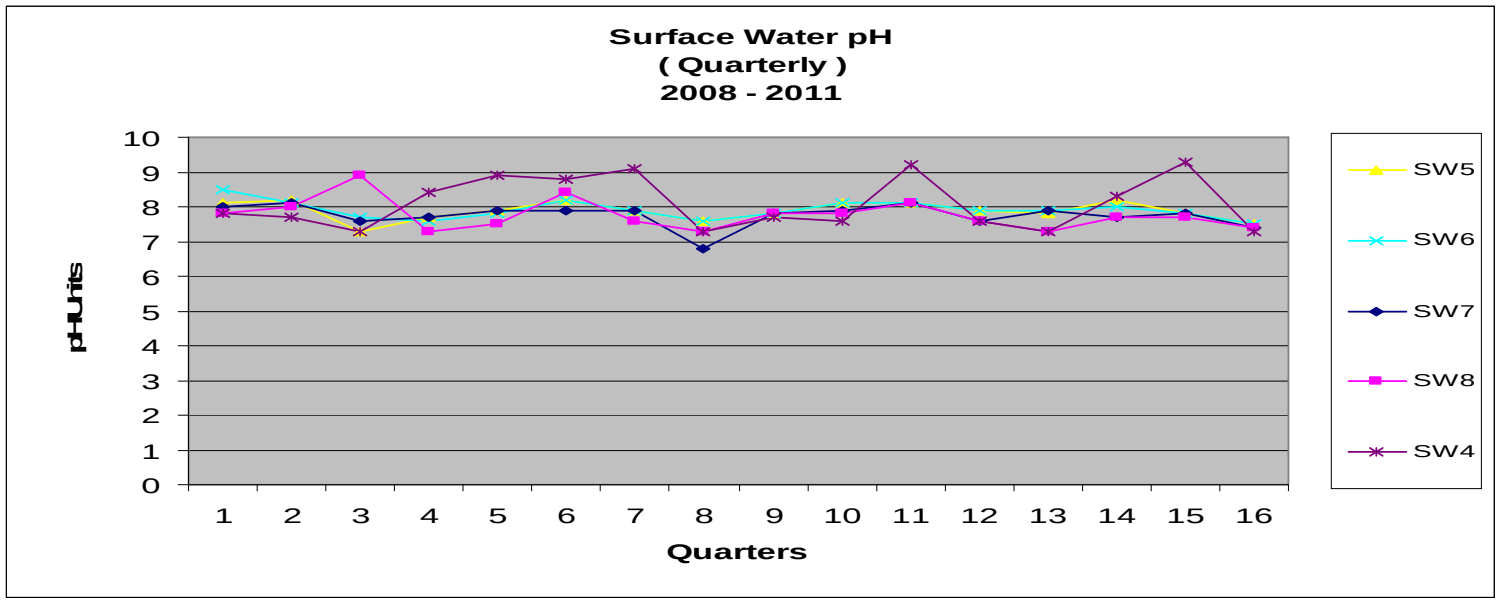
Monitoring Location: SW6					
Parameter	**Date**	28/02/2011	16/05/2011	18/07/2011	25/11/2011
Ammonia mg/l	**Quarterly**	0.23	0.12	0.59	0.57
COD (mg/l)	**Quarterly**	60	53	76	149
pH (pH units)	**Quarterly**	7.9	8	7.8	7.5
Total Suspended Solids (mg/l)	**Quarterly**	14	5	5	121

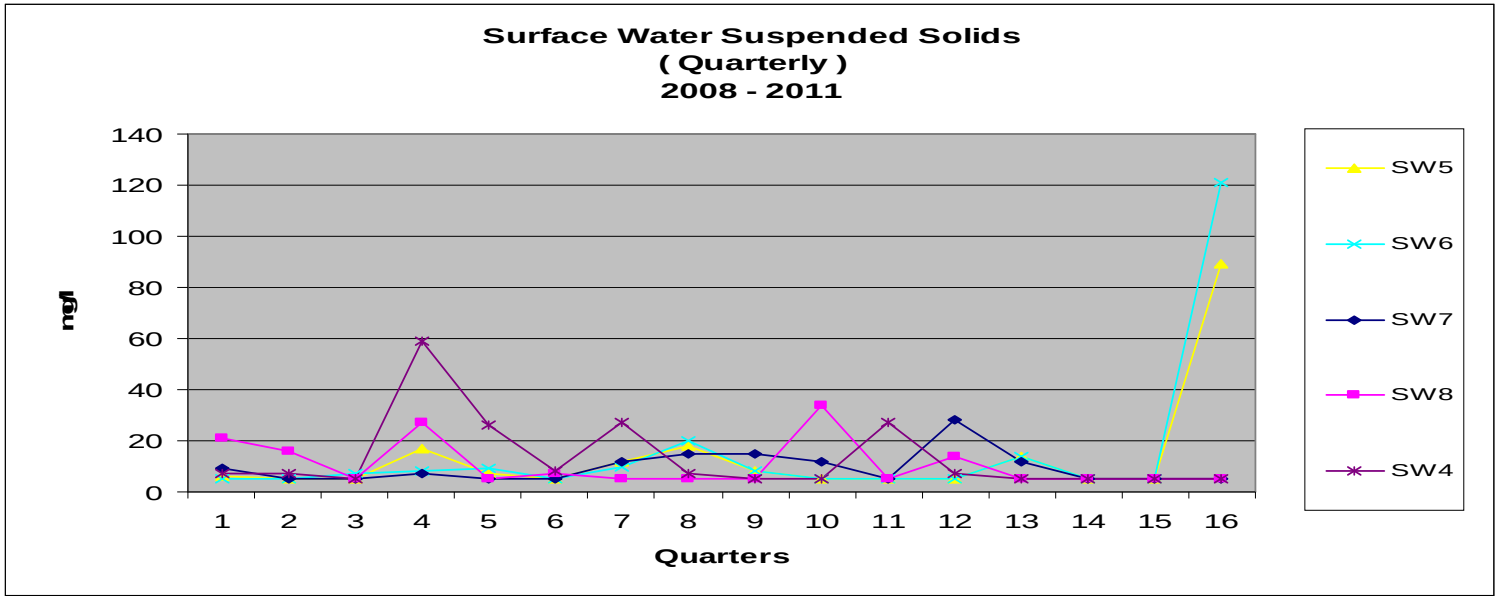
Monitoring Location: SW7					
Parameter	**Date**	28/02/2011	16/05/2011	18/07/2011	25/11/2011
Ammonia mg/l	**Quarterly**	0.22	0.12	0.14	0.13
COD (mg/l)	**Quarterly**	58	63	52	46
pH (pH units)	**Quarterly**	7.9	7.7	7.8	7.4
Total Suspended Solids (mg/l)	**Quarterly**	12	5	5	5

Monitoring Location: SW8					
Parameter	**Date**	24/02/2011	16/05/2011	18/07/2011	25/11/2011
Ammonia mg/l	**Quarterly**	0.58	0.05	0.04	0.15
COD (mg/l)	**Quarterly**	47	61	65	28
pH (pH units)	**Quarterly**	7.3	7.7	7.7	7.4
Total Suspended Solids (mg/l)	**Quarterly**	5	5	5	5


Surface Water Ammonia
(Quarterly)
2008 - 2011
mg/l
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Quarters
SW5
SW6
SW7
SW8
SW4

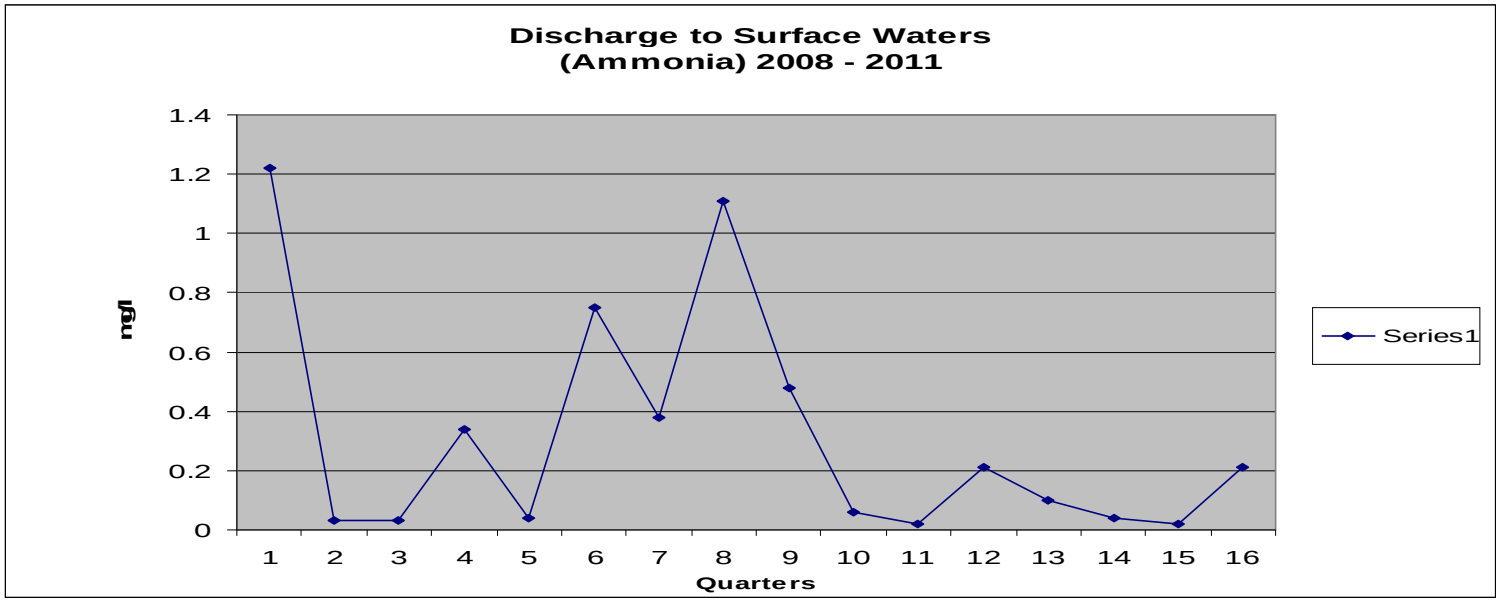

Surface Water COD
(Quarterly)
2008 - 2011
mg/l
160
140
120
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Quarters
SW5
SW6
SW7
SW8
SW4

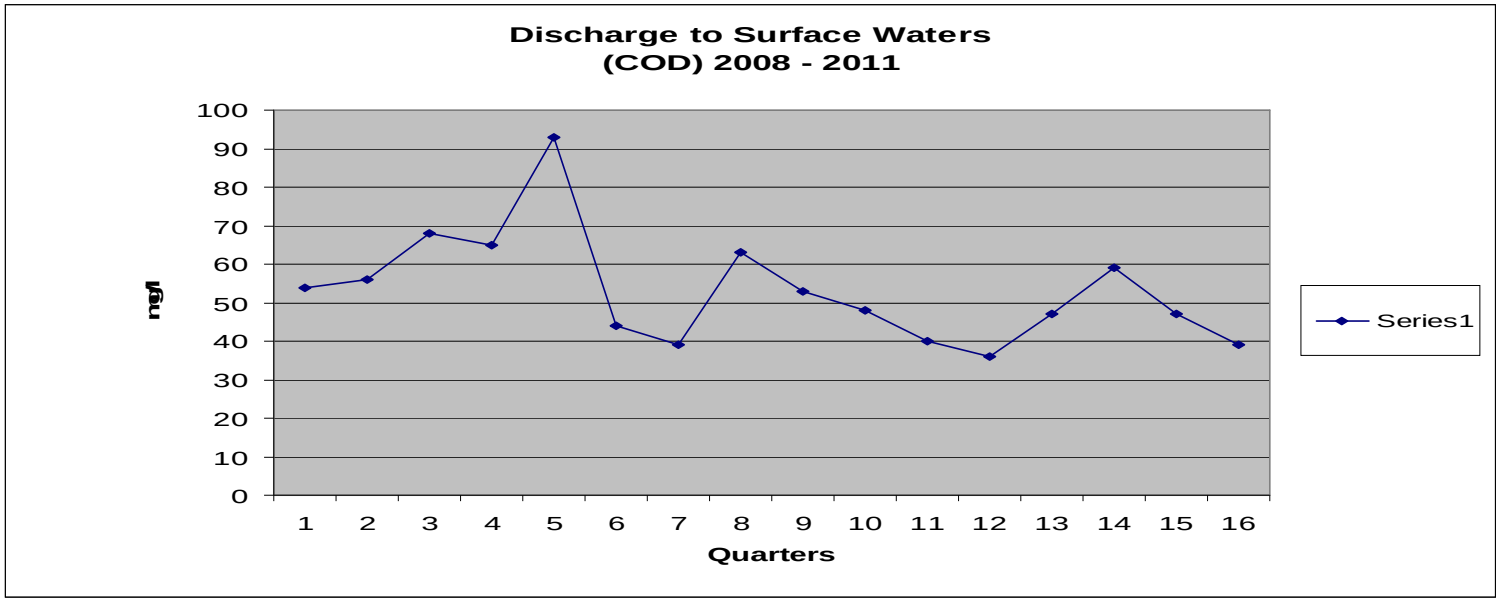

Surface Water pH
(Quarterly)
2008 - 2011
pH-Units
10
9
8
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Quarters
SW5
SW6
SW7
SW8
SW4

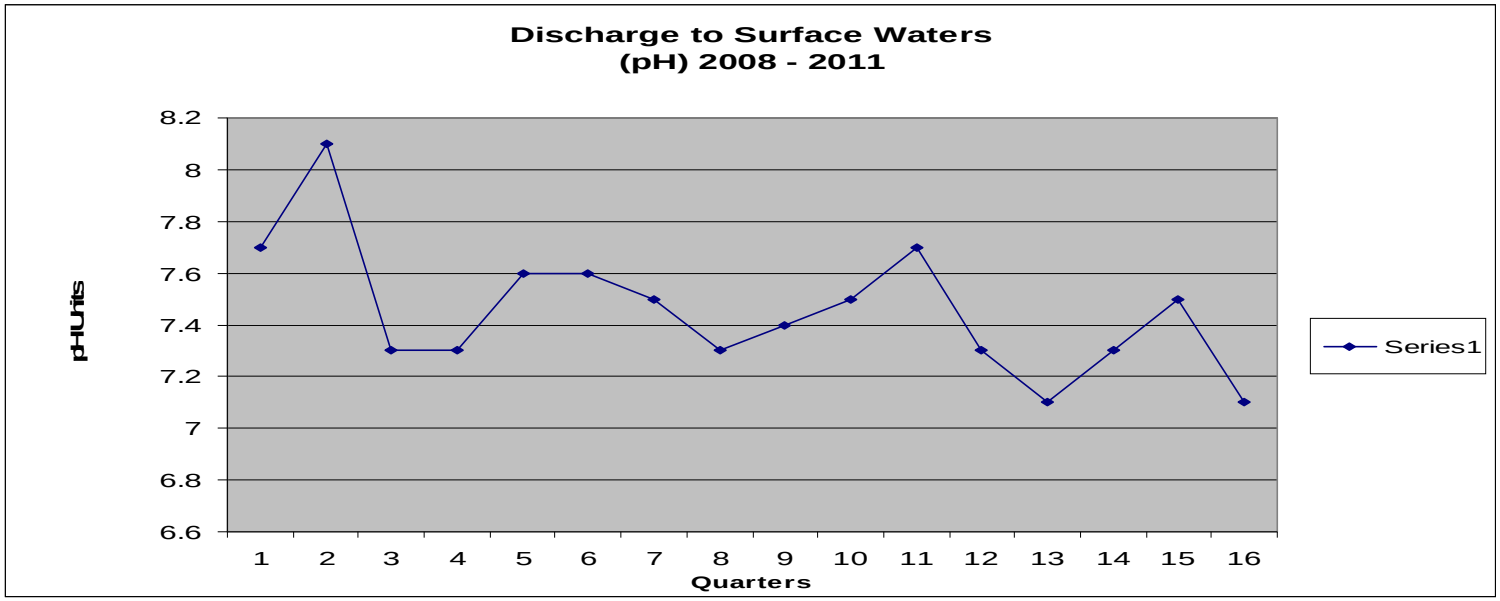

Surface Water Suspended Solids
(Quarterly)
2008 - 2011
140
120
100
80
60
40
20
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Quarters
SW5
SW6
SW7
SW8
SW4

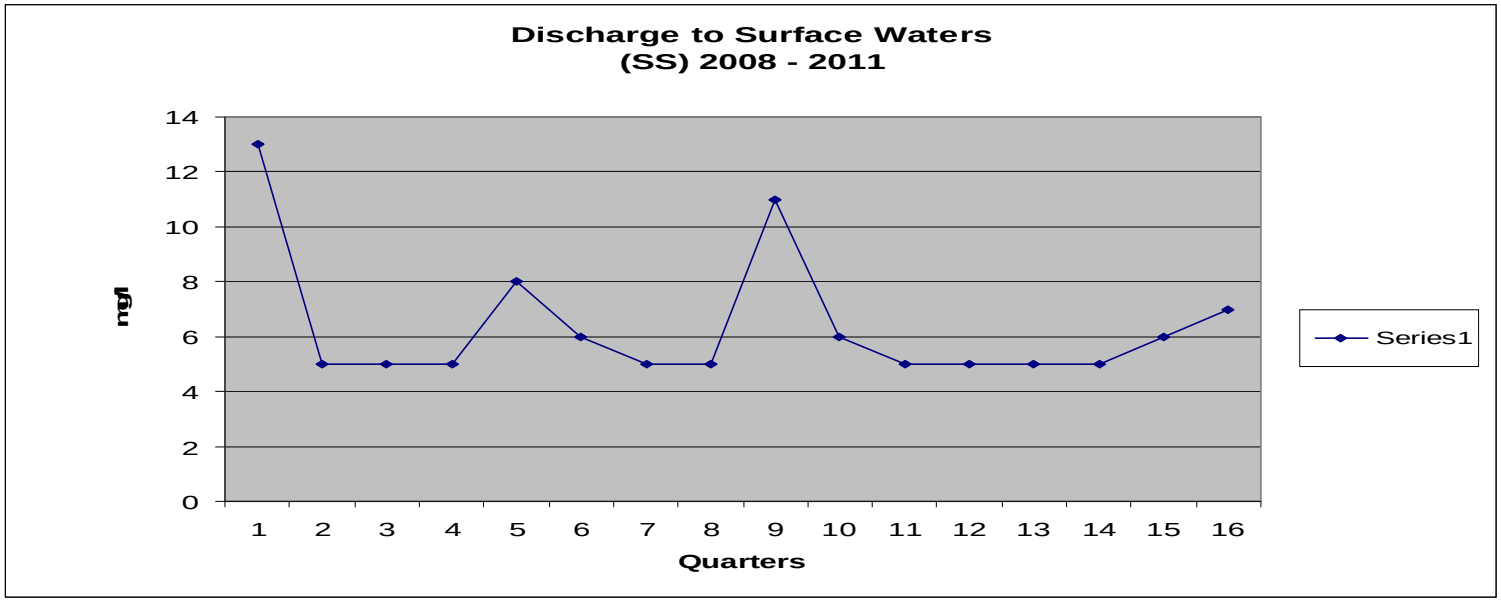
Discharges to Surface Waters.

Monitoring Location: SWR1					
Parameter	**Date**	24/02/2011	16/05/2011	18/07/2011	25/11/2011
Ammonia mg/l	**Quarterly**	0.1	0.04	0.02	0.21
COD (mg/l)	**Quarterly**	47	59	47	39
pH (pH units)	**Quarterly**	7.1	7.3	7.5	7.1
Suspended Solids (mg/l)	**Quarterly**	5	5	6	7




Discharge to Surface Waters
(COD) 2008 - 2011
mg/l
100
90
80
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Quarters
Series1


Discharge to Surface Waters
(pH) 2008 - 2011
pH Units
8.2
8
7.8
7.6
7.4
7.2
7
6.8
6.6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Quarters
Series1



Leachate.

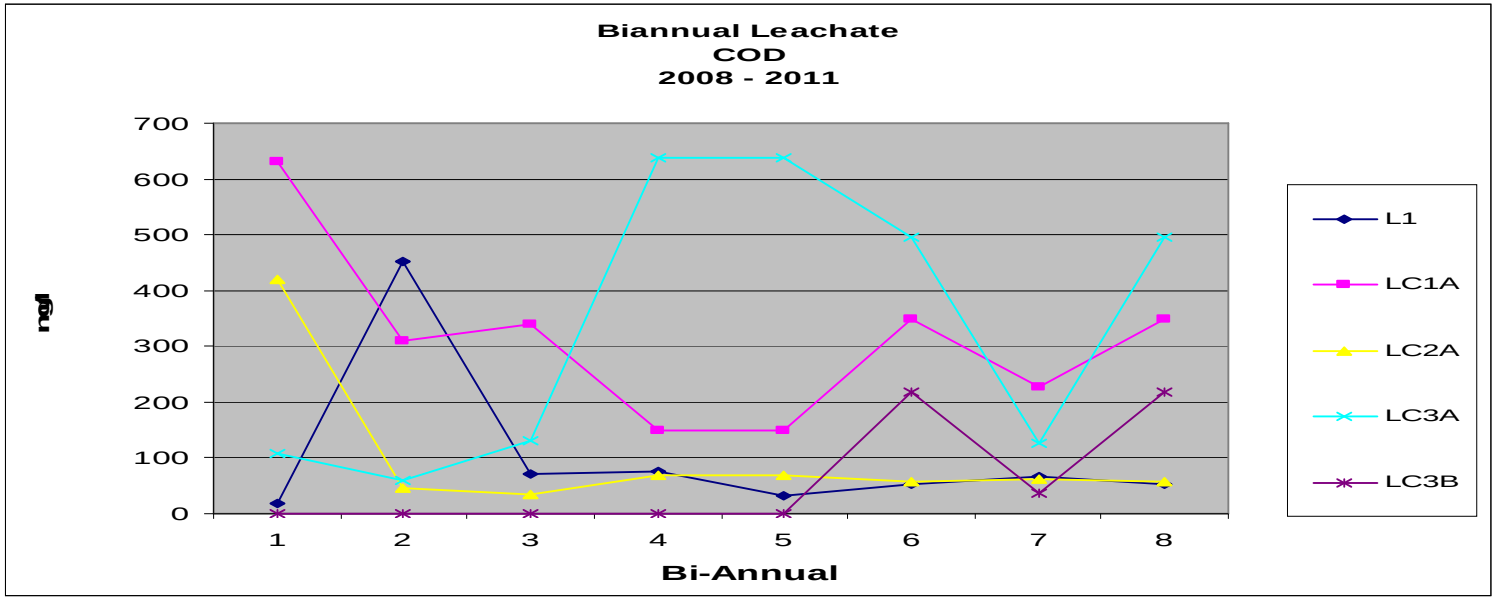
Monitoring Location: L1			
Parameter	**Date**	31/01/2011	26/07/2011
COD (mg/l)	**Bi-Annually**	66	53
Amonical nitrogen (mg/l NH4)	**Bi-Annually**	2.06	0.53
Temperature (0C)	**Bi-Annually**	7.8	11.8
Electrical Conductivity (µS/cm)	**Bi-Annually**	1279	972
pH (pH units)	**Bi-Annually**	10.66	9.1

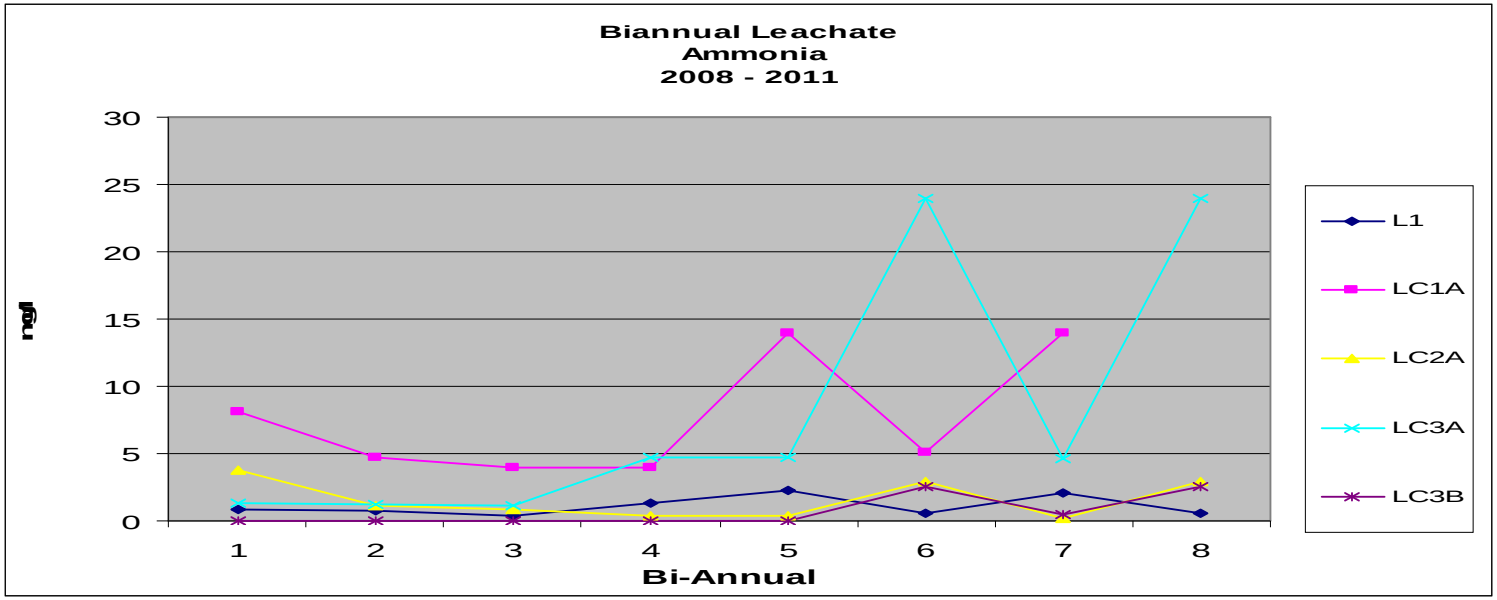
Monitoring Location: LC1A			
Parameter	**Date**	31/01/2011	26/07/2011
COD (mg/l)	**Bi-Annually**	227	350
Amonical nitrogen (mg/l NH4-N)	**Bi-Annually**	5.1	14
Temperature (0C)	**Bi-Annually**	9.5	11.9
Electrical Conductivity (µS/cm)	**Bi-Annually**	1279	14840
pH (pH units)	**Bi-Annually**	10.66	12.81

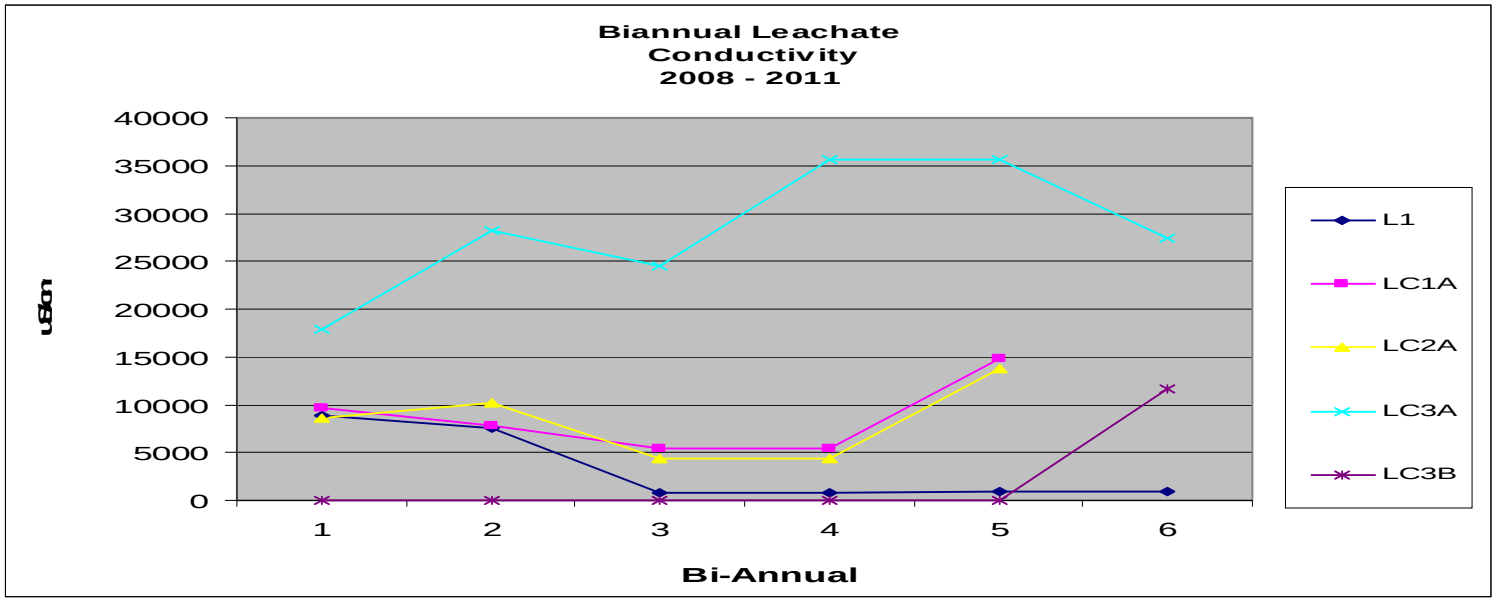
Monitoring Location: LC2A			
Parameter	**Date**	31/01/2011	26/07/2011
COD (mg/l)	**Bi-Annually**	61	57
Amonical nitrogen (mg/l NH4)	**Bi-Annually**	0.2	2.92
Temperature (0C)	**Bi-Annually**	10.2	11.8
Electrical Conductivity (µS/cm)	**Bi-Annually**	2663	13710
pH (pH units)	**Bi-Annually**	11.89	12.77

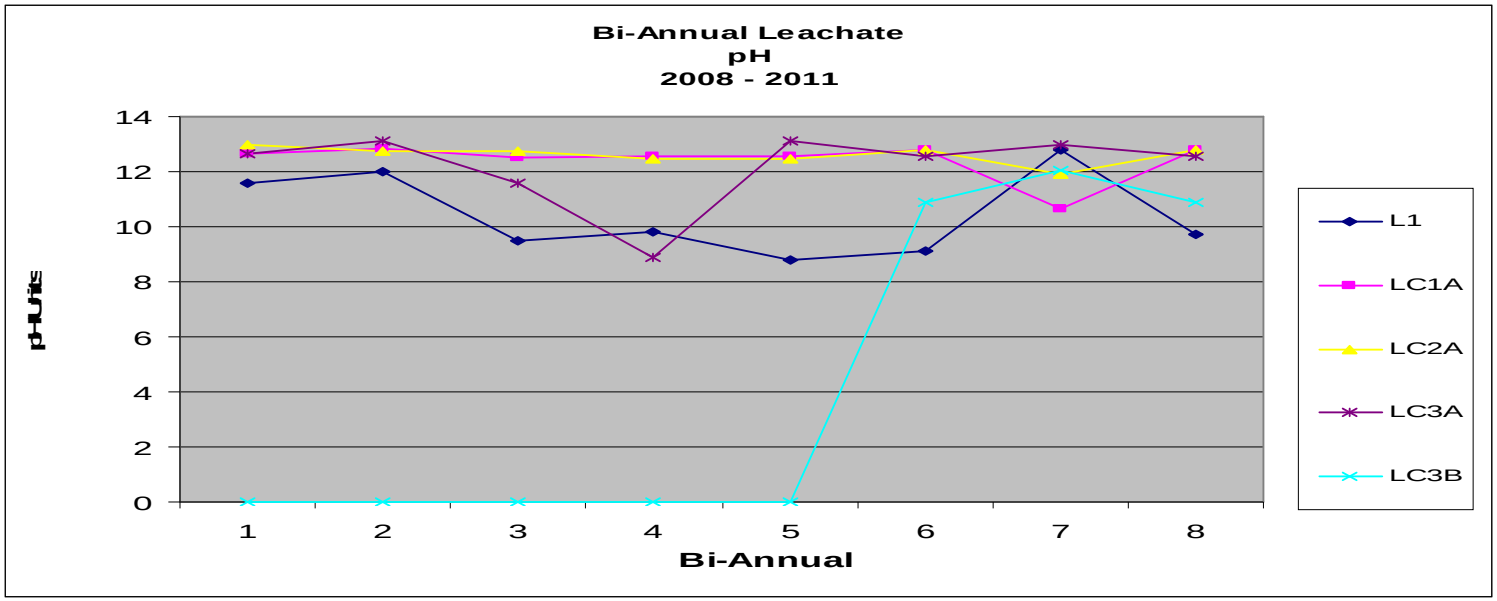
Monitoring Location: LC3A			
Parameter	**Date**	31/01/2011	26/07/2011
COD (mg/l)	**Bi-Annually**	126	496
Amonical nitrogen (mg/l NH4)	**Bi-Annually**	4.59	24
Temperature (0C)	**Bi-Annually**	9.3	11.4
Electrical Conductivity (µS/cm)	**Bi-Annually**	30900	27410
pH (pH units)	**Bi-Annually**	12.99	12.55

Monitoring Location: LC3B			
Parameter	**Date**	31/01/2011	26/07/2011
COD (mg/l)	**Bi-Annually**	37	217
Amonical nitrogen (mg/l NH4)	**Bi-Annually**	0.43	2.54
Temperature (0C)	**Bi-Annually**	9.7	11.6
Electrical Conductivity (µS/cm)	**Bi-Annually**	6090	11670
pH (pH units)	**Bi-Annually**	12.05	10.87


Biannual Leachate
COD
2008 - 2011
700
600
500
400
300
200
100
0
1
2
3
4
5
6
7
8
Bi-Annual
L1
LC1A
LC2A
LC3A
LC3B

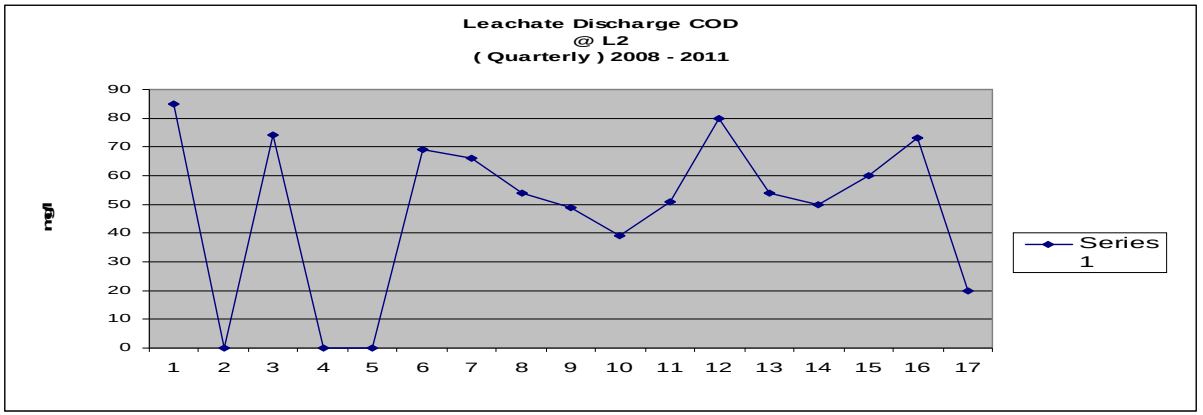

Biannual Leachate
Ammonia
2008 - 2011
30
25
20
15
10
5
0
1
2
3
4
5
6
7
8
Bi-Annual
L1
LC1A
LC2A
LC3A
LC3B

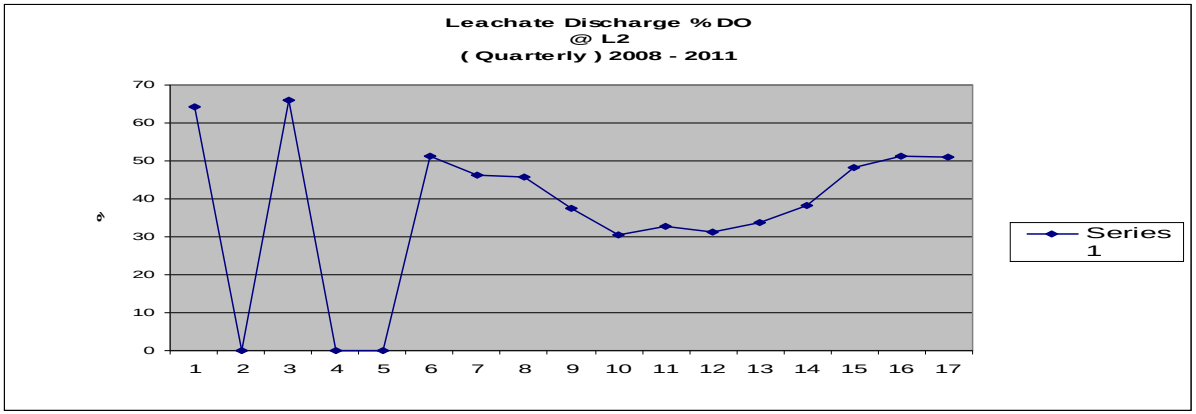

Biannual Leachate
Conductivity
2008 - 2011
40000
35000
30000
25000
20000
15000
10000
5000
0
1
2
3
4
5
6
Bi-Annual
L1
LC1A
LC2A
LC3A
LC3B

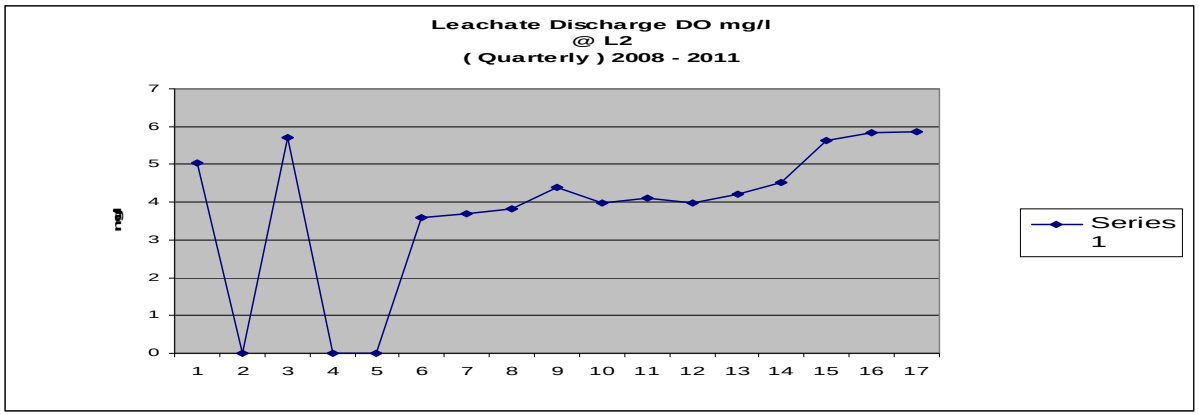

Bi-Annual Leachate
pH
2008 - 2011
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
Bi-Annual
L1
LC1A
LC2A
LC3A
LC3B

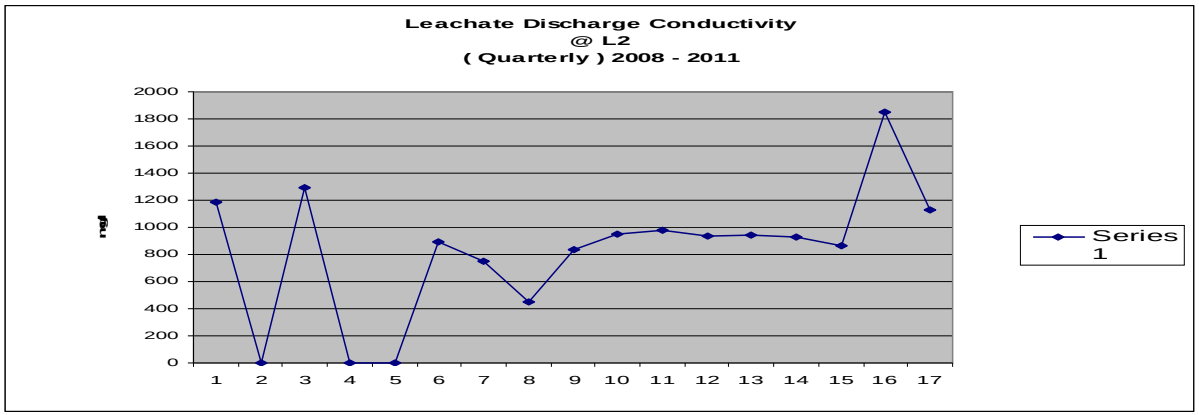
Leachate Discharges L2.

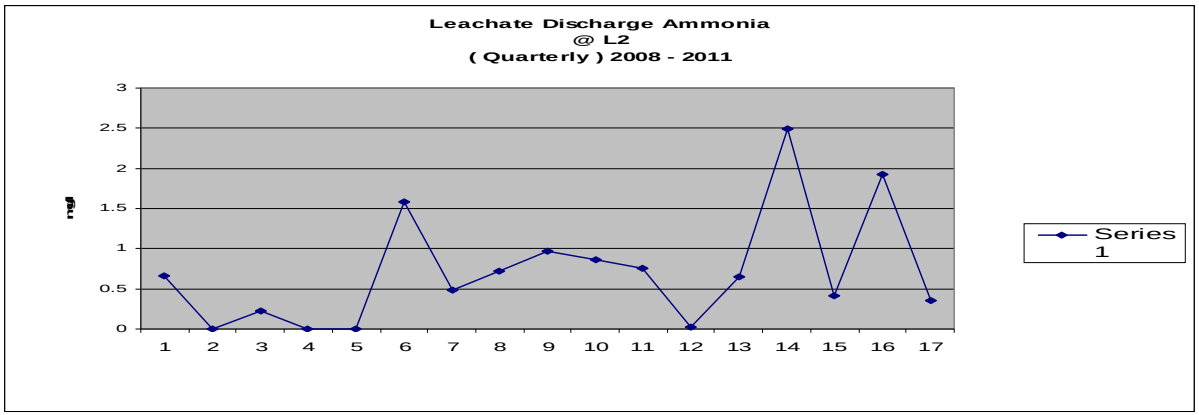
Monitoring Location: L2					
Parameter	**Date**	24/02/2011	16/05/2011	17/07/2011	25/11/2011
COD (mg/l)	**Quarterly**	50	60	73	20
Dissolved oxygen (%)	**Quarterly**	38.2	48.2	51.3	51
Dissolved oxygen (mg/l)	**Quarterly**	4.51	5.64	5.85	5.86
Electrical Conductivity (µS/cm)	**Quarterly**	931	867	1848	1130
Ammoniacal Nitrogen (mg/l NH4)	**Quarterly**	2.49	0.41	1.93	0.36
pH (pH units)	**Quarterly**	8.5	8.3	11	7.6
Total Suspended Solids (mg/l)	**Quarterly**	5	5	5	8

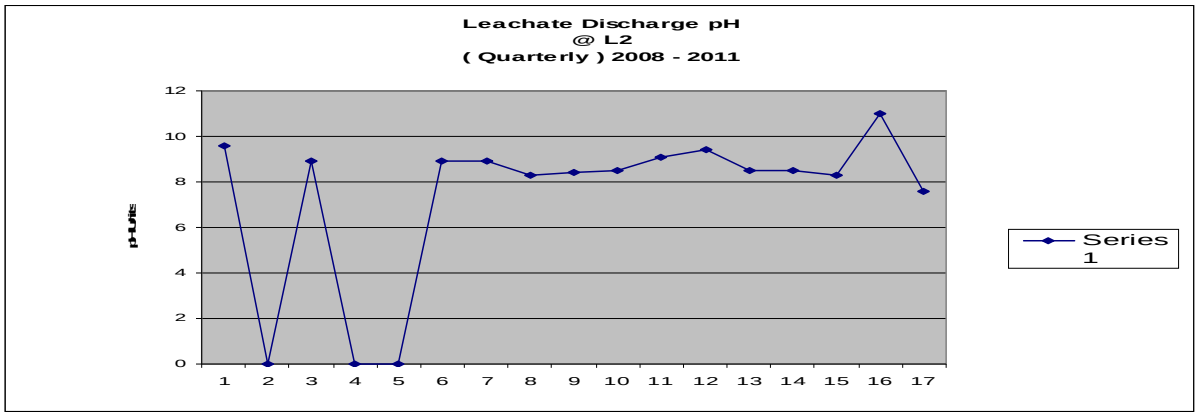



Leachate Discharge % DO
@ L2
(Quarterly) 2008 - 2011
%
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Series 1


Leachate Discharge DO mg/l
@ L2
(Quarterly) 2008 - 2011
mg/l
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Series 1

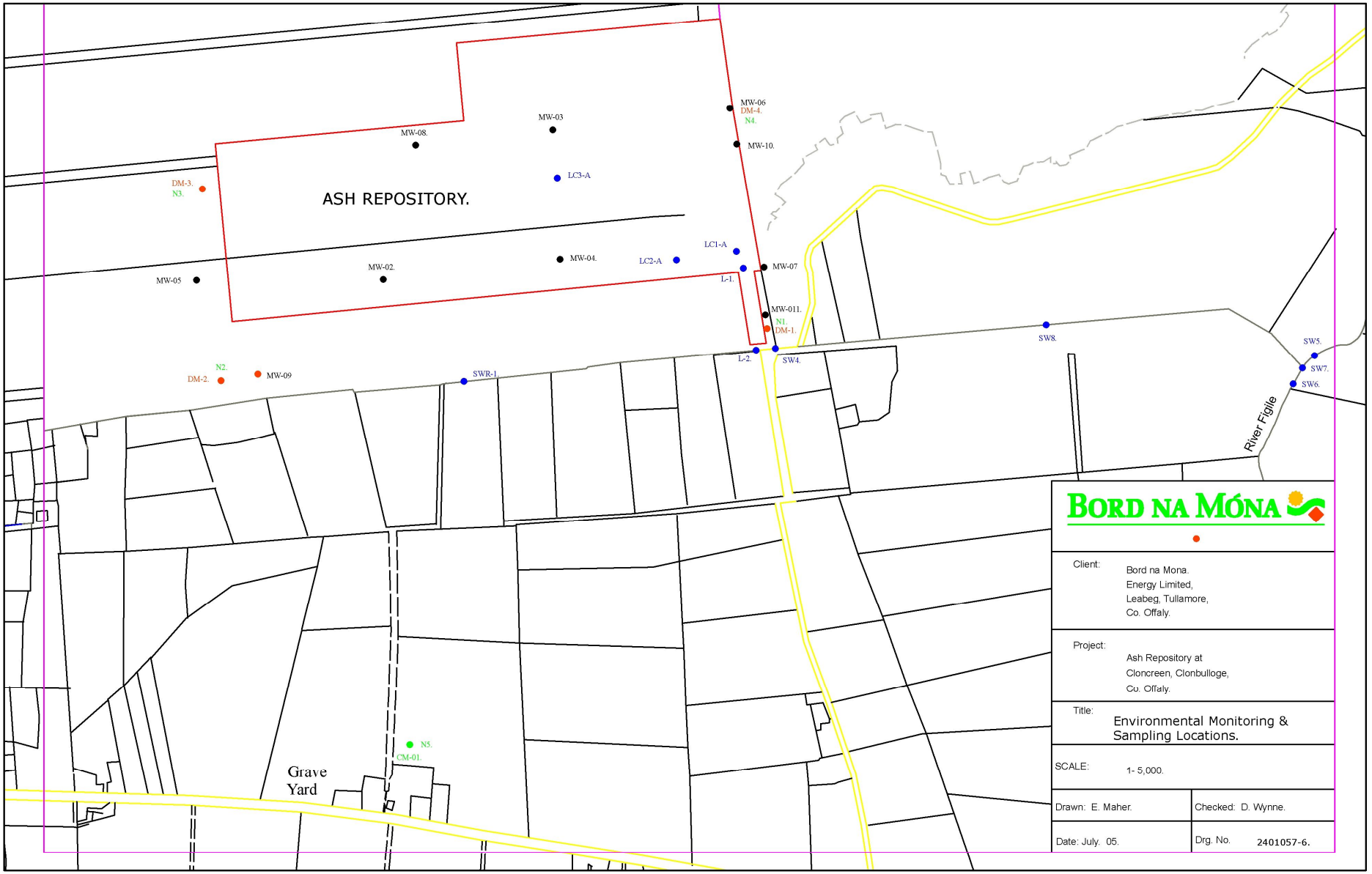

Leachate Discharge Conductivity
@ L2
(Quarterly) 2008 - 2011
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Series 1


Leachate Discharge Ammonia
@ L2
(Quarterly) 2008 - 2011
3
2.5
2
1.5
1
0.5
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Series 1


Leachate Discharge pH
@ L2
(Quarterly) 2008 - 2011
pH Units
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Series 1

Appendix 3

Monitoring Locations


ASH REPOSITORY.
MW-03
MW-06
DM-4.
N4.
MW-08.
MW-10.
LC3-A
DM-3.
N3.
LC1-A
MW-07
MW-04.
LC2-A
MW-02.
MW-05
L-1.
MW-011.
N1.
DM-1.
SW8.
SW5.
SW7.
SW6.
N2.
DM-2.
MW-09
SWR-1.
L-2.
SW4.
River Figile
N5.
CM-01.
Grave
Yard
BORD NA MÓNA
Client: Bord na Mona.
Energy Limited,
Leabeg, Tullamore,
Co. Offaly.
Project: Ash Repository at
Cloncreen, Clonbulloge,
Co. Offaly.
Title: Environmental Monitoring &
Sampling Locations.
SCALE: 1- 5,000.
Drawn: E. Maher.
Checked: D. Wynne.
Date: July. 05.
Drg. No. 2401057-6.

Appendix 4

Ecological Survey

Ecological Survey Report – Cloncreen Ash Site			
Bog Name:	**Cloncreen**	**Area (ha):**	
Works Name:	Derrygreenagh	**County:**	Offaly
Recorder(s):	MMC	**Survey Date(s):**	21st December 2011
Photos:	Photos taken – see L:\AI_Data\Boora\Ecology Team\Photos\Cloncreen		

Introduction

The main objective of this survey was to carry out a walk-over survey of Cell 1 and 2 at the Cloncreen Ash Site to determine the extent of vegetation cover and habitat development. This ecological survey forms part of the EPA requirement for reporting on the site.

Results

Vegetation is now well established on both cells with over 95% of the ground cover now vegetated (Figures 1-2). The remaining small bare areas are related to maintenance work and vehicle access to facilitate this work.

Cell 1 was initially capped in 2003-2004 and grass cover was initially established using a grass seed mixture. Cell 2 is several years younger and was also capped with a grass seed mixture. This has now matured and forms a dense rank sward dominated by Ryegrass (sown) but also now including other grass, sedge and rush species such as Yorkshire Fog, Creeping Bentgrass, Reed Canarygrass, False Oatgrass, Cocksfoot, Red Fescue, Hard Rush, Soft Rush, Carnation Sedge and Glaucous Sedge. Other species present include Broad-leaved Dock, Red Clover, Black Medick, Creeping Buttercup, Ragwort, Red Bartsia, Creeping Cinquefoil, Colt's-foot, Sorrel, Weld, Nettle, Bramble, Heather, Yarrow, Long-leaved Plantain, Spear Thistle, Creeping Thistle, Dandelion, Daisy, St John's-wort and Willowherb sp. The majority of these species are all typical species of meadow grassland (GS2). There is no significant grazing and the vegetation is quite rank in places.

In addition, there are several patches of scrub dominated by Gorse, particularly on Cell 1, the oldest cell. The scrub (WS1) has established naturally on the site. There are also several patches of Brambles and several patches of Willow saplings. More typical scrubby vegetation has established along the eastern boundary. This contains Gorse, Birch, Bracken and Bramble and is the result of natural colonisation from the surrounding cutaway.

There was some bird life on the site at the time of the survey with the presence of Meadow Pipit, Wren and Blackbird. The open grassland would be expected to provide suitable breeding habitat for ground-nesting birds such as Meadow Pipit and Skylark in the summer and this now enhances the overall ecological value of the site.

The vegetation cover on both cells is now well established and stabilised. Small bare areas related to maintenance work will quickly re-vegetate following the completion of this work. The grassland habitat is likely to continue to mature into the future and scrub such as Gorse, Birch and Willow can be expected to spread slowly over both cells in time.

Continued regular monitoring of vegetation cover on the site is not now required as the ground cover of both cells is assessed as being stable. It is recommended that monitoring now take place at a 5-yearly interval.

Figure 1. View of typical meadow-type sward (GS2) in foreground with Gorse scrub (WS1) in background of Cell 1.

Figure 2. A somewhat more diverse sward in Cell 2.

Appendix 5

Slope Stability Assessment

BORD NA MÓNA

Cloncreen Ash Repository

Licence Register Number: WL0049-02

Licensee: Bord na Mona Energy Ltd.

Slope Stabilisation Assessment

2011

A Submission to the Environmental Protection Agency by Bord na Móna Energy Ltd.

Table of Contents

Foreword

This Slope Stability Assessment Study has been prepared by the Civil Engineering Department of Bord na Mona to comply with condition 6.6 of the Waste Licence for Cloncreen Ash Repository.

The purpose of this Slope Stability Assessment Study is to assess the current condition of the embankments surrounding the ash repository and to develop a method for the ongoing monitoring of slopes on an annual basis.

General

1.1 Introduction

This slope stability assessment has been prepared to comply with Condition 6.6 of Waste Licence No. WL0049-02 for Cloncreen Ash Repository.

The purpose of this assessment is to set out the controls required to ensure that the civil engineering works are installed in such a way as to provide adequate confidence that they meet regulatory requirements and perform satisfactory in service.

This assessment will detail the embankments as they are currently constructed and what measures will be used for the future assessment of all embankments.

1.2 Definitions

The word “Engineer” shall mean “The Head of Civil Engineering” or such person or persons as he may authorise to act for the purpose of this report.

The word “Employer” shall mean Bord na Móna Energy Ltd., Leabeg, Tullamore, Co. Offaly

The “Contractor” may be defined as the party responsible for the preparation and construction of the works to the Specifications as detailed under technical supervision of the “Engineer”.

Site Overview

2.1 Introduction

As of end 2011 there are three completed cells on site at Cloncreen Ash Repository. Ash is currently been deposited into Cell 3. Cells 1 and 2 have been capped in accordance with the Licence.

Cell 4 is almost complete and lining works are expected to commence in 2012.

Cells 1, 2 and 3 each have existing external embankments which are now standing for a number of years. Cell 4's embankments have been standing for less than 12 months.

Cells 1,2 and 3 also share embankments with each other. The inter cell boundary is hard to establish as capping material has filled the boundary area.

2.2 Slope Stability Survey

A base line survey of some of the embankments was carried out. This was developed using wooden stakes driven at intervals along the top and toe of the embankments. These were then surveyed using total station. The results of this survey are contained in the Appendix to this report.

This survey will be repeated annually which will give a good indication if the embankments are remaining stable over this period.

The survey for 2011 is contained in the appendix with a comparison on 2010 figures.

Some embankments could not be assessed in this way as there were large areas of plant colonisation. Some embankments are also likely to undergo construction work as they form part of Cell 4.

Any cell that could not be surveyed was visually inspected and photographs taken of each embankment.

2.3 Cell 1 Embankments

Cell 1 has a floor area of 9,000m^2. This cell was originally constructed in the year 2000. It has three external embankments and one internal embankment shared with Cell 2. The external embankments cover a perimeter of 300 metres. This cell was capped in 2003 and seeded as per the Licence.

Cell 1 Embankment Condition 2011

In the years after the final capping of Cell 1 native plants have colonised large areas of the embankments. The Eastern embankment of Cell 1 is heavily colonised with native Birch 'Behula Pendula' and native Gorse 'Ulex Europaesus'. Grass growth is also well established on the embankments. The northern and southern embankments also have large areas of dense vegetation.

The photographs below illustrate the large amount of growth present on the embankment slopes.

Figure 1 – Cell 1 Eastern Embankment

Figure 2 – Cell 2 Southern Embankment

Cell 1 Slope Stability Assessment

Due to the large amount of vegetation only a small portion of Cell 1 could be surveyed using the stakes as a marker. In order to survey the remaining areas large areas of vegetation would have been disturbed.

The remaining area was assessed visually and no damage was observed. The slopes are well vegetated and no erosion was recorded.

2.4 Cell 2 Embankments

Cell 2 has a floor area of 14,500m^2. This cell was originally constructed in the year 2003. It has two external embankments and two internal embankment shared with Cell 1 and Cell 3. The external embankments cover a perimeter of 240 metres. This cell was capped in 2006 and seeded as per the Licence.

The northern embankment of Cell 2 will form part of the embankment for Cell 4 and was not surveyed as construction work will be ongoing in the next year.

Cell 2 Embankment Condition 2011

In the years after the final capping of Cell 2 native plants have colonised large areas of the embankments. The southern embankment of Cell 2 is heavily colonised with native firs. Grass growth is also well established on the embankments.

The photographs below illustrate the large amount of growth present on the embankment slopes.

Figure 3 – Cell 2 Southern Embankment

Figure 4 – Cell 2 Northern Embankment

Cell 2 Slope Stability Assessment

The top portion of the southern embankment was surveyed for future measurement. The northern embankment will form part of Cell 4 and there will be construction work ongoing so a survey here would not be permanent.

The remaining area was assessed visually and no damage was observed. The slopes are well vegetated and no erosion was recorded.

2.5 Cell 3 Embankments

Cell 3 has a floor area of 21,000m^2. This cell was originally constructed in the year 2006. It has three external embankments and one internal embankment shared with Cell 2. The external embankments cover a perimeter of 500 metres. This cell is currently active and is receiving ash deliveries.

The railway line used to deliver the ash is situated on the northern embankment of cell 3 and a full survey was not possible here.

Cell 3 Embankment Condition 2011

The embankments of Cell 3 have only been in position for 3 years and as yet have not been colonised to the same extent as Cell 1 and Cell 2. Native plants are beginning to establish on the embankments and this will increase over the coming years.

The photographs below illustrate the condition of the embankments at present. Overall the embankments are in good condition. There are no slippages and no signs of erosion over the area.

Figure 5 – Cell 3 Southern Embankment

Figure 6 – Cell 3 Western Embankment

Cell 3 Slope Stability Assessment

Three sides of Cell 3 have been surveyed for future slope stability measurements. Stakes have been placed top and bottom of the embankments and future surveys should indicate any movement.

The remaining area was assessed visually and no damage was observed. The slopes are well vegetated and no erosion was recorded.

2.6 Cell 4 Embankments

Cell 4 has a floor area of 22,000m^2. Construction of this cell began in the year 2009 with embankment construction beginning in 2010. It has three external embankments and one internal embankment shared with Cell 2. The external embankments cover a perimeter of 625 metres. This cell is not completely finished but will be lined partially in 2012.

The railway line used to deliver the ash is situated on the southern embankment of cell 4.

Cell 4 Embankment Condition 2011

The embankments of Cell 4 have only been in position for less than 1 year and have not been fully completed. Small works are still to be completed on the eastern end of the embankment.

The photographs below illustrate the condition of the embankments at present. Overall the embankments are in good condition.

Figure 7 – Cell 4 Southern Embankment


Figure 8 – Cell 4 Eastern Embankment

Cell 4 Slope Stability Assessment

As Cell 4 has yet to be completed there are no survey points in place on the embankments as yet. When this cell becomes the active ash receiving area we will begin surveying the embankments.

Results Comparison 2010 & 2011

As we now have 2 years worth of data we can compare results from the surveys taken on the slope stability markers. The table below shows the results from the previous surveys and the percentage difference in results.

Point No.	Easting	Northing	2010 Elevation (m) AOD	2011 Elevation (m) AOD	Difference (mm)	% Difference
1	259386.96	225084.023	74.291	74.287	4	-0.0054
2	259423.62	225086.873	73.596	73.59	6	-0.0082
3	259463.78	225089.761	73.533	73.553	-20	0.0272
4	259499.69	225093.489	73.466	73.48	-14	0.0191
5	259540.92	225098.694	73.911	73.917	-6	0.0081
6	259581.81	225101.567	74.245	74.253	-8	0.0108
7	259614.39	225103.917	73.978	73.964	14	-0.0189
8	259655.96	225108.422	73.971	73.973	-2	0.0027
9	259695.24	225113.674	73.086	73.077	9	-0.0123
10	259500.15	225090.266	71.182	71.236	-54	0.0758
11	259463.96	225085.485	70.769	70.804	-35	0.0494
12	259423.81	225081.975	70.386	70.431	-45	0.0639
13	259387.25	225079.463	70.563	70.603	-40	0.0567
14	259334.38	225082.684	70.642	70.67	-28	0.0396
15	259328.58	225129.476	69.922	69.956	-34	0.0486
16	259326.23	225159.563	71.902	71.896	6	-0.0083
17	259323.75	225200.118	70.533	70.569	-36	0.0510
18	259323	225234.123	71.01	71.065	-55	0.0774
19	259326.48	225249.891	72.329	72.344	-15	0.0207
20	259364.5	225253.812	72.773	72.794	-21	0.0288
21	259403.03	225261.302	72.405	72.481	-76	0.1049
22	259403.29	225253.864	74.331	74.395	-64	0.0860
23	259364.81	225250.766	73.969	74.018	-49	0.0662
24	259326.66	225247.11	73.627	73.649	-22	0.0299
25	259327.67	225233.868	74.035	74.046	-11	0.0149
26	259330.16	225199.613	74.337	74.376	-39	0.0524
27	259333.09	225159.696	74.158	74.158	0	0.0000
28	259335.55	225125.651	73.857	73.873	-16	0.0217
29	259338.58	225084.629	73.017	73.559	-542	0.7368

Most of the survey totals are within +/- 50mm of the 2010 survey totals. This error can be accounted for by the expected error within the survey equipment.

However it is also noted that peg numbers 19 to 24 are showing large differences from the 2010 values. This can be explained by the proximity of the ash unloading area. This area is used daily to unload the ash wagons and would have a higher degree of vibration that may of contributed to the difference.

It is interesting to note that measurement taken from the top of the embankments show very little difference in level.

However there is one figure that is very suspect. Point number 29 is showing up as having a height difference of greater than half a metre.

We have re-checked this figure and we believe that the 2010 figure was measured incorrectly and thus we will discount this difference.

Summary

In summary the current stability of the slopes is sound, with no signs of slippage or erosion on any of the slopes.
Cell 1 has large areas of dense vegetation which help the embankments remain stable.
Cell 2 has large areas of dense vegetation with no signs of erosion or slippage.
All inter cell embankments are sound and some are no longer visible as capping material has overtopped.
Cell 3 has the most recently constructed embankment and is also in good condition with no erosion or slippage.
Cell 4 embankments have only been completed recently and will not be measured until ash deposition commences.
Differences in levels between 2010 and 2011 are relatively minor and are within the surveying equipments margin of error. Some levels with greater differences are relatively close to the existing working area.
Annual measurements will continue to be taken on the stakes surrounding Cell 3. These will indicate any movement in the area where they are present.

Drawing No. CW/37/274 contained in Appendix A details the position of the stakes. The table in Appendix B gives the location and levels of each stake and the comparison between 2010 and 2011 levels.

Appendix A

Drawing No: CW/37/274

Drawing No: 2401057-4

The above mentioned drawings are submitted as separate attachments

Appendix B

Peg Numbers

Location and Elevation

Point No.	Easting	Northing	2010 Elevation (m) AOD	2011 Elevation (m) AOD	Difference (mm)	% Difference
1	259386.96	225084.023	74.291	74.287	4	-0.0054
2	259423.62	225086.873	73.596	73.59	6	-0.0082
3	259463.78	225089.761	73.533	73.553	-20	0.0272
4	259499.69	225093.489	73.466	73.48	-14	0.0191
5	259540.92	225098.694	73.911	73.917	-6	0.0081
6	259581.81	225101.567	74.245	74.253	-8	0.0108
7	259614.39	225103.917	73.978	73.964	14	-0.0189
8	259655.96	225108.422	73.971	73.973	-2	0.0027
9	259695.24	225113.674	73.086	73.077	9	-0.0123
10	259500.15	225090.266	71.182	71.236	-54	0.0758
11	259463.96	225085.485	70.769	70.804	-35	0.0494
12	259423.81	225081.975	70.386	70.431	-45	0.0639
13	259387.25	225079.463	70.563	70.603	-40	0.0567
14	259334.38	225082.684	70.642	70.67	-28	0.0396
15	259328.58	225129.476	69.922	69.956	-34	0.0486
16	259326.23	225159.563	71.902	71.896	6	-0.0083
17	259323.75	225200.118	70.533	70.569	-36	0.0510
18	259323	225234.123	71.01	71.065	-55	0.0774
19	259326.48	225249.891	72.329	72.344	-15	0.0207
20	259364.5	225253.812	72.773	72.794	-21	0.0288
21	259403.03	225261.302	72.405	72.481	-76	0.1049
22	259403.29	225253.864	74.331	74.395	-64	0.0860
23	259364.81	225250.766	73.969	74.018	-49	0.0662
24	259326.66	225247.11	73.627	73.649	-22	0.0299
25	259327.67	225233.868	74.035	74.046	-11	0.0149
26	259330.16	225199.613	74.337	74.376	-39	0.0524
27	259333.09	225159.696	74.158	74.158	0	0.0000
28	259335.55	225125.651	73.857	73.873	-16	0.0217
29	259338.58	225084.629	73.017	73.559	-542	0.7368

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	Bord Na Mona
Facility Name	Clonbulloge Ash Repository
PRTR Identification Number	W0049
Licence Number	W0049-02

Waste or IPPC Classes of Activity

No.	class_name
3.1	The initial melting or production of iron and steel

Address 1	Cloncreen Bog
Address 2	Clonbulloge
Address 3	Co. Offaly
Address 4	
	Offaly
Country	Ireland
Coordinates of Location	-7.11013 53.274
River Basin District	IESE
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Enda McDonagh (W0049)
AER Returns Contact Email Address	enda.mcdonagh@bnm.ie
AER Returns Contact Position	Head of Environmental Engineering
AER Returns Contact Telephone Number	057 9345911
AER Returns Contact Mobile Phone Number	086 2370816
AER Returns Contact Fax Number	057 9345160
Production Volume	0.0
Production Volume Units	0
Number of Installations	1
Number of Operating Hours in Year	3796
Number of Employees	4
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
50.1	General

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

Is it applicable?	No
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

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

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

SECTION B : REMAINING PRTR POLLUTANTS

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

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

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

RELEASES TO AIR					Please enter all quantities in this section in KGs						
POLLUTANT		METHOD							QUANTITY		
			Method Used		DM-01	DM-02	DM-03	DM-04			
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	Emission Point 2	Emission Point 3	Emission Point 4	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
210	Dust	C	OTH	VDI 2199 Blatt 2/Part 2	0.0	0.0	0.0	0.0	0.055605	0.0	0.055605

* 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: Clonbulloge Ash Repository

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

4.2 RELEASES TO WATERS

Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

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

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

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

SECTION B : REMAINING PRTR POLLUTANTS

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

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

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

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

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

SECTION A : PRTR POLLUTANTS

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

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

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

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

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

SECTION A : PRTR POLLUTANTS

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

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

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

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

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

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	20 03 01	No	0.905	mixed municipal waste	D1	C	Volume Calculation	Offsite in Ireland	AES Ltd Cappincur Tullamore Co Offaly,WCP-OY-08-601-01	Cappincur,Tullamore,Co Offaly,.,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