APPENDIX H- AGREED CHANGES TO WASTE LICENCE W0021-01

ENVIRONMENTAL MANAGEMENT PROGRAMME FOR 2007

COMHAIRLE CHONTAE MHAIGH EO

Aras an Chontae, Caislean a 'Bharraigh, Contae Mhaigh Eo.
Teileafóin (094) 24444 Fax (094) 23937

Your Ref. Our Ref.

Derrinumera Landfill,
Newport Road,
Co.Mayo.

COPY

Ms. Derval Devaney,
Office of Environmental Enforcement,
Environmental Protection Agency,
Regional Inspectorate,
John Moore Road,
Castlebar,
Co.Mayo.

20/7/07

RE: Environmental Management Programme.

Dear Ms Devaney,
Please find one original and two copies of the Environmental Management Programme 2007 for Derrinumera enclosed. I trust this meets with your approval, please contact me should you have any queries.
Yours sincerely,

Killian Farrell,
A/ Deputy Landfill Manager.

Enviromental Protection Agency
OEE Castlebar
26 JUL 2007
Received
Initial

COPY

Comhairle Chontae Mhaigh Eo

Environmental Management Programme for Derrinumera Landfill, Newport Co. Mayo.

Waste Licence 0021-01

July 2007

INDEX

TITLE **PAGE NO.**

Environmental Management Programme

Site Details

- Details of Operator

Name:	Mayo County Council
Address:	Aras an Chontae
	Castlebar
	Co. Mayo
Tel:	(094)9024444
Fax:	(094) 9023937

Mayo County Council currently employs eleven people at the Derrinumera Landfill Site. Other site personnel are employed under contract, one excavator operative and one full time bird control specialist.

The County Manager has responsibility for setting the overall policy in all aspects of the Councils activities including those pertaining to the landfill.

The current management structure is outlined in Section Appendix A.

- Site Description

Derrinumera Landfill is one of two Mayo County Council refuse disposal facilities. The site has been receiving domestic waste, commercial waste, non-hazardous industrial waste and sewage sludge since 1974. The landfill is located between two hills 500 m north of the R311, the main Castlebar to Newport road (Ref. Drawing No. 002034/14/600). The site is surrounded by blanket bog and is remote from housing. Large tracts of land within the blanket peat to the north, west and east of the site have been afforested in recent years. The Glaishwy River passes 50 m east of the site, although at this point in its course the river is little more than a stream. The river flows into Beltra Lough 3.5 km north of the landfill.

Bedrock outcrops can be seen as ridges to the west of the site and as rocky hills protruding through the peat to the south of the landfill. Beneath the peat, and removed from the bedrock outcrops, glacial deposits are evident. These deposits consist of very sandy glacial till (boulder clay) and fluvioglacial outwash sands. Depth to bedrock is very shallow around the landfill, between 3.5m and 4.5m.

The underlying geology of the area consists of rocks of the Croaghmoyle formation. This formation combined with the Birreen and Kings Hill formations make up the Middle Devonian Beltra Group. The Croaghmoyle formation comprises red conglomerates with mainly quartzite pebble clasts and is believed to be derived from an alluvial fan from high-round to the north-east.

Groundwater flows in the area of the landfill are from the west of the site. Permeability testing carried out on the overburden and bedrock has shown that the majority of groundwater flow into the landfill is in the more permeable overburden. Halting this flow of groundwater into the landfill was one of the first priorities of the upgrading and remediation of the site. This was achieved by the construction of a cut-off wall around the circumference of the existing landfill.

Rainfall recorded at the onsite meteorological station from 1st January until 30th June 2007 was 891.4mm. Temperatures ranged between -4.02 and 24.3 degrees celcius, with atmospheric pressure ranging between 959.81mbar and 1027.67 mbar. The principal wind direction is south westerly. As weather data is recorded on an hourly basis it has not been included in an Appendix, but can be made available if requested.

- Types of Waste Accepted

Derrinumera Landfill under its licensing condition can only accept inert household and non-hazardous commercial and industrial waste only. Liquid wastes, sludges and/or animal wastes cannot be accepted at the facility.

Each load of waste arriving at the facility must be accompanied by a Waste Transfer Document **(DS 002 REV3).** Open topped vehicles are checked by the weighbridge controller. Enclosed vehicles have their contents examined at the tip head and these are cross-checked with the documentation presented. Should it be unacceptable the waste shall be isolated and arrangements put in place for the contractor to remove it from site.

- Quantities of Waste Accepted

Only household waste, commercial waste, non-hazardous industrial waste are disposed of at the site. An estimate of the current waste input into the landfill from the 1st January to 30th June 2007 is presented in Table.1 below.

Table.1 Waste inputs in Derrinumera Landfill

Waste Type	Tonnes Per Annum
Domestic	5097.17
Commercial	1650.64
Industrial	269.96
Street Cleanings	358.36
Hospital	205.32
Civic Amenity	1648.46
Illegal dumping clean up	18.91
TOTAL	**9248.82**

- Site Capacity

P.J. Tobin & Co. Ltd. carried out computer generated profiling to calculate the remaining void space of the landfill at the beginning of 2002. The estimated material volumes for cell construction and final capping were extracted from the overall figures to determine final estimated waste void space.

The total waste void space calculated for Cell 1 is 140,356m^3. Construction of Cell 1 and final capping utilised approximately 68,666m^3 resulting in a waste void space of 71,690m^3. Waste placed in the new cell during 2005 was 24,393 tonnes. Estimating that with compaction 0.75 tonne has a volume of 1m^3, the volume of waste deposited in the new cell during 2005 was 32,524m^3. Waste deposition in Cell 1 is complete apart from some profiling to allow the permanent cap to be constructed.

The total void space calculated for new Cell 2 is approx 245,336.06m^3. Waste deposition commenced in this cell during the November of 2005 following EPA approval.

The total remaining void space at the beginning of 2007 is approx 207,600 m^3. Should annual tonnages continue as for 2006 the landfill will be operational until the end of 2009 approximately.

Engineering Details

- Site Preparation and Provision of Services

Derrinumera landfill consists of some 5 hectares. The original site is best described as an un-engineered dilute and attenuate site. The site has been receiving domestic waste, commercial waste, non-hazardous industrial waste and sewage sludge since 1974. The landfill is located between two hills 500m north of the R311, the main Castlebar to Newport road. The site is surrounded by blanket bog and is remote from housing. Large tracts of land within the blanket peat to the north, west and east of the site have been afforested in recent years.

- Containment Details

The presence of the existing waste and the natural conditions at the site do not allow for the installation of an impermeable base line site. In order to reduce the amount of groundwater entering the perimeter system, a low permeability vertical cut-off wall has been installed as shown on Figure 1 entitled "Cut-off Wall Site Plan", previously submitted in Cut-off Wall Construction Quality Assurance Validation Report, May 2002. The cut-off wall consists of a 600mm wide bentonite wall with a vertical 2mm HDPE liner installed around the complete periphery of the landfill. The wall extends from 0.5m into competent bed rock to 0.5m above existing ground level.

A leachate collection zone has been constructed using a 2mm HDPE liner at the northern end of the site as shown on Drawing No. 002039/11/692A entitled "Site Layout Plan Showing Existing & Proposed Collection Zones", previously submitted on 26th January 2001. This serves to provide an area to where leachate from the unlined landfill migrates, is collected and pumped to holding tanks where it is subsequently removed for treatment at Castlebar Waste Water Treatment Works.

On top of the present landfill two new lined cells have been constructed. The waste deposited in these new cells achieves complete containment. In essence the base lining system consists of a cover material, horizontal gas collection drains to collect gas generated from the decomposition of existing placed waste, geotextiles and LLDPE liner, a drainage layer, a leachate collection drainage system and leachate extraction system. These are as detailed in June 2001 submission on the Landfill Liner and subsequent alterations. The first lined cell has accepted waste between February 2003 and November 2005. Construction of the second lined cell was completed during 2005 and waste deposition commenced in November 2005 following EPA approval.

- Leachate Drainage, Collection and Treatment

At present leachate generated within the unlined waste body drains to the north east of the site where it collects in the leachate collection zone as shown in Drawing No. 002039/11/692A entitled "Site Layout Plan Showing Existing & Proposed Leachate Collection Zones", submitted on 26th January 2001. The leachate is currently being pumped from the collection zone to three precast concrete tanks from where it is being tankered off site to the Castlebar Sewage Treatment Works for treatment.

A horizontal drainage system extends around the inside of the cut-off wall, which collects leachate moving laterally through the waste body. This is withdrawn by pumping and discharged to the leachate collection zone. Leachate from the lined cell is collected through leachate pipes and pumped to the holding tanks.

Following consultation with the agency a Wellpoint groundwater remediation system was installed during the first quarter of '05 and was operational during the second quarter. This system was put in place following the detection of leachate contamination outside of the Cut-off wall. The system consists of 5 wells which pump continuously to a priming tank. Any leachate collected by this system is pumped directly to the leachate collection zone. This system has been running 24 hrs/day since August 2005 and its effect has been to reduce the contamination detected in the groundwater. The system will continue to operate until such time as there is no serious contamination detected.

- Landfill Gas Abatement Methods, Collection and Flaring

An SC250 Ground Flare with automatic flame temperature control rated at 250 cubic metres per hour has been installed at the landfill. This burns with a combustion chamber temperature of over 1000 degrees Celsius minimum when the methane concentration is above 25% and with a minimum residence time of 0.5 seconds. This flare is currently in operation 24 hours per day 7 days per week. The current flow rate of the flare is approx $120m^3$ per hour

Vertical gas wells and extraction pipelines have been installed along the southern side of Cell 1 and the eastern side of Cell 2 as shown in Drawing No. 002039/14/610 entitled "Site Layout Plan Showing Proposed Vertical Gas Well Locations" previously submitted in January 2001. Vertical gas wells have also been installed in the completed new Cell 1 in preparation for the final capping.

Landfill gas production exists from the old landfill beneath the new lined cells. To prevent uncontrolled landfill gas emissions, a horizontal gas collection system has been installed beneath the landfill liner in Cell 1. This extracts landfill gas from the existing waste body, and through interconnecting pipe work, removes it to the gas flare for safe flaring. Similarly a landfill gas collection system has been constructed in Cell 2 during the construction of the new cell 2.

Vertical gas extraction wells and interconnecting pipe work connect and remove landfill gas from the cells to the gas flare.

- Monitoring Points

Landfill gas is monitored in 9 gas wells located around site both inside and outside the cut-off wall. Permanent gas monitoring locations have been installed in the new site buildings and these are shown on Drawing No. 002034/14/620.Landfill gas monitoring takes place on a monthly basis for the following parameters methane, carbon dioxide, oxygen, hydrogen sulphide, carbon monoxide, atmospheric pressure and temperature.

Surface water monitoring is carried out at locations SW1-SW6 and which includes the diverted surface water monitoring point DSW1. The surface water monitoring programme also involves a weekly visual and odour inspection at each of the monitoring locations. The parameters analysed are set out in Appendix B1.

Two flow monitoring stations have been installed on the Glaishwy River. There is a flow monitoring station located at the Glaishwy Bridge and one at the downstream end of the boundary fence. Both of the flow monitoring stations are incorporated into the EPA national hydrometric programme.
Groundwater levels are monitored monthly as set out in the licence. At present there are 23 groundwater-monitoring wells and include MW1-MW5 inclusive, MW7-MW9 inclusive and MW17-MW28 inclusive.
During sampling each of the wells are purged and are sampled for the parameters set out in Appendix B2. Each of the boreholes is protected with a locking mechanism to prevent against interference and vandalism.

Currently there are two leachate monitoring points in operation L1 and L5. L1 is located at the leachate collection zone and L5 is located at the leachate holding tanks. Chemical analysis of the leachate from each monitoring point is carried out monthly, quarterly and annually. The monitoring frequency of the various leachate parameters is detailed in Appendix B3.

Noise monitoring is carried out on an annual basis at locations N1, N2, N5 and N6. A condition of the licence is that noise levels do not exceed 55db (A) by day and 45db (A) at night.

Dust monitoring is carried out annually at 4 locations and it is conditional that dust deposition arising from the facility does not exceed 350 mg/m^2/day.

- Fencing Gates and Other Security

In accordance with the proposed EU Council Directive on the landfill of waste, a number of security measures have been provided at the site including fencing around the entire boundary of the site, supplemented by a perimeter drain to avoid unauthorised access to

the site. The security fencing reaches 2.4 m in height and comprises of palisade type fencing at the reception/front gate area and concrete unassailable type post and chain link fencing on the majority of the remainder. A proportion of the fencing comprises of wire mesh fencing.
A security gate has also been provided, which is locked outside normal operating hours.
A permanent public lighting system has been installed on the site. A CCTV system has also been installed at the site to monitor for illegal activities, this system has been upgraded and is now fully digital with an additional camera located in the public office.

- Site Access Roads and Secondary Roads

Site roads within the Derrinumera landfill site are constructed with 75mm size hardcore stone laid 300mm deep on a geotechnical material on compacted waste or a compacted mixture of waste and cover material.
Upgrading on the access road to the site has been completed. This work involved the widening of the road by 4m (2m either side) and the laying of a new road base and bitumen surface layer. An assessment will be made regularly of the access roads condition and appropriate actions will be taken when required to maintain the surface. The main road R311 and site entrance are currently being upgraded and realigned for increased safety and to deal with increased traffic.

- Fuel Stores

The bunded concrete fuel storage area is located as shown in Drawing No. 002034/16/612 as previously submitted in June 2001. A bunded fuel bowser is in use on site to provide fuel for the site vehicles.

- Current Landscaping and Tree Planting

Landscaping to provide screening to the landfill has been completed. Tree and hedge planting was carried out along the Regional Road, on both sides of the access road to the facility and along the southern boundary to a point where the undulating hillside provided natural screening from the public road.

- Site Weighbridge

The weighbridge in use at the facility is a pit mounted 18m precast concrete weighbridge supplied by Rite Weigh Ltd. It has a 60,000 kg capacity. The weighbridge is located directly adjacent to the control room as shown in Drawing No. 002034/14/615 previously submitted in June 2001. This bridge is calibrated annually by Irish weights and measures.

- Wheel Cleaning Infrastructure

A Mudblaster wheel wash system has been installed at the landfill in the location shown on Drawing No. 002034/14/615 previously submitted in June 2001. Water supply to the

wheelwash is primarily from collected clean surface water runoff with a secondary supply from the mains water supply. The outlet from this system is connected to the foul water collection system, which in turn is pumped to the leachate collection tanks.

- Surface Water Control Measures, Ditches, Road Drains and Wheelwash Water

Foul and surface water drainage pipework is shown on Drawing No's 002034/16/615 and 002034/15/610A previously submitted in June 2001 and July 2001 respectively. All foul water, surface water from the civic amenity area and road drainage is collected and pumped from the foul pump sump to the leachate holding tanks for subsequent removal off site. Other surface waters are collected in a surface water drain and discharged to the Glaishwy River following settlement in settling ponds No.1 and 2.

Operational Matters

- Description of the Operations

At present the main activity at the landfill facility is the deposition of household and non-hazardous commercial and industrial refuse into the lined Cell No.2. This refuse is placed in layers not exceeding 2.0 m in height and is compacted by at least four runs of the on-site compactor.

Water coming in contact with the refuse will become contaminated and is termed leachate. This leachate drains to the western base of the lined cell where it collects and is pumped to the leachate holding site.

The anaerobic breakdown of the organic fraction of the waste produces landfill gases of which the major constituents are methane and carbon dioxide. This landfill gas is flammable and is an asphyxiate if present in high concentrations. It is therefore incumbent upon Mayo County Council as part of its future operations to ensure that there will be no migration off site of this gas and that it is safely vented and/or collected for flaring.

An important aspect of the works at the Derrinumera Landfill is to maintain proper site appearance and infrastructure. This is essential in order to counteract the negative public image of landfills which has developed down the years.

Employees are currently deployed to maintain in good order and appearance, the civic amenity area, the site office and the entrance, the roads throughout and around the tipping area. In light of the exposed location of the landfill employees spend an amount of their time picking up litter which gathers in the planned netting system around the active cells and from those areas beyond the nets. The maintenance of the access roads, plant, building, waste inspection area, wheel cleaning pit and weighbridge is actively undertaken and kept in good repair.

In order to minimise environmental nuisances within the active cell all the deposited refuse is covered at the end of every working day. The type of cover material currently in use is V-net Polypropylene Sheeting, which upon application is maintained in position by the placement of small quantities of subsoils/woodchip. Upon completion the temporary completion of filling in any one area the daily cover is in turn covered using subsoils in order to prevent the exposure of waste.

In order to maintain control over the utilisation of void space, and to maintain proper financial policy it is imperative that records are kept and, to this end there is one member of staff deployed to check and weigh in every load that is presented for deposition. There is a further member of staff employed to visibly inspect every load of waste being deposited at the tip head.

- Phasing of Filling

Filling is now taking place in lined Cell No.2. This cell was divided in two using an impermeable liner to create a north side and a south side. Waste deposition is currently taking place in the northern side of this cell with the southern end close to its final fill height. Leachate is collected in a sump on the western side of this cell and is pumped to the leachate storage tanks.

- Water, Leachate and Gas Control Measures

A surface water drainage system extends around the outside of the cut-off wall, which collects and discharges clean surface water to the Glaishwy River. A horizontal drainage system extends around the inside of the cut-off wall, which collects leachate moving laterally through the waste body. This is withdrawn by pumping and discharged to the leachate collection zone. The cut-off wall together with these drains helps minimise the quantity of leachate being produced and prevents the contamination of clean surface water and groundwater with leachate.

The ground water monitoring points are protected from accidental or intended damage by housing them in manhole chambers with suitable covers. The headworks above the boreholes are secured with padlocks to act as a further deterrent to vandalism.

Leachate is removed on a daily basis from the site and tankered to Castlebar for treatment in the Wastewater Treatment Plant. Under the conditions of the licence it is required to maintain the level of leachate within the lined cells to a maximum of 1m. Leachate level is measured in terms of its level above the floor of the collection zone at its discharge point. This depth is checked daily and recorded once per week. Pumps are inspected regularly and a watchful eye is kept on the volume being discharged at the collection zone.

The floor of the leachate collection zone has a difference in level of 1 metre from east to west with the draw-off point being 0.5m above the floor level on the west side. This facilitates the draining of the zone and its cleaning when required.

In the event of a prolonged power failure contingency arrangements include the availability of diesel pumps and a temporary loading gantry to collect the leachate and transport it to Castlebar Treatment Plant.

- Measures for the Control of Environmental Nuisances

The nuisances, which cause concern, include litter, odours, noise, birds, vermin, insects and other pests, fires and dust. These are dealt with as follows:

Litter:

Windblown litter at the working face will be minimised by keeping the working face as small as possible. With regard to litter along the approach road to the site Mayo County Council require that all vehicles have their waste adequately covered and secured. The approach roads to the site are monitored on at least a daily basis and in the event of litter being found on these roads, then it is promptly removed by Mayo County Council staff and deposited in the appropriate manner at the landfill site. A general clean up and attendance work will be carried out on a weekly basis by Mayo County Council staff around the entire perimeter of the landfill site including the perimeter drain.

Odours:

Odour emission from the landfill site is reduced and controlled through the implementation of various measures including;

- the minimisation of the size of the working face;
- compaction of the waste after it has been deposited;
- the frequent covering of waste with a mineral soil layer which reduces odorous components.
- The extraction and flaring of landfill gas.

Noise:

Any plant, which is considered to exceed the noise limits, will be fitted out with noise attenuation measures.

Birds:

Environmental nuisance resulting from the activities of birds on the landfill site will be controlled and minimised by the use of birds of prey and by keeping the active face as small as possible and by covering this area with soil on a daily basis.

Vermin:

There is no vermin problem at the site at present and therefore no special measures are required. Ongoing vermin control measures are employed utilising a specialist company in this field.

Insects and Pests:

Insect and pest nuisance does not present a significant problem. The application of a daily cover functions in the fight against pests. Environmentally friendly insect sprays are used when required to keep this nuisance factor under control.

Fires:

Immediate compaction of waste as it is deposited on the landfill site, maintaining active working face as small as is practicable and daily covering of the compacted waste help to reduce considerably the risks of fire at Derrinumera landfill site. Further additional fire prevention and control measures are provided at the site, as recommended in the EPA manual on Landfill Operational Practices, include:

- training of all site operatives and employees in fire prevention and control
- prominent posting of emergency response contact numbers (fire services, police, ambulance and other agencies)
- the provision of on-site water supply and if necessary, water storage and portable tanks and
- the provision of fire fighting equipment in the site office.

Mud and Dust:

Measures to mitigate against mud and dust nuisance include
the installation of wheelwash at a suitable distance from the public road

- regular maintenance of all site roads
- when conditions arise whereby dust is likely to be a problem then the working area and/or site roads will be dampened down to mitigate the impacts.

Site Opening and Operating Times:

The landfill facility is open from 08.00-17.00 Monday to Friday. The civic amenity site is open 08.00-17.00 Monday to Saturday.

Access Control and Waste Acceptance Procedures

There are three main streams in which waste can be accepted into the site.

- Waste accepted into the site by contractors under the Waste Management Act, 1996 and;
- Private individuals transporting their own waste to the landfill.

Each load of waste arriving at the facility must be accompanied by a Waste Transfer Document **(DS 002 REV3).** Open topped vehicles are checked by the weighbridge controller. Enclosed vehicles have their contents examined at the tip head and are cross-checked with the documentation presented. Should it be unacceptable the waste shall be isolated and arrangements put in place for the contractor to remove from site.

Waste producers/registered contractors are required to carry out a basic characterisation or Level 1 characterisation as outlined in the draft EPA manual on waste acceptance. It is the responsibility of the waste producer/contractor to inform the landfill operator if he/she feels that the waste may have changed in comparison to the Level 1 characterisation.

All the waste entering the site is logged and weighed with the information being stored in the sites permanent records.

- Equipment Utilised

Plant	Model	Comments
Compactor	Bomag Compactor (BC 671RB)	In continuous use at working face
Excavator	Excavator Hitachi (EX225)	In use at working face

- Waste Placement Procedures

In the case where waste is to be placed in an area covered with temporary or intermediate cover then this cover will as far as possible be removed prior to emplacement of fresh waste but with cognisance of the possible odour consequences, and assuming that previously deposited waste is not exposed.
Deposited waste will be compacted into layers up to 2 metres and the working face should be maintained at a slope no greater than 1 in 3 to ensure effectiveness of the compaction system.
The active working face is to be kept as small as possible, with a maximum area of about 400m^2. At the end of each day all waste will be covered by daily cover material.
The process of waste deposit, emplacement and compaction should be as rapid as practicable to minimise bird, odour and vermin problems.

- Cover Requirements

At the end of each working day the active tipping face is covered by a layer of V-net polypropylene. Where an area is to be capped for a period of a number of weeks/months then the intermediate cover will consist of subsoil spread to a depth of approximately 300mm. At the commencement of filling as much as possible of the temporary/intermediate cover material should be removed. Procedures for the final capping of a filled area are dealt with in the section relating to Closure and Aftercare.

- Site Personnel including Qualifications, Duties and Responsibilities

  Refer to management structure contained in Appendix A.

- Monitoring and Maintenance Procedures

Monitoring is carried out at Derrinumera Landfill in accordance with Schedule E of the Waste Licence 21-1.

The main elements of the monitoring programme include:

- Landfill Gas Monitoring
- Leachate Monitoring

- Surface water Monitoring
- Groundwater Monitoring
- Noise and Dust Monitoring
- Meteorological Monitoring
- Ecological Monitoring

Monitoring of landfill gas emissions takes place on a monthly basis for the following parameters: Methane, Carbon Dioxide, Oxygen, Hydrogen Sulphide and Atmospheric Pressure.

At present two leachate monitoring wells (L1 and L5) exist specifically for the purpose of leachate monitoring. The chemical analysis of the leachate is similar to that of surface water. Parameters analysed are outlined in Appendix B3.

The volumes of leachate transported off site every month are also monitored.

Analysis of surface water, groundwater and leachate samples is carried out in accordance with Schedule F of Waste Licence 21-1.

The two flow monitoring stations planned for the Glaishwy River have been installed. There is a flow monitoring station located at the Glaishwy Bridge and one at the downstream end of the boundary fence. Both of the flow monitoring stations are incorporated into the EPA national hydrometric programme.

Both noise and dust monitoring are carried out on an annual basis at four noise monitoring locations and four dust monitoring locations.

Meteorological Monitoring is carried out daily and the following parameters are recorded: Precipitation, Temperature (Max. and Min.) Wind Force and Direction, Evaporation, Humidity and Atmospheric Pressure.

- Operational and Safety Rules and Emergency Procedures:

Refer to both the Guidelines on Safe Tipping Procedures at the landfill site and Emergency Response Procedures.

- Assessment of Settlement and Requirements for Surcharging

A topographical survey was carried out on the landfill in May 2007. The drawing of the topographical survey carried out will be forwarded to the Agency once it is complete.

- Assessment of Compacted waste density

The assessment of the void space taken up since the last survey is currently being prepared by the surveyors, National Land Surveys Ltd. This shall serve to enable remaining void space and compacted waste density to be assessed. Immediately this data becomes available it shall be supplied to the Agency. The current compaction rate is .786 tonnes/m^3

Closure and Aftercare

- Final Capacity and Expected Operational Period of the Facility

The total remaining void space at the beginning of 2007 is approx 207,600 m^3. Should annual tonnages continue as for 2006 the landfill will be operational until the end of 2009 approximately.

- Final Contours

The final contours of the site are shown in Drawing No. 002034/16/612 previously submitted in 2001.

- Restoration Plan

The complete restoration and aftercare relating to the facility has not been fully decided upon, however the following commitments have been outlined/given:

- On cessation of filling, each cell will be capped with an impermeable liner and soil layer;
- Gas extraction and leachate treatment will continue post closure;
- Monitoring of gas, surface and groundwater and leachate quality will continue post closure.

Capping:

When the cells are filled a final cover will be constructed on the waste body. In order to limit the risk of damage due to waste settlement a 3 month waiting period will be introduced. Once the settlement is sufficiently decreased the construction of the top cover can start. The purpose of the final cover will be to minimise infiltration of water into the waste by promoting surface drainage and maximising runoff. It will also function to control gas migration and to provide a physical separation between waste and plant and animal life.

The capping layer will comprise of the following layers as detailed in SEW ES/MMcD1718/1a.

1. Topsoil cover (0.15m depth), on;
2. Subsoil cover (0.85m depth), on;
3. Geosynthetic surface water drainage layer, on;
4. 1mm LLDPE liner, on:
5. Geosynthetic gas equalisation layer, on;
6. Re-profiled temporary cap (0.3 m depth).

The landfill waste body is to be landscaped by the shaping of the landfill profile to imitate a naturally weathered form in the landscape – an extension of the ridge itself. When finally capped and seeded with indigenous wild grasses and scrub vegetation, the landfill will be visually subsumed into the existing landscape. This will be achieved with a staged landscaping schedule to follow closely with the completion of each stage in the overall development, weather and ground conditions permitting. Shrub vegetation on the landfill profile will be planted with a selection of wild flowering heathers, Plant List (A1) and scrub vegetation, Plant List (A2) (refer to Table 2.4). These will be planted at the end of the summer when completion of each stage of development is carried out. These areas will be planted in large blocks of individual species to blend in with the surrounding landscape. Large areas will be seeded with indigenous wild grasses to complete the overall visual image of the landfill.

The shape of the landfill will have to support the final cover. Slopes must be less than 1:3 for stability reasons. The slopes at the top of the landfill must be no less than 4 % (1 vertical: 25 horizontal) in order to assist gravity drainage and to limit the chance of locked water.

- Phases for closure and Other Control Measures

Not to be decided until after commencement of the proposed development of the site with respect to Cell No.1 and Cell No.2.

- Aftercare Monitoring and Other Control Measures

Monitoring at post closure stage is to be as follows:

Dust:
Following completion of final landscaping dust monitoring will not be applicable

Ecology:
The vicinity shall be monitored once, approx. 6 months after completion of landscaping operations. No further monitoring of ecology is expected thereafter.

Groundwater:
The post closure monitoring programme will be developed on the basis of the results of the monitoring programme over the remaining operating life of the landfill. The principle aim of the programme will be to comply with the legislation and requirements of the EPA. Other aims will be to continue to quantify the water quality in the vicinity of the landfill site and identify any adverse impacts and also to assess the performance of the perimeter leachate collection system.

The programme will consist of a minimum of twice a year sampling of groundwater from up-gradient and down-gradient monitoring points. Water levels will be recorded at time of complying. The analyses will include the areas as set out for "Compliance

Monitoring", in the EPA Manual on Landfill Monitoring or as otherwise required by the Agency.

Surface Water:
As with groundwater, the post closure monitoring programme will be developed on the basis of the results of the monitoring programmes over the remaining operating life of the landfill. Again the principle aim will be to comply with the legislation and requirements of the EPA. The monitoring will also function in quantifying the water quality in the vicinity of the landfill site and to identify any adverse impacts, in addition to assessing the performance of the perimeter leachate collection system.

The programme will consist of a minimum of twice yearly sampling of surface water from upstream and downstream positions in the flow regimes. Water level measurements will be recorded in the wells and at the available staff gauges at the same time as sampling.
The analyses will include the areas as set out for "Compliance Monitoring", in the EPA Manual on Landfill Monitoring or as otherwise required by the Agency.

Landfill Gas:
During the initial phase of the post closure period, monitoring of landfill gas will continue on a weekly basis in and around the site buildings and on a monthly basis both within and outside the waste body, until it is shown that conditions at the site are stable, at which stage the frequency of monitoring may be reduced to six monthly monitoring.

Leachate:
Following closure, leachate levels and flow rates will continue to be recorded at the pump sumps .
Leachate composition will be sampled and analysed on a twice yearly basis in conjunction with the groundwater monitoring and will be analysed for the same parameters as that outlined for pre-closure.

Meteorological Data:
The meteorological monitoring will remain in place upon completion of landfill activities.

Noise:
Noise monitoring is not expected to be required following completion of landfill activities at Derrinumera.

Odours:
The need to monitor odours may arise in response to complaints. However proper management of the landfill operation and installation of a gas extraction plant will ensure that odour problems are kept to a minimum.

- Maintenance Programme for Aftercare Phase

At present an Environmental Management System exists for Derrinumera landfill. The management programme that will be implemented pre-closure will extend to the post-closure period with particular emphasis being placed on the management of leachate, landfill gas emissions, surface and groundwater systems to ensure that the potential for environmental damage is eliminated/minimised.

Attention will also be given to security of the facility in order to safeguard the integrity of the management systems implemented. Management will also be extended to minimise problems caused from environmental nuisances in accordance with the guidelines from the Agency.

Table 2.4

Plant List

Species

A1		**Size**		**Spacing**
	Erica carnea	10/30 cm		0.5 m
	Erica darleyensis			
	Daboecia			
	Calluna			
A2				
	Uxelus europaeus	30/100 cm		1 m
	Fuchsia m "Riccartonii"			
	Contoneaster horizontalis			
	Cornus			
A3				
	Sorbus	60/120 cm		1m
	Corylus			
	Betula			
	Alnus			
	Crataegus			
	Acer			
	Fraxinus			
	Picea			
	Pinus			
A4		**Girth**	**Height**	**Spacing**
	Sorbus	12/14 cm	3-4 m	3m
	Betula			
	Alnus			
	Crataegus			
	Acer			
	Fraxinus			

APPENDIX A