APPENDIX 3.3.2
Compost Facility and Associated Processes

1 COMPOST FACILITY AND PROCESS DESCRIPTION

One of the principal elements of infrastructure to be provided at the facility is the proposed composting facility, to be located as shown on Drawing No. 3369-2417. Planning permission has already been granted for this element of the Drehid Waste Management Facility.

The composting facility comprises the following sections:

- A biowaste reception/handling area, where biowaste will be unloaded, stored and pre-treated;
- A pre-composting area, where biowaste will be composted in tunnels for a period of one week;
- A post-composting area where the pre-composted biowaste is composted in aerated piles for a period of four weeks.
- A compost refinement and storage area;
- Equipment for treatment of process air, including air scrubbers and biofilter;
- Control Room (housing PLC-equipment and process computer).

The layout of the composting facility in relation to the overall Drehid Site layout is as shown on Drawing No. 3369-2401 and Drawing No. 3369-2417. The internal layout of the composting facility is as shown on Drawing No. 3369-2418. The elevations and sections of the buildings are as shown on Drawing No. 3369-2419. Details of the aeration floors, air treatment and water treatment systems are as show on Drawing No. 3369-2420.

1.1 Biowaste reception/handling area

After weighing and registration of the waste at the facility entrance, the trucks will be directed towards the biowaste reception area in the composting building. In this area, the biowaste will be tipped on the tipping floor. The reception area also contains a waste inspection/quarantine area and a number of storage bays for specific biowaste streams such as batches of food waste with high moisture contents etc. and bulking materials such as woodchips etc.

After tipping the waste, the contents of the truck will be visually inspected by the operator in charge. If the waste does not meet the acceptance criteria, e.g. the type of waste does not meet the licensed categories or the content of impurities (i.e. non-organic material) is high, it will not be accepted. In such instances the waste will be reloaded and transferred to the adjacent landfill for deposition, if the waste meets the acceptance criteria at the landfill. Alternatively the delivering party will have to transport the waste off-site to alternative recovery/disposal facilities. In both instances the delivering party will incur the associated costs.

A number of bays will be installed in the reception area, separated by concrete retention walls of approximately 4m high, which allow separate storage of mono waste streams, and bulking materials.

Waste that meets the facilities acceptance criteria may contain a limited percentage of bulky non-compostable materials, which may cause process disturbances or damage to mechanical equipment (e.g. concrete blocks, large plastic foils). These contaminants will be removed by the front-end loader and placed in a storage bay for subsequent transfer to the adjacent landfill.

Proper mixing of different types of waste streams will be carried out throughout the day in order to allow for both a proper composting process and the production of compost with a near constant quality. In particular, the mixing of wet and dry waste streams to produce a mixture that has sufficient structure and porosity for the composting process will be carried out. As a rule of thumb it can be stated that the mixture should have a dry solids content of at least 30-40%. This will depend on a number of factors, e.g. particle size, free water absorption capacity and free water.

In addition, specific biowaste streams may contain relatively high or low concentrations of certain elements, e.g. nitrogen, sulphur or heavy metals. To prevent process disturbances (e.g. high Carbon/Nitrogen (C/N) ratio), excessive emissions (e.g. ammonia, Hydrogen Sulphide (H_2S)) and bad quality compost, levelling out peaks by proper mixing is therefore essential.

The composition of the input to the facility may vary over time, due to the acceptance of a wide variety of household, commercial and industrial wastes, and periodical fluctuations (e.g. seasonal). Specific (mono) waste streams e.g. fruit and vegetable waste, will be kept apart in the biowaste storage area and mixed with bulking material prior to transporting biowaste to the aeration bay.

Wet organic fraction (WOF) streams, e.g. off specification food wastes, can be handled in two different ways:

- Unloading the WOF on a bed of 'dry' biowaste (> 30-40% dry solids) spread out on the tipping floor, which will be subsequently mixed by a front-end loader to get a solid mixture;
- Mixing the WOF with structure/bulking agents, such as shredded waste timber or shredded waste paper or cardboard, which cannot be recycled otherwise. These materials will be stored in bays in the biowaste reception area.

With the exception of mixing with bulking material where necessary, no further pre-treatment of the biowaste will be carried out. The reasons for this are to maintain the porosity of the fresh biowaste whereas shredding this material may lead to a loss of porosity. In addition this minimises the need for mechanical plant and labour. Efficient sieving of relatively wet materials in a trommel or other sieving equipment will be difficult from a practical point of view, and may cause additional odour emissions. In addition, during the composting process, the material will be dried to approximately 60-70% dry solids, and therefore will be easier to handle. Furthermore, the quantity of compost will have been reduced to approximately 40% of the biowaste input, which reduces operational time of mechanical equipment.

The only exception to this will be that dry biowaste, containing a relatively large quantity of coarse elements, e.g. green waste, will be shredded by a mobile shredder and then used as a bulking agent. Shredding will take place at the composting facility on a periodic basis only, generally of the order of at maximum once a fortnight.

The small percentage of pollutants in the biowaste (e.g. small stones and plastics) can pass through the composting process without interfering with the composting process or damaging plant or equipment.

All biowaste delivered to the composting facility, with the possible exception of bulking materials, will be loaded into a pre-composting tunnel on the same day of delivery.

As shown on Drawing No. 3369-2418 the surface area of the biowaste reception area will be approximately 235m^2. The required maximum fresh biowaste storage capacity is calculated as a (peak) factor of 1.5 times the average daily intake. With a maximum treatment capacity of 25,000tpa, this equals to approximately 150 tonnes. At a maximum storage height of 3m, or 1-1.5 tonnes/m^2, the required floor area equals approximately 150m^2. The area available is therefore more than sufficient at the maximum capacity of 25,000tpa. Beside the actual waste reception area there is also an area of approximately 880m² available within the building for the routing and unloading of trucks.

1.1.1 Composting areas

1.1.1.1 General Layout

As shown on Drawing No. 3369-2418 the composting process will take place in two principal areas, namely:

- The pre-composting area comprising 5 No. enclosed composting tunnels.
- The post-composting area consisting of an aerated floor separated from the rest of the building using PVC industrial curtains.

The composting facility will be constructed to meet a design capacity of 25,000tpa. The facility however has the flexibility to provide for the gradual increase in the quantities at the facility to this overall 25,000tpa capacity. There are two principal ways of using only a part of the design capacity of the facility:

- Filling the composting tunnels with biowaste to a lower height e.g. less than 2m high. This will however require the aeration rates to be reduced, in order to prevent drying out of the composting biomass in the tunnels;
- Using only a part of the aeration floor area, equivalent to the actual quantity to be treated (percentage of design capacity)

As illustrated on Drawing No. 3369-2418, the main features of the composting facility will be:

(1) Pre-composting area (Composting Tunnels)

- 5 No. composting tunnels each with a surface area of 100m^2 (20m in length by 5m in width).
- The tunnels will be comprised of reinforced concrete floor, walls (5m high), and roof.
- The front end of each tunnel will comprise an airtight retractable steel door.
- A concrete aeration floor, through which air will be blown, will be installed

underneath each tunnel, with aeration channels embedded in the concrete floor. These channels will also collect any leachate and process water.

- 1 No. air blower/ventilator will be installed at the back of each of the composting tunnels, to supply air to the individual aeration floors of each of the tunnels. The ventilators will feed the aeration floors via channels connected through the concrete retention wall.
- An air collection duct will be installed over the middle of the compost in the tunnels to collect the process air. The collected air will be fed to the air treatment system, i.e. scrubber and biofilter, which will be situated at the rear of the building.
- A water sprinkler system will be installed in each of the tunnels with the capability to disperse water through fine nozzles to the tunnels when required.

(2) Post-composting area (Aeration Floor)

- The post-composting area will be located adjacent to the composting tunnels and be bound by a 4m high concrete retaining wall along the length of the post-composting area.
- Industrial PVC curtains will be installed along both sides of the post-composting area. The curtains will hang from the facility roof and will be fixed and non-removable. The post-composting area will be subdivided along the length of the area using a further industrial PVC curtain, thereby creating two enclosed areas.
- The front and back end of the post-compost area will also have industrial PVC curtains running from floor to ceiling. However these curtains will be movable and will be opened to fill the post-compost area with the pre-composted material, to turn the compost and to remove the mature compost.
- A concrete aeration floor will be installed underneath the post-compost area, with aeration channels embedded in the concrete floor. These channels will also collect any leachate and process water.
- A total of 5 No. air blowers/ventilators will be installed along the length of the post-compost area, to supply air to the aeration floor. The ventilators will feed the aeration floor via channels connected through the concrete retention wall.
- At the roof of the post-composting area air collection ducts will be installed over the middle of the compost piles to collect the process air. The collected air will be recirculated, with excess air fed to the air treatment system, i.e. scrubber and biofilter, which will be situated at the rear of the building. In this way an enclosed composting bay is created, in which the process conditions for the composting process can be controlled, without impacting on the working environment in the adjacent areas of the building or allowing uncontrolled emissions to occur.
- A water sprinkler system will be installed over the compost bay with the capability to disperse water through fine nozzles to the entire compost bay when required.

Feeding of fresh material to the composting tunnels and pre-composted biowaste to the compost bay will be carried out by an industrial front end loader such as the Volvo L90D or similar. Turning of material in the post composting areas will be carried out by a 360° hydraulic excavator with a grab attachment such as the Komatsu PW 130ES-6 or similar.

The loader will also be used to transport the compost to the compost refinement/storage section.

After a 7-day period in a tunnel, the tunnel will be emptied using the front-end loader and deposited in piles up to 3m high in the aerated post-composting area, which is partitioned from the rest of the building by a series of industrial curtains. The compost piles will be turned and moved along the post-composting area by the 360° hydraulic excavator on two occasions. The material will remain on the aerated beds for a period of up to 4 weeks at which point the finished compost will be moved using the front-end loader to the compost to the compost refinement area and then the storage area within the building.

1.1.1.1.1 Aerated floor system

For the proposed facility it is proposed to install a sophisticated aerated floor system whereby aeration ducts are embedded in the concrete floors of the tunnels and also in the post-composting area. This system allows significant operational flexibility with respect to handling of material and input composition.

Air will be supplied to the aeration floors by a series of ventilators or air blowers placed at the back of the tunnels and along the length of the post-composting area. All ventilators have adjustable capacities (up to a maximum of 15,000m^3/hour), so that the airflow can be adjusted as required. For the post-composting area higher rates of aeration are required in the first stages of the composting process. The positioning of the air blowers is as illustrated in Drawing No. 3369-2421.

1.1.1.1.2 Process description

The fresh biowaste will be filled into the composting tunnels on a 5-day per week basis, with one tunnel filled each day and subsequently emptied on the same day the following week thereby allowing for 7days of composting in each of the tunnels.

The fresh waste will have a density of on average 0.45tonnes/m^3 and will be filled to a height of approximately 2.15m within the tunnels. Filling and emptying of the tunnels will be carried out using an industrial front-end loader. At the end of the pre-composting process in the tunnels there will be an approximate 20% mass reduction of the input biowaste.

The pre-composted biowaste will be placed in piles over the whole length and width of the aeration floor, to a height of approximately 2.5-3m. Due to the intensive aeration through the floor, it is not required to place the material in separate windrows thereby maximising the capacity per square metre of aeration floor. The post-composting area is divided into two separate sections partitioned by an industrial curtain running along the middle of the composting area.

In a period of 4 weeks, the biowaste is moved from the front-end to the back-end of the post-composting section, by turning the compost on two occasions (end of week 1 and end of week 3) and finally removing the compost (end of week 4). The 360° hydraulic excavator works through the post-composting area from the back-end to the front-end i.e. it starts by removing the mature compost (at the back-end) to the compost refinement area, and subsequently moves (turns) biowaste along the composting section. Once it has turned the whole composting section, the area at the front-end will be empty and will be ready for the intake of fresh biowaste. The usage of two separate aerated areas allows for flexibility in the biowaste handling process i.e. the front-end of one of the two areas will always be available for receipt of the composting biowaste from the tunnels.

The mechanical turning of the material loosens and homogenises the composting biowaste, while at the same time water can be sprinkled (if necessary) to further enhance the process.

During the turning of the biowaste in the post-composting area of the facility the visibility within these enclosed (curtained) sections of the composting facility for the operators of the mobile plant will be improved by the following measures:

- Switching off the under floor aeration at the section of the post-composting area where material is being turned.
- Ensuring continuous air collection in the central air duct located above the post-composting area (to a maximum rate of 75m³/hr.).
- Provision of independently climate controlled cabins and headlights to the mobile plant.

At the maximum capacity of 25,000tpa, approximately 480 tonnes of biowaste will be present in the tunnels, with approximately 1,500 to 1,750 tonnes of material present in the post-composting area during any given week. Depending on operator efficiency the industrial front end loader and 360° hydraulic excavator will each be capable of operating at a rate of 75-100 tonnes/hr. which equates to between 20-30 operational hours/week. The capacity of the plant will therefore be more than sufficient to handle the biowaste and compost at the capacity of 25,000tpa.

During the six week composting period, the mass and volume of the material will be gradually reduced, due to biological degradation and evaporation of moisture. In the post-composting area, the height of the composting mass will be kept constant over the total composting period, so that the area, which will be occupied by a charge of biowaste, decreases as the composting period advances. The dimensions of the composting section are calculated on the basis of the expected mass loss over time, in relation to the required biowaste throughput.

1.1.1.1.3 Process control

The primary process control will be executed by temperature sensors placed at different locations and depths in the biowaste in the tunnels and in the composting piles on the aerated floors in the post-composting area. The signal of the temperature sensors will be transmitted to the central process computer, which will be installed in the adjoining facility accommodation.

Oxygen will be supplied to the composting biowaste by a system of forced aeration. The ventilators, which supply air to the compost tunnels and aerated floor, will all have a variable capacity. The volume of air supplied to the composting mass will be primarily determined by the temperature of the composting mass, and automatically steered from the process computer. The composting process will be regulated at an optimum temperature of 55 - 65°C.

The maximum capacity of the ventilators (volume per hour related to pressure drop) will be based on calculations of the peak air consumption of the composting process, such as to ensure that sufficient oxygen supply will be guaranteed at all times and anaerobic conditions will be prevented.

As outlined previously 5 No. ventilators or air blowers will be installed behind the compost tunnels i.e. one per tunnel, thereby ensuring the maximum control of air input to the individual tunnels. Each of the ventilators will have an adjustable aeration rate up to a maximum of 2,500m³/hr and therefore the rate of aeration in each of the tunnels can be adjusted according to optimum process requirements, which will be controlled by the central process computer.

In addition, 5 No. ventilators or air blowers will be installed at the post-composting area. The rate of aeration of these ventilators will be higher than for the tunnels as the surface area to be covered is greater. In addition the rate of aeration needs to be higher at the front end of the post-composting area and therefore the ventilators will be concentrated towards the front end. In addition each of the ventilators will have an adjustable aeration rate up to a maximum of 15,000m³/hr. and therefore the rate of aeration along the length of the post-composting area can be adjusted according to optimum process requirements, which will also be controlled by the central process computer.

Additional water can be added to the compost tunnels and compost piles by the fixed sprinkling system located in the roof of each of the tunnels and above the post-composting areas. The rate of application of water to each tunnel and each section of the post-composting bay will be determined by a visual assessment of the composting biowaste within the tunnels and the post-composting area by the facility operator.

1.1.1.2 Compost refinement/storage area

A compost refinement step will be installed to remove impurities to the extent required by the relevant compost standard. This refinement step will include removal of metals by an overhead magnet, and sieving of the compost. The mechanical equipment used for compost refinement will comprise of a mobile hopper/overhead magnet/trommel system, with adjustable sieving plates in the trommel.

The compost will be conveyed to the refinement area via the industrial front end loader.

It is envisaged that the compost will be sieved over a diameter between 15 and 25mm. However, the adjustable sieving plates allow for the sieving of the compost over variable diameters, and thus various qualities can be produced as required (e.g. a finer compost for future high-grade applications).

The underflow of the trommel, the sieved compost, will be moved using the front end loader to the compost storage area. The compost will be utilised on-site in the short to medium term for landscaping and restoration purposes. Once alternative markets are developed the compost will be hauled off site using articulated trucks at a maximum rate of 100 tonnes per day, which equates to 5 No. trucks at a payload of 20 tonnes.

The overflow of the trommel will be conveyed from the trommel to oversize fraction storage bay and subsequently returned to the composting cycle or alternatively, if this fraction contains mainly non-biodegradable impurities, transported to the adjacent landfill. The metals will be collected in a small skip and transported for recovery to the metal industry.

1.1.1.3 Air management

The composting process will extract air from the composting building, generating slight under pressure and preventing emissions through open doors. This air will be fed via ventilators or air blowers through the aeration floors of the composting tunnels and the post-composting area.

The tunnels will consist of reinforced concrete walls with a retractable airtight steel door at the front of each tunnel through which the tunnels are loaded and unloaded. Each tunnel will in effect be will be separate from each other and also from the rest of the building and therefore allow for the maximum degree of process air control.

The aerated piles where the post-composting process takes place will be separated from the rest of the building by concrete retention walls and vertical industrial PVC curtains. These curtains can be opened as required, e.g. to load the composting biowaste from the tunnels or to remove compost. The primary purpose of the curtains will be to create separate air conditions in the post-composting area, with warm, humid conditions, and the operations areas outside the aerated piles.

An air collection duct will be installed below the roof of each of the tunnels, which will collect air for transport to the air treatment system comprising of a water scrubber and biofilter.

Above each of the separate post-composting areas air collection ducts will be installed for collecting and transporting process air at a maximum rate of 75,000m³/hr. From this duct, the warm, humid air will be transported to a water scrubber and subsequently recirculated through the aeration floors in the tunnels. Excess air will be sent to the process air treatment system including biofilter.

A separate air collection duct will be installed in the biowaste reception/handling area and the compost refinement/storage area, as odour emissions can be high during handling of fresh biowaste and compost. This air collection channel leads to the scrubber treating the excess air of the post-composting area.

Two scrubbers will be installed at the rear of the building, adjacent to the biofilters. One scrubber will treat the process air from the compost tunnels while the second scrubber will treat the process air of the post-composting area plus the pre-treatment and refinement areas.

The water scrubber consists of a tank in which water will be sprinkled through fine nozzles, creating a vapour mist. The water for the water scrubber is extracted from the underground process water tank. Excess water from the scrubber will be recirculated into the leachate/wash water tank from where it passes through a mechanical filter into the process water tank.

The primary purpose of the water scrubber will be to work as a cooler and condenser, cooling the collected process air from approximately 45°C to approximately 30°C and removing dust particles. This allows air from the post-composting area, biowaste reception/handling area and the compost refinement/storage area to be recirculated to the composting tunnels. The pre-treatment in the scrubber of excess air from these areas and air from the tunnels also optimises the condition of the air for biofilter treatment, which increases the efficiency of the biofilter and its lifetime.

From the scrubber, the excess air will be fed through a biofilter. The biofilter comprises a large concrete box, in which a layer of biofilter media (e.g. granular peat, woodchips, compost etc.) will be placed, with a manifold and a system of air ducts on the bottom to ensure an even distribution of air through the biofilter.

In dry and relatively warm periods, water can be sprinkled on to the biofilter to maintain the proper moisture content. The biofilter will be covered with a hood, which will collect the air from the top of the biofilter and will emit this air through an air vent.

The biofilter material will have to be replaced by fresh material, in order to maintain the odour removal efficiency of the filter on a periodic basis of the order of 2- 7 years depending on the biofilter material used. On the side of the biofilter a maintenance access will be provided, through which a small bobcat can enter. Spoilt biofilter material will be removed and then replaced by the bobcat through the maintenance access.
The exact surface of the biofilters depends on the amount of process air to be treated. Biofilters of the envisaged type will treat 100-150 m^3 process air/m^2 of biofilter/hour. The loading rate of the biofilter is determined as a volumetric loading rate, and not based on odour concentrations per cubic metre.
The aeration floor area for the composting tunnels is 500m^2, with an aeration floor area for the post-composting area of 900m^2 giving a total floor area of 1,400m^2.

The average aeration rate is expected to be 20m^3/m^2/hr. or 28,000m^3/hr. With a loading of 125m^3/m^2 the total biofilter surface area is calculated at 225m^2.

1.1.1.4 Water management

The underground water tanks will be constructed adjacent to the biofilters and will be comprised of two compartments: a leachate/wash water tank and a process water tank separated by a mechanical filter.

Leachate and condensate from the tunnels, composting bays, together with any run-off from hardstand areas (e.g. through cleansing) will be collected in the leachate/wash water tank. From there, it will be pumped through a mechanical filter, retaining particles in the water, to the process water tank.

The water from the process water tank will be used for several purposes:

- To moisten the composting biomass in the tunnels and post-composting area, as required. A sprinkling system will be installed within the compost tunnels and above the post-compost area.
- As process water in the water scrubber, to condition process air prior to bio filtration.
- To moisten the biofilters, if required.
- For cleansing of hardstand areas within the composting building.

Although the composting facility will generally be a closed loop system in terms of water usage, there may be limited times whereby the biowaste over a period of time has an elevated moisture content resulting in a continuous surplus of leachate/wash water emanating from the process. As a contingency measure, an access chamber and collection sump will therefore be provided in each of the leachate/wash water tanks, which will facilitate the pumping of the leachate/wash water tanks to the leachate holding tanks which serve the adjacent landfill. The collected effluent will then be safely tankered off-site along with the leachate from the landfill by a licensed specialist contractor to an approved wastewater treatment facility. This arrangement is provided as a contingency measure only, as in general these types of composting facilities are net water users.

In periods of the year when the incoming biowaste will be relatively dry, e.g. in summer, additional water may be required for cleaning purposes, as the process water will not be sufficient for this purpose. Annually, the composting facility is expected to have a net water intake of not more than 1,000 m^3. A contingency water supply of 5m^3 per day maximum will therefore be provided at the facility.

1.1.1.5 *Facility accommodation*

Facility accommodation will be provided in the main site administration building as illustrated on Drawing No. 3369-2422. The canteen, toilet/shower/changing facilities within the site administration building will also be utilised by the site operatives working in the composting facility. The central composting process computer will also be located in the Assistant Facility Managers Office in the administration building. The admin building also includes a storage area for sampling equipment and spare parts of small equipment (e.g. for ventilators, temperature sensors). A control room housing PLC-equipment will be provided in the compost building.

APPENDIX 3.7.1
Leachate Arrangements with Kildare County Council

Kildare County Council
Comhairle Contae Chill Dara

21st June 2007

Water Services

Mr. Garrett Leech
Bórd Na Móna
Leabeg
Tullamore
Co. Offaly

RE: Leachate treatment for Drehid Waste Management Facility

Dear Mr. Leech

I refer to your letter of the 1st May 2007 and our subsequent meeting of the 13th June last regarding the above.

As advised I hereby confirm that Kildare County Council will accept leachate from the above facility at our Wastewater Treatment Plant in Leixlip subject to the following:-

(i) There being available capacity in the Plant
(ii) There being no adverse effect on the performance of the wastewater treatment process at the Plant
(iii) All delivery times and dates of discharge being agreed in advance with the Plant Manager
(iv) Payment of an appropriate fee – scale of charges to be agreed between Bórd Na Móna and Kildare County Council
(v) The Council reserves the right to alter arrangements or withdraw the facility at any time

With regard to (iv) above, as requested, please forward site specific details of projected volumes and characteristics of leachate for years one to three of operation.

Trusting the above to be in order.

I remain

Yours sincerely

M. O'Leary
Director of Services

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14th March 2008

Michael O'Leary
Senior Engineer
Water Services
Kildare County Council
Áras Chill Dara
Devoy Park
Naas
Co. Kildare

Re: Revised Leachate Quantities arising from the Proposed Intensification and Extension of the Drehid Waste Management Facility

Dear Mr. O' Leary,

TOBIN Consulting Engineers are providing professional services to Bord na Móna with regard to the development of the Drehid Waste Management Facility. Hence, this letter is written on behalf of Bord na Móna.

As you are aware, Bord na Móna is currently developing a waste management facility, including a composting facility and a residual landfill, in County Kildare. Correspondence has previously taken place between Bord na Móna and Kildare County Council with respect to the treatment of the leachate generated by the facility, culminating in a letter issued by Kildare County Council on June 21st 2007, confirming acceptance of leachate generated by the Drehid Waste Management Facility at the Leixlip Wastewater Treatment Plant.

Bord na Móna is currently in the process of preparing a proposal for the intensification and extension of the previously permitted engineered residual landfill. The proposal will enable an additional 240,000 tonnes per annum (TPA) of waste (over and above that previously permitted) to be disposed of for 7 years. After 7 years the development will revert back to receiving the permitted 120,000 TPA for the remaining permitted operational life of the landfill.

The proposed intensification and extension of the facility as described above will lead to additional leachate generation over and above the quantities provided to Kildare County Council for the previously permitted facility. Details of the revised estimated

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total leachate quantities are provided in Table 1. The anticipated composition of the leachate is provided in Table 2.

As discussed at a consultation meeting with relevant departments of Kildare County Council, (including Water Services) on January 17th 2007, we wish to secure an outlet for the additional leachate that will be generated as a result of the revised proposal. Hence, Bord na Móna is now seeking confirmation that Kildare County Council will accept the additional leachate generated by the proposed intensification and extension of the facility at the its Leixlip Wastewater Treatment Plant or at another Waste Water Treatment Plant.

Please do not hesitate to contact me should you require any further information with respect to this request.

Yours sincerely

On behalf of Bord na Móna

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Table 1: Estimated Leachate Quantities to the Wastewater Treatment Plant

Year	Leachate Generation Rate	Daily Average Quantity	Average Daily quantity to WWTP (5 day)	No. of Tankers per day @ 23m³ capacity
	(m³/hr.)	(m³/day)	(m³/day)	
2008	0.2	5	7	0.3
2009	0.6	15	21	0.9
2010	1.2	29	40	1.7
2011	1.4	33	46	2.0
2012	1.8	43	61	2.6
2013	1.8	44	62	2.7
2014	1.5	35	50	2.2
2015	2.1	51	71	3.1
2016	2.0	49	68	3.0
2017	1.4	34	48	2.1
2018	1.6	37	52	2.3
2019	0.9	22	31	1.3
2020	1.6	39	54	2.4
2021	1.6	39	55	2.4
2022	1.5	37	51	2.2
2023	1.7	40	56	2.4
2024	1.0	25	35	1.5
2025	1.7	42	58	2.5
2026	1.7	42	59	2.5
2027	1.2	30	42	1.8
2028	1.5	36	50	2.2
2029	1.0	23	33	1.4
2030	0.8	20	28	1.2
2031	0.8	20	28	1.2
2032	0.8	20	28	1.2
2033	0.8	20	28	1.2
2034	0.8	20	28	1.2
2035	0.8	20	28	1.2
2036	0.8	20	28	1.2
2037	0.8	20	28	1.2
2038	0.8	20	28	1.2
2039	0.8	20	28	1.2
2040	0.8	20	28	1.2

Table 2: Leachate Composition as per EPA Landfill Site Design Manual (2000)

Parameter	Units	Mean Value	
		Acetogenic Phase	Methanogenic Phase
pH-value		6.73	7.52
conductivity	µS/cm	16,921	11,502
alkalinity (as $CaCO_3$)	mg/l	7,251	5,376
COD	mg/l	36,817	2,307
BOD_{20}	mg/l	25,108	544
BOD_5	mg/l	18,632	374
TOC	mg/l	12,217	733
Fatty acids (as C)	mg/l	8,197	18
Ammoniacal-N	mg/l	922	889
Nitrate-N	mg/l	1.8	0.86
Nitrite-N	mg/l	0.2	0.17
Sulphate (as SO_4)	mg/l	676	67
Phosphate (as P)	mg/l	5.0	4.3
Chloride	mg/l	1,805	2,074
Sodium	mg/l	1,371	1,480
Magnesium	mg/l	384	250
Potassium	mg/l	1,143	854
Calcium	mg/l	2,241	151
Chromium	mg/l	0.13	0.09
Manganese	mg/l	32.94	0.46
Iron	mg/l	653.8	27.4
Nickel	mg/l	0.42	0.17
Copper	mg/l	.013	0.13
Zinc	mg/l	17.37	1.14
Arsenic	mg/l	0.024	0.034
cadmium	mg/l	0.02	0.015
mercury	mg/l	0.0004	0.0002
Lead	mg/l	0.28	0.20

APPENDIX 3.8.1
EPA Circular Letter

epa
Office of
Environmental
Enforcement

Environmental Protection Agency
Regional Inspectorate, [illegible] Road
Castlebar, County Mayo, Ireland
[illegible]
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Mr Garrett Leech
Bord na Mona plc
Leabeg
Tullamore
County Offaly
RE: Drehid Waste Management Facility

20th June 2007

Ref. - Circular letter to all Landfills

Dear Mr Leech,

I refer to your Waste Licence Reg. No. W0201-01, Drehid Waste Management Facility.

In 1997 and 2000, the Agency published a number of guideline manuals specifically to assist different parties in the operation (Landfill Operational Practices) and design (Landfill Site Design) of landfills in Ireland. Through its role as an enforcement body for all landfills licensed by the Agency, the Office of Environmental Enforcement (OEE) has undertaken a review of the various practices taking place at such facilities. The OEE is of the opinion that some of the strategies outlined in the above named manuals should be revised and/or updated to take into account the changing situations at landfills across the country.

In particular, you will be aware that odours from landfills continue to be the single biggest problem encountered by the OEE at licensed landfills. To date in 2007, the OEE has received over 500 complaints from members of the public in relation to odours from landfills. Many of the odour issues at landfills occur because of poor planning in relation to phasing of cells, inadequate waste deposition methods employed, lack of landfill gas management infrastructure, poor maintenance of gas infrastructure or failing to put in place measures to minimise odours/gas emissions arising from deposited waste (e.g. delays in final capping). With this in mind, the OEE draws your attention to the following key issues and requests that you revise your plans/procedures to take account of them.

Cell Design/Capping

1. Cell sizes should be designed to accept no more than one years waste intake for disposal as specified by the waste licence. In the case where the actual rate of waste acceptance decreases or is less than the licensed annual tonnage the cells should not be operated for a period greater than 15 months from the date of commencement of filling. Existing cells which have already been

constructed and are larger than this requirement should be subdivided to reflect it.

2. The slopes of cells and deposited waste should be engineered in order to provide safe access for maintenance machinery and staff and to provide for the proper application and maintenance of daily/intermediate cover and capping layers (including those in the working face).
3. Cell design should be such so as to allow for progressive final capping of each cell/sub cell.
4. Cells or sub-cells should be final capped within 3 months of the cessation of waste disposal in that cell/sub cell i.e. all barrier layer capping works completed. The application of subsoil and top soil restoration layers of the final capping can follow afterwards provided the barrier layer is adequately protected in the interim.
5. A gas barrier membrane should be incorporated into the barrier layer of the final capping specification and should also be laid on the interphases between filled cells and future cells. The application of the sub-soil/top soil layers to such interphases is not considered necessary by the Agency.
6. Agreement will not be given for waste disposal in future cells unless the Agency is satisfied that that previous cells will be finally capped within 3 months.

Landfill Gas Management

1. A landfill gas management plan should be submitted in conjunction with the phasing/filling plan for each cell/subcell.
2. As a minimum, the Agency considers that active gas management infrastructure should be provided prior to the commencement of waste disposal and should also be provided to match the phased filling of each cell. This infrastructure shall consist of horizontal and/or vertical gas collection and shall be placed at intervals to allow adequate gas collection in each cell. Gas flares and interconnecting pipework should also be operational prior to the commencement of waste disposal.
3. The Agency also considers it necessary that a horizontal gas collection system is provided at the top of side slopes to minimise gas emanating from the leachate collection layer. In this regard, for future cells (or cells under construction) the leachate collection layer on the side slopes shall not exceed 2m from the base of each cell (i.e top of artificial liner)
4. All gas collected should be flared in an enclosed gas flare and/or engine. The use of open flares is only acceptable as an interim measure on a temporary basis and must be agreed with the Agency.
5. The landfill gas flaring/utilisation plant should be designed, managed and operated to ensure the optimum management of gas irrespective of the quality of the gas. The Agency considers that at least one on-site representative for the licensee should have adequate knowledge and training on the operation of the landfill gas management system and balancing of the gas field to maximise landfill gas control. Regular assessment of the operation of the gas management system (e.g. field balancing and control of condensate) should be carried out and records maintained of this. In addition, the Agency considers that an independent assessment of the on-site gas management system should be carried out on an annual basis. This should be reported to the Agency on completion.

6. Consideration should be given to the provision of active landfill gas collection from other potential migration pathways such as leachate collection side slope risers.

Leachate Recirculation

1. Provision shall be made for the commencement of leachate recirculation in lined cells but only when the final capping has been completed in each cell

General

The Agency now requests that, henceforth, the following information should be submitted and agreed with the Agency as part of future submissions related to the construction of any lined cells:

- Specified Engineering Works proposal for construction of the cell basal liner and leachate collection system;
- Phasing/Filling Plan for waste emplacement within the cell;
- Specified Engineering Works proposal for Final Capping of the cell; and,
- Specified Engineering Works proposal for the collection and flaring or utilisation of landfill gas arising from within the cell.

The Agency will require that these items are agreed and established prior to providing permission for the deposition of waste into new cells.

If you require any further clarification in relation to the issues raised in this letter, please contact the local OEE Regional Team Leader.

Yours sincerely,

Mr. Kieran O Brien
Programme Manager
Office of Environmental Enforcement

APPENDIX 3.8.2
Predicted Gas Outputs

Trace Gases

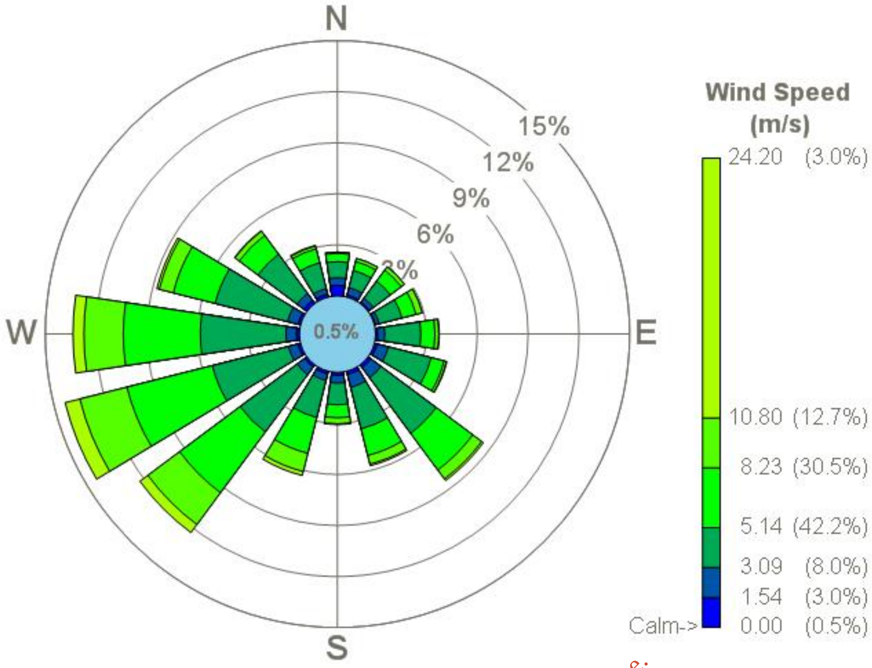
Source Gases	Concentration [mg/m3]
Acetalehyde (ethanal)	LOGUNIFORM(0.25, 18.0)
Benzene	LOGTRIANGULAR(0.012, 6.6, 114.0)
Benzyl chloride (chlorobenzene)	LOGTRIANGULAR(1.00E-04, 1.00E+00, 9.81E+01)
Butadiene (modelled as 1,3-Butadiene)	LOGTRIANGULAR(0.05, 1.45, 20.0)
Butene isomers	LOGTRIANGULAR(0.02, 0.05, 170.0)
Carbon disulphide	LOGTRIANGULAR(0.01, 1.0, 48.0)
Carbon monoxide	SINGLE(1124.5)
Carbon tetrachloride (tetrachloromethane)	LOGTRIANGULAR(0.005, 0.94, 2.5)
Chlorofluorocarbons (CFCs) (Total)	LOGTRIANGULAR(0.06, 102.3, 1230.0)
Chloroform (trichloromethane)	LOGTRIANGULAR(0.04, 1.0, 50.0)
Dichloromethane (methylene chloride)	LOGTRIANGULAR(0.0039, 77.6, 3000.0)
Dimethyl disulphide	LOGTRIANGULAR(0.02, 6.03, 40.0)
Ethyl toluene (all isomers)	LOGUNIFORM(7.00E-04, 3.80E+01)
Ethylene	UNIFORM(13.0, 42.0)
Ethylene dichloride	LOGTRIANGULAR(0.05, 1.41, 302.0)
Formaldehyde (methanal)	LOGTRIANGULAR(0.05, 1.6, 18.0)
Halons	SINGLE(0)
Hexachlorocyclohexane (all isomers)	SINGLE(0)
Hydrochlorofluorocarbons (HCFCs) (Total)	LOGTRIANGULAR(0.02, 128.8, 916.2)
Hydrofluorocarbons (HFCs) (Total)	SINGLE(0)
Methyl chloride (chloromethane)	LOGTRIANGULAR(0.05, 1.0, 1300.0)
Methyl chloroform (1,1,1-Trichloroethane)	LOGTRIANGULAR(0.005, 1.0, 177.0)
PAH (reported as Naphthalene)	LOGTRIANGULAR(0.005, 1.1, 21.0)
para-Dichlorobenzene (modelled as 1,4-Dichlorobenzene)	LOGTRIANGULAR(0.025, 0.0251, 14.8)
Pentane	LOGTRIANGULAR(0.02, 16.0, 613.0)
Pentene (all isomers)	LOGTRIANGULAR(0.05, 1.0, 210.0)
Perfluorocarbons (PFCs) (Total)	SINGLE(0)
Phenol	SINGLE(0)
PM10s	SINGLE(0)
Sulphur reduced (reported as SO2)	LOGUNIFORM(30.8, 430.5)
Tetrachloroethane (modelled as 1,1,2,2-Tetrachloroethane)	LOGTRIANGULAR(0.05, 8.91, 264.0)
Tetrachloroethylene (Tetrachloroethene)	LOGTRIANGULAR(7.00E-04, 2.63E+01, 2.20E+03)
Toluene	LOGTRIANGULAR(0.0022, 195.0, 1700.0)
Total chloride (reported as HCl)	LOGTRIANGULAR(14.7, 79.5, 850.0)
Total fluoride (reported as HF)	LOGTRIANGULAR(5.6, 251.2, 735.0)
Total non-methane volatile organic compounds (NMVOCs)	LOGUNIFORM(0.05, 1473.0)
Trichlorobenzene (all isomers)	SINGLE(0.005)
Trichloroethylene (trichloroethene)	LOGTRIANGULAR(0.012, 14.13, 912.0)
Trimethylbenzene (all isomers)	LOGTRIANGULAR(7.00E-04, 2.51E-02, 1.87E+02)
Vinyl chloride (chloroethene, chloroethylene)	LOGTRIANGULAR(0.019, 8.12, 264.0)
Xylene (all isomers)	LOGTRIANGULAR(4.00E-04, 1.29E+02, 1.10E+03)

Justification:
Default Value

Trace Gas Half-life (years) NORMAL(4.11, 1.56)
Justification:
Default Value

APPENDIX 4.1.3
Meteorological data for Dispersion modelling exercise

Meteorological data examined and used in the Dispersion modelling exercise



Schematic illustrating windrose for meteorological data used for atmospheric dispersion modelling (Dub 03 to Dub 06).

Cumulative wind speed and direction for meteorological data used for atmospheric dispersion modelling (Dub 03 to Dub 06).

Cumulative Wind Speed Categories							
Relative Direction	**> 1.54**	**>3.09**	**>5.14**	**>8.23**	**> 10.80**	**< 10.80**	**Total**
0.0	0.62	0.44	0.95	0.49	0.07	0.00	2.58
22.5	0.13	0.43	1.04	0.54	0.19	0.00	2.34
45.0	0.10	0.28	1.25	0.80	0.24	0.01	2.68
67.5	0.07	0.21	1.39	0.86	0.38	0.01	2.92
90.0	0.13	0.41	2.13	0.84	0.22	0.03	3.76
112.5	0.16	0.68	2.61	0.78	0.15	0.04	4.41
135.0	0.19	0.75	4.06	2.69	0.65	0.12	8.47
157.5	0.20	0.78	2.51	1.61	0.52	0.10	5.72
180.0	0.18	0.45	1.28	0.76	0.35	0.05	3.07
202.5	0.17	0.39	2.25	2.17	1.10	0.24	6.32
225.0	0.16	0.56	4.19	4.45	2.33	0.59	12.28
247.5	0.16	0.58	4.63	5.20	2.86	0.90	14.33
270.0	0.18	0.61	5.06	4.55	2.32	0.65	13.37
292.5	0.15	0.64	4.40	2.55	0.86	0.15	8.75
315.0	0.23	0.50	2.87	1.38	0.31	0.04	5.32
337.5	0.19	0.32	1.57	0.84	0.17	0.05	3.13
Total	3.02	8.03	42.17	30.52	12.73	2.97	99.45
Calms	-	-	-	-	-	-	0.52
Missing	-	-	-	-	-	-	0.03
Total	**-**	**-**	**-**	**-**	**-**	**-**	**100**